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OREGON
ENVIRONMENTAL QUALITY
COMMISSION MEETING
MATERIALS 03/19/1999

DEQ

State of Oregon
Department of
Environmental
Quality

AGENDA

ENVIRONMENTAL QUALITY COMMISSION MEETING

March 19, 1999
DEQ Conference Room 3A
811 S. W. Sixth Avenue
Portland, Oregon

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Notes: Because of the uncertain length of time needed for each agenda item, the Commission may deal with any item at any time in the meeting. If a specific time is indicated for an agenda item, an effort will be made to consider that item as close to that time as possible. However, scheduled times may be modified if agreeable with participants. Anyone wishing to listen to the discussion on any item should arrive at the beginning of the meeting to avoid missing the item of interest.

Public Forum: The Commission will break the meeting at approximately **11:30 a.m.** for the Public Forum if there are people signed up to speak. The Public Forum is an opportunity for citizens to speak to the Commission on environmental issues and concerns not a part of the agenda for this meeting. The public comment period has already closed for the Rule Adoption items and, in accordance with ORS 183.335(13), no comments can be presented to the Commission on those agenda items. Individual presentations will be limited to 5 minutes. The Commission may discontinue this forum after a reasonable time if an exceptionally large number of speakers wish to appear.

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Beginning at 8:30 a.m.

A. **Approval of Minutes**

B. **Approval of Tax Credits**

C. **Action Item**: National Marine Fisheries Request for a Waiver for Total Dissolved Gas for Fish Passage on the Mainstem of the Columbia River

D. †**Rule Adoption**: LRAPA Stationary Source (ACDP) Fee Increases and Asbestos Rule Amendments

E. †**Rule Adoption**: Amend OAR to Adopt New Land Disposal Restrictions (LDR) for Spent Hazardous Waste Potliner and Certain Federal Hazardous Waste Regulations

F-1. **Action Item**: Adoption of Order Clarifying Hazardous Waste Permit Decision for Umatilla Chemical Agent Disposal Facility

F-2. **Informational Item**: Discussion of Future Opportunity for Update and Comment on Development of Carbon Filter Technology

G. **Action Item:** Appeal of Hearing Order Regarding Violation and Assessment of Ci Penalty in the Matter of Staff Jennings, Inc., Case No. UT-NWR-96-274A

H. **Action Item**: Petition for Rulemaking to Regulate Recreational 2-Stroke Marine Engines

I. **Commissioners' Reports**

J. **Director's Report**

Hearings have already been held on the Rule Adoption items and the public comment period has closed. In accordance with ORS 183.335(13), no comments can be presented by any party to either the Commission or the Department on these items at any time during this meeting.

The Commission will have lunch at 12:00 noon. . No Commission business will be discussed.

The Commission has set aside May 6-7, 1999, for their next meeting. It will be held in Portland, Oregon.

Copies of staff reports for individual agenda items are available by contacting the Director's Office of the Department of Environmental Quality, 811 S. W. Sixth Avenue, Portland, Oregon 97204, telephone 229-5301, or toll-free 1-800-452-4011. Please specify the agenda item letter when requesting.

If special physical, language or other accommodations are needed for this meeting, please advise the Director's Office, (503)229-5301 (voice)/(503)229-6993 (TTY) as soon as possible but at least 48 hours in advance of the meeting.

February 25, 1999

Approved_____
Approved with Corrections_X___

Minutes are not final until approved by the EQC

Environmental Quality Commission
Minutes of the Two Hundred and Seventy-Fourth Meeting

January 29, 1999
Regular Meeting

On January 29, 1999 the Environmental Quality Commission met for their regular meeting at DEQ headquarters, 811 SW Sixth, Portland, Oregon 97204. The following Environmental Quality Commission members were present:

Carol Whipple, Chair
Melinda Eden, Vice Chair
Linda McMahan, Member
Tony Van Vliet, Member
Mark Reeve, Member

Also present were Larry Knudsen, Assistant Attorney General, Oregon Department of Justice (DOJ); Langdon Marsh, Director, Department of Environmental Quality (DEQ); and other staff from the Department.

Note: The Staff report presented at this meeting, which contain the Department's recommendations, are on file in the Office of the Director, 811 SW Sixth Avenue, Portland, Oregon 97204. Written material submitted at this meeting is made a part of the record and is on file at the above address. These written materials are incorporated in the minutes of the meeting by reference.

Chair Whipple called the meeting to order at 8:40 a.m.

A. Informational Item: Oregon Bio-Diversity Project of the Defenders of Wildlife

Sara Vickerman and Bruce Taylor, from the Defenders of Wildlife, presented an overview of their Biodiversity Project. The Project was a collaborative effort involving dozens of public and private groups. Funding was in the form of grants from corporate, private and federal sources.

The purpose of the project was to develop a pragmatic statewide strategy to conserve Oregon's native biodiversity. The strategy is intended to reduce the risk of future endangered species designations and give landowners more flexibility in resource management decisions. The Project also sought to establish a process to improve communication among diverse public and private interests, and to help people find common ground in resource management decisions. They compiled the best available information to identify habitats and species that may be at risk.

They identified conservation opportunities where social and economic conditions are most favorable; recommended management actions and policies to assure that representative examples of all of Oregon's habitats are maintained or restored to healthy condition; and engaged a broad spectrum of interested persons in discussions about the future of Oregon's resources by providing high quality and easy to use products. They have established a Biodiversity Information System made up of hundreds of data layers organized into more than 50 different GIS layers. This data is available on CD-ROM. The

Defenders of Wildlife also produced a major document called Oregon's Living Landscape which includes extensive maps and information from their efforts.

G. Informational Item: Community Solutions Team Approach and What it Means for the Department of Environmental Quality

Langdon Marsh introduced the Community Solutions Team (CST) approach. The CST was formed by the Governor to provide advice and agency coordination for quality community development. The CST is comprised of five state agencies: Oregon Economic Development Department, Department of Land Conservation and Development, Oregon Department of Transportation, Department of Housing and Community Services, and DEQ. The Director has participated in twice monthly meetings of the CST agency directors since August 1996. There are now nine regional Community Solutions field teams involving field staff from each of the agencies. The field teams are working collaboratively with state, local and federal partners to find solutions for local community problems. DEQ regional staff work closely as members of the field teams. Examples of projects involving the regional Community Solutions field teams were shared with the Commission. Stephanie Hallock discussed projects in Eastern Region; Neil Mullane gave an overview of projects in the Northwest Region; and Gary Messer presented examples of collaborative work in Western Region. Pete Dalke represents DEQ in the Governor's Community Development Office. This Office provides senior staff support for the CST and the regional field teams. A copy of the Governor's Livability Initiative was distributed to the Commission. The Livability Initiative will provide additional funding for quality community development and continued support for the CST approach, subject to review and approval by the Legislature.

D1. Action Item: Waiver of Spring Creek

The U.S. Fish & Wildlife Service (USFWS) requested a waiver to the state of Oregon's water quality standard for total dissolved gas to allow water to be spilled at Bonneville Dam in an effort to increase juvenile Chinook salmon survivorship released from the Spring Creek National Fish Hatchery.

Gene Foster, Water Quality Division, introduced the subject to the Commissioners. Public testimony on the subject was allowed during the meeting. Jim Greer, Director, and Ron Boyce, staff with Oregon Department of Fish & Wildlife addressed the Commission in support of the waiver request citing treaty and scientific reasons. Ted Strong, Director, Rob Lathrop, Policy, and Tom Bachman, staff of Columbia River Intertribal Fish Commission, addressed the commission in support of the waiver request citing cultural, treaty, and scientific reasons.

Gene Foster representing DEQ and Lee Holburg and Marv Yoshinaka representing USFWS discussed the staff report. The fish raised at the Spring Creek National Fish Hatchery are important for salmon management as seed stock for areas within the Columbia River Basin and may offer protection to threatened and endangered salmonids when in the ocean. Progress is being made in understanding the physical dynamics of total dissolved gas when water is spilled at the dams. The relation between total dissolved gas levels and incidence of gas bubble disease trauma is also better understood. The incidence of gas bubble disease in salmonids examined by the biological monitoring program is similar to the incidence of gas bubble disease for in-river migrating juvenile salmonids. It is believed that spilling water offers a lower risk than passage through turbines by downstream migrating juvenile salmonids. A biological and physical monitoring program would be conducted during the spill event.

Commissioner Van Vliet moved to approve the request with the addendum *including the findings approved by staff*. It was seconded by Commissioner Eden and carried with five "yes" votes.

D2. Informational Item: Report by NMFS on Total Dissolved Gas

Mark Schneider with National Marine Fisheries Service and Margaret Filardo with the Fish Passage Center gave a presentation on the results of the 1998 monitoring and research for total dissolved gas in the Columbia River Basin. The presentation highlighted the type of water year, and the physical and biological monitoring that occurred. Last year's research results were also discussed. A more detailed discussion of the 1998 spill season will occur at the March 19 1999 EQC meeting when the NMFS waiver request is to be addressed.

E. Rule Adoption: Amendments to OAR Chapter 340, Division 52, Review of Plans and Specifications to Exempt Certain Projects from Submittal of Engineering Plans and Specifications

Jan Renfroe, Water Quality Policy and Program Development Manager, gave an overview of the rulemaking process for the proposed engineering plan review exemptions. The proposed amendments would allow for reallocation of resources to other high priority work, consistent with the Department's ongoing strategic planning process. Tom Lucas, Water Quality Rules Coordinator, reviewed the various planning documents associated with planning and constructing municipal and industrial wastewater treatment facilities, the proposed amendments in Division 52, review of plans and specifications, and proposed housekeeping amendments in Division 45, containing regulations pertaining to NPDES and WPCF Permits. Engineering plans would be reviewed directly by exempted municipalities or industries, and the Department would retain statutory responsibility for plan review. Exemptions would be given individually to requesting municipalities and industries only after findings were made that the applicant was capable of performing the reviews.

When asked if gravity sewers, pump stations, and pressure sewers account for everything aside from the wastewater treatment facilities and if so, can one term be used to cover these items, it was decided the term "collection system projects" would be used. When asked about reviews, the Department indicated that collection system project reviews can be performed by outside registered engineers under contract to the municipality but that wastewater treatment facility projects are very complex and require on-going, capable staff in-house to take the project from the planning phase through facility construction.

The Commission asked whether the "history of compliance" criteria for municipalities under 30,000 was discussed and is the criteria purposely open-ended? Staff stated the "history of compliance" was a good indication of staff capability and correlates well with community size. The criteria is purposely open-ended to allow the Department flexibility in the review of applicant qualifications. Concern was expressed that communities under 30,000 may not adequately plan for long-range growth and development. Staff indicated the 20-year planning requirement would be adhered to for all communities.

The Commission asked whether the Department will grant exemptions, and will Department staff assist in facility design with small municipalities that lack adequate funds? Staff responded that for many municipalities, particularly small ones that lack engineering capability, exemptions will not be granted, and they will continue to send in engineering plans for Department review. Regarding wastewater treatment, of the 500 plus domestic sources, exemptions will be limited to the 12 municipalities over 30,000 and perhaps a few others that can qualify. The Department will not assist in design but will provide advice and technical assistance through the review process. Director Marsh asked if the requirement for submittal of facility plans and predesign reports was meant to apply to all municipalities or just to exempted municipalities. The response was that the requirement only applied to exempted municipalities but that non-exempted municipalities would have to send in facility plans and predesign reports as part of the engineering plan review process.

The Commission suggested that the comma in the first line of sections (2), (3) and (4) deleted to improve clarity. Counsel advised to delete.

A motion was made by Commissioner Reeve to adopt the rules as laid out in the staff report with the following changes: In section (1) "gravity sewer projects, pump station projects, and pressure sewer projects" was changed to "collection sewer projects;" and in sections (2), (3) and (4) the comma in the first line was deleted. The motion was seconded by Commissioner Eden and carried with five "yes" votes.

Executive Session

The Commission heard advice from legal counsel on G.A.S.P., et al v. Department of Environmental Quality (Case No. 9708-06159).

After the executive session, the regular meeting was resumed.

G.A.S.P. et al v. Department of Environmental Quality (Case No. 9708-06159)

At the December 11, 1998, EQC meeting staff was directed to come back to the January 1999 meeting with a clarifying order. That was not done because there was a motion for relief filed in the court case that was argued during this interim period and because the staff needed additional time for preparation. Legal counsel, Larry Knudsen, indicated staff would like to recommend a new motion. The staff would recommend the Commission adopt a motion indicating it would address the issue of clarifying the final order in the Umatilla Munitions Incinerator matter as directed by the court in the G.A.S.P. et al v. DEQ case at its meeting scheduled in March 1999. They also recommend the Commission direct the Department to prepare and make available to G.A.S.P. members and interested members of the public by February 16, 1999, a recommended clarifying order. The Department would prepare a notice on behalf of the Commission notifying members of the public that it will accept written comment and only written comment relating to the matter of the clarifying order and that such comments must be received by DEQ on or before March 9, 1999. Commissioner Eden so moved this motion. It was seconded by Commissioner Van Vliet and carried with four "yes" votes. Commissioner Reeve abstained.

B. Informational Item: Report on the Governor's Budget

Helen Lottridge, Management Services Division Administrator, presented an overview of the DEQ portion of the Governor's Budget, and answered questions.

F. Informational Item: Outstanding Resource Waters (ORW) Designations

Mike Llewelyn, Water Quality Administrator, and Avis Newell, Outstanding Resource Water Program Coordinator, presented an update about Outstanding Resource Water Designations and current proposed department policy regarding that designation. Outstanding Resource Water is a water quality classification, that endows a nondegradation standard to the waterbody, and is so designated through rulemaking by the Environmental Quality Commission. The Department has worked with an *ad hoc* work group to develop screening criteria to identify sites with outstanding values. Critical salmonid habitat and the ten sites included in a 1997 petition for ORW status will be evaluated to identify outstanding sites. One policy question not yet answered by the Department and the Work Group, is how the ORW designation differs from the Antidegradation Policy extended to high quality waters. The Department feels it is necessary to review the Antidegradation Policy Implementation, with regard to both point and nonpoint pollution sources, prior to designating specific sites as Outstanding Resource Waters.

Shauna Whidden presented comments indicating Oregon Trout has been involved in the ORW issue for the past several years, first with the Policy Advisory Group that reviewed the initial ORW candidates (1994), then preparing five of the ten petitions for rulemaking (presented in December, 1997), and most recently with the *ad hoc* work group. They feel the ORW designation is an important tool for protecting dwindling salmonid stocks, and are dismayed that DEQ is moving so slowly toward designations.

The Commission had several questions, including whether other parties felt that we were moving slowly, how Oregon ranked compared to other states, and what nature of process might be identified in a designation to protect the water. The Commission feels that it is appropriate for the Department to first work on the Antidegradation Policy as it is both necessary for further work with ORW designations and is currently the most cost effective use of Department time.

G. Action Item: Governor's Water Enhancement Board (GWEB) Delegate from the Environmental Quality Commission

Commissioner Van Vliet made a motion to designate Commissioner Reeve as the GWEB representative from the Commission. The motion was seconded by Commissioner McMahan and carried with five "yes" votes.

C. Approval of Minutes

The following corrections were made to the December 10-11, 1998 minutes: on page three, item C, line six should read "outcome *of the* vote. Commissioner ..."; on page four, item E, line five should read "issue*s are* soil sampling requirement and a waiver provision for this implementation. The Department feels that *the*"; on page four, item F, first line, the word *airshed* should be one word; on page five, item D, first line after the first table, the s needs to be removed from Commissioner Reeve's name; on page nine, item G.A.S.P., the first line should begin "After advice from ..."; on page nine, item K, line three should read "those 20,000 tanks being decommissioned, 5,500 releases of produc*t* were ..."; on page nine, item K, line four, the line should read "been clean*ed* up..."; on page ten, item K, paragraph six, the last line should read "hazardous wastes. The warehouse and *its* owner..."; on page ten, paragraph eight, line three should read "of 1999. In a ..."; and on page ten, paragraph eight, line six should read "any harm resulted to *the environment*. DEQ ..." A motion was made by Commissioner Van Vliet to approve the minutes as corrected. The motion was seconded by Commissioner Reeve and passed with five "yes" votes.

The following corrections were made to the December 30, 1998 minutes: on page two, item 4993, Lamb Weston, line five should read "a motion to approve tax credit application 4993. Commissioner *Eden* seconded..."; on page three, item 5130, Ernest Glaser Farms, the second line should read "Stating that the ~~timing~~ error was staff's not the applicant's error, Commissioner ..." A motion was made by Commissioner Eden to approve the minutes as corrected. Commissioner Van Vliet seconded the motion and it carried with five "yes" votes.

H. Commissioners' Reports

Commissioner Whipple and Commissioner Reeve reported on the last GWEB meeting.

I. Director's Report

DEQ recently completed a review of solid waste disposals at the Ross Island based on a Ross Island Sand & Gravel inventory. DEQ found several disposals that are considered solid waste rather than permitted clean fill. A Notice of Non-compliance was issued on January 22. Review continues on the remainder of the inventory. This work is incorporated within the on-going assessment effort at the island. The Department continues to work with the company, the Port of Portland and the Division of State Lands on current and future assessment and management issues.

A plan to set a long-term framework for assessing and managing contaminated Willamette River sediments in the Portland Harbor area of downtown Portland is underway and on track. DEQ will direct the technical work, assisted by three environmental consulting firms hired last month. The Portland Harbor Group has agreed to fund plan development.

Calapooya and Sutherlin Creeks Watershed project is getting underway, with a cross-media group working to enhance each other's programmatic efforts and involve the community. Drinking water assessment, wastewater treatment assessment, and waste reduction efforts have begun. The technical assistance outreach will begin soon, with a flyer being sent to all known businesses in the area.

The Center for Environmental Equity has filed a petition with US EPA seeking to have EPA withdraw NPDES delegation to DEQ. The petition alleges that DEQ's enforcement program and permit management program contain serious deficiencies which should lead EPA to withdraw delegation. The petition is not specific to any particular situation, nor does the petition identify specific permits of concern. EPA has not indicated how they intend to follow-up on the petition at this point other than stating their intention to discuss the petition with the petitioner and having similar discussions with DEQ.

Director Marsh acknowledged several employees for their outstanding work.

DMV services at DEQ Clean Air Stations are growing in popularity. During 1998, about 41% of customers that tested at DEQ also renewed their registration, compared to 1997 when the percentage for the Portland Metro was 27% and for Rogue Valley was 36%. Even though DEQ has offered the "renew at DEQ" service for 3 years, some of our customers still say how pleased they are to be able to complete their registration business in one stop.

There being no further business, the meeting was adjourned at 3:25 p.m.

State of Oregon
Department of Environmental Quality

Memorandum

Date: March 18, 1999

To: Environmental Quality Commission

From: Langdon Marsh, Director

Subject: Addendum
Agenda Item B, March 19, 1999, EQC Meeting
Tax Credit Applications

This addendum includes corrections to **HMT Technology Corporation's** applications numbered 5041 and 5042.

The applicant provided additional information regarding the allocation of costs and the use of the Emergency Diesel Generator (EDG.) Staff determined that the EDG is considered an essential backup system to this installation. According to OAR 340-016-0070 (2)(l), essential backup systems are eligible costs under the pollution control facility tax credit program.

The entire cost of the EDG was claimed on application 5042. However, staff allocated EDG costs based upon the kilovolt amperage (kva) requirements as follows:

		Allocation of EDG Costs		**% of Use**	**Eligible Costs**
Set System	$ 110,364				
Fuel Tank & Piping	$ 11,092	560 kva	**App 5041** Air	43.75%	$ 165,150
Labor	$ 1,187	45 kva	**App 5042** Water	3.52%	$ 13,271
Fuel Station Wiring	$ 1,468	675 kva	Non-TC Qualifying	52.73%	0
Fuel Distribution	$ 7,138	1280 kva		100.00%	
Generator Wiring	$ 215,545				
Materials	$ 30,691				
Total EDG	$ 377,485				

Application Number 5041

The facility cost increased from $907,319 to $1,072,469. The increase represents 43.75% of the claimed EDG costs or $165,150.

Application Number 5042

The facility cost increased from $5,439,991 to $5,613,466. Staff only reduced the cost of the Emergency Diesel Generator (EDG) by the amount allocated to the facility claimed on application number 5041. ($13,271) However, the facility cost increased to include the cost of the Universal Power Supply (UPS), which is dedicated to the systems claimed in application number 5042. The UPS is an essential backup system in this installation. One hundred percent of the claimed UPS costs are allowed ($149,113.) Staff also corrected a footing error within the table ($11,091)

Recommendation

Please remove applications numbered 5041 and 5042 from the approvals shown in Attachment B to Agenda Item B. Approve application 5041 in the amount of $1,072,469 and approve application number 5042 in the amount of $5,613,466.

Tax Credit Review Report

EQC 03/19/1999

Director's Recommendation: **APPROVE**

Applicant	**HMT Technology Corporation**
Application No.	**5041**
Facility Cost	**$1,072,469**
Percentage Allocable	**100%**
Useful Life	**10 years**

Pollution Control Facility: Air
Final Certification
ORS 468.150 -- 468.190
OAR 340-016-0005 -- 340-016-0050

Applicant Identification

The applicant is a C corporation and is operating a film media substrate manufacturing facility. The applicant's taxpayer identification number is 94-3084354. The applicant's address is:

HMT Technology Corporation
1055 Page Avenue
Fremont, CA 94538

Facility Identification

The certificate will identify the facility as:

Air Pollution Control Facility
1. **Acid Fume Scrubber System**
2. **Nickel Fume Scrubber System**
3. **Ammonia Fume Scrubber System**

The applicant is the owner of the facility located at:

Eugene Division
3590 West 3rd Avenue
Eugene, OR 97402

Technical Information

The Air Pollution Control Facility consists of the following three packed scrubber systems that have been installed to treat the fumes generated during the manufacturing of film media substrates:

1. **Acid Fume Scrubber System.** The acid fume scrubber system treats the acid fumes that are emitted from the aluminum plating line, the stripping line, the wastewater treatment area, and the bulk chemical storage areas. The cost for the 60,000-cfm acid fume scrubber system includes all labor, equipment, and materials necessary to install the Harrington packed scrubber model ECH914-5, two HPCA 6600 exhaust fans, and three Gusher 11032 rcirculation pumps.

2. **Nickel Fume Scrubber System.** The nickel fume scrubber is dedicated to treat the acid fumes that are emitted from nickel plating line. The cost for the 40,000-cfm nickel fume scrubber system includes all labor, equipment, and materials necessary to install the Harrington packed scrubber model ECH99-5, two HPCA 5425 exhaust fans, and two Gusher 11032 recirculation pumps.

3. **Ammonia Fume Scrubber System.** The ammonia fume scrubber treats all the ammonia fumes separately to prevent the formation of the ammonium chloride particulates which caused the opacity problem with the acid scrubber exhaust. The cost for the 2,000-cfm ammonia fume scrubber system includes all labor, equipment, and materials necessary to install the Harrington packed scrubber model ECH23-5, two HPC 1350 exhaust fans, and two Penguin P-3/4A recirculation pumps.

The blowdowns from the the acid and nickel fume scrubbers are pH adjusted and eventually sent to the wastewater treatment facility. The blowdown from the ammonia fume scrubber is sent to the city sewer system.

Eligibility

ORS 468.155 (1)(a)(A)	The **principal purpose** of the **new installation** of all three systems is to control a substantial quantity of air pollution. This is a requirement of the Air Contaminant Discharge Permit (ACDP) #201284 issued on 9/18/96 by Lane Regional Air Pollution Authority.
ORS 468.155 (1)(b)(B)	The disposal or elimination of or redesign to eliminate air contamination sources and the use of air cleaning devices as defined in ORS 468A.005.

Timeliness of Application

The application was submitted within the timing requirements of ORS 468.165 (6).

Application Received	**07/24/1998**
Additional Information Requested	**10/28/1998**
Additional Information Received	**10/28/1998**
Application Substantially Complete	**11/02/1998**
Construction Started	**05/15/1996**
Construction Completed	**01/14/1997**
Facility Placed into Operation	**01/15/1997**

Facility Cost

	Ineligible Costs	Eligible Costs
Initial Application		$1,596,857
Additional Claimed Cost - EDG		$165,150
Allowable Scrubbers (Plating and NH3)		$227,370
Total Cost		$1,989,377
Add Capacity to Plating Area Air Handlers	$ (70,628)	
Epoxy Added to Neutralization Ductwork	$ (45,592)	
Neutralization Process Exhaust Ductwork	$ (551,215)	
Ductwork to Tanks Col. 2.5 b/w Col. 3&4	$ (27,636)	
Scrubber exhaust ducting/FRP	$ (221,837)	
	$ (916,908)	$ (916,908)
Eligible Facility Cost		$1,072,469

mcv 3/18/99

The Emergency Diesel Generator (EDG) is considered an essential backup system in this installation and represents an eligible costs according to OAR 340-016-0070 (2)(l). The entire cost of the EDG was claimed on application 5042. However, 43.75% of the claimed EDG costs may be allocated to the facility claimed on application 5041 as represented in the following table.

Emergency Diesel Generator (EDG)		
Set System	$	110,364
Fuel Tank & Piping	$	11,092
Labor	$	1,187
Fuel Station Wiring	$	1,468
Fuel Distribution	$	7,138
Generator Wiring	$	215,545
Materials	$	30,691
Total EDG	$	377,485

mcv 3/18/99

Allocation of EDG Costs			% of Use	Eligible Costs
560	kva	App 5041 Air	43.75%	$ 165,150
45	kva	App 5042 Water	3.52%	$ 13,271
675	kva	Non-TC Qualifying	52.73%	0
1280	kva		100.00%	

The facility cost exceeds $500,000 therefore, **Symonds, Evans & Larson, CPA, PC** performed an accounting review on behalf of the department.

Facility Cost Allocable to Pollution Control

According to ORS.190 (1), the facility cost exceeds $50,000 and therefore, the following factors were used to determine the percentage of the facility cost allocable to pollution control.

Factor	Applied to This Facility
ORS 468.190(1)(a) Salable or Usable Commodity	No salable or useable commodity.
ORS 468.190(1)(b) Return on Investment	The useful life of the facility used for the return on investment consideration is 20 years. No gross annual revenues were associated with this facility.
ORS 468.190(1)(c) Alternative Methods	No alternative investigated.
ORS 468.190(1)(d) Savings or Increase in Costs	No savings or increase in costs.
ORS 468.190(1)(e) Other Relevant Factors	No other relevant factors.

Considering these factors, the percentage allocable to pollution control is 100%.

Compliance

The applicant states that the facility is in compliance with Department rules and statutes and with EQC orders. The Air Contaminant Discharge Permit (ACDP) #201284 was issued on 9/18/96 by Lane Regional Air Pollution Authority.

Reviewers:
Gordon K.H. Chun, P.E. SJO Consulting Engineers, Inc.
Lois L. Payne, P.E., SJO Consulting Engineers, Inc.
Dave Kauth, AQ-DEQ
Symonds, Evans & Larson, CPA, PC
Maggie Vandehey, MSD-DEQ (3/18/99)

Tax Credit Review Report

EQC 03/99

Director's Recommendation: **APPROVE**

Applicant	**HMT Technology Corporation**
Application No.	**5042**
Facility Cost	**$5,613,466**
Percentage Allocable	**100%**
Useful Life	**10 years**

Pollution Control Facility: Water
Final Certification
ORS 468.150 -- 468.190
OAR 340-016-0005 -- 340-016-0050

Applicant Identification

The applicant is a C corporation operating as operates a thin film media substrate manufacturing facility taking tax relief under taxpayer identification number 94-3084354. The applicant is the owner of the facility. The applicant's address is:

HMT Technology Corporation
Eugene Division
1055 Page Avenue
Fremont, CA 94538

Facility Identification

The certificate will identify the facility as:

A Water Pollution Control Facility including:

1. **Aluminum Treatment System**
2. **Nickel Plating and Polish Treatment System**
3. **Storm Water Control System**

The facility is located at:

3590 West 3rd Avenue
Eugene, OR 97402

Technical Information

The Water Pollution Control Facility consists of the following three systems which were installed to control and treat wastewater streams generated during the manufacture of film media substrates:

Aluminum Treatment System. The aluminum treatment system removes the aluminum and zinc from the grinding coolant, then sodium hydroxide is metered into the wastewater to adjust the pH prior to discharge to the city sewer. Components include:

1. Transfer pumps and piping associated with a previously existing transfer tank.
2. Chemical addition lines.
3. Two treatment tanks and associated pumps and piping.
4. Pumps and piping associated with a previously existing neutralization tank.
5. Two loadout tanks and associated pumps and piping.
6. Five flow meters for chemically controlling the system.
7. Control system readout panel.
8. pH control system, which includes:
   a. pH probes
   b. pH controller
   c. Two chemical metering pumps

Nickel Plating and Polish Treatment System. The waste treatment system came on-line with the nickel-plating and polish operation. The treatment system makes pH adjustments and removes nickel and zinc from the wastewater prior to discharge to the sewer. Wastewater that contains metal is routed to one of three pretreatment systems, which are described below. Metal bearing water is pH adjusted to make metal hydroxide floc. Wastewater that does not contain metal is routed to the neutralization system for pH adjustment.

1. **Coprecipitation Process or Heavy Metal and Polishing Rinse, (HMR)** The coprecipitation system removes zinc from the wastewater generated in numerous production processes, the air scrubber and polish slurry settling sludge. Effluent is stored in the following tank systems for processing:
    a. Acid etch tank (TK-5115) and associated discharge pumps and piping,
    b. Spent nitric acid tank (TK-8803) and associated pumps and piping
    c. Polisher tank (TK-3107) and associated mixer, pumps and piping,
    d. Polisher equalization (decant) tank (TK-3208) and associated pumps and piping,
    e. Zincate tank (TK-6116) and associated pumps and piping,
    f. Feed tank (TK-3309) and associated pumps and piping.

    The effluent is then processed through a system which consists of the following components:
    a. Chelate breaker tank (TK-3410) and associated mixer and piping,
    b. Metal hydroxide maker tank (TK-3511) and associated mixer, pump and piping,
    c. Floc maker tank (TK-3612) and associated piping,
    d. Sedimentation settling tanks (TK-3713, 3714) and associated pumps and piping,
    e. Diversion tank (TK-3715) and associated pumps and piping.

2. **Sludge Dewatering Process** The metal hydroxide that settles out of the wastewater is routed from the settling tanks to the filter presses for dewatering. The dewatered sludge is sent to a disposal facility. The nickel bath sludge from the filter press is sent to a recycling facility for the recovery of nickel. Components include:
    a. Sludge storage tanks (TK-9101 and TK-9102) and associated pumps and piping,
    b. Four filter presses.

3. **Nickel Reduction Process** The nickel reduction system removes the nickel and zinc from process wastewater. Components include:
    a. Nickel feed tank (TK-2102) and associated pumps and piping,
    b. 1st stage batch treatment tanks (TK-2203, TK-2304, TK-2405) and associated pumps, piping, and mixers,
    c. Seven bag filters,
    d. Three cartridge filters,
    e. One 2nd stage treatment tank (TK-7117) and associated pumps, mixers, and piping, and
    f. Decant (Dribble Set) tank (TK-2506) and associated pumps and piping.

4. **Neutralization Process** The neutralization system treats the effluent from the nickel reduction and HMR systems and from several non-metal rinse processes. Installation of this system includes the following components:
    a. Non-metal bearing tank (TK-1101) and associated pumps and piping,
    b. Reclaimed water tank (TK-9104) and associated piping,
    c. Emergency storage tank (TK-9103) and associated piping,
    d. Neutralization tanks (TK-3816, -3817) and associated mixers and piping,
    e. Sample box (TK-3818) and associated piping.

Storm Water Control System The storm water control system prevents the aluminum chips from being swept away in the storm water discharge. A bag filter system on the "diamond turn" operation was modified to control the loss of aluminum chips to storm water and a building was constructed to cover and enclose the aluminum bailing machine, thus preventing scrap aluminum shavings from being carried away into the storm water system. Prior to construction of the building, the aluminum bailer was sitting outside the production building on the asphalt.

Since the installation of the **neutralization system**, the pH of the discharge has ranged from 6.0 to 9.5 which is the range required by their waste discharge permit. Since the installation of the **nickel plating and polish treatment system**, the nickel and zinc concentration discharge is normally less than 0.2 ppm; the maximum allowable concentration imposed by their discharge permit is 0.9 ppm zinc and 1.3 ppm nickel.

Eligibility

ORS 468.155 (1)(a)	The **principal purpose** of this **new structure and equipment** is to control a substantial quantity of water pollution. It is required by the City of Eugene Public Works discharge permit and the applicant's DEQ Stormwater permit.
ORS 468.155 (1)(b)(A)	The control is accomplished by eliminating industrial waste and the use of treatment works for industrial waste as defined in ORS 468B.005.

Timeliness of Application

The application was submitted within the timing requirements of ORS 468.165 (6).

Application Received	**07/24/1998**
Additional Information Requested	**12/17/1998**
Additional Information Received	**01/29/1999**
Application Substantially Complete	**02/17/1999**
Construction Started	**05/06/1996**
Construction Completed	**12/15/1996**
Facility Placed into Operation	**12/16/1996**

Facility Cost

		Ineligible Costs	Eligible Costs
Initial Application			$6,220,264
Allowable Costs:	Filter Presses (2)		$42,131
	Aluminum Tank		$1,336
	Total Cost		$6,263,731
Vault Sump Pumps (2)		($5,600)	
Insulation on Chemical Feed Tank (not included in final design)		($3,040)	
Exhaust Fan in Nickel Reduction System (venting hydrogen)		($6,000)	
Exhaust Ductwork (for above fan)		($2,840)	
Nitric Acid Storage Tanks (3 claimed at $55,080 - 1 eligible)		($36,720)	
Recirculation Pumps (4) for used and fresh nitric acid to plating line		($8,000)	
Aluminum & Duster Collector		($49,913)	
Emergency Diesel Generator		($364,214)	
Water Chemical Treatment System (Cooling Tower Treatment)		($20,622)	
Coolant Farm Safety Modifications		($40,296)	
Fire Sprinklers		($17,441)	
Safety Equipment		($10,802)	
Chart Plotter & Pens (Monitoring)		($1,739)	
HMT Internal Capitalized Interest		($83,038)	
	Total	$ (650,265)	$ (650,265)
Eligible Facility Cost			$5,613,466

mcv 3/18/99

The Emergency Diesel Generator (EDG) and the Universal Power Supply (UPS) are both considered essential backup systems in this installation and are eligible costs according to OAR 340-016-0070 (2)(l). One hundred percent of the claimed UPS costs are allowed. However, only 3.52% of the claimed EDG costs may be allocated to the facility claimed on application 5042 as determined by the following table.

Emergency Diesel Generator (EDG)

Set System	$	110,364
Fuel Tank & Piping	$	11,092
Labor	$	1,187
Fuel Station Wiring	$	1,468
Fuel Distribution	$	7,138
Generator Wiring	$	215,545
Materials	$	30,691
Total EDG	$	377,485

Allocation of EDG Costs			**% of Use**	**Eligible Costs**
560	kva	App 5041 Air	43.75%	$ 165,150
45	kva	App 5042 Water	3.52%	$ 13,271
675	kva	Non-TC Qualifying	52.73%	0
1280	kva		100.00%	

mcv 3/18/99

The facility cost exceeds $500,000 therefore, **Symonds, Evans & Larson, P.C.** performed an accounting review on behalf of the department. Coopers & Lybrand L.L.P. (now Price-Waterhouse Coopers) provided the certified public accountant's statement on behalf of HMT Technology Corporation.

Facility Cost Allocable to Pollution Control

According to ORS.190 (1), the facility cost exceeds $50,000 and therefore, the following factors were used to determine the percentage of the facility cost allocable to pollution control.

Factor	Applied to This Facility
ORS 468.190(1)(a) Salable or Usable Commodity	The waste recovered in the filter presses #1 & 2 is a nickel and zinc hydroxide. The waste from press #4 has a low content of nickel and zinc sulfide. These wastes are hauled away as hazardous waste at a cost to HMT. The waste recovered in press #3 is a nickel-rich solid contaminated with treatment chemicals which is recycled and resulted in $2271 earned in 1998.
ORS 468.190(1)(b) Return on Investment	The useful life of the facility used for the return on investment consideration is 20 years. No gross annual revenues were associated with this facility.

ORS 468.190(1)(c) Alternative Methods	**Aluminum Treatment** Complete chemical dissolution of the aluminum fines with subsequent precipitation was considered but would have required more facility space than was available. Micro filtration was considered but was not expected to be reliable enough to keep the plant in operation. **Nickel Plating and Polish Treatment** To improve the treatment of the plating, waste ultra violet light (UV) oxidation and ion exchange was considered but found cost prohibitive. Ion exchange was also considered but determined less effective.
ORS 468.190(1)(d) Savings or Increase in Costs	Operations costs increase as a result of the pretreatment systems.
ORS 468.190(1)(e) Other Relevant Factors	No other relevant factors.

Considering these factors, the percentage allocable to pollution control is 100%.

Compliance

The applicant states that the facility is in compliance with Department rules and statutes. General Permit NPDES Stormwater Discharge Permit 1200Z issued July 22, 1997. The applicants Wastewater Discharge Permit H-100E is issued by Public Works, Wastewater Division, City of Eugene and became effective 12/13/96.

Reviewers: Gordon K.H. Chun, P.E. SJO Consulting Engineers, Inc
Lois L. Payne, P.E. SJO Consulting Engineers, Inc.
Dennis Cartier, Associate, SJO Consulting Engineers, Inc.
Renato Dulay, DEQ
Maggie Vandehey, MSD-DEQ 3/18/99

Commission Action on Tax Credit Applications
March 19, 1999

					Attachment B		Attachment C		Addendum	
App.No.	Applicant	Certified Cost	Percentage		Recommend	Commission Action	Recommend	Commission Action	Recommend	Commission Action
4751	PGE	$759,299	100%		Approve					
4881	PGE	$18,576	100%		Approve					
5041	HMT Technology Corp.	$1,072,469	100%		Remove				Approve	
5042	HMT Technology Corp.	$5,613,466	100%		Remove				Approve	
5046	Thomas Joseph, Inc.	$66,700	NA		Approve					
5053	Wellons, Inc.	$294,745	100%		Approve					
5080	Morrow Co. Grain Growers	$33,014	100%		Approve					
5082	Morrow Co. Grain Growers	$29,697	100%		Approve					
5107	Russell Oil Company	$13,724	100%		Approve					
5108	Russell Oil Company	$5,300	100%		Approve					
5113	United Disposal Service Inc.	$42,213	100%		Approve					
5117	Capitol Recycling & Disposal, Inc.	$20,709	100%		Approve					
5119	Freres Lumber Co., Inc.	$27,962	100%				Deny			
5120	United Disposal Service Inc.	$8,814	100%		Approve					
5122	McKern's Texaco Food Mart	$92,423	94%		Approve					
5131	Carter's Service Stations, Inc.	$83,968	89%		Approve					
5145	Dean McKay Farms, Inc.	$136,817	75%		Approve					
5146	Mark McKay Farms, Inc.	$173,719	84%		Approve					

Environmental Quality Commission

☐ Rule Adoption Item
X Action Item
☐ Information Item

Agenda Item B
March 19, 1999, Meeting

Title: Approval and Denial of Tax Credit Applications

Summary: Staff recommends the following actions regarding tax credits:

	Certified Cost	Value
Approve (17)		
Pollution Control Facility Tax Credit (16)		
Air (2 applications)	$1,202,064	$601,032
Field Burning (2 applications)	$310,536	$124,268
Solid Waste (3 applications)	$71,736	$35,868
USTs (4 applications)	$189,894	$87,860
Water (5 applications)	$6,280,577	$3,140,289
Pollution Prevention Tax Credit (1)		
Perc (1 application)	$66,700	$33,350
17 Approvals	$8,121,508	$4,022,667
Deny (1)		
Pollution Control Facility Tax Credit		
Air (1 application)	$27,962	$13,981

Approve issuance of tax credit certificates for the applications presented in Attachment B. Deny issuance of tax credit certificate for the application presented in Attachment D.

Margaret C. Vandehey
Report Author

Helen Lottridge
Division Administrator

Director

February 26, 1999

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†Accommodations for disabilities are available upon request by contacting the Public Affairs Office at (503)

State of Oregon
Department of Environmental Quality **Memorandum**

Date: February 26, 1999

To: Environmental Quality Commission

From: Langdon Marsh, Director

Subject: Agenda Item B, March 19, 1999, EQC Meeting
Tax Credit Applications

Statement of the Need for Action

This staff report presents the staff analysis of pollution control facility and pollution prevention tax credit applications and the Department's recommendation for Commission action on these applications.

- ☐ All applications are summarized in Attachment A of this staff report.
- ☐ Applications recommended for Approval are presented in detail in Attachment B.
- ☐ The application recommended for denial is presented in Attachment C.
- ☐ Advice regarding EQC Tax Credit Monitoring Authority is presented in Attachment D.

There are no policy issues regarding the approval or denial of tax credits presented in the staff report.

Tidewater Barge Line, Inc.'s Postponement

The two Tidewater Barge Line, Inc. applications (4965 and 4959) postponed from the Commission meeting on December 11, 1998, was scheduled to return to the Commission in the first quarter of 1999. Presentation of these two applications has been postponed until the second quarter of 1999 at staff's request with agreement from the applicant.

Tidewater Barge Line, Inc. submitted the applications for two of their petroleum barges, *The Prospector* and *The Tri-Cities Voyager,* each claiming double hull construction. In December, David Fillippi of Stoel Rives, LLP, attorney for Tidewater Barge Lines, Inc., requested that the two denials be postponed until the Oregon Court of Appeal made a ruling having to do with procedural issues in the Commission's denial of the double-hulling of another barge (application #4417.) Arguments were presented on June 4, 1998. The court's ruling is expected in the near future.

Conclusions

The recommendations for action on the attached applications are consistent with statutory provisions and administrative rules related to the pollution control, pollution prevention and reclaimed plastic product tax credit programs.

Recommendation for Commission Action

The Department recommends the Commission approve certification for the tax credit applications as presented in Attachment B of the Department's Staff Report.

The Department recommends the Commission deny the application presented in Attachment D of the Department's Staff Report.

Intended Follow-up Actions

Notify applicants of Environmental Quality Commission actions. Notify Department of Revenue of Issued, Transferred or Revoked certificates. Transmit electronic files to Department of Revenue.

Attachments

A. Summary
B. Approvals
C. Denials
D. Advice – EQC Monitoring Authority

Reference Documents (available upon request)

1. ORS 468.150 through 468.190.
2. OAR 340-16-100 through 340-16-125.
3. OAR 340-16-005 through 340-16-050.

Approved:

Section: ____________________

Division: Helen Lottridge

Report Prepared by: Margaret Vandehey
Phone: (503) 229-6878
Date Prepared: February 26, 1999

Attachment A

Summary

Application Summary

Application Number	Applicant	Description of Facility	Facility Cost	Percent Allocable	Possible Tax Benefit

Approve

Pollution Control Facility Tax Credit

Air

Application Number	Applicant	Description of Facility	Facility Cost	Percent Allocable	Possible Tax Benefit
5041	HMT Technology Corp.	Air Pollution Control Facility 1) Acid Fume Scrubber system, 2) Nickel Fume Scrubber System, 3) Amonia Fume Scrubber System	$907,319	100%	$453,660
5053	Wellons, Inc.	An electrostatic precipitator particulate removal and monitoring system.	$294,745	100%	$147,373
Air (2 applications)			**$1,202,064**		**$601,032**

Field Burning

Application Number	Applicant	Description of Facility	Facility Cost	Percent Allocable	Possible Tax Benefit
5145	Dean McKay Farms, Inc.	A John Deere 7210 tractor, baler, Tilling - Concomly, Rear's Flail, Tilling-Kock Place	$136,817	75%	$51,306
5146	Mark McKay Farms, Inc.	A storage shed, a John Deere tractor, Tilling-Waconda, Northwest Tiller, Disc Ripper, and John Deere Ripper.	$173,719	84%	$72,962
Field Burning (2 applications)			**$310,536**		**$155,268**

Solid Waste

Application Number	Applicant	Description of Facility	Facility Cost	Percent Allocable	Possible Tax Benefit
5113	United Disposal Service Inc.	Five 20-yd SC style drop boxes, serial numbers 10610 through 10614. Ten 30-yd SC style drop boxes, serial numbers 10595 through 10604.	$42,213	100%	$21,106
5117	Capitol Recycling & Disposal, Inc.	Twenty 3-yd front load slant top recycling containers with lids. Twenty 6-yd front load cathedral-style recycling containers with comp lids.	$20,709	100%	$10,355
5120	United Disposal Service Inc.	Twenty 4-yd front load cardboard containers with lids and casters. Serial numbers #154646 through #154664.	$8,814	100%	$4,407
Solid Waste (3 applications)			**$71,736**		**$35,868**

Application Number	Applicant	Description of Facility	Facility Cost	Percent Allocable	Possible Tax Benefit
USTs					
5107	Russell Oil Company	Upgrade facility to meet federal and state regulations.	$13,724	100%	$6,862
5108	Russell Oil Company	Upgrade facility to meet federal and state regulations.	$5,300	100%	$2,650
5122	McKern's Texaco Food Mart	Upgrade facility to meet state and federal requirements.	$92,423	94%	$43,439
5131	Carter's Service Stations, Inc.	Underground storage tank upgrade.	$78,448	89%	$34,909
USTs (4 applications)			**$189,894**		**$87,860**
Water					
4751	Portland General Electric Company	Six oil/mist eliminators	$759,299	100%	$379,650
4881	Portland General Electric Company	Drainage piping within the concrete secondary containment sump.	$18,576	100%	$9,288
5042	HMT Technology Corp.	Water Pollution Control Facility 1) Aluminum Treatment System, 2) Nickel Plating and Polish Treatment System, 3) Storm water Control System	$5,439,991	100%	$2,719,996
5080	Morrow County Grain Growers, Inc.	Installation of a walled containment facility to contain any possible spills of liquid fertilizer and chemicals.	$33,014	100%	$16,507
5081	Morrow County Grain Growers, Inc.	A Karcher ASA-600 serial #10229 closed loop waste water filtration System.	$29,697	100%	$14,849
Water (5 applications)			**$6,280,577**		**$3,140,289**

Approve 16 Pollution Control Facility Tax Credit Applications

			$8,054,808		**$3,989,317**

Pollution Prevention Tax Credit

Application Number	Applicant	Description of Facility	Facility Cost	Percent Allocable	Possible Tax Benefit
Perc					
5046	Thomas Joseph, Inc.	Installation of a new 5th generation multimatic, non-venting, dry-to-dry perchloroethylene dry-cleaning machine that reduces consumption to less than 140 gallons.	$66,700		$33,350

Approve 17 applications

			$8,121,508		**$4,022,667**

Application Number	Applicant	Description of Facility	Facility Cost	Percent Allocable	Possible Tax Benefit

Deny

Pollution Control Facility Tax Credit

Air

Application Number	Applicant	Description of Facility	Facility Cost	Percent Allocable	Possible Tax Benefit
5119	Freres Lumber Co., Inc.	Installation of a negative air system to evacuate plytrim from the trimmsaw and saw dust from a flying cut-off saw and discharge onto an existing drag chain conveyor.	$27,962	100%	$13,981

Deny 1 Application	**$27,962**		**$13,981**

Attachment B

Approvals

Tax Credit Review Report

EQC 03/19/99

Director's Recommendation:	**APPROVE**
Applicant	**Portland General Electric Company**
Application No.	**4751**
Facility Cost	**$759,299**
Percentage Allocable	**100%**
Useful Life	**10 years**

Pollution Control Facility Tax Credit: Water
Final Certification
ORS 468.150 -- 468.190
OAR 340-016-0005 -- 340-016-0050

Applicant Identification

The applicant is a C Corporation who is operating as a supplier of electrical energy. The applicant's taxpayer identification number is 93-0256820 and their address is:

121 SW Salmon St
1WTC-04-02
Portland, OR 97204

Facility Identification

The certificate will identify the facility as:

Six oil/mist eliminators

The applicant is the owner of the facility located at:

80998 Kallunki Road
Clatskanie, OR

Technical Information

The facility consists of six Oil Mist Eliminators (OME) which are used to capture the oil mist from the generator bearings of each gas turbine. The system operates under a vacuum. A 15 hp fan pulls the oil/air stream through 8-inch piping and then through a set of filters. The filter media captures the oil droplets and the air passes through and out an exhaust pipe. The oil drains back to the main lube reservoir.

Eligibility

ORS 468.155 (1)(a)	The **sole purpose** of this **new device** is to prevent, control or reduce a substantial quantity of water pollution.
OAR 360-16-025 (2)(g)	Installation or construction of facilities which will be used to **prevent** spills or unauthorized releases.

Timeliness of Application

The application was submitted within the timing requirements of ORS 468.165 (6).

Application Received	**04/11/1997**
Application Substantially Complete	**10/15/1998**
Construction Started	**06/15/1993**
Construction Completed	**08/14/1995**
Facility Placed into Operation	**08/14/1995**

Facility Cost

Facility Cost		**$ 759,299**
Labor	$442,556	
Construction Overhead	$183,036	
Ineligible Costs		
Eligible Facility Cost		**$ 759,299**

The facility cost exceeds $500,000; therefore, **Symonds, Evans & Larson, P.C.** performed an accounting review on behalf of the Department. The internal labor and labor-related charges included in the claimed facility cost appear to be reported at actual cost. Since this application was recveived prior to the effective date of the 1998 rule, construction overhead is claimed at a reasonable rate.

Facility Cost Allocable to Pollution Control

According to ORS.190 (1), the following factors were used to determine the percentage of the facility cost allocable to pollution control.

Factor	Applied to This Facility
ORS 468.190(1)(a) Salable or Usable Commodity	No salable or useable commodity.
ORS 468.190(1)(b) Return on Investment	The useful life of the facility used for the return on investment consideration is 20 years. No gross annual revenues associated with this facility.
ORS 468.190(1)(c) Alternative Methods	No alternatives were investigated, however different vendors were compared.
ORS 468.190(1)(d) Savings or Increase in Costs	No savings or increase in costs.
ORS 468.190(1)(e) Other Relevant Factors	No other relevant factors.

Considering these factors, the percentage allocable to pollution control is 100%.

Compliance

The applicant states that the facility is in compliance with Department rules and statutes and with EQC orders. DEQ Air Permit 05-2520 has been issued to the PGE Beaver Generating Plant.

Reviewers: Lois L. Payne, P.E., SJO Consulting Engineers, Inc.
Dennis Cartier, Associate, SJO Consulting Engineers, Inc.
Symonds, Evans & Larson, PC
Maggie Vandehey, DEQ

Tax Credit Review Report

EQC 03/19/1998

Director's Recommendation: **APPROVE**

Applicant	**Portland General Electric Company**
Application No.	**4881**
Facility Cost	**$18,576**
Percentage Allocable	**100%**
Useful Life	**10 years**

Pollution Control Facility Tax Credit: Water
Final Certification
ORS 468.150 -- 468.190
OAR 340-016-0005 -- 340-016-0050

Applicant Identification

The applicant is a C corporation and is operating as a provider of electical services. The applicant's taxpayer identification number is 93-0256820 and their address is:

121 SW Salmon Street
Portland, OR 97204

Facility Identification

The certificate will identify the facility as:

Drainage piping system of the secondary oil spill containment

The applicant is the owner of the facility located at:

Round Butte Plant
726 SW Lower Bend Road
Madras, OR

Technical Information

The claimed facility consists of piping system for the secondary oil spill containment system. New pipes were installed down the side of the concrete sump to route the drainage from the existing inlets down to the low water level in the sump. This prevents the turbulent mixing of drainage in the sump that could result to pumping of entrained oil and be discharged to the Deschutes River.

Eligibility

ORS 468.155 (1)(a)	The **principal purpose** of the **new system** is to prevent a substantial quantity of water pollution. The requirement is imposed by the federal Environmental Protection Agency per 40 CFR Part 112 (Oil Pollution Prevention).
ORS 468.155 (1)(b)(A)	The prevention is accomplished with the use of treatment works for industrial waste as defined in ORS 468B.005.

Timeliness of Application

The application was submitted within the timing requirements of ORS 468.165 (6).

Application Received	**11/24/1997**
Application Substantially Complete	**04/28/1998**
Construction Started	**01/02/1997**
Construction Completed	**02/28/1997**
Facility Placed into Operation	**02/28/1997**

Facility Cost

PGE Labor	$12,098.53
Materials	1300.51
Overheads	5,177.00
Claimed Facility Cost	**$18,576.04**
Eligible Facility Cost	**$18,576.00**

An invoice substantiated the cost of materials. A job cost summary substantiated the payroll costs and the construction overhead. The construction overhead amount is 42% of the cost of direct labor. Since the claimed facility cost does not exceed $50,000, an independent accounting statement was not required.

Facility Cost Allocable to Pollution Control

According to ORS.190 (3), the only factor used to determine the percentage of the facility cost allocable to pollution control was the percentage of time the facility is used for pollution control. The percentage of time the facility was used for pollution control and therefore the percentage allocable to pollution control is 100%.

Compliance

The facility is in compliance with the requirements imposed by the federal Environmental Protection Agency.

Reviewers: R.C. Dulay
Maggie Vandehey

Tax Credit Review Report

EQC 03/19/1999

Director's Recommendation: **APPROVE**

Applicant	**HMT Technology Corporation**
Application No.	**5041**
Facility Cost	**$907,319**
Percentage Allocable	**100%**
Useful Life	**10 years**

Pollution Control Facility: Air
Final Certification
ORS 468.150 -- 468.190
OAR 340-016-0005 -- 340-016-0050

Applicant Identification

The applicant is a C corporation and is operating a film media substrate manufacturing facility. The applicant's taxpayer identification number is 94-3084354. The applicant's address is:

HMT Technology Corporation
1055 Page Avenue
Fremont, CA 94538

Facility Identification

The certificate will identify the facility as:

Air Pollution Control Facility

1. **Acid Fume Scrubber System**
2. **Nickel Fume Scrubber System**
3. **Amonia Fume Scrubber System**

The applicant is the owner of the facility located at:

Eugene Division
3590 West 3rd Avenue
Eugene, OR 97402

Technical Information

The Air Pollution Control Facility consists of the following three packed scrubber systems that have been installed to treat the fumes generated during the manufacturing of film media substrates:

1. **Acid Fume Scrubber System.** The acid fume scrubber system treats the acid fumes that are emitted from the aluminum plating line, the stripping line, the wastewater treatment area, and the bulk chemical storage areas. The cost for the 60,000-cfm acid fume scrubber system includes all labor, equipment, and materials necessary to install the Harrington packed scrubber model ECH914-5, <u>two HPCA 6600 exhaust fans</u>, and three Gusher 11032 rcirculation pumps.

2. **Nickel Fume Scrubber System.** The nickel fume scrubber is dedicated to treat the acid fumes that are emitted from nickel plating line. The cost for the 40,000-cfm nickel fume scrubber system includes all labor, equipment, and materials necessary to install the Harrington packed scrubber model ECH99-5, <u>two HPCA 5425 exhaust fans</u>, and two Gusher 11032 recirculation

pumps.

3. **Ammonia Fume Scrubber System.** The ammonia fume scrubber treats all the ammonia fumes separately to prevent the formation of the ammonium chloride particulates which caused the opacity problem with the acid scrubber exhaust. The cost for the 2,000-cfm ammonia fume scrubber system includes all labor, equipment, and materials necessary to install the Harrington packed scrubber model ECH23-5, two HPC 1350 exhaust fans, and two Penguin P-3/4A recirculation pumps.

The blowdowns from the the acid and nickel fume scrubbers are pH adjusted and eventually sent to the wastewater treatment facility. The blowdown from the ammonia fume scrubber is sent to the city sewer system.

Eligibility

ORS 468.155 (1)(a)(A)	The **principal purpose** of the **new installation** of all three systems is to control a substantial quantity of air pollution. This is a requirement of the Air Contaminant Discharge Permit (ACDP) #201284 issued on 9/18/96 by Lane Regional Air Pollution Authority.
ORS 468.155 (1)(b)(B)	The disposal or elimination of or redesign to eliminate air contamination sources and the use of air cleaning devices as defined in ORS 468A.005.

Timeliness of Application

The application was submitted within the timing requirements of ORS 468.165 (6).

Application Received	**07/24/1998**
Additional Information Requested	**10/28/1998**
Additional Information Received	**10/28/1998**
Application Substantially Complete	**11/02/1998**
Construction Started	**05/15/1996**
Construction Completed	**01/14/1997**
Facility Placed into Operation	**01/15/1997**

Facility Cost

Facility Cost	**$ 1,596,857**
Additional allowable costs	
Scrubbers (Plating and NH3)	$ 227,370
Ineligible Costs	
Add Capacity to Plating Area Air Handlers	($ 70,628)
Epoxy Added to Neutralization Ductwork	($ 45,592)
Neutralization Process Exhaust Ductwork	($ 551,215)
Ductwork to Tanks Col. 2.5 b/w Col. 3&4	($ 27,636)
Scrubber exhaust ducting/FRP	($ 916,908)
Eligible Facility Cost	**$ 907,319**

The ineligible items listed above do not "prevent, control, or reduce pollution".

The facility cost exceeds $500,000 therefore, **Symonds, Evans & Larson, CPA, PC** performed an accounting review on behalf of the department.

Facility Cost Allocable to Pollution Control

According to ORS.190 (1), the facility cost exceeds $50,000 and therefore, the following factors were used to determine the percentage of the facility cost allocable to pollution control.

Factor	Applied to This Facility
ORS 468.190(1)(a) Salable or Usable Commodity	No salable or useable commodity.
ORS 468.190(1)(b) Return on Investment	The useful life of the facility used for the return on investment consideration is 20 years. No gross annual revenues were associated with this facility.
ORS 468.190(1)(c) Alternative Methods	No alternative investigated.
ORS 468.190(1)(d) Savings or Increase in Costs	No savings or increase in costs.
ORS 468.190(1)(e) Other Relevant Factors	No other relevant factors.

Considering these factors, the percentage allocable to pollution control is 100%.

Compliance

The applicant states that the facility is in compliance with Department rules and statutes and with EQC orders. The Air Contaminant Discharge Permit (ACDP) #201284 was issued on 9/18/96 by Lane Regional Air Pollution Authority.

Reviewers:
Gordon K.H. Chun, P.E. SJO Consulting Engineers, Inc.
Lois L. Payne, P.E., SJO Consulting Engineers, Inc.
Dave Kauth, AQ-DEQ
Symonds, Evans & Larson, CPA, PC

Tax Credit Review Report

EQC 06/99

Director's Recommendation:	**APPROVE**
Applicant	**HMT Technology Corporation**
Application No.	**5042**
Facility Cost	**$5,439,991**
Percentage Allocable	**100%**
Useful Life	**10 years**

Pollution Control Facility: Water
Final Certification
ORS 468.150 -- 468.190
OAR 340-016-0005 -- 340-016-0050

Applicant Identification

The applicant is a C corporation operating as operates a thin film media substrate manufacturing facility taking tax relief under taxpayer identification number 94-3084354. The applicant is the owner of the facility. The applicant's address is:

HMT Technology Corporation
Eugene Division
1055 Page Avenue
Fremont, CA 94538

Facility Identification

The certificate will identify the facility as:

A Water Pollution Control Facility including:

1. **Aluminum Treatment System**
2. **Nickel Plating and Polish Treatment System**
3. **Storm Water Control System**

The facility is located at:

3590 West 3rd Avenue
Eugene, OR 97402

Technical Information

The Water Pollution Control Facility consists of the following three systems which were installed to control and treat wastewater streams generated during the manufacture of film media substrates:

Aluminum Treatment System. The aluminum treatment system removes the aluminum and zinc from the grinding coolant, then sodium hydroxide is metered into the wastewater to adjust the pH prior to discharge to the city sewer. Components include:

1. Transfer pumps and piping associated with a previously existing transfer tank.
2. Chemical addition lines.
3. Two treatment tanks and associated pumps and piping.
4. Pumps and piping associated with a previously existing neutralization tank.
5. Two loadout tanks and associated pumps and piping.
6. Five flow meters for chemically controlling the system.
7. Control system readout panel.
8. pH control system, which includes:
    a. pH probes
    b. pH controller
    c. Two chemical metering pumps

Nickel Plating and Polish Treatment System. The waste treatment system came on-line with the nickel-plating and polish operation. The treatment system makes pH adjustments and removes nickel and zinc from the wastewater prior to discharge to the sewer. Wastewater that contains metal is routed to one of three pretreatment systems which are described below. Metal bearing water is pH adjusted to make metal hydroxide floc. Wastewater that does not contain metal is routed to the neutralization system for pH adjustment.

1. **Coprecipitation Process or Heavy Metal and Polishing Rinse, (HMR)** The coprecipitation system removes zinc from the wastewater generated in numerous production processes, the air scrubber and polish slurry settling sludge. Effluent is stored in the following tank systems for processing:
    a. Acid etch tank (TK-5115) and associated discharge pumps and piping,
    b. Spent nitric acid tank (TK-8803) and associated pumps and piping
    c. Polisher tank (TK-3107) and associated mixer, pumps and piping,
    d. Polisher equalization (decant) tank (TK-3208) and associated pumps and piping,
    e. Zincate tank (TK-6116) and associated pumps and piping,
    f. Feed tank (TK-3309) and associated pumps and piping.

    The effluent is then processed through a system which consists of the following components:
    a. Chelate breaker tank (TK-3410) and associated mixer and piping,
    b. Metal hydroxide maker tank (TK-3511) and associated mixer, pump and piping,
    c. Floc maker tank (TK-3612) and associated piping,
    d. Sedimentation settling tanks (TK-3713, 3714) and associated pumps and piping,
    e. Diversion tank (TK-3715) and associated pumps and piping.

2. **Sludge Dewatering Process** The metal hydroxide which settles out of the wastewater is routed from the settling tanks to the filter presses for dewatering. The dewatered sludge is sent to a disposal facility. The nickel bath sludge from the filter press is sent to a recycling facility for the recovery of nickel. Components include:
    a. Sludge storage tanks (TK-9101 and TK-9102) and associated pumps and piping,
    b. Four filter presses.

3. **Nickel Reduction Process** The nickel reduction system removes the nickel and zinc from process wastewater. Components include:
    a. Nickel feed tank (TK-2102) and associated pumps and piping,
    b. 1st stage batch treatment tanks (TK-2203, TK-2304, TK-2405) and associated pumps, piping, and mixers,
    c. Seven bag filters,
    d. Three cartridge filters,
    e. One 2nd stage treatment tank (TK-7117) and associated pumps, mixers, and piping, and
    f. Decant (Dribble Set) tank (TK-2506) and associated pumps and piping.

4. **Neutralization Process** The neutralization system treats the effluent from the nickel reduction and HMR systems and from several non-metal rinse processes. Installation of this system includes the following components:
    a. Non-metal bearing tank (TK-1101) and associated pumps and piping,
    b. Reclaimed water tank (TK-9104) and associated piping,
    c. Emergency storage tank (TK-9103) and associated piping,
    d. Neutralization tanks (TK-3816, -3817) and associated mixers and piping,
    e. Sample box (TK-3818) and associated piping.

Storm Water Control System The storm water control system prevents the aluminum chips from being swept away in the storm water discharge. A bag filter system on the "diamond turn" operation was modified to control the loss of aluminum chips to storm water and a building was constructed to cover and enclose the aluminum bailing machine, thus preventing scrap aluminum shavings from being carried away into the storm water system. Prior to construction of the building, the aluminum bailer was sitting outside the production building on the asphalt.

Since the installation of the **neutralization system**, the pH of the discharge has ranged from 6.0 to 9.5 which is the range required by their waste discharge permit. Since the installation of the **nickel plating and polish treatment system**, the nickel and zinc concentration discharge is normally less than 0.2 ppm; the maximum allowable concentration imposed by their discharge permit is 0.9 ppm zinc and 1.3 ppm nickel.

Eligibility

ORS 468.155 (1)(a)	The **principal purpose** of this **new structure and equipment** is to control a substantial quantity of water pollution. It is required by the City of Eugene Public Works discharge permit and the applicant's DEQ Stormwater permit.
ORS 468.155 (1)(b)(A)	The control is accomplished by eliminating industrial waste and the use of treatment works for industrial waste as defined in ORS 468B.005.

Timeliness of Application

The application was submitted within the timing requirements of ORS 468.165 (6).

Application Received	**07/24/1998**
Additional Information Requested	**12/17/1998**
Additional Information Received	**01/29/1999**
Application Substantially Complete	**02/17/1999**
Construction Started	**05/06/1996**
Construction Completed	**12/15/1996**
Facility Placed into Operation	**12/16/1996**

Facility Cost

Claimed Facility Cost		**$ 6,263,732**
Ineligible Costs		**- 823,741**
Vault Sump pumps (2)	$ 5,600	
Insulation on Chemical Feed Tank (not included in final design)	$ 3,040	
Exhaust fan in Nickel Reduction system (venting hydrogen)	$ 6,000	
Exhaust ductwork (for above listed fan)	$ 2,840	
Nitric Acid Storage Tanks (3 claimed -$55,080; one is eligible)	$ 36,720	
Recirculation pumps (4) for used & fresh nitric acid to plating line	$ 8,000	
Aluminum & Dust Collector	$ 49,913	
UPS Equipment (Engineering Cost)	$106,000	
UPS Equipment Installation (Labor)	$ 43,113	
Emergency Diesel Generator (EDG) Set (Equipment)	$110,364	
EDG (Fuel tank & piping)	$ 11,092	
EDG (Labor)	$ 1,187	
EDG (Fuel Station Wiring)	$ 1,468	
EDG (Fuel Distribution)	$ 7,138	
EDG (Generator Wiring)	$215,545	
EDG (Materials)	$ 30,691	
Water Chemical Treatment System (Cooling Tower Treatment)	$ 20,622	
Coolant Farm Safety Modifications	$ 40,296	
Fire Sprinklers	$ 17,441	
Safety Equipment	$ 2,651	

Safety Equipment	$ 4,183	
Safety Equipment	$ 3,968	
Chart Plotter & Pens (Monitoring)	$ 1,739	
HMT Internal Capitalized Interest	$ 83,038	
Eligible Facility Cost		**$ 5,439,991**

Listed below are the ineligible components that do not prevent, control, or reduce pollution:

The facility cost exceeds $500,000 therefore, **Symonds, Evans & Larson, P.C.** performed an accounting review on behalf of the department. Coopers & Lybrand L.L.P. (now Price-Waterhouse Coopers) provided the certified public accountant's statement on behalf of HMT Technology Corporation.

Facility Cost Allocable to Pollution Control

According to ORS.190 (1), the facility cost exceeds $50,000 and therefore, the following factors were used to determine the percentage of the facility cost allocable to pollution control.

Factor	Applied to This Facility
ORS 468.190(1)(a) Salable or Usable Commodity	The waste recovered in the filter presses #1 & 2 is a nickel and zinc hydroxide. The waste from press #4 has a low content of nickel and zinc sulfide. These wastes are hauled away as hazardous waste at a cost to HMT. The waste recovered in press #3 is a nickel-rich solid contaminated with treatment chemicals which is recycled and resulted in $2271 earned in 1998.
ORS 468.190(1)(b) Return on Investment	The useful life of the facility used for the return on investment consideration is 20 years. No gross annual revenues were associated with this facility.
ORS 468.190(1)(c) Alternative Methods	**Aluminum Treatment** Complete chemical dissolution of the aluminum fines with subsequent precipitation was considered but would have required more facility space than was available. Micro filtration was considered but was not expected to be reliable enough to keep the plant in operation. **Nickel Plating and Polish Treatment** To improve the treatment of the plating, waste ultra violet light (UV) oxidation and ion exchange was considered but found cost prohibitive. Ion exchange was also considered but determined less effective.
ORS 468.190(1)(d) Savings or Increase in Costs	Operations costs increase as a result of the pretreatment systems.
ORS 468.190(1)(e) Other Relevant Factors	No other relevant factors.

Considering these factors, the percentage allocable to pollution control is 100%.

Compliance

The applicant states that the facility is in compliance with Department rules and statutes. DEQ permits issued to facility:

General Permit NPDES Stormwater Discharge Permit 1200Z issued July 22, 1997.

The applicants Wastewater Discharge Permit H-100E is issued by Public Works, Wastewater Division, City of Eugene and became effective 12/13/96.

Reviewers: Gordon K.H. Chun, P.E. SJO Consulting Engineers, Inc
Lois L. Payne, P.E. SJO Consulting Engineers, Inc.
Dennis Cartier, Associate, SJO Consulting Engineers, Inc.
Renato Dulay, DEQ
Maggie Vandehey, DEQ

Tax Credit Review Report

EQC 03/19/1999

Director's Recommendation:	**APPROVE**
Applicant	**THOMAS JOSEPH, INC.**
Application No.	**5046**
Facility Cost	**$66,700**

Pollution Prevention: Perc
Final Certification
ORS 468A.095 -- 468A.098
OAR 340-016-0100 -- 340-016-0150

Applicant Identification

The applicant is an S corporation and is operating a dry-cleaning shop. The applicant is the owner of the facility. The applicant's taxpayer identification number is 93-0990175 and the applicant's address is:

Thomas Joseph, Inc.
16060 SE 82nd Dr.
Clackamas, Oregon 97015

Facility Identification

The certificate will identify the facility as:

Installation of a new 5th generation multimatic, non-venting, dry-to-dry perchloroethylene dry-cleaning machine that reduce consumption to less than 140 gallons.

The facility is located at:

16060 SE 82nd Dr.
Clackamas, Oregon.

Technical Information

The claimed facility is a new non-venting dry-to-dry perchloroethylene dry-cleaning machine that was installed as a **replacement for an old perc dry-cleaning machine that vented emissions to the atmosphere**. The new perc machine reduces the creation of emissions by maintaining them within the machine.

Eligibility

The pollution prevention facility is eligible because it meets the requirement of avoiding the substantive requirements of the National Emission Standard for Hazardous Air Pollutants (NESHAP), specifically 40 CFR 63.320 to 63.325 national perchloroethylene air emissions standard for dry cleaning facilities.

1. The owner installed equipment which resulted in perchloroethylene use of less than 140 gallons per year and the dry cleaning facility qualifies as a small area source under the NESHAP.
2. The dry cleaning facility is registered under the Clean Air Act Title III National Emissions Standards for Hazardous Air Pollutants.

3. The facility does not qualify for a pollution control tax credit under ORS 468.165 and 468.170.

Timeliness of Application

The application was submitted within the timing requirements of ORS 468.165 (6).

Application Received	**07/31/1998**
Application Substantially Complete	**01/07/1999**
Construction Completed	**08/31/1997**

Facility Cost

Facility Cost	**$66,700**
Eligible Facility Cost	**$66,700**

An invoice substantiated the cost of the facility.

Reviewer: Dave Kauth

Tax Credit Review Report

EQC 03/.19/1999

Director's Recommendation: **APPROVE**

Applicant	**Wellons, Inc.**
Application No.	**5053**
Facility Cost	**$294,745**
Percentage Allocable	**100%**
Useful Life	**7 years**

Pollution Control Facility: Air
Final Certification
ORS 468.150 -- 468.190
OAR 340-016-0005 -- 340-016-0050

Applicant Identification

The applicant is operating as an equipment manufacturer, constructor, owner, operator and supplier of a steam production plant. The business is an S corporation identified by taxpayer identification number 93-0547956. The applicant's address is:

Wellons, Inc.
PO Box 1030
Sherwood, OR 97140-1030

Facility Identification

The certificate will identify the facility as:

An Electrostatic Precipitator (ESP), multiple cone collector, ash conveyors and augers and an opacity monitoring system.

The applicant is the owner and operator of the facility installed at the Willamette Industries Foster Plywood Plant located at:

611 E. Hwy 20
Sweet Home, OR 97386

Technical Information

The air pollution control facility consists of:

- a **multiple cone collector** which collects large cinders and other particles by centrifugal separation,
- an **electrostatic precipitator** which collects very fine particles by giving them an electrical charge and then attracting them to charged surfaces,
- **conveyors and augers** move the cinders and ash to a bin for disposal, and
- an **opacity monitoring system** which monitors and records performance as required to meet DEQ ACDP reporting requirements.

The claimed facility is a boiler installed to reduce the boiler emissions located at the Willamette Industries Foster Plywood site. Willamette Industries provides hog fuel, waste bark, sander dust and other wood waste to the gasifier which delivers combustible gas to the boiler to produce steam. The steam is then sold to Willamette Industries for use in their Foster plywood plant.

Wellons owns the boiler and the air pollution control equipment and Willamette Industries owns the fuel feed system, gasifier and the fuel cell.

The fuel cell is the located below the boiler and includes the grate system and the first few feet above the grate. In this space the fuel is reacted with less than enough oxygen to complete combustion and a combustible fuel gas is produced. In the equipment above this area, which is owned by Wellons, the fuel gas is burned and the heat produces steam in a water tube boiler.

Wellons has a contract with Willamette Industries for Willamette to operate the boiler. Wellons performs all the maintenance work on their system. Willamette Industries holds the Air Contaminant Discharge Permit.

Eligibility

ORS 468.155 (1)(a)	The **principal purpose** of this **new equipment installation** is to meet the requirements of Air Contaminent Discharge Permit No. 22-3010 issued to Willamette Industries.
ORS 468.155 (1)(b)(B)	The disposal or elimination of or redesign to eliminate air contamination sources and the use of air cleaning devices as defined in ORS 468A.005

Timeliness of Application

The application was submitted within the timing requirements of ORS 468.165 (6).

Application Received	**08/06/1998**
Additional Information Requested	**11/13/1998**
Additional Information Received	**11/13/1998**
Application Substantially Complete	**11/13/1998**
Construction Started	**02/01/1996**
Construction Completed	**12/02/1996**
Facility Placed into Operation	**12/02/1996**

Facility Cost

Facility Cost	**$ 294,745**
Ineligible Costs	$ - 0
Eligible Facility Cost	**$ 294,745**

A cost summary prepared by Wellons substantiated the cost of the facility. The facility cost was greater than $50,000 but less than $500,000. **Aldrich, Kilbride, & Tatone** performed an accounting review according to Department guidelines on behalf of the Applicant.

Facility Cost Allocable to Pollution Control

According to ORS.190 (1), the facility cost exceeds $50,000; therefore, the following factors were used to determine the percentage of the facility cost allocable to pollution control.

Factor	Applied to This Facility
ORS 468.190(1)(a) Salable or Usable Commodity	No salable or useable commodity.
ORS 468.190(1)(b) Return on Investment	The useful life of the facility used for the return on investment consideration is 7 years. No gross annual revenues were associated with this facility.
ORS 468.190(1)(c) Alternative Methods	No alternative investigated.
ORS 468.190(1)(d) Savings or Increase in Costs	No savings or increase in costs.
ORS 468.190(1)(e) Other Relevant Factors	No other relevant factors.

Considering these factors, the percentage allocable to pollution control is 100%.

Compliance

The applicant states that the facility is in compliance with Department rules and statutes and with EQC orders.

DEQ permits issued to Willamette Industries which cover the claimed facility:

> Air Contaminent Discharge Permit No. 22-3010, issued 10/26/93; Addendum 1 issued 3/28/95; Addendum 2 issued 2/2/96; Addendum 3 issued 2/5/97; Addendum 4 issued 5/21/97.

Reviewers:
Lois L. Payne, P.E., SJO Consulting Engineers, Inc.
Waldemar Seton, Principal, SJO Consulting Engineers, Inc.
Dave Kauth, DEQ
Maggie Vandehey, DEQ

Tax Credit Review Report

EQC: 03/19/1998

Director's Recommendation:	**APPROVE**
Applicant	**Morrow County Grain Growers**
Application No.	**5080**
Facility Cost	**$33,014**
Percentage Allocable	**100%**
Useful Life	**10 years**

Pollution Control Facility: Water
Final Certification
ORS 468.150 -- 468.190
OAR 340-016-0005 -- 340-016-0050

Applicant Identification

The applicant is operating a **cooperative** for grain growers. This C corporation elects to take **income tax** relief under taxpayer identification number 93-0230800. The applicant's address is:

Morrow County Grain Growers Inc.
P.O.Box 367
Lexington, OR 97839

Facility Identification

The certificate will identify the facility as:

A walled secondary containment facility for a liquid fertilizer and chemical storage tank farm.

The applicant is the owner of the facility located at:

71025 Old Highway 97
Wasco, OR

Technical Information

The facility consists of several walled secondary containment structures built to prevent water pollution by containing any fertilizer or chemical spills. Tanks RT-1 and RT-2 each have a secondary containment that will hold 2,000 gallons. The loading station containment will hold 2,065 gallons and includes a sump. The tank farm secondary containment will hold 22,500 gallons including a sump. The facility includes all excavation, forms, rebar, concrete, liner, sump pumps, electrical and labor.

The following is a list of the chemicals and fertilizers tanks and the average amount stored in the containment facility:

Two - 1,500 gallon Roundup tanks, each containing an average of 1,500 gallons Roundup
One - 6,500 gallon Solution 32 containing an average of 6,500 gallons Solution 32
One - 10,000 gallon Solution 32 containing an average of 10,000 gallons Solution 32
Two - 10,000 gallon Thio-sol, each containing an average of 10,000 gallons Thio-sol
One - 10,000 gallon 10-0-0-34 containing an average of 6,000 gallons 10-0-0-34
One - 18,000 gallon NH3 (Ammonia) containing an average of 12,000 gallons NH3

Eligibility

ORS 468.155 (1)(a)	The **sole purpose** of this **new installation** is to **control or reduce** a substantial quantity of water pollution.
OAR-016-0025 (2)(g)	Installation or construction of facilities which will be used to detect, deter, or **prevent** spills or unauthorized releases.

Timeliness of Application

The application was submitted within the timing requirements of ORS 468.165 (6).

Application Received	**9/15/98**
Additional Information Requested	**12/1/98**
Additional Information Received	**12/16/98**
Application Substantially Complete	**12/18/98**
Construction Started	**6/1/97**
Construction Completed	**12/1/97**
Facility Placed into Operation	**12/1/97**

Facility Cost

Claimed Facility Cost	**$ 33,014**
Eligible Facility Cost	**$ 33,014**

Green, Newhouse & Associates, LLP provided the certified public accountant's statement on behalf of Morrow County Grain Growers. The cost of the facility was substantiated by the copies of invoices that accompanied the application

Facility Cost Allocable to Pollution Control

According to ORS.190 (3), the facility cost does not exceed $50,000, therefore the only factor used to determine the percentage of the facility cost allocable to pollution control is the percentage of time the facility is used for pollution control. The facility is used for pollution control 100% of the time.

Compliance

The applicant states the facility is in compliance with Department rules and statutes and that there are no DEQ permits issued to the facility.

Reviewers: Lois L. Payne, P.E., SJO Consulting Engineers, Inc.
Maggie Vandehey, DEQ

Tax Credit Review Report

EQC 03/19/1999

Director's
Recommendation: **APPROVE**

Applicant	**Morrow County Grain Growers**
Application No.	**5082**
Facility Cost	**$29,697**
Percentage Allocable	**100%**
Useful Life	**10 years**

Pollution Control Facility: Water
Final Certification
ORS 468.150 -- 468.190
OAR 340-016-0005 -- 340-016-0050

Applicant Identification

The applicant is operating a **cooperative** for grain growers. This C corporation elects to take **income tax** relief under taxpayer identification number 93-0230800. The applicant's address is:

Morrow County Grain Growers Inc.
P.O. Box 367
Lexington, OR 97839

Facility Identification

The certificate will identify the facility as:

A Karcher ASA-600 Waste Water Filtration System

The applicant is the owner of the facility located at:

71025 Old Highway 97
Wasco, OR

Technical Information

The facility consists of a Karcher ASA-600 closed loop wastewater filtration system, serial #10229. System components include an AEC 6 bag type oil and water separator, an equipment washing and degreasing pad, and the equipment storage building.

A 4 gpm pressure washer is used for cleaning vehicles. The waste water is collected on a wash pad and pumped through the Karcher ASA-600 system. Free floating oils are captured and recycled; solids are separated and disposed of through DEQ approved haulers.

This system eliminates surface water pollution as there is zero discharge. Without the ASA-600 system, effluent from vehicle cleaning discharged to the ground and from surface water run-off would result in an excess of 100 ppm FOG, total dissolved solids in excess of 100 ppm, and suspended solids in excess of 1000 ppm.

Eligibility

ORS 468.155 (1)(a)	The **principal purpose** of this **new equipment** is to **prevent** a substantial quantity of water pollution in accordance with the EPA Clean Water Act.

Timeliness of Application

The application was submitted within the timing requirements of ORS 468.165 (6).

Application Received	**9/15/98**
Application Substantially Complete	**12/2/98**
Construction Started	**6/1/97**
Construction Completed	**12/1/97**
Facility Placed into Operation	**12/1/97**

Facility Cost

Claimed Facility Cost	**$ 34,794**
Ineligible Costs	
Hot water washer used to clean vehicles	$ - 5,097
Eligible Facility Cost	**$ 29,697**

Green, Newhouse & Associates, LLP provided the certified public accountant's statement on behalf of Morrow County Grain Growers. Copies of invoices were provided with the application to substantiated the cost of the facility.

Facility Cost Allocable to Pollution Control

According to ORS.190 (3), the facility cost does not exceed $50,000, therefore the only factor used to determine the percentage of the facility cost allocable to pollution control is the percentage of time the facility is used for pollution control. The facility is used for pollution control 100% of time.

Compliance

The applicant states the facility is in compliance with Department rules and statutes and that there are no DEQ permits issued to the facility.

Reviewers: Lois L. Payne, P.E., SJO Consulting Engineers, Inc.
Maggie Vandehey, DEQ

Tax Credit Review Report

EQC 03/19/99

Director's Recommendation:	**APPROVE**
Applicant	**Russell Oil Company**
Application No.	**5107**
Facility Cost	**$13,724**
Percentage Allocable	**100%**
Useful Life	**10 years**

Pollution Control Facility: USTs
Final Certification
ORS 468.150 -- 468.190
OAR 340-016-0005 -- 340-016-0050

Applicant Identification

The applicant is a C corporation and is operating as a retail gas station and commercial cardlock facility. The applicant's taxpayer identification number is 93-0815129. The applicant's address is:

Russell Oil Company
PO Box 7
Boardman, OR 97818

Facility Identification

The certificate will identify the facility as:

An automatic tank gauge system with overfill alarm

The applicant is the owner of the facility located at:

101 SW Front Street
Boardman, OR 97818

Technical Information

To respond to Underground Storage Tank requirements under OAR 340-Division 150, the applicant installed for spill and over fill prevention an over fill alarm and for leak detection an automatic tank gauge system.

Eligibility

ORS 468.155 (1)(a)	The **principal purpose** of this **improvement** is to comply with underground storage tank requirements imposed by the federal Environmental Protection Agency to prevent pollution of soil, water and air. This is accomplished by preventing releases into soil, water or air.
ORS 468.155 (1)(b)(A)	The disposal or elimination of or redesign to eliminate industrial waste and the use of treatment works for industrial waste as defined in ORS 468B.005

OAR-016-0025 (2)(g) Installation or construction of facilities which will be used to detect or prevent spills or unauthorized releases.

Timeliness of Application

The application was submitted within the timing requirements of ORS 468.165 (6).

Application Received	**10/27/1998**
Application Substantially Complete	**09/17/1998**
Construction Started	**09/15/1998**
Construction Completed	**09/17/1998**
Facility Placed into Operation	**09/17/1998**

Facility Cost

Claimed Facility Cost	**$13,724**	
Spill and Overfill Prevention:Overfill alarm		300
Leak Detection:Tank gauge system		11,224
Labor, Material, Misc Parts		2,200
Eligible Facility Cost		**$13,724**

The facility cost does not exceed $50,000. An independent accounting review was not required. However, documentation of cost was provided.

Facility Cost Allocable to Pollution Control

The facility cost does not exceed $50,000. According to ORS 468.190 (3), the only factor used in determining the percentage allocable to pollution control is the percentage of time the facility is used for pollution control. Therefore, the percentage of the facility cost allocable to pollution control is **100%**.

Compliance and Other Tax Credits

The facility is in compliance with Department rules and statutes and with EQC orders. especially, Underground Storage Tank requirements under OAR Chapter 340, Division 150.

Reviewers: Barbara J Anderson

Tax Credit Review Report

EQC 03/19/99

Director's Recommendation:	**APPROVE**
Applicant	**Russell Oil Company**
Application No.	**5108**
Facility Cost	**$5,300**
Percentage Allocable	**100%**
Useful Life	**10 years**

Pollution Control Facility: USTs
Final Certification
ORS 468.150 -- 468.190
OAR 340-016-0005 -- 340-016-0050

Applicant Identification

The applicant is a C corporation and is operating as a retail gas station and commercial cardlock facility. The applicant's taxpayer identification number is 93-0815129 and their address is:

Russell Oil Company
PO Box 7
Boardman, OR 97818

Facility Identification

The certificate will identify the facility as:

Installation of spill containment basins

The applicant is the owner of the facility located at:

1430 B 1st Street
Hermistor, OR 97838

Technical Information

To respond to Underground Storage Tank requirements under OAR 340-Division 150, the applicant installed Spill containment basins for spill and overfill prevention.

Eligibility

ORS 468.155 (1)(a)	The **principal purpose** of this **installation** is to comply with underground storage tank requirements imposed by the federal Environmental Protection Agency to prevent pollution of soil, water and air. This is accomplished by preventing releases into soil, water or air.
ORS 468.155 (1)(b)(A)	The disposal or elimination of or redesign to eliminate industrial waste and the use of treatment works for industrial waste as defined in ORS 468B.005
OAR-016-0025 (2)(g)	Installation or construction of facilities which will be used to detect, deter, or prevent spills or unauthorized releases.

Timeliness of Application

The application was submitted within the timing requirements of ORS 468.165 (6).

Application Received	**10/27/1998**
Application Substantially Complete	**03/12/1998**
Construction Started	**03/08/1998**
Construction Completed	**03/12/1998**
Facility Placed into Operation	**03/12/1998**

Facility Cost

Facility Cost	**$5,300**
Spill & Overfill Prevention: Spill Containment Basins	
Eligible Facility Cost	**$5,300**

The facility cost does not exceed $50,000. An independent accounting review was not required. However, documentation of cost was provided.

Facility Cost Allocable to Pollution Control

The facility cost does not exceed $50,000. According to ORS 468.190 (3), the only factor used in determining the percentage allocable to pollution control is the percentage of time the facility is used for pollution control. Therefore, the percentage of the facility cost allocable to pollution control is **100%**.

Compliance and Other Tax Credits

The facility is in compliance with Department rules and statutes and with EQC orders. especially, Underground Storage Tank requirements under OAR Chapter 340, Division 150.

Reviewers: Barbara J Anderson

Tax Credit Review Report

EQC 3/19/1999

Pollution Control Facility: Solid Waste
Final Certification
ORS 468.150 -- 468.190
OAR 340-016-0005 -- 340-016-0050

Director's Recommendation:	**APPROVE**
Applicant	**United Disposal Service Inc.**
Application No.	**5113**
Facility Cost	**$42,213**
Percentage Allocable	**100%**
Useful Life	**10 years**

Applicant Identification

The applicant is a C corporation and is operating a residential, commercial and industrial recycling collection firm. The applicant's taxpayer identification number is 93-0625022 and their address is:

United Disposal Service Inc.
2215 N Front Street
Woodburn, OR 97071

Facility Identification

The certificate will identify the facility as:

Five 20-yd SC style drop boxes, serial numbers 10610 thru 10614. Ten 30-yd SC style drop boxes, serial numbers 10595 thru 10604.

The applicant is the owner of the facility located at:

2215 N Front Street
Woodburn, OR 97071

Technical Information

These drop boxes are part of the companies recycling program and are used to collect and transport recyclable material from generators to the companies processing facility or directly to market.

Eligibility

ORS 468.155 (1)(a)	The **sole purpose** of this **new equipment** is to prevent, control or reduce a substantial quantity of solid waste.
ORS 468.155 (1)(b)(D)	The use of a material recovery process which obtains useful material from material that would otherwise be solid waste as defined in ORS 459.005.

Timeliness of Application

The application was submitted within the timing requirements of ORS 468.165 (6).

Application Received	**11/06/1998**
Application Substantially Complete	**01/26/1999**
Construction Started	**06/17/1998**
Construction Completed	**06/30/1998**
Facility Placed into Operation	**07/10/1998**

Facility Cost

Facility Cost	**$42,213**
Insignificant Contribution ORS 468.155(2)(d)	
Eligible Facility Cost	**$42,213**

The facility cost does not exceed $50,000. An independent accounting review was not required. However, invoices or canceled checks substantiated the cost of the facility.

Facility Cost Allocable to Pollution Control

The facility cost does not exceed $50,000. According to ORS 468.190 (3), the only factor used in determining the percentage allocable to pollution control is the percentage of time the facility is used for pollution control. Therefore, the percentage of the facility cost allocable to pollution control is **100%**.

Compliance and Other Tax Credits

The facility is in compliance with Department rules and statutes and with EQC orders.

There are no DEQ permits issued to this facility.

Reviewers: William R Bree

Tax Credit Review Report

EQC 3/19/1999

Director's Recommendation: **APPROVE**

Applicant	**Capitol Recycling & Disposal, Inc.**
Application No.	**5117**
Facility Cost	**$20,709**
Percentage Allocable	**100%**
Useful Life	**10 years**

Pollution Control Facility: Solid Waste
Final Certification
ORS 468.150 -- 468.190
OAR 340-016-0005 -- 340-016-0050

Applicant Identification

The applicant is a C corporation and is operating as a residential, commercial and industrial solid waste and recycling firm. The applicant's taxpayer identification number 93-1197641. The applicant's address is:

Capitol Recycling & Disposal, Inc.
1890 16th Street SE
Salem, OR 97302

Facility Identification

The certificate will identify the facility as:

Twenty 3-yd front load slant top recycling containers with Competitor lids, serial numbers 140048 – 141057 and 141100 – 141057,and 20 6-yd front load cathedral style recyling containers with Competitor lids.

The applicant is the owner of the facility located at:

1890 16th Street SE
Salem, OR

Technical Information

These recycling containers are placed at the customer's facility and are used for the collection of newspaper.

Eligibility

ORS 468.155 (1)(a)	The **sole purpose** of this **new equipment device** is to prevent, control or reduce a substantial quantity of solid waste.
ORS 468.155 (1)(b)(D)	The use of a material recovery process which obtains useful material from material that would otherwise be solid waste as defined in ORS 459.005.

Timeliness of Application

The application was submitted within the timing requirements of ORS 468.165 (6).

Application Received	**11/13/1998**
Application Substantially Complete	**01/26/1999**
Construction Started	**10/01/1996**
Construction Completed	**11/17/1996**
Facility Placed into Operation	**11/22/1996**

Facility Cost

Facility Cost	**$20,709**
Insignificant Contribution ORS 468.155(2)(d)	$ -
Eligible Facility Cost	**$20,709**

The facility cost does not exceed $50,000; therefore, an independent accounting review was not required. However, invoices or canceled checks substantiated the cost of the facility.

Facility Cost Allocable to Pollution Control

The facility cost does not exceed $50,000. According to ORS 468.190 (3), the only factor used in determining the percentage allocable to pollution control is the percentage of time the facility is used for pollution control. Therefore, the percentage of the facility cost allocable to pollution control is **100%**.

Compliance and Other Tax Credits

The facility is in compliance with Department rules and statutes and with EQC orders.

There are no DEQ permits issued to this facility.

Reviewers: William R Bree

Tax Credit Review Report

EQC 03/19/1999

Director's Recommendation: **APPROVE**

Applicant	**United Disposal Service Inc.**
Application No.	**5120**
Facility Cost	**$8,814**
Percentage Allocable	**100%**
Useful Life	**10 years**

Pollution Control Facility: Solid Waste
Final Certification
ORS 468.150 -- 468.190
OAR 340-016-0005 -- 340-016-0050

Applicant Identification

The applicant is a C corporation. The applicant's taxpayer identification number is 93-0625022. The applicant's address is:

United Disposal Service Inc.
2215 N Front Street
Woodburn, OR 97071

Facility Identification

The certificate will identify the facility as:

Twenty 4-yd front load cardboard containers with lids and casters. Serial numbers #154646 through #154665

The applicant is the owner of the facility located at:

2215 N Front Street
Woodburn, OR 97071

Technical Information

These recycling front load containers are used in Woodburn for the storage and collection of old corrugated cardboard from commercial customers.

Eligibility

ORS 468.155 (1)(a)	The **sole purpose** of this new equipment is to prevent, control or reduce a substantial quantity of solid waste.
ORS 468.155 (1)(b)(D)	The use of a material recovery process which obtains useful material from material that would otherwise be hazardous waste as defined in ORS 466.005, or used oil as defined in ORS 459A.555.

Timeliness of Application

The application was submitted within the timing requirements of ORS 468.165 (6).

Application Received	**11/20/1998**
Application Substantially Complete	**01/26/1999**
Construction Started	**07/31/1998**
Construction Completed	**08/20/1998**
Facility Placed into Operation	**09/04/1998**

Facility Cost

Facility Cost	**$8,814**
Insignificant Contribution ORS 468.155(2)(d)	
Eligible Facility Cost	**$8,814.**

The facility cost does not exceed $50,000. An independent accounting review was not required. However, invoices or canceled checks substantiated the cost of the facility.

Facility Cost Allocable to Pollution Control

The facility cost does not exceed $50,000. According to ORS 468.190 (3), the only factor used in determining the percentage allocable to pollution control is the percentage of time the facility is used for pollution control. Therefore, the percentage of the facility cost allocable to pollution control is **100%.**

Compliance and Other Tax Credits

The facility is in compliance with Department rules and statutes and with EQC orders.

There are no DEQ permits issued to this facility.

Reviewers: William R Bree

Tax Credit Review Report

EQC 03/19/1999

Director's Recommendation:	**APPROVE**
Applicant	**McKern's Texaco Food Mart**
Application No.	**5122**
Facility Cost	**$92,423**
Percentage Allocable	**94%**
Useful Life	**10 years**

Pollution Control Facility: USTs
Final Certification
ORS 468.150 -- 468.190
OAR 340-016-0005 -- 340-016-0050

Applicant Identification

The applicant is an individual and is operating as retail gas station. The applicant's taxpayer identification number is 93-1005666. The applicant's address is:

McKern's Texaco Food Mart
PO Box 115
Mt. Vernon, OR 97865

Facility Identification

The certificate will identify the facility as:

One doublewall above ground tank with built-in secondary containment, doublewall flexible plastic piping, automatic tank gauge system, overfill alarm, sumps and automatic shutoff valves.

The applicant is the owner of the facility located at:

PO Box 115
Mt. Vernon, OR 97865

Technical Information

To comply with underground storage tank requirements under OAR 340, Division 150 the applicant installed: Double wall above ground storage tank with secondary containment and doublewall flexible plastic piping for corrosion protection; Sumps, overfill alarm and automatic shutoff valves for spill and overfill prevention; and Automatic tank gauge system for leak detection.

Eligibility

ORS 468.155 (1)(a)	The **principal purpose** of the facility is to comply with requirements imposed by the federal Environmental Protection Agency to prevent pollution of soil, water and air. This is accomplished by preventing releases into soil, water or air.
ORS 468.155 (1)(b)(A)	The disposal or elimination of or redesign to eliminate industrial waste and the use of treatment works for industrial waste as defined in ORS 468B.005
OAR-016-0025 (2)(g)	Installation or construction of facilities which will be used to detect, deter, or prevent spills or unauthorized releases.

Timeliness of Application

The application was submitted within the timing requirements of ORS 468.165 (6).

Application Received	**11/24/1998**
Application Substantially Complete	**08/15/1997**
Construction Started	**07/15/1997**
Construction Completed	**08/15/1997**
Facility Placed into Operation	**08/15/1997**

Facility Cost

Claimed Facility Cost	**$92,423**	
Corrosion Protection:		
Doublewall tank with secondary containment & Flexible plastic piping		22,800
Spill & Overfill Prevention:		
Sumps		495
Automatic shutoff valves		264
Overfill alarm		300
Lead Detection:		
Tank gauge system		3,009
Labor, Material, Misc. parts		65,555
Eligible Facility Cost		**$92,423**

The facility cost was greater than $50,000 but less than $500,000. Therefore, Jean M. Hodges, CPA performed an accounting review according to Department guidelines on behalf of the Applicant.

Facility Cost Allocable to Pollution Control

The facility cost exceeds $50,000. According to ORS 468.190 (1), the factors listed below were considered in determining the percentage of the facility cost allocable to pollution control. The percentage of the facility cost allocable to pollution control is **100%**.

Factor	Applied to This Facility
ORS 468.190(1)(a) Salable or Usable Commodity	No salable or useable commodity.
ORS 468.190(1)(b) Return on Investment	The useful life of the facility used for the return on investment consideration is 10 years. No gross annual revenues were associated with this facility.
ORS 468.190(1)(c) Alternative Methods	No alternative investigated.
ORS 468.190(1)(d) Savings or Increase in Costs	No savings or increase in costs.
ORS 468.190(1)(e) Other Relevant Factors	The percent allocable on the cost of a corrosion protected tank and piping system is determined by using a formula based on the difference in cost between the protected tank and piping system and an equivalent bare steel system as a percent of the protected system. Applying this formula to the costs presented by the applicant, where the protected system cost is $22,800 and the bare steel system is $4,858, the resulting portion of the eligible tank piping cost allocable to pollution control is 79%. The applicant's cost for a tank gauge system is reduced to 90% of cost based on a determination by the Department that this is the portion properly allocable to pollution control since the device can serve other purposes, for example, inventory control.

Compliance and Other Tax Credits

The facility is in compliance with Department rules and statutes and with EQC orders. especially, Underground Storage Tank requirements under OAR Chapter 340, Division 150.

Reviewers: Barbara J Anderson

Tax Credit Review Report

EQC 03/19/1999

Director's Recommendation:	**APPROVE**
Applicant	**Carter's Service Stations, Inc.**
Application No.	**5131**
Facility Cost	**$83,968**
Percentage Allocable	**89%**
Useful Life	**10 years**

Pollution Control Facility: USTs
Final Certification
ORS 468.150 -- 468.190
OAR 340-016-0005 -- 340-016-0050

Applicant Identification

The applicant is an S corporation and is operating a retail gas station and commercial cardlock facility. The applicant's taxpayer identification number 93-0604394 and their address is:

Carter's Service Stations, Inc.
32191 Cartney Drive
Harrisburg, OR 97446

Facility Identification

The certificate will identify the facility as:

Three fiberglass underground storage tanks, doublewall flexible plastic piping, spill containment basins, automatic tank gauge system, overfill alarm, line leak detectors, sumps, monitoring wells and automatic shutoff valves.

The applicant is the owner of the facility located at:

King Road Chevron
6217 SE King Road
Milwaukie, OR 97222

Technical Information

To respond to Underground Storage Tank requirements under OAR 340-Division 150 the applicant installed fiberglass tanks and doublewall flexible plastic piping for corrosion protection; spill containment basins, sumps, overfill alarm and automatic shutoff valves for spill and overfill prevention; and automatic tank gauge system, monitoring wells and line leak detectors for leak detection.

Eligibility

ORS 468.155 (1)(a)	The **principal purpose** of this **installation** is to comply with underground storage tank requirements imposed by the federal Environmental Protection Agency to prevent pollution of soil, water and air. This is accomplished by preventing releases into soil, water or air
ORS 468.155 (1)(b)(A)	The disposal or elimination of or redesign to eliminate industrial waste and the use of treatment works for industrial waste as defined in ORS 468B.005
OAR-016-0025 (2)(g)	Installation or construction of facilities which will be used to detect, deter, or prevent spills or unauthorized releases.

Timeliness of Application

The application was submitted within the timing requirements of ORS 468.165 (6).

Application Received	**12/09/1998**
Application Substantially Complete	**12/15/1996**
Construction Started	**09/01/1996**
Construction Completed	**12/15/1996**
Facility Placed into Operation	**12/15/1996**

Facility Cost

Claimed Facility Cost	**$83,968**	
Corrosion Protection		
Fiberglas tanks/flexible plastic piping		21,952
Spill & Overfill Prevention		
Spill containment basins		3,030
Sumps		2,086
Automatic shutoff valves		4,127
Overfill alarm		345
Leak Detection		
Tank gauge system		5,395
Line leak detectors		713
Monitoring wells		585
Labor, Material, Misc Parts		45,735
Eligible Facility Cost		**$83,968**

The applicant applied for a waiver of the independent accounting review since they submitted invoices that substantiated the cost of the facility.

Facility Cost Allocable to Pollution Control

The facility cost exceeds $50,000. According to ORS 468.190 (1), the factors listed below were considered in determining the percentage of the facility cost allocable to pollution control. The percentage of the facility cost allocable to pollution control is **100%.**

Factor	Applied to This Facility
ORS 468.190(1)(a) Salable or Usable Commodity	No salable or useable commodity.
ORS 468.190(1)(b) Return on Investment	The useful life of the facility used for the return on investment consideration is 10 years. No gross annual revenues were associated with this facility.
ORS 468.190(1)(c) Alternative Methods	No alternative investigated.
ORS 468.190(1)(d) Savings or Increase in Costs	No savings or increase in costs.
ORS 468.190(1)(e) Other Relevant Factors	The department has determined the percent allocable on the cost of a corrosion protected tank and piping system by using a formula based on the difference in cost between the protected tank and piping system and an equivalent bare steel system as a percent of the protected system. Applying this formula to the costs presented by the applicant, where the protected system cost is $21,952 and the bare steel system is $8,490, the resulting portion of the eligible tank and piping cost allocable to pollution control is 61%. The applicant's cost for a tank gauge system is reduced to 90% of cost based on a determination by the Department that this is the portion properly allocable to pollution control since the device can serve other purposes, for example, inventory control.

Based on these findings, it is recommended that a Pollution Control Facility Certificate be issued at 89%

Compliance and Other Tax Credits

The facility is in compliance with Department rules and statutes and with EQC orders. especially, Underground Storage Tank requirements under OAR Chapter 340, Division 150.

Reviewers: Barbara J Anderson

Tax Credit Review Report

EQC 03/19/1999

Director's Recommendation:	**APPROVE**
Applicant	**Dean McKay Farms, Inc.**
Application No.	**5145**
Facility Cost	**$136,817**
Percentage Allocable	**75%**
Useful Life	**10 years**

Pollution Control Facility: Field Burning
Final Certification
ORS 468.150 -- 468.190
OAR 340-016-0005 -- 340-016-0050

Applicant Identification

The applicant is a C corporation and is operating a grass seed farm. The applicant's taxpayer identification number is 93-0856830 and their address is:

Dean McKay Farms, Inc.
19172 French Prairie Rd. NE
St. Paul, OR 97137

Facility Identification

The certificate will identify the facility as:

John Deere 7210 tractor, baler, Tilling - Concomly, Rear's Flail, Tilling-Kock Place

The applicant is the owner of the facility located at:

19172 French Prairie Rd., NE
St Paul, OR 97137

Technical Information

The applicant has 1,400 acres of perennial grass seed under cultivation. In the past the applicant open field burned as many acres as the weather and smoke management permitted. Some acreage was baled each year with the stacks of baled straw often burned. One of the applicants' alternatives to open field burning and stack burning has evolved to a bale and flail/plow operation. Initially the applicants engaged custom balers to remove the straw from their fields. To ensure timely removal of the straw it became apparent that they would need to do some of the baling themselves.

To replace the weed and pest control benefits of open field burning the applicants are investigating and incorporating crop rotation. They have found that the number and variety of crops available for rotation with the perennial grasses is enhanced with the installation of drainage tiles.

Eligibility

ORS 468.155 (1)(a)	The **principal purpose** of this **new equipment** is to prevent, control or reduce a substantial quantity of air pollution
OAR-016-025 (2)(f)(A)	Equipment, facilities, and land for gathering, densifying, processing, handling, storing, transporting and incorporating grass straw or straw based products which will result in reduction of open field burning.

Timeliness of Application

The application was submitted within the timing requirements of ORS 468.165 (6).

Application Received	**01/15/1999**
Application Substantially Complete	**01/27/1999**
Construction Started	**09/03/1997**
Construction Completed	**10/12/1998**
Facility Placed into Operation	**10/12/1998**

Facility Cost

Claimed Facility Cost	**$136,817**
Eligible Facility Cost	**$136,817**

The facility cost was greater than $50,000 but less than $500,000. Therefore, Burton, Creamer & Co., P.C.,performed an accounting review according to Department guidelines on behalf of the Applicant.

Facility Cost Allocable to Pollution Control

The facility cost exceeds $50,000. According to ORS 468.190 (1), the factors listed below were considered in determining the percentage of the facility cost allocable to pollution control. The percentage of the facility cost allocable to pollution control is **75%**.

Factor	Applied to This Facility
ORS 468.190(1)(a) Salable or Usable Commodity	No salable or useable commodity.
ORS 468.190(1)(b) Return on Investment	The useful life of the facility used for the return on investment consideration is 10 years. No gross annual revenues were associated with this facility.
ORS 468.190(1)(c) Alternative Methods	No alternative investigated.
ORS 468.190(1)(d) Savings or Increase in Costs	No savings or increase in costs.

ORS 468.190(1)(e) Other Relevant Factors

The established average annual operating hours for tractors is set at 450 hours. To obtain a total percent allocable, the annual operating hours per implement used in reducing acreage open field burned is as follows:

Implement	# of Acres	Implement Capacity	Annual Operating Hours
Baler	200	4	50
Rake	200	5	40
Flail	200	5	40
Total			**130**

The total annual operating hours of 130 divided by the average annual operating hours of 450 produces a percentage allocable of 29%

Equipment	Claimed Cost	Percent Allocable	Cost Allocable
John Deere Tractor	$49,000	29	$14,210
585 Baler	$42,434	100	$42,434
Drain Tile (Concomly)	$35,498	100	$35,498
Rear's Flail	$5,279	100	$5,279
Drain tile (Kock)	$4,606	100	$4,606
Total	**$136,817**	**75**	**$102,027**

Compliance and Other Tax Credits

The facility is in compliance with Department rules and statutes and with EQC orders.

Reviewers: James Britton

Tax Credit Review Report

EQC 3/19/1999

Recommendation:	**APPROVE**
Applicant	**Mark McKay Farms, Inc.**
Application No.	**5146**
Facility Cost	**$173,719.00**
Percentage Allocable	**84%**
Useful Life	**10 years**

Pollution Control Facility: Field Burning
Final Certification
ORS 468.150 -- 468.190
OAR 340-016-0005 -- 340-016-0050

Applicant Identification

The applicant is a C corporation and is operating a grass seed farm. The applicant's taxpayer identification number 93-0857251 and their address is:

Mark McKay Farms, Inc.
19393 French Prairie Rd, NE
St Paul, OR 97137

Facility Identification

The certificate will identify the facility as:

A storage shed, a John Deere tractor, Tilling-Waconda, Northwest Tiller, Disc Ripper, and John Deere Ripper.

The applicant is the owner of the facility located at:

19172 French Prairie Rd, NE
St. Paul, OR 97137

Technical Information

The applicant has 1,400 acres of perennial grass seed under cultivation. In the past the applicant open field burned as many acres as the weather and smoke management program permitted. Some acreage was baled each year with the stacks of baled straw often burned.

As the applicant moved away from burning he turned more toward custom balers to remove the bulk straw from the fields. To guarantee the timely services of the custom baler the applicant was compelled to provide storage for the straw to protect it from inclement weather.

The reduction in open field burning shortened the stand life of the perennial grass seed fields causing the applicant to rip out the stands more often and replanting in shorter cycles.

Eligibility

ORS 468.155 (1)(a)	The **principal purpose** of this **new machinery** and is to prevent, control or reduce a substantial quantity of air pollution.

OAR-016-025 (2)(f)(A)	Equipment, facilities, and land for gathering, densifying, processing, handling, storing, transporting and incorporating grass straw or straw based products which will result in reduction of open field burning.

Timeliness of Application

The application was submitted within the timing requirements of ORS 468.165 (6).

Application Received	**1/15/99**
Application Substantially Complete	**1/27/99**
Construction Started	**10/12/98**
Construction Completed	**10/12/98**
Facility Placed into Operation	**10/12/98**

Facility Cost

Facility Cost	**$173,719**
Insignificant Contribution ORS 468.155(2)(d)	$ -
Eligible Facility Cost	**$173,719**

The facility cost was greater than $50,000 but less than $500,000. Therefore, **Burton, Creamer & Co., P.C.** performed an accounting review according to Department guidelines on behalf of the Applicant.

Facility Cost Allocable to Pollution Control

The facility cost exceeds $50,000. According to ORS 468.190 (1), the factors listed below were considered in determining the percentage of the facility cost allocable to pollution control. The percentage of the facility cost allocable to pollution control is **100%**.

Factor	Applied to This Facility
ORS 468.190(1)(a) Salable or Usable Commodity	The hay shed preserves the salability of the straw by protecting it from inclement weather.
ORS 468.190(1)(b) Return on Investment	The useful life of the facility used for the return on investment consideration is 10 years. No gross annual revenues were associated with this facility.
ORS 468.190(1)(c) Alternative Methods	No alternative investigated.
ORS 468.190(1)(d) Savings or Increase in Costs	No savings or increase in costs.

ORS 468.190(1)(e) Other Relevant Factors

The established average annual operating hours for tractors is set at 450 hours. To obtain a total percent allocable the annual operating hours per implement used in reducing acreage open field burned is as follows:

Implement	# of Acres	Implement Capacity	Annual Operating Hours
Baler	200	4	50
Rake	200	5	40
Flail	200	5	40
Total			**130**

The total annual operating hours of 130 divided by the average annual operating hours of 450 produces a percent allocable of 29%.

Equipment	Claimed Cost	Percent Allocable	Cost Allocable
Hay Shed	$39,723	100	$39,723
John Deere Tractor	$ 38,073	29	$ 11,041
Drain Tile (Waconda)	$25,830	100	$25,830
Tiller	$30,293	100	$30,293
Disc Ripper	$27,000	100	$27,000
John Deere Ripper	$12,800	100	$12,800
Total	**$173,719**	**84**	**$146,687**

Compliance and Other Tax Credits

The facility is in compliance with Department rules and statutes and with EQC orders.

Reviewers: James Britton

Attachment C

Denial

Tax Credit Review Report

EQC 03/19/1999

Director's Recommendation:	**Deny – Ineligible Facility**

Applicant	**Freres Lumber Co., Inc.**
Application No.	**5119**
Claimed Facility Cost	**$27,962**
Claimed Percentage Allocable	**100%**
Useful Life	**7 years**

Pollution Control Facility: Air
Final Certification
ORS 468.150 -- 468.190
OAR 340-016-0005 -- 340-016-0050

Applicant Identification

The applicant is a C corporation and is operating a plywood division of a lumber company. The applicant's taxpayer identification number is 93-0357299. The applicant's address is:

Freres Lumber Co., Inc.
Plywood Division
PO Box 276
Lyons, OR 97358

Facility Identification

The claimed facility is:

Plytrim and saw dust conveying system

The applicant is the owner of the facility located at:

47842 Lyons-Mill City Drive
Lyons, OR 97358

Technical Information

Freres Lumber Co., Inc. operates a plywood manufacturing and veneer drying facility that produces softwood veneer in Lyons, Oregon. The claimed facility is a negative air system to evacuate plytrim from the trim-saw and sawdust from a flying cutoff saw and discharge into an existing drag chain conveyor. This material handling system transfers material, which was previously manually collected, through the use of an air conveying system. The facility consists of a cyclone, and associated fan and ductwork.

Eligibility

ORS 468.155 (1)(a)	The facility was not required by DEQ or EPA; therefore, it does not meet the principle purpose portion of the definition of a pollution control facility. The **sole purpose** of this new equipment is not to prevent, control or reduce a substantial quantity of air pollution, but to convey material.
ORS 468.155 (1)(b)(B)	The claimed facility is not used for the disposal or elimination of or redesign to eliminate air contamination sources nor does it consitute the use of air cleaning devices as defined in ORS 468A.005

Timeliness of Application

The application was submitted within the timing requirements of ORS 468.165 (6).

Application Received	**11/17/1998**
Application Substantially Complete	**01/13/1999**
Construction Started	**04/17/1998**
Construction Completed	**07/07/1998**
Facility Placed into Operation	**07/07/1998**

Facility Cost

Facility Cost	**$27,962**
Insignificant Contribution ORS 468.155(2)(d)	$ 27,962
Eligible Facility Cost	**$0**

The facility cost does not exceed $50,000. An independent accounting review was not required. However, invoices and copies of checks substantiated the cost of the claimed facility.

Facility Cost Allocable to Pollution Control

The facility cost does not exceed $50,000. According to ORS 468.190 (3), the only factor used in determining the percentage allocable to pollution control is the percentage of time the facility is used for pollution control. The facility is used for material handling and not pollution control. Therefore, the percentage of the facility cost allocable to pollution control is **0%**.

Compliance and Other Tax Credits

The facility is in compliance with Department rules and statutes and with EQC orders.

DEQ permits issued to facility include:
Air Contaminant Discharge Permit (ACDP) No. 22-2522

Reviewers: Dave Kauth: DEQ Air Quality
Maggie Vandehey: Management Services

Attachment D

Advice
EQC Tax Credit
Monitoring
Authority

HARDY MYERS
ATTORNEY GENERAL

DAVID SCHUMAN
DEPUTY ATTORNEY GENERAL

1515 SW 5th Avenue
Suite 410
Portland, Oregon 97201
FAX: (503) 229-5797
TDD: (503) 378-5938
Telephone: (503) 229-5725

DEPARTMENT OF JUSTICE
PORTLAND OFFICE

February 4, 1999

Maggie Vandehey
Department of Environmental Quality
811 Southwest Sixth Avenue
Portland, Oregon 97204

Re: EQC Tax Credit Monitoring Authority
DOJ File No.: 340-990-6N0041-99

Dear Ms. Vandehey:

The Environmental Quality Commission (EQC) has asked whether it has authority to adopt a rule allowing DEQ to monitor facilities granted pollution control tax credits. The objective of such monitoring would be to ensure that those facilities are still being used for pollution control and not other purposes. Alternatively, the EQC wishes to know if it has the authority to require that persons with certified pollution control equipment affirm, on an annual basis, that they are still using the certified equipment for purposes of pollution control. For the reasons briefly stated below, we think the answer to both questions is yes.

The EQC has statutory authority to revoke a certification if it finds that:

> "The holder of the certificate has failed substantially to operate the facility for the purpose of, and to the extent necessary for, preventing, controlling or reducing air, water, or noise pollution or solid waste, hazardous wastes or used oil as specified in such certificate."

ORS 468.185(1)(B); <u>see also</u> OAR 340-016-0080(3)(a)(B). In addition, the EQC has authority to "adopt such rules and standards as it considers necessary and proper in performing the functions vested by law in the commission." ORS 468.020(1).

A strong case can be made that some monitoring power over pollution control tax certificates is "necessary and proper" for the Commission to be able to carry out the revocation provision. As long as the monitoring is reasonably related to determining whether the certified facilities are still being operated to control pollution, it should be legally defensible. In addition, as the EQC's questions seem to assume, new rulemaking to establish and delineate the monitoring would have to be conducted.

One possible limitation should be noted. There is good reason to question whether the EQC's authority extends into matters that deal not with certification of pollution control facilities under ORS 468.150-190, but instead with use of a certificate to claim a credit under the tax statutes.[1] See Phelan v. Environmental Quality Commission, 141 Or App 321, 329, 917 P2d 1029, 1033 (1996)(stating, in apparent dictum, that the EQC's "authority to look to the tax law to determine who is eligible for a certificate is not clear . . ."). Nonetheless, given the EQC's clear authority to revoke a certificate, properly drafted monitoring rules need not impinge matters governed by the tax statutes.

The tax statutes and the Department of Revenue's authority thereunder warrant mention because they do appear to deal with questions of adherence to certificate conditions. For example, facilities requesting property tax exemption based on a pollution control tax certification "must file not later than April 1 [every year for which the exemption is claimed] a statement with the county assessor . . . stating that the ownership of all property included in the certificate **and its use** remain unchanged." ORS 307.420(1) (emphasis added). If the applicant misrepresents the use of the facility, the applicant may be guilty of a misdemeanor under ORS 307.990. Although the pollution control provisions in the income tax credit statute (ORS 315.304) do not discuss yearly statements, the applicant presumably must make some request each year to have the pollution control tax credit applied. If the applicant misrepresents the use of the facility in such a request, the applicant may have violated ORS 314.075(5).

We assume that these tax statutes are enforced through the traditional means of auditing and complaints or other instances in which specific information is brought to the Department of Revenue's attention. We did not discuss this matter with anyone at the Department of Revenue but would gladly do so upon request.

If you or the EQC have any additional questions, please feel free to call me.

Sincerely,

Michael B. Huston (by dcs)

Michael B. Huston
Assistant Attorney General

MBH/dcs

cc: AAG – Larry Knudsen

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[1] The certificate granted by EQC does not actually grant the tax credit. Instead, the certificate allows the applicant to apply for a tax credit under ORS 307.405 or 315.304.

1998 Highlights

- 1998 water year was near average due to heavy spring precipitation. Runoff volume above The Dalles was 105% of average (1961-90) (Jan-Jul) and 104.1% of average above Lower Granite.
- Resulting flows were considerably less than observed in 1996 and 1997.
- Flows during the spring often exceeded hydraulic capacity of projects. Most spill that occurred was involuntary.
- Spill was managed to meet the TDGS waivers, with exception of some time periods during the spring runoff.
- TDGS levels exceeded 130% on only one day. Gas abatement structures (spillway deflectors) were installed at both John Day and Ice Harbor dams over the past few years.
- The biological criteria established by NMFS were never exceeded in 1998.
- Few signs of GBT were observed in migrating salmonids (similar to 1995) and very few fish were observed with severe signs.

State of Oregon
Department of Environmental Quality

Memorandum

Date: March 10, 1999

To: Environmental Quality Commission

From: Langdon Marsh, Director

Subject: Agenda Item C, National Marine Fisheries Service's Request for a Waiver to the Total Dissolved Gas Water Quality Standard, EQC Meeting March 19, 1999.

Statement of Purpose

The National Marine Fisheries Service (NMFS) has petitioned the Commission for a variance to the state's total dissolved gas standard to enable spill over McNary, John Day, The Dalles, and Bonneville Dams to assist juvenile outmigrating salmon and steelhead.

The petition requests a waiver from the current total dissolved gas standard of 110 percent to 115 percent total dissolved gas as measured in the forebays of the dams and 120 percent in the tailraces of the dams. The waiver request is for the dates April 3, 1999 through August 31, 1999.

Rationale for Waiver Request

In late 1991 and early 1992, NMFS determined that three "species" of salmon from the Snake River Basin were endangered or threatened under the Endangered Species Act (ESA). The listed species were sockeye salmon, spring/summer chinook, and fall chinook. In March of 1995, an ESA Section 7 Biological Opinion (BiOp) on the operation of the federal Columbia River Power System was issued. The BiOp established a set of reasonable and prudent alternatives (RPA) with the objective of improving the operation and configuration of the federal power system to meet a no jeopardy requirement of the ESA, and to fulfill the United States commitment to uphold treaty rights. The RPA's relative to spill and total dissolved gas are:

1. RPA#2 – Recommends that the U.S. Army Corps of Engineers (COE) spill water at the Snake and Columbia River hydroelectric projects to increase fish passage efficiency (FPE) during the period of spring/summer chinook migration at all projects. The objective of spilling water over a hydroelectric project is achieving a FPE of 80 percent (that is 80 percent of the juvenile migrants pass the project via nonturbine routes such as through spill or bypass systems). Exceptions to this RPA is under specified flow conditions or limited by water quality conditions.

2. RPA#16 – Directs Bonneville Power Administration (BPA), Bureau of Reclamation (BOR), and the COE to participate in the development and implementation of a monitoring and evaluation program to investigate the effects of the dissolved gas saturation.

3. RPA#18 – The COE is directed to participate in the development and implementation of a gas abatement program at all projects using structural modifications.

In May of 1998, The NMFS issued a Supplemental Biological Opinion to the BiOp. The Supplemental Biological Opinion was developed in part to address the needs of the newly listed threatened Snake River and Lower Columbia River steelhead and the endangered Upper Columbia River steelhead. The Supplemental Biological Opinion calls for additional spill on a system-wide basis and an extended spill season.

There are a four methods by which downstream migrating salmonids can pass by dams. These passage methods include through the turbines, transportation by barge, through the fish by-pass system, and over the spillway. The FPE can be increased by increasing the level of spill. This is one method used by the NMFS to try and increase the number of returning adult salmon and steelhead. The Independent Science Advisory Board (ISAB) recommended that no one method be used for passing fish by the dams but to use multiple methods including fish by-pass systems and transportation. Multiple methods are employed in the Columbia River Basin in an attempt to increase fish returns.

The purpose of the spill program is to improve the downstream passage of ESA listed stocks of fish by providing a route of passage by the dams that has less mortality than passage by the turbines. Spilling water for fish passage can generate elevated levels of total dissolved gas that can have detrimental effects on fish. Spill for fish as an alternate passage route and the associated mortality due to total dissolved gas must be balanced against mortality of turbine passage. The increased survivorship associated with increased levels of spill as measured by total dissolved gas levels are contained in Table 1. These estimates were calculated from the NMFS SIMPAS model used for estimating fish passage and survivorship at the dams.

Table 1. Estimated spring chinook project survivals at two different river flows with tailrace TDG capped at two different levels for each of the lower Columbia River dams.

	% Survivorship			
River Flow	250 kcfs		300 kcfs	
TDG	110%	120%	110%	120%
Bonneville	92.9	93.4	92.5	93.0
The Dalles	94.9	97.6	94.7	96.9
John Day	95.0	95.3	94.9	95.2
McNary	96.9	97.4	97.1	97.2

Monitoring Results for the 1998 Spill Season

Columbia River water flows, spill conditions, physical total dissolved gas, and the incidence and severity of gas bubble disease were monitored during the 1998 spill season. The results of the monitoring are discussed below.

Columbia River Flows

The 1998 runoff volume was slightly higher than average with runoff volume for The Dalles Dam of 104% and for Lower Granite Dam of 105% of the average runoff volume, respectively. However, 1998 flows were less than the flows observed in 1997 which were 150% and 166% of the average for The Dalles Dam and Lower Granite Dam, respectively. The reduced flows for 1998 were reflective in the total dissolved gas levels observed during the 1998 spill season.

Physical Monitoring of Total Dissolved Gas

Total dissolved gas is monitored at the forebay and tailrace of McNary, John Day, and The Dalles Dams. Total dissolved gas is monitored in the forebay of Bonneville Dam and at Camas/Washougal downstream of Bonneville Dam. Total dissolved gas levels were reported hourly for the duration of the spill season. In general, the water flows that occurred in 1998 resulted in spill that was managed to meet the total dissolved gas standard (TDGS) waiver. There were exceptions that occurred when involuntary spill caused exceedances of the TDGS waiver. These events occurred during the spring when runoff volumes were greatest. Total dissolved gas levels were above the TDGS waiver at McNary Dam in late April and early May and again in early June. The TDGS waiver was exceeded in late May and early June at the John Day Dam. Total dissolved gas levels at The Dalles exceeded the TDGS waiver for a short period in early June. The TDGS waiver was exceeded in late May and early June at Bonneville Dam. The exceedances of the TDGS waiver was a result of involuntary spill due to either reduced power demand or lack of hydraulic capacity.

Biological Monitoring of Gas Bubble Disease

Monitoring for gas bubble disease in juvenile and adult salmonids was conducted in 1998. Juvenile salmonid gas bubble disease monitoring was conducted at McNary, John Day, and Bonneville Dams. Adult salmonid gas bubble disease monitoring was conducted at Bonneville and Lower Granite Dams. The results of the monitoring showed low incidence and severity of gas bubble disease in juveniles and no detections of gas bubble disease in adults at Bonneville and only four adults with gas bubble disease at Lower Granite Dam. Based on the results of the monitoring the juveniles have a higher incidence of gas bubble disease than adults and juveniles are probably a better monitor for gas bubble disease than adults. More detail on monitoring results are contained below.

Juvenile Monitoring

Monitoring for incidence and severity of gas bubble disease was conducted at McNary, John Day, and Bonneville Dams. Juvenile salmonids were examined by Smolt Monitoring Program personnel 3 days a week at McNary and 6 days a week at John Day and Bonneville Dams. The goal was to examine 100 fish of each species during each day of sampling. The fish were examined using variable magnification dissecting scopes. The lateral line and unpaired fins were examined for the presence of bubbles. The bubbles present were quantified using a ranking system based on the percent of the fins or lateral line covered with bubbles. A total of 46,498 juvenile salmon were examined for signs of gas bubble trauma. There were 449 or 1.0% of the fish examined showed signs of gas bubble trauma (Table 2). The severity of gas bubble trauma was ranked low for the majority of the fish exhibiting signs of gas bubble disease. The biological criteria that was established for the termination of the spill was never violated.

Table 2. The incidence and severity of gas bubble disease (GBD) for juvenile salmon examined in 1998. Rank 1 = 1%-5% of a fin covered with bubbles; Rank 2 = 5%-25% of a fin covered with bubbles; Rank 3 = >25% of a fin covered with bubbles.

Number of Fish Examined	Rank 1	Rank 2	Rank 3	Total
46,498	405 (0.9%)	38 (0.1%)	6 (0.01%)	449 (1.0%)

Adult Monitoring

Because of the difficulty in sampling adult salmonid migrants for gas bubble disease monitoring was conducted with on-going research at the adult sampling facilities at Bonneville and Lower Granite Dams. Adult chinook, steelhead and sockeye salmon were examined at Bonneville and chinook were examined at Lower Granite. No signs of gas bubble disease were observed in fish examined at Bonneville and 4 fish had signs of gas bubble disease at Lower Granite (Table 3).

Table 3. Summary of adult salmonid gas bubble disease (GBD) monitoring for 1998.

Site	Species	# Fish Examined	# Fish with GBT Signs	Percent Signs
Bonneville	Chinook	729	0	0.0
	Steelhead	260	0	0.0

	Sockeye	184	0	0.0
Lower Granite	Chinook	3755	4	0.0

Dissolved Gas Research

Research on the biological effects and physical distribution of dissolved gas has been conducted and is in the final stages of completion. These research efforts were undertaken to validate the biological monitoring program, gain a better understanding of the effects of total dissolved gas on aquatic life and the physical distribution of total dissolved gas levels in the Columbia River system. The research conducted in 1998 focused on the remaining questions of whether the incidence and severity of gas bubble disease signs observed in fish monitored at the dams are representative of the fish in-river and the vertical distribution of in-river juvenile salmonids.

Research was conducted to determine if there was a difference in the incidence and severity of gas bubble disease signs between in-river fish and the fish sampled at the dams. The results of this research showed that incidence and severity of gas bubble disease were no different between the in-river salmonids and the salmonids collected at the dams. This research indicates that the biological monitoring conducted at the dams as part of the total dissolved gas waiver is reflective of gas bubble disease for in-river salmonids and is a useful tool for monitoring gas bubble disease.

Research was conducted to determine the vertical distribution of migrating juvenile salmonids. Vertical distribution is important in understanding the potential effects of total dissolved gas on fish because it takes higher levels of total dissolved gas to cause the same level of gas bubble disease for fish traveling at deeper depths. This is referred to as depth compensation. The results of the research for 1998 showed that tagged fish were below the compensation depth and migrated through the study reach more directly than during 1997. This research indicates that migrating juvenile salmonids can migrate at depths compensating for the effects of total dissolved gas.

The research on total dissolved gas over the last four years has improved our understanding of the physical distribution of total dissolved gas levels during spill events the effects of total dissolved gas on resident and anadromous fish, and validation of the biological monitoring program. We now believe that the physical fixed monitoring station for total dissolved gas are representative of the river conditions or can be extrapolated to conditions upstream of the monitors. We have a better understanding on the progression of gas bubble disease signs with exposure to elevated levels of total dissolved gas. Most importantly we have seen that the biological monitoring conducted at the dams is reflective of the incidence and severity of gas bubble disease signs for in-river salmonids. Also, the data collected over the past four years have shown that increases in total dissolved gas levels as measured by the physical monitoring program are reflected in the incidence and severity of gas bubble disease observed in the biological monitoring program. The total dissolved gas research projects funded last year were scheduled for completion in 1999. The research scheduled for the 1999 spill season would complete the work on the incidence and severity of gas bubble disease in juvenile salmonids. The research conducted in 1999 will be dependent on the level of funding available.

Physical & Biological Monitoring for the 1999 Spill Season

A total dissolved gas and gas bubble disease monitoring plan has been submitted by the NMFS. The plan submitted is similar to the plan and effort for during the 1998 spill season. The COE is responsible for monitoring for total dissolved gas. Total dissolved gas will be monitored in the forebays and tailraces of McNary, John Day, and The Dalles dams. Total dissolved gas monitoring will occur at the Bonneville Dam forebay and at the Camas/Washougal site. The Camas/Washougal site is used to represent the Bonneville Dam tailrace because there is not a suitable location for tailrace monitoring below Bonneville Dam. Total dissolved gas levels will be recorded hourly with daily reports and postings of the data.

Juvenile salmonids will be routinely monitored for signs of gas bubble disease by the Smolt Monitoring Program. Monitoring for gas bubble disease in juveniles will be conducted twice weekly at McNary and Bonneville Dams. This is a reduction in the number of sampling dates and locations sampled in an effort to reduce handling stress that occurs when monitoring for gas bubble disease signs. The current plan would monitor approximately 22,000 juvenile salmonids down from the 46,000 fish examined in 1998. Results of the biological monitoring will be reported weekly. Given that the physical monitoring has been shown to be reflective of the incidence and severity of gas bubble disease signs and the concern for handling stress causing mortality this reduction in the number of fish monitored appears reasonable. The frequency of biological sampling should be sufficient to detect increases in gas bubble disease signs. Adult monitoring for gas bubble disease may be conducted at selected locations during the spill season. Monitoring adult salmonids for gas bubble disease is not a sensitive method for detecting effects of total dissolved gas based on past data that show adults have much lower frequency of gas bubble disease signs than juveniles. Because of this it is recommended that adult monitoring not be required for the waiver.

Columbia River Water and Fish Management

Columbia River system configuration and the decision to spill water is made collectively between state, federal, and tribal Columbia River water and fish managers. However, voluntary spill resulting in total dissolved gas levels above the standard require a waiver before the operating agencies will spill water over the dam that would result in total dissolved gas levels above the 110 percent state standard. The waiver to the total dissolved gas standard would **allow** water to be spilled for fish passage as determined by the water and fish managers. The Commission action **does not require** water to be spilled for fish passage.

Past Actions

The NMFS request for a waiver to the total dissolved gas water quality standard to allow system-wide spill to aid downstream migrating salmonids was approved by the EQC in 1995, 1996, 1997, and 1998. The approved waiver allowed total dissolved gas levels of 115% in the forebays and 120% in the tailraces at McNary, John Day, The Dalles, and Bonneville Dams. The NMFS was required to measure the levels of total dissolved gas and conduct biological monitoring on the incidence and severity of gas bubble disease. Research was required to validate the biological monitoring program. A report of the years activity was required to be submitted to DEQ the following year.

Gas Abatement for the Columbia River

The COE has a program for reducing total dissolved gas supersaturation at its mainstem dams. The objective of the program is to respond to the recommendations of the NMFS gas bubble disease expert panel that structural and operational changes would be needed to reduce total dissolved gas supersaturation in the river system based on the managed spill program. The NMFS BiOp found that the COE should develop and implement a gas abatement program at all projects. The original goal of the program was to determine how the projects could be modified to comply with the state water quality standard for total dissolved gas saturation. The state standard for total dissolved gas is 110% for flows less than the ten year, seven day peak flood event.

The COE program involved conceptual evaluation of technical alternatives for reducing dissolved gas in spilled water, work plans for detailed engineering evaluations and biological studies, which would lead to eventual structural modifications at the dams. Results from the studies which are approximately 60% complete indicate that the structural modifications that would be the most effective at reducing total dissolved gas are the most injurious to fish due to physical damage from passage. The structural modifications that reduce gas and do not injure fish would not reduce total dissolved gas levels to the standard of 110%. According to the NMFS Independent Science Advisory Board the objective of reducing total dissolved gas levels to the state water quality standard of 110% during times when water is spilled involuntarily is unattainable even with major reconfiguration of the hydropower system short of dam breaching or major drawdowns. Work is on-going in the region, examining the options available for reducing total dissolved gas levels.

Authority of the Commission with Respect to the Issue

The authority of the Commission to address this issue is contained in Oregon Administrative Rules - OAR 340-41-205, 445, 485, and 525 (2)(n). A copy of the rule is attached as Appendix A.

At its meeting of February 16, 1995, the Commission modified the Oregon Administrative Rules to enable it to modify the total dissolved gas standard for the Columbia River for the purpose of assisting juvenile in-river salmon migration.

If the Commission is to grant this variance, it is required to make four findings under the rules. These are:

(i) that failure to act would result in greater harm to salmonid stock survival through in-river migration than would occur by increased spill;

(ii) that the modified total dissolved gas criteria associated with the increased spill provides a reasonable balance of the risk of impairment due to elevated total dissolved gas to both resident biological communities and other migrating fish and to migrating adult and juvenile salmonids when compared to other options for in-river migration of salmon;

(iii) that adequate data will exist to determine compliance with the standards; and

(iv) that biological monitoring is occurring to document that the migratory salmonid and resident biological communities are being protected.

The rule also allows the Commission to consider alternative modes of migration at its discretion.

Alternatives and Evaluation

There are four main methods of salmonid migration down the Columbia River. These are transportation, turbine passage, dam by-pass passage, and spill. In practice, all four of these modes will be used in 1999 as they have been in the past. None of these passage routes is without risk. While studies on transportation are continuing, preliminary findings of adults straying upon returning to spawning, and temperature concerns at the collector projects pose a risk to fish by this method. Turbine passage has a level of mortality associated with it variously calculated at between 10 and 15 percent. By-pass facilities do not guide all smolts away from the turbines, and there are concerns at temperatures exceeding 68 degrees Fahrenheit in the by-pass structures. Temperatures at these levels are considerably above what is optimal for cold water fisheries. Finally, spill has associated with it the risk of elevated levels of dissolved gas which can result in mortalities from gas bubble disease. Mortalities from spill at the levels requested in the NMFS' request have been calculated at between 2 and 3 percent.

The issue before the Commission is one of balancing risk. To not approve the waiver to the state's dissolved gas standard will result in more fish going through the turbines. In earlier work conducted by the Department, the waiver at the level requested was determined to be a relatively conservative approach which would result in protection of migrating salmonids. At the same time, it was determined that waivers at the level of 125 to 130 percent would pose increased risks to fish. Between 120 and 125 percent, the Department was unsure of the impacts, and elected to recommend that the Commission adopt the more conservative approach, at which the Department believed the risks of elevated dissolved gas were outweighed by the benefits, and that the risks inherent in spill were preferable to the risks inherent in other modes of fish passage. This is supported by the National Research Council's publication, *Upstream: Salmon and Society in the Pacific Northwest*, that recommended risk be spread by facilitating alternative modes of migration. The use of these alternatives are designed to increase survival of outmigrating juvenile salmonids. Although it appears spill benefits outmigrating juvenile salmonid as compared to turbine passage, there is still a low risk of adverse effects occurring from total dissolved gas. In addition, the Department remains concerned about the effects of gas bubble disease resulting from the spill program on early life stages of salmonids, other anadromous fish, and resident fish.

In relation to the four findings required to be made under the total dissolved gas rule, the following are supported by the petition:

(i) failure to act will result in more salmonid passage via hydroelectric dam turbines. Estimated mortalities from fish passing through turbines is between 11 and 15 percent. Fish passing over spillways as a result of spill experience 2 to 3 percent mortality. The Commission is, therefore able to make the first finding;

(ii) the balance of risk of impairment to migrating salmonids, resident fish, and other aquatic life due to elevated dissolved gas levels needs to be balanced against migrating juvenile salmonid mortality from turbine passage. Resident fish and aquatic invertebrates in the Columbia River downstream of Bonneville Dam were monitored by NMFS for signs of gas bubble disease in 1993, 1994, 1995, 1996, 1997, and 1998. There was a low incidence of gas bubble disease (less than 1 percent) in resident fish examined in 1993 and 1995 while in 1994, 1997, and 1998 none of the fish observed had signs of gas bubble disease. There were no signs of gas bubble disease observed in the aquatic invertebrates examined. Signs of gas bubble disease were prevalent in 1996 but this was a high flow year with large volumes of involuntary spill and total dissolved gas levels above 115 percent in the forebays and 120 percent in the tail races of dams. There is a low incidence of gas bubble disease in migrating juvenile and adult salmonids when the total dissolved gas levels are at or below 115 percent in the dam forebays and 120 percent in the tailraces. The low incidence of gas bubble disease observed has been regarded as a low risk for mortality from gas bubble disease. Total dissolved gas of 130 to 140 percent, that have resulted from involuntary spill, resulted in an increased incidence of gas bubble disease and is regarded as an increased risk of mortality from gas bubble disease. Given the past monitoring of gas bubble disease the levels requested in this petition seem to be a reasonable balance between increased survivorship due to reduced turbine mortality and the risk of mortality from gas bubble disease. The Commission is, therefore able to make the second finding;

(iii) NMFS has submitted a detailed physical monitoring plan. Physical monitoring will be conducted by the Army Corps of Engineers at Camas/Washougal, and the Bonneville Dam forebay and in the forebay and tailraces of McNary, John Day, and The Dalles Dams. Hourly data will be available on the Corps of Engineers' Internet World Wide Web pages. Implementation of the physical monitoring plan will ensure that data will exist to determine compliance with the standards for the voluntary spill program; The Commission is, therefore able to make the third finding.

(iv) NMFS has submitted a detailed biological monitoring plan. Juvenile salmonids will be collected at Bonneville and McNary Dams and examined for signs of gas bubble disease on non-paired fins, eyes, and lateral lines. Therefore, the Commission is able to make the fourth finding.

With these findings, the Commission is able to approve the variation to the total dissolved gas standard as sought by the NMFS.

Alternative Commission Actions

The petition is such that the required findings are able to be made, and the waiver approved. Clearly, any level of action less than approval can also be undertaken by the Commission, including denying the petition or approving it with conditions.

Summary of Public Input Opportunity

A public comment period was opened on February 23, 1999 and closed on March 4, 1999. There was one response that was received during the public comment period. The U.S Environmental Protection Agency submitted a letter in support of the waiver request.

Conclusions

The Department continues to support the waiver request.

Department Recommendation

The Department recommends that the Commission grant this petition by adopting the findings contained in the Draft Order attached as Appendix B, subject to implementation of the physical and biological monitoring regime as detailed in the monitoring plan accompanying the NMFS request dated February 19, 1999, and:

(i) Approve a revised total dissolved gas standard for the Columbia River for the period from midnight on April 3, 1999 to midnight on August 31, 1999;

(ii) Approve a total dissolved gas standard for the Columbia River of a daily (12 highest hours) average of 115 percent as measured in the forebays of McNary, John Day, The Dalles, and Bonneville Dams and at the Camas/Washougal monitoring stations;

(iii) Approve a cap on total dissolved gas for the Columbia River during the spill program of 120 percent measured in the tailraces of McNary, John Day, and The Dalles monitoring stations, based on the highest two hours during the 12 highest hourly measurements per calendar day during these times; and

(iv) Require that if 15 percent of the juvenile fish examined show signs of gas bubble disease in their non-paired fins where more than 25 percent of the surface area of the fin is occluded by gas bubbles, the Director will terminate the waiver;

(vi) Require NMFS to incorporate the following conditions into its program:

1. NMFS must provide written notice to the Department within 24 hours of any violations of the conditions in the variance as it relates to voluntary spill. Such notice shall include actions proposed to reduce TDG levels or the reason(s) for no action;

2. that NMFS provide a report of the spill program for 1999. The report should be completed by February 27, 2000 and supply information on the levels of total dissolved gas, the fish monitored and incidence and severity of gas bubble disease.

3. NMFS shall include in the report of the spill program information on the status of the Columbia River gas abatement program which would include the schedule for

the gas abatement program, COE and NMFS commitments to the gas abatement program, and efforts to achieve the state water quality standard of 110%.

Attachments

A. Copy of OAR 340-41-205, 445, 485, and 525 (2)(n)
B. Copy of EQC Draft Order

Approved:

Section:

Division:

Report Prepared By: Eugene Foster

Phone: (503) 229-5358

Date Prepared: March 10, 1999

Appendix A

OAR 340-41-205, 445, 485, and 525(2)(n)

(A) The concentration of total dissolved gas relative to atmospheric pressure at the point of sample collection shall not exceed 110 percent of saturation, except when stream flow exceeds the ten-year, seven-day average flood. However, for Hatchery receiving waters and waters less than two feet in depth, the concentration of total dissolved gas relative to atmospheric pressure at the point of sample collection shall not exceed 105 percent of saturation.

(B)The Commission may modify the total dissolved gas criteria in the Columbia River for the purpose of allowing increased spill for salmonid migration. The Commission must find that:

(i) Failure to act would result in greater harm to salmonid stock survival through in-river migration than would occur by increased spill.
(ii) The modified total dissolved gas criteria associated with the increased spill provides a reasonable balance of the risk of impairment due to elevated total dissolved gas to both resident biological communities and other migrating fish and to migrating adult and juvenile salmonids when compared to other options for in-river migration of salmon;
(iii) Adequate biological data will exist to determine compliance with the standards; and,
(iv) Biological monitoring is occurring to document that the migratory salmonid and resident biological communities are being protected.

(C) The Commission will give public notice and notify all known interested parties and will make provision for the for opportunity to be heard and comment on the evidence presented by others, except that the Director may modify the total dissolved gas criteria for emergencies for a period not exceeding 48 hours;

(D) The Commission may, at its discretion, consider alternative modes of migration.

Appendix B

BEFORE THE ENVIRONMENTAL QUALITY COMMISSION

In the matter of the National Marine Fisheries Service's request to adjust the total dissolved gas water quality standard to allow spill of water at the mainstem Columbia River Dams to assist out-migrating Snake and Columbia River salmon smolts	(((((((	ORDER

WHEREAS the Department of Environmental Quality received a request from the National Marine Fisheries Service dated February 19, 1999, to adjust the Total Dissolved Gas Standard as necessary to spill over dams on the Columbia River to assist out-migrating Snake and Columbia River salmon smolts from midnight on April 3 to midnight on August 31, 1999.

WHEREAS the public was notified of the request on February 23, 1999 and given the opportunity to provide written comments until 5:00 p.m. on March 4, 1999.

WHEREAS the Environmental Quality Commission met on March 19, 1999 and considered the request, justification and public comment.

THEREFORE the Environmental Quality Commission orders as follows:

1. Acting under OAR 340-41-205, 445, 485, and 525 (2)(n)(B), the Commission finds:

   (i) failure to act will result in more salmonid passage via hydroelectric dam turbines. Estimated mortalities from fish passing through turbines is between 10 and 15 percent. Fish passing over spillways as a result of spill experience 2 to 3 percent mortality;

   (ii) the balance of risk of impairment to migrating salmonids, resident fish, and other aquatic life due to elevated dissolved gas levels is balanced against migrating juvenile salmonid mortality from turbine passage. Resident fish and aquatic invertebrates in the Columbia River downstream of Bonneville Dam were monitored by NMFS for signs of gas bubble disease in 1993, 1994, 1995, 1996, 1997, and 1998. There was a low incidence of gas bubble disease (less than 1 percent) in resident fish examined in 1993 and 1995 while in 1994, 1997, and 1998 none of the fish observed had signs of gas bubble disease. There were no signs of gas bubble disease observed in the aquatic invertebrates examined. Signs of gas bubble disease were prevalent in 1996 but this was a high flow year with large volumes of involuntary spill and total dissolved gas levels above 115 percent in the forebays and 120 percent in the tail races of dams. There is a low incidence of gas bubble disease in migrating juvenile and adult salmonids when the total dissolved gas levels are at or below 115 percent in the dam forebays and 120 percent in the tailraces. The low incidence of gas bubble disease observed has been regarded as a low risk for mortality from gas bubble disease. Total dissolved gas of 130 to 140 percent, that have resulted from involuntary spill, resulted in an increased incidence of gas bubble disease and is regarded as an increased risk of mortality from gas bubble disease. Given the past monitoring of gas bubble disease the levels requested in this petition seem to be a reasonable balance between increased survivorship due to reduced turbine mortality and the risk of mortality from gas bubble disease.

(iii) NMFS has submitted a detailed physical monitoring plan. Physical monitoring will be conducted by the Army Corps of Engineers at the forebays of McNary, John Day, The Dalles, and Bonneville Dams and in the tailraces of McNary, John Day, The Dalles, and at Camas/Washougal. Hourly data will be posted electronically. Implementation of the physical monitoring plan will ensure that data will exist to determine compliance with the standards for the voluntary spill program;

(iv) NMFS has submitted a detailed biological monitoring plan. Smolt monitoring will be conducted at McNary and Bonneville Dams with examination of smolts with 10X to 40X dissecting microscopes. Signs of GBD will be sought on non-paired fins, eyes and lateral lines.

2. The Environmental Quality Commission approves a modification to the Total Dissolved Gas standard for spill over the Columbia River dams subject to the following conditions:

(i) implementation of the physical and biological monitoring regime as detailed in the monitoring plan accompanying the National Marine Fisheries Service request dated February 19, 1999, and:

(ii) a revised total dissolved gas standard for the Columbia River for the period midnight on April 3, 1999 to midnight on August 31, 1999;

(iii) a total dissolved gas standard for the Columbia River of a daily (12 highest hours) average of 115 percent as measured at established monitors at the forebay of the next dam downstream from the spilling dam during these times;

(iv) a further modification of the total dissolved gas standard for the Columbia River to allow for a daily (12 highest hours) average of 120 percent as measured at established tailrace monitors below the spilling dams during these times;

(v) a cap on total dissolved gas for the Columbia River during the spill program of 125 percent, based on the highest two hours during the 12 highest hourly measurements per calendar day during these times; and

(vi) that if 15 percent of the juvenile fish examined show signs of gas bubble disease in their non-paired fins where more than 25 percent of the surface area of the fin is occluded by gas bubbles, the Director will halt the spill program;

(vii) NMFS will incorporate the following conditions into its program:

1. NMFS must provide written notice to the Department within 24 hours of any violations of the conditions in the variance as it relates to voluntary spill. Such notice shall include actions proposed to reduce TDG levels or the reason(s) for no action;

2. TDG data and incidence of GBD signs in smolts will be reported to the Department weekly. Hourly TDG levels collected from the forebays and downstream locations of McNary, John Day, The Dalles, and Bonneville Dams will be available electronically to the Department daily and reported weekly. Incidence of GBD signs in smolts collected from McNary and Bonneville Dams will be reported to the Department weekly. Signs of GBD in smolts will be measured by using a variable (10X to 40X) dissecting scope. Unpaired fins, eyes, and lateral line will be examined for the presence of bubbles;

3. that NMFS provide an annual report of the spill program for 1999 and supply information on the levels of total dissolved gas, the fish monitored and incidence and severity of gas bubble disease. NMFS shall provide in the report, information on the status of the Columbia River gas abatement program which would include the schedule for the gas abatement program, COE and NMFS commitments to the gas abatement program, and the efforts to achieve state water quality standard of 110%. This report should be forwarded for public and ISAB review by January 19, 2000, and should arrive at DEQ by February 27, 2000, accompanied by any waiver request for 2000.

Dated: ________________ ON BEHALF OF THE COMMISSION

____

Appendix C

BEFORE THE ENVIRONMENTAL QUALITY COMMISSION

In the matter of the U. S. Fish & (ORDER
Wildlife Service's request to spill (
water to assist out-migrating Spring (
Creek National Fish Hatchery Chinook (
salmon smolts (

WHEREAS the Department of Environmental Quality received a request from the U. S. Fish & Wildlife Service dated December 11, 1998, to adjust the Total Dissolved Gas Standard as necessary to spill over Bonneville Dam on the Columbia River to assist out-migrating Spring Creek National Fish Hatchery fall Chinook salmon smolts from midnight on March 18 to midnight on March 28, 1999.

WHEREAS the public was notified of the request on December 15, 1998, and given the opportunity to provide written comments until 5:00 p.m. on December 29, 1998.

WHEREAS the Environmental Quality Commission met on January 29, 1999 and considered the request, justification and public comment.

THEREFORE the Environmental Quality Commission orders as follows:

1. Acting under OAR 340-41-205(2)(n)(B), the Commission finds:

   (i) failure to act will result in more salmonid passage via hydroelectric dam turbines. Estimated mortalities from fish passing through turbines at Bonneville is between 11 and 15 percent. Fish passing over spillways as a result of spill experience 2 to 3 percent mortality. The Commission makes the first finding;

   (ii) the balance of risk of impairment to migrating salmonids, resident fish, and other aquatic life due to elevated dissolved gas levels needs to be balanced against migrating juvenile salmonid mortality from turbine passage. Resident fish and aquatic invertebrates in the Columbia River downstream of Bonneville Dam were monitored by NMFS for signs of gas bubble disease in 1993, 1994, 1995, 1996, 1997, and 1998. There was a low incidence of gas bubble disease (less than 1 percent) in resident fish examined in 1993 and 1995 while in 1994, 1997, and 1998 none of the fish observed had signs of gas bubble disease. There were no signs of gas bubble disease observed in the aquatic invertebrates examined. There is a low incidence of gas bubble disease in migrating juvenile and adult salmonids when the total dissolved gas levels are at or below 115 percent in the dam forebays and 120 percent in the tailraces. The low incidence of gas bubble disease observed has been regarded as a low risk for mortality from gas bubble disease. Total dissolved gas of 130 to 140 percent, that have resulted from involuntary spill, resulted in an increased incidence of gas bubble disease and regarded as an increased risk of mortality from gas bubble disease. Given the past monitoring of gas bubble disease the levels requested in this petition seem to be a reasonable balance between increased survivorship due to reduced turbine mortality and the risk of mortality from gas bubble disease. The Commission makes the second finding;

(iii) USFWS has submitted a detailed physical monitoring plan. Physical monitoring will be conducted by the Army Corps of Engineers at Warrendale, Skamania, Camas/Washougal, and the Bonneville Dam forebay. Hourly data will be available on the Corps of Engineers' Internet World Wide Web pages. Implementation of the physical monitoring plan will ensure that data will exist to determine compliance with the standards for the voluntary spill program; The Commission makes the third finding.

(iv) USFWS has submitted a detailed biological monitoring plan. Juvenile salmonids and resident fish will be collected with a beach seine downstream of Bonneville Dam and examined for signs of gas bubble disease on non-paired fins, eyes, and lateral lines. Adult salmonids will be monitored for signs of gas bubble disease by using video tape as they pass through the viewing chambers of the Bonneville Dam fish ladders. The Commission makes the fourth finding.

2. The Environmental Quality Commission approves a modification to the Total Dissolved Gas standard for spill over the Columbia River dams subject to the following conditions:

(i) implementation of the physical and biological monitoring regime as detailed in the monitoring plan accompanying the U. S. Fish & Wildlife Service request dated December 11, 1998, and:

(ii) a revised total dissolved gas standard for the Columbia River for the period midnight on March 18, 1999 to midnight on March 28, 1999;

(iii) a total dissolved gas standard for the Columbia River of a daily (12 highest hours) average of 115 percent as measured at established monitors at the Camas/Washougal monitoring station during these times;

(iv) a cap on total dissolved gas for the Columbia River during the spill program of 120 percent as measured at the Camas/Washougal monitoring station, based on the highest two hours during the 12 highest hourly measurements per calendar day during these times; and

(v) that if *either* 15 percent of the fish examined show signs of gas bubble disease in their non-paired fins, *or* five percent of the fish examined show signs of gas bubble trauma in their non-paired fins where more than 25 percent of the surface area of the fin is occluded by gas bubbles, whichever is the less, the Director will terminate the waiver;

(vii) USFWS will incorporate the following conditions into its program:

1. USFWS must provide written notice to the Department within 24 hours of any violations of the conditions in the variance as it relates to voluntary spill. Such notice shall include actions proposed to reduce TDG levels or the reason(s) for no action;
2. that USFWS provide a report of the Spring Creek NFH spill program for 1999. The report should be completed by September 30, 1999 and supply information on the levels of total dissolved gas, the fish monitored and incidence of gas bubble disease.

Dated: ______________ ON BEHALF OF THE COMMISSION

____
Director

Environmental Quality Commission

☒ Rule Adoption Item
☐ Action Item
☐ Information Item

Agenda Item D
March 19, 1999 EQC Meeting

Title:

LRAPA Asbestos Rule Amendments and Adoption of LRAPA Permit Fee Increases into the SIP.

Summary:

Lane Regional Air Pollution Authority (LRAPA) adopted asbestos rule revisions to align the agency's requirements with state and federal rule modifications. These rules are presented to the Environmental Quality Commission's for approval under ORS 468A.135.

LRAPA also adopted rule modifications to increase the fees assessed for Air Contaminant Discharge Permits. These amendments are proposed as a revision to the State of Oregon Clean Air Act Implementation Plan under OAR 340-020-0047.

Department Recommendation:

The department recommends that the commission approve amendments to LRAPA's asbestos rules and adopt changes to LRAPA's Air Contaminant Discharge Permit fees as a revision ot the State Implementation Plan.

Dave Nordberg	Gregory A. Gr	Langdon Marsh
Report Author	Division Administrator	Director

Accommodations for disabilities are available upon request by contacting the Public Affairs Office at (503)229-5317(voice)/(503)229-6993(TDD).

State of Oregon
Department of Environmental Quality Memorandum

Date: February 26, 1999

To: Environmental Quality Commission

From: Langdon Marsh

Subject: Agenda Item D, Approval of LRAPA Asbestos Rules, and SIP Revision for LRAPA ACDP Fee Increases: EQC Meeting of March 19, 1999

Background

This package contains regulations requiring two actions by the commission. The first is approval of asbestos rule amendments adopted by Lane Regional Air Pollution Authority (LRAPA). The second is adoption of LRAPA's increased fees for ACDP (Air Contaminant Discharge Permits) as a revision to the State Implementation Plan (SIP). The need for these actions is described as follows:

1. ORS 468A.135 allows regional air pollution agencies to exercise the authority to regulate air pollution that is otherwise vested in the commission and the department. ORS 468A.135(2) prohibits any regional agency from adopting any rule or standard that is less strict than that adopted by the commission. The statute gives the Environmental Quality Commission (EQC) oversight by requiring a regional agency to submit its emission standards for the commission's approval before they may be enforced.

   The statute does not indicate a standard of review for such approval, but it is apparent the commission's role is limited to the issue of stringency. In the present case, LRAPA adopted regulations that are similar to rules previously adopted by the EQC, and staff finds them to be as stringent as state requirements.

2. Because LRAPA ACDP fees do not constitute emission standards, they do not need to be submitted for EQC approval under ORS 468A.135. However, the U.S. Environmental Protection Agency (EPA) determined that ACDP fee schedules do belong in the SIP. The SIP is revised through the readoption of OAR 340-020-0047, after which the department submits the modifications to EPA for approval. The Attorney General's office indicates this is not a substantive matter. At this point, the commission need only adopt the SIP rule to incorporate LRAPA's rules into the State Implementation Plan.

Accommodations for disabilities are available upon request by contacting the Public Affairs Office at (503) 229-5317 (voice)/(503) 229-6993 (TDD).

LRAPA provided public notice for these regulations pursuant to its own process. LRAPA's Board of Directors authorized public hearings to be held, and the department authorized LRAPA staff to act concurrently as the EQC's Hearing Officer for revising the SIP (OAR 340-020-0047) to incorporate LRAPA's new ACDP fees. Public notices and informational materials were mailed to the persons who had asked to be notified of rulemaking actions in accordance with LRAPA's procedures.

Public hearings were held as follows:

Issue	Public Notice SOS Bulletin	Public Hearing/ LRAPA Adoption	Hearing Officer
Asbestos Rules	Not Applicable	October 20, 1998	Barbara Cole
ACDP Fees	April 1, 1998	May 12, 1998	Barbara Cole

Comments received are summarized in the "Agenda Item" staff reports of the October 20, 1998 and May 12, 1998 LRAPA board meetings. These reports include LRAPA's evaluation of comments received and modifications recommended to the proposed regulations. The department's air quality staff also evaluated LRAPA's regulations and concluded they comply with ORS 468A.135 by being at least as stringent as air quality rules adopted by the EQC.

The following sections summarize the issues that this proposed approval/rulemaking action is intended to address, cite the authority to address the issues, describe the action taken by the LRAPA Board of Directors, and provide a recommendation for commission action.

Issue this Proposed Rulemaking Action is Intended to Address

This approval/rulemaking action is intended to complete the procedural requirements necessary for the enforcement of these rule modifications and to bring LRAPA's portion of the SIP up to date with its own rules and with the state's portion of the SIP.

Commission approval of LRAPA regulations demonstrates the Commission's agreement with the LRAPA Board that the regulations meet the provisions of ORS 468A.135 which requires that a regional authority's regulations must be at least as stringent as state regulations.

Relationship to Federal and Adjacent State Rules

Regarding EQC approval of asbestos rules, LRAPA regulations must be at least as stringent as state and federal regulations. DEQ staff reviewed LRAPA's rules and found them to meet the stringency requirements.

Regarding revision of the SIP to include LRAPA's new ACDP fees, all agencies responsible for achieving the National Ambient Air Quality Standards (NAAQS--established under the Clean Air Act) must include the rules used to attain those standards as part of the state plan. The Air Contaminant Discharge Permit Program is one of the mechanisms used to achieve the NAAQS and therefore falls into this category. The SIP serves as the primary enforcement mechanism through which EPA oversees air programs, and its revision is subject to federal review and approval. Procedures for SIP modification vary from state to state. In Oregon, the SIP is revised by the amendment of OAR 340-020-0047.

Authority to Address the Issues

ORS 468A.135 authorizes the commission to approve standards and rules of regional authorities. ORS 468 and 468A authorize the commission to amend the SIP in OAR 340-020-0047.

Process for Development of the Rulemaking Proposal (including Advisory Committee and alternatives considered)

LRAPA and its board are subject to the requirements of ORS Chapters 183 and 192 regarding rulemaking procedures and public meetings. LRAPA has its own rulemaking process which parallels the Department's. It uses advisory committees in rule development, holds public hearings in front of its board, and adopts rules. The attached regulations are products of this process.

Summary of Rulemaking Proposal Presented for Public Hearing and Discussion of Significant Issues Involved.

Asbestos Rules: The Department of Environmental Quality's rules for asbestos demolition and removal were amended several times during past years to incorporate new federal requirements. These changes to DEQ's rules increased fees, clarified which projects are exempt from regulations, and added new requirements for sources subject to the federal Title V Operating Permit Program. The LRAPA rule amendments presented for the commission's approval with this package are at least as stringent as the department's current measures, and comply with EPA's national requirements. Generally described, the amendments constitute evolutionary adjustments of the asbestos program's requirements. Details of the specific issues addressed by the rule modifications are described in the report for Agenda Item 6 of the LRAPA Board of Directors' meeting of October 20, 1998. (See Attachment B.)

ACDP Fees: LRAPA's fees for Air Contaminant Discharge Permits were last increased in 1991. Since then, the Clean Air Act Amendments of 1990 added to LRAPA's work load by raising the required level of technical analysis, and making federal compliance and reporting more complex. As a result, the existing fees were no longer adequate to sustain the required level of service, and LRAPA raised ACDP fees to cover a greater percentage of program costs.

Overall, LRAPA fees were raised to approximately 84 percent of DEQ's fees for comparable permit categories. (LRAPA's fees are lower than the department's because unlike DEQ, LRAPA is financially supported by local governments to partially cover the agency's operating costs.) The result of LRAPA's action typically represents an increase of 24 percent over previous fee levels. However, fees for certain sources were adjusted by other percentages to better match the service required for individual categories. For example, application fees for simple "synthetic minor" permits (permits used for certain small emitters in lieu of complicated Title V permits) increased from $500 to $1,000. In additon, the annual compliance assurance charge for simple "synthetic minors" went up from $200 to $500. Other exceptions to the 24 percent increase are listed in the "Attachment to LRAPA Rulemaking Proposal Announcement..." which is included at the end of LRAPA's report for Agenda Item 6 of the Board of Directors' meeting of May 12, 1998. (See Attachment I.)

Summary of Significant Public Comment and Changes Proposed in Response

Public comments received and LRAPA's responses are cited in the Agenda Item 6 reports for the LRAPA Board meetings of May 12 and October 20, 1998. (See Attachments B and I)

Summary of How the Proposed Rule Will Work and How it Will be Implemented

These regulations are being implemented as evolutionary modifications to LRAPA's ongoing ACDP and asbestos programs.

Recommendation for Commission Action

The department recommends that the commission approve amendments to LRAPA's asbestos rules and adopt changes to LRAPA's ACDP fees as a revision to the State of Oregon Clean Air Act Implementation Plan under OAR 340-020-0047.

Attachments

Asbestos Rules (for EQC Approval):

A. Amendments to LRAPA Title 43: Emission Standards for Hazardous Air Pollutants
B. Staff Report (Agenda Item 6) of LRAPA Board Meeting of Oct. 20, 1998 (including Fiscal Impact Statement, Summary of Public Comments and LRAPA Responses, and Rulemaking Justification Analysis).
C. DEQ Letter of September 30, 1998
D. Minutes of LRAPA Board Meeting of Oct. 20, 1998
E. Public Notice Cover Memo of August 3, 1998 (including Land Use Consistency Statement)
F. Legal Advertisement Affidavits of Publication

ACDP Fees (for Adoption as a SIP Revision):

G. Amendments to LRAPA Title 34: Stationary Source Rules and Permitting Procedures
H. OAR 340-020-0047 (Oregon's SIP Rule)
I. Staff Report (Agenda Item 6) of LRAPA Board Meeting of May 12, 1998 (including Advisory Committee Report, Summary of Public Comments and LRAPA Responses, and Rulemaking Justification Analysis)
J. Statement of Need for Rule Amendments, Fiscal Impact Statement and Land Use Consistency Statement
K. DEQ Letter of March 23, 1998
L. Barbara Cole's Hearing Officer's Report of May 12, 1998 Public Hearing
M. Minutes of LRAPA Board Meeting of May 12, 1998
N. Oregon Bulletin Notice and Legal Ad Affidavits of Publication
O. Questions to be Answered to Reveal Potential Justification for Differing from Federal Requirements

Reference Documents (available upon request)

Written Comments Received (listed in Attachments B and I)
Principal Documents Relied Used for ACDP Rulemaking (listed in Attachment J)

Approved:

Section:

Division: Gregory A. Gre

Report Prepared By: Dave Nordberg

Phone: (503) 229-5519

Date Prepared: January 26, 1999

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10/19/95

LANE REGIONAL AIR POLLUTION AUTHORITY

TITLE 43
Emission Standards for Hazardous Air Pollutants

AMENDMENTS
10-20-98

Section 43-001 Policy

The board finds and declares that certain air contaminants for which there is no ambient air standard may cause or contribute to an identifiable and significant increase in mortality or to an increase in serious irreversible or incapacitating reversible illness, and are therefore considered to be hazardous air contaminants.

Section 43-002 Hazardous Air Contaminants Listing and Applicability

1. Pursuant to Section 112 of the Federal Clean Air Act, the following air contaminants have been declared by the federal EPA to be hazardous:

   A. Asbestos

   B. Benzene

   C. Beryllium

   D. Coke Oven Emissions

   E. Inorganic Arsenic

   F. Mercury

   G. Radionuclides

   H. Vinyl Chloride

2. The Lane Regional Air Pollution Authority has been delegated responsibility by the federal EPA for administering standards for the following hazardous air contaminants:

   A. Asbestos

   B. Beryllium

   C. Mercury

   D. Radon from Underground Uranium Mines

Section 43-005 Definitions

The following definitions are relevant to this title. Additional general definitions can be found in Title [~~14~~]12.

- "Adequately wet" means to sufficiently mix or penetrate asbestos-containing material with liquid to prevent the release of particulate asbestos materials. The absence of visible emissions is not sufficient evidence of being adequately wet.

- "Asbestos" means the asbestiform varieties of serpentine (chrysotile), riebeckite (crocidolite), cumingtonite-grunerite (amosite), anthophyllite, actinolite and trimolite.

- "Asbestos abatement project" means any demolition, renovation, repair, construction or maintenance activity of any public or private facility that involves the repair, enclosure, encapsulation, removal, salvage, handling or disposal of any material with the potential of releasing asbestos fibers from asbestos-containing material into the air. Note: An asbestos abatement project is not considered to be a source under 43-010-2 through 43-010-6. Emergency fire fighting is not an asbestos abatement project.

- "Asbestos-containing material" means asbestos or any material containing [~~at least~~] more than 1% asbestos by weight, including particulate asbestos material.

- "Asbestos-containing waste material" means any waste which contains asbestos [~~mill~~] tailings or any commercial asbestos and is generated by a source subject to the provisions of this subsection, including but not limited to asbestos mill tailings, control device asbestos waste, [~~friable~~] asbestos waste material, asbestos abatement project waste and bags or containers that previously contained commercial asbestos.

- "Asbestos manufacturing operation" means the combining of commercial asbestos, or in the case of woven friction products, the combining of textiles containing commercial asbestos with any other material(s) including commercial asbestos, and the processing of this combination into a product as specified in Section 43-015-3.

- "Asbestos mill" means any facility engaged in the conversion or any intermediate step in the conversion of asbestos ore into commercial asbestos.

- "Asbestos tailings" means any solid waste product of asbestos mining or milling operations which contains asbestos.

- "Asbestos waste generator" means any person performing an asbestos abatement project or any owner or operator of a source subject to 43-005 through 43-015 whose act or process generates asbestos-containing waste material.

- "Asbestos waste shipment record" means the shipment document, required to be originated and signed by the asbestos waste generator, used to track and substantiate the disposition of asbestos-containing waste material.

- "Authority" means the Lane Regional Air Pollution Authority.

- "Beryllium" means the element beryllium. Where weight or concentrations are specified in these rules, such weights or concentrations apply to beryllium only, excluding any associated elements.

- "Beryllium alloy" means any metal to which beryllium has been added in order to increase its beryllium content, and which contains more than 0.1 percent beryllium by weight.

- "Beryllium containing waste" means any material contaminated with beryllium and/or beryllium compounds used or generated during any process or operation performed by a source subject to these rules.

- "Beryllium ore" means any naturally occurring material mined or gathered for its beryllium content.

- "Commercial asbestos" means any variety of asbestos which is produced by extracting asbestos from asbestos ore.

- "Commission" means the Environmental Quality Commission.

- "Demolish" or "Demolition" means the wrecking or removal of any load-supporting structural member of a facility together with any related handling operations or the intentional burning of any facility.

- "Department" means the Oregon Department of Environmental Quality.

- "Director" means the Director of the Lane Regional Air Pollution Authority and authorized deputies or officers.

- "Fabricating" means any processing (e.g., cutting, sawing, drilling) of a manufactured product that contains commercial asbestos, with the exception of processing at temporary sites (field fabricating) for the construction or restoration of facilities. In the case of friction products, fabricating includes bonding, debonding, grinding, sawing, drilling, or other similar operations performed as part of fabricating.

- "Facility" means all or part of any public or private building, structure, installation, equipment, or vehicle or vessel including but not limited to ships.

- "Friable asbestos material" means any asbestos-containing material that hand pressure can crumble, pulverize or reduce to powder when dry.

- "Fugitive emissions" means any emissions which escape from a point or area that is not identifiable as a stack, vent, duct or equivalent opening.

- ~~["Full-scale asbestos abatement project" means any asbestos abatement project which is intended to prevent the release of asbestos fibers into the air and which is not classified as "small-scale asbestos abatement project" [43-005-40] as defined in this section (43-005).]~~

- "Hazardous air contaminant" means any air contaminant considered by the Authority, Department or Commission to cause or contribute to an identifiable and significant increase in mortality or to an increase in serious irreversible or incapacitating irreversible illness and for which no ambient air standard exists.

- "HEPA filter" means a high-efficiency particulate air filter capable of filtering 0.3 micrometer particles with 99.97 percent efficiency.

- "Inactive asbestos waste disposal site" means any disposal site for asbestos-containing waste where the operator has allowed the Department's solid waste permit to lapse, has gone out of business, or no longer receives asbestos-containing waste.

- "Interim storage of asbestos-containing material" means the storage of asbestos-containing waste material which has been placed in a container outside a regulated area until transported to an authorized landfill.

- "Major Source," as used in this Title, is the same as the definition of major source in **OAR 340-28-0110**.

- "Mercury" means the element mercury, excluding any associated elements and includes mercury in particulate, vapors, aerosols, and compounds.

- "Mercury ore" means any mineral mined specifically for its mercury content.

- "Mercury ore processing facility" means a facility processing mercury ore to obtain mercury.

- "Mercury chlor-alkali cell" means a device which is basically composed of an electrolyzer section and a denuder (decomposer) section, and utilizes mercury to produce chlorine gas, hydrogen gas, and alkali metal hydroxide.

- "Negative pressure enclosure" means any enclosure of an asbestos abatement project area where ambient air pressure is greater than the air pressure within the enclosure, and the air inside the enclosure is changed at least two times an hour by exhausting it through a HEPA filter.

- "Nonfriable asbestos-containing material" means any material containing more than one percent (1%) asbestos as determined by weight that when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.

- "Open accumulation" means any accumulation, including storage, of friable asbestos-containing waste material other than material securely enclosed and stored as required by 43-015-18.

- "Particulate asbestos material" means any finely divided particles of asbestos material.

- "Person" means any individual, corporation, association, firm, partnership, joint stock company, public and municipal corporation, political sub-division, the state and any agency thereof, and the federal government and any agency thereof.

- "Propellant" means a fuel and oxidizer physically or chemically combined, containing beryllium or beryllium compounds, which undergoes combustion to provide rocket propulsion.

- "Propellant plant" means any facility engaged in the mixing, casting, or machining of propellant.

- "Renovate" or "Renovation" means altering in any way one or more facility components. Operations in which load-supporting structural members are wrecked or removed are considered demolition and are not included in the definition of renovation [~~excluded~~].

- "Roadways" mean surfaces on which vehicles travel. This term includes public and private highways, roads, streets, parking areas, and driveways.

[~~• "Small-scale asbestos abatement project" means any short-duration asbestos abatement project as defined in 41, below, and/or removal, renovation, encapsulation, repair, or maintenance procedures intended to prevent asbestos containing material from releasing fibers into the air and which:~~

~~A. Remove, encapsulate, repair or maintain less than 40 linear feet or 80 square feet of asbestos-containing material;~~

~~B. Do not subdivide an otherwise full-scale asbestos abatement project into smaller-sized units in order to avoid the requirements of these rules;~~

~~C. Utilize all practical worker isolation techniques and other control measures; and~~

~~D. Do not result in worker exposure to an airborne concentration of asbestos in excess of 0.1 fibers per cubic centimeter of air calculated as an eight (8) hour time-weighted average.~~]

- "Small-scale, short-duration [~~renovating and maintenance~~] activity" means a task for which the removal of asbestos is not the primary objective of the job, including, but not limited to:

  A. Removal of asbestos-containing insulation on pipes, not to exceed amounts greater than those which can be contained in a single glove bag;

  B. Removal of small quantities of asbestos-containing insulation on beams or above ceilings;

  C. Replacement of an asbestos-containing gasket on a valve;

  D. Installation or removal of a small section of drywall; [~~or~~]

  E. Installation of electrical conduits through or proximate to asbestos-containing materials.

F. Minor repairs to damaged thermal system insulation which does not require removal;

G. Repairs to asbestos-containing wallboard; or

H. Repairs involving encapsulation, enclosure, or removal of small amounts of friable asbestos-containing material in the performance of emergency or routine maintenance activity and not intended solely as asbestos abatement. Such work may not exceed amounts greater than those which can be contained in a single prefabricated mini-enclosure. Such an enclosure shall conform spatially and geometrically to the localized work area, in order to perform its intended containment function.

[~~Small-scale activities shall be limited to no more than forty (40) linear feet or eighty (80) square feet of asbestos-containing materials. An activity that would otherwise qualify as a full-scale abatement project shall not be subdivided into smaller units in order to avoid the requirements of these rules.~~]

[F] No such activity described above shall result in airborne asbestos concentrations above 0.1 fibers per cubic centimeter of air (calculated on an 8-hour weighted average).

- "Startup" means commencement of operation of a new or modified source resulting in release of contaminants to the ambient air.

- "Structural member" means any load-supporting member, such as beams and load-supporting walls, or any non-supporting member, such as ceilings and non-load-supporting walls.

[~~• "Waste generator" means any person performing an asbestos abatement project or any owner or operator of a source covered by this section whose act or process generates asbestos-containing waste material.~~

~~• "Waste shipment record" means the shipment document, required to be originated and signed by the waste generator, used to track and substantiate the disposition of asbestos-containing waste material.~~]

Section 43-010 General Provisions

1. The provisions of these rules shall apply to any source which emits air contaminants for which a hazardous air contaminant standard is prescribed. Compliance with the provisions of these rules shall not relieve the source from compliance with other applicable rules of the Authority or with applicable provisions of the Oregon Clean Air Act Implementation Plan.

2. Prohibited activities:

   A. No person shall construct, install, establish, develop or operate any source of emissions subject to these rules without first obtaining an air contaminant discharge permit from the Authority.

B. No person shall modify any existing source so as to cause or increase emissions of contaminants subject to these rules without first obtaining a modified permit from the Authority.

C. No person subject to the provisions of these emission standards shall fail to provide reports or report revisions as required in these rules.

3. All applications for construction or modification shall comply with the requirements of Titles 34 and 38 and the requirements of the standards set forth in these rules.

4. Notwithstanding the requirements of Title 34, any person owning or operating a new source of emissions subject to these emission standards shall furnish the Authority written notification as follows:

A. Notification of the anticipated date of startup of the source not more than sixty (60) days nor less than thirty (30) days prior to the anticipated date.

B. Notification of the actual startup date of the source within fifteen (15) days after the actual date.

5. Any person operating any existing source, or any new source for which a standard is prescribed in these rules which had an initial startup which preceded the effective date of these rules shall provide the following information to the Authority within ninety (90) days of the effective date of these rules:

A. Name and address of the owner or operator;

B. Location of the source.

C. A brief description of the source, including nature, size, design, method of operations, design capacity, and identification of emission points of hazardous contaminants.

D. The average weight per month of materials being processed by the source and percentage by weight of hazardous contaminant contained in the processed materials, including yearly information as available.

E. A description of existing control equipment for each emission point, including primary and secondary control devices and estimated control efficiency of each control device.

6. The following are requirements for source emission tests and ambient air monitoring:

A. Emission tests and monitoring shall be conducted using methods set forth in 40 CFR, Part 61, Appendix B. The methods described in 40 CFR, Part 61, Appendix B are adopted by reference and made a part of these rules. Copies of these methods are on file at the Lane Regional Air Pollution Authority.

B. At the request of the Authority, any source subject to standards set forth in these rules may be required to provide emission testing facilities as follows:

(1) Sampling ports, safe sampling platforms, and access to sampling platforms adequate for test methods applicable to such source.

(2) Utilities for sampling and testing equipment.

C. Emission tests may be deferred if the Authority determines that the source is meeting the standard as proposed in these rules. If such a deferral of emission tests is requested, information supporting the request shall be submitted with the request for written approval of operation. Approval of a deferral of emission tests shall not in any way prohibit the Authority from canceling the deferral if further information indicates that such testing may be necessary to insure compliance with these rules.

Section 43-015 Emission Standards and Procedural Requirements for Asbestos

1. EMISSIONS STANDARDS FOR ASBESTOS MILLS. No person shall cause to be discharged into the atmosphere any visible emissions from any asbestos milling operation, including fugitive emissions, except as provided under [s]Subsection [~~11~~]15 of this section. For purposes of these rules, the presence of uncombined water in the emission plume shall not be cause for failure to meet the visible emission requirement. Outside storage of asbestos materials is not considered a part of an asbestos mill. Each owner or operator of an asbestos mill shall meet the following requirements:

A. Monitor each potential source of asbestos emissions from any part of the mill facility, including air cleaning devices, process equipment, and buildings that house equipment for material processing and handling, at least once each day, during daylight operations, for visible emissions to the outside air during periods of operations. The monitoring shall be by visual observation of at least fifteen (15) seconds duration per source of emissions.

B. Inspect each air cleaning device at least once each week for proper operation and for changes that signal the potential for malfunction including, to the maximum extent possible without dismantling other than opening the device, the presence of tears, holes, and abrasions in filter bags and for dust deposits on the clean side of bags. For air cleaning devices that cannot be inspected on a weekly basis according to this paragraph, submit to the Authority, revise as necessary, and implement a written maintenance plan to include, at a minimum, the following:

(1) Maintenance schedule; and

(2) Record keeping plan.

C. Maintain records of the results of visible emissions monitoring and air cleaning device inspections using a format approved by the Authority which includes the following:

(1) Date and time of each inspection;

(2) Presence of visible emissions;

(3) Condition of fabric filters, including presence of any tears, holes, and abrasions;

(4) Presence of dust deposits on clean side of fabric filters;

(5) Brief description of corrective actions taken, including date and time; and

(6) Daily hours of operation for each air cleaning device.

D. Furnish upon request, and make available at the affected facility during normal business hours for inspection by the Authority, all records required under this section.

E. Retain a copy of all monitoring and inspection records for at least two (2) years.

F. Submit a copy of visible emission monitoring records to the Authority quarterly. The quarterly reports shall be postmarked by the thirtieth (30th) day following the end of the calendar quarter.

G. Asbestos-containing waste material produced by any asbestos milling operation will be disposed of according to Section 43-015-[~~14~~]18.

2. ROADWAYS AND PARKING LOTS. No person may construct or maintain a roadway with asbestos tailings or asbestos-containing waste material on that roadway, unless (for asbestos tailings):

A. It is a temporary roadway on an area of asbestos ore deposits (asbestos mine); or

B. It is a temporary roadway at an active asbestos mill site and is encapsulated with a resinous or bituminous binder[~~. T~~], and the encapsulated road surface [~~must be~~] is maintained at a minimum frequency of once per year to prevent dust emissions; or

C. It is encapsulated in asphalt concrete meeting the specifications contained in section 401 of Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects, FP-85, 1985, or their equivalent.

3. MANUFACTURING. No person shall cause to be discharged into the atmosphere any visible emissions, except as provided in subsection [~~11~~] 16 of this section, from any building or structure in which manufacturing operations utilizing asbestos are conducted, or directly from any such manufacturing operations if they are conducted outside buildings or structures, or from any other fugitive emissions. All asbestos-containing waste material produced by any manufacturing operation shall be disposed of according to 43-015-[~~14~~]18. Visible emissions from boilers or other points not producing emissions directly from the manufacturing operation[~~;~~], and having no possible asbestos material in the exhaust gases, shall not be considered for purposes of this

rule. The presence of uncombined water in the exhaust plume shall not be cause for failure to meet the visible emission requirements.

A. Applicability. Manufacturing operations considered for purposes of these rules are as follows:

(1) The manufacture of cloth, cord, wicks, tubing, tape, twine, rope, thread, yarn, roving, lap, or other textile materials;

(2) The manufacture of fire proofing and insulating materials;

(3) The manufacture of cement products;

(4) The manufacture of friction products;

(5) The manufacture of paper, millboard, and felt;

(6) The manufacture of floor tile;

(7) The manufacture of paints, coatings, caulks, adhesives, or sealants;

(8) The manufacture of plastics and rubber materials;

(9) The manufacture of chlorine, using asbestos diaphragm technology;

(10) The manufacture of shotgun shell wads;

(11) The manufacture of asphaltic concrete;

(12) Any other manufacturing operation which results or may result in the release of asbestos material to the ambient air.

B. Monitor each potential source of asbestos emissions from any part of the manufacturing facility, including air cleaning devices, process equipment, and buildings housing material processing and handling equipment, at least once each day during daylight hours for visible emissions to the outside air during periods of operation. The monitoring shall be visual observation for at least fifteen (15) seconds.

C. Inspect each air cleaning device at least once each week for proper operation and for changes that signal the potential for malfunctions[;] including, to the maximum extent possible without dismantling other than opening the device, the presence of tears, holes, and abrasions in filter bags, and for dust deposits on the clean side of bags. For air cleaning devices that cannot be inspected on a weekly basis according to this paragraph, submit to the Authority, revise as necessary, and implement a written maintenance plan to include, at a minimum, the following:

(1) Maintenance schedule[~~.~~], and

(2) Record keeping plan.

D. [~~(3)~~] Maintain records of the results of visible emission monitoring and air cleaning device inspections using a format approved by the Authority which includes the following:

(1) [~~(a)~~] Date and time of each inspection[~~.~~];

(2) [~~(b)~~] Presence of visible emissions[.];

(3) [~~(c)~~] Condition of fabric filters, including presence of any tears, holes, and abrasions[.];

(4) [~~(d)~~] Presence of dust deposits on clean side of fabric filters[.];

(5) [~~(e)~~] Brief description of corrective actions taken, including date and time[.], and

(6) [~~(f)~~] Daily hours of operation for each air cleaning device.

E. [~~(4)~~] Furnish upon request, and make available at the affected facility during normal business hours for inspection by the Authority, all records required under this section.

F. [~~(5)~~] Retain a copy of all monitoring and inspection records for at least two (2) years.

G. [~~(6)~~] Submit quarterly a copy of the visible emission monitoring records to the Authority if visible emissions occurred during the report period. Quarterly reports shall be postmarked by the thirtieth (30th) day following the end of the calendar quarter.

H. [~~(7)~~] Asbestos containing waste material produced by any asbestos milling operation shall be disposed of according to 43-015-[~~14~~]18.

I. Open accumulation of friable asbestos-containing material or asbestos-containing waste material is prohibited.

4. SOURCES USING AIR CLEANING DEVICES

A. New sources covered by this rule shall submit the requested information 90 days prior to initial startup. Existing sources covered by this rule shall comply by March 1, 1996. Changes in the information provided to the Authority shall be submitted within thirty (30) days after the change

B. Sources covered by 43-015-1 Mills, 43-015-3 Manufacturing, 43-015-16 Fabricating, and 43-015-5 Asbestos to Nonasbestos Conversion Operations, shall provide the following information to the Authority.

(1) A description of the emission control equipment used for each process; and

(2) If a fabric filter device is used to control emissions,

(a) the airflow permeability in $m^3/min/m^2$ ($ft^3/min/ft^2$) if the fabric filter device uses a woven fabric, and, if the fabric is synthetic, whether the fill yarn is spun or not spun; and

(b) if the fabric filter device uses a felted fabric, the density in g/m^2 (oz/yd^2), the minimum thichness in millimeters (inches), and the airflow permeability in $m^3/min/m^2$ ($ft^3/min/ft^2$).

(3) If a HEPA filter is used to control emissions, the certified efficiency.

C. For sources covered by this rule and subject to 43-015-18 Asbestos Disposal Requirements:

(1) A brief description of each process that generates asbestos containing waste material;

(2) The average volume of asbestos containing waste material disposed of, measured in m^3/day (yd^3/day);

(3) The emission control methods used in all stages of waste disposal; and

(4) The type of disposal site or incineration site used for ultimate disposal, the name of the site operator and the name and location of the disposal site.

D. For sources covered by this rule and subject to 43-015-18.J Active Disposal Sites and 43-015-18.M Inactive Disposal Sites.

(1) A brief description of the site; and

(2) The method or methods used to comply with the standard, or alternative procedures to be used.

5. ASBESTOS TO NONASBESTOS CONVERSION OPERATIONS. (See 340-032-5605)

6. MAJOR SOURCES. This section applies only to renovation and demolition activities at major sources subject to the federal operating permit program as defined in **OAR 340-28-0110**.

A. To determine applicability of the Authority's asbestos regulations, the owner or operator of a renovation or demolition project shall thoroughly inspect the affected area for the presence of asbestos.

B. For demolition projects where no asbestos-containing material is present, written notification shall be submitted to the Authority on an approved form. The notification shall be submitted by the owner or operator or by the demolition contractor as follows:

(1) Submit the notification, as specified in Part C of this Subsection to the Authority at least ten (10) days before beginning any demolition project; and

(2) Notify the Authority prior to any changes in the scheduled starting or completion dates or other substantial changes, or the notification of demolition will be void.

C. The following information shall be provided for each notification of demolition:

(1) Name, address and telephone number of the person conducting the demolition;

(2) Contractor's Oregon demolition license number, if applicable;

(3) Certification that no asbestos was found during the predemolition asbestos inspection and that, if asbestos-containing material is uncovered during demolition, the procedures found in Sections 43-015-7 through 43-015-18 will be followed;

(4) Description of the building, structure, facility, installation, vehicle, or vessel to be demolished, including:

(a) the age and present and prior use(s) of the facility;

(b) address or location where the demolition project is to be accomplished.

(5) Major source owner's or operator's name, address and phone number;

(6) Scheduled starting and completion dates of demolition work; and

(7) Any other information requested on the Authority form.

[4]7. ASBESTOS ABATEMENT PROJECTS. Any person who conducts or provides for the conduct of an asbestos abatement project shall comply with the requirements set forth in 43-015-[~~5~~]9 through [~~9A~~]13.

A. The [~~following~~] asbestos abatement projects described in (1), (2), (3) and (4) below are exempt from the requirements in 43-015-7 through 11 and OAR Chapter 340, Division 33.

[~~A~~] (1). Asbestos abatement conducted in a single, private residence which is occupied by the owner and the owner-occupant performs the asbestos abatement.

[~~B~~] (2). Mastics and roofing products that are fully encapsulated with a petroleum-based binder that are not hard, dry and brittle, and the conditions in (a) and (b) below are met. This exemption shall end whenever these materials are burned, shattered, crumbled, pulverized or reduced to dust. [~~Removal of nonfriable asbestos-containing materials that are not shattered, crumbled, pulverized or reduced to dust until disposed of in an authorized disposal site. This exemption shall end whenever the asbestos-containing material becomes friable and releases asbestos fibers into the environment.~~]

(a) The generation of particulate asbestos material is minimized; and

(b) Asbestos-containing materials are wetted prior to removal and during subsequent handling, to the extent practicable.

[~~C~~](3). Removal of less than three square feet or three linear feet of asbestos-containing material provided that the removal of asbestos is not the primary objective [~~and~~], methods of removal are in compliance with **OAR 437 Division 3, "Construction" (29 CFR 1926.1101(g)**, and the conditions in (a), (b), (c), and (d) below are met. An asbestos abatement project shall not be subdivided into smaller sized units in order to qualify for this exemption. [~~the following conditions are met:~~

(a) The generation of particulate asbestos material is minimized;

(b) No vacuuming or local exhaust ventilation and collection is conducted with equipment having a collection efficiency lower than that of a HEPA filter;

(c) All asbestos-containing waste materials shall be cleaned up using HEPA filters or wet methods; and

(d) Asbestos-containing materials are wetted prior to removal and during subsequent handling, to the extent practicable[~~;~~].

[~~(e) An asbestos abatement project shall not be subdivided into smaller-sized units in order to qualify for this exemption.~~]

[~~D~~](4). Removal of asbestos-containing materials which are sealed from the atmosphere by a rigid casing, provided that the casing is not broken or otherwise altered such that asbestos fibers could be released during removal, handling and transport to an authorized disposal site.

B. Open storage or open accumulation of asbestos-containing material or asbestos-containing waste material is prohibited.

(Note: The requirements and jurisdiction of the State of Oregon Department of Insurance and Finance, Accident Prevention Division (Oregon OSHA) and any other state agency are not affected by these rules.)

8. NON-FRIABLE ASBESTOS ABATEMENT PROJECTS. Any person who removes non-friable asbestos-containing material not exempted under 43-015-7.A shall comply with the following:

A. Submit notification and fee to the Authority, on an Authority form in accordance with 43-015-9.

B. Removal of non-friable asbestos-containing materials that are not shattered, crumbled, pulverized or reduced to dust until delivered to an authorized disposal site is exempt from 43-015-10.N and 43-015-12. This exemption shall end whenever these asbestos-containing material becomes friable and releases asbestos fibers into the environment.

C. Open storage or open accumulation of nonfriable asbestos-containing material or asbestos-containing waste material is prohibited.

D. Any waste which contains non-friable asbestos-containing material and which is not subject to Section 43-015 shall be handled and disposed of using methods that will prevent the release of airborne asbestos-containing material.

[~~5~~]9. ASBESTOS ABATEMENT NOTIFICATION REQUIREMENTS. Written notification of any asbestos abatement project shall be provided to the Authority on an Authority form. The notification must be submitted by the facility owner or operator or by the contractor, in accordance with one of the procedures specified in subsections A, B or C below, except as provided in subsections [~~D,~~] F and G below.

A. Submit the notifications as specified in subsection D below, and the project notification fee to the Authority at least ten (10) days before beginning any friable asbestos abatement project and at least five (5) days before beginning any non-friable asbestos abatement project.

(1) The project notification fee shall be:

(a) Thirty-five dollars ($35) for each asbestos abatement project less than 40 linear feet or 80 square feet, residential building, or non-friable asbestos abatement project.

(b) Seventy-five dollars ($75) for each asbestos abatement project greater than or equal to[~~a small-scale asbestos abatement project~~] 40 linear feet or 80 square feet of asbestos-containing material and less than 260 linear feet or 160 square feet.

(c) Three-hundred dollars ($300) for each project greater than or equal to 260 linear feet or 160 square feet, and less than 2600 linear feet or 1600 square feet.

(d) Seven hundred and fifty dollars ($750) for each project greater than or equal to 2600 linear feet or 1600 square feet, and less than 26,000 linear feet or 16,000 square feet.

(e) One thousand and two hundred dollars ($1,200) for each project greater than or equal to 26,000 linear feet or 16,000 square feet, and less than 260,000 linear feet or 160,000 square feet.

(f) One thousand and five hundred dollars ($1,500) for each project greater than or equal to 260,000 linear feet or 160,000 square feet.

(g) Two hundred sixty dollars ($260) for annual notifications for friable asbestos abatement projects involving less than 40 linear feet or 80 square feet of asbestos removal.

(h) Three hundred fifty dollars ($350) for annual notifications for non-friable asbestos abatement projects performed at schools, colleges, and facilities.

(2) Project notification fees shall be payable with the completed project notification form. No notification will be considered to have occurred until the notification fee is submitted.

(3) The ten-day notification requirement in subsection A above may be temporarily waived in emergencies which directly affect human life, health, and property. This includes:

(a) Emergencies where there is an imminent threat of loss of life or severe injury; or

(b) Emergencies where the public is exposed to air-borne asbestos fibers; or

(c) Emergencies where significant property damage will occur if repairs are not made.

(4) The ten-day notification requirement in subsection A above may be temporarily waived for asbestos abatement projects which were not planned, resulted from unexpected events, and which if not immediately performed will cause damage to equipment or impose unreasonable financial burden. This includes the non-routine failure of equipment.

(5) In either (3) or (4) above persons responsible for such asbestos abatement projects shall notify the Authority by telephone prior to commencing work, or by 9:00 a.m. of the next working day if the work was performed on a weekend or holiday. In any case, notification as specified in sub-section D below and the appropriate fee shall be submitted to the Authority within three (3) days of commencing emergency or unexpected event asbestos abatement projects.

(6) If an asbestos project, equal to or greater than 2600 linear feet or 1600 square feet continues for more than one year, a new notification and fee shall be submitted annually thereafter until the project is complete.

(7) The Authority must be notified prior to any changes in the scheduled starting or completion dates or other substantial changes, or the notification will be void.

B. [~~For small-scale asbestos abatement projects conducted at one or more facilit[y]ies with a single owner, under a centrally controlled asbestos abatement project, where there is less than 40 linear feet or 80 square feet of asbestos-containing material, [the] an annual notification may be submitted as follows:~~] An annual notification for friable asbestos abatement projects shall only be used for projects where less than forty (40) linear or eighty (80) square feet of asbestos-containing material is removed. These projects shall only be conducted at one or more facilities by a single contractor or a single facility owner with a centrally controlled asbestos operation. The annual notification may be submitted as follows:

(1) Establish eligibility for use of this notification procedure with the Authority prior to use.

(2) Maintain on file with the Authority a general asbestos abatement plan. The plan shall contain the information specified in [~~subsections~~]part D [~~(1) through (9) below,~~] of this subsection to the extent possible.

(3) Provide to the Authority a summary report of all [~~small-scale applicable~~] asbestos abatement projects conducted using the annual notification procedure, [~~at the facility~~] in the previous three months, by the 15th day of the month following the end of each calendar quarter. The summary report shall include the information specified in [~~subsections~~] part D [~~(9) through (13) below~~] of this subsection for each project, a description of any significant variations from the general asbestos abatement plan, and a description of asbestos abatement projects anticipated for the next quarter.

(4) Provide to the Authority, upon request, a list of asbestos abatement projects which are scheduled or are being conducted at the time of the request;

([4]5) Submit a project notification fee [~~of two-hundred dollars per year ($200/year)~~] prior to use of this annual notification procedure [~~and annually thereafter while this procedure is in use~~].

([5]6) Failure to provide payment for use of this notification procedure shall void the general asbestos abatement plan, and each subsequent abatement project shall be individually assessed a project notification fee.

C. [~~For annual notification for friable asbestos abatement projects. For [small-scale] asbestos abatement projects of less than 40 linear feet or 80 square feet conducted by a single contractor at one or more facilities, the notification may be submitted as follows:~~] Annual non-friable asbestos abatement projects shall only be performed at schools, colleges, and facilities where the removal work is done by certified asbestos abatement workers. Submit the notification as follows:

(1) Establish eligibility for use of this notification procedure with the Authority prior to use;

(2) Maintain on file with the Authority a general non-friable asbestos abatement plan. The plan shall contain the information specified in [~~subsections D (1) through (7)~~]part D of this [~~rule~~] subsection to the extent possible;

(3) Provide to the Authority a [~~monthly~~] summary report of all [~~small-scale applicable~~] non-friable asbestos abatement projects [~~performed~~] conducted in the previous three months by the 15th day of the [~~following~~] month following the end of the calendar quarter[~~, including~~]. The summary shall include the information specified in [~~subsections~~] part D [~~(8) through (13)~~] of this [~~rule~~] subsection for each project, [~~and~~] a description of any significant variations from the general asbestos abatement plan [~~for each project~~], and a list describing the non-friable asbestos abatement projects anticipated for the next quarter, where possible.

(4) [~~Provide to the Authority, upon request, a list of asbestos abatement projects which are scheduled or are being conducted at the time of the request; and~~] Submit project notification and fee prior to use of this notification porcedure;

[~~(5) Submit a notification fee of $25 per monthly summary prior to the use of this notification procedure.~~]

([~~6~~]5) Failure to provide payment for use of this notification procedure shall void the general non-friable asbestos abatement plan, and each subsequent non-friable abatement project shall be individually assessed a project notification fee.

D. The following information shall be provided for each notification:

(1) Name and address of person intending to engage in asbestos abatement[~~.~~];

(2) Contractor's Oregon asbestos abatement license number, if applicable, and certification number of the supervisor for full-scale asbestos abatement or certification number of the trained worker for a project which does not have a certified supervisor[~~.~~];

(3) Method of asbestos abatement to be employed[~~.~~];

(4) Procedures to be employed to insure compliance with 43-015[~~.~~];

(5) Names, addresses and phone numbers of waste transporters[~~.~~];

(6) Name and address or location of the waste disposal site where the asbestos-containing waste material will be deposited[.];

(7) Description of asbestos disposal procedure[.];

(8) Description of building, structure, facility, installation, vehicle or vessel to be demolished or renovated, including address or location where the asbestos abatement project is to be accomplished:

(a) The age, present and prior use of the facility; and

(b) Address or location where the asbestos abatement project is to be accomplished

(9) Facility owner's or operator's name, address and phone number[.];

(10) Scheduled starting and completion dates of asbestos abatement work[.];

(11) Description of the asbestos type, approximate asbestos content (percent) and location of the asbestos-containing material[.];

(12) Amount of asbestos to be abated: linear feet, square feet, thickness[.];

(13) For facilities described in 43-015-[6]10(J), provide the name, title and authority of the state or local government official who ordered the demolition, date the order was issued, and the date the demolition is to begin[.]; and

(14) Any other information requested on the Authority form.

[~~E. No project notification fee shall be assessed for asbestos abatement projects conducted in the following residential buildings: site-built homes, modular homes constructed off site, condominium units, mobile homes, and duplexes or other multi-unit residential buildings consisting of four units or less. Project notification for a full-scale asbestos abatement project, as defined in 43-005-23, in any of these residential buildings shall otherwise be in accordance with subsection 5.A of this section. Project notification for a small-scale asbestos abatement project, as defined in 43-005-40 in any of these residential buildings is not required.~~] *(see 43-015-9.A(1)(a))*

[F] E. In addition to any other legal remedy available, the project notification fees specified in this section shall be increased by fifty (50) percent when an asbestos abatement project is commenced without filing of a project notification and/or submittal of a notification fee or when notification of less than ten days is provided under 43-015-[5]9A(3) and (4).

[G] F. The Director may waive part or all of a project notification fee. Requests for waiver of fees shall be made in writing to the Director, on a case-by-case basis, and be based upon financial hardship. Applicants for waivers must describe the reason for the request and certify financial hardship.

[6]10. ASBESTOS ABATEMENT WORK PRACTICES AND PROCEDURES. The following procedures shall be employed during an asbestos abatement project to prevent emissions of particulate asbestos material into the ambient air:

A. Remove [~~friable~~] asbestos-containing materials before any wrecking or dismantling that would break up the materials or preclude access to the materials for subsequent removal. However, [~~friable~~] asbestos-containing materials need not be removed before demolition if:

(1) They are on a facility component that is encased in concrete or other similar material and are adequately wetted whenever exposed during demolition.

(2) They were not discovered before demolition and cannot be removed because of unsafe conditions as a result of the demolition. Upon discovery the owner or operator performing the demolition shall:

(a) Stop demolition work immediately[~~.~~];

(b) Notify the Authority immediately of the occurrence[~~.~~];

(c) Keep the exposed asbestos-containing materials and any asbestos-contaminated waste material adequately wet at all times until a licensed asbestos abatement contractor begins removal activities[~~.~~]; and

(d) Have the licensed asbestos abatement contractor remove and dispose of the asbestos-containing waste material.

[~~(3) These materials are adequately wetted whenever exposed during demolition.~~]

B. Enclose the area of the asbestos-containing materials to be abated, in a negative pressure enclosure prior to abatement unless prior approval has been granted by the Authority.

C. Asbestos-containing materials shall be adequately wetted when they are being removed. In renovation, maintenance, repair and construction operations, where wetting would unavoidably damage equipment or is incompatible with specialized work practices, or presents a safety hazard, adequate wetting is not required, if the owner or operator:

~~(1) Demonstrates to the Authority that wetting would unavoidably damage equipment;~~

[~~(2)~~](1) Obtains prior written approval from the Authority for dry removal of asbestos-containing material;

[~~(3)~~](2) Keeps a copy of the Authority's written approval available for inspection at the work site;

[~~(4)~~](3) Adequately wraps or encloses any asbestos-containing material during handling to avoid releasing fibers; and

[~~(5)~~](4) Uses a local exhaust ventilation and collection system designed and operated to capture the particulate asbestos material produced by the asbestos abatement project which is no less efficient than a HEPA filter.

D. When a facility component covered or coated with [~~friable~~] asbestos-containing materials is being taken out of the facility as units or in sections:

(1) Adequately wet any [~~friable~~] asbestos-containing materials exposed during cutting or disjointing operation; and

(2) Carefully lower the units or sections to ground level, not dropping them or throwing them.

(3) Asbestos-containing materials do not need to be removed from large facility components such as reactor vessels, large tanks, steam generators, but excluding beams if the following requirements are met:

(a) The component is removed, transported, stored, disposed of, or reused without disturbing or damaging the regulated asbestos-containing material;

(b) The component is encased in leak-tight wrapping; and

(c) The leak-tight wrapping is labeled according to 43-015-[~~14C~~]18.B(3)(b) during all loading and unloading operations and during storage.

E. For friable asbestos materials being removed or stripped:

(1) Adequately wet the materials to ensure that they remain wet until they are disposed of in accordance with 43-015-[~~14~~]18;

(2) Carefully lower the materials to the floor, not dropping or throwing them; and

(3) Transport the materials to the ground via dust-tight chutes or containers if they have been removed or stripped above ground level and were not removed as units or in sections.

F. The asbestos abatement project area shall be adequately cleaned at the conclusion of the project to assure removal of all asbestos debris.

G. While at the project site, all asbestos-containing waste shall be secured in a posted area or receptacle.

H. Ambient air sampling may be required in proximity to any asbestos removal project where work practices prescribed in this section are not being followed, whether or not prior approval to use alternate method has been obtained from the Authority.

I. Before a facility is demolished by intentional burning; all asbestos containing material shall be removed and disposed of in accordance with sections 43-015-[5]10 Work Practices through [~~14~~]18 Disposal.

J. If a facility is being demolished under an order of the state or a local governmental agency, issued because the facility is structurally unsound and in danger of imminent collapse, the requirements of subsections A, B, C, D, E and I of this section shall not apply, provided that the portion of the facility that contains friable asbestos materials is adequately wetted during the wrecking operation.

K. None of the operations in subsections A through [~~D~~]E of this section shall cause any visible emissions. Any local exhaust ventilation and collection system or other vacuuming equipment used during an asbestos abatement project shall be equipped with a HEPA filter or other filter of equal or greater collection efficiency.

L. Open storage or open accumulation of friable asbestos-containing material or asbestos-containing waste material is prohibited.

M. Any materials within a container which displays an asbestos hazard warning shall be subject to all applicable rules and regulations pertaining to the storage and disposal of asbestos-containing waste materials.

[~~L~~] N. No person shall conduct an asbestos abatement project unless they possess a current asbestos abatement Contractors license or workers certification, issued by the Department under OAR 340-33-040 or OAR 340-33-050, respectively, unless exempted by 43-015-[4]8.B.

[~~M. Contractors licensed and workers certified to conduct only small-scale asbestos abatement projects under OAR 340-33-040 and 340-33-050 respectively may use only those work practices and engineering controls specified by OAR 437 Division 3 "Construction" (29 CFR 1926.58 Appendix G, unless the Authority authorizes other methods on a case-by-case basis.~~]

[~~N~~]O. An owner or operator of a facility shall not allow any persons other than those employees of the facility owner or operator who are appropriately certified or a licensed asbestos abatement contractor to perform an asbestos abatement project in or on that facility unless exempted by 43-015-8.B.

[~~O~~]P. The Director may approve, on a case-by-case basis, requests to use an alternative to a public health protection requirement provided by these rules for an asbestos abatement project. The contractor or facility owner or operator must submit in advance a written description of the alternative procedure which demonstrates, to the Director's satisfaction, that the proposed alternative procedure provides public health protection equivalent to the protection that would be provided by the specific provision, or that such level of protection cannot be obtained for the asbestos abatement project.

[7]11. FINAL AIR CLEARANCE SAMPLING REQUIREMENTS apply to projects involving more than 160 square feet or 260 linear feet of asbestos-containing material. Before a containment around such an area is removed, the person(s), contractor or facility owner/operator performing the abatement shall document that the air inside the containment has no more than 0.01 fibers per cubic centimeter of air. The air sample(s) collected shall not exceed 0.01 fibers per cubic centimeter of air. The Authority may grant a waiver to this section or exceptions to the following requirements upon written request.

A. The air clearance samples shall be performed and analyzed by a party who is National Institute of Occupational Safety and Health (NIOSH) 582, or equivalent, certified and financially independent from the person(s) conducting the asbestos abatement project.

B. Before final air clearance sampling is performed the following shall be completed:

(1) All visible asbestos-containing debris shall be removed according to the requirements of this section;

(2) The air and surfaces within the containment shall be sprayed with an encapsulant;

(3) Air sampling may commence when the encapsulant has settled sufficiently so that the filter of the sample is not clogged by airborne encapsulant;

(4) Air filtration units shall remain on during the air monitoring period.

C. Air clearance sampling inside containment areas shall be aggressive and comply with the following procedures:

(1) Immediately prior to starting the sampling pumps, direct exhaust from a minimum one horse power forced air blower against all walls, ceilings, floors, ledges, and other surfaces in the containment.

(2) Then place stationary fans in locations which will not interfere with air monitoring equipment and directed toward the ceiling. Use one fan per 10,000 cubic feet of room space.

(3) Start sampling pumps and sample an adequate volume of air to detect concentrations of 0.01 fibers per cubic centimeter according to the U.S. National Institute of Occupational Safety and Health, (NIOSH) 7400 method.

(4) When sampling is completed turn off the pump and then the fan(s).

(5) As an alternative to meeting the requirements of (1) through (4) of this sub-section, air clearance sample analysis may be performed according to Transmission Electron Microscopy Analytical Methods prescribed by 40 CFR 763.99, Appendix A to Subpart E.

D. The persons(s) performing asbestos abatement projects requiring air clearance sampling shall submit to the Authority[~~;~~] clearance results within thirty (30) days after the monitoring procedures were performed.

[~~8~~]12. RELATED WORK PRACTICES AND ENGINEERING CONTROLS employed for asbestos abatement projects by contractors and/or workers who are not otherwise subject to the requirements of the Oregon Department of Insurance and Finance, [~~Accident Prevention Division~~]Oregon Occupational Safety and Health Division, shall comply with the subsections of OAR Chapter 437, Division 3, "Construction" (29 CFR 1926.1101(g) [~~58 Appendix G~~]) which limit the release of asbestos-containing materials or exposure of other persons. As used in this subsection the term "employer" shall mean the operator of the asbestos abatement project, and the term "employee" shall mean any other person.

[9]13. SPRAYING OPERATIONS. The following apply to spraying operations:

A. No person shall cause to be discharged into the atmosphere any visible emissions from any spray-on application of materials containing more than one percent (1%) asbestos on a dry weight basis used to insulate or fireproof equipment or machinery, except as provided in subsection [9]15 of this section. Spray-on materials used to insulate or fireproof buildings, structures, pipes, and conduits shall contain less than one percent (1%) asbestos on a dry weight basis. In the case of any city or area of local jurisdiction having ordinances or regulations for spray application materials more stringent than those in this section, the provisions of such ordinances or regulations shall apply.

B. [~~Twenty days before any~~] A person planning to spray[s] asbestos materials to insulate, fireproof, cover or coat buildings, structures, pipes, conduits, equipment, or machinery shall notify the Authority in writing twenty (20) days before the spraying operation begins. The notification shall contain the following information:

(1) Name and address of person intending to conduct the spraying operation;

(2) Address or location of the spraying operation;

(3) Name and address of the owner of the facility being sprayed.

C. The spray-on application of materials in which the asbestos fibers are encapsulated with a bituminous or resinous binder during spraying and which are not friable after drying is exempted from the requirements of [~~subsections~~] parts [~~10;~~] A and B of this [~~rule~~] subsection.

[~~10~~]14. OPTIONS FOR AIR CLEANING. Rather than meet the no visible emissions requirements of 43-015-1 and 3, owners and operators may elect to use methods specified in section [~~11~~]15, below.

[~~11~~]15. AIR CLEANING. All persons electing to use air cleaning methods rather than comply with the no visible emission requirements must meet all provisions of this section:

A. Fabric filter collection devices must be used, except as provided in subsections B and C of this section. Such devices must be operated at a pressure drop of no more than four (4) inches (10.16 cm) water gauge as measured across the filter fabric. The air flow permeability, as determined by ASTM Method D737-75, must not exceed 30 ft.^{3}/min./ft.^{2} (9 m^3/min./m^2) for woven fabrics or 35 ft.^{3}/min./ft.^{2} (11 m^3/min./m^2) for felted fabrics with the exception that airflow permeability of 40 ft.^{3}/min/ft.^{2} (12 m^3/min./m^2) for woven and 45 ft.^{3}/min./ft.^{2} (14 m^3/min./m^2) for felted fabrics shall be allowed for filtering air emissions from asbestos ore dryers. Each square yard of felted fabric must weigh at least 14 ounces (475 grams/square meter) and be at least one-sixteenth 1/16 inch (1.6 mm) thick throughout. Any synthetic fabrics used must not contain fill yarn other than that which is spun.

B. The Authority may authorize the use of wet collectors designed to operate with a unit contacting energy of at least forty (40) inches (10.16 cm) of water gauge pressure when the use of fabric filters creates a fire or explosion hazard, as determined by the local fire department.

C. The Authority may authorize the use of filtering equipment other than that described in [~~subsections~~]parts A and [~~C~~]B of this sub-section if such filtering equipment is satisfactorily demonstrated and certified to provide filtering efficiency of at least 99.97 percent for particles 0.3 microns or greater.

D. All air cleaning devices authorized by this section must be properly installed, operated, and maintained. Devices to bypass the air cleaning equipment may be used only during upset and emergency conditions, and then only for such time as is necessary to shut down the operation generating the particulate asbestos-containing material.

E. All persons operating any existing source using air cleaning devices shall, within ninety (90) days of the effective date of these rules provide the following information to the Authority:

(1) A description of the emission control equipment used for each process.

(2) If a fabric is utilized, the following information shall be reported:

(a) The pressure drop across the fabric filter in inches water gauge and the airflow permeability in ft.^{3}/min./ft.^{2} (m^3/min./m^2).

(b) For woven fabrics, indicate whether the fill yarn is spun or not spun.

(c) For felted fabrics, the density in ounces/yard^3 (gms/m^3) and the minimum thickness in inches (centimeters).

(3) If a wet collector is used the unit contact energy shall be reported in terms of inches of pressure, water gauge.

F. For fabric filter collection systems installed after January 10, 1989, provide for easy inspection for faulty bags.

[~~12~~]16. FABRICATION. No person using commercial asbestos shall cause to be discharged into the atmosphere any visible emissions including fugitive emissions except as provided in 43-015-[~~11~~]15, from any fabricating operations including, but not limited to, the following:

A. The fabrication of cement building products.

B. The fabrication of friction products, except those operations that primarily install asbestos friction materials on motor vehicles.

C. The fabrication of cement or silicate board for ventilation hoods; ovens; electrical panels; laboratory furniture; bulkheads, partitions and ceilings for marine construction; and flow control devices for the molten metal industry.

D. Unless receiving prior approval from the authority, persons subject to this section shall:

(1) Monitor each potential source of asbestos emissions from any part of the fabricating facility, including air cleaning devices, process equipment for material processing and handling, at least once each day, during daylight hours, for visible emissions to the outside air during periods of operations. The monitoring shall be by visual observation of at least fifteen (15) seconds duration per source of emissions.

(2) Inspect each air cleaning device at least once each week for proper operation and for changes that signal the potential for malfunctions[~~;~~] including, to the maximum extent possible without dismantling other than opening the device, the presence of tears, holes, and abrasions in filter bags and for dust deposits on the clean side of bags. For air cleaning devices that cannot be inspected on a weekly basis according to this subsection, submit to the Authority, revise as necessary, and implement a written maintenance plan to include, at a minimum, the following:

(a) Maintenance schedule; and

(b) Record keeping plan.

(3) Maintain records of the results of visible emission monitoring and air cleaning device inspections using a format approved by the Authority which includes the following:

(a) Date and time of each inspection;

(b) Presence or absence of visible emissions;

(c) Condition of fabric filters, including presence of any tears, holes, and abrasions;

(d) Presence of dust deposits on clean side of fabric filters;

(e) Brief description of corrective actions taken, including date and time; and

(f) Daily hours of operation for each air cleaning device.

(4) Furnish upon request and make available at the affected facility during normal working hours for inspection by the Authority, all records required under this subsection.

(5) Retain a copy of all monitoring and inspection records for at least two (2) years.

(6) Submit a copy of the visible emission monitoring records to the Authority quarterly. The quarterly report shall be postmarked by the thirtieth (30th) day following the end of the calendar quarter.

[~~13~~]17. INSULATION. Molded insulating materials which are friable and wet-applied insulating materials which are friable after drying, installed after October 21, 1982, the effective date of these regulations, shall contain no commercial asbestos. The provisions of this subsection do not apply to insulating materials which are spray applied; such materials are regulated under subsection [~~10~~]13 of this section.

[~~14~~]18. ASBESTOS DISPOSAL REQUIREMENTS. Work practices and procedures for packaging, storage, transport, and disposal of asbestos containing waste material. The owner or operator of any source covered under the provisions of 43-015-[~~3, 6, 9 or 12~~]1 through 18, or any other source of friable asbestos-containing waste material shall meet the following standards:

A. There shall be no visible emissions to the atmosphere, except as provided in 43-015-[~~9~~]12, during the collection, processing, including incineration, packaging, transporting, or deposition of any asbestos-containing waste material which is generated by such source.

B. All asbestos-containing waste materials shall be adequately wetted to ensure that they remain wet until disposed of, [~~then~~] and:

(1) Persons [~~intending to~~] dispos[~~e~~]ing of asbestos-containing waste material shall notify the landfill operator of the type and volume of the asbestos-containing waste material and obtain the approval of the landfill operator prior to bringing the asbestos-containing waste to the disposal site.

(2) Processed into nonfriable pellets or other shapes; or

(3) Packaged in leak-tight containers such as two plastic bags with a minimum [~~of~~] thickness of 6 mil.; or fiber or metal drum. Containers are to be labeled as follows:

(a) The name of the asbestos waste generator and the location at which the asbestos waste was generated; and

(b) A warning label that states:

DANGER
Contains Asbestos Fibers
Avoid Creating Dust
Cancer and Lung Disease Hazard
Avoid Breathing Airborne
Asbestos Fibers

Alternatively, warning labels specified by 29 CFR 19[~~10.1001 (7/1/88)~~] 26.1101(k)(8)(07/07/95) may be used.

(4) Vacuum trucks approved by the Authority may deliver asbestos-containing slurries directly to the authorized disposal site.

(5) Nonfriable asbestos, such as asbestos cement siding, shall be covered when transported.

(6) The waste transporter shall immediately notify the landfill operator upon arrival of the asbestos-containing waste material at the disposal site. Off-loading of asbestos-containing waste shall be done under the direction and supervision of the landfill operator.

(7) Off-loading of asbestos-containing waste material shall occur at the immediate location where the asbestos-containing waste is to be buried.

(8) Off-loading of asbestos-containing waste material shall be accomplished in a manner that prevents the leak-tight transfer containers from rupturing and prevents visible emissions to the air.

C. Where the asbestos-containing materials are not removed from a facility prior to demolition as described in 43-015-[~~6(A)~~]10.J, they shall be adequately wetted at all times after demolition and kept wet during handling and loading for transport to a disposal site. Such asbestos-containing waste materials shall be transported in lined and covered containers for bulk disposal.

D. The interim storage of asbestos-containing waste material shall protect the asbestos-containing waste from dispersal into the environment and provide physical security from tampering by unauthorized persons. The interim storage of asbestos-containing waste material is the sole responsibility of the contractor, owner or operator performing the asbestos abatement project.

E. All asbestos-containing waste material shall be deposited as soon as possible by the waste generator at:

(1) An asbestos-containing waste disposal site authorized by the Department and operated in accordance with the provisions of this rule; or

(2) A Department approved site that converts asbestos-containing waste material into non-asbestos (asbestos free) material according to the provisions of [~~40 CFR 61.155~~] OAR 340-32-5605 Standard for Operations that convert asbestos-containing waste material into non-asbestos (asbestos free) material.

[~~F. Persons disposing of asbestos-containing waste material shall notify the landfill operator of the type and volume of the waste material and obtain the approval of the landfill operator prior to bringing the waste to the disposal site.~~]

[~~G~~] F. For each asbestos-containing waste shipment, the following information shall be recorded on an Authority form:

(1) The name, address, and telephone number of the waste generator;

(2) The number and type of asbestos-containing waste material containers and volume in cubic yards;

(3) A certification that the contents of this consignment are carefully and accurately described by the proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highways according to applicable regulations;

(4) The date transported;

(5) The name, address, and telephone number of the transporter(s);

(6) The name and telephone number of the disposal site operator;

(7) The name and address or location of the waste disposal site;

(8) The quantity of the asbestos-containing waste material in cubic yards;

(9) The presence of improperly enclosed or uncovered asbestos-containing waste, or any asbestos-containing waste material not sealed in leak-tight containers; and

(10) The date asbestos-containing waste is received at the disposal site.

[~~H~~] G. For the transportation of asbestos-containing waste material, the waste generator shall:

(1) Maintain the waste shipment records and ensure that all the information requested on the Authority form regarding waste generation and transportation has been supplied[~~.~~];

(2) Limit access into loading and unloading area to authorized personnel[~~.~~]; and

(3) Mark vehicles, while loading and unloading asbestos-containing waste, with signs (20 in. X 14 in.) that state:

DANGER
ASBESTOS DUST HAZARD
CANCER AND LUNG DISEASE HAZARD
Authorized Personnel Only

Alternatively, language that conforms to the requirements of 29 CFR 19[~~10.1001 (7/1/88)~~]26.1101(k)(7)(07/07/95) may be used.

[~~I~~] H. The waste transporter shall:

(1) Immediately notify the landfill operator upon arrival of the asbestos-containing waste at the disposal site[~~.~~]; and

(2) Provide a copy of the waste shipment record to the disposal site owners or operators when the asbestos-containing waste material is delivered to the disposal site.

[~~J~~] I. After initial transport of asbestos-containing waste material, the waste generator shall:

(1) Receive a copy of the completed waste shipment record within thirty-five (35) days, or determine the status of the asbestos-containing waste shipment. A completed waste shipment record will include the signature of the owner or operator of the designated disposal site.

(2) Have a copy of the completed waste shipment record within forty-five (45) days, or submit to the Authority[,] a written report including:

(a) A copy of the waste shipment record for which a confirmation of delivery was not received; and

(b) A cover letter signed by the waste generator explaining the efforts taken to locate the asbestos-containing waste shipment and the results of those efforts.

(3) Keep waste shipment records, including a copy signed by the owner or operator of the designated waste disposal site, for at least three (3) years. Make all disposal records available upon request to the Authority. For an asbestos abatement project

conducted by a contractor licensed under OAR 340-33-040, the records shall be retained by the licensed contractor. For any other asbestos abatement project, the records shall be retained by the facility owner.

[~~K~~] J. Each owner or operator of an active asbestos-containing waste disposal site shall, for all asbestos-containing waste material received, meet the following standards:

(1) Ensure that off-loading of asbestos-containing waste material is done under the direction and supervision of the landfill operator or [~~their~~] authorized agent and accomplished in a manner that prevents the leak-tight transfer containers from rupturing and prevents visible emissions to the air.

(2) Ensure that off-loading of asbestos-containing waste material occurs at the immediate location where the asbestos-containing waste is to be buried; and restrict public access to the off-loading area until asbestos-containing waste is covered in accordance with 9, below.

(3) Maintain waste shipment records and ensure that all information requested on the Authority form regarding asbestos-containing waste disposal has been supplied.

(4) Retain a copy of waste shipment records for at least three (3) years.

(5) Immediately notify the Authority by telephone, followed by a written report to the Authority the following working day, of the presence of improperly enclosed or uncovered asbestos-containing waste. Submit a copy of the waste shipment record along with the report. The disposal site operator shall not knowingly accept improperly prepared asbestos-containing waste material.

(6) As soon as possible and no longer than thirty (30) days after receipt of the asbestos-containing waste, send a copy of the signed waste shipment record to the waste generator.

(7) Upon discovering a discrepancy between the quantity of asbestos-containing waste designated on the waste shipment records and the quantity actually received, attempt to reconcile the discrepancy with the waste generator. Report in writing to the Authority within [~~the~~]fifteen (15[~~th~~]) days after receiving the asbestos-containing waste any discrepancy between the quantity of asbestos-containing waste designated on the waste shipment records and the quantity actually received which cannot be reconciled between the waste generator and the waste disposal site. Describe the discrepancy and attempts to reconcile it, and submit a copy of the waste shipment record along with the report. Identify the Authority assigned asbestos abatement project number in the discrepancy report.

(8) Select the asbestos-containing waste burial site in an area of minimal work activity that is not subject to future excavation.

(9) Cover all asbestos-containing waste material deposited at the disposal site with at least twelve (12) inches of soil or six (6) inches of soil plus twelve (12) inches of other waste before compacting equipment runs over it, but not later than the end of the operating day.

(10) Maintain, until closure, record of the location, depth and area, and quantity in cubic yards of asbestos-containing waste material within the disposal site on a map or diagram of the disposal area.

[~~L~~] K. Excavation or disturbance of asbestos-containing waste material[~~;~~] that has been deposited at a waste disposal site and is covered[~~;~~] shall be considered an asbestos abatement project. The notification for any such project shall be submitted as specified in 43-015-[~~5~~]9 but modified as follows:

(1) Submit the project notification and project notification fee to the Authority at least forty-five (45) days before beginning any excavation or disturbance of asbestos-containing waste disposal site.

(2) Explain the [~~R~~]reason for disturbing the asbestos-containing waste.

(3) Describe the [~~P~~]procedures to be used to control emissions during the excavation, storage, transport and ultimate disposal of the excavated asbestos-containing waste material. If deemed necessary, the Authority may require changes in the emission control procedures to be used.

(4) Specify the [~~L~~]location of any temporary storage site and the final disposal site.

[~~M~~] L. Upon closure of an active asbestos-containing waste disposal site, each owner or operator shall:

(1) Comply with all the provisions for inactive asbestos-containing waste disposal sites;

(2) Submit to the Authority a copy of records of asbestos-containing waste disposal locations and quantities; and

(3) Furnish upon request, and make available during normal business hours for inspection by the Authority, all records required under this section.

[~~N~~] M. The owner or operator of an inactive asbestos-containing waste disposal site shall meet the following standards:

(1) [~~I~~]Ensure that a cover of at least two (2) feet of soil or one (1) foot of soil plus one (1) foot of other waste be maintained.

(2) Grow and maintain a cover of vegetation on the area to prevent erosion of the non-asbestos-containing cover of soil or other waste materials; or in desert areas where

vegetation would be difficult to maintain, a layer of at least three (3) inches of well graded, non-asbestos crushed rock may be placed and maintained on top of the final cover instead of vegetation.

(3) For inactive waste disposal sites for asbestos-containing tailings, a resinous or petroleum-based dust suppression agent that effectively binds dust to control surface air emissions may be used and maintained to achieve the requirements of (1) [~~&~~]and (2) of this sub-section, provided prior written approval of the Authority is obtained.

(4) Excavation or disturbance at any inactive asbestos-containing waste disposal site shall be considered an asbestos abatement project. The notification for any such project shall be submitted as specified in 43-015-[~~5~~]9, but modified as follows:

- (a) Submit the project notification and project notification fee to the Authority at least forth-five (45) days before beginning any excavation or disturbance of an inactive asbestos-containing waste disposal site.

- (b) Explain the [~~R~~]reason for disturbing the asbestos-containing waste.

- (c) Describe the [~~P~~]procedures to be used to control emissions during the excavation, storage, transport and ultimate disposal of the excavated asbestos-containing waste material. If deemed necessary, the Authority may require changes in the emission control procedures to be used.

- (d) Specify the [~~L~~]location of any temporary storage site and the final disposal site.

(5) Within sixty (60) days of a site becoming inactive, request in writing that the Commission issue an environmental hazard notice for the site. This environmental hazard notice will in perpetuity notify any potential purchaser of the property that:

- (a) The land has been used for the disposal of asbestos-containing waste material; [~~and~~]

- (b) T[~~hat t~~]he survey plot and record of the location and quantity of asbestos-containing waste disposed of within the disposal site, required for active asbestos disposal sites, have been filed with the Authority; and

- (c) The site is subject to Title 43.

[~~O~~] N. Rather than meet these requirements, an owner or operator may elect to use and alternative disposal method which has received prior approval by the Authority in writing.

[~~15. Open storage or open accumulation of friable asbestos-containing material or asbestos-containing waste material is prohibited.~~](*It is proposed to add this prohibition to each of the affected sections within the rule.*)

[~~16. Any waste which contains non-friable asbestos-containing material and which is not subject to subsection 13 of this rule shall be handled and disposed of using methods that will prevent the release of airborne asbestos-containing material.~~] *(It is proposed to move this to 8.D.)*

[~~17. Any materials within a container which displays an asbestos hazard warning, shall be subject to all applicable rules and regulations pertaining to the storage and disposal of asbestos-containing waste materials.~~] *(It is proposed to move this to 10.M.)*

Section 43-020 Emission Standard for Beryllium

The emission standard for Beryllium, 40 CFR, Part 61, Section 61.30 through 61.34 as last amended on November 7, 1985, is adopted by reference and made a part of these rules. A copy of this emission standard is on file at the Lane Regional Air Pollution Authority.

Section 43-025 Emission Standard for Beryllium Rocket Motor Firing

The emission standard for Beryllium Rocket Motor Firing, 40 CFR, Part 61, Section 61.40 through 61.44 as last amended on November 7, 1985, is adopted by reference and made a part of these rules. A copy of this emission standard is on file at the Lane Regional Air Pollution Authority.

Section 43-030 Emission Standard for Mercury

The emission standard for Mercury, 40 CFR, Part 61, Section 61.50 through 61.55 as last amended on November 7, 1985, is adopted by reference and made a part of these rules. A copy of this emission standard is on file at the Lane Regional Air Pollution Authority.

Section 43-035 Work Practice Standard for Radon 222 Emissions from Underground Uranium Mines

The work practice standard for Radon 222 Emissions from Active Underground Uranium Mines, 40 CFR, Part 61, Sections 61.20 through 61.28 as published in the Federal Register on April 17, 1985, is adopted by reference and made a part of these rules. The standard requires airtight bulkheads to prevent Radon 222 from escaping from abandoned parts of uranium mines that are extracting greater than 10,000 tons of ore per year, or will extract more than 100,000 tons of ore during the life of the mine.

AGENDA ITEM NO. 6

LRAPA Board of Directors Meeting

October 20, 1998

TO: Board of Directors

FROM: Barbara Cole, Director

SUBJ: **Public Hearing on Proposed Revisions to Asbestos Rules (Title 43)**

This is the same staff report which was presented at the September 8 board meeting at which time the board authorized public hearing for October 20. The only parts of this report which have changed are the public notice and comment sections.

Staff is proposing to amend LRAPA's rules regarding asbestos demolition and removal. This amendment process was originally begun in January of 1996, at which time an amendment proposal was sent to asbestos abatement contractors for comment. The process was interrupted for several months due to other priorities. The comments we received in 1996 were incorporated into a subsequent proposal which was, again, distributed to asbestos abatement contractors in January of 1997. Comments received at that time were incorporated into the current proposal. DEQ has evaluated the current proposal to assure that LRAPA rules are at least as stringent as the corresponding state rules.

BACKGROUND

In order for Lane Regional Air Pollution Authority (LRAPA) to maintain its program authorization from the Environmental Quality Commission (Commission), Oregon statute requires the we must, among other things, ensure that the rules and standards by which LRAPA operates are at least as stringent as those of the Commission.

The Commission rules governing asbestos demolition and removal have been changed several times to increase fees, to better define which projects are exempted from certain parts of the rule, and to include additional federal requirements to those sources subject to the federal Title V Operating Permit Program. The amendment of LRAPA rules has not kept pace with all of these changes. The revisions being proposed are necessary to keep LRAPA up-to-date with Commission rules and to allow us to maintain our authority over asbestos demolition and removal and Title V permitting activities.

PROPOSED CHANGES

1. These amendments include additional requirements for sources subject to the Title V Operating Permit program. There are currently twenty Title V sources in Lane County. Some of these requirements are:
   - A. A thorough inspection of the affected area for the presence or absence of asbestos-containing materials prior to doing any demolition or renovation;
   - B. For demolition projects, only, certification that no asbestos-containing materials were found during the inspection;
   - C. Written notification, on a LRAPA form, of any demolition where <u>no</u> asbestos-containing materials are found; and
   - D. Submittal of a written notification, on a LRAPA form, for demolitions where asbestos-containing material are present.

2. For all sources, the amendments exempt certain projects from many requirements as long as the exempt materials aren't burned, shattered, crumbled, pulverized or reduced to dust.

3. The amendments require notice 5 (five) days prior to the beginning of a non-friable asbestos abatement project and 10 (ten) days prior to beginning a friable asbestos abatement project.

4. The asbestos notification fee schedule is changed in include a $260 fee for annual notifications for friable asbestos abatement projects involving less than 40 linear feet or 80 square feet of asbestos removal.

5. The asbestos notification fee schedule is changed to include a $35 notification fee for non-friable asbestos abatement projects, and a $350 annual notification fee for non-friable asbestos abatement projects performed at schools, colleges and facilities.

6. The asbestos notification fee schedule is changed to include a $35 notification fee for asbestos abatement projects in residential buildings.

7. The amendments remove references to non-friable asbestos-containing materials in the exempt projects section and instead states, "this exemption shall end whenever the materials are burned, shattered, crumbled, pulverized or reduced to dust."

8. For annual notifications, the wording is changed to more closely resemble DEQ rules, and an additional sub-part (4) is added requiring that the annual notification include a list of asbestos abatement project scheduled or being conducted at the time of a request for annual notification (upon request by the Authority).

9. The words, "small-scale asbestos abatement project" are replaced with, "project less than 40 linear feet or 80 square feet" in several places in the rules.

10. Certain definitions are added or revised by these amendments.

11. Various house-keeping changes are also taken care of by this amendment.

REVISIONS TO DRAFT AMENDMENTS SINCE ORIGINAL PROPOSAL WAS SENT OUT

As with any rule, the more it is revised to try and provide flexibility to the regulated community and be more specific, the more complicated it becomes. LRAPA has tried to accommodate as many of the comments as possible and still maintain the stringency and flexibility needed.

1. 1996 Changes

   A. Section 43-005 Definitions. The definition of "asbestos-containing material" is changed to read "more than" 1% asbestos by weight, instead of "at least" 1%, for consistency with the state's definition.

   B. Section 43-005 Definitions. The definition of "major source" originally proposed is removed from this draft and replaced with reference to the state definition in OAR 340-28-0110.

   C. Subsection 43-015-4. Additional wording is added to clarify that this subsection applies only to the specific activities listed in the subsection.

2. 1997 Changes

   A. Section 43-005. The definition of "small-scale asbestos abatement project" is removed. This is in response to DEQ concerns that use of this LRAPA term may be confused with the state's "small scale, short-duration renovating and maintenance activity." Some subparts of this subsection are retained and included in other subsections.

   B. Subsection 43-015-6.B and C. Amended to include provisions of sub-part A of above-referenced definition, concerning volume of asbestos-containing materials subject to annual notification requirements.

   C. Sub-parts B(3) and C(3) of 43-015-6. The words, "small-scale" changed to "applicable."

3. 1998 Changes

   A. Section 43-005. A definition for "open accumulation" is added

   B. Section 43-015-3.D. Item I is added prohibiting open storage of friable asbestos-containing material or asbestos containing waste material.

D. Subsections 43-015-9.B and C are amended for annual notification for friable asbestos abatement projects involving less than 40 linear feet or 80 square feet, and for non-friable asbestos abatement projects performed at schools, colleges, and facilities where removal work is done by certified asbestos abatement workers.

E. Existing subsection 43-015-5.E, prohibition of notification fees for residential buildings, is removed.

DIFFERENCES BETWEEN LRAPA RULE AND DEQ RULE

1. Section 43-015-5. LRAPA rules include the phrase, “or provides for the conduct,” which DEQ chose to eliminate from its rules. LRAPA rules hold not only the person who conducts the asbestos abatement project, but also anyone who provides for that conduct, accountable for adhering to requirements of the rules.

2. Section 43-015-7.2. DEQ rules do not include items (a) and (b) requiring minimization of particulate asbestos material, and requiring wetting of asbestos-containing material prior to removal and during handling, on projects involving mastics and roofing products fully encapsulated with a petroleum-based binder which are not hard, dry and brittle.

3. 43-015-10.B. LRAPA requires the use of a “Negative Pressure Enclosure”. The definition of Negative Pressure Enclosure fits within the definition of Negative Pressure Enclosure required by OR-OSHA. If an asbestos abatement contractor chose not to use the OR-OSHA required Negative Pressure Enclosure, LRAPA had no authority to require it. This rule allows LRAPA to require this precaution.

4. 43-015-9.A(1)(a). The existing LRAPA rule prohibits a project notification fee for asbestos abatement projects in certain residential buildings. DEQ requires a $35.00 notification fee for asbestos abatement projects conducted in residences. It is proposed that LRAPA include this fee, making this part of the rule the same as the DEQ rule.

5 43-015-9. LRAPA project size categories and fees are different from DEQ’s. LRAPA has fewer size categories and fees.

6. 43-015-10.F. LRAPA requires that all asbestos abatement project areas be adequately cleaned at the conclusion of the project. DEQ requires this on projects larger than 160 square feet or 260 linear feet.

7. 43-015-10.G. LRAPA requires that while at the project site, all asbestos-containing waste be secured in a posted area or receptacle. DEQ rules do not require this.

8. 43-015-10.H. LRAPA allows for requiring ambient air sampling where work practices other than those required by rule are being used.

9. 43-015-18.B(4). LRAPA may allow the use of vacuum trucks approved by LRAPA to deliver asbestos-containing slurries directly to the authorized disposal site.

10. 43-015-7.B. LRAPA prohibits the open storage or open accumulation of friable asbestos-containing materials or asbestos-containing waste materials.

11. 43-015-10.M. LRAPA requires that any materials (asbestos-containing or not) within a container that displays an asbestos hazard warning be subject to all rules and regulations pertaining to the storage and disposal of asbestos-containing waste materials.

FISCAL AND ECONOMIC IMPACT OF PROPOSED AMENDMENTS

1. <u>Industry</u>

    A. The proposed amendments require 5-day notification for non-friable asbestos abatement projects and add fees for the notification. While this is required by DEQ's rules, it has not been required by LRAPA.

    B. The proposed amendments add a $350 annual notification fee for non-friable asbestos abatement projects performed at schools, colleges, and facilities.

    C. The proposed amendments add a $260 annual notification fee for friable asbestos abatement projects involving less than 40 linear feet or 80 square feet of asbestos removal.

    D. The proposed amendments require a $35 notification fee for residential asbestos abatement projects. While DEQ's rules already include such a fee, LRAPA's existing rule does not.

    E. Under the proposed amendments, Title V Operating Permit sources must do pre-demolition or renovation inspections of the area where the demolishing is going to occur, to determine the presence or absence of asbestos-containing materials. Written notification of the demolition is required regardless of whether asbestos-containing materials are or are not found. The notification if asbestos is not found must be in the form of certification that no asbestos is present (for demolition only).

    F. The proposed amendments include exemptions from notification and work practice requirements for specific non-friable asbestos abatement projects. The existing rules give broad exemptions for this type of activity; for example, the existing rules include an exemption for removal of non-friable asbestos-containing floor tile which is deleted in the proposed amendments.

2. <u>Public</u>

    A. Owners of residences who hire asbestos abatement contractors to abate asbestos in the residence will be required to pay a $35 notification fee.

B. Better funding of LRAPA's asbestos abatement oversight program helps to maintain the current level of public health protection.

3. LRAPA

The additional fees included in the proposal will recover a greater percentage of the cost of operating the asbestos abatement oversight program.

4. Other Government Agencies

There is no direct impact on other government agencies.

COMMENTS RECEIVED AND LRAPA RESPONSES

Following is a summary of comments received and LRAPA's response to each. Copies of the correspondence received are attached for your reference.

1996

1. EWEB

A. The definition of "asbestos abatement project" is vague and not defined elsewhere in the text. Does this definition refer to just friable asbestos-containing material or any material containing at least 1% asbestos?

Response: This definition refers to all friable and non-friable asbestos-containing material containing at least 1% asbestos. This is in agreement with the DEQ definition. LRAPA will leave the language as proposed.

B. The term "major source" as defined in Section 43-005 includes only HAPs emissions; while in Section 43-015-4, the term "major source" should include criteria pollutants, as well.

Response: LRAPA agrees. However this definition of major source must stay in Section 43-005 because it applies to all other HAPs regulated in Title 43. Therefore, the words "except as used in Section 43-015-4" have been included in the definition in 43-005. Section 43-015-4 presently defines where the definition of major source as used in that section can be found.

C. Transite pipe and wallboard should be included in the exemptions for mastic and roofing products.

Response: This would not be consistent with DEQ rules and would make LRAPA's rules less stringent that DEQ's. Therefore it must be left as is.

2. Willamette Industries

A. In the definition of "full-scale asbestos abatement project," there is reference made to Section 43-005-40; however, there is no such section. The reference should be removed.

<u>Response</u>: LRAPA concurs and has changed the reference from 43-005-40 to 43-005.

B. The phrase "not to exceed amounts greater than those which can be contained in a single glove bag" should be deleted from the definition of small-scale, short-duration renovation and maintenance activity.

<u>Response</u>: This would not be consistent with the DEQ rules and would make LRAPA's rules less stringent than DEQ's. The definition of volume in 43-015-5.D sets a limit below which the work practices, notification and sampling requirements contained in 43-15-6 through 10 do not apply. Many of these requirements still apply to small-scale, short-duration jobs. Therefore, LRAPA will leave the language as proposed.

C. Why must a major source which is subject to the Title V permitting program notify LRAPA of a demolition project at their facility, even when there is not asbestos present in the structure to be demolished?

<u>Response</u>: This is a requirement of the federal NESHAPs program in 40 CFR Part 63, Subpart M. All state and local air programs which wanted to receive delegation from EPA to implement the federal Title V program had to have the regulatory ability to enforce <u>all</u> federal regulations at Title V facilities. This included Subpart M. Therefore, both LRAPA and the state of Oregon had to adopt Subpart M as it applies to Title V sources, and this section will remain as proposed.

D. The intent of the phrase "or non-friable asbestos abatement project" in 43-015-6.A(1)(a) isn't clear. (*This is 43-015-7.A(1)(a) in the current draft.*)

<u>Response</u>: This phrase is a stand-alone requirement. It doesn't modify the phrase "small-scale asbestos abatement project." The $35 fee is required for both. The language will remain as proposed. (*The phrase "small-scale asbestos abatement project has been replaced with the phrase "less than 40 linear feet or 80 square feet of asbestos-containing material" in the current draft.*)

E. The addition of the word friable to the first sentence of Section 43-015-6.C is not consistent with the definition of asbestos abatement project and leaves non-friable abatement projects without direction. (*This is 43-015-7.C in the current draft.*)

<u>Response</u>: This section only deals with annual notification for friable asbestos projects. There are other sections which provide direction to non-friable jobs. LRAPA will leave the language as proposed.

F. The frequency of progress reporting as found in 43-015-6.C(3) should be quarterly as in 43-015-6.B(3), instead of monthly. (*This is 43-015-7.C(3) and 7.B(3) in the current draft.*)

Response: The reporting frequency of quarterly is for facility owners who submit annual notification of small-scale jobs to be done at facilities which they own, while the monthly frequency is for contractors who submit annual notifications for work done at one or more facilities. It is LRAPA's belief that there should be a more frequent reporting done by contractors than facility owners; therefore, we will leave this section as proposed.

G. DEQ charges a $200 annual fee for the types of asbestos abatement jobs found in 43-015-6.C(5). Why is LRAPA charging $25 per job? (*This is 43-015-7.C(5) in the current draft.*)

Response: The $200 annual fee is for owners of facilities who do small-scale asbestos abatement work at their own facilities. This is the same fee charged by LRAPA in 43-015-6.B(4). The $25 per job fee is charged to contractors who submit annual small-scale asbestos abatement notification for work done at one or more sites. The language will remain as proposed. (*This is 43-015-7.B(4) in the current draft.*)

H. The intent of Section 43-015-6.D isn't clear. Does the $350 fee apply to all non-friable asbestos abatement projects? This appears to contradict Section 43-015-6.A(1)(a). (*This is 43-015-7.D and 43-015-7.A(1)(a) in the current draft.*)

Response: The $350 per year fee applies to annual notifications for any size non-friable asbestos abatement project. The fee in 43-015-6.A(1)(a) applies to all other non-friable asbestos abatement projects. LRAPA will leave the language as proposed.

I. The removal of the word "not" from the last sentence of Section 43-015-6.F appears to make this section contradictory.

Response: This section says that no notification fee is required for the types of residential buildings listed in the section, but notification is required as per other sections. Therefore, the language will remain as proposed.

J. For the sake of clarity, section 430-015-17 should be moved to between section 43-015-5 and 6.

Response: LRAPA disagrees. The section will remain as is.

K. The rules as proposed are difficult to read and understand. Rule adoption should be postponed so that the amendments may be rewritten to: make them as succinct as possible; restructure them to put related topics in the same sections; and remove overly burdensome requirements which don't protect human health and the environment.

Response: LRAPA is revising these rules for several reasons: to make our rule conform with the DEQ rule; to accept delegation of certain parts of the federal NESHAPs rule in order to have authority to implement the Title V operating permit program; and to provide clarification on some requirements. Therefore, the form of many of these changes is beyond our control.

3. PBS Environmental

In order to facilitate faster job starts in third-party situations where a contractor must be hired, LRAPA rules should include provision to allow the notification to be accepted and the 10-day clock to start upon filing of specific, necessary, project-related information, as determined by the Authority, and payment of the appropriate fees, with additional contractor-specific information being required only prior to the beginning of abatement.

Response: The current rules do allow for this. LRAPA has encountered some problems in these situations, where there is miscommunication between the building owner and the contractor, and the contractor operates in a different manner than what is specified in the notice. For this reason, LRAPA prefers to have the abatement contractor file the notification, even if it delays receipt of notice until close to the projected start date. LRAPA will waive the 10-day notice in emergency situations. Therefore, the rule will remain as is.

4. ECS/Wagner Environmental

The definitions of "asbestos-containing material" and "nonfriable asbestos-containing material" contain different wording for the volume, both "at least 1%" and "more than 1%." For consistency, definitions in 43-005 should all read, "more than one percent (1%) asbestos as defined by weight."

Response: LRAPA concurs, and this change has been made in the current draft.

1997

1. Jerry Ritter

The requirement that notification, on a proper form, be made of any demolition where no asbestos-containing materials are found is onerous, unnecessary and unreasonable.

Response: This requirement applies only to major sources, as defined by OAR 340-28-0110 (Title V sources). Even for Title V sources, this section only applies to those activities that fit the definition of demolition--basically "wrecking or removal of load-supporting structural members and related activities, and intentional burning." This section is the same as DEQ's rule.

2. John Mathews, Oregon DEQ

   LRAPA's use of the term "small-scale asbestos abatement project" may be confused with "small-scale, short-duration renovating and maintenance activity."

   Response: Reference to "small-scale asbestos abatement projects" is removed from the proposed amendments.

3. Gregory Green, Oregon DEQ

   Section 43-015-7.A(1)(b) contains a phrasing error and should be changed for clarity.

   Response: LRAPA agrees, and the change is made in the current draft.

1998

1. Chuck Gottfried of PBS Environmental in Eugene:

   A. Subsection 43-015-6.A requires that the owner or operator of a major emission source inspect renovation and demolition projects prior to these projects commencing. The rule does not specify qualifications for the inspector. The rule should require an AHERA accredited inspector to provide greater assurance that all asbestos-containing materials are located and that workers and the public are not inadvertently exposed to asbestos. This would also decrease the owner's liability and risk for OSHA and LRAPA enforcement actions.

      Response:

      40 CFR, Part 61, Subpart M, National Emission Standard for Asbestos, is the foundation on which LRAPA Title 43, Section 43-015-6 is based. Section 61.145 of the CFR (standard for demolition and renovation) requires, for the purpose of determining which section(s) of Subpart M apply to the owner or operator of a renovation or demolition, prior to commencement of the demolition or renovation, that the owner or operator "thoroughly inspect the affected facility which the demolition or renovation operation will occur for the presence of asbestos, . . .".

      There are no particular qualifications required for anyone "thoroughly inspecting" the facility. The burden is placed on the owner or operator to determine which section(s) of Subpart M apply. The owner or operator may use anyone, of any qualifications, since the rule applies to them (the owner or operator). It is left to the owner or operator's discretion to use whatever level of expertise they are confident with to do the inspection, understanding that the owner or operator is the one who has to certify compliance with all federal, state, and local regulations, as required in the Title V Operating Permit.

      LRAPA has chosen, as has DEQ, to allow the owner the flexibility of choosing whomever they desire to "thoroughly inspect". LRAPA concurs that the owner or operator should use a knowledgeable, preferably certified, inspector.

B. Subsection 43-015-6.B requires the source to submit a detailed demolition plan, no less than 10 days prior to activities, for project which do not contain asbestos. This will require monitoring and tracking by the Authority and could result in enforcement actions if a source does not adhere precisely to the schedule or modifies the schedule without providing follow-up notification of the change in writing to LRAPA. An adequate, qualified survey and report of demolition/renovation areas, filed on the Authority form, could remove the need for the Authority to monitor and track every major demolition project with no asbestos. Mr. Gottfried acknowledges that this rule is the same as the DEQ rule but believes that an adequate thorough survey and report by an accredited inspector would meet the requirement that LRAPA rules be no less restrictive than DEQ's but would eliminate the bureaucracy of the current state rule. Mr. Gottfried also notes that the rule does not include a fee for this tracking requirement, thus placing further strain on an already busy agency staff; and it also increases the cost to business for the time to generate and track the notification paperwork and ensure compliance.

Response:

LRAPA has been delegated the responsibility of implementing the Title V Operating Permit program in Lane County. The Title V Operating Permit requires that anyone subject to the Title V Operating program be in compliance with all federal, state, and local regulations. The CFR cited above in response number 1 to Mr. Gottfried's comments is the origin of the notification requirements. To be in compliance with their Title V Operating Permit, the owner or operator of a Title V source would have to submit the required notice to someone (EPA), if it were not already required by LRAPA. As proposed, the source will be in compliance with the notification requirements of the CFR by notifying LRAPA as required in Section 43-015-6. Furthermore, in order to adopt an alternative to a mandatory federal and state Title V requirement, LRAPA would have to demonstrate to the satisfaction of the Oregon Environmental Quality Commission and the U. S. EPA that the proposed alternative is at least as strict as the state rule. The application of this requirement is limited to major demolition projects at Title V facilities.

2. Dave Nordberg, DEQ, Portland.

A. The definition of "small-scale, short-duration activity" should be revised to include the following:

F. Minor repairs to damaged thermal system insulation which does not require removal;

G. Repairs to asbestos-containing wallboard;

H. Repairs involving encapsulation, enclosure, or removal of small amounts of friable asbestos-containing material in the performance of emergency or routine maintenance activity and not intended solely as asbestos abatement. Such work may not exceed amounts greater than those which can be contained in a single prefabricated mini-enclosure. Such an enclosure shall conform spatially and geometrically to the localized work area, in order to perform its intended containment function.

Response:

LRAPA agrees, and this language has been added to the current draft amendments.

B. On page 13, subpart 43-015-7.A refers to , "B, C and D below" and should be, "(1), (2), (3) and (4) below."

Response:

LRAPA agrees, and this correction has been made to the current draft amendments.

C. On page 22, subpart 43-015-10.M, the word "storage" is misspelled.

Response:

LRAPA agrees, and this correction has been made to the current draft amendments.

As with any rule, the more it is revised to try and provide flexibility to the regulated community and be more specific, the more complicated it becomes. LRAPA has tried to accommodate as many of the comments as possible and still maintain the stringency and flexibility needed. We propose to issue the proposed rule with the changes discussed in the above answers to comments.

PUBLIC COMMENT PROCESS

An updated proposal was sent out August 3 to asbestos abatement contractors, all LRAPA permitted sources, DEQ, EPA, and other interested or affected agencies and persons. The notice included our projected schedule for public hearing and adoption and requested comments as early as possible so that they could be included in the proposal that actually went out on public notice prior to the hearing. The proposal was also presented to the LRAPA Advisory Committee and discussed at two separate meetings. The committee had no recommendations regarding this proposal.

The asbestos rules are not included in the Oregon's State Implementation Plan. Consequently, although the EQC must approve the rules following adoption by the LRAPA Board of Directors, it is not necessary to hold a joint LRAPA/EQC hearing or to publish notice of hearing in the Oregon Bulletin. The public hearing required only public notice in local newspapers at least 30 days prior to the hearing date. At its September 8 meeting, the board authorized public hearing on the proposed amendments on October 20. Notice of the hearing date, time and place were published in the Cottage Grove Sentinel, the Oakridge Dead Mountain Echo, Eugene Register Guard, and the Springfield News..

Following the public hearing, the board will be asked to adopt the rules, either as proposed or with any changes deemed necessary in response to information received at the public hearing.

RULEMAKING JUSTIFICATION ANALYSIS

1. Are there state requirements that are applicable to this situation? If so, exactly what are they?

   Response: These proposed changes will bring LRAPA's rules in line with the state rules. For example, the state revised their rules in 1994. The changes we are now proposing are the same changes the DEQ made in 1994, (i.e. those pertaining to Title V Sources and the removal of the exemption for non-friable asbestos abatement projects). We are not proposing any changes in existing fees at this time.

2. Are the applicable state requirements performance based, technology based, or both with the most stringent controlling?

   Response: Performance based.

3. Do the applicable state requirements specifically address the issues that are of concern in Lane County? Was data or information that would reasonably reflect Lane County's concern and situation considered in the state process that established the state requirements?

   Response: Yes.

4. Will the proposed requirement improve existing requirements or prevent the need for costly retrofit to meet more stringent future requirements?

   Response: The proposed changes will improve some existing requirements (i.e. "Non-friable" asbestos abatement projects). Future retrofit is not applicable to asbestos abatement projects.

5. Is there a timing issue which might justify changing the time frame for implementation of state requirements?

   Response: No.

6. Will the proposed requirement assist in establishing and maintaining a reasonable margin for accommodation of uncertainty and future growth?

   Response: This question is not applicable since the proposed changes only apply during renovation or demolition projects. It does not affect new construction.

7. Does the proposed requirement establish or maintain reasonable equity in the requirements for various sources (level the playing field)?

Response: The proposed changes will maintain equity for asbestos abatement projects.

8. Would others face increased costs if a more stringent rule is not enacted?

   Response: No.

9. Does the proposed requirement include procedural requirements, reporting or monitoring requirements that are different from applicable state requirements? If so, why? What is the "compelling reason" for different procedural, reporting or monitoring requirements?

   Response: No.

10. Is demonstrated technology available to comply with the proposed requirement?

    Response: This question is not applicable since the proposed changes only address the administrative process and do not require any additional emission controls.

11. Will the proposed requirement contribute to the prevention of pollution or address a potential problem and represent a more cost-effective environmental gain?

    Response: Yes, particularly that which applies to "non-friable" asbestos abatement projects. The "lay" person has not had a good understanding of the subjective term "non-friable". When non-friable projects are exempt from the rules (which is the case under current LRAPA rules), people have assumed "once non-friable, always non-friable" , and this not the case. Non-friable asbestos-containing materials can be made friable because of work practices or other circumstances, causing release of asbestos fibers into the environment and presenting a potential for public exposure. Removing the exemption will allow better control, thus reducing the potential risks associated with uncontrolled asbestos abatement.

OPTIONS FOR BOARD ACTION

1. Do not adopt the amendments. LRAPA's rules would continue to lag behind the state's rules, further jeopardizing LRAPA's authority to regulate asbestos demolition and removal and Title V permitting activities in Lane County.

2. Require additional time for public comment and possible additional revisions to the draft amendments. Given the amount of public review these revisions have already received, it is unlikely that a better set of rules would result from additional public comment at this time.

3. Adopt the amendments as revised. LRAPA's rules would be brought more in line with the state's asbestos rules. The increased and additional fees included in the amendments would help to recover a greater portion of the costs associated with LRAPA's asbestos abatement regulatory activities. The rules would take effect immediately upon adoption.

DIRECTOR'S RECOMMENDATION

It is the director's recommendation that the board adopt the amendments to LRAPA Title 43, as revised.

BJC/mjd

1859

Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
811 SW Sixth Avenue
Portland, OR 97204-1390
(503) 229-5696
TDD (503) 229-6993

RECEIVED
OCT - 5 1998
LANE REGIONAL AIR
POLLUTION AUTHORITY

Sept. 30, 1998

Barbara Cole, Director
Lane Regional Air Pollution Authority
225 North 5th, Suite 501
Springfield, OR 97477-4671

Re: Proposed Amendments to LRAPA Title 43, "Emission Standards for Hazardous Air Pollutants"

Dear Ms. ~~Cole~~: Barbara

We have reviewed your proposed amendments to Lane Regional Air Pollution Authority (LRAPA) Title 43 regulations concerning changes to the rules for asbestos demolition and removal. We find these amendments to contain some minor but potentially significant differences from the comparable rules enforced by this department, and suggest the following modifications be made.

In section 43-005 the definition for "Small-scale, short-duration activity" does not include provisions for "repair". To make the rules more closely correspond to state and federal regulations and to make it more evident that LRAPA's regulations, the definition should add:

F. Minor repairs to damaged thermal system insulation which does not require removal;

G. Repairs to asbestos-containing wallboard;

H. Repairs involving encapsulation, enclosure or removal to small amounts of friable asbestos-containing material in the performance of emergency or routine maintenance activity and not intended solely as asbestos abatement. Such work may not exceed amounts greater than those which can be contained in a single prefabricated mini-enclosure. Such an enclosure shall conform spatially and geometrically to the localized work area, in order to perform its intended containment function.

In section 43-015, paragraph 7.A refers to subsequent items "B, C and D below". This referenced should be corrected to cite "1, 2, 3 and 4 below".

As provided in OAR 340-032-0110(2), these rules must be at least as stringent as corresponding state rules, and are subject to approval by the Environmental Quality

Commission. In consideration of this requirement, the department finds that with the above changes, the proposed regulations will be at least as stringent as the comparable state measures.

If you have any questions, please contact Dave Nordberg at (503) 229-5519.

Sincerely,

Andy Ginsburg

Andy Ginsburg
Program Development Manager
Air Quality Division

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MINUTES

LANE REGIONAL AIR POLLUTION AUTHORITY
BOARD OF DIRECTORS MEETING
TUESDAY--OCTOBER 20, 1998
SPRINGFIELD CITY COUNCIL CHAMBERS
225 5th Street
Springfield, Oregon

ATTENDANCE:

Board

Al Johnson, Chair--Eugene; Steve Dodrill--Eugene; Maureen Maine--Springfield; Betty Taylor--Eugene
(ABSENT: Steve Cornacchia--Lane County; Don Hampton--Oakridge/Cottage Grove; Gary Whitney--At-Large)

Staff

Barbara Cole--Director; Sharon Banks; Grecia Castro; Merrie Dinteman; Tom Freeman; Kim Metzler; John Morrissey

OPENING:

Johnson called the meeting to order at 12:16 p.m.

MINUTES:

MSP(Maine/Dodrill)(Unanimous) approval of September 8, 1998 minutes, as submitted.

EXPENSE REPORTS:

Banks explained that the report as submitted did not include transfers out on the General Fund side to correspond to the transfers in on the Capital Fund side. She said the "net increase" line on the General Fund should actually be a negative $146,265.77 to account for the transfers out.

Banks showed the board some new products developed and being sold by AirMetrics, including a new filter cassette and a device used to open the cassette without disturbing the contents. She said the new filter cassette is superior to the ones the agency has been purchasing from other vendors and will fit federal reference method samplers as well as the AirMetrics Minivol sampler. Consequently, there is potential to sell them not only to AirMetrics sampler customers but also to users of reference method sampling equipment. Maine asked if the income from these and future products will be split with EPA, and Banks responded that AirMetrics has a licensing agreement to make and sell the Minivol, but any other products developed belong to AirMetrics and LRAPA. Taylor suggested that staff hold press conferences when new products like the ones seen today come out, and look into doing a program on public access TV about what AirMetrics is doing.

Banks said that staff is being as frugal as possible to ensure that there are sufficient funds to complete the lab construction. The demolition of the drive-up window cover, removal of the concrete and asphalt, excavation and soil disposal, and gravel backfill and grading were accomplished at a lower cost than was anticipated. Staff expects the lab to be completed about February of 1999. The footings were poured and the stem wall forms in at the time of this meeting. The stem walls were to be poured two days later. In the meantime, the lab will operate a weigh room in a trailer outside the AirMetrics shop in Eugene. They will be able to keep the temperature more consistent and control the humidity there better than in the city hall building.

**** ACTION **** **MSP (Dodrill/Taylor)(Unanimous) approval of expense reports through September 30, 1998 as presented.**

ADVISORY COMMITTEE: Metzler reported that the committee did not meet in September because of the agency move. The final report on the comment cards is ready but will not be presented to the board until the advisory committee has seen it first, in case they want to make any changes in it. Metzler said there were about 55 comment cards sent out during the period being considered, and the return rate was 75 percent. After the committee finishes the comment card summary, they will be reviewing rulemaking packages for about three months.

PUBLIC PARTICIPATION: None.

PUBLIC HEARING ON PROPOSED AMENDMENTS TO LRAPA TITLE 43 (ASBESTOS): Cole said the major reasons for the rule revisions were to incorporate Title V requirements into the rule for major sources, to revise reporting requirements for various source categories, and to change the fee structure as discussed in earlier meetings. She reported that notices of the current rulemaking were sent out to asbestos contractors, LRAPA permitted sources, DEQ, EPA and other stakeholders.

Public Hearing: Johnson opened the public hearing at 12:40 p.m. Cole entered into the hearing record affidavits of publication of hearing notice in the Cottage Grove Sentinel, the Eugene Register-Guard, the Oakridge Dead Mountain Echo, and the Springfield News. Johnson asked if anyone present wished to speak either in favor of or in opposition to the proposed rule amendments. Hearing no response, he closed the public hearing at 12:42 p.m.

**** ACTION **** **MSP (Dodrill/Maine)(Unanimous) adoption of the amendments to LRAPA Title 43, as revised.**

AUTHORIZATION TO EXPEND SPECIAL-PURPOSE GRANT FUNDS: Agenda Items Numbers 7 through 11 were all requests for authorization to expend special-purpose grant funds. Staff gave a brief explanation of each one, as follows:

1. Resolution Number 99-1, Green Permits Program Development--$17,500. Cole explained that regulation-based controls don't provide any incentive for a source to go beyond the minimum controls that are required by law. The Legislature authorized DEQ and LRAPA to look at developing an incentive system to encourage sources to go beyond legal requirements and has appropriated funding for development of the program. The money will be spent to work with stakeholders, participate in the DEQ advisory committee process, do LRAPA rulemaking, and educate LRAPA staff and others who might want to participate in the system.

2. Resolution Number 99-2, Pass-Through Grants Administration for EPA Region 10--$563,603. Banks explained that this is carry-over of Title 10 grant funds for which LRAPA does the financial record keeping for EPA. Region 10 allocates the funds for small projects throughout the region, and the money is passed through LRAPA. For its management services, LRAPA gets to keep 15 percent of the amount which gets awarded. The grant is

typically carried over for five years. This resolution is necessary because it is not known at the time LRAPA's budget is developed how much of this grant will be awarded and expended during LRAPA's fiscal year.

3. Resolution Number 99-3, Establishment of $PM_{2.5}$ Network, Upgrade of LRAPA Lab Facility, Provision of Technician for One Year--$111,429. Banks said that part of this grant is to pay for a technical salary for a year to run the $PM_{2.5}$ monitoring program. Cole added that the word at the recent STAPPA/ALAPCO conference was that EPA's preference is to fund these positions for five years out of the 103 funds. Banks said part of the grant also will go toward making LRAPA's lab a state-of-the-art facility which will be one of two EPA-certified labs in Oregon. The funds must be spent by the end of June 1999.

4. Resolution Number 99-4, PM_{10} Non-Attainment Area Public Information, Monitoring, and Survey Costs--$10,800. Banks said this is a carry-over of funds that were not spent on public education in the last fiscal year.

5. Resolution Number 99-5, Public Education and Outreach to the Community--$11,800. Banks explained that the grant will help pay for the agency's Lane County Fair presentation and exhibit and other public education projects.

**** ACTION **** **MSP (Dodrill/Taylor)(Unanimous) approval of LRAPA Resolutions 99-1 through 99-5.**

DIRECTOR'S REPORT: Cole reported on a few items which were not included in the written report sent out with the agenda packets.

Hyundai Permit The permit should be ready for public notice and a 30-day public comment period by the end of October or early November.

Air Toxics DEQ's Air Toxics Advisory Committee process has started, and both Cole and a technical staff person will participate on two committees. One is the 112(r) committee whose purpose is to prevent catastrophic accidents involving chemicals at a facility that would affect neighborhoods really badly. Section 112(r) of the Clean Air Act requires sources with large amounts of dangerous chemicals to do a thorough review of what could happen and what they need to do to minimize the risks and inform the community, which is done as part of the permitting process. This information could be passed on to EPA, or DEQ and LRAPA could get delegation to handle it locally. The advantage of local handling would be the opportunity to interface with local emergency responders to ensure that your plan is workable for the community. The advisory committee is to meet with stakeholders and decide whether to handle it locally and, if so, whether they would support the fee that would be necessary to handle it. Staff thinks there are about five sources in Lane County which would be affected. The second committee will look at how toxics below the current deminimus of 10 tons per year for a single HAP or 25 tons for a group of HAPs are handled in Oregon. Staff will keep the board, advisory committee, and stakeholders advised of developments as the committee progresses.

Maine asked Cole to contact Paxton Hart, who brought his concerns about diese truck emissions to the board earlier in the year, about her work with DEQ's heavy-duty diesel group.

OLD BUSINESS:

Springfield Forest Products SFO

Cole said staff is preparing to issue a Notice of Civil Penalty for a violation which has occurred since the new owners took over the facility. Part of the SFO negotiated with the previous owner, and which the current owners are aware is also binding on them, states that any further civil penalties must be paid within five days of issuance. If the penalty is not paid within five days, the company forfeits its permit and must shut down and start over. Staff has been in contact with facility management about the violations and is advising them that the civil penalty is coming so that they know it is a serious matter. They can appeal it if they want to, and if their appeal is successful the penalty will be refunded. There is another violation being assessed currently which will also likely result in issuance of a civil penalty.

Agency Housing

This item was discussed earlier under the expense report agenda item. Board members asked when LRAPA will have an open house at the new location. Cole said staff has discussed whether they want to have an open house to show off the new facility or to make our customers aware of our new location and welcome them to the new location. In order to help people find us, it is better to have an open house sooner, so staff plans to have one in November and another after the lab is completed

NEW BUSINESS:

Steve Dodrill regretfully notified the board and staff that he must resign his position on the board after seven years, due to other family and work obligations. He said he will continue to be interested in air quality issues and the way LRAPA does business He will remain on the board through the December meeting. Johnson thanked Dodrill for his years of dedication to LRAPA. Cole also thanked him on behalf of staff for his many services to the agency.

Maine introduced Sid Leiken, a new Springfield City Councilor who will be taking her place on the LRAPA board in January. Maine said she wants to remain on the board through the director's evaluation process and has asked Leiken to attend meetings and begin learning about LRAPA so that he will be more familiar with it in January. Leiken owns dry cleaning businesses in Springfield, Eugene and Roseburg and so is familiar with air quality issues already.

ADJOURNMENT:

The meeting adjourned at 1:05 p.m. The next regular meeting of the LRAPA Board of Directors is scheduled for Tuesday, November 10, 1998, 12:15 p.m. in the LRAPA meeting room at 1010 Main Street in Springfield.

Respectfully submitted,

Merrie J. Dinteman

Merrie Dinteman
Recording Secretary

LRAPA
Lane Regional Air Pollution Authority

225 5th Street, Suite 501
Springfield, OR 97477

(541) 726-2514 phone
(541) 726-1205 fax
www.lrapa.org
E-mail: lrapa@lrapa.org

TO: Interested and Affected Parties

FROM: Barbara Cole, Director

DATE: August 3, 1998

SUBJ: **Proposed Rulemaking--Amendments to LRAPA Asbestos Rules (Title 43, Section 015)**

Staff is proposing to amend LRAPA's rules regarding asbestos demolition and removal. This amendment process was originally begun in January of 1996, at which time an amendment proposal was sent to asbestos abatement contractors for comment. The process was interrupted for several months due to other priorities. The comments we received in 1996 were incorporated into a subsequent proposal which was, again, distributed to asbestos abatement contractors in January of 1997. Comments received at that time were incorporated into a second proposal which was again sent to asbestos abatement contractors for comment. As LRAPA was preparing to request authorization of public hearing on the proposed amendments, additional changes were made to the state rules. After reviewing those changes, staff made additional revisions to its own amendment proposal.

This rulemaking announcement is to alert interested parties to the proposed changes prior to beginning the public hearing process. The full proposal is being sent to asbestos contractors. If others would like copies of the draft amendments, they are available from the LRAPA office. Please contact Merrie Dinteman at (541) 726-2514 Extension 225.

NEED FOR AMENDMENTS

In order for Lane Regional Air Pollution Authority (LRAPA) to maintain its program authorization from the Environmental Quality Commission (Commission), Oregon statute requires that we must, among other things, ensure that the rules and standards by which LRAPA operates are at least as stringent as those of the Commission.

The Commission rules governing asbestos demolition and removal have been changed several times to increase fees, to better define which projects are exempted from certain parts of the rule, and to include additional federal requirements to those sources subject to the federal Title V Operating Permit Program. The amendment of LRAPA rules has not kept pace with all of these changes. The revisions being proposed are necessary to keep LRAPA up-to-date with Commission rules and to allow us to maintain our authority over asbestos demolition and removal and Title V permitting activities.

LEGAL AUTHORITY:

ORS 183, 468.020, 468A.135; OAR 340-011-0010; LRAPA Titles 13, 14 and 43

PRINCIPAL DOCUMENTS RELIED UPON

1. Attorney General's Uniform and Model Rules of Procedure
2. LRAPA Title 14
3. LRAPA Title 43
4. OAR 340-032-5590--5650
5. OAR 340-033

PROPOSED CHANGES

1. These amendments include additional requirements for sources subject to the Title V Operating Permit program. Some of these requirements are:

   A. A thorough inspection of the affected area for the presence or absence of asbestos-containing materials prior to doing any demolition or renovation;

   B. For demolition projects, only, certification that no asbestos-containing materials were found during the inspection;

   C. Written notification, on a LRAPA form, of any demolition where <u>no</u> asbestos-containing materials are found; and

   D. Submittal of a written notification, on a LRAPA form, for demolitions where asbestos-containing material are present.

2. For all sources, the amendments exempt certain projects from many requirements as long as the exempt materials aren't burned, shattered, crumbled, pulverized or reduced to dust.

3. For exempted projects, the amendments require notice 5 (five) days prior to the beginning of a non-friable asbestos abatement project and 10 (ten) days prior to beginning a friable asbestos abatement project.

4. The asbestos notification fee schedule is changed to include a new $260 fee for annual notifications for friable asbestos abatement projects involving less than 40 linear feet or 80 square feet of asbestos removal.

5. The asbestos notification fee schedule is changed to include a new $35 notification fee for non-friable asbestos abatement projects, and a $350 annual notification fee for non-friable asbestos abatement projects performed at schools, colleges and facilities.

6. The asbestos notification fee schedule is changed to include a $35 notification fee for asbestos abatement projects in residential buildings.

7. The amendments remove references to non-friable asbestos-containing materials in the exempt projects section and instead states, "this exemption shall end whenever the materials are burned, shattered, crumbled, pulverized or reduced to dust."

8. For annual notifications, the wording is changed to more closely resemble DEQ rules, and an additional sub-part (4) is added requiring that the annual notification include a list of asbestos abatement projects scheduled or being conducted at the time of a request for annual notification (upon request by the Authority).

9. Certain definitions are added or revised by these amendments.

10. Various house-keeping changes are also taken care of by this amendment.

11. The words, "small-scale asbestos abatement project" are replaced with, "project less than 40 linear feet or 80 square feet" in several places in the rules.

REVISIONS TO DRAFT AMENDMENTS SINCE ORIGINAL PROPOSAL WAS SENT OUT

As with any rule, the more it is revised to try and provide flexibility to the regulated community and be more specific, the more complicated it becomes. LRAPA has tried to accommodate as many of the comments as possible and still maintain the stringency and flexibility needed.

1. 1996 Changes

    A. Section 43-005 Definitions. The definition of "asbestos-containing material" is changed to read "more than" 1% asbestos by weight, instead of "at least" 1%, for consistency with the state's definition.

    B. Section 43-005 Definitions. The definition of "major source" originally proposed is removed from this draft and replaced with reference to the state definition in OAR 340-28-0110.

    C. Subsection 43-015-4. Additional wording is added to clarify that this subsection applies only to the specific activities listed in the subsection.

2. 1997 Changes

    A. Section 43-005. The definition of "small-scale asbestos abatement project" is removed. This is in response to DEQ concerns that use of this LRAPA term may be confused with the state's "small scale, short-duration renovating and maintenance activity." Some subparts of this subsection are retained and included in other subsections.

B. Subsection 43-015-6.B and C. Amended to include provisions of sub-part A of above-referenced definition, concerning volume of asbestos-containing materials subject to annual notification requirements.

C. Sub-parts B(3) and C(3) of 43-015-6. The words, “small-scale” changed to “applicable.”

3. 1998 Changes

A. Section 43-005. A definition for “open accumulation” is added

B. Section 43-015-3.D. Item I is added prohibiting open storage of friable asbestos-containing material or asbestos containing waste material.

D. Subsections 43-015-9.B and C are amended for annual notification for friable asbestos abatement projects involving less than 40 linear feet or 80 square feet, and annual notification for non-friable asbestos abatement projects performed at schools, colleges, and facilities where removal work is done by certified asbestos abatement workers, respectively.

E. Existing subsection 43-015-5.E, prohibition of notification fees for residential buildings, is removed.

DIFFERENCES BETWEEN LRAPA RULE AND DEQ RULE

1. Section 43-015-5. LRAPA rules include the phrase, “or provides for the conduct,” which DEQ chose to eliminate from its rules. LRAPA rules hold not only the person who conducts the asbestos abatement project, but also anyone who provides for that conduct, accountable for adhering to requirements of the rules.

2. Section 43-015-7.2. DEQ rules do not include items (a) and (b) requiring minimization of particulate asbestos material, and requiring wetting of asbestos-containing material prior to removal and during handling, on projects involving mastics and roofing products fully encapsulated with a petroleum-based binder which are not hard, dry and brittle.

3. 43-015-10.B. LRAPA requires the use of a “Negative Pressure Enclosure”. The definition of Negative Pressure Enclosure fits within the definition of Negative Pressure Enclosure required by OR-OSHA. If an asbestos abatement contractor chose not to use the OR-OSHA required Negative Pressure Enclosure, LRAPA had no authority to require it. This rule allows LRAPA to require this precaution.

4. 43-015-9.A(1)(a). The existing LRAPA rule prohibits a project notification fee for asbestos abatement projects in certain residential buildings. DEQ requires a $35.00 notification fee for asbestos abatement projects conducted in residences. It is proposed that LRAPA include this fee, making this part of the rule the same as the DEQ rule.

5 43-015-9. LRAPA project size categories and fees are different from DEQ's. LRAPA has fewer size categories and fees.

6. 43-015-10.F. LRAPA requires that all asbestos abatement project areas be adequately cleaned at the conclusion of the project. DEQ requires this on projects larger than 160 square feet or 260 linear feet.

7. 43-015-10.G. LRAPA requires that while at the project site, all asbestos-containing waste be secured in a posted area or receptacle. DEQ rules do not require this.

8. 43-015-10.H. LRAPA allows for requiring ambient air sampling where work practices other than those required by rule are being used.

9. 43-015-18.B(4). LRAPA may allow the use of vacuum trucks approved by LRAPA to deliver asbestos-containing slurries directly to the authorized disposal site.

10. 43-015-7.B. LRAPA prohibits the open storage or open accumulation of friable asbestos-containing materials or asbestos-containing waste materials.

11. 43-015-10.M. LRAPA requires that any materials (asbestos-containing or not) within a container that displays an asbestos hazard warning be subject to all rules and regulations pertaining to the storage and disposal of asbestos-containing waste materials.

FISCAL AND ECONOMIC IMPACT OF PROPOSED AMENDMENTS

1. <u>Industry</u>

   A. The proposed amendments require 5-day notification for non-friable asbestos abatement projects and add fees for the notification. While this is required by DEQ's rules, it has not been required by LRAPA.

   B. The proposed amendments add a $350 annual notification fee for non-friable asbestos abatement projects performed at schools, colleges, and facilities.

   C. The proposed amendments add a $260 annual notification fee for friable asbestos abatement projects involving less than 40 linear feet or 80 square feet of asbestos removal.

   D. The proposed amendments require a $35 notification fee for residential asbestos abatement projects. While DEQ's rules already include such a fee, LRAPA's existing rule does not.

   E. Under the proposed amendments, Title V Operating Permit sources must do pre-demolition or renovation inspections of the area where the demolishing is going to occur, to determine the presence or absence of asbestos-containing materials. Written notification of the demolition is required regardless of whether asbestos-containing materials are or are not found. The notification if asbestos isn't found must be in the form of certification that no asbestos is present (for demolition only).

F. The proposed amendments include exemptions from notification and work practice requirements for specific non-friable asbestos abatement projects. The existing rules give broad exemptions for this type of activity; for example, the existing rules include an exemption for removal of non-friable asbestos-containing floor tile which is deleted in the proposed amendments.

2. Public

A. Owners of residences who hire asbestos abatement contractors to abate asbestos in the residence will be required to pay a $35 notification fee.

B. Better funding of LRAPA's asbestos abatement oversight program helps to maintain the current level of public health protection.

3. LRAPA

The additional fees included in the proposal will recover a greater percentage of the cost of operating the asbestos abatement oversight program.

4. Other Government Agencies

There is no direct impact on other government agencies, except for those which conduct asbestos abatement projects subject to these rules..

LAND USE CONSISTENCY STATEMENT

The proposed rule amendments are consistent with land use as described in applicable land use plans in Lane County.

PUBLIC COMMENT PROCESS

Parts of this proposal have already been reviewed by asbestos abatement contractors, as well as DEQ, EPA, the LRAPA Advisory Committee, and a number of other individuals and companies. Their comments, and LRAPA's responses, have been considered in redrafting the proposal. Anyone wishing to comment on this proposal should direct written comments to:

Merrie Dinteman
Lane Regional Air Pollution Authority
225 5th Street, Suite 501
Springfield, OR 97477

Oral comments may also be made to Tom Freeman at (541) 726-2514 Extension 222 (rule writer), Barbara Cole at (541) 726-2514 Extension 216 (Director), or Merrie Dinteman at (541) 726-2514 Extension 225 (coordinator for rulemaking administrative process). Comments should be submitted by Tuesday, September 1, 1998. Comments received by that date will be considered for inclusion in the proposal submitted to the board with request for public hearing authorization. We anticipate asking the board at its September 8 meeting to authorize public hearing at the October 13 meeting.

DEQ is evaluating the current proposal to be sure it is at least as stringent as state rules. Since this rule is not a part of Oregon's State Implementation Plan, the rule does not require approval by Oregon's Environmental Quality Commission or the U. S. EPA. If the board authorizes public hearing on the proposed amendments, notice of the hearing date, time and place will be published in local newspapers, giving an additional 30-day opportunity for public review and comment prior to the hearing.

Following public hearing, the board will be asked to adopt the rules, either as proposed or with any changes deemed necessary in response to information received at the public hearing.

BJC/MJD

Attachment F, pg. 1

GUARD PUBLISHING COMPANY

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Received by
LRAPA 9/23/98

Legal Notice Advertising

☐ Tearsheet Notice

☐ Duplicate Affidavit

LANE REG. AIR
M. DINTEMAN
225 5TH ST. #601
SPRINGFIELD OR 97477

AFFIDAVIT OF PUBLICATION

STATE OF OREGON,)
COUNTY OF LANE,) ss.

I, KELLY REDFEARN, being first duly affirmed, depose and say that I am the Advertising Manager, or his principal clerk, of the Eugene Register-Guard, a newspaper of general circulation as defined in ORS 193.010 and 193.020; published at Eugene in the aforesaid county and state; that the NOTICE OF INTENT, a printed copy of which is hereto annexed, was published in the entire issue of said newspaper for ONE successive and consecutive DAY in the following issues:

SEPT. 16, 1998

NOTICE OF INTENT TO ADOPT AMENDMENTS TO LRAPA RULES

In accordance with Title 14 of the Lane Regional Air Pollution Authority (LRAPA) Rules and Regulations, the Board of Directors is proposing.

To amend LRAPA Title 43, "Emission Standards for Hazardous Air Pollutants," to: bring LRAPA's rules up-do-date with the state's rules regarding asbestos demolition and removal, thus allowing LRAPA to maintain its authority over asbestos demolition and removal and Title V permitting activities; amend the fee schedule to adopt some additional fees; amend some of the notification requirements; prohibit open storage of friable asbestos-containing materials or asbestos-containing waste material; amend or add certain definitions; and make some other housekeeping changes for clarity.

WHO IS AFFECTED: Asbestos abatement contractors doing business in Lane County; major industrial sources subject to the federal Title V permitting program; industries or businesses who have asbestos abated within the business facility; owners of residences who hire asbestos abatement contractors to abate asbestos in the residence.

PUBLIC HEARING:

Public hearing on the above rule adoption will be held before the LRAPA Board of Directors:

Location: City Council Chambers
Springfield City Hall
225 5th Street
Springfield, Oregon

Date: Tuesday, October 20, 1998
Time: 12:30

Copies of the proposed rules, as well as Statements of Need and Fiscal Impact, are available for review at the LRAPA office at 225 5th Street, Suite 601, Springfield, Oregon until September 21, 1998, then at our new location, 1010 Main Street, Springfield, Oregon until October 20, 1998. The public may comment on the proposed regulations by calling the LRAPA business office, 726-2514, Extension 222 (Tom Freeman), Extension 216 (Barbara Cole), or Extension 225 (Merrie Dinteman); or written comment may be submitted until October 12, 1997, to the LRAPA Board of Directors, 1010 Main Street, Springfield, Oregon 97477.

No. 22600 – September 16, 1998.

Subscribed and affirmed to before me this 9/21/98

Debbie Buzalsky
Notary Public of Oregon

My Commission Expires: 8·29·02

OFFICIAL SEAL
DEBBIE S BUZALSKY
NOTARY PUBLIC - OREGON
COMMISSION NO. 314262
MY COMMISSION EXPIRES AUGUST 29, 2002

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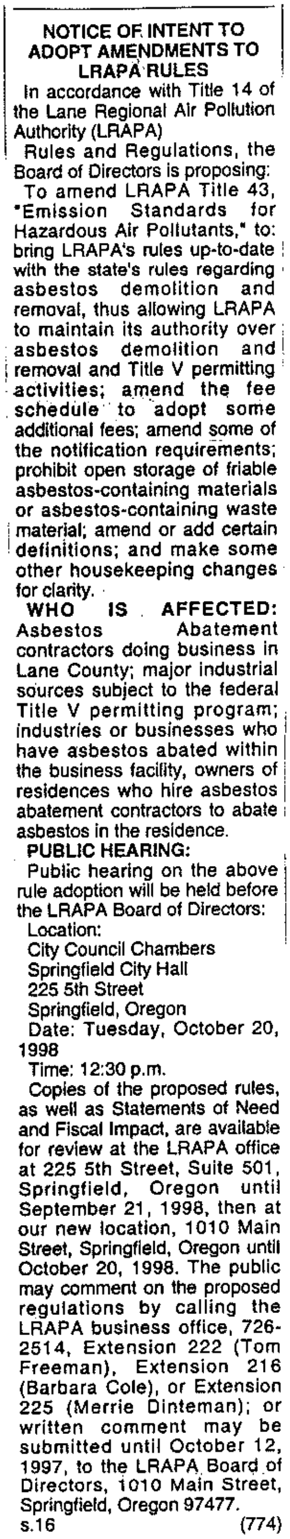
OCT - 2 1998
LANE REGIONAL AIR POLLUTION AUTHORITY



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s.16 (774)

Affidavit of Publication

State of Oregon, County of Lane-ss

I, Adriana Perez being duly sworn, depose and say that I am the legal clerk of the Springfield News a newspaper of general circulation, as defined by ORS 193.010 and 193.020; printed and published at Springfield in the aforesaid county and state, that the legal publication re: Notice of intent to adopt amendments to LRAPA rules.

A printed copy of which is hereto annexed, was published in the entire issue of said newspaper for one successive and consecutive weeks in the following issues: September 16,1998.

THE SPRINGFIELD NEWS
by: Adriana Perez

Subscribed and sworn to me this 17th day of September, 1998

Frances R Ramsey
Notary Public for Oregon

My commission expires August 8, 1999.

Affidavit of Publication

RECEIVED
SEP 29 1998
LANE REGIONAL AIR
POLLUTION AUTHORITY

State of Oregon
County of Lane

I, Larry D. Roberts, being first duly sworn deposes and say that I am the Publisher of the Dead Mountain Echo, a newspaper of general circulation published at Oakridge, Oregon in the aforesaid county and state, as defined by ORS 193-010 ET SEQ that a notice, a printed copy of which is hereto annexed, was published in the entire issue of said newspaper for :

1 consecutive week(s), in the following issues: 9.17.98; #23

Signed:..

Subscribed and sworn to before me this 25th day of Sept., 1998

OFFICIAL SEAL
KAREN E O'BRIEN
NOTARY PUBLIC - OREGON
COMMISSION NO. 060089
MY COMMISSION EXPIRES FEBRUARY 11, 2001

..............................Notary Public of Oregon

My commission expires: 2-11-2001

Attachment F, pg. 4

lassified ads

Classified deadline is M
for the following Thursday's issue
advance of publication. Ads with
Display classifieds are $7.50 per
48013 Hwy. 58 or mail with
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Monday at 5:30 p.m. for that wee

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status, or national
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Westoak #A Studio.
by appointment. Call

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"AVON"

Representatives needed. No inventory required. IND/SALES/REP. 800-236-0041.
HW22-25P

PART TIME AD SALES PERSON

Flexible hours. Enthusiastic self-starter, able to work independently Willing to train right candidate. Come join our team! Pick up your application or drop off resume at the Dead Mountain Echo/First Street Collection, 48013 Hwy. 58. Job description available. Drug screen required. EOE.
HW22TFNNC

ON CALL CHILD CARE WORKERS,

$6.00 per hour-Oakridge. Substitute Teacher, $8.50 per hour-Oakridge. Substitute Classroom Food Service Worker, $6.50 per hour, on call position-Oakridge. Positions start ASAP. Applicants and job descriptions available in person, by mail, or by fax at Head Start of Lane County Central Office, 221 "B" Street, Springfield, OR, 97477. Phone 541 747-2425. Fax: (541)747-6648. Head Start is an **equal opportunity employer.**
HW23B

CHOKESETTER

$13.00 per hour. BOE. Must pass drug test. Only dependable, hard working and motivated need apply. Will train if you qualify. Working in Oakridge area. Call for application. 503-363-4284.
HW23,24B

PERSONALS

ATTENTION VETERANS

If you have served 2-4 years you have $261-$528 coming back from the U.S. Government. Send $10 check of M.O. Agincourt Services, 1905 S. 6th, Cottage Grove, OR 97424. Money back guarantee.
P23P

LEGAL NOTICE

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LN23TSAB

Classified Deadline is
Monday at 5:30 p.m.

Statewide Classifieds

Your ad will reach most newspapers in Oregon fo
Contact the Dead Mountain Echo at 782-
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CASH immediate $$ for structured settlements and deferred insurance claims. J.G. Wentworth 1-888-231-5375.

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HOMEOWNERS! Debt consolidation! Borrow $25,000-$100,000. Too many bills? Home Improvements. Apply by phone 24-hour approval. No equity required. Platinum Capital. 1-800-523-5363. Open 7 days.

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ALL cash. Receiving payments on a mortgage? Why wait? Best prices paid locally and nationwide, plus we pay transfer costs. Sell all/part: PEI 1-800-999-9892.

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5:00 to 7:00 p.m. September 27. $5.00 per adult. $2.50 per child under 10. Oakridge Church of the Nazarene. 48187 Highway 58.
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Affidavit of Publication

State of Oregon
County of Lane

I, Krista Wamhoff being first duly sworn, depose and say that I am the legal clerk of The Cottage Grove Sentinel, a newspaper of general circulation, as defined by ORS 193,010, and 193,020, printed and published at Cottage Grove in the aforesaid county and state; that :Legal Notice of Itent to adopt amendments to LRAPA rules........ a printed copy of which is hereto annexed, was published once a week in the entire issue of said newspaper for_____successive and consecutive weeks in the following issues: September 16, 1998 Issue 8

JODY B ROLNICK
COMMISSION NO. 058805
MY COMMISSION EXPIRES OCT. 24, 2000

Subscribed and sworn to before me this____day of _________, 19___.

Jody Rolnick
Notary Public for Oregon

Classifieds

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Cottage Grove Sentinel

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8:30-5:00 pm
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Legal Notice

REQUEST FOR LETTERS OF INTEREST: WELFARE TO WORK ACTIVITIES

The Southern Willamette Private Industry Council (SWPIC), Prime Contractor for the JOBS/Welfare to Work Program in Lane County, is seeking subcontractors for four Welfare to Work activities. Bidders must be able to demonstrate administrative capacity, fiscal capability and sufficient organizational resources to deliver services. Experience administering federal programs, working with low income individuals, and collaborating with other agencies is desirable, as is the ability to leverage additional services to clients.

Bidders must be able to provide year-round services from December 1, 1998 through June 30, 1999. Contracts will be negotiated for that time period, with a Lane County option to renew contracts annually for up to two additional years, based on funding availability and the contractor's performance. SWPIC may reject any bid not in compliance with all prescribed public bidding procedures and requirements and may reject for good cause any or all bids if it is in the public interest to do so. This project depends upon state and federal funding.

The following conditions will apply to the subcontracts resulting from this bidding process: *The contractor must operate the program independently, not as an agent of Lane County. *The contractor must comply with all terms in the contract and with all applicable federal, state, and local statutes and rules governing the operations of the program. A sample boilerplate for Lane County JOBS/Welfare to Work contracts will be provided to potential bidders upon request. The boilerplate is subject to change to comply with the legal requirements of Lane County and the State of Oregon and with changes in federal and state legislation related to welfare reform.

*Any article of tangible property acquired with funds under these contracts which costs $500 or more and which has a useful life of more than two yeas is a capital

LEGAL NOTICE:
NOTICE OF INTENT TO ADOPT AMENDMENTS TO LRAPA RULES

In accordance with Title 14 of the Lane Regional Air Pollution Authority (:LRAPA) Rules and Regulations, the Board of Directors is proposing:

To amend LRAPA Title 43, "Emission Standards for Hazardous Air Pollutants," to: bring LRAPA's rules up-to-date with the state's rules regarding asbestos demolition and removal, thus allowing LRAPA to maintain its authority over asbestos demolition and removal and Title V permitting activities; amend the fee schedule to adopt some additional fees; amend some of the notification requirements; prohibit open storage of friable asbestos-containing materials or asbestos-containing waste material; amend or add certain definitions; and make some other housekeeping changes for clarity.

WHO IS AFFECTED: Asbestos abatement contractors doing business in Lane County, major industrial sources subject to the federal Title V permitting program; industries or businesses who have asbestos abated within the business facility; owners of residences who hire asbestos abatement contractors to abate asbestos in the residence.

PUBLIC HEARING: Public hearing on the above rule adoption will be held before the LRAPA Board of Directors: Location: City Council Chambers Springfield City Hall 225 5th Street Springfield, Oregon DATE: Tuesday, October 20, 1998 TIME: 12:30 p.m. Copies of the proposed rules, as well as Statements of Need and Fiscal Impact, are available for review at the LRAPA office at 225 5th Street, Suite 501, Springfield, Oregon until September 21, 1998, then at our new location, 1010 Main Street, Springfield, Oregon until October 20, 1998. The public may comment on the proposed regulations by calling the LRAPA business office, 726-2514, Extension 222 (Tom Freeman), Extension 216 (Barbara Cole), or Extension 225 (Merrie Dinteman); or written comment may be submitted until October 12, 1998, to the LRAPA Board of Directors, 1010 Main Street, Springfield, Oregon 97477.

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LANE REGIONAL AIR POLLUTION AUTHORITY

AMENDMENTS TO

TITLE 34

Stationary Source Rules and Permitting Procedures

Section 34-060 Plant Site Emission Limit Rules

8. Alternative Emission Controls (Bubble)

   A. Alternative emission controls may be approved for use within a plant site such that specific mass emission limit rules are exceeded if:

      (1) such alternatives are not specifically prohibited by a permit condition;
      (2) net emissions for each pollutant are not increased above the PSEL;
      (3) The net air quality impact is not increased as demonstrated by procedures required by Section 38-035 (Requirements for Net Air Quality Benefit);
      (4) No other pollutants including malodorous, toxic or hazardous pollutants are substituted;
      (5) Best Available Control Technology (BACT) and Lowest Achievable Emission Rate (LAER), where required by a previously issued permit, and New Source Performance Standards (NSPS) and National Emission Standards for Hazardous Air Pollutants (NESHAP), where required, are not relaxed;
      (6) specific mass emission limits are established for each emission unit involved such that compliance with the PSEL can be readily determined; or
      (7) application is made for a permit modification and such modification is approved by the Authority.

   B. Operators of existing sources requesting alternative emission controls shall, at the time of application, pay the following fees:

      (1) a filing fee of $[~~75~~]93; and
      (2) an application processing fee of $500.

Section 34-150 ACDP Fees

1. All persons applying for a new ACD permit or a renewal of an existing ACDP shall at the time of application pay the following fees:

   A. A filing fee of $[~~75~~]93;

   B. An application processing fee; and

   C. An annual compliance determination fee.

   Both the application processing fee and the annual compliance fee may be waived when applying for letter permits (see Section 34-100-6, Permit Categories).

2. All persons applying for a modification of an existing ACDP shall at the time of application pay the following fees:

   A. a filing fee of $[~~75~~]93; and

   B. an application processing fee.

   The application processing fee may be waived when applying for letter permits (see Section 34-100-6, Permit Categories). Modifications subject to the requirements of Section 34-035, Requirements for Construction, may be subject to the fees of Table A Part I, in addition to the fees of Table A Part II.

3. All persons applying for a Synthetic Minor ACDP (34-120) shall at the time of application pay the following fees:

   A. a filing fee of $[~~75~~]93;

   B. an application processing fee;

   C. an annual compliance determination fee; and

   D. all of the applicable fees of Table A Part I.

4. The fee schedule contained in Table A Part II shall be applied to determine the ACDP fees on a standard industrial classification (SIC) basis.

5. Applications for multiple-source permits received pursuant to Section 34-100-4 (Permit Categories) shall be subject to a single $[~~75~~]93 filing fee. The

application processing fee and annual compliance determination fee for multiple-source permits shall be equal to the total amounts required by the individual sources involved, as listed in Table A Part II.

6. In addition to the fees mentioned above, sources may be subject to the fees of Table A Part I. The fees for construction review shall be based on the definitions of review levels in Section 34-035-3.

7. Modifications of existing, unexpired permits, which are instituted by the Authority due to changing conditions or standards, receipt of additional information or any other reason pursuant to applicable statutes and which do not require refiling or review of an application or plans and specifications, shall not require submittal of the filing fee or the application processing fee.

8. The annual compliance determination fee shall be paid at least thirty (30) days prior to the start of each subsequent permit year. Failure to remit the annual compliance determination fee on time shall be considered grounds for not issuing a permit or for terminating an existing permit. Also, such a failure is, in and of itself, a violation and may subject the permittee to enforcement procedures as defined in Title 15 of LRAPA Rules and Regulations.

9. If a permit is issued for a period of less than one year, the applicable annual compliance determination fee shall be equal to the full annual fee. If a permit is issued for a period greater than twelve (12) months, the applicable annual compliance determination fee shall be prorated by multiplying the annual compliance fee by the number of months covered by the permit and dividing by twelve (12).

10. If a temporary or conditional permit is issued in accordance with adopted procedure, fees submitted with the application shall be applied to the regular permit when it is granted or denied.

11. All fees shall be made payable to the Authority.

12. Table A Part II of this Title lists all air contaminant sources required to have a permit and the associated fee schedule.

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TABLE
AIR CONTAMINANT SOURCES AND ASSOCIATED FEE SCHEDULE

PART I

NOTE: Fees in A-I are in addition to any other applicable fees.

A.	Late Payment	
	(1) 8-30 days	10%
	(2) Greater than 30 days	25%
B.	Ambient Monitoring Network Review	$900
C.	Modeling Review	$2,000
D.	Alternative Emission Control Review	$1,500
E.	Non-technical permit modification (name change, ownership transfer, similar)	$50
F.	Construction Review (see Section 34-035 for definition of level of construction review)	
	(1) Level I	$200
	(2) Level II	$2,000
	(3) Level III	$10,000
	(4) Level IV	$20,000
G.	Elective Permits--Synthetic Minor Sources	
	(1) Permit application or modification	$1,900 *($ [~~500~~]1,000)
	(2) Annual compliance assurance	$1,000 *($ [~~200~~]500)
H.	Emission Banking Review	
	(1) Initial setup	$1,000
	(2) Annual review	$500
I.	Emission Offsetting Review	$1,000

* These fees may apply where a source electing to be a synthetic minor would otherwise require a federal operating permit due to its potential to emit air contaminants above the major source threshold <u>and</u> the source has two or less equipment types. The applicability of these fees will be determined by the Director.

NOTE: Persons who operate boilers shall include fees as indicated in Items 58, 59, or 60 in Part II, in addition to fee for other applicable category.

PUBLIC HEARING DATE: MAY 12, 1998

TABLE A

LRAPA

AIR CONTAMINANT SOURCES AND ASSOCIATED FEE SCHEDULE

PART II

	Air Contaminant Source	Standard Industrial Classification Number	Application Processing Fee	Annual Compliance Determination Fee
1.	Seed cleaning located in Air Quality Maintenance Areas, commercial operations only (not elsewhere classified)	0723	[~~490~~]608	[~~750~~]930
2.	RESERVED			
3.	Flour and other grain mill products in Air Quality Maintenance Areas			
	(a) 10,000 or more tons per year	2041	[~~1,600~~]1,984	[~~1,480~~]1,835
	(b) Less than 10,000 tons per year	2041	[~~1,230~~]1,525	[~~630~~]781
4.	Cereal preparations in Air Quality Maintenance Areas.	2043	[~~1,600~~]1,984	[~~1,070~~]1,327
5.	Blended and prepared flour in Air Quality Maintenance Areas			
	(a) 10,000 or more tons per year	2045	~~[1,600~~]1,984	[~~1,070~~]1,327
	(b) Less than 10,000 tons per year	2045	[~~1,230~~]1,525	[~~620~~]769
6.	Prepared feeds for animals and fowl in Air Quality Maintenance Areas			
	(a) 10,000 or more tons per year	2048	[~~1,600~~]1,984	[~~1,480~~]1,835
	(b) Less than 10,000 tons per year	2048	[~~990~~]1,228	[~~1,160~~]1,438
7.	Beet sugar manufacturing	2063	[~~2,090~~]2,592	[~~7,340~~]9,102

<u>Note</u>: *A filing fee of $[~~75~~]93 is required for all sources.*

Public Hearing Date: May 12, 19

TABLE

AIR CONTAMINANT SOURCES AND ASSOCIATED FEE SCHEDULE

PART II

	Air Contaminant Source	Standard Industrial Classification Number	Application Processing Fee	Annual Compliance Determination Fee
8.	Rendering plant			
	(a) 10,000 or more tons per year	2077	[~~1,970~~]2,443	[~~2,370~~]2,939
	(b) Less than 10,000 tons per year	2077	[~~1,480~~]1,835	[~~1,280~~]1,587
9.	Coffee roasting			
	(a) 1 to 40 Kg. roasting capacity	2095	[~~320~~]399	[~~480~~]595
	(b) Greater than 40 Kg. roasting capacity	2095	[~~990~~]1,228	[~~970~~]1,203
10.	Sawmill and/or planing mill			
	(a) 25,000 or more board feet per shift	2421	[~~990~~]1,228	[~~1,480~~]1,835
	(b) Less than 25,000 board feet per shift	2421	[~~330~~]409	[~~690~~]856
11.	Hardwood mills	2426	[~~330~~]409	[~~930~~]1,153
12.	Shake and shingle mills with air transfer systems	2429	[~~330~~]409	[~~350~~]434
13.	Mill work (including kitchen cabinets and structural wood members) 25,000 or more board feet per shift	2431, 2434 & 2439	[~~740~~]918	[~~1,160~~]1,438

<u>Note</u>: *A filing fee of $[~~75~~]93 is required for all sources.*

Public Hearing Date: May 12, 1998

TABLE A

AIR CONTAMINANT SOURCES AND ASSOCIATED FEE SCHEDULE

PART II

	Air Contaminant Source	Standard Industrial Classification Number	Application Processing Fee	Annual Compliance Determination Fee
14.	Plywood manufacturing			
	(a) 25,000 or more square feet per hour (3/8" basis finished product)	2435 & 2436	[~~3,080~~]3,819	[~~2,980~~]3,695
	(b) Less than 25,000 square feet per hour (3/8" basis finished product)	2435 & 2436	[~~1,490~~]1,848	[~~1,740~~]2,157
15.	Veneer manufacturing only (not elsewhere classified)	2435 & 2436	[~~330~~]918	[~~930~~]1,450
16.	Wood preserving	2491	[~~1,950~~]2,002	[~~1,740~~]1,921
17.	Particleboard manufacturing (including strandboard, flakeboard and waferboard)			
	(a) ≥ 10,000 sq.ft./hr--3/4" basis finished product	2492	[~~3,080~~]3,819	[~~3,510~~]4,352
	(b) < 10,000 sq.ft./hr--3/4" basis finished product	2492	[~~1,480~~]1,835	[~~1,680~~]2,083
18.	Hardboard manufacturing			
	(a) ≥ 10,000 sq.ft./hr--1/8" basis finished product	2493	[~~3,080~~]3,819	[~~2,880~~]3,571
	(b) < 10,000 sq.ft./hr--1/8" basis finished product	2493	[~~1,480~~]1,835	[~~1,480~~]1,835

Note: *A filing fee of $[~~75~~]93 is required for all sources.*

TABLE

LRAPA

AIR CONTAMINANT SOURCES AND ASSOCIATED FEE SCHEDULE

PART II

Air Contaminant Source	Standard Industrial Classification Number	Application Processing Fee	Annual Compliance Determination Fee
19. Battery separator manufacturing	3069	[~~1,230~~]1,525	[~~2,560~~]3,174
20. Furniture and fixture manufacturing 25,000 or more board feet/shift	2511	[~~740~~]918	[~~1,160~~]1,438
21. Pulp mills, paper mills and paperboard mills	2611, 2621 & 2631	[~~6,160~~]7,638	[~~12,760~~]15,822
22. Building paper and building board mills	2661	[~~990~~]1,228	[~~970~~]1,203
23. Alkalies and chlorine manufacturing			
(a) Simple Permit *	2812	[~~1,730~~]2,145	[~~2,540~~]3,150
(b) Complex Permit *	2812	[~~3,020~~]3,745	[~~3,390~~]4,204
24. Calcium carbide manufacturing			
(a) Simple Permit *	2819	[~~1,850~~]2,294	[~~2,540~~]3,150
(b) Complex Permit *	2819	[~~3,230~~]4,005	[~~3,390~~]4,204
25. Nitric acid manufacturing			
(a) Simple Permit *	2819	[~~1,230~~]1,525	[~~1,280~~]1,587
(b) Complex Permit *	2819	[~~2,160~~]2,678	[~~1,710~~]2,120

Note: *A filing fee of $[~~75~~]93 is required for all sources.*

Public Hearing Date: May 12, 1998

LRAPA

TABLE A

AIR CONTAMINANT SOURCES AND ASSOCIATED FEE SCHEDULE

PART II

	Air Contaminant Source	Standard Industrial Classification Number	Application Processing Fee	Annual Compliance Determination Fee
26.	Ammonia manufacturing			
	(a) Simple Permit *	2819	[~~1,230~~]1,525	[~~1,480~~]1,835
	(b) Complex Permit *	2819	[~~2,160~~]2,678	[~~1,970~~]2,443
27.	Industrial inorganic and organic chemicals manufacturing (not elsewhere classified)			
	(a) Simple Permit *	2819 & 2869	[~~1,600~~]1,984	[~~1,820~~]2,257
	(b) Complex Permit *	2819 & 2869	[~~2,800~~]3,472	[~~2,410~~]2,988
28.	Synthetic resin manufacturing			
	(a) Simple Permit *	2821	[~~1,230~~]1,525	[~~1,480~~]1,835
	(b) Complex Permit *	2821	[~~2,160~~]2,678	[~~1,970~~]2,443
29.	Charcoal manufacturing	2861	[~~1,730~~]2,145	[~~3,080~~]3,819
30.	Pesticide/Herbicide manufacturing	2879	[~~3,080~~]3,819	[~~12,760~~]15,822
31.	Petroleum refining	2911	[~~6,160~~]7,638	[~~12,760~~]15,822
32.	Asphalt production by distillation	2951	[~~1,230~~]1,525	[~~1,480~~]1,835
33.	Asphalt blowing plants	2951	[~~1,230~~]1,525	[~~1,920~~]2,381

Note: *A filing fee of $[~~75~~]93 is required for all sources.*

TABLE

LRAPA

AIR CONTAMINANT SOURCES AND ASSOCIATED FEE SCHEDULE

PART II

	Air Contaminant Source	Standard Industrial Classification Number	Application Processing Fee	Annual Compliance Determination Fee
34.	Concrete Paving Plants: Asphalt Production			
	(a) Stationary	2951	[~~1,640~~]1,001	[~~1,760~~]2,182
	(b) Portable	2951	[~~1,640~~]1,001	[~~1,970~~]2,182
35.	Asphalt felts or coating	2952	[~~660~~]818	[~~1,460~~]1,810
36.	Blending, compounding or refining of lubricating oils and reprocessing of oils and solvents for fuel	2992	[~~1,110~~]1,376	[~~1,380~~]1,711
37.	Glass container manufacturing	3221	[~~1,230~~]1,525	[~~1,820~~]2,257
38.	Cement manufacturing	3241 & 3251	[~~3,940~~]4,886	[~~9,350~~]11,594
39.	Concrete Manufacturing including Redimix and CTB	3271, 3272 & 3273	[~~250~~]310	[~~390~~]484
40.	Lime manufacturing	3274	[~~1,850~~]2,294	[~~970~~]1,203
41.	Gypsum products	3275	[~~990~~]1,228	[~~1,070~~]1,327
42.	Sand and Gravel Plants: Rock Crusher			
	(a) Stationary	1429, 1442, 1446 & 3295	1,870	1,960
	(b) Portable	1429, 1442, 1446 & 3295	1,370	1,160
	(c) Stationary or Portable < 300,000 Tons/Year Throughput	1429, 1442, 1446 & 3295	[~~200~~]248	[~~300~~]372

Note: *A filing fee of $[~~75~~]93 is required for all sources.*

Public Hearing Date: May 12, 1998

TABLE A

LRAPA

AIR CONTAMINANT SOURCES AND ASSOCIATED FEE SCHEDULE

PART II

	Air Contaminant Source	Standard Industrial Classification Number	Application Processing Fee	Annual Compliance Determination Fee
43.	Steel works, rolling and finishing mills, electrometallurgical products	3312 & 3313	[~~3,080~~]3,819	[~~2,540~~]3,150
44.	Incinerators	4953 & 7261		
	(a) 250 or more ton/day capacity or an off-site infectious waste incinerator		[~~14,780~~]18,327	[~~6,370~~]7,899
	(b) 50 or more but less than 250 tons/day capacity		[~~3,700~~]4,588	[~~1,930~~]2,393
	(c) 0.5 or more but less than 50 tons/day capacity		[~~620~~]769	[~~750~~]930
	(d) crematoriums and pathological waste incinerators not elsewhere classified		[~~620~~]769	[~~750~~]930
	(e) PCB and/or off-site hazardous waste incinerator		[~~14,780~~]18,327	[~~6,370~~]7,899
45.	Gray iron and steel foundries, malleable iron foundries, steel investment foundries, steel foundries (not elsewhere classified)	3321 & 3322 & 3324 & 3325		
	(a) 3,500 or more tons per year production		[~~3,080~~]3,819	[~~2,230~~]2,765
	(b) Less than 3,500 tons per year production		[~~740~~]918	[~~1,160~~]1,438
46.	Primary aluminum production	3334	[~~6,160~~]7,638	[~~12,760~~]15,822

Note: *A filing fee of $[~~75~~]93 is required for all sources.*

TABLE

LRAPA

AIR CONTAMINANT SOURCES AND ASSOCIATED FEE SCHEDULE

PART II

	Air Contaminant Source	Standard Industrial Classification Number	Application Processing Fee	Annual Compliance Determination Fee
47.	Primary smelting of zirconium or hafnium or primary smelting and refining of other ferrous or non-ferrous metals not elsewhere classified			
	(a) ≥ 2,000 TPY production	3339	[~~6,160~~]7,638	[~~12,760~~]15,822
	(b) < 2,000 TPY production	3339	[~~1,000~~]2,240	[~~2,000~~]2,480
48.	Primary smelting of silicon	3339	[~~2,610~~]3,236	[~~5,880~~]7,291
49.	Secondary smelting and refining of nonferrous metals	3341	[~~1,480~~]1,835	[~~1,480~~]1,835
50.	Nonferrous metal foundries (100 or more tons/year metal charged)	3361, 3362 & 3369	[~~740~~]918	[~~1,280~~]1,587
51.	Electroplating, polishing and anodizing	3471	[~~500~~]620	[~~960~~]1,190
52.	Galvanizing and pipe coating--exclude all other activities	3479	[~~620~~]769	[~~970~~]1,203
53.	Battery manufacturing	3691	[~~740~~]918	[~~1,280~~]1,587
54.	Grain elevators--intermediate storage only, located in Air Quality Maintenance Areas			
	(a) 20,000 or more tons per year	4221	[~~1,110~~]1,376	[~~2,010~~]2,492
	(b) Less than 20,000 tons per year	4221	[~~620~~]769	[~~970~~]1,203

Note: *A filing fee of $[~~75~~]93 is required for all sources.*

Public Hearing Date: May 12, 1998

TABLE A

LRAPA

AIR CONTAMINANT SOURCES AND ASSOCIATED FEE SCHEDULE

PART II

Air Contaminant Source	Standard Industrial Classification Number	Application Processing Fee	Annual Compliance Determination Fee
55. Electric power generation or cogeneration			
(a) Solid fuel--25 MW or greater	4911	[~~24,640~~]30,554	[~~12,760~~]15,822
(b) Solid Fuel--less than 25 MW	4911	[~~11,670~~]14,471	[~~6,270~~]7,775
(c) Oil or gas fired	4911	[~~2,200~~]2,728	[~~3,080~~]3,819
56. Fuel burning Equipment at gas production and/or distribution facilities	4925	[~~2,340~~]2,902	[~~1,480~~]1,835
57. Grain elevators--terminal elevators primarily engaged in buying and/or marketing grain in Air Quality Maintenance Areas			
(a) 20,000 or more tons per year	5153	[~~3,080~~]3,819	[~~2,540~~]3,150
(b) Less than 20,000 tons per year	5153	[~~860~~]1,066	[~~970~~]1,203
58. Fuel-Burning Equipment (gas or oil), Aggregate Heat Input			
(a) >250 million BTU/hr	4961	[~~2,220~~]2,753	[~~3,080~~]3,819
(b) >100 and <250 million BTU/hr	4961	[~~1,510~~]1,872	1,730
(c) >10 and <100 million BTU/hr	4961	[~~990~~]1,228	1,210
(d) <10 million BTU/hr	4961	[~~330~~]409	[~~350~~]434

<u>Note</u>: *A filing fee of $[~~75~~]93 is required for all sources.*

TABLE

AIR CONTAMINANT SOURCES AND ASSOCIATED FEE SCHEDULE

PART II

	Air Contaminant Source	Standard Industrial Classification Number	Application Processing Fee	Annual Compliance Determination Fee
59.	Fuel-Burning Equipment Inside the AQMA (Wood or Coal Only) Aggregate Heat Input			
	(a) >250 million BTU/hr	4961	[~~3,510~~]4,352	[~~3,020~~]3,745
	(b) >100 and <250 million BTU/hr	4961	[~~2,490~~]3,088	[~~2,320~~]2,877
	(c) >10 and <100 million BTU/hr	4961	[~~1,810~~]2,244	[~~1,530~~]1,897
	(d) <10 million BTU/hr	4961	[~~1,220~~]1,365	[~~1,010~~]1,252
60.	Fuel-Burning Equipment Outside the AQMA (Wood or Coal Only)Aggregate Heat Input			
	(a) >250 million BTU/hr	4961	[~~2,640~~]3,274	[~~2,410~~]2,988
	(b) >100 and <250 million BTU/hr	4961	[~~1,970~~]2,443	[~~2,130~~]2,641
	(c) >10 and <100 million BTU/hr	4961	[~~1,190~~]1,476	[~~1,310~~]1,624
	(d) <10 million BTU/hr	4961	[~~490~~]608	[~~1,070~~]1,327
61.	Sources not listed herein which would emit 10 or more tons per year of the aggregate of any air contaminants, including including but not limited to: particulates, SO_x, NO_x or hydrocarbons, if the source were to operate uncontrolled			
	(a) Complex Permit *		[~~5,200~~]7,800	[~~5,200~~]7,800
	(Complex Permit fees proposed to increase to $10,000, effective July 1, 1999.)			
	(b) Moderate Permit		4,400	4,400
	([~~b~~]c) Simple Permit *		1,000	1,000

Note: *A filing fee of $[~~75~~]93 is required for all sources.*

Public Hearing Date: May 12, 1998

Attachment G, pg. 16

TABLE A

LRAPA

AIR CONTAMINANT SOURCES AND ASSOCIATED FEE SCHEDULE

PART II

	Air Contaminant Source	Standard Industrial Classification Number	Application Processing Fee	Annual Compliance Determination Fee
62.	Sources not listed herein which would emit significant malodorous emissions as determined by Authority review of sources which are known to produce similar air contaminant emissions			
	(a) Complex Permit *		[~~5,200~~]7,800	[~~5,200~~]7,800
	(Complex Permit fees proposed to increase to $10,000, effective July 1, 1999.)			
	(b) Moderate Permit		4,400	4,400
	([~~b~~]c) Simple Permit *		1,000	1,000
63.	Sources not listed herein for which an air quality problemis identified by the Authority, including but not limited to: open storage of dusty or odorous material, dry material handling air transfer systems and sandblasting operations			
	(a) Complex Permit *		[~~5,200~~]7,800	[~~5,200~~]7,800
	(Complex Permit fees proposed to increase to $10,000, effective July 1, 1999.)			
	(b) Moderate Permit		4,400	4,400
	([~~b~~]c) Simple Permit *		1,000	1,000
64.	Bulk gasoline plants	5100 & 5171	[~~490~~]608	[~~630~~]781
65.	Bulk gasoline terminals	5171	[~~4,930~~]6,113	[~~2,380~~]2,951

Note: *A filing fee of $[~~75~~]93 is required for all sources.*

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TABLE

LRAPA

AIR CONTAMINANT SOURCES AND ASSOCIATED FEE SCHEDULE

PART II

	Air Contaminant Source	Standard Industrial Classification Number	Application Processing Fee	Annual Compliance Determination Fee
66.	Liquid storage tanks--39,000 gallons or more capacity (not elsewhere classified) except for water	4200, 5169 & 5171	[~~250~~]310/tank	[~~440~~]546/tank
67.	Can or drum coating			
	(a) ≥ 50,000 units/mon.	3411 & 3412	[~~7,390~~]9,164	[~~3,830~~]4,749
	(b) < 50,000 units/mon.	3411 & 3412	[~~1,900~~]2,356	[~~1,200~~]1,488
68.	Paper or other substrate coating	2641 & 3861	[~~7,390~~]9,164	[~~3,830~~]4,749
69.	Coating flat wood	2400 & 2672	[~~2,460~~]3,050	[~~1,700~~]2,108
70.	Surface coating manufacturing			
	(a) 100 tons or more of VOC per year	2851	[~~2,460~~]3,050	[~~1,700~~]2,108
	(b) 10 tons or more but less than 100 tons/year VOC	2951	[~~740~~]918	[~~850~~]1,054
	(c) Less than 10 tons VOC per year	2851	[~~250~~]310	[~~360~~]446
71.	Flexographic or rotograveure printing 10 tons or more VOC per year per plant	2751, 2754 & 2759	[~~390~~]780	[~~840~~]1,680
72.	RESERVED			
73.	Sources subject to federal NESHAPS rules under Section 112 of the federal Clean Air Act (except demolition or renovation)		[~~490~~]608	[~~620~~]769

<u>Note</u>: *A filing fee of $[~~75~~]93 is required for all sources.*

Public Hearing Date: May 12, 1998

TABLE A

LRAPA

AIR CONTAMINANT SOURCES AND ASSOCIATED FEE SCHEDULE

PART II

	Air Contaminant Source	Standard Industrial Classification Number	Application Processing Fee	Annual Compliance Determination Fee
74.	Sources of toxic air pollutants, including Maximum Available Control Technology (MACT) (not elsewhere classified)			
	(a) High Toxicity **		[~~1,230~~]1,525	[~~1,180~~]1,463
	(b) Moderate Toxicity **		[~~830~~]1,029	[~~990~~]1,228
75.	Soil remediation Plants			
	(a) Stationary (emissions ≥ SER)	1799	[~~1,230~~]1,525	[~~1,160~~]1,438
	(b) Portable (emissions ≥ SER)	1799	[~~1,230~~]1,525	[~~1,480~~]1,835
	(c) Stationary (emissions < SER)	1799	[~~300~~]372	[~~400~~]496
	(d) Portable (emissions < SER)	1799	[~~300~~]372	[~~500~~]620

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* **Complex Permit**:
- sources requiring PSD or NSR review or
- sources requiring source-specific MACT/GACT determination or
- sources requiring a large amount of staff time to complete the permitting process

Simple Permit:
- sources which are not complex

** New York State Air Guide-1 1985-86 Edition

Note: *A filing fee of $[~~75~~]93 is required for all sources.*

340-020-0047

State of Oregon Clean Air Act Implementation Plan

(1) This implementation plan, consisting of Volumes 2 and 3 of the State of Oregon Air Quality Control Program, contains control strategies, rules and standards prepared by the Department of Environmental Quality and is adopted as the state implementation plan (SIP) of the State of Oregon pursuant to the federal **Clean Air Act**, Public Law 88-206 as last amended by Public Law 101-549.

(2) Except as provided in section (3) of this rule, revisions to the SIP shall be made pursuant to the Commission's rulemaking procedures in Division 11 of this Chapter and any other requirements contained in the SIP and shall be submitted to the United States Environmental Protection Agency for approval.

(3) Notwithstanding any other requirement contained in the SIP, the Department is authorized

(a) to submit to the Environmental Protection Agency any permit condition implementing a rule that is part of the federally-approved SIP as a source-specific SIP revision after the Department has complied with the public hearings provisions of **40 CFR 51.102 (July 1, 1992)** ; and

(b) to approve the standards submitted by a regional authority if the regional authority adopts verbatim any standard that the Commission has adopted, and submit the standards to EPA for approval as a SIP revision.

[**NOTE:** Revisions to the State of Oregon Clean Air Act Implementation Plan become federally enforceable upon approval by the United States Environmental Protection Agency. If any provision of the federally approved Implementation Plan conflicts with any provision adopted by the Commission, the Department shall enforce the more stringent provision.]

[Publications: The publication(s) referred to or incorporated by reference in this rule are available from the office of the Department of Environmental Quality.]

Stat. Auth.: ORS Ch. 468.020

Stat. Implemented: ORS Ch. 468A.035

Hist.: DEQ 35, f. 2-3-72, ef. 2-15-72; DEQ 54, f. 6-21-73, ef. 7-1-73; DEQ 19-1979, f. & ef. 6-25-79; DEQ 21-1979, f. & ef. 7-2-79; DEQ 22-1980, f. & ef. 9-26-80; DEQ 11-1981, f. & ef. 3-26-81; DEQ 14-1982, f. & ef. 7-21-82; DEQ 21-1982, f. & ef. 10-27-82; DEQ 1-1983, f. & ef. 1-21-83; DEQ 6-1983, f. & ef. 4-18-83; DEQ 18-1984, f. & ef. 10-16-84; DEQ 25-1984, f. & ef. 11-27-84; DEQ 3-1985, f. & ef. 2-1-85; DEQ 12-1985, f. & ef. 9-30-85; DEQ 5-1986, f. & ef. 2-21-86; DEQ 10-1986, f. & ef. 5-9-86; DEQ 20-1986, f. & ef. 11-7-86; DEQ 21-1986, f. & ef. 11-7-86; DEQ 4-1987, f. & ef. 3-2-87; DEQ 5-1987, f. & ef. 3-2-87; DEQ 8-1987, f. & ef. 4-23-87; DEQ 21-1987, f. & ef. 12-16-87; DEQ 31-1988, f. 12-20-88, cert. ef. 12-23-88; DEQ 2-1991, f. & cert. ef. 2-14-91; DEQ 19-1991, f. & cert. ef. 11-13-91; DEQ 20-1991, f. & cert. ef. 11-13-91; DEQ 21-1991, f. & cert. ef. 11-13-91; DEQ 22-1991, f. & cert. ef. 11-13-91; DEQ 23-1991, f. & cert. ef. 11-13-91; DEQ 24-1991, f. & cert. ef. 11-13-91; DEQ 25-1991, f. & cert. ef. 11-13-91; DEQ 1-1992, f. & cert. ef. 2-4-92; DEQ 3-1992, f. & cert. ef. 2-4-92; DEQ 7-1992, f. & cert. ef. 3-30-92; DEQ 19-1992, f. & cert. ef. 8-11-92; DEQ 20-1992, f. & cert. ef. 8-11-92; DEQ 25-1992, f. 10-30-92, cert. ef. 11-1-92; DEQ 26-1992, f. & cert. ef. 11-2-92; DEQ 27-1992, f. &cert. ef. 11-12-92; DEQ 4-1993, f. & cert. ef. 3-10-93; DEQ 8-1993, f. & cert. ef. 5-11-93; DEQ 12-1993, f. & cert. ef. 9-24-93; DEQ 15-1993, f. & cert. ef. 11-4-93; DEQ 16-1993, f. & cert. ef. 11-4-93; DEQ 17-1993, f. & cert. ef. 11-4-93; DEQ 19-1993, f. & cert. ef. 11-4-93; DEQ 1-1994, f. & cert. ef. 1-3-94; DEQ 5-1994, f. & cert. ef. 3-21-94; DEQ 14-1994, f. & cert. ef. 5-31-94; DEQ 15-1994, f. 6-8-94, cert. ef. 7-1-94; DEQ 25-1994, f. & cert. ef. 11-2-94; DEQ 9-1995, f. & cert. ef. 5-1-95; DEQ 10-1995, f. & cert. ef. 5-1-95; DEQ 14-1995, f. & cert. ef. 5-25-95; DEQ 17-1995, f. & cert. ef. 7-12-95; DEQ 19-1995, f. & cert. ef. 9-1-95; DEQ 20-1995 (Temp), f. & cert. ef. 9-14-95; DEQ 8-1996(Temp), f. & cert. ef. 6-3-96; DEQ 15-1996, f. & cert. ef. 8-14-96; DEQ 19-1996, f. & cert. ef. 9-24-96; DEQ 22-1996, f. & cert. ef. 10-22-96; DEQ 23-1996, f. & cert. ef. 11-4-96; DEQ

24-1996, f. & cert. ef. 11-26-96; DEQ 10-1998, f. & cert ef. 6-22-98; DEQ 15-1998, f. & cert. ef. 9-23-98; DEQ 16-1998, f. & cert. ef. 9-23-98; DEQ 17-1998, f. & cert. ef. 9-23-98; DEQ 20-1998, f. & cert. ef. 10-12-98; DEQ 21-1998, f. & cert. ef. 10-14-98; DEQ 1-1999, f. & cert. ef. 1-25-99

AGENDA ITEM NO. 6

LRAPA Board of Directors Meeting

May 12, 1998

TO: Board of Directors

FROM: Barbara J. Cole, Director

DATE: May 12, 1998

SUBJ: Public Hearing on Proposed Amendments to LRAPA Rules & Regulations, Title 34, "Stationary Source Rules and Permitting Procedures," and Table A, "Air Contaminant Sources and Associated Fee Schedule"

DESCRIPTION OF PROBLEMS AND PROPOSED SOLUTIONS

The fees for Air Contaminant Discharge Permits (ACDP) have not been increased since 1991. ACDP fees support permitting, compliance assurance, and complaint response services relative to sources covered by the ACDP program. Requirements resulting from the Clean Air Act Amendments of 1990 have increased LRAPA's level of technical analysis, the complexity of federal reporting and compliance requirements, and the necessary sophistication of the technical staff. In addition, reporting and oversight requirements for the sources have increased, resulting in a significant work load increase for LRAPA staff. Since 1991, LRAPA has increased its permitting staff from four to eight. While fees for the Title V program for major source permitting support that program, the ACDP fees no longer cover the costs of the ACDP program to the extent they did in 1991. In order to sustain the current level of service, LRAPA must increase ACDP fees to pay for a greater percentage of the program costs.

The LRAPA Board of Directors decided upon a multi-phased approach to cover the budget shortfall:

1. Increase ACDP fees by 24 percent, overall, raising LRAPA's ACDP fees to approximately 84 percent of the state Department of Environmental Quality's (DEQ) ACDP fees.

2. Amend the fee schedule for open burning special letter permits. This proposal will be developed and presented for public hearing in the next couple of months.

3. Amend the fee schedule for asbestos abatement notifications. This proposal will also be developed and presented for public hearing in the next couple of months.

4. Request an increase in annual dues from the local participants in the intergovernmental agreement under which LRAPA operates.

5. By state statute, all civil penalties received by LRAPA go to Lane County's general fund. LRAPA currently has an agreement with the county to allow LRAPA to retain any legal costs

associated with the specific contested cases for which fines have been received. The agreement is to be renegotiated to allow LRAPA to retain from the general amount of civil penalties received the amount of legal and staff costs associated with any enforcement actions involving civil penalties.

This proposed rulemaking deals only with the ACDP fees.

SPECIFIC AMENDMENTS BEING PROPOSED FOR TITLE 34, TABLE A

Staff has reviewed the source categories and evaluated the equity between categories, based on work load required to process applications, issue permits, conduct compliance assurance inspections, and respond to citizen complaints for the different source categories. Fees for some categories would go down, while the majority would go up by 24 percent. The filing fee would also increase 24 percent, from $75 to $93.

Permit Fees, Table A, Part I

LRAPA has a simple synthetic minor permit category which the state DEQ does not have in its fee schedule. This category was created to avoid charging the same fee for a relatively simple permit process as for a more complex one. The current fees are recovering only a small portion of the costs of processing those permits. It is proposed to keep the second category but to increase the fees. The permit application or modification fee would increase from $500 to $1,000; and the annual compliance assurance fee would increase from $200 to $500. Both fees would still be significantly below the DEQ fees.

Permit Fees, Table A, Part II

Most fees would go up by 24 percent. Exceptions are included on the attached table.

PROCESS

During its February 10, 1998 meeting, the LRAPA Board of Directors authorized a public hearing on this proposal at the May 12, 1998 meeting. Notice of the May 12 hearing was published in local newspapers and in the April 1, 1998 edition of the Secretary of State's Oregon Bulletin. In addition, notice of the proposal was mailed to all LRAPA permittees, as well as other interested persons. The proposed amendments were also submitted to the state Department of Environmental Quality headquarters in Portland and to the U. S. Environmental Protection Agency's Region 10 office in Seattle, for their review and comment. LRAPA requested and received designation as hearings officer for the Environmental Quality Commission, and the May 12 hearing is a joint DEQ/LRAPA hearing. The LRAPA Advisory Committee has discussed this matter, and the proposal addresses the committee's concerns and recommendations.

To facilitate public comment and answer questions prior to the hearing date, LRAPA staff was available for an air quality forum on Thursday, April 16. All sources subject to ACDP fees were mailed a notice of the forum. No one but LRAPA staff attended the event.

Comments received from all sources (copies attached) have been evaluated by staff. LRAPA's responses to those comments are detailed below. Following the public hearing, the LRAPA Board of Directors will be asked to adopt the rules, either as proposed or with any changes deemed necessary in response to information received at the hearing.

LRAPA ADVISORY COMMITTEE DISCUSSION

Committee Consensus

The LRAPA Advisory Committee discussed the ACDP fee increase proposal at its January and February meetings. Although committee members felt they did not have adequate background regarding either the ACDP fee schedule or the agency's budget to be able to give formal recommendations to the board, there was consensus on several points:

1. Additional funding is necessary to continue to operate the ACDP program.
2. Any ACDP fee increase should be based on LRAPA's workload, rather than on a percentage of the state's ACDP fee schedule.
3. LRAPA should pursue the concept of receipts authority as a means to have industrial sources provide extra funding to pay for expedited processing of permits.
4. LRAPA needs to develop a strategic plan for a long-term budgeting process.

Staff Response

The proposal is to increase LRAPA's fees to approximately 84% of the state's schedule; however, the draft amendments have been revised to better reflect actual workload for individual source categories. This still does not recover 100% of the cost of the ACDP program. (It should be noted, here, that the board also has expressed the opinion that industry should not bear the entire cost of operating this program, since individual behaviors also contribute to air pollution levels in Lane County's airshed but there are no fees attached to those individual behaviors.)

Rules and process for receipts authority are being developed at the state level, and LRAPA is participating in that effort. LRAPA's intent is to use the receipts authority; however, this cannot be used to support the ongoing routine efforts of the ACDP program. This is intended to provide a means for a source to obtain a permit on an expedited schedule when a delay in issuance of the permit would cause undue hardship of financial loss for the source.

LRAPA will develop an overall strategic plan for the agency, and part of that plan will be long-term budgeting.

COMMENTS RECEIVED AND LRAPA RESPONSES

Written

1. COMMENT:

   Robert Rothwell, Globe Metallurgical, Inc., agrees with most of the proposal, with one exception: the proposal to renegotiate LRAPA's agreement with Lane County to recover a greater percentage of civil penalties collected. Mr. Rothwell believes removing the phrase, ". . .regardless of whether they pertain to the specific cases for which the fines are received," from the proposal would allow LRAPA to retain a portion of civil penalties to help offset the costs of enforcement but not allow those funds to be used for routine field activities. Mr. Rothwell is also concerned that LRAPA's retention of part of the penalties could create inequities for industries in the rest of the state.

   LRAPA RESPONSE:

   The civil penalty agreement with Lane County has no effect on the ACDP fee proposal. LRAPA appreciates Mr. Rothwell's apparent trust that LRAPA's intent is not to make money through civil penalties, as well as his suggested rewording. The intent is merely to recover actual costs associated with enforcement actions which result in assessment of civil penalties, and those funds cannot be used for any other purpose.

   As to inequities between industries in Lane County and in the rest of the state, the current proposal puts Lane County sources at a competitive advantage with respect to sources in the rest of the state. The proposed LRAPA ACDP fee structure is overall only 84 percent of the fees currently changed by DEQ for similar services. Retention of a portion of the civil penalties is proposed to avoid a greater increase of ACDP fees for all sources. A higher ACDP fee structure than proposed would in effect result in all sources subsidizing the costs of enforcement actions for a minority of sources. This proposal would impose more of the cost of direct enforcement actions on the sources that are in violation.

2. COMMENT:

   Kevin Godbout of Weyerhaeuser agrees that the costs of the ACDP program have risen and that raising the fees is reasonable; however, he had two suggestions:

   A. that LRAPA implement a permit-streamlining program to increase program efficiencies and reduce program costs; and,

B. that LRAPA consider phasing the increase in over several years. Because industry has difficulty planning for large one-time increases in fees, Mr. Godbout suggested more frequent review of the fee schedule and smaller, more frequent increases.

LRAPA RESPONSE:

A. LRAPA is streamlining the permitting program and will continue to do so in the future.

B. LRAPA can not afford to phase-in the current proposed ACDP fee increase without creating a deficit in the next fiscal year. LRAPA agrees, however, that the fees should be adjusted more frequently to avoid large fee increases. More frequent program evaluation and smaller, more frequent fee adjustment would be better for both affected industries and for LRAPA. Staff plans to pursue this process at least every two years.

COMMENT:

Regarding the civil penalty retention policy, Mr. Godbout said Weyerhaeuser does not support the current agreement with Lane County because it potentially gives the agency an incentive to impose civil penalties as a means to funds its enforcement program. He suggests that LRAPA rescind the agreement altogether. He states further that LRAPA's policy is inconsistent with DEQ's policy for the rest of the state, and that it may not be consistent with state statute.

LRAPA RESPONSE:

The proposal to retain more of the civil penalties which LRAPA collects has no bearing on this rule revision. As to the agreement with Lane County not being consistent with state statute, both Lane County and LRAPA legal counsels were involved in development of the current agreement and researched that question at the time. The renegotiation of this agreement is, at this point, just a suggested means to recover more of LRAPA's costs. The matter must first be researched by legal counsel, who will then draw up a proposed revised agreement if allowed by statute. Any revised agreement will be placed on the agenda for board discussion at an open meeting.

<u>Telephone</u>

1. COMMENT:

Mark Porterfield, Sundance Lumber Co. questioned the notice that said fees had not increased since 1991. He said he paid $620 in 1992 and $2,500 in 1997.

LRAPA RESPONSE:

We explained that increased emissions put his company into a different category subject to higher fees. Mr. Porterfield understood and seemed to be satisfied with the explanation.

2. A representative of Georgia Pacific called to ask how the proposed fee increase would affect his source, specifically.

   LRAPA RESPONSE:

   LRAPA staff provided specific information for the source in question.

Internet

COMMENT:

William Van Vactor of Lane County commented regarding the penalty retention proposal as follows.

A. He asked what the current collections were under the Intergovernmental Agreement (IGA) that allows retention of civil penalties and how it would increase if the IGA amendment is made.

B. He also asked what safeguards LRAPA has in place to prevent an over reliance on fines as a source of revenue.

C. He questioned whether LRAPA's mission of assisting local businesses to comply with state and federal laws was changing as a result of Title V.

LRAPA RESPONSE:

A. As of October 31, 1997 LRAPA had collected $86,369 for Fiscal Year 96/97 of which $12,733 was retained to cover contested case legal fees. Since that time $34,313 in penalties has accrued in Fiscal Year 97/98. The total amount to be retained under the current IGA is not complete since the fiscal year and ongoing enforcement actions are not complete; but at this time at least $2-3,000 in contested case legal fees are expected. LRAPA estimates that the proposed change in the IGA would result in retention of an additional $15,000 a year. The amount retained in future years under the current and proposed IGA would vary significantly depending on number and nature of enforcement actions in any given fiscal year.

B. LRAPA does not rely on penalties. Penalties are not in our budget. Enforcement decisions should never be linked to budget needs. LRAPA's goal is to only cover the actual costs of enforcement. Enforcement is not and should not be a money-making venture. However, you can go too far the other way. In the past, LRAPA enforcement actions have been abandoned due to a lack of resources. We have been unable to correct some air quality violations for this reason. This proposal is intended to provide for retention of penalties equivalent to the cost of air quality enforcement actions with no net revenue gain for LRAPA. The retained penalties would help offset the directly related costs that we are currently subsidizing with other resources. The proposed retained fees are small, ½ of 1% of our $2,500,000 overall budget. It is a small enough percentage of LRAPA's budget to prevent over reliance on fines as a source of revenue. Also, no other activities or costs except for those associated with enforcement could be included.

The current IGA only allows LRAPA retention of penalty funds to cover the legal costs associated with contested cases on a case-by-case basis. In many cases, LRAPA incurs substantial legal fees that are not collectable since the parties involved frequently do not pay the penalties imposed. In other cases, the penalty is insignificant, but the party chooses to contest the case anyway. An example is a contested open burning enforcement action involving an $80 penalty that cost LRAPA $2000 in legal fees. The LRAPA enforcement action was upheld by the hearings officer, but the penalty was never paid. LRAPA did lien the real property of the party, but unless it is sold the penalty may not ever be paid. This type of situation is not uncommon. The proposal is not intended to create a revenue source, but to serve as a mechanism to ensure that LRAPA has the resources to enforce air quality rules by recovering actual costs.

C. *LRAPA's mission of assisting local businesses, individuals, and agencies to comply with federal, state, and local air quality laws has not changed. Our focus is on achieving compliance, and enforcement is always the last resort. Enforcement action is undertaken only after other approaches have failed or if the violation is very serious. Unfortunately, enforcement is a necessary tool. Title V has not changed LRAPA's policy in that regard. Title V fees are structured to cover the cost of enforcement actions for Title V sources. The Title V program only covers 24 major industrial air pollution sources in Lane County. Collectively other sources emit more pollution and take up more of LRAPA staff time. LRAPA remains committed to alternatives that assist sources, large and small, to achieve compliance without enforcement and penalties.*

As noted earlier, the penalty retention IGA and policy should be reviewed.

RULEMAKING JUSTIFICATION ANALYSIS

1. Are there state or federal requirements that are applicable to this situation? If so, exactly what are they?

   Yes, LRAPA is authorized by ORS 468A.135 and OAR 340-28-1750 (12) to establish its own ACDP fee schedules.

2. Are the applicable state or federal requirements performance based, technology based, or both, with the most stringent controlling?

   This question is not applicable to the rule revision under consideration.

3. Do the applicable state or federal requirements specifically address the issues that are of concern in Lane County? Was data or information that would reasonably reflect Lane County's concern and situation considered in the state or federal processes that established the state or federal requirements?

Yes, the applicable state requirement specifically addresses and reflects the situation and issues of concern to Lane County. It allows regional air pollution authorities to adopt different ACDP fees than those adopted by DEQ, provided such fees are adopted by rule and after hearing and in accordance with ORS 468.065(2).

4. Will the proposed requirement improve the ability of the regulated community to comply in a more cost-effective way by clarifying confusing or potentially conflicting requirements, increasing certainty, or preventing or reducing the need for costly retrofit to meet more stringent requirements later?

   Yes, the proposed requirement will allow LRAPA to continue providing ACDP services to the regulated community. The increased revenues from ACDP fees will allow LRAPA to maintain its current level of staffing, including one vacant position which has just been refilled and another vacant position which is to be refilled in the next couple of months. Those services will allow the regulated community to comply with state and federal laws in a more cost-effective way than if local ACDP services were not available.

5. Is there a timing issue which might justify changing the time frame for implementation of state or federal requirements?

   No, an ACDP fee increase is overdue. LRAPA has not increased ACDP fees since 1991. Diminishing resources for the ACDP program have eroded LRAPA's ability to ensure timely compliance with state and federal requirements.

6. Will the proposed requirement assist in establishing and maintaining a reasonable margin for accommodation of uncertainty and future growth?

   No, this proposed ACDP fee increase is just enough to provide the minimal resources needed for LRAPA's short-term ACDP program needs. LRAPA will consider ACDP fee adjustments on a regular basis in the future to accommodate growth and inflation as it becomes necessary.

7. Does the proposed requirement establish or maintain reasonable equity in the requirements for various sources (level the playing field)?

   Yes, the proposed ACDP fee increase is based on a review of the amount of work it takes to permit, conduct compliance inspections, and respond to complaints for each ACDP source category. The proposal reflects a level playing field among ACDP sources.

   In an effort to create a more level playing field among source categories, LRAPA will propose fee increases for other services including open burning permits and asbestos abatement oversight. A 5% increase in Lane County, Eugene, and Springfield dues is also proposed. Mobile sources are responsible for over half of all air pollution in most communities. That fact suggests that a more fair fee structure in the future would include support of the air pollution control program by fees directly related to automobiles.

8. Would others face increased costs if a more stringent rule is not enacted?

   Yes, LRAPA must provide core ACDP services to comply with state and federal law. If ACDP fees are not adequate to cover the costs, the ACDP program would have to be subsidized by other revenue sources.

9. Does the proposed requirement include procedural requirements, reporting or monitoring requirements that are different from applicable state or federal requirements? If so, why? What is the "compelling reason" for different procedural, reporting or monitoring requirements?

   No, the proposal does not include procedural, reporting, or monitoring requirements.

10. Is demonstrated technology available to comply with the proposed requirement?

    The proposal does not require technology to comply.

11. Will the proposed requirement contribute to the prevention of pollution or address a potential problem and represent a more cost-effective environmental gain?

    Yes, the proposed ACDP fee increase will result in pollution prevention by providing the resources needed for LRAPA oversight of ACDP sources. It will enable LRAPA staff to help sources avoid potential problems and identify more cost-effective environmental protection methods.

OPTIONS FOR BOARD ACTION

1. Do nothing. The ACDP program would remain in a deficit situation, and LRAPA would be unable to maintain the staffing and service level necessary to operate the program as required by state and federal laws.

2. Request additional revisions to the proposal. Any substantive revisions to the current proposal would require that the public comment process and public hearing be repeated, thus delaying LRAPA's ability to collect higher fees for several months. Since the proposed fee schedule still gives Lane County industries a financial advantage over their counterparts in the rest of the state, and since those individuals who provided comments support the current proposal, it is believed that nothing would be gained by such a delay unless strong testimony to the contrary is received at the public hearing.

3. Adopt the proposal, with revisions in response to testimony. The written testimony does not warrant any revisions to the proposal. Changes made in response to oral testimony at the hearing may or may not require that the public comment process be repeated (see number 2, above). If revisions to do not require additional public comment, the rule amendments could take effect upon adoption.

4. Adopt the proposal as presented. The ACDP fee schedule increase would take effect immediately upon adoption, enabling LRAPA to maintain its current staff and fill the remaining vacant permit writer position. Permittees would pay more in fees, but permits would be issued more quickly, and compliance inspections would be more timely.

DIRECTOR'S RECOMMENDATION

The director recommends that the LRAPA Board of Directors adopt the increase to ACDP fees as presented.

BJC/MJD

ATTACHMENT TO LRAPA RULEMAKING PROPOSAL ANNOUNCEMENT
EXCEPTIONS TO 24% PROPOSED INCREASE IN ACDP FEES
PUBLIC HEARING: MAY 12, 1998

Category	**Air Contaminant Source**	**Application Processing Fee**			**Annual Compliance Determination Fee**		
		Current	Proposed	Percent	Current	Proposed	Percent
15	Veneer Manufacturing	330	918	278%	930	1450	56%
16	Wood Preserving	1950	2002	2.7%	1740	1921	10.4%
34a	Asphalt Production Stationary	1640	1001	(39%)	1760	2182	24%
34b	Asphalt Production Portable	1640	1001	(39%)	1970	2182	10.8%
42a	Rock Crusher Stationary	1870	1870	0%	1960	1960	0%
42b	Rock Crusher Portable	1370	1370	0%	1160	1160	0%
42c	Rock Crusher <300K TPU	200	248	24%	300	372	24%
58b	Fuel Burning Eq 100-250m BTU/hr	1510	1872	24%	1730	1730	0%
58c	Fuel Burning Eq 10-100m BTU/hr	990	1228	24%	1210	1210	0%
59d	Fuel Burning Eq <10m BTU/hr	1220	1365	11.8%	1010	1252	24%
61	See Description**						
61a	Complex Permit	5200	7800*	50%	5200	7800*	50%
61b	Moderate Permit	New	4400	n/a	New	4400	n/a
61c	Simple Permit	1000	1000	0%	1000	1000	0%
62	See Description ***						
62a	Complex Permit	5200	7800*	50%	5200	7800*	50%
62b	Moderate Permit	New	4400	n/a	New	4400	n/a
62c	Simple Permit	1000	1000	0%	1000	1000	0%
63	See Description****						
63a	Complex Permit	5200	7800*	50%	5200	7800*	50%
63b	Moderate Permit	New	4400	n/a	New	4400	n/a
63c	Simple Permit	New	1000	n/a	New	1000	n/a

*These categories are proposed to be increased to $10,000, effective July 1, 1999.

**Sources not specifically listed which would emit 10 or more tons/year of the aggregate of any air contaminants, including but not limited to particulate, sox, NOx or hydrocarbons, if the source were to operate uncontrolled.

***Sources not specifically listed which would emit significant malodorous emissions as determined by Authority review of sources which are known to produce similar air contaminant emissions.

****Sources not specifically listed for which an air quality problem is identified by the Authority, including but not limited to open storage of dusty or odorous material, dry material handling air transfer systems, and sandblasting operations.

STATEMENT OF NEED FOR PROPOSED RULE AMENDMENTS

Pursuant to ORS 183.335(2), the following statement provides information on the proposed action to amend Oregon's Revised State Implementation Plan (SIP) for Particulate Matter for the Eugene/Springfield Air Quality Maintenance Area.

Legal Authority

ORS 183, 468.065, 468A.135 and 468A.155, OAR 340-11-010 and 340-20-047, LRAPA Titles 14 and 34, and the Federal Clean Air Act Amendments of 1990.

Need for Amendments

The current funding level is not sufficient to sustain the current level of activity in the Air Contaminant Discharge Permit program. The proposed amendments would increase ACDP fees by approximately 24 percent, overall, to recover a greater percentage of the cost of operating the program. This would help to sustain LRAPA's current level of service.

Principal Documents Relied Upon

1. Attorney General's Uniform and Model Rules of Procedure
2. LRAPA Titles 14 and 34
3. OAR 340-028-1750
4. Clean Air Act Amendments of 1990
5. ORS 183, 468 and 468A et. seq.

FISCAL AND ECONOMIC IMPACT STATEMENT

Impact on State Agencies: **None.**

Impact on Local Agencies: **Positive.** LRAPA ACDP fees would recover more of the cost of operating the program which would help to sustain the current level of service.

Impact on Public: **Positive.** LRAPA's ability to sustain its current level of service in the industrial permitting program helps to ensure protection of public health through air quality controls.

Impact on Industry: **Positive.** The increased revenue allows LRAPA to continue to provide technical assistance and permitting service to help industry remain with state and federal air pollution limitations, thus avoiding state of federal enforcement actions.

Negative. The rule amendments would increase the fees charged to non-major air pollution sources.

LAND USE CONSISTENCY STATEMENT

The proposed rule amendments are consistent with land use as described in applicable land use plans in Lane County.

/MJD
03/12/1998

Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
811 SW Sixth Avenue
Portland, OR 97204-1390
(503) 229-5696
TDD (503) 229-6993

March 23, 1998

Barbara Cole, Director
Lane Regional Air Pollution Authority
225 North 5th, Suite 501
Springfield, OR 97477-4671

Re: Proposed Amendments to LRAPA Title 34, "Stationary Source Rules and Permitting Procedures"

Dear Ms. Cole:

We have reviewed your proposed amendments to Lane Regional Air Pollution Authority Title 34 regulations concerning ACDP fee increases. We find the proposed regulations to be as substantively stringent as the comparable rules of the Department of Environmental Quality.

We hereby authorize you to act as Hearings Officer on behalf of the Environmental Quality Commission for the public comment purposes of these modifications. If you have any questions, please contact Dave Nordberg at (503) 229-5519.

Sincerely,

Gregory A. Green

Gregory A. Green
Administrator
Air Quality Division

GAG:DN:j
LTR\AQ76586.DOC

LRAPA
Lane Regional Air Pollution Authority

225 5th Street, Suite 501
Springfield, OR 97477

(541) 726-2514 phone
(541) 726-1205 fax
www.lrapa.org
E-mail: lrapa@lrapa.org

MEMORANDUM

TO: Record of Adoption Proceedings, LRAPA Title 34

FROM: Barbara J. Cole, Hearings Officer BJC

SUBJ: Public Hearing, May 12, 1998

Summary of Procedure

Pursuant to public notice, a public hearing was convened by the Board of Directors of the Lane Regional Air Pollution Authority on May 12, 1998 in the Springfield City Council Chamber at 225 5th Street, Springfield, Oregon. LRAPA had received authorization from the DEQ Air Quality Administrator to serve as hearings officer for the Oregon Environmental Quality Commission, and this was a concurrent EQC/LRAPA hearing. The purpose of the hearing was to receive testimony concerning proposed adoption of amendments to LRAPA Title 34, "Stationary Source Rules and Permitting Procedures," including Table A, "Air Contaminant Sources and Associated Fee Schedule."

Summary of Testimony

There was no public testimony presented at the hearing.

Written comments received prior to the hearing, and LRAPA's responses, are included in the staff report of May 12, 1998.

Action of the LRAPA Board of Directors

Based on the information presented, the board voted unanimously to adopt the proposed amendments to Title 34.

/MJD

MINUTES

LANE REGIONAL AIR POLLUTION AUTHORITY
BOARD OF DIRECTORS MEETING

TUESDAY--MAY 12, 1998
SPRINGFIELD CITY COUNCIL CHAMBERS
225 5th Street
Springfield, Oregon

ATTENDANCE:

Board

Al Johnson, Chair--Eugene; Steve Cornacchia--Lane County; Don Hampton--Oakridge/Cottage Grove; Maureen Maine--Springfield; Betty Taylor--Eugene (ABSENT: Steve Dodrill--Eugene; Gary Whitney--At-Large)

Staff

Barbara Cole--Director; Grecia Castro; Merrie Dinteman; Tom Freeman; Kim Metzler; Sharon Moody; John Morrissey

OPENING:

Johnson called the meeting to order at 12:23 p.m.

MINUTES:

MSP(Hampton/Maine)(Unanimous) approval of April 14, 1998 minutes, as submitted.

EXPENSE REPORTS:

MSP(Taylor/Hampton)(Unanimous) approval of expense reports through April 30, 1998, as presented.

ADVISORY COMMITTEE:

Metzler reported that the committee discussed the proposed increases in fees for open burning activities. Several points came out of the committee's discussion:

1. A fee increase is necessary.

2. With regard to LRAPA-issued letter burning permits, there should not be a distinction between residential and commercial burning of large amounts of yard-type debris.

3. There should be a range of fees associated with the volume of materials to be burned, such as a flat fee for all letter permits, plus another charge per cubic yard of material above the flat fee.

4. Perhaps the fees should not only cover the agency's costs to do inspections and issue letter permits, but also include an increment above that amount to discourage open burning and encourage recycling. On the point, the committee felt Lane County Solid Waste should be consulted regarding the possible increase in yard materials placed in the landfills.

5. Fire districts should be consulted regarding fire safety aspects of the possibility of more people leaving large piles of yard debris over the summer rather than burning it in the spring.

Staff plans to contact Lane County Solid Waste and the fire districts regarding the committee's concerns.

PUBLIC PARTICIPATION: None.

PUBLIC HEARING, PROPOSED AMENDMENTS TO LRAPA TITLE 34 (ACDP PERMIT FEES):

Moody explained that the proposed amendments would increase the fees for Air Contaminant Discharge Permits by approximately 24%, overall. Fees for a few source categories would decrease, a few would remain at the current levels, and a few others would increase over 24%, in order to bring those fees more in line with the level of staff effort to permit those source categories. Moody stated that the ACDP fee increase is one component of an effort to recover more of LRAPA costs to cover budget shortfalls. Rulemaking proposals will be brought to the board in the next few months for proposed increases in fees associated with open burning and asbestos abatement.

Public Hearing

Johnson opened the public hearing at 12:30 p.m. Cole submitted into the record affidavits of hearing notice publication in the Eugene Register Guard, the Oakridge Dead Mountain Echo, the Springfield News, and the Cottage Grove Sentinel, as well as publication of notice in the April 1, 1998 edition of the Secretary of State's Oregon Bulletin. Cole also submitted a letter from DEQ authorizing LRAPA to serve as EQC hearings officer for a joint LRAPA/EQC hearing.

Johnson asked if anyone else wished to speak either in support of or in opposition to the proposed permit fee increase. There was no response, and Johnson closed the public hearing at 12:31 p.m.

**** ACTION ****

MSP (Cornacchia/Maine)(Unanimous) adoption of the amendments to Title 34, as proposed.

ADOPTION OF CRITERIA FOR DIRECTOR'S PERFORMANCE EVALUATION:

Johnson explained that, if the board should decide to go into executive session for the director's performance appraisal, they must first have adopted, in an open meeting, criteria on which to base the appraisal. The criteria being proposed for adoption at this time were the items included in the evaluation form developed over the past few months. Board members agreed that there is some redundancy in the current form and that the form will be changed over time, as it is used.

**** ACTION ****

MSP (Maine/Hampton)(Unanimous) adoption of criteria for evaluation of the director's performance.

DIRECTOR'S REPORT:

Cole reported on a few items which were not included in the written report.

LRAPA has been using the new Air Pollution Index (API) since May 1. The key API difference between the old and new API's is that the new one has two different level to reflect the new standard promulgated by EPA last summer for ozone. Additional sub-categories have different health notice requirements, and there is a limited health notice below the standard. The previous API assumed that any levels below the standard presented no significant public health risk. The new standard does not make that assumption, and an area could end up with a health notice even if there is no exceedance of the National Ambient Air Quality Standard (NAAQS) for ozone.

Rules

There are a number of rules which the LRAPA board adopted in the past few years which, for a number of reasons, have not been acted on by DEQ or forwarded to EPA for adoption into Oregon's SIP. At least three of those rulemaking actions will be on EQC's agenda in June and will then be forwarded to EPA.

Operations Manager

Cole introduced Grecia Castro, who began her duties as LRAPA operations manager on May 1. Castro has a bachelors degree in civil engineering and a masters in civil engineering with an environmental engineering emphasis.

OLD BUSINESS:

Springfield Forest Products SFO

Cole reported that the facility is on track. The change of ownership has actually taken place, and staff has requested the exact date for the purposes of tracking the SFO and making sure all the deadlines are met.

Update on Hyundai Compliance Status:

At the April meeting, Cole advised the board of some unexpected salt particulate emissions which resulted in visible emissions from the plant when they started production. It was uncertain whether they would violate the 2.7 tons per year Plant Site Emission Limit (PSEL) for fine particulate in the permit. Since there is no definitive evidence, LRAPA has required that Hyundai do source testing in June. The testing will measure the pollutants being emitted and the amounts of each, and that information will be used to determine whether or not the facility is meeting its PSEL for particulate. Cole added that the source testing is a requirement of the permit and is simply being required earlier than would otherwise have been the case, due to the unexpected emissions.

Agency Housing

Moody gave a brief recap of the current situation in comparing the Black Angus site on Franklin site and the downtown Eugene site at 7th and Willamette. She said there is a need to lock in on something soon in order to have the lab moved and established before the end of the year. Otherwise, the lab won't meet federal protocols and will not be able to operate. Moody added that this is good timing for moving the lab since EPA has awarded LRAPA funding for upgrading the lab facility. The money can be spent at a new location rather than putting it into the current space and then leaving soon thereafter.

Board members discussed the question of public access at the Black Angus, and the proposal to install an elevator. Moody explained that the cost of a two-stop elevator is not much less than for a three-stop. The point at which the cost goes up radically is with a four-stop, due to increased building and safety code requirements. A three-stop elevator would provide access to the LRAPA office level, the restaurant level, and the banquet room level. LRAPA could use the large banquet rooms for its board and advisory committee meetings if there were public access to those rooms. The lab would be on the lowest level which has direct access at the back of the building. The restaurant manager has indicated he would like to provide part of the financing for an elevator but cannot fit it into the restaurant's budget. Maine stated that the public access does not have to be perfect as long as it accommodates those who cannot negotiate the stairs. She asked staff to pursue the idea of modifying the existing freight elevator with a separate access to the offices, instead of installing a whole new elevator. Johnson stated that if the public access issue cannot be resolved, staff should look for another location.

The downtown Eugene site may not be large enough to accommodate the offices and lab adequately without tearing out existing walls and reconfiguring the space. It's possible that the floor in the potential lab space could be leveled to allow more of that space to be used. Demolition and construction would add significantly to the cost and increase the financial disparity of the two options. Both Johnson and Taylor said they want to keep the downtown site as an option if at all possible, due to the high visibility of the location and proximity to other local government agencies.

Moody asked the board's opinion of advertising in the newspapers for available space, pointing out that the Black Angus space is not actually on the market and that LRAPA wouldn't know the space is a possibility if not for the current relationship with the facility management in connection with AirMetrics. There might be other facilities which owners or managers would be interested in providing on a long-term lease to a single tenant. Johnson commented that this seemed like a reasonable optio and that staff should pursue it.

Director's Performance Evaluation

The adoption of the evaluation criteria under an earlier agenda item allows the board to use executive session to discuss the director's performance. This was done as a result of previous board discussions at which there was some indication that the board might prefer to handle the actual evaluation in executive session and then share the outcome and take formal action in open session. Johnson suggested scheduling an executive session immediately after the board's June meeting. Following discussion of the merits of executive session, the board decided that it would be better to hold the evaluation session in an open meeting since the public has a right to see what public employees and elected officials are doing. Cole said she has no preference regarding open or closed session. The board also indicated they would like to meet in another room, because the elevated dais of the council chamber does not lend itself to such a discussion. They directed staff to try to schedule the June board meeting in the Jesse Maine room. Since the Jesse Maine room is available only until 2:00 on the second Tuesday of the month, the LRAPA board meeting would need to be over before then. Johnson reminded staff that the agenda should be light for June to allow adequate time for the evaluation discussion.

The board members will each receive a blank evaluation form with the agenda packet for the June meeting. They also asked Cole to fill out a self-evaluation and include it in the packets for the board's information. There was some concern among boar members that, because Cole is not allowed to see the evaluation forms which were submitted by staff and advisory committee members, she will be put on the spot and have to come up with quick responses without time to really think about them. Maine suggested that, for future evaluations, the board should prepare their evaluations ahead of time, incorporating staff and other input, and then get a composite evaluation to the director prior to the formal evaluation session, to allow time to prepare responses. It was also pointed out by several other board members that this first evaluation is meant to also evaluate the process and the form, and that changes in both should be made as they are used.

NEW BUSINESS: None.

ADJOURNMENT: The meeting adjourned at 1:15 p.m. and was followed immediately by a meeting of LRAPA Budget Committee. The next regular meeting of the LRAPA Board of Directors is scheduled for Tuesday, June 9, 1998, 12:15 p.m. in the Jesse Maine Room of the Springfield City Hall.

Respectfully submitted,

Merrie Dinteman
Recording Secretary

OREGON BULLETIN

VOLUME 37, No. 4
April 1, 1998

For February 14, 1998 - March 13, 1998

Published by
PHIL KEISLING
Secretary of State

Attachment N, pg. 2

other provisions in OAR 345 Division 023, particularly OAR 345-023-0005(3) and OAR 345-023-0005(4).

**Auxiliary aids for persons with disabilities are available upon advance request.*

Rules Coordinator: Adam Bless

Address: 625 Marion St. NE, Salem, OR 97310

Telephone: (503) 556-0005 - adam.bless@state.or.us

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Department of Environmental Quality
Chapter 340

Date:	Time:	Location:
5-12-98	12:15 pm	City Council Chambers Springfield City Hall 225 5th St. Springfield, OR

Hearing Officer: Barbara Cole (541) 726-2514 - ext. 216

Stat. Auth.: ORS 183 & 468A

Proposed Amendments: 340-020-0047

Last Date for Comment: 4-20-98

Summary: Under the proposed amendments, LRAPA would increase Air Contaminant Discharge Permit fees in order to recover a greater percentage of the cost of operating the ACDP program. Part I of Table A, the permit application or modification fee for simple synthetic minor permits would increase from $500 to $1,000; and the annual compliance assurance fee for simple synthetic minor permits would increase from $200 to $500. This is still well below DEQ's current fees. In Part II of Table A, fees would generally increase by 24%. Several source categories would either be decreased or increased according to work load associated with processing permits for those categories. Categories 61, 62, and 63 would add a third subcategory so that there would be separate fees for simple, moderate, and complex permits where there are currently only simple and complex subcategories. In addition, the fees for the complex permits in these categories would go up 50% upon adoption of the rule amendments and another 50% on July 1, 1999. (Categories 61, 62 and 63 are sources not specifically listed in Table A: Category 61, which would emit 10 tons or more per year of the aggregate of any air contaminants, including but not limited to particulates, SOx, NOx or hydrocarbons, if the source were to operate uncontrolled; Category 62, which would emit significant malodorous emissions as determined by Authority review of sources which are known to produce similar air contaminant emissions; and Category 63, for which an air quality problem is identified by the Authority, including but not limited to open storage of dusty or odorous material, dry material handling air transfer systems, and sandblasting operations.) These amendments would put LRAPA's fees at approximately 84% of the state DEQ's fees for the same services outside of Lane County.

Rules Coordinator: Merrie Dinteman

Address: 225 North 5th, Suite 501, Springfield, OR 97477

Telephone: (541) 726-2514 - ext. 225

••••••

Date:	Time:	Location:
4-15-98	2 pm	811 SW Sixth Ave. Rm 3A Portland

Hearing Officer: Sarah Armitage

Stat. Auth.: ORS 468.020, 468A.025 & 468A.315

Stats. Implemented: ORS 468.020, 468A.010, 468A.025, 468A.045 & 468A.315

Proposed Amendments: 340-028-1750, 340-028-2580, 340-028-2590, 340-028-2600

Last Date for Comment: 4-22-98

Summary: The Department of Environmental Quality is proposing to amend its rules by adopting an increase in the Title V Operating Permit Program fees. This increase includes sources that have Synthetic Minor permits.

**Auxiliary aids for persons with disabilities are available upon advance request.*

Rules Coordinator: Susan M. Greco

Address: 811 SW 6th Ave., Portland, OR 97213

Telephone: (503) 229-5213

Department of Fish and Wildlife
Chapter 635

Date:	Time:	Location:
4-24-98	8 am	ODFW Commission Rm 2501 SW First Ave. Portland, OR 97201

Hearing Officer: N/A

Stat. Auth.: ORS 496.138, 496.146 & 506.119

Stats. Implemented: ORS 496.162 & 506.129

Proposed Amendments: Chapter 635 — Divisions 003, 011, 013, 014, 016, 017, 023

Last Date for Comment: 4-24-98

Summary: Amend rules relating to commercial and sport salmon fishing in the Pacific Ocean and sport salmon fishing in specific near-shore ocean waters and coastal streams.

**Auxiliary aids for persons with disabilities are available upon advance request.*

Rules Coordinator: Sharon Bird

Address: 2501 SW First Ave., P.O. Box 59, Portland, OR 97207

Telephone: (503) 872-5260 - ext. 5333

••••••

Date:	Time:	Location:
5-15-98	8 am	Holiday Inn Express 375 W Harvard Blvd. Roseburg, OR 97470

Hearing Officer: Fish and Wildlife Commission

Stat. Auth.: ORS 496.012, 496.138, 496.146, 496.162, 496.558, 496.562, 496.566 & 496.570

Stats. Implemented: ORS 496.138, 496.558, 496.562, 496.566 & 496.570

Proposed Amendments: 635-053-0100, 635-053-0105, 635-053-0125

Last Date for Comment: 5-15-98

Summary: Amend rules regarding the Upland Game Bird Stamp by establishing dates for the submission of artwork from 1999-2003.

**Auxiliary aids for persons with disabilities are available upon advance request.*

Rules Coordinator: Sharon Bird

Address: 2501 SW First Ave., P.O. Box 59, Portland, OR 97207

Telephone: (503) 872-5260 - ext. 5333

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Department of Forestry
Chapter 629

Date:	Time:	Location:
4-20-98	9 am	Oregon Department of Forestry 2600 State St. Salem, OR 97310

Hearing Officer: Peter J. Norkeveck

Stat. Auth.: ORS Ch. 183 & 526

Stats. Implemented: ORS 477.260 & 477.291

Proposed Adoptions: 629-041-0035

Last Date for Comment: 4-20-98

Summary: Provides a procedure by which the Oregon Board of Forestry will receive and process requests for hearings and appeals from owners of forestland, as provided for in ORS 477.260 and 477.291.

**Auxiliary aids for persons with disabilities are available upon advance request.*

Rules Coordinator: Gayle Jones

Address: 2600 State St., Salem, OR 97310

Telephone: (503) 945-7210

••••••

Date:	Time:	Location:
4-20-98	9 am	Oregon Department of Forestry 2600 State St. Salem, OR 97310

Hearing Officer: Peter J. Norkeveck

Stat. Auth.: ORS 477.565, 477.615, 477.640, 477.645, 477.650, 477.655, 477.665, 526.016 & 526.041

Stats. Implemented: ORS 477.565, 477.615, 477.625, 477.630, 477.640, 477.645, 477.650, 477.655, 477.665 & 477.670

Proposed Adoptions: 629-043-0076

Affidavit of Publication

State of Oregon
County of Lane

I, Larry D. Roberts, being first duly sworn deposes and say that I am the Publisher of the Dead Mountain Echo, a newspaper of general circulation published at Oakridge, Oregon in the aforesaid county and state, as defined by ORS 193-010 ET SEQ that a notice, a printed copy of which is hereto annexed, was published in the entire issue of said newspaper for :

one consecutive week, in the following issues: #52, 4-2-98.

Signed: Larry D. ....

Subscribed and sworn to before me this
....15th.....day of ....May., 19.98.......

Karen E. O'B...................................Notary Public of Oregon

My commission expires: 2-11-2001.......................

OFFICIAL SEAL
KAREN E O'BRIEN
NOTARY PUBLIC - OREGON
COMMISSION NO. 060089
MY COMMISSION EXPIRES FEBRUARY 11, 2001

LEGAL NOTICES

NOTICE OF INTENT TO ADOPT AMENDMENTS TO OREGON'S AIR QUALITY IMPLEMENTATION PLAN

Pursuant to the statutory authority of ORS 183 and 468A, and in accordance with Title 14 of the Lane Regional Air Pollution Authority (LRAPA) Rules and Regulations, the Board of Directors is proposing:

To amend LRAPA Title 34, "Stationary Source Rules and Permitting procedures," and Table A, "Air Contaminant Sources and Associated Fee Schedule." This action will also result in amendment of OAR 340-020- 0047.

Summary:

Under the proposed amendment, LRAPA would increase Air Contaminant Discharge Permit (ACDP) fees in order to recover a greater percentage of the cost of operating the ACDP Program. In Part I of Table A, the permit application or modification fee for simple synthetic minor permits would increase from $500 to $1,000; and the annual compliance assurance fee for simple synthetic minor permits would increase from $200 to $500. This is still well below DEQ's current fees. In Part II of Table A, fees would generally increase by 24% Several source categories would either be decreased or increased according to work load associated with processing permits for those categories. Categories 61, 62, and 63 would add a third subcategory so that there would be separate fees for simple, moderate and complex permits where there are currently only simple and complex subcategories. In addition, the fees for the complex permits in these categories would go up 50% upon adoption of the rule amendments and another 50% on July 1, 1999 due to the a large work load involved in inspecting and permitting the category of sources. (Categories 61, 62 and 63 are sources not specifically listed in Table A: Category 61, which would emit 10 tons or more per year of the aggregate of any air contaminants, including but not limited to particulates, SOx, NOx or hydrocarbons, if the source were to operate uncontrolled; Category 62, which would emit significant malodorous emissions as determined by Authority review of sources which are known to produce similar air contaminant emissions; and Category 63, for which an air quality program is identified by the Authority, including but now limited to open storage of dusty or odorous material, dry material handling air transfer systems, and sandblasting operations.) These amendments would put LRAPA's fees at approximately 84% of the state DEQ's fees for the same services outside of Lane County.

Who is Affected: Air contaminant sources subject to ACDP rules and associated fees; and sources subject to sample synthetic minor permits and associated fees.

Public Hearing:

Public hearing on the above rule amendments will be held before the LRAPA Board of Directors:

Location: City Council Chamber
Springfield City Hall
225 North 5th Street
Springfield, Oregon
Date: Tuesday, May 12, 1998
Time: 12:30 p.m.

Copies of the proposed rule amendments, as well as Statements of Need and Fiscal Impact, are available for review at the LRAPA office located at 225 5th Street, Suite 501 (Springfield City Hall Building), Springfield, Oregon until May 12, 1998. The public may comment on the proposed regulations by calling the LRAPA business office, 726-2514, extension 215 (Sharon Moody), 216 (Barbara Cole) or 225 (Merrie Dinteman); or written comment may be submitted until April 20, 1998, to the LRAPA Board of Directors, 225 5th Street, Suite 501, Springfield, Oregon 97477-4671. Written and oral comments may also be presented at the hearing.

LNTSAB

LEGAL NOTICE :
NOTICE OF INTENT TO ADOPT AMENDMENTS TO OREGON'S AIR QUALITY IMPLEMENTATION PLAN:

Pursuant to the statutory authority o ORS [illegible] and 468A, and in accordance with Title 14 of the Lane Regional Air Pollution Authority (LRAPA) Rules and Regulations, the Board of Directors is proposing:

To amend LRAPA Title 34, "Stationary Source Rules and Permitting Procedures," and Table A, "Air Contaminant Sources and Associated Fee Schedule." This action will also result in amendment of OAR 340-020-0047.

SUMMARY:

Under the proposed amendments, LRAPA would increase Air Contaminant Discharge Permit (ACDP) fees in order to recover a greater percentage of the cost of operating the ACDP program. In Part I of Table A, the permit application or modification fee for simple synthetic minor permits would increase from $500 to $1,000; and the annual compliance assurance fee for simple synthetic minor permits would increase from $200 to $500. This is still well below DEQ's current fees. In Part II of Table A, fees would generally increase by 24%. Several source categories would either be decreased or increased according to work load associated with processing permits for those categories. Categories 61, 62, and 63 would add a third sub[illegible]gory so that there would be separate fees for simple, moderate, and complex permits where there are currently only simple and complex subcategorize. In addition, the fees for the complex permits in these categories would go up 50% upon adoption of the rule amendments and another 50% on July 1, 1999 due to the large work load involved in inspecting and permitting this category of sources. (Categories 61, 62 and 63 are sources not specifically listed in Table A: Category 61, which would emit 10 tons or more per year of the aggregate of any air contaminants, including but not limited to particulates, SOx, NOx or hydrocarbons, if the source were to operate uncontrolled; Category 62, which would emit significant malodorous emissions as determined by Authority review of sources which are known to produce similar air contaminant emissions; and Category 63, for which an air quality problem is identified by the Authority, including but not limited to open storage of dusty or odorous material, dry material handling air transfer systems, and sandblasting operations.) These amendments would put LRAPA's fees at approximately 84% of the state DEQ's fees for the same services outside of Lane [illegible]ounty.

WHO IS AFFECTED: Air contaminant sources subject to ACDP rules and associated fees; and sources subject to simple synthetic minor permits and associated fees.

PUBLIC HEARING:

Public hearing on the above rule amendments will be held before the LRAPA Board of Directors:

Location: City Council Chambers
Springfield City Hall
225 North 5th Street
Springfield, Oregon

Date: Tuesday, May 12, 1998
Time: 12:30 p.m.

Copies of the proposed rule amendments, as well as Statements of Need and Fiscal Impact, are available for review at the LRAPA office located at 225 5th Street, Suite 501 (Springfield City Hall building), Springfield, Oregon until May 12, 1998. The public may comment on the proposed regulations by calling the LRAPA business office, 726-2514, extension 215 (Sharon Moody), 216 (Barbara Cole) or 225 (Merrie Dinteman); or written comment may be submitted until April 20, 1998, to the LRAPA Board of Directors, 225 5th Street, Suite 501, Springfield, Oregon 97477-4671. Written and oral comments may also be presented at the hearing.

Affidavit of Publication

State of Oregon
County of Lane

I,Henrietta Cunningham being first duly sworn, depose and say that I am the legal clerk of The Cottage Grove Sentinel, a newspaper of general circulation, as defined by ORS 193,010, and 193,020, printed and published at Cottage Grove in the aforesaid county and state; that the Legal Notice of Intent to adopt amendments to Oregon's Air Quality Implementation Plan.

a printed copy of which is hereto annexed, was published once a week in the entire issue of said newspaper for 1 successive and consecutive weeks in the following issues: April 1, 1998

Henrietta Cunningham

Subscribed and sworn to before me this 6th day of April, 1998.

Jody B. Rolnick

Notary Public for Oregon
(My commission expires) 10/24/2000

OFFICIAL SEAL
JODY B ROLNICK
NOTARY PUBLIC - OREGON
COMMISSION NO. 058805
MY COMMISSION EXPIRES OCT. 24, 2000

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AFFIDAVIT OF PUBLICATION

STATE OF OREGON,)
COUNTY OF LANE,) ss.

I, RHONDA K. FABRETH, being first duly affirmed, depose and say that I am the Advertising Manager, or his principal clerk, of the Eugene Register-Guard, a newspaper of general circulation as defined in ORS 193.010 and 193.020; published at Eugene in the aforesaid county and state; that the NOTICE OF INTENT, a printed copy of which is hereto annexed, was published in the entire issue of said newspaper for ONE successive and consecutive DAY in the following issues:

APRIL 1, 1998

Rhonda K. Fabreth

Subscribed and affirmed to before me this 4/8/98

Debbie Buzalsky
Notary Public of Oregon

My Commission Expires: 8-29-98

OFFICIAL SEAL
DEBBIE BUZALSKY
NOTARY PUBLIC - OREGON
COMMISSION NO. 037462
MY COMMISSION EXPIRES AUG. 29, 1998

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SUMMARY:

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a:1 (445)

Affidavit of Publication

State of Oregon, County of Lane-ss

I, Adriana Perez being duly sworn, depose and say that I am the legal clerk of the Springfield News, a newspaper of general circulation, as defined by ORS 193.010 and 193.020; printed and published at Springfield in the aforesaid county and state: that the legal publication re: Notice of Intent to Adopt Amendments to Oregon's Air Quality Implementation Plan.

A printed copy of which is hereto annexed, was published in the entire issue of said newspaper for one successive and consecutive weeks in the following issues: April 1, 1998

THE SPRINGFIELD NEWS
by: Adriana Perez

Subscribed and sworn to me this 1st day of April, 1998

Frances D Ramsey
Notary Public for Oregon

My commission expires August 8, 1999.

FRANCES D. RAMSEY
COMMISSION NO. 040061
AUGUST 8, 1999

Questions to be Answered to Reveal
Potential Justification for Differing from Federal Requirements.

This document is prepared to comply with OAR Chapter 340, Division 11. This rulemaking pertains to the revision of the State Implementation Plan (OAR 340-020-0047) to incorporate revised fees for Air Contaminant Discharge Permits issued by the Lane Regional Air Pollution Authority (LRAPA). Because ORS 468A.135 authorizes regional air pollution agencies the exclusive power to regulate air quality within their jurisdictions, amendment of OAR 340-020-0047 to include LRAPA provisions does not present a substantive rulemaking issue. Therefore, questions posed by this form are not applicable.

1. Are there federal requirements that are applicable to this situation? If so, exactly what are they?

Yes. Under section 110 of the Clean Air Act, states are required to adopt and maintain a State Implementation Plan (SIP) and submit the plan and plan revisions to EPA for approval. In Oregon, SIP revisions (which are needed when state or regional authorities' regulations change) are accomplished by the amendment of OAR 340-020-0047.

2. Are the applicable federal requirements performance based, technology based, or both with the most stringent controlling?

Not applicable.

3. Do the applicable federal requirements specifically address the issues that are of concern in Oregon? Was data or information that would reasonably reflect Oregon's concern and situation considered in the federal process that established the federal requirements?

Not applicable.

4. Will the proposed requirement improve the ability of the regulated community to comply in a more cost effective way by clarifying confusing or potentially conflicting requirements (within or cross-media), increasing certainty, or preventing or reducing the need for costly retrofit to meet more stringent requirements later?

Not applicable.

5. Is there a timing issue which might justify changing the time frame for implementation of federal requirements?

Not applicable.

6. Will the proposed requirement assist in establishing and maintaining a reasonable margin for accommodation of uncertainty and future growth?

Not applicable.

7. Does the proposed requirement establish or maintain reasonable equity in the requirements for various sources? (level the playing field)

Not applicable.

8. Would others face increased costs if a more stringent rule is not enacted?

Not applicable.

9. Does the proposed requirement include procedural requirements, reporting or monitoring requirements that are different from applicable federal requirements? If so, Why? What is the "compelling reason" for different procedural, reporting or monitoring requirements?

Not applicable.

10. Is demonstrated technology available to comply with the proposed requirement?

Not applicable.

11. Will the proposed requirement contribute to the prevention of pollution or address a potential problem and represent a more cost effective environmental gain?

Not applicable.

5. Is there a timing issue which might justify changing the time frame for implementation of federal requirements?

Not applicable.

6. Will the proposed requirement assist in establishing and maintaining a reasonable margin for accommodation of uncertainty and future growth?

Not applicable.

7. Does the proposed requirement establish or maintain reasonable equity in the requirements for various sources? (level the playing field)

Not applicable.

8. Would others face increased costs if a more stringent rule is not enacted?

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Not applicable.

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Not applicable.

11. Will the proposed requirement contribute to the prevention of pollution or address a potential problem and represent a more cost effective environmental gain?

Not applicable.

Environmental Quality Commission

☒ Rule Adoption Item
☐ Action Item
☐ Information Item

Agenda Item E
March 19, 1999 Meeting

Title:

Amend Oregon Hazardous Waste Administrative Rules

Summary:

Amend the Department's rules to permanently adopt new Land Disposal Restrictions (LDRs) for spent hazardous waste potliner generated from primary aluminum production; adopt an EPA stay of the application of new, more prescriptive and broader in scope LDRs to zinc-containing fertilizers made from characteristic hazardous wastes, and apply instead Third-Third prohibition levels to those fertilizers (the Department had proposed to not adopt the stay, and to apply the new, more prescriptive 1998 Phase IV LDR s to those fertilizers); delete an existing federal and state exemption from any LDRs for zinc-containing fertilizers made from K061 hazardous waste dust from steel production, and apply the same Third-Third LDR standards to those fertilizers as applied to zinc-containing characteristic derived fertilizers (the Department had proposed to apply the new Phase IV standards); establish or revise LDR constituent concentration levels, including establishing optional, broader in scope levels for hazardous constituents in soils contaminated by hazardous wastes; conditionally exclude from most hazardous waste regulations certain hazardous wastes that are recycled; and establish new hazardous wastes.

Department Recommendation:

Adopt the rule amendments as presented in Attachment A of the Department Staff Report.

Halaba
Report Author

Mary Wahl
Division Administrator

Langdon Marsh
Director

Accommodations for disabilities are available upon request by contacting the Public Affairs Office at (503)229-5317(voice)/(503)229-6993(TDD).

State of Oregon
Department of Environmental Quality **Memorandum**

Date: March 2, 1999

To: Environmental Quality Commission

From: Langdon Marsh, Director

Subject: Agenda Item E, March 19, 1999 EQC Meeting

Statement of Purpose

These proposed rule changes:

- permanently adopt new Land Disposal Restrictions[1] (LDRs) for spent hazardous waste potliner generated from primary aluminum production;
- adopt an EPA stay of the application of new, more prescriptive and broader in scope LDRs to zinc-containing fertilizers made from characteristic hazardous wastes, and apply instead Third-Third treatment standards or prohibition levels to those fertilizers (the Department had proposed to not adopt the stay, and to apply the new, more prescriptive 1998 Phase IV LDR s to those fertilizers);
- delete an existing federal and state exemption from any LDRs for zinc-containing fertilizers made from K061 hazardous waste dust from steel production, and apply the same Third-Third LDR standards to those fertilizers as applied to zinc-containing characteristic fertilizers (the Department had proposed to apply the new Phase IV standards);
- establish or revise LDR constituent concentration levels, including establishing optional, broader in scope levels for hazardous constituents in soils contaminated by hazardous wastes;
- conditionally exclude from most hazardous waste regulations certain hazardous wastes that are recycled; and
- establish new hazardous wastes.

Background

On January 14 1999, the Director authorized the Waste Management and Cleanup Division to proceed to a rulemaking hearing on proposed rules which would amend Oregon Administrative Rules to permanently adopt new Land Disposal Restrictions (LDRs) for spent hazardous waste potliner and to adopt a number of other federal hazardous waste regulations with amendments through October 9, 1998.

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[1] "LDR" standards are technology-based constituent concentration levels that must be met before a hazardous waste may be disposed of in a hazardous waste landfill.

Pursuant to authorization, hearing notice was published in the Secretary of State's Bulletin on February 1, 1999. Informational materials (sent December 24, 1998 and February 11, 1999) and the Notice of proposed Rulemaking (sent January 15, 1999) were mailed to the mailing list of those persons who have asked to be notified of rulemaking actions, and to a mailing list of persons known by the Department to be potentially affected by or interested in the proposed rulemaking action. These lists totaled more than 1,900 persons. In addition, the Department held an informational meeting on January 11, 1999 and participated in a public meeting with fertilizer registrants held by the Oregon Department of Agriculture on February 9, 1999.

A Public Hearing was held on February 18, 1999, with Gary Calaba as Presiding Officer. Written comments were received through February 22, 1999. The Presiding Officer's Report (Attachment C) summarizes the oral testimony presented at the hearing and lists all the written comments received. (A copy of the comments is available upon request.)

Department staff have evaluated and responded to the comments received (see Attachment D). Based upon the evaluation of the comments, modifications to the initial rulemaking proposal are being recommended by the Department. These modifications are summarized below and detailed in Attachment E.

Issue this Proposed Rulemaking Action is Intended to Address

The Department is now proposing to adopt all of the federal hazardous waste regulations without changes that have been promulgated by U.S. EPA from April 30, 1998 through October 9, 1998. The rules proposed for adoption include those that are already in effect in Oregon through federal implementation and oversight. Adoption of these rules will ensure that the Department remains the primary implementing agency in the State. Also proposed for adoption are a number of rules that provide midcourse corrections to or are considered to be less stringent than the current hazardous waste regulations. These rules will allow for greater flexibility or provide increased clarity in key areas, such as hazardous waste recycling.

Only one rule was not originally proposed for adoption and that was a stay from the Phase IV land disposal restriction standards for zinc-containing fertilizers made from characteristic hazardous wastes. In response to comments, as explained below, the Department is now proposing to adopt the stay, thereby applying EPA's Third-Third land disposal restriction standards (see Table 1, Applying LDRs to Fertilizers made from Wastes) for those fertilizers. While the Department's original intention to apply the Phase IV standard to these fertilizers was based on a desire to apply the same standards to all hazardous wastes that are manufactured into products to be placed on the land, the commenters raised considerations that caused us to look more closely at what the most effective standards might be for these materials at this point in time.

However, the Department continues to be concerned about these fertilizers. They may contain concentrations of toxic substances such as lead, cadmium, and chromium which do not contribute to the value of the fertilizer. Applying the less prescriptive Third-Third standards to such fertilizers (see Table 1, Applying LDRs to Fertilizers made from Wastes) will ensure that the fertilizers are subject to some standards, however. The Department will proceed with this less stringent approach with the full understanding that EPA will, in 1999, propose alternative standards. If EPA does not proceed with such standards, the Department may reconsider its proposed approach.

In an effort to apply some degree of consistency, the Department is still proposing to remove the land disposal restriction standard exemption of K061 hazardous waste baghouse dust-derived fertilizers and apply the Third-Third standards (see Table 1, Applying LDRs to Fertilizers made from Wastes) to those fertilizers. The Department, however, acknowledges that application of these standards to fertilizers made from this waste stream is a new obligation and is proposing a one year compliance date of March 31, 2000 to allow industry time to comply with these new standards.

Relationship to Federal and Adjacent State Rules

This rulemaking proposes adoption of all federal hazardous waste regulations through October 9, 1998. The application of EPA's Third-Third land disposal restriction standards to fertilizers made from K061 hazardous waste baghouse dust is the only area in which the Department is proposing to be more stringent than EPA. Therefore, the Department is proposing a compliance deadline of March 31, 2000 to allow industry the time to meet the new standards.

Washington State has adopted, in statute, fertilizer standards for all fertilizers, not just fertilizers made from hazardous wastes. The standards, which are modified from the Canadian fertilizer standards, are based on a maximum loading rates for metals (lb./acre/year[2]). The rates are calculated by multiplying the concentration of metals in the fertilizers by the manufacturer's recommended application rate. If the rates do not comply with the standards, then the concentration of the metals, the application rate or both must be reduced to comply with standards. The fertilizer must also be labeled to certify compliance with Washington's standards for several metals listed on the label, but does not mean the fertilizer actually contains any of those metals.

Due to the differences in how the Washington and EPA standards are calculated, it is not possible to make a one-to-one comparison of the potential impact of the standards. However, by adopting the EPA stay, applying the Third-Third standards instead of the Phase IV standards to fertilizers made from characteristic zinc-containing characteristic hazardous wastes, and applying the identical standards to K061 listed zinc-containing hazardous, the Department's rules will provide some standards for fertilizers made from these two categories of hazardous wastes.

It is important to note that all other fertilizers that may be manufactured from non-hazardous waste sources will not need to meet any of these standards. If the fertilizer is not hazardous waste

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[2] Washington's loading rates for metals in lb./acre/year, are: arsenic, .297; cadmium, .079; cobalt, .594; lead, 1.981; mercury, .019, molybdenum, .079; nickel, .713; selenium, .055; and zinc, 7.329.

derived, the Department does not, in its hazardous waste rules, have the authority to regulate resultant products.

Authority to Address the Issue

The Department has statutory authority to address this issue under ORS 466.015, 466.020, 466.025, 466.070, 466.075, 466.086, 466.095, and 466.100.

Oregon Administrative Rules (OAR) 340-100-0002(1) and 340-101-0004.

Process for Development of the Rulemaking Proposal (including Advisory Committee and alternatives considered)

No advisory committee was convened for this rulemaking. On January 11, 1999, the Department held an information meeting to discuss the impact that the Department's rulemaking would have on regulated parties, if the proposed federal rules and rule amendments, as originally proposed, were adopted by the EQC. Prior to that, on December 24, 1998, the Department mailed a comprehensive Notice of Proposed Rulemaking, including: notice of the information meeting, to approximately 1,900 interested parties, including hazardous waste generators; treatment, storage and disposal facilities; facilities interested in hazardous waste cleanups; pulp and paper kraft mills; facilities interested in used oil; and fertilizer manufacturers whose products are registered for use in Oregon. Fifteen people, representing hazardous waste generators, attended the information meeting.

The formal Notice of Proposed Rulemaking, including the proposed rule, fiscal and economic impact statement, land use statement and answers to questions about the Department's proposed rules were mailed to nearly the same set of interested parties on January 15, 1999. As is described below, not all manufacturers of hazardous waste derived zinc-containing fertilizers learned about the proposal through this mailing. The Notice of Proposed Rulemaking was published in the Secretary of State's Bulletin on February 1, 1999. On February 9, 1999, the Department met with some fertilizer registrants, at a joint meeting with the Department of Agriculture, to discuss the proposed rules pertaining to regulating the non-nutritive constituents in fertilizers made from some hazardous wastes.

It was at this meeting that the Department learned that, although it believed that two fertilizer manufacturers who have utilized K061 and zinc-containing characteristic hazardous waste sources for their fertilizer products were included in the original mailing list provided by the Department of Agriculture, they were not. It was an oversight that they were not individually notified at the same time as other parties. The Department immediately obtained a list of agricultural mineral registrants from the Oregon Department of Agriculture and, on February 11, 1999, sent out another notice to approximately 160 persons whose products are registered for use in Oregon as agricultural minerals.

The Department met its legal notice obligation and the Department believes that the manufacturers effectively received timely notice through other avenues. However, this potential lack of notice is one factor in the Department's recommendation for a one year compliance deadline for the only rule for which the state will deviate from federal rules.

The public hearing was held on February 18, 1999.

Summary of Rulemaking Proposal for Public Hearing and Discussion of Significant Issues Involved.

At the Public Hearing, the Department presented its original proposal to amend Oregon Administrative Rules to permanently adopt new LDRs for spent hazardous waste potliner, to adopt all other federal hazardous waste regulations through October 9, 1998 without amendments, and to not adopt the EPA stay of LDRs for zinc-containing hazardous waste fertilizers and apply LDRs to K061 for the first time.

Most federal hazardous waste rules published through October 9, 1998 that were proposed for adoption: (1) establish or revise concentration levels for hazardous constituents when they are disposed, including constituents in soils contaminated by hazardous wastes; (2) conditionally exclude from most hazardous waste regulations certain hazardous wastes that are recycled; and (3) establish new hazardous wastes. The most significant change to the federal rules the Department proposed would have removed a stay from new Phase IV land disposal restrictions for zinc-containing fertilizers made from characteristic hazardous wastes and removed an existing federal and state exemption from any land disposal restrictions for zinc-containing fertilizers made from K061 hazardous waste dust from steel production. Adopting the proposed rule would have had the effect of applying the most stringent LDR constituent concentration levels to certain hazardous constituents, primarily heavy metals, in these waste-derived fertilizers before they could be applied to Oregon land (see Table 1, Applying LDRs to Zinc-Containing Fertilizers made from Wastes). The rulemaking package as proposed received comments as described below and the Department has modified the proposal based on those comments.

Summary of Significant Public Comment and Changes Proposed in Response

This section provides the Department's proposed changes and then summarizes the significant comments with reference to the impact they did or did not have on the Department's changed recommendation. The Department is recommending the following two changes to its original proposal:

1. Adopt EPA's stay of the Phase IV standards for zinc-containing hazardous waste characteristic fertilizers, and apply EPA's Third-Third regulatory standards to those fertilizers.

   This change will make Oregon consistent with EPA in applying the Third-Third regulatory standards to those fertilizers.

2. Remove the federal and state K061 exemption from any LDRs and apply the same Third-Third LDR standards currently required for other fertilizers made from zinc-containing characteristic hazardous wastes. Extend the compliance deadline for this requirement to March 31, 2000.

   This change will be more stringent than EPA, but is less stringent than the previously proposed Phase IV standards. Application of the Third-Third EPA standards to K061 waste-derived fertilizers will then be consistent with standards for all zinc-containing fertilizers made from any zinc-containing hazardous wastes.

Comment Summary:

- There is no imminent environmental or human health impact.

The Department believes that there is sufficient evidence to defend the proposal to limit the levels of these contaminants in hazardous waste derived fertilizers. Recent studies on fertilizers carried out by the Washington Department of Ecology (DOE) indicate that these products can be a source of non-nutritive toxic constituents, such as cadmium, lead and other heavy metals. In tests on 51 different fertilizers, DOE found seven that failed the state's Dangerous Waste Regulations for cadmium. Lead levels were as high as 9,490 parts per million. Five of these seven products are suspected to be made from recycled hazardous wastes.

Given that (1) the heavy metals regulated under this proposal are very toxic, (2) these metals are found at elevated concentrations in hazardous waste derived fertilizers, and (3) once dispersed into the environment they create potential future exposures and are very difficult to recover, the Department believes that increased regulation of fertilizers derived from hazardous wastes is a step in protecting human health and the environment.

- The Department's proposed standards do not level the regulatory playing field.

The Department realizes that non-hazardous wastes, such as galvanizing dust[3] containing zinc, that is made into zinc-containing fertilizer, and is not regulated, may contain more non-nutrients than the hazardous waste-derived (e.g., tire ash, brass dust, K061) fertilizers. See Table 1 below. Commenters argued that the Department's proposed rulemaking would not level the playing field because fertilizers made from these other non-hazardous wastes do not need to meet those standards. The Department acknowledges this and believes that this argument highlights the issue of non-nutrients present in all fertilizers, regardless of source, and their potential impact on the environment. However, the Department only has jurisdiction over hazardous-waste derived fertilizers. Because the Department can only address part of the problem, is not a reason for inaction on the part of the Department.

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[3] Wastes from hot galvanizing steel.

The Department did not hear adverse testimony on its proposal to remove the LDR exemption and apply standards to K061 hazardous waste-derived fertilizers. Even EPA, in the preamble to the stay from the Phase IV standards for fertilizers made from zinc-containing hazardous wastes, argued that fertilizers manufactured from other wastes, such as K061 may in fact be "dirtier" than the fertilizers manufactured from the toxicity characteristic hazardous waste tire ash or brass dust.

Table 1 illustrates how different land disposal restriction standards (LDRs) apply currently and under the original and final proposal.

Table 1. Applying LDRs to Fertilizers made from Wastes

Nonwastewater Wastes	**Standards it Must Meet Now**	**Proposed Standards (mg/l)**	**Final Proposed Standards (mg/l)**
Listed Hazardous Wastes			
• K061	No Standards	Phase IV Levels:	Third-Third Levels:
		Antimony 1.15	NA[4]
		Arsenic 5.0	5.0[5]
		Barium 21	100.0
		Beryllium 1.22	NA
		Cadmium 0.11	1.0
		Chromium 0.60	5.0
		Lead 0.75	5.0
		Mercury 0.025	0.20
		Nickel 11	NA
		Selenium 5.7	5.7
		Silver 0.14	5.0
		Thallium 0.20	NA
		Zinc 4.3	NA
Possible Characteristic Hazardous Wastes[6]			
• Tire Ash	EPA Third-Third	Phase IV and UHCs[7]:	Third-Third Levels[8]:

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[4] Not applicable.

[5] The test method for arsenic is the Extraction Procedure Toxicity Test, the forerunner of the current Toxicity Characteristic Leaching Procedure test. Both procedures test for leachability of certain constituents of concern.

[6] These may be hazardous wastes and fail tests for heavy metals, typically lead and cadmium.

[7] EPA's underlying constituents (UHCs) and UHC concentration levels apply if they are reasonably expected to be in the waste.

[8] UHCs do not need to meet standards if present.

[9] The test method for arsenic is the Extraction Procedure Toxicity Test, the forerunner of the current Toxicity Characteristic Leaching Procedure test. Both procedures test for leachability of certain constituents of concern.

Nonwastewater Wastes	**Standards it Must Meet Now**	**Proposed Standards (mg/l)**	**Final Proposed Standards (mg/l)**
• Brass Dust			
		Arsenic 5.0	5.0[9]
		Barium 21	100.0
		Cadmium 0.11	1.0
		Chromium 0.60	5.0
		Lead 0.75	5.0
		Mercury 0.025	0.20
		Selenium 5.7	5.7
		Silver 0.14	5.0
Industrial Wastes			
• Galvanizing fines[10]	MNHW[11]	NA	NA
• Pulp Sludge	MNHW	NA	NA
Mineral Processing Wastes[12]	Phase IV and 268.48	Phase IV and 268.48	UHCs in 268.48
Beneficiation and Extraction Wastes			
• Ironite[13]	No Standards	NA	NA

- The Phase IV standards may not be achievable.

The Department does not have the information available to assess the validity or accuracy of the commenters' claim. However, discussions with the EPA have revealed that they consider the lack of available treatment technology as one of the reasons they are evaluating other options for standards. The Department has determined that adoption of the stringent Phase IV standards for these waste streams at the time when EPA is developing proposed technology-based standards would send a confusing message to the industry: reduction of non-nutrients is critical, but the required standards may be unachievable with existing technology.

Therefore, the Department is now recommending the EQC adopt the less stringent leachable metal constituent concentration levels (the Third-Third metal regulatory levels) that EPA currently imposes on fertilizers made from zinc-containing characteristic hazardous wastes. In addition, in an effort to address the issue of consistency, the Department recommends that those same levels apply to fertilizers made from K061 hazardous waste baghouse dust. The

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[10] Galvanizing fines are wastes created from hot-galvanizing of steel. Even though the wastes do not fail toxicity tests, the manufactured zinc product may fail TCLP for lead. In any case, the constituents of concern may have concentrations above current land disposal restriction standard levels.

[11] MNHW means that the wastes may not fail hazardous waste tests, and therefore, may not be designated hazardous.

[12] Those that are by definition a hazardous waste.

[13] Because the source of the fertilizer is from mineral beneficiation wastes, it is exempt from federal and Oregon's hazardous waste regulations. However, in one TCLP test the Department conducted on Ironite, the product failed the test for arsenic.

Department recommends to the EQC that the implementation of those standards to K061-derived fertilizers be delayed until March 31, 2000. This will allow the industry time to meet the standards and provide a window for EPA to develop its proposed standards.

The Department will continue to evaluate the possible options for hazardous waste-derived fertilizer standards development. In the event that EPA does not adequately or timely address these issues, Oregon may reconsider its approach.

- DEQ should wait for EPA's standards.

While the Department is aware of EPA's efforts to address the issue of standards for hazardous waste-derived fertilizers, the Department historically has not waited for EPA to make decisions about issues that are of importance to the state. However, the Department understands industry's concerns and is proposing to delay implementation of the Third-Third standards to K061 waste-derived fertilizers until March 31, 2000. If EPA does not promulgate standards, the Department will reconsider its approach.

- LDR standards are not appropriate for fertilizers.

EPA's entire regulatory structure is based on the use of the Toxicity Characteristic Leaching Procedure (TCLP) or Extraction Procedure (EP) toxicity tests for providing a level of certainty as to acceptable levels when using a waste-derived product in a manner constituting disposal or land application. The Department believes that, short of developing an entirely new basis for setting fertilizer standards, the LDRs are a reasonable proxy.

- Request for comment period extension.

As is described more fully in Attachment E, the Department did not grant the request for extension of the comment period because legal notice was made, actual notice was received, and the extend compliance deadline for the K061 waste derived fertilizer standards more than addresses the commenters concerns.

Recommendation for Commission Action

It is recommended that the Commission adopt the rule amendments as presented in Attachment A of the Department Staff Report.

Attachments

A. Rule Amendments Proposed for Adoption
B. Supporting Procedural Documentation:
    1. Legal Notice of Hearing
    2. Fiscal and Economic Impact Statement

    3. Land Use Evaluation Statement
    4. Questions to be Answered to Reveal Potential Justification for Differing from Federal Requirements
    5. Cover Memorandum from Public Notice

C. Presiding Officer's Report on Public Hearing
D. Department's Summary, Evaluation and Response to Public Comments Received
E. Detailed Changes to Original Rulemaking Proposal made in Response to Public Comment
F. Rule Implementation Plan

Reference Documents (available upon request)

Written Comments Received (listed in Attachment C)
Federal and State Hazardous Waste Regulations
Reference Documents from Washington State and Federal EPA
Reference Documents from Oregon Department of Agriculture

Approved:

Section: Anne C Price

Division: Mary Wahl

Report Prepared by: Gary Calaba
Phone: (503) 229-6534
Date Prepared: February 25, 1999

Gjc3199

Environmental Quality Commission

☒ Rule Adoption Item
☐ Action Item
☐ Information Item

Agenda Item E
March 19, 1999 Meeting

Title:

Amend Oregon Hazardous Waste Administrative Rules

Summary:

Amend the Department's rules to permanently adopt new Land Disposal Restrictions (LDRs) for spent hazardous waste potliner generated from primary aluminum production; adopt an EPA stay of the application of new, more prescriptive and broader in scope LDRs to zinc-containing fertilizers made from characteristic hazardous wastes, and apply instead Third-Third prohibition levels to those fertilizers (the Department had proposed to not adopt the stay, and to apply the new, more prescriptive 1998 Phase IV LDR s to those fertilizers); delete an existing federal and state exemption from any LDRs for zinc-containing fertilizers made from K061 hazardous waste dust from steel production, and apply the same Third-Third LDR standards to those fertilizers as applied to zinc-containing characteristic derived fertilizers (the Department had proposed to apply the new Phase IV standards); establish or revise LDR constituent concentration levels, including establishing optional, broader in scope levels for hazardous constituents in soils contaminated by hazardous wastes; conditionally exclude from most hazardous waste regulations certain hazardous wastes that are recycled; and establish new hazardous wastes.

Department Recommendation:

Adopt the rule amendments as presented in Attachment A of the Department Staff Report.

Halaba Report Author	Mary Wahl Division Administrator	Langdon Marsh Director

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Accommodations for disabilities are available upon request by contacting the Public Affairs Office at (503)229-5317(voice)/(503)229-6993(TDD).

State of Oregon
Department of Environmental Quality **Memorandum**

Date: March 2, 1999

To: Environmental Quality Commission

From: Langdon Marsh, Director

Subject: Agenda Item E, March 19, 1999 EQC Meeting

Statement of Purpose

These proposed rule changes:

- permanently adopt new Land Disposal Restrictions[1] (LDRs) for spent hazardous waste potliner generated from primary aluminum production;
- adopt an EPA stay of the application of new, more prescriptive and broader in scope LDRs to zinc-containing fertilizers made from characteristic hazardous wastes, and apply instead Third-Third treatment standards or prohibition levels to those fertilizers (the Department had proposed to not adopt the stay, and to apply the new, more prescriptive 1998 Phase IV LDR s to those fertilizers);
- delete an existing federal and state exemption from any LDRs for zinc-containing fertilizers made from K061 hazardous waste dust from steel production, and apply the same Third-Third LDR standards to those fertilizers as applied to zinc-containing characteristic fertilizers (the Department had proposed to apply the new Phase IV standards);
- establish or revise LDR constituent concentration levels, including establishing optional, broader in scope levels for hazardous constituents in soils contaminated by hazardous wastes;
- conditionally exclude from most hazardous waste regulations certain hazardous wastes that are recycled; and
- establish new hazardous wastes.

Background

On January 14 1999, the Director authorized the Waste Management and Cleanup Division to proceed to a rulemaking hearing on proposed rules which would amend Oregon Administrative Rules to permanently adopt new Land Disposal Restrictions (LDRs) for spent hazardous waste potliner and to adopt a number of other federal hazardous waste regulations with amendments through October 9, 1998.

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[1] "LDR" standards are technology-based constituent concentration levels that must be met before a hazardous waste may be disposed of in a hazardous waste landfill.

Pursuant to authorization, hearing notice was published in the Secretary of State's Bulletin on February 1, 1999. Informational materials (sent December 24, 1998 and February 11, 1999) and the Notice of proposed Rulemaking (sent January 15, 1999) were mailed to the mailing list of those persons who have asked to be notified of rulemaking actions, and to a mailing list of persons known by the Department to be potentially affected by or interested in the proposed rulemaking action. These lists totaled more than 1,900 persons. In addition, the Department held an informational meeting on January 11, 1999 and participated in a public meeting with fertilizer registrants held by the Oregon Department of Agriculture on February 9, 1999.

A Public Hearing was held on February 18, 1999, with Gary Calaba as Presiding Officer. Written comments were received through February 22, 1999. The Presiding Officer's Report (Attachment C) summarizes the oral testimony presented at the hearing and lists all the written comments received. (A copy of the comments is available upon request.)

Department staff have evaluated and responded to the comments received (see Attachment D). Based upon the evaluation of the comments, modifications to the initial rulemaking proposal are being recommended by the Department. These modifications are summarized below and detailed in Attachment E.

Issue this Proposed Rulemaking Action is Intended to Address

The Department is now proposing to adopt all of the federal hazardous waste regulations without changes that have been promulgated by U.S. EPA from April 30, 1998 through October 9, 1998. The rules proposed for adoption include those that are already in effect in Oregon through federal implementation and oversight. Adoption of these rules will ensure that the Department remains the primary implementing agency in the State. Also proposed for adoption are a number of rules that provide midcourse corrections to or are considered to be less stringent than the current hazardous waste regulations. These rules will allow for greater flexibility or provide increased clarity in key areas, such as hazardous waste recycling.

Only one rule was not originally proposed for adoption and that was a stay from the Phase IV land disposal restriction standards for zinc-containing fertilizers made from characteristic hazardous wastes. In response to comments, as explained below, the Department is now proposing to adopt the stay, thereby applying EPA's Third-Third land disposal restriction standards (see Table 1, Applying LDRs to Fertilizers made from Wastes) for those fertilizers. While the Department's original intention to apply the Phase IV standard to these fertilizers was based on a desire to apply the same standards to all hazardous wastes that are manufactured into products to be placed on the land, the commenters raised considerations that caused us to look more closely at what the most effective standards might be for these materials at this point in time.

However, the Department continues to be concerned about these fertilizers. They may contain concentrations of toxic substances such as lead, cadmium, and chromium which do not contribute to the value of the fertilizer. Applying the less prescriptive Third-Third standards to such fertilizers (see Table 1, Applying LDRs to Fertilizers made from Wastes) will ensure that the fertilizers are subject to some standards, however. The Department will proceed with this less stringent approach with the full understanding that EPA will, in 1999, propose alternative standards. If EPA does not proceed with such standards, the Department may reconsider its proposed approach.

In an effort to apply some degree of consistency, the Department is still proposing to remove the land disposal restriction standard exemption of K061 hazardous waste baghouse dust-derived fertilizers and apply the Third-Third standards (see Table 1, Applying LDRs to Fertilizers made from Wastes) to those fertilizers. The Department, however, acknowledges that application of these standards to fertilizers made from this waste stream is a new obligation and is proposing a one year compliance date of March 31, 2000 to allow industry time to comply with these new standards.

Relationship to Federal and Adjacent State Rules

This rulemaking proposes adoption of all federal hazardous waste regulations through October 9, 1998. The application of EPA's Third-Third land disposal restriction standards to fertilizers made from K061 hazardous waste baghouse dust is the only area in which the Department is proposing to be more stringent than EPA. Therefore, the Department is proposing a compliance deadline of March 31, 2000 to allow industry the time to meet the new standards.

Washington State has adopted, in statute, fertilizer standards for all fertilizers, not just fertilizers made from hazardous wastes. The standards, which are modified from the Canadian fertilizer standards, are based on a maximum loading rates for metals (lb./acre/year[2]). The rates are calculated by multiplying the concentration of metals in the fertilizers by the manufacturer's recommended application rate. If the rates do not comply with the standards, then the concentration of the metals, the application rate or both must be reduced to comply with standards. The fertilizer must also be labeled to certify compliance with Washington's standards for several metals listed on the label, but does not mean the fertilizer actually contains any of those metals.

Due to the differences in how the Washington and EPA standards are calculated, it is not possible to make a one-to-one comparison of the potential impact of the standards. However, by adopting the EPA stay, applying the Third-Third standards instead of the Phase IV standards to fertilizers made from characteristic zinc-containing characteristic hazardous wastes, and applying the identical standards to K061 listed zinc-containing hazardous, the Department's rules will provide some standards for fertilizers made from these two categories of hazardous wastes.

It is important to note that all other fertilizers that may be manufactured from non-hazardous waste sources will not need to meet any of these standards. If the fertilizer is not hazardous waste

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[2] Washington's loading rates for metals in lb./acre/year, are: arsenic, .297; cadmium, .079; cobalt, .594; lead, 1.981; mercury, .019, molybdenum, .079; nickel, .713; selenium, .055; and zinc, 7.329.

derived, the Department does not, in its hazardous waste rules, have the authority to regulate resultant products.

Authority to Address the Issue

The Department has statutory authority to address this issue under ORS 466.015, 466.020, 466.025, 466.070, 466.075, 466.086, 466.095, and 466.100.

Oregon Administrative Rules (OAR) 340-100-0002(1) and 340-101-0004.

Process for Development of the Rulemaking Proposal (including Advisory Committee and alternatives considered)

No advisory committee was convened for this rulemaking. On January 11, 1999, the Department held an information meeting to discuss the impact that the Department's rulemaking would have on regulated parties, if the proposed federal rules and rule amendments, as originally proposed, were adopted by the EQC. Prior to that, on December 24, 1998, the Department mailed a comprehensive Notice of Proposed Rulemaking, including: notice of the information meeting, to approximately 1,900 interested parties, including hazardous waste generators; treatment, storage and disposal facilities; facilities interested in hazardous waste cleanups; pulp and paper kraft mills; facilities interested in used oil; and fertilizer manufacturers whose products are registered for use in Oregon. Fifteen people, representing hazardous waste generators, attended the information meeting.

The formal Notice of Proposed Rulemaking, including the proposed rule, fiscal and economic impact statement, land use statement and answers to questions about the Department's proposed rules were mailed to nearly the same set of interested parties on January 15, 1999. As is described below, not all manufacturers of hazardous waste derived zinc-containing fertilizers learned about the proposal through this mailing. The Notice of Proposed Rulemaking was published in the Secretary of State's Bulletin on February 1, 1999. On February 9, 1999, the Department met with some fertilizer registrants, at a joint meeting with the Department of Agriculture, to discuss the proposed rules pertaining to regulating the non-nutritive constituents in fertilizers made from some hazardous wastes.

It was at this meeting that the Department learned that, although it believed that two fertilizer manufacturers who have utilized K061 and zinc-containing characteristic hazardous waste sources for their fertilizer products were included in the original mailing list provided by the Department of Agriculture, they were not. It was an oversight that they were not individually notified at the same time as other parties. The Department immediately obtained a list of agricultural mineral registrants from the Oregon Department of Agriculture and, on February 11, 1999, sent out another notice to approximately 160 persons whose products are registered for use in Oregon as agricultural minerals.

The Department met its legal notice obligation and the Department believes that the manufacturers effectively received timely notice through other avenues. However, this potential lack of notice is one factor in the Department's recommendation for a one year compliance deadline for the only rule for which the state will deviate from federal rules.

The public hearing was held on February 18, 1999.

Summary of Rulemaking Proposal for Public Hearing and Discussion of Significant Issues Involved.

At the Public Hearing, the Department presented its original proposal to amend Oregon Administrative Rules to permanently adopt new LDRs for spent hazardous waste potliner, to adopt all other federal hazardous waste regulations through October 9, 1998 without amendments, and to not adopt the EPA stay of LDRs for zinc-containing hazardous waste fertilizers and apply LDRs to K061 for the first time.

Most federal hazardous waste rules published through October 9, 1998 that were proposed for adoption: (1) establish or revise concentration levels for hazardous constituents when they are disposed, including constituents in soils contaminated by hazardous wastes; (2) conditionally exclude from most hazardous waste regulations certain hazardous wastes that are recycled; and (3) establish new hazardous wastes. The most significant change to the federal rules the Department proposed would have removed a stay from new Phase IV land disposal restrictions for zinc-containing fertilizers made from characteristic hazardous wastes and removed an existing federal and state exemption from any land disposal restrictions for zinc-containing fertilizers made from K061 hazardous waste dust from steel production. Adopting the proposed rule would have had the effect of applying the most stringent LDR constituent concentration levels to certain hazardous constituents, primarily heavy metals, in these waste-derived fertilizers before they could be applied to Oregon land (see Table 1, Applying LDRs to Zinc-Containing Fertilizers made from Wastes). The rulemaking package as proposed received comments as described below and the Department has modified the proposal based on those comments.

Summary of Significant Public Comment and Changes Proposed in Response

This section provides the Department's proposed changes and then summarizes the significant comments with reference to the impact they did or did not have on the Department's changed recommendation. The Department is recommending the following two changes to its original proposal:

1. Adopt EPA's stay of the Phase IV standards for zinc-containing hazardous waste characteristic fertilizers, and apply EPA's Third-Third regulatory standards to those fertilizers.

   This change will make Oregon consistent with EPA in applying the Third-Third regulatory standards to those fertilizers.

2. Remove the federal and state K061 exemption from any LDRs and apply the same Third-Third LDR standards currently required for other fertilizers made from zinc-containing characteristic hazardous wastes. Extend the compliance deadline for this requirement to March 31, 2000.

   This change will be more stringent than EPA, but is less stringent than the previously proposed Phase IV standards. Application of the Third-Third EPA standards to K061 waste-derived fertilizers will then be consistent with standards for all zinc-containing fertilizers made from any zinc-containing hazardous wastes.

Comment Summary:

- There is no imminent environmental or human health impact.

The Department believes that there is sufficient evidence to defend the proposal to limit the levels of these contaminants in hazardous waste derived fertilizers. Recent studies on fertilizers carried out by the Washington Department of Ecology (DOE) indicate that these products can be a source of non-nutritive toxic constituents, such as cadmium, lead and other heavy metals. In tests on 51 different fertilizers, DOE found seven that failed the state's Dangerous Waste Regulations for cadmium. Lead levels were as high as 9,490 parts per million. Five of these seven products are suspected to be made from recycled hazardous wastes.

Given that (1) the heavy metals regulated under this proposal are very toxic, (2) these metals are found at elevated concentrations in hazardous waste derived fertilizers, and (3) once dispersed into the environment they create potential future exposures and are very difficult to recover, the Department believes that increased regulation of fertilizers derived from hazardous wastes is a step in protecting human health and the environment.

- The Department's proposed standards do not level the regulatory playing field.

The Department realizes that non-hazardous wastes, such as galvanizing dust[3] containing zinc, that is made into zinc-containing fertilizer, and is not regulated, may contain more non-nutrients than the hazardous waste-derived (e.g., tire ash, brass dust, K061) fertilizers. See Table 1 below. Commenters argued that the Department's proposed rulemaking would not level the playing field because fertilizers made from these other non-hazardous wastes do not need to meet those standards. The Department acknowledges this and believes that this argument highlights the issue of non-nutrients present in all fertilizers, regardless of source, and their potential impact on the environment. However, the Department only has jurisdiction over hazardous-waste derived fertilizers. Because the Department can only address part of the problem, is not a reason for inaction on the part of the Department.

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[3] Wastes from hot galvanizing steel.

The Department did not hear adverse testimony on its proposal to remove the LDR exemption and apply standards to K061 hazardous waste-derived fertilizers. Even EPA, in the preamble to the stay from the Phase IV standards for fertilizers made from zinc-containing hazardous wastes, argued that fertilizers manufactured from other wastes, such as K061 may in fact be "dirtier" than the fertilizers manufactured from the toxicity characteristic hazardous waste tire ash or brass dust.

Table 1 illustrates how different land disposal restriction standards (LDRs) apply currently and under the original and final proposal.

Table 1. Applying LDRs to Fertilizers made from Wastes

Nonwastewater Wastes	**Standards it Must Meet Now**	**Proposed Standards (mg/l)**	**Final Proposed Standards (mg/l)**
Listed Hazardous Wastes • K061	No Standards	Phase IV Levels: Antimony 1.15 Arsenic 5.0 Barium 21 Beryllium 1.22 Cadmium 0.11 Chromium 0.60 Lead 0.75 Mercury 0.025 Nickel 11 Selenium 5.7 Silver 0.14 Thallium 0.20 Zinc 4.3	Third-Third Levels: NA[4] 5.0[5] 100.0 NA 1.0 5.0 5.0 0.20 NA 5.7 5.0 NA NA
Possible Characteristic Hazardous Wastes[6] • Tire Ash	EPA Third-Third	Phase IV and UHCs[7]:	Third-Third Levels[8]:

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[4] Not applicable.

[5] The test method for arsenic is the Extraction Procedure Toxicity Test, the forerunner of the current Toxicity Characteristic Leaching Procedure test. Both procedures test for leachability of certain constituents of concern.

[6] These may be hazardous wastes and fail tests for heavy metals, typically lead and cadmium.

[7] EPA's underlying constituents (UHCs) and UHC concentration levels apply if they are reasonably expected to be in the waste.

[8] UHCs do not need to meet standards if present.

[9] The test method for arsenic is the Extraction Procedure Toxicity Test, the forerunner of the current Toxicity Characteristic Leaching Procedure test. Both procedures test for leachability of certain constituents of concern.

Nonwastewater Wastes	**Standards it Must Meet Now**	**Proposed Standards (mg/l)**	**Final Proposed Standards (mg/l)**
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		Arsenic 5.0	5.0[9]
		Barium 21	100.0
		Cadmium 0.11	1.0
		Chromium 0.60	5.0
		Lead 0.75	5.0
		Mercury 0.025	0.20
		Selenium 5.7	5.7
		Silver 0.14	5.0
Industrial Wastes			
• Galvanizing fines[10]	MNHW[11]	NA	NA
• Pulp Sludge	MNHW	NA	NA
Mineral Processing Wastes[12]	Phase IV and 268.48	Phase IV and 268.48	UHCs in 268.48
Beneficiation and Extraction Wastes			
• Ironite[13]	No Standards	NA	NA

- The Phase IV standards may not be achievable.

The Department does not have the information available to assess the validity or accuracy of the commenters' claim. However, discussions with the EPA have revealed that they consider the lack of available treatment technology as one of the reasons they are evaluating other options for standards. The Department has determined that adoption of the stringent Phase IV standards for these waste streams at the time when EPA is developing proposed technology-based standards would send a confusing message to the industry: reduction of non-nutrients is critical, but the required standards may be unachievable with existing technology.

Therefore, the Department is now recommending the EQC adopt the less stringent leachable metal constituent concentration levels (the Third-Third metal regulatory levels) that EPA currently imposes on fertilizers made from zinc-containing characteristic hazardous wastes. In addition, in an effort to address the issue of consistency, the Department recommends that those same levels apply to fertilizers made from K061 hazardous waste baghouse dust. The

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[10] Galvanizing fines are wastes created from hot-galvanizing of steel. Even though the wastes do not fail toxicity tests, the manufactured zinc product may fail TCLP for lead. In any case, the constituents of concern may have concentrations above current land disposal restriction standard levels.

[11] MNHW means that the wastes may not fail hazardous waste tests, and therefore, may not be designated hazardous.

[12] Those that are by definition a hazardous waste.

[13] Because the source of the fertilizer is from mineral beneficiation wastes, it is exempt from federal and Oregon's hazardous waste regulations. However, in one TCLP test the Department conducted on Ironite, the product failed the test for arsenic.

Department recommends to the EQC that the implementation of those standards to K061-derived fertilizers be delayed until March 31, 2000. This will allow the industry time to meet the standards and provide a window for EPA to develop its proposed standards.

The Department will continue to evaluate the possible options for hazardous waste-derived fertilizer standards development. In the event that EPA does not adequately or timely address these issues, Oregon may reconsider its approach.

- DEQ should wait for EPA's standards.

While the Department is aware of EPA's efforts to address the issue of standards for hazardous waste-derived fertilizers, the Department historically has not waited for EPA to make decisions about issues that are of importance to the state. However, the Department understands industry's concerns and is proposing to delay implementation of the Third-Third standards to K061 waste-derived fertilizers until March 31, 2000. If EPA does not promulgate standards, the Department will reconsider its approach.

- LDR standards are not appropriate for fertilizers.

EPA's entire regulatory structure is based on the use of the Toxicity Characteristic Leaching Procedure (TCLP) or Extraction Procedure (EP) toxicity tests for providing a level of certainty as to acceptable levels when using a waste-derived product in a manner constituting disposal or land application. The Department believes that, short of developing an entirely new basis for setting fertilizer standards, the LDRs are a reasonable proxy.

- Request for comment period extension.

As is described more fully in Attachment E, the Department did not grant the request for extension of the comment period because legal notice was made, actual notice was received, and the extend compliance deadline for the K061 waste derived fertilizer standards more than addresses the commenters concerns.

Recommendation for Commission Action

It is recommended that the Commission adopt the rule amendments as presented in Attachment A of the Department Staff Report.

Attachments

A. Rule Amendments Proposed for Adoption
B. Supporting Procedural Documentation:
    1. Legal Notice of Hearing
    2. Fiscal and Economic Impact Statement

    3. Land Use Evaluation Statement
    4. Questions to be Answered to Reveal Potential Justification for Differing from Federal Requirements
    5. Cover Memorandum from Public Notice

C. Presiding Officer's Report on Public Hearing
D. Department's Summary, Evaluation and Response to Public Comments Received
E. Detailed Changes to Original Rulemaking Proposal made in Response to Public Comment
F. Rule Implementation Plan

<u>Reference Documents (available upon request)</u>

Written Comments Received (listed in Attachment C)
Federal and State Hazardous Waste Regulations
Reference Documents from Washington State and Federal EPA
Reference Documents from Oregon Department of Agriculture

Approved:

Section:
Division: Mary Wahl

Report Prepared by: Gary Calaba
Phone: (503) 229-6534
Date Prepared: February 25, 1999

Gjc3199

ATTACHMENT A

Proposed Rule Amendments

BEFORE THE ENVIRONMENTAL QUALITY COMMISSION OF THE STATE OF OREGON

In the Matter of Rulemaking)

Proposed Amendments
Restrictions: OAR Chapter 340,)
Divisions 100 and 101.

1. Rule 340-100-0002 is proposed to be amended as follows:

Adoption of United States Environmental Protection Agency Hazardous Waste and Used Oil Management Regulations

340-100-0002 (1) Except as otherwise modified or specified by OAR Chapter 340, Divisions 100 to 106, 108, 109, 111, 113 and 120, the rules and regulations governing the management of hazardous waste, including its generation, transportation, treatment, storage, recycling and disposal, prescribed by the United States Environmental Protection Agency in Title 40 Code of Federal Regulations, Parts 260 to 266, 268, 270, 273 and Subpart A and Subpart B of Part 124 promulgated through ~~April 30~~October 9, 1998 are adopted by reference and prescribed by the Commission to be observed by all persons subject to ORS 466.005 to 466.080 and 466.090 to 466.215.[1] ~~In addition, effective September 21, 1998, Title 40 Code of Federal Register Parts 268 and 271, as adopted by the Commission (as it applies to spent potliner (K088)), are temporarily repealed, and these Parts, as amended at 63 Federal Register 51254-51267, September 24, 1998, are temporarily adopted by reference~~.

(2) Except as otherwise modified or specified by OAR Chapter 340, Division 111, the rules and regulations governing the standards for the management of used oil, prescribed by the United

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[1] Note: On March 3, 1992, in 57 Federal Register 7628, EPA promulgated a re-adoption of 40 CFR 261.3, the mixture and derived-from rules, because the rules had been vacated as a result of federal litigation. The EQC did not adopt this amendment at that time because the State had independently and legally adopted mixture and derived-from rules under state law in 1984, and has indicated its intent to maintain the mixture and derived-from rules with each annual rulemaking update.

States Environmental Protection Agency in Title 40 Code of Federal Regulations, Part 279 promulgated through ~~April 30~~October 9, 1998, are adopted by reference into Oregon Administrative Rules and prescribed by the Commission to be observed by all persons subject to ORS 466.005 to 466.080 and 466.090 to 466.215.

(**Comment:** The Department uses the federal preamble accompanying the federal regulations and federal guidance as a basis for regulatory decision making.)

[**Publications:** The publication(s) referred to or incorporated by reference in this rule are available from the Department of Environmental Quality.]

2. Rule 340-101-0004 is proposed to be amended as follows:

Exclusions

340-101-0004(1) The provisions of 40 CFR 261.4(b)(7) are adopted except that 40 CFR 261.4(b)(7)(ii) is deleted~~-and replaced with section (2) of this rule~~.
(2) ~~Residues from the extraction and beneficiation of ores and minerals (including coal), including phosphate rock and overburden from the mining of uranium ore, are not hazardous waste.~~
~~NOTE: The program is more stringent than the federal program in that the latter also excludes residues from processing.~~
~~(3)~~ Residue described in 40 CFR 261.4(b)(9) is exempted from Divisions 100-106 and 109.

3. Rule 340-101-0050 is proposed to be created as follows:

Standards for Materials being Recycled

340-101-0050(1) The following portion of 40 CFR 266.20(b) ". . . However, zinc-containing fertilizers using hazardous waste K061 that are produced for the general public's use are not presently subject to regulation." shall be replaced by ". . . However, zinc-containing fertilizers using hazardous waste K061 that are produced for use in Oregon, and which contain non-nutrients at levels exceeding the applicable prohibition levels for any non-nutrients as specified in Table 1 must comply with those prohibition levels. Compliance with these standards is required by March 31, 2000.

Table 1. Prohibition Levels for Fertilizer Using K061 Hazardous Waste

Non-Nutrient Hazardous Constituent	Fertilizer Standard (mg/l, TCLP[1])
Arsenic	5.0[2]
Barium	100.0
Cadmium	1.0
Chromium (Total)	5.0
Lead	5.0
Mercury[3]	0.20
Selenium	5.7
Silver	5.0

[1] Toxicity Characteristic Leaching Procedure (TCLP).

[2] Using the Extraction Procedure Toxicity Test.

[3] Fertilizers made only from mercury wastes containing less than 260mg/kg total mercury."

Stat. Auth.: ORS Ch. 183.337, 465.009, 466.020, 468.020
Stat. Implemented: ORS Ch. 466.015, 466.075, 466.086

Hist.: DEQ 8-1985, f. & ef. 7-25-85; DEQ 10-1987, f. & ef. 6-11-87; DEQ 23-1987, f. & ef. 12-16-87; DEQ 19-1988, f. & cert. ef. 7-13-88; DEQ 12-1989, f. & cert. ef. 6-12-89; DEQ 4-1991, f. & cert. ef. 3-15-91 (and corrected 6-20-91); DEQ 24-1992, f. 10-23-92, cert. ef. 11-1-92; DEQ 11-1993, f. & cert. ef. 7-29-93; DEQ 6-1994, f. & cert. ef. 3-22-94; DEQ 31-1994 (Temp), f. 12-6-94, cert. ef. 12-19-94

Gjc300499

Secretary of State

NOTICE OF PROPOSED RULEMAKING HEARING

A Statement of Need and Fiscal Impact accompanies this form.

DEQ - Waste Management and Cleanup Agency and Division	Chapter 340 Administrative Rules Chapter Number
Susan M. Greco Rules Coordinator	(503) 229-5213 Telephone

811 S.W. 6th Avenue, Portland, OR 97204
Address

Public Hearing is on February 18, 1999, 1 p.m., Room 3A (Third Floor), Department of Environmental Quality, 811 S.W. 6th Avenue, Portland, Oregon 97204. Gary Calaba is the Hearings Officer.

Auxiliary aids for persons with disabilities are available upon advance request.

RULEMAKING ACTION

ADOPT: OAR 340-101-0050, Standards for Materials being Recycled.

AMEND: OAR 340-100-0002, 340-101-0004.

Stat. Auth.: ORS 466.015, 466.020, 466.025, 466.070, 466.075, 466.086, 466.095. and 466.100.
Stats. Implemented: ORS 466.015, 466.020, 466.025, 466.070, 466.075, 466.086, 466.095. and 466.100.

RULE SUMMARY

Amend Oregon Administrative rules to permanently adopt new Land Disposal Restrictions for spent hazardous waste potliner and to adopt a number of other federal hazardous waste regulations with amendments. Most federal hazardous waste rules published through October 9, 1998 that are proposed for adoption (1) establish or revise concentration levels for hazardous constituents when they are disposed, including constituents in soils contaminated with hazardous wastes; (2) conditionally exclude from most hazardous waste regulations certain hazardous wastes that are recycled; and (3) establish new hazardous wastes. Proposed amendments to the rules remove (1) an exemption from new land disposal restrictions for zinc-containing fertilizers made from characteristic hazardous wastes; and (2) an existing federal and state exemption from any land disposal restrictions for zinc-containing fertilizers made from K061 hazardous waste dust from steel production.

Amending these rules will have the effect of applying new federal EPA land disposal restriction constituent concentration levels to hazardous constituents in these wastes-derived before they are applied to Oregon land.

February 22, 1999	Susan M Greco 1/13/99
Last Day for Public Comment	Authorized Signer and Date

State of Oregon
DEPARTMENT OF ENVIRONMENTAL QUALITY

Rulemaking Proposal
for
for Amending Oregon Hazardous Waste Administrative Rules

Fiscal and Economic Impact Statement

Introduction

This Hazardous Waste rulemaking:

> **Amends Oregon Administrative Rules to permanently adopt new Land Disposal Restrictions[1] for spent hazardous waste potliner and to adopt a number of other federal hazardous waste regulations with amendments.**

The fiscal and economic impact for a regulated category and the federal rule(s) being adopted or amended is covered below under each rule category.

Land Disposal Restriction Standards

1. **Steel mills and other facilities producing zinc-containing hazardous wastes, manufacturers of fertilizers or soil amendments made from zinc-containing Toxicity Characteristic[2] (TC) hazardous wastes or zinc-containing listed hazardous waste[3].**

   a. **Proposed Rules:** Requires zinc-containing fertilizers made from either TC characteristic hazardous waste or K061 hazardous waste (emission control dust from primary production of steel in electric arc furnaces) to meet Phase IV LDR standards before land application.

General Public

There is no direct fiscal and economic impact on the general public from these rules.

Small Businesses

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[1] LDR standards are technology-based constituent concentration levels which must be met before a hazardous waste is disposed of in a hazardous waste landfill.

[2] "Toxicity Characteristic" hazardous wastes are hazardous because they exhibit measurable chemical and/or physical properties that threaten human health and the environment.

[3] "Listed Hazardous Wastes" are hazardous because they contain hazardous contaminants produced from specific or non-specific sources and that threaten human health or the environment if not controlled.

Some additional economic and fiscal impact may occur from requiring hazardous waste derived zinc-containing fertilizers to meet Phase IV LDR standards before they are applied to land in Oregon, because the fertilizer manufacturer may have to remove or reduce the concentration of metals to meet the standards. This action may increase the cost to the buyer(s) the fertilizers.

Large Businesses

Some additional economic and fiscal impact may occur from requiring hazardous waste derived zinc-containing fertilizers to meet Phase IV LDR standards before they are applied to land in Oregon, because the fertilizer manufacturer may have to remove or reduce the concentration of metals to meet the standards. This action may increase the cost to the buyer(s) the fertilizers.

Local Governments

No additional economic and fiscal impact will occur from requiring hazardous waste derived zinc-containing fertilizers to meet the Phase IV LDR standards before they are applied to land in Oregon.

State Agency

No additional economic and fiscal impact is will occur from requiring hazardous waste derived zinc-containing fertilizers to meet the Phase IV LDR standards before they are applied to land in Oregon.

Housing Cost Impact Statement

The Department has determined that the rulemaking will have no effect on the cost of development of a 6,000 square foot parcel and the construction of a 1,200 square foot detached single family dwelling on that parcel.

2. **Primary mineral processors, chemical manufacturers, pharmaceutical producers, paint producers, motor vehicle parts manufacturers, blast furnaces, boilers, steel mills, metal plating, and aircraft parts and equipment that are generators of Toxicity Characteristic (TC) metal hazardous wastes (D004-D011), other characteristic wastes (D001-D003 and D012-D043) when subject to UTS, characteristic mineral processing wastes, or any hazardous waste required to meet the LDR treatment standards for antimony, barium, beryllium, cadmium, chromium, lead, nickel, selenium, silver, thallium, vanadium, or zinc.**

    a. **Proposed Rule:** Revises Universal Treatment Standard[4] (UTS) levels for 12 nonwastewater treatment standards for metal-bearing listed or characteristic hazardous

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[4] "Universal Treatment Standards" are universal concentration limits for constituents of concern regardless of the waste in which they are found.

wastes.

b. **Proposed Rule:** Requires UTS levels to be met for all known Underlying Hazardous Constituents (UHCs) in Toxicity Characteristic (TC) metallic wastes.

c. **Proposed Rule:** Establishes LDR treatment standards for characteristic mineral processing wastes, including manufactured gas plant wastes.

d. **Proposed Rule:** Clarifies LDR applicability to boiler cleanout wastewater.

General Public

There is no direct fiscal and economic impact on the general public from adopting these rules.

Small Businesses

No additional fiscal or economic impact is anticipated from adopting revisions to federal hazardous waste rules that are currently in effect in Oregon.

Large Businesses

No additional fiscal or economic impact is anticipated from adopting revisions to federal hazardous waste rules that are currently in effect in Oregon. Some additional economic impact is anticipated from applying new land disposal restriction standards to cleanup debris from manufactured gas plants because if the debris is hazardous waste then the constituents of concern in the wastes must be treated before the wastes may be disposed in a hazardous waste landfill.

Local Governments

No additional fiscal or economic impact is anticipated from adopting revisions to federal hazardous waste rules that are currently in effect in Oregon.

State Agencies

No additional fiscal or economic impact is anticipated from adopting revisions to federal hazardous waste rules that are currently in effect in Oregon.

Housing Cost Impact Statement

The Department has determined that the rulemaking will have no effect on the cost of development of a 6,000 square foot parcel and the construction of a 1,200 square foot detached single family dwelling on that parcel.

3. Private or public parties cleaning up soils contaminated by hazardous waste.

a. **Proposed Rule:** Establishes alternative LDR treatment standards for soils contaminated by hazardous waste.

General Public

There is no direct fiscal and economic impact on the general public from adopting this rule.

Small Businesses

If this optional treatment approach is selected, potential economic and fiscal benefits may be expected from establishing alternative LDR treatment standards for soils contaminated by hazardous waste. At least in some cases, these new alternative standards may be less rigorous than previous standards and this will allow larger volumes of contaminated soils to be disposed at a hazardous waste landfill rather than having to be sent off to an incinerator at greater expense for disposal. However, there is some uncertainty as to the expense of sampling and testing which will be required for a site specific determination. This may involve significant additional costs.

Large Businesses

If this optional treatment approach is selected, potential economic and fiscal benefits may be expected from establishing alternative LDR treatment standards for soils contaminated by hazardous waste. At least in some cases, these new alternative standards may be less rigorous than previous standards and this will allow larger volumes of contaminated soils to be disposed at a hazardous waste landfill rather than having to be sent off to an incinerator at greater expense for disposal. However, there is some uncertainty as to the expense of sampling and testing which will be required for a site specific determination. This may involve significant additional costs.

Local Governments

If this optional treatment approach is selected, potential economic and fiscal benefits may be expected from establishing alternative LDR treatment standards for soils contaminated by hazardous waste. At least in some cases, these new alternative standards may be less rigorous than previous standards and this will allow larger volumes of contaminated soils to be disposed at a hazardous waste landfill rather than having to be sent off to an incinerator at greater expense for disposal. However, there is some uncertainty as to the expense of sampling and testing which will be required for a site specific determination. This may involve significant additional costs.

State Agencies

If this optional treatment approach is selected, potential economic and fiscal benefits may be expected from establishing alternative LDR treatment standards for soils contaminated by hazardous waste. At least in some cases, these new alternative standards may be less rigorous than previous standards and this will allow larger volumes of contaminated soils to be disposed at a hazardous waste landfill rather than having to be sent off to an incinerator at greater expense for disposal. However, there is some uncertainty as to the expanses of sampling and testing which will be required for a site specific determination. This may involve significant additional costs.

Housing Cost Impact Statement

The Department has determined that the rulemaking will have no effect on the cost of development of a 6,000 square foot parcel and the construction of a 1,200 square foot detached single family dwelling on that parcel.

4. Facilities melting lead recovered primarily from lead-battery reclamation.

a. **Proposed Rule:** Extends the LDR compliance date for characteristic slags generated from thermal recovery of lead by secondary lead smelters.

b. **Proposed Rule:** Requires slag from lead smelting operations to meet LDR standards before being land disposed.

General Public

There is no direct fiscal and economic impact on the general public from adopting these rules.

Small Businesses

There is no thermal lead recovery facility in Oregon; therefore, no additional fiscal or economic impact is anticipated from adopting these revisions to federal hazardous waste rules that are currently in effect in Oregon.

Large Businesses

There is no thermal lead recovery facility in Oregon; therefore, no additional fiscal or economic impact is anticipated from adopting these revisions to federal hazardous waste rules that are currently in effect in Oregon.

Local Governments

There is no thermal lead recovery facility in Oregon; therefore, no additional fiscal or economic impact is anticipated from adopting these revisions to federal hazardous waste rules that are currently in effect in Oregon.

State Agencies

There is no thermal lead recovery facility in Oregon; therefore, no additional fiscal or economic impact is anticipated from adopting these revisions to federal hazardous waste rules that are currently in effect in Oregon.

Housing Cost Impact Statement

The Department has determined that the rulemaking will have no effect on the cost of development of a 6,000 square foot parcel and the construction of a 1,200 square foot detached single family dwelling on that parcel.

5. Manufacturers of carbamate.

1. **Proposed Rule:** Revises the LDRs for seven listed hazardous wastes from carbamate production and amends previous regulations.

General Public

No additional fiscal or economic impact is anticipated from adopting this rule.

Small Businesses

There is no carbamate manufacturer in Oregon; therefore, no additional fiscal or economic impact is anticipated from adopting this revision to federal hazardous waste rules that are currently in effect in Oregon.

Large Businesses

There is no carbamate manufacturer in Oregon; therefore, no additional fiscal or economic impact is anticipated from adopting this revision to federal hazardous waste rules that are currently in effect in Oregon.

Local Governments

There is no carbamate manufacturer in Oregon; therefore, no additional fiscal or economic impact is anticipated from adopting this revision to federal hazardous waste rules that are currently in effect in Oregon.

State Agencies

There is no carbamate manufacturer in Oregon; therefore, no additional fiscal or economic impact is anticipated from adopting this revision to federal hazardous waste rules that are currently in effect in Oregon.

Housing Cost Impact Statement

The Department has determined that the rulemaking will have no effect on the cost of development of a 6,000 square foot parcel and the construction of a 1,200 square foot detached single family dwelling on that parcel.

6. Primary aluminum reduction facilities.

1. **Proposed rule:** Adopts permanently the adopted temporary LDR standards for spent potliners (K088) from primary aluminum reduction

General Public

No additional fiscal or economic impact is anticipated from adopting this rule.

Small Businesses

No additional fiscal or economic impact is anticipated from adopting this revision to federal hazardous waste rules that are currently in effect in Oregon.

Large Businesses

No additional fiscal or economic impact is anticipated from adopting this revision to federal hazardous waste rules that are currently in effect in Oregon.

Local Governments

No additional fiscal or economic impact is anticipated from adopting this rule.

State Agencies

No additional fiscal or economic impact is anticipated from adopting this rule.

Housing Cost Impact Statement

The Department has determined that the rulemaking will have no effect on the cost of development of a 6,000 square foot parcel and the construction of a 1,200 square foot detached single family dwelling on that parcel.

7. Petroleum refining facilities.

a. **Proposed rule:** Applies waste-specific (K169-K172) land disposal restriction standards to four newly listed petroleum refining wastes.

General Public

No additional fiscal or economic impact is anticipated from adopting this rule.

Small Businesses

No additional fiscal or economic impact is anticipated from adopting this revision to federal hazardous waste rules that are currently in effect in Oregon.

Large Businesses

No additional fiscal or economic impact is anticipated from adopting this revision to federal hazardous waste rules that are currently in effect in Oregon.

Local Governments

No additional fiscal or economic impact is expected from adopting this rule.

State Agencies

No additional fiscal or economic impact is anticipated from adopting this rule.

Housing Cost Impact Statement

The Department has determined that the rulemaking will have no effect on the cost of development of a 6,000 square foot parcel and the construction of a 1,200 square foot detached single family dwelling on that parcel.

8. Facilities manufacturing organobromine.

a. **Proposed Rule:** Revises the LDRs for certain wastes from organobromine production and establishes LDR standards for those wastes.

General Public

No direct fiscal or economic impact is anticipated from adopting this rule.

Small Businesses

There is no organobromine production facility in Oregon; therefore, no additional fiscal or economic impact is anticipated from adopting this revision to federal hazardous waste rules that are currently in effect in Oregon.

Large Businesses

There is no organobromine production facility in Oregon; therefore, no additional fiscal or economic impact is anticipated from adopting this revision to federal hazardous waste rules that are currently in effect in Oregon.

Local Governments

No additional fiscal or economic impact is anticipated from adopting this rule.

State Agencies

No additional fiscal or economic impact is anticipated from adopting this rule.

Housing Cost Impact Statement

The Department has determined that the rulemaking will have no effect on the cost of development of a 6,000 square foot parcel and the construction of a 1,200 square foot detached single family dwelling on that parcel.

Exclusion from Certain Hazardous Waste Regulations

1. **Facilities that generate and recycle drippage and wastewaters on-site from water-borne wood preservation operations; facilities that recycle printed circuit boards; pulp and integrated mills that manufacture pulp and paper/paperboard; chemically pulp wood fiber using kraft, sulfite, soda, or semi-chemical methods to bleach wood; pulp secondary fiber, pulp nonwood fiber; and mechanically pulp wood fiber that generate condensate gases that are burned.**

    a. **Proposed Rules**: Conditionally excludes, from the definition of solid waste, recycled wastewater and spent formulation from water-borne wood preservation processes; clarifies the exclusion from RCRA regulation of whole printed circuit boards that are recycled; exempts from RCRA regulation condensates derived from steam stripping overhead condensate gases and then burning the characteristic hazardous waste gases in industrial boilers and furnaces.

General Public

No direct fiscal and economic impact is expected from adopting these rules.

Local Governments

No direct fiscal and economic impact is expected from adopting these rules.

Small Businesses

Potential economic and fiscal benefit is expected from adopting these rules because reusing secondary materials as primary materials may be less costly than disposing of them as wastes in a hazardous waste management facility.

Large Businesses

Potential economic and fiscal benefit is expected from adopting these rules because reusing secondary materials as primary materials may be less costly than disposing of them as wastes in a hazardous waste management facility.

State Agencies

No direct fiscal and economic impact is expected from adopting these rules.

Housing Cost Impact Statement

The Department has determined that the rulemaking will have no effect on the cost of development of a 6,000 square foot parcel and the construction of a 1,200 square foot detached single family dwelling on that parcel.

2. Facilities managing used oil.

a. **Proposed Rules:** Clarifies release requirements for used oil generators, transporters, processors, rerefiners, burners and marketers apply in states not authorized for the base RCRA program; amends three incorrect references to the pre-1992 used oil specifications managed under 40 CFR 279.

General Public

No direct fiscal and economic impact is expected from adopting this rule.

Small Businesses

No additional fiscal or economic impact is anticipated from adopting this revision to federal hazardous waste rules that are currently in effect in Oregon.

Large Businesses

No additional fiscal or economic impact is anticipated from adopting this revision to federal hazardous waste rules that are currently in effect in Oregon.

Local Governments

No direct fiscal and economic impact is expected from adopting this rule.

State Agencies

No direct fiscal and economic impact is expected from adopting this rule.

Housing Cost Impact Statement

The Department has determined that the rulemaking will have no effect on the cost of development of a 6,000 square foot parcel and the construction of a 1,200 square foot detached single family dwelling on that parcel.

3. Facilities generating petroleum refining wastes.

a. **Proposed rule:** Excludes from hazardous waste regulations certain oil bearing hazardous secondary materials, petrochemical recovered oil and spent caustic solutions from petroleum refining processes when they are recycled.

b. **Proposed rule:** Excludes catalyst support media from regulation when recycled.

c. **Proposed rule:** Expands the headworks exemption to include waste generated during petroleum refining process (K169-K172).

General Public

No direct fiscal and economic impact is expected from adopting this rule.

Small Businesses

Potential economic and fiscal benefit is expected from adopting these rules because reusing secondary materials as primary materials may be less costly than disposing of them as wastes in a hazardous waste management facility.

Large Businesses

Potential economic and fiscal benefit is expected from adopting these rules because reusing secondary materials as primary materials may be less costly than disposing of them as wastes in a hazardous waste management facility.

Local Governments

No direct fiscal and economic impact is expected from adopting this rule.

State Agencies

No direct fiscal and economic impact is expected from adopting this rule.

Housing Cost Impact Statement

The Department has determined that the rulemaking will have no effect on the cost of development of a 6,000 square foot parcel and the construction of a 1,200 square foot detached single family dwelling on that parcel.

4. **Facilities managing or burning fuel-like hazardous wastes.**

   a. **Proposed Rule:** Excludes from the definition of solid waste fuels which would normally be a hazardous waste, but which are comparable to some currently used fossil fuels.

General Public

No direct fiscal and economic impact is expected from adopting this rule.

Small Businesses

Potential economic and fiscal benefit is expected from adopting this rule because reusing secondary materials as primary materials may be less costly than disposing of them as wastes in a hazardous waste management facility.

Large Businesses

Potential economic and fiscal benefit is expected from adopting this rule because reusing secondary materials as primary materials may be less costly than disposing of them as wastes in a hazardous waste management facility.

Local Governments

No additional or economic impact is anticipated from adopting this rule.

State Agencies

No additional fiscal or economic impact is anticipated from adopting this rules.

Housing Cost Impact Statement

The Department has determined that the rulemaking will have no effect on the cost of development of a 6,000 square foot parcel and the construction of a 1,200 square foot detached single family dwelling on that parcel.

5. Facilities managing mineral processing wastes.

1. **Proposed Rule:** Conditionally excludes from the definition of solid waste mineral processing waste that is recycled.

General Public

No direct fiscal and economic impact is expected from adopting this rule.

Small Businesses

Potential economic and fiscal benefit is expected from adopting this rule because reusing secondary materials as primary materials may be less costly than disposing of them as wastes in a hazardous waste management facility.

Large Businesses

Potential economic and fiscal benefit is expected from adopting this rule because reusing secondary materials as primary materials may be less costly than disposing of them as wastes in a hazardous waste management facility.

Local Governments

No additional or economic impact is anticipated from adopting this rule.

State Agencies

No additional fiscal or economic impact is anticipated from adopting this rules.

Housing Cost Impact Statement

The Department has determined that the rulemaking will have no effect on the cost of development of a 6,000 square foot parcel and the construction of a 1,200 square foot detached single family dwelling on that parcel.

Newly Listed Hazardous Waste

1. **Facilities manufacturing organobromine.**

    a. **Proposed rule:** Lists certain wastes (K140, U408) from organobromine production.

General Public

No direct fiscal and economic impact is expected from adopting this rule.

Small Businesses

No additional fiscal or economic impact is anticipated from adopting this rule because there are no organobromine producers in Oregon.

Large Businesses

No additional fiscal or economic impact is anticipated from adopting this rule because there are no organobromine producers in Oregon.

Local Governments

No direct fiscal and economic impact is expected from adopting this rule.

State Agencies

No direct fiscal and economic impact is expected from adopting this rule.

Housing Cost Impact Statement

The Department has determined that the rulemaking will have no effect on the cost of development of a 6,000 square foot parcel and the construction of a 1,200 square foot detached single family dwelling on that parcel.

2. Facilities generating petroleum refining wastes.

a. **Proposed rule:** Lists four new wastes (K169-K172) generated during petroleum refining.

General Public

No direct fiscal and economic impact is expected from adopting this rule.

Small Businesses

No additional fiscal or economic impact is anticipated from adopting this rule because the rule is already in effect in Oregon.

Large Businesses

No additional fiscal or economic impact is anticipated from adopting this rule because the rule is already in effect in Oregon.

Local Governments

No direct fiscal and economic impact is expected from adopting this rule.

Housing Cost Impact Statement

The Department has determined that the rulemaking will have no effect on the cost of development of a 6,000 square foot parcel and the construction of a 1,200 square foot detached single family dwelling on that parcel.

State of Oregon
DEPARTMENT OF ENVIRONMENTAL QUALITY

Rulemaking Proposal
for
Amending Oregon Hazardous Waste Administrative Rules

Land Use Evaluation Statement

1. Explain the purpose of the proposed rules.

A. Amend Oregon Administrative Rules to permanently adopt new Land Disposal Restrictions[1] for spent hazardous waste potliner and to adopt a number of other federal hazardous waste regulations with amendments.

The purpose of amending and adopting proposed changes to current federal hazardous waste rules is to largely maintain consistency and equivalency with the federal hazardous waste program and to implement that program in lieu of EPA.

2. Do the proposed rules affect existing rules, programs or activities that are considered land use programs in the DEQ State Agency Coordination (SAC) Program?

Yes X No____

a. If yes, identify existing program/rule/activity:

The hazardous waste treatment, storage and disposal permit program has been identified as a program affecting land use. OAR 340-18-030.

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[1] LDR standards are technology-based constituent concentration levels that must be met before a hazardous waste is disposed of in a hazardous waste landfill.

b. If yes, do the existing statewide goal compliance and local plan compatibility procedures adequately cover the proposed rules?

Yes X No_____ (see explanation below):

The majority of the amendments address changes to the Land Disposal Restriction requirements for hazardous wastes. Amendments to incorporate changes to federal regulations affecting hazardous waste generators and treatment, storage and disposal facilities will be incorporated into permit criteria. Under current land use procedures, a Land Use Compatibility Statement is required of local government before a hazardous waste permit is issued.

c. If no, apply the following criteria to the proposed rules.

In the space below, state if the proposed rules are considered programs affecting land use. State the criteria and reasons for the determination.

N/A

3. If the proposed rules have been determined a land use program under 2. above, but are not subject to existing land use compliance and compatibility procedures, explain the new procedures the Department will use to ensure compliance and compatibility.

N/A

Mary Wahl
Waste Management and Cleanup Division — Intergovernmental Coord. — 1/13/99 Date
Amending Oregon Hazardous Waste Administrative Rules

Attachment B.4
Supporting Procedural Documentation
Questions to be Answered to Reveal Potential Justification for Differing from Federal Regulations
Amending Oregon Hazardous Waste Rules
EQC Agenda Item E
March 19, 1999

Questions to be Answered to Reveal Potential Justification for Differing from Federal Requirements.

1. Are there federal requirements that are applicable to this situation? If so, exactly what are they?

All proposed changes except two are changes to the federal program that have been promulgated by the Environmental Protection Agency (EPA). The two changes to the federal program that the Department proposes to make affect the land application in Oregon of fertilizer that is manufactured from hazardous wastes.

EPA's hazardous waste regulations (1) exempt from any land disposal restriction requirements[1] K061 hazardous waste dust from electric arc furnaces when the dust is manufactured into fertilizer[2]; and (2) apply previous, old land disposal restriction requirements to fertilizers that are produced from zinc-containing characteristic hazardous wastes. The Department proposes to reject both regulations for fertilizers made from zinc-containing hazardous wastes and proposes to apply current federal land disposal restriction standards to those waste-derived fertilizers when they are applied to Oregon land.

2. Are the applicable federal requirements performance based, technology based, or both with the most stringent controlling?

The proposed changes to current federal requirements are technology based.

3. Do the applicable federal requirements specifically address the issues that are of concern in Oregon? Was data or information that would reasonably reflect Oregon's concern and situation considered in the federal process that established the federal requirements?

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[1] Land Disposal Restrictions are concentration-based levels of hazardous constituents that must be met before a hazardous waste containing those constituents may be disposed of on land such as in a landfill.

[2] This exemption has been in effect since 1988.

Yes. The proposed changes to current federal requirements address the issues that are of concern in Oregon. All hazardous wastes should be required to meet appropriate land disposal restriction standards before being disposed on land, regardless of whether disposal occurs in a landfill or on land as a fertilizer. It is not known whether data or information specific to Oregon was considered in the establishment of the federal requirements.

4. Will the proposed requirement improve the ability of the regulated community to comply in a more cost effective way by clarifying confusing or potentially conflicting requirements (within or cross-media), increasing certainty, or preventing or reducing the need for costly retrofit to meet more stringent requirements later?

Yes. Some of the proposed changes clarify existing, confusing language, and some changes may be less prescriptive and onerous than the requirements being currently implemented in Oregon. For example, the changes to the regulations for recycling used printed circuit boards clarifies that boards can be recycled with minimum amounts of mercury; and the conditional exemption from the definition of hazardous wastes for certain wastes that are recycled is a reduction in regulations for parties that recycle those wastes.

5. Is there a timing issue which might justify changing the time frame for implementation of federal requirements?

No.

6. Will the proposed requirement assist in establishing and maintaining a reasonable margin for accommodation of uncertainty and future growth?

Yes.

7. Does the proposed requirement establish or maintain reasonable equity in the requirements for various sources? (level the playing field)

Yes, all affected parties that dispose of hazardous waste on Oregon land, either in landfills, or on the land as waste-derived fertilizers must comply with the same requirements.

8. Would others face increased costs if a more stringent rule were not enacted?

N/A

9. Does the proposed requirement include procedural requirements, reporting or monitoring requirements that are different from applicable federal requirements? If so, Why? What is the "compelling reason" for different procedural, reporting or monitoring requirements?

No.

10. Is demonstrated technology available to comply with the proposed requirement?

Yes. There is demonstrated technology available to manufacture zinc-containing fertilizers that contain fewer contaminants or less concentration of contaminants than previous technology that was used to manufacture zinc-containing hazardous waste derived fertilizers.

11. Will the proposed requirement contribute to the prevention of pollution or address a potential problem and represent a more cost-effective environmental gain?

Yes. The zinc-containing fertilizers derived from hazardous wastes will contain fewer hazardous constituents or will have reduced concentrations of hazardous contaminants. This in turn will reduce the volume of hazardous contaminants in the environment.

Gcgjc11599

Attachment B.5
Supporting Procedural Documentation
Cover Memorandum from Public Notice
Amending Oregon Hazardous Waste Rules
EQC Agenda Item E
March 19, 1999

State of Oregon
Department of Environmental Quality **Memorandum**

Date: January 15, 1999

To: Interested and Affected Public

From: Anne Price, Manager, Hazardous Waste Policy and Program Development

Subject: **Hazardous Waste Rulemaking**

I. HAZARDOUS WASTE PROGRAM PROPOSED RULEMAKING PROCESS

A. Subject

Amend Oregon Administrative Rules to permanently adopt new Land Disposal Restrictions[1] for spent hazardous waste potliner and to adopt a number of other federal hazardous waste regulations with amendments. Most federal hazardous waste rules published through October 9, 1998 that are proposed for adoption (1) establish or revise concentration levels for hazardous constituents when they are disposed, including constituents in soils contaminated by hazardous wastes; (2) conditionally exclude from most hazardous waste regulations certain hazardous wastes that are recycled; and (3) establish new hazardous wastes. Proposed amendments to the rules remove (1) an exemption from new land disposal restrictions for zinc-containing fertilizers made from characteristic hazardous wastes; and (2) an existing federal and state exemption from any land disposal restrictions for zinc-containing fertilizers made from K061 hazardous waste dust from steel production. Amending these rules will have the effect of applying new federal U.S. EPA land disposal restriction constituent concentration levels to hazardous constituents in these waste-derived fertilizers before they may be applied to Oregon land.

With this rulemaking package, the Department has evaluated and made recommendations for adoption on all federal hazardous waste regulations promulgated by U.S. EPA as of October 9, 1998.

The Department has statutory authority to address this issue under ORS 466.015, 466.020, 466.025, 466.070, 466.075, 466.086, 466.095, and 466.100.

B. What's in this Package?

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[1] "LDR" standards are technology-based constituent concentration levels that must be met before a hazardous waste may be disposed of in a hazardous waste landfill.

Section II lists the rules the Department is proposing for adoption by the Environmental Quality Commission (EQC). The rules are arranged by three main issue categories and then by the category of facility potentially impacted. Section III contains more detailed information on the proposed rules.
Attachments to this memorandum provide details on the proposal as follows:

Attachment A	The actual language of the proposed rule.
Attachment B	The official statement describing the fiscal and economic impact of the proposed rule. (Required by ORS 183.335).
Attachment C	A statement providing assurance that the proposed rules are consistent with statewide land use goals and compatible with local land use plans.
Attachment D	Questions to be Answered to Reveal Potential Justification for Differing from Federal Requirements.

C. Rulemaking Process

How was the rule developed?

The Department held an information meeting on January 11, 1999 to hear comments and questions on the proposed rulemaking. Prior to this meeting, the Department mailed information on this rulemaking to approximately 1,900 parties, including hazardous waste treatment, storage, and disposal facilities; hazardous waste generators; fertilizer registrants; and parties interested in hazardous waste cleanups. This notice included the two known manufacturers of fertilizer using K061. Notice of this staff report will be sent to a similar group of interested parties.

Public Hearing and Comments Process Details

The Department will conduct a public hearing on the proposed rule amendments at which comments will be accepted either orally or in writing. The hearing will be held as follows:

Date: **February 18, 1999**
Time: 1:00 p.m.
Place: Department of Environmental Quality
Rm. 3A (third floor), 811 S.W. 6th Avenue
Portland OR 97204.

Gary Calaba will be the Presiding Officer at the hearing.

Deadline for written comments: 5:00 p.m., February 22, 1999.

Written comments can be presented at the hearing or to the Department any time prior to 5:00 p.m., February 22, 1999. Comments should be sent to: Department of Environmental Quality, Attn: Gary Calaba, 811 S.W. 6th Avenue, Portland, Oregon 97204; or calaba.gary.j@deq.state.or.us.

No comments from any party can be accepted after the deadline for submission of comments has passed (ORS 183.335(13)). If you wish the Department to consider your comments in the development of these rules, you must submit them prior to the close of the comment period. The Department recommends that comments be submitted as early as possible to allow for adequate review and evaluation.

What Happens After the Public Comment Period Closes

Following close of the public comment period, the Presiding Officer will prepare a report which summarizes the oral testimony presented and identifies written comments submitted. The Environmental Quality Commission (EQC) will receive a copy of the Presiding Officer's report. The public hearing will be tape recorded, but the tape will not be transcribed.

The Department will then review and evaluate the rulemaking proposal in light of all information received during the comment period. Following the review, the Department may present the rules to the EQC as originally proposed in the staff report or with modifications made in response to public comments received.

The EQC will consider the Department's recommendation for rule adoption at their **March 19, 1999 meeting to be held in Portland, Oregon.**

You will be notified of the time and place for final EQC action if you present oral testimony at the hearing or submit written comment during the comment period. Otherwise, if you wish to be kept advised of this proceeding, you should request that your name be placed on the mailing list.

Contact for More Information

If you would like more information on this rulemaking proposal, or would like to be added to the mailing list, please contact: Gary Calaba at 503-229-6534; or calaba.gary.j@deq.state.or.us. Documents relied upon in the development of this rulemaking proposal can be reviewed at the Department Headquarters office at 811 S.W. 6th Avenue, Portland, Oregon. Please contact Gary Calaba for times when the documents[2] are available for review.

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[2] Documents include Oregon Revised Statutes; federal and state hazardous waste regulations; federal statutes; federal EPA Stakeholder Meeting [Notes] on Hazardous Waste Derived Fertilizers; Federal Court rulings; and Washington State information on fertilizers.

This publication is available in alternate format (e.g., large print, Braille) upon request. Please contact DEQ Public Affairs at 503-229-5317 to request an alternate format.

II. OVERVIEW OF PROPOSED RULES

Listed below are the rules proposed for adoption and whom they will affect. Rules designated "not in effect (NIE)" are not in effect in Oregon until they are adopted. The remaining rules are currently in effect in Oregon, but implemented and overseen by U.S. EPA. The Department prefers to maintain its position as the primary implementing agency with respect to the hazardous waste program in the State of Oregon.

These rules are arranged in three categories:

(1) land disposal restriction standards;
(2) exclusions from certain hazardous waste regulations; and
(3) newly listed hazardous waste.

Each of these categories, and the background, Oregon impact and Department recommendation, is covered more fully in Section III.

Land Disposal Restriction Standards

Land Disposal Restriction Standards must be met before hazardous wastes may be disposed of in a hazardous waste landfill or on land. The standards apply to the hazardous constituents found in the wastes and are based on best available technology. The standards may be either concentration-based or technology specific. The requirement for standards was mandated by Congress in 1984 to minimize the threat of hazardous constituents to human health and the environment. Standards are achieved by either removing constituents from the wastes; rendering them immobile; or reducing their concentrations.

A. Steel mills and other facilities producing zinc-containing hazardous wastes, manufacturers of fertilizers or soil amendments made from zinc-containing Toxicity Characteristic[3] (TC) hazardous wastes or zinc-containing listed hazardous waste[4].

1. **Proposed Rule:** Requires zinc-containing fertilizers made from TC characteristic hazardous wastes to meet new LDR standards before land

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[3] "Toxicity Characteristic" hazardous wastes are hazardous because they exhibit measurable chemical and/or physical properties that threaten human health and the environment. (40 CFR § 261.24)

[4] "Listed Hazardous Wastes" are hazardous because they contain hazardous contaminants produced from specific and non-specific sources that threaten human health and the environment. (40 CFR Part 261, Subpart D)

application. 63 Federal Register (FR) 46332. NIE.

2. **Proposed Rule**: Requires zinc-containing fertilizers made from K061 listed hazardous waste (emission control dust from primary production of steel in electric arc furnaces) to meet new LDR standards before land application. 53 FR 31164. NIE.

B. Primary mineral processors, chemical manufacturers, pharmaceutical producers, paint producers, motor vehicle parts manufacturers, blast furnaces, boilers, steel mills, metal plating, and aircraft parts and equipment manufacturers that are generators of Toxicity Characteristic (TC) metal hazardous wastes (D004-D011), other characteristic wastes (D001-D003 and D012 -D043) when subject to UTS, characteristic mineral processing wastes, or any hazardous waste required to meet the LDR treatment standards for antimony, barium, beryllium, cadmium, chromium, lead, nickel, selenium, silver, thallium, vanadium, or zinc.

1. **Proposed Rule:** Revises Universal Treatment Standard[5] (UTS) levels for 12 nonwastewater treatment standards for metal-bearing listed or characteristic hazardous wastes. 63 FR 28556.

2. **Proposed Rule:** Requires UTS levels to be met for all known Underlying Hazardous Constituents[6] (UHCs) in Toxicity Characteristic (TC) metallic wastes. 63 FR 28556.

3. **Proposed Rule:** Establishes LDR treatment standards for characteristic mineral processing wastes, including manufactured gas plant wastes. 63 FR 28556.

4. **Proposed Rule:** Clarifies LDR applicability to boiler cleanout wastewater. 63 FR 28556.

C. Private or public parties cleaning up soil contaminated by hazardous waste.

1. **Proposed Rule:** Establishes alternative LDR treatment standards for soils contaminated by hazardous waste. 63 FR 28556. NIE.

D. Facilities melting lead recovered primarily from lead-battery reclamation.

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[5] "Universal Treatment Standards" (UTS) are universal concentration limits for constituents of concern regardless of the waste in which they are found.

[6] "Underlying Hazardous Constituents" (UHCs) are constituents listed in the UTS table which can reasonably be expected to be present in wastes at concentrations above the UTS treatment levels.

1. **Proposed Rule:** Extends the LDR compliance date for characteristic slags generated from thermal recovery of lead by secondary lead smelters. 63 FR 48124.

2. **Proposed Rule:** Requires slag from lead smelting operations to meet LDR standards before being land disposed. 63 FR 48124.

E. **Manufacturers of carbamate.**

1. **Proposed Rule:** Revises the LDRs for seven listed hazardous wastes from carbamate production and amends previous regulations. 63 FR 47409.

F. **Primary aluminum reduction facilities.**

1. **Proposed Rule**: Adopts permanently the adopted temporary LDR standards for spent potliners (K088) from primary aluminum reduction. 63 FR 51254.

G. **Petroleum refining facilities.**

1. **Proposed Rule:** Applies waste-specific (K169-K172) land disposal restriction standards to four newly listed petroleum refining wastes. 63 FR 24596.

H. **Facilities manufacturing organobromine.**

1. **Proposed Rule:** Revises the LDRs for certain wastes from organobromine production and establishes LDR standards for those wastes. 63 FR 35147.

Exclusion from Certain Hazardous Waste Regulations

Under certain conditions, usually predicated on what a hazardous waste is and how it is being managed, EPA will exclude a waste from some or all hazardous waste regulations. The most common example of this is when a waste is excluded from hazardous waste regulations because it is being regulated under another set of environmental controls, such as when a hazardous waste is discharged to a sewage treatment plant. In this example, the hazardous waste becomes regulated by water quality standards because the sewage treatment plant discharges treated wastewater (hazardous wastes) to a waterway and will need to comply with water quality standards. Another example of how EPA excludes hazardous wastes from regulation, is the exclusion from regulation of wastes that are recycled by being used as ingredients to make salable products, or are themselves product-like, or when the recycling process poses little or no threat to human health or the environment. Many of the following proposed regulations exclude wastes from most or all hazardous regulations because of what the wastes are and how they are being recycled.

A. **Facilities that generate and recycle drippage and wastewaters on-site from water-borne wood preservation operation.**

1. **Proposed Rule**: Conditionally excludes from the definition of solid waste recycled wastewater and spent formulation from water-borne wood preservation processes. 63 FR 28556. NIE.

B. **Facilities that recycle printed circuit boards.**

1. **Proposed Rule:** Clarifies the exclusion from RCRA regulation of whole printed circuit boards that are recycled. 63 FR 28556. NIE.

C. **Pulp and integrated mills that manufacture pulp and paper/ paperboard; chemically pulp wood fiber using kraft , sulfite, soda, or semi-chemical methods to bleach wood; pulp secondary fiber, pulp nonwood fiber; and mechanically pulp wood fiber.**

1. **Proposed Rule:** Exempts from RCRA regulation condensates derived from steam stripping overhead condensate wastes and then burning the characteristic hazardous waste gases in industrial boilers and furnaces. 63 FR 18504. NIE.

D. **Facilities managing used oil.**

1. **Proposed Rule:** Clarifies release requirements for used oil generators, transporters, processors, rerefiners, burners and marketers apply in states not authorized for the base RCRA program; amends three incorrect references to the pre-1992 used oil specifications managed under 40 CFR 279. 63 FR 24963 and 63 FR 37780. NIE.

E. **Facilities generating petroleum refining wastes.**

1. **Proposed Rule:** Excludes from hazardous waste regulations certain oil-bearing hazardous secondary materials, petrochemical recovered oil, and spent caustic solutions from petroleum refining processes when they are recycled. 63 FR 42110. NIE.

2. **Proposed Rule:** Excludes catalyst support media from regulation when recycled. 63 FR 42110. NIE

3. **Proposed Rule:** Expands the headworks exemption to include waste generated during petroleum refining process (K169-K172). 63 FR 42110. NIE.

F. Facilities managing or burning fuel-like hazardous wastes.

1.Proposed Rule: Excludes from the definition of solid waste fuels which would normally be a hazardous waste, but which are comparable to some currently used fossil fuels. 63 FR 33782. NIE.

G. Facilities managing mineral processing wastes.

1. **Proposed Rule:** Conditionally excludes from the definition of solid waste mineral processing waste that is recycled. 63 FR 28556. NIE.

Newly Listed Hazardous Wastes

One way in which wastes become identified as being "hazardous" is when U.S. EPA adds them to an existing listing of hazardous wastes. The listing decision is based on the degree of hazard wastes poses to human health and the environment if not managed properly. EPA collects data on a waste and evaluates the information to determine whether or not the waste is a threat to human health and the environment if it is not managed properly. If the waste is a threat, then EPA will list the waste as hazardous. After a waste is listed, EPA requires responsible parties to manage the waste according to the hazardous waste regulations.

A. Facilities manufacturing organobromine.

1. **Proposed Rule:** Lists certain wastes (K140, U408) from organobromine production and establishes LDR standards for those wastes. 63 FR 24596.

B. Facilities generating petroleum refining wastes.

1. **Proposed Rule:** Lists new wastes (K169-K172) generated during petroleum refining. 63 FR 56709.

III. PROPOSED RULE DESCRIPTION

The Department usually adopts federal U.S. EPA hazardous waste regulations by reference without providing as much detail as is included in this package. However, federal rules are becoming more complex, with less stringent and more stringent requirements intertwined in one rule. The Department has attempted to clarify the impact these rules will have by

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grouping them by issue and then by the category of facility affected. Then, for each rule, the Department has provided the rule background, the projected Oregon impact and the Department's recommendation.

Overall, the Department is proposing to adopt all but one of the federal hazardous waste regulations promulgated by U.S. EPA from April 30, 1998 through October 9, 1998. The rules proposed for adoption include those that are already in effect in Oregon through federal implementation and oversight. Adoption of these rules will ensure that the Department remains the primary implementing agency in the State. Also proposed for adoption are a number of rules (denoted by "NIE" - not in effect) that provide midcourse corrections to or are considered to be less stringent than the current hazardous waste regulations. These rules will allow for greater flexibility or provide increased clarity in key areas, such as hazardous waste recycling.

The one federal rule (see LDR Rule A(1) below) the Department is not proposing to adopt would have continued to treat zinc-containing characteristic hazardous wastes that are used to manufacture fertilizer differently from all other recycled wastes. In addition, to ensure consistency among all hazardous wastes recycled into fertilizers, the Department is proposing to remove an existing regulatory exemption for K061 (zinc-containing baghouse dust from primary steel production) that only that waste stream had available. (See LDR Rule A(2) below.)

Land Disposal Restriction Standards

A. Steel mills and other facilities producing zinc-containing hazardous wastes, manufacturers of fertilizers or soil amendments made from zinc-containing Toxicity Characteristic[10] (TC) hazardous wastes or zinc-containing listed hazardous waste[11].

1. **Proposed Rule:** Requires zinc-containing fertilizers made from TC characteristic hazardous wastes to meet new LDR standards before land application. 63 Federal Register FR 46332. NIE.

a. **Background**:

On May 26, 1998, EPA published an amendment to the Land Disposal Restriction (LDR) treatment standards for metal-bearing hazardous wastes that exhibit the characteristic of toxicity (TC). The EPA rule stays application of the required land disposal restriction

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[10] "Toxicity Characteristic" hazardous wastes are hazardous because they exhibit measurable chemical and/or physical properties that threaten human health and the environment. (40 CFR § 261.24)

[11] "Listed Hazardous Wastes" are hazardous because they contain hazardous contaminants produced from specific and non-specific sources that threaten human health and the environment. (40 CFR Part 261, Subpart D)

standards for characteristic zinc-containing hazardous waste that is made into fertilizer. EPA issued the amendment because they are evaluating the overarching issue of how LDRs should apply to hazardous waste derived fertilizers.

The Department believes the Phase IV land disposal restriction standards should apply to characteristic hazardous wastes when they are used in the manufacture of fertilizer (the standards apply to the fertilizer product). These characteristic hazardous waste-derived fertilizers may contain concentrations of toxic substances, such as lead, cadmium, arsenic, and chromium, which do not contribute to the nutritive value of the fertilizer. Applying the Phase IV LDR standards to these fertilizers levels the regulatory playing field. All other hazardous wastes (LDR rule A(2) would be the exception if not adopted), including those used in fertilizer must meet the LDRs before being land applied through a use constituting disposal. The metal-bearing hazardous waste fertilizers largely affected by this rule are made from brass dust and tire ash, both zinc-containing and both TC hazardous wastes.

b. Oregon Impact:

Not adopting the federal stay of the LDRs for zinc containing hazardous waste fertilizers affects Oregon in two ways:

- Zinc-containing TC hazardous waste derived fertilizers will need to meet the lower Phase IV concentrations levels for toxic, non-nutritive constituents, than previously required. The economic impact to farmers in Oregon should be minimal because there are other sources of zinc-containing fertilizers that are not derived from TC hazardous wastes or that may meet the standards. The longer term environmental impact to farmers could be great if fields receive a reduced loading of non-nutritive hazardous ingredients.

- Manufacturers marketing the TC hazardous waste-derived zinc fertilizer products to Oregon distributors or users will need to ensure that those fertilizers meet the new LDR standards before being used in Oregon. There are two known manufacturers of zinc containing hazardous waste fertilizer; one in Washington State, one in Illinois. Both have been notified of this rulemaking.

c. Department Recommendation:

The Department proposes not to adopt the stay. The Department believes that all hazardous waste derived fertilizers should meet applicable land disposal restriction levels for constituents of concern. The LDR constituent levels the stay would cause to remain in effect are different (some are less stringent) than the Phase IV levels that other, non-zinc, characteristic derived fertilizers need to meet. It does not make sense for the non-nutritive toxic constituent concentration levels in one fertilizer made from one metal-bearing characteristic hazardous waste to meet standards that are different than the constituent concentration levels in another fertilizer made from a different metal-bearing hazardous waste. The Department cannot justify two sets of different standards and believes, instead, that all TC metal-bearing hazardous waste derived fertilizers should meet the same standards before being applied to land, regardless of whether they contain zinc.

2. **Proposed Rule**: Requires zinc-containing fertilizers made from K061 listed hazardous waste (emission control dust from primary production of steel in electric arc furnaces) to meet new LDR standards before land application. 53 FR 31164. NIE.

a. **Background:**

Currently, federal and state regulations do not require application of the LDR constituent concentration levels to zinc-containing fertilizers made from the listed hazardous waste K061, baghouse dust, that is applied to Oregon land. K061 is the baghouse dust that is generated during primary steel production. This exclusion was promulgated by EPA in 1988 and was adopted by the Department. The prevailing federal view at the time was that there was no significant difference between K061-derived fertilizer and other zinc-containing fertilizers made from naturally occurring materials. We now believe that there is a difference that the regulations should reflect.

Historically, K061 hazardous waste baghouse dust has been made into zinc-containing micronutrient fertilizer in Washington State. Zinc is a valuable nutrient for plants, particularly row crops, such as potatoes. When soils do not contain enough zinc, Oregon farmers apply zinc-containing fertilizers. A substantial proportion of zinc fertilizers are made from baghouse dust. These fertilizers may contain high concentrations of non-nutritive constituents such as heavy metals (9,490 ppm lead[12]). Other feedstocks (refined zinc ores; galvanizing fines) are available sources of zinc and are less likely to contain high concentrations of non-nutritive ingredients.

There are two manufacturers in the country that produce fertilizers from K061 hazardous waste: one facility in Illinois, and one in Washington State. The state of Washington recently adopted regulations that require hazardous waste derived fertilizers including K061 to meet new fertilizer standards. The facility in Washington State is currently modifying its K061 fertilizer manufacturing processes to meet Washington State's fertilizer standards. These standards limited the production and use of K061 derived fertilizers in Washington State, because toxic constituents in the fertilizer failed to meet the State's fertilizer laws. The facility in Illinois still manufactures a K061-derived fertilizer that does not meet Washington State's new standards. In addition to containing non-nutritive heavy metals, those fertilizers

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[12] Commercial Fertilizer, Frit F-420G, *Fact Sheet, 1998 Washington State Fertilizer and Soil Studies.* This fertilizer is not registered for use in Washington State.

contain the highest concentration of dioxin measured to-date by Washington State environmental personnel. Those fertilizers are in use in Oregon.

For the reasons stated above (and in LDR Rule A(1)), the Department proposes to delete the current federal and Oregon LDR exclusion for K061 baghouse dust from primary steel production when used as a zinc micronutrient fertilizer and applied to land.

b. Oregon Impact:

Taking this action affects Oregon in two ways:

- Deleting the exclusion imposes, for the first time, the land disposal restriction constituent concentration levels on 12 non-nutritive metal constituents found in K061 derived fertilizers that are applied to Oregon land.
- The manufacturers marketing, to fertilizer distributors or users, any K061 baghouse dust derived fertilizers, regardless of the K061's origin, must ensure that those fertilizers meet those LDR standards before being applied to Oregon land.

c. Department Recommendation:

The Department recommends removal of the existing exclusion from the land disposal restrictions for K061 hazardous waste derived fertilizer. All hazardous wastes, whether they are listed or characteristic hazardous wastes, that are made into fertilizers should meet applicable LDR standards before they are applied to land. There should be no exceptions. The land disposal restriction standards were developed to minimize threats to human health and the environment from hazardous waste constituents leaching from regulated landfills. Environmental planners realized that hazardous constituents were being concentrated in confined spaces and would eventually leak from landfills, and the hazardous constituents in the leachate would be at high concentration. To reduce the impact of the leachate on the environment, the LDR standards, with their low constituent concentration levels, were developed. Those same concentration restrictions should apply to hazardous waste fertilizers before they are applied to land. All other hazardous wastes that are recycled and will be applied to the land must meet the LDRs. This rule levels the playing field for all wastes.

B. Primary mineral processors, chemical manufacturers, pharmaceutical producers, paint producers, motor vehicle parts manufacturers, blast furnaces, boilers, steel mills, metal plating, and aircraft parts and equipment manufacturers that are generators of Toxicity Characteristic (TC) metal hazardous wastes (D004-D011), other characteristic wastes (D001-D003 and D012 -D043) when subject to UTS, characteristic mineral processing wastes, or any hazardous waste required to meet the LDR treatment standards for antimony, barium, beryllium, cadmium, chromium, lead, nickel, selenium, silver, thallium, vanadium, or zinc.

1. **Proposed Rule:** Revises Universal Treatment Standard[13] (UTS) levels for 12 nonwastewater treatment standards for metal-bearing listed or characteristic hazardous wastes. 63 FR 28556.

a. Background:

The federal rules require D004-D011 characteristic metal hazardous wastes and other metal bearing characteristic wastes, D001-D003 and D012-D043, when their treatment standards include meeting the UTS, to meet UTS levels in nonwastewater before the wastes may be land disposed. This new rule changes 12 metal UTS levels previously established under Phase II and III rules. The new UTS levels for five metals (antimony, cadmium (D006), chromium (D007), silver (D011) and zinc) are lower (more stringent) than previous standards; and the UTS levels for seven metals (barium (D005), beryllium, lead (D008), nickel, selenium, thallium, and vanadium) are higher (less stringent) than previous standards. EPA revised the numerical standards for the 12 metals, because new data became available on which to base more accurate standards.

b. Oregon Impact:

Hazardous waste generators and treatment, storage and disposal facilities managing D004-D011 characteristic or listed metal wastes, or other characteristic wastes containing metals, and required to meet UTS, need to meet LDR requirements before disposing of the wastes on land. Generators need to notify the management facility that their wastes either meet or do not meet the standards. If they meet the standards, the generator must certify that they do and maintain all notifications on-site for three years. EPA states that the overall impact from revising the UTS levels for the 12 metals is neither more nor less stringent, even though some concentration levels are clearly lower and some are higher than previous standards for those metals.

c. Department Recommendation:

Adopt both the lower and higher UTS standards for any characteristic wastes containing the 12 metals because that will eliminate competing federal and state concentration level requirements for those metals.

2. **Proposed Rule:** Requires UTS levels to be met for all known Underlying Hazardous Constituents[14] ("UHC") in Toxicity Characteristic (TC) metallic wastes. 63 FR 28556.

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[13] "Universal Treatment Standards" are universal concentration limits for constituents of concern regardless of the waste in which they are found.

[14] "UHCs (Underlying Hazardous Constituents)" are toxic constituents listed in the UTS table which can reasonably be expected to be present at the point of generation at a concentration above the constituent-specific UTS treatment standard.

a. Background:

The Phase IV LDR rule requires that all reasonably known UHCs in TC metal wastes that are listed in the UTS table be treated before the wastes are land disposed. This rule makes it clear that certain metallic wastes, including toxic characteristic ("TC") metal wastes (see LDR rule B(3)), when rendered nonhazardous and subsequently managed in Clean Water Act ("CWA") systems, are not subject to RCRA treatment standards. Also, TC wastes D004-D011, may be diluted such that they no longer exhibit a characteristic and then may be managed in CWA systems without meeting LDR standards.

b. Oregon Impact:

The new standards are already in effect in Oregon under EPA's oversight. Generators and TSDs will need to meet the new mandatory UTS standards before their metal-bearing listed or characteristic hazardous wastes may be land disposed.

c. Department Recommendation:

Adopt the new rule to maintain consistency with the federal program and to maintain the state as the primary implementing agency.

3. **Proposed Rule:** Establishes LDR treatment standards for characteristic mineral processing wastes, including manufactured gas plant wastes. 63 FR 28556.

a. Background:

Prior to this federal rule, Oregon's more stringent program already regulated all hazardous mineral processing wastes[15], including the 20 U.S. EPA exempted Bevill mineral processing wastes. However, under Oregon's rules the federal LDRs did not apply. EPA is now choosing to regulate all generators and mineral processing facilities if their newly identified mineral processing wastes are hazardous and are not one of the 20 Bevill exempted wastes. EPA's Phase IV rule requires that newly identified mineral processing hazardous wastes comply with LDR standards. The newly identified mineral processing hazardous wastes must meet UTS for all known UHCs before they may be disposed in a hazardous waste landfill.

b. Oregon Impact:

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[15] Mineral processing wastes are any wastes that are derived from processes that make available for use a desired mineral and which are regulated as hazardous wastes if they fail any characteristic.

Facilities generating mineral processing wastes, including the 20 Bevill wastes, that are hazardous, will need to make certain that those wastes meet applicable LDR standards and meet UTS for any UHCs reasonably expected to be in the wastes before the wastes are disposed in a hazardous wastes landfill.

In addition, there are five cleanup sites in Oregon where debris and soils contain manufactured gas plant wastes. Manufactured gas plant wastes is considered by EPA as a subset of mineral processing wastes. Therefore, if manufactured gas plant wastes are hazardous, then the rules require that the wastes meet the applicable LDR standards and UTS for any UHCs before the wastes are disposed in a hazardous waste landfill.

c. Department Recommendation:

Adopt the federal LDR standards for hazardous mineral processing waste that is disposed, and maintain Oregon's more stringent regulation of the 20 Bevill exempt wastes.[16]

4. **Proposed Rule:** Clarifies LDR applicability to boiler cleanout wastewater. 63 FR 28556.

a. Background:

The rule clarifies that boiler cleanout washwater at power plants often is hazardous (D002, D007 and D008) and that the point of determination is after the entire volume of washwater has been captured in a single, dedicated tank system, or in temporary tanks. If the accumulated wastewater continues to exhibit any characteristic, then the wastewater is subject to LDR if land disposal is an option.

b. Oregon Impact:

This federal rule is already in effect in Oregon through federal EPA oversight. Adopting this rule will make the Oregon requirement program consistent with EPA and will maintain the state as the primary implementing agency. This rule affects power plants, such as the PGE plant in Boardman, Oregon.

c. Department Recommendation:

Adopt the federal rule clarification to maintain consistency with the federal program and to maintain the state as the primary implementing agency.

C. Private or public parties cleaning up soil contaminated by hazardous waste.

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[16] See Attachment A, proposed changes to OAR 340-101-0004.

1. **Proposed Rule:** Establishes alternative LDR treatment standards for soils contaminated by hazardous waste. 63 FR 28556. NIE.

a. Background:

Generators and treaters of any soil contaminated by hazardous waste will now have more options to choose from to meet LDR standards for the listed or characteristic hazardous wastes that those soils contain. EPA established the rule to hasten cleanups, to encourage cleanups based on treatment and removal of wastes and to provide flexibility in remediating low levels of hazardous waste contamination in soil. Generators may meet:

1. Current LDR standards in 40 CFR Part 268.40 for hazardous characteristic or listed wastes; or
2. Obtain a treatability variance under 40 CFR 268.44(h); or
3. Meet new alternative treatment standards in 40 CFR 268.49.

This new rule offers alternative treatment standards for all known, likely occurring underlying hazardous constituents ("UHCs") listed in the universal treatment standards ("UTS") for characteristic and listed hazardous wastes. Characteristic wastes already need to meet levels for UHCs under the existing LDR requirements, although the UTS levels are less rigorous than the new levels. For soils containing listed wastes, however, requiring any known UHCs to meet UTS is a new, because EPA currently only requires treatment of the UHC constituents that make a listed waste hazardous. The number of the constituents to be treated can be considerably fewer than if any other known constituents among the approximate 250 UHCs are found in the soils.

For either characteristic or listed wastes in soils, and using the alternative treatment standards, treaters have the option of reducing the concentration of UTS hazardous constituents by 90%, with treatment of any given constituent capped at ten times the UTS level ("10xUTS"). Compliance with the standards is based on grab, not composite samples. Chemical analysis of contaminated soils for all UHCs is not necessary. Process knowledge may be used to identify those UHC constituents reasonably likely to be present at levels above 10xUTS.

Soil containing characteristic hazardous waste that has had the characteristic removed and is therefore no longer a hazardous waste, may be disposed in a subtitle D facility after meeting applicable LDR standards for all UHCs reasonably expected to be found in the soil. The new rules require generators and treaters of soils that contained listed hazardous wastes, but no longer contain the wastes because of a "contained-in" determination by DEQ, and have disposed of the soil in a Subtitle D facility, to maintain a notice of that determination and all supporting information on file for three years.

The new rules also allow a site-specific risk-based soil analysis instead of treating soils containing UTS to 90% of the UTS constituent concentrations, or ten times UTS (10 X UTS) concentrations, whichever concentrations are greater. This "treatability variance" may be used when risk-based treatment levels numerically higher than the technology-based UTS standards can be shown to meet the minimized threat standards in RCRA. The analysis to determine if the standards are met must include both short and long-term threats to human health and the environment, as well as uncertainties associated with land disposal. However, the analysis may not consider engineered structures such as liners, caps, slurry walls or other post-disposal practices to meet the minimized threat level.

b. Oregon Impact:

Most cleanup in Oregon is being completed under the State Cleanup Rules. The cleanup program has indicated that the alternative LDR treatment standards may provide more flexibility when cleaning up soils contaminated by hazardous waste.

c. Department Recommendation:

Adopt the new alternative LDR cleanup standards.

D. Facilities melting lead recovered primarily from lead-battery reclamation.

1. **Proposed Rule:** Extends the LDR compliance date for characteristic slags generated from thermal recovery of lead by secondary lead smelters. 63 FR 48124.

a. Background:

This EPA rule extended the compliance date until November 26, 1998 for a limited portion of the Phase IV Final Rule (63 FR 28556). The Phase IV Final Rule amended the LDR treatment standards for metal-bearing hazardous wastes exhibiting the toxicity characteristic. This action extended the date for treatment standards only for secondary lead slags exhibiting the toxicity characteristic for one or more metals that are generated from thermal recovery of lead-bearing wastes (principally batteries). EPA delayed this date because of a possible temporary shortage of treatment capacity for these particular wastes. The stay expired on November 26, 1998, and the new LDR standards now apply to the metals in slag.

b. Oregon Impact:

There are no battery lead smelters operating in Oregon, but there are closed lead smelters undergoing cleanup that would be subject to the new standards.

c. Department Recommendation:

To remain consistent with the federal program, the Department should adopt the stay. In effect, this means that during the time period when the stay was operative, the new Phase IV LDR standards did not apply to TC metal bearing slags. If a Department enforcement action should occur at an impacted facility, this rule would ensure that the facility would be treated consistently with the federal rules in effect at the time.

2. **Proposed Rule:** Requires slag from lead smelting operations to meet LDR standards before being land disposed. 63 FR 48124.

a. Background:

The federal rule requires lead slag residues that exhibit a toxicity characteristic (TC) after recovery of the lead to be treated again for lead and any other UHC before being land disposed. (Under previous rules, slag from resmelting lead that was recovered from batteries could be land disposed at a hazardous waste landfill.) The rule also prohibits iron filings from being used to stabilize lead-containing wastes because the filings only temporarily stabilize the metals in the slag and will eventually oxidize (rust) and allow the metals to leach out of the slag waste.

b. Oregon Impact:

No lead smelters operate in Oregon; however, the standards would still need to be met before slag that is no longer a hazardous waste may be disposed in a solid waste landfill in Oregon. In addition, adding iron filings in the form of fines, or dust to lead-containing hazardous wastes is impermissible dilution and therefore, prohibited.

c. Department Recommendation:

Adopt the new rule to remain consistent with the federal program and to maintain the state as the primary implementing agency.

E. Manufacturers of carbamate.

1. **Proposed Rule:** Revises the LDRs for seven listed hazardous wastes from carbamate production and amends previous regulations. 63 FR 47409.

a. Background:

This federal rule revises the waste treatment standards applicable to 40 waste constituents associated with the production of carbamates. The rule establishes revised LDR standards for seven specific carbamate waste constituents (bendiocarb phenol; diethylene glycol; dicarbamate; dimetilan; formparanate; isolan; and tirpate) for which there are no available analytical reference standards. The revised LDR standards for the seven hazardous waste constituents are effective immediately. The temporary alternative treatment standards previously in effect, which expired on August 26, 1998, are the standards and are extended indefinitely. This rule also deletes the LDR standard for one additional constituent (o-phenylenediamine) for which available analytical methods do not achieve reliable measurements.

This rule also deletes these eight (bendiocarb phenol; diethylene glycol; dicarbamate; dimetilan; formparanate; isolan; and tirpate; and o-phenylenediamine) affected carbamate waste constituents as underlying hazardous constituents.

Lastly the rule extends for an additional six months (until March 4, 1999), the temporary alternative treatment standards for 32 other carbamate waste constituents whose LDR standards had expired on August 26, 1998.

b. Oregon Impact:

There are no carbamate manufacturers in Oregon. However, regulatory application of the LDR standards clarifies requirements for TSDs and solid waste landfills in Oregon because the carbamate wastes must meet applicable standards before disposal in a landfill. One solid waste landfill recently contacted the Department about receiving carbamate wastes from out of state.

c. Department Recommendation:

Adopt the rule to remain consistent with the federal program.

F. Primary aluminum reduction facilities.

1. **Proposed Rule**: Permanently adopts temporarily adopted LDR standards for spent potliners (K088) from primary aluminum reduction. 63 FR 51254.

a. Background:

This federal rule establishes interim replacement LDR standards for spent potliners from primary aluminum reduction (EPA hazardous waste K088) under EPA's Land Disposal Restriction program. Prior to this new federal rule, spent potliners were prohibited from land disposal unless constituents were treated in compliance with certain numerical standards. Those standards were flawed. The newly promulgated and replacement standards will be in place until EPA has fully reviewed all information on all treatment processes which may serve as a basis for a more permanent revised standard. In addition, this rule extends the K088 national capacity variance until September 21, 1998.

b. Oregon Impact:

The rules are already in effect in Oregon. In October 1998, the EQC adopted temporarily this rule that established new hazardous constituent treatment standards for spent potliner from primary aluminum reduction. The justification for the Department's temporary rulemaking was that failure to immediately adopt the U.S. EPA's new LDR treatment standards for spent potliner (K088) and to repeal the existing state-adopted LDR treatment standards for spent potliner would seriously prejudice the public interest and the interests of K088 generators, facilities managing K088, the Department and U.S. EPA. Serious prejudice to interested parties would result due to the conflict between the existing state-adopted treatment standards and the new treatment standards U.S. EPA had adopted to address test method deficiencies found by the U.S. Court of Appeals for the District of Columbia.

c. Department Recommendation:

Permanently adopt the LDR standards for K088 potliner to make the Department's program consistent with the federal program. The temporary rules must be permanently adopted within 180 days of their enactment.

G. Petroleum refining facilities.

1. **Proposed Rule:** Applies waste-specific (K169-K172) land disposal restriction standards to four newly listed petroleum refining wastes. 63 FR 24596.

a. Background:

This rule establishes LDR treatment standards for 4 newly listed hazardous wastes (K169-K172) generated by petroleum refining facilities (see rule Newly Listed Hazardous Wastes rule, B(1) below).

b. Oregon Impact

There is one facility in Oregon that may be affected by this rule proposal. The facility is an asphalt manufacturing plant that uses partially refined crude oil as feedstock and in the past (1995 and 1996) reported generating listed petroleum refining wastes. It is unknown if this facility will be generating any of the newly listed wastes. Wastes generated at the asphalt manufacturing facility may be impacted by the new listings.

c. Department Recommendation

Adopt the new rule to maintain consistency with the federal program and maintain the state as the primary implementing agency.

H. Facilities manufacturing organobromine.

1. **Proposed Rule:** Revises and establishes the LDRs for certain wastes from organobromine production. 63 FR 35147.

a. Background:

This federal rule modifies the land disposal treatment standards for hazardous waste in 40 CFR part 268 to include new organobromine production wastes (see rule Newly Listed Hazardous Wastes rule, A(1) below). 63 FR 35147.

b. Oregon Impact:

There are no organobromine production facilities in Oregon. However, any production wastes that would be disposed in a hazardous waste landfill in Oregon must meet these new standards.

c. Department Recommendation

Adopt the new rule to maintain consistency with the federal program and maintain the state as the primary implementing agency.

Exclusion from Certain Hazardous Waste Regulations

A. Facilities that generate and recycle drippage and wastewaters on-site from water-borne wood preservation operation.

1. **Proposed Rule**: Conditionally excludes from the definition of solid waste recycled wastewater and spent formulation from water-borne wood preservation processes. 63 FR 28556. NIE.

a. Background:

The rule conditionally excludes from the definition of solid waste[17] water-borne fungicides at wood preservation facilities that produce F032, F034 and F035 wastewater containing the water-borne fungicides and spent formulation that are reclaimed and then reused to treat wood. The rule emphasizes that the conditional exclusion only covers plants using water-borne fungicides. The exclusion from the definition of solid waste for recycled materials is conditional. Under the exclusion, wastewaters and spent solutions:

1. Used on site for their original intended purposes (to treat wood);
2. Managed to prevent releases;
3. Managed in any unit(s) that come in contact with the wastewaters or spent solutions;
4. Managed in unit(s) that are designed such that they can be inspected; and

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[17] Excluding a waste from the definition of solid waste renders it a non-hazardous waste. In this instance, the exclusion depends on whether or not certain conditions are being met. Violation of those conditions would re-instate the hazardous waste definition on the waste.

5. Managed on drip pads that meet 40 CFR Part 265, Subpart W standards regardless of whether the plant meets CEG status as a result of the exclusion (recycled wastewater need not be counted to determine generator status)

In addition, a one-time notification must be submitted to the Department by the plant that intends to use the exclusion. If any condition of the exclusion is violated, it is not available for subsequently generated wastewaters and spent solutions until the department is notified and it determines that the plant has returned to compliance. For example, spills will result in loss of the exclusion because they indicate that wastes are not being managed to prevent releases.

b. Oregon Impact:

There are several wood preservation facilities in Oregon that use both water-borne fungicides and chlorophenolic compounds to preserve lumber. The water-borne processes they use water-based fungicides to preserve wood are addressed by this rule. The rule clearly applies to wood preservers, although wood "treaters" may be subject to the rule depending on whether or not the label on the fungicide they are using describes their activity as wood "treatment" or wood "preservation".

c. Department Recommendation:

Adopting the new rules encourage hazardous waste recycling. One of the major changes EPA is making to current requirements, is that wood preservers using water-borne fungicide will no longer need to count, for generator category determination, wastewater that is reused to preserve wood. This conditional relaxation of current requirements is a significant incentive for affected parties to recycle wastewaters. The industry has for years pointed out that it is being portrayed as a massive generator of hazardous wastes even though the materials are typically recycled back into production process. By relaxing the standard for counting waste that is recycled, additional parties will likely recycle their wastewaters and those already doing so will strive even harder to collect as much wastewater as possible for recycling. This change makes sense and it should not result in additional threat to human health and the environment, because necessary federal and state controls remain in place.

B. Facilities that recycle printed circuit boards.

1. **Proposed Rule:** Clarifies the exclusion from RCRA regulation of whole printed circuit boards that are recycled. 63 FR 28556.NIE.

a. Background:

In the May 12, 1997 Phase IV rule, previously adopted by the Department, EPA conditionally excluded recycled scrap metal and shredded circuit boards from the definition of solid waste. EPA stated that whole circuit boards could be defined as scrap metal and could be exempt from regulations if they contained no mercury switches or batteries. Therefore, mercury switches and batteries needed to be removed before the boards. The reason for this caveat was that mercury did not meet the definition of scrap metal.

This new rule clarifies that whole used printed circuit boards, containing minimum quantities of mercury, that are recycled, and batteries which are protectively packaged before recycling, are excluded from the definition of solid waste. EPA changed their minds from previous requirements (mercury switches, relays and lithium or nickel-cadmium batteries needed to be removed first before the boards became exempt) because EPA found that minimal quantities of hazardous materials attached to the boards did not warrant continuing RCRA regulation during generator accumulation, while being transported to a recycling facility, and while being accumulated at the facility.

b. Oregon Impact:

Printed circuit board facilities in Oregon routinely recycle scrap or used printed circuit boards. The new rule clarifies the conditions under which scrap boards may be safely recycled without regulation.

c. Department Recommendation:

Adopt the clarifying rule to encourage recycling and to remain consistent with the federal program.

C. Pulp and integrated mills that manufacture pulp and paper/paperboard; chemically pulp wood fiber using kraft , sulfite, soda, or semi-chemical methods to bleach wood; pulp secondary fiber, pulp nonwood fiber; and mechanically pulp wood fiber.

1. **Proposed Rule:** Exempts from RCRA regulation condensates derived from steam stripping overhead condensate wastes and then burning the characteristic hazardous waste gases in industrial boilers and furnaces. 63 FR 18504. NIE.

a. Background:

The rule excludes from RCRA regulation condensates derived from the overhead gases from kraft mill steam strippers that are used to comply with 40 CFR 63.446(e). Without this exclusion, these condensates would be regulated under RCRA because they exhibit the ignitability characteristic, and the boilers and burning these condensates for fuel would be subject to emission standards in 40 CFR 266, Subpart H, boilers and industrial furnaces. EPA has determined that RCRA regulation of the rectification and combustion of the condensate is not appropriate or necessary. The rectification practice would not increase environmental risk, would reduce secondary environmental impacts, and would provide a cost savings. Moreover, the burning of condensate will not increase the potential environmental risk over the burning of the steam stripper vent gases prior to condensation.

The scope of this exemption is limited to combustion at the facility generating the condensates. The exclusion is part of a much larger rule that affects both effluent guidelines and air emission standards for specified sections of the pulp and paper industry. (EPA strives to let one program handle any program overlap issues.) The Department's Air Quality Program has adopted the rule.

b. Oregon Impact:

Five kraft mills in Oregon may be affected by this rule. Condensate, generated from steam stripping off-gases from paper manufacturing, typically fail the characteristic for ignitability because they contain flammable organics. This rule excludes condensates from RCRA regulation provided they are burned in an on-site facility that is being monitored under the Clean Air Act.

c. Department Recommendation:

Adopt the rule. It allows full implementation of the Clean Air Act regulations at kraft plants.

D. Facilities managing used oil.

1. **Proposed Rule:** Clarifies release requirements for used oil generators, transporters, processors, rerefiners, burners and marketers apply in states not authorized for the base RCRA program; amends three incorrect references to the pre-1992 used oil specifications managed under 40 CFR 279. 63 FR 24963 and 63 FR 37780. NIE.

a. Background:

EPA promulgated two rules in this area.

The first rule clarified four issues: 1) when used oil contaminated with PCBs is regulated under the used oil management standards; 2) the requirements applicable to releases of used oil apply in States that are not authorized for the RCRA base program; 3) mixtures of Conditionally Exempt Small Quantity Generator (CESQG) wastes and used oil are subject to the used oil management standards irrespective of how that mixture is to be recycled; and 4) the initial marketer of used oil that meets the used oil fuel specification needs to keep a record of the shipment of used oil to the facility to which the initial marketer delivers the used oil, but does not need to keep records on the subsequent transfers of that used oil. This rule also amended incorrect references to the pre-1992 used oil specifications in the provisions which address hazardous waste fuel produced from, or reclaimed from, oil bearing hazardous wastes from petroleum refining operations.

The second rule was a technical correction that removed three of the clarifying amendments (nos. 1, 3 and 4) made in the first rule. Therefore, only the second amendment and the technical corrections remain in effect at the federal level.

b. Oregon Impact:

Rule clarifies previously adopted used oil rules and would have little or no effect on used oil management.

c. Department Recommendation:

The federal rule reinstates regulatory requirements currently in effect in Oregon. The Department recommends adopting both rules since there is no adverse impact to Oregon

E. Facilities generating petroleum refining wastes.

1. **Proposed Rule:** Excludes from hazardous waste regulations certain oil-bearing hazardous secondary materials, petrochemical recovered oil, and spent caustic solutions from petroleum refining processes when they are recycled. 63 FR 42110. NIE.

a. Background:

EPA is listing four petroleum refining process wastes as hazardous (K169-K172). The wastes will be subject to more stringent management and treatment standards and emergency notification requirements than previously required. The rule excludes certain recycled secondary materials from the definition of solid waste. The excluded materials include: both oil-bearing residuals from petroleum refineries and oil from associated petrochemical facilities, when they are inserted into the refining process; and spent caustic from liquid treating operations when used as a feedstock to make certain chemical products. The rule clarifies an existing exclusion for recovered oil from certain petroleum industry sources. Finally, this rule applies the universal treatment standards to the petroleum refining wastes.

b. Oregon Impact:

There is one facility in Oregon that may be affected by this rule proposal. The facility is an asphalt manufacturing plant that uses partially refined crude oil as feedstock and in the past (1995 and 1996) reported generating listed petroleum refining wastes. It is unknown if this facility will be generating any of the newly listed wastes. Wastes generated at the asphalt manufacturing facility may be eligible for proposed petroleum waste recycling exclusions.

c. Department Recommendation:

Adopt the rule as proposed. Oregon is obligated to adopt the new petroleum listing to maintain federal program administration. Adoption of petroleum exclusions would provide management flexibility for wastes that are recycled back into the petroleum refining process.

2. **Proposed Rule:** Excludes catalyst support media from regulation when recycled. 63 FR 42110. NIE

a. Background:

This rule excludes petroleum refining catalyst support media from regulation as a hazardous waste, because it is believed to be generally inert and commonly managed separately from other refinery wastes.

b. Oregon Impact

There is one known facility in Oregon that may be affected by this rule proposal. The facility is an asphalt manufacturing plant that uses partially refined crude oil as feedstock and in the past (1995 and 1996) reported generating listed petroleum refining wastes. It is unknown if this facility generates spent petroleum catalyst support media.

c. Department Recommendation:

Adopt the federal rule as proposed. Adoption of the exclusion would provide management flexibility for inert spent petroleum refining catalyst support media.

3. **Proposed Rule:** Expands the headworks exemption to include waste generated during petroleum refining process (K169-K172). 63 FR 42110. NIE.

a. Background:

This rule exempts petroleum refining wastewaters when they reach the headworks of the wastewater treatment system. The exemption is not intended to allow the discharge of the entire wastestream (e.g., tank sediments or spent catalysts), but rather dilute waters generated during tank or unit clean-outs and de-watering operations.

b. Oregon Impact:

There is one facility in Oregon that may be affected by this rule proposal. The facility is an asphalt manufacturing plant that uses partially refined crude oil as feedstock. If regulated as a petroleum refinery, this facility would likely qualify for the headworks exemption.

c. Department Recommendation:

Adopt the federal rule as proposed. Adoption of the exclusion would provide management flexibility for dilute wastewaters generated in the petroleum refining process.

F. Facilities managing or burning fuel-like hazardous wastes.

1. **Proposed Rule:** Excludes from the definition of solid waste fuels which would normally be a hazardous waste, but which are comparable to some currently used fossil fuels. 63 FR 33782.IE.

a. Background:

These rules exclude from the definition of solid waste fuels which are produced from a hazardous waste, but which are comparable to some currently used fossil fuels; and include requirements for hazardous waste combustion facility permit modifications to meet 40 CFR Part 63 Maximum Achievable Technical (MACT) standards. EPA is excluding, from the regulatory definition of solid waste, fuels produced from a hazardous waste which are comparable to some currently used fossil fuels. EPA is also adding a new RCRA permit modification provision intended to make it easier for facilities to make changes to their existing RCRA permits. Facilities with certain hazardous waste combustion units can use this permit modification provision when adding air pollution control equipment, when making other changes in equipment or when making changes in operation needed to comply with upcoming air emission standards. EPA is also adding notification requirements for sources that intend to comply with this rule because the fuel-like hazardous waste is exempt from regulation and there would not be any other mechanism available to the agency to know that fuel-like hazardous waste is being burned. Finally, EPA is adding allowances for extensions to the compliance period to promote the installation of cost effective pollution prevention technologies.

b. Oregon Impact:

The combustion rule will exempt few hazardous wastes because it requires that the fuel-like hazardous waste be essentially equivalent in composition to normal fuel. There are currently no permitted hazardous waste combustors in Oregon that would be subject to the permit provisions included in this rule.

c. Department Recommendation:

Adopt the rule to remain consistent with the federal program and maintain the state as the primary implementing agency.

G. Facilities managing mineral processing wastes.

1. **Proposed Rule:** Conditionally excludes from the definition of solid waste mineral processing waste that is recycled. 63 FR 28556. NIE.

a. Background:

EPA has determined that mineral processing secondary materials (materials that are potentially solid and hazardous wastes) removed from production processes for storage prior to reclaiming are not "immediately used" (if a secondary material is immediately reused after generation it is exempt from RCRA regulations) and when placed on land are part of the waste disposal problem. In Phase IV regulations, in order to discourage storage of these secondary materials in land-based units, EPA provides a conditional exclusion from the definition of solid and hazardous wastes for mineral processing secondary materials that are not stored on the land. To receive the exclusion, processors must (1) not store the secondary material on land (it must be contained); (2) legitimately recycle the material to recover metal, acid, cyanide,water, or other values; (3) not speculatively accumulate the material; and (4) must submit a one-time notification of their recycling activities to the Department describing the types and amounts of materials being recycled, and the location and type of storage units. Once mineral processing secondary materials are removed from storage for reclamation, they are no longer consider to be solid or hazardous wastes.

b. Oregon Impact:

There is one known facility in Oregon that may be potentially affected by this rule.

c. Department Recommendation:

Adopt the rule to remain consistent with the federal program and maintain the state as the primary implementing agency.

<u>Newly Listed Hazardous Wastes</u>

A. Facilities manufacturing organobromine.

1. **Proposed Rule:** Lists certain wastes (K140, U408) from organobromine production. 63 FR 24596.

a. Background:

This federal rule adds K140 and U408 hazardous waste codes to the current lists found in 40 CFR Part 261. The effect of listing these wastes will be to subject them to stringent management and treatment standards under RCRA, as well as to emergency notification requirements for releases of hazardous substances to the environment (CERCLA and EPCRA). EPA has made a final determination not to list as hazardous ten waste streams from the production of bromochloromethane, ethyl bromide, tetrabromobisphenol A, 2,4,6-tribromophenol wastewaters, octabromodiphenyl oxide, and decabromodiphenyl oxide). The rule also prohibits K140 and U408 hazardous wastes from underground injection.

b. Oregon Impact:

Currently, there are no organobromine manufacturers in Oregon.

c. Department Recommendation:

The rule is already in effect in Oregon so adopting it will make the program consistent with the federal program and maintain the state as the primary implementing agency.

B. Facilities generating petroleum refining wastes.

1. **Proposed Rule:** Lists new wastes (K169-K172) generated during petroleum refining. 63 FR 56709

a. Background:

EPA is listing four petroleum refining process wastes as hazardous (K169-K172). The wastes will be subject to more stringent management and treatment standards and emergency notification requirements than previously required. The rule excludes certain recycled secondary materials from the definition of solid waste. The excluded materials include: both oil-bearing residuals from petroleum refineries and oil from associated petrochemical facilities, when they are inserted into the refining process; and spent caustic from liquid treating operations when used as a feedstock to make certain chemical products. The rule clarifies an existing exclusion for recovered oil from certain petroleum industry sources. Finally, this rule applies the universal treatment standards to the petroleum refining wastes (see "Land Disposal Restriction Standards", B(2)).

b. Oregon Impact:

There is one facility in Oregon that may be affected by this rule proposal. The facility is an asphalt manufacturing plant that uses partially refined crude oil as feedstock and in the past (1995 and 1996) reported generating listed petroleum refining wastes. It is unknown if this facility will be generating any of the newly listed wastes. Wastes generated at the asphalt manufacturing facility may be eligible for proposed petroleum waste recycling exclusions.

c. Department Recommendation:

Adopt the rule as proposed. Oregon is obligated to adopt new petroleum listing to maintain federal program administration. Adoption of petroleum exclusions would provide management flexibility for wastes that are recycled back into the petroleum refining process

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State of Oregon
Department of Environmental Quality **Memorandum**

Date: February 25, 1999

To: Environmental Quality Commission

From: Gary Calaba, Waste Management and Cleanup Division, Hazardous Waste Policy and Program Development

Subject: Presiding Officer's Report for Rulemaking Hearing
Hearing Date and Time: February 18, 1999, beginning at 1:00 p.m.
Hearing Location: DEQ Headquarters, 811 S.W. 6th Ave., Room 3A
Portland, Oregon 97204

Title of Proposal: Amend Oregon administrative rules to permanently adopt new land disposal restrictions for spent hazardous waste potliner and to adopt a number of other federal hazardous waste regulations with amendments through October 9, 1998.

The rulemaking hearing on the above titled proposal was convened at 1:05 p.m. Attendees were asked to sign witness registration forms if they wished to present oral testimony. Attendees were also advised that the hearing was being recorded and of the procedures to be followed.

Ten people attended the Public Hearing, not including Department personnel. Three attendees registered and gave testimony. Seven affected parties submitted written comments, one at the hearing, the other six during the open comment period.

With the record open, and prior to receiving testimony, Gary Calaba, Hearings Officer, briefly explained the specific rulemaking proposal and the reasons for the proposal. At the conclusion of testimony, the hearing was closed. The time was 1:35 p.m.

The following summary presents the comments made during oral testimony and from written testimony. Where more than one commenter made the same comment, this is reflected in a combined presentation of the comment.

Summary of Oral and Written Testimony[1]

1. Comment: Request for an extension of the comment period because contrary to the notification provided in the state of Oregon's package, neither Bay Zinc nor Fritt Industries, both registered and known manufacturers of fertilizer using K061, were notified.

Commenters: Carl Schauble, Executive Vice President, Frit Industries, consumers of K061 for recycling into fertilizer, February 16, 1999 (WT); Jodi Gearon, Environmental Regulatory Consulting, February 18, 1999, representing the micronutrient producers; Richard J. Camp, President, Bay Zinc Company, Inc., Washington, manufacturer of zinc-containing fertilizers made from hazardous wastes, February 15, 1999 (WT); Kathryn VanNatta, Government Affairs Manager, Northwest Pulp & Paper, February 18, 1999.

2. Comment: Processes are not available to manufacture zinc-micronutrients to the Phase IV levels in the proposal.

Commenter: Jodi Gearon, February 18, 1999.

3. Comment: EPA is in the process of developing standards for zinc-containing fertilizers made from hazardous wastes; Oregon should wait for EPA's efforts to be completed.

Commenters: Carl Schauble, February 16, 1999 (WT); Jodi Gearon, February 18, 1999; Richard J. Camp, February 15, 1999 (WT); Terry Witt, Executive Director, Oregonians for Food and Shelter, representing primarily agricultural and forest growers, commodity groups, applicators and manufacturers of agri-chemicals; officially represent Farwest Fertilizer Association, Western Crop Protection Association, Fertilizer Institute, and American Crop Protection Association, February 18, 1999; Kathryn VanNatta, February 18, 1999.

4. Comment: There is no imminent environmental or human health impact.

Commenter: Terry Witt, February 18, 1999.

5. Comment: The rule change will have a significant and adverse effect on agriculture and the micronutrient industry without any significant improvement in environmental quality.

Commenter: Terry Witt, February 18, 1999.

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[1] Written testimony similar to oral testimony is included in each comment. Written testimony is distinguished from oral testimony by a "WT" next to the date of the comment.

6. Comment: Washington's fertilizer laws have caused problems for growers, manufacturers, shippers and suppliers.

Commenters: Terry Witt, February 18, 1999; Jodi Gearon, February 18, 1999.

7. Comment: The rules seem to be adopted to punish the cognizant responsible industries. Many people produce fertilizers from uncertain waste sources. Therefore, the industry that informs itself of its waste sources is potentially penalized with greater standards due to that knowledge.

Commenter: Jodi Gearon, February 18, 1999.

8. Comment: Changing the standards does not level the playing field. Other sources of non-hazardous waste recycled sources of zinc used to make fertilizers may have higher levels of lead and cadmium than current recycled products.

Commenters: Richard J. Camp, February 15, 1999 (WT); Jodi Gearon, February 18, 1999; Terry Witt, February 18, 1999.

9. Comment: The proposed rule arbitrarily sets treatment standards by using the TCLP test, which is more suited for landfill conditions than fertilizer application.

Commenter: Richard J. Camp, February 15, 1999 (WT).

10. Comment: The rule, if implemented as written, would essentially remove most of the zinc products from the marketplace or make availability very difficult and expensive.

Commenter: Scott McKinnie, Executive Director, Far West Fertilizer and Agri-Chemical Association. February 18, 1999 (WT).

11. States will have different programs than the [forthcoming] federal standards. The Department's proposal unlevels the playing field, making it much more difficult for manufacturers and farmers to do their jobs. "Level" the playing field across the nation by waiting for EPA to promulgate the rules.

Commenter: Terry Witt, February 18, 1999; Richard J. Camp, February 15, 1999 (WT).

12. Comment: Supports adoption of regulations exempting from RCRA condensates derived from stream stripping overhead condensate wastes and burning the characteristic hazardous waste gases in industrial boilers and furnaces. Supports consistency based on adoption of NESHPS.

Commenter: Kathryn VanNatta, February 18, 1999, February 22, 1999 (WT).

13. Comment: Supports adoption of regulations exempting from RCRA condensates derived from steam stripping "overhead" condensate gases from kraft mill steam strippers but requests rule clarification of the term "overhead" which should not be interpreted as limiting what streams are included in the definition.

Commenters: Mark Lewallen, Russell Ayers; Weyerhaeuser, February 18, 1999 (WT).

14. Comment: The Western Wood Preservers Institute supports adoption of the proposed rule which would incorporate the federal exclusion from certain hazardous waste regulations of waste water which is reused in the [wood] treating process.

Commenter: Dennis Hayward, Executive Director, Western Wood Preservers Institute, February 3, 1999 (WT).

Written Testimony

The following people submitted written comments but did not present oral testimony:

1. Richard J. Camp, President, Bay Zinc Company, Inc., P.O. Box 167, Moxee, Washington 98936. February 15, 1999.
2. R. Dennis Hayward, Executive Director, Western Wood Preservers Institute, 7017 N.E. Highway 99, Suite 108, Vancouver, WA 98665. February 3, 1999.
3. Marv Lewallen, Russell Ayers, Weyerhaeuser, P.O. Box 275, Springfield, OR 97477. February 18, 1999.
4. Scott McKinnie, Executive Director, Far West Fertilizer and Agri-Chemical Association, (no address). February 18, 1999.
5. Carl Schauble, Executive Vice President, Frit Industries, P.O. Box 1589, Jodie Parker Rd., Ozark, Alabama 36361-2515. February 16, 1999.

6. Kathryn VanNatta, Governmental Affairs Manager, Northwest Pulp & Paper Association, 1300 114th Ave., S.E., Suite 110, Bellevue, Washington 98004. February 22, 1999.

7. Terry Witt, e-mail, February 16, 1999.

State of Oregon
Department of Environmental Quality **Memorandum**

Date: February 25, 1999

To: Environmental Quality Commission

From: Anne R. Price, Manager, Hazardous Waste Policy and Program Development, Waste Management and Cleanup Division

Subject: Summary, Evaluation and Response to Public Comments Received

At the February 18, 1999 Public Hearing, the Department received 14 major oral comments on the Department's proposal to amend Oregon Hazardous Waste Administrative Rules from three commenters. Written comments from seven commenters addressed some of those comments and added additional comments.

All of the public comments and the Department's responses are presented below.

Comment: Request for an extension of the comment period because, contrary to the notification provided in the state of Oregon's package, neither Bay Zinc nor Fritt Industries, both registered and known manufacturers of fertilizer using K061, were notified.

Commenters: Carl Schauble, Executive Vice President, Frit Industries, consumers of K061 for recycling into fertilizer, February 16, 1999; Jodi Gearon, Environmental Regulatory Consulting, February 18, 1999, representing the micronutrient producers; Richard J. Camp, President, Bay Zinc Company, Inc., Washington, manufacturer of zinc-containing fertilizers made from hazardous wastes, February 15, 1999; Kathryn VanNatta, Government Affairs Manager, Northwest Pulp & Paper, February 18, 1999.

Department Response: The Department does not agree that an extension is warranted for two reasons: First, actual notice was received. Second, the Department's final proposal provides sufficient time for compliance.

With respect to notice, the proposed rulemaking package was noticed according to the public notice requirements. In addition, on December 24, 1998, in preparation for an informational meeting, the Department mailed an information package on the proposed rulemaking to approximately 1,900 parties, including companies registered in Oregon to sell fertilizers (approximately 300). The list, obtained from the Oregon Department of Agriculture, included fertilizer registrants, but the list did not contain the names of registered micronutrient producers. This same mailing list of approximately 1,900 was also sent the proposed rulemaking on January 15, 1999. The Department learned that the micronutrient producers did not receive individual notice at the February 9, 1999 presentation of its rulemaking proposal to a group of fertilizer registrants in conjunction with a meeting the Oregon Department of Agriculture had convened to discuss fertilizer issues. At that meeting, a representative from Bay Zinc Company, Inc., Washington, a zinc-micronutrient producer told us that they had not directly received the proposed rulemaking, but had received the information from another industry source.

In order to ensure individual notice, which is not required by law, the Department conducted another mailing on February 11, 1999 to approximately 160 registered agricultural mineral producers, some of which produce zinc-containing fertilizers made from hazardous wastes.

The Department attempts to ensure that affected parties received the notice was more than adequate under the law with respect to the substance of the proposal. The time needed for industry to comply with the proposed requirements is accounted for in the Department's proposal to allow one year for compliance with the only part of the regulations that are more stringent than the federal regulations.

Comment: Processes are not available to manufacture zinc-micronutrients to the Phase IV levels in the proposal.

Commenter: Jodi Gearon, February 18, 1999.

Department Response: In its January 15, 1999 Notice (Attachment D, page 3, Item 10), the Department stated that there is technology available to allow compliance with Phase IV requirements and to manufacture zinc-containing fertilizers that contain fewer contaminants or less concentration of contaminants than previous manufacturing technology. It would have been more accurate for the Department have stated that there "may" be available technology that meets Phase IV. For example, although there is technology available that will meet Phase IV standards for characteristic hazardous wastes, that technology may produce a material that is solidified and unusable as fertilizer (January 15, 1999 Notice, page 11, Section b, Oregon Impact.).

The Department does not have the information available to assess the validity or accuracy of the commenter's claim. However, discussions with the EPA have revealed that they consider the lack of available treatment technology as one of the reasons they are evaluating other options for standards.

The Department has determined that adoption of the stringent Phase IV standards for these waste streams at the time when EPA is developing proposed technology-based standards would send a confusing message to the industry: reduction of non-nutrients is critical, but the required standards may be unachievable with existing technology.

Therefore, the Department is now recommending the EQC adopt the less stringent leachable metal constituent concentration levels (the Third-Third metal regulatory levels) that EPA currently imposes on fertilizers made from zinc-containing characteristic hazardous wastes. In addition, in an effort to address the issue of consistency, the Department recommends that those same levels apply to fertilizers made from K061 hazardous waste baghouse dust. This action implements EPA's stay, aligns the Department's program with EPA's rule imposing the Third-Third treatment standards on metal constituents of concern, and addresses the commenter's concerns that the more stringent Phase IV standards cannot be met.

The Department will recommend to the EQC that the implementation of those standards to K061 hazardous waste-derived fertilizers be delayed until March 31, 2000. This will allow the industry time to meet the standards and provide a window for EPA to develop its proposed standards.

The Department will continue to evaluate the possible options for hazardous waste-derived fertilizer standards development. In the event that EPA does not adequately or timely address these issues, Oregon may reconsider its approach.

Comment: EPA is in the process of developing standards for zinc-containing fertilizers made from hazardous wastes; Oregon should wait for EPA's efforts to be completed.

Commenters: Carl Schauble, February 16, 1999; Jodi Gearon, February 18, 1999; Richard J. Camp, February 15, 1999; Terry Witt, Executive Director, Oregonians for Food and Shelter, representing Farwest Fertilizer Association, Western Crop Protection Association, Fertilizer Institute, and American Crop Protection Association, February 18, 1999; Kathryn VanNatta, February 18, 1999.

Department Response: The Department has discussed this issue with EPA and has been assured that EPA is working with all affected stakeholders to develop technology-based standards for fertilizers made from zinc-containing hazardous wastes. These standards would likely address the concerns of industry that the current Phase IV standards are unachievable and that the LDRs are inappropriate for use in setting constituent levels for a product intended to be placed on the land for agricultural use. The current projected EPA time frame for a proposed rule is late 1999.

The Department is willing to proceed to require compliance only with EPA's Third-Third standards, now in effect at the federal level, and to extend the compliance deadline for the application of the LDR standards to the K061-derived fertilizer in part to allow EPA the opportunity to develop technology-based fertilizer standards. However, Oregon notes that EPA often does not meet their deadlines and in the interim, we will continue to assess the Washington standards, the California standards and other options. If EPA does not move forward, Oregon will reassess the direction it wishes to take.

Comment: There is no imminent environmental or human health impact.

Commenter: Terry Witt, February 18, 1999.

Department Response: The Department believes that there is sufficient evidence to defend the proposal to limit the levels of these contaminants in hazardous waste derived fertilizers. Recent studies on fertilizers carried out by the Washington Department of Ecology (DOE) indicate that these products can be a source of non-nutritive toxic constituents such as cadmium, lead and other heavy metals. In tests on 51 different fertilizers, DOE found seven that failed the state's Dangerous Waste Regulations for cadmium. Lead levels were as high as 9,490 parts per million. Five of these seven products are suspected to be made from recycled hazardous wastes.

Washington DOE also studied concentrations of heavy metals in soils to determine if levels in agricultural soils were different from levels in background soils. Results showed that cadmium and zinc levels were significantly elevated. Although other metals did not differ as much as cadmium and zinc, average concentrations in agricultural soils were still higher, indicating a possible trend for these metals also.

Given that (1) the heavy metals regulated under this proposal are very toxic, (2) these metals are found at elevated concentrations in hazardous waste derived fertilizers, and (3) once dispersed into the environment they create potential future exposures and are very difficult to recover, the Department believes that increased regulation of fertilizers derived from hazardous wastes is a step in protecting human health and the environment.

Comment: The rule change will have a significant and adverse affect on agriculture and the micronutrient industry without any significant improvement in environmental quality.

Commenter: Terry Witt, February 18, 1999.

Department Response: The Department is unable to quantify the expected improvement in environmental quality and the commenter is unable to demonstrate the lack of significant benefits they cite. As commented above, the Department believes that increased levels of non-nutrient metals in the environment cannot be viewed as a positive result especially when the full impact of such metals is unknown. The Department is currently proposing to proceed with levels that are consistent with the federal program and that treat fertilizers made from zinc-containing hazardous wastes similarly. We will continue to evaluate the information available to us regarding the human health and environmental impacts of non-nutrients in fertilizers.

Comment: Washington's fertilizer laws have caused problems for growers, manufacturers, shippers and suppliers.

Commenters: Terry Witt, February 18, 1999; Jodi Gearon, February 18, 1999.

Department Response: Washington's fertilizer law is administratively distinct and different enough from Oregon's proposal that a comparison of the "problems" does not provide a substantive reason to alter Oregon's proposal.

Comment: The rules seem to be adopted to punish the cognizant responsible industries. Many people produce fertilizers from uncertain waste sources. Therefore, the industry that informs itself of its waste sources is potentially penalized with greater standards due to that knowledge.

Commenter: Jodi Gearon, February 18, 1999.

Department Response: The hazardous waste regulations in part rely upon the accurate characterization of a waste stream prior to transporting it to a manufacturing facility, a disposal facility or a waste broker. In addition, there is an obligation on the part of the receiver of the waste stream to know whether they are managing a hazardous wastes. While it is true that knowledge of a waste stream's source may lead to greater regulation, lack of knowledge may lead to greater long term enforcement liability. Because some individuals may choose to stay ignorant of their regulatory obligations is not a reason for Oregon to choose not regulate to protect human health and the environment.

Comment: Changing the standards does not level the playing field. Other sources of non-hazardous waste recycled sources of zinc used to make fertilizers may have higher levels of lead and cadmium than current recycled products.

Commenters: Richard J. Camp, February 15, 1999; Terry Witt, February 18, 1999.

Department Response: The Department argued in its proposal that applying the new Phase IV LDR standards to fertilizers made from zinc-containing hazardous wastes was leveling the playing field because any other fertilizer made from hazardous wastes needs to meet the Phase IV standards. This is still an accurate statement. Within the universe of fertilizers derived from hazardous wastes, the application of the Phase IV standards to zinc-containing fertilizers made from hazardous wastes would have leveled the regulatory playing field. Lowering the LDR requirements for zinc-containing hazardous waste-derived fertilizers may actually create an inequity between hazardous waste-derived zinc-containing fertilizers and all other hazardous waste-derived fertilizers that still have to meet Phase IV standards. However, given the other reasons stated in response to comments, the Department believes it is appropriate to require compliance with only the Third-Third standards at this point. The Department has attempted to research this area of other hazardous waste derived fertilizers and has had little success in determining that universe. For example, it is known that spent phosphoric and sulfuric acids, brass dust and tire ash may be used in the manufacture of fertilizers, but there are likely others that the Department does not know about.

In addition, the commenter is correct that other non-hazardous wastes that are made into zinc-containing fertilizers may in fact contain higher levels of non-nutrients than hazardous waste-derived fertilizers. However, by the very nature of the source of those materials, the hazardous waste program cannot regulate them. Statewide fertilizer standards, regardless of content, would address this concern.

Comment: The proposed rule arbitrarily sets treatment standards by using the TCLP test, which is more suited for landfill conditions than fertilizer application.

Commenter: Richard J. Camp, February 15, 1999.

Department Response: The Department understands the commenter's argument. However, EPA's entire regulatory structure is based on the use of the TCLP or EP Toxicity tests for providing a level of certainty as to acceptable levels when using a waste-derived product in a manner constituting disposal or land application. The Department believes that, short of developing an entirely new basis for setting fertilizer standards, the LDRs are a reasonable proxy.

Comment: The rule, if implemented as written, would essentially remove most of the zinc products from the marketplace or make availability very difficult and expensive.

Commenter: Scott McKinnie, Executive Director, Far West Fertilizer and AgriChemical Association, February 18, 1999.

Department Response: The Department understands that imposing greater regulation on one type of product may drive consumer prices up, and may create demand for other less expensive and, in this case, perhaps products with potentially greater environmental harm. Increased cost alone is not a sufficient reason to avoid application of standards that have been determined reasonable for all other similar hazardous waste-derived products.

In addition, the movement toward products that are unregulated by the hazardous waste program, but contain greater levels of metals, does not mean hazardous waste should go unregulated. Rather, other means should be evaluated to level the overall playing field for all fertilizer products.

Comment: States will have different programs than the [forthcoming] federal standards. The Department's proposal unlevels the playing field, making it much more difficult for manufacturers and farmers to do their jobs. "Level" the playing field across the nation by waiting for EPA to promulgate the rules.

Commenters: Richard J. Camp, February 15, 1999; Terry Witt, February 18, 1999.

Department Response: The Department understands commenters concerns, but now believes that its revised proposal to apply the Third-Third LDR standards to fertilizers made from zinc-containing hazardous waste has the effect of leveling the regulatory playing field for those fertilizers, because they will have to comply with the same EPA standards when they are made from characteristic or K061 zinc-containing hazardous wastes.

Comment: Supports adoption of regulations exempting from RCRA condensates derived from steam stripping overhead condensate wastes and burning the characteristic hazardous wastes in industrial boilers and furnaces. Supports consistency based on the adoption of NESHPS.

Commenter: Kathryn VanNatta, February 18, 1999.

Department Response: The Department agrees with the need for this consistency, as stated in its proposal.

Comment: Supports adoption of regulations exempting from RCRA condensates derived from steam stripping "overhead" condensate gases from kraft mill steam strippers but requests rule clarification of the term "overhead" which should not be interpreted as limiting what streams are included in the definition.

Commenters: Mark Lewallen, Russell Ayers; Weyerhaueuser, February 18, 1999.

Department Response: The commenters are requesting specificity around a federal definition of "overhead," desiring clarification of EPA's intent of which materials constituent "overhead" materials. This question is a program implementation issue that is best addressed through Department guidance. The Department did not evaluate the benefits of the specific proposal.

Comment: The Western Wood Preservers Institute supports adoption of the proposed rule which would incorporate the federal exclusion from certain hazardous waste regulations of waste water which is reused in the [wood] treating process.

Commenter: Dennis Hayward, Executive Director, Western Wood Preservers Institute, February 3, 1999.

Department Response: The Department agrees, as was discussed in the proposal.

State of Oregon

Department of Environmental Quality **Memorandum**

Date: February 26, 1999

To: Environmental Quality Commission

From: Anne R. Price, Manager, Hazardous Waste Policy and Program Development, Waste Management and Cleanup Division

Subject: Detailed Changes to Original Rulemaking Proposal Made in Response to Public Comments

In response to comments detailed and evaluated in Attachment D, the Department proposes to make two changes to its original rulemaking proposal:

1. Adopt EPA's stay of the Phase IV standards for zinc-containing hazardous waste characteristic fertilizers, and apply EPA's Third-Third regulatory standards to those fertilizers.

This change will make Oregon consistent with EPA in applying the Third-Third regulatory standards to those fertilizers.

2. Remove the federal and state K061 exemption from any LDRs and apply the same Third-Third LDR standards currently required for other fertilizers made from zinc-containing characteristic hazardous wastes, and extend the effective date to March 31, 2000 for complying with those standards.

This change will be more stringent than EPA, but is less stringent than the previously proposed Phase IV standards. Application of the Third-Third EPA standards to K061 waste-derived fertilizers will then be consistent with standards for all zinc-containing fertilizers made from any zinc-containing hazardous wastes.

The other rules remain unchanged from the original proposal and are re-listed below.

Changes to the Original Proposal

1. **Align Oregon's hazardous waste regulation of fertilizers containing characteristic hazardous zinc-wastes with EPA's Third-Third regulatory standards.**

Original Proposed Rule: Requires zinc-containing fertilizers made from TC characteristic hazardous wastes to meet Phase IV LDR standards before land application. 63 Federal Register FR 46332. NIE.

Revised Department Final Recommendation:

The Department is modifying its recommendation and proposing to apply the Third-Third standards to fertilizers made from characteristic zinc-containing hazardous wastes through the adoption of EPA's stay of the Phase IV standards. This standard will be consistent with EPA while EPA develops standards for all zinc-containing fertilizers made from hazardous wastes. The application of these older EPA standards, rather than the originally proposed new EPA Phase IV standards, may have the effect of raising the concentration levels of non-nutrients, primarily heavy metals, that may leach from these hazardous waste-derived fertilizers. However, applying the Phase IV standards would likely have driven manufacturers and farmers to potentially more dirty sources of zinc-containing fertilizers. The Department considers this approach to be a good compromise while EPA works to develop technology-based standards. However, the Department will continue to evaluate the impacts of fertilizer and may alter its approach depending on EPA's action.

2. **Apply Third-Third standards to and delay compliance for K061 waste-derived fertilizers.**

Original Proposed Rule: Requires zinc-containing fertilizers made from K061 listed hazardous waste (emission control dust from primary production of steel in electric arc furnaces) to meet new LDR standards before land application. 53 FR 31164. NIE.

Revised Department Final Recommendation:

The Department now proposes to apply the same Third-Third standards to fertililizers made from K061 as apply to fertilizers made from other zinc-containing hazardous wastes. Application of any LDR standards to K061 waste-derived fertilizer is new. Therefore, the Department is proposing to extend the LDR standard compliance date for K061 hazardous waste-derived fertilizer to March 31, 2000.

Unchanged Rules from the Original Proposal

Listed below are the rules proposed for adoption. Rules designated "not in effect (NIE)" are not in effect in Oregon until they are adopted. The remaining rules are currently in effect in Oregon, but implemented and overseen by U.S. EPA. The Department prefers to maintain its position as the primary implementing agency with respect to the hazardous waste program in the State of Oregon.

These rules are arranged in three categories:

(1) land disposal restriction standards;
(2) exclusions from certain hazardous waste regulations; and
(3) newly listed hazardous waste.

Land Disposal Restriction Standards:

1. **Proposed Rule:** Revises Universal Treatment Standard (UTS) levels for 12 nonwastewater treatment standards for metal-bearing listed or characteristic hazardous wastes. 63 FR 28556.

2. **Proposed Rule:** Requires UTS levels to be met for all known Underlying Hazardous Constituents (UHCs) in Toxicity Characteristic (TC) metallic wastes. 63 FR 28556.

3. **Proposed Rule:** Establishes LDR treatment standards for characteristic mineral processing wastes, including manufactured gas plant wastes. 63 FR 28556.

4. **Proposed Rule:** Clarifies LDR applicability to boiler cleanout wastewater. 63 FR 28556.

5. **Proposed Rule:** Establishes alternative LDR treatment standards for soils contaminated by hazardous waste. 63 FR 28556. NIE.

6. **Proposed Rule:** Extends the LDR compliance date for characteristic slags generated from thermal recovery of lead by secondary lead smelters. 63 FR 48124.

7. **Proposed Rule:** Requires slag from lead smelting operations to meet LDR standards before being land disposed. 63 FR 48124.

8. **Proposed Rule:** Revises the LDRs for seven listed hazardous wastes from carbamate production and amends previous regulations. 63 FR 47409.

9. **Proposed Rule**: Adopts permanently the adopted temporary LDR standards for spent potliners (K088) from primary aluminum reduction. 63 FR 51254.

10. **Proposed Rule:** Applies waste-specific (K169-K172) land disposal restriction standards to four newly listed petroleum refining wastes. 63 FR 24596.

11. **Proposed Rule:** Revises the LDRs for certain wastes from organobromine production and establishes LDR standards for those wastes. 63 FR 35147.

Exclusion from Certain Hazardous Waste Regulations:

1. **Proposed Rule**: Conditionally excludes from the definition of solid waste recycled wastewater and spent formulation from water-borne wood preservation processes. 63 FR 28556. NIE.

2. **Proposed Rule:** Clarifies the exclusion from RCRA regulation of whole printed circuit boards that are recycled. 63 FR 28556. NIE.

3. **Proposed Rule:** Exempts from RCRA regulation condensates derived from steam stripping overhead condensate wastes and then burning the characteristic hazardous waste gases in industrial boilers and furnaces. 63 FR 18504. NIE.

4. **Proposed Rule:** Clarifies release requirements for used oil generators, transporters, processors, re-refiners, burners and marketers apply in states not authorized for the base RCRA program; amends three incorrect references to the pre-1992 used oil specifications managed under 40 CFR 279. 63 FR 24963 and 63 FR 37780. NIE.

5. **Proposed Rule:** Excludes from hazardous waste regulations certain oil-bearing hazardous secondary materials, petrochemical recovered oil, and spent caustic solutions from petroleum refining processes when they are recycled. 63 FR 42110. NIE.

6. **Proposed Rule:** Excludes catalyst support media from regulation when recycled. 63 FR 42110. NIE

7. **Proposed Rule:** Expands the headworks exemption to include waste generated during petroleum refining process (K169-K172). 63 FR 42110. NIE.

8. **Proposed Rule:** Excludes from the definition of solid waste fuels which would normally be a hazardous waste, but which are comparable to some currently used fossil fuels. 63 FR 33782. NIE.

9. **Proposed Rule:** Conditionally excludes from the definition of solid waste mineral processing waste that is recycled. 63 FR 28556. NIE.

Newly Listed Hazardous Wastes:

1. **Proposed Rule:** Lists certain wastes (K140, U408) from organobromine production and establishes LDR standards for those wastes. 63 FR 24596.

2. **Proposed Rule:** Lists new wastes (K169-K172) generated during petroleum refining. 63 FR 56709.

Gcgjc22699

State of Oregon
DEPARTMENT OF ENVIRONMENTAL QUALITY

Rulemaking Proposal
to
Amend Oregon Administrative Rules to permanently adopt new Land Disposal Restrictions[1] for spent hazardous waste potliner and to adopt a number of other federal hazardous waste regulations with amendments through October 9, 1998.

Rule Implementation Plan

Summary of the Proposed Rule

Adopt Oregon Administrative Rules to:

- permanently adopt new Land Disposal Restrictions (LDRs) for spent hazardous waste potliner;
- establish or revise concentration levels for hazardous constituents when they are disposed, including constituents in soils contaminated by hazardous wastes;
- conditionally exclude from most hazardous waste regulations certain hazardous wastes that are recycled; and
- establish new hazardous wastes.

Proposed amendments to the rules adopt (1) an EPA exemption from new land disposal restrictions for zinc-containing fertilizers made from characteristic hazardous wastes; and (2) remove an existing federal and state exemption from any land disposal restrictions for zinc-containing fertilizers made from K061 hazardous waste dust from steel production. Amending this rule will have the effect of applying federal U.S. EPA Third-Third land disposal restriction or prohibition constituent concentration levels to hazardous metal constitutents in these waste-derived fertilizers before they may be applied to Oregon land.

With this rulemaking package, the Department has evaluated and made recommendations for adoption on all other federal hazardous waste regulations promulgated by U.S. EPA as of October 9, 1998.

Proposed Effective Date of the Rule

Upon filing with the Secretary of State. Compliance with the Third-Third standards to zinc-containing fertilizers made from K061 hazardous waste is delayed until March 31, 2000.

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[1] LDR standards are technology-based constituent concentration levels which must be met before a hazardous waste is disposed of in a hazardous waste landfill.

Notification of Affected Persons

The complete mailing list of over 2,200 persons will receive notice of this final rulemaking proposal.

Proposed Training/Assistance Actions

The majority of the new federal rules proposed for adoption will affect most hazardous waste generators and treatment, storage and disposal facilities because those rules pertain to the application of LDRs. All of those facilities have been advised of the proposed standards. Implementing these new standards will not impact the Department because these rules are either changes or additions to restrictions which the Department already reviews when it inspects an affected party. Other EPA regulations proposed for adoption, such as the one requiring fewer standards for wood preservers who recycle wastewater containing fungicide, provide potentially less regulatory burden on the facility than previous EPA standards. The burden on the Department to implement these new rules should not change since most of the proposed rules are already being implemented by the same facilities that the Department oversees.

In September, staffs were introduced to the new federal Phase IV LDR rule, the most significant rule in the rulemaking package. Training of staff will continue. EPA training on this rule occurred in December.

Additional fact sheets and guidance will be developed. Full implementation of the LDRs on zinc-containing waste materials, including K061, will be developed jointly with the Oregon Department of Agriculture.

Gjgjc22699

BEFORE THE ENVIRONMENTAL QUALITY COMMISSION

OF THE STATE OF OREGON

In the Matter of the Application of the United States Army for a Permit to Construct and Operate a Chemical Weapons Demilitarization Facility at the Umatilla Chemical Depot	)))))	ORDER CLARIFYING PERMIT DECISION

BACKGROUND

1. On February 10, 1997, the Environmental Quality Commission issued the FINDINGS AND CONCLUSIONS OF THE COMMISSION AND ORDER ("Commission Order") directing issuance of a Hazardous Waste Storage and Treatment Permit to the United States Army (Army) for construction and operation of incinerators to destroy chemical weapons stored at the Umatilla Chemical Depot (the facility is known as the Umatilla Chemical Agent Disposal Facility).

2. The Commission's February 10 order was based upon certain statutory findings the Commission was required to make before issuing such a permit. Commission Order, Findings 67-86.

3. G.A.S.P., Sierra Club, and other concerned organizations and individuals opposed to use of incineration for chemical weapons destruction filed a petition for review of the Commission's order in Multnomah County Circuit Court (PETITION FOR REVIEW, Case No. 9708-06159, *G.A.S.P. et al. v. Environmental Quality Commission et al.*).

4. On December 6, 1998, the Court issued an OPINION AND ORDER ON CROSS MOTIONS FOR SUMMARY JUDGMENT ("Court Opinion and Order").

5. The Court's Opinion and Order upheld the Commission's findings with only one exception, that the Commission's findings are ambiguous regarding the extent to which the Commission relied on inclusion of pollution abatement system (PAS) carbon filters. Court Opinion and Order, p. 18.

6. The Court remanded the Commission's Order for the limited purpose of further proceedings to "determine what role the PAS carbon filters play [in its analysis]." Court Opinion and Order, p. 27.

FINDINGS AND CONCLUSIONS OF THE COMMISSION IN RESPONSE TO REMAND

1. The Umatilla Chemical Agent Disposal Facility Hazardous Waste Treatment Permit issued to the Army by the Commission on February 12, 1997 regulates the five incinerators that will treat various components of the chemical weapons stockpile at the Umatilla Chemical Depot. Hazardous Waste Permit, AR 40 (CD 2, folder 10A).[1]

2. Each of the incineration systems is designed with a standard pollution abatement system (PAS) followed by an additional carbon filtration system (carbon filters) to further clean gases emitted from the incinerator. AR 40 (CD 2, folder 10A, at Module VII).

3. The PAS carbon filters were included in the Army's permit application as part of the system design for the incinerators. The PAS carbon filters were at a preliminary design stage at the time of issuance of the permit. AR 7 (CD 1B, folder 5A, at 234-256).

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[1] Citations to the Administrative Record (AR) are to the document number assigned by the Department of Environmental Quality in compiling the record, shown in the index provided to the Court, with the CD and folder numbers provided in parentheses for ease of reference.

4. The incinerators are designed to meet all applicable regulatory criteria without the PAS carbon filters. AR 40 (CD2, folder 10A, at Permit Condition VII.A.8).

5. The Commission's finding that the facility will not have any major adverse effects on public health and safety, or the environment of adjacent lands (Commission Order, Finding 85) did not assume additional protection based on inclusion of the PAS carbon filters. AR 2268 (CD 1, folder 7B at 156).

6. The Commission did not rely on PAS carbon filters in finding that the baseline incineration technology is the best available technology for destruction of agent at Umatilla. Commission Order, Finding 75.

7. For the purpose of providing an additional measure of safety the Commission has authority to require, and, therefore, has required inclusion of the PAS carbon filters as an additional pollution control component of the baseline incineration technology.

DATED this _____ day of ______, 1999.

Carol A. Whipple
Chair

Melinda S. Eden
Vice Chair

Tony Van Vliet
Member

Linda A. McMahon
Member

Mark P. Reeve
Member

____
Carol A. Whipple, Chair
For the Environmental Quality Commission

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Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
Eastern Region
Hermiston Office
256 E Hurlburt
Hermiston, OR 97838
Phone: (541) 567-8297
FAX: (541) 567-4741
TTY: (503) 229-6993

State of Oregon
Department of Environmental Quality
Received
MAR 5 1999
OFFICE OF THE DIRECTOR

Memorandum

DEQ Item No. 99-0333

DATE: March 3, 1999

TO: Environmental Quality Commission

FROM: Sue Oliver SO
DEQ, Hermiston

SUBJECT: Umatilla ("Order Clarifying Permit Decision")
(Agenda Item F-1, March 19, 1999 EQC meeting)

Enclosed is the draft "Order Clarifying Permit Decision" that will be mailed out to the Umatilla mailing list tomorrow, along with the "Chance to Comment" form. The comment period (written comments only) will close on March 15. We will be assembling all comments received and overnighting them to you on March 16.

Please call me at 541-567-8297 (ext. 26) if you have any questions.

Cc: Steve Bushong, Department of Justice
Larry Knudsen, Department of Justice
Kitty Purser, Office of the Director

Enclosures: Chance to Comment Form (DEQ Item No. 99-0332)
Draft Order Clarifying Permit Decision (DEQ Item No. 99-0334)

Oregon Department of Environmental Quality

A CHANCE TO COMMENT ON...

INVITATION TO COMMENT ON AN "ORDER CLARIFYING PERMIT DECISION" OF THE ENVIRONMENTAL QUALITY COMMISSION RELATED TO THE UMATILLA CHEMICAL AGENT DISPOSAL FACILITY
(I.D. No. ORQ 000 009 431)

Public Notice Date: March 3, 1999
Comments Due: March 15, 1999

For what facility?

This Invitation to Comment is related to the **Umatilla Chemical Agent Disposal Facility (UMCDF)** currently under construction at the U.S. Army's Umatilla Chemical Depot near Hermiston in Eastern Oregon. The Environmental Quality Commission (EQC) and the Department of Environmental Quality (DEQ) approved a Hazardous Waste Storage and Treatment Permit (HW Permit) and an Air Contaminant Discharge Permit for the UMCDF in February 1997. The UMCDF will use incineration technology to destroy the stockpile of chemical warfare agents that have been stored at the Umatilla Chemical Depot since the mid-1960s. The chemical agents are stored in munitions and bulk containers and include the lethal nerve agents known as "GB" (Sarin) and "VX," and the blister agent "HD" (commonly known as "mustard"). Nerve agents are highly toxic in both liquid and vapor form, and blister agents cause severe damage on exposed skin, eyes, and to the respiratory tract if inhaled.

As required by Oregon laws and regulations (ORS 466.055 and 466.060 and OAR 340-120-010) the EQC made a series of affirmative "findings" before the Permits were issued ("Findings and Conclusions of the Commission and Order," dated February 10, 1997).

Why is the EQC making additional findings now?

The EQC has prepared an Order Clarifying Permit Decision to clarify the findings made in the 1997 UMCDF Permit decision. The clarification is in response to a legal ruling made in December 1998, by the Multnomah County Circuit Court.

What was the legal ruling?

In August, 1997, a legal challenge to the UMCDF permits was filed in the Multnomah County Circuit Court (Case No. 9708-06159) by citizens concerned about using incineration to destroy the chemical weapons. In December, 1998, the Court ("Opinion and Order on Cross Motions for Summary Judgment," dated December 6, 1998) concluded that "apart from one critical ambiguity, the findings, conclusions, and procedures of the [EQC and DEQ] were consistent with applicable law, supported by substantial evidence in the record as of the time that record closed, and within the discretion afforded to the [EQC and DEQ]."

The Court also concluded, however, that the findings were ambiguous with respect to the extent to which EQC and DEQ may have relied on operable carbon filters, when the record establishes that the filters were only in the design stage and did not yet represent a proven technology.

What are the carbon filters?

The UMCDF will use five incinerators to treat the various components of the chemical weapons stockpile at the Umatilla Chemical Depot. Each of the furnace systems has a standard Pollution Abatement System (PAS), followed by an additional carbon filtration system to further clean the gases coming from the furnaces. The air emissions from the UMCDF furnaces are required to meet all of the emission limits established by the air and hazardous waste permits before the gases pass through the carbon filter system. The carbon filter system will further reduce emissions of some pollutants, especially dioxins.

The EQC concluded that the incineration technology proposed for use at UMCDF met the criteria that the EQC developed to determine the "best available technology" to treat the chemical weapons and that incineration would pose no adverse effects to human health or the environment. During the public comment periods on the draft Permits the EQC heard concerns from numerous commenters about the stack emissions from the UMCDF. Although the Pre-Trial Burn Human Health and Ecological Risk Assessment conducted by the DEQ showed that there would be no adverse effects on public health or the environment from the operation of the UMCDF (without the carbon filters), the EQC responded to public concerns by directing the DEQ to strengthen the language in the HW Permit requiring the Army to install and operate the carbon filter systems.

What would be the effect of this Order?

This Order would clarify that the Commission findings do not rely on the PAS Carbon Filters and that the filters are required as an extra safety precaution.

This Invitation to comment is limited solely to the proposed Order and does not affect the status of the current Permits.

Where can I find more information?

For more information concerning the Umatilla Chemical Agent Disposal Facility please call Misti McDowell of the DEQ in Hermiston at 541-567-8297, ext. 25 (Toll-free in Oregon 1-800-452-4011).

Where do I send my comments?

Written comments should be presented to the DEQ by 5:00 p.m., March 15, 1999. The mailing address is Wayne Thomas, Umatilla Program Manager, DEQ, 256 E. Hurlburt, Suite 105, Hermiston, OR, 97838. Written comments may also be submitted to the DEQ Hermiston office via facsimile transmission to 541-567-4741.

What happens next?

The Environmental Quality Commission will review all comments received during the public comment period. This issue will be on the EQC Agenda for discussion at the regular meeting to be held March 19 in Portland, Oregon. The EQC will not be accepting oral testimony at this meeting.

Accommodation of disabilities:

Please notify DEQ about any special physical or language accommodations you may need as far in advance of the meeting or hearing as possible. To make these arrangements, contact Sylvia Herrley at 1-800-452-4011 (toll free in Oregon), or at (503) 229-5317. People with hearing impairments may call DEQ's TDD number at (503) 229-6993. This publication is also available in alternate format (e.g. large print, Braille, Spanish) upon request.

BEFORE THE ENVIRONMENTAL QUALITY COMMISSION

OF THE STATE OF OREGON

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6. The Court remanded the Commission's Order for the limited purpose of further proceedings to "determine what role the PAS carbon filters play [in its analysis]." Court Opinion and Order, p. 27.

FINDINGS AND CONCLUSIONS OF THE COMMISSION IN RESPONSE TO REMAND

1. The Umatilla Chemical Agent Disposal Facility Hazardous Waste Treatment Permit issued to the Army by the Commission on February 12, 1997 regulates the five incinerators that will treat various components of the chemical weapons stockpile at the Umatilla Chemical Depot. Hazardous Waste Permit, AR 40 (CD 2, folder 10A).[1]

2. Each of the incineration systems is designed with a standard pollution abatement system (PAS) followed by an additional carbon filtration system (carbon filters) to further clean gases emitted from the incinerator. AR 40 (CD 2, folder 10A, at Module VII).

3. The PAS carbon filters were included in the Army's permit application as part of the system design for the incinerators. The PAS carbon filters were at a preliminary design stage at the time of issuance of the permit. AR 7 (CD 1B, folder 5A, at 234-256).

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[1] Citations to the Administrative Record (AR) are to the document number assigned by the Department of Environmental Quality in compiling the record, shown in the index provided to the Court, with the CD and folder numbers provided in parentheses for ease of reference.

4. The incinerators are designed to meet all applicable regulatory criteria without the PAS carbon filters. AR 40 (CD2, folder 10A, at Permit Condition VII.A.8).

5. The Commission's finding that the facility will not have any major adverse effects on public health and safety, or the environment of adjacent lands (Commission Order, Finding 85) did not assume additional protection based on inclusion of the PAS carbon filters. AR 2268 (CD 1, folder 7B at 156).

6. The Commission did not rely on PAS carbon filters in finding that the baseline incineration technology is the best available technology for destruction of agent at Umatilla. Commission Order, Finding 75.

7. For the purpose of providing an additional measure of safety the Commission has authority to require, and, therefore, has required inclusion of the PAS carbon filters as an additional pollution control component of the baseline incineration technology.

DATED this _____ day of ______, 1999.

Carol A. Whipple
Chair

Melinda S. Eden
Vice Chair

Tony Van Vliet
Member

Linda A. McMahon
Member

Mark P. Reeve
Member

____
Carol A. Whipple, Chair
For the Environmental Quality Commission

GEN12178

Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
Eastern Region
Hermiston Office
256 E Hurlburt
Hermiston, OR 97838
Phone: (541) 567-8297
FAX: (541) 567-4741
TTY: (503) 229-6993

Memorandum

DEQ Item No. 99-0404 (92)

DATE: March 16, 1999

TO:
Carol Whipple
Melinda Eden
Tony Van Vliet
Linda McMahon
Mark Reeve
Langdon Marsh
Stephanie Hallock
Larry Edelman
Larry Knudsen
Steve Bushong

FROM: Sue Oliver SO
DEQ, Hermiston

SUBJECT: Public Comments received on draft "Order Clarifying Permit Decision"
Umatilla Chemical Agent Disposal Facility
Agenda Item F-1 for the EQC meeting to be held March 19, 1999

Enclosed is a copy of the only public comment the Department received in response to the "Chance to Comment" on the draft Order Clarifying Permit Decision (the comment period closed at 5:00 p.m. on March 15). G.A.S.P. et al. sent the enclosed letter via facsimile transmission. It includes excerpts from an Army report titled "Risk Assessment of the Pollution Abatement Filter System of the Umatilla Chemical Agent Disposal Facility" dated September 1998. The Department has included a full copy of the report.

The Department became aware of this report on October 21, 1998 during a public meeting that the Army held at their Outreach Office in Hermiston. At that meeting the Army presented a summary of the results of their "risk assessment" of the carbon filter system at Umatilla. On November 23, 1998, the Department requested that the Army provide a full copy of the report. The report was received in the Hermiston office on January 14, 1999. It is the Department's understanding that the National Research Council has reviewed the report, and is preparing an assessment of the Army's risk evaluation process.

If you have any questions please call me at 541-567-8297, ext. 26.

600

99-0402

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DEPARTMENT OF ENVIRONMENTAL QUALITY
RECEIVED
MAR 15 1999

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Fax # 541 567-4741	Fax # 503 234-1330	

STUART A. SUGARMAN
ATTORNEY AT LAW

3430 S.E. BELMONT ST., SUITE 101
PORTLAND, OREGON 97214
(503) 234-2694
EMAIL: BLC@HEVANET.COM
FAX (503) 234-1330

15 March 1999

Mr. Wayne Thomas
Umatilla Program Manager
Department of Environmental Quality
256 East Hurlburt Street, Suite 105
Hermiston, OR. 97838

HERMISTON OFFICE

VIA FACSIMILE -- (541) 567-4741

RE: Invitation to Comment dated March 3, 1999 regarding proposed Order Clarifying Permit Decision

Dear Mr. Thomas:

We write on behalf of G.A.S.P., Sierra Club, Oregon Wildlife Federation, Karyn Jones, Susan Jones, Heather Billy, Deborah Burns, Janice H. Lohman, Leandra Phillips, Merle C. Jones, Cindy Beatty, Andrea E. Stine, Dorothy Irish, Mary Bloom, Robert J. Palzer, Janet Nagy, Ladonna King, John Spomer, Christine Clark, Stuart Dick, Gail Horning, David Burns, Pius A. Horning, Karla Stuck, and Melanie Beltane (collectively referred to as "Citizens") regarding the proposed Umatilla Chemical Demilitarization Facility (UMCDF). As you know, the Multnomah County Circuit Court issued a decision on 6 December 1998 remanding this matter to the Oregon Environmental Quality Commission (EQC) and Department of Environmental Quality (DEQ). The Court stated, in part, "I must remand these orders to the respondents to determine what role the PAS carbon filters play in their analysis." Opinion and Order at 27.

On 3 March 1999, the DEQ issued an invitation to comment on a proposed Order Clarifying Permit Decision. The permit decision being clarified is the February 10, 1997 decision issued by the EQC. In the invitation to comment, the DEQ stated "[t]his invitation to comment is limited solely to the proposed Order and does not affect the status of the current permits." Invitation to Comment at 2.

First, Citizens raise the general objection that the proposed Order Clarifying Permit Decision appears to have been prepared by the DEQ and not the EQC. The proposed Order Clarifying Permit Decision appears not to have been drafted by any of the decision makers that issued the decision approving the Army's permit. Citizens expect that the EQC, and not DEQ, would best be able to clarify its own findings. Citizens hereby make a public records request pursuant to ORS 192.001 *et. seq.* seeking all DEQ and EQC records pertaining to the proposed Order Clarifying Permit Decision.

Second, the proposed Order Clarifying Permit Decision fails to clarify anything It merely concludes that the EQC (or DEQ) "did not rely on PAS carbon filters . . ." Proposed Order Clarifying Permit Decision at 3. The proposed order does not explain how its earlier findings, which would appear to hinge the entire decision, including best available technology (BAT) on carbon filters, does not actually do so. The proposed order also does not attempt to explain how the EQC now is taking a stance which appears diametrically opposed to the clear, stated emphasis individual EQC members placed on the filters with no equivocation or counter statements from any members, that the decision hinged on carbon filters.

Third, the DEQ and EQC have, once again, failed to provide the Citizens and others with a contested case process that would permit full airing of the critical issues being raised here and in the Citizens other submissions. In fact, the DEQ/EQC have failed even to address many issues raised by the Citizens. See, e.g., Citizens December 14, 1998 letter to the EQC and attachments. Consequently, the DEQ's/EQC's process concerning the Army's permit continues to march forward without balance or even a sense of fairness.

Fourth, in the proposed Order Clarifying Permit Decision, the DEQ completely abandons the PAS carbon filter system as a system necessary to meet statutory or regulatory requirements to choose the best available technology (BAT) and protect public health and the environment. However, the DEQ notes that the PAS carbon filters are being added to provide "an additional measure of safety . . ." Proposed Order Clarifying Permit Decision at 3.

Yet, the DEQ fails to assess what negative impacts may result from the addition of PAS carbon filters. Ironically, the Army and National Research Council have not determined to this day, four years after submitting a permit application, what risk is associated with the addition of PAS carbon filters to the baseline incineration system. Citizens urge the EQC to consider the permittee's following statements which reflect the Army's knowledge of this risk and the EQC's continuing habit of ignoring these risks:

> a) "Since the Army's initial assessment, additional risk assessment tools have been developed to assist in the characterization of baseline system performance, both with and without the proposed PAS filter system. Preliminary assessments using these tools indicate that the addition of the PAS filter system may not contribute to any measurable reduction in risk and may actually be the source of new risk to both workers and to the public." Department of Defense; Interim Status Assessment of the Chemical Stockpile Disposal Program: April, 1996.
>
> b) "Two areas where cost reductions have been identified in developing the December 1996 cost estimate are associated with the filter system for the Pollution Abatement System (PAS) and optimizing operations. The Program Manager has completed a value engineering study that modified the design and found reductions in capital and operating costs." (Statement

before the House National Security Committee of the House of Representatives by Mr. Gil Decker, Assistant Secretary Army/Research Development and Acquisition).

In addition, within the last thirty days, Citizens have uncovered a draft document prepared and reviewed by Army contractors that demonstrate PAS carbon filters are not a benign technology. Citizens request that the DEQ/EQC add the enclosed excerpts of the following document into the record: Mitretek Systems, Inc. "Risk Assessment of the Pollution Abatement Filter System for the Umatilla Chemical Agent Disposal Facility" (Draft September 1998) (herein referred to as the "Mitretek RA"). The following pages of the Mitretek PAFS Risk Assessment are being offered into the record: cover - vii; 1-1 to 1-2; 3-2 to 3-7; 4-7 to 4-18; 4-30 to 4-36. These pages directly address PAS carbon filter issues as well as other issues related to the overall risk of the baseline incineration system.

Fifth, and more specifically, the Mitretek PAFS Risk Assessment acknowledges a large percent increase in the frequency of some accident events (from 168% to 385% more likely) due to addition of the PFS carbon filters. Mitretek RA at 4-13 (Table 4-8). Moreover, the addition of PFS carbon filters presents new accident scenarios "not present in the baseline QRA [Quantitative Risk Assessment]." Mitretek RA at 4-14 to 4-18. The addition of PFS carbon filters also presents "a 13 percent increase in worker fatality risk for the UMCDF." Mitretek RA at 4-30. Finally, the Mitretek PAFS Risk Assessment acknowledges that significant uncertainties in the QRA process have not been "treated", "including uncertainty in the parameters affecting the downwind transport of agent and in the dose/response behavior of the population." Mitretek RA at 4-35. Significant omissions indeed!

This new information points out the need to provide a contested case process and to re-evaluate whether incineration is the best available technology. If the DEQ/EQC will not reopen all issues to the contested case process, then Citizens request that the agencies open the assessment of best available technology to the contested case process. Specifically, Citizens request that the DEQ/EQC immediately authorize subpoenas for the undersigned to allow the timely capture and preservation of documents and testimony from various government officials regarding the ever-changing risks and status of the major components in the continually changing design of the "baseline" incineration system.

We would appreciate a prompt written response to these comments and the requests made herein in order to allow the Citizens to determine how to further address the issues raised to date with the Circuit Court and in other fora. As we (namely, Richard Condit and Stu Sugarman) did not directly receive copies of the Invitation to Comment, we request that the undersigned be placed on all mailing lists associated with the permitting and further assessment of UMCDF, and we reserve the right to challenge this entire proceeding because of lack of adequate notice despite our previous request to be placed on all relevant mailing lists. We also reserve the right to challenge any other procedural defect relevant to this proceeding.

Please contact us if you have any questions.

Respectfully Submitted,

Stuart A. Sugarman, OSB #92137
3430 SE Belmont, Suite 101
Portland, OR 97214

for Richard

Richard E. Condit, Attorney
2525 Arapahoe Ave., Suite E4-309
Boulder, CO. 80302
303-444-1188 ext. 219

Counsel for G.A.S.P., Sierra Club, and OWF et al.

SAS.ss

Enclosure as noted

MTR 1997-58

Mitretek Technical Report

Risk Assessment of the Pollution Abatement Filter System for the Umatilla Chemical Agent Disposal Facility

September 1998

Sponsor:	U.S. Army Office of the Program Manager for Chemical Demilitarization	**Contract No.:**	DAAM01-95-D-0002
Dept. No.:	H050	**Project No.:**	0695220N

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MITRETEK
SYSTEMS
Center for Science and Technology
McLean, Virginia

EXH TO
3/15 UMCDF
Comments

Mitretek Department
and Project Approval: Darcy Ligon
for Abu Talib

EXH TO
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COMMENTS

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Section 1

Introduction

1.1 Background

In 1993, the National Research Council (NRC) recommended that the U.S. Army evaluate the addition of carbon filters to treat effluent gases from the pollution abatement systems (PASs) of chemical agent disposal facilities (CDFs). It was believed that carbon filters could enhance the safety of the facility by reducing the risk of accidental agent release from the incinerator stack (NRC, 1994). In addition, while air emissions from normal operations of CDF furnaces contain only trace amounts of substances that may present health hazards, the PAS filter system (PFS) potentially would have the added benefit of further reducing these trace emissions.

In response to the NRC's recommendation, the Army developed a conceptual design of the PFS. The design served as the basis of the Army's preliminary assessment of the potential impacts of the PFS on human health and environmental safety (Army, 1994). This evaluation concluded that carbon filters could potentially enhance system performance but would also increase system cost and complexity. The Army's study was not site-specific. In addition, health risk assessments (HRAs) and quantitative risk assessments (QRAs) were not available at the time to quantify the benefits in terms of risk. Since the 1994 study, the original PFS design has been modified to a more efficient configuration. Additionally, the Army has utilized the subsequently completed Umatilla Chemical Agent Disposal Facility (UMCDF) HRA and QRA to conduct a more comprehensive, facility-specific risk analysis of the PFS.

Mitretek has the lead responsibility of coordinating and integrating the work of other Army contractors. This report documents the PFS risk analysis for the UMCDF and is a collaborative effort of Mitretek, Science Applications International Corporation (SAIC), the Center for Health Promotion and Preventive Medicine (CHPPM), and the Edgewood Research, Development, and Engineering Center (ERDEC). The evaluation follows the general methodology described in a separate report (Mitretek, 1998).

1.2 Objective and Scope

In its risk evaluations of proposed changes to the CDFs, the Army's primary objectives are to verify that the facility remains in compliance with the state-approved health risk thresholds and that the proposed changes will not compromise public and worker safety. The specific objectives of the PFS study that is documented in this report are to (1) estimate the net effects on health risks and safety, and (2) address other factors that affect or may be affected by removal of the PFS at the UMCDF.

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As a starting point, this study draws from previously completed risk assessments for the UMCDF. These assessments are the Pre-Trial Burn Risk Assessment (commonly called the HRA) performed by Ecology and Environment, Inc. (E & E) for the Oregon Department of Environmental Quality (ODEQ) (E & E, 1996) and the QRA performed by SAIC (SAIC, 1996a). They are used by the Army as the foundation for making decisions on Chemical Stockpile Disposal Program changes for controlling or mitigating risks.

HRAs are conducted as part of the Resource Conservation and Recovery Act (RCRA) permit requirements for hazardous waste combustion facilities. The HRA consists of two major components—human health risk assessment (HHRA) and ecological risk assessment (ERA). The HHRA quantifies cancer risk and other health effects resulting from exposure to stack emissions. The ERA estimates the potential ecological risk (e.g., terrestrial vegetation and soil invertebrates) as a result of exposure to emissions of pollutants that may affect the ecology.

The approach for HRAs is deliberately conservative to ensure that health risks are not underestimated. The UMCDF HRA analyzed the health and ecological effects of stack emissions based on gas volumetric flow rates and temperature that assumed the presence of a PFS. To be conservative, however, no credit was taken for the capture efficiency of the carbon filters. For the UMCDF PFS evaluation, that HRA is revised to estimate the effects from stack emissions of a facility configuration that did not have the PFS (unchanged chemical emissions but dispersion governed by appropriate flow rates and temperatures).

QRAs quantify the risks from accidents involving the release of agent. As such, QRA results are utilized by the Army as a design and operational tool for managing accident-related risks. The Phase 1 QRA has been completed for the UMCDF (SAIC,1996a). A Phase 1 QRA essentially updates the risk assessment that was performed previously as part of the Army's *Final Programmatic Environmental Impact Statement (FPEIS) for the Chemical Stockpile Disposal Program* (Army, 1988) The Phase 1 QRA *does not* include the PFS. As part of this effort, the UMCDF Phase 1 QRA was updated to determine the net effect of the PFS on risk related to accidental agent release.

In addition to the HRA and QRA evaluations, a hazard evaluation (HE) was performed to qualitatively evaluate the hazards from solid waste disposal involving the PFS. While these hazards are also accident-driven, the risks to the public and workers associated with these hazards are not primarily from chemical agent but are from potential exposure to non-agent hazardous substances. As such, these types of hazards are not addressed in the QRA.

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assessment, the state-approved threshold for excess cancer risk is 1E-05[3] (E & E, 1996).

- **Chronic noncarcinogenic health effect.** Expressed as a hazard quotient (HQ) and as a hazard index (HI). The HQ represents the potential long-term adverse health impact of exposure to a toxic chemical emitted from the incinerator stacks. It is expressed as the ratio of a receptor's dose resulting from exposure to a single substance for a specified time period (chronic) to a reference dose for that substance for a similar time period. When more than one chemical is released, the overall potential for noncarcinogenic effects is assessed by calculating the HI. The HQs for all chemicals that affect specific target organs are added together to obtain the HI for those target organs. Separate HIs are developed for each exposure route. For the UMCDF, the state-approved HQ and HI for chronic exposure scenarios is 0.25 (E & E, 1996).

An HHRA may also address acute health effects. This was not a requirement for the UMCDF and thus is not addressed in the HHRA.

3.2.1 Constituent of Potential Concern (COPC) Concentration Data

Table 3-1 presents a list of 82 constituents of potential concern (COPCs) that could be discharged to the atmosphere through stack gas emissions during operation of the various incinerators at the UMCDF. They include 10 potentially toxic dioxin and furan homologue chemicals which, for the purposes of this analysis, have been assumed to be and modeled as 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) toxicity equivalents (TEQ). The table gives the maximum concentration for each COPC based on tests performed at the Johnston Atoll Chemical Agent Disposal System (JACADS) on Johnston Island in the Pacific Ocean. Of these 82 COPCs, 46 are considered "regulated," which means that they are specifically addressed in the RCRA permit for the applicable source (e.g., LIC and DFS). As the table indicates, many of the regulated COPCs are at or just slightly above their detection limit concentrations. Additional information on the specific COPC emission rates used in the air dispersion analysis for each UMCDF emission source is provided in the Pre-Trial Burn Risk Assessment report (E & E, 1996).

3.2.2 Air Dispersion Model

The UMCDF HHRA used the Industrial Source Complex Short Term, Version 3 (ISCST3) computer model to predict chronic ambient air vapor and particulate

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[3] 1E-05 is the same as 1×10^{-5}

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Table 3-1. JACADS Maximum Stack Concentration Data

COPC	Regulated Pollutant?	Maximum Stack Gas Concentration* (ug/m^3)	Source	Detection Limit (DL)**
Dioxin/Furan Homologue Chemicals				
2,3,7,8-Tetrachlorodibenzo-p-Dioxin	Yes	8.83E-05	GB-LIC	1.10E-05
Pentachlorodibenzo-p-Dioxin***	Yes	5.66E-05	GB-LIC	5.66E-05
Hexachlorodibenzo-p Dioxin	Yes	9.72E-05	VX-DFS	3.24E-05
Heptachlorodibenzo-p-Dioxon	Yes	7.62E-05	VX-DFS	3.24E-05
Octachlorodibenzo p Dioxin	Yes	1.71E-04	HD-MPF	8.46E-05
2,3,7,8-Tetrachlorodibenzofuran	Yes	1.16E-05	HD-LIC	7.58E-06
Pentachlorodibenzofuran	Yes	1.34E-04	HD-MPF	4.23E-05
Hexachlorodibenzofuran	Yes	2.11E-04	HD-MPF	4.23E-05
Heptachlorodibenzofuran	Yes	4.00E-04	HD-MPF	4.23E-05
Octachlorodibenzofuran	Yes	2.38E-04	HD-MPF	8.46E-05
Volatile Products of Incomplete Combustion (PICs)				
Acetone	No	3.58E+04	VX-LIC	1.00E-01
Benzene	Yes	4.75E+01	GB-LIC	3.00E-01
Bromodichloromethane	No	1.46E+00	VX-DFS	1.00E-01
Bromoform	No	1.71E+01	VX-DFS	1.00E-01
2-Butanone (or methyl ethyl ketone)	No	1.47E+02	VX-DFS	1.00E-01
Carbon Disulfide	No	1.00E+01	HD-LIC	1.00E-01
Carbon Tetrachloride	No	4.33E+01	HD-LIC	1.00E-01
Chlorobenzene	No	1.94E+00	HD-LIC	1.00E-01
Chloroform	No	3.96E+01	VX-DFS	1.00E-01
Chloromethane	No	5.59E+02	GB-LIC	3.00E-01
Dibromochloromethane	No	1.04E+00	VX-DFS	1.00E-01
1,1-Dichloroethane	No	3.00E-01	GB-LIC	3.00E-01
Dichloromethane (or methylene chloride)	No	5.86E+03	VX-DFS	1.00E-01
1,2-Dichloropropane (or propylene dichloride)	No	4.96E+02	GB-LIC	3.00E-01
Cis-1,3-Dichloropropene	No	4.28E+02	GB-LIC	3.00E-01
Trans-1,3-Dichloropropene	No	4.45E-01	HD-LIC	1.00E-01
Ethylbenzene	No	3.85E+00	VX-DFS	1.00E-01
4-Methyl-2 Pentanone (or methyl isobutyl ketone)	No	4.91E+00	GB-LIC	3.00E-01
2-Hexanone	No	3.71E+00	GB-LIC	3.00E-01
Styrene	No	2.41E+02	HD-LIC	1.00E-01
1,1,2,2-Tetrachloroethane	No	1.04E+00	GB-LIC	3.00E-01

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Table 3-1. (Continued)

COPC	Regulated Pollutant?	Maximum Stack Gas Concentration* ($\mu g/m^3$)	Source	DL**
Volatile PICs (continued)				
Tetrachloroethene (or tetachloroethylene)	No	1.20E+00	GB-LIC	3.00E-01
Toluene	No	3.02E+03	VX-DFS	1.00E-01
1,1,1-Trichloroethane (or methyl chloroform)	No	1.77E+01	VX-DFS	1.00E-01
Vinyl Acetate	No	6.90E-01	GB-LIC	3.00E-01
Vinyl Chloride	Yes	9.92E+00	HD-MPF	1.00E-01
Xylenes	No	3.76E+00	VX-LIC	1.00E-01
Semi-Volatile PICs				
Benzoic Acid	No	1.23E+02	VX-DFS	1.40E+00
Benzyl Alcohol	No	6.16E+02	VX-LIC	1.40E+00
Diethyl Phthalate	No	2.89E+01	GB-LIC	1.40E+00
Dimethyl Phthalate	No	1.15E+02	HD-LIC	9.50E-01
Di-n-Butyl Phthalate	No	5.52E+00	GB-LIC	1.40E+00
Di-n-Octyl Phthalate	No	2.76E+01	GB-LIC	1.40E+00
Bis(2-Ethylhexyl)-Phthalate	No	9.28E+01	HD-LIC	1.10E+00
2-Methylphenol (or o-cresol)	No	1.24E+02	GB-LIC	1.40E+00
3-Methylphenol (or m-cresol)	No	5.08E+01	HD-LIC	1.10E+00
4-Methylphenol (or p-cresol)	No	5.80E+01	GB-LIC	1.40E+00
Naphthalene	No	2.92E+00	VX-DFS	1.40E+00
Pollutants				
GB***	Yes	6.00E-02****	GB-LIC	6.00E-02
HD***	Yes	8.70E+00****	HD-LIC	6.00E+00
VX***	Yes	6.00E-02****	VX-LIC	6.00E-02
Chlorine***	Yes	3.42E+03	HD-LIC	3.42E+03
Hydrogen Chloride	Yes	3.70E+03	GB-LIC	-
Hydrogen Fluoride	Yes	9.30E+03	GB-LIC	-
Nitroglycerine	Yes	8.18E+01	VX-DFS	-
Polychlorinated biphenyls (PCB)	Yes	8.50E-02	VX-DFS	-
Particulate	Yes	8.00E+03	VX-LIC	-
2,4-Dinitrotoluene	Yes	3.71E-01	VX-DFS	3.57E-01
2,6-Dinitrotoluene	Yes	3.71E-01	VX-DFS	3.57E-01
2,4,6-Trinitrotoluene	Yes	3.71E-01	VX-DFS	3.57E-01
RDX	Yes	3.71E-01	VX-DFS	3.57E-01
HMX	Yes	3.71E-01	VX-DFS	3.57E-01

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Table 3-1. (Concluded)

COPC	Regulated Pollutant?	Maximum Stack Gas Concentration* (μg/m³)	Source	DL**
Metals				
Antimony***	Yes	1.60E+01	HD-MPF	1.60E+01
Arsenic	Yes	2.22E+01	HD-LIC	6.78E+00
Barium	Yes	1.57E+01	HD-MPF	1.50E+01
Berylium***	Yes	5.27E+00	GB-LIC	5.27E+00
Boron	Yes	5.30E+02	VX-LIC	1.25E+01
Cadmium	Yes	9.81E+00	HD-MPF	3.75E+00
Nickel	Yes	3.52E+01	GB-LIC	5.12E+00
Phosphorus	Yes	3.43E+02	VX-LIC	1.25E+01
Selenium	Yes	1.06E+01	HD-LIC	6.73E+00
Silver***	Yes	1.60E+01	HD-MPF	1.60E+01
Thallium	Yes	5.27E+01	GB-LIC	5.27E+01
Tin	Yes	3.61E+01	VX-LIC	6.41E+00
Vanadium	Yes	1.07E+01	HD-LIC	2.56E+00
Zinc	Yes	2.31E+02	HD-LIC	6.73E+00

* Maximum reported stack concentrations from all tests during JACADS Operational Verification Testing.

** Detection Limit (DL) concentrations (in μg/m³) vary depending on sampling conditions. Agent DL shown is equal to 20 percent of the allowable stack concentration (ASC).

*** Undetected.

**** Based on JACADS analytical DLs. For the analysis presented in this report, agent DL concentration is assumed to be 20 percent of the ASC.

concentrations, as well as the chronic wet and dry deposition rates. ISCST3 is the most up-to-date model and incorporates many improvements over previous air dispersion models. The refinements include (E & E, 1996):

- Revised dry deposition calculation routine
- Revised scaveriging coefficients for wet deposition calculations
- Expanded number of receptors for which calculations can be performed
- Plume depletion mechanism to account for wet and dry removal processes
- Separation of particulate and vapor phases of same compounds
- Incorporation of complex terrain algorithms

PAX "19A"

3.2.3 Other Key HHRA Assumptions

The following were some of the key assumptions in the existing UMCDF HHRA:

- Study area encompassed all the area within a 50-km radius of the UMCDF.
- Campaign duration was 3.2 years[4] with all furnaces operating continuously during that time, even though actual run-time, based on the stockpile inventory, was projected at 1.0 year (3.2 years accounted for equipment downtime).
- For the DFS, LIC, and MPF, the emission rates of regulated COPCs for the UMCDF were based on the maximum emission rate detected for each constituent during the JACADS test runs for each furnace and were adjusted to reflect the UMCDF incinerator feed rates. However, for the DUN, the greatest emission rate from all sources (i.e., total of 19 test runs) was used.[5] These emission rates served as the initial inputs to the air dispersion analysis.
- Emission rates of chemical agents (even if they were not detected) were derived based on the assumption that they were present at the maximum allowable stack concentration (ASC) (0.3 µg/m³ for GB and VX, 30 µg/m³ for HD).
- Undetected, regulated COPCs were assumed present at concentrations equal to the detection limit. Undetected, unregulated COPCs were assumed present at concentrations equal to one-half the detection limit.
- Off-peak performance, leading to emission rates that were 10 times normal, occurring 20 percent of the time for nonmetals and 5 percent of the time for metals.
- Emissions of certain metals (Pb, Ba, Cd, Cr, Ni) from the MPF were not based on JACADS data but were calculated separately. Emissions were expected to be greater for these metals because of the processing of painted 155-millimeter shells, which contain greater amounts of these metals than the ton containers used in the JACADS trial burns.
- Risks from direct inhalation and indirect exposures were estimated using the ISCST3 model. All COPCs listed in Table 3-1 were evaluated for direct inhalation exposure, and cancer risk was estimated for carcinogenic substances.

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[4] The campaign duration of 3.2 years was used in the E & E HRA report. This differs slightly from the campaign duration value used in the QRA (3.3 years). We believe this discrepancy is largely due to rounding-off errors.

[5] At the time the UMCDF HRA was performed, JACADS trial burn tests for the DUN had not been completed.

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- A COPC was selected for indirect exposure if it met any one of the following criteria:
    - Recommended by the Environmental Protection Agency (EPA) in its Risk Assessment Implementation Guide (EPA, 1994)
    - Persistent in the environment
    - Accumulates in plant and animal tissues
    - Toxic relative to other COPC (i.e., cancer slope factor >0.1 or reference dose <0.09 mg/kg-day)
- The indirect exposure risk calculation did not include volatile organic compounds regardless of their toxicity because of their limited ability to accumulate in plant and animal tissues.
- The chronic HHRA focused on the following exposed individuals (or receptors): subsistence farmer, subsistence fisher, adult resident, and child resident. Discrete receptor locations determine the maximum air concentrations and maximum deposition rates associated with each receptor. They were selected based on wind direction and the probability that an individual will be exposed at that location. The impact on each exposed individual was modeled at two locations: the high-impact location 100 meters northeast of the proposed common stack location (except for subsistence fisher because no water body was present), and the fenceline location with maximum impact (except for subsistence fisher, where maximum impact location in Umatilla River was used).
- Acute health effects were not analyzed.
- The cancer slope factor approach was used to calculate cancer risk from direct inhalation (E & E, 1996).

3.2.4 Human Health Risk Assessment Results

A summary of the HHRA results from the original UMCDF HHRA is presented in Table 3-2, and more details are provided in the Pre-Trial Burn Risk Assessment report (E & E, 1996). The excess cancer risk values shown in the table are driven by risk due to direct exposure (i.e., inhalation) rather than indirect exposure (i.e., ingestion of contaminated food). The HHRA assumed the presence of the PFS, which affected temperatures, humidity, and flow rates, but took no credit for potential emissions reductions. The results show that the UMCDF meets all the state-approved thresholds for the screening risk assessment.

3.2.5 Evolving Guidance on the HHRA Methodology

The methodology used to perform the screening risk assessment for the UMCDF was mandated by the ODEQ and the US EPA. These regulating entities recognized that the methodology, in particular that for performing indirect exposure risk assessments, would

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of the UPA that attaches to the CHB) along with the failure of the munitions in this area also has the potential to involve a significant amount of agent.

Other external events also contribute to the risks at the UMCDF. Although the aircraft crash risks are not associated with any undue exposure to aircraft, calculations were made for the probability that an in-flight plane could crash into one of the storage structures or the facility. Such accidents are more important to processing risk than to storage risk, primarily due to the dominance of earthquake and lightning events at the storage yard.

In addition to external events, only one activity related to munition disposal (which includes all activities associated with munition handling through incineration) was important to risk at the UMCDF. During the removal of rocket pallets from their storage igloos, it is postulated that a forklift-related event may either cause a rocket to explode or its propellant to ignite. These scenarios are risk significant because an ignition within an igloo could propagate to other rockets in the igloo, possibly causing an igloo fire involving the entire igloo inventory of rockets. Although a substantial fraction of the agent would be consumed in the resulting fire, the amount that could potentially be released is large because the available quantity is large. The results show that all other activities related to munition disposal do not contribute significantly to processing risk (approximately 1 percent).

For the UMCDF, the QRA results clearly indicate that the fatality risk of munition storage is much greater than that of processing (see Tables 4-2 and 4-3). Based on these results, and the fact that both munition disposal and storage risks are dominated by external events, similar risk analysis with the PFS should result in minimal impact on the overall risk associated with accidental agent releases. A thorough evaluation of the potential risk increases and decreases due to the PFS has been performed. The results of this evaluation are presented in Sections 4.2 through 4.6.

4.2 Examination of Potential Benefits of the PFS

As mentioned in Section 4.1, the UMCDF Phase 1 QRA considers a comprehensive set of accident scenarios that could lead to chemical agent release from the UMCDF or the storage yard. The PFS could mitigate some of these scenarios by capturing the chemical agent before it is released to the environment. In this section, the potential benefits of the PFS are examined in detail, and the positive impact on the QRA risk is quantified and discussed.

4.2.1 Elimination of PAS Releases

The furnaces (and afterburners) at the UMCDF are designed to operate at temperatures that ensure chemical agent destruction to 99.9999 percent efficiency. This destruction efficiency has been demonstrated at JACADS during agent trial burns and during normal toxic operations. Should an upset result in furnace operation outside of the design range, numerous safety systems act to move the furnace systems into a safe shutdown mode that precludes any

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agent release from the facility. Nevertheless, as part of the QRA, accidents are postulated that could result in agent releases from the furnaces to their PASs. In such accidents, the PAS, which ordinarily acts to scrub pollutants from the exhaust gases, would also act to remove and destroy chemical agent in the airstream.

In the PFS design, carbon filters would be installed downstream of the PAS on each of the furnaces. These filters would have the opportunity to capture any chemical agent that made it through the furnace and its PAS during an accident. The quantity of chemical agent involved in such a release is predicted in the baseline QRA to be very small due to the combined agent destruction in the furnace and the PAS.[8] Simplified modeling efforts indicate that the PFS carbon will easily adsorb this small amount of agent, effectively reducing the quantity of agent released to zero. Therefore, the PFS has the potential to eliminate the likelihood of a PAS release accident.

4.2.2 Baseline Accident Scenarios Affected

All postulated accidents in the UMCDF baseline QRA have been reviewed to determine any potential impact that the PFS might have. This assessment was based on design and operational information for the proposed PFS and on the UMCDF baseline QRA models. In terms of potential benefits, the PFS would serve to mitigate only those sequences involving releases through the PASs (see Section 4.2.1). The baseline QRA includes many other releases (e.g., releases during onsite transportation accidents, releases during handling accidents, etc.), but the PFS would not mitigate these releases. For the purpose of this study, it is assumed that the PFS operates at optimum capture efficiency.

The specific accident scenarios mitigated by the PFS are as follows (the top event name from the baseline QRA is shown in parentheses):

1. *Agent Release from the MPF PAS (MPFPASR).* In this scenario, an upset occurs while one or more munitions are present within the furnace. These munitions contain the residual chemical agent that remains after draining (normally less than 5 percent of the original agent mass). Chemical agent continues to volatilize from the munitions but is not completely destroyed in the MPF due to either overventilation or underventilation following furnace shutdown. Overventilation results in rapid cooling of the furnace to the point where the gas residence time cannot ensure adequate agent destruction. Underventilation results in incomplete agent destruction due to lack of

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[8] Note that the operation of the furnace outside the design envelope means that the agent destruction efficiencies may not be optimal; it does *not* mean that no destruction will take place in the furnace. In addition, the agent destruction and removal efficiency of the PAS alone has been estimated at 99.98 percent based on testing performed at the Chemical Agent Munitions Disposal System facility in Utah (SAIC, 1996a).

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oxygen with which to react. Both system failures and human failures are included in the QRA fault tree models. The overall initiator frequency is dominated by failures that would cause a lockout of all furnace burners followed by a failure to stop the combustion air blower from running or a failure to stop the primary ID fans from running (overventilation).

2. *Agent Release from the LIC PAS (LICPASR).* This sequence includes releases where (1) agent feed to a LIC fails to stop following a LIC upset, and a release occurs as the furnace cools down; or (2) the agent feed line is not properly purged following a LIC shutdown, and the release occurs on restart. The initiator frequency was dominated by a failure of the operators to purge the agent feed line.

Agent releases from the DFS and the DUN via their respective PASs were considered in the QRA. However, these furnaces handle only small quantities of chemical agent (the DUN normally handles trace amounts of agent, if any), and no credible PAS release sequences were identified.

4.2.3 Risk Results

In the baseline QRA, the risks associated with each of the PAS release sequences described in Section 4.2.2 are added together to yield the total risk from PAS releases. It is assumed that the net effect of the PFS on PAS releases is to reduce the probability of an agent release by capturing any chemical agent before it reaches the stack. This is a bounding calculation because it was assumed that the filters will capture all agent. To put this risk into perspective, the comparisons shown in Tables 4-6 and 4-7 have been developed. Table 4-6 deals with public acute fatality risk, while Table 4-7 shows public cancer risk. Each table shows the risk associated with the PAS release sequences with and without the PFS and the overall baseline processing risk from all accidents in the QRA (shaded). Two risk measures are presented for each item: risk to those members of the public exposed to the highest concentrations of contaminants (the most exposed individual), and the overall risk to the public as a whole (societal risk). The results shown in Table 4-6 indicate that while the PFS can potentially reduce the probability of an agent release from the stack, its net effect on public acute fatality risk is zero. This is because the amount of agent that could be released from the PAS is relatively small and does not contribute to individual and societal acute fatality risks.

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Table 4-6. Public Acute Fatality Risk of PAS Release Sequences

Description	Individual Risk (over facility life)	Societal Risk (over facility life)
Risk with the PFS	0	0
Risk without the PFS	0	0
Total Baseline Processing Risk	1.2E-07	2.0E-05

Table 4-7. Public Cancer Risk of PAS Release Sequences

Description	Individual Risk (over facility life)	Societal Risk (over facility life)
Risk with the PFS	0	0
Risk without the PFS	<1.0E-12	<1.0E-10
Total Baseline Processing Risk	<1.0E-12	1.3E-08

4.3 Examination of Potential Increased Risk Due to the PFS

Section 4.2 described the potential mitigative effects of the PFS on accidental agent releases through the PASs and common stack. Due to its location in the furnace exhaust path, the PFS also has the potential to *increase* risks in several ways. Using the methodologies described in separate reports (Mitretek, 1998; SAIC, 1997c) a master logic diagram (MLD) was developed to identify accident scenarios that the PFS could either cause or exacerbate. An MLD is a logic diagram that illustrates a fault tree, while a fault tree illustrates the decomposition of a given top event into specific causes that can be subsequently assessed. Using the MLD developed for this task, the potential negative impacts of the PFS were grouped into four general areas:

1. *Effects on Baseline Accidents.* The PFS could increase the frequencies of existing agent release accidents in the baseline QRA, due to additional system complexities and interactions with the baseline furnace/PAS systems. This analysis is presented in Section 4.3.1.
2. *"New" Releases from Outside the PFS.* Interactions between the PFS and the existing systems might also lead to releases from outside the PFS boundary that were not

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modeled in the baseline QRA. After examination of the preliminary PFS design, no new events in this area were identified.

3. *"New" Releases from the PFS.* The PFS could act as a reservoir for toxic pollutants (and possibly small quantities of chemical agent) that could subsequently be released in concentrated quantities during "new" accidents. This analysis is presented in Section 4.3.2.
4. *Waste Disposal.* The PFS includes new solid hazardous waste streams that would need to be disposed of safely. An accident during these disposal activities could result in a release of agent or toxic pollutants from the waste. This analysis is presented in Section 4.3.4.

In addition, the PFS could also impact risk in one other way:

5. *Processing Delay.* There are also ways that the PFS could delay the disposal process. Any delay in disposal translates to an increase in the munition storage period and consequently an increase in risk. Disposal could be delayed as a result of increased furnace/PAS system unavailability due to the PFS (downtime for PFS related repairs and maintenance). It could be delayed as a result of the RCRA permit modification process or from possible public backlash associated with a proposed change to remove the PFS. In addition, disposal could be delayed if a stack release were to occur on a system that did not include the PFS which could have been prevented by the PFS. The UMCDF baseline QRA results indicate that the risk of storage is much greater than that of processing (see Section 4.1.2.2). Therefore, any extension in the storage period is undesirable. This analysis is presented in Section 4.3.3.

4.3.1 Increased Risk for Baseline Accidents

As mentioned above, the PFS is installed just after the existing PASs. Initiators within the PASs (e.g., equipment failures) that can adversely impact the operation of the furnaces are modeled in the baseline QRA. Since the PFS essentially extends each PAS, an engineering review of the existing QRA models was conducted to determine where upsets in the PAS appear. Two PAS upsets are modeled in the QRA: (1) blockage of the exhaust stream flow and (2) subsequent loss of ID. Although there are a number of ways to achieve such blockages, this *class* of initiator is the only one that deals with failures within the PAS. That is, the baseline QRA, which included a comprehensive search for accident initiators, identified no other ways that failures within the PAS could lead to an agent release.

The PFS design contains several failure modes that result in furnace exhaust flowpath blockage (e.g., one of the PFS dampers transfers closed, etc.). Such PFS-induced flowpath blockages have an effect on the facility that is identical to the blockage of the PAS flowpath already modeled within the QRAs; hence, the frequency of accidental releases induced by PFS

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blockages was determined by modifying the existing QRA models. Review of the baseline QRA identified the following top events involving PAS flowpath blockage and loss of ID (the top event name from the baseline QRA is shown in parentheses):

- *Agent Vapor Explosion in the MPF (MPFAGVP).* If loss of ID occurred with a volatilizing munition load within the furnace, agent vapors could accumulate within the MPF. A failure to follow contingency procedures could result in the ignition of this vapor and an explosion within the furnace. The room boundary could be compromised by the explosion, and the agent contents of the munitions within the furnace could then be released to the external environment.
- *Agent Vapor Explosion in the MPF Airlock (MPFARDL).* If a loss of ID occurred while a tray of munitions was in the MPF airlock, the resultant stop feed could leave the tray within the airlock long enough for a flammable air-agent mixture to form. Ignition of this mixture could lead to an explosion that fails the airlock and possibly the MPF external room wall. The agent contents of the munitions within the furnace/airlock could then be released to the external environment.
- *MPF Natural Gas Explosion (MPFNGAS).* If a loss of ID resulted in a furnace shutdown and the natural gas flow to the furnace failed to stop, then an accumulation of natural gas within the furnace and/or the furnace room could occur. Ignition of this gas could result in an explosion that might fail the furnace and the room walls. The agent contents of the munitions within the furnace could then be released to the external environment.
- *DFS Natural Gas Explosion (DFSNGAS).* If a loss of ID resulted in a furnace shutdown and the natural gas flow to the furnace failed to stop, then an accumulation of natural gas within the furnace room could occur. Ignition of this gas could result in an explosion that might fail the room walls and ceiling. The agent contents of the munitions within the UPA above could be released to the external environment if catastrophic failure of the DFS room ceiling occurred.
- *LIC Room Release (LICROOM).* If a loss of ID resulted in a furnace shutdown and the agent feed to the furnace was not isolated, a release of agent into the LIC room could occur. A concurrent or subsequent failure of the heating, ventilating, and air conditioning (HVAC) system could result in an agent release to the external environment.

Other initiators (besides loss of ID) can lead to these upsets as well; however, these initiators are not affected by the PFS. Thus, the relative impact of the PFS on the occurrence frequency varies among the events.

Since completion of the UMCDF baseline QRA, two new initiators have been included in the TOCDF baseline QRA (SAIC, 1996b) that involve PAS upsets (MPFEXPL and

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LICEXPL). These events involve potential natural gas explosions within the LICs and the MPF following an unplanned shutdown and failure to purge. Although these events are not included in the UMCDF baseline QRA, it is important to note that (1) they were both negligible contributors to risk in the TOCDF baseline QRA and (2) the impact of the PFS resulted in a negligible increase in their accident frequencies (SAIC, 1997). Therefore, even if these events were added to the UMCDF baseline QRA, no changes in the baseline risk should occur, and no changes in the risk impact of the PFS would be expected.

4.3.1.1 Impact on Accident Frequency

In order to quantitatively evaluate the impact of the PFS on the above accident sequences, system drawings along with descriptions of system operation and furnace interfaces were used to develop logic (fault tree) models for the PFS. These models are very similar in construction to the fault tree models already developed for the baseline QRA. Component failure and human reliability values were estimated in order to quantify the top event frequencies, and the primary source for this data was the baseline QRA database. The PFS fault tree models were subsequently linked with the affected QRA furnace system models, and the resultant changes in the accident sequence frequencies were calculated. The results of these calculations are presented in Table 4-8.

From Table 4-8, it can be seen that the impact of the PFS varies among the events (increases range from 0 percent to 385 percent). Although loss of ID appears as a contributor to these events, other initiators can dominate over the impact of the PFS on loss of ID. The two primary contributors to the increases shown are (1) plugging of the filters by particulate with failure to change out or bypass and (2) inadvertent damper closure in the PFS.

Table 4-8. Baseline Top Event Frequencies Affected by the PFS

QRA Top Event Name	Baseline Frequency (per hour)	Percent Increase in Frequency due to PFS	New Frequency with PFS (per hour)
MPFAGVP	4.8E-05	385*	2.3E-04
MPFARDL	1.7E-04	9	1.8E-04
MPFNGAS	2.9E-08	168**	7.8E-08
DFSNGAS	1.7E-11	4	1.8E-11
LICROOM	2.8E-14	0	2.8E-14

* This translates into a factor increase of 4.8.
** This translates into a factor increase of 2.7.

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4.3.1.2 Accident Consequence Evaluation

Dispersion and consequence calculations for agent release sequences involving loss of ID have been performed in the baseline QRA using the CHEMMACCS computer code (SAIC, 1996a). CHEMMACCS is a modification of the MACCS code, developed by Sandia National Laboratories to predict the transport and consequences of radioactive releases. CHEMMACCS contains a standard Gaussian plume model specifically modified to handle chemical agent dispersion and transport. It also includes probabilistic, site-specific weather data sampling; site-specific demographics; evacuation modeling; and probabilistic health effects evaluation using probit (dose-response) equations.

The PFS would affect only the *frequency* of loss-of-ID sequences (see Section 4.3.1). Therefore, the existing consequence results for these sequences remain valid, and no new CHEMMACCS calculations were necessary.

4.3.1.3 Risk Results

In Section 4.3.1.1, it was shown that the only detrimental impact of the PFS on the existing QRA accidents was to increase the frequencies of the top events as shown in Table 4-8. To put these increases in perspective, the comparisons shown in Tables 4-9 and 4-10 have been developed. Table 4-9 deals with public acute fatality risk, while Table 4-10 shows public cancer risk. Each table shows the risk associated with each PAS upset sequence with and without the PFS and the overall baseline processing risk from all accidents in the QRA (shaded). Two risk measures are presented: risk to those members of the public closest to the UMCDF site boundary (individual risk), and risk to the public as a whole (societal risk).

It can be seen that the PFS results in no impact to the fatality risks from existing processing sequences and a small increase in societal and individual cancer risk. The processing risks (both acute fatality and cancer) are dominated by external event sequences such as earthquakes, which remain unaffected by the PFS (see Section 4.1.3.1).

4.3.2 New PFS Release Sequences

Because the PFS should trap some of the small quantities of compounds of concern present in the PAS exhaust gases, the PFS carbon would act as a reservoir to concentrate these substances in one location. If a process upset resulted in an agent release through the PAS, then small amounts of chemical agent could be included in this concentrated mass. The collected pollutants could be released accidentally, and the concentrated nature of the release could lead to public and worker health effects. Such accidents represent new scenarios not present in the baseline QRA. To address these accidents, a portion of the MLD was developed to identify all of the potential new releases. Both internal events (those initiating

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Table 4-9. Public Acute Fatality Risk of PAS Upset Sequences

Description	Individual Risk (over facility life)	Societal Risk (over facility life)
MPFAGVP Risk with the PFS	< 1.0E-12	< 1.0E-10
MPFAGVP Risk without the PFS	< 1.0E-12	< 1.0E-10
MPFARDL Risk with the PFS	< 1.0E-12	< 1.0E-10
MPFARDL Risk without the PFS	< 1.0E-12	< 1.0E-10
MPFNGAS Risk with the PFS	0	0
MPFNGAS Risk without the PFS	0	0
DFSNGAS Risk with the PFS	< 1.0E-12	< 1.0E-10
DFSNGAS Risk without the PFS	7.0E-12	4.0E-10
LICROOM Risk with the PFS*	0	0
LICROOM Risk without the PFS*	0	0
Total Baseline Processing Risk	1.2E-07	2.0E-05

* Consequences were not calculated for an agent release into the LIC room because the frequency of this event (LICROOM) fell below the truncation limit (i.e., this sequence was screened). The sequence was included in this study to ensure that analysis with the PFS did not result in an increase in the frequency above the truncation limit (about 1.1E-13/hr), which it did not (see Table 4-8).

within the process) and external events (those initiating outside of the process) were considered. Ultimately, four new classes of accidents were identified:

- *Aircraft Crashes into the PFS.* If an aircraft were to crash into the PFS, a fire could ensue and the agent adsorbed onto the filters could be released. Small, medium, and large aircraft are capable of causing different amounts of damage and were considered separately.
- *Carbon Filter Fires.* If the carbon in the PFS catches fire as a result of an external source, internal (adsorption or chemical) heating, or an explosion in the PFS, then the agent adsorbed onto the filters could be released.
- *High Humidity Desorption.* If the gas reheater were to fail to operate, the elevated humidity of the gases entering the carbon filters could lead to desorption of the adsorbed contaminants. (Subsequent analysis showed that this event would result in zero consequences; however, it has been retained for completeness.)

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Table 4-10. Public Cancer Risk of PAS Upset Sequences

Description	Individual Risk (over facility life)	Societal Risk (over facility life)
MPFAGVP Risk with the PFS	1.2E-12	3.7E-09
MPFAGVP Risk without the PFS	<1.0E-12	9.6E-10
MPFARDL Risk with the PFS	<1.0E-12	< 1.0E-10
MPFARDL Risk without the PFS	<1.0E-12	< 1.0E-10
MPFNGAS Risk with the PFS	<1.0E-12	2.1E-10
MPFNGAS Risk without the PFS	<1.0E-12	1.3E-10
DFSNGAS Risk with the PFS	0	0
DFSNGAS Risk without the PFS	0	0
LICROOM Risk with the PFS*	0	0
LICROOM Risk without the PFS*	0	0
Total Baseline Processing Risk	<1.0E-12	1.3E-08

* Consequences were not calculated for an agent release into the LIC room because the frequency of this event (LICROOM) fell below the truncation limit (i.e., this sequence was screened).

- *High Temperature Desorption.* If the gas reheater were to fail such that it were on continuously, the elevated temperature of the gases entering the carbon filters could cause desorption of the adsorbed contaminants. (It has been decided that the gas reheater will be sized such that it is not capable of heating the gas stream to the point where the carbon would catch fire.)

[Seismic events were, of course, included in the list of external events. However, it was judged that the PFS components could be made robust enough to render seismic release scenarios unimportant to risk. This is already the case with the HVAC filters at the CDFs.]

4.3.2.1 Accident Frequency Evaluation

Different methods were used to estimate the frequencies associated with new PFS accidents, depending on the type of accident and the data available. The frequencies of aircraft crashes (small, medium, and large) into various structures at the UMCDF have been calculated in the baseline QRA. It was assumed in this study that the PFS filters would be

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roughly the same size as the HVAC filters, and the frequency of aircraft crashes into the HVAC filters was used for the PFS filters as well. The conditional probability of fire given a crash was taken as 0.45, as in the baseline QRA. For the filter desorption accidents PFS system drawings and descriptions of system operation were used to develop stand-alone logic (fault tree) models. These models were then quantified using component data from the baseline QRA database and other industry sources.

Filter fires were considered to have four possible causes:

1. *Fires originating outside of the carbon beds that subsequently propagate to the filters.* Review of the PFS system layout and general arrangement drawings indicates no important internal ignition sources (the carbon filter units are located in a separate room which contains no high-voltage electrical sources or natural gas supplies). Transient fires (such as fires ignited by welding done during corrective maintenance) are a possibility; however, such fires are extremely unlikely given the low frequency of repairs that require welding and the low probability that proper safety precautions are not taken. The occurrence frequency of this initiator was considered to be much lower than that calculated for cause 4 below; therefore, it was not quantified explicitly.
2. *Heating of the carbon to above its ignition temperature by the gas reheater.* As mentioned previously, the reheater will be sized such that it is incapable of heating the process stream enough to cause ignition of the carbon.
3. *Explosions in the PFS during furnace startup.* Procedures call for the operators to bypass the PFS during startup. Failure to follow these procedures could result in a "puff" of natural gas reaching the PFS reheater, causing a fire or explosion. This could ignite the carbon. A prediction of the frequency of startups was made based on JACADS data, and a human failure event probability of 3E-03 per opportunity was used to generate an estimate of the explosion frequency.
4. *Spontaneous combustion of the carbon from internal heating.* If airflow through the filters is lost after they have been loaded to some extent with pollutants (including organics), spontaneous heating of the carbon can occur due to slow oxidation or continued adsorption. If this heat is not effectively dissipated, ignition of the carbon can occur. To account for this effect, data on spontaneous ignition of carbon in tests was obtained, and a probability distribution was constructed to estimate the conditional probability that, given a loss of airflow, ignition would occur. This was coupled with the loss-of-draft frequency discussed in Section 4.3.1 to produce an estimate of the frequency of spontaneous carbon ignition.

Once the event frequencies had been calculated as described above, it was necessary to adjust these frequencies to account for the probability that chemical agent was on the filters at the time of the accident. In the UMCDF baseline QRA (SAIC, 1996a), the frequency of the

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upset that led to agent being present on the filters was assumed to be that associated with the *most frequent* potential PAS release (8.9E-06 per hour of operation, or an average probability of 0.09 over the operational life of the facility). This could tend to overestimate the risk impact of these new accidents, since the probability of agent contamination could be much less. However, it is shown in Section 4.3.2.3 that, even with this approximation, the risk impact of these new accidents is not significant. Therefore, no refinement of the approach is necessary. The resultant frequencies for each of the new accidents are summarized in Table 4-11.

4.3.2.2 Accident Consequence Evaluation

The chemical agent source terms for the new PFS accident sequences also depend upon the upset that led to agent being present on the filters in the first place. As an approximation, the quantity of agent (and the associated heath consequences) from the PAS release sequence with the greatest consequences is used as the source term for the new PFS releases. This involves a release from the MPF PAS during HD ton container processing. The mean agent source term to the environment from this accident is 0.30 lb_m of HD. As with the frequency approximation introduced in Section 4.3.2.1, this could tend to overestimate the impact of these accidents because much less agent could be present on the filters. However, it is shown in the next section that the risk impact of the new sequences is not significant and that no refinement of the approach is necessary.

Table 4-11. Frequencies of New PFS Accidents

Accident	Frequency (per year)	Frequency [with agent present on filters] (per year)*
Aircraft Crash into the PFS w/fire		
Large aircraft	4.5E-09	4.0E-10
Medium aircraft	2.2E-07	1.9E-08
Small aircraft	1.7E-07	1.5E-08
Carbon Filter Fires	1.2E-02	1.0E-03
Filter Desorption		
High humidity	5.6E-01	5.0E-02
High temperature	1.1E-08	9.3E-10

* Represents the accident frequency multiplied by the average conditional probability of agent contamination over the time between changeouts (0.09; changeout prior to commencing a new agent campaign). The overall filter fire frequency was formed as a combination of these individual contributors.

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Table 4-20. Dominant Worker Acute Fatality Risk Contributors for Processing at the TOCDF

Scenario	Percent of Total Worker Risk
Accidents During Maintenance	44
Earthquakes	36
Handling Accidents	6
MPFAGVP	3
Munition Accidentally Sent to MPF	3
Other	8

The results of the TOCDF baseline QRA indicate that the total worker risk is dominated by DRW maintenance and DRW direct effects. The same maintenance activities will be required at TOCDF and UMCDF, so the maintenance risk will be much the same. In addition, the DRW direct effects risk depends primarily upon the number of workers in the immediate vicinity of an accident, rather than on downwind agent transport. This, too, will be relatively site-independent. The mix of munitions at the two sites is comparable; therefore the same types of processing and handling accidents are possible. This implies that the impact of the PFS on worker risk at the TOCDF can be used as a reasonable guide to qualitatively evaluate the corresponding impact at the UMCDF.

The worker risk results from the TOCDF PFS QRA are shown in Table 4-21. These results indicate that the PFS will not result in a decrease of the risk to workers from accidental agent releases. Instead, an 8 percent increase in the worker acute fatality risk is predicted for the TOCDF. This is due primarily to the potential increased frequency of agent vapor explosions in the MPF due to loss of ID caused by filter plugging and inadvertent damper closure within the PFS. The resultant potential explosion can cause worker fatalities if personnel are nearby. It is judged that a similar impact on worker risk would be calculated for the UMCDF. Based on the risk values presented in Table 4-22, the increase in worker fatality risk due to increased frequency of existing accidents is 2.5E-05 over 3.3 years of UMCDF operation. This translates to a 13 percent increase in the worker fatality risk for the UMCDF.

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Table 4-21. Worker Risk Impact of the PFS in the TOCDF QRA (Individual Acute Fatality Risk)

Description	Worker Risk (over facility life)
Risk of PAS Releases with the PFS	0*
Risk of PAS Releases without the PFS	3.4E-09*
Risk of PAS Upsets with the PFS	3.3E-05*
Risk of PAS Upsets without the PFS	1.1E-05*
Risk of New PFS Accidents	1.4E-09*
Total TOCDF Baseline Worker Risk (All Campaigns)	4.1E-04

* Based on Campaigns 6-13 only (4.3 years)

4.5 Uncertainty in Risk

The baseline UMCDF Phase 1 QRA does not include an assessment of the uncertainties in the calculated risks. That is, the results are *point estimate* values—single predictions that are intended to represent *best estimates* of the true risks. In contrast, the QRA for the TOCDF is a Phase 2 assessment that includes a detailed estimate of the uncertainties in the risks (SAIC, 1996b). The UMCDF Phase 2 QRA will include an uncertainty analysis. In this section, the TOCDF baseline QRA uncertainty analysis results are used to qualitatively evaluate the potential implications of uncertainty on the UMCDF PFS QRA.

4.5.1 Baseline Accidents

Table 4-22 presents a comparison of the mean public societal acute fatality risks at TOCDF and UMCDF for (1) the accident sequence groups affected by the PFS and (2) all processing accidents. One can see that the risks are slightly higher for the TOCDF and that, for both sites, the affected sequences are not significant contributors to the processing risk. This is a reasonable indicator that, at least on a general scale, the impact of the uncertainty will be similar for the two sites for these accidents.

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Table 4-22. Comparison of Mean Public Societal Acute Fatality Risk in the Baseline TOCDF and UMCDF QRAs

	Public Societal Acute Fatality Risk (over facility life)	
Accidents	TOCDF	UMCDF
All Processing	1.3E-4	2.0E-5
PAS Releases	0.0	0
MPFAGVP	< 1E-10	< 1E-10
MPFARDL	1.9E-10	< 1E-10
MPFNGAS	< 1E-10	0
DFSNGAS	3.3E-10	4.0E-10

Table 4-23 shows a comparison similar to that in Table 4-22, but this time the risk measure is public societal cancers. Again, the risks are slightly higher at the TOCDF, and the relative contributions of the accidents affected by the PFS are similar for both sites. One of these accidents, MPFAGVP, does contribute to the cancer risk from processing, and this

Table 4-23. Comparison of Mean Public Societal Cancer Risk in the Baseline TOCDF and UMCDF QRAs

	Public Societal Cancer Risk (over facility life)	
Accidents	TOCDF	UMCDF
All Processing	2.3E-8	1.3E-8
PAS Releases	1.0E-10	< 1E-10
MPFAGVP	3.9E-10	9.6E-10
MPFARDL	< 1E-10	< 1E-10
MPFNGAS	< 1E-10	1.3E-10
DFSNGAS	< 1E-10	0

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modeled in the baseline QRA. After examination of the preliminary PFS design, no new events in this area were identified.

3. *"New" Releases from the PFS.* The PFS could act as a reservoir for toxic pollutants (and possibly small quantities of chemical agent) that could subsequently be released in concentrated quantities during "new" accidents. This analysis is presented in Section 4.3.2.

4. *Waste Disposal.* The PFS includes new solid hazardous waste streams that would need to be disposed of safely. An accident during these disposal activities could result in a release of agent or toxic pollutants from the waste. This analysis is presented in Section 4.3.4.

In addition, the PFS could also impact risk in one other way:

5. *Processing Delay.* There are also ways that the PFS could delay the disposal process. Any delay in disposal translates to an increase in the munition storage period and consequently an increase in risk. Disposal could be delayed as a result of increased furnace/PAS system unavailability due to the PFS (downtime for PFS related repairs and maintenance). It could be delayed as a result of the RCRA permit modification process or from possible public backlash associated with a proposed change to remove the PFS. In addition, disposal could be delayed if a stack release were to occur on a system that did not include the PFS which could have been prevented by the PFS. The UMCDF baseline QRA results indicate that the risk of storage is much greater than that of processing (see Section 4.1.2.2). Therefore, any extension in the storage period is undesirable. This analysis is presented in Section 4.3.3.

4.3.1 Increased Risk for Baseline Accidents

As mentioned above, the PFS is installed just after the existing PASs. Initiators within the PASs (e.g., equipment failures) that can adversely impact the operation of the furnaces are modeled in the baseline QRA. Since the PFS essentially extends each PAS, an engineering review of the existing QRA models was conducted to determine where upsets in the PAS appear. Two PAS upsets are modeled in the QRA: (1) blockage of the exhaust stream flow and (2) subsequent loss of ID. Although there are a number of ways to achieve such blockages, this *class* of initiator is the only one that deals with failures within the PAS. That is, the baseline QRA, which included a comprehensive search for accident initiators, identified no other ways that failures within the PAS could lead to an agent release.

The PFS design contains several failure modes that result in furnace exhaust flowpath blockage (e.g., one of the PFS dampers transfers closed, etc.). Such PFS-induced flowpath blockages have an effect on the facility that is identical to the blockage of the PAS flowpath already modeled within the QRAs; hence, the frequency of accidental releases induced by PFS

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contribution is more pronounced at the UMCDF than the TOCDF. Overall, it is again judged that the uncertainty results at TOCDF can be used to qualitatively estimate the impact of uncertainty on the UMCDF PFS QRA.

Table 4-24 shows the distributions on public societal acute fatality risk for (1) the accident sequence groups affected by the PFS and (2) all processing accidents. These results are from the TOCDF baseline QRA without the PFS. Looking at the 5th and 95th percentile information, it is observed that the 95th percentile values for the five groups of sequences affected by the PFS are *over four orders of magnitude less* than the 5th percentile processing risk value (these values are shaded in the table). As described in Section 4.3.1, the PFS would shift the means of the four negatively affected sequences up by far less than one order of magnitude (this is true for both the UMCDF and the TOCDF), and no significant broadening of the distributions would be expected. The impact of the PFS on societal risk, if any, should be less than the uncertainty associated with processing risk. Therefore, the conclusion that the impact of the PFS on societal fatality risk would be insignificant at the TOCDF is confirmed when uncertainty in the risk estimate is considered. The similarity in the relative risks shown in Table 4-22 suggests that this would be the case at the UMCDF as well.

Table 4-25 presents information similar to Table 4-24, this time for societal cancer risk. In this case, the 95th percentile values for the groups of sequences affected by the PFS are also below the 5th percentile processing risk value (the values are shaded in the table). The sequence group with the highest 95th percentile (MPFAGVP; 1.3E-09), is still a factor of four lower than the processing 5th percentile (5.3E-09). This confirms the conclusion that, at the TOCDF, the impact of the PFS on societal public cancer risk is not significant. From

Table 4-24. Comparison of Distributions on Public Societal Acute Fatality Risk in the TOCDF Baseline QRA

Accidents	Public Societal Acute Fatality Risk (7.1 years of operation)		
	Mean	5th Percentile	95th Percentile
All Processing	1.3E-4	2.0E-5	4.4E-4
PAS Releases	0.0	0.0	0.0
MPFAGVP	< 1E-10	0.0	< 1E-10
MPFARDL	1.9E-10	0.0	4.9E-10
MPFNGAS	< 1E-10	0.0	< 1E-10
DFSNGAS	3.3E-10	< 1E-10	8.7E-10

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Table 4-25. Comparison of Distributions on Public Societal Cancer Risk in the TOCDF Baseline QRA

	Public Societal Cancer Risk (over facility life)		
Accidents	Mean	5th Percentile	95th Percentile
All Processing	2.3E-08	5.3E-09	5.4E-08
PAS Releases	1.0E-10	< 1E-10	2.2E-10
MPFAGVP	3.9E-10	< 1E-10	1.3E-09
MPFARDL	< 1E-10	< 1E-10	< 1E-10
MPFNGAS	< 1E-10	< 1E-10	2.1E-10
DFSNGAS	< 1E-10	< 1E-10	< 1E-10

Table 4-23, it can be seen that the contribution of MPFAGVP to this risk is more pronounced at the UMCDF than at the TOCDF (7 percent versus under 2 percent). Even so, it is judged that consideration of uncertainty would not alter the conclusions about the effects of the PFS on accidents already modeled in the UMCDF baseline QRA --namely, that the impact on societal cancer risk would be small.

4.5.2 New PFS Accidents

In the TOCDF PFS QRA, the public acute fatality risks associated with releases *from* the PFS were identically zero. This means that even with the probabilistic treatment of weather in the QRA, the doses to all individuals in the surrounding population were below the no-deaths threshold in all uncertainty runs. Therefore, within the uncertainty analysis framework used in the TOCDF baseline QRA, these new sequences would have no impact at all on the public acute fatality risk distribution for processing. This would also be the case at the UMCDF, where the mean public acute fatality risks associated with releases from the PFS were also identically zero.

At the TOCDF, the public cancer risks due to releases from the PFS were less than 1E-10 over the facility life, and Table 4-26 presents the distributions on this risk measure for (1) the new PFS accident sequences, and (2) all baseline processing accidents at the TOCDF. The 95th percentile values for the six new sequences are all below 1E-10, so the impact of these sequences is again seen to be insignificant. This should also be the case at the UMCDF because the corresponding mean risks from such sequences were also below 1E-10.

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Table 4-26. Distributions on Public Societal Cancer Risk from New Accidental Agent Releases from the PFS Versus Baseline Processing Risk (TOCDF)

Accidents	Public Societal Cancer Risk (over facility life)		
	Mean	5th Percentile	95th Percentile
All Processing	2.3E-08	5.3E-09	5.4E-08
Large Aircraft Crash w/fire	< 1E-10	< 1E-10	< 1E-10
Medium Aircraft Crash w/fire	< 1E-10	< 1E-10	< 1E-10
Small Aircraft Crash w/fire	< 1E-10	< 1E-10	< 1E-10
Carbon Filter Fire	< 1E-10	< 1E-10	< 1E-10
Filter Desorption – High Humidity	0.0	0.0	0.0
Filter Desorption – High Temperature	< 1E-10	< 1E-10	< 1E-10

4.5.3 Limitations in the TOCDF Uncertainty Analysis

The uncertainty methodology employed in the TOCDF baseline QRA is a state-of-the-art process involving sophisticated Monte Carlo sampling procedures. Uncertainties in the accident initiator occurrence frequencies, the conditional probabilities of successive events, and the quantities of agent potentially released in accidents are considered. Nevertheless, some sources of uncertainty are not treated, including uncertainty in the parameters affecting the downwind transport of agent and in the dose/response behavior of the population. The evaluation of uncertainty regarding the effects of the PFS is, therefore, made within the existing QRA uncertainty analysis framework and carries with it the same limitations (SAIC, 1996b).

4.5.4 Conclusions

Based on the TOCDF uncertainty analysis and on similarities between the TOCDF and UMCDF baseline QRA results, it is likely that conclusions regarding the impact of the PFS on public acute fatality risk at the UMCDF would remain unchanged.

4.6 Summary of PFS Impacts on Accident Risk

Based on the analyses presented in this section, the only change in QRA risk associated with the PFS is the potential for a delay in munition disposal. A delay in disposal translates to an increase in the munition storage period and consequently an increase in risk. Disposal could be delayed as a result of increased furnace/PAS system unavailability due to the PFS. It could

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also be delayed by the RCRA permit process associated with a change to remove the PFS. Furthermore, the process could be stopped and disposal could be delayed if a stack release were to occur on a system design that did not include the PFS.

Even though this evaluation was based on a preliminary design of the PFS, no change in the overall conclusion would be expected from changes to the PFS design. Small changes in risk may result from design refinements; however, the results show that operation of the PFS has almost no impact on risk. Consequently, the overall conclusion would not be expected to change.

In addition, the uncertainty analysis described in Section 4.5 (based on that done at the TOCDF) shows that it is likely that conclusions regarding the impact of the PFS on public acute fatality risk at the UMCDF would remain unchanged.

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STUART A. SUGARMAN
ATTORNEY AT LAW

3430 S.E. BELMONT ST., SUITE 101
PORTLAND, OREGON 97214
EMAIL: BLC@HEVANET.COM
(503) 234-2694
FAX (503) 234-1330

Post-it™ Fax Note 7671
Date
# of pages ▼
To WAYNE THOMAS
From STU SUGARMAN
Co./Dept. DEQ
Co.
Phone #
Phone # 503 234-2694
Fax # 541 567-4741
Fax # 503 234-1330

15 March 1999

Mr. Wayne Thomas
Umatilla Program Manager
Department of Environmental Quality
256 East Hurlburt Street, Suite 105
Hermiston, OR, 97838

HERMISTON OFFICE

VIA FACSIMILE -- (541) 567-4741

RE: Invitation to Comment dated March 3, 1999 regarding proposed Order Clarifying Permit Decision

Dear Mr. Thomas:

We write on behalf of G.A.S.P., Sierra Club, Oregon Wildlife Federation, Karyn Jones, Susan Jones, Heather Billy, Deborah Burns, Janice H. Lohman, Leandra Phillips, Merle C. Jones, Cindy Beatty, Andrea E. Stine, Dorothy Irish, Mary Bloom, Robert J. Palzer, Janet Nagy, Ladonna King, John Spomer, Christine Clark, Stuart Dick, Gail Horning, David Burns, Pius A. Horning, Karla Stuck, and Melanie Beltane (collectively referred to as "Citizens") regarding the proposed Umatilla Chemical Demilitarization Facility (UMCDF). As you know, the Multnomah County Circuit Court issued a decision on 6 December 1998 remanding this matter to the Oregon Environmental Quality Commission (EQC) and Department of Environmental Quality (DEQ). The Court stated, in part, "I must remand these orders to the respondents to determine what role the PAS carbon filters play in their analysis." Opinion and Order at 27.

On 3 March 1999, the DEQ issued an invitation to comment on a proposed Order Clarifying Permit Decision. The permit decision being clarified is the February 10, 1997 decision issued by the EQC. In the invitation to comment, the DEQ stated "[t]his invitation to comment is limited solely to the proposed Order and does not affect the status of the current permits." Invitation to Comment at 2.

First, Citizens raise the general objection that the proposed Order Clarifying Permit Decision appears to have been prepared by the DEQ and not the EQC. The proposed Order Clarifying Permit Decision appears not to have been drafted by any of the decision makers that issued the decision approving the Army's permit. Citizens expect that the EQC, and not DEQ, would best be able to clarify its own findings. Citizens hereby make a public records request pursuant to ORS 192.001 *et. seq.* seeking all DEQ and EQC records pertaining to the proposed Order Clarifying Permit Decision.

Second, the proposed Order Clarifying Permit Decision fails to clarify anything It merely concludes that the EQC (or DEQ) "did not rely on PAS carbon filters . . ." Proposed Order Clarifying Permit Decision at 3. The proposed order does not explain how its earlier findings, which would appear to hinge the entire decision, including best available technology (BAT) on carbon filters, does not actually do so. The proposed order also does not attempt to explain how the EQC now is taking a stance which appears diametrically opposed to the clear, stated emphasis individual EQC members placed on the filters with no equivocation or counter statements from any members, that the decision hinged on carbon filters.

Third, the DEQ and EQC have, once again, failed to provide the Citizens and others with a contested case process that would permit full airing of the critical issues being raised here and in the Citizens other submissions. In fact, the DEQ/EQC have failed even to address many issues raised by the Citizens. See, e.g., Citizens December 14, 1998 letter to the EQC and attachments. Consequently, the DEQ's/EQC's process concerning the Army's permit continues to march forward without balance or even a sense of fairness.

Fourth, in the proposed Order Clarifying Permit Decision, the DEQ completely abandons the PAS carbon filter system as a system necessary to meet statutory or regulatory requirements to choose the best available technology (BAT) and protect public health and the environment. However, the DEQ notes that the PAS carbon filters are being added to provide "an additional measure of safety . . ." Proposed Order Clarifying Permit Decision at 3.

Yet, the DEQ fails to assess what negative impacts may result from the addition of PAS carbon filters. Ironically, the Army and National Research Council have not determined to this day, four years after submitting a permit application, what risk is associated with the addition of PAS carbon filters to the baseline incineration system. Citizens urge the EQC to consider the permittee's following statements which reflect the Army's knowledge of this risk and the EQC's continuing habit of ignoring these risks:

> a) "Since the Army's initial assessment, additional risk assessment tools have been developed to assist in the characterization of baseline system performance, both with and without the proposed PAS filter system. Preliminary assessments using these tools indicate that the addition of the PAS filter system may not contribute to any measurable reduction in risk and may actually be the source of new risk to both workers and to the public." Department of Defense; Interim Status Assessment of the Chemical Stockpile Disposal Program: April, 1996.
>
> b) "Two areas where cost reductions have been identified in developing the December 1996 cost estimate are associated with the filter system for the Pollution Abatement System (PAS) and optimizing operations. The Program Manager has completed a value engineering study that modified the design and found reductions in capital and operating costs." (Statement

before the House National Security Committee of the House of Representatives by Mr. Gil Decker, Assistant Secretary Army/Research Development and Acquisition).

In addition, within the last thirty days, Citizens have uncovered a draft document prepared and reviewed by Army contractors that demonstrate PAS carbon filters are not a benign technology. Citizens request that the DEQ/EQC add the enclosed excerpts of the following document into the record: Mitretek Systems, Inc. "Risk Assessment of the Pollution Abatement Filter System for the Umatilla Chemical Agent Disposal Facility" (Draft September 1998) (herein referred to as the "Mitretek RA"). The following pages of the Mitretek PAFS Risk Assessment are being offered into the record: cover - vii; 1-1 to 1-2; 3-2 to 3-7; 4-7 to 4-18; 4-30 to 4-36. These pages directly address PAS carbon filter issues as well as other issues related to the overall risk of the baseline incineration system.

Fifth, and more specifically, the Mitretek PAFS Risk Assessment acknowledges a large percent increase in the frequency of some accident events (from 168% to 385% more likely) due to addition of the PFS carbon filters. Mitretek RA at 4-13 (Table 4-8). Moreover, the addition of PFS carbon filters presents new accident scenarios "not present in the baseline QRA [Quantitative Risk Assessment]." Mitretek RA at 4-14 to 4-18. The addition of PFS carbon filters also presents "a 13 percent increase in worker fatality risk for the UMCDF." Mitretek RA at 4-30. Finally, the Mitretek PAFS Risk Assessment acknowledges that significant uncertainties in the QRA process have not been "treated", "including uncertainty in the parameters affecting the downwind transport of agent and in the dose/response behavior of the population." Mitretek RA at 4-35. Significant omissions indeed!

This new information points out the need to provide a contested case process and to re-evaluate whether incineration is the best available technology. If the DEQ/EQC will not reopen all issues to the contested case process, then Citizens request that the agencies open the assessment of best available technology to the contested case process. Specifically, Citizens request that the DEQ/EQC immediately authorize subpoenas for the undersigned to allow the timely capture and preservation of documents and testimony from various government officials regarding the ever-changing risks and status of the major components in the continually changing design of the "baseline" incineration system.

We would appreciate a prompt written response to these comments and the requests made herein in order to allow the Citizens to determine how to further address the issues raised to date with the Circuit Court and in other fora. As we (namely, Richard Condit and Stu Sugarman) did not directly receive copies of the Invitation to Comment, we request that the undersigned be placed on all mailing lists associated with the permitting and further assessment of UMCDF, and we reserve the right to challenge this entire proceeding because of lack of adequate notice despite our previous request to be placed on all relevant mailing lists. We also reserve the right to challenge any other procedural defect relevant to this proceeding.

Please contact us if you have any questions.

Respectfully Submitted,

Stuart A. Sugarman, OSB #92137
3430 SE Belmont, Suite 101
Portland, OR 97214

for Richard

Richard E. Condit, Attorney
2525 Arapahoe Ave., Suite E4-309
Boulder, CO. 80302
303-444-1188 ext. 219

Counsel for G.A.S.P., Sierra Club, and OWF et al.

SAS.ss

Enclosure as noted

MTR 1997-58

Mitretek Technical Report

Risk Assessment of the Pollution Abatement Filter System for the Umatilla Chemical Agent Disposal Facility

September 1998

Sponsor:	U.S. Army Office of the Program Manager for Chemical Demilitarization	Contract No.:	DAAM01-95-D-0002
Dept. No.:	H050	Project No.:	0695220N

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MITRETEK SYSTEMS
Center for Science and Technology
McLean, Virginia

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Comments

Mitretek Department
and Project Approval: ____________ ______
for Abu Talib

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Section 1

Introduction

1.1 Background

In 1993, the National Research Council (NRC) recommended that the U.S. Army evaluate the addition of carbon filters to treat effluent gases from the pollution abatement systems (PASs) of chemical agent disposal facilities (CDFs). It was believed that carbon filters could enhance the safety of the facility by reducing the risk of accidental agent release from the incinerator stack (NRC, 1994). In addition, while air emissions from normal operations of CDF furnaces contain only trace amounts of substances that may present health hazards, the PAS filter system (PFS) potentially would have the added benefit of further reducing these trace emissions.

In response to the NRC's recommendation, the Army developed a conceptual design of the PFS. The design served as the basis of the Army's preliminary assessment of the potential impacts of the PFS on human health and environmental safety (Army, 1994). This evaluation concluded that carbon filters could potentially enhance system performance but would also increase system cost and complexity. The Army's study was not site-specific. In addition, health risk assessments (HRAs) and quantitative risk assessments (QRAs) were not available at the time to quantify the benefits in terms of risk. Since the 1994 study, the original PFS design has been modified to a more efficient configuration. Additionally, the Army has utilized the subsequently completed Umatilla Chemical Agent Disposal Facility (UMCDF) HRA and QRA to conduct a more comprehensive, facility-specific risk analysis of the PFS.

Mitretek has the lead responsibility of coordinating and integrating the work of other Army contractors. This report documents the PFS risk analysis for the UMCDF and is a collaborative effort of Mitretek, Science Applications International Corporation (SAIC), the Center for Health Promotion and Preventive Medicine (CHPPM), and the Edgewood Research, Development, and Engineering Center (ERDEC). The evaluation follows the general methodology described in a separate report (Mitretek, 1998).

1.2 Objective and Scope

In its risk evaluations of proposed changes to the CDFs, the Army's primary objectives are to verify that the facility remains in compliance with the state-approved health risk thresholds and that the proposed changes will not compromise public and worker safety. The specific objectives of the PFS study that is documented in this report are to (1) estimate the net effects on health risks and safety, and (2) address other factors that affect or may be affected by removal of the PFS at the UMCDF.

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As a starting point, this study draws from previously completed risk assessments for the UMCDF. These assessments are the Pre-Trial Burn Risk Assessment (commonly called the HRA) performed by Ecology and Environment, Inc. (E & E) for the Oregon Department of Environmental Quality (ODEQ) (E & E, 1996) and the QRA performed by SAIC (SAIC, 1996a). They are used by the Army as the foundation for making decisions on Chemical Stockpile Disposal Program changes for controlling or mitigating risks.

HRAs are conducted as part of the Resource Conservation and Recovery Act (RCRA) permit requirements for hazardous waste combustion facilities. The HRA consists of two major components—human health risk assessment (HHRA) and ecological risk assessment (ERA). The HHRA quantifies cancer risk and other health effects resulting from exposure to stack emissions. The ERA estimates the potential ecological risk (e.g., terrestrial vegetation and soil invertebrates) as a result of exposure to emissions of pollutants that may affect the ecology.

The approach for HRAs is deliberately conservative to ensure that health risks are not underestimated. The UMCDF HRA analyzed the health and ecological effects of stack emissions based on gas volumetric flow rates and temperature that assumed the presence of a PFS. To be conservative, however, no credit was taken for the capture efficiency of the carbon filters. For the UMCDF PFS evaluation, that HRA is revised to estimate the effects from stack emissions of a facility configuration that did not have the PFS (unchanged chemical emissions but dispersion governed by appropriate flow rates and temperatures).

QRAs quantify the risks from accidents involving the release of agent. As such, QRA results are utilized by the Army as a design and operational tool for managing accident-related risks. The Phase 1 QRA has been completed for the UMCDF (SAIC,1996a). A Phase 1 QRA essentially updates the risk assessment that was performed previously as part of the Army's *Final Programmatic Environmental Impact Statement (FPEIS) for the Chemical Stockpile Disposal Program* (Army, 1988) The Phase 1 QRA *does not* include the PFS. As part of this effort, the UMCDF Phase 1 QRA was updated to determine the net effect of the PFS on risk related to accidental agent release.

In addition to the HRA and QRA evaluations, a hazard evaluation (HE) was performed to qualitatively evaluate the hazards from solid waste disposal involving the PFS. While these hazards are also accident-driven, the risks to the public and workers associated with these hazards are not primarily from chemical agent but are from potential exposure to non-agent hazardous substances. As such, these types of hazards are not addressed in the QRA.

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assessment, the state-approved threshold for excess cancer risk is 1E-05[3] (E & E, 1996).

- **Chronic noncarcinogenic health effect.** Expressed as a hazard quotient (HQ) and as a hazard index (HI). The HQ represents the potential long-term adverse health impact of exposure to a toxic chemical emitted from the incinerator stacks. It is expressed as the ratio of a receptor's dose resulting from exposure to a single substance for a specified time period (chronic) to a reference dose for that substance for a similar time period. When more than one chemical is released, the overall potential for noncarcinogenic effects is assessed by calculating the HI. The HQs for all chemicals that affect specific target organs are added together to obtain the HI for those target organs. Separate HIs are developed for each exposure route. For the UMCDF, the state-approved HQ and HI for chronic exposure scenarios is 0.25 (E & E, 1996).

An HHRA may also address acute health effects. This was not a requirement for the UMCDF and thus is not addressed in the HHRA.

3.2.1 Constituent of Potential Concern (COPC) Concentration Data

Table 3-1 presents a list of 82 constituents of potential concern (COPCs) that could be discharged to the atmosphere through stack gas emissions during operation of the various incinerators at the UMCDF. They include 10 potentially toxic dioxin and furan homologue chemicals which, for the purposes of this analysis, have been assumed to be and modeled as 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) toxicity equivalents (TEQ). The table gives the maximum concentration for each COPC based on tests performed at the Johnston Atoll Chemical Agent Disposal System (JACADS) on Johnston Island in the Pacific Ocean. Of these 82 COPCs, 46 are considered "regulated," which means that they are specifically addressed in the RCRA permit for the applicable source (e.g., LIC and DFS). As the table indicates, many of the regulated COPCs are at or just slightly above their detection limit concentrations. Additional information on the specific COPC emission rates used in the air dispersion analysis for each UMCDF emission source is provided in the Pre-Trial Burn Risk Assessment report (E & E, 1996).

3.2.2 Air Dispersion Model

The UMCDF HHRA used the Industrial Source Complex Short Term, Version 3 (ISCST3) computer model to predict chronic ambient air vapor and particulate

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[3] 1E-05 is the same as 1 x 10^{-5}

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Table 3-1. JACADS Maximum Stack Concentration Data

COPC	Regulated Pollutant?	Maximum Stack Gas Concentration* (ug/m^3)	Source	Detection Limit (DL)**
Dioxin/Furan Homologue Chemicals				
2,3,7,8-Tetrachlorodibenzo-p-Dioxin	Yes	8.83E-05	GB-LIC	1.10E-05
Pentachlorodibenzo-p-Dioxin***	Yes	5.66E-05	GB-LIC	5.66E-05
Hexachlorodibenzo-p Dioxin	Yes	9.72E-05	VX-DFS	3.24E-05
Heptachlorodibenzo-p-Dioxon	Yes	7.62E-05	VX-DFS	3.24E-05
Octachlorodibenzo p Dioxin	Yes	1.71E-04	HD-MPF	8.46E-05
2,3,7,8-Tetrachlorodibenzofuran	Yes	1.16E-05	HD-LIC	7.58E-06
Pentachlorodibenzofuran	Yes	1.34E-04	HD-MPF	4.23E-05
Hexachlorodibenzofuran	Yes	2.11E-04	HD-MPF	4.23E-05
Heptachlorodibenzofuran	Yes	4.00E-04	HD-MPF	4.23E-05
Octachlorodibenzofuran	Yes	2.38E-04	HD-MPF	8.46E-05
Volatile Products of Incomplete Combustion (PICs)				
Acetone	No	3.58E+04	VX-LIC	1.00E-01
Benzene	Yes	4.75E+01	GB-LIC	3.00E-01
Bromodichloromethane	No	1.46E+00	VX-DFS	1.00E-01
Bromoform	No	1.71E+01	VX-DFS	1.00E-01
2-Butanone (or methyl ethyl ketone)	No	1.47E+02	VX-DFS	1.00E-01
Carbon Disulfide	No	1.00E+01	HD-LIC	1.00E-01
Carbon Tetrachloride	No	4.33E+01	HD-LIC	1.00E-01
Chlorobenzene	No	1.94E+00	HD-LIC	1.00E-01
Chloroform	No	3.96E+01	VX-DFS	1.00E-01
Chloromethane	No	5.59E+02	GB-LIC	3.00E-01
Dibromochloromethane	No	1.04E+00	VX-DFS	1.00E-01
1,1-Dichloroethane	No	3.00E-01	GB-LIC	3.00E-01
Dichloromethane (or methylene chloride)	No	5.86E+03	VX-DFS	1.00E-01
1,2-Dichloropropane (or propylene dichloride)	No	4.96E+02	GB-LIC	3.00E-01
Cis-1,3-Dichloropropene	No	4.28E+02	GB-LIC	3.00E-01
Trans-1,3-Dichloropropene	No	4.45E-01	HD-LIC	1.00E-01
Ethylbenzene	No	3.85E+00	VX-DFS	1.00E-01
4-Methyl-2 Pentanone (or methyl isobutyl ketone)	No	4.91E+00	GB-LIC	3.00E-01
2-Hexanone	No	3.71E+00	GB-LIC	3.00E-01
Styrene	No	2.41E+02	HD-LIC	1.00E-01
1,1,2,2-Tetrachloroethane	No	1.04E+00	GB-LIC	3.00E-01

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Table 3-1. (Continued)

COPC	Regulated Pollutant?	Maximum Stack Gas Concentration* (µg/m^3)	Source	DL**
Volatile PICs (continued)				
Tetrachloroethene (or tetachloroethylene)	No	1.20E+00	GB-LIC	3.00E-01
Toluene	No	3.02E+03	VX-DFS	1.00E-01
1,1,1-Trichloroethane (or methyl chloroform)	No	1.77E+01	VX-DFS	1.00E-01
Vinyl Acetate	No	6.90E-01	GB-LIC	3.00E-01
Vinyl Chloride	Yes	9.92E+00	HD-MPF	1.00E-01
Xylenes	No	3.76E+00	VX-LIC	1.00E-01
Semi-Volatile PICs				
Benzoic Acid	No	1.23E+02	VX-DFS	1.40E+00
Benzyl Alcohol	No	6.16E+02	VX-LIC	1.40E+00
Diethyl Phthalate	No	2.89E+01	GB-LIC	1.40E+00
Dimethyl Phthalate	No	1.15E+02	HD-LIC	9.50E-01
Di-n-Butyl Phthalate	No	5.52E+00	GB-LIC	1.40E+00
Di-n-Octyl Phthalate	No	2.76E+01	GB-LIC	1.40E+00
Bis(2-Ethylhexyl)-Phthalate	No	9.28E+01	HD-LIC	1.10E+00
2-Methylphenol (or o-cresol)	No	1.24E+02	GB-LIC	1.40E+00
3-Methylphenol (or m-cresol)	No	5.08E+01	HD-LIC	1.10E+00
4-Methylphenol (or p-cresol)	No	5.80E+01	GB-LIC	1.40E+00
Naphthalene	No	2.92E+00	VX-DFS	1.40E+00
Pollutants				
GB***	Yes	6.00E-02****	GB-LIC	6.00E-02
HD***	Yes	8.70E+00****	HD-LIC	6.00E+00
VX***	Yes	6.00E-02****	VX-LIC	6.00E-02
Chlorine***	Yes	3.42E+03	HD-LIC	3.42E+03
Hydrogen Chloride	Yes	3.70E+03	GB-LIC	-
Hydrogen Fluoride	Yes	9.30E+03	GB-LIC	-
Nitroglycerine	Yes	8.18E+01	VX-DFS	-
Polychlorinated biphenyls (PCB)	Yes	8.50E-02	VX-DFS	-
Particulate	Yes	8.00E+03	VX-LIC	-
2,4-Dinitrotoluene	Yes	3.71E-01	VX-DFS	3.57E-01
2,6-Dinitrotoluene	Yes	3.71E-01	VX-DFS	3.57E-01
2,4,6-Trinitrotoluene	Yes	3.71E-01	VX-DFS	3.57E-01
RDX	Yes	3.71E-01	VX-DFS	3.57E-01
HMX	Yes	3.71E-01	VX-DFS	3.57E-01

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Table 3-1. (Concluded)

COPC	Regulated Pollutant?	Maximum Stack Gas Concentration* ($\mu g/m^3$)	Source	DL**
Metals				
Antimony***	Yes	1.60E+01	HD-MPF	1.60E+01
Arsenic	Yes	2.22E+01	HD-LIC	6.78E+00
Barium	Yes	1.57E+01	HD-MPF	1.50E+01
Berylium***	Yes	5.27E+00	GB-LIC	5.27E+00
Boron	Yes	5.30E+02	VX-LIC	1.25E+01
Cadmium	Yes	9.81E+00	HD-MPF	3.75E+00
Nickel	Yes	3.52E+01	GB-LIC	5.12E+00
Phosphorus	Yes	3.43E+02	VX-LIC	1.25E+01
Selenium	Yes	1.06E+01	HD-LIC	6.73E+00
Silver***	Yes	1.60E+01	HD-MPF	1.60E+01
Thallium	Yes	5.27E+01	GB-LIC	5.27E+01
Tin	Yes	3.61E+01	VX-LIC	6.41E+00
Vanadium	Yes	1.07E+01	HD-LIC	2.56E+00
Zinc	Yes	2.31E+02	HD-LIC	6.73E+00

* Maximum reported stack concentrations from all tests during JACADS Operational Verification Testing.

** Detection Limit (DL) concentrations (in $\mu g/m^3$) vary depending on sampling conditions. Agent DL shown is equal to 20 percent of the allowable stack concentration (ASC).

*** Undetected.

**** Based on JACADS analytical DLs. For the analysis presented in this report, agent DL concentration is assumed to be 20 percent of the ASC.

concentrations, as well as the chronic wet and dry deposition rates. ISCST3 is the most up-to-date model and incorporates many improvements over previous air dispersion models. The refinements include (E & E, 1996):

- Revised dry deposition calculation routine
- Revised scaveriging coefficients for wet deposition calculations
- Expanded number of receptors for which calculations can be performed
- Plume depletion mechanism to account for wet and dry removal processes
- Separation of particulate and vapor phases of same compounds
- Incorporation of complex terrain algorithms

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3.2.3 Other Key HHRA Assumptions

The following were some of the key assumptions in the existing UMCDF HHRA:

- Study area encompassed all the area within a 50-km radius of the UMCDF.
- Campaign duration was 3.2 years[4] with all furnaces operating continuously during that time, even though actual run-time, based on the stockpile inventory, was projected at 1.0 year (3.2 years accounted for equipment downtime).
- For the DFS, LIC, and MPF, the emission rates of regulated COPCs for the UMCDF were based on the maximum emission rate detected for each constituent during the JACADS test runs for each furnace and were adjusted to reflect the UMCDF incinerator feed rates. However, for the DUN, the greatest emission rate from all sources (i.e., total of 19 test runs) was used.[5] These emission rates served as the initial inputs to the air dispersion analysis.
- Emission rates of chemical agents (even if they were not detected) were derived based on the assumption that they were present at the maximum allowable stack concentration (ASC) (0.3 $\mu g/m^3$ for GB and VX, 30 $\mu g/m^3$ for HD).
- Undetected, regulated COPCs were assumed present at concentrations equal to the detection limit. Undetected, unregulated COPCs were assumed present at concentrations equal to one-half the detection limit.
- Off-peak performance, leading to emission rates that were 10 times normal, occurring 20 percent of the time for nonmetals and 5 percent of the time for metals.
- Emissions of certain metals (Pb, Ba, Cd, Cr, Ni) from the MPF were not based on JACADS data but were calculated separately. Emissions were expected to be greater for these metals because of the processing of painted 155-millimeter shells, which contain greater amounts of these metals than the ton containers used in the JACADS trial burns.
- Risks from direct inhalation and indirect exposures were estimated using the ISCST3 model. All COPCs listed in Table 3-1 were evaluated for direct inhalation exposure, and cancer risk was estimated for carcinogenic substances.

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[4] The campaign duration of 3.2 years was used in the E & E HRA report. This differs slightly from the campaign duration value used in the QRA (3.3 years). We believe this discrepancy is largely due to rounding-off errors.

[5] At the time the UMCDF HRA was performed, JACADS trial burn tests for the DUN had not been completed.

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- A COPC was selected for indirect exposure if it met any one of the following criteria:
  - Recommended by the Environmental Protection Agency (EPA) in its Risk Assessment Implementation Guide (EPA, 1994)
  - Persistent in the environment
  - Accumulates in plant and animal tissues
  - Toxic relative to other COPC (i.e., cancer slope factor >0.1 or reference dose <0.09 mg/kg-day)
- The indirect exposure risk calculation did not include volatile organic compounds regardless of their toxicity because of their limited ability to accumulate in plant and animal tissues.
- The chronic HHRA focused on the following exposed individuals (or receptors): subsistence farmer, subsistence fisher, adult resident, and child resident. Discrete receptor locations determine the maximum air concentrations and maximum deposition rates associated with each receptor. They were selected based on wind direction and the probability that an individual will be exposed at that location. The impact on each exposed individual was modeled at two locations: the high-impact location 100 meters northeast of the proposed common stack location (except for subsistence fisher because no water body was present), and the fenceline location with maximum impact (except for subsistence fisher, where maximum impact location in Umatilla River was used).
- Acute health effects were not analyzed.
- The cancer slope factor approach was used to calculate cancer risk from direct inhalation (E & E, 1996).

3.2.4 Human Health Risk Assessment Results

A summary of the HHRA results from the original UMCDF HHRA is presented in Table 3-2, and more details are provided in the Pre-Trial Burn Risk Assessment report (E & E, 1996). The excess cancer risk values shown in the table are driven by risk due to direct exposure (i.e., inhalation) rather than indirect exposure (i.e., ingestion of contaminated food). The HHRA assumed the presence of the PFS, which affected temperatures, humidity, and flow rates, but took no credit for potential emissions reductions. The results show that the UMCDF meets all the state-approved thresholds for the screening risk assessment.

3.2.5 Evolving Guidance on the HHRA Methodology

The methodology used to perform the screening risk assessment for the UMCDF was mandated by the ODEQ and the US EPA. These regulating entities recognized that the methodology, in particular that for performing indirect exposure risk assessments, would

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of the UPA that attaches to the CHB) along with the failure of the munitions in this area also has the potential to involve a significant amount of agent.

Other external events also contribute to the risks at the UMCDF. Although the aircraft crash risks are not associated with any undue exposure to aircraft, calculations were made for the probability that an in-flight plane could crash into one of the storage structures or the facility. Such accidents are more important to processing risk than to storage risk, primarily due to the dominance of earthquake and lightning events at the storage yard.

In addition to external events, only one activity related to munition disposal (which includes all activities associated with munition handling through incineration) was important to risk at the UMCDF. During the removal of rocket pallets from their storage igloos, it is postulated that a forklift-related event may either cause a rocket to explode or its propellant to ignite. These scenarios are risk significant because an ignition within an igloo could propagate to other rockets in the igloo, possibly causing an igloo fire involving the entire igloo inventory of rockets. Although a substantial fraction of the agent would be consumed in the resulting fire, the amount that could potentially be released is large because the available quantity is large. The results show that all other activities related to munition disposal do not contribute significantly to processing risk (approximately 1 percent).

For the UMCDF, the QRA results clearly indicate that the fatality risk of munition storage is much greater than that of processing (see Tables 4-2 and 4-3). Based on these results, and the fact that both munition disposal and storage risks are dominated by external events, similar risk analysis with the PFS should result in minimal impact on the overall risk associated with accidental agent releases. A thorough evaluation of the potential risk increases and decreases due to the PFS has been performed. The results of this evaluation are presented in Sections 4.2 through 4.6.

4.2 Examination of Potential Benefits of the PFS

As mentioned in Section 4.1, the UMCDF Phase 1 QRA considers a comprehensive set of accident scenarios that could lead to chemical agent release from the UMCDF or the storage yard. The PFS could mitigate some of these scenarios by capturing the chemical agent before it is released to the environment. In this section, the potential benefits of the PFS are examined in detail, and the positive impact on the QRA risk is quantified and discussed.

4.2.1 Elimination of PAS Releases

The furnaces (and afterburners) at the UMCDF are designed to operate at temperatures that ensure chemical agent destruction to 99.9999 percent efficiency. This destruction efficiency has been demonstrated at JACADS during agent trial burns and during normal toxic operations. Should an upset result in furnace operation outside of the design range, numerous safety systems act to move the furnace systems into a safe shutdown mode that precludes any

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agent release from the facility. Nevertheless, as part of the QRA, accidents are postulated that could result in agent releases from the furnaces to their PASs. In such accidents, the PAS, which ordinarily acts to scrub pollutants from the exhaust gases, would also act to remove and destroy chemical agent in the airstream.

In the PFS design, carbon filters would be installed downstream of the PAS on each of the furnaces. These filters would have the opportunity to capture any chemical agent that made it through the furnace and its PAS during an accident. The quantity of chemical agent involved in such a release is predicted in the baseline QRA to be very small due to the combined agent destruction in the furnace and the PAS.[8] Simplified modeling efforts indicate that the PFS carbon will easily adsorb this small amount of agent, effectively reducing the quantity of agent released to zero. Therefore, the PFS has the potential to eliminate the likelihood of a PAS release accident.

4.2.2 Baseline Accident Scenarios Affected

All postulated accidents in the UMCDF baseline QRA have been reviewed to determine any potential impact that the PFS might have. This assessment was based on design and operational information for the proposed PFS and on the UMCDF baseline QRA models. In terms of potential benefits, the PFS would serve to mitigate only those sequences involving releases through the PASs (see Section 4.2.1). The baseline QRA includes many other releases (e.g., releases during onsite transportation accidents, releases during handling accidents, etc.), but the PFS would not mitigate these releases. For the purpose of this study, it is assumed that the PFS operates at optimum capture efficiency.

The specific accident scenarios mitigated by the PFS are as follows (the top event name from the baseline QRA is shown in parentheses):

1. *Agent Release from the MPF PAS (MPFPASR).* In this scenario, an upset occurs while one or more munitions are present within the furnace. These munitions contain the residual chemical agent that remains after draining (normally less than 5 percent of the original agent mass). Chemical agent continues to volatilize from the munitions but is not completely destroyed in the MPF due to either overventilation or underventilation following furnace shutdown. Overventilation results in rapid cooling of the furnace to the point where the gas residence time cannot ensure adequate agent destruction. Underventilation results in incomplete agent destruction due to lack of

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[8] Note that the operation of the furnace outside the design envelope means that the agent destruction efficiencies may not be optimal; it does *not* mean that no destruction will take place in the furnace. In addition, the agent destruction and removal efficiency of the PAS alone has been estimated at 99.98 percent based on testing performed at the Chemical Agent Munitions Disposal System facility in Utah (SAIC, 1996a).

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oxygen with which to react. Both system failures and human failures are included in the QRA fault tree models. The overall initiator frequency is dominated by failures that would cause a lockout of all furnace burners followed by a failure to stop the combustion air blower from running or a failure to stop the primary ID fans from running (overventilation).

2. *Agent Release from the LIC PAS (LICPASR).* This sequence includes releases where (1) agent feed to a LIC fails to stop following a LIC upset, and a release occurs as the furnace cools down; or (2) the agent feed line is not properly purged following a LIC shutdown, and the release occurs on restart. The initiator frequency was dominated by a failure of the operators to purge the agent feed line.

Agent releases from the DFS and the DUN via their respective PASs were considered in the QRA. However, these furnaces handle only small quantities of chemical agent (the DUN normally handles trace amounts of agent, if any), and no credible PAS release sequences were identified.

4.2.3 Risk Results

In the baseline QRA, the risks associated with each of the PAS release sequences described in Section 4.2.2 are added together to yield the total risk from PAS releases. It is assumed that the net effect of the PFS on PAS releases is to reduce the probability of an agent release by capturing any chemical agent before it reaches the stack. This is a bounding calculation because it was assumed that the filters will capture all agent. To put this risk into perspective, the comparisons shown in Tables 4-6 and 4-7 have been developed. Table 4-6 deals with public acute fatality risk, while Table 4-7 shows public cancer risk. Each table shows the risk associated with the PAS release sequences with and without the PFS and the overall baseline processing risk from all accidents in the QRA (shaded). Two risk measures are presented for each item: risk to those members of the public exposed to the highest concentrations of contaminants (the most exposed individual), and the overall risk to the public as a whole (societal risk). The results shown in Table 4-6 indicate that while the PFS can potentially reduce the probability of an agent release from the stack, its net effect on public acute fatality risk is zero. This is because the amount of agent that could be released from the PAS is relatively small and does not contribute to individual and societal acute fatality risks.

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Table 4-6. Public Acute Fatality Risk of PAS Release Sequences

Description	Individual Risk (over facility life)	Societal Risk (over facility life)
Risk with the PFS	0	0
Risk without the PFS	0	0
Total Baseline Processing Risk	1.2E-07	2.0E-05

Table 4-7. Public Cancer Risk of PAS Release Sequences

Description	Individual Risk (over facility life)	Societal Risk (over facility life)
Risk with the PFS	0	0
Risk without the PFS	<1.0E-12	<1.0E-10
Total Baseline Processing Risk	<1.0E-12	1.3E-08

4.3 Examination of Potential Increased Risk Due to the PFS

Section 4.2 described the potential mitigative effects of the PFS on accidental agent releases through the PASs and common stack. Due to its location in the furnace exhaust path, the PFS also has the potential to *increase* risks in several ways. Using the methodologies described in separate reports (Mitretek, 1998; SAIC, 1997c) a master logic diagram (MLD) was developed to identify accident scenarios that the PFS could either cause or exacerbate. An MLD is a logic diagram that illustrates a fault tree, while a fault tree illustrates the decomposition of a given top event into specific causes that can be subsequently assessed. Using the MLD developed for this task, the potential negative impacts of the PFS were grouped into four general areas:

1. *Effects on Baseline Accidents.* The PFS could increase the frequencies of existing agent release accidents in the baseline QRA, due to additional system complexities and interactions with the baseline furnace/PAS systems. This analysis is presented in Section 4.3.1.
2. *"New" Releases from Outside the PFS.* Interactions between the PFS and the existing systems might also lead to releases from outside the PFS boundary that were not

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modeled in the baseline QRA. After examination of the preliminary PFS design, no new events in this area were identified.

3. *"New" Releases from the PFS.* The PFS could act as a reservoir for toxic pollutants (and possibly small quantities of chemical agent) that could subsequently be released in concentrated quantities during "new" accidents. This analysis is presented in Section 4.3.2.
4. *Waste Disposal.* The PFS includes new solid hazardous waste streams that would need to be disposed of safely. An accident during these disposal activities could result in a release of agent or toxic pollutants from the waste. This analysis is presented in Section 4.3.4.

In addition, the PFS could also impact risk in one other way:

5. *Processing Delay.* There are also ways that the PFS could delay the disposal process. Any delay in disposal translates to an increase in the munition storage period and consequently an increase in risk. Disposal could be delayed as a result of increased furnace/PAS system unavailability due to the PFS (downtime for PFS related repairs and maintenance). It could be delayed as a result of the RCRA permit modification process or from possible public backlash associated with a proposed change to remove the PFS. In addition, disposal could be delayed if a stack release were to occur on a system that did not include the PFS which could have been prevented by the PFS. The UMCDF baseline QRA results indicate that the risk of storage is much greater than that of processing (see Section 4.1.2.2). Therefore, any extension in the storage period is undesirable. This analysis is presented in Section 4.3.3.

4.3.1 Increased Risk for Baseline Accidents

As mentioned above, the PFS is installed just after the existing PASs. Initiators within the PASs (e.g., equipment failures) that can adversely impact the operation of the furnaces are modeled in the baseline QRA. Since the PFS essentially extends each PAS, an engineering review of the existing QRA models was conducted to determine where upsets in the PAS appear. Two PAS upsets are modeled in the QRA: (1) blockage of the exhaust stream flow and (2) subsequent loss of ID. Although there are a number of ways to achieve such blockages, this *class* of initiator is the only one that deals with failures within the PAS. That is, the baseline QRA, which included a comprehensive search for accident initiators, identified no other ways that failures within the PAS could lead to an agent release.

The PFS design contains several failure modes that result in furnace exhaust flowpath blockage (e.g., one of the PFS dampers transfers closed, etc.). Such PFS-induced flowpath blockages have an effect on the facility that is identical to the blockage of the PAS flowpath already modeled within the QRAs; hence, the frequency of accidental releases induced by PFS

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blockages was determined by modifying the existing QRA models. Review of the baseline QRA identified the following top events involving PAS flowpath blockage and loss of ID (the top event name from the baseline QRA is shown in parentheses):

- *Agent Vapor Explosion in the MPF (MPFAGVP).* If loss of ID occurred with a volatilizing munition load within the furnace, agent vapors could accumulate within the MPF. A failure to follow contingency procedures could result in the ignition of this vapor and an explosion within the furnace. The room boundary could be compromised by the explosion, and the agent contents of the munitions within the furnace could then be released to the external environment.
- *Agent Vapor Explosion in the MPF Airlock (MPFARDL).* If a loss of ID occurred while a tray of munitions was in the MPF airlock, the resultant stop feed could leave the tray within the airlock long enough for a flammable air-agent mixture to form. Ignition of this mixture could lead to an explosion that fails the airlock and possibly the MPF external room wall. The agent contents of the munitions within the furnace/airlock could then be released to the external environment.
- *MPF Natural Gas Explosion (MPFNGAS).* If a loss of ID resulted in a furnace shutdown and the natural gas flow to the furnace failed to stop, then an accumulation of natural gas within the furnace and/or the furnace room could occur. Ignition of this gas could result in an explosion that might fail the furnace and the room walls. The agent contents of the munitions within the furnace could then be released to the external environment.
- *DFS Natural Gas Explosion (DFSNGAS).* If a loss of ID resulted in a furnace shutdown and the natural gas flow to the furnace failed to stop, then an accumulation of natural gas within the furnace room could occur. Ignition of this gas could result in an explosion that might fail the room walls and ceiling. The agent contents of the munitions within the UPA above could be released to the external environment if catastrophic failure of the DFS room ceiling occurred.
- *LIC Room Release (LICROOM).* If a loss of ID resulted in a furnace shutdown and the agent feed to the furnace was not isolated, a release of agent into the LIC room could occur. A concurrent or subsequent failure of the heating, ventilating, and air conditioning (HVAC) system could result in an agent release to the external environment.

Other initiators (besides loss of ID) can lead to these upsets as well; however, these initiators are not affected by the PFS. Thus, the relative impact of the PFS on the occurrence frequency varies among the events.

Since completion of the UMCDF baseline QRA, two new initiators have been included in the TOCDF baseline QRA (SAIC, 1996b) that involve PAS upsets (MPFEXPL and

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LICEXPL). These events involve potential natural gas explosions within the LICs and the MPF following an unplanned shutdown and failure to purge. Although these events are not included in the UMCDF baseline QRA, it is important to note that (1) they were both negligible contributors to risk in the TOCDF baseline QRA and (2) the impact of the PFS resulted in a negligible increase in their accident frequencies (SAIC, 1997). Therefore, even if these events were added to the UMCDF baseline QRA, no changes in the baseline risk should occur, and no changes in the risk impact of the PFS would be expected.

4.3.1.1 Impact on Accident Frequency

In order to quantitatively evaluate the impact of the PFS on the above accident sequences, system drawings along with descriptions of system operation and furnace interfaces were used to develop logic (fault tree) models for the PFS. These models are very similar in construction to the fault tree models already developed for the baseline QRA. Component failure and human reliability values were estimated in order to quantify the top event frequencies, and the primary source for this data was the baseline QRA database. The PFS fault tree models were subsequently linked with the affected QRA furnace system models, and the resultant changes in the accident sequence frequencies were calculated. The results of these calculations are presented in Table 4-8.

From Table 4-8, it can be seen that the impact of the PFS varies among the events (increases range from 0 percent to 385 percent). Although loss of ID appears as a contributor to these events, other initiators can dominate over the impact of the PFS on loss of ID. The two primary contributors to the increases shown are (1) plugging of the filters by particulate with failure to change out or bypass and (2) inadvertent damper closure in the PFS.

Table 4-8. Baseline Top Event Frequencies Affected by the PFS

QRA Top Event Name	Baseline Frequency (per hour)	Percent Increase in Frequency due to PFS	New Frequency with PFS (per hour)
MPFAGVP	4.8E-05	385*	2.3E-04
MPFARDL	1.7E-04	9	1.8E-04
MPFNGAS	2.9E-08	168**	7.8E-08
DFSNGAS	1.7E-11	4	1.8E-11
LICROOM	2.8E-14	0	2.8E-14

* This translates into a factor increase of 4.8.

** This translates into a factor increase of 2.7.

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4.3.1.2 Accident Consequence Evaluation

Dispersion and consequence calculations for agent release sequences involving loss of ID have been performed in the baseline QRA using the CHEMMACCS computer code (SAIC, 1996a). CHEMMACCS is a modification of the MACCS code, developed by Sandia National Laboratories to predict the transport and consequences of radioactive releases. CHEMMACCS contains a standard Gaussian plume model specifically modified to handle chemical agent dispersion and transport. It also includes probabilistic, site-specific weather data sampling; site-specific demographics; evacuation modeling; and probabilistic health effects evaluation using probit (dose-response) equations.

The PFS would affect only the *frequency* of loss-of-ID sequences (see Section 4.3.1). Therefore, the existing consequence results for these sequences remain valid, and no new CHEMMACCS calculations were necessary.

4.3.1.3 Risk Results

In Section 4.3.1.1, it was shown that the only detrimental impact of the PFS on the existing QRA accidents was to increase the frequencies of the top events as shown in Table 4-8. To put these increases in perspective, the comparisons shown in Tables 4-9 and 4-10 have been developed. Table 4-9 deals with public acute fatality risk, while Table 4-10 shows public cancer risk. Each table shows the risk associated with each PAS upset sequence with and without the PFS and the overall baseline processing risk from all accidents in the QRA (shaded). Two risk measures are presented: risk to those members of the public closest to the UMCDF site boundary (individual risk), and risk to the public as a whole (societal risk).

It can be seen that the PFS results in no impact to the fatality risks from existing processing sequences and a small increase in societal and individual cancer risk. The processing risks (both acute fatality and cancer) are dominated by external event sequences such as earthquakes, which remain unaffected by the PFS (see Section 4.1.3.1).

4.3.2 New PFS Release Sequences

Because the PFS should trap some of the small quantities of compounds of concern present in the PAS exhaust gases, the PFS carbon would act as a reservoir to concentrate these substances in one location. If a process upset resulted in an agent release through the PAS, then small amounts of chemical agent could be included in this concentrated mass. The collected pollutants could be released accidentally, and the concentrated nature of the release could lead to public and worker health effects. Such accidents represent new scenarios not present in the baseline QRA. To address these accidents, a portion of the MLD was developed to identify all of the potential new releases. Both internal events (those initiating

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Table 4-9. Public Acute Fatality Risk of PAS Upset Sequences

Description	Individual Risk (over facility life)	Societal Risk (over facility life)
MPFAGVP Risk with the PFS	< 1.0E-12	< 1.0E-10
MPFAGVP Risk without the PFS	< 1.0E-12	< 1.0E-10
MPFARDL Risk with the PFS	< 1.0E-12	< 1.0E-10
MPFARDL Risk without the PFS	< 1.0E-12	< 1.0E-10
MPFNGAS Risk with the PFS	0	0
MPFNGAS Risk without the PFS	0	0
DFSNGAS Risk with the PFS	< 1.0E-12	< 1.0E-10
DFSNGAS Risk without the PFS	7.0E-12	4.0E-10
LICROOM Risk with the PFS*	0	0
LICROOM Risk without the PFS*	0	0
Total Baseline Processing Risk	1.2E-07	2.0E-05

* Consequences were not calculated for an agent release into the LIC room because the frequency of this event (LICROOM) fell below the truncation limit (i.e., this sequence was screened). The sequence was included in this study to ensure that analysis with the PFS did not result in an increase in the frequency above the truncation limit (about 1.1E-13/hr), which it did not (see Table 4-8).

within the process) and external events (those initiating outside of the process) were considered. Ultimately, four new classes of accidents were identified:

- *Aircraft Crashes into the PFS.* If an aircraft were to crash into the PFS, a fire could ensue and the agent adsorbed onto the filters could be released. Small, medium, and large aircraft are capable of causing different amounts of damage and were considered separately.
- *Carbon Filter Fires.* If the carbon in the PFS catches fire as a result of an external source, internal (adsorption or chemical) heating, or an explosion in the PFS, then the agent adsorbed onto the filters could be released.
- *High Humidity Desorption.* If the gas reheater were to fail to operate, the elevated humidity of the gases entering the carbon filters could lead to desorption of the adsorbed contaminants. (Subsequent analysis showed that this event would result in zero consequences; however, it has been retained for completeness.)

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Table 4-10. Public Cancer Risk of PAS Upset Sequences

Description	Individual Risk (over facility life)	Societal Risk (over facility life)
MPFAGVP Risk with the PFS	1.2E-12	3.7E-09
MPFAGVP Risk without the PFS	<1.0E-12	9.6E-10
MPFARDL Risk with the PFS	<1.0E-12	< 1.0E-10
MPFARDL Risk without the PFS	<1.0E-12	< 1.0E-10
MPFNGAS Risk with the PFS	<1.0E-12	2.1E-10
MPFNGAS Risk without the PFS	<1.0E-12	1.3E-10
DFSNGAS Risk with the PFS	0	0
DFSNGAS Risk without the PFS	0	0
LICROOM Risk with the PFS*	0	0
LICROOM Risk without the PFS*	0	0
Total Baseline Processing Risk	<1.0E-12	1.3E-08

* Consequences were not calculated for an agent release into the LIC room because the frequency of this event (LICROOM) fell below the truncation limit (i.e., this sequence was screened).

- *High Temperature Desorption.* If the gas reheater were to fail such that it were on continuously, the elevated temperature of the gases entering the carbon filters could cause desorption of the adsorbed contaminants. (It has been decided that the gas reheater will be sized such that it is not capable of heating the gas stream to the point where the carbon would catch fire.)

[Seismic events were, of course, included in the list of external events. However, it was judged that the PFS components could be made robust enough to render seismic release scenarios unimportant to risk. This is already the case with the HVAC filters at the CDFs.]

4.3.2.1 Accident Frequency Evaluation

Different methods were used to estimate the frequencies associated with new PFS accidents, depending on the type of accident and the data available. The frequencies of aircraft crashes (small, medium, and large) into various structures at the UMCDF have been calculated in the baseline QRA. It was assumed in this study that the PFS filters would be

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roughly the same size as the HVAC filters, and the frequency of aircraft crashes into the HVAC filters was used for the PFS filters as well. The conditional probability of fire given a crash was taken as 0.45, as in the baseline QRA. For the filter desorption accidents PFS system drawings and descriptions of system operation were used to develop stand-alone logic (fault tree) models. These models were then quantified using component data from the baseline QRA database and other industry sources.

Filter fires were considered to have four possible causes:

1. *Fires originating outside of the carbon beds that subsequently propagate to the filters.* Review of the PFS system layout and general arrangement drawings indicates no important internal ignition sources (the carbon filter units are located in a separate room which contains no high-voltage electrical sources or natural gas supplies). Transient fires (such as fires ignited by welding done during corrective maintenance) are a possibility; however, such fires are extremely unlikely given the low frequency of repairs that require welding and the low probability that proper safety precautions are not taken. The occurrence frequency of this initiator was considered to be much lower than that calculated for cause 4 below; therefore, it was not quantified explicitly.
2. *Heating of the carbon to above its ignition temperature by the gas reheater.* As mentioned previously, the reheater will be sized such that it is incapable of heating the process stream enough to cause ignition of the carbon.
3. *Explosions in the PFS during furnace startup.* Procedures call for the operators to bypass the PFS during startup. Failure to follow these procedures could result in a "puff" of natural gas reaching the PFS reheater, causing a fire or explosion. This could ignite the carbon. A prediction of the frequency of startups was made based on JACADS data, and a human failure event probability of 3E-03 per opportunity was used to generate an estimate of the explosion frequency.
4. *Spontaneous combustion of the carbon from internal heating.* If airflow through the filters is lost after they have been loaded to some extent with pollutants (including organics), spontaneous heating of the carbon can occur due to slow oxidation or continued adsorption. If this heat is not effectively dissipated, ignition of the carbon can occur. To account for this effect, data on spontaneous ignition of carbon in tests was obtained, and a probability distribution was constructed to estimate the conditional probability that, given a loss of airflow, ignition would occur. This was coupled with the loss-of-draft frequency discussed in Section 4.3.1 to produce an estimate of the frequency of spontaneous carbon ignition.

Once the event frequencies had been calculated as described above, it was necessary to adjust these frequencies to account for the probability that chemical agent was on the filters at the time of the accident. In the UMCDF baseline QRA (SAIC, 1996a), the frequency of the

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upset that led to agent being present on the filters was assumed to be that associated with the *most frequent* potential PAS release (8.9E-06 per hour of operation, or an average probability of 0.09 over the operational life of the facility). This could tend to overestimate the risk impact of these new accidents, since the probability of agent contamination could be much less. However, it is shown in Section 4.3.2.3 that, even with this approximation, the risk impact of these new accidents is not significant. Therefore, no refinement of the approach is necessary. The resultant frequencies for each of the new accidents are summarized in Table 4-11.

4.3.2.2 Accident Consequence Evaluation

The chemical agent source terms for the new PFS accident sequences also depend upon the upset that led to agent being present on the filters in the first place. As an approximation, the quantity of agent (and the associated heath consequences) from the PAS release sequence with the greatest consequences is used as the source term for the new PFS releases. This involves a release from the MPF PAS during HD ton container processing. The mean agent source term to the environment from this accident is 0.30 lb_m of HD. As with the frequency approximation introduced in Section 4.3.2.1, this could tend to overestimate the impact of these accidents because much less agent could be present on the filters. However, it is shown in the next section that the risk impact of the new sequences is not significant and that no refinement of the approach is necessary.

Table 4-11. Frequencies of New PFS Accidents

Accident	Frequency (per year)	Frequency [with agent present on filters] (per year)*
Aircraft Crash into the PFS w/fire		
Large aircraft	4.5E-09	4.0E-10
Medium aircraft	2.2E-07	1.9E-08
Small aircraft	1.7E-07	1.5E-08
Carbon Filter Fires	1.2E-02	1.0E-03
Filter Desorption		
High humidity	5.6E-01	5.0E-02
High temperature	1.1E-08	9.3E-10

* Represents the accident frequency multiplied by the average conditional probability of agent contamination over the time between changeouts (0.09; changeout prior to commencing a new agent campaign). The overall filter fire frequency was formed as a combination of these individual contributors.

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Table 4-20. Dominant Worker Acute Fatality Risk Contributors for Processing at the TOCDF

Scenario	Percent of Total Worker Risk
Accidents During Maintenance	44
Earthquakes	36
Handling Accidents	6
MPFAGVP	3
Munition Accidentally Sent to MPF	3
Other	8

The results of the TOCDF baseline QRA indicate that the total worker risk is dominated by DRW maintenance and DRW direct effects. The same maintenance activities will be required at TOCDF and UMCDF, so the maintenance risk will be much the same. In addition, the DRW direct effects risk depends primarily upon the number of workers in the immediate vicinity of an accident, rather than on downwind agent transport. This, too, will be relatively site-independent. The mix of munitions at the two sites is comparable; therefore the same types of processing and handling accidents are possible. This implies that the impact of the PFS on worker risk at the TOCDF can be used as a reasonable guide to qualitatively evaluate the corresponding impact at the UMCDF.

The worker risk results from the TOCDF PFS QRA are shown in Table 4-21. These results indicate that the PFS will not result in a decrease of the risk to workers from accidental agent releases. Instead, an 8 percent increase in the worker acute fatality risk is predicted for the TOCDF. This is due primarily to the potential increased frequency of agent vapor explosions in the MPF due to loss of ID caused by filter plugging and inadvertent damper closure within the PFS. The resultant potential explosion can cause worker fatalities if personnel are nearby. It is judged that a similar impact on worker risk would be calculated for the UMCDF. Based on the risk values presented in Table 4-22, the increase in worker fatality risk due to increased frequency of existing accidents is 2.5E-05 over 3.3 years of UMCDF operation. This translates to a 13 percent increase in the worker fatality risk for the UMCDF.

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Table 4-21. Worker Risk Impact of the PFS in the TOCDF QRA (Individual Acute Fatality Risk)

Description	Worker Risk (over facility life)
Risk of PAS Releases with the PFS	0*
Risk of PAS Releases without the PFS	3.4E-09*
Risk of PAS Upsets with the PFS	3.3E-05*
Risk of PAS Upsets without the PFS	1.1E-05*
Risk of New PFS Accidents	1.4E-09*
Total TOCDF Baseline Worker Risk (All Campaigns)	4.1E-04

* Based on Campaigns 6-13 only (4.3 years)

4.5 Uncertainty in Risk

The baseline UMCDF Phase 1 QRA does not include an assessment of the uncertainties in the calculated risks. That is, the results are *point estimate* values—single predictions that are intended to represent *best estimates* of the true risks. In contrast, the QRA for the TOCDF is a Phase 2 assessment that includes a detailed estimate of the uncertainties in the risks (SAIC, 1996b). The UMCDF Phase 2 QRA will include an uncertainty analysis. In this section, the TOCDF baseline QRA uncertainty analysis results are used to qualitatively evaluate the potential implications of uncertainty on the UMCDF PFS QRA.

4.5.1 Baseline Accidents

Table 4-22 presents a comparison of the mean public societal acute fatality risks at TOCDF and UMCDF for (1) the accident sequence groups affected by the PFS and (2) all processing accidents. One can see that the risks are slightly higher for the TOCDF and that, for both sites, the affected sequences are not significant contributors to the processing risk. This is a reasonable indicator that, at least on a general scale, the impact of the uncertainty will be similar for the two sites for these accidents.

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Table 4-22. Comparison of Mean Public Societal Acute Fatality Risk in the Baseline TOCDF and UMCDF QRAs

	Public Societal Acute Fatality Risk (over facility life)	
Accidents	TOCDF	UMCDF
All Processing	1.3E-4	2.0E-5
PAS Releases	0.0	0
MPFAGVP	< 1E-10	< 1E-10
MPFARDL	1.9E-10	< 1E-10
MPFNGAS	< 1E-10	0
DFSNGAS	3.3E-10	4.0E-10

Table 4-23 shows a comparison similar to that in Table 4-22, but this time the risk measure is public societal cancers. Again, the risks are slightly higher at the TOCDF, and the relative contributions of the accidents affected by the PFS are similar for both sites. One of these accidents, MPFAGVP, does contribute to the cancer risk from processing, and this

Table 4-23. Comparison of Mean Public Societal Cancer Risk in the Baseline TOCDF and UMCDF QRAs

	Public Societal Cancer Risk (over facility life)	
Accidents	TOCDF	UMCDF
All Processing	2.3E-8	1.3E-8
PAS Releases	1.0E-10	< 1E-10
MPFAGVP	3.9E-10	9.6E-10
MPFARDL	< 1E-10	< 1E-10
MPFNGAS	< 1E-10	1.3E-10
DFSNGAS	< 1E-10	0

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modeled in the baseline QRA. After examination of the preliminary PFS design, no new events in this area were identified.

3. *"New" Releases from the PFS.* The PFS could act as a reservoir for toxic pollutants (and possibly small quantities of chemical agent) that could subsequently be released in concentrated quantities during "new" accidents. This analysis is presented in Section 4.3.2.
4. *Waste Disposal.* The PFS includes new solid hazardous waste streams that would need to be disposed of safely. An accident during these disposal activities could result in a release of agent or toxic pollutants from the waste. This analysis is presented in Section 4.3.4.

In addition, the PFS could also impact risk in one other way:

5. *Processing Delay.* There are also ways that the PFS could delay the disposal process. Any delay in disposal translates to an increase in the munition storage period and consequently an increase in risk. Disposal could be delayed as a result of increased furnace/PAS system unavailability due to the PFS (downtime for PFS related repairs and maintenance). It could be delayed as a result of the RCRA permit modification process or from possible public backlash associated with a proposed change to remove the PFS. In addition, disposal could be delayed if a stack release were to occur on a system that did not include the PFS which could have been prevented by the PFS. The UMCDF baseline QRA results indicate that the risk of storage is much greater than that of processing (see Section 4.1.2.2). Therefore, any extension in the storage period is undesirable. This analysis is presented in Section 4.3.3.

4.3.1 Increased Risk for Baseline Accidents

As mentioned above, the PFS is installed just after the existing PASs. Initiators within the PASs (e.g., equipment failures) that can adversely impact the operation of the furnaces are modeled in the baseline QRA. Since the PFS essentially extends each PAS, an engineering review of the existing QRA models was conducted to determine where upsets in the PAS appear. Two PAS upsets are modeled in the QRA: (1) blockage of the exhaust stream flow and (2) subsequent loss of ID. Although there are a number of ways to achieve such blockages, this *class* of initiator is the only one that deals with failures within the PAS. That is, the baseline QRA, which included a comprehensive search for accident initiators, identified no other ways that failures within the PAS could lead to an agent release.

The PFS design contains several failure modes that result in furnace exhaust flowpath blockage (e.g., one of the PFS dampers transfers closed, etc.). Such PFS-induced flowpath blockages have an effect on the facility that is identical to the blockage of the PAS flowpath already modeled within the QRAs; hence, the frequency of accidental releases induced by PFS

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contribution is more pronounced at the UMCDF than the TOCDF. Overall, it is again judged that the uncertainty results at TOCDF can be used to qualitatively estimate the impact of uncertainty on the UMCDF PFS QRA.

Table 4-24 shows the distributions on public societal acute fatality risk for (1) the accident sequence groups affected by the PFS and (2) all processing accidents. These results are from the TOCDF baseline QRA without the PFS. Looking at the 5th and 95th percentile information, it is observed that the 95th percentile values for the five groups of sequences affected by the PFS are *over four orders of magnitude less* than the 5th percentile processing risk value (these values are shaded in the table). As described in Section 4.3.1, the PFS would shift the means of the four negatively affected sequences up by far less than one order of magnitude (this is true for both the UMCDF and the TOCDF), and no significant broadening of the distributions would be expected. The impact of the PFS on societal risk, if any, should be less than the uncertainty associated with processing risk. Therefore, the conclusion that the impact of the PFS on societal fatality risk would be insignificant at the TOCDF is confirmed when uncertainty in the risk estimate is considered. The similarity in the relative risks shown in Table 4-22 suggests that this would be the case at the UMCDF as well.

Table 4-25 presents information similar to Table 4-24, this time for societal cancer risk. In this case, the 95th percentile values for the groups of sequences affected by the PFS are also below the 5th percentile processing risk value (the values are shaded in the table). The sequence group with the highest 95th percentile (MPFAGVP; 1.3E-09), is still a factor of four lower than the processing 5th percentile (5.3E-09). This confirms the conclusion that, at the TOCDF, the impact of the PFS on societal public cancer risk is not significant. From

Table 4-24. Comparison of Distributions on Public Societal Acute Fatality Risk in the TOCDF Baseline QRA

Accidents	Public Societal Acute Fatality Risk (7.1 years of operation)		
	Mean	5th Percentile	95th Percentile
All Processing	1.3E-4	2.0E-5	4.4E-4
PAS Releases	0.0	0.0	0.0
MPFAGVP	< 1E-10	0.0	< 1E-10
MPFARDL	1.9E-10	0.0	4.9E-10
MPFNGAS	< 1E-10	0.0	< 1E-10
DFSNGAS	3.3E-10	< 1E-10	8.7E-10

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Table 4-25. Comparison of Distributions on Public Societal Cancer Risk in the TOCDF Baseline QRA

	Public Societal Cancer Risk (over facility life)		
Accidents	Mean	5th Percentile	95th Percentile
All Processing	2.3E-08	5.3E-09	5.4E-08
PAS Releases	1.0E-10	< 1E-10	2.2E-10
MPFAGVP	3.9E-10	< 1E-10	1.3E-09
MPFARDL	< 1E-10	< 1E-10	< 1E-10
MPFNGAS	< 1E-10	< 1E-10	2.1E-10
DFSNGAS	< 1E-10	< 1E-10	< 1E-10

Table 4-23, it can be seen that the contribution of MPFAGVP to this risk is more pronounced at the UMCDF than at the TOCDF (7 percent versus under 2 percent). Even so, it is judged that consideration of uncertainty would not alter the conclusions about the effects of the PFS on accidents already modeled in the UMCDF baseline QRA --namely, that the impact on societal cancer risk would be small.

4.5.2 New PFS Accidents

In the TOCDF PFS QRA, the public acute fatality risks associated with releases *from* the PFS were identically zero. This means that even with the probabilistic treatment of weather in the QRA, the doses to all individuals in the surrounding population were below the no-deaths threshold in all uncertainty runs. Therefore, within the uncertainty analysis framework used in the TOCDF baseline QRA, these new sequences would have no impact at all on the public acute fatality risk distribution for processing. This would also be the case at the UMCDF, where the mean public acute fatality risks associated with releases from the PFS were also identically zero.

At the TOCDF, the public cancer risks due to releases from the PFS were less than 1E-10 over the facility life, and Table 4-26 presents the distributions on this risk measure for (1) the new PFS accident sequences, and (2) all baseline processing accidents at the TOCDF. The 95th percentile values for the six new sequences are all below 1E-10, so the impact of these sequences is again seen to be insignificant. This should also be the case at the UMCDF because the corresponding mean risks from such sequences were also below 1E-10.

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Table 4-26. Distributions on Public Societal Cancer Risk from New Accidental Agent Releases from the PFS Versus Baseline Processing Risk (TOCDF)

Accidents	Public Societal Cancer Risk (over facility life)		
	Mean	5th Percentile	95th Percentile
All Processing	2.3E-08	5.3E-09	5.4E-08
Large Aircraft Crash w/fire	< 1E-10	< 1E-10	< 1E-10
Medium Aircraft Crash w/fire	< 1E-10	< 1E-10	< 1E-10
Small Aircraft Crash w/fire	< 1E-10	< 1E-10	< 1E-10
Carbon Filter Fire	< 1E-10	< 1E-10	< 1E-10
Filter Desorption – High Humidity	0.0	0.0	0.0
Filter Desorption – High Temperature	< 1E-10	< 1E-10	< 1E-10

4.5.3 Limitations in the TOCDF Uncertainty Analysis

The uncertainty methodology employed in the TOCDF baseline QRA is a state-of-the-art process involving sophisticated Monte Carlo sampling procedures. Uncertainties in the accident initiator occurrence frequencies, the conditional probabilities of successive events, and the quantities of agent potentially released in accidents are considered. Nevertheless, some sources of uncertainty are not treated, including uncertainty in the parameters affecting the downwind transport of agent and in the dose/response behavior of the population. The evaluation of uncertainty regarding the effects of the PFS is, therefore, made within the existing QRA uncertainty analysis framework and carries with it the same limitations (SAIC, 1996b).

4.5.4 Conclusions

Based on the TOCDF uncertainty analysis and on similarities between the TOCDF and UMCDF baseline QRA results, it is likely that conclusions regarding the impact of the PFS on public acute fatality risk at the UMCDF would remain unchanged.

4.6 Summary of PFS Impacts on Accident Risk

Based on the analyses presented in this section, the only change in QRA risk associated with the PFS is the potential for a delay in munition disposal. A delay in disposal translates to an increase in the munition storage period and consequently an increase in risk. Disposal could be delayed as a result of increased furnace/PAS system unavailability due to the PFS. It could

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also be delayed by the RCRA permit process associated with a change to remove the PFS. Furthermore, the process could be stopped and disposal could be delayed if a stack release were to occur on a system design that did not include the PFS.

Even though this evaluation was based on a preliminary design of the PFS, no change in the overall conclusion would be expected from changes to the PFS design. Small changes in risk may result from design refinements; however, the results show that operation of the PFS has almost no impact on risk. Consequently, the overall conclusion would not be expected to change.

In addition, the uncertainty analysis described in Section 4.5 (based on that done at the TOCDF) shows that it is likely that conclusions regarding the impact of the PFS on public acute fatality risk at the UMCDF would remain unchanged.

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DEPARTMENT OF THE ARMY
PROGRAM MANAGER FOR CHEMICAL DEMILITARIZATION
ABERDEEN PROVING GROUND, MARYLAND 21010-5401

99-0065

January 13, 1999

Office of the Project Manager
Chemical Stockpile Disposal

STATE OF OREGON
DEPARTMENT OF ENVIRONMENTAL QUALITY
RECEIVED

JAN 14 1999

HERMISTON OFFICE

Ms. Sue Oliver
Oregon Department of Environmental Quality
256 East Hurlburt Ave, Suite 105
Hermiston, Oregon 97838

Dear Ms. Oliver,

It was good to speak with you Monday regarding the Umatilla Chemical Agent Disposal Facility (UMCDF) Pollution Abatement System Filter System (PFS) risk assessment. As we discussed, enclosed are two copies of the report *Risk Assessment of the Pollution Abatement Filter System for the Umatilla Chemical Agent Disposal Facility*, September 1998, referred to here as the Risk Assessment.

The Risk Assessment addresses the affect of the PFS on various individual risks, such as emissions health risk and public risks of potential accident scenarios. It serves as the technical source document for the report you received at the October meeting, *Umatilla Chemical Agent Disposal Facility Summary of Risk Assessment Results*, October 1998, referred to as the Letter Report. The Letter Report discusses tradeoffs between the various risk presented in the Risk Assessment as well as our risk management conclusion that the current plan to install the UMCDF PFS remains the best course of action.

I hope that the Risk Assessment further clarifies our PFS evaluation process for you. Once you have had an opportunity to review the report I will be happy to meet with you to discuss this issue in more detail if you so desire. Please feel free to contact me at any time if I can be of further assistance.

Sincerely,

Mark Evans
Chief, Operations Team

Enclosures (2)

99-0066

DUPLICATE

MTR 1997-60

Mitretek Technical Report

Risk Assessment of the Pollution Abatement Filter System for the Umatilla Chemical Agent Disposal Facility

September 1998

MITRETEK
SYSTEMS
Center for Science and Technology
McLean, Virginia

MTR 1997-58

Mitretek Technical Report

Risk Assessment of the Pollution Abatement Filter System for the Umatilla Chemical Agent Disposal Facility

September 1998

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MITRETEK SYSTEMS
Center for Science and Technology
McLean, Virginia

Mitretek Department
and Project Approval:

fn Abu Talib

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Executive Summary

Background

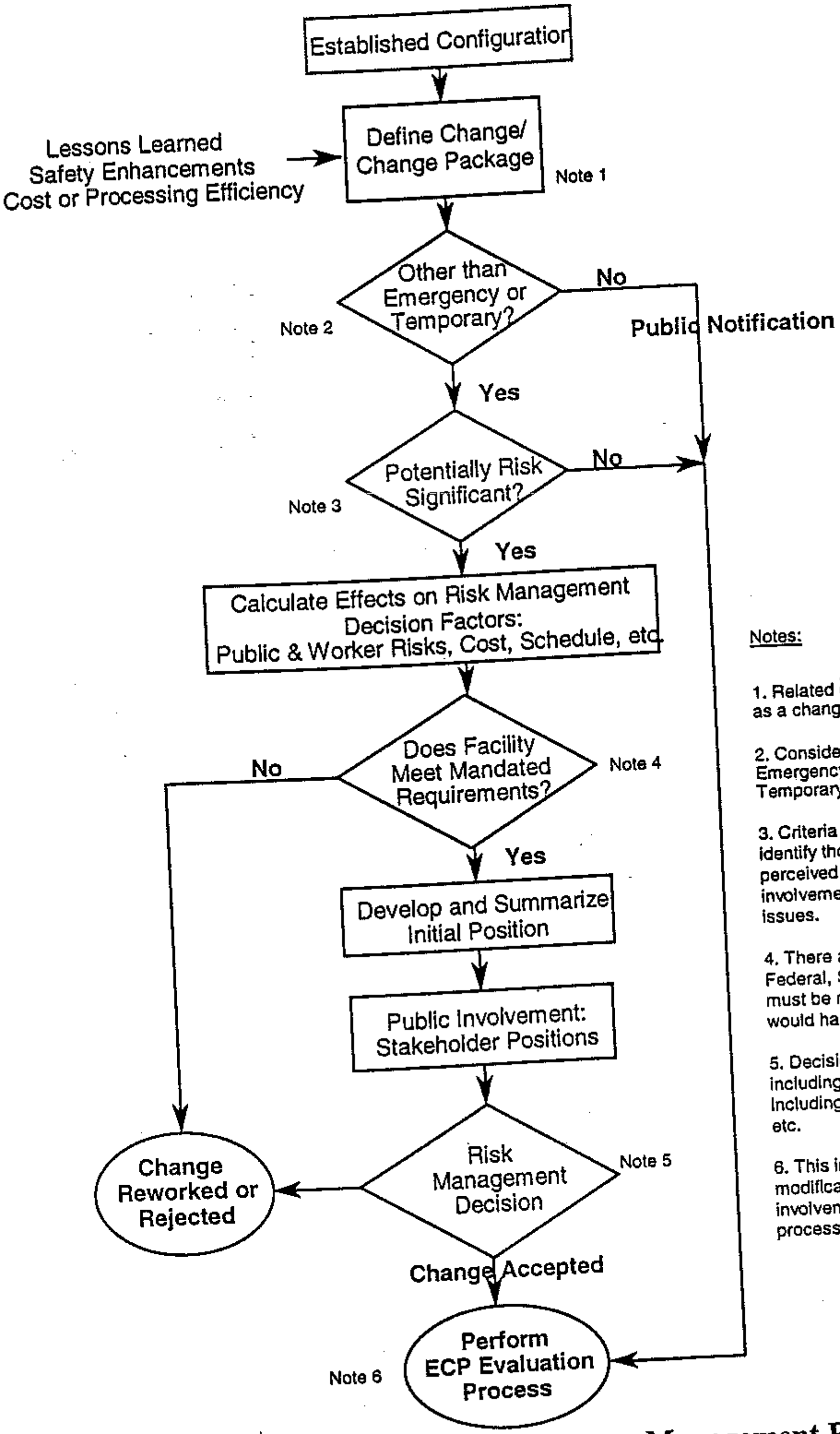
In 1993, the National Research Council (NRC) recommended that the U.S. Army evaluate the addition of carbon filters to treat effluent gases from the pollution abatement systems (PASs) of chemical agent disposal facilities (CDFs). It was believed that carbon filters could enhance the safety of the facility by reducing the risk of accidental agent release from the incinerator stack. In addition, while emissions from normal operations of CDF furnaces contain only trace amounts of substances that may present health hazards, the PAS filter system (PFS) potentially would have the added benefit of further reducing these trace emissions.

In response to the NRC's recommendation, the Army developed a conceptual design of the PFS. The design served as the basis for the Army's 1994 preliminary assessment of the potential impacts of the PFS on human health and environmental safety. This evaluation concluded that carbon filters could potentially enhance the baseline system performance but would also increase system cost and complexity. At the time of the preliminary assessment, facility-specific health risk assessments (HRAs) and quantitative risk assessments (QRAs) were not available to quantify the benefits in terms of risk reduction. Since the 1994 study, the original PFS design has been modified to a more efficient configuration. Additionally, the Army has utilized the subsequently completed Umatilla Chemical Agent Disposal Facility (UMCDF) HRA and QRA to conduct more comprehensive, facility-specific risk assessments of the PFS. This report provides these assessments, as well as the evaluation of other factors that may affect or be affected by a decision on the PFS, for the UMCDF.

The UMCDF PFS evaluation has been conducted in accordance with the Change Management Process (CMP). The CMP includes an augmented risk review as appropriate (illustrated in Figure ES-1). This report documents the results of the risk review and is intended to serve as a basis for the Army's initial decision on whether to move ahead with the proposed change.

General Framework for the PFS Risk Evaluation

In applying the CMP to the PFS evaluation, the Army is guided by its commitment to ensure maximum protection of the public, the personnel involved in the disposal of the stockpile, and the environment. The established UMCDF configuration includes the PFS. This configuration is the basis of the Resource Conservation and Recovery Act (RCRA) permit for the facility issued by the state of Oregon. As shown in Figure ES-1, review of the proposed change from a risk standpoint is required.



Notes:

1. Related changes may be combined as a change package.

2. Considers the potential for an Emergency Permit (40CFR270.61) or Temporary Authorization (40CFR270.42).

3. Criteria have been established to identify those items of potential real or perceived risk significance. Public involvement is most applicable to these issues.

4. There are some criteria mandated by Federal, State and Army authorities that must be met. If not met, the change would have to be reworked or rejected.

5. Decision based on a value judgment including risks as well as other factors including cost, expediency, public input, etc.

6. This includes the RCRA Permit modification process. Additional public involvement may be required in that process.

Figure ES-1. The Change Management Process

PFS Risk Evaluation for the Umatilla Chemical Agent Disposal Facility

The first part of this report pertains to the evaluation of the potential differences in the risk associated with a PFS-fitted facility relative to a facility configuration that does not include the PFS. As its basis, this study draws from previously completed risk assessments—HRA and QRA—for the UMCDF.

An HRA consists of two major components—human health risk assessment (HHRA) and ecological risk assessment (ERA). The HHRA quantifies potential excess cancer risk and other health effects from exposure to stack emissions. The ERA assesses the potential risk to ecological communities as a result of exposure to constituents of potential ecological concern (COPECs) dispersed in the stack emissions.

The original UMCDF HRA assumed the presence of a PFS, but no credit was taken for the capture efficiency of the filters. For the UMCDF PFS evaluation, that HRA is revised to estimate the effects from stack emissions of a facility configuration that did not have the PFS (unchanged chemical emissions but dispersion governed by appropriate flow rates and temperatures). In addition, an HHRA sensitivity analysis is conducted to gauge the degree of conservatism inherent in the cancer risk estimates.

QRAs quantify the risks from accidents involving the release of agent. As such, QRA results are utilized by the Army as a design and operational tool for managing accident-related agent risks. The Phase 1 QRA has been completed for the UMCDF and does not include the PFS. A Phase 1 QRA essentially updates the QRA that was performed previously as part of the Army's *Final Programmatic Environmental Impact Statement for the Chemical Stockpile Disposal Program*. For this study, the Phase 1 QRA is expanded to determine the net effect of the PFS on risk related to accidental agent release. The sensitivity of the QRA results to the amount of agent that may be released from the carbon filter is also determined in this assessment.

In addition to the HRA and QRA evaluations, a hazard evaluation is performed to qualitatively evaluate the hazards associated with the disposal of PFS-generated solid waste. While these hazards are accident-driven, the risk to the public and workers associated with these hazards are not primarily from chemical agent but are from potential exposure to non-agent hazardous substances. Therefore, these types of hazards are not addressed in the QRA, which only focuses on agent-related accidents.

Impact of Other Factors

The second part of this report involves the evaluation of other factors, besides regulatory requirements and worker and public safety, that may affect or be affected by the overall decision on the PFS. The impact of factors, such as PFS costs and stockpile disposal schedule, is evaluated to provide additional insights on tradeoffs that warrant further consideration in deciding whether or not to proceed with the proposed change (i.e., remove the PFS).

Furthermore, the implications of the PFS risk assessment results on risk management decisions the Army has to make regarding the PFS are also examined.

Summary of Results

The results of the PFS risk evaluation for the UMCDF are as follows:

1. **For all receptors (subsistence farmer, subsistence fisher, adult resident, and child resident), the baseline system for the UMCDF without the PFS achieves the state-approved health risk thresholds.** For example, the estimated excess cancer risk is 4E-06 for the subsistence farmer (i.e., an additional chance of about 4 in 1 million that an individual will contract cancer during his or her lifetime) and 4E-07 for the adult resident. With the PFS, the estimated excess cancer risk for the subsistence farmer is 2E-06; for the adult resident it is 2E-07. For the UMCDF, the corresponding state-approved threshold for excess cancer risk is 1E-05 (an additional 10 in 1 million chance of contracting cancer).
2. **A sensitivity analysis shows that the calculated excess cancer risk values using the state-approved methodology are overly conservative.** When certain parameter values are adjusted to more accurately reflect program factors or conditions, there is insignificant difference between the risk calculated for a facility "with PFS" and one "without PFS." The difference in risk values for the 2 facilities is on the order of 2E-08.
3. **The PFS is not expected to affect the potential for PAS emissions to negatively impact ecological communities.** Removal of the PFS will not change the screening level ERA findings that there is little potential for the COPECs to impact vegetation, soil invertebrates, or aquatic and benthic species in the Umatilla depot area.
4. **The PFS does not reduce the risk from accidents related to agent stack release.** The QRA results show that the PFS is relatively risk neutral. While the PFS could reduce the potential for agent release from the stack, the PFS has no net effect on the overall individual or societal risk from stockpile disposal activities because the risk is dominated by external events—such as aircraft crashes—which are unaffected by the PFS. Furthermore, while there is an increase in the risk for worker fatality associated with the operation and maintenance of the PFS, the magnitude of the increased risk is relatively small (i.e., 3E-05 risk increase over a baseline worker risk of 2E-04).
5. **Any delay in the disposal schedule will result in an increase in the munition storage period and therefore an increase in risk.** Facility operation with the filters is expected to result in a small delay due to additional downtime associated with filter maintenance activities. However, this is insignificant when compared to: 1) the potential delay associated with a permit change to remove the filters; or 2) the shutdown that would accompany a potential stack release on a design without filters.

6. **The hazard evaluation of solid waste generated from the PFS shows that there is some additional risk associated with solid waste disposal, but its overall impact on public and worker risk is insignificant.** The PFS increases the amount of solid waste generated for the baseline system by about 1.6 percent. Hence, removal of the PFS has very little effect on the risk from solid waste disposal.

7. **The total cost of implementing the PFS at the UMCDF is in the range of $63 million to $73 million; however, the cost of removing the PFS from the UMCDF could range from about $52 million to $102 million.** The net effect is a cost savings of about $21 million ($73M minus $52M) or an increase in cost of as much as $39 million ($102M minus $63M). The largest uncertainty is in how long destruction schedule could be delayed as a result of obtaining a RCRA permit modification. The increase in stockpile storage cost for destruction schedule delay is the main cost driver.

Conclusions

The risk results do not show that significant health and safety benefits are realized from the PFS and the analysis further shows that there may or may not be cost savings from not implementing the PFS. Such a change would require a RCRA permit modification. The regulatory process, which could delay destruction of the munitions stockpile at Umatilla, has a greater impact on risk than does the implementation and operation of the PFS because it could considerably extend the storage period.

Section 1

Introduction

1.1 Background

In 1993, the National Research Council (NRC) recommended that the U.S. Army evaluate the addition of carbon filters to treat effluent gases from the pollution abatement systems (PASs) of chemical agent disposal facilities (CDFs). It was believed that carbon filters could enhance the safety of the facility by reducing the risk of accidental agent release from the incinerator stack (NRC, 1994). In addition, while air emissions from normal operations of CDF furnaces contain only trace amounts of substances that may present health hazards, the PAS filter system (PFS) potentially would have the added benefit of further reducing these trace emissions.

In response to the NRC's recommendation, the Army developed a conceptual design of the PFS. The design served as the basis of the Army's preliminary assessment of the potential impacts of the PFS on human health and environmental safety (Army, 1994). This evaluation concluded that carbon filters could potentially enhance system performance but would also increase system cost and complexity. The Army's study was not site-specific. In addition, health risk assessments (HRAs) and quantitative risk assessments (QRAs) were not available at the time to quantify the benefits in terms of risk. Since the 1994 study, the original PFS design has been modified to a more efficient configuration. Additionally, the Army has utilized the subsequently completed Umatilla Chemical Agent Disposal Facility (UMCDF) HRA and QRA to conduct a more comprehensive, facility-specific risk analysis of the PFS.

Mitretek has the lead responsibility of coordinating and integrating the work of other Army contractors. This report documents the PFS risk analysis for the UMCDF and is a collaborative effort of Mitretek, Science Applications International Corporation (SAIC), the Center for Health Promotion and Preventive Medicine (CHPPM), and the Edgewood Research, Development, and Engineering Center (ERDEC). The evaluation follows the general methodology described in a separate report (Mitretek, 1998).

1.2 Objective and Scope

In its risk evaluations of proposed changes to the CDFs, the Army's primary objectives are to verify that the facility remains in compliance with the state-approved health risk thresholds and that the proposed changes will not compromise public and worker safety. The specific objectives of the PFS study that is documented in this report are to (1) estimate the net effects on health risks and safety, and (2) address other factors that affect or may be affected by removal of the PFS at the UMCDF.

As a starting point, this study draws from previously completed risk assessments for the UMCDF. These assessments are the Pre-Trial Burn Risk Assessment (commonly called the HRA) performed by Ecology and Environment, Inc. (E & E) for the Oregon Department of Environmental Quality (ODEQ) (E & E, 1996) and the QRA performed by SAIC (SAIC, 1996a). They are used by the Army as the foundation for making decisions on Chemical Stockpile Disposal Program changes for controlling or mitigating risks.

HRAs are conducted as part of the Resource Conservation and Recovery Act (RCRA) permit requirements for hazardous waste combustion facilities. The HRA consists of two major components—human health risk assessment (HHRA) and ecological risk assessment (ERA). The HHRA quantifies cancer risk and other health effects resulting from exposure to stack emissions. The ERA estimates the potential ecological risk (e.g., terrestrial vegetation and soil invertebrates) as a result of exposure to emissions of pollutants that may affect the ecology.

The approach for HRAs is deliberately conservative to ensure that health risks are not underestimated. The UMCDF HRA analyzed the health and ecological effects of stack emissions based on gas volumetric flow rates and temperature that assumed the presence of a PFS. To be conservative, however, no credit was taken for the capture efficiency of the carbon filters. For the UMCDF PFS evaluation, that HRA is revised to estimate the effects from stack emissions of a facility configuration that did not have the PFS (unchanged chemical emissions but dispersion governed by appropriate flow rates and temperatures).

QRAs quantify the risks from accidents involving the release of agent. As such, QRA results are utilized by the Army as a design and operational tool for managing accident-related risks. The Phase 1 QRA has been completed for the UMCDF (SAIC,1996a). A Phase 1 QRA essentially updates the risk assessment that was performed previously as part of the Army's *Final Programmatic Environmental Impact Statement (FPEIS) for the Chemical Stockpile Disposal Program* (Army, 1988) The Phase 1 QRA *does not* include the PFS. As part of this effort, the UMCDF Phase 1 QRA was updated to determine the net effect of the PFS on risk related to accidental agent release.

In addition to the HRA and QRA evaluations, a hazard evaluation (HE) was performed to qualitatively evaluate the hazards from solid waste disposal involving the PFS. While these hazards are also accident-driven, the risks to the public and workers associated with these hazards are not primarily from chemical agent but are from potential exposure to non-agent hazardous substances. As such, these types of hazards are not addressed in the QRA.

1.3 Overview of the Evaluation Process

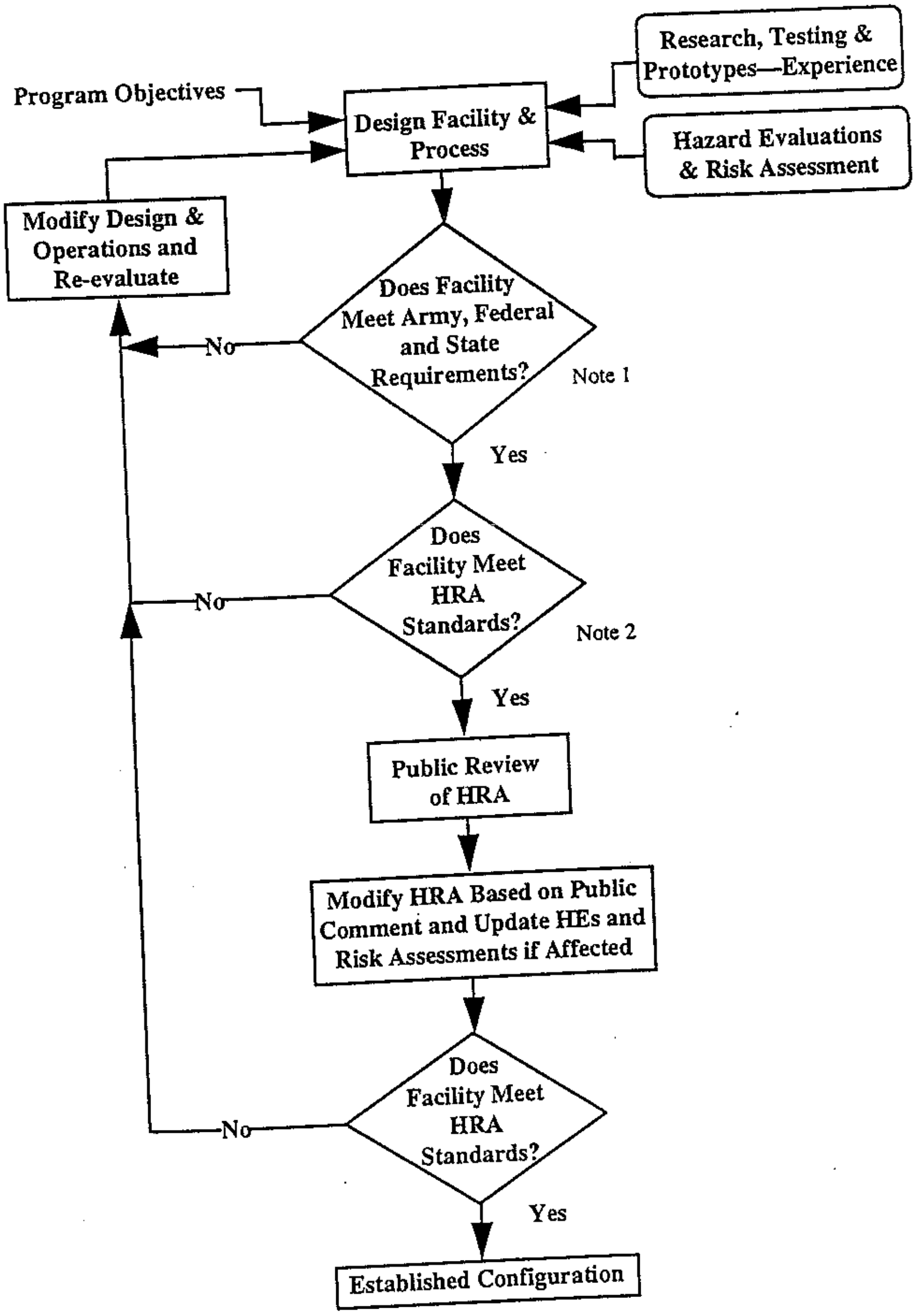
The Army's general methodology for evaluating the PFS effects on risks is presented in a separate report (Mitretek, 1998). The methodology is briefly summarized below.

Consistent with the Army's risk management policy, the evaluation of the PFS effects on overall risk follows the Army's general process for evaluating the health and safety impacts of proposed changes (Army, 1997). The process of evaluating any proposed change to a facility specific plant configuration begins with the initial establishment of that configuration. Figure 1-1 illustrates the steps integral in the establishment of this configuration. Once the specific design has been completed, determinations are made concerning whether the facility meets various Army, federal, and state requirements. The performance of an HRA is an essential determination of whether the site-specific configuration is in compliance with regulatory requirements. For a CDF, a key regulatory requirement pertains to compliance with state-approved health risk thresholds for RCRA combustion facilities.

The UMCDF HRA is a screening HRA. It incorporates conservative default values for many of the parameters used to calculate excess cancer risk and other health effects. Therefore, if the risks calculated using these default values meets the state-approved thresholds, further costly analysis is not needed. Such screening HRAs are very useful and cost effective, and they can be used as a basis from which to evaluate modifications to a facility. Thus, the protocol—including models, data, and other assumptions—used in the original UMCDF HRA serves as the starting point for the UMCDF PFS HRA evaluation.

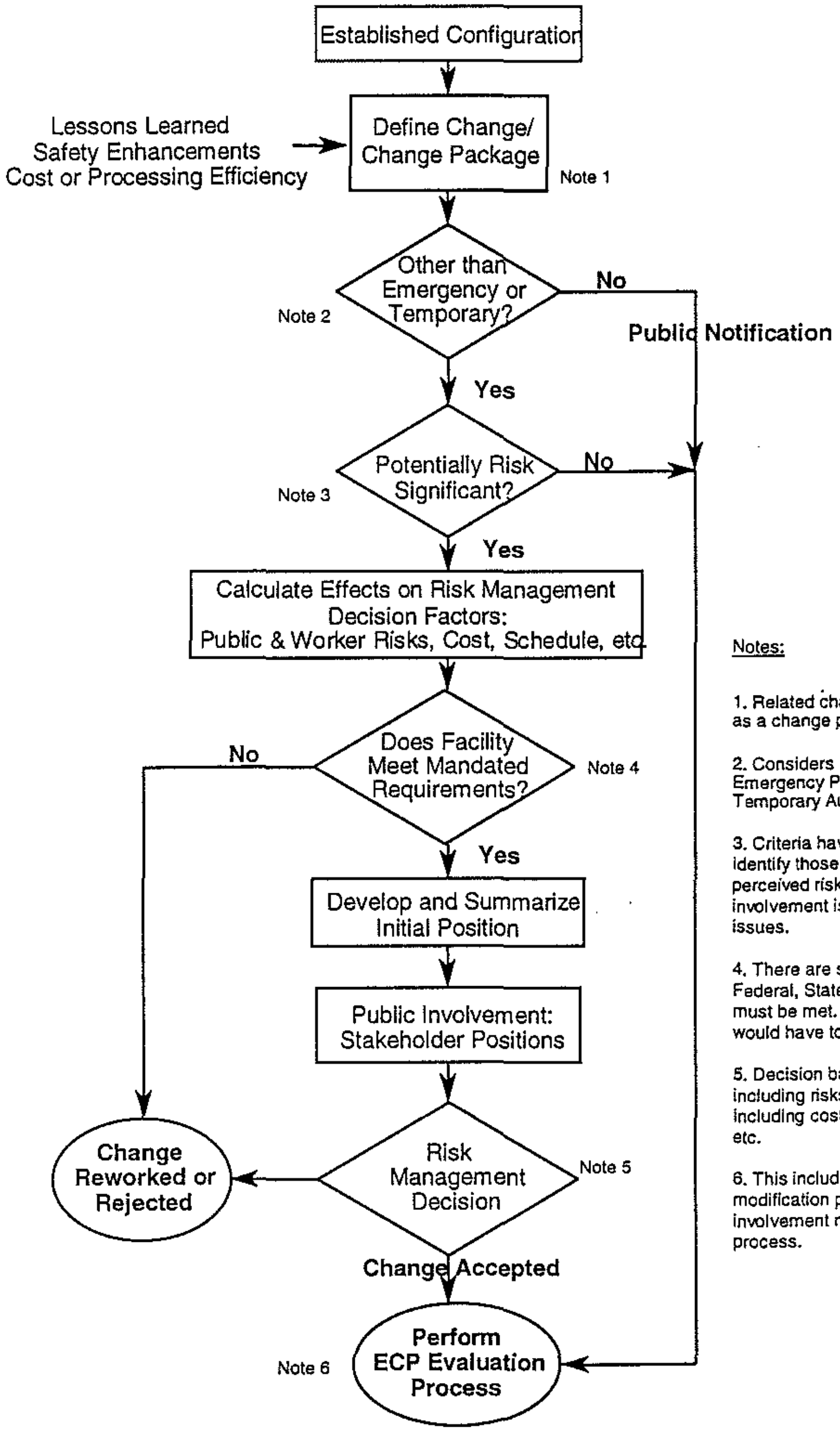
As shown in Figure 1-1, the HRA undergoes a formal public review process. In the course of this review, modification to the design or operating procedures may be necessary to satisfy public concern. The final facility-specific configuration represented in a publicly-reviewed HRA document meets all the health and ecological risk thresholds established by the ODEQ for the facility. A system configuration that requires modification in order to achieve regulatory compliance is subjected to additional QRA and/or HE to ensure that the modification does not cause a significant increase in public or worker risk.

The change process illustrated in Figure 1-2 is applied to the evaluation of whether removal of the PFS at the UMCDF is warranted from safety and health and ecological risk standpoints. First, the UMCDF HRA is re-evaluated to determine if the facility without the PFS remains in compliance with the thresholds established by the ODEQ for health and ecological risks. In addition, a sensitivity analysis of the excess cancer risk estimated in the HHRA is conducted to provide additional insight on the conservatism of the HHRA methodology used for the UMCDF analysis. Furthermore, because the initial QRA and HE for the UMCDF do not include the PFS, they are reviewed to determine the effects of the PFS on public and worker risk from accidents.



1. This internal review includes consideration of Army safety criteria during the design phase.
2. HRA is for incineration processes. There may be analogous assessments for alternative technologies.

Figure 1-1. Process for Establishing a Site-Specific Configuration



Notes:

1. Related changes may be combined as a change package.

2. Considers the potential for an Emergency Permit (40CFR270.61) or Temporary Authorization (40CFR270.42).

3. Criteria have been established to identify those items of potential real or perceived risk significance. Public involvement is most applicable to these issues.

4. There are some criteria mandated by Federal, State and Army authorities that must be met. If not met, the change would have to be reworked or rejected.

5. Decision based on a value judgment including risks as well as other factors including cost, expediency, public input, etc.

6. This includes the RCRA Permit modification process. Additional public involvement may be required in that process.

Figure 1-2. The Change Management Process

An evaluation of other factors that affect or could be affected by a decision to remove the PFS is also conducted. Factors that are evaluated include cost, schedule, and the potential implications regarding interpretation of the PFS risk assessment results from a risk management standpoint.

1.4 Deviation from the Standard Change Management Methodology

The risk assessments performed in support of establishing the configuration, as shown in Figure 1-1, were not entirely based on the same design. The Phase 1 QRA was based on a facility design that *did not* include the PFS. However, the HRA performed in support of the facility's RCRA permit application assumed a facility design that included the PFS. Thus, the path towards establishing a configuration for the UMCDF is the design basis for the existing RCRA permit (i.e., with PFS). It is for this reason that an augmented risk review is warranted (see Figure 1-2) because no QRA of the PFS has been performed and the HRA for a facility without the PFS has also not been performed.

1.5 Report Content

Following this introductory section, a short description of the design and operation of the PFS is included in Section 2. The results of the HRA review are presented in Section 3. Section 4 discusses the PFS QRA and HE approach. The public and worker risk results obtained for the UMCDF are also presented. Section 5 presents the evaluation of other factors, such as schedule and cost, that affect or may be affected by a decision on the PFS. Finally, Section 6 summarizes the results and discusses the conclusions drawn from these results.

Data supporting the HHRA sensitivity analysis are presented in the appendixes. Appendix A presents the HHRA results using different emission assumptions. Data on cancer risk parameters included in the HHRA sensitivity analysis are presented in Appendix B.

Section 2

Description of PFS Design and Operation

The design for the "PFS Alternative Configuration with Gas Cooling," described in the Parsons reports (Parsons, 1995; Parsons, 1996) forms the basis for the PFS models developed as part of this study. A brief description of this design is now presented.

2.1 General Description

As shown in Figure 2-1, the PFS will be installed between the demister and the stack blower of the existing PAS for the Deactivation Furnace System (DFS), Metal Parts Furnace (MPF), and Liquid Incinerator (LIC). Plans also exist for a Dunnage Incinerator (DUN) PFS, but the potential for agent release through the DUN PAS has been demonstrated in the baseline QRA (without PFS) to be sufficiently low as to warrant no further analysis. Therefore, the DUN PFS is not evaluated in this report.

A clean liquor air cooler—connected to the existing PAS scrubber tower—cools the scrubber clean liquor circulation loop and condenses the bulk of the evaporated moisture in the furnace exhaust; upon exiting the demister, the furnace exhaust stream temperature is 120°F at a relative humidity of 100 percent. The furnace exhaust flow passes through pneumatically operated dampers (001[1] and 002) and travels through ducting until it reaches the gas reheater; a main bypass damper (004) provides a furnace exhaust flowpath during furnace startup. The natural-gas-fired gas reheater lowers the relative humidity of the furnace exhaust stream to prevent the carbon filter media from becoming water saturated by raising the stream temperature to 160°F at a relative humidity of about 39 percent. After traveling through the carbon filter bank (described below), the furnace exhaust stream travels through a pneumatically operated damper (003) to the suction of the exhaust blower. The exhaust blower has been upgraded; it is a variable frequency drive, and both stages are on emergency power. The emergency induced draft (ID) fan has been removed.

The carbon filter bank (Figure 2-2) consists of six identical carbon filter units: two for the DFS, one for the MPF, one for each of the LICs, and a spare to allow for carbon replacement during facility operation. The carbon filter units devoted to a particular furnace contain pneumatically operated dampers on the inlet (005 for the MPF, and 05A and 05B for the DFS

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[1] The damper identification numbers have been generated to assist in the preparation of fault trees for the QRA.

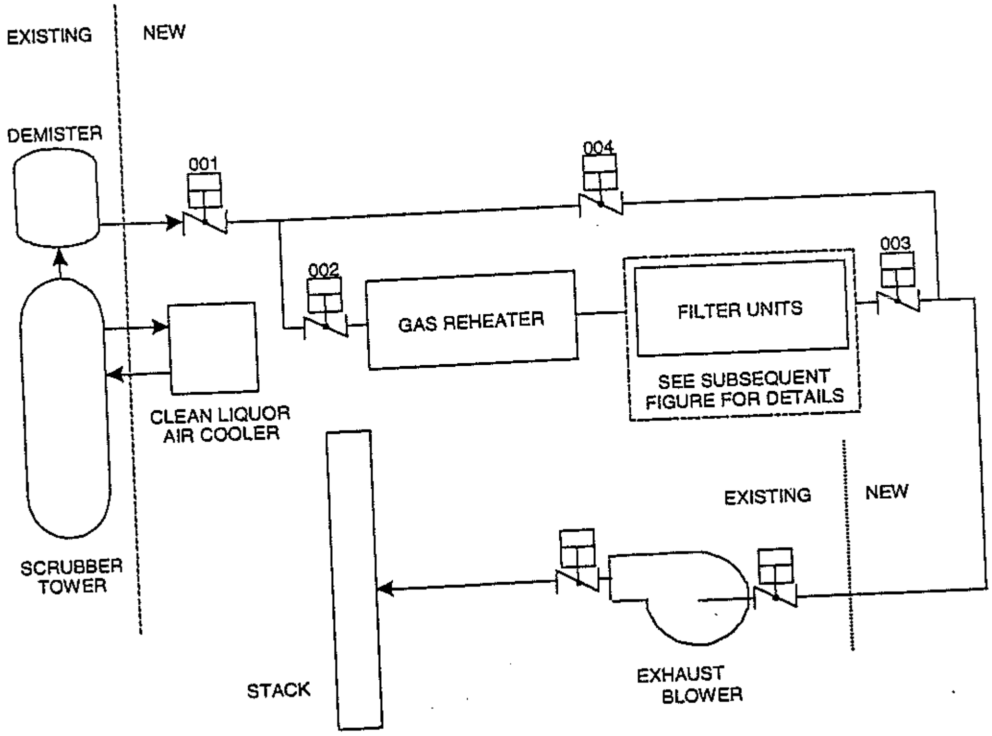

Figure 2-1. The PFS with Gas Cooling

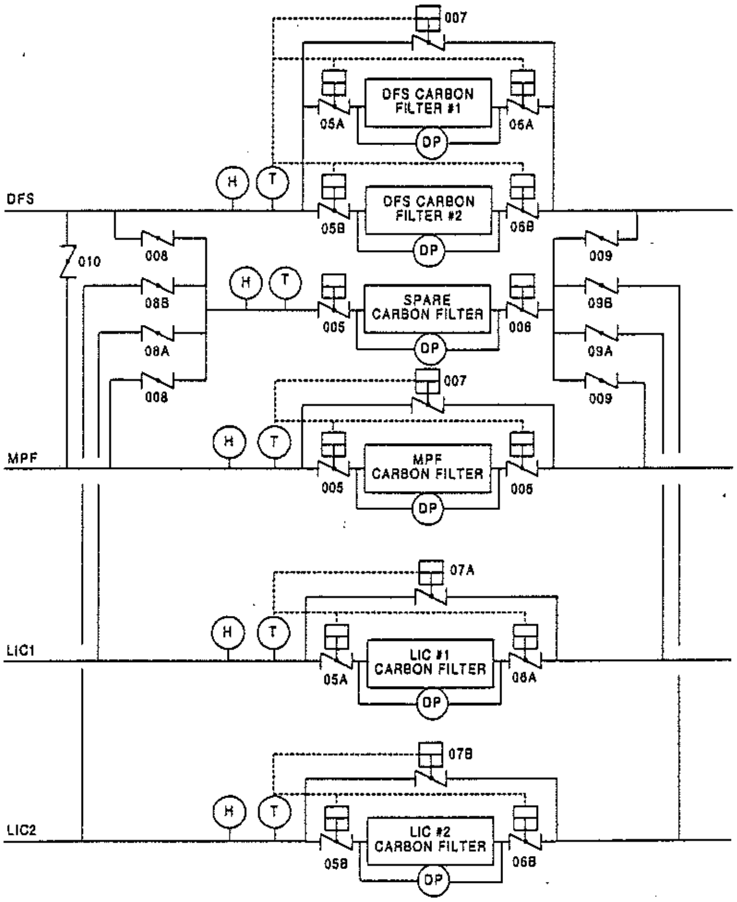

Figure 2-2. The PFS Filter Units and Their Dampers

and the LIC) and the outlet (006 for the MPF, and 06A and 06B for the DFS and the LIC); a pneumatically operated carbon filter unit bypass damper (007 for the MPF and DFS, and 07A and 07B for the LIC) is also provided. The spare carbon filter unit contains pneumatically operated dampers on the inlet (005) and the outlet (006), but it does not contain a bypass damper. During on-line carbon replacement, the spare carbon filter unit is placed into operation by manipulating manually operated inlet (008 for the MPF and DFS, and 08A and 08B for the LIC) and outlet (009 for the MPF and DFS, and 09A and 09B for the LIC) dampers. The carbon in both DFS filter banks can be simultaneously replaced by opening a cross-connect damper (010) between the DFS and MPF furnace exhaust flowpaths.

As described by the Parsons study (Parsons, 1995) for Vendor A, each carbon filter unit consists of an inlet prefilter, an inlet high efficiency particulate air (HEPA) filter, three sets of carbon beds connected in parallel, an outlet prefilter, and an outlet HEPA filter. The inlet prefilter and HEPA filter trap any large particulate material to prevent prematurely clogging the carbon beds; the outlet prefilter and HEPA filter trap any carbon fines produced within the carbon beds. Each carbon filter set consists of two 12-inch thick carbon beds in series that are separated by a small plenum (i.e., each filter unit consists of six carbon beds arranged in a 3 x 2 modular filter array). Table 2-1 summarizes important design information for the carbon filter units.

Table 2-1. PFS Carbon Filter Unit Design Information

Parameter	Value
Flow capacity	12,000 acfm (actual cubic feet per minute)
Prefilter efficiency	80% to 85% American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) rating
HEPA filter efficiency	99.97% based on dioctyl phthalate (DOP) test
Carbon filter media	15,000 lbs of 8 x 16 mesh coconut shell carbon
Carbon filter bed depth	12 inches
Carbon filter bed width	120 inches
Carbon filter bed height	138 inches (the lower one-third of the bed is tampered into a discharge chute)
Carbon filter face area	214 ft^2
Carbon filter superficial face velocity	56 ft/sec

2.2 Instrumentation and Controls

The facility operators are provided with the following instrumentation:

- Carbon filter unit inlet stream relative humidity
- Carbon filter unit inlet stream temperature
- Carbon filter unit differential pressure

The main pneumatic dampers 001, 002, 003, and 004 are remote-manually operated. Pneumatic dampers associated with the carbon filter units (DFS: 05A, 05B, 06A, 06B and 007; MPF: 005, 006 and 007; LIC: 05A, 05B, 06A, 06B, 07A and 07B) may be remote-manually operated; they are also automatically operated to protect the carbon beds from high temperature as sensed by a probe installed at the inlet to the carbon filter units (upon high temperature, the inlet and outlet dampers are closed and the bypass damper is opened). It should be noted that the carbon filter unit bypass dampers are not automatically opened on either high stream relative humidity or high filter differential pressure. The inlet (005) and outlet (006) pneumatically operated dampers for the spare carbon filter unit are remote-manually operated.

The temperature of the outlet stream from the gas reheater is controlled by regulating the flow of natural gas. A signal generated by a thermocouple installed in the gas reheater outlet stream is compared to a setpoint (160°F) maintained by a setpoint controller; if actual outlet temperature varies from the setpoint, an error signal is sent to a current-to-pneumatic controller which regulates the position of the fuel throttle valve. The gas reheater also contains a high temperature cutout, consisting of a temperature switch and a double block valve; upon high temperature, the switch is opened and the double block valve solenoids are de-energized, thus isolating natural gas flow to the gas reheater.

2.3 PFS Operation

Prior to agent or contaminated material feed into a furnace, the PFS is placed into service. Operation of the PFS requires only routine monitoring of its associated instrumentation; the only active component of the system is the fuel throttle valve, whose position is regulated as previously described to maintain the temperature of the gas reheater outlet stream at 160°F. During filter media replacement, stream flow is manually aligned through the spare carbon filter unit; the spent carbon is discharged through a chute installed in the bottom of the carbon filter unit and managed as contaminated waste. HEPA filters and prefilters are removed and disposed of as well. The frequency of HEPA/prefilter replacement has been estimated at once every 100 hours of operation assuming premium grade filters are used. Since this period is so short, the system design is being reviewed for possible enhancements. However, in this study, 100 hours is conservatively assumed. Based on the facility's current RCRA permit, carbon replacement is required prior to commencing a new agent campaign.

Section 3

Health Risk Assessment

This section discusses the effects of the PFS on two major components of the HRA—the HHRA and the ERA.

3.1 Existing HRA for the UMCDF

The HRA in support of a RCRA construction permit application for the UMCDF has been completed and has been approved by the ODEQ. That HRA is based on a process design that includes the PFS. However, because the PFS design was still evolving, the UMCDF HRA did not take credit for any reduction in chemical emissions that may be achieved due to the presence of the PFS.

It is necessary to cool down and dehumidify the PAS exhaust gas before it enters the PFS in order to maximize filter efficiency. Because of this dehumidification process, the gas exhausted from the PFS has a lower volumetric flow rate as compared to gas exhausted directly from the PAS to the stack. The gas temperature is also reduced by about 30°F. This assumed system would result in greater concentrations of stack emissions at potential receptor locations as dispersion of an unchanged mass of chemicals occurs at a reduced rate, thereby presenting very conservative HRA results.[2] It should be noted, therefore, that this emission scenario (assuming that the PFS is present but not removing any chemical emissions) does not truly reflect the actual conditions for the established configuration. However, as shown in the results presented in Sections 3.3 and 3.4, the differences in the calculated risk values relative to those reported in the UMCDF RCRA Screening Risk Assessment are quite insignificant.

3.2 Human Health Risk Assessment Overview

The HHRA primarily focuses on health risks from organic and inorganic contaminants contained in the flue gas emitted from the incinerator stack during normal operating and process upset conditions. The risk and hazards estimated in the HHRA are as follows:

- **Individual excess cancer risk**. Expressed as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to a carcinogen. Due to the diverse mixture of constituents present in the stack emission, an overall cancer risk is reported, which represents the sum of cancer risk from each carcinogen for which exposure occurs by inhalation and ingestion. For the UMCDF screening risk

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[2] Other assumptions in the UMCDF HHRA methodology also contribute to the over estimation of risk. These are discussed in Section 3.2.5.

assessment, the state-approved threshold for excess cancer risk is 1E-05[3] (E & E, 1996).

- **Chronic noncarcinogenic health effect.** Expressed as a hazard quotient (HQ) and as a hazard index (HI). The HQ represents the potential long-term adverse health impact of exposure to a toxic chemical emitted from the incinerator stacks. It is expressed as the ratio of a receptor's dose resulting from exposure to a single substance for a specified time period (chronic) to a reference dose for that substance for a similar time period. When more than one chemical is released, the overall potential for noncarcinogenic effects is assessed by calculating the HI. The HQs for all chemicals that affect specific target organs are added together to obtain the HI for those target organs. Separate HIs are developed for each exposure route. For the UMCDF, the state-approved HQ and HI for chronic exposure scenarios is 0.25 (E & E, 1996).

An HHRA may also address acute health effects. This was not a requirement for the UMCDF and thus is not addressed in the HHRA.

3.2.1 Constituent of Potential Concern (COPC) Concentration Data

Table 3-1 presents a list of 82 constituents of potential concern (COPCs) that could be discharged to the atmosphere through stack gas emissions during operation of the various incinerators at the UMCDF. They include 10 potentially toxic dioxin and furan homologue chemicals which, for the purposes of this analysis, have been assumed to be and modeled as 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) toxicity equivalents (TEQ). The table gives the maximum concentration for each COPC based on tests performed at the Johnston Atoll Chemical Agent Disposal System (JACADS) on Johnston Island in the Pacific Ocean. Of these 82 COPCs, 46 are considered "regulated," which means that they are specifically addressed in the RCRA permit for the applicable source (e.g., LIC and DFS). As the table indicates, many of the regulated COPCs are at or just slightly above their detection limit concentrations. Additional information on the specific COPC emission rates used in the air dispersion analysis for each UMCDF emission source is provided in the Pre-Trial Burn Risk Assessment report (E & E, 1996).

3.2.2 Air Dispersion Model

The UMCDF HHRA used the Industrial Source Complex Short Term, Version 3 (ISCST3) computer model to predict chronic ambient air vapor and particulate

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[3] 1E-05 is the same as 1×10^{-5}

Table 3-1. JACADS Maximum Stack Concentration Data

COPC	Regulated Pollutant?	Maximum Stack Gas Concentration* (ug/m^3)	Source	Detection Limit (DL)**
Dioxin/Furan Homologue Chemicals				
2,3,7,8-Tetrachlorodibenzo-p-Dioxin	Yes	8.83E-05	GB-LIC	1.10E-05
Pentachlorodibenzo-p-Dioxin***	Yes	5.66E-05	GB-LIC	5.66E-05
Hexachlorodibenzo-p-Dioxin	Yes	9.72E-05	VX-DFS	3.24E-05
Heptachlorodibenzo-p-Dioxon	Yes	7.62E-05	VX-DFS	3.24E-05
Octachlorodibenzo-p-Dioxin	Yes	1.71E-04	HD-MPF	8.46E-05
2,3,7,8-Tetrachlorodibenzofuran	Yes	1.16E-05	HD-LIC	7.58E-06
Pentachlorodibenzofuran	Yes	1.34E-04	HD-MPF	4.23E-05
Hexachlorodibenzofuran	Yes	2.11E-04	HD-MPF	4.23E-05
Heptachlorodibenzofuran	Yes	4.00E-04	HD-MPF	4.23E-05
Octachlorodibenzofuran	Yes	2.38E-04	HD-MPF	8.46E-05
Volatile Products of Incomplete Combustion (PICs)				
Acetone	No	3.58E+04	VX-LIC	1.00E-01
Benzene	Yes	4.75E+01	GB-LIC	3.00E-01
Bromodichloromethane	No	1.46E+00	VX-DFS	1.00E-01
Bromoform	No	1.71E+01	VX-DFS	1.00E-01
2-Butanone (or methyl ethyl ketone)	No	1.47E+02	VX-DFS	1.00E-01
Carbon Disulfide	No	1.00E+01	HD-LIC	1.00E-01
Carbon Tetrachloride	No	4.33E+01	HD-LIC	1.00E-01
Chlorobenzene	No	1.94E+00	HD-LIC	1.00E-01
Chloroform	No	3.96E+01	VX-DFS	1.00E-01
Chloromethane	No	5.59E+02	GB-LIC	3.00E-01
Dibromochloromethane	No	1.04E+00	VX-DFS	1.00E-01
1,1-Dichloroethane	No	3.00E-01	GB-LIC	3.00E-01
Dichloromethane (or methylene chloride)	No	5.86E+03	VX-DFS	1.00E-01
1,2-Dichloropropane (or propylene dichloride)	No	4.96E+02	GB-LIC	3.00E-01
Cis-1,3-Dichloropropene	No	4.28E+02	GB-LIC	3.00E-01
Trans-1,3-Dichloropropene	No	4.45E-01	HD-LIC	1.00E-01
Ethylbenzene	No	3.85E+00	VX-DFS	1.00E-01
4-Methyl-2-Pentanone (or methyl isobutyl ketone)	No	4.91E0+00	GB-LIC	3.00E-01
2-Hexanone	No	3.71E+00	GB-LIC	3.00E-01
Styrene	No	2.41E+02	HD-LIC	1.00E-01
1,1,2,2-Tetrachloroethane	No	1.04E+00	GB-LIC	3.00E-01

Table 3-1. (Continued)

COPC	Regulated Pollutant?	Maximum Stack Gas Concentration* (μg/m^3)	Source	DL**
Volatile PICs (continued)				
Tetrachloroethene (or tetachloroethylene)	No	1.20E+00	GB-LIC	3.00E-01
Toluene	No	3.02E+03	VX-DFS	1.00E-01
1,1,1-Trichloroethane (or methyl chloroform)	No	1.77E+01	VX-DFS	1.00E-01
Vinyl Acetate	No	6.90E-01	GB-LIC	3.00E-01
Vinyl Chloride	Yes	9.92E+00	HD-MPF	1.00E-01
Xylenes	No	3.76E+00	VX-LIC	1.00E-01
Semi-Volatile PICs				
Benzoic Acid	No	1.23E+02	VX-DFS	1.40E+00
Benzyl Alcohol	No	6.16E+02	VX-LIC	1.40E+00
Diethyl Phthalate	No	2.89E+01	GB-LIC	1.40E+00
Dimethyl Phthalate	No	1.15E+02	HD-LIC	9.50E-01
Di-n-Butyl Phthalate	No	5.52E+00	GB-LIC	1.40E+00
Di-n-Octyl Phthalate	No	2.76E+01	GB-LIC	1.40E+00
Bis(2-Ethylhexyl)-Phthalate	No	9.28E+01	HD-LIC	1.10E+00
2-Methylphenol (or o-cresol)	No	1.24E+02	GB-LIC	1.40E+00
3-Methylphenol (or m-cresol)	No	5.08E+01	HD-LIC	1.10E+00
4-Methylphenol (or p-cresol)	No	5.80E+01	GB-LIC	1.40E+00
Naphthalene	No	2.92E+00	VX-DFS	1.40E+00
Pollutants				
GB***	Yes	6.00E-02****	GB-LIC	6.00E-02
HD***	Yes	8.70E+00****	HD-LIC	6.00E+00
VX***	Yes	6.00E-02****	VX-LIC	6.00E-02
Chlorine***	Yes	3.42E+03	HD-LIC	3.42E+03
Hydrogen Chloride	Yes	3.70E+03	GB-LIC	-
Hydrogen Fluoride	Yes	9.30E+03	GB-LIC	-
Nitroglycerine	Yes	8.18E+01	VX-DFS	-
Polychlorinated biphenyls (PCB)	Yes	8.50E-02	VX-DFS	-
Particulate	Yes	8.00E+03	VX-LIC	-
2,4-Dinitrotoluene	Yes	3.71E-01	VX-DFS	3.57E-01
2,6-Dinitrotoluene	Yes	3.71E-01	VX-DFS	3.57E-01
2,4,6-Trinitrotoluene	Yes	3.71E-01	VX-DFS	3.57E-01
RDX	Yes	3.71E-01	VX-DFS	3.57E-01
HMX	Yes	3.71E-01	VX-DFS	3.57E-01

Table 3-1. (Concluded)

COPC	Regulated Pollutant?	Maximum Stack Gas Concentration* ($\mu g/m^3$)	Source	DL**
Metals				
Antimony***	Yes	1.60E+01	HD-MPF	1.60E+01
Arsenic	Yes	2.22E+01	HD-LIC	6.78E+00
Barium	Yes	1.57E+01	HD-MPF	1.50E+01
Berylium***	Yes	5.27E+00	GB-LIC	5.27E+00
Boron	Yes	5.30E+02	VX-LIC	1.25E+01
Cadmium	Yes	9.81E+00	HD-MPF	3.75E+00
Nickel	Yes	3.52E+01	GB-LIC	5.12E+00
Phosphorus	Yes	3.43E+02	VX-LIC	1.25E+01
Selenium	Yes	1.06E+01	HD-LIC	6.73E+00
Silver***	Yes	1.60E+01	HD-MPF	1.60E+01
Thallium	Yes	5.27E+01	GB-LIC	5.27E+01
Tin	Yes	3.61E+01	VX-LIC	6.41E+00
Vanadium	Yes	1.07E+01	HD-LIC	2.56E+00
Zinc	Yes	2.31E+02	HD-LIC	6.73E+00

* Maximum reported stack concentrations from all tests during JACADS Operational Verification Testing.

** Detection Limit (DL) concentrations (in $\mu g/m^3$) vary depending on sampling conditions. Agent DL shown is equal to 20 percent of the allowable stack concentration (ASC).

*** Undetected.

**** Based on JACADS analytical DLs. For the analysis presented in this report, agent DL concentration is assumed to be 20 percent of the ASC.

concentrations, as well as the chronic wet and dry deposition rates. ISCST3 is the most up-to-date model and incorporates many improvements over previous air dispersion models. The refinements include (E & E, 1996):

- Revised dry deposition calculation routine
- Revised scavenging coefficients for wet deposition calculations
- Expanded number of receptors for which calculations can be performed
- Plume depletion mechanism to account for wet and dry removal processes
- Separation of particulate and vapor phases of same compounds
- Incorporation of complex terrain algorithms

3.2.3 Other Key HHRA Assumptions

The following were some of the key assumptions in the existing UMCDF HHRA:

- Study area encompassed all the area within a 50-km radius of the UMCDF.
- Campaign duration was 3.2 years[4] with all furnaces operating continuously during that time, even though actual run-time, based on the stockpile inventory, was projected at 1.0 year (3.2 years accounted for equipment downtime).
- For the DFS, LIC, and MPF, the emission rates of regulated COPCs for the UMCDF were based on the maximum emission rate detected for each constituent during the JACADS test runs for each furnace and were adjusted to reflect the UMCDF incinerator feed rates. However, for the DUN, the greatest emission rate from all sources (i.e., total of 19 test runs) was used.[5] These emission rates served as the initial inputs to the air dispersion analysis.
- Emission rates of chemical agents (even if they were not detected) were derived based on the assumption that they were present at the maximum allowable stack concentration (ASC) (0.3 μg/m³ for GB and VX, 30 μg/m³ for HD).
- Undetected, regulated COPCs were assumed present at concentrations equal to the detection limit. Undetected, unregulated COPCs were assumed present at concentrations equal to one-half the detection limit.
- Off-peak performance, leading to emission rates that were 10 times normal, occurring 20 percent of the time for nonmetals and 5 percent of the time for metals.
- Emissions of certain metals (Pb, Ba, Cd, Cr, Ni) from the MPF were not based on JACADS data but were calculated separately. Emissions were expected to be greater for these metals because of the processing of painted 155-millimeter shells, which contain greater amounts of these metals than the ton containers used in the JACADS trial burns.
- Risks from direct inhalation and indirect exposures were estimated using the ISCST3 model. All COPCs listed in Table 3-1 were evaluated for direct inhalation exposure, and cancer risk was estimated for carcinogenic substances.

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[4] The campaign duration of 3.2 years was used in the E & E HRA report. This differs slightly from the campaign duration value used in the QRA (3.3 years). We believe this discrepancy is largely due to rounding-off errors.

[5] At the time the UMCDF HRA was performed, JACADS trial burn tests for the DUN had not been completed.

- A COPC was selected for indirect exposure if it met any one of the following criteria:
  - Recommended by the Environmental Protection Agency (EPA) in its Risk Assessment Implementation Guide (EPA, 1994)
  - Persistent in the environment
  - Accumulates in plant and animal tissues
  - Toxic relative to other COPC (i.e., cancer slope factor >0.1 or reference dose <0.09 mg/kg-day)
- The indirect exposure risk calculation did not include volatile organic compounds regardless of their toxicity because of their limited ability to accumulate in plant and animal tissues.
- The chronic HHRA focused on the following exposed individuals (or receptors): subsistence farmer, subsistence fisher, adult resident, and child resident. Discrete receptor locations determine the maximum air concentrations and maximum deposition rates associated with each receptor. They were selected based on wind direction and the probability that an individual will be exposed at that location. The impact on each exposed individual was modeled at two locations: the high-impact location 100 meters northeast of the proposed common stack location (except for subsistence fisher because no water body was present), and the fenceline location with maximum impact (except for subsistence fisher, where maximum impact location in Umatilla River was used).
- Acute health effects were not analyzed.
- The cancer slope factor approach was used to calculate cancer risk from direct inhalation (E & E, 1996).

3.2.4 Human Health Risk Assessment Results

A summary of the HHRA results from the original UMCDF HHRA is presented in Table 3-2, and more details are provided in the Pre-Trial Burn Risk Assessment report (E & E, 1996). The excess cancer risk values shown in the table are driven by risk due to direct exposure (i.e., inhalation) rather than indirect exposure (i.e., ingestion of contaminated food). The HHRA assumed the presence of the PFS, which affected temperatures, humidity, and flow rates, but took no credit for potential emissions reductions. The results show that the UMCDF meets all the state-approved thresholds for the screening risk assessment.

3.2.5 Evolving Guidance on the HHRA Methodology

The methodology used to perform the screening risk assessment for the UMCDF was mandated by the ODEQ and the US EPA. These regulating entities recognized that the methodology, in particular that for performing indirect exposure risk assessments, would

Table 3-2. UMCDF HHRA Results for the Established Configuration (with PFS, Zero Capture Efficiency)[1]

	Adult Resident	Child Resident	Subsistence Farmer	Subsistence Fisher
Total Excess Lifetime Cancer Risk (Regulatory Std: 1E-05)	4E-07	6E-07	3E-06	5E-07
Total Hazard Index (HI) (Regulatory Std: 0.25)	0.10	0.10	0.12	0.06

[1] Results shown are for fenceline location, except the fisher located approximately 8.5 kilometers from the facility. Calculations were also made for high-impact location within Umatilla Depot Activity, but this location was not used for assessing regulatory compliance.

evolve over time. When the UMCDF assessment was initiated, the guidance for performing a screening risk assessment for RCRA combustion facilities was still in its infancy; many of the default values used in the assessment were conservative estimates and in general erred towards protectiveness of the individual at risk. Areas of conservatism include use of inflated operational time (all incinerators were assumed to operate for a period of time that could not be supported by the actual size of the stockpile), location of receptors, wind direction, and use of emission rates derived from detection limit levels for undetected COPCs.

3.3 Updates to the Existing HHRA

The initial step in the overall PFS evaluation is the determination of whether the UMCDF without the PFS achieves state-approved thresholds using the screening HHRA methodology.

As noted previously, the existing HHRA was based on a configuration that reflects the presence of the PFS but takes no credit in capturing the trace amounts of pollutants present in the exhaust gas stream. This design difference primarily affects the gas flow rate and temperature, and consequently the dispersion of air pollutants. It is this effect on dispersion rate that affects ambient concentrations, exposure rates, and risks. A summary of the results (for the "without PFS" case) is presented in Table 3-3. As indicated by a comparison of Tables 3-2 and 3-3, the results for the "with PFS, zero capture efficiency" case are very similar to those achieved in the "without PFS" case. Additional information is included in Appendix A.

3.4 Effects of the PFS on Health Risks

Absent actual testing of PFS performance, one can only predict the capability of the PFS to capture the already small amounts of pollutants present in the stack emissions. ERDEC has

Table 3-3. Updated UMCDF HHRA Results for the "without PFS" Configuration[1]

	Adult Resident	Child Resident	Subsistence Farmer	Subsistence Fisher
Total Excess Lifetime Cancer Risk (Regulatory Std: 1E-05)	4E-07	6E-07	4E-06	6E-07
Total Hazard Index (HI) (Regulatory Std: 0.25)	0.11	0.12	0.11	0.007

[1] Fenceline location, except the fisher located approximately 8.5 kilometers from the facility.

developed a carbon filter simulation model to predict filter performance (Goldfarb et al., 1998). The state of the model is such that it could not be used directly to determine the COPC emission rates. However, the simulation modeling results support the conclusions that the carbon filter can indeed capture many hazardous organic compounds—dioxins and furans in particular—and that these contaminants will be retained on the carbon for a relatively long period of time (more than one year).

Lacking more specific data at this time, the analysis reported here assumes an optimistic case for the adsorption capacity of the PFS. Consistent with the UMCDF HHRA protocol, the hypothetical case for the facility with the PFS assumes that all nondetected regulated COPCs are emitted at their detection limits, while all nondetected nonregulated COPCs are emitted at one-half their detection limits (see discussion in Section 3.2.3). In accordance with the protocol, these are the lowest emission levels that can be assumed. As such, it is expected that the PFS would not cause an increase in excess lifetime cancer risk and non-cancer chronic health effects. Therefore, the UMCDF would still be in compliance with the state-approved health risk thresholds for RCRA combustion facilities.

The reduction in the total amount of COPCs released to the atmosphere during normal operations will lead to a reduction in the calculated excess lifetime cancer risk. However, any upset conditions that could result in the atmospheric release of all carcinogenic pollutants captured on the filters would, in the worst case, cause the total cancer risk to be the same[6] as that of the "without PFS" case. This is because the estimation of cancer risk is based on total cumulative dose to the individual during his/her lifetime.

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[6] The possibility of releasing all the carcinogenic contaminants adsorbed on the filters is highly unlikely. Metals and other particulate matter adsorbed on the prefilters and HEPA filters will stay on the filter material even when filters are ruptured. The carbon filter simulation model has shown that organics will not be totally desorbed from the carbon bed during high temperature or high humidity transients.

As for chronic noncarcinogenic health effects, which are based on total daily intake of a toxic substance, a reduction in emission during normal operations would result in a reduction in the calculated HIs. During upset conditions that may affect the PFS, a higher concentration of pollutants released over a short period of time would not have a significant effect on the calculated chronic HIs, because the concentrated release will not be sustained for a sufficiently long period of time as to cause a chronic effect.

3.5 HHRA Sensitivity Analysis

The HHRA sensitivity analysis[7] is performed to provide additional insight into the conservatism of the HHRA results. The primary motivation behind this analysis is the fact that the screening HHRA performed for the UMCDF used a relatively conservative methodology that is designed to ensure that risks are not under-predicted. Examining the sensitivity in the values used for the major parameters in the risk calculations gauges the inherent conservatism associated with the health risks estimated by the screening HHRA. The results of the sensitivity analysis help to determine whether cancer risk estimated from the emission profile with the lowest chemical concentrations permitted by the protocol (assumed condition for the PFS) is changed relative to the reference case emission profile (without PFS) when taking data conservatism into consideration.

Four scenarios (or cases) are analyzed. These cases are as follows:

- Case 1: Without PFS, HHRA protocol (conservative assumptions)
- Case 2: Without PFS, actual program factors
- Case 3: With PFS, HHRA protocol
- Case 4: With PFS, actual program factors

The cases are used in the sensitivity analysis to evaluate the inherent conservatism associated with the HHRA, which is related to (1) emission values, (2) operating assumptions, (3) toxicity assumptions, and (4) cancer slope factor values.

A two-step analysis is performed on those cases in order to reflect actual program factors. First, the air dispersion analysis is performed using a more accurate representation of emission values. Outputs from the air dispersion analysis are used to estimate excess cancer risk and other chronic health effects to selected receptors. Next, the cancer risk estimate for the subsistence farmer (the receptor at greatest risk) is further refined by assigning more accurate values to several parameters that were identified as highly conservative. These refined values are applied only to the risk calculations for exposure to those COPCs that are the major

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[7] For the analysis presented in this section, the more appropriate term is a comparison of HHRA cases using assumptions and data that better reflect actual program conditions.

contributors to the overall cancer risk estimate (se and HD/HT represent 98 percent of the total exc More details on the sensitivity analysis are provided .

3.5.1 Impact of Emissions on HHRA Risk

Table 3-5 presents a summary of the emissions-related ass cases 1 through 4. Based on these assumptions, the air dispersio estimate excess cancer risk and the HI to the various receptors for the results is presented in Tables 3-6 and 3-7, and more detailed infor Appendix A. For all cases, excess cancer risk and HI values are below th thresholds.

3.5.2 Application of Additional Actual Program Factors to Subsistence Far

The cancer risk estimate for the subsistence farmer is further refined to reflect a s more accurate values for several parameters that were identified to be highly conservati These adjustments are applied only to the risk resulting from exposure to those COPCs tha are the major contributors to the overall cancer risk estimate (see Table 3-4), which include dioxins and furans, arsenic, and HD/HT. Table 3-8 shows the additional assumptions that are applied to the excess cancer risk estimate for the subsistence farmer. More detailed information is provided in Appendix B.

Table 3-4. Major Cancer Risk Drivers in Baseline System (Without PFS) for Subsistence Farmer

Constituent of Potential Concern	Excess Cancer Risk	Contribution to Risk (%)
Dioxins and Furans	2.9E-06	81
Arsenic	3.6E-07	11
HD/HT	2.7E-07	7.5
Chromium	2.8E-08	0.8
Others	4.2E-08	1.2
Total Risk	3.6E-06	100

Table 3-5. Emissions-Related Assumptions Used in HHRA Sensitivity Analysis

Assumption	Case 1: Without PFS, HHRA Protocol	Case 2: Without PFS, Actual Program Factors	Case 3: With PFS, HHRA Protocol	Case 4: With PFS, Actual Program Factors
Regulated COPC Emission Rates	DFS, LIC, MPF: JACADS MAX DUN: JACADS MAX from all sources*	JACADS average of all test runs*	Detection limit	Detection limit
Unregulated COPC Emission Rates	JACADS average of all test runs*	JACADS average of all test runs*	50% of detection limit	50% of detection limit
Chemical Agent Emission Rates	ASC	20% of ASC**	20% of ASC**	20% of ASC**
Operating Time	8760 hours per year for 3.2 years	Adjusted for actual stockpile quantities	8760 hours per year for 3.2 years	Adjusted for actual stockpile quantities
Process Upset Frequency***	Nonmetals 20% Metals 5%	2%****	Nonmetals 20% Metals 5%	2%****

ASC: Allowable stack concentration (0.3 μg/m^3 for GB and VX, 30 μg/m^3 for HD)

* For each source, adjusted for UMCDF feed rates

** Stack alarm level

*** Resulting in 10 times normal emissions for all COPCs, except 5 times normal for chemical agents

**** Based on JACADS experience

Table 3-6. Total Excess Lifetime Cancer Risk Values* for All Receptors

	Adult Resident	Child Resident	Subsistence Farmer	Subsistence Fisher
Case 1: Without PFS, HHRA protocol	4E-07	6E-07	4E-06	6E-07
Case 2: Without PFS, actual program factors**	3E-08	4E-08	3E-07	7E-08
Case 3: With PFS, HHRA protocol	2E-07	2E-07	2E-06	3E-07
Case 4: With PFS, actual program factors**	2E-08	2E-08	2E-07	4E-08

* State-approved threshold for excess cancer risk: 1E-05

** Adjusted for assumptions related to emissions only.

Table 3-7. Total Hazard Index Values* for All Receptors

	Adult Resident	Child Resident	Subsistence Farmer	Subsistence Fisher
Case 1: Without PFS, HHRA protocol	0.11	0.12	0.11	0.007
Case 2: Without PFS, actual program factors**	0.01	0.01	0.009	0.001
Case 3: With PFS, HHRA protocol	0.02	0.02	0.02	0.002
Case 4: With PFS, actual program factors**	0.005	0.006	0.005	0.0005

* State approved HI: 0.25

** Adjusted for assumptions related to emissions only.

Table 3-8. Additional Assumptions Applied to Subsistence Farmer

Assumption	Cases 1 and 3: HHRA protocol	Cases 2 and 4: Actual Program Factors
Percentage of chromium emitted as Cr(+6) [as opposed to Cr(+3)]	100%	3.5%*
Inhalation cancer slope factor for arsenic	50 per mg/kg-day	15.1 per mg/kg-day**
Length of time contaminated pasture plants contribute to concentration of contaminants in beef and milk	40 years	3.2 years***
Percentage of PCDF present as 2,3,4,7,8-PCDF (as opposed to 1,2,3,7,8-PCDF) in emissions	100%	50%
Default values for other parameters	In accordance with the UMCDF HHRA protocol	In accordance with the UMCDF HHRA protocol

PCDF: pentachlorodibenzofuran

* Cr(+6) is not particularly stable under most environmental conditions

** Derived from unit risk value provided in the Integrated Risk Information System (IRIS) database

*** Maximum length of time that UMCDF is expected to operate

3.5.3 Results

Table 3-9 presents the risk results for the four cases described above for the subsistence farmer. These results indicate that the actual excess cancer risk (without the PFS) is more reasonably estimated as 5.5E-08 rather than the conservative estimate of 3.6E-06 presented in the "without PFS" HHRA (Case 1). Furthermore, bringing emissions down to detection limit concentrations (by adding the PFS) would only reduce risk to 3.2E-08. Considering the relatively low risk values involved, there is no practical difference between 5.5E-08 and 3.2E-08. Thus, removing the PFS would have very little influence on the estimated excess cancer risk for the UMCDF.

Table 3-9. Sensitivity Analysis of Excess Cancer Risk Estimates to Subsistence Farmer

Cancer Risk Category	Case 1 Without PFS, HHRA Protocol (Appendix A)	Case 2 Without PFS, Actual Program Factors (Appendix B)	Case 3 With PFS, HHRA Protocol (Appendix A)	Case 4 With PFS, Actual Program Factors (Appendix B)
Risk from indirect exposure	3.5E-06	4.8E-08	2.1E-06	2.9E-08
Risk from direct exposure	1.4E-07	5.1E-09	8.7E-08	3.6E-09
Total cancer risk	**3.6E-06**	**5.5E-08**	**2.2E-06**	**3.2E-08**

3.6 Ecological Risk Assessment

3.6.1 Overview

A screening level ecological risk assessment (SLERA) was performed for the UMCDF. This was limited to the assessment of potential risks to ecological communities in the Umatilla depot area due to emissions from the UMCDF (E & E, 1996). Modeled stack emissions from the facility were used to calculate media concentrations of COPECs. These media concentrations were compared to media-specific toxicity criteria and bench mark concentrations obtained from the literature to measure the potential ecological risks posed by the facility. No analytical or biological data were collected specifically for this assessment. The impacts on terrestrial vegetation, soil invertebrates, and aquatic and benthic species was qualitatively assessed.

3.6.2 Effects of the PFS on Ecological Risk Assessment Findings

The SLERA performed for the UMCDF indicated little potential for ecological risk. However, it also identified important data gaps requiring reassessment of the ecological risks when the UMCDF trial burn data are available. Removing the PFS is not expected to change the overall SLERA findings.

3.7 Conclusions

The updated UMCDF HHRA for the "without PFS" case indicates that the state-approved excess cancer risk and other health effects thresholds are achieved. Thus, the facility remains in regulatory compliance. Removal of the PFS has no significant effect on human health risk. Similarly, removal of the PFS is not expected to change the SLERA findings.

Section 4

Evaluation of Risk from Accidents and Other Hazards

The PFS has the potential to mitigate, cause, or exacerbate accidents at the UMCDF. In this section, the risk impacts of the PFS (both favorable and detrimental) on accidents and other hazards are evaluated. Because the Phase 1 QRA performed for the UMCDF was based on a facility design without PFS units, this evaluation addresses the impact the PFS has on the risks associated with accidents involving a release of chemical agent. Therefore, in this section, the QRA *without* PFS units is referred to as the "baseline" QRA.

4.1 Overview of Baseline QRA Risk

As discussed in the introduction, the UMCDF QRA (SAIC, 1996a) considers the potential health consequences to the public from accidental releases of chemical agent during chemical storage and disposal activities. In succinct terms, the purpose of a QRA is to systematically identify potential accidents associated with a particular process or activity and to estimate quantitatively the risk *associated with these accidents*. Accidents can occur due to *internal events* (those associated with the process or equipment) or *external events* (those external to the process such as earthquakes and aircraft crashes). Direct exposures to chemical agent via inhalation and absorption through the skin are the exposure routes considered. Accidental releases of substances other than chemical agent are not included in the QRA.

4.1.1 Categories of QRA Results

Risk, as calculated in the QRA, refers to the combination of the accident sequence frequency (e.g., accidents per year) and the potential consequences (e.g., fatalities per accident), that is,

$$\text{Risk}_i = f_i C_i$$

where f_i is the frequency of accident i and C_i is the consequence of accident i. The total risk is then calculated as the sum of the individual risks for all postulated accidents:

$$\text{Total Risk} = \sum_{i=1}^{\#\,\text{accidents}} \text{Risk}_i = \sum_{i=1}^{\#\,\text{accidents}} f_i C_i$$

Depending on the associated health consequence, two types of risk are calculated:

1. *Acute Fatality Risk.* This represents the probability of death (or the number of deaths) in the surrounding population due to a one-time exposure resulting from a postulated accidental release of chemical agent. Any fatalities would occur soon after the exposure.
2. *Latent Cancer Risk.* This represents the probability of cancer (or the number of cancers) in the surrounding population due to a one-time exposure resulting from a postulated accidental release of mustard agent. Any cancers would occur sometime in the future, possibly years after exposure.

Each of these risks can be expressed as either societal or individual. *Societal risk* is calculated over an entire affected population as a whole. *Individual risk* is societal risk divided by the number of persons in the population at risk; it represents the risk to an average individual in that population. The individual risks are calculated as averages for groups residing within various distance intervals from the facility. (There would be variations from the average for specific individuals at different distances within the intervals.) These definitions are summarized in Table 4-1.

4.1.2 Baseline QRA Numerical Results for UMCDF

This section summarizes the numerical risk results from the UMCDF baseline QRA (without the PFS). These risks fall into the four categories defined in Table 4-1 and are calculated separately for processing and stockpile storage.

It is important to note that the UMCDF Phase 1 QRA only includes a point estimate of risk. The complete risk picture will be developed in the Phase 2 QRA. Decisions based on the Phase 1 QRA results need to be tempered by a thorough understanding of the limitations of not having uncertainty parameters for the risk results. In some cases, conclusions concerning uncertainty have been drawn from the Tooele Chemical Agent Disposal Facility (TOCDF) Phase 2 QRA.

4.1.2.1 Processing Risk Results

The mean public acute fatality and cancer risks (individual and societal) from processing at the UMCDF are shown in Table 4-2. These risks are presented as both "per year of processing" and "over the facility life" (3.3 years at UMCDF). Individual risk refers to persons living between 2 and 5 km from the facility. Due to their close proximity to the facility, these individuals are the members of the public with the greatest potential for exposure as a result of accidents. (No members of the public are closer than 2 km from the UMCDF or the storage yard.)

Table 4-1. Summary of QRA Risk Measures and Population Types

Measure	Description
Societal Acute Fatality Risk	Average number of fatalities in the surrounding population due to a one-time exposure resulting from a postulated accidental release of chemical agent. Any fatalities would occur soon after the exposure. Public risk includes people who could be affected up to 100 km from the point of release. Societal risks are also provided for specific sub-populations, such as societal risk to those people residing within various distance intervals from the site.
Individual Acute Fatality Risk	Probability of fatality per individual in an affected population. It is calculated as the appropriate societal acute fatality risk divided by the population of interest. For this study, individual risks have been calculated for sub-populations residing within various distance intervals from the site, e.g., individual risk for persons living between 5 and 10 km from the site. (There would be variations from the average for specific individuals at different distances within the intervals.)
Societal Latent Cancer Risk	Average number of cancers in the surrounding population (within 100 km of the point of reference) due to a one-time exposure resulting from a postulated accidental release of mustard agent.* Any cancers would occur sometime in the future, possibly years after exposure. Societal risks are also provided for specific sub-populations, such as societal risk to those people residing within various distance intervals from the site.
Individual Latent Cancer Risk	Probability of cancer per individual in the surrounding population due to a one-time exposure resulting from a postulated accidental release of mustard agent.* It is calculated as the appropriate societal latent cancer risk divided by the population of interest.

* There are no non-acute (latent) effects, such as cancer, for nerve agent after an extended length of time following the postulated exposure.

4.1.2.2 Stockpile Storage Risk Results

The mean public acute fatality and cancer risks (individual and societal) from continued stockpile storage at the UMCDF are shown in Table 4-3. These risks are presented as "per year of storage" to facilitate a direct comparison with the per-year processing risk. Note that the per year fatality risk values are much greater for continued storage than for processing (see the "risk ratio" column). This indicates that the stockpile storage fatality risks at the UMCDF far exceed the processing fatality risks when viewed on a common basis. The societal cancer risk is also higher for storage than for processing, but to a much smaller degree.

Table 4-2. Mean Public Risks from Disposal Processing in the UMCDF Baseline QRA

Risk Category	Risk (per year of processing)	Risk (over facility life)
Individual Public Fatality Risk (2-5 km ring)	3.6E-08	1.2E-07
Societal Public Fatality Risk	6.1E-06	2.0E-05
Individual Public Cancer Risk (2-5 km ring)	<1.0E-12	<1.0E-12
Societal Public Cancer Risk	3.9E-09	1.3E-08

Table 4-3. Mean Public Risks from Stockpile Storage in the UMCDF Baseline QRA

Risk Category	Risk (per year of storage)	Risk Ratio (storage to processing)
Individual Public Fatality Risk (2-5 km ring)	3.3E-06	90
Societal Public Fatality Risk	3.0E-02	4900
Individual Public Cancer Risk (2-5 km ring)	<1.0E-12	2.4
Societal Public Cancer Risk	1.2E-08	3

4.1.2.3 Risk Cutoff Value

In the UMCDF baseline QRA, sequences with *frequencies* below 1E-08 per year were generally considered non-credible. However, in order to help ensure that sequences whose frequencies are just below this cutoff (but whose consequences could be severe) were not ignored, a 1E-09 per year screening threshold was utilized. This accounts for very rare events that would only occur once every 100,000,000 or once every one billion years. Decision making is not based on considerations of events rarer than this. In addition, a *public risk* cutoff of 1E-10 (1 in 10,000,000,000 or 1 in 10 billion) was established in the baseline QRA. This cutoff is similar to those used in similar risk studies (e.g., U.S. Nuclear Regulatory Commission [USNRC], 1975 and USNRC, 1990). An *individual risk* cutoff of 1E-12 (1 in 1 trillion) was also used. (There are less than 100 people in the first population ring studied, upon which individual risk results are based, so societal risk divided by the number of people would suggest a 1E-12 cutoff.) There are limitations in risk modeling concerning very rare events with limited supporting data. Reporting of values lower than these cutoff values would not be meaningful because the uncertainty in the results is larger than the risk value itself. These values were also adopted for the PFS QRA analysis described in this report, and lower values are shown only as <1E-10 for public risk and <1E-12 for individual risk.

4.1.3 Risk Drivers in the UMCDF Baseline QRA

The results of the UMCDF baseline QRA show that the greatest risk is associated with external events because they have the potential to result in large agent releases. The results also show that the risk associated with munition storage is significantly higher than that of disposal. Risk drivers for processing and stockpile storage are presented in greater detail below.

4.1.3.1 Dominant Contributors to Processing Risk

The scenarios that comprise the majority of the public risk associated with processing at UMCDF are shown in Table 4-4. Earthquakes affecting the UMCDF account for 72 percent of the public fatality risk. The earthquake risk at the UMCDF is dominated by the potential for a structural failure of the Container Handling Building (CHB) unpack area (UPA). While the building is built to appropriate earthquake codes, a portion of the second floor has been analytically determined to be vulnerable to failure from earthquakes that are larger than those for which the facility was designed. In addition, this area can have a large inventory of munitions not protected by onsite containers (ONCs), because this is where munitions are unpacked. Handling accidents during removal of rocket pallets from their storage igloos and aircraft crashes are also important contributors.

4.1.3.2 Dominant Contributors to Stockpile Storage Risk

Table 4-5 shows the important sequences for public acute fatality risk from continued stockpile storage at the UMCDF. As with processing (see Table 4-4), earthquakes are the dominant contributor (this time associated with munitions in storage). Earthquakes can result in toppling of stacked munition pallets, and agent leakage or explosions are possible due to impacts with the floor of the igloo or with other munitions. An explosion/fire in an M55 rocket igloo due to a lightning strike is also a small contributor. Lightning can create a powerful electromagnetic field that might cause one or more rocket motors to ignite and start a fire that could spread to the entire igloo. All other scenarios are negligible contributors (about 1 percent of the storage risk).

Table 4-4. Dominant Public Acute Fatality Risk Contributors for Disposal Processing at the UMCDF

Scenario	Percent of Processing Risk
Earthquake	72
Rocket Handling Accidents	14
Aircraft Crash	13
All Others	about 1

Table 4-5. Dominant Public Acute Fatality Risk Contributors for Stockpile Storage in the UMCDF Baseline QRA

Scenario	Percent of Stockpile Storage Risk
Earthquake	97
Lightning (M55 rocket igloo explosion/fire)	2
All Others	about 1

4.1.4 Baseline Risk Driver Summary

As already mentioned, both processing and stockpile storage risks are dominated by external events, so-called because they result from influences external to the process. In particular, accident sequences initiated by earthquakes overwhelmingly dominate the risk at the UMCDF. These events, although rare, would have widespread effects and could possibly result in large agent releases and public consequences.

The UMCDF is in an area of moderate seismic activity. Earthquakes can initiate accident sequences by either causing system components to fail or by direct damage, such as collapse of site structures or toppling of the munitions themselves if they are stacked. The results show that direct damage effects are most significant because they have the potential to involve much larger quantities of agent than system-oriented effects. Several site structures could be affected by an earthquake. Failure of the CHB could result in a significant potential for agent release since the munitions within, if not in ONCs, could be crushed. Munition stacks within igloos or warehouses may fall and leak during an earthquake. In addition, falling pallets of rockets have a small (but non-zero) probability of exploding or igniting if they are dropped. A postulated collapse of a vulnerable area of the munitions demilitarization building (the portion of the UPA that attaches to the CHB) along with the failure o has the potential to involve a significant amount of agent.

Other external events also contribute to the risks at the UMCDF. crash risks are not associated with any undue exposure to aircraft, calcu the probability that an in-flight plane could crash into one of the storage st facility. Such accidents are more important to processing risk than to storage due to the dominance of earthquake and lightning events at the storage yard.

In addition to external events, only one activity related to munition disposal (wh includes all activities associated with munition handling through incineration) was impo to risk at the UMCDF. During the removal of rocket pallets from their storage igloos, it is postulated that a forklift-related event may either cause a rocket to explode or its propellant to ignite. These scenarios are risk significant because an ignition within an igloo could propagate to other rockets in the igloo, possibly causing an igloo fire involving the entire igloo inventory of rockets. Although a substantial fraction of the agent would be consumed in the resulting fire, the amount that could potentially be released is large because the available quantity is large. The results show that all other activities related to munition disposal do not contribute significantly to processing risk (approximately 1 percent).

For the UMCDF, the QRA results clearly indicate that the fatality risk of munition storage is much greater than that of processing (see Tables 4-2 and 4-3). Based on these results, and the fact that both munition disposal and storage risks are dominated by external events, similar risk analysis with the PFS should result in minimal impact on the overall risk associated with accidental agent releases. A thorough evaluation of the potential risk increases and decreases due to the PFS has been performed. The results of this evaluation are presented in Sections 4.2 through 4.6.

4.2 Examination of Potential Benefits of the PFS

As mentioned in Section 4.1, the UMCDF Phase 1 QRA considers a comprehensive set of accident scenarios that could lead to chemical agent release from the UMCDF or the storage yard. The PFS could mitigate some of these scenarios by capturing the chemical agent before it is released to the environment. In this section, the potential benefits of the PFS are examined in detail, and the positive impact on the QRA risk is quantified and discussed.

4.2.1 Elimination of PAS Releases

The furnaces (and afterburners) at the UMCDF are designed to operate at temperatures that ensure chemical agent destruction to 99.9999 percent efficiency. This destruction efficiency has been demonstrated at JACADS during agent trial burns and during normal toxic operations. Should an upset result in furnace operation outside of the design range, numerous safety systems act to move the furnace systems into a safe shutdown mode that precludes any

agent release from the facility. Nevertheless, as part of the QRA, accidents are postulated that could result in agent releases from the furnaces to their PASs. In such accidents, the PAS, which ordinarily acts to scrub pollutants from the exhaust gases, would also act to remove and destroy chemical agent in the airstream.

In the PFS design, carbon filters would be installed downstream of the PAS on each of the furnaces. These filters would have the opportunity to capture any chemical agent that made it through the furnace and its PAS during an accident. The quantity of chemical agent involved in such a release is predicted in the baseline QRA to be very small due to the combined agent destruction in the furnace and the PAS.[8] Simplified modeling efforts indicate that the PFS carbon will easily adsorb this small amount of agent, effectively reducing the quantity of agent released to zero. Therefore, the PFS has the potential to eliminate the likelihood of a PAS release accident.

4.2.2 Baseline Accident Scenarios Affected

All postulated accidents in the UMCDF baseline QRA have been reviewed to determine any potential impact that the PFS might have. This assessment was based on design and operational information for the proposed PFS and on the UMCDF baseline QRA models. In terms of potential benefits, the PFS would serve to mitigate only those sequences involving releases through the PASs (see Section 4.2.1). The baseline QRA includes many other releases (e.g., releases during onsite transportation accidents, releases during handling accidents, etc.), but the PFS would not mitigate these releases. For the purpose of this study, it is assumed that the PFS operates at optimum capture efficiency.

The specific accident scenarios mitigated by the PFS are as follows (the top event name from the baseline QRA is shown in parentheses):

1. *Agent Release from the MPF PAS (MPFPASR).* In this scenario, an upset occurs while one or more munitions are present within the furnace. These munitions contain the residual chemical agent that remains after draining (normally less than 5 percent of the original agent mass). Chemical agent continues to volatilize from the munitions but is not completely destroyed in the MPF due to either overventilation or underventilation following furnace shutdown. Overventilation results in rapid cooling of the furnace to the point where the gas residence time cannot ensure adequate agent destruction. Underventilation results in incomplete agent destruction due to lack of

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[8] Note that the operation of the furnace outside the design envelope means that the agent destruction efficiencies may not be optimal; it does *not* mean that no destruction will take place in the furnace. In addition, the agent destruction and removal efficiency of the PAS alone has been estimated at 99.98 percent based on testing performed at the Chemical Agent Munitions Disposal System facility in Utah (SAIC, 1996a).

oxygen with which to react. Both system failures and human failures are included in the QRA fault tree models. The overall initiator frequency is dominated by failures that would cause a lockout of all furnace burners followed by a failure to stop the combustion air blower from running or a failure to stop the primary ID fans from running (overventilation).

2. *Agent Release from the LIC PAS (LICPASR).* This sequence includes releases where (1) agent feed to a LIC fails to stop following a LIC upset, and a release occurs as the furnace cools down; or (2) the agent feed line is not properly purged following a LIC shutdown, and the release occurs on restart. The initiator frequency was dominated by a failure of the operators to purge the agent feed line.

Agent releases from the DFS and the DUN via their respective PASs were considered in the QRA. However, these furnaces handle only small quantities of chemical agent (the DUN normally handles trace amounts of agent, if any), and no credible PAS release sequences were identified.

4.2.3 Risk Results

In the baseline QRA, the risks associated with each of the PAS release sequences described in Section 4.2.2 are added together to yield the total risk from PAS releases. It is assumed that the net effect of the PFS on PAS releases is to reduce the probability of an agent release by capturing any chemical agent before it reaches the stack. This is a bounding calculation because it was assumed that the filters will capture all agent. To put this risk into perspective, the comparisons shown in Tables 4-6 and 4-7 have been developed. Table 4-6 deals with public acute fatality risk, while Table 4-7 shows public cancer risk. Each table shows the risk associated with the PAS release sequences with and without the PFS and the overall baseline processing risk from all accidents in the QRA (shaded). Two risk measures are presented for each item: risk to those members of the public exposed to the highest concentrations of contaminants (the most exposed individual), and the overall risk to the public as a whole (societal risk). The results shown in Table 4-6 indicate that while the PFS can potentially reduce the probability of an agent release from the stack, its net effect on public acute fatality risk is zero. This is because the amount of agent that could be released from the PAS is relatively small and does not contribute to individual and societal acute fatality risks.

Table 4-6. Public Acute Fatality Risk of PAS Release Sequences

Description	Individual Risk (over facility life)	Societal Risk (over facility life)
Risk with the PFS	0	0
Risk without the PFS	0	0
Total Baseline Processing Risk	1.2E-07	2.0E-05

Table 4-7. Public Cancer Risk of PAS Release Sequences

Description	Individual Risk (over facility life)	Societal Risk (over facility life)
Risk with the PFS	0	0
Risk without the PFS	<1.0E-12	<1.0E-10
Total Baseline Processing Risk	<1.0E-12	1.3E-08

4.3 Examination of Potential Increased Risk Due to the PFS

Section 4.2 described the potential mitigative effects of the PFS on accidental agent releases through the PASs and common stack. Due to its location in the furnace exhaust path, the PFS also has the potential to *increase* risks in several ways. Using the methodologies described in separate reports (Mitretek, 1998; SAIC, 1997c) a master logic diagram (MLD) was developed to identify accident scenarios that the PFS could either cause or exacerbate. An MLD is a logic diagram that illustrates a fault tree, while a fault tree illustrates the decomposition of a given top event into specific causes that can be subsequently assessed. Using the MLD developed for this task, the potential negative impacts of the PFS were grouped into four general areas:

1. *Effects on Baseline Accidents.* The PFS could increase the frequencies of existing agent release accidents in the baseline QRA, due to additional system complexities and interactions with the baseline furnace/PAS systems. This analysis is presented in Section 4.3.1.
2. *"New" Releases from Outside the PFS.* Interactions between the PFS and the existing systems might also lead to releases from outside the PFS boundary that were not

modeled in the baseline QRA. After examination of the preliminary PFS design, no new events in this area were identified.

3. *"New" Releases from the PFS.* The PFS could act as a reservoir for toxic pollutants (and possibly small quantities of chemical agent) that could subsequently be released in concentrated quantities during "new" accidents. This analysis is presented in Section 4.3.2.
4. *Waste Disposal.* The PFS includes new solid hazardous waste streams that would need to be disposed of safely. An accident during these disposal activities could result in a release of agent or toxic pollutants from the waste. This analysis is presented in Section 4.3.4.

In addition, the PFS could also impact risk in one other way:

5. *Processing Delay.* There are also ways that the PFS could delay the disposal process. Any delay in disposal translates to an increase in the munition storage period and consequently an increase in risk. Disposal could be delayed as a result of increased furnace/PAS system unavailability due to the PFS (downtime for PFS related repairs and maintenance). It could be delayed as a result of the RCRA permit modification process or from possible public backlash associated with a proposed change to remove the PFS. In addition, disposal could be delayed if a stack release were to occur on a system that did not include the PFS which could have been prevented by the PFS. The UMCDF baseline QRA results indicate that the risk of storage is much greater than that of processing (see Section 4.1.2.2). Therefore, any extension in the storage period is undesirable. This analysis is presented in Section 4.3.3.

4.3.1 Increased Risk for Baseline Accidents

As mentioned above, the PFS is installed just after the existing PASs. Initiators within the PASs (e.g., equipment failures) that can adversely impact the operation of the furnaces are modeled in the baseline QRA. Since the PFS essentially extends each PAS, an engineering review of the existing QRA models was conducted to determine where upsets in the PAS appear. Two PAS upsets are modeled in the QRA: (1) blockage of the exhaust stream flow and (2) subsequent loss of ID. Although there are a number of ways to achieve such blockages, this *class* of initiator is the only one that deals with failures within the PAS. That is, the baseline QRA, which included a comprehensive search for accident initiators, identified no other ways that failures within the PAS could lead to an agent release.

The PFS design contains several failure modes that result in furnace exhaust flowpath blockage (e.g., one of the PFS dampers transfers closed, etc.). Such PFS-induced flowpath blockages have an effect on the facility that is identical to the blockage of the PAS flowpath already modeled within the QRAs; hence, the frequency of accidental releases induced by PFS

blockages was determined by modifying the existing QRA models. Review of the baseline QRA identified the following top events involving PAS flowpath blockage and loss of ID (the top event name from the baseline QRA is shown in parentheses):

- *Agent Vapor Explosion in the MPF (MPFAGVP).* If loss of ID occurred with a volatilizing munition load within the furnace, agent vapors could accumulate within the MPF. A failure to follow contingency procedures could result in the ignition of this vapor and an explosion within the furnace. The room boundary could be compromised by the explosion, and the agent contents of the munitions within the furnace could then be released to the external environment.
- *Agent Vapor Explosion in the MPF Airlock (MPFARDL).* If a loss of ID occurred while a tray of munitions was in the MPF airlock, the resultant stop feed could leave the tray within the airlock long enough for a flammable air-agent mixture to form. Ignition of this mixture could lead to an explosion that fails the airlock and possibly the MPF external room wall. The agent contents of the munitions within the furnace/airlock could then be released to the external environment.
- *MPF Natural Gas Explosion (MPFNGAS).* If a loss of ID resulted in a furnace shutdown and the natural gas flow to the furnace failed to stop, then an accumulation of natural gas within the furnace and/or the furnace room could occur. Ignition of this gas could result in an explosion that might fail the furnace and the room walls. The agent contents of the munitions within the furnace could then be released to the external environment.
- *DFS Natural Gas Explosion (DFSNGAS).* If a loss of ID resulted in a furnace shutdown and the natural gas flow to the furnace failed to stop, then an accumulation of natural gas within the furnace room could occur. Ignition of this gas could result in an explosion that might fail the room walls and ceiling. The agent contents of the munitions within the UPA above could be released to the external environment if catastrophic failure of the DFS room ceiling occurred.
- *LIC Room Release (LICROOM).* If a loss of ID resulted in a furnace shutdown and the agent feed to the furnace was not isolated, a release of agent into the LIC room could occur. A concurrent or subsequent failure of the heating, ventilating, and air conditioning (HVAC) system could result in an agent release to the external environment.

Other initiators (besides loss of ID) can lead to these upsets as well; however, these initiators are not affected by the PFS. Thus, the relative impact of the PFS on the occurrence frequency varies among the events.

Since completion of the UMCDF baseline QRA, two new initiators have been included in the TOCDF baseline QRA (SAIC, 1996b) that involve PAS upsets (MPFEXPL and

LICEXPL). These events involve potential natural gas explosions within the LICs and the MPF following an unplanned shutdown and failure to purge. Although these events are not included in the UMCDF baseline QRA, it is important to note that (1) they were both negligible contributors to risk in the TOCDF baseline QRA and (2) the impact of the PFS resulted in a negligible increase in their accident frequencies (SAIC, 1997). Therefore, even if these events were added to the UMCDF baseline QRA, no changes in the baseline risk should occur, and no changes in the risk impact of the PFS would be expected.

4.3.1.1 Impact on Accident Frequency

In order to quantitatively evaluate the impact of the PFS on the above accident sequences, system drawings along with descriptions of system operation and furnace interfaces were used to develop logic (fault tree) models for the PFS. These models are very similar in construction to the fault tree models already developed for the baseline QRA. Component failure and human reliability values were estimated in order to quantify the top event frequencies, and the primary source for this data was the baseline QRA database. The PFS fault tree models were subsequently linked with the affected QRA furnace system models, and the resultant changes in the accident sequence frequencies were calculated. The results of these calculations are presented in Table 4-8.

From Table 4-8, it can be seen that the impact of the PFS varies among the events (increases range from 0 percent to 385 percent). Although loss of ID appears as a contributor to these events, other initiators can dominate over the impact of the PFS on loss of ID. The two primary contributors to the increases shown are (1) plugging of the filters by particulate with failure to change out or bypass and (2) inadvertent damper closure in the PFS.

Table 4-8. Baseline Top Event Frequencies Affected by the PFS

QRA Top Event Name	Baseline Frequency (per hour)	Percent Increase in Frequency due to PFS	New Frequency with PFS (per hour)
MPFAGVP	4.8E-05	385*	2.3E-04
MPFARDL	1.7E-04	9	1.8E-04
MPFNGAS	2.9E-08	168**	7.8E-08
DFSNGAS	1.7E-11	4	1.8E-11
LICROOM	2.8E-14	0	2.8E-14

* This translates into a factor increase of 4.8.

** This translates into a factor increase of 2.7.

4.3.1.2 Accident Consequence Evaluation

Dispersion and consequence calculations for agent release sequences involving loss of ID have been performed in the baseline QRA using the CHEMMACCS computer code (SAIC, 1996a). CHEMMACCS is a modification of the MACCS code, developed by Sandia National Laboratories to predict the transport and consequences of radioactive releases. CHEMMACCS contains a standard Gaussian plume model specifically modified to handle chemical agent dispersion and transport. It also includes probabilistic, site-specific weather data sampling; site-specific demographics; evacuation modeling; and probabilistic health effects evaluation using probit (dose-response) equations.

The PFS would affect only the *frequency* of loss-of-ID sequences (see Section 4.3.1). Therefore, the existing consequence results for these sequences remain valid, and no new CHEMMACCS calculations were necessary.

4.3.1.3 Risk Results

In Section 4.3.1.1, it was shown that the only detrimental impact of the PFS on the existing QRA accidents was to increase the frequencies of the top events as shown in Table 4-8. To put these increases in perspective, the comparisons shown in Tables 4-9 and 4-10 have been developed. Table 4-9 deals with public acute fatality risk, while Table 4-10 shows public cancer risk. Each table shows the risk associated with each PAS upset sequence with and without the PFS and the overall baseline processing risk from all accidents in the QRA (shaded). Two risk measures are presented: risk to those members of the public closest to the UMCDF site boundary (individual risk), and risk to the public as a whole (societal risk).

It can be seen that the PFS results in no impact to the fatality risks from existing processing sequences and a small increase in societal and individual cancer risk. The processing risks (both acute fatality and cancer) are dominated by external event sequences such as earthquakes, which remain unaffected by the PFS (see Section 4.1.3.1).

4.3.2 New PFS Release Sequences

Because the PFS should trap some of the small quantities of compounds of concern present in the PAS exhaust gases, the PFS carbon would act as a reservoir to concentrate these substances in one location. If a process upset resulted in an agent release through the PAS, then small amounts of chemical agent could be included in this concentrated mass. The collected pollutants could be released accidentally, and the concentrated nature of the release could lead to public and worker health effects. Such accidents represent new scenarios not present in the baseline QRA. To address these accidents, a portion of the MLD was developed to identify all of the potential new releases. Both internal events (those initiating

Table 4-9. Public Acute Fatality Risk of PAS Upse

Description	Individual Risk (over facility life)	(over
MPFAGVP Risk with the PFS	< 1.0E-12	< 1.0E-
MPFAGVP Risk without the PFS	< 1.0E-12	< 1.0E-10
MPFARDL Risk with the PFS	< 1.0E-12	< 1.0E-10
MPFARDL Risk without the PFS	< 1.0E-12	< 1.0E-10
MPFNGAS Risk with the PFS	0	0
MPFNGAS Risk without the PFS	0	0
DFSNGAS Risk with the PFS	< 1.0E-12	< 1.0E-10
DFSNGAS Risk without the PFS	7.0E-12	4.0E-10
LICROOM Risk with the PFS*	0	0
LICROOM Risk without the PFS*	0	0
Total Baseline Processing Risk	1.2E-07	2.0E-05

* Consequences were not calculated for an agent release into the LIC room because the frequency of this event (LICROOM) fell below the truncation limit (i.e., this sequence was screened). The sequence was included in this study to ensure that analysis with the PFS did not result in an increase in the frequency above the truncation limit (about 1.1E-13/hr), which it did not (see Table 4-8).

within the process) and external events (those initiating outside of the process) were considered. Ultimately, four new classes of accidents were identified:

- *Aircraft Crashes into the PFS.* If an aircraft were to crash into the PFS, a fire could ensue and the agent adsorbed onto the filters could be released. Small, medium, and large aircraft are capable of causing different amounts of damage and were considered separately.
- *Carbon Filter Fires.* If the carbon in the PFS catches fire as a result of an external source, internal (adsorption or chemical) heating, or an explosion in the PFS, then the agent adsorbed onto the filters could be released.
- *High Humidity Desorption.* If the gas reheater were to fail to operate, the elevated humidity of the gases entering the carbon filters could lead to desorption of the adsorbed contaminants. (Subsequent analysis showed that this event would result in zero consequences; however, it has been retained for completeness.)

Table 4-10. Public Cancer Risk of PAS Upset Sequences

Description	Individual Risk (over facility life)	Societal Risk (over facility life)
MPFAGVP Risk with the PFS	1.2E-12	3.7E-09
MPFAGVP Risk without the PFS	<1.0E-12	9.6E-10
MPFARDL Risk with the PFS	<1.0E-12	< 1.0E-10
MPFARDL Risk without the PFS	<1.0E-12	< 1.0E-10
MPFNGAS Risk with the PFS	<1.0E-12	2.1E-10
MPFNGAS Risk without the PFS	<1.0E-12	1.3E-10
DFSNGAS Risk with the PFS	0	0
DFSNGAS Risk without the PFS	0	0
LICROOM Risk with the PFS*	0	0
LICROOM Risk without the PFS*	0	0
Total Baseline Processing Risk	<1.0E-12	1.3E-08

* Consequences were not calculated for an agent release into the LIC room because the frequency of this event (LICROOM) fell below the truncation limit (i.e., this sequence was screened).

- *High Temperature Desorption.* If the gas reheater were to fail such that it were on continuously, the elevated temperature of the gases entering the carbon filters could cause desorption of the adsorbed contaminants. (It has been decided that the gas reheater will be sized such that it is not capable of heating the gas stream to the point where the carbon would catch fire.)

[Seismic events were, of course, included in the list of external events. However, it was judged that the PFS components could be made robust enough to render seismic release scenarios unimportant to risk. This is already the case with the HVAC filters at the CDFs.]

4.3.2.1 Accident Frequency Evaluation

Different methods were used to estimate the frequencies associated with new PFS accidents, depending on the type of accident and the data available. The frequencies of aircraft crashes (small, medium, and large) into various structures at the UMCDF have been calculated in the baseline QRA. It was assumed in this study that the PFS filters would be

roughly the same size as the HVAC filters, and the frequency of aircraft crashes into the HVAC filters was used for the PFS filters as well. The conditional probability of fire given a crash was taken as 0.45, as in the baseline QRA. For the filter desorption accidents PFS system drawings and descriptions of system operation were used to develop stand-alone logic (fault tree) models. These models were then quantified using component data from the baseline QRA database and other industry sources.

Filter fires were considered to have four possible causes:

1. *Fires originating outside of the carbon beds that subsequently propagate to the filters.* Review of the PFS system layout and general arrangement drawings indicates no important internal ignition sources (the carbon filter units are located in a separate room which contains no high-voltage electrical sources or natural gas supplies). Transient fires (such as fires ignited by welding done during corrective maintenance) are a possibility; however, such fires are extremely unlikely given the low frequency of repairs that require welding and the low probability that proper safety precautions are not taken. The occurrence frequency of this initiator was considered to be much lower than that calculated for cause 4 below; therefore, it was not quantified explicitly.
2. *Heating of the carbon to above its ignition temperature by the gas reheater.* As mentioned previously, the reheater will be sized such that it is incapable of heating the process stream enough to cause ignition of the carbon.
3. *Explosions in the PFS during furnace startup.* Procedures call for the operators to bypass the PFS during startup. Failure to follow these procedures could result in a "puff" of natural gas reaching the PFS reheater, causing a fire or explosion. This could ignite the carbon. A prediction of the frequency of startups was made based on JACADS data, and a human failure event probability of 3E-03 per opportunity was used to generate an estimate of the explosion frequency.
4. *Spontaneous combustion of the carbon from internal heating.* If airflow through the filters is lost after they have been loaded to some extent with pollutants (including organics), spontaneous heating of the carbon can occur due to slow oxidation or continued adsorption. If this heat is not effectively dissipated, ignition of the carbon can occur. To account for this effect, data on spontaneous ignition of carbon in tests was obtained, and a probability distribution was constructed to estimate the conditional probability that, given a loss of airflow, ignition would occur. This was coupled with the loss-of-draft frequency discussed in Section 4.3.1 to produce an estimate of the frequency of spontaneous carbon ignition.

Once the event frequencies had been calculated as described above, it was necessary to adjust these frequencies to account for the probability that chemical agent was on the filters at the time of the accident. In the UMCDF baseline QRA (SAIC, 1996a), the frequency of the

upset that led to agent being present on the filters was assumed to be that associated with the *most frequent* potential PAS release (8.9E-06 per hour of operation, or an average probability of 0.09 over the operational life of the facility). This could tend to overestimate the risk impact of these new accidents, since the probability of agent contamination could be much less. However, it is shown in Section 4.3.2.3 that, even with this approximation, the risk impact of these new accidents is not significant. Therefore, no refinement of the approach is necessary. The resultant frequencies for each of the new accidents are summarized in Table 4-11.

4.3.2.2 Accident Consequence Evaluation

The chemical agent source terms for the new PFS accident sequences also depend upon the upset that led to agent being present on the filters in the first place. As an approximation, the quantity of agent (and the associated heath consequences) from the PAS release sequence with the greatest consequences is used as the source term for the new PFS releases. This involves a release from the MPF PAS during HD ton container processing. The mean agent source term to the environment from this accident is 0.30 lb_m of HD. As with the frequency approximation introduced in Section 4.3.2.1, this could tend to overestimate the impact of these accidents because much less agent could be present on the filters. However, it is shown in the next section that the risk impact of the new sequences is not significant and that no refinement of the approach is necessary.

Table 4-11. Frequencies of New PFS Accidents

Accident	Frequency (per year)	Frequency [with agent present on filters] (per year)*
Aircraft Crash into the PFS w/fire		
Large aircraft	4.5E-09	4.0E-10
Medium aircraft	2.2E-07	1.9E-08
Small aircraft	1.7E-07	1.5E-08
Carbon Filter Fires	1.2E-02	1.0E-03
Filter Desorption		
High humidity	5.6E-01	5.0E-02
High temperature	1.1E-08	9.3E-10

* Represents the accident frequency multiplied by the average conditional probability of agent contamination over the time between changeouts (0.09; changeout prior to commencing a new agent campaign). The overall filter fire frequency was formed as a combination of these individual contributors.

Subsequent analysis of the high humidity filter desorption sequence concluded that this event would not result in any consequences. The ERDEC carbon filter model was used to evaluate the following conditions to predict the timing and quantity of agent desorbed in the high-humidity release accident:

- HD loading on the filters at detection limit for 144 weeks
- 100 percent relative humidity suddenly introduced to the filters
- Upset conditions persist for one hour

The results showed that the amount of agent released was essentially zero. Similar results were obtained for GB and VX. Therefore, no agent would be released from the filters to the environment for a high humidity event.

4.3.2.3 Risk Results

The new accidents described in Section 4.3.2 represent risks not present in the baseline QRA. Therefore, they result in an increase in the risk of operating the facility. To put this risk increase in perspective, the comparison shown in Tables 4-12 and 4-13 have been developed. Table 4-12 deals with public acute fatality risk, while Table 4-13 shows public cancer risk. Each table shows: (1) the risk associated with the new accident sequences, and (2) the overall baseline processing risk from all accidents in the QRA (shaded). Two risk measures are presented: risk to those members of the public closest to the UMCDF site boundary (individual risk), and risk to the public as a whole (societal risk).

Table 4-12. Public Acute Fatality Risk of New PFS Accidents

Description	Individual Risk (over facility life)	Societal Risk (over facility life)
Aircraft Crash into the PFS		
Large aircraft	0	0
Medium aircraft	0	0
Small aircraft	0	0
Carbon Filter Fires	0	0
Filter Desorption		
High humidity	0	0
High temperature	0	0
Total Baseline Processing Risk	1.2E-07	2.0E-05

Table 4-13. Public Cancer Risk of New PFS Accidents

Description	Individual Risk (over facility life)	Societal Risk (over facility life)
Aircraft Crash into the PFS		
Large aircraft	<1.0E-12	< 1.0E-10
Medium aircraft	<1.0E-12	< 1.0E-10
Small aircraft	<1.0E-12	< 1.0E-10
Carbon Filter Fires	<1.0E-12	< 1.0E-10
Filter Desorption		
High humidity*	0	0
High temperature	<1.0E-12	< 1.0E-10
Total Baseline Processing Risk	<1.0E-12	1.3E-08

* Note that subsequent analysis concluded that this event would result in zero consequences. It has only been retained for completeness.

Once again, it can be seen that the new accidents associated with the PFS result in no significant impact to the existing processing risks. In fact, in Table 4-12, the impact on the public acute fatality risks (both individual and societal) are seen to be identically zero. This means that the predicted doses from these releases for all population members under all sampled weather conditions were below the medically-established no-deaths threshold doses for the chemical agents in question. The primary reason for this result is that the quantities of agent released from the filters were extremely small (see Section 4.3.2.2).

4.3.2.4 Sensitivity Study on Filter Agent Loading

If agent were assumed to be present in the PAS exhaust stream at just under detection limits during processing, a different agent loading on the PFS filters would result, and no accidental release would be required to produce this loading. A sensitivity study was performed on the risk impact of assuming agent loading onto the PFS carbon at the detection limit concentration. For consistency with the PFS HHRA, the detection limit concentration is set equal to the ASC (i.e., 0.3 $\mu g/m^3$ for GB and VX, and 30 $\mu g/m^3$ for HD).

Using the events and frequencies described in Section 4.3.2, adjustments were made to account for the assumed agent loading. Table 4-14 summarizes the average quantities of agent potentially present on the PFS carbon filters at detection limits. Agent loads were calculated based on the detection limit, the common stack volumetric flow rate, and the expected number of operating hours for each agent type. The average quantity is estimated as one-half of the total emission (at stack alarm concentration) over the life of the facility.

Table 4-15 shows the results of the risk calculations assuming agent loading at detection limits. Also shown (for comparison purposes) are the baseline processing risk results and the "original" estimate of the overall effects of the PFS (the combined estimates from Sections 4.2 through 4.3.2.3). The individual and societal fatality risk changes are similar for the original PFS analysis and the sensitivity study. The societal cancer risk change is slightly higher for the sensitivity study, but the baseline cancer risk is very low to begin with (1.3E-08).

Table 4-14. Agent Loads on the PFS: Sensitivity Study

Agent	Loading of PFS at Detection Limits (lb_m)
GB	0.23
VX	0.079
HD	7.47

Table 4-15. Sensitivity Analysis Results on Filter Agent Loading

	Public Individual (Ring 2)		Public Societal	
	Fatality Risk	Cancer Risk	Fatality Risk	Cancer Risk
Risk (sensitivity study)	<1E-12	3.4E-12	<1.0E-10	4.0E-09
Risk (original estimate)	<1E-12	1.2E-12	<1.0E-10	3.8E-09
Total Baseline Processing Risk	1.2E-07	<1.0E-12	2.0E-05	1.3E-08

4.3.3 Effects on Stockpile Storage Risk

It was shown in Section 4.1.2.2 that the fatality risks of continued storage at the UMCDF are greater than those of processing when put on common terms (i.e., on a per-year-of-activity basis). In fact, for the public individual acute fatality risk measure, the risk of continued storage exceeds that associated with processing by a factor of 90 (see Table 4-3). This implies that any processing delays that result in extension of the stockpile storage period are very undesirable. For example, a delay of only 13 days at the beginning of processing would produce an individual public fatality risk increase equal to the total risk of 3.3 years of processing (the planned operating life of the facility). The following paragraphs identify ways in which the PFS could result in delays in disposal processing.

The PFS is expected to increase facility downtime due to the presence of extra system components that must be repaired and maintained. This increased downtime translates into a delay in agent processing and, hence, an increase in the stockpile storage duration. Fault tree models have been constructed to estimate the magnitude of this increase. The results indicate that a 229-hour (10-day) extension to the 3.3-year operational period can be expected. The mean individual public acute fatality risk (2-5 km ring) *from storage during baseline processing* is 4.6E-06, or an average value of 1.4E-06 per year over the facility life. Using this value, the 229-hour delay translates into a mean individual public acute fatality risk (2-5 km ring) of 3.6E-08. For comparison, the corresponding risk for 3.3 years of processing is 1.2E-07. Therefore, the predicted risk *increase* due to processing delays caused by the PFS is equal to approximately 30 percent of the *total* risk from processing without the PFS. The net effect on cancer risk would be less pronounced, since the cancer risks for processing and storage are similar (see Table 4-3).

The disposal process could also be delayed as a result of the RCRA modification process or possible public backlash associated with a proposed change to remove the PFS. Any delay in the disposal process will result in increased storage time and therefore increase risk. As identified above, a delay of 13 days adds risk that is equivalent to the total individual public acute fatality risk of processing.

In addition, if a stack release were to occur on a system design that did not include the PFS which could have been prevented by the PFS, the process could be shutdown for a considerable period of time. As discussed in paragraph 4.3.2.1, the frequency of the *most frequent* PAS release was 8.9E-06 per hour of operation, or an average probability of 0.09 over the operational life of the facility.

4.3.4 Effects on Hazardous Waste Disposal

The PFS will result in solid waste streams not present in the baseline process, namely spent carbon, HEPA filters, and prefilter material from the PFS. A preliminary analysis of the amount of waste generated from the PFS indicated that there would be a 0.2 percent increase in hazardous waste produced, relative to the baseline process (Army, 1994). That analysis assumed that the spent filter material would be incinerated onsite and that the remaining ash (uncontaminated) would be disposed of offsite. At the present time, the actual method for disposing of contaminated carbon has not been determined. If no on-site treatment of the spent filter material were to take place, then this waste stream would be composed of solid filter material, rather than ash, containing scrubbed combustion products.

As reported in the *Alternative Demilitarization Technology Report for Congress* (Army, 1994), it is considered likely that if the PFS-generated wastes are not incinerated, they would need to be disposed of in a RCRA hazardous waste landfill, due primarily to the presence of metals collected during the filtration process. It is possible that only the HEPA filters and the prefilters would be sufficiently contaminated; however, this would have to be determined by actual testing of spent filter material. If some type of process upset were to occur such that chemical agent reached these filters, agent contamination could be a problem as well. Agent-contaminated filters would need to be disposed of similarly to those for the HVAC filtration system.

The waste disposal process itself has associated risks. Because the proposed PFS filters act to concentrate combustion products from the incineration process (as well as any accidental agent releases), the potential exists for (1) accidents that could occur during changeout and temporary on-site storage of the spent filters, (2) accidents that could occur during on-site disposal, if such disposal takes place, and (3) accidents that could occur during transportation to an off-site disposal location, if off-site disposal is implemented. These accidents could expose workers and the public to concentrated contaminant releases.

4.3.4.1 PFS-Related Solid Waste

To evaluate the potential risks associated with PFS-related solid waste disposal, quantitative estimates of the volume of solid waste that would be generated at the UMCDF have been made. These estimates update the material presented in a previous report (Appendix E, Section 3.2.3 of Army, 1994), but on a site-specific basis for the UMCDF. The new analysis used the latest information on (1) stack release rates for the various contaminants of concern and (2) HEPA and carbon filter efficiency in removing these contaminants in order to determine the quantity of solid waste that is likely to be generated. The time between HEPA filter changeouts is estimated to be approximately 100 hours, based on the HEPA capacity and particulate loading rates. Carbon changeout is assumed required prior to commencing a new agent campaign and at the end of the facility operating period. The results are summarized in Table 4-16, where the PFS is shown to cause a 1.6 percent increase in the total volume of waste from the facility.

4.3.4.2 Solid Waste Disposal Process

The waste streams from the PFS fall into two categories: (1) spent HEPA filters and prefilters that contain particulate and (2) spent carbon that contains adsorbed gaseous pollutants and, potentially, small quantities of chemical agent. Process Operational Diagrams (PODs) showing the steps involved in the agent disposal process and the possible accident initiators that could occur at each step have been utilized successfully in the baseline QRAs. Similar diagrams were developed for the assumed PFS spent carbon disposal HEPA/prefilter disposal processes (SAIC, 1997). Textual descriptions of the waste disposal processes modeled in the PODs are provided on the next page.

Table 4-16. Comparison of Baseline and PFS-Related Solid Wastes Generated Over the Operational Life of the UMCDF

Baseline Waste (tons)	18,300
PFS Waste (tons)*	
Front-End Filter Particulate	25
Spent Carbon	270
Percent Increase in Waste Over Baseline*	1.6 percent

* HEPA/prefilter changeout every 100 operating hours; carbon changeout prior to commencing a new agent campaign and at the end of the facility operational period (total of six changeouts).

- *Spent Carbon Disposal.* When carbon changeout is required, the spent carbon from the filter units is discharged into approximately sixty-eight 55-gallon drums per unit. The drums are monitored to ensure that the filter material is not agent-contaminated. If the material is agent-contaminated, then it is disposed of in the same manner as the HVAC carbon filters. Uncontaminated drums are transported by forklift to waiting flatbed trucks and are subsequently moved to a temporary onsite storage location (possibly a vacant or partially occupied igloo). Once at the storage location, the drums are taken by forklift into the structure, where they may be stored for less than 90 days, and transported to a RCRA-approved landfill.
- *HEPA and Prefilter Disposal.* When HEPA/prefilter changeout is required, the filters are removed and overpacked with protective plastic bags. The bags are placed in containers and are monitored to ensure that the filter material is not agent-contaminated. If agent contamination is detected, then the material is disposed of in the same manner as the HVAC carbon filters. Uncontaminated material is transported by forklift to waiting flatbed trucks and is subsequently moved to a temporary onsite storage location (possibly a vacant igloo). Once at the storage location, the containers are taken by forklift into the structure, where they may be stored for less than 90 days, and transported to a RCRA-approved landfill.

4.3.4.3 Risk Evaluation Process

There are a number of points within the disposal process at which a release from the filter material could take place. An accident during the initial changeout activities is one possibility. A fire within the temporary storage facility could burn the combustible carbon, potentially releasing concentrated contaminants to the atmosphere. Such a fire could happen as the result of an external event, such as an aircraft crash or a lightning strike, or it could be initiated by other causes including faulty electrical wiring. If it is decided to dispose spent filter material offsite, accidents during the transportation to a disposal location also have the potential to release concentrated contaminants. These accidents could expose members of the public other than those near the site to such releases, depending on the transportation route and the location of the landfill. However, because the hazardous material is adsorbed onto the carbon, an energetic event, such as a fire or an explosion, would be necessary to cause a substantial release.

The PODs described in Section 4.3.4.2 were used to identify the various steps in the process where an accident could lead to a release. To assess the relative risks associated with each release scenario, the System Safety Risk Assessment (SSRA) methodology from the PMCD *System Safety Management Plan* (SSMP) (Army, 1998) has been employed. In this approach, each initiator is assigned a frequency category (A [frequent] through F [rare]) and a hazard severity category (I [catastrophic] through IV [negligible]), depending on the frequency of occurrence and the severity of the consequences. These two categories are then combined to yield a risk assessment code (RAC) between 1 and 4. A RAC of 4 indicates a negligible risk, and a RAC of 3 is generally considered acceptable (with controls). To aid in the assignment of the frequency category, information from the UMCDF QRA (SAIC, 1996a) concerning similar activities was utilized. Additional details regarding the SSRA methodology are provided in the SSMP (Army, 1996b).

There are several reasons why the SSRA methodology (rather than a QRA-type approach) was used to evaluate the risk from PFS-related solid waste disposal. First, there is no analogous risk calculated in the UMCDF baseline QRA to compare with. Second, the health consequences from agent and non-agent exposures during disposal process accidents are difficult to quantify with accuracy. Unlike the Gaussian plume downwind transport modeling performed for the QRA, many of the potential exposures in the disposal process occur as a result of limited localized releases (e.g., brushing against contaminated material or inhaling contaminated carbon particulate).

In the PFS solid waste disposal risk analysis discussed in this section, both agent and non-agent releases were considered, as were health effects to both the public and the workers. (This is in contrast to the other QRA analyses described earlier which consider only agent releases.) Because the solid waste analysis is quite different, some general comments on the potential for public/worker exposures are offered. The HEPA filters and prefilters capture contaminants in particulate form, primarily by impaction and direct interception for larger particles (> 1 μm) and by diffusion and electrostatic attraction for smaller ones (< 1 μm). The carbon filters capture gaseous contaminants by adsorption. In both cases, the collected material is physically retained by the filter, and some external initiator is required to cause a release. Possible initiators include impact (e.g., dropping or jarring the filters), elevated temperature (desorbing the adsorbed substances), or fire.

Impacts involving the filter material could potentially release some of the collected substances, especially for the HEPA filters and prefilters. However, the amount of material released from such impacts is expected to be small. A U.S. Department of Energy (DOE) report (DOE, 1994), conservatively estimates that 0.05 percent of the HEPA contents could be released. These small releases are judged to have no potential for causing offsite health effects (hazard severity category IV for the public). Workers in the vicinity are expected to be wearing appropriate Personal Protective Equipment (PPE), and the possibility of exposure will be minimal. If the PPE fails, Hazard Severity Category I is applied if agent is present; Category III is applied if agent is not present.

Elevated temperature could lead to the release of trapped materials, but the operating temperature of the PFS gas stream is 160°F, so the temperature would need to be above this value. If the filter material is placed in the direct sun for an extended period, heating to above 160°F is possible. The release from such events is judged to be small, and they are considered to have no potential for causing offsite health effects (Hazard Severity Category IV for the public). Workers in the vicinity are again expected to be wearing appropriate PPE. If the PPE fails, Hazard Severity Category I is applied if agent is present; Category III is applied if agent is not present.

Fires involving the filter material are considered the only credible mechanism for releasing a significant amount of contaminants to the environment. The fire itself will act to destroy many of the captured substances, and in the UMCDF baseline QRA (SAIC, 1996a), release fractions between 2.5 percent and 10 percent were used for the release of adsorbed chemical agent from carbon. If a fire involving the filter material were to occur, both onsite and offsite health effects are possible. Hazard Severity Category I is conservatively applied for the workers. Due to the distances involved, the potential hazard severity is much less for the public, and Category III is assigned.

4.3.4.4 Risk Results

Using the SSRA methodology, RACs were assigned to each of the accident scenarios identified in the PODs. These RACs are shown in Table 4-17 for the public and Table 4-18 for the worker.

Based on these results, it is concluded that the risk impact of the disposal of solid waste from the proposed PFS is not significant. Using the SSRA RAC methodology, all accident sequences were assigned worker and public RACs of either 4 (negligible risk) or 3 (acceptable with administrative controls).

The current analysis assumes that the uncontaminated spent filter material will be transported offsite for ultimate disposal. If, instead, the waste was treated onsite in the DUN, the volume of additional waste would be reduced. The offsite transportation would be replaced by additional onsite transportation and handling activities. These activities are not expected to result in a risk increase over the offsite transportation case, and the conclusions above are expected to remain valid.

4.4 Risk to Workers

One aspect of worker risk, namely that associated with the disposal of PFS-related solid wastes, has already been discussed in Section 4.3.4. In that section, it was concluded that the PFS would not create a significant worker risk from waste disposal accidents. Workers can also be affected by the accidents described in Sections 4.2, 4.3.1, and 4.3.2. This section addresses those impacts.

Table 4-17. Public Risk Results for PFS-Related Waste Disposal

Scenario	Estimated Frequency (per year)	Hazard Frequency Category	Hazard Severity Category	RAC
Release During Discharge	2.9E-01	A	IV	3
Agent on Filters; Monitoring Fails	3.0E-06	E	IV	4
Impact/Drop During Forklift Operations	5.8E-01	A	IV	3
Release During Onsite Transportation with Fire	1.8E-07	F	III	4
Release During Onsite Transportation without Fire	1.1E-05	E	IV	4
Release During Offsite Transportation with Fire	3.7E-05	E	III	3
Release During Offsite Transportation without Fire	2.3E-03	C	IV	4
Earthquake with Fire	≤ 2E-06	E	III	3
Earthquake without Fire	≤ 2E-04	D	IV	4
Tornado	≤ 5E-08	F	n/a	4
Fire	< 1E-03	D	III	3
Aircraft Crash	≤ 1E-07	F	III	4

n/a: not assessed; in this case, the consequences of a tornado release are very uncertain, but all frequency category F sequences are assigned a RAC of 4, so an assessment of the consequences was not necessary.

Table 4-18. Worker Risk Results for PFS-Related Waste Disposal

Scenario*	Estimated Frequency* (per year)	Hazard Frequency Category	Hazard Severity Category	RAC
Release During Discharge	8.7E-04	D	III	3
Agent on Filters; Monitoring Fails; Workers Exposed	9.1E-09	F	I	4
Impact/Drop During Forklift Operations	1.7E-03	C	III	3
Release During Onsite Transportation with Fire	1.8E-08	F	I	4
Release During Onsite Transportation without Fire	1.1E-06	E	III	3
Release During Offsite Transportation with Fire	3.7E-06	E	I	3
Release During Offsite Transportation without Fire	2.3E-04	D	III	3
Earthquake with Fire	≤ 6E-09	F	I	4
Earthquake without Fire	≤ 6E-07	F	III	4
Tornado	≤ 5E-08	F	n/a	4
Fire	< 3E-06	E	I	3
Aircraft Crash	≤ 1E-07	F	I	4

* Note that the scenario frequency in many cases includes the conditional probability of worker exposure given a release (i.e., the probability of PPE failure).

n/a: not assessed (see Table 4-17).

The UMCDF Phase 1 QRA (SAIC, 1996a) does not include an assessment of the risk to workers from accidental agent releases during processing, whereas the TOCDF Phase 2 QRA (which is used as a model for this section) does include such an assessment (SAIC, 1996b). The UMCDF Phase 2 QRA will include worker risk. The TOCDF QRA divides the site workforce into two groups:

- *Disposal-related workers (DRWs)*—persons who work within the TOCDF or the Area 10 (storage yard) security fences, or in offices just outside those fences;

- *Other site workers (OSWs)*—all other persons within the depot boundary (exclusive of the DRWs).

Consequences are evaluated separately for each group and are then combined to yield the total worker risk. The primary reason for this division is that DRWs can be affected "directly" by accidents, whereas OSWs can be affected only if downwind transport of agent exposure does not "involve" significant outdoor downwind transport (e.g., splashing from a ruptured munition, airborne transport within a small room, dissemination by a nearby munition detonation, etc.). "Indirect effects" are those resulting from downwind agent transport to either DRWs or OSWs. DRWs can also be exposed to chemical agent from accidents during maintenance. The total worker risk is calculated as follows:

$$\begin{aligned}\text{Total Worker Risk} = {} & \text{DRW Direct Effect Risk} + \text{DRW Indirect Effect Risk} \\ & + \text{DRW Maintenance Risk} + \text{OSW Indirect Effect Risk}\end{aligned}$$

The results of the TOCDF baseline QRA indicate that the total worker risk is dominated by DRW maintenance and DRW direct effects. Downwind transport of accidental releases to OSWs contributes much less than 1 percent to the total worker risk. The mean worker risks from processing in the TOCDF baseline QRA are summarized in Table 4-19 (SAIC, 1996b).

The accident sequences that dominate the worker risks in the TOCDF baseline QRA are shown in Table 4-20 (SAIC, 1996b). As with public risk, the dominant contributors are sequences that would not be influenced by the PFS. The single exception is MPFAGVP (agent vapor explosion in the MPF), which accounts for approximately 3 percent of the total worker fatality risk.

Table 4-19. Mean Worker Risks from Processing in the TOCDF Baseline QRA

Risk Category	Risk Value (per year of processing)	Risk Value (over facility life)
Individual Worker Fatality Risk	5.7E-05	4.1E-04
Societal Worker Fatality Risk	1.8E-02	1.3E-01

Table 4-20. Dominant Worker Acute Fatality Risk Contributors for Processing at the TOCDF

Scenario	Percent of Total Worker Risk
Accidents During Maintenance	44
Earthquakes	36
Handling Accidents	6
MPFAGVP	3
Munition Accidentally Sent to MPF	3
Other	8

The results of the TOCDF baseline QRA indicate that the total worker risk is dominated by DRW maintenance and DRW direct effects. The same maintenance activities will be required at TOCDF and UMCDF, so the maintenance risk will be much the same. In addition, the DRW direct effects risk depends primarily upon the number of workers in the immediate vicinity of an accident, rather than on downwind agent transport. This, too, will be relatively site-independent. The mix of munitions at the two sites is comparable; therefore the same types of processing and handling accidents are possible. This implies that the impact of the PFS on worker risk at the TOCDF can be used as a reasonable guide to qualitatively evaluate the corresponding impact at the UMCDF.

The worker risk results from the TOCDF PFS QRA are shown in Table 4-21. These results indicate that the PFS will not result in a decrease of the risk to workers from accidental agent releases. Instead, an 8 percent increase in the worker acute fatality risk is predicted for the TOCDF. This is due primarily to the potential increased frequency of agent vapor explosions in the MPF due to loss of ID caused by filter plugging and inadvertent damper closure within the PFS. The resultant potential explosion can cause worker fatalities if personnel are nearby. It is judged that a similar impact on worker risk would be calculated for the UMCDF. Based on the risk values presented in Table 4-22, the increase in worker fatality risk due to increased frequency of existing accidents is 2.5E-05 over 3.3 years of UMCDF operation. This translates to a 13 percent increase in the worker fatality risk for the UMCDF.

Table 4-21. Worker Risk Impact of the PFS in the TOCDF QRA (Individual Acute Fatality Risk)

Description	Worker Risk (over facility life)
Risk of PAS Releases with the PFS	0*
Risk of PAS Releases without the PFS	3.4E-09*
Risk of PAS Upsets with the PFS	3.3E-05*
Risk of PAS Upsets without the PFS	1.1E-05*
Risk of New PFS Accidents	1.4E-09*
Total TOCDF Baseline Worker Risk (All Campaigns)	4.1E-04

* Based on Campaigns 6-13 only (4.3 years)

4.5 Uncertainty in Risk

The baseline UMCDF Phase 1 QRA does not include an assessment of the uncertainties in the calculated risks. That is, the results are *point estimate* values—single predictions that are intended to represent *best estimates* of the true risks. In contrast, the QRA for the TOCDF is a Phase 2 assessment that includes a detailed estimate of the uncertainties in the risks (SAIC, 1996b). The UMCDF Phase 2 QRA will include an uncertainty analysis. In this section, the TOCDF baseline QRA uncertainty analysis results are used to qualitatively evaluate the potential implications of uncertainty on the UMCDF PFS QRA.

4.5.1 Baseline Accidents

Table 4-22 presents a comparison of the mean public societal acute fatality risks at TOCDF and UMCDF for (1) the accident sequence groups affected by the PFS and (2) all processing accidents. One can see that the risks are slightly higher for the TOCDF and that, for both sites, the affected sequences are not significant contributors to the processing risk. This is a reasonable indicator that, at least on a general scale, the impact of the uncertainty will be similar for the two sites for these accidents.

Table 4-22. Comparison of Mean Public Societal Acute Fatality Risk in the Baseline TOCDF and UMCDF QRAs

	Public Societal Acute Fatality Risk (over facility life)	
Accidents	TOCDF	UMCDF
All Processing	1.3E-4	2.0E-5
PAS Releases	0.0	0
MPFAGVP	< 1E-10	< 1E-10
MPFARDL	1.9E-10	< 1E-10
MPFNGAS	< 1E-10	0
DFSNGAS	3.3E-10	4.0E-10

Table 4-23 shows a comparison similar to that in Table 4-22, but this time the risk measure is public societal cancers. Again, the risks are slightly higher at the TOCDF, and the relative contributions of the accidents affected by the PFS are similar for both sites. One of these accidents, MPFAGVP, does contribute to the cancer risk from processing, and this

Table 4-23. Comparison of Mean Public Societal Cancer Risk in the Baseline TOCDF and UMCDF QRAs

	Public Societal Cancer Risk (over facility life)	
Accidents	TOCDF	UMCDF
All Processing	2.3E-8	1.3E-8
PAS Releases	1.0E-10	< 1E-10
MPFAGVP	3.9E-10	9.6E-10
MPFARDL	< 1E-10	< 1E-10
MPFNGAS	< 1E-10	1.3E-10
DFSNGAS	< 1E-10	0

contribution is more pronounced at the UMCDF than the TOCDF. Overall, it is again judged that the uncertainty results at TOCDF can be used to qualitatively estimate the impact of uncertainty on the UMCDF PFS QRA.

Table 4-24 shows the distributions on public societal acute fatality risk for (1) the accident sequence groups affected by the PFS and (2) all processing accidents. These results are from the TOCDF baseline QRA without the PFS. Looking at the 5th and 95th percentile information, it is observed that the 95th percentile values for the five groups of sequences affected by the PFS are *over four orders of magnitude less* than the 5th percentile processing risk value (these values are shaded in the table). As described in Section 4.3.1, the PFS would shift the means of the four negatively affected sequences up by far less than one order of magnitude (this is true for both the UMCDF and the TOCDF), and no significant broadening of the distributions would be expected. The impact of the PFS on societal risk, if any, should be less than the uncertainty associated with processing risk. Therefore, the conclusion that the impact of the PFS on societal fatality risk would be insignificant at the TOCDF is confirmed when uncertainty in the risk estimate is considered. The similarity in the relative risks shown in Table 4-22 suggests that this would be the case at the UMCDF as well.

Table 4-25 presents information similar to Table 4-24, this time for societal cancer risk. In this case, the 95th percentile values for the groups of sequences affected by the PFS are also below the 5th percentile processing risk value (the values are shaded in the table). The sequence group with the highest 95th percentile (MPFAGVP; 1.3E-09), is still a factor of four lower than the processing 5th percentile (5.3E-09). This confirms the conclusion that, at the TOCDF, the impact of the PFS on societal public cancer risk is not significant. From

Table 4-24. Comparison of Distributions on Public Societal Acute Fatality Risk in the TOCDF Baseline QRA

	Public Societal Acute Fatality Risk (7.1 years of operation)		
Accidents	Mean	5th Percentile	95th Percentile
All Processing	1.3E-4	2.0E-5	4.4E-4
PAS Releases	0.0	0.0	0.0
MPFAGVP	< 1E-10	0.0	< 1E-10
MPFARDL	1.9E-10	0.0	4.9E-10
MPFNGAS	< 1E-10	0.0	< 1E-10
DFSNGAS	3.3E-10	< 1E-10	8.7E-10

Table 4-25. Comparison of Distributions on Public Societal Cancer Risk in the TOCDF Baseline QRA

	Public Societal Cancer Risk (over facility life)		
Accidents	Mean	5th Percentile	95th Percentile
All Processing	2.3E-08	5.3E-09	5.4E-08
PAS Releases	1.0E-10	< 1E-10	2.2E-10
MPFAGVP	3.9E-10	< 1E-10	1.3E-09
MPFARDL	< 1E-10	< 1E-10	< 1E-10
MPFNGAS	< 1E-10	< 1E-10	2.1E-10
DFSNGAS	< 1E-10	< 1E-10	< 1E-10

Table 4-23, it can be seen that the contribution of MPFAGVP to this risk is more pronounced at the UMCDF than at the TOCDF (7 percent versus under 2 percent). Even so, it is judged that consideration of uncertainty would not alter the conclusions about the effects of the PFS on accidents already modeled in the UMCDF baseline QRA—namely, that the impact on societal cancer risk would be small.

4.5.2 New PFS Accidents

In the TOCDF PFS QRA, the public acute fatality risks associated with releases *from* the PFS were identically zero. This means that even with the probabilistic treatment of weather in the QRA, the doses to all individuals in the surrounding population were below the no-deaths threshold in all uncertainty runs. Therefore, within the uncertainty analysis framework used in the TOCDF baseline QRA, these new sequences would have no impact at all on the public acute fatality risk distribution for processing. This would also be the case at the UMCDF, where the mean public acute fatality risks associated with releases from the PFS were also identically zero.

At the TOCDF, the public cancer risks due to releases from the PFS were less than 1E-10 over the facility life, and Table 4-26 presents the distributions on this risk measure for (1) the new PFS accident sequences, and (2) all baseline processing accidents at the TOCDF. The 95^{th} percentile values for the six new sequences are all below 1E-10, so the impact of these sequences is again seen to be insignificant. This should also be the case at the UMCDF because the corresponding mean risks from such sequences were also below 1E-10.

Table 4-26. Distributions o
Accidental Agent Releases from the P

Accidents	Mean	
All Processing	2.3E-08	
Large Aircraft Crash w/fire	< 1E-10	
Medium Aircraft Crash w/fire	< 1E-10	
Small Aircraft Crash w/fire	< 1E-10	
Carbon Filter Fire	< 1E-10	<
Filter Desorption – High Humidity	0.0	0.
Filter Desorption – High Temperature	< 1E-10	< 1E-10

4.5.3 Limitations in the TOCDF Uncertainty Analysis

The uncertainty methodology employed in the TOCDF baseline QRA is a st process involving sophisticated Monte Carlo sampling procedures. Uncertainties i accident initiator occurrence frequencies, the conditional probabilities of successive and the quantities of agent potentially released in accidents are considered. Neverthele some sources of uncertainty are not treated, including uncertainty in the parameters affe the downwind transport of agent and in the dose/response behavior of the population. The evaluation of uncertainty regarding the effects of the PFS is, therefore, made within the existing QRA uncertainty analysis framework and carries with it the same limitations (SAIC, 1996b).

4.5.4 Conclusions

Based on the TOCDF uncertainty analysis and on similarities between the TOCDF and UMCDF baseline QRA results, it is likely that conclusions regarding the impact of the PFS on public acute fatality risk at the UMCDF would remain unchanged.

4.6 Summary of PFS Impacts on Accident Risk

Based on the analyses presented in this section, the only change in QRA risk associated with the PFS is the potential for a delay in munition disposal. A delay in disposal translates to an increase in the munition storage period and consequently an increase in risk. Disposal could be delayed as a result of increased furnace/PAS system unavailability due to the PFS. It could also be delayed by the RCRA permit process associated with a change to remove the PFS. Furthermore, the process could be stopped and disposal could be delayed if a stack release were to occur on a system design that did not include the PFS.

Even though this evaluation was based on a preliminary design of the PFS, no change in the overall conclusion would be expected from changes to the PFS design. Small changes in risk may result from design refinements; however, the results show that operation of the PFS has almost no impact on risk. Consequently, the overall conclusion would not be expected to change.

In addition, the uncertainty analysis described in Section 4.5 (based on that done at the TOCDF) shows that it is likely that conclusions regarding the impact of the PFS on public acute fatality risk at the UMCDF would remain unchanged.

Section 5

Evaluation of Other Factors

Information presented in Sections 3 and 4 shows that the proposed change to remove the PFS at the UMCDF meets regulatory requirements and has an insignificant impact on public- and worker-safety objectives. The PFS costs of construction, operations and maintenance, as well as its impact on the overall schedule for destroying the munitions stockpiled at Umatilla, also need to be considered in providing the overall framework for the Army's decision on the PFS. Furthermore, the implications of the results of the human health and safety risk assessments presented in Sections 3 and 4 need to be examined from the context of risk management in order to assist the Army in making the most appropriate judgment with respect to the value of the PFS. This section addresses each of the above factors.

5.1 Schedule Analysis

The schedule for destruction of the stockpile at the UMCDF could be affected no matter which decision is finally made on the PFS installation, for the following reasons:

- If the PFS is installed as is currently planned, there would be no permit-related delays because the PFS is already included in the RCRA-permitted design. However, as discussed in Section 4, the PFS unavailability causes a small delay in the overall disposal of the stockpile.
- If the PFS is removed from the current design, there could be schedule delays related to approving the RCRA permit modification.

In the present situation, the operational impact of implementing the PFS, due to downtime, has been estimated at 10 days over the life of the facility (Section 4.3.3). In addition, there is added schedule risk associated with systemization of the PFS into the UMCDF. Integration of the PFS into the systemization schedule will not be done until late in the second quarter of fiscal year 1999. While no impact on schedule as a result of this has been identified as yet, there remains the risk that systemization may indeed lead to some schedule slippage.

Removal of the PFS from the design of the UMCDF would mean that there would be no operational impact due to the PFS, but there is potentially large uncertainty in the disposal schedule depending on the RCRA permit modification process. This uncertainty depends largely on how long it would take to obtain the necessary RCRA permit modification and whether a consensus for removing the PFS emerges during the public review process (which is part of the CMP). This schedule risk is difficult to quantify, but should such a delay occur, the UMCDF project would likely be delayed by possibly much more than the estimated 10-day delay associated with PFS unavailability. Furthermore, as discussed in Section 4, a delay in destroying the munitions stockpile extends storage risk. Based on the QRA, the individual risk from continued storage is about 2 orders of magnitude greater than the risk from munition processing operations (i.e., 3.3E-06 for continued storage vs. 3.6E-08 from processing). The impact of the uncertainty in the length of schedule delay has implications on the overall program that the Army must address in making a decision on this proposed change.

5.2 Cost Analysis

A limited cost analysis was performed for this study. Costs associated with the PFS are compared with those associated with removing the PFS taking into consideration the status of UMCDF construction as of August 1998.

5.2.1 PFS Costs

Costs associated with implementing the PFS at the UMCDF are presented in Table 5-1 and include the following:

- Capital and operating costs
- Additional facility operating and stockpile storage costs associated with any destruction schedule delay

Capital and operating costs for the PFS at the UMCDF have been estimated at between $60 and $70 million (Hopkins, 1998). This range is based on bid prices received for construction of similar units at the TOCDF and adjusted for several factors (the design has been modified since those bids were received, and the PFS at the UMCDF would be installed as the facility is built, which is less expensive than adding it later, as would be the case at the TOCDF).

Facility operating costs have been estimated at $250,000 per day, and stockpile storage costs at Umatilla have been estimated at $27,000 per day. Therefore, there is a cost associated with the PFS that amounts to $277,000 for every day that the PFS causes the destruction schedule to slip. The PFS is estimated to delay the schedule by 10 days, so the cost associated with this slippage is about $3 million.

Therefore, the total cost of implementing the PFS at the UMCDF is in the range of $63 to $73 million.

Table 5-1. Costs of the PFS at the UMCDF*

Type of Cost	Amount ($M)
Capital and Operating	60 to 70
Schedule delay	3
Total	63 to 73

* Source: Hopkins, 1998

5.2.2 Costs Associated with Removing the PFS

Several factors contribute to the total cost of removing the PFS. Because construction of the UMCDF is already well underway, the equipment cost of about $10 million will not be fully recovered. The unrecovered portion of the equipment cost is estimated as follows. Assuming that the equipment has an economic life of 10 years, and that since it has been procured, the Army stands to lose 1/10 of the equipment cost or $1 million.

There will be resources spent on the system redesign effort. For example, new drawings will be prepared on where remaining equipment will be located now that the PFS units are gone and what will be done with the area of the building originally housing the PFS units. In addition, the change will have to undergo a formal engineering change process (e.g., engineering and design configuration review, safety and environmental review, etc.). Furthermore, a permit modification application, including the necessary documentation providing the basis for the modification, will have to be prepared, reviewed and processed. Table 5-2 provides a summary of the major costs associated with removing the PFS.

5.2.3 Conclusions

By comparing the total PFS cost of $63 million to $73 million with the cost associated with removing the PFS of about $52 million to $102 million, it is clear that removing the PFS at the UMCDF could lead to a cost saving of as much as $21 million ($73M minus $52M) but could also increase total UMCDF cost by as much as $39 million ($102M minus $63M). The largest uncertainty associated with the cost estimate is the schedule delay in obtaining a RCRA permit modification.

Table 5-2. Costs Associated with Removing the PFS

Type of Cost	Amount ($)
Unrecovered equipment cost (assume total cost = $10M)	1,000,000
System redesign and review (assume 500 to 600 labor hours at $100/hr)	50,000 — 60,000
Engineering change proposal activities (assume 300 to 400 labor hours at $100/hr)	30,000 — 40,000
RCRA permit modification application activities (500 to 600 labor hours at $100/hr)	50,000 — 60,000
State permit review (including public hearing)	10,000
Stockpile storage costs (assuming 6 months to 1 year schedule delay)	50.5 — 101 M
Total Cost	$52 M — $102 M

5.3 Interpretation and Implications of the Risk Results

In Sections 3 and 4, the estimated risk results are presented as values that lie within a range or continuum. The portion of the risk continuum of greatest interest starts at a value of one and decreases to the limits of applicable methods to estimate a lower bound value. A value of one, referred to as 'unity' means there is a 100 percent (1 in 1) chance that the consequence being evaluated will occur. Although the consequence being evaluated always remains the same, as the chance of occurrence decreases, so does the risk.

At some level, the chance of occurrence becomes so small that the value judgment of the estimated risk changes from unacceptable to acceptable. Each entity at risk is considered a stakeholder in the process of determining the acceptability of the estimated risk. This does not mean that all stakeholders view a given level of estimated risk as either acceptable or unacceptable. An important example to illustrate this point is the measure of acceptable risk for the consequence of an increased incidence of cancer related to the UMCDF (as presented in Section 3). The ODEQ's approved risk threshold is 1 in 100,000 (1E-05) chance of occurrence. This is the primary criterion for increased cancer incidence in this valuation. The U.S. EPA concurs with this general level of acceptability but expresses its level of acceptability as a range between 1 in 10,000 to 1 in 1,000,000 (1E-04 to 1E-06). Any estimated risks below a 1 in 1,000,000 (1E-06) chance are generally viewed by regulators as acceptable.

Interpreting the meaning of these estimated risk values requires both an understanding of their magnitude relative to decision making thresholds (i.e., risk management) and an appreciation of the level of protectiveness incorporated in the models used to produce the estimates. For risks that are well understood it is generally possible to make fairly accurate estimations without substantially over- or under-estimating the results relative to reality. Estimating risks that are less well understood requires increasingly complex models to quantify, and the likelihood of over or under-estimating the result increases. When issues of human health, safety, the environment and significant economics are involved, the prudent approach requires that the model input values used to calculate risk result in estimations that are protective of the risk bearing entity (i.e., the public).

This protective approach produces results that are generally considered to be representative of high or possibly over-estimates of the actual risks. For the estimation of chronic human health risks in this report, the screening methods used were of such a nature. As can be seen, there is an intentional effort to estimate on the high side for the sake of protectiveness. This allows decisions to be made that are not dependent on knowing what the *actual risks* are but that whatever they might be they are very likely to be below the *estimated risk* value. How far the *actual risks* are below the *estimated risks* depends on how conservative (or protective) the model input values are and how many of these conservative inputs are entered into the model. The incorporation of these incremental 'safety factors' increases the magnitude of the estimated risks above the actual risk value that would be calculated if the risk assessor knew an exact value for each input.

This is the case for the PFS at the UMCDF. Section 3 has shown that, by using protective methods, estimated risks associated with operation of the UMCDF, either with or without the PFS, are well below the risk threshold established by the ODEQ. And, due to the level of protectiveness or conservatism associated with risk estimates as small as these, actual risks are likely to be significantly below estimated values.

The Army can utilize these results in a manner that applies risk management principles to make the most appropriate judgement with respect to implementation of the PFS. Sections 3 and 4 indicated that there is little technical value in including the PFS. However, due to the schedule uncertainties associated with an attempt to remove the PFS (Section 5.1), the Army may determine that overall risk may be adversely impacted, thus warranting continued inclusion of the PFS in the design of the UMCDF.

Section 6

Summary and Conclusions

6.1 HRA Results

Based on the results presented in Section 3, the established configuration for the UMCDF (with the PFS) achieves the state-approved thresholds for excess lifetime cancer risk and other health effects for all receptors (subsistence farmer, subsistence fisher, adult resident, and child resident). For example, the excess lifetime cancer risk for the subsistence farmer is 3.6E-06 (or about 4 in a million chance that a farmer living near the facility will contract cancer), as compared to the threshold value of 1E-05 (or 10 in a million chance that an individual living or working near the facility will contract cancer). The removal of the PFS does not change this conclusion.

Similarly, the removal of the PFS will not change the overall ecological risk assessment results. The facility operating without the PFS will still achieve the state-approved ecological risk thresholds.

6.2 HHRA Sensitivity Analysis

The comparative analysis using HHRA assumptions that more accurately reflect program conditions focused only on the receptor that has the greatest calculated risk. For the UMCDF, this is the subsistence farmer. Whatever insights are gained in the analysis of the risk to this receptor generally would also apply to the other receptors. The results indicate that, for the UMCDF subsistence farmer, the excess cancer risk from a facility that is configured without the PFS is 5.5E-08 (or about 5 in 100 million chance that an individual will contract cancer as a result of being exposed to pollutants emitted from the incinerator stacks) under a set of assumptions that more accurately reflect actual program conditions. The corresponding risk estimate for a configuration with the PFS is 3.2E-08 (about 3 in 100 million).

6.3 QRA and Hazard Evaluation Results

The results of the Phase 1 QRA performed for the UMCDF show that the risk is dominated by external events because they have the potential to result in large agent releases. The results also show that the risk associated with munition storage is significantly greater than that of disposal.

Based on the analyses presented in Section 4, the risk calculated using the QRA methodology for a PFS-fitted facility is not significantly different than the risk without

PFS. The PFS has minimal impact on public and worker risk associated with accidental release of agent. Specifically:

- The elimination of PAS chemical releases by the PFS results in essentially no reduction in the processing risk. PAS releases are insignificant contributors to processing risks, which are dominated by external event sequences.
- The increases in the frequencies of baseline accident sequences due to the presence of the PFS result in essentially no increase in the processing risk (individual and societal). Societal cancer risk increases by 38 percent, but this risk is very small in the baseline (1.3E-08). There are two reasons for this: (1) the affected accidents are not significant contributors to the overall risk; and (2) the addition of the PFS does not significantly raise the accident frequencies enough for them to be of concern.
- Accidents that would be peculiar to a PFS-fitted facility and that result in a release of chemical agent from the PFS do not significantly impact the overall risk associated with processing because (1) the frequencies of most of these accidents are very low, and (2) the quantity of agent potentially present on the filters is small, thus there is a low potential for adverse health effects.
- The increase in facility unavailability due to the PFS causes a small *increase* in the overall storage risk during processing by increasing the overall storage period. This is insignificant when compared to the combined risk of processing and storage during the disposal activities. It is also insignificant when compared to other factors that could delay disposal and increase the overall storage period, such as a requested change to the RCRA permit or a shutdown that would accompany a potential stack release for the design without the PFS.
- Based on the worker risk results for the TOCDF, the addition of the PFS would likely cause a small net increase in the worker fatality risk at the UMCDF. However, this result was not based on UMCDF-specific models. It is judged that the change in worker risk could be adequately controlled so that it remains small.
- The risks associated with the disposal of PFS-related solid waste are insignificant.

6.4 QRA Sensitivity Analysis

As part of the QRA, a sensitivity analysis was performed to determine the impact on risk if agent were assumed to be present in the PAS exhaust stream at just under the detection limit concentration. Using the events and frequencies described in Section 4.3.2, adjustments were made to account for assumed agent loading and the amount of time that releases from the PFS could occur (i.e., about 3 years of operation). The individual and societal fatality risk changes are virtually the same for the original PFS analysis and the sensitivity study. Therefore, the presence of the PFS has no effect on the overall QRA risk results.

6.5 Other Factors

The total cost of implementing the PFS at the UMCDF ranges from $63 million to $73 million. PFS downtime has an insignificant effect on the potential for delaying the schedule for disposing the munitions stockpile. However, the total amount of time the program could be delayed because of regulatory issues regarding a decision to remove the PFS could greatly outweigh any schedule delay presented by PFS downtime. The estimated costs to remove the PFS from the UMCDF design range from about $52 million to $102 million. Thus, removing the PFS could lead to a cost saving of as much as $21 million but could also increase cost by $39 million if, for instance, the RCRA permit modification were to delay the destruction schedule by one year.

6.6 Conclusions

Following the change management process laid out in Figure 1-2, the HRA results presented in this report conclude that the PFS at the UMCDF has an overall neutral value from a risk standpoint. While removing the PFS will slightly reduce the risk from normal emissions, the reduction is small and the state-approved risk threshold is still achieved. Additional evidence that the PFS at Umatilla has no overall effect on health risk results from the comparative analysis of the excess cancer risk estimates when factors that more accurately reflect program conditions are considered. The results, which were discussed earlier in Section 6.1, show that there is essentially no difference between the calculated cancer risk values for the configuration with and without the PFS, particularly when conservative assumptions in the original HHRA protocol are adjusted to reflect more accurate conditions.

The specific results of the PFS evaluation relative to the thresholds of acceptability as defined by ODEQ has been addressed in Section 5. As can be seen, whether or not the PFS is considered, the estimated HHRA risks fall below the threshold of acceptability defined by ODEQ. Moreover, the protective approach of the HHRA estimates health risks on the high side. How far the actual risks are below the estimated risks depends on the conservatism (or protectiveness) of the input values to the HHRA. Thus, whether the incremental benefit is worth achieving is subject to value judgement.

The Phase 1 UMCDF QRA was further re-evaluated to determine whether the PFS significantly affects the risks associated with accidental agent release as determined in the QRA. In addition, a hazard evaluation was performed to evaluate the risk associated with PFS solid waste disposal. The results of the QRA and HE indicate that the PFS does not lead to a net reduction in accident-related risks. Again, the differences in risk values are small and fall within the uncertainty associated with the QRA methodology. The only change in QRA risk associated with the PFS is the potential for a delay in munition disposal which translates to an increase in storage time, which, in turn, extends risk due to stockpile storage. Disposal could be delayed as a result of increased furnace/PAS unavailability due to the PFS. It could also be delayed by the permitting process associated with a proposed change to remove the PFS or a shutdown that would accompany a potential stack release from a design without the PFS. Similar to the argument presented for interpreting HHRA results, the small increase in QRA calculated risk that results from having the PFS is difficult to discuss with confidence because of the uncertainty in the estimates. Hence, the overall conclusion is that the PFS is QRA-risk neutral.

List of References

Department of the Army, 1988. *Chemical Stockpile Disposal Program Final Programmatic Environmental Impact Statement*, Program Manager for Chemical Demilitarization, Aberdeen Proving Ground, MD.

Department of the Army, 1994. *U.S. Army's Alternative Demilitarization Technology Report for Congress*, Program Manager for Chemical Demilitarization, Aberdeen Proving Ground, MD.

Department of the Army, 1998. *System Safety Management Plan for the Chemical Stockpile Disposal Program*, PMCD-R-385-2, Aberdeen Proving Ground, MD, to be published 1998.

Department of the Army, Office of the Surgeon General, 1996. Memorandum on "Interim Chronic Toxicological Criteria for Chemical Warfare Compounds".

Department of the Army, 1997. U.S. Department of the Army Program Manager for Chemical Demilitarization, *A Guide to Risk Management Policy and Activities*, Aberdeen Proving Ground, MD, May 1997.

Department of Energy, 1994. *Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities*, DOE-HDBK-3010-94, Washington, DC.

Ecology and Environment, Inc., 1996. *Pre-Trial Burn Risk Assessment for the Proposed Umatilla Chemical Demilitarization Facility,* Draft, Hermiston, OR.

EPA, 1994. U.S. Environmental Protection Agency, *Revised Draft of Risk Assessment Implementation Guidance for Hazardous Waste Combustion Facilities*, EPA Office of Solid Waste and Emergency Response, Washington, DC., May 1994.

Goldfarb A., G. Anderson, J. Mahle, and D. Croft, 1998. *Development of a Simulation Model for a Pollution Abatement Carbon Filter System*, Final Draft, Mitretek Systems, Inc., McLean, VA.

Hopkins, M., 1998. U.S. Department of the Army Program Manager for Chemical Demilitarization, personal communication, May 1998.

Hsia, S., 1996. Personal communication, Mitretek Systems, Inc.

Mitretek Systems, 1998. *Evaluation of the Pollution Abatement Filter System in Chemical Agent Disposal Facilities, Methodology for Evaluating Risks*, MTR-1996-3, McLean, VA.

National Research Council, 1994. *Recommendations for the Disposal of Chemical Agents and Munitions*, National Academy Press, Washington, DC.

Parsons, 1995. *Value Engineering Report PFS Alternative Configuration Study*, Draft Report under Task B-11G1, prepared by Ralph M. Parsons Company for the Department of the Army, Program Manager for Chemical Demilitarization.

Parsons, 1996. *UMCDF Alternative PFS Concepts.*

Science Applications International Corporation, 1996a. *Umatilla Chemical Agent Disposal Facility Phase 1 Quantitative Risk Assessment*, Report No. SAIC-96-2601, Abingdon, MD.

Science Applications International Corporation, 1996b. *Tooele Chemical Agent Disposal Facility Quantitative Risk Assessment*, Revision 0, Report No. SAIC-96/2600, Abingdon, MD.

Science Applications International Corporation, 1997. *Pollution Abatement System Carbon Filter System Quantitative Risk Assessment*, Draft, Abingdon, MD.

U.S. Nuclear Regulatory Commission, 1990. *Severe Accident Risks: An Assessment for Five U.S. Nuclear Power Plants*, NUREG-1150, Office of Nuclear Regulatory Research, Washington, DC.

U.S. Nuclear Regulatory Commission, 1975. *Reactor Safety Study: Assessment of Accident Risks in U.S. Commercial Nuclear Power Plants*, Report WASH-1400 (NUREG 75/014).

Appendix A

HHRA Results: Sensitivity to Emission Assumptions

A.1 Assumptions on Emissions

The sensitivity analysis is limited to cancer risk estimates for the subsistence farmer because for the UMCDF the greatest cancer risk is to this receptor. Furthermore, whatever insights are gained in the sensitivity of the cancer risk estimates would also apply to the other receptors, as well as to the other health effects (e.g., chronic noncancer health effects) reported in the HHRA.

As discussed in the main report, the original UMCDF HHRA used an extremely conservative approach in estimating emissions. It was assumed that emission rates for regulated pollutants were the maximum rates observed over several test runs at JACADS. In addition, it assumed such emissions over 3.2 years of continuous operation instead of using values based on the amount of munitions and agent actually to be destroyed. As part of the sensitivity analysis, the effect of using average emission rate values for each COPC is determined. The excess cancer risk is recalculated using this more reasonable assumption on emissions.

The assumptions that were used to estimate excess cancer risk for each of the four cases are summarized in Section 3.5 of the main report. Table A-1 summarizes the results of the more accurate emissions assumptions. The new assumptions result in a reduction of emissions by about an order of magnitude.

A.2 PFS Cases

The HHRA results for Case 1: Without PFS, HHRA Protocol, are presented in Tables A-2.1.1 through A-2.1.29 for adult resident, child resident, subsistence farmer, and subsistence fisher.

The HHRA results for Case 2: Without PFS, Actual Program Factors, are presented in Tables A-2.2.1 through A-2.2.29 for adult resident, child resident, subsistence farmer, and subsistence fisher.

The HHRA results for Case 3: With PFS, HHRA Protocol, are presented in Tables A-2.3.1 through A-2.3.29 for adult resident, child resident, subsistence farmer, and subsistence fisher.

The HHRA results for Case 4: With PFS, Actual Program Factors, are presented in Tables A-2.4.1 through A-2.4.29 for adult resident, child resident, subsistence farmer, and subsistence fisher.

Table A-1. Emissions Assumptions Summary

	Old Assumption	New Assumption	Impact on Emissions
Operating Time	3.2 years operating continuously	Based on individual campaign durations and maximum permitted processing rates	↓ about 70%
Emissions (based on JACADS data)	Maximum all furnace-specific runs*	Average emission rate from all furnace-specific runs	↓ about 50%
Process upsets	20% for nonmetals 5% for metals	2% for all COPCs	↓ about 60% (nonmetals) ↓ about 20% (metals)

* Except for DUN (see discussion in Section 3).

Table A-2.1.1 Case 1. Without PFS, HHRA Protocol: UMCDF RESIDENT

CONCENTRATIONS AND DEPOSITIONS: **Calculated depositions and concentrations for indirect exposure pathways**

Substances of Potential Concern	Particulate Dry Deposition Pdd (g/m2)/yr	Particulate Wet Deposition Pwd (g/m2)/yr	Vapor Wet Deposition Vwd (g/m2)/yr	Vapor Concentration Vc (ug/m3)	Toxicity Equivalency Factor	2,3,7,8-TCDD Toxicity Equivalents Particulate. Conc. (ug/m3)	2,3,7,8-TCDD Toxicity Equivalents Dry Deposition (g/m2)	2,3,7,8-TCDD Toxicity Equivalents Wet Deposition (g/m2)	2,3,7,8-TCDD Toxicity Equivalents Vapor Conc. (ug/m3)
Tetra CDD	5.21E-11	5.25E-12	1.18E-11	4.31E-10	1.000	5.21E-11	5.25E-12	1.18E-11	4.31E-10
Penta CDD	9.53E-11	9.54E-12	6.19E-12	2.25E-10	0.500	4.77E-11	4.77E-12	3.09E-12	1.13E-10
Hexa CDD	1.62E-10	1.62E-11	2.26E-12	8.21E-11	0.100	1.62E-11	1.62E-12	2.26E-13	8.21E-12
Hepta CDD	1.55E-10	1.55E-11	5.83E-13	2.12E-11	0.010	1.55E-12	1.55E-13	5.83E-15	2.12E-13
Octa CDD	3.69E-10	3.69E-11	1.36E-14	4.96E-13	0.001	3.69E-13	3.69E-14	1.36E-17	4.96E-16
Tetra CDF	8.09E-12	8.09E-13	3.66E-12	1.33E-10	0.100	8.09E-13	8.09E-14	3.66E-13	1.33E-11
Penta CDF	1.10E-10	1.10E-11	1.48E-11	5.37E-10	0.500	5.49E-11	5.52E-12	7.38E-12	2.69E-10
Hexa CDF	2.67E-10	2.68E-11	6.12E-12	2.23E-10	0.100	2.67E-11	2.68E-12	6.12E-13	2.23E-11
Hepta CDF	3.96E-10	4.00E-11	3.08E-12	1.12E-10	0.010	3.96E-12	4.00E-13	3.08E-14	1.12E-12
Octa CDF	3.11E-10	3.13E-11	1.16E-13	4.22E-12	0.001	3.11E-13	3.13E-14	1.16E-16	4.22E-15
					Total =	2.05E-10	2.05E-11	2.36E-11	8.57E-10
Antimony	1.40E-05	1.40E-06	0.00E+00	0.00E+00					
Arsenic	1.89E-05	1.90E-06	0.00E+00	0.00E+00					
Barium	2.33E-05	2.33E-06	0.00E+00	0.00E+00					
Beryllium	4.28E-06	4.30E-07	0.00E+00	0.00E+00					
bis (2-Ethylhexyl) Phthalate	6.89E-05	6.87E-06	5.07E-05	1.85E-03					
Cadmium	6.32E-06	6.32E-07	0.00E+00	0.00E+00					
Chromium	8.36E-06	8.37E-07	0.00E+00	0.00E+00					
2,4-Dinitrotoluene	0.00E+00	0.00E+00	5.02E-08	1.83E-06					
2,6-Dinitrotoluene	0.00E+00	0.00E+00	5.02E-08	1.83E-06					
Di-n-octyl Phthalate	4.15E-06	4.21E-07	3.11E-06	1.13E-04					
GB	2.07E-14	2.11E-15	4.41E-08	1.61E-06					
HD/HT	5.36E-11	5.44E-12	4.41E-06	1.61E-04					
Lead	4.32E-05	4.34E-06	0.00E+00	0.00E+00					
Mercury	0.00E+00	0.00E+00	1.04E-06	3.77E-05					
Nickel	2.77E-05	2.79E-06	0.00E+00	0.00E+00					
Total PCBs	0.00E+00	0.00E+00	1.22E-08	4.42E-07					
Selenium	9.71E-06	9.74E-07	0.00E+00	0.00E+00					
Silver	1.29E-05	1.29E-06	0.00E+00	0.00E+00					
2,3,7,8-TCDD & Dioxin-Like SOPCs	**2.05E-10**	**2.05E-11**	**2.36E-11**	**8.57E-10**					
Thallium	3.04E-05	3.06E-06	1.89E-15	6.87E-14					
VX	6.52E-11	6.61E-12	4.41E-08	1.61E-06					
Di-n-butyl Phthalate	2.55E-06	2.55E-07	1.88E-06	6.85E-05					
Diethyl Phthalate	6.34E-06	6.39E-07	4.72E-06	1.72E-04					
Manganese	7.26E-04	7.27E-05	0.00E+00	0.00E+00					
4-Methylphenol	9.74E-11	9.85E-12	1.04E-05	3.79E-04					
RDX	0.00E+00	0.00E+00	5.02E-08	1.83E-06					
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	5.02E-08	1.83E-06					
Vanadium	7.57E-06	7.61E-07	0.00E+00	0.00E+00					

CDD = Chlorinated dibenzo-p-dioxin
CDF = Chlorinated dibenzo-p-furan

Table A-2.1.2 Case 1. Without PFS, HHRA Protocol: UMCDF RESIDENT

SOIL INGESTION: Calculation of soil concentration due to deposition

Soil mixing depth, Z=	1	cm
Soil bulk density, BD=	1.5	g/cm3
Total deposition time period, Tc=	3.2	yrs
Dry deposition velocity of vapor phase, Vdv=	3	cm/s

Sc = Soil concentration after total time period of deposition
Ds = Deposition term
Pdd = Yearly dry deposition from particle phase
Pwd = Yearly wet deposition from particle phase
Vwd = Yearly wet deposition from vapor phase
Vc = Vapor phase air concentration

Substances of Potential Concern	Pdd (g/m2)/yr	Pwd (g/m2)/yr	Vwd (g/m2)/yr	Vc (ug/m3)	Ds (1/yr)	Sc (mg/kg)
Antimony	1.40E-05	1.40E-06	0.00E+00	0.00E+00	**1.03E-03**	**3.28E-03**
Arsenic	1.89E-05	1.90E-06	0.00E+00	0.00E+00	**1.38E-03**	**4.43E-03**
Barium	2.33E-05	2.33E-06	0.00E+00	0.00E+00	**1.71E-03**	**5.47E-03**
Beryllium	4.28E-06	4.30E-07	0.00E+00	0.00E+00	**3.14E-04**	**1.00E-03**
bis (2-Ethylhexyl) Phthalate	6.89E-05	6.87E-06	5.07E-05	1.85E-03	**1.25E-01**	**4.00E-01**
Cadmium	6.32E-06	6.32E-07	0.00E+00	0.00E+00	**4.63E-04**	**1.48E-03**
Chromium	8.36E-06	8.37E-07	0.00E+00	0.00E+00	**6.13E-04**	**1.96E-03**
2,4-Dinitrotoluene	0.00E+00	0.00E+00	5.02E-08	1.83E-06	**1.19E-04**	**3.79E-04**
2,6-Dinitrotoluene	0.00E+00	0.00E+00	5.02E-08	1.83E-06	**1.19E-04**	**3.79E-04**
Di-n-octyl Phthalate	4.15E-06	4.21E-07	3.11E-06	1.13E-04	**7.65E-03**	**2.45E-02**
GB	2.07E-14	2.11E-15	4.41E-08	1.61E-06	**1.04E-04**	**3.33E-04**
HD/HT	5.36E-11	5.44E-12	4.41E-06	1.61E-04	**1.04E-02**	**3.33E-02**
Lead	4.32E-05	4.34E-06	0.00E+00	0.00E+00	**3.17E-03**	**1.01E-02**
Mercury	0.00E+00	0.00E+00	1.04E-06	3.77E-05	**2.45E-03**	**7.84E-03**
Nickel	2.77E-05	2.79E-06	0.00E+00	0.00E+00	**2.03E-03**	**6.51E-03**
Total PCBs	0.00E+00	0.00E+00	1.22E-08	4.42E-07	**2.87E-05**	**9.19E-05**
Selenium	9.71E-06	9.74E-07	0.00E+00	0.00E+00	**7.13E-04**	**2.28E-03**
Silver	1.29E-05	1.29E-06	0.00E+00	0.00E+00	**9.43E-04**	**3.02E-03**
2,3,7,8-TCDD & Dioxin-Like SOPCs	2.05E-10	2.05E-11	2.36E-11	8.57E-10	**7.06E-08**	**2.26E-07**
Thallium	3.04E-05	3.06E-06	1.89E-15	6.87E-14	**2.23E-03**	**7.13E-03**
VX	6.52E-11	6.61E-12	4.41E-08	1.61E-06	**1.04E-04**	**3.33E-04**
Di-n-butyl Phthalate	2.55E-06	2.55E-07	1.88E-06	6.85E-05	**4.63E-03**	**1.48E-02**
Diethyl Phthalate	6.34E-06	6.39E-07	4.72E-06	1.72E-04	**1.16E-02**	**3.72E-02**
Manganese	7.26E-04	7.27E-05	0.00E+00	0.00E+00	**5.32E-02**	**1.70E-01**
4-Methylphenol	9.74E-11	9.85E-12	1.04E-05	3.79E-04	**2.46E-02**	**7.88E-02**
RDX	0.00E+00	0.00E+00	5.02E-08	1.83E-06	**1.19E-04**	**3.79E-04**
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	5.02E-08	1.83E-06	**1.19E-04**	**3.79E-04**
Vanadium	7.57E-06	7.61E-07	0.00E+00	0.00E+00	**5.55E-04**	**1.78E-03**

Table A-2.1.3 Case 1. Without PFS, HHRA Protocol: UMCDF RESIDENT

CONSUMPTION OF ABOVE-GROUND VEGETABLES:

Calculation of above-ground vegetable concentration due to direct deposition
Calculation of above-ground vegetable concentration due to air-to-plant transfer

Interception fraction of edible portion, Rp=	0.04	unitless
Plant surface loss coefficient, kp=	18	1/yr
Time between rainfalls, t-rain=	14	days
Length of plant exposure per harvest, Tp=	0.16	yrs
Standing crop biomass, Yp=	1.7	kg DW/m2
Density of air, p=	1200	g/m3
Above ground veg. correction factor, VGab=	0.01	unitless

Pd = Concentration in plant due to direct deposition
Pv = Concentration in plant due to air-to-plant transfer
Pd + Pv = Concentration in plant due to direct deposition and air-to-plant transfer
Fw = Fraction of wet deposition of particles that adheres to plant
Bv = Air-to-plant bioconcentration factor

Substances of Potential Concern	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Fw	**Pd (mg/kg)**	Vc (ug/m3)	Bv (mg/kg)/(ug/g)	**Pv (mg/kg)**	**Pd+Pv (mg/kg)**
Antimony	1.40E-05	1.40E-06	0.2	1.76E-05	0.00E+00	NA	0.00E+00	1.76E-05
Arsenic	1.89E-05	1.90E-06	0.2	2.38E-05	0.00E+00	NA	0.00E+00	2.38E-05
Barium	2.33E-05	2.33E-06	0.6	3.05E-05	0.00E+00	NA	0.00E+00	3.05E-05
Beryllium	4.28E-06	4.30E-07	0.6	5.59E-06	0.00E+00	NA	0.00E+00	5.59E-06
bis (2-Ethylhexyl) Phthalate	6.89E-05	6.87E-06	0.6	9.00E-05	1.85E-03	5.11E+02	7.86E-06	9.79E-05
Cadmium	6.32E-06	6.32E-07	0.6	8.26E-06	0.00E+00	NA	0.00E+00	8.26E-06
Chromium	8.36E-06	8.37E-07	0.6	1.09E-05	0.00E+00	NA	0.00E+00	1.09E-05
2,4-Dinitrotoluene	0.00E+00	0.00E+00	0.6	0.00E+00	1.83E-06	1.50E+02	2.28E-09	2.28E-09
2,6-Dinitrotoluene	0.00E+00	0.00E+00	0.6	0.00E+00	1.83E-06	1.30E+02	1.98E-09	1.98E-09
Di-n-octyl Phthalate	4.15E-06	4.21E-07	0.6	5.43E-06	1.13E-04	2.32E+02	2.19E-07	5.65E-06
GB	2.07E-14	2.11E-15	0.6	2.71E-14	1.61E-06	2.90E+00	3.88E-11	3.88E-11
HD/HT	5.36E-11	5.44E-12	0.6	7.02E-11	1.61E-04	1.58E-01	2.11E-10	2.82E-10
Lead	4.32E-05	4.34E-06	0.6	5.65E-05	0.00E+00	NA	0.00E+00	5.65E-05
Mercury	0.00E+00	0.00E+00	0.6	0.00E+00	3.77E-05	2.30E+04	7.23E-06	7.23E-06
Nickel	2.77E-05	2.79E-06	0.6	3.63E-05	0.00E+00	NA	0.00E+00	3.63E-05
Total PCBs	0.00E+00	0.00E+00	0.6	0.00E+00	4.42E-07	1.72E+03	6.34E-09	6.34E-09
Selenium	9.71E-06	9.74E-07	0.2	1.22E-05	0.00E+00	NA	0.00E+00	1.22E-05
Silver	1.29E-05	1.29E-06	0.6	1.68E-05	0.00E+00	NA	0.00E+00	1.68E-05
2,3,7,8-TCDD & Dioxin-Like SOPCs	2.05E-10	2.05E-11	0.6	2.68E-10	8.57E-10	8.39E+04	5.99E-10	8.67E-10
Thallium	3.04E-05	3.06E-06	0.6	3.97E-05	6.87E-14	NA	0.00E+00	3.97E-05
VX	6.52E-11	6.61E-12	0.6	8.53E-11	1.61E-06	2.26E+03	3.02E-08	3.03E-08
Di-n-butyl Phthalate	2.55E-06	2.55E-07	0.6	3.33E-06	6.85E-05	4.40E+02	2.51E-07	3.58E-06
Diethyl Phthalate	6.34E-06	6.39E-07	0.6	8.29E-06	1.72E-04	4.48E+02	6.41E-07	8.93E-06
Manganese	7.26E-04	7.27E-05	0.6	9.49E-04	0.00E+00	NA	0.00E+00	9.49E-04
4-Methylphenol	9.74E-11	9.85E-12	0.6	1.27E-10	3.79E-04	1.71E+01	5.40E-08	5.42E-08
RDX	0.00E+00	0.00E+00	0.6	0.00E+00	1.83E-06	9.92E-02	1.51E-12	1.51E-12
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	0.6	0.00E+00	1.83E-06	2.32E+02	3.53E-09	3.53E-09
Vanadium	7.57E-06	7.61E-07	0.6	9.90E-06	0.00E+00	NA	0.00E+00	9.90E-06

Table A-2.1.4 Case 1. Without PFS, HHRA Protocol: UMCDF RESIDENT

CONSUMPTION OF ROOT VEGETABLES:

USING TIME-AVERAGED SOIL CONCENTRATIONS **Calculation of soil concentration due to deposition**

Calculation of root vegetable concentration due to root uptake

Soil mixing depth, Z=	20	cm
Soil bulk density, BD=	1.5	g/cm3
Total deposition time period, Tc=	3.2	yrs
Below ground veg. correction factor, VGbg=	0.01	unitless
Dry deposition velocity of vapor phase, Vdv=	3	cm/s

Pr(bg) = Root vegetable concentration due to root uptake
Sc = Soil concentration after total time period of deposition
Ds = Deposition term
Kds = Soil-water partition coefficient
RCF = Ratio of concentration in roots to concentration in soil pore water
Vwd = Yearly wet deposition from vapor phase

Substances of Potential Concern	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Vwd (g/m2-yr)	Vc (µg/m3)	Ds (1/yr)	Sc (mg/kg)	Kds mL/g	RCF (mg/kg)/(ug/mL)	**Pr(bg) (mg/kg)**
Antimony	1.40E-05	1.40E-06	0.00E+00	0.00E+00	**5.13E-05**	**1.64E-04**	2	3.00E-02	**2.46E-08**
Arsenic	1.89E-05	1.90E-06	0.00E+00	0.00E+00	**6.92E-05**	**2.22E-04**	29	8.00E-03	**6.11E-10**
Barium	2.33E-05	2.33E-06	0.00E+00	0.00E+00	**8.54E-05**	**2.73E-04**	530	1.50E-02	**7.74E-11**
Beryllium	4.28E-06	4.30E-07	0.00E+00	0.00E+00	**1.57E-05**	**5.02E-05**	70	1.50E-03	**1.08E-11**
bis (2-Ethylhexyl) Phthalate	6.89E-05	6.87E-06	5.07E-05	1.85E-03	**6.24E-03**	**2.00E-02**	280000	3.20E+02	**2.28E-07**
Cadmium	6.32E-06	6.32E-07	0.00E+00	0.00E+00	**2.32E-05**	**7.41E-05**	160	3.20E-02	**1.48E-10**
Chromium	8.36E-06	8.37E-07	0.00E+00	0.00E+00	**3.06E-05**	**9.81E-05**	18	4.50E-03	**2.45E-10**
2,4-Dinitrotoluene	0.00E+00	0.00E+00	5.02E-08	1.83E-06	**5.93E-06**	**1.90E-05**	0.87	1.90E+00	**4.14E-07**
2,6-Dinitrotoluene	0.00E+00	0.00E+00	5.02E-08	1.83E-06	**5.93E-06**	**1.90E-05**	0.67	1.70E+00	**4.81E-07**
Di-n-octyl Phthalate	4.15E-06	4.21E-07	3.11E-06	1.13E-04	**3.83E-04**	**1.22E-03**	280000	3.20E+02	**1.40E-08**
GB	2.07E-14	2.11E-15	4.41E-08	1.61E-06	**5.21E-06**	**1.67E-05**	0.032	9.30E-01	**4.85E-06**
HD/HT	5.36E-11	5.44E-12	4.41E-06	1.61E-04	**5.21E-04**	**1.67E-03**	1.2	1.16E+00	**1.60E-05**
Lead	4.32E-05	4.34E-06	0.00E+00	0.00E+00	**1.58E-04**	**5.07E-04**	600	NA	**NA**
Mercury	0.00E+00	0.00E+00	1.04E-06	3.77E-05	**1.22E-04**	**3.92E-04**	57000	NA	**NA**
Nickel	2.77E-05	2.79E-06	0.00E+00	0.00E+00	**1.02E-04**	**3.25E-04**	82	4.00E-03	**1.59E-10**
Total PCBs	0.00E+00	0.00E+00	1.22E-08	4.42E-07	**1.44E-06**	**4.59E-06**	4300	2.10E+03	**2.24E-08**
Selenium	9.71E-06	9.74E-07	0.00E+00	0.00E+00	**3.56E-05**	**1.14E-04**	4.3	2.00E-02	**5.30E-09**
Silver	1.29E-05	1.29E-06	0.00E+00	0.00E+00	**4.72E-05**	**1.51E-04**	0.4	1.00E-01	**3.77E-07**
2,3,7,8-TCDD & Dioxin-Like SOPCs	2.05E-10	2.05E-11	2.36E-11	8.57E-10	**3.53E-09**	**1.13E-08**	142000	1.21E+04	**9.63E-12**
Thallium	3.04E-05	3.06E-06	1.89E-15	6.87E-14	**1.11E-04**	**3.57E-04**	74	4.00E-04	**1.93E-11**
VX	6.52E-11	6.61E-12	4.41E-08	1.61E-06	**5.21E-06**	**1.67E-05**	0.15	1.85E+00	**2.06E-06**
Di-n-butyl Phthalate	2.55E-06	2.55E-07	1.88E-06	6.85E-05	**2.32E-04**	**7.41E-04**	1.6	1.80E+02	**8.34E-04**
Diethyl Phthalate	6.34E-06	6.39E-07	4.72E-06	1.72E-04	**5.81E-04**	**1.86E-03**	5.3	6.56E+00	**2.32E-05**
Manganese	7.26E-04	7.27E-05	0.00E+00	0.00E+00	**2.66E-03**	**8.52E-03**	23	1.00E-01	**3.70E-07**
4-Methylphenol	9.74E-11	9.85E-12	1.04E-05	3.79E-04	**1.23E-03**	**3.94E-03**	0.50	1.76E+00	**1.39E-04**
RDX	0.00E+00	0.00E+00	5.02E-08	1.83E-06	**5.93E-06**	**1.90E-05**	0.63	9.61E-01	**2.89E-07**
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	5.02E-08	1.83E-06	**5.93E-06**	**1.90E-05**	11	4.44E+00	**7.66E-08**
Vanadium	7.57E-06	7.61E-07	0.00E+00	0.00E+00	**2.78E-05**	**8.88E-05**	100	1.00E-01	**8.88E-10**

Table A-2.1.5 Case 1. Without PFS, HHRA Protocol: UMCDF ADULT RESIDENT

INDIRECT EXPOSURES Calculation of cancer risks

Consumption rate of soil, CR(soil)=	0.0001 kg/day
Fraction of soil impacted, F(soil)=	1 unitless
Consumption rate of abv grd veg, CR(ag)=	0.024 kg/day
Fraction of abv grd veg impacted, F(ag)=	0.25 unitless
Consumption rate of root veg, CR(bg)=	0.0063 kg/day
Fraction of root veg impacted, F(bg)=	0.25 unitless
Exposure duration, ED=	30 yr
Exposure frequency, EF=	350 day/yr
Body weight, BW=	70 kg
Averaging time, AT=	70 yr

I(tot) = Total daily intake of substance
Sc = Soil concentration after total time period of deposition
I(soil) = Daily intake of substance from soil
Pd + Pv = Concentration in plant
I(ag) = Daily intake of substance from above ground vegetables
Pr(bg) = Concentration in below ground plant parts due to root uptake
I(bg) = Daily intake of substance from below ground vegetables
CSF = Carcinogenic slope factor

Substances of Potential Concern	Sc (mg/kg)	I(soil) (mg/day)	Pd+Pv (mg/kg)	I(ag) (mg/day)	Pr(bg) (mg/kg)	I(bg) (mg/day)	I(tot) (mg/day)	CSF (per mg/kg-day)	Cancer Risk
Antimony	3.28E-03	3.28E-07	1.76E-05	1.06E-07	2.46E-08	3.87E-11	4.34E-07		
Arsenic	4.43E-03	4.43E-07	2.38E-05	1.43E-07	6.11E-10	9.63E-13	5.86E-07	1.50E+00	**5.16E-09**
Barium	5.47E-03	5.47E-07	3.05E-05	1.83E-07	7.74E-11	1.22E-13	7.30E-07		
Beryllium	1.00E-03	1.00E-07	5.59E-06	3.36E-08	1.08E-11	1.69E-14	1.34E-07	4.30E+00	**3.38E-09**
bis (2-Ethylhexyl) Phthalate	4.00E-01	4.00E-05	9.79E-05	5.87E-07	2.28E-07	3.60E-10	4.05E-05	1.40E-02	**3.33E-09**
Cadmium	1.48E-03	1.48E-07	8.26E-06	4.96E-08	1.48E-10	2.34E-13	1.98E-07		
Chromium	1.96E-03	1.96E-07	1.09E-05	6.56E-08	2.45E-10	3.86E-13	2.62E-07		
2,4-Dinitrotoluene	3.79E-04	3.79E-08	2.28E-09	1.37E-11	4.14E-07	6.52E-10	3.86E-08	6.80E-01	**1.54E-10**
2,6-Dinitrotoluene	3.79E-04	3.79E-08	1.98E-09	1.19E-11	4.81E-07	7.58E-10	3.87E-08	6.80E-01	**1.55E-10**
Di-n-octyl Phthalate	2.45E-02	2.45E-06	5.65E-06	3.39E-08	1.40E-08	2.20E-11	2.48E-06		
GB	3.33E-04	3.33E-08	3.88E-11	2.33E-13	4.85E-06	7.63E-09	4.10E-08		
HD/HT	3.33E-02	3.33E-06	2.82E-10	1.69E-12	1.60E-05	2.52E-08	3.36E-06	9.50E+00	**1.87E-07**
Lead	1.01E-02	1.01E-06	5.65E-05	3.39E-07	NA	NA	1.35E-06		
Mercury	7.84E-03	7.84E-07	7.23E-06	4.34E-08	NA	NA	8.27E-07		
Nickel	6.51E-03	6.51E-07	3.63E-05	2.18E-07	1.59E-10	2.50E-13	8.68E-07		
Total PCBs	9.19E-05	9.19E-09	6.34E-09	3.80E-11	2.24E-08	3.53E-11	9.26E-09	7.70E+00	**4.19E-10**
Selenium	2.28E-03	2.28E-07	1.22E-05	7.34E-08	5.30E-09	8.35E-12	3.01E-07		
Silver	3.02E-03	3.02E-07	1.68E-05	1.01E-07	3.77E-07	5.94E-10	4.03E-07		
2,3,7,8-TCDD & Dioxin-Like SOPCs	2.26E-07	2.26E-11	8.67E-10	5.20E-12	9.63E-12	1.52E-14	2.78E-11	1.50E+05	**2.45E-08**
Thallium	7.13E-03	7.13E-07	3.97E-05	2.38E-07	1.93E-11	3.04E-14	9.52E-07		
VX	3.33E-04	3.33E-08	3.03E-08	1.82E-10	2.06E-06	3.24E-09	3.68E-08		
Di-n-butyl Phthalate	1.48E-02	1.48E-06	3.58E-06	2.15E-08	8.34E-04	1.31E-06	2.82E-06		
Diethyl Phthalate	3.72E-02	3.72E-06	8.93E-06	5.36E-08	2.32E-05	3.65E-08	3.81E-06		
Manganese	1.70E-01	1.70E-05	9.49E-04	5.69E-06	3.70E-07	5.83E-10	2.27E-05		
4-Methylphenol	7.88E-02	7.88E-06	5.42E-08	3.25E-10	1.39E-04	2.18E-07	8.10E-06		
RDX	3.79E-04	3.79E-08	1.51E-12	9.06E-15	2.89E-07	4.56E-10	3.84E-08	1.10E-01	**2.48E-11**
2,4,6-Trinitrotoluene	3.79E-04	3.79E-08	3.53E-09	2.12E-11	7.66E-08	1.21E-10	3.81E-08	3.00E-02	**6.71E-12**
Vanadium	1.78E-03	1.78E-07	9.90E-06	5.94E-08	8.88E-10	1.40E-12	2.37E-07		

Total cancer risk= **2E-07**

Table A-2.1.6 Case 1. Without PFS, HHRA Protocol: UMCDF ADULT RESIDENT
INDIRECT EXPOSURES

Calculation of hazard quotients, and hazard indices

Consumption rate of soil, CR(soil)=	0.0001	kg/day
Fraction of soil impacted, F(soil)=	1	unitless
Consumption rate of abv grd veg, CR(ag)=	0.024	kg/day
Fraction of abv grd veg impacted, F(ag)=	0.25	unitless
Consumption rate of root veg, CR(bg)=	0.0063	kg/day
Fraction of root veg impacted, F(bg)=	0.25	unitless
Body weight, BW=	70	kg

I(tot) = Total daily intake of substance
Sc = Soil concentration after total time period of deposition
I(soil) = Daily intake of substance from soil
Pd + Pv = Concentration in plant
I(ag) = Daily intake of substance from above ground vegetables
Pr(bg) = Concentration in below ground plant parts due to root uptake
I(bg) = Daily intake of substance from below ground vegetables
RfD = Reference dose
HI = Hazard Index

Substances of Potential Concern	Sc (mg/kg)	I(soil) (mg/day)	Pd+Pv (mg/kg)	I(ag) (mg/day)	Pr(bg) (mg/kg)	I(bg) (mg/day)	I(tot) (mg/day)	RfD (mg/kg-day)	Hazard Index Liver	Hazard Index Neuro	Hazard Quotient
Antimony	3.28E-03	3.28E-07	1.76E-05	1.06E-07	2.46E-08	3.87E-11	4.34E-07	4.00E-04			1E-05
Arsenic	4.43E-03	4.43E-07	2.38E-05	1.43E-07	6.11E-10	9.63E-13	5.86E-07	3.00E-04			3E-05
Barium	5.47E-03	5.47E-07	3.05E-05	1.83E-07	7.74E-11	1.22E-13	7.30E-07	7.00E-02			1E-07
Beryllium	1.00E-03	1.00E-07	5.59E-06	3.36E-08	1.08E-11	1.69E-14	1.34E-07	5.00E-03			4E-07
bis (2-Ethylhexyl) Phthalate	4.00E-01	4.00E-05	9.79E-05	5.87E-07	2.28E-07	3.60E-10	4.05E-05	2.00E-02	2.90E-05		3E-05
Cadmium	1.48E-03	1.48E-07	8.26E-06	4.96E-08	1.48E-10	2.34E-13	1.98E-07	1.00E-03			3E-06
Chromium	1.96E-03	1.96E-07	1.09E-05	6.56E-08	2.45E-10	3.86E-13	2.62E-07	5.00E-03			7E-07
2,4-Dinitrotoluene	3.79E-04	3.79E-08	2.28E-09	1.37E-11	4.14E-07	6.52E-10	3.86E-08	2.00E-03		2.76E-07	3E-07
2,6-Dinitrotoluene	3.79E-04	3.79E-08	1.98E-09	1.19E-11	4.81E-07	7.58E-10	3.87E-08	1.00E-03		5.53E-07	5E-07
Di-n-octyl Phthalate	2.45E-02	2.45E-06	5.65E-06	3.39E-08	1.40E-08	2.20E-11	2.48E-06	2.00E-02	1.77E-06		2E-06
GB	3.33E-04	3.33E-08	3.88E-11	2.33E-13	4.85E-06	7.63E-09	4.10E-08	4.30E-05		1.36E-05	1E-05
HD/HT	3.33E-02	3.33E-06	2.82E-10	1.69E-12	1.60E-05	2.52E-08	3.36E-06				
Lead	1.01E-02	1.01E-06	5.65E-05	3.39E-07	NA	NA	1.35E-06				
Mercury	7.84E-03	7.84E-07	7.23E-06	4.34E-08	NA	NA	8.27E-07	1.00E-04		1.18E-04	1E-04
Nickel	6.51E-03	6.51E-07	3.63E-05	2.18E-07	1.59E-10	2.50E-13	8.68E-07	2.00E-02	6.20E-07		6E-07
Total PCBs	9.19E-05	9.19E-09	6.34E-09	3.80E-11	2.24E-08	3.53E-11	9.26E-09				
Selenium	2.28E-03	2.28E-07	1.22E-05	7.34E-08	5.30E-09	8.35E-12	3.01E-07	5.00E-03			8E-07
Silver	3.02E-03	3.02E-07	1.68E-05	1.01E-07	3.77E-07	5.94E-10	4.03E-07	5.00E-03			1E-06
2,3,7,8-TCDD & Dioxin-Like SOPCs	2.26E-07	2.26E-11	8.67E-10	5.20E-12	9.63E-12	1.52E-14	2.78E-11				
Thallium	7.13E-03	7.13E-07	3.97E-05	2.38E-07	1.93E-11	3.04E-14	9.52E-07	8.00E-05	1.70E-04		2E-04
VX	3.33E-04	3.33E-08	3.03E-08	1.82E-10	2.06E-06	3.24E-09	3.68E-08	4.30E-05		1.22E-05	1E-05
Di-n-butyl Phthalate	1.48E-02	1.48E-06	3.58E-06	2.15E-08	8.34E-04	1.31E-06	2.82E-06	1.00E-01			4E-07
Diethyl Phthalate	3.72E-02	3.72E-06	8.93E-06	5.36E-08	2.32E-05	3.65E-08	3.81E-06	8.00E-01			7E-08
Manganese	1.70E-01	1.70E-05	9.49E-04	5.69E-06	3.70E-07	5.83E-10	2.27E-05	1.40E-01		2.32E-06	2E-06
4-Methylphenol	7.88E-02	7.88E-06	5.42E-08	3.25E-10	1.39E-04	2.18E-07	8.10E-06	5.00E-03		2.31E-05	2E-05
RDX	3.79E-04	3.79E-08	1.51E-12	9.06E-15	2.89E-07	4.56E-10	3.84E-08	3.00E-03			2E-07
2,4,6-Trinitrotoluene	3.79E-04	3.79E-08	3.53E-09	2.12E-11	7.66E-08	1.21E-10	3.81E-08	5.00E-04	1.09E-06		1E-06
Vanadium	1.78E-03	1.78E-07	9.90E-06	5.94E-08	8.88E-10	1.40E-12	2.37E-07	7.00E-03			5E-07
								HI=	0.00020	0.00017	0.0004

Table A-2.1.7 Case 1. Without PFS, HHRA Protocol: UMCDF CHILD RESIDENT
INDIRECT EXPOSURES

Calculation of cancer risks

Consumption rate of soil, CR(soil)=	0.0002	kg/day
Fraction of soil impacted, F(soil)=	1	unitless
Consumption rate of abv grd veg, CR(ag)=	0.005	kg/day
Fraction of abv grd veg impacted, F(ag)=	0.25	unitless
Consumption rate of root veg, CR(bg)=	0.0014	kg/day
Fraction of root veg impacted, F(bg)=	0.25	unitless
Exposure duration, ED=	6	yr
Exposure frequency, EF=	350	day/yr
Body weight, BW=	15	kg
Averaging time, AT=	70	yr

I(tot) = Total daily intake of substance
Sc = Soil concentration after total time period of deposition
I(soil) = Daily intake of substance from soil
Pd + Pv = Concentration in plant
I(ag) = Daily intake of substance from above ground vegetables
Pr(bg) = Concentration in below ground plant parts due to root uptake
I(bg) = Daily intake of substance from below ground vegetables
CSF = Carcinogenic slope factor

Substances of Potential Concern	Sc (mg/kg)	I(soil) (mg/day)	Pd+Pv (mg/kg)	I(ag) (mg/day)	Pr(bg) (mg/kg)	I(bg) (mg/day)	I(tot) (mg/day)	CSF (per mg/kg-day)	Cancer Risk
Antimony	3.28E-03	6.56E-07	1.76E-05	2.20E-08	2.46E-08	8.61E-12	6.78E-07		
Arsenic	4.43E-03	8.86E-07	2.38E-05	2.97E-08	6.11E-10	2.14E-13	9.16E-07	1.50E+00	**7.53E-09**
Barium	5.47E-03	1.09E-06	3.05E-05	3.81E-08	7.74E-11	2.71E-14	1.13E-06		
Beryllium	1.00E-03	2.01E-07	5 59E-06	6.99E-09	1.08E-11	3.77E-15	2.08E-07	4.30E+00	**4.90E-09**
bis (2-Ethylhexyl) Phthalate	4.00E-01	7.99E-05	9 79E-05	1.22E-07	2.28E-07	7.99E-11	8.00E-05	1.40E-02	**6.14E-09**
Cadmium	1.48E-03	2.97E-07	8.26E-06	1.03E-08	1.48E-10	5.19E-14	3.07E-07		
Chromium	1.96E-03	3.92E-07	1.09E-05	1.37E-08	2.45E-10	8.58E-14	4.06E-07		
2,4-Dinitrotoluene	3.79E-04	7.59E-08	2.28E-09	2.85E-12	4.14E-07	1.45E-10	7.60E-08	6.80E-01	**2.83E-10**
2,6-Dinitrotoluene	3.79E-04	7.59E-08	1.98E-09	2.47E-12	4.81E-07	1.68E-10	7.60E-08	6.80E-01	**2.83E-10**
Di-n-octyl Phthalate	2.45E-02	4.90E-06	5.65E-06	7.06E-09	1.40E-08	4.90E-12	4.91E-06		
GB	3.33E-04	6.67E-08	3.88E-11	4.85E-14	4.85E-06	1.70E-09	6.84E-08		
HD/HT	3.33E-02	6.67E-06	2.82E-10	3.52E-13	1.60E-05	5.59E-09	6.68E-06	9.50E+00	**3.47E-07**
Lead	1.01E-02	2.03E-06	5.65E-05	7.06E-08	NA	NA	2.10E-06		
Mercury	7.84E-03	1.57E-06	7.23E-06	9.04E-09	NA	NA	1.58E-06		
Nickel	6.51E-03	1.30E-06	3.63E-05	4.53E-08	1.59E-10	5.55E-14	1.35E-06		
Total PCBs	9.19E-05	1.84E-08	6.34E-09	7.93E-12	2.24E-08	7.85E-12	1.84E-08	7.70E+00	**7.76E-10**
Selenium	2.28E-03	4.56E-07	1.22E-05	1.53E-08	5.30E-09	1.86E-12	4.71E-07		
Silver	3.02E-03	6.04E-07	1.68E-05	2.10E-08	3.77E-07	1.32E-10	6.25E-07		
2,3,7,8-TCDD & Dioxin-Like SOPCs	2.26E-07	4.52E-11	8.67E-10	1.08E-12	9.63E-12	3.37E-15	4.63E-11	1.50E+05	**3.80E-08**
Thallium	7.13E-03	1.43E-06	3.97E-05	4.97E-08	1.93E-11	6.75E-15	1.48E-06		
VX	3.33E-04	6.67E-08	3.03E-08	3.79E-11	2.06E-06	7.20E-10	6.74E-08		
Di-n-butyl Phthalate	1.48E-02	2.97E-06	3.58E-06	4.48E-09	8.34E-04	2.92E-07	3.26E-06		
Diethyl Phthalate	3.72E-02	7.43E-06	8.93E-06	1.12E-08	2.32E-05	8.11E-09	7.45E-06		
Manganese	1.70E-01	3.41E-05	9.49E-04	1.19E-06	3.70E-07	1.30E-10	3.53E-05		
4-Methylphenol	7.88E-02	1.58E-05	5.42E-08	6.77E-11	1.39E-04	4.85E-08	1.58E-05		
RDX	3.79E-04	7.59E-08	1.51E-12	1.89E-15	2.89E-07	1.01E-10	7.60E-08	1.10E-01	**4.58E-11**
2,4,6-Trinitrotoluene	3.79E-04	7.59E-08	3.53E-09	4.41E-12	7.66E-08	2.68E-11	7.59E-08	3.00E-02	**1.25E-11**
Vanadium	1.78E-03	3.55E-07	9.90E-06	1.24E-08	8.88E-10	3.11E-13	3.68E-07		

Total cancer risk= 4E-07

Table A-2.1.8 Case 1. Without PFS, HHRA Protocol: UMCDF CHILD RESIDENT

INDIRECT EXPOSURES

Calculation of hazard quotients, and hazard indices

Consumption rate of soil, CR(soil)=	0.0002	kg/day
Fraction of soil impacted, F(soil)=	1	unitless
Consumption rate of abv grd veg, CR(ag)=	0.005	kg/day
Fraction of abv grd veg impacted, F(ag)=	0.25	unitless
Consumption rate of root veg, CR(bg)=	0.0014	kg/day
Fraction of root veg impacted, F(bg)=	0.25	unitless
Body weight, BW=	15	kg

I(tot) = Total daily intake of substance
Sc = Soil concentration after total time period of deposition
I(soil) = Daily intake of substance from soil
Pd + Pv = Concentration in plant
I(ag) = Daily intake of substance from above ground vegetables
Pr(bg) = Concentration in below ground plant parts due to root uptake
I(bg) = Daily intake of substance from below ground vegetables
RfD = Reference dose
HI = Hazard Index

Substances of Potential Concern	Sc (mg/kg)	I(soil) (mg/day)	Pd+Pv (mg/kg)	I(ag) (mg/day)	Pr(bg) (mg/kg)	I(bg) (mg/day)	I(tot) (mg/day)	RfD (mg/kg-day)	Hazard Index Liver	Hazard Index Neuro	Hazard Quotient
Antimony	3.28E-03	**6.56E-07**	1.76E-05	**2.20E-08**	2.46E-08	**8.61E-12**	**6.78E-07**	4.00E-04			**1E-04**
Arsenic	4.43E-03	**8.86E-07**	2.38E-05	**2.97E-08**	6.11E-10	**2.14E-13**	**9.16E-07**	3.00E-04			**2E-04**
Barium	5.47E-03	**1.09E-06**	3.05E-05	**3.81E-08**	7.74E-11	**2.71E-14**	**1.13E-06**	7.00E-02			**1E-06**
Beryllium	1.00E-03	**2.01E-07**	5.59E-06	**6.99E-09**	1.08E-11	**3.77E-15**	**2.08E-07**	5.00E-03			**3E-06**
bis (2-Ethylhexyl) Phthalate	4.00E-01	**7.99E-05**	9.79E-05	**1.22E-07**	2.28E-07	**7.99E-11**	**8.00E-05**	2.00E-02	5.72E-05		**3E-04**
Cadmium	1.48E-03	**2.97E-07**	8.26E-06	**1.03E-08**	1.48E-10	**5.19E-14**	**3.07E-07**	1.00E-03			**2E-05**
Chromium	1.96E-03	**3.92E-07**	1.09E-05	**1.37E-08**	2.45E-10	**8.58E-14**	**4.06E-07**	5.00E-03			**5E-06**
2,4-Dinitrotoluene	3.79E-04	**7.59E-08**	2.28E-09	**2.85E-12**	4.14E-07	**1.45E-10**	**7.60E-08**	2.00E-03		5.43E-07	**2E-06**
2,6-Dinitrotoluene	3.79E-04	**7.59E-08**	1.98E-09	**2.47E-12**	4.81E-07	**1.68E-10**	**7.60E-08**	1.00E-03		1.09E-06	**5E-06**
Di-n-octyl Phthalate	2.45E-02	**4.90E-06**	5.65E-06	**7.06E-09**	1.40E-08	**4.90E-12**	**4.91E-06**	2.00E-02	3.50E-06		**2E-05**
GB	3.33E-04	**6.67E-08**	3.88E-11	**4.85E-14**	4.85E-06	**1.70E-09**	**6.84E-08**	4.30E-05		2.27E-05	**1E-04**
HD/HT	3.33E-02	**6.67E-06**	2.82E-10	**3.52E-13**	1.60E-05	**5.59E-09**	**6.68E-06**				
Lead	1.01E-02	**2.03E-06**	5.65E-05	**7.06E-08**	NA	**NA**	**2.10E-06**				
Mercury	7.84E-03	**1.57E-06**	7.23E-06	**9.04E-09**	NA	**NA**	**1.58E-06**	1.00E-04		2.25E-04	**1E-03**
Nickel	6.51E-03	**1.30E-06**	3.63E-05	**4.53E-08**	1.59E-10	**5.55E-14**	**1.35E-06**	2.00E-02	9.62E-07		**4E-06**
Total PCBs	9.19E-05	**1.84E-08**	6.34E-09	**7.93E-12**	2.24E-08	**7.85E-12**	**1.84E-08**				
Selenium	2.28E-03	**4.56E-07**	1.22E-05	**1.53E-08**	5.30E-09	**1.86E-12**	**4.71E-07**	5.00E-03			**6E-06**
Silver	3.02E-03	**6.04E-07**	1.68E-05	**2.10E-08**	3.77E-07	**1.32E-10**	**6.25E-07**	5.00E-03			**8E-06**
2,3,7,8-TCDD & Dioxin-Like SOPCs	2.26E-07	**4.52E-11**	8.67E-10	**1.08E-12**	9.63E-12	**3.37E-15**	**4.63E-11**				
Thallium	7.13E-03	**1.43E-06**	3.97E-05	**4.97E-08**	1.93E-11	**6.75E-15**	**1.48E-06**	8.00E-05	2.64E-04		**1E-03**
VX	3.33E-04	**6.67E-08**	3.03E-08	**3.79E-11**	2.06E-06	**7.20E-10**	**6.74E-08**	4.30E-05		2.24E-05	**1E-04**
Di-n-butyl Phthalate	1.48E-02	**2.97E-06**	3.58E-06	**4.48E-09**	8.34E-04	**2.92E-07**	**3.26E-06**	1.00E-01			**2E-06**
Diethyl Phthalate	3.72E-02	**7.43E-06**	8.93E-06	**1.12E-08**	2.32E-05	**8.11E-09**	**7.45E-06**	8.00E-01			**6E-07**
Manganese	1.70E-01	**3.41E-05**	9.49E-04	**1.19E-06**	3.70E-07	**1.30E-10**	**3.53E-05**	1.40E-01		3.60E-06	**2E-05**
4-Methylphenol	7.88E-02	**1.58E-05**	5.42E-08	**6.77E-11**	1.39E-04	**4.85E-08**	**1.58E-05**	5.00E-03		4.51E-05	**2E-04**
RDX	3.79E-04	**7.59E-08**	1.51E-12	**1.89E-15**	2.89E-07	**1.01E-10**	**7.60E-08**	3.00E-03			**2E-06**
2,4,6-Trinitrotoluene	3.79E-04	**7.59E-08**	3.53E-09	**4.41E-12**	7.66E-08	**2.68E-11**	**7.59E-08**	5.00E-04	2.17E-06		**1E-05**
Vanadium	1.78E-03	**3.55E-07**	9.90E-06	**1.24E-08**	8.88E-10	**3.11E-13**	**3.68E-07**	7.00E-03			**3E-06**
								HI=	**0.0003**	**0.0003**	0.003

Table A-2.1.9 Case 1. Without PFS, HHRA Protocol: UMCDF RESIDENT

DIRECT INHALATION EXPOSURES

Exposure parameter	Exposure Scenario			
	Subsistence Farmer	Subsistence Fisher	Adult Resident	Child Resident
Inhalation rate, IR (m3/hr)	0.8	0.8	0.8	0.2
Exposure duration, ED (yr)	3.2	3.2	3.2	3.2
Body weight, BW (kg)	70	70	70	15
Exposure time, ET (hr/day)			24	24
Exposure frequency, EF (day/yr)			350	350
Carcinogenic averaging time, LT (day)			25550	25550
Noncancer averaging time, LT (day)			1168	1168

CSF = Cancer Slope Factor
RfD = Reference Dose
HI = Hazard Index

CDD = Chlorinated dibenzo-p-dioxin
CDF = Chlorinated dibenzo-p-furan

Substances of Potential Concern	Respirable Concentration (ug/m3)	Cancer Inh. Intake-Adult (mg/kg-day)	Cancer Inh. Intake-Child (mg/kg-day)	Inhalation CSF (per mg/kg-day)	Cancer Risk Adult	Cancer Risk Child	Inhalation RfD (mg/kg/day)	Hazard Quotient Adult	Hazard Quotient Child
Tetra CDD	7.67E-10	9.60E-15	1.08E-14	1.16E+05	1.11E-09	1.25E-09			
Penta CDD	8.36E-10	1.05E-14	1.17E-14	5.80E+04	6.08E-10	6.80E-10			
Hexa CDD	1.12E-09	1.41E-14	1.57E-14	2.38E-06	3.34E-20	3.74E-20			
Hepta CDD	1.01E-09	1.27E-14	1.42E-14	2.38E-07	3.01E-21	3.37E-21			
Octa CDD	2.37E-09	2.96E-14	3.32E-14	2.38E-08	7.04E-22	7.88E-22			
Tetra CDF	1.85E-10	2.32E-15	2.59E-15	2.38E-06	5.50E-21	6.16E-21			
Penta CDF	1.24E-09	1.56E-14	1.75E-14	1.19E-05	1.85E-19	2.07E-19			
Hexa CDF	1.94E-09	2.43E-14	2.72E-14	2.38E-06	5.77E-20	6.46E-20			
Hepta CDF	2.68E-09	3.35E-14	3.75E-14	2.38E-07	7.96E-21	8.92E-21			
Octa CDF	2.01E-09	2.52E-14	2.82E-14	2.38E-08	5.98E-22	6.70E-22			
2,3,7,8-TCDD TEQ	2.17E-09	2.72E-14	3.05E-14	1.50E+05	4.08E-09	4.57E-09			
Antimony	8.98E-05	1.12E-09	1.26E-09						
Arsenic	1.22E-04	1.53E-09	1.71E-09	5.00E+01	7.63E-08	8.55E-08			
Barium	1.49E-04	1.87E-09	2.09E-09				1.45E-03	2.82E-05	3.16E-05
Beryllium	2.75E-05	3.45E-10	3.86E-10	8.40E+00	2.89E-09	3.24E-09			
Boron	3.32E-03	4.16E-08	4.66E-08				5.80E-03	1.57E-04	1.76E-04
Cadmium	4.05E-05	5.07E-10	5.68E-10	6.30E+00	3.20E-09	3.58E-09			
Chromium	5.36E-05	6.71E-10	7.52E-10	4.10E+01	2.75E-08	3.08E-08			
Cobalt	4.60E-05	5.76E-10	6.46E-10						
Copper	5.68E-05	7.11E-10	7.97E-10						
Lead	2.78E-04	3.48E-09	3.90E-09						
Manganese	4.66E-03	5.83E-08	6.53E-08				1.40E-05	9.11E-02	1.02E-01
Mercury	3.77E-05	4.72E-10	5.29E-10				8.60E-05	1.20E-04	1.35E-04
Nickel	1.78E-04	2.23E-09	2.50E-09	8.40E-01	1.88E-09	2.10E-09			
Phosphorus	2.02E-03	2.53E-08	2.84E-08						
Selenium	6.24E-05	7.82E-10	8.75E-10						
Silver	8.27E-05	1.04E-09	1.16E-09						
Thallium	1.96E-04	2.46E-09	2.75E-09						
Tin	2.33E-04	2.91E-09	3.26E-09						
Vanadium	4.88E-05	6.11E-10	6.84E-10						
Zinc	1.01E-03	1.26E-08	1.42E-08						
Acetone	2.66E-01	3.33E-06	3.73E-06						
Benzene	6.20E-04	7.77E-09	8.70E-09	2.90E-02	2.25E-10	2.52E-10			
Bromodichloromethane	5.70E-06	7.13E-11	7.99E-11						
Bromoform	9.61E-05	1.20E-09	1.35E-09	3.85E-03	4.63E-12	5.19E-12			
2-Butanone	1.33E-03	1.66E-08	1.86E-08				2.90E-01	1.25E-06	1.41E-06
Carbon Disulfide	7.08E-05	8.87E-10	9.94E-10				2.90E-03	6.69E-06	7.50E-06
Carbon Tetrachloride	1.76E-04	2.21E-09	2.47E-09	5.30E-02	1.17E-10	1.31E-10			
Chlorobenzene	1.38E-05	1.73E-10	1.94E-10				5.80E-03	6.52E-07	7.31E-07
Chloroform	1.70E-04	2.13E-09	2.39E-09	8.10E-02	1.73E-10	1.94E-10			
Chloromethane	3.43E-03	4.29E-08	4.81E-08	6.30E-03	2.70E-10	3.03E-10			
Dibromochloromethane	6.17E-06	7.73E-11	8.66E-11						
1,1-Dichloroethane	3.16E-06	3.95E-11	4.43E-11				1.45E+00	5.96E-10	6.68E-10
1,2-Dichloropropane	1.57E-03	1.96E-08	2.20E-08				3.80E-03	1.13E-04	1.27E-04
cis-1,3-Dichloropropene	1.35E-03	1.69E-08	1.90E-08	1.30E-01	2.20E-09	2.46E-09	5.80E-03	6.38E-05	7.15E-05
trans-1,3-Dichloropropene	3.22E-06	4.03E-11	4.51E-11	1.30E-01	5.24E-12	5.86E-12	5.70E-03	1.55E-07	1.73E-07
Ethylbenzene	2.33E-05	2.92E-10	3.27E-10				2.90E-01	2.20E-08	2.47E-08
2-Hexanone	1.43E-05	1.80E-10	2.01E-10						
Methylene Chloride	3.42E-02	4.29E-07	4.80E-07	1.70E-03	7.29E-10	8.17E-10	8.70E-01	1.08E-05	1.21E-05
4-Methyl-2-pentanone	1.83E-05	2.29E-10	2.57E-10				2.30E-01	2.18E-08	2.44E-08
Styrene	6.55E-04	8.20E-09	9.19E-09				8.70E-01	2.06E-07	2.31E-07
1,1,2,2-Tetrachloroethane	5.51E-06	6.90E-11	7.73E-11	2.00E-01	1.38E-11	1.55E-11			
Tetrachloroethene	8.59E-06	1.08E-10	1.20E-10						
Toluene	1.86E-02	2.33E-07	2.61E-07				1.10E-01	4.64E-05	5.19E-05
1,1,1-Trichloroethane	1.83E-04	2.29E-09	2.57E-09						
Vinyl Acetate	4.30E-06	5.39E-11	6.03E-11				5.70E-02	2.07E-08	2.32E-08
Vinyl Chloride	5.99E-05	7.50E-10	8.40E-10	3.00E-01	2.25E-10	2.52E-10			
Xylenes	3.88E-05	4.86E-10	5.44E-10						
Benzoic Acid	1.29E-03	1.62E-08	1.82E-08						
Benzyl Alcohol	1.16E-02	1.45E-07	1.63E-07						
Diethyl Phthalate	2.13E-04	2.66E-09	2.98E-09						
Dimethyl Phthalate	2.12E-03	2.66E-08	2.97E-08						
Di-n-butyl Phthalate	8.48E-05	1.06E-09	1.19E-09						
Di-n-octyl Phthalate	1.40E-04	1.76E-09	1.97E-09						
bis(2-Ethylhexyl)-Phthalate	2.29E-03	2.86E-08	3.21E-08						
2-Methylphenol	1.97E-03	2.47E-08	2.76E-08						
3-Methylphenol	8.19E-04	1.03E-08	1.15E-08						
4-Methylphenol	3.79E-04	4.75E-09	5.32E-09						
Naphthalene	8.42E-05	1.05E-09	1.18E-09						
GB	1.61E-06	2.01E-11	2.25E-11				8.67E-07	5.07E-04	5.68E-04
HD/HT	1.61E-04	2.01E-09	2.25E-09	9.50E+00	1.91E-08	2.14E-08	2.90E-05	1.52E-03	1.70E-03
VX	1.61E-06	2.01E-11	2.25E-11				8.67E-07	5.07E-04	5.68E-04
Chlorine	5.70E-02	7.13E-07	7.99E-07						
Hydrogen Chloride	3.28E-01	4.11E-06	4.61E-06				5.80E-03	1.55E-02	1.74E-02
Hydrogen Fluoride	9.01E-02	1.13E-06	1.26E-06						
Nitroglycerine	3.83E-04	4.79E-09	5.37E-09						
PCB	4.42E-07	5.54E-12	6.21E-12						
Particulate	8.02E-02	1.01E-06	1.13E-06						
2,4-Dinitrotoluene	1.83E-06	2.29E-11	2.56E-11						
2,6-Dinitrotoluene	1.83E-06	2.29E-11	2.56E-11						
2,4,6-Trinitrotoluene	1.83E-06	2.29E-11	2.56E-11						
RDX	1.83E-06	2.29E-11	2.56E-11						
HMX	1.83E-06	2.29E-11	2.56E-11						
					1E-07	2E-07	Total HI=	0.1	0.1

Table A-2.1.10 Case 1. Without PFS, HHRA Protocol: UMCDF ADULT RESIDENT

	Risk UMCDF	HI-Liver UMCDF	HI-Neuro UMCDF	HQ
Indirect				
Antimony				1.48E-05
Arsenic	5.16E-09			2.67E-05
Barium				1.43E-07
Beryllium	3.38E-09			3.67E-07
bis (2-Ethylhexyl) Phthalate	3.33E-09	2.90E-05		2.78E-05
Cadmium				2.71E-06
Chromium				7.17E-07
2,4-Dinitrotoluene	1.54E-10		2.76E-07	2.64E-07
2,6-Dinitrotoluene	1.55E-10		5.53E-07	5.30E-07
Di-n-octyl Phthalate		1.77E-06		1.70E-06
GB			1.36E-05	1.31E-05
HD/HT	1.87E-07			
Lead				
Mercury			1.18E-04	1.13E-04
Nickel				5.95E-07
Total PCBs	4.19E-10			
Selenium				8.26E-07
Silver				1.10E-06
2,3,7,8-TCDD & Others	2.45E-08			
Thallium		1.70E-04		1.63E-04
VX			1.22E-05	1.17E-05
Di-n-butyl Phthalate				3.86E-07
Diethyl Phthalate				6.52E-08
Manganese			2.32E-06	2.22E-06
4-Methylphenol			2.31E-05	2.22E-05
RDX	2.48E-11			1.75E-07
2,4,6-Trinitrotoluene	6.71E-12	1.09E-06		1.04E-06
Vanadium				4.64E-07
Total	2.25E-07	2.02E-04	1.70E-04	
Grand Total	4E-07	0.000202	0.00017	

	Risk-Inh. UMCDF	HI-Inh. UMCDF
Inhalation		
Tetra CDD	1.11E-09	
Penta CDD	6.08E-10	
Hexa CDD	3.34E-20	
Hepta CDD	3.01E-21	
Octa CDD	7.04E-22	
Tetra CDF	5.50E-21	
Penta CDF	1.85E-19	
Hexa CDF	5.77E-20	
Hepta CDF	7.96E-21	
Octa CDF	5.98E-22	
2,3,7,8-TCDD TEQ	4.08E-09	
Antimony		
Arsenic	7.63E-08	
Barium		2.82E-05
Beryllium	2.89E-09	
Boron		1.57E-04
Cadmium	3.20E-09	
Chromium	2.75E-08	
Cobalt		
Copper		
Lead		
Manganese		9.11E-02
Mercury		1.20E-04
Nickel	1.88E-09	0.00E+00
Phosphorus		
Selenium		
Silver		
Thallium		
Tin		
Vanadium		
Zinc		
Acetone		
Benzene	2.25E-10	
Bromodichloromethane		
Bromoform	4.63E-12	
2-Butanone		1.25E-06
Carbon Disulfide		6.69E-06
Carbon Tetrachloride	1.17E-10	
Chlorobenzene		6.52E-07
Chloroform	1.73E-10	
Chloromethane	2.70E-10	
Dibromochloromethane		
1,1-Dichloroethane		5.96E-10
1,2-Dichloropropane		1.13E-04
cis-1,3-Dichloropropene	2.20E-09	6.38E-05
trans-1,3-Dichloropropene	5.24E-12	1.55E-07
Ethylbenzene		2.20E-08
2-Hexanone		
Methylene Chloride	7.29E-10	1.08E-05
4-Methyl-2-pentanone		
Styrene		2.06E-07
1,1,2,2-Tetrachloroethane	1.38E-11	
Tetrachloroethene		
Toluene		4.64E-05
1,1,1-Trichloroethane		
Vinyl Acetate		2.07E-08
Vinyl Chloride	2.25E-10	
Xylenes		
Benzoic Acid		
Benzyl Alcohol		
Diethyl Phthalate		
Dimethyl Phthalate		
Di-n-butyl Phthalate		
Di-n-octyl Phthalate		
bis(2-Ethylhexyl)-Phthalate		
2-Methylphenol		
3-Methylphenol		
4-Methylphenol		
Naphthalene		
GB		5.07E-04
HD/HT	1.91E-08	1.52E-03
VX		5.07E-04
Chlorine		
Hydrogen Chloride		1.55E-02
Hydrogen Fluoride		
Nitroglycerine		
PCB		
Particulates		
2,4-Dinitrotoluene		
2,6-Dinitrotoluene		
2,4,6-Trinitrotoluene		
RDX		
HMX		
	1.39E-07	1.10E-01
	1E-07	0.11

Table A-2.1.11 Case 1. Without PFS, HHRA Protocol: UMCDF CHILD RESIDENT

	Risk UMCDF	HI-Liver UMCDF	HI-Neuro UMCDF	HQ
Indirect				
Antimony				1.08E-04
Arsenic	7.53E-09			1.95E-04
Barium				1.03E-06
Beryllium	4.90E-09			2.66E-06
bis (2-Ethylhexyl) Phthalate	6 14E-09	5.72E-05		2.56E-04
Cadmium				1.96E-05
Chromium				5.19E-06
2,4-Dinitrotoluene	2.83E-10		5.43E-07	2.43E-06
2,6-Dinitrotoluene	2.83E-10		1.09E-06	4.86E-06
Di-n-octyl Phthalate		3.50E-06		1.57E-05
GB			2.27E-05	1.02E-04
HD/HT	3.47E-07			
Lead				
Mercury			2.25E-04	1.01E-03
Nickel				4.30E-06
Total PCBs	7.76E-10			
Selenium				6.03E-06
Silver				7.99E-06
2,3,7,8-TCDD & Others	3.80E-08			
Thallium		2.64E-04		1.18E-03
VX			2.24E-05	1.00E-04
Di-n-butyl Phthalate				2.09E-06
Diethyl Phthalate				5.96E-07
Manganese			3.60E-06	1.61E-05
4-Methylphenol			4.51E-05	2.02E-04
RDX	4.58E-11			1.62E-06
2,4,6-Trinitrotoluene	1.25E-11	2.17E-06		9.71E-06
Vanadium				3.36E-06
Total	4.05E-07	3.26E-04	3.21E-04	
Grand Total	6E-07	0.00033	0.00032	

	Risk-Inh. UMCDF	HI-Inh. UMCDF
Inhalation		
Tetra CDD	1.25E-09	
Penta CDD	6.80E-10	
Hexa CDD	3.74E-20	
Hepta CDD	3.37E-21	
Octa CDD	7.88E-22	
Tetra CDF	6.16E-21	
Penta CDF	2.07E-19	
Hexa CDF	6.46E-20	
Hepta CDF	8.92E-21	
Octa CDF	6.70E-22	
2,3,7,8-TCDD TEQ	4.57E-09	
Antimony		
Arsenic	8.55E-08	
Barium		3.16E-05
Beryllium	3.24E-09	
Boron		1.76E-04
Cadmium	3.58E-09	
Chromium	3.08E-08	
Cobalt		
Copper		
Lead		
Manganese		1.02E-01
Mercury		1.35E-04
Nickel	2.10E-09	
Phosphorus		
Selenium		
Silver		
Thallium		
Tin		
Vanadium		
Zinc		
Acetone		
Benzene	2.52E-10	
Bromodichloromethane		
Bromoform	5.19E-12	
2-Butanone		1 41E-06
Carbon Disulfide		7.50E-06
Carbon Tetrachloride	1.31E-10	
Chlorobenzene		7.31E-07
Chloroform	1.94E-10	
Chloromethane	3.03E-10	
Dibromochloromethane		
1,1-Dichloroethane		6.68E-10
1,2-Dichloropropane		1.27E-04
cis-1,3-Dichloropropene	2.46E-09	7.15E-05
trans-1,3-Dichloropropene	5.86E-12	1.73E-07
Ethylbenzene		2 47E-08
2-Hexanone		
Methylene Chloride	8 17E-10	1.21E-05
4-Methyl-2-pentanone		
Styrene		2.31E-07
1,1,2,2-Tetrachloroethane	1.55E-11	
Tetrachloroethene		
Toluene		5.19E-05
1,1,1-Trichloroethane		
Vinyl Acetate		2.32E-08
Vinyl Chloride	2.52E-10	
Xylenes		
Benzoic Acid		
Benzyl Alcohol		
Diethyl Phthalate		
Dimethyl Phthalate		
Di-n-butyl Phthalate		
Di-n-octyl Phthalate		
bis(2-Ethylhexyl)-Phthalate		
2-Methylphenol		
3-Methylphenol		
4-Methylphenol		
Naphthalene		
GB		5.68E-04
HD/HT	2.14E-08	1.70E-03
VX		5.68E-04
Chlorine		
Hydrogen Chloride		1.74E-02
Hydrogen Fluoride		
Nitroglycerine		
PCB		
Particulates		
2,4-Dinitrotoluene		
2,6-Dinitrotoluene		
2,4,6-Trinitrotoluene		
RDX		
HMX		
	1.56E-07	1.23E-01
	2E-07	0.12

Table A-2.1.12 Case 1. Without PFS, HHRA Protocol: UMCDF SUBSISTENCE FARMER

CONCENTRATIONS AND DEPOSITIONS: **Calculated depositions and concentrations for indirect exposure pathways**

Substances of Potential Concern	Particulate Dry Deposition Pdd (g/m2)/yr	Particulate Wet Deposition Pwd (g/m2)/yr	Vapor Wet Deposition Vwd (g/m2)/yr	Vapor Concentration Vc (ug/m3)	Toxicity Equivalency Factor	2,3,7,8-TCDD Toxicity Equivalents Pdd (ug/m3)	2,3,7,8-TCDD Toxicity Equivalents Pwd (g/m2-yr)	2,3,7,8-TCDD Toxicity Equivalents Vwd (g/m2-yr)	2,3,7,8-TCDD Toxicity Equivalents Vc (ug/m3)
Tetra CDD	5.21E-11	5.25E-12	1.18E-11	4.31E-10	1.000	5.21E-11	5.25E-12	1.18E-11	4.31E-10
Penta CDD	9.53E-11	9.54E-12	6.19E-12	2.25E-10	0.500	4.77E-11	4.77E-12	3.09E-12	1.13E-10
Hexa CDD	1.62E-10	1.62E-11	2.26E-12	8.21E-11	0.100	1.62E-11	1.62E-12	2.26E-13	8.21E-12
Hepta CDD	1.55E-10	1.55E-11	5.83E-13	2.12E-11	0.010	1.55E-12	1.55E-13	5.83E-15	2.12E-13
Octa CDD	3.69E-10	3.69E-11	1.36E-14	4.96E-13	0.001	3.69E-13	3.69E-14	1.36E-17	4.96E-16
Tetra CDF	8.09E-12	8.09E-13	3.66E-12	1.33E-10	0.100	8.09E-13	8.09E-14	3.66E-13	1.33E-11
Penta CDF	1.10E-10	1.10E-11	1.48E-11	5.37E-10	0.500	5.49E-11	5.52E-12	7.38E-12	2.69E-10
Hexa CDF	2.67E-10	2.68E-11	6.12E-12	2.23E-10	0.100	2.67E-11	2.68E-12	6.12E-13	2.23E-11
Hepta CDF	3.96E-10	4.00E-11	3.08E-12	1.12E-10	0.010	3.96E-12	4.00E-13	3.08E-14	1.12E-12
Octa CDF	3.11E-10	3.13E-11	1.16E-13	4.22E-12	0.001	3.11E-13	3.13E-14	1.16E-16	4.22E-15
					Total =	2.05E-10	2.05E-11	2.36E-11	8.57E-10
Antimony	1.40E-05	1.40E-06	0.00E+00	0.00E+00					
Arsenic	1.89E-05	1.90E-06	0.00E+00	0.00E+00					
Barium	2.33E-05	2.33E-06	0.00E+00	0.00E+00					
Beryllium	4.28E-06	4.30E-07	0.00E+00	0.00E+00					
bis (2-Ethylhexyl) Phthalate	6.89E-05	6.87E-06	5.07E-05	1.85E-03					
Cadmium	6.32E-06	6.32E-07	0.00E+00	0.00E+00					
Chromium	8.36E-06	8.37E-07	0.00E+00	0.00E+00					
2,4-Dinitrotoluene	0.00E+00	0.00E+00	5.02E-08	1.83E-06					
2,6-Dinitrotoluene	0.00E+00	0.00E+00	5.02E-08	1.83E-06					
Di-n-octyl Phthalate	4.15E-06	4.21E-07	3.11E-06	1.13E-04					
GB	2.07E-14	2.11E-15	4.41E-08	1.61E-06					
HD/HT	5.36E-11	5.44E-12	4.41E-06	1.61E-04					
Lead	4.32E-05	4.34E-06	0.00E+00	0.00E+00					
Mercury	0.00E+00	0.00E+00	1.04E-06	3.77E-05					
Nickel	2.77E-05	2.79E-06	0.00E+00	0.00E+00					
PCB	0.00E+00	0.00E+00	1.22E-08	4.42E-07					
Selenium	9.71E-06	9.74E-07	0.00E+00	0.00E+00					
Silver	1.29E-05	1.29E-06	0.00E+00	0.00E+00					
2,3,7,8-TCDD & Dioxin-Like SOPCs	2.05E-10	2.05E-11	2.36E-11	8.57E-10					
Thallium	3.04E-05	3.06E-06	1.89E-15	6.87E-14					
VX	6.52E-11	6.61E-12	4.41E-08	1.61E-06					
Di-n-butyl Phthalate	2.55E-06	2.55E-07	1.88E-06	6.85E-05					
Diethyl Phthalate	6.34E-06	6.39E-07	4.72E-06	1.72E-04					
Manganese	7.26E-04	7.27E-05	0.00E+00	0.00E+00					
4-Methlyphenol	9.74E-11	9.85E-12	1.04E-05	3.79E-04					
RDX	0.00E+00	0.00E+00	5.02E-08	1.83E-06					
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	5.02E-08	1.83E-06					
Vanadium	7.57E-06	7.61E-07	0.00E+00	0.00E+00					

CDD = Chlorinated dibenzo-p-dioxin
CDF = Chlorinated dibenzo-p-furan

Table A-2.1.13 Case 1. Without PFS, HHRA Protocol: UMCDF SUBSISTENCE FARMER

SOIL INGESTION: Calculation of soil concentration due to deposition

Soil mixing depth, Z=	1	cm
Soil bulk density, BD=	1.5	g/cm3
Total deposition time period, Tc=	3.2	yrs
Dry deposition velocity of vapor phase, Vdv=	3	cm/s

Sc = Soil concentration after total time period of deposition
Ds = Deposition term
Pdd = Yearly dry deposition from particle phase
Pwd = Yearly wet deposition from particle phase
Vwd = Yearly wet deposition from vapor phase
Vc = Vapor phase air concentration

Substances of Potential Concern	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Vwd (g/m2-yr)	Vc (μg/m3)	Ds (1/yr)	Sc (mg/kg)
Antimony	1.40E-05	1.40E-06	0.00E+00	0.00E+00	1.03E-03	**3.28E-03**
Arsenic	1.89E-05	1.90E-06	0.00E+00	0.00E+00	1.38E-03	**4.43E-03**
Barium	2.33E-05	2.33E-06	0.00E+00	0.00E+00	1.71E-03	**5.47E-03**
Beryllium	4.28E-06	4.30E-07	0.00E+00	0.00E+00	3.14E-04	**1.00E-03**
bis (2-Ethylhexyl) Phthalate	6.89E-05	6.87E-06	5.07E-05	1.85E-03	1.25E-01	**4.00E-01**
Cadmium	6.32E-06	6.32E-07	0.00E+00	0.00E+00	4.63E-04	**1.48E-03**
Chromium	8.36E-06	8.37E-07	0.00E+00	0.00E+00	6.13E-04	**1.96E-03**
2,4-Dinitrotoluene	0.00E+00	0.00E+00	5.02E-08	1.83E-06	1.19E-04	**3.79E-04**
2,6-Dinitrotoluene	0.00E+00	0.00E+00	5.02E-08	1.83E-06	1.19E-04	**3.79E-04**
Di-n-octyl Phthalate	4.15E-06	4.21E-07	3.11E-06	1.13E-04	7.65E-03	**2.45E-02**
GB	2.07E-14	2.11E-15	4.41E-08	1.61E-06	1.04E-04	**3.33E-04**
HD/HT	5.36E-11	5.44E-12	4.41E-06	1.61E-04	1.04E-02	**3.33E-02**
Lead	4.32E-05	4.34E-06	0.00E+00	0.00E+00	3.17E-03	**1.01E-02**
Mercury	0.00E+00	0.00E+00	1.04E-06	3.77E-05	2.45E-03	**7.84E-03**
Nickel	2.77E-05	2.79E-06	0.00E+00	0.00E+00	2.03E-03	**6.51E-03**
PCB	0.00E+00	0.00E+00	1.22E-08	4.42E-07	2.87E-05	**9.19E-05**
Selenium	9.71E-06	9.74E-07	0.00E+00	0.00E+00	7.13E-04	**2.28E-03**
Silver	1.29E-05	1.29E-06	0.00E+00	0.00E+00	9.43E-04	**3.02E-03**
2,3,7,8-TCDD & Dioxin-Like SOPCs	2.05E-10	2.05E-11	2.36E-11	8.57E-10	7.06E-08	**2.26E-07**
Thallium	3.04E-05	3.06E-06	1.89E-15	6.87E-14	2.23E-03	**7.13E-03**
VX	6.52E-11	6.61E-12	4.41E-08	1.61E-06	1.04E-04	**3.33E-04**
Di-n-butyl Phthalate	2.55E-06	2.55E-07	1.88E-06	6.85E-05	4.63E-03	**1.48E-02**
Diethyl Phthalate	6.34E-06	6.39E-07	4.72E-06	1.72E-04	1.16E-02	**3.72E-02**
Manganese	7.26E-04	7.27E-05	0.00E+00	0.00E+00	5.32E-02	**1.70E-01**
4-Methylphenol	9.74E-11	9.85E-12	1.04E-05	3.79E-04	2.46E-02	**7.88E-02**
RDX	0.00E+00	0.00E+00	5.02E-08	1.83E-06	1.19E-04	**3.79E-04**
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	5.02E-08	1.83E-06	1.19E-04	**3.79E-04**
Vanadium	7.57E-06	7.61E-07	0.00E+00	0.00E+00	5.55E-04	**1.78E-03**

Table A-2.1.14 Case 1. Without PFS, HHRA Protocol: UMCDF SUBSISTENCE FARMER

CONSUMPTION OF ABOVE-GROUND VEGETABLES:

Calculation of above-ground vegetable concentration due to direct deposition
Calculation of above-ground vegetable concentration due to air-to-plant transfer

Interception fraction of edible portion, Rp=	0.04	unitless
Plant surface loss coefficient, kp=	18	1/yr
Time between rainfalls, t-rain=	14	days
Length of plant exposure per harvest, Tp=	0.16	yrs
Standing crop biomass, Yp=	1.7	kg DW/m2
Density of air, p=	1200	g/m3
Above ground veg. correction factor, VGab=	0.01	unitless

Pd = Concentration in plant due to direct deposition
Pv = Concentration in plant due to air-to-plant transfer
Pd + Pv = Concentration in plant due to direct deposition and air-to-plant transfer
Fw = Fraction of wet deposition of particles that adheres to plant
Bv = Air-to-plant bioconcentration factor

Substances of Potential Concern	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Fw	Pd (mg/kg)	Vc (µg/m3)	Bv (mg/kg)/(ug/g)	Pv (mg/kg)	Pd+Pv (mg/kg)
Antimony	1.40E-05	1.40E-06	0.2	**1.76E-05**	0.00E+00	NA	**0.00E+00**	**1.76E-05**
Arsenic	1.89E-05	1.90E-06	0.2	**2.38E-05**	0.00E+00	NA	**0.00E+00**	**2.38E-05**
Barium	2.33E-05	2.33E-06	0.6	**3.05E-05**	0.00E+00	NA	**0.00E+00**	**3.05E-05**
Beryllium	4.28E-06	4.30E-07	0.6	**5.59E-06**	0.00E+00	NA	**0.00E+00**	**5.59E-06**
bis (2-Ethylhexyl) Phthalate	6.89E-05	6.87E-06	0.6	**9.00E-05**	1.85E-03	5.11E+02	**7.86E-06**	**9.79E-05**
Cadmium	6.32E-06	6.32E-07	0.6	**8.26E-06**	0.00E+00	NA	**0.00E+00**	**8.26E-06**
Chromium	8.36E-06	8.37E-07	0.6	**1.09E-05**	0.00E+00	NA	**0.00E+00**	**1.09E-05**
2,4-Dinitrotoluene	0.00E+00	0.00E+00	0.6	**0.00E+00**	1.83E-06	1.50E+02	**2.28E-09**	**2.28E-09**
2,6-Dinitrotoluene	0.00E+00	0.00E+00	0.6	**0.00E+00**	1.83E-06	1.30E+02	**1.98E-09**	**1.98E-09**
Di-n-octyl Phthalate	4.15E-06	4.21E-07	0.6	**5.43E-06**	1.13E-04	2.32E+02	**2.19E-07**	**5.65E-06**
GB	2.07E-14	2.11E-15	0.6	**2.71E-14**	1.61E-06	2.90E+00	**3.88E-11**	**3.88E-11**
HD/HT	5.36E-11	5.44E-12	0.6	**7.02E-11**	1.61E-04	1.58E-01	**2.11E-10**	**2.82E-10**
Lead	4.32E-05	4.34E-06	0.6	**5.65E-05**	0.00E+00	NA	**0.00E+00**	**5.65E-05**
Mercury	0.00E+00	0.00E+00	0.6	**0.00E+00**	3.77E-05	2.30E+04	**7.23E-06**	**7.23E-06**
Nickel	2.77E-05	2.79E-06	0.6	**3.63E-05**	0.00E+00	NA	**0.00E+00**	**3.63E-05**
PCB	0.00E+00	0.00E+00	0.6	**0.00E+00**	4.42E-07	1.72E+03	**6.34E-09**	**6.34E-09**
Selenium	9.71E-06	9.74E-07	0.2	**1.22E-05**	0.00E+00	NA	**0.00E+00**	**1.22E-05**
Silver	1.29E-05	1.29E-06	0.6	**1.68E-05**	0.00E+00	NA	**0.00E+00**	**1.68E-05**
2,3,7,8-TCDD & Dioxin-Like SOPCs	2.05E-10	2.05E-11	0.6	**2.68E-10**	8.57E-10	8.39E+04	**5.99E-10**	**8.67E-10**
Thallium	3.04E-05	3.06E-06	0.6	**3.97E-05**	6.87E-14	NA	**0.00E+00**	**3.97E-05**
VX	6.52E-11	6.61E-12	0.6	**8.53E-11**	1.61E-06	2.26E+03	**3.02E-08**	**3.03E-08**
Di-n-butyl Phthalate	2.55E-06	2.55E-07	0.6	**3.33E-06**	6.85E-05	4.40E+02	**2.51E-07**	**3.58E-06**
Diethyl Phthalate	6.34E-06	6.39E-07	0.6	**8.29E-06**	1.72E-04	4.48E+02	**6.41E-07**	**8.93E-06**
Manganese	7.26E-04	7.27E-05	0.6	**9.49E-04**	0.00E+00	NA	**0.00E+00**	**9.49E-04**
4-Methylphenol	9.74E-11	9.85E-12	0.6	**1.27E-10**	3.79E-04	1.71E+01	**5.40E-08**	**5.42E-08**
RDX	0.00E+00	0.00E+00	0.6	**0.00E+00**	1.83E-06	9.92E-02	**1.51E-12**	**1.51E-12**
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	0.6	**0.00E+00**	1.83E-06	2.32E+02	**3.53E-09**	**3.53E-09**
Vanadium	7.57E-06	7.61E-07	0.6	**9.90E-06**	0.00E+00	NA	**0.00E+00**	**9.90E-06**

Table A-2.1.15 Case 1. Without PFS, HHRA Protocol: UMCDF SUBSISTENCE FARMER

CONSUMPTION OF ROOT VEGETABLES:

Calculation of soil concentration due to deposition
Calculation of root vegetable concentration due to root uptake

Soil mixing depth, Z=	20 cm
Soil bulk density, BD=	1.5 g/cm3
Total deposition time period, Tc=	3.2 yrs
Below ground veg. correction factor, VGbg=	0.01 unitless
Dry deposition velocity of vapor phase, Vdv=	3 cm/s

Pr(bg) = Root vegetable concentration due to root uptake
Sc = Soil concentration after total time period of deposition
Ds = Deposition term
Kds = Soil-water partition coefficient
RCF = Ratio of concentration in roots to concentration in soil pore water

Substances of Potential Concern	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Vwd (g/m2-yr)	Vc (μg/m3)	**Ds (1/yr)**	Sc (mg/kg)	Kds mL/g	RCF (mg/kg)/(ug/mL)	Pr(bg) (mg/kg)
Antimony	1.40E-05	1.40E-06	0.00E+00	0.00E+00	**5.13E-05**	1.64E-04	2	3.00E-02	**2.46E-08**
Arsenic	1.89E-05	1.90E-06	0.00E+00	0.00E+00	**6.92E-05**	2.22E-04	29	8.00E-03	**6.11E-10**
Barium	2.33E-05	2.33E-06	0.00E+00	0.00E+00	**8.54E-05**	2.73E-04	530	1.50E-02	**7.74E-11**
Beryllium	4.28E-06	4.30E-07	0.00E+00	0.00E+00	**1.57E-05**	5.02E-05	70	1.50E-03	**1.08E-11**
bis (2-Ethylhexyl) Phthalate	6.89E-05	6.87E-06	5.07E-05	1.85E-03	**6.24E-03**	2.00E-02	280000	3.20E+02	**2.28E-07**
Cadmium	6.32E-06	6.32E-07	0.00E+00	0.00E+00	**2.32E-05**	7.41E-05	160	3.20E-02	**1.48E-10**
Chromium	8.36E-06	8.37E-07	0.00E+00	0.00E+00	**3.06E-05**	9.81E-05	18	4.50E-03	**2.45E-10**
2,4-Dinitrotoluene	0.00E+00	0.00E+00	5.02E-08	1.83E-06	**5.93E-06**	1.90E-05	0.87	1.90E+00	**4.14E-07**
2,6-Dinitrotoluene	0.00E+00	0.00E+00	5.02E-08	1.83E-06	**5.93E-06**	1.90E-05	0.67	1.70E+00	**4.81E-07**
Di-n-octyl Phthalate	4.15E-06	4.21E-07	3.11E-06	1.13E-04	**3.83E-04**	1.22E-03	280000	3.20E+02	**1.40E-08**
GB	2.07E-14	2.11E-15	4.41E-08	1.61E-06	**5.21E-06**	1.67E-05	0.032	9.30E-01	**4.85E-06**
HD/HT	5.36E-11	5.44E-12	4.41E-06	1.61E-04	**5.21E-04**	1.67E-03	1.2	1.16E+00	**1.60E-05**
Lead	4.32E-05	4.34E-06	0.00E+00	0.00E+00	**1.58E-04**	5.07E-04	600	NA	**NA**
Mercury	0.00E+00	0.00E+00	1.04E-06	3.77E-05	**1.22E-04**	3.92E-04	57000	NA	**NA**
Nickel	2.77E-05	2.79E-06	0.00E+00	0.00E+00	**1.02E-04**	3.25E-04	82	4.00E-03	**1.59E-10**
PCB	0.00E+00	0.00E+00	1.22E-08	4.42E-07	**1.44E-06**	4.59E-06	4300	2.10E+03	**2.24E-08**
Selenium	9.71E-06	9.74E-07	0.00E+00	0.00E+00	**3.56E-05**	1.14E-04	4.3	2.00E-02	**5.30E-09**
Silver	1.29E-05	1.29E-06	0.00E+00	0.00E+00	**4.72E-05**	1.51E-04	0.4	1.00E-01	**3.77E-07**
2,3,7,8-TCDD & Dioxin-Like SOPCs	2.05E-10	2.05E-11	2.36E-11	8.57E-10	**3.53E-09**	1.13E-08	142000	1.21E+04	**9.63E-12**
Thallium	3.04E-05	3.06E-06	1.89E-15	6.87E-14	**1.11E-04**	3.57E-04	74	4.00E-04	**1.93E-11**
VX	6.52E-11	6.61E-12	4.41E-08	1.61E-06	**5.21E-06**	1.67E-05	0.15	1.85E+00	**2.06E-06**
Di-n-butyl Phthalate	2.55E-06	2.55E-07	1.88E-06	6.85E-05	**2.32E-04**	7.41E-04	1.6	1.80E+02	**8.34E-04**
Diethyl Phthalate	6.34E-06	6.39E-07	4.72E-06	1.72E-04	**5.81E-04**	1.86E-03	5.3	6.56E+00	**2.32E-05**
Manganese	7.26E-04	7.27E-05	0.00E+00	0.00E+00	**2.66E-03**	8.52E-03	23	1.00E-01	**3.70E-07**
4-Methylphenol	9.74E-11	9.85E-12	1.04E-05	3.79E-04	**1.23E-03**	3.94E-03	0.50	1.76E+00	**1.39E-04**
RDX	0.00E+00	0.00E+00	5.02E-08	1.83E-06	**5.93E-06**	1.90E-05	0.63	9.61E-01	**2.89E-07**
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	5.02E-08	1.83E-06	**5.93E-06**	1.90E-05	11	4.44E+00	**7.66E-08**
Vanadium	7.57E-06	7.61E-07	0.00E+00	0.00E+00	**2.78E-05**	8.88E-05	100	1.00E-01	**8.88E-10**

Table A-2.1.16 Case 1. Without PFS, HHRA Protocol: UMCDF SUBSISTENCE FARMER

CONSUMPTION OF BEEF AND MILK:

USING TIME-AVERAGED SOIL CONCENTRATIONS

Calculation of beef concentration due to plant and soil ingestion
Calculation of milk concentration due to plant and soil ingestion

Interception fraction of edible portion, Rp=	0.44	unitless
Plant surface loss coefficient, kp=	18	1/yr
Time between rainfalls, t-rain=	14	days
Length of plant exposure per harvest, Tp=	0.12	yrs
Yield or standing crop biomass, Yp=	0.2	kgDW/m2
Fraction grown on impacted soil, F=	1	unitless
Quantity eaten by beef cattle, Qpb=	8.8	kg DW/day
Quantity soil eaten by beef cattle, Qsb=	0.4	kg soil/day
Quantity eaten by dairy cattle, Qpm=	13.2	kg DW/day
Quantity soil eaten by dairy cattle, Qsm=	0.4	kg soil/day
Density of air, p=	1200	g/m3

A(beef) = Concentration in beef
A(milk) = Concentration in milk
Sc = Soil concentration after total time period of deposition
Pd = Concentration in plant due to direct deposition
Pv = Concentration in plant due to air-to-plant transfer
Pd + Pv = Concentration in plant due to direct deposition and air-to-plant transfer
Vc = Concentration in air due to direct emissions
Bv = Air-to-Plant biotransfer factor
Ba(beef) = Biotransfer factor for beef
Ba(milk) = Biotransfer factor for milk

Substances of Potential Concern	Sc (mg/kg)	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Fw	Pd (mg/kg)	Vc (µg/m3)	Bv (mg/kg)/(ug/g)	Pv (mg/kg)	Pv+Pd (mg/kg)	Ba(beef) (day/kg)	A(beef) (mg/kg)	Ba(milk) (day/kg)	A(milk) (mg/kg)
Antimony	3.28E-03	1.40E-05	1.40E-06	0.2	1.54E-03	0.00E+00	NA	0.00E+00	1.54E-03	1.00E-03	1.49E-05	1.00E-04	2.17E-06
Arsenic	4.43E-03	1.89E-05	1.90E-06	0.2	2.08E-03	0.00E+00	NA	0.00E+00	2.08E-03	2.00E-03	4.02E-05	6.00E-03	1.75E-04
Barium	5.47E-03	2.33E-05	2.33E-06	0.6	2.67E-03	0.00E+00	NA	0.00E+00	2.67E-03	1.50E-04	3.85E-06	3.50E-04	1.31E-05
Beryllium	1.00E-03	4.28E-06	4.30E-07	0.6	4.90E-04	0.00E+00	NA	0.00E+00	4.90E-04	1.00E-03	4.72E-06	9.00E-07	6.19E-09
bis (2-Ethylhexyl) Phthalate	4.00E-01	6.89E-05	6.87E-06	0.6	7.89E-03	1.85E-03	5.11E+02	7.86E-04	8.68E-03	NA	NA	NA	NA
Cadmium	1.48E-03	6.32E-06	6.32E-07	0.6	7.24E-04	0.00E+00	NA	0.00E+00	7.24E-04	1.20E-01	8.36E-04	7.60E-03	7.72E-05
Chromium	1.96E-03	8.36E-06	8.37E-07	0.6	9.58E-04	0.00E+00	NA	0.00E+00	9.58E-04	5.50E-03	5.07E-05	1.50E-03	2.01E-05
2,4-Dinitrotoluene	3.79E-04	0.00E+00	0.00E+00	0.6	0.00E+00	1.83E-06	1.50E+02	2.28E-07	2.28E-07	2.50E-06	3.84E-10	7.90E-07	1.22E-10
2,6-Dinitrotoluene	3.79E-04	0.00E+00	0.00E+00	0.6	0.00E+00	1.83E-06	1.30E+02	1.98E-07	1.98E-07	1.90E-06	2.92E-10	6.10E-07	9.42E-11
Di-n-octyl Phthalate	2.45E-02	4.15E-06	4.21E-07	0.6	4.76E-04	1.13E-04	2.32E+02	2.19E-05	4.98E-04	NA	NA	NA	NA
GB	3.33E-04	2.07E-14	2.11E-15	0.6	2.38E-12	1.61E-06	2.90E+00	3.88E-09	3.88E-09	1.30E-07	1.73E-11	4.20E-08	5.60E-12
HD/HT	3.33E-02	5.36E-11	5.44E-12	0.6	6.15E-09	1.61E-04	1.58E-01	2.11E-08	2.73E-08	5.89E-07	7.86E-09	1.86E-07	2.48E-09
Lead	1.01E-02	4.32E-05	4.34E-06	0.6	4.95E-03	0.00E+00	NA	0.00E+00	4.95E-03	NA	NA	NA	NA
Mercury	7.84E-03	0.00E+00	0.00E+00	0.6	0.00E+00	3.77E-05	2.30E+04	7.23E-04	7.23E-04	8.00E-05	7.60E-07	4.00E-04	5.07E-06
Nickel	6.51E-03	2.77E-05	2.79E-06	0.6	3.18E-03	0.00E+00	NA	0.00E+00	3.18E-03	6.00E-03	1.83E-04	1.00E-03	4.45E-05
PCB	9.19E-05	0.00E+00	0.00E+00	0.6	0.00E+00	4.42E-07	1.72E+03	6.34E-07	6.34E-07	5.00E-02	2.12E-06	1.60E-02	7.22E-07
Selenium	2.28E-03	9.71E-06	9.74E-07	0.2	1.07E-03	0.00E+00	NA	0.00E+00	1.07E-03	1.50E-02	1.55E-04	4.00E-03	6.02E-05
Silver	3.02E-03	1.29E-05	1.29E-06	0.6	1.47E-03	0.00E+00	NA	0.00E+00	1.47E-03	3.00E-03	4.25E-05	2.00E-02	4.13E-04
2,3,7,8-TCDD & Dioxin-Like SOPCs	2.26E-07	2.05E-10	2.05E-11	0.60	2.35E-08	8.57E-10	8.39E+04	5.99E-08	8.34E-08	4.00E-02	3.30E-08	7.00E-03	8.34E-09
Thallium	7.13E-03	3.04E-05	3.06E-06	0.6	3.48E-03	6.87E-14	NA	0.00E+00	3.48E-03	4.00E-02	1.34E-03	2.00E-03	9.76E-05
VX	3.33E-04	6.52E-11	6.61E-12	0.6	7.48E-09	1.61E-06	2.26E+03	3.02E-06	3.03E-06	2.45E-06	3.92E-10	7.76E-07	1.35E-10
Di-n-butyl Phthalate	1.48E-02	2.55E-06	2.55E-07	0.6	2.92E-04	6.85E-05	4.40E+02	2.51E-05	3.17E-04	NA	NA	NA	NA
Diethyl Phthalate	3.72E-02	6.34E-06	6.39E-07	0.6	7.27E-04	1.72E-04	4.48E+02	6.41E-05	7.91E-04	NA	NA	NA	NA
Manganese	1.70E-01	7.26E-04	7.27E-05	0.6	8.32E-02	0.00E+00	NA	0.00E+00	8.32E-02	1.20E-01	9.60E-02	2.00E-02	2.33E-02
4-Methylphenol	7.88E-02	9.74E-11	9.85E-12	0.6	1.12E-08	3.79E-04	1.71E+01	5.40E-06	5.42E-06	2.19E-06	6.91E-08	6.92E-07	2.19E-08
RDX	3.79E-04	0.00E+00	0.00E+00	0.6	0.00E+00	1.83E-06	9.92E-02	1.51E-10	1.51E-10	1.86E-07	2.82E-11	5.89E-08	8.94E-12
2,4,6-Trinitrotoluene	3.79E-04	0.00E+00	0.00E+00	0.6	0.00E+00	1.83E-06	2.32E+02	3.53E-07	3.53E-07	1.26E-05	1.95E-09	3.98E-06	6.23E-10
Vanadium	1.78E-03	7.57E-06	7.61E-07	0.6	8.68E-04	0.00E+00	NA	0.00E+00	8.68E-04	1.20E-01	1.00E-03	2.00E-02	2.43E-04

Table A-2.1.17 Case 1. Without PFS, HHRA Protocol: UMCDF SUBSISTENCE FARMER

INDIRECT EXPOSURES: Calculation of cancer risks

Consumption rate of soil, CR(soil)=	0.0001	kg/day
Fraction of soil impacted, F(soil)=	1	unitless
Consumption rate of abv grd veg, CR(ag)=	0.024	kg/day
Fraction of abv grd veg impacted, F(ag)=	0.95	unitless
Consumption rate of root veg, CR(bg)=	0.0063	kg/day
Fraction of root veg impacted, F(bg)=	0.95	unitless
Consumption rate of beef, CR(beef)=	0.1	kg/day
Fraction of beef impacted, F(beef)=	0.44	unitless
Consumption rate of milk, CR(milk)=	0.3	kg/day
Fraction of milk impacted, F(milk)=	0.4	unitless
Exposure duration, ED=	40	yr
Exposure frequency, EF=	350	day/yr
Body weight, BW=	70	kg
Averaging time, AT=	70	yr

I(tot) = Total daily intake of substance
Sc = Soil concentration after total time period of deposition
I(soil) = Daily intake of substance from soil
Pd + Pv = Concentration in plant
I(ag) = Daily intake of substance from above ground vegetables
Pr(bg) = Concentration in below ground plant parts due to root uptake
I(bg) = Daily intake of substance from below ground vegetables
A(beef) = Concentration in beef
I(beef) = Daily intake of substance from beef
A(milk) = Concentration in milk
I(milk) = Daily intake of substance from milk
CSF = Carcinogenic slope factor

Substances of Potential Concern	Sc (mg/kg)	I(soil) (mg/day)	Pd+Pv (mg/kg)	I(ag) (mg/day)	Pr(bg) (mg/kg)	I(bg) (mg/day)	A(beef) (mg/kg)	I(beef) (mg/day)	A(milk) (mg/kg)	I(milk) (mg/day)	I(tot) (mg/day)	CSF (per mg/kg-day)	Cancer Risk
Antimony	3.28E-03	3.28E-07	1.76E-05	4.01E-07	2.46E-08	1.47E-10	1.49E-05	6.55E-07	2.17E-06	2.60E-07	1.64E-06		
Arsenic	4.43E-03	4.43E-07	2.38E-05	5.42E-07	6.11E-10	3.66E-12	4.02E-05	1.77E-06	1.75E-04	2.11E-05	2.38E-05	1.50E+00	2.80E-07
Barium	5.47E-03	5.47E-07	3.05E-05	6.95E-07	7.74E-11	4.63E-13	3.85E-06	1.70E-07	1.31E-05	1.57E-06	2.98E-06		
Beryllium	1.00E-03	1.00E-07	5.59E-06	1.28E-07	1.08E-11	6.44E-14	4.72E-06	2.08E-07	6.19E-09	7.42E-10	4.36E-07	4.30E+00	1.47E-08
bis (2-Ethylhexyl) Phthalate	4.00E-01	4.00E-05	9.79E-05	2.23E-06	2.28E-07	1.37E-09	NA	NA	NA	NA	4.22E-05	1.40E-02	4.62E-09
Cadmium	1.48E-03	1.48E-07	8.26E-06	1.88E-07	1.48E-10	8.88E-13	8.36E-04	3.68E-05	7.72E-05	9.26E-06	4.64E-05		
Chromium	1.96E-03	1.96E-07	1.09E-05	2.49E-07	2.45E-10	1.47E-12	5.07E-05	2.23E-06	2.01E-05	2.42E-06	5.09E-06		
2,4-Dinitrotoluene	3.79E-04	3.79E-08	2.28E-09	5.21E-11	4.14E-07	2.48E-09	3.84E-10	1.69E-11	1.22E-10	1.47E-11	4.05E-08	6.80E-01	2.16E-10
2,6-Dinitrotoluene	3.79E-04	3.79E-08	1.98E-09	4.51E-11	4.81E-07	2.88E-09	2.92E-10	1.28E-11	9.42E-11	1.13E-11	4.09E-08	6.80E-01	2.18E-10
Di-n-octyl Phthalate	2.45E-02	2.45E-06	5.65E-06	1.29E-07	1.40E-08	8.38E-11	NA	NA	NA	NA	2.58E-06		
GB	3.33E-04	3.33E-08	3.88E-11	8.85E-13	4.85E-06	2.90E-08	1.73E-11	7.63E-13	5.60E-12	6.73E-13	6.24E-08		
HD/HT	3.33E-02	3.33E-06	2.82E-10	6.42E-12	1.60E-05	9.57E-08	7.86E-09	3.46E-10	2.48E-09	2.98E-10	3.43E-06	9.50E+00	2.55E-07
Lead	1.01E-02	1.01E-06	5.65E-05	1.29E-06	NA	NA	NA	NA	NA	NA	2.30E-06		
Mercury	7.84E-03	7.84E-07	7.23E-06	1.65E-07	NA	NA	7.60E-07	3.34E-08	5.07E-06	6.09E-07	1.59E-06		
Nickel	6.51E-03	6.51E-07	3.63E-05	8.27E-07	1.59E-10	9.50E-13	1.83E-04	8.07E-06	4.45E-05	5.35E-06	1.49E-05		
PCB	9.19E-05	9.19E-09	6.34E-09	1.45E-10	2.24E-08	1.34E-10	2.12E-06	9.31E-08	7.22E-07	8.66E-08	1.89E-07	7.70E+00	1.14E-08
Selenium	2.28E-03	2.28E-07	1.22E-05	2.79E-07	5.30E-09	3.17E-11	1.55E-04	6.82E-06	6.02E-05	7.23E-06	1.46E-05		
Silver	3.02E-03	3.02E-07	1.68E-05	3.83E-07	3.77E-07	2.26E-09	4.25E-05	1.87E-06	4.13E-04	4.96E-05	5.21E-05		
2,3,7,8-TCDD & Dioxin-Like SOPCs	2.26E-07	2.26E-11	8.67E-10	1.98E-11	9.63E-12	5.76E-14	3.30E-08	1.45E-09	8.34E-09	1.00E-09	2.49E-09	1.50E+05	2.93E-06
Thallium	7.13E-03	7.13E-07	3.97E-05	9.06E-07	1.93E-11	1.15E-13	1.34E-03	5.90E-05	9.76E-05	1.17E-05	7.23E-05		
VX	3.33E-04	3.33E-08	3.03E-08	6.91E-10	2.06E-06	1.23E-08	3.92E-10	1.73E-11	1.35E-10	1.61E-11	4.64E-08		
Di-n-butyl Phthalate	1.48E-02	1.48E-06	3.58E-06	8.17E-08	8.34E-04	4.99E-06	NA	NA	NA	NA	6.56E-06		
Diethyl Phthalate	3.72E-02	3.72E-06	8.93E-06	2.04E-07	2.32E-05	1.39E-07	NA	NA	NA	NA	4.06E-06		
Manganese	1.70E-01	1.70E-05	9.49E-04	2.16E-05	3.70E-07	2.22E-09	9.60E-02	4.22E-03	2.33E-02	2.80E-03	7.06E-03		
4-Methylphenol	7.88E-02	7.88E-06	5.42E-08	1.24E-09	1.39E-04	8.30E-07	6.91E-08	3.04E-09	2.19E-08	2.62E-09	8.71E-06		
RDX	3.79E-04	3.79E-08	1.51E-12	3.44E-14	2.89E-07	1.73E-09	2.82E-11	1.24E-12	8.94E-12	1.07E-12	3.97E-08	1.10E-01	3.42E-11
2,4,6-Trinitrotoluene	3.79E-04	3.79E-08	3.53E-09	8.05E-11	7.66E-08	4.58E-10	1.95E-09	8.59E-11	6.23E-10	7.47E-11	3.86E-08	3.00E-02	9.07E-12
Vanadium	1.78E-03	1.78E-07	9.90E-06	2.26E-07	8.88E-10	5.32E-12	1.00E-03	4.41E-05	2.43E-04	2.92E-05	7.37E-05		

Total cancer risk= 3E-06

Table A-2.1.18 Case 1. Without PFS, HHRA Protocol: UMCDF SUBSISTENCE FARMER

INDIRECT EXPOSURES: Calculation of hazard quotients, and hazard indices

Consumption rate of soil, CR(soil)=	0.0001	kg/day
Fraction of soil impacted, F(soil)=	1	unitless
Consumption rate of abv grd veg, CR(ag)=	0.024	kg/day
Fraction of abv grd veg impacted, F(ag)=	0.95	unitless
Consumption rate of root veg, CR(bg)=	0.0063	kg/day
Fraction of root veg impacted, F(bg)=	0.95	unitless
Consumption rate of beef, CR(beef)=	0.1	kg/day
Fraction of beef impacted, F(beef)=	0.44	unitless
Consumption rate of milk, CR(milk)=	0.3	kg/day
Fraction of milk impacted, F(milk)=	0.4	unitless
Body weight, BW=	70	kg

I(tot) = Total daily intake of substance
Sc = Soil concentration after total time period of deposition
I(soil) = Daily intake of substance from soil
Pd + Pv = Concentration in plant
I(ag) = Daily intake of substance from above ground vegetables
Pr(bg) = Concentration in below ground plant parts due to root uptake
I(bg) = Daily intake of substance from below ground vegetables
A(beef) = Concentration in beef
I(beef) = Daily intake of substance from beef
A(milk) = Concentration in milk
I(milk) = Daily intake of substance from milk
RfD = Reference dose
HI = Hazard Index

Substances of Potential Concern	Sc (mg/kg)	I(soil) (mg/day)	Pd+Pv (mg/kg)	I(ag) (mg/day)	Pr(bg) (mg/kg)	I(bg) (mg/day)	A(beef) (mg/kg)	I(beef) (mg/day)	A(milk) (mg/kg)	I(milk) (mg/day)	I(tot) (mg/day)	RfD (mg/kg-day)	Hazard Index	Hazard Index	Hazard Quotient
													Liver	Neuro	
Antimony	3.28E-03	3.28E-07	1.76E-05	4.01E-07	2.46E-08	1.47E-10	1.49E-05	6.55E-07	2.17E-06	2.60E-07	1.64E-06	4.00E-04			6E-05
Arsenic	4.43E-03	4.43E-07	2.38E-05	5.42E-07	6.11E-10	3.66E-12	4.02E-05	1.77E-06	1.75E-04	2.11E-05	2.38E-05	3.00E-04			1E-03
Barium	5.47E-03	5.47E-07	3.05E-05	6.95E-07	7.74E-11	4.63E-13	3.85E-06	1.70E-07	1.31E-05	1.57E-06	2.98E-06	7.00E-02			6E-07
Beryllium	1.00E-03	1.00E-07	5.59E-06	1.28E-07	1.08E-11	6.44E-14	4.72E-06	2.08E-07	6.19E-09	7.42E-10	4.36E-07	5.00E-03			1E-06
bis (2-Ethylhexyl) Phthalate	4.00E-01	4.00E-05	9.79E-05	2.23E-06	2.28E-07	1.37E-09	NA	NA	NA	NA	4.22E-05	2.00E-02	2.89E-05		3E-05
Cadmium	1.48E-03	1.48E-07	8.26E-06	1.88E-07	1.48E-10	8.88E-13	8.36E-04	3.68E-05	7.72E-05	9.26E-06	4.64E-05	1.00E-03			6E-04
Chromium	1.96E-03	1.96E-07	1.09E-05	2.49E-07	2.45E-10	1.47E-12	5.07E-05	2.23E-06	2.01E-05	2.42E-06	5.09E-06	5.00E-03			1E-05
2,4-Dinitrotoluene	3.79E-04	3.79E-08	2.28E-09	5.21E-11	4.14E-07	2.48E-09	3.84E-10	1.69E-11	1.22E-10	1.47E-11	4.05E-08	2.00E-03		2.77E-07	3E-07
2,6-Dinitrotoluene	3.79E-04	3.79E-08	1.98E-09	4.51E-11	4.81E-07	2.88E-09	2.92E-10	1.28E-11	9.42E-11	1.13E-11	4.09E-08	1.00E-03		5.60E-07	6E-07
Di-n-octyl Phthalate	2.45E-02	2.45E-06	5.65E-06	1.29E-07	1.40E-08	8.38E-11	NA	NA	NA	NA	2.58E-06	2.00E-02	1.77E-06		2E-06
GB	3.33E-04	3.33E-08	3.88E-11	8.85E-13	4.85E-06	2.90E-08	1.73E-11	7.63E-13	5.60E-12	6.73E-13	6.24E-08	4.30E-05		1.99E-05	2E-05
HD/HT	3.33E-02	3.33E-06	2.82E-10	6.42E-12	1.60E-05	9.57E-08	7.86E-09	3.46E-10	2.48E-09	2.98E-10	3.43E-06				
Lead	1.01E-02	1.01E-06	5.65E-05	1.29E-06	NA	NA	NA	NA	NA	NA	2.30E-06				
Mercury	7.84E-03	7.84E-07	7.23E-06	1.65E-07	NA	NA	7.60E-07	3.34E-08	5.07E-06	6.09E-07	1.59E-06	1.00E-04		2.18E-04	2E-04
Nickel	6.51E-03	6.51E-07	3.63E-05	8.27E-07	1.59E-10	9.50E-13	1.83E-04	8.07E-06	4.45E-05	5.35E-06	1.49E-05	2.00E-02	1.02E-05		1E-05
PCB	9.19E-05	9.19E-09	6.34E-09	1.45E-10	2.24E-08	1.34E-10	2.12E-06	9.31E-08	7.22E-07	8.66E-08	1.89E-07				
Selenium	2.28E-03	2.28E-07	1.22E-05	2.79E-07	5.30E-09	3.17E-11	1.55E-04	6.82E-06	6.02E-05	7.23E-06	1.46E-05	5.00E-03			4E-05
Silver	3.02E-03	3.02E-07	1.68E-05	3.83E-07	3.77E-07	2.26E-09	4.25E-05	1.87E-06	4.13E-04	4.96E-05	5.21E-05	5.00E-03			1E-04
2,3,7,8-TCDD & Dioxin-Like SOPCs	2.26E-07	2.26E-11	8.67E-10	1.98E-11	9.63E-12	5.76E-14	3.30E-08	1.45E-09	8.34E-09	1.00E-09	2.49E-09				
Thallium	7.13E-03	7.13E-07	3.97E-05	9.06E-07	1.93E-11	1.15E-13	1.34E-03	5.90E-05	9.76E-05	1.17E-05	7.23E-05	8.00E-05	1.24E-02		1E-02
VX	3.33E-04	3.33E-08	3.03E-08	6.91E-10	2.06E-06	1.23E-08	3.92E-10	1.73E-11	1.35E-10	1.61E-11	4.64E-08	4.30E-05		1.48E-05	1E-05
Di-n-butyl Phthalate	1.48E-02	1.48E-06	3.58E-06	8.17E-08	8.34E-04	4.99E-06	NA	NA	NA	NA	6.56E-06	1.00E-01			9E-07
Diethyl Phthalate	3.72E-02	3.72E-06	8.93E-06	2.04E-07	2.32E-05	1.39E-07	NA	NA	NA	NA	4.06E-06	8.00E-01			7E-08
Manganese	1.70E-01	1.70E-05	9.49E-04	2.16E-05	3.70E-07	2.22E-09	9.60E-02	4.22E-03	2.33E-02	2.80E-03	7.06E-03	1.40E-01		6.91E-04	7E-04
4-Methylphenol	7.88E-02	7.88E-06	5.42E-08	1.24E-09	1.39E-04	8.30E-07	6.91E-08	3.04E-09	2.19E-08	2.62E-09	8.71E-06	5.00E-03		2.39E-05	2E-05
RDX	3.79E-04	3.79E-08	1.51E-12	3.44E-14	2.89E-07	1.73E-09	2.82E-11	1.24E-12	8.94E-12	1.07E-12	3.97E-08	3.00E-03			2E-07
2,4,6-Trinitrotoluene	3.79E-04	3.79E-08	3.53E-09	8.05E-11	7.66E-08	4.58E-10	1.95E-09	8.59E-11	6.23E-10	7.47E-11	3.86E-08	5.00E-04	1.06E-06		1E-06
Vanadium	1.78E-03	1.78E-07	9.90E-06	2.26E-07	8.88E-10	5.32E-12	1.00E-03	4.41E-05	2.43E-04	2.92E-05	7.37E-05	7.00E-03			1E-04
												HI=	0.0124	0.0010	0.02

Table A-2.1.19 Case 1. Without PFS, HHRA Protocol: UMCDF SUBSISTENCE FARMER

DIRECT INHALATION EXPOSURES:

Exposure Parameter	Exposure Scenario			
	Subsistence Farmer	Subsistence Fisher	Adult Resident	Child Resident
Inhalation rate, IH (m3/hr)	0.8	0.8	0.8	0.2
Exposure duration, ED (yr)	3.2	3.2	3.2	3.2
Body weight, BW (kg)	70	70	70	15
Exposure time, ET (hr/day)	24			
Exposure frequency, EF (day/yr)	350			
Carcinogenic averaging time, LT (day)	25550			
Noncancer averaging time, LT(day)	1168			

CSF = Cancer Slope Factor
RfD = Reference Dose
HI = Hazard Index

CDD = Chlorinated dibenzo-p-dioxin
CDF = Chlorinated dibenzo-p-furan

Substances of Potential Concern	Respirable Concentration (ug/m3)	Cancer Inh. Intake-Farmer (mg/kg-day)	Inhalation CSF (per mg/kg-day)	Cancer Risk Farmer	Inhalation RfD (mg/kg-day)	Hazard Quotient Farmer
Tetra CDD	7.67E-10	9.60E-15	1.16E+05	1.11E-09		
Penta CDD	8.36E-10	1.05E-14	5.80E+04	6.08E-10		
Hexa CDD	1.12E-09	1.41E-14	1.16E+04	1.63E-10		
Hepta CDD	1.01E-09	1.27E-14	1.16E+03	1.47E-11		
Octa CDD	2.37E-09	2.96E-14	1.16E+02	3.44E-12		
Tetra CDF	1.85E-10	2.32E-15	1.16E+04	2.69E-11		
Penta CDF	1.24E-09	1.56E-14	5.80E+04	9.04E-10		
Hexa CDF	1.94E-09	2.43E-14	1.16E+04	2.82E-10		
Hepta CDF	2.68E-09	3.35E-14	1.16E+03	3.89E-11		
Octa CDF	2.01E-09	2.52E-14	1.16E+02	2.92E-12		
2,3,7,8-TCDD TEQ	2.17E-09	2.72E-14	1.50E+05	4.08E-09		
Antimony	8.98E-05	1.12E-09				
Arsenic	1.22E-04	1.53E-09	5.00E+01	7.63E-08		
Barium	1.49E-04	1.87E-09			1.45E-03	2.82E-05
Beryllium	2.75E-05	3.45E-10	8.40E+00	2.89E-09		
Boron	3.32E-03	4.16E-08			5.80E-03	1.57E-04
Cadmium	4.05E-05	5.07E-10	6.30E+00	3.20E-09		
Chromium	5.36E-05	6.71E-10	4.10E+01	2.75E-08		
Cobalt	4.60E-05	5.76E-10				
Copper	5.68E-05	7.11E-10				
Lead	2.78E-04	3.48E-09				
Manganese	4.66E-03	5.83E-08			1.40E-05	9.11E-02
Mercury	3.77E-05	4.72E-10			8.60E-05	1.20E-04
Nickel	1.78E-04	2.23E-09	8.40E-01	1.88E-09		
Phosphorus	2.02E-03	2.53E-08				
Selenium	6.24E-05	7.82E-10				
Silver	8.27E-05	1.04E-09				
Thallium	1.96E-04	2.46E-09				
Tin	2.33E-04	2.91E-09				
Vanadium	4.88E-05	6.11E-10				
Zinc	1.01E-03	1.26E-08				
Acetone	2.66E-01	3.33E-06				
Benzene	6.20E-04	7.77E-09	2.90E-02	2.25E-10		
Bromodichloromethane	5.70E-06	7.13E-11				
Bromoform	9.61E-05	1.20E-09	3.85E-03	4.63E-12		
2-Butanone	1.33E-03	1.66E-08			2.90E-01	1.25E-06
Carbon Disulfide	7.08E-05	8.87E-10			2.90E-03	6.69E-06
Carbon Tetrachloride	1.76E-04	2.21E-09	5.30E-02	1.17E-10		
Chlorobenzene	1.38E-05	1.73E-10			5.80E-03	6.52E-07
Chloroform	1.70E-04	2.13E-09	8.10E-02	1.73E-10		
Chloromethane	3.43E-03	4.29E-08	6.30E-03	2.70E-10		
Dibromochloromethane	6.17E-06	7.73E-11				
1,1-Dichloroethane	3.16E-06	3.95E-11			1.45E+00	5.96E-10
1,2-Dichloropropane	1.57E-03	1.96E-08			3.80E-03	1.13E-04
cis-1,3-Dichloropropene	1.35E-03	1.69E-08	1.30E-01	2.20E-09	5.80E-03	6.38E-05
trans-1,3-Dichloropropene	3.22E-06	4.03E-11	1.30E-01	5.24E-12	5.70E-03	1.55E-07
Ethylbenzene	2.33E-05	2.92E-10			2.90E-01	2.20E-08
2-Hexanone	1.43E-05	1.80E-10				
Methylene Chloride	3.42E-02	4.29E-07	1.70E-03	7.29E-10	8.70E-01	1.08E-05
4-Methyl-2-pentanone	1.83E-05	2.29E-10			2.30E-01	2.18E-08
Styrene	6.55E-04	8.20E-09			8.70E-01	2.06E-07
1,1,2,2-Tetrachloroethane	5.51E-06	6.90E-11	2.00E-01	1.38E-11		
Tetrachloroethene	8.59E-06	1.08E-10				
Toluene	1.86E-02	2.33E-07			1.10E-01	4.64E-05
1,1,1-Trichloroethane	1.83E-04	2.29E-09				
Vinyl Acetate	4.30E-06	5.39E-11			5.70E-02	2.07E-08
Vinyl Chloride	5.99E-05	7.50E-10	3.00E-01	2.25E-10		
Xylenes	3.88E-05	4.86E-10				
Benzoic Acid	1.29E-03	1.62E-08				
Benzyl Alcohol	1.16E-02	1.45E-07				
Diethyl Phthalate	2.13E-04	2.66E-09				
Dimethyl Phthalate	2.12E-03	2.66E-08				
Di-n-butyl Phthalate	8.48E-05	1.06E-09				
Di-n-octyl Phthalate	1.40E-04	1.76E-09				
bis(2-Ethylhexyl)-Phthalate	2.29E-03	2.86E-08				
2-Methylphenol	1.97E-03	2.47E-08				
3-Methylphenol	8.19E-04	1.03E-08				
4-Methylphenol	3.79E-04	4.75E-09				
Naphthalene	8.42E-05	1.05E-09				
GB	1.61E-06	2.01E-11			8.67E-07	5.07E-04
HD/HT	1.61E-04	2.01E-09	9.50E+00	1.91E-08	2.90E-05	1.52E-03
VX	1.61E-06	2.01E-11			8.67E-07	5.07E-04
Chlorine	5.70E-02	7.13E-07				
Hydrogen Chloride	3.28E-01	4.11E-06			5.80E-03	1.55E-02
Hydrogen Fluoride	9.01E-02	1.13E-06				
Nitroglycerine	3.83E-04	4.79E-09				
PCB	4.42E-07	5.54E-12				
Particulate	8.02E-02	1.01E-06				
2,4-Dinitrotoluene	1.83E-06	2.29E-11				
2,6-Dinitrotoluene	1.83E-06	2.29E-11				
2,4,6-Trinitrotoluene	1.83E-06	2.29E-11				
RDX	1.83E-06	2.29E-11				
HMX	1.83E-06	2.29E-11				
				1E-07	Total HI=	0.1

Table A-2.1.20 Case 1. Without PFS, HHRA Protocol: UMCDF SUBSISTENCE FARMER

	Risk UMCDF	HI-Liver UMCDF	HI-Neuro UMCDF	HQ
Indirect				
Antimony				5.63E-05
Arsenic	2.80E-07			1.09E-03
Barium				5.84E-07
Beryllium	1.47E-08			1.20E-06
bis (2-Ethylhexyl) Phthalate	4.62E-09	2.89E-05		2.89E-05
Cadmium				6.35E-04
Chromium				1.40E-05
2,4-Dinitrotoluene	2.16E-10		2.77E-07	2.77E-07
2,6-Dinitrotoluene	2.18E-10		5.60E-07	5.60E-07
Di-n-octyl Phthalate		1.77E-06		1.77E-06
GB			1.99E-05	1.99E-05
HD/HT	2.55E-07			
Lead				
Mercury			2.18E-04	2.18E-04
Nickel				1.02E-05
PCB	1.14E-08			
Selenium				3.99E-05
Silver				1 43E-04
2,3,7,8-TCDD&Others	2.93E-06			
Thallium		1.24E-02		1.24E-02
VX			1.48E-05	1.48E-05
Di-n-butyl Phthalate				8 98E-07
Diethyl Phthalate				6.95E-08
Manganese			6.91E-04	6.91E-04
4-Methylphenol			2.39E-05	2.39E-05
RDX	3.42E-11			1.81E-07
2,4,6-Trinitrotoluene	9.07E-12	1.06E-06		1.06E-06
Vanadium				1.44E-04
Total	3.49E-06	1.24E-02	9.68E-04	
Grand Total	4E-06	0.012	0.001	

	Risk-Inh. UMCDF	HI-Inh. UMCDF
Inhalation		
Tetra CDD	1.11E-09	
Penta CDD	6.08E-10	
Hexa CDD	1.63E-10	
Hepta CDD	1.47E-11	
Octa CDD	3.44E-12	
Tetra CDF	2.69E-11	
Penta CDF	9.04E-10	
Hexa CDF	2.82E-10	
Hepta CDF	3.89E-11	
Octa CDF	2.92E-12	
2,3,7,8-TCDD TEQ	4.08E-09	
Antimony		
Arsenic	7.63E-08	
Barium		2.82E-05
Beryllium	2.89E-09	
Boron		1.57E-04
Cadmium	3.20E-09	
Chromium	2.75E-08	
Cobalt		
Copper		
Lead		
Manganese		9.11E-02
Mercury		1.20E-04
Nickel	1.88E-09	
Phosphorus		
Selenium		
Silver		
Thallium		
Tin		
Vanadium		
Zinc		
Acetone		
Benzene	2.25E-10	
Bromodichloromethane		
Bromoform	4.63E-12	
2-Butanone		1.25E-06
Carbon Disulfide		6.69E-06
Carbon Tetrachloride	1.17E-10	
Chlorobenzene		6.52E-07
Chloroform	1.73E-10	
Chloromethane	2.70E-10	
Dibromochloromethane		
1,1-Dichloroethane		5.96E-10
1,2-Dichloropropane		1.13E-04
cis-1,3-Dichloropropene	2.20E-09	6.38E-05
trans-1,3-Dichloropropene	5.24E-12	1.55E-07
Ethylbenzene		2.20E-08
2-Hexanone		
Methylene Chloride	7.29E-10	1.08E-05
4-Methyl-2-pentanone		
Styrene		2.06E-07
1,1,2,2-Tetrachloroethane	1.38E-11	
Tetrachloroethene		
Toluene		4.64E-05
1,1,1-Trichloroethane		
Vinyl Acetate		2.07E-08
Vinyl Chloride	2.25E-10	
Xylenes		
Benzoic Acid		
Benzyl Alcohol		
Diethyl Phthalate		
Dimethyl Phthalate		
Di-n-butyl Phthalate		
Di-n-octyl Phthalate		
bis(2-Ethylhexyl)-Phthalate		
2-Methylphenol		
3-Methylphenol		
4-Methylphenol		
Naphthalene		
GB		5.07E-04
HD/HT	1.91E-08	1.52E-03
VX		5.07E-04
Chlorine		
Hydrogen Chloride		1.55E-02
Hydrogen Fluoride		
Nitroglycerine		
PCB		
Particulates		
2,4-Dinitrotoluene		
2,6-Dinitrotoluene		
2,4,6-Trinitrotoluene		
RDX		
HMX		
	1.39E-07	1.10E-01
	1E-07	0.11

Table A-2.1.21 Case 1. Without PFS, HHRA Protocol: UMATILLA RIVER SUBSISTENCE FISHER

CONCENTRATIONS AND DEPOSITIONS: **Calculated depositions and concentrations for indirect exposure pathways**

Substances of Potential Concern	Particulate Dry Deposition Pdd (g/m2)/yr	Particulate Wet Deposition Pwd (g/m2)/yr	Vapor Wet Deposition Vwd (g/m2)/yr	Vapor Concentration Vc (ug/m3)	Toxicity Equivalency Factor	2,3,7,8-TCDD Toxicity Equivalents Pdd (ug/m3)	2,3,7,8-TCDD Toxicity Equivalents Pwd (g/m2)	2,3,7,8-TCDD Toxicity Equivalents Vwd (g/m2)	2,3,7,8-TCDD Toxicity Equivalents Vc (ug/m3)
Tetra CDD	5.49E-13	1.20E-12	2.50E-12	2.60E-11	1.000	5.49E-13	1.20E-12	2.50E-12	2.60E-11
Penta CDD	9.88E-13	2.19E-12	1.31E-12	1.34E-11	0.500	4.94E-13	1.10E-12	6.55E-13	6.69E-12
Hexa CDD	1.69E-12	3.73E-12	4.77E-13	4.91E-12	0.100	1.69E-13	3.73E-13	4.77E-14	4.91E-13
Hepta CDD	1.60E-12	3.55E-12	1.23E-13	1.26E-12	0.010	1.60E-14	3.55E-14	1.23E-15	1.26E-14
Octa CDD	3.83E-12	8.48E-12	2.89E-15	2.95E-14	0.001	3.83E-15	8.48E-15	2.89E-18	2.95E-17
Tetra CDF	8.37E-14	1.86E-13	7.74E-13	7.90E-12	0.100	8.37E-15	1.86E-14	7.74E-14	7.90E-13
Penta CDF	1.15E-12	2.53E-12	3.12E-12	3.24E-11	0.500	5.77E-13	1.27E-12	1.56E-12	1.62E-11
Hexa CDF	2.80E-12	6.15E-12	1.29E-12	1.34E-11	0.100	2.80E-13	6.15E-13	1.29E-13	1.34E-12
Hepta CDF	4.22E-12	9.16E-12	6.50E-13	6.84E-12	0.010	4.22E-14	9.16E-14	6.50E-15	6.84E-14
Octa CDF	3.28E-12	7.18E-12	2.45E-14	2.55E-13	0.001	3.28E-15	7.18E-15	2.45E-17	2.55E-16
					Total =	2.14E-12	4.71E-12	4.98E-12	5.16E-11
Antimony	1.46E-07	3.22E-07	0.00E+00	0.00E+00					
Arsenic	2.00E-07	4.36E-07	0.00E+00	0.00E+00					
Barium	2.40E-07	5.35E-07	0.00E+00	0.00E+00					
Beryllium	4.48E-08	9.85E-08	0.00E+00	0.00E+00					
bis (2-Ethylhexyl) Phthalate	7.07E-07	1.58E-06	1.07E-05	1.09E-04					
Cadmium	6.55E-08	1.45E-07	0.00E+00	0.00E+00					
Chromium	8.67E-08	1.92E-07	0.00E+00	0.00E+00					
2,4-Dinitrotoluene	0.00E+00	0.00E+00	1.06E-08	1.14E-07					
2,6-Dinitrotoluene	0.00E+00	0.00E+00	1.06E-08	1.14E-07					
Di-n-octyl Phthalate	4.49E-08	9.63E-08	6.57E-07	7.04E-06					
GB	2.24E-16	4.81E-16	9.31E-09	9.95E-08					
HD/HT	5.79E-13	1.24E-12	9.31E-07	9.95E-06					
Lead	4.53E-07	9.95E-07	0.00E+00	0.00E+00					
Mercury	0.00E+00	0.00E+00	2.19E-07	2.30E-06					
Nickel	2.91E-07	6.39E-07	0.00E+00	0.00E+00					
Total PCBs	0.00E+00	0.00E+00	2.56E-09	2.75E-08					
Selenium	1.01E-07	2.24E-07	0.00E+00	0.00E+00					
Silver	1.35E-07	2.96E-07	0.00E+00	0.00E+00					
2,3,7,8-TCDD & Dioxin-Like SOPCs	2.14E-12	4.71E-12	4.98E-12	5.16E-11					
Thallium	3.22E-07	7.02E-07	3.99E-16	4.18E-15					
VX	7.04E-13	1.51E-12	9.31E-09	9.95E-08					
Di-n-butyl Phthalate	2.64E-08	5.86E-08	3.99E-07	4.07E-06					
Diethyl Phthalate	6.73E-08	1.46E-07	9.98E-07	1.05E-05					
Manganese	7.55E-06	1.67E-05	0.00E+00	0.00E+00					
4-Methylphenol	1.04E-12	2.25E-12	2.20E-06	2.32E-05					
RDX	0.00E+00	0.00E+00	1.06E-08	1.14E-07					
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	1.06E-08	1.14E-07					
Vanadium	7.96E-08	1.75E-07	0.00E+00	0.00E+00					

?

CDD = Chlorinated dibenzo-p-dioxin
CDF = Chlorinated dibenzo-p-furan

Table A-2.1.22 Case 1. Without PFS, HHRA Protocol: UMATILLA RIVER SUBSISTENCE FISHER

SOIL INGESTION: Calculation of soil concentration due to deposition

Soil mixing depth, Z=	1 cm
Soil bulk density, BD=	1.5 g/cm3
Total deposition time period, Tc=	3.2 yrs
Dry deposition velocity of vapor phase, Vdv=	3 cm/s

Sc = Soil concentration after total time period of deposition
Ds = Deposition term
Pdd = Yearly dry deposition from particle phase
Pwd = Yearly wet deposition from particle phase
Vwd = Yearly wet deposition from vapor phase
Vc = Vapor phase air concentration

Substances of Potential Concern	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Vwd (g/m2-yr)	Vc (µg/m3)	Ds (1/yr)	Sc (mg/kg)
Antimony	1.46E-07	3.22E-07	0.00E+00	0.00E+00	3.12E-05	**9.98E-05**
Arsenic	2.00E-07	4.36E-07	0.00E+00	0.00E+00	4.24E-05	**1.36E-04**
Barium	2.40E-07	5.35E-07	0.00E+00	0.00E+00	5.17E-05	**1.65E-04**
Beryllium	4.48E-08	9.85E-08	0.00E+00	0.00E+00	9.55E-06	**3.06E-05**
bis (2-Ethylhexyl) Phthalate	7.07E-07	1.58E-06	1.07E-05	1.09E-04	7.73E-03	**2.47E-02**
Cadmium	6.55E-08	1.45E-07	0.00E+00	0.00E+00	1.40E-05	**4.49E-05**
Chromium	8.67E-08	1.92E-07	0.00E+00	0.00E+00	1.86E-05	**5.95E-05**
2,4-Dinitrotoluene	0.00E+00	0.00E+00	1.06E-08	1.14E-07	7.89E-06	**2.52E-05**
2,6-Dinitrotoluene	0.00E+00	0.00E+00	1.06E-08	1.14E-07	7.89E-06	**2.52E-05**
Di-n-octyl Phthalate	4.49E-08	9.63E-08	6.57E-07	7.04E-06	4.97E-04	**1.59E-03**
GB	2.24E-16	4.81E-16	9.31E-09	9.95E-08	6.90E-06	**2.21E-05**
HD/HT	5.79E-13	1.24E-12	9.31E-07	9.95E-06	6.90E-04	**2.21E-03**
Lead	4.53E-07	9.95E-07	0.00E+00	0.00E+00	9.65E-05	**3.09E-04**
Mercury	0.00E+00	0.00E+00	2.19E-07	2.30E-06	1.60E-04	**5.11E-04**
Nickel	2.91E-07	6.39E-07	0.00E+00	0.00E+00	6.20E-05	**1.98E-04**
Total PCBs	0.00E+00	0.00E+00	2.56E-09	2.75E-08	1.90E-06	**6.09E-06**
Selenium	1.01E-07	2.24E-07	0.00E+00	0.00E+00	2.17E-05	**6.93E-05**
Silver	1.35E-07	2.96E-07	0.00E+00	0.00E+00	2.87E-05	**9.19E-05**
2,3,7,8-TCDD & Dioxin-Like SOPCs	2.14E-12	4.71E-12	4.98E-12	5.16E-11	4.04E-09	**1.29E-08**
Thallium	3.22E-07	7.02E-07	3.99E-16	4.18E-15	6.82E-05	**2.18E-04**
VX	7.04E-13	1.51E-12	9.31E-09	9.95E-08	6.89E-06	**2.21E-05**
Di-n-butyl Phthalate	2.64E-08	5.86E-08	3.99E-07	4.07E-06	2.89E-04	**9.25E-04**
Diethyl Phthalate	6.73E-08	1.46E-07	9.98E-07	1.05E-05	7.41E-04	**2.37E-03**
Manganese	7.55E-06	1.67E-05	0.00E+00	0.00E+00	1.62E-03	**5.17E-03**
4-Methylphenol	1.04E-12	2.25E-12	2.20E-06	2.32E-05	1.61E-03	**5.16E-03**
RDX	0.00E+00	0.00E+00	1.06E-08	1.14E-07	7.89E-06	**2.52E-05**
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	1.06E-08	1.14E-07	7.89E-06	**2.52E-05**
		1.75E-07	0.00E+00	0.00E+00	1.69E-05	**5.42E-05**

Table A-2.1.23 Case 1. Without PFS, HHRA Protocol: UMATILLA RIVER SUBSISTENCE FISHER

CONSUMPTION OF ABOVE-GROUND VEGETABLES:

Calculation of above-ground vegetable concentration due to direct deposition
Calculation of above-ground vegetable concentration due to air-to-plant transfer

Interception fraction of edible portion, Rp=	0.04	unitless
Plant surface loss coefficient, kp=	18	1/yr
Time between rainfalls, t-rain=	14	days
Length of plant exposure per harvest, Tp=	0.16	yrs
Standing crop biomass, Yp=	1.7	kg DW/m2
Density of air, p=	1200	g/m3
Above ground veg. correction factor, VGab=	0.01	unitless

Pd = Concentration in plant due to direct deposition
Pv = Concentration in plant due to air-to-plant transfer
Pd + Pv = Concentration in plant due to direct deposition and air-to-plant transfer
Fw = Fraction of wet deposition of particles that adheres to plant
Bv = Air-to-plant bioconcentration factor

Substances of Potential Concern	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Fw	Pd (mg/kg)	Vc (ug/m3)	Bv (mg/kg)/(ug/g)	Pv (mg/kg)	Pd+Pv (mg/kg)
Antimony	1.46E-07	3.22E-07	0.2	**2.59E-07**	0.00E+00	NA	**0.00E+00**	**2.59E-07**
Arsenic	2.00E-07	4.36E-07	0.2	**3.54E-07**	0.00E+00	NA	**0.00E+00**	**3.54E-07**
Barium	2.40E-07	5.35E-07	0.6	**6.93E-07**	0.00E+00	NA	**0.00E+00**	**6.93E-07**
Beryllium	4.48E-08	9.85E-08	0.6	**1.28E-07**	0.00E+00	NA	**0.00E+00**	**1.28E-07**
bis (2-Ethylhexyl) Phthalate	7.07E-07	1.58E-06	0.6	**2.04E-06**	1.09E-04	5.11E+02	**4.63E-07**	**2.51E-06**
Cadmium	6.55E-08	1.45E-07	0.6	**1.88E-07**	0.00E+00	NA	**0.00E+00**	**1.88E-07**
Chromium	8.67E-08	1.92E-07	0.6	**2.49E-07**	0.00E+00	NA	**0.00E+00**	**2.49E-07**
2,4-Dinitrotoluene	0.00E+00	0.00E+00	0.6	**0.00E+00**	1.14E-07	1.50E+02	**1.42E-10**	**1.42E-10**
2,6-Dinitrotoluene	0.00E+00	0.00E+00	0.6	**0.00E+00**	1.14E-07	1.30E+02	**1.23E-10**	**1.23E-10**
Di-n-octyl Phthalate	4.49E-08	9.63E-08	0.6	**1.27E-07**	7.04E-06	2.32E+02	**1.36E-08**	**1.40E-07**
GB	2.24E-16	4.81E-16	0.6	**6.33E-16**	9.95E-08	2.90E+00	**2.40E-12**	**2.41E-12**
HD/HT	5.79E-13	1.24E-12	0.6	**1.64E-12**	9.95E-06	1.58E-01	**1.31E-11**	**1.47E-11**
Lead	4.53E-07	9.95E-07	0.6	**1.30E-06**	NA	NA	**0.00E+00**	**1.30E-06**
Mercury	0.00E+00	0.00E+00	0.6	**0.00E+00**	2.30E-06	2.30E+04	**4.41E-07**	**4.41E-07**
Nickel	2.91E-07	6.39E-07	0.6	**8.32E-07**	0.00E+00	NA	**0.00E+00**	**8.32E-07**
Total PCBs	0.00E+00	0.00E+00	0.6	**0.00E+00**	2.75E-08	1.72E+03	**3.94E-10**	**3.94E-10**
Selenium	1.01E-07	2.24E-07	0.2	**1.80E-07**	0.00E+00	NA	**0.00E+00**	**1.80E-07**
Silver	1.35E-07	2.96E-07	0.6	**3.85E-07**	0.00E+00	NA	**0.00E+00**	**3.85E-07**
2,3,7,8-TCDD & Dioxin-Like SOPCs	2.14E-12	4.71E-12	0.6	**6.13E-12**	5.16E-11	8.39E+04	**3.61E-11**	**4.22E-11**
Thallium	3.22E-07	7.02E-07	0.6	**9.17E-07**	4.18E-15	NA	**0.00E+00**	**9.17E-07**
VX	7.04E-13	1.51E-12	0.6	**1.99E-12**	9.95E-08	2.26E+03	**1.87E-09**	**1.88E-09**
Di-n-butyl Phthalate	2.64E-08	5.86E-08	0.6	**7.59E-08**	4.07E-06	4.40E+02	**1.49E-08**	**9.08E-08**
Diethyl Phthalate	6.73E-08	1.46E-07	0.6	**1.91E-07**	1.05E-05	4.48E+02	**3.91E-08**	**2.30E-07**
Manganese	7.55E-06	1.67E-05	0.6	**2.17E-05**	0.00E+00	NA	**0.00E+00**	**2.17E-05**
4-Methylphenol	1.04E-12	2.25E-12	0.6	**2.95E-12**	2.32E-05	1.71E+01	**3.31E-09**	**3.31E-09**
RDX	0.00E+00	0.00E+00	0.6	**0.00E+00**	1.14E-07	9.92E-02	**9.41E-14**	**9.41E-14**
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	0.6	**0.00E+00**	1.14E-07	2.32E+02	**2.20E-10**	**2.20E-10**
Vanadium	7.96E-08	1.75E-07	0.6	**2.27E-07**	0.00E+00	NA	**0.00E+00**	**2.27E-07**

Table A-2.1.24 Case 1. Without PFS, HHRA Protocol: UMATILLA RIVER SUBSISTENCE FISHER
CONSUMPTION OF ROOT VEGETABLES:

Calculation of soil concentration due to deposition
Calculation of root vegetable concentration due to root uptake

Soil mixing depth, Z=	20	cm
Soil bulk density, BD=	1.5	g/cm3
Total deposition time period, Tc=	3.2	yrs
Below ground veg. correction factor, VGbg=	0.01	unitless
Dry deposition velocity of vapor phase, Vdv=	3	cm/s

Pr(bg) = Root vegetable concentration due to root uptake
Sc = Soil concentration after total time period of deposition
Ds = Deposition term
Kds = Soil-water partition coefficient
RCF = Ratio of concentratio
Vwd = Yearly wet deposition from vapor phase

Substances of Potential Concern	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Vwd (g/m2-yr)	Vc (µg/m3)	Ds (1/yr)	Sc (mg/kg)	Kds (cm3/g)	RCF (mg/kg)/(ug/mL)	Pr(bg) (mg/kg)
Antimony	1.46E-07	3.22E-07	0.00E+00	0.00E+00	1.56E-06	4.99E-06	2	3.00E-02	**7.48E-10**
Arsenic	2.00E-07	4.36E-07	0.00E+00	0.00E+00	2.12E-06	6.78E-06	29	8.00E-03	**1.87E-11**
Barium	2.40E-07	5.35E-07	0.00E+00	0.00E+00	2.59E-06	8.27E-06	530	1.50E-02	**2.34E-12**
Beryllium	4.48E-08	9.85E-08	0.00E+00	0.00E+00	4.78E-07	1.53E-06	70	1.50E-03	**3.28E-13**
bis (2-Ethylhexyl) Phthalate	7.07E-07	1.58E-06	1.07E-05	1.09E-04	3.86E-04	1.24E-03	280000	3.20E+02	**1.41E-08**
Cadmium	6.55E-08	1.45E-07	0.00E+00	0.00E+00	7.02E-07	2.25E-06	160	3.20E-02	**4.49E-12**
Chromium	8.67E-08	1.92E-07	0.00E+00	0.00E+00	9.30E-07	2.97E-06	18	4.50E-03	**7.44E-12**
2,4-Dinitrotoluene	0.00E+00	0.00E+00	1.06E-08	1.14E-07	3.94E-07	1.26E-06	0.87	1.90E+00	**2.76E-08**
2,6-Dinitrotoluene	0.00E+00	0.00E+00	1.06E-08	1.14E-07	3.94E-07	1.26E-06	0.67	1.70E+00	**3.20E-08**
Di-n-octyl Phthalate	4.49E-08	9.63E-08	6.57E-07	7.04E-06	2.49E-05	7.96E-05	280000	3.20E+02	**9.09E-10**
GB	2.24E-16	4.81E-16	9.31E-09	9.95E-08	3.45E-07	1.10E-06	0.032	9.30E-01	**3.21E-07**
HD/HT	5.79E-13	1.24E-12	9.31E-07	9.95E-06	3.45E-05	1.10E-04	1.2	1.16E+00	**1.06E-06**
Lead	4.53E-07	9.95E-07	0.00E+00	0.00E+00	4.83E-06	1.54E-05	600	NA	**NA**
Mercury	0.00E+00	0.00E+00	2.19E-07	2.30E-06	7.98E-06	2.56E-05	57000	NA	**NA**
Nickel	2.91E-07	6.39E-07	0.00E+00	0.00E+00	3.10E-06	9.92E-06	82	4.00E-03	**4.84E-12**
Total PCBs	0.00E+00	0.00E+00	2.56E-09	2.75E-08	9.52E-08	3.05E-07	4300	2.10E+03	**1.49E-09**
Selenium	1.01E-07	2.24E-07	0.00E+00	0.00E+00	1.08E-06	3.47E-06	4.3	2.00E-02	**1.61E-10**
Silver	1.35E-07	2.96E-07	0.00E+00	0.00E+00	1.44E-06	4.59E-06	0.4	1.00E-01	**1.15E-08**
2,3,7,8-TCDD & Dioxin-Like SOPCs	2.14E-12	4.71E-12	4.98E-12	5.16E-11	2.02E-10	6.47E-10	142000	1.21E+04	**5.51E-13**
Thallium	3.22E-07	7.02E-07	3.99E-16	4.18E-15	3.41E-06	1.09E-05	74	4.00E-04	**5.90E-13**
VX	7.04E-13	1.51E-12	9.31E-09	9.95E-08	3.45E-07	1.10E-06	0.15	1.85E+00	**1.36E-07**
Di-n-butyl Phthalate	2.64E-08	5.86E-08	3.99E-07	4.07E-06	1.44E-05	4.62E-05	1.6	1.80E+02	**5.20E-05**
Diethyl Phthalate	6.73E-08	1.46E-07	9.98E-07	1.05E-05	3.70E-05	1.18E-04	5.3	6.56E+00	**1.48E-06**
Manganese	7.55E-06	1.67E-05	0.00E+00	0.00E+00	8.08E-05	2.59E-04	23	1.00E-01	**1.12E-08**
4-Methylphenol	1.04E-12	2.25E-12	2.20E-06	2.32E-05	8.06E-05	2.58E-04	0.50	1.76E+00	**9.08E-06**
RDX	0.00E+00	0.00E+00	1.06E-08	1.14E-07	3.94E-07	1.26E-06	0.63	9.61E-01	**1.93E-08**
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	1.06E-08	1.14E-07	3.94E-07	1.26E-06	11	4.44E+00	**5.09E-09**
Vanadium	7.96E-08	1.75E-07	0.00E+00	0.00E+00	8.47E-07	2.71E-06	100	1.00E-01	**2.71E-11**

Table A-2.1.25 Case 1. Without PFS, HHRA Protocol: UMATILLA RIVER SUBSISTENCE FISHER

CONSUMPTION OF FISH FROM THE UMATILLA RIVER:

USING TIME-AVERAGED SOIL CONCENTRATIONS

Water body area, WA(w)=	9.80E+06	m2
Impervious watershed area, WA(I)=	1.35E+08	m2
Average annual runoff, R=	0.0	cm/yr
Soil bulk density, BD=	1.5	g/cm3
Soil mixing depth, Z=	1	cm
Total deposition time period, Tc=	3.2	yrs
Total watershed area, WA(L)=	2.70E+09	m2
Volumetric soil water content, Os=	0.2	cm3/cm3
USLE rainfall (or erosivity) factor, RF=	20	1/yr
USLE erodability factor, K=	0.36	tons/acre
USLE length-slope factor, LS=	1.5	unitless
USLE cover management factor, C=	0.1	unitless
USLE supporting practice factor, P=	1	unitless
Unit soil loss, Xe=	0.24	kg/m2-yr
Empirical intercept coefficient, a=	0.6	unitless
Watershed sediment delivery ratio, SD=	3.97E-02	unitless
Soil enrichment ratio, ER=	3	unitless
Average volumetric flow rate, Vf(x)=	4.14E+08	m3/yr
Total suspended solids, TSS=	10	mg/L
Depth of water column, d(w)=	0.50	m
Depth of upper benthic layer, d(b)=	0.03	m
Bed sediment porosity, O(bs)=	0.5	LH20/L
Bed sediment concentration, BS=	1.0	g/cm3
Fish lipid content, f(lipid)=	0.07	unitless
Fraction organic carbon, OC(sed)=	0.04	unitless
deposition velocity of vapor phase, Vdv=	3	cm/s

1042.47 sq.mile

L(T) = Total substance load to the water body
L(dep) = Deposition of particle bound substance to the water body
L(RI) = Runoff load from impervious surfaces
L(R) = Runoff load from pervious surfaces
L(E) - Soil erosion load
Sc = Soil concentration after total exposure period
Pddw = Yearly average dry deposition rate onto the watershed
Pwdw = Yearly average wet deposition rate onto the watershed
Pdds = Yearly dry deposition rate onto surface water body
Pwds = Yearly wet deposition rate onto surface water body
Kds = Soil-water partition coefficient
Ds = Deposition term

Substances of Potential Concern	Pdds (g/m2-yr)	Pdws (g/m2-yr)	Vwds (g/m2-yr)	Vcs (µg/m3)	Ds (1/yr)	Sc (mg/kg)	Pddb (g/m2-yr)	Pwdb (g/m2-yr)	Vwdb (g/m2-yr)	L(dep) (g/yr)	L(RI) (g/yr)	Kds (L/kg)	L(R) (g/yr)	L(E) (g/yr)	L(T) (g/yr)
Antimony	1.14E-07	5.58E-08	0.00E+00	0.00E+00	1.13E-05	3.62E-05	1.44E-07	1.82E-07	0.00E+00	3.20E+00	2.29E+01	2	0.00E+00	2.51E+00	2.86E+01
Arsenic	1.60E-07	9.15E-08	0.00E+00	0.00E+00	1.68E-05	5.38E-05	2.03E-07	2.57E-07	0.00E+00	4.51E+00	3.40E+01	29	0.00E+00	3.96E+00	4.25E+01
Barium	3.04E-07	1.92E-07	0.00E+00	0.00E+00	3.30E-05	1.06E-04	3.68E-07	5.16E-07	0.00E+00	8.66E+00	6.69E+01	530	0.00E+00	7.82E+00	8.34E+01
Beryllium	3.89E-08	2.13E-08	0.00E+00	0.00E+00	4.01E-06	1.28E-05	4.87E-08	6.32E-08	0.00E+00	1.10E+00	8.13E+00	70	0.00E+00	9.49E-01	1.02E+01
bis (2-Ethylhexyl) Phthalate	5.28E-07	2.00E-07	1.19E-06	5.11E-05	3.35E-03	1.07E-02	6.67E-07	8.45E-07	6.07E-06	7.43E+01	2.59E+02	280000	0.00E+00	7.94E+02	1.13E+03
Cadmium	5.92E-08	3.07E-08	0.00E+00	0.00E+00	5.99E-06	1.92E-05	7.36E-08	9.70E-08	0.00E+00	1.67E+00	1.21E+01	160	0.00E+00	1.42E+00	1.52E+01
Chromium	1.26E-07	8.69E-08	0.00E+00	0.00E+00	1.42E-05	4.54E-05	1.51E-07	2.16E-07	0.00E+00	3.60E+00	2.87E+01	18	0.00E+00	3.34E+00	3.57E+01
2,4-Dinitrotoluene	0.00E+00	0.00E+00	1.79E-09	5.11E-08	3.34E-06	1.07E-05	0.00E+00	0.00E+00	5.92E-09	5.80E-02	2.41E-01	0.87	0.00E+00	6.86E-01	9.85E-01
2,6-Dinitrotoluene	0.00E+00	0.00E+00	1.79E-09	5.11E-08	3.34E-06	1.07E-05	0.00E+00	0.00E+00	5.92E-09	5.80E-02	2.41E-01	0.67	0.00E+00	6.60E-01	9.59E-01
Di-n-octyl Phthalate	3.27E-08	2.14E-08	1.09E-07	3.17E-06	2.10E-04	6.74E-04	4.22E-08	5.11E-08	3.67E-07	4.52E+00	2.20E+01	280000	0.00E+00	4.99E+01	7.64E+01
GB	4.15E-16	6.72E-16	1.14E-08	1.12E-07	7.84E-06	2.51E-05	5.40E-16	6.30E-16	1.28E-08	1.26E-01	1.54E+00	0.032	0.00E+00	3.59E-01	2.03E+00
HD/HT	1.07E-12	1.74E-12	1.14E-06	1.12E-05	7.84E-04	2.51E-03	1.40E-12	1.63E-12	1.28E-06	1.26E+01	1.54E+02	1.2	0.00E+00	1.67E+02	3.34E+02
Lead	4.18E-07	2.41E-07	0.00E+00	0.00E+00	4.39E-05	1.41E-04	5.20E-07	6.84E-07	0.00E+00	1.18E+01	8.90E+01	600	0.00E+00	1.04E+01	1.11E+02
Mercury	0.00E+00	0.00E+00	4.66E-08	1.27E-06	8.33E-05	2.67E-04	0.00E+00	0.00E+00	1.53E-07	1.50E+00	6.29E+00	57000	0.00E+00	1.97E+01	2.75E+01
Nickel	2.73E-07	1.61E-07	0.00E+00	0.00E+00	2.89E-05	9.24E-05	3.39E-07	4.47E-07	0.00E+00	7.70E+00	5.85E+01	82	0.00E+00	6.83E+00	7.30E+01
Total PCBs	0.00E+00	0.00E+00	4.22E-10	1.24E-08	8.08E-07	2.59E-06	0.00E+00	0.00E+00	1.44E-09	1.41E-02	5.70E-02	4300	0.00E+00	1.91E-01	2.62E-01
Selenium	8.09E-08	3.99E-08	0.00E+00	0.00E+00	8.05E-06	2.58E-05	1.02E-07	1.30E-07	0.00E+00	2.27E+00	1.63E+01	4.3	0.00E+00	1.85E+00	2.04E+01
Silver	1.05E-07	5.31E-08	0.00E+00	0.00E+00	1.06E-05	3.38E-05	1.33E-07	1.69E-07	0.00E+00	2.96E+00	2.14E+01	0.4	0.00E+00	1.88E+00	2.62E+01
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.58E-12	7.59E-13	6.62E-13	2.38E-11	1.70E-09	5.45E-09	2.02E-12	2.51E-12	2.80E-12	7.19E-05	4.06E-04	142000	0.00E+00	4.03E-04	8.81E-04
Thallium	2.48E-07	1.40E-07	6.34E-17	2.01E-15	2.59E-05	8.28E-05	3.16E-07	3.95E-07	2.37E-16	6.97E+00	5.24E+01	74	0.00E+00	6.12E+00	6.55E+01
VX	1.30E-12	2.11E-12	1.14E-08	1.12E-07	7.84E-06	2.51E-05	1.70E-12	1.98E-12	1.28E-08	1.26E-01	1.54E+00	0.15	0.00E+00	9.83E-01	2.65E+00
Di-n-butyl Phthalate	1.96E-08	8.29E-09	4.75E-08	1.90E-06	1.25E-04	3.99E-04	2.49E-08	3.13E-08	2.25E-07	2.75E+00	1.02E+01	1.6	0.00E+00	2.73E+01	4.02E+01
Diethyl Phthalate	4.94E-08	2.71E-08	1.44E-07	4.78E-06	3.16E-04	1.01E-03	6.33E-08	7.79E-08	5.60E-07	6.88E+00	2.97E+01	5.3	0.00E+00	7.31E+01	1.10E+02
Manganese	5.63E-06	2.51E-06	0.00E+00	0.00E+00	5.42E-04	1.73E-03	7.14E-06	8.95E-06	0.00E+00	1.58E+02	1.10E+03	23	0.00E+00	1.28E+02	1.38E+03
4-Methylphenol	7.62E-13	4.42E-13	3.32E-07	1.06E-05	6.89E-04	2.20E-03	9.78E-13	1.20E-12	1.24E-06	1.21E+01	4.48E+01	0.50	0.00E+00	1.29E+02	1.86E+02
RDX	0.00E+00	0.00E+00	1.79E-09	5.11E-08	3.34E-06	1.07E-05	0.00E+00	0.00E+00	5.92E-09	5.80E-02	2.41E-01	0.63	0.00E+00	6.53E-01	9.52E-01
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	1.79E-09	5.11E-08	3.34E-06	1.07E-05	0.00E+00	0.00E+00	5.92E-09	5.80E-02	2.41E-01	11	0.00E+00	7.82E-01	1.08E+00
Vanadium	9.91E-08	6.82E-08	0.00E+00	0.00E+00	1.12E-05	3.57E-05	1.21E-07	1.67E-07	0.00E+00	2.82E+00	2.26E+01	100	0.00E+00	2.64E+00	2.81E+01

Table A-2.1.25 Case 1. Without PFS, HHRA Protocol: UMATILLA RIVER SUBSISTENCE FISHER (continued)

CONSUMPTION OF FISH FROM THE UMATILLA RIVER:

USING TIME-AVERAGED SOIL CONCENTRATIONS

Calculation of fish concentration from dissolved water concentration, C1(fish)
Calculation of fish concentration from total water column concentration, C2(fish)
Calculation of fish concentration from bed sediments, C3(fish)

Water body area, WA(w)=	9.80E+06	m2
Impervious watershed area, WA(I)=	1.35E+08	m2
Average annual runoff, R=	0.0	cm/yr
Soil bulk density, BD=	1.5	g/cm3
Soil mixing depth, Z=	1	cm
Total deposition time period, Tc=	3.2	yrs
Total watershed area, WA(L)=	2.70E+09	m2
Volumetric soil water content, Os=	0.2	cm3/cm3
USLE rainfall (or erosivity) factor, RF=	20	1/yr
USLE erodability factor, K=	0.36	tons/acre
USLE length-slope factor, LS=	1.5	unitless
USLE cover management factor, C=	0.1	unitless
USLE supporting practice factor, P=	1	unitless
Unit soil loss, Xe=	0.24	kg/m2-yr
Empirical intercept coefficient, a=	0.6	unitless
Watershed sediment delivery ratio, SD=	3.97E-02	unitless
Soil enrichment ratio, ER=	3	unitless
Average volumetric flow rate, Vf(x)=	4.14E+08	m3/yr
Total suspended solids, TSS=	10	mg/L
Depth of water column, d(w)=	0.50	m
Depth of upper benthic layer, d(b)=	0.03	m
Bed sediment porosity, O(bs)=	0.5	LH20/L
Bed sediment concentration, BS=	1.0	g/cm3
Fish lipid content, I(lipid)=	0.07	unitless
Fraction organic carbon, OC(sed)=	0.04	unitless
Dry deposition velocity of vapor phase, Vdv=	3	cm/s

1042.47 sq mile

C(fish) = Concentration in fish
f(water) = Fraction of total water body substance concentration that occurs in the water column
C(wtot) = Total water body concentration, including water column and bed sediment
C(wt) = Total concentration in water column
C(dw) = Dissolved phase water concentration
f(benthic) = Fraction of total water body substance concentration that occurs in the bed sediment
kwt = Total water body dissipation rate constant
C(sb) = Concentration sorbed to bed sediments
Kd(sw) = Suspended sediment/surface water partition coefficient
Kd(bs) = Bed sediment/sediment pore water partition coefficient
BCF = Bioconcentration factor
BAF = Bioaccumulation factor
BSAF = Biota to sediment accumulation factor

Substances of Potential Concern	Kd(sw) (L/kg)	Kd(bs) (L/kg)	f(water)	C(wtot) (mg/L)	C(wt) (mg/L)	C(dw) (mg/L)	f(benth)	kwt (1/yr)	C(sb) (mg/kg)	BCF (L/kg)	C1(fish) (mg/kg)	BAF (L/kg)	C2(fish) (mg/kg)	BSAF	C3(fish) (mg/kg)	C(fish) (mg/kg)
Antimony	15	8	6.62E-01	9.84E-08	6.91E-08	6.91E-08	3.38E-01	2.51E-02	5.52E-07	1.0E+00	6.91E-08	NA	NA	NA	NA	6.91E-08
Arsenic	220	120	1.22E-01	7.90E-07	1.02E-07	1.02E-07	8.78E-01	6.52E-02	1.22E-05	4.4E+01	4.48E-06	NA	NA	NA	NA	4.48E-06
Barium	4000	2100	8.18E-03	2.10E-05	1.82E-07	1.75E-07	9.92E-01	7.37E-02	3.67E-04	NA	NA	4.0E+00	7.28E-07	NA	NA	7.28E-07
Beryllium	525	280	5.64E-02	4.05E-07	2.42E-08	2.41E-08	9.44E-01	7.01E-02	6.75E-06	2.0E+01	4.82E-07	NA	NA	NA	NA	4.82E-07
bis (2-Ethylhexyl) Phthalate	2100000	1100000	3.33E-04	2.12E-03	7.48E-07	3.40E-08	1.00E+00	7.42E-02	3.74E-02	NA	NA	1.2E+02	8.98E-05	NA	NA	8.98E-05
Cadmium	1200	640	2.57E-02	1.31E-06	3.56E-08	3.52E-08	9.74E-01	7.24E-02	2.25E-05	6.4E+01	2.25E-06	NA	NA	NA	NA	2.25E-06
Chromium	140	70	1.91E-01	4.23E-07	8.58E-08	8.57E-08	8.09E-01	6.01E-02	6.00E-06	1.6E+01	1.37E-06	NA	NA	NA	NA	1.37E-06
2,4-Dinitrotoluene	6.5	3.5	8.06E-01	2.78E-09	2.38E-09	2.38E-09	1.94E-01	1.44E-02	8.33E-09	3.2E+00	7.61E-09	NA	NA	NA	NA	7.61E-09
2,6-Dinitrotoluene	5	2.7	8.39E-01	2.60E-09	2.32E-09	2.32E-09	1.61E-01	1.20E-02	6.25E-09	2.6E+00	6.02E-09	NA	NA	NA	NA	6.02E-09
Di-n-octyl Phthalate	2100000	1100000	3.33E-04	1.44E-04	5.07E-08	2.31E-09	1.00E+00	7.42E-02	2.54E-03	NA	NA	1.2E+02	6.09E-06	NA	NA	6.09E-06
GB	0.24	0.13	9.64E-01	4.80E-09	4.90E-09	4.90E-09	3.64E-02	2.71E-03	6.37E-10	1.4E+00	6.86E-09	NA	NA	NA	NA	6.86E-09
HD/HT	9.1	4.8	7.59E-01	1.00E-06	8.07E-07	8.07E-07	2.41E-01	1.79E-02	3.87E-06	4.8E+00	3.87E-06	NA	NA	NA	NA	3.87E-06
Lead	4500	2400	7.20E-03	3.14E-05	2.40E-07	2.29E-07	9.93E-01	7.37E-02	5.50E-04	NA	NA	NA	NA	NA	NA	NA
Mercury	95000	160000	2.03E-04	5.80E-05	1.25E-08	6.40E-09	1.00E+00	7.43E-02	1.02E-03	NA	NA	1.3E+05	1.62E-03	NA	NA	1.62E-03
Nickel	620	330	4.83E-02	3.39E-06	1.73E-07	1.72E-07	9.52E-01	7.07E-02	5.69E-05	4.7E+01	8.10E-06	NA	NA	NA	NA	8.10E-06
Total PCBs	32000	17000	1.29E-03	2.76E-07	3.78E-10	2.86E-10	9.99E-01	7.42E-02	4.86E-06	NA	NA	NA	NA	1.6E+00	1.36E-05	1.36E-05
Selenium	32	17	4.88E-01	9.53E-08	4.93E-08	4.93E-08	5.12E-01	3.80E-02	8.38E-07	6.0E+00	2.96E-07	NA	NA	NA	NA	2.96E-07
Silver	3	2	8.70E-01	6.87E-08	6.33E-08	6.33E-08	1.30E-01	9.69E-03	1.27E-07	5.0E-01	3.17E-08	NA	NA	NA	NA	3.17E-08
2,3,7,8-TCDD & Dioxin-Like SOPCs	1070000	570000	3.42E-04	1.64E-09	5.96E-13	5.09E-14	1.00E+00	7.42E-02	2.90E-08	NA	NA	NA	NA	6.7E-02	3.40E-09	3.40E-09
Thallium	560	300	5.28E-02	2.78E-06	1.56E-07	1.55E-07	9.47E-01	7.03E-02	4.65E-05	1.2E+02	1.86E-05	NA	NA	NA	NA	1.86E-05
VX	1.1	0.60	9.38E-01	6.45E-09	6.41E-09	6.41E-09	6.19E-02	4.60E-03	3.85E-09	1.5E+01	9.61E-08	NA	NA	NA	NA	9.61E-08
Di-n-butyl Phthalate	12	6.4	7.07E-01	1.30E-07	9.71E-08	9.71E-08	2.93E-01	2.17E-02	6.22E-07	NA	NA	3.0E+04	2.91E-03	NA	NA	2.91E-03
Diethyl Phthalate	39	21	4.37E-01	5.72E-07	2.65E-07	2.65E-07	5.63E-01	4.18E-02	5.56E-06	NA	NA	4.3E+02	1.14E-04	NA	NA	1.14E-04
Manganese	170	93	1.52E-01	2.07E-05	3.32E-06	3.32E-06	8.48E-01	6.30E-02	3.09E-04	1.2E+02	3.98E-04	NA	NA	NA	NA	3.98E-04
4-Methylphenol	3.8	2.0	8.70E-01	4.87E-07	4.49E-07	4.49E-07	1.30E-01	9.69E-03	8.97E-07	1.4E+01	6.28E-06	NA	NA	NA	NA	6.28E-06
RDX	4.7	2.5	8.47E-01	2.56E-09	2.30E-09	2.30E-09	1.53E-01	1.13E-02	5.75E-09	1.9E+00	4.37E-09	NA	NA	NA	NA	4.37E-09
2,4,6-Trinitrotoluene	83	44	2.73E-01	9.01E-09	2.61E-09	2.60E-09	7.27E-01	5.40E-02	1.15E-07	5.4E+01	1.41E-07	NA	NA	NA	NA	1.41E-07
Vanadium	750	400	4.02E-02	1.56E-06	6.64E-08	6.59E-08	9.60E-01	7.13E-02	2.63E-05	1.2E+02	7.90E-06	NA	NA	NA	NA	7.90E-06

Table A-2.1.26 Case 1. Without PFS, HHRA Protocol: UMATILLA RIVER SUBSISTENCE FISHER

INDIRECT EXPOSURES

Calculation of cancer risks

Consumption rate of soil, CR(soil)=	0.0001	kg/day
Fraction of soil impacted, F(soil)=	1	unitless
Consumption rate of abv grd veg, CR(ag)=	0.024	kg/day
Fraction of abv grd veg impacted, F(ag)=	0.25	unitless
Consumption rate of root veg, CR(bg)=	0.0063	kg/day
Fraction of root veg impacted, F(bg)=	0.25	unitless
Consumption rate of fish, CR(fish)=	0.140	kg/day
Fraction of fish impacted, F(fish)=	1	unitless
Exposure duration, ED=	30	yr
Exposure frequency, EF=	350	day/yr
Body weight, BW=	70	kg
Averaging time, AT=	70	yr

I(tot) = Total daily intake of substance
Sc = Soil concentration after total time period of deposition
I(soil) = Daily intake of substance from soil
Pd + Pv = Concentration in plant
I(ag) = Daily intake of substance from above ground vegetables
Pr(bg) = Concentration in below ground plant parts due to root uptake
I(bg) = Daily intake of substance from below ground vegetables
C(fish) = Concentration in fish
I(fish) = Daily intake of substance from fish
CSF = Carcinogenic slope factor

Substances of Potential Concern	Sc (mg/kg)	I(soil) (mg/day)	Pd+Pv (mg/kg)	I(ag) (mg/day)	Pr(bg) (mg/kg)	I(bg) (mg/day)	C(fish) (mg/kg)	I(fish) (mg/day)	I(tot) (mg/day)	CSF (per mg/kg-day)	Cancer Risk
Antimony	9.98E-05	9.98E-09	2.59E-07	1.56E-09	7.48E-10	1.18E-12	6.91E-08	9.67E-09	2.12E-08		
Arsenic	1.36E-04	1.36E-08	3.54E-07	2.12E-09	1.87E-11	2.95E-14	4.48E-06	6.27E-07	6.43E-07	1.50E+00	**5.66E-09**
Barium	1.65E-04	1.65E-08	6.93E-07	4.16E-09	2.34E-12	3.69E-15	7.28E-07	1.02E-07	1.23E-07		
Beryllium	3.06E-05	3.06E-09	1.28E-07	7.69E-10	3.28E-13	5.16E-16	4.82E-07	6.75E-08	7.13E-08	4.30E+00	**1.80E-09**
bis (2-Ethylhexyl) Phthalate	2.47E-02	2.47E-06	2.51E-06	1.50E-08	1.41E-08	2.23E-11	8.98E-05	1.26E-05	1.51E-05	1.40E-02	**1.24E-09**
Cadmium	4.49E-05	4.49E-09	1.88E-07	1.13E-09	4.49E-12	7.08E-15	2.25E-06	3.15E-07	3.21E-07		
Chromium	5.95E-05	5.95E-09	2.49E-07	1.50E-09	7.44E-12	1.17E-14	1.37E-06	1.92E-07	1.99E-07		
2,4-Dinitrotoluene	2.52E-05	2.52E-09	1.42E-10	8.54E-13	2.76E-08	4.34E-11	7.61E-09	1.07E-09	3.63E-09	6.80E-01	**1.45E-11**
2,6-Dinitrotoluene	2.52E-05	2.52E-09	1.23E-10	7.40E-13	3.20E-08	5.04E-11	6.02E-09	8.43E-10	3.42E-09	6.80E-01	**1.36E-11**
Di-n-octyl Phthalate	1.59E-03	1.59E-07	1.40E-07	8.42E-10	9.09E-10	1.43E-12	6.09E-06	8.52E-07	1.01E-06		
GB	2.21E-05	2.21E-09	2.41E-12	1.44E-14	3.21E-07	5.05E-10	6.86E-09	9.61E-10	3.67E-09		
HD/HT	2.21E-03	2.21E-07	1.47E-11	8.84E-14	1.06E-06	1.67E-09	3.87E-06	5.42E-07	7.65E-07	9.50E+00	**4.27E-08**
Lead	3.09E-04	3.09E-08	1.30E-06	7.77E-09	NA	NA	NA	NA	3.87E-08		
Mercury	5.11E-04	5.11E-08	4.41E-07	2.65E-09	NA	NA	1.62E-03	2.27E-04	2.27E-04		
Nickel	1.98E-04	1.98E-08	8.32E-07	4.99E-09	4.84E-12	7.62E-15	8.10E-06	1.13E-06	1.16E-06		
Total PCBs	6.09E-06	6.09E-10	3.94E-10	2.36E-12	1.49E-09	2.34E-12	1.36E-05	1.91E-06	1.91E-06	7.70E+00	**8.62E-08**
Selenium	6.93E-05	6.93E-09	1.80E-07	1.08E-09	1.61E-10	2.54E-13	2.96E-07	4.14E-08	4.94E-08		
Silver	9.19E-05	9.19E-09	3.85E-07	2.31E-09	1.15E-08	1.81E-11	3.17E-08	4.43E-09	1.60E-08		
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.29E-08	1.29E-12	4.22E-11	2.53E-13	5.51E-13	8.68E-16	3.40E-09	4.77E-10	4.78E-10	1.50E+05	**4.21E-07**
Thallium	2.18E-04	2.18E-08	9.17E-07	5.50E-09	5.90E-13	9.30E-16	1.86E-05	2.60E-06	2.63E-06		
VX	2.21E-05	2.21E-09	1.88E-09	1.13E-11	1.36E-07	2.14E-10	9.61E-08	1.35E-08	1.59E-08		
Di-n-butyl Phthalate	9.25E-04	9.25E-08	9.08E-08	5.45E-10	5.20E-05	8.19E-08	2.91E-03	4.08E-04	4.08E-04		
Diethyl Phthalate	2.37E-03	2.37E-07	2.30E-07	1.38E-09	1.48E-06	2.33E-09	1.14E-04	1.59E-05	1.62E-05		
Manganese	5.17E-03	5.17E-07	2.17E-05	1.30E-07	1.12E-08	1.77E-11	3.98E-04	5.58E-05	5.64E-05		
4-Methylphenol	5.16E-03	5.16E-07	3.31E-09	1.99E-11	9.08E-06	1.43E-08	6.28E-06	8.79E-07	1.41E-06		
RDX	2.52E-05	2.52E-09	9.41E-14	5.65E-16	1.93E-08	3.03E-11	4.37E-09	6.12E-10	3.17E-09	1.10E-01	**2.04E-12**
2,4,6-Trinitrotoluene	2.52E-05	2.52E-09	2.20E-10	1.32E-12	5.09E-09	8.02E-12	1.41E-07	1.97E-08	2.22E-08	3.00E-02	**3.91E-12**
Vanadium	5.42E-05	5.42E-09	2.27E-07	1.36E-09	2.71E-11	4.27E-14	7.90E-06	1.11E-06	1.11E-06		

Total cancer risk= 6E-07

Table A-2.1.27 Case 1. Without PFS, HHRA Protocol: UMATILLA RIVER SUBSISTENCE FISHER
INDIRECT EXPOSURES

Calculation of hazard quotients, and hazard indices

Consumption rate of soil, CR(soil)=	0.0001	kg/day
Fraction of soil impacted, F(soil)=	1	unitless
Consumption rate of abv grd veg, CR(ag)=	0.024	kg/day
Fraction of abv grd veg impacted, F(ag)=	0.25	unitless
Consumption rate of root veg, CR(bg)=	0.0063	kg/day
Fraction of root veg impacted, F(bg)=	0.25	unitless
Consumption rate of fish, CR(fish)=	0.140	kg/day
Fraction of fish impacted, F(fish)=	1	unitless
Body weight, BW=	70	kg

I(tot) = Total daily intake of substance
Sc = Soil concentration after total time period of deposition
I(soil) = Daily intake of substance from soil
Pd + Pv = Concentration in plant
I(ag) = Daily intake of substance from above ground vegetables
Pr(bg) = Concentration in below ground plant parts due to root uptake
I(bg) = Daily intake of substance from below ground vegetables
C(fish) = Concentration in fish
I(fish) = Daily intake of substance from fish
RfD = Reference dose
HI = Hazard Index

Substances of Potential Concern	Sc (mg/kg)	I(soil) (mg/day)	Pd+Pv (mg/kg)	I(ag) (mg/day)	Pr(bg) (mg/kg)	I(bg) (mg/day)	C(fish) (mg/kg)	I(fish) (mg/day)	I(tot) (mg/day)	RfD (mg/kg-day)	Hazard Index Liver	Hazard Index Neuro	Hazard Quotient
Antimony	9.98E-05	9.98E-09	2.59E-07	1.56E-09	7.48E-10	1.18E-12	6.91E-06	9.67E-09	2.12E-08	4.00E-04			7E-07
Arsenic	1.36E-04	1.36E-08	3.54E-07	2.12E-09	1.87E-11	2.95E-14	4.48E-06	6.27E-07	6.43E-07	3.00E-04			3E-05
Barium	1.65E-04	1.65E-08	6.93E-07	4.16E-09	2.34E-12	3.69E-15	7.28E-07	1.02E-07	1.23E-07	7.00E-02			2E-08
Beryllium	3.06E-05	3.06E-09	1.28E-07	7.69E-10	3.28E-13	5.16E-16	4.82E-07	6.75E-08	7.13E-08	5.00E-03			2E-07
bis (2-Ethylhexyl) Phthalate	2.47E-02	2.47E-06	2.51E-06	1.50E-08	1.41E-08	2.23E-11	8.98E-05	1.26E-05	1.51E-05	2.00E-02	1.08E-05		1E-05
Cadmium	4.49E-05	4.49E-09	1.88E-07	1.13E-09	4.49E-12	7.08E-15	2.25E-06	3.15E-07	3.21E-07	1.00E-03			4E-06
Chromium	5.95E-05	5.95E-09	2.49E-07	1.50E-09	7.44E-12	1.17E-14	1.37E-06	1.92E-07	1.99E-07	5.00E-03			5E-07
2,4-Dinitrotoluene	2.52E-05	2.52E-09	1.42E-10	8.54E-13	2.76E-08	4.34E-11	7.61E-09	1.07E-09	3.63E-09	2.00E-03		2.60E-08	2E-08
2,6-Dinitrotoluene	2.52E-05	2.52E-09	1.23E-10	7.40E-13	3.20E-08	5.04E-11	6.02E-09	8.43E-10	3.42E-09	1.00E-03		4.88E-08	5E-08
Di-n-octyl Phthalate	1.59E-03	1.59E-07	1.40E-07	8.42E-10	9.09E-10	1.43E-12	6.09E-06	8.52E-07	1.01E-06	2.00E-02	7.23E-07		7E-07
GB	2.21E-05	2.21E-09	2.41E-12	1.44E-14	3.21E-07	5.05E-10	6.86E-09	9.61E-10	3.67E-09	4.30E-05		1.22E-06	1E-06
HD/HT	2.21E-03	2.21E-07	1.47E-11	8.84E-14	1.06E-06	1.67E-09	3.87E-06	5.42E-07	7.65E-07				
Lead	3.09E-04	3.09E-08	1.30E-06	7.77E-09	NA	NA	NA	NA	3.87E-08				
Mercury	5.11E-04	5.11E-08	4.41E-07	2.65E-09	NA	NA	1.62E-03	2.27E-04	2.27E-04	1.00E-04		3.25E-02	3E-02
Nickel	1.98E-04	1.98E-08	8.32E-07	4.99E-09	4.84E-12	7.62E-15	8.10E-06	1.13E-06	1.16E-06	2.00E-02			8E-07
Total PCBs	6.09E-06	6.09E-10	3.94E-10	2.36E-12	1.49E-09	2.34E-12	1.36E-05	1.91E-06	1.91E-06				
Selenium	6.93E-05	6.93E-09	1.80E-07	1.08E-09	1.61E-10	2.54E-13	2.96E-07	4.14E-08	4.94E-08	5.00E-03			1E-07
Silver	9.19E-05	9.19E-09	3.85E-07	2.31E-09	1.15E-08	1.81E-11	3.17E-08	4.43E-09	1.60E-08	5.00E-03			4E-08
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.29E-08	1.29E-12	4.22E-11	2.53E-13	5.51E-13	8.68E-16	3.40E-09	4.77E-10	4.78E-10				
Thallium	2.18E-04	2.18E-08	9.17E-07	5.50E-09	5.90E-13	9.30E-16	1.86E-05	2.60E-06	2.63E-06	8.00E-05	4.69E-04		5E-04
VX	2.21E-05	2.21E-09	1.88E-09	1.13E-11	1.36E-07	2.14E-10	9.61E-08	1.35E-08	1.59E-08	4.30E-05		5.28E-06	5E-06
Di-n-butyl Phthalate	9.25E-04	9.25E-08	9.08E-08	5.45E-10	5.20E-05	8.19E-08	2.91E-03	4.08E-04	4.08E-04	1.00E-01			6E-05
Diethyl Phthalate	2.37E-03	2.37E-07	2.30E-07	1.38E-09	1.48E-06	2.33E-09	1.14E-04	1.59E-05	1.62E-05	8.00E-01			3E-07
Manganese	5.17E-03	5.17E-07	2.17E-05	1.30E-07	1.12E-08	1.77E-11	3.98E-04	5.58E-05	5.64E-05	1.40E-01		5.76E-06	6E-06
4-Methylphenol	5.16E-03	5.16E-07	3.31E-09	1.99E-11	9.08E-06	1.43E-08	6.28E-06	8.79E-07	1.41E-06	5.00E-03		4.03E-06	4E-06
RDX	2.52E-05	2.52E-09	9.41E-14	5.65E-16	1.93E-08	3.03E-11	4.37E-09	6.12E-10	3.17E-09	3.00E-03			1E-08
2,4,6-Trinitrotoluene	2.52E-05	2.52E-09	2.20E-10	1.32E-12	5.09E-09	8.02E-12	1.41E-07	1.97E-08	2.22E-08	5.00E-04	6.35E-07		6E-07
Vanadium	5.42E-05	5.42E-09	2.27E-07	1.36E-09	2.71E-11	4.27E-14	7.90E-06	1.11E-06	1.11E-06	7.00E-03			2E-06
										HI=	0.0005	0.03	0.03

Table A-2.1.28 Case 1. Without PFS, HHRA Protocol: UMATILLA RIVER SUBSISTENCE FISHER

DIRECT INHALATION EXPOSURES:

Exposure parameter	Exposure Scenario			
	Subsistence Farmer	Subsistence Fisher	Adult Resident	Child Resident
Inhalation rate, IR (m3/hr)	0.8	0.8	0.8	0.2
Exposure duration, ED (yr)	3.2	3.2	3.2	3.2
Body weight, BW (kg)	70	70	70	15
Exposure time, ET (hr/day)		24		
Exposure frequency, EF (day/yr)		350		
Carcinogenic averaging time, LT (day)		25550		
Noncancer averaging time, LT (day)		1168		

CSF = Cancer Slope Factor
RfD = Reference Dose
HI = Hazard Index

CDD = Chlorinated dibenzo-p-dioxin
CDF = Chlorinated dibenzo-p-furan

Substances of Potential Concern	Respirable Concentration (ug/m3)	Cancer Inh. Intake Fisher-Umatilla River (mg/kg-day)	Inhalation CSF (per mg/kg-day)	Cancer Risk Fisher-Umatilla River	Inhalation RfD (mg/kg/day)	Hazard Quotient Fisher-Umatilla River
Tetra CDD	4.78E-11	5.99E-16	1.16E+05	6.95E-11		
Penta CDD	5.24E-11	6.56E-16	5.80E+04	3.81E-11		
Hexa CDD	7.17E-11	8.98E-16	1.16E+04	1.04E-11		
Hepta CDD	6.47E-11	8.10E-16	1.16E+03	9.40E-13		
Octa CDD	1.51E-10	1.89E-15	1.16E+02	2.20E-13		
Tetra CDF	1.12E-11	1.40E-16	1.16E+04	1.63E-12		
Penta CDF	7.81E-11	9.79E-16	5.80E+04	5.68E-11		
Hexa CDF	1.25E-10	1.56E-15	1.16E+04	1.81E-11		
Hepta CDF	1.75E-10	2.19E-15	1.16E+03	2.54E-12		
Octa CDF	1.30E-10	1.63E-15	1.16E+02	1.90E-13		
2,3,7,8-TCDD TEQ	1.37E-10	1.71E-15	1.50E+05	2.56E-10		
Antimony	5.78E-06	7.24E-11				
Arsenic	7.95E-06	9.95E-11	5.00E+01	4.98E-09		
Barium	9.48E-06	1.19E-10			1.45E-03	1.79E-06
Beryllium	1.77E-06	2.22E-11	8.40E+00	1.87E-10		
Boron	2.13E-04	2.67E-09			5.80E-03	1.01E-05
Cadmium	2.59E-06	3.24E-11	6.30E+00	2.04E-10		
Chromium	3.43E-06	4.29E-11	4.10E+01	1.76E-09		
Cobalt	2.96E-06	3.71E-11				
Copper	3.64E-06	4.56E-11				
Lead	1.80E-05	2.25E-10				
Manganese	2.99E-04	3.74E-09			1.40E-05	5.84E-03
Mercury	2.30E-06	2.88E-11			8.60E-05	7.33E-06
Nickel	1.15E-05	1.45E-10	8.40E-01	1.21E-10		
Phosphorus	1.30E-04	1.63E-09				
Selenium	4.01E-06	5.02E-11				
Silver	5.34E-06	6.68E-11				
Thallium	1.28E-05	1.61E-10				
Tin	1.49E-05	1.87E-10				
Vanadium	3.16E-06	3.96E-11				
Zinc	6.56E-05	8.22E-10				
Acetone	1.62E-02	2.03E-07				
Benzene	3.70E-05	4.63E-10	2.90E-02	1.34E-11		
Bromodichloromethane	3.62E-07	4.53E-12				
Bromoform	5.94E-06	7.44E-11	3.85E-03	2.86E-13		
2-Butanone	8.02E-05	1.00E-09			2.90E-01	7.58E-08
Carbon Disulfide	4.32E-06	5.42E-11			2.90E-03	4.09E-07
Carbon Tetrachloride	1.12E-05	1.40E-10	5.30E-02	7.40E-12		
Chlorobenzene	8.43E-07	1.06E-11			5.80E-03	3.98E-08
Chloroform	1.07E-05	1.34E-10	8.10E-02	1.09E-11		
Chloromethane	2.11E-04	2.64E-09	6.30E-03	1.66E-11		
Dibromochloromethane	3.80E-07	4.76E-12				
1,1-Dichloroethane	1.90E-07	2.37E-12			1.45E+00	3.58E-11
1,2-Dichloropropane	1.01E-04	1.27E-09			3.80E-03	7.31E-06
cis-1,3-Dichloropropene	8.75E-05	1.10E-09	1.30E-01	1.42E-10	5.80E-03	4.13E-06
trans-1,3-Dichloropropene	1.96E-07	2.46E-12	1.30E-01	3.19E-13	5.70E-03	9.42E-09
Ethylbenzene	1.43E-06	1.80E-11			2.90E-01	1.35E-09
2-Hexanone	9.11E-07	1.14E-11				
Methylene Chloride	2.11E-03	2.64E-08	1.70E-03	4.50E-11	8.70E-01	6.65E-07
4-Methyl-2-pentanone	1.17E-06	1.46E-11			2.30E-01	1.39E-09
Styrene	4.31E-05	5.40E-10			8.70E-01	1.36E-08
1,1,2,2-Tetrachloroethane	3.42E-07	4.28E-12	2.00E-01	8.56E-13		
Tetrachloroethene	5.24E-07	6.56E-12				
Toluene	1.14E-03	1.43E-08			1.10E-01	2.85E-06
1,1,1-Trichloroethane	1.10E-05	1.38E-10				
Vinyl Acetate	2.64E-07	3.31E-12			5.70E-02	1.27E-09
Vinyl Chloride	3.69E-06	4.62E-11	3.00E-01	1.39E-11		
Xylenes	2.33E-06	2.92E-11				
Benzoic Acid	7.77E-05	9.73E-10				
Benzyl Alcohol	6.87E-04	8.60E-09				
Diethyl Phthalate	1.31E-05	1.65E-10				
Dimethyl Phthalate	1.27E-04	1.59E-09				
Di-n-butyl Phthalate	5.11E-06	6.40E-11				
Di-n-octyl Phthalate	8.84E-06	1.11E-10				
bis(2-Ethylhexyl)-Phthalate	1.37E-04	1.71E-09				
2-Methylphenol	1.17E-04	1.46E-09				
3-Methylphenol	4.86E-05	6.09E-10				
4-Methylphenol	2.32E-05	2.91E-10				
Naphthalene	4.95E-06	6.20E-11				
GB	9.95E-08	1.25E-12			8.67E-07	3.14E-05
HD/HT	9.95E-06	1.25E-10	9.50E+00	1.18E-09	2.90E-05	9.40E-05
VX	9.95E-08	1.25E-12			8.67E-07	3.14E-05
Chlorine	3.38E-03	4.23E-08				
Hydrogen Chloride	2.55E-02	3.19E-07			5.80E-03	1.20E-03
Hydrogen Fluoride	5.42E-03	6.79E-08				
Nitroglycerine	2.39E-05	3.00E-10				
PCB	2.75E-08	3.44E-13				
Particulate	5.10E-03	6.38E-08				
2,4-Dinitrotoluene	1.14E-07	1.43E-12				
2,6-Dinitrotoluene	1.14E-07	1.43E-12				
2,4,6-Trinitrotoluene	1.14E-07	1.43E-12				
RDX	1.14E-07	1.43E-12				
HMX	1.14E-07	1.43E-12				
				9E-09	Total HI=	0.007

Table A-2.1.29 Case 1. Without PFS, HHRA Protocol: UMATILLA RIVER SUBSISTENCE FISHER

	Risk UMCDF	HI-Liver UMCDF	HI-Neuro UMCDF	HQ		Risk-Inh. UMCDF	HI-Inh. UMCDF
Indirect					Inhalation		
Antimony				7.26E-07	Tetra CDD	6.95E-11	
Arsenic	5.66E-09			2.93E-05	Penta CDD	3.81E-11	
Barium				2.40E-08	Hexa CDD	1.04E-11	
Beryllium	1.80E-09			1.95E-07	Hepta CDD	9.40E-13	
bis (2-Ethylhexyl) Phthalate	1.24E-09	1.08E-05		1.03E-05	Octa CDD	2.20E-13	
Cadmium				4.39E-06	Tetra CDF	1.63E-12	
Chromium				5.46E-07	Penta CDF	5.68E-11	
2,4-Dinitrotoluene	1.45E-11		2.60E-08	2.49E-08	Hexa CDF	1.81E-11	
2,6-Dinitrotoluene	1.36E-11		4.88E-08	4.68E-08	Hepta CDF	2.54E-12	
Di-n-octyl Phthalate		7.23E-07		6.93E-07	Octa CDF	1.90E-13	
GB			1.22E-06	1.17E-06	2,3,7,8-TCDD TEQ	2.56E-10	
HD/HT	4.27E-08				Antimony		
Lead					Arsenic	4.98E-09	
Mercury			3.25E-02	3.11E-02	Barium		1.79E-06
Nickel				7.94E-07	Beryllium	1.87E-10	
Total PCBs	8.62E-08				Boron		1.01E-05
Selenium				1.35E-07	Cadmium	2.04E-10	
Silver				4.37E-08	Chromium	1.76E-09	
2,3,7,8-TCDD & Others	4.21E-07				Cobalt		
Thallium		4.69E-04		4.50E-04	Copper		
VX			5.28E-06	5.06E-06	Lead		
Di-n-butyl Phthalate				5.59E-05	Manganese		5.84E-03
Diethyl Phthalate				2.77E-07	Mercury		7.33E-06
Manganese			5.76E-06	5.52E-06	Nickel	1.21E-10	
4-Methylphenol			4.03E-06	3.86E-06	Phosphorus		
RDX	2.04E-12			1.45E-08	Selenium		
2,4,6-Trinitrotoluene	3.91E-12	6.35E-07		6.09E-07	Silver		
Vanadium				2.18E-06	Thallium		
					Tin		
					Vanadium		
					Zinc		
					Acetone		
					Benzene	1.34E-11	
					Bromodichloromethane		
					Bromoform	2.86E-13	
					2-Butanone		7.58E-08
					Carbon Disulfide		4.09E-07
					Carbon Tetrachloride	7.40E-12	
					Chlorobenzene		3.98E-08
					Chloroform	1.09E-11	
					Chloromethane	1.66E-11	
					Dibromochloromethane		
					1,1-Dichloroethane		3.58E-11
					1,2-Dichloropropane		7.31E-06
					cis-1,3-Dichloropropene	1.42E-10	4.13E-06
					trans-1,3-Dichloropropene	3.19E-13	9.42E-09
					Ethylbenzene		1.35E-09
					2-Hexanone		
					Methylene Chloride	4.50E-11	6.65E-07
					4-Methyl-2-pentanone		
					Styrene		1.36E-08
					1,1,2,2-Tetrachloroethane	8.56E-13	
					Tetrachloroethene		
					Toluene		2.85E-06
					1,1,1-Trichloroethane		
					Vinyl Acetate		1.27E-09
					Vinyl Chloride	1.39E-11	
					Xylenes		
					Benzoic Acid		
					Benzyl Alcohol		
					Diethyl Phthalate		
					Dimethyl Phthalate		
					Di-n-butyl Phthalate		
					Di-n-octyl Phthalate		
					bis(2-Ethylhexyl)-Phthalate		
					2-Methylphenol		
					3-Methylphenol		
					4-Methylphenol		
					Naphthalene		
					GB		3.14E-05
					HD/HT	1.18E-09	9.40E-05
					VX		3.14E-05
					Chlorine		
					Hydrogen Chloride		1.20E-03
					Hydrogen Fluoride		
					Nitroglycerine		
					PCB		
					Particulates		
					2,4-Dinitrotoluene		
					2,6-Dinitrotoluene		
					2,4,6-Trinitrotoluene		
					RDX		
					HMX		
Total	5.59E-07	4.82E-04	3.25E-02			8.94E-09	7.24E-03
Grand Total	6E-07	0.00048	0.0325			9E-09	0.007

Table A-2.2.1 Case 2. Without PFS, Actual Program Factors: UMCDF RESIDENT

CONCENTRATIONS AND DEPOSITIONS: Calculated depositions and concentrations for indirect exposure pathways

Substances of Potential Concern	Particulate Dry Deposition Pdd (g/m2)/yr	Particulate Wet Deposition Pwd (g/m2)/yr	Vapor Wet Deposition Vwd (g/m2)/yr	Vapor Concentration Vc (ug/m3)	Toxicity Equivalency Factor	2,3,7,8-TCDD Toxicity Equivalents Particulate. Conc. (ug/m3)	2,3,7,8-TCDD Toxicity Equivalents Dry Deposition (g/m2)	2,3,7,8-TCDD Toxicity Equivalents Wet Deposition (g/m2)	2,3,7,8-TCDD Toxicity Equivalents Vapor Conc. (ug/m3)
Tetra CDD	1.73E-12	1.77E-13	4.00E-13	1.45E-11	1.000	1.73E-12	1.77E-13	4.00E-13	1.45E-11
Penta CDD	7.45E-12	7.85E-13	5.10E-13	1.86E-11	0.500	3.72E-12	3.93E-13	2.55E-13	9.28E-12
Hexa CDD	2.66E-11	2.91E-12	4.05E-13	1.47E-11	0.100	2.66E-12	2.91E-13	4.05E-14	1.47E-12
Hepta CDD	5.48E-11	6.07E-12	2.29E-13	8.34E-12	0.010	5.48E-13	6.07E-14	2.29E-15	8.34E-14
Octa CDD	4.25E-11	4.59E-12	1.70E-15	6.18E-14	0.001	4.25E-14	4.59E-15	1.70E-18	6.18E-17
Tetra CDF	1.86E-12	2.05E-13	9.30E-13	3.38E-11	0.100	1.86E-13	2.05E-14	9.30E-14	3.38E-12
Penta CDF	1.40E-11	1.52E-12	2.04E-12	7.43E-11	0.500	7.00E-12	7.62E-13	1.02E-12	3.71E-11
Hexa CDF	4.05E-11	4.46E-12	1.02E-12	3.71E-11	0.100	4.05E-12	4.46E-13	1.02E-13	3.71E-12
Hepta CDF	3.57E-11	3.89E-12	3.00E-13	1.09E-11	0.010	3.57E-13	3.89E-14	3.00E-15	1.09E-13
Octa CDF	2.08E-11	2.19E-12	8.10E-15	2.95E-13	0.001	2.08E-14	2.19E-15	8.10E-18	2.95E-16
					Total =	2.03E-11	2.20E-12	1.92E-12	6.97E-11
Antimony	1.44E-06	1.50E-07	0.00E+00	0.00E+00					
Arsenic	1.75E-06	1.80E-07	0.00E+00	0.00E+00					
Barium	3.33E-06	3.47E-07	0.00E+00	0.00E+00					
Beryllium	3.76E 07	3.80E-08	0.00E+00	0.00E+00					
bis (2-Ethylhexyl) Phthalate	4.79E-06	4.95E-07	3.66E-06	1.33E-04					
Cadmium	8.31E-07	8.62E-08	0.00E+00	0.00E+00					
Chromium	2.52E-06	2.75E-07	0.00E+00	0.00E+00					
2,4-Dinitrotoluene	0.00E+00	0.00E+00	2.27E-09	8.27E-08					
2,6-Dinitrotoluene	0.00E+00	0.00E+00	2.27E-09	8.27E-08					
Di-n-octyl Phthalate	1.04E-06	1.14E-07	8.47E-07	3.08E-05					
GB	9.92E-16	1.05E-16	2.21E-09	8.03E-08					
HD/HT	2.57E-12	2.72E-13	2.21E-07	8.03E-06					
Lead	4.69E-06	4.89E-07	0.00E+00	0.00E+00					
Mercury	0.00E+00	0.00E+00	7.93E-08	2.89E-06					
Nickel	3.24E-06	3.45E-07	0.00E+00	0.00E+00					
Total PCBs	0.00E+00	0.00E+00	3.27E-10	1.19E-08					
Selenium	1.20E-06	1.26E-07	0.00E+00	0.00E+00					
Silver	1.32E-06	1.38E-07	0.00E+00	0.00E+00					
2,3,7,8-TCDD & Dioxin-Like SOPCs	2.03E-11	2.20E-12	1.92E-12	6.97E-11					
Thallium	2.59E-06	2.59E-07	1.59E-16	5.80E-15					
VX	3.12E-12	3.30E-13	2.21E-09	8.02E-08					
Di-n-butyl Phthalate	9.88E-07	1.09E-07	8.10E-07	2.95E-05					
Diethyl Phthalate	7.98E-07	8.60E-08	6.37E-07	2.32E-05					
Manganese	3.47E-05	3.55E-06	0.00E+00	0.00E+00					
4-Methylphenol	1.19E-11	1.28E-12	1.36E-06	4.93E-05					
RDX	0.00E+00	0.00E+00	2.27E-09	8.27E-08					
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	2.27E-09	8.27E-08					
Vanadium	7.87E-07	8.06E-08	0.00E+00	0.00E+00					

CDD = Chlorinated dibenzo-p-dioxin
CDF = Chlorinated dibenzo-p-furan

Table A-2.2.2 Case 2. Without PFS, Actual Program Factors: UMCDF RESIDENT

SOIL INGESTION:

Calculation of soil concentration due to deposition

Soil mixing depth, Z=	1 cm
Soil bulk density, BD=	1.5 g/cm3
Total deposition time period, Tc=	3.2 yrs
Dry deposition velocity of vapor phase, Vdv=	3 cm/s

Sc = Soil concentration after total time period of deposition
Ds = Deposition term
Pdd = Yearly dry deposition from particle phase
Pwd = Yearly wet deposition from particle phase
Vwd = Yearly wet deposition from vapor phase
Vc = Vapor phase air concentration

Substances of Potential Concern	Pdd (g/m2)/yr	Pwd (g/m2)/yr	Vwd (g/m2)/yr	Vc (ug/m3)	Ds (1/yr)	Sc (mg/kg)
Antimony	1.44E-06	1.50E-07	0.00E+00	0.00E+00	1.06E-04	**3.40E-04**
Arsenic	1.75E-06	1.80E-07	0.00E+00	0.00E+00	1.29E-04	**4.11E-04**
Barium	3.33E-06	3.47E-07	0.00E+00	0.00E+00	2.45E-04	**7.84E-04**
Beryllium	3.76E-07	3.80E-08	0.00E+00	0.00E+00	2.76E-05	**8.83E-05**
bis (2-Ethylhexyl) Phthalate	4.79E-06	4.95E-07	3.66E-06	1.33E-04	8.99E-03	**2.88E-02**
Cadmium	8.31E-07	8.62E-08	0.00E+00	0.00E+00	6.11E-05	**1.96E-04**
Chromium	2.52E-06	2.75E-07	0.00E+00	0.00E+00	1.86E-04	**5.97E-04**
2,4-Dinitrotoluene	0.00E+00	0.00E+00	2.27E-09	8.27E-08	5.37E-06	**1.72E-05**
2,6-Dinitrotoluene	0.00E+00	0.00E+00	2.27E-09	8.27E-08	5.37E-06	**1.72E-05**
Di-n-octyl Phthalate	1.04E-06	1.14E-07	8.47E-07	3.08E-05	2.08E-03	**6.64E-03**
GB	9.92E-16	1.05E-16	2.21E-09	8.03E-08	5.21E-06	**1.67E-05**
HD/HT	2.57E-12	2.72E-13	2.21E-07	8.03E-06	5.21E-04	**1.67E-03**
Lead	4.69E-06	4.89E-07	0.00E+00	0.00E+00	3.45E-04	**1.10E-03**
Mercury	0.00E+00	0.00E+00	7.93E-08	2.89E-06	1.87E-04	**6.00E-04**
Nickel	3.24E-06	3.45E-07	0.00E+00	0.00E+00	2.39E-04	**7.65E-04**
Total PCBs	0.00E+00	0.00E+00	3.27E-10	1.19E-08	7.72E-07	**2.47E-06**
Selenium	1.20E-06	1.26E-07	0.00E+00	0.00E+00	8.86E-05	**2.84E-04**
Silver	1.32E-06	1.38E-07	0.00E+00	0.00E+00	9.74E-05	**3.12E-04**
2,3,7,8-TCDD & Dioxin-Like SOPCs	2.03E-11	2.20E-12	1.92E-12	6.97E-11	6.03E-09	**1.93E-08**
Thallium	2.59E-06	2.59E-07	1.59E-16	5.80E-15	1.90E-04	**6.08E-04**
VX	3.12E-12	3.30E-13	2.21E-09	8.02E-08	5.21E-06	**1.67E-05**
Di-n-butyl Phthalate	9.88E-07	1.09E-07	8.10E-07	2.95E-05	1.99E-03	**6.35E-03**
Diethyl Phthalate	7.98E-07	8.60E-08	6.37E-07	2.32E-05	1.56E-03	**5.00E-03**
Manganese	3.47E-05	3.55E-06	0.00E+00	0.00E+00	2.55E-03	**8.16E-03**
4-Methylphenol	1.19E-11	1.28E-12	1.36E-06	4.93E-05	3.20E-03	**1.02E-02**
RDX	0.00E+00	0.00E+00	2.27E-09	8.27E-08	5.37E-06	**1.72E-05**
	0.00E+00	0.00E+00	2.27E-09	8.27E-08	5.37E-06	**1.72E-05**

Table A-2.2.3 Case 2. Without PFS, Actual Program Factors: UMCDF RESIDENT

CONSUMPTION OF ABOVE-GROUND VEGETABLES:

Calculation of above-ground vegetable concentration due to direct deposition
Calculation of above-ground vegetable concentration due to air-to-plant transfer

Interception fraction of edible portion, Rp=	0.04	unitless
Plant surface loss coefficient, kp=	18	1/yr
Time between rainfalls, t-rain=	14	days
Length of plant exposure per harvest, Tp=	0.16	yrs
Standing crop biomass, Yp=	1.7	kg DW/m2
Density of air, ρ=	1200	g/m3
Above ground veg. correction factor, VGab=	0.01	unitless

Pd = Concentration in plant due to direct deposition
Pv = Concentration in plant due to air-to-plant transfer
Pd + Pv = Concentration in plant due to direct deposition and air-to-plant transfer
Fw = Fraction of wet deposition of particles that adheres to plant
Bv = Air-to-plant bioconcentration factor

Substances of Potential Concern	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Fw	**Pd (mg/kg)**	Vc (ug/m3)	Bv (mg/kg)/(ug/g)	**Pv (mg/kg)**	**Pd+Pv (mg/kg)**
Antimony	1.44E-06	1.50E-07	0.2	**1.82E-06**	0.00E+00	NA	**0.00E+00**	**1.82E-06**
Arsenic	1.75E-06	1.80E-07	0.2	**2.20E-06**	0.00E+00	NA	**0.00E+00**	**2.20E-06**
Barium	3.33E-06	3.47E-07	0.6	**4.37E-06**	0.00E+00	NA	**0.00E+00**	**4.37E-06**
Beryllium	3.76E-07	3.80E-08	0.6	**4.92E-07**	0.00E+00	NA	**0.00E+00**	**4.92E-07**
bis (2-Ethylhexyl) Phthalate	4.79E-06	4.95E-07	0.6	**6.27E-06**	1.33E-04	5.11E+02	**5.67E-07**	**6.84E-06**
Cadmium	8.31E-07	8.62E-08	0.6	**1.09E-06**	0.00E+00	NA	**0.00E+00**	**1.09E-06**
Chromium	2.52E-06	2.75E-07	0.6	**3.32E-06**	0.00E+00	NA	**0.00E+00**	**3.32E-06**
2,4-Dinitrotoluene	0.00E+00	0.00E+00	0.6	**0.00E+00**	8.27E-08	1.50E+02	**1.03E-10**	**1.03E-10**
2,6-Dinitrotoluene	0.00E+00	0.00E+00	0.6	**0.00E+00**	8.27E-08	1.30E+02	**8.96E-11**	**8.96E-11**
Di-n-octyl Phthalate	1.04E-06	1.14E-07	0.6	**1.37E-06**	3.08E-05	2.32E+02	**5.96E-08**	**1.43E-06**
GB	9.92E-16	1.05E-16	0.6	**1.30E-15**	8.03E-08	2.90E+00	**1.94E-12**	**1.94E-12**
HD/HT	2.57E-12	2.72E-13	0.6	**3.37E-12**	8.03E-06	1.58E-01	**1.06E-11**	**1.39E-11**
Lead	4.69E-06	4.89E-07	0.6	**6.15E-06**	0.00E+00	NA	**0.00E+00**	**6.15E-06**
Mercury	0.00E+00	0.00E+00	0.6	**0.00E+00**	2.89E-06	2.30E+04	**5.53E-07**	**5.53E-07**
Nickel	3.24E-06	3.45E-07	0.6	**4.26E-06**	0.00E+00	NA	**0.00E+00**	**4.26E-06**
Total PCBs	0.00E+00	0.00E+00	0.6	**0.00E+00**	1.19E-08	1.72E+03	**1.71E-10**	**1.71E-10**
Selenium	1.20E-06	1.26E-07	0.2	**1.52E-06**	0.00E+00	NA	**0.00E+00**	**1.52E-06**
Silver	1.32E-06	1.38E-07	0.6	**1.73E-06**	0.00E+00	NA	**0.00E+00**	**1.73E-06**
2,3,7,8-TCDD & Dioxin-Like SOPCs	2.03E-11	2.20E-12	0.60	**2.67E-11**	6.97E-11	8.39E+04	**4.87E-11**	**7.54E-11**
Thallium	2.59E-06	2.59E-07	0.6	**3.39E-06**	5.80E-15	NA	**0.00E+00**	**3.39E-06**
VX	3.12E-12	3.30E-13	0.6	**4.09E-12**	8.02E-08	2.26E+03	**1.51E-09**	**1.52E-09**
Di-n-butyl Phthalate	9.88E-07	1.09E-07	0.6	**1.30E-06**	2.95E-05	4.40E+02	**1.08E-07**	**1.41E-06**
Diethyl Phthalate	7.98E-07	8.60E-08	0.6	**1.05E-06**	2.32E-05	4.48E+02	**8.64E-08**	**1.13E-06**
Manganese	3.47E-05	3.55E-06	0.6	**4.54E-05**	0.00E+00	NA	**0.00E+00**	**4.54E-05**
4-Methylphenol	1.19E-11	1.28E-12	0.6	**1.56E-11**	4.93E-05	1.71E+01	**7.03E-09**	**7.05E-09**
RDX	0.00E+00	0.00E+00	0.6	**0.00E+00**	8.27E-08	9.92E-02	**6.84E-14**	**6.84E-14**
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	0.6	**0.00E+00**	8.27E-08	2.32E+02	**1.60E-10**	**1.60E-10**
Vanadium	7.87E-07	8.06E-08	0.6	**1.03E-06**	0.00E+00	NA	**0.00E+00**	**1.03E-06**

Table A-2.2.4 Case 2. Without PFS, Actual Program Factors: UMCDF RESIDENT

CONSUMPTION OF ROOT VEGETABLES:

USING TIME-AVERAGED SOIL CONCENTRATIONS **Calculation of soil concentration due to deposition**
Calculation of root vegetable concentration due to root uptake

Soil mixing depth, Z=	20	cm
Soil bulk density, BD=	1.5	g/cm3
Total deposition time period, Tc=	3.2	yrs
Below ground veg. correction factor, VGbg=	0.01	unitless
Dry deposition velocity of vapor phase, Vdv=	3	cm/s

Pr(bg) = Root vegetable concentration due to root uptake
Sc = Soil concentration after total time period of deposition
Ds = Deposition term
Kds = Soil-water partition coefficient
RCF = Ratio of concentration in roots to concentration in soil pore water
Vwd = Yearly wet deposition from vapor phase

Substances of Potential Concern	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Vwd (g/m2-yr)	Vc (µg/m3)	Ds (1/yr)	Sc (mg/kg)	Kds mL/g	RCF (mg/kg)/(ug/mL)	**Pr(bg) (mg/kg)**
Antimony	1.44E-06	1.50E-07	0.00E+00	0.00E+00	5.31E-06	1.70E-05	2	3.00E-02	**2.55E-09**
Arsenic	1.75E-06	1.80E-07	0.00E+00	0.00E+00	6.43E-06	2.06E-05	29	8.00E-03	**5.67E-11**
Barium	3.33E-06	3.47E-07	0.00E+00	0.00E+00	1.23E-05	3.92E-05	530	1.50E-02	**1.11E-11**
Beryllium	3.76E-07	3.80E-08	0.00E+00	0.00E+00	1.38E-06	4.41E-06	70	1.50E-03	**9.46E-13**
bis (2-Ethylhexyl) Phthalate	4.79E-06	4.95E-07	3.66E-06	1.33E-04	4.50E-04	1.44E-03	280000	3.20E+02	**1.64E-08**
Cadmium	8.31E-07	8.62E-08	0.00E+00	0.00E+00	3.06E-06	9.78E-06	160	3.20E-02	**1.96E-11**
Chromium	2.52E-06	2.75E-07	0.00E+00	0.00E+00	9.32E-06	2.98E-05	18	4.50E-03	**7.46E-11**
2,4-Dinitrotoluene	0.00E+00	0.00E+00	2.27E-09	8.27E-08	2.69E-07	8.59E-07	0.87	1.90E+00	**1.88E-08**
2,6-Dinitrotoluene	0.00E+00	0.00E+00	2.27E-09	8.27E-08	2.69E-07	8.59E-07	0.67	1.70E+00	**2.18E-08**
Di-n-octyl Phthalate	1.04E-06	1.14E-07	8.47E-07	3.08E-05	1.04E-04	3.32E-04	280000	3.20E+02	**3.80E-09**
GB	9.92E-16	1.05E-16	2.21E-09	8.03E-08	2.60E-07	8.34E-07	0.032	9.30E-01	**2.42E-07**
HD/HT	2.57E-12	2.72E-13	2.21E-07	8.03E-06	2.60E-05	8.34E-05	1.2	1.16E+00	**7.99E-07**
Lead	4.69E-06	4.89E-07	0.00E+00	0.00E+00	1.73E-05	5.52E-05	600	NA	**NA**
Mercury	0.00E+00	0.00E+00	7.93E-08	2.89E-06	9.37E-06	3.00E-05	57000	NA	**NA**
Nickel	3.24E-06	3.45E-07	0.00E+00	0.00E+00	1.20E-05	3.83E-05	82	4.00E-03	**1.87E-11**
Total PCBs	0.00E+00	0.00E+00	3.27E-10	1.19E-08	3.86E-08	1.24E-07	4300	2.10E+03	**6.03E-10**
Selenium	1.20E-06	1.26E-07	0.00E+00	0.00E+00	4.43E-06	1.42E-05	4.3	2.00E-02	**6.60E-10**
Silver	1.32E-06	1.38E-07	0.00E+00	0.00E+00	4.87E-06	1.56E-05	0.4	1.00E-01	**3.89E-08**
2,3,7,8-TCDD & Dioxin-Like SOPCs	2.03E-11	2.20E-12	1.92E-12	6.97E-11	3.01E-10	9.64E-10	142000	1.21E+04	**8.21E-13**
Thallium	2.59E-06	2.59E-07	1.59E-16	5.80E-15	9.50E-06	3.04E-05	74	4.00E-04	**1.64E-12**
VX	3.12E-12	3.30E-13	2.21E-09	8.02E-08	2.60E-07	8.33E-07	0.15	1.85E+00	**1.03E-07**
Di-n-butyl Phthalate	9.88E-07	1.09E-07	8.10E-07	2.95E-05	9.93E-05	3.18E-04	1.6	1.80E+02	**3.57E-04**
Diethyl Phthalate	7.98E-07	8.60E-08	6.37E-07	2.32E-05	7.81E-05	2.50E-04	5.3	6.56E+00	**3.12E-06**
Manganese	3.47E-05	3.55E-06	0.00E+00	0.00E+00	1.28E-04	4.08E-04	23	1.00E-01	**1.77E-08**
4-Methylphenol	1.19E-11	1.28E-12	1.36E-06	4.93E-05	1.60E-04	5.12E-04	0.50	1.76E+00	**1.80E-05**
RDX	0.00E+00	0.00E+00	2.27E-09	8.27E-08	2.69E-07	8.59E-07	0.63	9.61E-01	**1.31E-08**
2,4,6 Trinitrotoluene	0.00E+00	0.00E+00	2.27E-09	8.27E-08	2.69E-07	8.59E-07	11	4.44E+00	**3.47E-09**
							100	1.00E-01	**9.25E-11**

Table A-2.2.5 Case 2. Without PFS, Actual Program Factors: UMCDF ADULT RESIDENT INDIRECT EXPOSURES

Calculation of cancer risks

Consumption rate of soil, CR(soil)=	0.0001	kg/day
Fraction of soil impacted, F(soil)=	1	unitless
Consumption rate of abv grd veg, CR(ag)=	0.024	kg/day
Fraction of abv grd veg impacted, F(ag)=	0.25	unitless
Consumption rate of root veg, CR(bg)=	0.0063	kg/day
Fraction of root veg impacted, F(bg)=	0.25	unitless
Exposure duration, ED=	30	yr
Exposure frequency, EF=	350	day/yr
Body weight, BW=	70	kg
Averaging time, AT=	70	yr

I(tot) = Total daily intake of substance
Sc = Soil concentration after total time period of deposition
I(soil) = Daily intake of substance from soil
Pd + Pv = Concentration in plant
I(ag) = Daily intake of substance from above ground vegetables
Pr(bg) = Concentration in below ground plant parts due to root uptake
I(bg) = Daily intake of substance from below ground vegetables
CSF = Carcinogenic slope factor

Substances of Potential Concern	Sc (mg/kg)	I(soil) (mg/day)	Pd+Pv (mg/kg)	I(ag) (mg/day)	Pr(bg) (mg/kg)	I(bg) (mg/day)	I(tot) (mg/day)	CSF (per mg/kg-day)	Cancer Risk
Antimony	3.40E-04	3.40E-08	1.82E-06	1.09E-08	2.55E-09	4.01E-12	4.49E-08		
Arsenic	4.11E-04	4.11E-08	2.20E-06	1.32E-08	5.67E-11	8.94E-14	5.43E-08	1.50E+00	**4.79E-10**
Barium	7.84E-04	7.84E-08	4.37E-06	2.62E-08	1.11E-11	1.75E-14	1.05E-07		
Beryllium	8.83E-05	8.83E-09	4.92E-07	2.95E-09	9.46E-13	1.49E-15	1.18E-08	4.30E+00	**2.97E-10**
bis (2-Ethylhexyl) Phthalate	2.88E-02	2.88E-06	6.84E-06	4.10E-08	1.64E-08	2.59E-11	2.92E-06	1.40E-02	**2.40E-10**
Cadmium	1.96E-04	1.96E-08	1.09E-06	6.53E-09	1.96E-11	3.08E-14	2.61E-08		
Chromium	5.97E-04	5.97E-08	3.32E-06	1.99E-08	7.46E-11	1.17E-13	7.96E-08		
2,4-Dinitrotoluene	1.72E-05	1.72E-09	1.03E-10	6.21E-13	1.88E-08	2.96E-11	1.75E-09	6.80E-01	**6.98E-12**
2,6-Dinitrotoluene	1.72E-05	1.72E-09	8.96E-11	5.38E-13	2.18E-08	3.43E-11	1.75E-09	6.80E-01	**7.00E-12**
Di-n-octyl Phthalate	6.64E-03	6.64E-07	1.43E-06	8.55E-09	3.80E-09	5.98E-12	6.73E-07		
GB	1.67E-05	1.67E-09	1.94E-12	1.16E-14	2.42E-07	3.82E-10	2.05E-09		
HD/HT	1.67E-03	1.67E-07	1.39E-11	8.36E-14	7.99E-07	1.26E-09	1.68E-07	9.50E+00	**9.37E-09**
Lead	1.10E-03	1.10E-07	6.15E-06	3.69E-08	NA	NA	1.47E-07		
Mercury	6.00E-04	6.00E-08	5.53E-07	3.32E-09	NA	NA	6.33E-08		
Nickel	7.65E-04	7.65E-08	4.26E-06	2.55E-08	1.87E-11	2.94E-14	1.02E-07		
Total PCBs	2.47E-06	2.47E-10	1.71E-10	1.02E-12	6.03E-10	9.50E-13	2.49E-10	7.70E+00	**1.13E-11**
Selenium	2.84E-04	2.84E-08	1.52E-06	9.10E-09	6.60E-10	1.04E-12	3.75E-08		
Silver	3.12E-04	3.12E-08	1.73E-06	1.04E-08	3.89E-08	6.13E-11	4.16E-08		
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.93E-08	1.93E-12	7.54E-11	4.53E-13	8.21E-13	1.29E-15	2.38E-12	1.50E+05	**2.10E-09**
Thallium	6.08E-04	6.08E-08	3.39E-06	2.03E-08	1.64E-12	2.59E-15	8.12E-08		
VX	1.67E-05	1.67E-09	1.52E-09	9.09E-12	1.03E-07	1.62E-10	1.84E-09		
Di-n-butyl Phthalate	6.35E-03	6.35E-07	1.41E-06	8.45E-09	3.57E-04	5.63E-07	1.21E-06		
Diethyl Phthalate	5.00E-03	5.00E-07	1.13E-06	6.81E-09	3.12E-06	4.91E-09	5.11E-07		
Manganese	8.16E-03	8.16E-07	4.54E-05	2.73E-07	1.77E-08	2.79E-11	1.09E-06		
4-Methylphenol	1.02E-02	1.02E-06	7.05E-09	4.23E-11	1.80E-05	2.84E-08	1.05E-06		
RDX	1.72E-05	1.72E-09	6.84E-14	4.10E-16	1.31E-08	2.06E-11	1.74E-09	1.10E-01	**1.12E-12**
2,4,6-Trinitrotoluene	1.72E-05	1.72E-09	1.60E-10	9.60E-13	3.47E-09	5.46E-12	1.73E-09	3.00E-02	**3.04E-13**
Vanadium	1.85E-04	1.85E-08	1.03E-06	6.18E-09	9.25E-11	1.46E-13	2.47E-08		

Total cancer risk= **1E-08**

Table A-2.2.6 Case 2. Without PFS, Actual Program Factors: UMCDF ADULT RESIDENT INDIRECT EXPOSURES

Calculation of hazard quotients, and hazard indices

Consumption rate of soil, CR(soil)=	0.0001	kg/day
Fraction of soil impacted, F(soil)=	1	unitless
Consumption rate of abv grd veg, CR(ag)=	0.024	kg/day
Fraction of abv grd veg impacted, F(ag)=	0.25	unitless
Consumption rate of root veg, CR(bg)=	0.0063	kg/day
Fraction of root veg impacted, F(bg)=	0.25	unitless
Body weight, BW=	70	kg

I(tot) = Total daily intake of substance
Sc = Soil concentration after total time period of deposition
I(soil) = Daily intake of substance from soil
Pd + Pv = Concentration in plant
I(ag) = Daily intake of substance from above ground vegetables
Pr(bg) = Concentration in below ground plant parts due to root uptake
I(bg) = Daily intake of substance from below ground vegetables
RfD = Reference dose
HI = Hazard Index

Substances of Potential Concern	Sc (mg/kg)	I(soil) (mg/day)	Pd+Pv (mg/kg)	I(ag) (mg/day)	Pr(bg) (mg/kg)	I(bg) (mg/day)	I(tot) (mg/day)	RfD (mg/kg-day)	Hazard Index Liver	Hazard Index Neuro	Hazard Quotient
Antimony	3.40E-04	3.40E-08	1 82E-06	1.09E-08	2.55E-09	4.01E-12	4.49E-08	4.00E-04			2E-06
Arsenic	4.11E-04	4.11E-08	2.20E-06	1.32E-08	5.67E-11	8.94E-14	5.43E-08	3.00E-04			2E-06
Barium	7.84E-04	7.84E-08	4.37E-06	2.62E-08	1.11E-11	1.75E-14	1.05E-07	7.00E-02			2E-08
Beryllium	8.83E-05	8.83E-09	4 92E-07	2.95E-09	9.46E-13	1.49E-15	1.18E-08	5.00E-03			3E-08
bis (2-Ethylhexyl) Phthalate	2.88E-02	2.88E-06	6.84E-06	4.10E-08	1.64E-08	2.59E-11	2.92E-06	2.00E-02	2.08E-06		2E-06
Cadmium	1.96E-04	1.96E-08	1.09E-06	6.53E-09	1 96E-11	3.08E-14	2.61E-08	1.00E-03			4E-07
Chromium	5.97E-04	5.97E-08	3.32E-06	1.99E-08	7.46E-11	1.17E-13	7.96E-08	5.00E-03			2E-07
2,4-Dinitrotoluene	1.72E-05	1.72E-09	1.03E-10	6.21E-13	1.88E-08	2.96E-11	1.75E-09	2.00E-03		1.25E-08	1E-08
2,6-Dinitrotoluene	1.72E-05	1.72E-09	8.96E-11	5.38E-13	2.18E-08	3.43E-11	1.75E-09	1.00E-03		2.51E-08	2E-08
Di-n-octyl Phthalate	6.64E-03	6.64E-07	1.43E-06	8.55E-09	3.80E-09	5.98E-12	6.73E-07	2.00E-02	4.81E-07		5E-07
GB	1.67E-05	1.67E-09	1.94E-12	1.16E-14	2.42E-07	3.82E-10	2.05E-09	4.30E-05		6.81E-07	7E-07
HD/HT	1.67E-03	1.67E-07	1.39E-11	8.36E-14	7.99E-07	1.26E-09	1.68E-07				
Lead	1.10E-03	1.10E-07	6.15E-06	3.69E-08	NA	NA	1.47E-07				
Mercury	6.00E-04	6.00E-08	5.53E-07	3.32E-09	NA	NA	6.33E-08	1.00E-04		9.04E-06	9E-06
Nickel	7.65E-04	7.65E-08	4.26E-06	2.55E-08	1.87E-11	2.94E-14	1.02E-07	2.00E-02	7.29E-08		7E-08
Total PCBs	2.47E-06	2.47E-10	1.71E-10	1.02E-12	6.03E-10	9.50E-13	2.49E-10				
Selenium	2.84E-04	2.84E-08	1.52E-06	9.10E-09	6.60E-10	1.04E-12	3.75E-08	5.00E-03			1E-07
Silver	3.12E-04	3.12E-08	1.73E-06	1.04E-08	3.89E-08	6.13E-11	4.16E-08	5.00E-03			1E-07
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.93E-08	1.93E-12	7.54E-11	4.53E-13	8.21E-13	1.29E-15	2.38E-12				
Thallium	6.08E-04	6.08E-08	3.39E-06	2.03E-08	1.64E-12	2.59E-15	8.12E-08	8.00E-05	1.45E-05		1E-05
VX	1.67E-05	1.67E-09	1.52E-09	9.09E-12	1.03E-07	1.62E-10	1.84E-09	4.30E-05		6.11E-07	6E-07
Di-n-butyl Phthalate	6.35E-03	6.35E-07	1.41E-06	8.45E-09	3.57E-04	5.63E-07	1.21E-06	1.00E-01			2E-07
Diethyl Phthalate	5.00E-03	5.00E-07	1.13E-06	6.81E-09	3.12E-06	4.91E-09	5.11E-07	8.00E-01			9E-09
Manganese	8.16E-03	8.16E-07	4.54E-05	2.73E-07	1.77E-08	2.79E-11	1.09E-06	1.40E-01		1.11E-07	1E-07
4-Methylphenol	1.02E-02	1.02E-06	7.05E-09	4.23E-11	1.80E-05	2.84E-08	1.05E-06	5.00E-03		3.01E-06	3E-06
RDX	1.72E-05	1.72E-09	6.84E-14	4.10E-16	1.31E-08	2.06E-11	1.74E-09	3.00E-03			8E-09
2,4,6-Trinitrotoluene	1.72E-05	1.72E-09	1.60E-10	9.60E-13	3.47E-09	5.46E-12	1.73E-09	5.00E-04	4.93E-08		5E-08
Vanadium	1.85E-04	1.85E-08	1.03E-06	6.18E-09	9.25E-11	1.46E-13	2.47E-08	7.00E-03			5E-08
									0.00002	0.00001	0.00003

Table A-2.2.7 Case 2. Without PFS, Actual Program Factors: UMCDF CHILD RESIDENT INDIRECT EXPOSURES

Calculation of cancer risks

Consumption rate of soil, CR(soil)=	0.0002	kg/day
Fraction of soil impacted, F(soil)=	1	unitless
Consumption rate of abv grd veg, CR(ag)=	0.005	kg/day
Fraction of abv grd veg impacted, F(ag)=	0.25	unitless
Consumption rate of root veg, CR(bg)=	0.0014	kg/day
Fraction of root veg impacted, F(bg)=	0.25	unitless
Exposure duration, ED=	6	yr
Exposure frequency, EF=	350	day/yr
Body weight, BW=	15	kg
Averaging time, AT=	70	yr

I(tot) = Total daily intake of substance
Sc = Soil concentration after total time period of deposition
I(soil) = Daily intake of substance from soil
Pd + Pv = Concentration in plant
I(ag) = Daily intake of substance from above ground vegetables
Pr(bg) = Concentration in below ground plant parts due to root uptake
I(bg) = Daily intake of substance from below ground vegetables
CSF = Carcinogenic slope factor

Substances of Potential Concern	Sc (mg/kg)	I(soil) (mg/day)	Pd+Pv (mg/kg)	I(ag) (mg/day)	Pr(bg) (mg/kg)	I(bg) (mg/day)	I(tot) (mg/day)	CSF (per mg/kg-day)	Cancer Risk
Antimony	3.40E-04	6.79E-08	1.82E-06	2.27E-09	2.55E-09	8.91E-13	7.02E-08		
Arsenic	4.11E-04	8.23E-08	2.20E-06	2.75E-09	5.67E-11	1.99E-14	8.50E-08	1.50E+00	**6.99E-10**
Barium	7.84E-04	1.57E-07	4.37E-06	5.46E-09	1.11E-11	3.89E-15	1.62E-07		
Beryllium	8.83E-05	1.77E-08	4.92E-07	6.15E-10	9.46E-13	3.31E-16	1.83E-08	4.30E+00	**4.30E-10**
bis (2-Ethylhexyl) Phthalate	2.88E-02	5.75E-06	6.84E-06	8.55E-09	1 64E-08	5.75E-12	5.76E-06	1.40E-02	**4.42E-10**
Cadmium	1.96E-04	3.91E-08	1.09E-06	1.36E-09	1.96E-11	6.85E-15	4.05E-08		
Chromium	5.97E-04	1.19E-07	3.32E-06	4.14E-09	7.46E-11	2.61E-14	1.23E-07		
2,4-Dinitrotoluene	1.72E-05	3.44E-09	1.03E-10	1.29E-13	1.88E-08	6.57E-12	3.44E-09	6.80E-01	**1.28E-11**
2,6-Dinitrotoluene	1.72E-05	3.44E-09	8.96E-11	1.12E-13	2.18E-08	7.63E-12	3.45E-09	6.80E-01	**1.28E-11**
Di-n-octyl Phthalate	6.64E-03	1.33E-06	1.43E-06	1.78E-09	3.80E-09	1.33E-12	1.33E-06		
GB	1.67E-05	3.33E-09	1.94E-12	2.43E-15	2.42E-07	8.48E-11	3.42E-09		
HD/HT	1.67E-03	3.33E-07	1.39E-11	1.74E-14	7.99E-07	2.80E-10	3.34E-07	9.50E+00	**1.74E-08**
Lead	1.10E-03	2.21E-07	6.15E-06	7.69E-09	NA	NA	2.29E-07		
Mercury	6.00E-04	1.20E-07	5.53E-07	6.92E-10	NA	NA	1.21E-07		
Nickel	7.65E-04	1.53E-07	4.26E-06	5.32E-09	1.87E-11	6.53E-15	1.58E-07		
Total PCBs	2.47E-06	4.94E-10	1.71E-10	2.13E-13	6.03E-10	2.11E-13	4.95E-10	7.70E+00	**2.09E-11**
Selenium	2.84E-04	5.67E-08	1.52E-06	1.89E-09	6.60E-10	2.31E-13	5.86E-08		
Silver	3.12E-04	6.23E-08	1.73E-06	2.17E-09	3.89E-08	1.36E-11	6.45E-08		
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.93E-08	3.86E-12	7.54E-11	9.43E-14	8.21E-13	2.88E-16	3.95E-12	1.50E+05	**3.25E-09**
Thallium	6.08E-04	1.22E-07	3.39E-06	4.24E-09	1.64E-12	5.75E-16	1.26E-07		
VX	1.67E-05	3.33E-09	1.52E-09	1.89E-12	1.03E-07	3.60E-11	3.37E-09		
Di-n-butyl Phthalate	6.35E-03	1.27E-06	1.41E-06	1.76E-09	3.57E-04	1.25E-07	1.40E-06		
Diethyl Phthalate	5.00E-03	1.00E-06	1.13E-06	1.42E-09	3.12E-06	1.09E-09	1.00E-06		
Manganese	8 16E-03	1.63E-06	4.54E-05	5.68E-08	1.77E-08	6.21E-12	1.69E-06		
4-Methylphenol	1.02E-02	2.05E-06	7.05E-09	8.81E-12	1.80E-05	6.31E-09	2.06E-06		
RDX	1.72E-05	3.44E-09	6.84E-14	8.55E-17	1.31E-08	4.59E-12	3.44E-09	1.10E-01	**2.07E-12**
2,4,6-Trinitrotoluene	1.72E-05	3.44E-09	1.60E-10	2.00E-13	3.47E-09	1.21E-12	3.44E-09	3.00E-02	**5.65E-13**
Vanadium	1.85E-04	3.70E-08	1.03E-06	1.29E-09	9.25E-11	3.24E-14	3.83E-08		

Total cancer risk= 2E-08

Table A-2.2.8 Case 2. Without PFS, Actual Program Factors: UMCDF CHILD RESIDENT

INDIRECT EXPOSURES Calculation of hazard quotients, and hazard indices

Consumption rate of soil, CR(soil)=	0.0002	kg/day
Fraction of soil impacted, F(soil)=	1	unitless
Consumption rate of abv grd veg, CR(ag)=	0.005	kg/day
Fraction of abv grd veg impacted, F(ag)=	0.25	unitless
Consumption rate of root veg, CR(bg)=	0.0014	kg/day
Fraction of root veg impacted, F(bg)=	0.25	unitless
Body weight, BW=	15	kg

I(tot) = Total daily intake of substance
Sc = Soil concentration after total time period of deposition
I(soil) = Daily intake of substance from soil
Pd + Pv = Concentration in plant
I(ag) = Daily intake of substance from above ground vegetables
Pr(bg) = Concentration in below ground plant parts due to root uptake
I(bg) = Daily intake of substance from below ground vegetables
RfD = Reference dose
HI = Hazard Index

Substances of Potential Concern	Sc (mg/kg)	I(soil) (mg/day)	Pd+Pv (mg/kg)	I(ag) (mg/day)	Pr(bg) (mg/kg)	I(bg) (mg/day)	I(tot) (mg/day)	RfD (mg/kg-day)	Hazard Index Liver	Hazard Index Neuro	Hazard Quotient
Antimony	3.40E-04	6.79E-08	1.82E-06	2.27E-09	2.55E-09	8.91E-13	7.02E-08	4.00E-04			1E-05
Arsenic	4.11E-04	8.23E-08	2.20E-06	2.75E-09	5.67E-11	1.99E-14	8.50E-08	3.00E-04			2E-05
Barium	7.84E-04	1.57E-07	4.37E-06	5.46E-09	1.11E-11	3.89E-15	1.62E-07	7.00E-02			1E-07
Beryllium	8.83E-05	1.77E-08	4.92E-07	6.15E-10	9.46E-13	3.31E-16	1.83E-08	5.00E-03			2E-07
bis (2-Ethylhexyl) Phthalate	2.88E-02	5.75E-06	6.84E-06	8.55E-09	1.64E-08	5.75E-12	5.76E-06	2.00E-02	4.12E-06		2E-05
Cadmium	1.96E-04	3.91E-08	1.09E-06	1.36E-09	1.96E-11	6.85E-15	4.05E-08	1.00E-03			3E-06
Chromium	5.97E-04	1.19E-07	3.32E-06	4.14E-09	7.46E-11	2.61E-14	1.23E-07	5.00E-03			2E-06
2,4-Dinitrotoluene	1.72E-05	3.44E-09	1.03E-10	1.29E-13	1.88E-08	6.57E-12	3.44E-09	2.00E-03		2.46E-08	1E-07
2,6-Dinitrotoluene	1.72E-05	3.44E-09	8.96E-11	1.12E-13	2.18E-08	7.63E-12	3.45E-09	1.00E-03		4.92E-08	2E-07
Di-n-octyl Phthalate	6.64E-03	1.33E-06	1.43E-06	1.78E-09	3.80E-09	1.33E-12	1.33E-06	2.00E-02	9.50E-07		4E-06
GB	1.67E-05	3.33E-09	1.94E-12	2.43E-15	2.42E-07	8.48E-11	3.42E-09	4.30E-05		1.14E-06	5E-06
HD/HT	1.67E-03	3.33E-07	1.39E-11	1.74E-14	7.99E-07	2.80E-10	3.34E-07				
Lead	1.10E-03	2.21E-07	6.15E-06	7.69E-09	NA	NA	2.29E-07				
Mercury	6.00E-04	1.20E-07	5.53E-07	6.92E-10	NA	NA	1.21E-07	1.00E-04		1.72E-05	8E-05
Nickel	7.65E-04	1.53E-07	4.26E-06	5.32E-09	1.87E-11	6.53E-15	1.58E-07	2.00E-02	1.13E-07		5E-07
Total PCBs	2.47E-06	4.94E-10	1.71E-10	2.13E-13	6.03E-10	2.11E-13	4.95E-10				
Selenium	2.84E-04	5.67E-08	1.52E-06	1.89E-09	6.60E-10	2.31E-13	5.86E-08	5.00E-03			7E-07
Silver	3.12E-04	6.23E-08	1.73E-06	2.17E-09	3.89E-08	1.36E-11	6.45E-08	5.00E-03			8E-07
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.93E-08	3.86E-12	7.54E-11	9.43E-14	8.21E-13	2.88E-16	3.95E-12				
Thallium	6.08E-04	1.22E-07	3.39E-06	4.24E-09	1.64E-12	5.75E-16	1.26E-07	8.00E-05	2.25E-05		1E-04
VX	1.67E-05	3.33E-09	1.52E-09	1.89E-12	1.03E-07	3.60E-11	3.37E-09	4.30E-05		1.12E-06	5E-06
Di-n-butyl Phthalate	6.35E-03	1.27E-06	1.41E-06	1.76E-09	3.57E-04	1.25E-07	1.40E-06	1.00E-01			9E-07
Diethyl Phthalate	5.00E-03	1.00E-06	1.13E-06	1.42E-09	3.12E-06	1.09E-09	1.00E-06	8.00E-01			8E-08
Manganese	8.16E-03	1.63E-06	4.54E-05	5.68E-08	1.77E-08	6.21E-12	1.69E-06	1.40E-01		1.72E-07	8E-07
4-Methylphenol	1.02E-02	2.05E-06	7.05E-09	8.81E-12	1.80E-05	6.31E-09	2.06E-06	5.00E-03		5.87E-06	3E-05
RDX	1.72E-05	3.44E-09	6.84E-14	8.55E-17	1.31E-08	4.59E-12	3.44E-09	3.00E-03			7E-08
2,4,6-Trinitrotoluene	1.72E-05	3.44E-09	1.60E-10	2.00E-13	3.47E-09	1.21E-12	3.44E-09	5.00E-04	9.82E-08		4E-07
Vanadium	1.85E-04	3.70E-08	1.03E-06	1.29E-09	9.25E-11	3.24E-14	3.83E-08	7.00E-03			3E-07
								HI=	0.00003	0.00003	0.0003

Table A-2.2.9 Case 2. Without PFS, Actual Program Factors: UMCDF RESIDENT

DIRECT INHALATION EXPOSURES

Exposure parameter	Exposure Scenario			
	Subsistence Farmer	Subsistence Fisher	Adult Resident	Child Resident
Inhalation rate, IR (m3/hr)	0.8	0.8	0.8	0.2
Exposure duration, ED (yr)	3.2	3.2	3.2	3.2
Body weight, BW (kg)	70	70	70	15
Exposure time, ET (hr/day)			24	24
Exposure frequency, EF (day/yr)			350	350
Carcinogenic averaging time, LT (day)			25550	25550
Noncancer averaging time, LT (day)			1168	1168

CSF = Cancer Slope Factor
RfD= Reference Dose
HI = Hazard Index

CDD = Chlorinated dibenzo-p-dioxin
CDF = Chlorinated dibenzo-p-furan

Substances of Potential Concern	Respirable Concentration (ug/m3)	Cancer Inh. Intake-Adult (mg/kg-day)	Cancer Inh. Intake-Child (mg/kg-day)	Inhalation CSF (per mg/kg-day)	Cancer Risk Adult	Cancer Risk Child	Inhalation RfD (mg/kg/day)	Hazard Quotient Adult	Hazard Quotient Child
Tetra CDD	2.59E-11	3.24E-16	3.63E-16	1.16E+05	3.76E-11	4.21E-11			
Penta CDD	6.90E-11	8.54E-16	9.68E-16	5.80E+04	5.01E-11	5.61E-11			
Hexa CDD	2.02E-10	2.53E-15	2.83E-15	2.20E-07	5.57E-22	6.24E-22			
Hepta CDD	4.00E-10	5.00E-15	5.60E-15	2.20E-08	1.10E-22	1.23E-22			
Octa CDD	2.96E-10	3.70E-15	4.15E-15	2.20E-09	8.15E-24	9.13E-24			
Tetra CDF	4.71E-11	5.89E-16	6.60E-16	2.20E-07	1.30E-22	1.45E-22			
Penta CDF	1.72E-10	2.16E-15	2.42E-15	1.10E-06	2.38E-21	2.66E-21			
Hexa CDF	3.24E-10	4.06E-15	4.55E-15	2.20E-07	8.95E-22	1.00E-21			
Hepta CDF	2.61E-10	3.27E-15	3.66E-15	2.20E-08	7.20E-23	8.07E-23			
Octa CDF	1.41E-10	1.76E-15	1.97E-15	2.20E-09	3.88E-24	4.35E-24			
2,3,7,8-TCDD TEQ	2.11E-10	2.64E-15	2.96E-15	1.50E+05	3.96E-10	4.44E-10			
Antimony	9.61E-06	1.20E-10	1.35E-10						
Arsenic	1.16E-05	1.45E-10	1.62E-10	5.00E+01	7.24E-09	8.11E-09			
Barium	2.23E-05	2.79E-10	3.13E-10				1.45E-03	4.21E-06	4.72E-06
Beryllium	2.43E-06	3.05E-11	3.42E-11	8.40E+00	2.56E-10	2.87E-10			
Boron	2.14E-04	2.68E-09	3.01E-09				5.80E-03	1.01E-05	1.13E-05
Cadmium	5.53E-06	6.93E-11	7.76E-11	6.30E+00	4.37E-10	4.89E-10			
Chromium	1.77E-05	2.21E-10	2.48E-10	4.10E+01	9.08E-09	1.02E-08			
Cobalt	5.10E-06	6.39E-11	7.16E-11						
Copper	1.40E-05	1.76E-10	1.97E-10						
Lead	3.14E-05	3.93E-10	4.40E-10						
Manganese	2.27E-04	2.85E-09	3.19E-09				1.40E-05	4.45E-03	4.98E-03
Mercury	2.89E-06	3.62E-11	4.05E-11				8.60E-05	9.20E-06	1.03E-05
Nickel	2.22E-05	2.78E-10	3.11E-10	8.40E-01	2.33E-10	2.61E-10			
Phosphorus	1.23E-04	1.54E-09	1.72E-09						
Selenium	8.09E-06	1.01E-10	1.14E-10						
Silver	8.85E-06	1.11E-10	1.24E-10						
Thallium	1.66E-05	2.08E-10	2.32E-10						
Tin	3.52E-05	4.41E-10	4.94E-10						
Vanadium	5.17E-06	6.47E-11	7.25E-11						
Zinc	1.46E-04	1.83E-09	2.05E-09						
Acetone	1.21E-02	1.51E-07	1.69E-07						
Benzene	3.86E-04	4.84E-09	5.42E-09	2 90E-02	1.40E-10	1.57E-10			
Bromodichloromethane	1.18E-06	1.48E-11	1.66E-11						
Bromoform	6.32E-06	7.92E-11	8.87E-11	3.85E-03	3.05E-13	3.42E-13			
2-Butanone	6.94E-05	8.69E-10	9.74E-10				2.90E-01	6.56E-08	7.35E-08
Carbon Disulfide	6 81E-06	8.53E-11	9.55E-11				2.90E-03	6.43E-07	7.21E-07
Carbon Tetrachloride	7.58E-06	9.49E-11	1.06E-10	5.30E-02	5.03E-12	5.63E-12			
Chlorobenzene	1.56E-06	1.95E-11	2.19E-11				5.80E-03	7.36E-08	8.24E-08
Chloroform	2.37E-05	2.97E-10	3.33E-10	8.10E-02	2.41E-11	2.69E-11			
Chloromethane	1.44E-04	1.80E-09	2.02E-09	6 30E-03	1.13E-11	1.27E-11			
Dibromochloromethane	1.31E-06	1.64E-11	1.84E-11						
1,1-Dichloroethane	1.10E-06	1.38E-11	1.55E-11				1.45E+00	2.08E-10	2.33E-10
1,2-Dichloropropane	5.44E-05	6.81E-10	7.63E-10				3.80E-03	3.92E-06	4.39E-06
cis-1,3-Dichloropropene	4.70E-05	5.89E-10	6.60E-10	1.30E-01	7.66E-11	8.58E-11	5.60E-03	2.22E-06	2.49E-06
trans-1,3-Dichloropropene	1.10E-06	1.37E-11	1.54E-11	1.30E-01	1.79E-12	2.00E-12	5 70E-03	5.28E-08	5.91E-08
Ethylbenzene	2.05E-06	2.56E-11	2.87E-11				2.90E-01	1.93E-09	2.16E-09
2-Hexanone	1.49E-06	1.87E-11	2.09E-11						
Methylene Chloride	1.48E-03	1.85E-08	2.08E-08	1.70E-03	3.15E-11	3.53E-11	8.70E-01	4.66E-07	5.22E-07
4-Methyl-2-pentanone	1.63E-06	2.04E-11	2.28E-11				2.30E-01	1.94E-09	2.17E-09
Styrene	2.22E-05	2.78E-10	3.11E-10				8.70E-01	6.98E-09	7.82E-09
1,1,2,2-Tetrachloroethane	1.18E-06	1.48E-11	1.66E-11	2 00E-01	2.96E-12	3.32E-12			
Tetrachloroethene	1.33E-06	1.66E-11	1.86E-11						
Toluene	8.60E-04	1.08E-08	1.21E-08				1.10E-01	2.14E-06	2.40E-06
1,1,1-Trichloroethane	1.08E-05	1.35E-10	1.52E-10						
Vinyl Acetate	1.83E-07	2.29E-12	2.57E-12				5.70E-02	8.80E-10	9.85E-10
Vinyl Chloride	2.76E-06	3.45E-11	3.87E-11	3.00E-01	1.04E-11	1.16E-11			
Xylenes	2.79E-06	3.49E-11	3.91E-11						
Benzoic Acid	3.51E-04	4.40E-09	4.93E-09						
Benzyl Alcohol	5.84E-04	7.32E-09	8.19E-09						
Diethyl Phthalate	2.87E-05	3.59E-10	4.02E-10						
Dimethyl Phthalate	1.20E-04	1.50E-09	1.68E-09						
Di-n-butyl Phthalate	3.65E-05	4.57E-10	5.12E-10						
Di-n-octyl Phthalate	3.82E-05	4.78E-10	5.36E-10						
bis(2-Ethylhexyl)-Phthalate	1.65E-04	2.06E-09	2.31E-09						
2-Methylphenol	1.23E-04	1.54E-09	1.73E-09						
3-Methylphenol	7.11E-05	8.90E-10	9.97E-10						
4-Methylphenol	4.93E-05	6.18E-10	6.92E-10						
Naphthalene	2.37E-05	2.97E-10	3.33E-10						
GB	8.03E-08	1.01E-12	1.13E-12				8.67E-07	2.54E-05	2.84E-05
HD/HT	8.03E-06	1.01E-10	1.13E-10	9.50E+00	9.55E-10	1.07E-09	2.90E-05	7.58E-05	8.49E-05
VX	8.03E-08	1.01E-12	1.13E-12				8.67E-07	2.54E-05	2.84E-05
Chlorine	2.80E-03	3.51E-08	3.93E-08						
Hydrogen Chloride	8.75E-02	1.10E-06	1.23E-06				5.80E-03	4.13E-03	4.63E-03
Hydrogen Fluoride	4.58E-02	5.73E-07	6.42E-07						
Nitroglycerine	9.03E-06	1.13E-10	1.27E-10						
PCB	1.19E-08	1.49E-13	1.67E-13						
Particulate	1.75E-02	2.19E-07	2.45E-07						
2,4-Dinitrotoluene	8.27E-08	1.04E-12	1.16E-12						
2,6-Dinitrotoluene	8.27E-08	1.04E-12	1.16E-12						
2,4,6-Trinitrotoluene	8.27E-08	1.04E-12	1.16E-12						
RDX	8.27E-08	1.04E-12	1.16E-12						
HMX	8.27E-08	1.04E-12	1.16E-12						
					2E-08	2E-08	Total HI=	0.009	0.010

Table A-2.2.10 Without PFS, Actual Program Factors: UMCDF ADULT RESIDENT

	Risk UMCDF	HI-Liver UMCDF	HI-Neuro UMCDF	HQ		Risk-Inh. UMCDF	HI-Inh. UMCDF
Indirect					Inhalation		
Antimony				1.54E-06	Tetra CDD	3.76E-11	
Arsenic	4.79E-10			2.48E-06	Penta CDD	5.01E-11	
Barium				2.05E-08	Hexa CDD	5.57E-22	
Beryllium	2.97E-10			3.23E-08	Hepta CDD	1.10E-22	
bis (2-Ethylhexyl) Phthalate	2.40E-10	2.08E-06		2.00E-06	Octa CDD	8.15E-24	
Cadmium				3.57E-07	Tetra CDF	1.30E-22	
Chromium				2.18E-07	Penta CDF	2.38E-21	
2,4-Dinitrotoluene	6.98E-12		1.25E-08	1.20E-08	Hexa CDF	8.95E-22	
2,6-Dinitrotoluene	7.00E-12		2.51E-08	2.40E-08	Hepta CDF	7.20E-23	
Di-n-octyl Phthalate		4.81E-07		4.61E-07	Octa CDF	3.88E-24	
GB			6.81E-07	6.53E-07	2,3,7,8-TCDD TEQ	3.96E-10	
HD/HT	9.37E-09				Antimony		
Lead					Arsenic	7.24E-09	
Mercury			9.04E-06	8.67E-08	Barium		4.21E-06
Nickel				6.99E-08	Beryllium	2.56E-10	
Total PCBs	1.13E-11				Boron		1.01E-05
Selenium				1.03E-07	Cadmium	4.37E-10	
Silver				1.14E-07	Chromium	9.08E-09	
2,3,7,8-TCDD & Others	2.10E-09				Cobalt		
Thallium		1.45E-05		1.39E-05	Copper		
VX			6.11E-07	5.85E-07	Lead		
Di-n-butyl Phthalate				1.65E-07	Manganese		4.45E-03
Diethyl Phthalate				8.76E-09	Mercury		9.20E-06
Manganese			1.11E-07	1.07E-07	Nickel	2.33E-10	0.00E+00
4-Methylphenol			3.01E-06	2.89E-06	Phosphorus		
RDX	1.12E-12			7.94E-09	Selenium		
2,4,6-Trinitrotoluene	3.04E-13	4.93E-08		4.73E-08	Silver		
Vanadium				4.83E-08	Thallium		
					Tin		
					Vanadium		
					Zinc		
					Acetone		
					Benzene	1.40E-10	
					Bromodichloromethane		
					Bromoform	3.05E-13	
					2-Butanone		6.56E-08
					Carbon Disulfide		6.43E-07
					Carbon Tetrachloride	5.03E-12	
					Chlorobenzene		7.36E-08
					Chloroform	2.41E-11	
					Chloromethane	1.13E-11	
					Dibromochloromethane		
					1,1-Dichloroethane		2.08E-10
					1,2-Dichloropropane		3.92E-06
					cis-1,3-Dichloropropene	7.66E-11	2.22E-06
					trans-1,3-Dichloropropene	1.79E-12	5.28E-08
					Ethylbenzene		1.93E-09
					2-Hexanone		
					Methylene Chloride	3.15E-11	4.66E-07
					4-Methyl-2-pentanone		
					Styrene		6.98E-09
					1,1,2,2-Tetrachloroethane	2.96E-12	
					Tetrachloroethene		
					Toluene		2.14E-06
					1,1,1-Trichloroethane		
					Vinyl Acetate		8.80E-10
					Vinyl Chloride	1.04E-11	
					Xylenes		
					Benzoic Acid		
					Benzyl Alcohol		
					Diethyl Phthalate		
					Dimethyl Phthalate		
					Di-n-butyl Phthalate		
					Di-n-octyl Phthalate		
					bis(2-Ethylhexyl)-Phthalate		
					2-Methylphenol		
					3-Methylphenol		
					4-Methylphenol		
					Naphthalene		
					GB		2.54E-05
					HD/HT	9.55E-10	7.58E-05
					VX		2.54E-05
					Chlorine		
					Hydrogen Chloride		4.13E-03
					Hydrogen Fluoride		
					Nitroglycerine		
					PCB		
					Particulates		
					2,4-Dinitrotoluene		
					2,6-Dinitrotoluene		
					2,4,6-Trinitrotoluene		
					RDX		
					HMX		
Total	1.25E-08	1.71E-05	1.35E-05			1.89E-08	8.74E-03
Grand Total	3E-08	0.000017	0.00001			2E-08	0.01

Table A-2.2.11 Case 2. Without PFS, Actual Program Factors: UMCDF CHILD RESIDENT

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	Risk UMCDF	HI-Liver UMCDF	HI-Neuro UMCDF	HQ
Indirect				
Antimony				1.12E-05
Arsenic	6.99E-10			1.81E-05
Barium				1.48E-07
Beryllium	4.30E-10			2.34E-07
bis (2-Ethylhexyl) Phthalate	4.42E-10	4.12E-06		1.84E-05
Cadmium				2.59E-06
Chromium				1.58E-06
2,4-Dinitrotoluene	1.28E-11		2.46E-08	1.10E-07
2,6-Dinitrotoluene	1.28E-11		4.92E-08	2.20E-07
Di-n-octyl Phthalate		9.50E-07		4.25E-06
GB			1.14E-06	5.08E-06
HD/HT	1.74E-08			
Lead				
Mercury			1.72E-05	7.71E-05
Nickel				5.06E-07
Total PCBs	2.09E-11			
Selenium				7.49E-07
Silver				8.25E-07
2,3,7,8-TCDD & Others	3.25E-09			
Thallium		2.25E-05		1.01E-04
VX			1.12E-06	5.01E-06
Di-n-butyl Phthalate				8.93E-07
Diethyl Phthalate				8.01E-08
Manganese			1.72E-07	7.71E-07
4-Methylphenol			5.87E-06	2.63E-05
RDX	2.07E-12			7.33E-08
2,4,6-Trinitrotoluene	5.65E-13	9.82E-08		4.40E-07
Vanadium				3.50E-07
Total	2.22E-08	2.76E-05	2.56E-05	
Grand Total	4E-08	0.00003	0.00003	

	Risk-Inh. UMCDF	HI-Inh. UMCDF
Inhalation		
Tetra CDD	4.21E-11	
Penta CDD	5.61E-11	
Hexa CDD	6.24E-22	
Hepta CDD	1.23E-22	
Octa CDD	9.13E-24	
Tetra CDF	1.45E-22	
Penta CDF	2.66E-21	
Hexa CDF	1.00E-21	
Hepta CDF	8.07E-23	
Octa CDF	4.35E-24	
2,3,7,8-TCDD TEQ	4.44E-10	
Antimony		
Arsenic	8.11E-09	
Barium		4.72E-06
Beryllium	2.87E-10	
Boron		1.13E-05
Cadmium	4.89E-10	
Chromium	1.02E-08	
Cobalt		
Copper		
Lead		
Manganese		4.98E-03
Mercury		1.03E-05
Nickel	2.61E-10	
Phosphorus		
Selenium		
Silver		
Thallium		
Tin		
Vanadium		
Zinc		
Acetone		
Benzene	1.57E-10	
Bromodichloromethane		
Bromoform	3.42E-13	
2-Butanone		7.35E-08
Carbon Disulfide		7.21E-07
Carbon Tetrachloride	5.63E-12	
Chlorobenzene		8.24E-08
Chloroform	2.69E-11	
Chloromethane	1.27E-11	
Dibromochloromethane		
1,1-Dichloroethane		2.33E-10
1,2-Dichloropropane		4.39E-06
cis-1,3-Dichloropropene	8.58E-11	2.49E-06
trans-1,3-Dichloropropene	2.00E-12	5.91E-08
Ethylbenzene		2.16E-09
2-Hexanone		
Methylene Chloride	3.53E-11	5.22E-07
4-Methyl-2-pentanone		
Styrene		7.82E-09
1,1,2,2-Tetrachloroethane	3.32E-12	
Tetrachloroethene		
Toluene		2.40E-06
1,1,1-Trichloroethane		
Vinyl Acetate		9.85E-10
Vinyl Chloride	1.16E-11	
Xylenes		
Benzoic Acid		
Benzyl Alcohol		
Diethyl Phthalate		
Dimethyl Phthalate		
Di-n-butyl Phthalate		
Di-n-octyl Phthalate		
bis(2-Ethylhexyl)-Phthalate		
2-Methylphenol		
3-Methylphenol		
4-Methylphenol		
Naphthalene		
GB		2.84E-05
HD/HT	1.07E-09	8.49E-05
VX		2.84E-05
Chlorine		
Hydrogen Chloride		4.63E-03
Hydrogen Fluoride		
Nitroglycerine		
PCB		
Particulates		
2,4-Dinitrotoluene		
2,6-Dinitrotoluene		
2,4,6-Trinitrotoluene		
RDX		
HMX		
Total	2.12E-08	9.79E-03
Grand Total	2E-08	0.01

Table A-2.2.12 Case 2. Without PFS, Actual Program Factors: UMCDF SUBSISTENCE FARMER

CONCENTRATIONS AND DEPOSITIONS: Calculated depositions and concentrations for indirect exposure pathways

Substances of Potential Concern	Particulate Dry Deposition Pdd (g/m2)/yr	Particulate Wet Deposition Pwd (g/m2)/yr	Vapor Wet Deposition Vwd (g/m2)/yr	Vapor Concentration Vc (ug/m3)	Toxicity Equivalency Factor	2,3,7,8-TCDD Toxicity Equivalents Pdd (ug/m3)	2,3,7,8-TCDD Toxicity Equivalents Pwd (g/m2-yr)	2,3,7,8-TCDD Toxicity Equivalents Vwd (g/m2-yr)	2,3,7,8-TCDD Toxicity Equivalents Vc (ug/m3)
Tetra CDD	1.73E-12	1.77E-13	4.00E-13	1.45E-11	1.000	1.73E-12	1.77E-13	4.00E-13	1.45E-11
Penta CDD	7.45E-12	7.85E-13	5.10E-13	1.86E-11	0.500	3.72E-12	3.93E-13	2.55E-13	9.28E-12
Hexa CDD	2.66E-11	2.91E-12	4.05E-13	1.47E-11	0.100	2.66E-12	2.91E-13	4.05E-14	1.47E-12
Hepta CDD	5.48E-11	6.07E-12	2.29E-13	8.34E-12	0.010	5.48E-13	6.07E-14	2.29E-15	8.34E-14
Octa CDD	4.25E-11	4.59E-12	1.70E-15	6.18E-14	0.001	4.25E-14	4.59E-15	1.70E-18	6.18E-17
Tetra CDF	1.86E-12	2.05E-13	9.30E-13	3.38E-11	0.100	1.86E-13	2.05E-14	9.30E-14	3.38E-12
Penta CDF	1.40E-11	1.52E-12	2.04E-12	7.43E-11	0.500	7.00E-12	7.62E-13	1.02E-12	3.71E-11
Hexa CDF	4.05E-11	4.46E-12	1.02E-12	3.71E-11	0.100	4.05E-12	4.46E-13	1.02E-13	3.71E-12
Hepta CDF	3.57E-11	3.89E-12	3.00E-13	1.09E-11	0.010	3.57E-13	3.89E-14	3.00E-15	1.09E-13
Octa CDF	2.08E-11	2.19E-12	8.10E-15	2.95E-13	0.001	2.08E-14	2.19E-15	8.10E-18	2.95E-16
					Total =	2.03E-11	2.20E-12	1.92E-12	6.97E-11
Antimony	1.44E-06	1.50E-07	0.00E+00	0.00E+00					
Arsenic	1.75E-06	1.80E-07	0.00E+00	0.00E+00					
Barium	3.33E-06	3.47E-07	0.00E+00	0.00E+00					
Beryllium	3.76E-07	3.80E-08	0.00E+00	0.00E+00					
bis (2-Ethylhexyl) Phthalate	4.79E-06	4.95E-07	3.66E-06	1.33E-04					
Cadmium	8.31E-07	8.62E-08	0.00E+00	0.00E+00					
Chromium	2.52E-06	2.75E-07	0.00E+00	0.00E+00					
2,4-Dinitrotoluene	0.00E+00	0.00E+00	2.27E-09	8.27E-08					
2,6-Dinitrotoluene	0.00E+00	0.00E+00	2.27E-09	8.27E-08					
Di-n-octyl Phthalate	1.04E-06	1.14E-07	8.47E-07	3.08E-05					
GB	9.92E-16	1.05E-16	2.21E-09	8.03E-08					
HD/HT	2.57E-12	2.72E-13	2.21E-07	8.03E-06					
Lead	4.69E-06	4.89E-07	0.00E+00	0.00E+00					
Mercury	0.00E+00	0.00E+00	7.93E-08	2.89E-06					
Nickel	3.24E-06	3.45E-07	0.00E+00	0.00E+00					
PCB	0.00E+00	0.00E+00	3.27E-10	1.19E-08					
Selenium	1.20E-06	1.26E-07	0.00E+00	0.00E+00					
Silver	1.32E-06	1.38E-07	0.00E+00	0.00E+00					
2,3,7,8-TCDD & Dioxin-Like SOPCs	2.03E-11	2.20E-12	1.92E-12	6.97E-11					
Thallium	2.59E-06	2.59E-07	1.59E-16	5.80E-15					
VX	3.12E-12	3.30E-13	2.21E-09	8.02E-08					
Di-n-butyl Phthalate	9.88E-07	1.09E-07	8.10E-07	2.95E-05					
Diethyl Phthalate	7.98E-07	8.60E-08	6.37E-07	2.32E-05					
Manganese	3.47E-05	3.55E-06	0.00E+00	0.00E+00					
4-Methlyphenol	1.19E-11	1.28E-12	1.36E-06	4.93E-05					
RDX	0.00E+00	0.00E+00	2.27E-09	8.27E-08					
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	2.27E-09	8.27E-08					
Vanadium	7.87E-07	8.06E-08	0.00E+00	0.00E+00					

CDD = Chlorinated dibenzo-p-dioxin
CDF = Chlorinated dibenzo-p-furan

Table A-2.2.13 Case 2. Without PFS, Actual Program Factors: UMCDF SUBSISTENCE FARMER

SOIL INGESTION: Calculation of soil concentration due to deposition

Soil mixing depth, Z= 1 cm
Soil bulk density, BD= 1.5 g/cm3
Total deposition time period, Tc= 3.2 yrs
Dry deposition velocity of vapor phase, Vdv= 3 cm/s

Sc = Soil concentration after total time period of deposition
Ds = Deposition term
Pdd = Yearly dry deposition from particle phase
Pwd = Yearly wet deposition from particle phase
Vwd = Yearly wet deposition from vapor phase
Vc = Vapor phase air concentration

Substances of Potential Concern	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Vwd (g/m2-yr)	Vc (µg/m3)	Ds (1/yr)	Sc (mg/kg)
Antimony	1.44E-06	1.50E-07	0.00E+00	0.00E+00	1.06E-04	3.40E-04
Arsenic	1.75E-06	1.80E-07	0.00E+00	0.00E+00	1.29E-04	4.11E-04
Barium	3.33E-06	3.47E-07	0.00E+00	0.00E+00	2.45E-04	7.84E-04
Beryllium	3.76E-07	3.80E-08	0.00E+00	0.00E+00	2.76E-05	8.83E-05
bis (2-Ethylhexyl) Phthalate	4.79E-06	4.95E-07	3.66E-06	1.33E-04	8.99E-03	2.88E-02
Cadmium	8.31E-07	8.62E-08	0.00E+00	0.00E+00	6.11E-05	1.96E-04
Chromium	2.52E-06	2.75E-07	0.00E+00	0.00E+00	1.86E-04	5.97E-04
2,4-Dinitrotoluene	0.00E+00	0.00E+00	2.27E-09	8.27E-08	5.37E-06	1.72E-05
2,6-Dinitrotoluene	0.00E+00	0.00E+00	2.27E-09	8.27E-08	5.37E-06	1.72E-05
Di-n-octyl Phthalate	1.04E-06	1.14E-07	8.47E-07	3.08E-05	2.08E-03	6.64E-03
GB	9.92E-16	1.05E-16	2.21E-09	8.03E-08	5.21E-06	1.67E-05
HD/HT	2.57E-12	2.72E-13	2.21E-07	8.03E-06	5.21E-04	1.67E-03
Lead	4.69E-06	4.89E-07	0.00E+00	0.00E+00	3.45E-04	1.10E-03
Mercury	0.00E+00	0.00E+00	7.93E-08	2.89E-06	1.87E-04	6.00E-04
Nickel	3.24E-06	3.45E-07	0.00E+00	0.00E+00	2.39E-04	7.65E-04
PCB	0.00E+00	0.00E+00	3.27E-10	1.19E-08	7.72E-07	2.47E-06
Selenium	1.20E-06	1.26E-07	0.00E+00	0.00E+00	8.86E-05	2.84E-04
Silver	1.32E-06	1.38E-07	0.00E+00	0.00E+00	9.74E-05	3.12E-04
2,3,7,8-TCDD & Dioxin-Like SOPCs	2.03E-11	2.20E-12	1.92E-12	6.97E-11	6.03E-09	1.93E-08
Thallium	2.59E-06	2.59E-07	1.59E-16	5.80E-15	1.90E-04	6.08E-04
VX	3.12E-12	3.30E-13	2.21E-09	8.02E-08	5.21E-06	1.67E-05
Di-n-butyl Phthalate	9.88E-07	1.09E-07	8.10E-07	2.95E-05	1.99E-03	6.35E-03
Diethyl Phthalate	7.98E-07	8.60E-08	6.37E-07	2.32E-05	1.56E-03	5.00E-03
Manganese	3.47E-05	3.55E-06	0.00E+00	0.00E+00	2.55E-03	8.16E-03
4-Methylphenol	1.19E-11	1.28E-12	1.36E-06	4.93E-05	3.20E-03	1.02E-02
RDX	0.00E+00	0.00E+00	2.27E-09	8.27E-08	5.37E-06	1.72E-05
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	2.27E-09	8.27E-08	5.37E-06	1.72E-05
Vanadium	7.87E-07	8.06E-08	0.00E+00	0.00E+00	5.78E-05	1.85E-04

Table A-2.2.14 Case 2. Without PFS, Actual Program Factors: UMCDF SUBSISTENCE FARMER

CONSUMPTION OF ABOVE-GROUND VEGETABLES:

Calculation of above-ground vegetable concentration due to direct deposition
Calculation of above-ground vegetable concentration due to air-to-plant transfer

Interception fraction of edible portion, Rp=	0.04	unitless
Plant surface loss coefficient, kp=	18	1/yr
Time between rainfalls, t-rain=	14	days
Length of plant exposure per harvest, Tp=	0.16	yrs
Standing crop biomass, Yp=	1.7	kg DW/m2
Density of air, p=	1200	g/m3
Above ground veg. correction factor, VGab=	0.01	unitless

Pd = Concentration in plant due to direct deposition
Pv = Concentration in plant due to air-to-plant transfer
Pd + Pv = Concentration in plant due to direct deposition and air-to-plant transfer
Fw = Fraction of wet deposition of particles that adheres to plant
Bv = Air-to-plant bioconcentration factor

Substances of Potential Concern	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Fw	Pd (mg/kg)	Vc (µg/m3)	Bv (mg/kg)/(ug/g)	Pv (mg/kg)	Pd+Pv (mg/kg)
Antimony	1.44E-06	1.50E-07	0.2	**1.82E-06**	0.00E+00	NA	**0.00E+00**	**1.82E-06**
Arsenic	1.75E-06	1.80E-07	0.2	**2.20E-06**	0.00E+00	NA	**0.00E+00**	**2.20E-06**
Barium	3.33E-06	3.47E-07	0.6	**4.37E-06**	0.00E+00	NA	**0.00E+00**	**4.37E-06**
Beryllium	3.76E-07	3.80E-08	0.6	**4.92E-07**	0.00E+00	NA	**0.00E+00**	**4.92E-07**
bis (2-Ethylhexyl) Phthalate	4.79E-06	4.95E-07	0.6	**6.27E-06**	1.33E-04	5.11E+02	**5.67E-07**	**6.84E-06**
Cadmium	8.31E-07	8.62E-08	0.6	**1.09E-06**	0.00E+00	NA	**0.00E+00**	**1.09E-06**
Chromium	2.52E-06	2.75E-07	0.6	**3.32E-06**	0.00E+00	NA	**0.00E+00**	**3.32E-06**
2,4-Dinitrotoluene	0.00E+00	0.00E+00	0.6	**0.00E+00**	8.27E-08	1.50E+02	**1.03E-10**	**1.03E-10**
2,6-Dinitrotoluene	0.00E+00	0.00E+00	0.6	**0.00E+00**	8.27E-08	1.30E+02	**8.96E-11**	**8.96E-11**
Di-n-octyl Phthalate	1.04E-06	1.14E-07	0.6	**1.37E-06**	3.08E-05	2.32E+02	**5.96E-08**	**1.43E-06**
GB	9.92E-16	1.05E-16	0.6	**1.30E-15**	8.03E-08	2.90E+00	**1.94E-12**	**1.94E-12**
HD/HT	2.57E-12	2.72E-13	0.6	**3.37E-12**	8.03E-06	1.58E-01	**1.06E-11**	**1.39E-11**
Lead	4.69E-06	4.89E-07	0.6	**6.15E-06**	0.00E+00	NA	**0.00E+00**	**6.15E-06**
Mercury	0.00E+00	0.00E+00	0.6	**0.00E+00**	2.89E-06	2.30E+04	**5.53E-07**	**5.53E-07**
Nickel	3.24E-06	3.45E-07	0.6	**4.26E-06**	0.00E+00	NA	**0.00E+00**	**4.26E-06**
PCB	0.00E+00	0.00E+00	0.6	**0.00E+00**	1.19E-08	1.72E+03	**1.71E-10**	**1.71E-10**
Selenium	1.20E-06	1.26E-07	0.2	**1.52E-06**	0.00E+00	NA	**0.00E+00**	**1.52E-06**
Silver	1.32E-06	1.38E-07	0.6	**1.73E-06**	0.00E+00	NA	**0.00E+00**	**1.73E-06**
2,3,7,8-TCDD & Dioxin-Like SOPCs	2.03E-11	2.20E-12	0.6	**2.67E-11**	6.97E-11	8.39E+04	**4.87E-11**	**7.54E-11**
Thallium	2.59E-06	2.59E-07	0.6	**3.39E-06**	5.80E-15	NA	**0.00E+00**	**3.39E-06**
VX	3.12E-12	3.30E-13	0.6	**4.09E-12**	8.02E-08	2.26E+03	**1.51E-09**	**1.52E-09**
Di-n-butyl Phthalate	9.88E-07	1.09E-07	0.6	**1.30E-06**	2.95E-05	4.40E+02	**1.08E-07**	**1.41E-06**
Diethyl Phthalate	7.98E-07	8.60E-08	0.6	**1.05E-06**	2.32E-05	4.48E+02	**8.64E-08**	**1.13E-06**
Manganese	3.47E-05	3.55E-06	0.6	**4.54E-05**	0.00E+00	NA	**0.00E+00**	**4.54E-05**
4-Methylphenol	1.19E-11	1.28E-12	0.6	**1.56E-11**	4.93E-05	1.71E+01	**7.03E-09**	**7.05E-09**
RDX	0.00E+00	0.00E+00	0.6	**0.00E+00**	8.27E-08	9.92E-02	**6.84E-14**	**6.84E-14**
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	0.6	**0.00E+00**	8.27E-08	2.32E+02	**1.60E-10**	**1.60E-10**
Vanadium	7.87E-07	8.06E-08	0.6	**1.03E-06**	0.00E+00	NA	**0.00E+00**	**1.03E-06**

Table A-2.2.15 Case 2. Without PFS, Actual Program Factors: UMCDF SUBSISTENCE FARMER
CONSUMPTION OF ROOT VEGETABLES:

Calculation of soil concentration due to deposition
Calculation of root vegetable concentration due to root uptake

Soil mixing depth, Z=	20	cm
Soil bulk density, BD=	1.5	g/cm3
Total deposition time period, Tc=	3.2	yrs
Below ground veg. correction factor, VGbg=	0.01	unitless
Dry deposition velocity of vapor phase, Vdv=	3	cm/s

Pr(bg) = Root vegetable concentration due to root uptake
Sc = Soil concentration after total time period of deposition
Ds = Deposition term
Kds = Soil-water partition coefficient
RCF = Ratio of concentration in roots to concentration in soil pore water

Substances of Potential Concern	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Vwd (g/m2-yr)	Vc (µg/m3)	Ds (1/yr)	Sc (mg/kg)	Kds mL/g	RCF (mg/kg)/(ug/mL)	Pr(bg) (mg/kg)
Antimony	1.44E-06	1.50E-07	0.00E+00	0.00E+00	**5.31E-06**	**1.70E-05**	2	3.00E-02	**2.55E-09**
Arsenic	1.75E-06	1.80E-07	0.00E+00	0.00E+00	**6.43E-06**	**2.06E-05**	29	8.00E-03	**5.67E-11**
Barium	3.33E-06	3.47E-07	0.00E+00	0.00E+00	**1.23E-05**	**3.92E-05**	530	1.50E-02	**1.11E-11**
Beryllium	3.76E-07	3.80E-08	0.00E+00	0.00E+00	**1.38E-06**	**4.41E-06**	70	1.50E-03	**9.46E-13**
bis (2-Ethylhexyl) Phthalate	4.79E-06	4.95E-07	3.66E-06	1.33E-04	**4.50E-04**	**1.44E-03**	280000	3.20E+02	**1.64E-08**
Cadmium	8.31E-07	8.62E-08	0.00E+00	0.00E+00	**3.06E-06**	**9.78E-06**	160	3.20E-02	**1.96E-11**
Chromium	2.52E-06	2.75E-07	0.00E+00	0.00E+00	**9.32E-06**	**2.98E-05**	18	4.50E-03	**7.46E-11**
2,4-Dinitrotoluene	0.00E+00	0.00E+00	2.27E-09	8.27E-08	**2.69E-07**	**8.59E-07**	0.87	1.90E+00	**1.88E-08**
2,6-Dinitrotoluene	0.00E+00	0.00E+00	2.27E-09	8.27E-08	**2.69E-07**	**8.59E-07**	0.67	1.70E+00	**2.18E-08**
Di-n-octyl Phthalate	1.04E-06	1.14E-07	8.47E-07	3.08E-05	**1.04E-04**	**3.32E-04**	280000	3.20E+02	**3.80E-09**
GB	9.92E-16	1.05E-16	2.21E-09	8.03E-08	**2.60E-07**	**8.34E-07**	0.032	9.30E-01	**2.42E-07**
HD/HT	2.57E-12	2.72E-13	2.21E-07	8.03E-06	**2.60E-05**	**8.34E-05**	1.2	1.16E+00	**7.99E-07**
Lead	4.69E-06	4.89E-07	0.00E+00	0.00E+00	**1.73E-05**	**5.52E-05**	600	NA	**NA**
Mercury	0.00E+00	0.00E+00	7.93E-08	2.89E-06	**9.37E-06**	**3.00E-05**	57000	NA	**NA**
Nickel	3.24E-06	3.45E-07	0.00E+00	0.00E+00	**1.20E-05**	**3.83E-05**	82	4.00E-03	**1.87E-11**
PCB	0.00E+00	0.00E+00	3.27E-10	1.19E-08	**3.86E-08**	**1.24E-07**	4300	2.10E+03	**6.03E-10**
Selenium	1.20E-06	1.26E-07	0.00E+00	0.00E+00	**4.43E-06**	**1.42E-05**	4.3	2.00E-02	**6.60E-10**
Silver	1.32E-06	1.38E-07	0.00E+00	0.00E+00	**4.87E-06**	**1.56E-05**	0.4	1.00E-01	**3.89E-08**
2,3,7,8-TCDD & Dioxin-Like SOPCs	2.03E-11	2.20E-12	1.92E-12	6.97E-11	**3.01E-10**	**9.64E-10**	142000	1.21E+04	**8.21E-13**
Thallium	2.59E-06	2.59E-07	1.59E-16	5.80E-15	**9.50E-06**	**3.04E-05**	74	4.00E-04	**1.64E-12**
VX	3.12E-12	3.30E-13	2.21E-09	8.02E-08	**2.60E-07**	**8.33E-07**	0.15	1.85E+00	**1.03E-07**
Di-n-butyl Phthalate	9.88E-07	1.09E-07	8.10E-07	2.95E-05	**9.93E-05**	**3.18E-04**	1.6	1.80E+02	**3.57E-04**
Diethyl Phthalate	7.98E-07	8.60E-08	6.37E-07	2.32E-05	**7.81E-05**	**2.50E-04**	5.3	6.56E+00	**3.12E-06**
Manganese	3.47E-05	3.55E-06	0.00E+00	0.00E+00	**1.28E-04**	**4.08E-04**	23	1.00E-01	**1.77E-08**
4-Methylphenol	1.19E-11	1.28E-12	1.36E-06	4.93E-05	**1.60E-04**	**5.12E-04**	0.50	1.76E+00	**1.80E-05**
RDX	0.00E+00	0.00E+00	2.27E-09	8.27E-08	**2.69E-07**	**8.59E-07**	0.63	9.61E-01	**1.31E-08**
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	2.27E-09	8.27E-08	**2.69E-07**	**8.59E-07**	11	4.44E+00	**3.47E-09**
Vanadium	7.87E-07	8.06E-08	0.00E+00	0.00E+00	**2.89E-06**	**9.25E-06**	100	1.00E-01	**9.25E-11**

Table A-2.2.16 Case 2. Without PFS, Actual Program Factors: UMCDF SUBSISTENCE FARMER

CONSUMPTION OF BEEF AND MILK:

USING TIME-AVERAGED SOIL CONCENTRATIONS

Calculation of beef concentration due to plant and soil ingestion
Calculation of milk concentration due to plant and soil ingestion

Interception fraction of edible portion, Rp=	0.44	unitless
Plant surface loss coefficient, kp=	18	1/yr
Time between rainfalls, t-rain=	14	days
Length of plant exposure per harvest, Tp=	0.12	yrs
Yield or standing crop biomass, Yp=	0.2	kgDW/m2
Fraction grown on impacted soil, F=	1	unitless
Quantity eaten by beef cattle, Qpb=	8.8	kg DW/day
Quantity soil eaten by beef cattle, Qsb=	0.4	kg soil/day
Quantity eaten by dairy cattle, Qpm=	13.2	kg DW/day
Quantity soil eaten by dairy cattle, Qsm=	0.4	kg soil/day
Density of air, p=	1200	g/m3

A(beef) = Concentration in beef
A(milk) = Concentration in milk
Sc = Soil concentration after total time period of deposition
Pd = Concentration in plant due to direct deposition
Pv = Concentration in plant due to air-to-plant transfer
Pd + Pv = Concentration in plant due to direct deposition and air-to-plant transfer
Vc = Concentration in air due to direct emissions
Bv = Air-to-Plant biotransfer factor
Ba(beef) = Biotransfer factor for beef
Ba(milk) = Biotransfer factor for milk

Substances of Potential Concern	Sc (mg/kg)	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Fw	Pd (mg/kg)	Vc (µg/m3)	Bv (mg/kg)/(ug/g)	Pv (mg/kg)	Pv+Pd (mg/kg)	Ba(beef) (day/kg)	A(beef) (mg/kg)	Ba(milk) (day/kg)	A(milk) (mg/kg)
Antimony	3.40E-04	1.44E-06	1.50E-07	0.2	1.59E-04	0.00E+00	NA	0.00E+00	1.59E-04	1.00E-03	1.54E-06	1.00E-04	2.24E-07
Arsenic	4.11E-04	1.75E-06	1.80E-07	0.2	1.93E-04	0.00E+00	NA	0.00E+00	1.93E-04	2.00E-03	3.72E-06	6.00E-03	1.63E-05
Barium	7.84E-04	3.33E-06	3.47E-07	0.6	3.83E-04	0.00E+00	NA	0.00E+00	3.83E-04	1.50E-04	5.52E-07	3.50E-04	1.88E-06
Beryllium	8.83E-05	3.76E-07	3.80E-08	0.6	4.31E-05	0.00E+00	NA	0.00E+00	4.31E-05	1.00E-03	4.15E-07	9.00E-07	5.44E-10
bis (2-Ethylhexyl) Phthalate	2.88E-02	4.79E-06	4.95E-07	0.6	5.50E-04	1.33E-04	5.11E+02	5.67E-05	6.06E-04	NA	NA	NA	NA
Cadmium	1.96E-04	8.31E-07	8.62E-08	0.6	9.54E-05	0.00E+00	NA	0.00E+00	9.54E-05	1.20E-01	1.10E-04	7.60E-03	1.02E-05
Chromium	5.97E-04	2.52E-06	2.75E-07	0.6	2.91E-04	0.00E+00	NA	0.00E+00	2.91E-04	5.50E-03	1.54E-05	1.50E-03	6.11E-06
2,4-Dinitrotoluene	1.72E-05	0.00E+00	0.00E+00	0.6	0.00E+00	8.27E-08	1.50E+02	1.03E-08	1.03E-08	2.50E-06	1.74E-11	7.90E-07	5.54E-12
2,6-Dinitrotoluene	1.72E-05	0.00E+00	0.00E+00	0.6	0.00E+00	8.27E-08	1.30E+02	8.96E-09	8.96E-09	1.90E-06	1.32E-11	6.10E-07	4.27E-12
Di-n-octyl Phthalate	6.64E-03	1.04E-06	1.14E-07	0.6	1.20E-04	3.08E-05	2.32E+02	5.96E-06	1.26E-04	NA	NA	NA	NA
GB	1.67E-05	9.92E-16	1.05E-16	0.6	1.14E-13	8.03E-08	2.90E+00	1.94E-10	1.94E-10	1.30E-07	8.67E-13	4.20E-08	2.80E-13
HD/HT	1.67E-03	2.57E-12	2.72E-13	0.6	2.95E-10	8.03E-06	1.58E-01	1.06E-09	1.35E-09	5.89E-07	3.93E-10	1.86E-07	1.24E-10
Lead	1.10E-03	4.69E-06	4.89E-07	0.6	5.39E-04	0.00E+00	NA	0.00E+00	5.39E-04	NA	NA	NA	NA
Mercury	6.00E-04	0.00E+00	0.00E+00	0.6	0.00E+00	2.89E-06	2.30E+04	5.53E-05	5.53E-05	8.00E-05	5.81E-08	4.00E-04	3.88E-07
Nickel	7.65E-04	3.24E-06	3.45E-07	0.6	3.73E-04	0.00E+00	NA	0.00E+00	3.73E-04	6.00E-03	2.15E-05	1.00E-03	5.23E-06
PCB	2.47E-06	0.00E+00	0.00E+00	0.6	0.00E+00	1.19E-08	1.72E+03	1.71E-08	1.71E-08	5.00E-02	5.69E-08	1.60E-02	1.94E-08
Selenium	2.84E-04	1.20E-06	1.26E-07	0.2	1.33E-04	0.00E+00	NA	0.00E+00	1.33E-04	1.50E-02	1.92E-05	4.00E-03	7.47E-06
Silver	3.12E-04	1.32E-06	1.38E-07	0.6	1.52E-04	0.00E+00	NA	0.00E+00	1.52E-04	3.00E-03	4.39E-06	2.00E-02	4.26E-05
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.93E-08	2.03E-11	2.20E-12	0.60	2.34E-09	6.97E-11	8.39E+04	4.87E-09	7.21E-09	4.00E-02	2.85E-09	7.00E-03	7.20E-10
Thallium	6.08E-04	2.59E-06	2.59E-07	0.6	2.97E-04	5.80E-15	NA	0.00E+00	2.97E-04	4.00E-02	1.14E-04	2.00E-03	8.33E-06
VX	1.67E-05	3.12E-12	3.30E-13	0.6	3.58E-10	8.02E-08	2.26E+03	1.51E-07	1.51E-07	2.45E-06	1.96E-11	7.76E-07	6.73E-12
Di-n-butyl Phthalate	6.35E-03	9.88E-07	1.09E-07	0.6	1.14E-04	2.95E-05	4.40E+02	1.08E-05	1.25E-04	NA	NA	NA	NA
Diethyl Phthalate	5.00E-03	7.98E-07	8.60E-08	0.6	9.19E-05	2.32E-05	4.48E+02	8.64E-06	1.01E-04	NA	NA	NA	NA
Manganese	8.16E-03	3.47E-05	3.55E-06	0.6	3.98E-03	0.00E+00	NA	0.00E+00	3.98E-03	1.20E-01	4.60E-03	2.00E-02	1.12E-03
4-Methylphenol	1.02E-02	1.19E-11	1.28E-12	0.6	1.37E-09	4.93E-05	1.71E+01	7.03E-07	7.04E-07	2.19E-06	8.99E-09	6.92E-07	2.84E-09
RDX	1.72E-05	0.00E+00	0.00E+00	0.6	0.00E+00	8.27E-08	9.92E-02	6.84E-12	6.84E-12	1.86E-07	1.28E-12	5.89E-08	4.05E-13
2,4,6-Trinitrotoluene	1.72E-05	0.00E+00	0.00E+00	0.6	0.00E+00	8.27E-08	2.32E+02	1.60E-08	1.60E-08	1.26E-05	8.84E-11	3.98E-06	2.82E-11
Vanadium	1.85E-04	7.87E-07	8.06E-08	0.6	9.03E-05	0.00E+00	NA	0.00E+00	9.03E-05	1.20E-01	1.04E-04	2.00E-02	2.53E-05

Table A-2.2.17 Case 2. Without PFS, Actual Program Factors: UMCDF SUBSISTENCE FARMER

INDIRECT EXPOSURES: Calculation of cancer risks

Consumption rate of soil, CR(soil)=	0.0001	kg/day
Fraction of soil impacted, F(soil)=	1	unitless
Consumption rate of abv grd veg, CR(ag)=	0.024	kg/day
Fraction of abv grd veg impacted, F(ag)=	0.95	unitless
Consumption rate of root veg, CR(bg)=	0.0063	kg/day
Fraction of root veg impacted, F(bg)=	0.95	unitless
Consumption rate of beef, CR(beef)=	0.1	kg/day
Fraction of beef impacted, F(beef)=	0.44	unitless
Consumption rate of milk, CR(milk)=	0.3	kg/day
Fraction of milk impacted, F(milk)=	0.4	unitless
Exposure duration, ED=	40	yr
Exposure frequency, EF=	350	day/yr
Body weight, BW=	70	kg
Averaging time, AT=	70	yr

I(tot) = Total daily intake of substance
Sc = Soil concentration after total time period of deposition
I(soil) = Daily intake of substance from soil
Pd + Pv = Concentration in plant
I(ag) = Daily intake of substance from above ground vegetables
Pr(bg) = Concentration in below ground plant parts due to root uptake
I(bg) = Daily intake of substance from below ground vegetables
A(beef) = Concentration in beef
I(beef) = Daily intake of substance from beef
A(milk) = Concentration in milk
I(milk) = Daily intake of substance from milk
CSF = Carcinogenic slope factor

Substances of Potential Concern	Sc (mg/kg)	I(soil) (mg/day)	Pd+Pv (mg/kg)	I(ag) (mg/day)	Pr(bg) (mg/kg)	I(bg) (mg/day)	A(beef) (mg/kg)	I(beef) (mg/day)	A(milk) (mg/kg)	I(milk) (mg/day)	I(tot) (mg/day)	CSF (per mg/kg-day)	Cancer Risk
Antimony	3.40E-04	3.40E-08	1.82E-06	4.14E-08	2.55E-09	1.52E-11	1.54E-06	6.76E-08	2.24E-07	2.68E-08	1.70E-07		
Arsenic	4.11E-04	4.11E-08	2.20E-06	5.02E-08	5.67E-11	3.40E-13	3.72E-06	1.64E-07	1.63E-05	1.95E-06	2.21E-06	1.50E+00	2.59E-08
Barium	7.84E-04	7.84E-08	4 37E-06	9.95E-08	1.11E-11	6.64E-14	5.52E-07	2.43E-08	1.88E-06	2.25E-07	4.28E-07		
Beryllium	8.83E-05	8.83E-09	4.92E-07	1.12E-08	9.46E-13	5.66E-15	4.15E-07	1.82E-08	5.44E-10	6.53E-11	3.83E-08	4.30E+00	1.29E-09
bis (2-Ethylhexyl) Phthalate	2.88E-02	2.88E-06	6.84E-06	1.56E-07	1.64E-08	9.84E-11	NA	NA	NA	NA	3.03E-06	1.40E-02	3.32E-10
Cadmium	1.96E-04	1.96E-08	1.09E-06	2.48E-08	1.96E-11	1.17E-13	1.10E-04	4.85E-06	1.02E-05	1.22E-06	6.11E-06		
Chromium	5.97E-04	5.97E-08	3 32E-06	7.56E-08	7.46E-11	4.46E-13	1.54E-05	6.77E-07	6.11E-06	7.33E-07	1.55E-06		
2,4-Dinitrotoluene	1.72E-05	1.72E-09	1.03E-10	2.36E-12	1.88E-08	1.12E-10	1.74E-11	7.66E-13	5.54E-12	6.65E-13	1.83E-09	6.80E-01	9.77E-12
2,6-Dinitrotoluene	1.72E-05	1.72E-09	8.96E-11	2.04E-12	2.18E-08	1.30E-10	1.32E-11	5.81E-13	4.27E-12	5.12E-13	1.85E-09	6.80E-01	9.86E-12
Di-n-octyl Phthalate	6.64E-03	6.64E-07	1.43E-06	3.25E-08	3.80E-09	2.27E-11	NA	NA	NA	NA	6.97E-07		
GB	1.67E-05	1.67E-09	1.94E-12	4.43E-14	2.42E-07	1.45E-09	8.67E-13	3.82E-14	2.80E-13	3.36E-14	3.12E-09		
HD/HT	1.67E-03	1.67E-07	1.39E-11	3.18E-13	7.99E-07	4.78E-09	3.93E-10	1.73E-11	1.24E-10	1.49E-11	1.72E-07	9.50E+00	1.28E-08
Lead	1.10E-03	1.10E-07	6.15E-06	1.40E-07	NA	NA	NA	NA	NA	NA	2.51E-07		
Mercury	6.00E-04	6.00E-08	5.53E-07	1.26E-08	NA	NA	5.81E-08	2.56E-09	3.88E-07	4.66E-08	1.22E-07		
Nickel	7.65E-04	7.65E-08	4.26E-06	9.71E-08	1.87E-11	1.12E-13	2.15E-05	9.48E-07	5.23E-06	6.28E-07	1.75E-06		
PCB	2.47E-06	2.47E-10	1.71E-10	3.89E-12	6.03E-10	3.61E-12	5.69E-08	2.50E-09	1.94E-08	2.33E-09	6.09E-09	7.70E+00	3.07E-10
Selenium	2.84E-04	2.84E-08	1.52E-06	3.46E-08	6.60E-10	3.95E-12	1.92E-05	8.46E-07	7.47E-06	8.96E-07	1.81E-06		
Silver	3.12E-04	3.12E-08	1.73E-06	3.95E-08	3.89E-08	2.33E-10	4.39E-06	1.93E-07	4.26E-05	5.11E-06	5.38E-06		
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.93E-08	1.93E-12	7.54E-11	1.72E-12	8.21E-13	4.92E-15	2.85E-09	1.25E-10	7.20E-10	8.65E-11	2.15E-10	1.50E+05	2.53E-07
Thallium	6.08E-04	6.08E-08	3.39E-06	7.73E-08	1.64E-12	9.84E-15	1.14E-04	5.03E-06	8.33E-06	9.99E-07	6.17E-06		
VX	1.67E-05	1.67E-09	1.52E-09	3.46E-11	1.03E-07	6.15E-10	1.96E-11	8.62E-13	6.73E-12	8.07E-13	2.32E-09		
Di-n-butyl Phthalate	6.35E-03	6.35E-07	1.41E-06	3.21E-08	3.57E-04	2.14E-06	NA	NA	NA	NA	2.81E-06		
Diethyl Phthalate	5.00E-03	5.00E-07	1.13E-06	2.59E-08	3.12E-06	1.87E-08	NA	NA	NA	NA	5.44E-07		
Manganese	8.16E-03	8.16E-07	4.54E-05	1.04E-06	1.77E-08	1.06E-10	4.60E-03	2.02E-04	1.12E-03	1.34E-04	3.38E-04		
4-Methylphenol	1.02E-02	1.02E-06	7.05E-09	1.61E-10	1.80E-05	1.08E-07	8.99E-09	3.96E-10	2.84E-09	3.41E-10	1.13E-06		
RDX	1.72E-05	1.72E-09	6.84E-14	1.56E-15	1.31E-08	7.85E-11	1.28E-12	5.63E-14	4.05E-13	4.86E-14	1.80E-09	1.10E-01	1.55E-12
2,4,6-Trinitrotoluene	1.72E-05	1.72E-09	1.60E-10	3.65E-12	3.47E-09	2.08E-11	8.84E-11	3.89E-12	2.82E-11	3.38E-12	1.75E-09	3.00E-02	4.11E-13
Vanadium	1.85E-04	1.85E-08	1.03E-06	2.35E-08	9.25E-11	5.54E-13	1.04E-04	4.59E-06	2.53E-05	3.04E-06	7.67E-06		

Total cancer risk= 3E-07

Table A-2.2.18 Case 2. Without PFS, Actual Program Factors: UMCDF SUBSISTENCE FARMER

INDIRECT EXPOSURES: Calculation of hazard quotients, and hazard indices

Consumption rate of soil, CR(soil)=	0.0001	kg/day
Fraction of soil impacted, F(soil)=	1	unitless
Consumption rate of abv grd veg, CR(ag)=	0.024	kg/day
Fraction of abv grd veg impacted, F(ag)=	0.95	unitless
Consumption rate of root veg, CR(bg)=	0.0063	kg/day
Fraction of root veg impacted, F(bg)=	0.95	unitless
Consumption rate of beef, CR(beef)=	0.1	kg/day
Fraction of beef impacted, F(beef)=	0.44	unitless
Consumption rate of milk, CR(milk)=	0.3	kg/day
Fraction of milk impacted, F(milk)=	0.4	unitless
Body weight, BW=	70	kg

I(tot) = Total daily intake of substance
Sc = Soil concentration after total time period of deposition
I(soil) = Daily intake of substance from soil
Pd + Pv = Concentration in plant
I(ag) = Daily intake of substance from above ground vegetables
Pr(bg) = Concentration in below ground plant parts due to root uptake
I(bg) = Daily intake of substance from below ground vegetables
A(beef) = Concentration in beef
I(beef) = Daily intake of substance from beef
A(milk) = Concentration in milk
I(milk) = Daily intake of substance from milk
RfD = Reference dose
HI = Hazard Index

Substances of Potential Concern	Sc (mg/kg)	I(soil) (mg/day)	Pd+Pv (mg/kg)	I(ag) (mg/day)	Pr(bg) (mg/kg)	I(bg) (mg/day)	A(beef) (mg/kg)	I(beef) (mg/day)	A(milk) (mg/kg)	I(milk) (mg/day)	I(tot) (mg/day)	RfD (mg/kg-day)	Hazard Index Liver	Hazard Index Neuro	Hazard Quotient
Antimony	3.40E-04	3.40E-08	1.82E-06	4.14E-08	2.55E-09	1.52E-11	1.54E-06	6.76E-08	2.24E-07	2.68E-08	1.70E-07	4.00E-04			6E-06
Arsenic	4.11E-04	4.11E-08	2.20E-06	5.02E-08	5.67E-11	3.40E-13	3.72E-06	1.64E-07	1.63E-05	1.95E-06	2.21E-06	3.00E-04			1E-04
Barium	7.84E-04	7.84E-08	4.37E-06	9.95E-08	1.11E-11	6.64E-14	5.52E-07	2.43E-08	1.88E-06	2.25E-07	4.28E-07	7.00E-02			8E-08
Beryllium	8.83E-05	8.83E-09	4.92E-07	1.12E-08	9.46E-13	5.66E-15	4.15E-07	1.82E-08	5.44E-10	6.53E-11	3.83E-08	5.00E-03			1E-07
bis (2-Ethylhexyl) Phthalate	2.88E-02	2.88E-06	6.84E-06	1.56E-07	1.64E-08	9.84E-11	NA	NA	NA	NA	3.03E-06	2.00E-02	2.08E-06		2E-06
Cadmium	1.96E-04	1.96E-08	1.09E-06	2.48E-08	1.96E-11	1.17E-13	1.10E-04	4.85E-06	1.02E-05	1.22E-06	6.11E-06	1.00E-03			8E-05
Chromium	5.97E-04	5.97E-08	3 32E-06	7.56E-08	7 46E-11	4.46E-13	1.54E-05	6.77E-07	6.11E-06	7.33E-07	1.55E-06	5.00E-03			4E-06
2,4-Dinitrotoluene	1.72E-05	1.72E-09	1.03E-10	2.36E-12	1 88E-08	1.12E-10	1.74E-11	7.66E-13	5.54E-12	6.65E-13	1.83E-09	2.00E-03		1.26E-08	1E-08
2,6-Dinitrotoluene	1.72E-05	1.72E-09	8.96E-11	2.04E-12	2.18E-08	1.30E-10	1.32E-11	5.81E-13	4.27E-12	5.12E-13	1.85E-09	1.00E-03		2.54E-08	3E-08
Di-n-octyl Phthalate	6.64E-03	6.64E-07	1.43E-06	3.25E-08	3.80E-09	2.27E-11	NA	NA	NA	NA	6.97E-07	2.00E-02	4.77E-07		5E-07
GB	1.67E-05	1.67E-09	1.94E-12	4.43E-14	2.42E-07	1.45E-09	8.67E-13	3.82E-14	2.80E-13	3.36E-14	3.12E-09	4.30E-05		9.93E-07	1E-06
HD/HT	1.67E-03	1.67E-07	1.39E-11	3.18E-13	7.99E-07	4.78E-09	3.93E-10	1.73E-11	1.24E-10	1.49E-11	1.72E-07				
Lead	1.10E-03	1.10E-07	6.15E-06	1.40E-07	NA	NA	NA	NA	NA	NA	2.51E-07				
Mercury	6.00E-04	6.00E-08	5.53E-07	1.26E-08	NA	NA	5.81E-08	2.56E-09	3.88E-07	4.66E-08	1.22E-07	1.00E-04		1.67E-05	2E-05
Nickel	7.65E-04	7.65E-08	4.26E-06	9.71E-08	1 87E-11	1.12E-13	2.15E-05	9.48E-07	5.23E-06	6.28E-07	1.75E-06	2.00E-02	1.20E-06		1E-06
PCB	2.47E-06	2.47E-10	1.71E-10	3.89E-12	6.03E-10	3.61E-12	5.69E-08	2.50E-09	1.94E-08	2.33E-09	5.09E-09				
Selenium	2.84E-04	2.84E-08	1.52E-06	3.46E-08	6.60E-10	3.95E-12	1.92E-05	8.46E-07	7.47E-06	8.96E-07	1.81E-06	5.00E-03			5E-06
Silver	3.12E-04	3.12E-08	1.73E-06	3.95E-08	3.89E-08	2.33E-10	4.39E-06	1.93E-07	4.26E-05	5.11E-06	5.38E-06	5.00E-03			1E-05
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.93E-08	1.93E-12	7.54E-11	1.72E-12	8.21E-13	4.92E-15	2.85E-09	1.25E-10	7.20E-10	8.65E-11	2.15E-10				
Thallium	6.08E-04	6.08E-08	3.39E-06	7.73E-08	1.64E-12	9.84E-15	1.14E-04	5.03E-06	8.33E-06	9.99E-07	6.17E-06	8.00E-05	1.06E-03		1E-03
VX	1.67E-05	1.67E-09	1.52E-09	3.46E-11	1.03E-07	6.15E-10	1.96E-11	8.62E-13	6.73E-12	8.07E-13	2.32E-09	4.30E-05		7.39E-07	7E-07
Di-n-butyl Phthalate	6.35E-03	6.35E-07	1.41E-06	3.21E-08	3.57E-04	2.14E-06	NA	NA	NA	NA	2.81E-06	1.00E-01			4E-07
Diethyl Phthalate	5.00E-03	5.00E-07	1.13E-06	2.59E-08	3.12E-06	1.87E-08	NA	NA	NA	NA	5.44E-07	8.00E-01			9E-09
Manganese	8.16E-03	8.16E-07	4.54E-05	1.04E-06	1 77E-08	1.06E-10	4.60E-03	2.02E-04	1.12E-03	1.34E-04	3.38E-04	1.40E-01		3.31E-05	3E-05
4-Methylphenol	1.02E-02	1.02E-06	7.05E-09	1.61E-10	1.80E-05	1.08E-07	8.99E-09	3.96E-10	2.84E-09	3.41E-10	1.13E-06	5.00E-03		3.11E-06	3E-06
RDX	1.72E-05	1.72E-09	6.84E-14	1.56E-15	1.31E-08	7.85E-11	1.28E-12	5.63E-14	4.05E-13	4.86E-14	1.80E-09	3.00E-03			8E-09
2,4,6-Trinitrotoluene	1.72E-05	1.72E-09	1.60E-10	3.65E-12	3.47E-09	2.08E-11	8.84E-11	3.89E-12	2.82E-11	3.38E-12	1.75E-09	5.00E-04	4.80E-08		5E-08
Vanadium	1.85E-04	1.85E-08	1.03E-06	2.35E-08	9.25E-11	5.54E-13	1.04E-04	4.59E-06	2.53E-05	3.04E-06	7.67E-06	7.00E-03			2E-05
												HI=	0.0011	0.0001	0.001

Table A-2.2.19 Case 2. Without PFS, Actual Program Factors: UMCDF SUBSISTENCE FARMER

DIRECT INHALATION EXPOSURES:

Exposure Parameter	Exposure Scenario			
	Subsistence Farmer	Subsistence Fisher	Adult Resident	Child Resident
Inhalation rate, IR (m3/hr)	0.8	0.8	0.8	0.2
Exposure duration, ED (yr)	3.2	3.2	3.2	3.2
Body weight, BW (kg)	70	70	70	15
Exposure time, ET (hr/day)	24			
Exposure frequency, EF (day/yr)	350			
Carcinogenic averaging time, LT (day)	25550			
Noncancer averaging time, LT(day)	1168			

CSF = Cancer Slope Factor
RfD = Reference Dose
HI = Hazard Index

CDD = Chlorinated dibenzo-p-dioxin
CDF = Chlorinated dibenzo-p-furan

Substances of Potential Concern	Respirable Concentration (ug/m3)	Cancer Inh. Intake-Farmer (mg/kg-day)	Inhalation CSF (per mg/kg-day)	Cancer Risk Farmer	Inhalation RfD (mg/kg/day)	Hazard Quotient Farmer
Tetra CDD	2.59E-11	3.24E-16	1.16E+05	3.76E-11		
Penta CDD	6.90E-11	8.64E-16	5.80E+04	5.01E-11		
Hexa CDD	2.02E-10	2.53E-15	1.16E+04	2.93E-11		
Hepta CDD	4.00E-10	5.00E-15	1.16E+03	5.80E-12		
Octa CDD	2.96E-10	3.70E-15	1.16E+02	4.30E-13		
Tetra CDF	4.71E-11	5.89E-16	1.16E+04	6.84E-12		
Penta CDF	1.72E-10	2.16E-15	5.80E+04	1.25E-10		
Hexa CDF	3.24E-10	4.06E-15	1.16E+04	4.71E-11		
Hepta CDF	2.61E-10	3.27E-15	1.16E+03	3.79E-12		
Octa CDF	1.41E-10	1.76E-15	1.16E+02	2.04E-13		
2,3,7,8-TCDD TEQ	2.11E-10	2.64E-15	1.50E+05	3.96E-10		
Antimony	9.61E-06	1.20E-10				
Arsenic	1.16E-05	1.45E-10	5.00E+01	7.24E-09		
Barium	2.23E-05	2.79E-10			1.45E-03	4.21E-06
Beryllium	2.43E-06	3.05E-11	8.40E+00	2.56E-10		
Boron	2.14E-04	2.68E-09			5.80E-03	1.01E-05
Cadmium	5.53E-06	6.93E-11	6.30E+00	4.37E-10		
Chromium	1.77E-05	2.21E-10	4.10E+01	9.08E-09		
Cobalt	5.10E-06	6.39E-11				
Copper	1.40E-05	1.76E-10				
Lead	3.14E-05	3.93E-10				
Manganese	2.27E-04	2.85E-09			1.40E-05	4.45E-03
Mercury	2.89E-06	3.62E-11			8.60E-05	9.20E-06
Nickel	2.22E-05	2.78E-10	8.40E-01	2.33E-10		
Phosphorus	1.23E-04	1.54E-09				
Selenium	8.09E-06	1.01E-10				
Silver	8.85E-06	1.11E-10				
Thallium	1.66E-05	2.08E-10				
Tin	3.52E-05	4.41E-10				
Vanadium	5.17E-06	6.47E-11				
Zinc	1.46E-04	1.83E-09				
Acetone	1.21E-02	1.51E-07				
Benzene	3.86E-04	4.84E-09	2.90E-02	1.40E-10		
Bromodichloromethane	1.18E-06	1.48E-11				
Bromoform	6.32E-06	7.92E-11	3.85E-03	3.05E-13		
2-Butanone	6.94E-05	8.69E-10			2.90E-01	6.56E-08
Carbon Disulfide	6.81E-06	8.53E-11			2.90E-03	6.43E-07
Carbon Tetrachloride	7.58E-06	9.49E-11	5.30E-02	5.03E-12		
Chlorobenzene	1.56E-06	1.95E-11			5.80E-03	7.36E-08
Chloroform	2.37E-05	2.97E-10	8.10E-02	2.41E-11		
Chloromethane	1.44E-04	1.80E-09	6.30E-03	1.13E-11		
Dibromochloromethane	1.31E-06	1.64E-11				
1,1-Dichloroethane	1.10E-06	1.38E-11			1.45E+00	2.08E-10
1,2-Dichloropropane	5.44E-05	6.81E-10			3.80E-03	3.92E-06
cis-1,3-Dichloropropene	4.70E-05	5.89E-10	1.30E-01	7.66E-11	5.80E-03	2.22E-06
trans-1,3-Dichloropropene	1.10E-06	1.37E-11	1.30E-01	1.79E-12	5.70E-03	5.28E-08
Ethylbenzene	2.05E-06	2.56E-11			2.90E-01	1.93E-09
2-Hexanone	1.49E-06	1.87E-11				
Methylene Chloride	1.48E-03	1.85E-08	1.70E-03	3.15E-11	8.70E-01	4.66E-07
4-Methyl-2-pentanone	1.63E-06	2.04E-11			2.30E-01	1.94E-09
Styrene	2.22E-05	2.78E-10			8.70E-01	6.98E-09
1,1,2,2-Tetrachloroethane	1.18E-06	1.48E-11	2.00E-01	2.96E-12		
Tetrachloroethene	1.33E-06	1.66E-11				
Toluene	8.60E-04	1.08E-08			1.10E-01	2.14E-06
1,1,1-Trichloroethane	1.08E-05	1.35E-10				
Vinyl Acetate	1.83E-07	2.29E-12			5.70E-02	8.80E-10
Vinyl Chloride	2.76E-06	3.45E-11	3.00E-01	1.04E-11		
Xylenes	2.79E-06	3.49E-11				
Benzoic Acid	3.51E-04	4.40E-09				
Benzyl Alcohol	5.84E-04	7.32E-09				
Diethyl Phthalate	2.87E-05	3.59E-10				
Dimethyl Phthalate	1.20E-04	1.50E-09				
Di-n-butyl Phthalate	3.65E-05	4.57E-10				
Di-n-octyl Phthalate	3.82E-05	4.78E-10				
bis(2-Ethylhexyl)-Phthalate	1.65E-04	2.06E-09				
2-Methylphenol	1.23E-04	1.54E-09				
3-Methylphenol	7.11E-05	8.90E-10				
4-Methylphenol	4.93E-05	6.16E-10				
Naphthalene	2.37E-05	2.97E-10				
GB	8.03E-08	1.01E-12			8.67E-07	2.54E-05
HD/HT	8.03E-06	1.01E-10	9.50E+00	9.55E-10	2.90E-05	7.58E-05
VX	8.03E-08	1.01E-12			8.67E-07	2.54E-05
Chlorine	2.80E-03	3.51E-08				
Hydrogen Chloride	8.75E-02	1.10E-06			5.80E-03	4.13E-03
Hydrogen Fluoride	4.58E-02	5.73E-07				
Nitroglycerine	9.03E-06	1.13E-10				
PCB	1.19E-08	1.49E-13				
Particulate	1.75E-02	2.19E-07				
2,4-Dinitrotoluene	8.27E-08	1.04E-12				
2,6-Dinitrotoluene	8.27E-08	1.04E-12				
2,4,6-Trinitrotoluene	8.27E-08	1.04E-12				
RDX	8.27E-08	1.04E-12				
HMX	8.27E-08	1.04E-12				
				2E-08	Total HI=	0.01

Table A-2.2.20 Case 2. Without PFS, Actual Program Factors: UMCDF SUBSISTENCE FARMER

	Risk UMCDF	HI-Liver UMCDF	HI-Neuro UMCDF	HQ		Risk-Inh. UMCDF	HI-Inh. UMCDF
Indirect					**Inhalation**		
Antimony				5.82E-06	Tetra CDD	3.76E-11	
Arsenic	2.59E-08			1.01E-04	Penta CDD	5.01E-11	
Barium				8.37E-08	Hexa CDD	2.93E-11	
Beryllium	1.29E-09			1.05E-07	Hepta CDD	5.80E-12	
bis (2-Ethylhexyl) Phthalate	3.32E-10	2.08E-06		2.08E-06	Octa CDD	4.30E-13	
Cadmium				8.37E-05	Tetra CDF	6.84E-12	
Chromium				4.23E-06	Penta CDF	1.25E-10	
2,4-Dinitrotoluene	9.77E-12		1.26E-08	1.26E-08	Hexa CDF	4.71E-11	
2,6-Dinitrotoluene	9.86E-12		2.54E-08	2.54E-08	Hepta CDF	3.79E-12	
Di-n-octyl Phthalate		4.77E-07		4.77E-07	Octa CDF	2.04E-13	
GB			9.93E-07	9.93E-07	2,3,7,8-TCDD TEQ	3.96E-10	
HD/HT	1.28E-08				Antimony		
Lead					Arsenic	7.24E-09	
Mercury			1.67E-05	1.67E-05	Barium		4.21E-06
Nickel				1.20E-06	Beryllium	2.56E-10	
PCB	3.07E-10				Boron		1.01E-05
Selenium				4.95E-06	Cadmium	4.37E-10	
Silver				1.47E-05	Chromium	9.08E-09	
2,3,7,8-TCDD&Others	2.53E-07				Cobalt		
Thallium		1.06E-03		1.06E-03	Copper		
VX			7.39E-07	7.39E-07	Lead		
Di-n-butyl Phthalate				3.84E-07	Manganese		4.45E-03
Diethyl Phthalate				9.32E-09	Mercury		9.20E-06
Manganese			3.31E-05	3.31E-05	Nickel	2.33E-10	
4-Methylphenol			3.11E-06	3.11E-06	Phosphorus		
RDX	1.55E-12			8.21E-09	Selenium		
2,4,6-Trinitrotoluene	4.11E-13	4.80E-08		4.80E-08	Silver		
Vanadium				1.50E-05	Thallium		
					Tin		
					Vanadium		
					Zinc		
					Acetone		
					Benzene	1.40E-10	
					Bromodichloromethane		
					Bromoform	3.05E-13	
					2-Butanone		6.56E-08
					Carbon Disulfide		6.43E-07
					Carbon Tetrachloride	5.03E-12	
					Chlorobenzene		7.36E-08
					Chloroform	2.41E-11	
					Chloromethane	1.13E-11	
					Dibromochloromethane		
					1,1-Dichloroethane		2.08E-10
					1,2-Dichloropropane		3.92E-06
					cis-1,3-Dichloropropene	7.66E-11	2.22E-06
					trans-1,3-Dichloropropene	1.79E-12	5.28E-08
					Ethylbenzene		1.93E-09
					2-Hexanone		
					Methylene Chloride	3.15E-11	4.66E-07
					4-Methyl-2-pentanone		
					Styrene		6.98E-09
					1,1,2,2-Tetrachloroethane	2.96E-12	
					Tetrachloroethene		
					Toluene		2.14E-06
					1,1,1-Trichloroethane		
					Vinyl Acetate		8.80E-10
					Vinyl Chloride	1.04E-11	
					Xylenes		
					Benzoic Acid		
					Benzyl Alcohol		
					Diethyl Phthalate		
					Dimethyl Phthalate		
					Di-n-butyl Phthalate		
					Di-n-octyl Phthalate		
					bis(2-Ethylhexyl)-Phthalate		
					2-Methylphenol		
					3-Methylphenol		
					4-Methylphenol		
					Naphthalene		
					GB		2.54E-05
					HD/HT	9.55E-10	7.58E-05
					VX		2.54E-05
					Chlorine		
					Hydrogen Chloride		4.13E-03
					Hydrogen Fluoride		
					Nitroglycerine		
					PCB		
					Particulates		
					2,4-Dinitrotoluene		
					2,6-Dinitrotoluene		
					2,4,6-Trinitrotoluene		
					RDX		
					HMX		
Total	2.94E-07	1.06E-03	5.46E-05			1.89E-08	8.74E-03
Grand Total	3E-07	0.001	0.000			2E-08	0.009

Table A-2.2.21 Case 2. Without PFS, Actual Program Factors: UMATILLA RIVER SUBSISTENCE FISHER

CONCENTRATIONS AND DEPOSITIONS: **Calculated depositions and concentrations for indirect exposure pathways**

Substances of Potential Concern	Particulate Dry Deposition Pdd (g/m2)/yr	Particulate Wet Deposition Pwd (g/m2)/yr	Vapor Wet Deposition Vwd (g/m2)/yr	Vapor Concentration Vc (ug/m3)	Toxicity Equivalency Factor	2,3,7,8-TCDD Toxicity Equivalents Pdd (ug/m3)	2,3,7,8-TCDD Toxicity Equivalents Pwd (g/m2)	2,3,7,8-TCDD Toxicity Equivalents Vwd (g/m2)	2,3,7,8-TCDD Toxicity Equivalents Vc (ug/m3)
Tetra CDD	1.92E-14	4.03E-14	8.41E-14	9.29E-13	1.000	1.92E-14	4.03E-14	8.41E-14	9.29E-13
Penta CDD	8.96E-14	1.77E-13	1.07E-13	1.27E-12	0.500	4.48E-14	8.85E-14	5.33E-14	6.37E-13
Hexa CDD	3.53E-13	6.48E-13	8.40E-14	1.11E-12	0.100	3.53E-14	6.48E-14	8.40E-15	1.11E-13
Hepta CDD	7.52E-13	1.35E-12	4.74E-14	6.45E-13	0.010	7.52E-15	1.35E-14	4.74E-16	6.45E-15
Octa CDD	5.47E-13	1.03E-12	3.53E-16	4.52E-15	0.001	5.47E-16	1.03E-15	3.53E-19	4.52E-18
Tetra CDF	2.52E-14	4.56E-14	1.93E-13	2.58E-12	0.100	2.52E-15	4.56E-15	1.93E-14	2.58E-13
Penta CDF	1.83E-13	3.40E-13	4.24E-13	5.51E-12	0.500	9.17E-14	1.70E-13	2.12E-13	2.76E-12
Hexa CDF	5.46E-13	9.92E-13	2.11E-13	2.82E-12	0.100	5.46E-14	9.92E-14	2.11E-14	2.82E-13
Hepta CDF	4.69E-13	8.67E-13	6.22E-14	8.12E-13	0.010	4.69E-15	8.67E-15	6.22E-16	8.12E-15
Octa CDF	2.48E-13	4.94E-13	1.69E-15	2.01E-14	0.001	2.48E-16	4.94E-16	1.69E-18	2.01E-17
					Total =	**2.61E-13**	**4.91E-13**	**3.99E-13**	**4.99E-12**
Antimony	1.66E-08	3.40E-08	0.00E+00	0.00E+00					
Arsenic	1.97E-08	4.10E-08	0.00E+00	0.00E+00					
Barium	3.88E-08	7.86E-08	0.00E+00	0.00E+00					
Beryllium	4.01E-09	8.69E-09	0.00E+00	0.00E+00					
bis (2-Ethylhexyl) Phthalate	5.46E-08	1.12E-07	7.68E-07	8.70E-06					
Cadmium	9.57E-09	1.95E-08	0.00E+00	0.00E+00					
Chromium	3.31E-08	6.13E-08	0.00E+00	0.00E+00					
2,4-Dinitrotoluene	0.00E+00	0.00E+00	4.82E-10	4.80E-09					
2,6-Dinitrotoluene	0.00E+00	0.00E+00	4.82E-10	4.80E-09					
Di-n-octyl Phthalate	1.40E-08	2.54E-08	1.75E-07	2.35E-06					
GB	1.21E-17	2.37E-17	4.61E-10	5.59E-09					
HD/HT	3.13E-14	6.12E-14	4.61E-08	5.59E-07					
Lead	5.48E-08	1.11E-07	0.00E+00	0.00E+00					
Mercury	0.00E+00	0.00E+00	1.67E-08	1.78E-07					
Nickel	3.99E-08	7.75E-08	0.00E+00	0.00E+00					
Total PCBs	0.00E+00	0.00E+00	6.93E-11	6.90E-10					
Selenium	1.42E-08	2.85E-08	0.00E+00	0.00E+00					
Silver	1.54E-08	3.12E-08	0.00E+00	0.00E+00					
2,3,7,8-TCDD & Dioxin-Like SOPCs	**2.61E-13**	**4.91E-13**	**3.99E-13**	**4.99E-12**					
Thallium	2.67E-08	5.95E-08	3.38E-17	3.42E-16					
VX	3.80E-14	7.44E-14	4.61E-10	5.59E-09					
Di-n-butyl Phthalate	1.35E-08	2.43E-08	1.67E-07	2.27E-06					
Diethyl Phthalate	1.02E-08	1.93E-08	1.32E-07	1.68E-06					
Manganese	3.82E-07	8.08E-07	0.00E+00	0.00E+00					
4-Methylphenol	1.51E-13	2.87E-13	2.82E-07	3.56E-06					
RDX	0.00E+00	0.00E+00	4.82E-10	4.80E-09					
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	4.82E-10	4.80E-09					
Vanadium	8.73E-09	1.84E-08	0.00E+00	0.00E+00					

CDD = Chlorinated dibenzo-p-dioxin
CDF = Chlorinated dibenzo-p-furan

Table A-2.2.22 Case 2. Without PFS, Actual Program Factors: UMATILLA RIVER SUBSISTENCE FISHER

SOIL INGESTION: Calculation of soil concentration due to deposition

Soil mixing depth, Z=	1 cm
Soil bulk density, BD=	1.5 g/cm3
Total deposition time period, Tc=	3.2 yrs
Dry deposition velocity of vapor phase, Vdv=	3 cm/s

Sc = Soil concentration after total time period of deposition
Ds = Deposition term
Pdd = Yearly dry deposition from particle phase
Pwd = Yearly wet deposition from particle phase
Vwd = Yearly wet deposition from vapor phase
Vc = Vapor phase air concentration

Substances of Potential Concern	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Vwd (g/m2-yr)	Vc (µg/m3)	Ds (1/yr)	Sc (mg/kg)
Antimony	1.66E-08	3.40E-08	0.00E+00	0.00E+00	3.37E-06	**1.08E-05**
Arsenic	1.97E-08	4.10E-08	0.00E+00	0.00E+00	4.05E-06	**1.29E-05**
Barium	3.88E-08	7.86E-08	0.00E+00	0.00E+00	7.83E-06	**2.51E-05**
Beryllium	4.01E-09	8.69E-09	0.00E+00	0.00E+00	8.47E-07	**2.71E-06**
bis (2-Ethylhexyl) Phthalate	5.46E-08	1.12E-07	7.68E-07	8.70E-06	6.11E-04	**1.95E-03**
Cadmium	9.57E-09	1.95E-08	0.00E+00	0.00E+00	1.94E-06	**6.21E-06**
Chromium	3.31E-08	6.13E-08	0.00E+00	0.00E+00	6.29E-06	**2.01E-05**
2,4-Dinitrotoluene	0.00E+00	0.00E+00	4.82E-10	4.80E-09	3.35E-07	**1.07E-06**
2,6-Dinitrotoluene	0.00E+00	0.00E+00	4.82E-10	4.80E-09	3.35E-07	**1.07E-06**
Di-n-octyl Phthalate	1.40E-08	2.54E-08	1.75E-07	2.35E-06	1.62E-04	**5.20E-04**
GB	1.21E-17	2.37E-17	4.61E-10	5.59E-09	3.83E-07	**1.23E-06**
HD/HT	3.13E-14	6.12E-14	4.61E-08	5.59E-07	3.83E-05	**1.23E-04**
Lead	5.48E-08	1.11E-07	0.00E+00	0.00E+00	1.10E-05	**3.53E-05**
Mercury	0.00E+00	0.00E+00	1.67E-08	1.78E-07	1.23E-05	**3.95E-05**
Nickel	3.99E-08	7.75E-08	0.00E+00	0.00E+00	7.83E-06	**2.51E-05**
Total PCBs	0.00E+00	0.00E+00	6.93E-11	6.90E-10	4.82E-08	**1.54E-07**
Selenium	1.42E-08	2.85E-08	0.00E+00	0.00E+00	2.85E-06	**9.11E-06**
Silver	1.54E-08	3.12E-08	0.00E+00	0.00E+00	3.11E-06	**9.95E-06**
2,3,7,8-TCDD & Dioxin-Like SOPCs	2.61E-13	4.91E-13	3.99E-13	4.99E-12	3.91E-10	**1.25E-09**
Thallium	2.67E-08	5.95E-08	3.38E-17	3.42E-16	5.74E-06	**1.84E-05**
VX	3.80E-14	7.44E-14	4.61E-10	5.59E-09	3.83E-07	**1.23E-06**
Di-n-butyl Phthalate	1.35E-08	2.43E-08	1.67E-07	2.27E-06	1.57E-04	**5.02E-04**
Diethyl Phthalate	1.02E-08	1.93E-08	1.32E-07	1.68E-06	1.17E-04	**3.74E-04**
Manganese	3.82E-07	8.08E-07	0.00E+00	0.00E+00	7.94E-05	**2.54E-04**
4-Methylphenol	1.51E-13	2.87E-13	2.82E-07	3.56E-06	2.44E-04	**7.79E-04**
RDX	0.00E+00	0.00E+00	4.82E-10	4.80E-09	3.35E-07	**1.07E-06**
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	4.82E-10	4.80E-09	3.35E-07	**1.07E-06**
Vanadium	8.73E-09	1.84E-08	0.00E+00	0.00E+00	1.81E-06	**5.78E-06**

Table A-2.2.23 Case 2. Without PFS, Actual Program Factors: UMATILLA RIVER SUBSISTENCE FISHER

CONSUMPTION OF ABOVE-GROUND VEGETABLES:

Calculation of above-ground vegetable concentration due to direct deposition
Calculation of above-ground vegetable concentration due to air-to-plant transfer

Interception fraction of edible portion, Rp=	0.04	unitless
Plant surface loss coefficient, kp=	18	1/yr
Time between rainfalls, t-rain=	14	days
Length of plant exposure per harvest, Tp=	0.16	yrs
Standing crop biomass, Yp=	1.7	kg DW/m2
Density of air, p=	1200	g/m3
Above ground veg. correction factor, VGab=	0.01	unitless

Pd = Concentration in plant due to direct deposition
Pv = Concentration in plant due to air-to-plant transfer
Pd + Pv = Concentration in plant due to direct deposition and air-to-plant transfer
Fw = Fraction of wet deposition of particles that adheres to plant
Bv = Air-to-plant bioconcentration factor

Substances of Potential Concern	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Fw	Pd (mg/kg)	Vc (ug/m3)	Bv (mg/kg)/(ug/g)	Pv (mg/kg)	Pd+Pv (mg/kg)
Antimony	1.66E-08	3.40E-08	0.2	**2.89E-08**	0.00E+00	NA	**0.00E+00**	**2.89E-08**
Arsenic	1.97E-08	4.10E-08	0.2	**3.45E-08**	0.00E+00	NA	**0.00E+00**	**3.45E-08**
Barium	3.88E-08	7.86E-08	0.6	**1.06E-07**	0.00E+00	NA	**0.00E+00**	**1.06E-07**
Beryllium	4.01E-09	8.69E-09	0.6	**1.14E-08**	0.00E+00	NA	**0.00E+00**	**1.14E-08**
bis (2-Ethylhexyl) Phthalate	5.46E-08	1.12E-07	0.6	**1.51E-07**	8.70E-06	5.11E+02	**3.70E-08**	**1.88E-07**
Cadmium	9.57E-09	1.95E-08	0.6	**2.63E-08**	0.00E+00	NA	**0.00E+00**	**2.63E-08**
Chromium	3.31E-08	6.13E-08	0.6	**8.61E-08**	0.00E+00	NA	**0.00E+00**	**8.61E-08**
2,4-Dinitrotoluene	0.00E+00	0.00E+00	0.6	**0.00E+00**	4.80E-09	1.50E+02	**6.00E-12**	**6.00E-12**
2,6-Dinitrotoluene	0.00E+00	0.00E+00	0.6	**0.00E+00**	4.80E-09	1.30E+02	**5.20E-12**	**5.20E-12**
Di-n-octyl Phthalate	1.40E-08	2.54E-08	0.6	**3.61E-08**	2.35E-06	2.32E+02	**4.54E-09**	**4.07E-08**
GB	1.21E-17	2.37E-17	0.6	**3.25E-17**	5.59E-09	2.90E+00	**1.35E-13**	**1.35E-13**
HD/HT	3.13E-14	6.12E-14	0.6	**8.39E-14**	5.59E-07	1.58E-01	**7.36E-13**	**8.20E-13**
Lead	5.48E-08	1.11E-07	0.6	**1.50E-07**	NA	NA	**0.00E+00**	**1.50E-07**
Mercury	0.00E+00	0.00E+00	0.6	**0.00E+00**	1.78E-07	2.30E+04	**3.41E-08**	**3.41E-08**
Nickel	3.99E-08	7.75E-08	0.6	**1.07E-07**	0.00E+00	NA	**0.00E+00**	**1.07E-07**
Total PCBs	0.00E+00	0.00E+00	0.6	**0.00E+00**	6.90E-10	1.72E+03	**9.90E-12**	**9.90E-12**
Selenium	1.42E-08	2.85E-08	0.2	**2.46E-08**	0.00E+00	NA	**0.00E+00**	**2.46E-08**
Silver	1.54E-08	3.12E-08	0.6	**4.21E-08**	0.00E+00	NA	**0.00E+00**	**4.21E-08**
2,3,7,8-TCDD & Dioxin-Like SOPCs	2.61E-13	4.91E-13	0.6	**6.86E-13**	4.99E-12	8.39E+04	**3.49E-12**	**4.17E-12**
Thallium	2.67E-08	5.95E-08	0.6	**7.69E-08**	3.42E-16	NA	**0.00E+00**	**7.69E-08**
VX	3.80E-14	7.44E-14	0.6	**1.02E-13**	5.59E-09	2.26E+03	**1.05E-10**	**1.05E-10**
Di-n-butyl Phthalate	1.35E-08	2.43E-08	0.6	**3.46E-08**	2.27E-06	4.40E+02	**8.32E-09**	**4.30E-08**
Diethyl Phthalate	1.02E-08	1.93E-08	0.6	**2.68E-08**	1.68E-06	4.48E+02	**6.27E-09**	**3.31E-08**
Manganese	3.82E-07	8.08E-07	0.6	**1.07E-06**	0.00E+00	NA	**0.00E+00**	**1.07E-06**
4-Methylphenol	1.51E-13	2.87E-13	0.6	**3.98E-13**	3.56E-06	1.71E+01	**5.08E-10**	**5.08E-10**
RDX	0.00E+00	0.00E+00	0.6	**0.00E+00**	4.80E-09	9.92E-02	**3.97E-15**	**3.97E-15**
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	0.6	**0.00E+00**	4.80E-09	2.32E+02	**9.29E-12**	**9.29E-12**
Vanadium	8.73E-09	1.84E-08	0.6	**2.44E-08**	0.00E+00	NA	**0.00E+00**	**2.44E-08**

Table A-2.2.24 Case 2. Without PFS, Actual Program Factors: UMATILLA RIVER SUBSISTENCE FISHER CONSUMPTION OF ROOT VEGETABLES:

Calculation of soil concentration due to deposition
Calculation of root vegetable concentration due to root uptake

Soil mixing depth, Z=	20 cm
Soil bulk density, BD=	1.5 g/cm3
Total deposition time period, Tc=	3.2 yrs
Below ground veg. correction factor, VGbg=	0.01 unitless
Dry deposition velocity of vapor phase, Vdv=	3 cm/s

Pr(bg) = Root vegetable concentration due to root uptake
Sc = Soil concentration after total time period of deposition
Ds = Deposition term
Kds = Soil-water partition coefficient
RCF = Ratio of concentratio
Vwd = Yearly wet deposition from vapor phase

Substances of Potential Concern	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Vwd (g/m2-yr)	Vc (μg/m3)	Ds (1/yr)	Sc (mg/kg)	Kds (cm3/g)	RCF (mg/kg)/(ug/mL)	**Pr(bg) (mg/kg)**
Antimony	1.66E-08	3.40E-08	0.00E+00	0.00E+00	1.69E-07	5.40E-07	2	3.00E-02	**8.09E-11**
Arsenic	1.97E-08	4.10E-08	0.00E+00	0.00E+00	2.02E-07	6.47E-07	29	8.00E-03	**1.79E-12**
Barium	3.88E-08	7.86E-08	0.00E+00	0.00E+00	3.91E-07	1.25E-06	530	1.50E-02	**3.54E-13**
Beryllium	4.01E-09	8.69E-09	0.00E+00	0.00E+00	4.24E-08	1.36E-07	70	1.50E-03	**2.90E-14**
bis (2-Ethylhexyl) Phthalate	5.46E-08	1.12E-07	7.68E-07	8.70E-06	3.05E-05	9.77E-05	280000	3.20E+02	**1.12E-09**
Cadmium	9.57E-09	1.95E-08	0.00E+00	0.00E+00	9.71E-08	3.11E-07	160	3.20E-02	**6.21E-13**
Chromium	3.31E-08	6.13E-08	0.00E+00	0.00E+00	3.14E-07	1.01E-06	18	4.50E-03	**2.51E-12**
2,4-Dinitrotoluene	0.00E+00	0.00E+00	4.82E-10	4.80E-09	1.68E-08	5.36E-08	0.87	1.90E+00	**1.17E-09**
2,6-Dinitrotoluene	0.00E+00	0.00E+00	4.82E-10	4.80E-09	1.68E-08	5.36E-08	0.67	1.70E+00	**1.36E-09**
Di-n-octyl Phthalate	1.40E-08	2.54E-08	1.75E-07	2.35E-06	8.12E-06	2.60E-05	280000	3.20E+02	**2.97E-10**
GB	1.21E-17	2.37E-17	4.61E-10	5.59E-09	1.92E-08	6.13E-08	0.032	9.30E-01	**1.78E-08**
HD/HT	3.13E-14	6.12E-14	4.61E-08	5.59E-07	1.92E-06	6.13E-06	1.2	1.16E+00	**5.88E-08**
Lead	5.48E-08	1.11E-07	0.00E+00	0.00E+00	5.52E-07	1.77E-06	600	NA	**NA**
Mercury	0.00E+00	0.00E+00	1.67E-08	1.78E-07	6.17E-07	1.98E-06	57000	NA	**NA**
Nickel	3.99E-08	7.75E-08	0.00E+00	0.00E+00	3.91E-07	1.25E-06	82	4.00E-03	**6.11E-13**
Total PCBs	0.00E+00	0.00E+00	6.93E-11	6.90E-10	2.41E-09	7.71E-09	4300	2.10E+03	**3.76E-11**
Selenium	1.42E-08	2.85E-08	0.00E+00	0.00E+00	1.42E-07	4.56E-07	4.3	2.00E-02	**2.12E-11**
Silver	1.54E-08	3.12E-08	0.00E+00	0.00E+00	1.55E-07	4.98E-07	0.4	1.00E-01	**1.24E-09**
2,3,7,8-TCDD & Dioxin-Like SOPCs	2.61E-13	4.91E-13	3.99E-13	4.99E-12	1.96E-11	6.26E-11	142000	1.21E+04	**5.34E-14**
Thallium	2.67E-08	5.95E-08	3.38E-17	3.42E-16	2.87E-07	9.19E-07	74	4.00E-04	**4.97E-14**
VX	3.80E-14	7.44E-14	4.61E-10	5.59E-09	1.92E-08	6.13E-08	0.15	1.85E+00	**7.56E-09**
Di-n-butyl Phthalate	1.35E-08	2.43E-08	1.67E-07	2.27E-06	7.84E-06	2.51E-05	1.6	1.80E+02	**2.82E-05**
Diethyl Phthalate	1.02E-08	1.93E-08	1.32E-07	1.68E-06	5.84E-06	1.87E-05	5.3	6.56E+00	**2.33E-07**
Manganese	3.82E-07	8.08E-07	0.00E+00	0.00E+00	3.97E-06	1.27E-05	23	1.00E-01	**5.52E-10**
4-Methylphenol	1.51E-13	2.87E-13	2.82E-07	3.56E-06	1.22E-05	3.90E-05	0.50	1.76E+00	**1.37E-06**
RDX	0.00E+00	0.00E+00	4.82E-10	4.80E-09	1.68E-08	5.36E-08	0.63	9.61E-01	**8.18E-10**
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	4.82E-10	4.80E-09	1.68E-08	5.36E-08	11	4.44E+00	**2.16E-10**
Vanadium	8.73E-09	1.84E-08	0.00E+00	0.00E+00	9.03E-08	2.89E-07	100	1.00E-01	**2.89E-12**

Table A-2.2.25 Case 2. Without PFS, Actual Program Factors: UMATILLA RIVER SUBSISTENCE FISHER

CONSUMPTION OF FISH FROM THE UMATILLA RIVER:

USING TIME-AVERAGED SOIL CONCENTRATIONS

Water body area, WA(w)=	9.80E+06	m2
Impervious watershed area, WA(I)=	1.35E+08	m2
Average annual runoff, R=	0.0	cm/yr
Soil bulk density, BD=	1.5	g/cm3
Soil mixing depth, Z=	1	cm
Total deposition time period, Tc=	3.2	yrs
Total watershed area, WA(L)=	2.70E+09	m2
Volumetric soil water content, Os=	0.2	cm3/cm3
USLE rainfall (or erosivity) factor, RF=	20	1/yr
USLE erodability factor, K=	0.36	tons/acre
USLE length-slope factor, LS=	1.5	unitless
USLE cover management factor, C=	0.1	unitless
USLE supporting practice factor, P=	1	unitless
Unit soil loss, Xe=	0.24	kg/m2-yr
Empirical intercept coefficient, a=	0.6	unitless
Watershed sediment delivery ratio, SD=	3.97E-02	unitless
Soil enrichment ratio, ER=	3	unitless
Average volumetric flow rate, Vf(x)=	4.14E+08	m3/yr
Total suspended solids, TSS=	10	mg/L
Depth of water column, d(w)=	0.50	m
Depth of upper benthic layer, d(b)=	0.03	m
Bed sediment porosity, O(bs)=	0.5	LH20/L
Bed sediment concentration, BS=	1.0	g/cm3
Fish lipid content, f(lipid)=	0.07	unitless
Fraction organic carbon, OC(sed)=	0.04	unitless
deposition velocity of vapor phase, Vdv=	3	cm/s

1042.47 sq.mile

L(T) = Total substance load to the water body
L(dep) = Deposition of particle bound substance to the water body
L(RI) = Runoff load from impervious surfaces
L(R) = Runoff load from pervious surfaces
L(E) - Soil erosion load
Sc = Soil concentration after total exposure period
Pddw = Yearly average dry deposition rate onto the watershed
Pwdw = Yearly average wet deposition rate onto the watershed
Pdds = Yearly dry deposition rate onto surface water body
Pwds = Yearly wet deposition rate onto surface water body
Kds = Soil-water partition coefficient
Ds = Deposition term

Substances of Potential Concern	Pdds (g/m2-yr)	Pdws (g/m2-yr)	Vwds (g/m2-yr)	Vcs (µg/m3)	Ds (1/yr)	Sc (mg/kg)	Pddb (g/m2-yr)	Pwdb (g/m2-yr)	Vwdb (g/m2-yr)	L(dep) (g/yr)	L(RI) (g/yr)	Kds (L/kg)	L(R) (g/yr)	L(E) (g/yr)	L(T) (g/yr)
Antimony	1.75E-08	1.70E-08	0.00E+00	0.00E+00	2.30E-06	7.36E-06	2.21E-08	2.85E-08	0.00E+00	4.96E-01	4.66E+00	2	0.00E+00	5.11E-01	5.66E+00
Arsenic	2.76E-08	2.52E-08	0.00E+00	0.00E+00	3.51E-06	1.12E-05	3.38E-08	4.65E-08	0.00E+00	7.87E-01	7.11E+00	29	0.00E+00	8.29E-01	8.73E+00
Barium	1.52E-07	1.48E-07	0.00E+00	0.00E+00	2.00E-05	6.39E-05	1.78E-07	2.71E-07	0.00E+00	4.39E+00	4.05E+01	530	0.00E+00	4.73E+00	4.96E+01
Beryllium	8.70E-09	7.25E-09	0.00E+00	0.00E+00	1.06E-06	3.40E-06	1.03E-08	1.53E-08	0.00E+00	2.51E-01	2.15E+00	70	0.00E+00	2.51E-01	2.66E+00
bis (2-Ethylhexyl) Phthalate	3.87E-08	3.55E-08	1.69E-07	3.76E-06	2.53E-04	8.10E-04	5.11E-08	5.92E-08	4.26E-07	5.26E+00	3.28E+01	280000	0.00E+00	5.99E+01	9.80E+01
Cadmium	1.73E-08	1.67E-08	0.00E+00	0.00E+00	2.27E-06	7.25E-06	2.09E-08	2.97E-08	0.00E+00	4.96E-01	4.59E+00	160	0.00E+00	5.36E-01	5.62E+00
Chromium	8.34E-08	9.50E-08	0.00E+00	0.00E+00	1.19E-05	3.81E-05	1.00E-07	1.45E-07	0.00E+00	2.40E+00	2.41E+01	18	0.00E+00	2.80E+00	2.93E+01
2,4-Dinitrotoluene	0.00E+00	0.00E+00	4.65E-11	2.28E-09	1.47E-07	4.71E-07	0.00E+00	0.00E+00	2.73E-10	2.68E-03	6.28E-03	0.87	0.00E+00	3.02E-02	3.92E-02
2,6-Dinitrotoluene	0.00E+00	0.00E+00	4.65E-11	2.28E-09	1.47E-07	4.71E-07	0.00E+00	0.00E+00	2.73E-10	2.68E-03	6.28E-03	0.67	0.00E+00	2.91E-02	3.80E-02
Di-n-octyl Phthalate	9.21E-09	1.64E-08	7.14E-08	8.97E-07	6.31E-05	2.02E-04	1.30E-08	1.30E-08	9.42E-08	1.18E+00	1.31E+01	280000	0.00E+00	1.49E+01	2.92E+01
GB	5.87E-17	1.24E-16	2.12E-09	1.58E-08	1.14E-06	3.63E-06	7.72E-17	8.73E-17	1.77E-09	1.74E-02	2.86E-01	0.032	0.00E+00	5.21E-02	3.56E-01
HD/HT	1.52E-13	3.21E-13	2.12E-07	1.58E-06	1.14E-04	3.63E-04	2.00E-13	2.26E-13	1.77E-07	1.74E+00	2.86E+01	1.2	0.00E+00	2.42E+01	5.46E+01
Lead	1.21E-07	1.20E-07	0.00E+00	0.00E+00	1.61E-05	5.14E-05	1.45E-07	2.11E-07	0.00E+00	3.49E+00	3.25E+01	600	0.00E+00	3.80E+00	3.98E+01
Mercury	0.00E+00	0.00E+00	1.74E-08	3.01E-07	2.01E-05	6.45E-05	0.00E+00	0.00E+00	3.96E-08	3.88E-01	2.34E+00	57000	0.00E+00	4.77E+00	7.50E+00
Nickel	8.49E-08	9.11E-08	0.00E+00	0.00E+00	1.17E-05	3.76E-05	1.03E-07	1.47E-07	0.00E+00	2.44E+00	2.38E+01	82	0.00E+00	2.78E+00	2.90E+01
Total PCBs	0.00E+00	0.00E+00	6.68E-12	3.28E-10	2.12E-08	6.77E-08	0.00E+00	0.00E+00	3.93E-11	3.85E-04	9.02E-04	4300	0.00E+00	5.01E-03	6.30E-03
Selenium	1.57E-08	1.64E-08	0.00E+00	0.00E+00	2.14E-06	6.85E-06	1.98E-08	2.56E-08	0.00E+00	4.45E-01	4.34E+00	4.3	0.00E+00	4.92E-01	5.27E+00
Silver	1.66E-08	1.67E-08	0.00E+00	0.00E+00	2.22E-06	7.11E-06	2.10E-08	2.70E-08	0.00E+00	4.70E-01	4.50E+00	0.4	0.00E+00	3.95E-01	5.36E+00
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.75E-13	2.69E-13	1.30E-13	2.00E-12	1.65E-10	5.27E-10	2.43E-13	2.54E-13	2.17E-13	7.00E-06	7.75E-05	142000	0.00E+00	3.90E-05	1.24E-04
Thallium	3.14E-08	1.88E-08	9.97E-18	2.53E-16	3.35E-06	1.07E-05	3.82E-08	5.31E-08	3.18E-17	8.94E-01	6.78E+00	74	0.00E+00	7.91E-01	8.46E+00
VX	1.84E-13	3.90E-13	2.12E-09	1.58E-08	1.14E-06	3.63E-06	2.42E-13	2.74E-13	1.77E-09	1.74E-02	2.86E-01	0.15	0.00E+00	1.42E-01	4.46E-01
Di-n-butyl Phthalate	8.83E-09	1.63E-08	7.06E-08	8.60E-07	6.06E-05	1.94E-04	1.25E-08	1.24E-08	8.97E-08	1.12E+00	1.29E+01	1.6	0.00E+00	1.33E+01	2.73E+01
Diethyl Phthalate	6.86E-09	1.03E-08	4.55E-08	6.67E-07	4.63E-05	1.48E-04	9.48E-09	9.97E-09	7.19E-08	8.95E-01	8.45E+00	5.3	0.00E+00	1.07E+01	2.00E+01
Manganese	2.99E-07	2.25E-07	0.00E+00	0.00E+00	3.49E-05	1.12E-04	3.85E-07	4.71E-07	0.00E+00	8.38E+00	7.07E+01	23	0.00E+00	8.22E+00	8.73E+01
4-Methylphenol	1.02E-13	1.50E-13	9.53E-08	1.42E-06	9.60E-05	3.07E-04	1.41E-13	1.48E-13	1.53E-07	1.50E+00	1.29E+01	0.50	0.00E+00	1.79E+01	3.23E+01
RDX	0.00E+00	0.00E+00	4.65E-11	2.28E-09	1.47E-07	4.71E-07	0.00E+00	0.00E+00	2.73E-10	2.68E-03	6.28E-03	0.63	0.00E+00	2.88E-02	3.77E-02
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	4.65E-11	2.28E-09	1.47E-07	4.71E-07	0.00E+00	0.00E+00	2.73E-10	2.68E-03	6.28E-03	11	0.00E+00	3.44E-02	4.34E-02
Vanadium	4.66E-08	4.37E-08	0.00E+00	0.00E+00	6.02E-06	1.93E-05	5.40E-08	8.41E-08	0.00E+00	1.35E+00	1.22E+01	100	0.00E+00	1.42E+00	1.50E+01

Table A-2.2.25 Case 2. Without PFS, Actual Program Factors: UMATILLA RIVER SUBSISTENCE FISHER (continued)

CONSUMPTION OF FISH FROM THE UMATILLA RIVER:

USING TIME-AVERAGED SOIL CONCENTRATIONS

Calculation of fish concentration from dissolved water concentration, C1(fish)
Calculation of fish concentration from total water column concentration, C2(fish)
Calculation of fish concentration from bed sediments, C3(fish)

Water body area, WA(w)=	9.80E+06	m2
Impervious watershed area, WA(I)=	1.35E+08	m2
Average annual runoff, R=	0.0	cm/yr
Soil bulk density, BD=	1.5	g/cm3
Soil mixing depth, Z=	1	cm
Total deposition time period, Tc=	3.2	yrs
Total watershed area, WA(L)=	2.70E+09	m2
Volumetric soil water content, Os=	0.2	cm3/cm3
USLE rainfall (or erosivity) factor, RF=	20	1/yr
USLE erodability factor, K=	0.36	tons/acre
USLE length-slope factor, LS=	1.5	unitless
USLE cover management factor, C=	0.1	unitless
USLE supporting practice factor, P=	1	unitless
Unit soil loss, Xe=	0.24	kg/m2-yr
Empirical Intercept coefficient, a=	0.6	unitless
Watershed sediment delivery ratio, SD=	3.97E-02	unitless
Soil enrichment ratio, ER=	3	unitless
Average volumetric flow rate, Vf(x)=	4.14E+08	m3/yr
Total suspended solids, TSS=	10	mg/L
Depth of water column, d(w)=	0.50	m
Depth of upper benthic layer, d(b)=	0.03	m
Bed sediment porosity, O(bs)=	0.5	LH20/L
Bed sediment concentration, BS=	1.0	g/cm3
Fish lipid content, f(lipid)=	0.07	unitless
Fraction organic carbon, OC(sed)=	0.04	unitless
Dry deposition velocity of vapor phase, Vdv=	3	cm/s

1042.47 sq mile

C(fish) = Concentration in fish
f(water) = Fraction of total water body substance concentration that occurs in the water column
C(wtot) = Total water body concentration, including water column and bed sediment
C(wt) = Total concentration in water column
C(dw) = Dissolved phase water concentration
f(benthic) = Fraction of total water body substance concentration that occurs in the bed sediment
kwt = Total water body dissipation rate constant
C(sb) = Concentration sorbed to bed sediments
Kd(sw) = Suspended sediment/surface water partition coefficient
Kd(bs) = Bed sediment/sediment pore water partition coefficient
BCF = Bioconcentration factor
BAF = Bioaccumulation factor
BSAF = Biota to sediment accumulation factor

Substances of Potential Concern	Kd(sw) (L/kg)	Kd(bs) (L/kg)	f(water)	C(wtot) (mg/L)	C(wt) (mg/L)	C(dw) (mg/L)	f(benth)	kwt (1/yr)	C(sb) (mg/kg)	BCF (L/kg)	C1(fish) (mg/kg)	BAF (L/kg)	C2(fish) (mg/kg)	BSAF	C3(fish) (mg/kg)	C(fish) (mg/kg)
Antimony	15	8	6.62E-01	1.95E-08	1.37E-08	1.37E-08	3.38E-01	2.51E-02	1.09E-07	1.0E+00	1.37E-08	NA	NA	NA	NA	1.37E-08
Arsenic	220	120	1.22E-01	1.62E-07	2.10E-08	2.09E-08	8.78E-01	6.52E-02	2.51E-06	4.4E+01	9.20E-07	NA	NA	NA	NA	9.20E-07
Barium	4000	2100	8.18E-03	1.25E-05	1.08E-07	1.04E-07	9.92E-01	7.37E-02	2.19E-04	NA	NA	4.0E+00	4.33E-07	NA	NA	4.33E-07
Beryllium	525	280	5.64E-02	1.06E-07	6.32E-09	6.29E-09	9.44E-01	7.01E-02	1.76E-06	2.0E+01	1.26E-07	NA	NA	NA	NA	1.26E-07
bis (2-Ethylhexyl) Phthalate	2100000	1100000	3.33E-04	1.84E-04	6.51E-08	2.96E-09	1.00E+00	7.42E-02	3.25E-03	NA	NA	1.2E+02	7.81E-06	NA	NA	7.81E-06
Cadmium	1200	640	2.57E-02	4.83E-07	1.31E-08	1.30E-08	9.74E-01	7.24E-02	8.31E-06	6.4E+01	8.31E-07	NA	NA	NA	NA	8.31E-07
Chromium	140	70	1.91E-01	3.47E-07	7.05E-08	7.04E-08	8.09E-01	6.01E-02	4.93E-06	1.6E+01	1.13E-06	NA	NA	NA	NA	1.13E-06
2,4-Dinitrotoluene	6.5	3.5	8.06E-01	1.11E-10	9.46E-11	9.46E-11	1.94E-01	1.44E-02	3.31E-10	3.2E+00	3.03E-10	NA	NA	NA	NA	3.03E-10
2,6-Dinitrotoluene	5	2.7	8.39E-01	1.03E-10	9.18E-11	9.18E-11	1.61E-01	1.20E-02	2.48E-10	2.6E+00	2.39E-10	NA	NA	NA	NA	2.39E-10
Di-n-octyl Phthalate	2100000	1100000	3.33E-04	5.49E-05	1.94E-08	8.82E-10	1.00E+00	7.42E-02	9.70E-04	NA	NA	1.2E+02	2.33E-06	NA	NA	2.33E-06
GB	0.24	0.13	9.64E-01	8.41E-10	8.59E-10	8.59E-10	3.64E-02	2.71E-03	1.12E-10	1.4E+00	1.20E-09	NA	NA	NA	NA	1.20E-09
HD/HT	9.1	4.8	7.59E-01	1.64E-07	1.32E-07	1.32E-07	2.41E-01	1.79E-02	6.33E-07	4.8E+00	6.33E-07	NA	NA	NA	NA	6.33E-07
Lead	4500	2400	7.20E-03	1.12E-05	8.58E-08	8.21E-08	9.93E-01	7.37E-02	1.97E-04	NA	NA	NA	NA	NA	NA	NA
Mercury	95000	160000	2.03E-04	1.58E-05	3.40E-09	1.74E-09	1.00E+00	7.43E-02	2.79E-04	NA	NA	1.3E+05	4.42E-04	NA	NA	4.42E-04
Nickel	620	330	4.83E-02	1.34E-06	6.88E-08	6.84E-08	9.52E-01	7.07E-02	2.26E-05	4.7E+01	3.21E-06	NA	NA	NA	NA	3.21E-06
Total PCBs	32000	17000	1.29E-03	6.61E-09	9.06E-12	6.86E-12	9.99E-01	7.42E-02	1.17E-07	NA	NA	NA	NA	1.6E+00	3.27E-07	3.27E-07
Selenium	32	17	4.88E-01	2.46E-08	1.27E-08	1.27E-08	5.12E-01	3.80E-02	2.16E-07	6.0E+00	7.63E-08	NA	NA	NA	NA	7.63E-08
Silver	3	2	8.70E-01	1.40E-08	1.30E-08	1.29E-08	1.30E-01	9.69E-03	2.59E-08	5.0E-01	6.47E-09	NA	NA	NA	NA	6.47E-09
2,3,7,8-TCDD & Dioxin-Like SOPCs	1070000	570000	3.42E-04	2.31E-10	8.36E-14	7.14E-15	1.00E+00	7.42E-02	4.07E-09	NA	NA	NA	NA	6.7E-02	4.77E-10	4.77E-10
Thallium	560	300	5.28E-02	3.59E-07	2.01E-08	2.00E-08	9.47E-01	7.03E-02	6.00E-06	1.2E+02	2.40E-06	NA	NA	NA	NA	2.40E-06
VX	1.1	0.60	9.38E-01	1.08E-09	1.08E-09	1.08E-09	6.19E-02	4.60E-03	6.47E-10	1.5E+01	1.62E-08	NA	NA	NA	NA	1.62E-08
Di-n-butyl Phthalate	12	6.4	7.07E-01	8.80E-08	6.59E-08	6.59E-08	2.93E-01	2.17E-02	4.22E-07	NA	NA	3.0E+04	1.98E-03	NA	NA	1.98E-03
Diethyl Phthalate	39	21	4.37E-01	1.04E-07	4.83E-08	4.83E-08	5.63E-01	4.18E-02	1.01E-06	NA	NA	4.3E+02	2.08E-05	NA	NA	2.08E-05
Manganese	170	93	1.52E-01	1.31E-06	2.10E-07	2.09E-07	8.48E-01	6.30E-02	1.95E-05	1.2E+02	2.51E-05	NA	NA	NA	NA	2.51E-05
4-Methylphenol	3.8	2.0	8.70E-01	8.47E-08	7.81E-08	7.80E-08	1.30E-01	9.69E-03	1.56E-07	1.4E+01	1.09E-06	NA	NA	NA	NA	1.09E-06
RDX	4.7	2.5	8.47E-01	1.01E-10	9.11E-11	9.11E-11	1.53E-01	1.13E-02	2.28E-10	1.9E+00	1.73E-10	NA	NA	NA	NA	1.73E-10
2,4,6-Trinitrotoluene	83	44	2.73E-01	3.62E-10	1.05E-10	1.04E-10	7.27E-01	5.40E-02	4.60E-09	5.4E+01	5.64E-09	NA	NA	NA	NA	5.64E-09
Vanadium	750	400	4.02E-02	8.30E-07	3.54E-08	3.52E-08	9.60E-01	7.13E-02	1.41E-05	1.2E+02	4.22E-06	NA	NA	NA	NA	4.22E-06

Table A-2.2.26 Case 2. Without PFS, Actual Program Factors: UMATILLA RIVER SUBSISTENCE FISHER INDIRECT EXPOSURES

Calculation of cancer risks

Consumption rate of soil, CR(soil)=	0.0001	kg/day
Fraction of soil impacted, F(soil)=	1	unitless
Consumption rate of abv grd veg, CR(ag)=	0.024	kg/day
Fraction of abv grd veg impacted, F(ag)=	0.25	unitless
Consumption rate of root veg, CR(bg)=	0.0063	kg/day
Fraction of root veg impacted, F(bg)=	0.25	unitless
Consumption rate of fish, CR(fish)=	0.140	kg/day
Fraction of fish impacted, F(fish)=	1	unitless
Exposure duration, ED=	30	yr
Exposure frequency, EF=	350	day/yr
Body weight, BW=	70	kg
Averaging time, AT=	70	yr

I(tot) = Total daily intake of substance
Sc = Soil concentration after total time period of deposition
I(soil) = Daily intake of substance from soil
Pd + Pv = Concentration in plant
I(ag) = Daily intake of substance from above ground vegetables
Pr(bg) = Concentration in below ground plant parts due to root uptake
I(bg) = Daily intake of substance from below ground vegetables
C(fish) = Concentration in fish
I(fish) = Daily intake of substance from fish
CSF = Carcinogenic slope factor

Substances of Potential Concern	Sc (mg/kg)	I(soil) (mg/day)	Pd+Pv (mg/kg)	I(ag) (mg/day)	Pr(bg) (mg/kg)	I(bg) (mg/day)	C(fish) (mg/kg)	I(fish) (mg/day)	I(tot) (mg/day)	CSF (per mg/kg-day)	Cancer Risk
Antimony	1.08E-05	1.08E-09	2.89E-08	1.73E-10	8 09E-11	1.27E-13	1.37E-08	1.91E-09	3.17E-09		
Arsenic	1.29E-05	1.29E-09	3.45E-08	2.07E-10	1.79E-12	2.81E-15	9.20E-07	1.29E-07	1.30E-07	1.50E+00	1.15E-09
Barium	2.51E-05	2.51E-09	1.06E-07	6.37E-10	3.54E-13	5.58E-16	4.33E-07	6.06E-08	6.37E-08		
Beryllium	2.71E-06	2.71E-10	1.14E-08	6.83E-11	2.90E-14	4.58E-17	1.26E-07	1.76E-08	1.79E-08	4.30E+00	4.53E-10
bis (2-Ethylhexyl) Phthalate	1.95E-03	1.95E-07	1.88E-07	1.13E-09	1 12E-09	1.76E-12	7 81E-06	1.09E-06	1.29E-06	1.40E-02	1.06E-10
Cadmium	6.21E-06	6.21E-10	2.63E-08	1.58E-10	6.21E-13	9.78E-16	8.31E-07	1.16E-07	1.17E-07		
Chromium	2.01E-05	2.01E-09	8.61E-08	5.17E-10	2.51E-12	3.96E-15	1 13E-06	1.58E-07	1.60E-07		
2,4-Dinitrotoluene	1.07E-06	1.07E-10	6.00E-12	3.60E-14	1.17E-09	1.84E-12	3.03E-10	4.24E-11	1.51E-10	6.80E-01	6.05E-13
2,6-Dinitrotoluene	1.07E-06	1.07E-10	5.20E-12	3.12E-14	1.36E-09	2.14E-12	2.39E-10	3.34E-11	1.43E-10	6.80E-01	5.70E-13
Di-n-octyl Phthalate	5.20E-04	5.20E-08	4.07E-08	2.44E-10	2.97E-10	4.68E-13	2.33E-06	3.26E-07	3.78E-07		
GB	1.23E-06	1.23E-10	1.35E-13	8.11E-16	1.78E-08	2.81E-11	1.20E-09	1.68E-10	3.19E-10		
HD/HT	1.23E-04	1.23E-08	8.20E-13	4.92E-15	5.88E-08	9.26E-11	6.33E-07	8.86E-08	1.01E-07	9.50E+00	5.63E-09
Lead	3.53E-05	3.53E-09	1.50E-07	8.97E-10	NA	NA	NA	NA	4.43E-09		
Mercury	3.95E-05	3.95E-09	3.41E-08	2.05E-10	NA	NA	4.42E-04	6.19E-05	6.19E-05		
Nickel	2.51E-05	2.51E-09	1.07E-07	6.40E-10	6.11E-13	9.62E-16	3.21E-06	4.50E-07	4.53E-07		
Total PCBs	1.54E-07	1.54E-11	9.90E-12	5.94E-14	3.76E-11	5.93E-14	3.27E-07	4.57E-08	4.58E-08	7.70E+00	2.07E-09
Selenium	9.11E-06	9.11E-10	2.46E-08	1.47E-10	2.12E-11	3.34E-14	7.63E-08	1.07E-08	1.17E-08		
Silver	9.95E-06	9.95E-10	4.21E-08	2.53E-10	1.24E-09	1.96E-12	6.47E-09	9.06E-10	2.16E-09		
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.25E-09	1.25E-13	4.17E-12	2.50E-14	5.34E-14	8.40E-17	4.77E-10	6.68E-11	6.70E-11	1.50E+05	5.90E-08
Thallium	1.84E-05	1.84E-09	7.69E-08	4.62E-10	4.97E-14	7.82E-17	2.40E-06	3.36E-07	3.38E-07		
VX	1.23E-06	1.23E-10	1.05E-10	6.32E-13	7.56E-09	1.19E-11	1.62E-08	2.26E-09	2.40E-09		
Di-n-butyl Phthalate	5.02E-04	5.02E-08	4.30E-08	2.58E-10	2.82E-05	4.45E-08	1.98E-03	2.77E-04	2.77E-04		
Diethyl Phthalate	3.74E-04	3.74E-08	3.31E-08	1.99E-10	2.33E-07	3.67E-10	2.08E-05	2.91E-06	2.95E-06		
Manganese	2.54E-04	2.54E-08	1.07E-06	6.42E-09	5.52E-10	8.70E-13	2.51E-05	3.52E-06	3.55E-06		
4-Methylphenol	7.79E-04	7.79E-08	5.08E-10	3.05E-12	1.37E-06	2.16E-09	1.09E-06	1.53E-07	2.33E-07		
RDX	1.07E-06	1.07E-10	3.97E-15	2.38E-17	8.18E-10	1.29E-12	1.73E-10	2.42E-11	1.33E-10	1.10E-01	8.57E-14
2,4,6-Trinitrotoluene	1.07E-06	1.07E-10	9.29E-12	5.57E-14	2.16E-10	3.41E-13	5.64E-09	7.90E-10	8.98E-10	3.00E-02	1.58E-13
Vanadium	5.78E-06	5.78E-10	2.44E-08	1.46E-10	2.89E-12	4.55E-15	4.22E-06	5.91E-07	5.91E-07		

Total cancer risk= 7E-08

Table A-2.2.27 Case 2. Without PFS, Actual Program Factors: UMATILLA RIVER SUBSISTENCE FISHER

INDIRECT EXPOSURES

Calculation of hazard quotients, and hazard indices

Consumption rate of soil, CR(soil)=	0.0001	kg/day
Fraction of soil impacted, F(soil)=	1	unitless
Consumption rate of abv grd veg, CR(ag)=	0.024	kg/day
Fraction of abv grd veg impacted, F(ag)=	0.25	unitless
Consumption rate of root veg, CR(bg)=	0.0063	kg/day
Fraction of root veg impacted, F(bg)=	0.25	unitless
Consumption rate of fish, CR(fish)=	0.140	kg/day
Fraction of fish impacted, F(fish)=	1	unitless
Body weight, BW=	70	kg

I(tot) = Total daily intake of substance
Sc = Soil concentration after total time period of deposition
I(soil) = Daily intake of substance from soil
Pd + Pv = Concentration in plant
I(ag) = Daily intake of substance from above ground vegetables
Pr(bg) = Concentration in below ground plant parts due to root uptake
I(bg) = Daily intake of substance from below ground vegetables
C(fish) = Concentration in fish
I(fish) = Daily intake of substance from fish
RfD = Reference dose
HI = Hazard Index

Substances of Potential Concern	Sc (mg/kg)	I(soil) (mg/day)	Pd+Pv (mg/kg)	I(ag) (mg/day)	Pr(bg) (mg/kg)	I(bg) (mg/day)	C(fish) (mg/kg)	I(fish) (mg/day)	I(tot) (mg/day)	RfD (mg/kg-day)	Hazard Index Liver	Hazard Index Neuro	Hazard Quotient
Antimony	1.08E-05	1.08E-09	2.89E-08	1.73E-10	8.09E-11	1.27E-13	1.37E-08	1.91E-09	3.17E-09	4.00E-04			1E-07
Arsenic	1.29E-05	1.29E-09	3.45E-08	2.07E-10	1.79E-12	2.81E-15	9 20E-07	1.29E-07	1.30E-07	3.00E-04			6E-06
Barium	2.51E-05	2.51E-09	1.06E-07	6.37E-10	3.54E-13	5.58E-16	4 33E-07	6.06E-08	6.37E-08	7.00E-02			1E-08
Beryllium	2.71E-06	2.71E-10	1.14E-08	6.83E-11	2.90E-14	4.58E-17	1.26E-07	1.76E-08	1.79E-08	5.00E-03			5E-08
bis (2-Ethylhexyl) Phthalate	1.95E-03	1.95E-07	1.88E-07	1.13E-09	1.12E-09	1.76E-12	7.81E-06	1.09E-06	1.29E-06	2.00E-02	9.21E-07		9E-07
Cadmium	6.21E-06	6.21E-10	2.63E-08	1.58E-10	6.21E-13	9.78E-16	8.31E-07	1.16E-07	1.17E-07	1.00E-03			2E-06
Chromium	2.01E-05	2.01E-09	8.61E-08	5.17E-10	2.51E-12	3.96E-15	1.13E-06	1.58E-07	1.60E-07	5.00E-03			4E-07
2,4-Dinitrotoluene	1 07E-06	1.07E-10	6.00E-12	3.60E-14	1.17E-09	1.84E-12	3.03E-10	4.24E-11	1.51E-10	2.00E-03		1.08E-09	1E-09
2,6-Dinitrotoluene	1.07E-06	1.07E-10	5.20E-12	3.12E-14	1.36E-09	2.14E-12	2 39E-10	3.34E-11	1.43E-10	1.00E-03		2.04E-09	2E-09
Di-n-octyl Phthalate	5.20E-04	5.20E-08	4.07E-08	2.44E-10	2.97E-10	4.68E-13	2 33E-06	3.26E-07	3.78E-07	2.00E-02	2.70E-07		3E-07
GB	1.23E-06	1.23E-10	1.35E-13	8.11E-16	1.78E-08	2.81E-11	1.20E-09	1.68E-10	3.19E-10	4.30E-05		1.06E-07	1E-07
HD/HT	1.23E-04	1.23E-08	8.20E-13	4.92E-15	5.88E-08	9.26E-11	6.33E-07	8.86E-08	1.01E-07				
Lead	3.53E-05	3.53E-09	1.50E-07	8.97E-10	NA	NA	NA	NA	4.43E-09				
Mercury	3.95E-05	3.95E-09	3.41E-08	2.05E-10	NA	NA	4.42E-04	6.19E-05	6.19E-05	1.00E-04		8.85E-03	8E-03
Nickel	2.51E-05	2.51E-09	1.07E-07	6.40E-10	6.11E-13	9.62E-16	3.21E-06	4.50E-07	4.53E-07	2.00E-02			3E-07
Total PCBs	1.54E-07	1.54E-11	9.90E-12	5.94E-14	3 76E-11	5.93E-14	3.27E-07	4.57E-08	4.58E-08				
Selenium	9.11E-06	9.11E-10	2.46E-08	1.47E-10	2 12E-11	3.34E-14	7.63E-08	1.07E-08	1.17E-08	5.00E-03			3E-08
Silver	9.95E-06	9.95E-10	4.21E-08	2.53E-10	1.24E-09	1.96E-12	6.47E-09	9.06E-10	2.16E-09	5.00E-03			6E-09
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.25E-09	1.25E-13	4.17E-12	2.50E-14	5.34E-14	8.40E-17	4.77E-10	6.68E-11	6.70E-11				
Thallium	1.84E-05	1.84E-09	7.69E-08	4.62E-10	4.97E-14	7.82E-17	2.40E-06	3.36E-07	3.38E-07	8.00E-05	6.04E-05		6E-05
VX	1.23E-06	1.23E-10	1.05E-10	6.32E-13	7.56E-09	1.19E-11	1.62E-08	2.26E-09	2.40E-09	4.30E-05		7.97E-07	8E-07
Di-n-butyl Phthalate	5.02E-04	5.02E-08	4.30E-08	2.58E-10	2.82E-05	4.45E-08	1.98E-03	2.77E-04	2.77E-04	1.00E-01			
Diethyl Phthalate	3.74E-04	3.74E-08	3.31E-08	1.99E-10	2.33E-07	3.67E-10	2.08E-05	2.91E-06	2.95E-06	8.00E-01			5E-08
Manganese	2.54E-04	2.54E-08	1.07E-06	6.42E-09	5.52E-10	8.70E-13	2.51E-05	3.52E-06	3.55E-06	1.40E-01		3.62E-07	3E-07
4-Methylphenol	7.79E-04	7.79E-08	5.08E-10	3.05E-12	1.37E-06	2.16E-09	1.09E-06	1.53E-07	2.33E-07	5.00E-03		6.66E-07	6E-07
RDX	1.07E-06	1.07E-10	3.97E-15	2.38E-17	8.18E-10	1.29E-12	1.73E-10	2.42E-11	1.33E-10	3.00E-03			6E-10
2,4,6-Trinitrotoluene	1.07E-06	1.07E-10	9.29E-12	5.57E-14	2.16E-10	3.41E-13	5.64E-09	7.90E-10	8.98E-10	5.00E-04	2.56E-08		2E-08
Vanadium	5.78E-06	5.78E-10	2.44E-08	1.46E-10	2.89E-12	4.55E-15	4.22E-06	5.91E-07	5.91E-07	7.00E-03			1E-06
										HI=	0.0001	0.009	0.01

Table A-2.2.28 Case 2. Without PFS, Actual Program Factors: UMATILLA RIVER SUBSISTENCE FISHER

DIRECT INHALATION EXPOSURES:

Exposure parameter	Exposure Scenario			
	Subsistence Farmer	Subsistence Fisher	Adult Resident	Child Resident
Inhalation rate, IR (m3/hr)	0.8	0.8	0.8	0.2
Exposure duration, ED (yr)	3.2	3.2	3.2	3.2
Body weight, BW (kg)	70	70	70	15
Exposure time, ET (hr/day)		24		
Exposure frequency, EF (day/yr)		350		
Carcinogenic averaging time, LT (day)		25550		
Noncancer averaging time, LT (day)		1168		

CSF = Cancer Slope Factor
RfD = Reference Dose
HI = Hazard Index

CDD = Chlorinated dibenzo-p-dioxin
CDF = Chlorinated dibenzo-p-furan

Substances of Potential Concern	Respirable Concentration (ug/m3)	Cancer Inh. Intake Fisher-Umatilla River (mg/kg-day)	Inhalation CSF (per mg/kg-day)	Cancer Risk Fisher-Umatilla River	Inhalation RfD (mg/kg/day)	Hazard Quotient Fisher-Umatilla River
Tetra CDD	1.71E-12	2.14E-17	1.16E+05	2.48E-12		
Penta CDD	4.96E-12	6.23E-17	5.80E+04	3.61E-12		
Hexa CDD	1.61E-11	2.02E-16	1.16E+04	2.34E-12		
Hepta CDD	3.28E-11	4.10E-16	1.16E+03	4.76E-13		
Octa CDD	2.30E-11	2.88E-16	1.16E+02	3.34E-14		
Tetra CDF	3.65E-12	4.57E-17	1.16E+04	5.30E-13		
Penta CDF	1.33E-11	1.66E-16	5.80E+04	9.63E-12		
Hexa CDF	2.61E-11	3.26E-16	1.16E+04	3.79E-12		
Hepta CDF	2.06E-11	2.59E-16	1.16E+03	3.00E-13		
Octa CDF	1.02E-11	1.28E-16	1.16E+02	1.49E-14		
2,3,7,8-TCDD TEQ	1.60E-11	2.00E-16	1.50E+05	3.00E-11		
Antimony	6.79E-07	8.51E-12				
Arsenic	8.01E-07	1.00E-11	5.00E+01	5.01E-10		
Barium	1.59E-06	1.99E-11			1.45E-03	3.01E-07
Beryllium	1.60E-07	2.01E-12	8.40E+00	1.68E-11		
Boron	1.34E-05	1.68E-10			5.80E-03	6.32E-07
Cadmium	3.91E-07	4.89E-12	6.30E+00	3.08E-11		
Chromium	1.40E-06	1.75E-11	4.10E+01	7.17E-10		
Cobalt	3.56E-07	4.46E-12				
Copper	1.09E-06	1.37E-11				
Lead	2.24E-06	2.81E-11				
Manganese	1.54E-05	1.93E-10			1.40E-05	3.01E-04
Mercury	1.78E-07	2.23E-12			8.60E-05	5.67E-07
Nickel	1.66E-06	2.08E-11	8.40E-01	1.74E-11		
Phosphorus	7.66E-06	9.59E-11				
Selenium	5.84E-07	7.32E-12				
Silver	6.32E-07	7.91E-12				
Thallium	1.05E-06	1.32E-11				
Tin	2.58E-06	3.23E-11				
Vanadium	3.53E-07	4.42E-12				
Zinc	1.12E-05	1.40E-10				
Acetone	7.05E-04	8.83E-09				
Benzene	3.04E-05	3.81E-10	2.90E-02	1.10E-11		
Bromodichloromethane	8.92E-08	1.12E-12				
Bromoform	4.12E-07	5.16E-12	3.85E-03	1.98E-14		
2-Butanone	4.17E-06	5.23E-11			2.90E-01	3.94E-09
Carbon Disulfide	4.77E-07	5.97E-12			2.90E-03	4.50E-08
Carbon Tetrachloride	4.60E-07	5.76E-12	5.30E-02	3.06E-13		
Chlorobenzene	1.11E-07	1.39E-12			5.80E-03	5.24E-09
Chloroform	1.73E-06	2.17E-11	8.10E-02	1.76E-12		
Chloromethane	8.37E-06	1.05E-10	6.30E-03	6.60E-13		
Dibromochloromethane	9.81E-08	1.23E-12				
1,1-Dichloroethane	8.43E-08	1.06E-12			1.45E+00	1.59E-11
1,2-Dichloropropane	3.18E-06	3.98E-11			3.80E-03	2.29E-07
cis-1,3-Dichloropropene	2.75E-06	3.44E-11	1.30E-01	4.48E-12	5.80E-03	1.30E-07
trans-1,3-Dichloropropene	8.41E-08	1.05E-12	1.30E-01	1.37E-13	5.70E-03	4.04E-09
Ethylbenzene	1.39E-07	1.74E-12			2.90E-01	1.31E-10
2-Hexanone	1.07E-07	1.34E-12				
Methylene Chloride	8.59E-05	1.08E-09	1.70E-03	1.83E-12	8.70E-01	2.71E-08
4-Methyl-2-pentanone	1.15E-07	1.44E-12			2.30E-01	1.37E-10
Styrene	1.31E-06	1.64E-11			8.70E-01	4.12E-10
1,1,2,2-Tetrachloroethane	8.90E-08	1.12E-12	2.00E-01	2.23E-13		
Tetrachloroethene	9.74E-08	1.22E-12				
Toluene	5.10E-05	6.38E-10			1.10E-01	1.27E-07
1,1,1-Trichloroethane	6.68E-07	8.37E-12				
Vinyl Acetate	1.06E-08	1.33E-13			5.70E-02	5.11E-11
Vinyl Chloride	2.01E-07	2.52E-12	3.00E-01	7.55E-13		
Xylenes	1.82E-07	2.28E-12				
Benzoic Acid	2.66E-05	3.33E-10				
Benzyl Alcohol	3.46E-05	4.33E-10				
Diethyl Phthalate	2.11E-06	2.64E-11				
Dimethyl Phthalate	7.49E-06	9.38E-11				
Di-n-butyl Phthalate	2.85E-06	3.57E-11				
Di-n-octyl Phthalate	2.95E-06	3.69E-11				
bis(2-Ethylhexyl)-Phthalate	1.09E-05	1.37E-10				
2-Methylphenol	7.84E-06	9.82E-11				
3-Methylphenol	4.83E-06	6.04E-11				
4-Methylphenol	3.56E-06	4.46E-11				
Naphthalene	1.80E-06	2.25E-11				
GB	5.59E-09	7.00E-14			8.67E-07	1.77E-06
HD/HT	5.59E-07	7.00E-12	9.50E+00	6.65E-11	2.90E-05	5.28E-06
VX	5.59E-09	7.00E-14			8.67E-07	1.77E-06
Chlorine	1.73E-04	2.17E-09				
Hydrogen Chloride	6.93E-03	8.68E-08			5.80E-03	3.27E-04
Hydrogen Fluoride	3.57E-03	4.47E-08				
Nitroglycerine	5.24E-07	6.57E-12				
PCB	6.90E-10	8.65E-15				
Particulate	1.30E-03	1.62E-08				
2,4-Dinitrotoluene	4.80E-09	6.02E-14				
2,6-Dinitrotoluene	4.80E-09	6.02E-14				
2,4,6-Trinitrotoluene	4.80E-09	6.02E-14				
RDX	4.80E-09	6.02E-14				
HMX	4.80E-09	6.02E-14				
				1E-09	Total HI=	0.001

Table A-2.2.29 Case 2. Without PFS, Actual Program Factors: UMATILLA RIVER SUBSISTENCE FISHER

	Risk UMCDF	HI-Liver UMCDF	HI-Neuro UMCDF	HQ		Risk-Inh. UMCDF	HI-Inh. UMCDF
Indirect					Inhalation		
Antimony				1.08E-07	Tetra CDD	2.48E-12	
Arsenic	1.15E-09			5.95E-06	Penta CDD	3.61E-12	
Barium				1.25E-08	Hexa CDD	2.34E-12	
Beryllium	4.53E-10			4.92E-08	Hepta CDD	4.76E-13	
bis (2-Ethylhexyl) Phthalate	1.06E-10	9.21E-07		8.83E-07	Octa CDD	3.34E-14	
Cadmium				1.60E-06	Tetra CDF	5.30E-13	
Chromium				4.39E-07	Penta CDF	9.63E-12	
2,4-Dinitrotoluene	6.05E-13		1.08E-09	1.04E-09	Hexa CDF	3.79E-12	
2,6-Dinitrotoluene	5.70E-13		2.04E-09	1.96E-09	Hepta CDF	3.00E-13	
Di-n-octyl Phthalate		2.70E-07		2.59E-07	Octa CDF	1.49E-14	
GB			1.06E-07	1.02E-07	2,3,7,8-TCDD TEQ	3.00E-11	
HD/HT	5.63E-09				Antimony		
Lead					Arsenic	5.01E-10	
Mercury			8.85E-03	8.48E-03	Barium		3.01E-07
Nickel				3.10E-07	Beryllium	1.68E-11	
Total PCBs	2.07E-09				Boron		6.32E-07
Selenium				3.22E-08	Cadmium	3.08E-11	
Silver				5.91E-09	Chromium	7.17E-10	
2,3,7,8-TCDD & Others	5.90E-08				Cobalt		
Thallium		6.04E-05		5.80E-05	Copper		
VX			7.97E-07	7.64E-07	Lead		
Di-n-butyl Phthalate					Manganese		3.01E-04
Diethyl Phthalate				5.05E-08	Mercury		5.67E-07
Manganese			3.62E-07	3.47E-07	Nickel	1.74E-11	
4-Methylphenol			6.66E-07	6.39E-07	Phosphorus		
RDX	8.57E-14			6.06E-10	Selenium		
2,4,6-Trinitrotoluene	1.58E-13	2.56E-08		2.46E-08	Silver		
Vanadium				1.16E-06	Thallium		
					Tin		
					Vanadium		
					Zinc		
					Acetone		
					Benzene	1.10E-11	
					Bromodichloromethane		
					Bromoform	1.98E-14	
					2-Butanone		3.94E-09
					Carbon Disulfide		4.50E-08
					Carbon Tetrachloride	3.06E-13	
					Chlorobenzene		5.24E-09
					Chloroform	1.76E-12	
					Chloromethane	6.60E-13	
					Dibromochloromethane		
					1,1-Dichloroethane		1.59E-11
					1,2-Dichloropropane		2.29E-07
					cis-1,3-Dichloropropene	4.48E-12	1.30E-07
					trans-1,3-Dichloropropene	1.37E-13	4.04E-09
					Ethylbenzene		1.31E-10
					2-Hexanone		
					Methylene Chloride	1.83E-12	2.71E-08
					4-Methyl-2-pentanone		
					Styrene		4.12E-10
					1,1,2,2-Tetrachloroethane	2.23E-13	
					Tetrachloroethene		
					Toluene		1.27E-07
					1,1,1-Trichloroethane		
					Vinyl Acetate		5.11E-11
					Vinyl Chloride	7.55E-13	
					Xylenes		
					Benzoic Acid		
					Benzyl Alcohol		
					Diethyl Phthalate		
					Dimethyl Phthalate		
					Di-n-butyl Phthalate		
					Di-n-octyl Phthalate		
					bis(2-Ethylhexyl)-Phthalate		
					2-Methylphenol		
					3-Methylphenol		
					4-Methylphenol		
					Naphthalene		
					GB		1.77E-06
					HD/HT	6.65E-11	5.28E-06
					VX		1.77E-06
					Chlorine		
					Hydrogen Chloride		3.27E-04
					Hydrogen Fluoride		
					Nitroglycerine		
					PCB		
					Particulates		
					2,4-Dinitrotoluene		
					2,6-Dinitrotoluene		
					2,4,6-Trinitrotoluene		
					RDX		
					HMX		
Total	6.84E-08	6.17E-05	8.85E-03			1.40E-09	6.39E-04
Grand Total	7E-08	0.00006	0.0088			1E-09	0.001

Table A-2.3.1 Case 3. With PFS, HHRA Protocol: UMCDF RESIDENT

CONCENTRATIONS AND DEPOSITIONS: **Calculated depositions and concentrations for indirect exposure pathways**

Substances of Potential Concern	Particulate Dry Deposition Pdd (g/m2)/yr	Particulate Wet Deposition Pwd (g/m2)/yr	Vapor Wet Deposition Vwd (g/m2)/yr	Vapor Concentration Vc (ug/m3)	Toxicity Equivalency Factor	2,3,7,8-TCDD Toxicity Equivalents Particulate. Conc. (ug/m3)	2,3,7,8-TCDD Toxicity Equivalents Dry Deposition (g/m2)	2,3,7,8-TCDD Toxicity Equivalents Wet Deposition (g/m2)	2,3,7,8-TCDD Toxicity Equivalents Vapor Conc. (ug/m3)
Tetra CDD	1.29E-11	1.28E-12	2.89E-12	1.22E-10	1.000	1.29E-11	1.28E-12	2.89E-12	1.22E-10
Penta CDD	1.06E-10	1.05E-11	6.83E-12	2.88E-10	0.500	5.29E-11	5.25E-12	3.42E-12	1.44E-10
Hexa CDD	1.33E-10	1.32E-11	1.84E-12	7.75E-11	0.100	1.33E-11	1.32E-12	1.84E-13	7.75E-12
Hepta CDD	1.40E-10	1.39E-11	5.26E-13	2.21E-11	0.010	1.40E-12	1.39E-13	5.26E-15	2.21E-13
Octa CDD	2.86E-10	2.83E-11	1.05E-14	4.43E-13	0.001	2.86E-13	2.83E-14	1.05E-17	4.43E-16
Tetra CDF	8.29E-12	8.22E-13	3.73E-12	1.57E-10	0.100	8.29E-13	8.22E-14	3.73E-13	1.57E-11
Penta CDF	8.29E-11	8.22E-12	1.10E-11	4.65E-10	0.500	4.14E-11	4.11E-12	5.52E-12	2.33E-10
Hexa CDF	1.27E-10	1.26E-11	2.89E-12	1.22E-10	0.100	1.27E-11	1.26E-12	2.89E-13	1.22E-11
Hepta CDF	1.37E-10	1.36E-11	1.05E-12	4.43E-11	0.010	1.37E-12	1.36E-13	1.05E-14	4.43E-13
Octa CDF	2.85E-10	2.83E-11	1.05E-13	4.43E-12	0.001	2.85E-13	2.83E-14	1.05E-16	4.43E-15
					Total =	1.37E-10	1.36E-11	1.27E-11	5.35E-10
Antimony	1.41E-05	1.39E-06	0.00E+00	0.00E+00					
Arsenic	1.22E-05	1.20E-06	0.00E+00	0.00E+00					
Barium	1.81E-05	1.78E-06	0.00E+00	0.00E+00					
Beryllium	3.99E-06	3.91E-07	0.00E+00	0.00E+00					
bis (2-Ethylhexyl) Phthalate	8.84E-07	8.82E-08	6.54E-07	2.75E-05					
Cadmium	4.44E-06	4.35E-07	0.00E+00	0.00E+00					
Chromium	4.55E-06	4.47E-07	0.00E+00	0.00E+00					
2,4-Dinitrotoluene	0.00E+00	0.00E+00	4.01E-08	1.69E-06					
2,6-Dinitrotoluene	0.00E+00	0.00E+00	4.01E-08	1.69E-06					
Di-n-octyl Phthalate	9.10E-07	9.08E-08	6.73E-07	2.84E-05					
GB	4.03E-15	4.01E-16	8.44E-09	3.56E-07					
HD/HT	1.04E-11	1.04E-12	8.44E-07	3.56E-05					
Lead	9.47E-06	9.36E-07	0.00E+00	0.00E+00					
Mercury	0.00E+00	0.00E+00	7.64E-07	3.23E-05					
Nickel	7.15E-06	7.04E-07	0.00E+00	0.00E+00					
Total PCBs	0.00E+00	0.00E+00	0.00E+00	0.00E+00					
Selenium	9.59E-06	9.49E-07	0.00E+00	0.00E+00					
Silver	1.30E-05	1.28E-06	0.00E+00	0.00E+00					
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.37E-10	1.36E-11	1.27E-11	5.35E-10					
Thallium	2.73E-05	2.67E-06	1.65E-15	6.98E-14					
VX	1.27E-11	1.26E-12	8.44E-09	3.55E-07					
Di-n-butyl Phthalate	9.10E-07	9.08E-08	6.73E-07	2.84E-05					
Diethyl Phthalate	8.43E-07	8.35E-08	6.19E-07	2.61E-05					
Manganese	4.48E-06	4.45E-07	0.00E+00	0.00E+00					
4-Methylphenol	7.94E-12	7.92E-13	8.42E-07	3.55E-05					
RDX	0.00E+00	0.00E+00	4.01E-08	1.69E-06					
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	4.01E-08	1.69E-06					
Vanadium	7.14E-06	7.00E-07	0.00E+00	0.00E+00					

CDD = Chlorinated dibenzo-p-dioxin
CDF = Chlorinated dibenzo-p-furan

Table A-2.3.2 Case 3. With PFS, HHRA Protocol: UMCDF RESIDENT

SOIL INGESTION: Calculation of soil concentration due to deposition

Soil mixing depth, Z=	1	cm
Soil bulk density, BD=	1.5	g/cm3
Total deposition time period, Tc=	3.2	yrs
Dry deposition velocity of vapor phase, Vdv=	3	cm/s

Sc = Soil concentration after total time period of deposition
Ds = Deposition term
Pdd = Yearly dry deposition from particle phase
Pwd = Yearly wet deposition from particle phase
Vwd = Yearly wet deposition from vapor phase
Vc = Vapor phase air concentration

Substances of Potential Concern	Pdd (g/m2)/yr	Pwd (g/m2)/yr	Vwd (g/m2)/yr	Vc (ug/m3)	Ds (1/yr)	Sc (mg/kg)
Antimony	1.41E-05	1.39E-06	0.00E+00	0.00E+00	1.03E-03	**3.31E-03**
Arsenic	1.22E-05	1.20E-06	0.00E+00	0.00E+00	8.92E-04	**2.85E-03**
Barium	1.81E-05	1.78E-06	0.00E+00	0.00E+00	1.32E-03	**4.23E-03**
Beryllium	3.99E-06	3.91E-07	0.00E+00	0.00E+00	2.92E-04	**9.34E-04**
bis (2-Ethylhexyl) Phthalate	8.84E-07	8.82E-08	6.54E-07	2.75E-05	1.85E-03	**5.91E-03**
Cadmium	4.44E-06	4.35E-07	0.00E+00	0.00E+00	3.25E-04	**1.04E-03**
Chromium	4.55E-06	4.47E-07	0.00E+00	0.00E+00	3.33E-04	**1.07E-03**
2,4-Dinitrotoluene	0.00E+00	0.00E+00	4.01E-08	1.69E-06	1.09E-04	**3.50E-04**
2,6-Dinitrotoluene	0.00E+00	0.00E+00	4.01E-08	1.69E-06	1.09E-04	**3.50E-04**
Di-n-octyl Phthalate	9.10E-07	9.08E-08	6.73E-07	2.84E-05	1.90E-03	**6.08E-03**
GB	4.03E-15	4.01E-16	8.44E-09	3.56E-07	2.30E-05	**7.36E-05**
HD/HT	1.04E-11	1.04E-12	8.44E-07	3.56E-05	2.30E-03	**7.36E-03**
Lead	9.47E-06	9.36E-07	0.00E+00	0.00E+00	6.94E-04	**2.22E-03**
Mercury	0.00E+00	0.00E+00	7.64E-07	3.23E-05	2.09E-03	**6.68E-03**
Nickel	7.15E-06	7.04E-07	0.00E+00	0.00E+00	5.24E-04	**1.68E-03**
Total PCBs	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Selenium	9.59E-06	9.49E-07	0.00E+00	0.00E+00	7.03E-04	**2.25E-03**
Silver	1.30E-05	1.28E-06	0.00E+00	0.00E+00	9.50E-04	**3.04E-03**
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.37E-10	1.36E-11	1.27E-11	5.35E-10	4.46E-08	**1.43E-07**
Thallium	2.73E-05	2.67E-06	1.65E-15	6.98E-14	2.00E-03	**6.40E-03**
VX	1.27E-11	1.26E-12	8.44E-09	3.55E-07	2.30E-05	**7.36E-05**
Di-n-butyl Phthalate	9.10E-07	9.08E-08	6.73E-07	2.84E-05	1.90E-03	**6.08E-03**
Diethyl Phthalate	8.43E-07	8.35E-08	6.19E-07	2.61E-05	1.75E-03	**5.59E-03**
Manganese	4.48E-06	4.45E-07	0.00E+00	0.00E+00	3.28E-04	**1.05E-03**
4-Methylphenol	7.94E-12	7.92E-13	8.42E-07	3.55E-05	2.29E-03	**7.34E-03**
RDX	0.00E+00	0.00E+00	4.01E-08	1.69E-06	1.09E-04	**3.50E-04**
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	4.01E-08	1.69E-06	1.09E-04	**3.50E-04**
Vanadium	7.14E-06	7.00E-07	0.00E+00	0.00E+00	5.23E-04	**1.67E-03**

Table A-2.3.3 Case 3. With PFS, HHRA Protocol: UMCDF RESIDENT

CONSUMPTION OF ABOVE-GROUND VEGETABLES:

Calculation of above-ground vegetable concentration due to direct deposition
Calculation of above-ground vegetable concentration due to air-to-plant transfer

Interception fraction of edible portion, Rp=	0.04	unitless
Plant surface loss coefficient, kp=	18	1/yr
Time between rainfalls, t-rain=	14	days
Length of plant exposure per harvest, Tp=	0.16	yrs
Standing crop biomass, Yp=	1.7	kg DW/m2
Density of air, p=	1200	g/m3
Above ground veg. correction factor, VGab=	0.01	unitless

Pd = Concentration in plant due to direct deposition
Pv = Concentration in plant due to air-to-plant transfer
Pd + Pv = Concentration in plant due to direct deposition and air-to-plant transfer
Fw = Fraction of wet deposition of particles that adheres to plant
Bv = Air-to-plant bioconcentration factor

Substances of Potential Concern	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Fw	**Pd (mg/kg)**	Vc (ug/m3)	Bv (mg/kg)/(ug/g)	**Pv (mg/kg)**	**Pd+Pv (mg/kg)**
Antimony	1.41E-05	1.39E-06	0.2	**1.78E-05**	0.00E+00	NA	**0.00E+00**	**1.78E-05**
Arsenic	1.22E-05	1.20E-06	0.2	**1.53E-05**	0.00E+00	NA	**0.00E+00**	**1.53E-05**
Barium	1.81E-05	1.78E-06	0.6	**2.36E-05**	0.00E+00	NA	**0.00E+00**	**2.36E-05**
Beryllium	3.99E-06	3.91E-07	0.6	**5.21E-06**	0.00E+00	NA	**0.00E+00**	**5.21E-06**
bis (2-Ethylhexyl) Phthalate	8.84E-07	8.82E-08	0.6	**1.16E-06**	2.75E-05	5.11E+02	**1.17E-07**	**1.27E-06**
Cadmium	4.44E-06	4.35E-07	0.6	**5.80E-06**	0.00E+00	NA	**0.00E+00**	**5.80E-06**
Chromium	4.55E-06	4.47E-07	0.6	**5.95E-06**	0.00E+00	NA	**0.00E+00**	**5.95E-06**
2,4-Dinitrotoluene	0.00E+00	0.00E+00	0.6	**0.00E+00**	1.69E-06	1.50E+02	**2.11E-09**	**2.11E-09**
2,6-Dinitrotoluene	0.00E+00	0.00E+00	0.6	**0.00E+00**	1.69E-06	1.30E+02	**1.83E-09**	**1.83E-09**
Di-n-octyl Phthalate	9.10E-07	9.08E-08	0.6	**1.19E-06**	2.84E-05	2.32E+02	**5.48E-08**	**1.25E-06**
GB	4.03E-15	4.01E-16	0.6	**5.28E-15**	3.56E-07	2.90E+00	**8.59E-12**	**8.60E-12**
HD/HT	1.04E-11	1.04E-12	0.6	**1.36E-11**	3.56E-05	1.58E-01	**4.68E-11**	**6.05E-11**
Lead	9.47E-06	9.36E-07	0.6	**1.24E-05**	0.00E+00	NA	**0.00E+00**	**1.24E-05**
Mercury	0.00E+00	0.00E+00	0.6	**0.00E+00**	3.23E-05	2.30E+04	**6.18E-06**	**6.18E-06**
Nickel	7.15E-06	7.04E-07	0.6	**9.35E-06**	0.00E+00	NA	**0.00E+00**	**9.35E-06**
Total PCBs	0.00E+00	0.00E+00	0.6	**0.00E+00**	0.00E+00	1.72E+03	**0.00E+00**	**0.00E+00**
Selenium	9.59E-06	9.49E-07	0.2	**1.21E-05**	0.00E+00	NA	**0.00E+00**	**1.21E-05**
Silver	1.30E-05	1.28E-06	0.6	**1.70E-05**	0.00E+00	NA	**0.00E+00**	**1.70E-05**
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.37E-10	1.36E-11	0.60	**1.80E-10**	5.35E-10	8.39E+04	**3.74E-10**	**5.53E-10**
Thallium	2.73E-05	2.67E-06	0.6	**3.57E-05**	6.98E-14	NA	**0.00E+00**	**3.57E-05**
VX	1.27E-11	1.26E-12	0.6	**1.66E-11**	3.55E-07	2.26E+03	**6.70E-09**	**6.71E-09**
Di-n-butyl Phthalate	9.10E-07	9.08E-08	0.6	**1.19E-06**	2.84E-05	4.40E+02	**1.04E-07**	**1.29E-06**
Diethyl Phthalate	8.43E-07	8.35E-08	0.6	**1.10E-06**	2.61E-05	4.48E+02	**9.74E-08**	**1.20E-06**
Manganese	4.48E-06	4.45E-07	0.6	**5.86E-06**	0.00E+00	NA	**0.00E+00**	**5.86E-06**
4-Methylphenol	7.94E-12	7.92E-13	0.6	**1.04E-11**	3.55E-05	1.71E+01	**5.05E-09**	**5.06E-09**
RDX	0.00E+00	0.00E+00	0.6	**0.00E+00**	1.69E-06	9.92E-02	**1.40E-12**	**1.40E-12**
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	0.6	**0.00E+00**	1.69E-06	2.32E+02	**3.27E-09**	**3.27E-09**
Vanadium	7.14E-06	7.00E-07	0.6	**9.33E-06**	0.00E+00	NA	**0.00E+00**	**9.33E-06**

Table A-2.3.4 Case 3. With PFS, HHRA Protocol: UMCDF RESIDENT

CONSUMPTION OF ROOT VEGETABLES:

USING TIME-AVERAGED SOIL CONCENTRATIONS **Calculation of soil concentration due to deposition**
Calculation of root vegetable concentration due to root uptake

Soil mixing depth, Z=	20	cm
Soil bulk density, BD=	1.5	g/cm3
Total deposition time period, Tc=	3.2	yrs
Below ground veg. correction factor, VGbg=	0.01	unitless
Dry deposition velocity of vapor phase, Vdv=	3	cm/s

Pr(bg) = Root vegetable concentration due to root uptake
Sc = Soil concentration after total time period of deposition
Ds = Deposition term
Kds = Soil-water partition coefficient
RCF = Ratio of concentration in roots to concentration in soil pore water
Vwd = Yearly wet deposition from vapor phase

Substances of Potential Concern	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Vwd (g/m2-yr)	Vc (µg/m3)	Ds (1/yr)	Sc (mg/kg)	Kds mL/g	RCF (mg/kg)/(ug/mL)	**Pr(bg) (mg/kg)**
Antimony	1.41E-05	1.39E-06	0.00E+00	0.00E+00	5.17E-05	1.65E-04	2	3.00E-02	**2.48E-08**
Arsenic	1.22E-05	1.20E-06	0.00E+00	0.00E+00	4.46E-05	1.43E-04	29	8.00E-03	**3.94E-10**
Barium	1.81E-05	1.78E-06	0.00E+00	0.00E+00	6.61E-05	2.12E-04	530	1.50E-02	**5.99E-11**
Beryllium	3.99E-06	3.91E-07	0.00E+00	0.00E+00	1.46E-05	4.67E-05	70	1.50E-03	**1.00E-11**
bis (2-Ethylhexyl) Phthalate	8.84E-07	8.82E-08	6.54E-07	2.75E-05	9.23E-05	2.95E-04	280000	3.20E+02	**3.38E-09**
Cadmium	4.44E-06	4.35E-07	0.00E+00	0.00E+00	1.63E-05	5.20E-05	160	3.20E-02	**1.04E-10**
Chromium	4.55E-06	4.47E-07	0.00E+00	0.00E+00	1.67E-05	5.34E-05	18	4.50E-03	**1.33E-10**
2,4-Dinitrotoluene	0.00E+00	0.00E+00	4.01E-08	1.69E-06	5.47E-06	1.75E-05	0.87	1.90E+00	**3.82E-07**
2,6-Dinitrotoluene	0.00E+00	0.00E+00	4.01E-08	1.69E-06	5.47E-06	1.75E-05	0.67	1.70E+00	**4.44E-07**
Di-n-octyl Phthalate	9.10E-07	9.08E-08	6.73E-07	2.84E-05	9.50E-05	3.04E-04	280000	3.20E+02	**3.48E-09**
GB	4.03E-15	4.01E-16	8.44E-09	3.56E-07	1.15E-06	3.68E-06	0.032	9.30E-01	**1.07E-06**
HD/HT	1.04E-11	1.04E-12	8.44E-07	3.56E-05	1.15E-04	3.68E-04	1.2	1.16E+00	**3.53E-06**
Lead	9.47E-06	9.36E-07	0.00E+00	0.00E+00	3.47E-05	1.11E-04	600	NA	**NA**
Mercury	0.00E+00	0.00E+00	7.64E-07	3.23E-05	1.04E-04	3.34E-04	57000	NA	**NA**
Nickel	7.15E-06	7.04E-07	0.00E+00	0.00E+00	2.62E-05	8.38E-05	82	4.00E-03	**4.09E-11**
Total PCBs	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4300	2.10E+03	**0.00E+00**
Selenium	9.59E-06	9.49E-07	0.00E+00	0.00E+00	3.51E-05	1.12E-04	4.3	2.00E-02	**5.23E-09**
Silver	1.30E-05	1.28E-06	0.00E+00	0.00E+00	4.75E-05	1.52E-04	0.4	1.00E-01	**3.80E-07**
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.37E-10	1.36E-11	1.27E-11	5.35E-10	2.23E-09	7.14E-09	142000	1.21E+04	**6.08E-12**
Thallium	2.73E-05	2.67E-06	1.65E-15	6.98E-14	1.00E-04	3.20E-04	74	4.00E-04	**1.73E-11**
VX	1.27E-11	1.26E-12	8.44E-09	3.55E-07	1.15E-06	3.68E-06	0.15	1.85E+00	**4.54E-07**
Di-n-butyl Phthalate	9.10E-07	9.08E-08	6.73E-07	2.84E-05	9.50E-05	3.04E-04	1.6	1.80E+02	**3.42E-04**
Diethyl Phthalate	8.43E-07	8.35E-08	6.19E-07	2.61E-05	8.74E-05	2.80E-04	5.3	6.56E+00	**3.49E-06**
Manganese	4.48E-06	4.45E-07	0.00E+00	0.00E+00	1.64E-05	5.25E-05	23	1.00E-01	**2.28E-09**
4-Methylphenol	7.94E-12	7.92E-13	8.42E-07	3.55E-05	1.15E-04	3.67E-04	0.50	1.76E+00	**1.29E-05**
RDX	0.00E+00	0.00E+00	4.01E-08	1.69E-06	5.47E-06	1.75E-05	0.63	9.61E-01	**2.67E-07**
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	4.01E-08	1.69E-06	5.47E-06	1.75E-05	11	4.44E+00	**7.06E-08**
Vanadium	7.14E-06	7.00E-07	0.00E+00	0.00E+00	2.61E-05	8.36E-05	100	1.00E-01	**8.36E-10**

Table A-2.3.5 Case 3. With PFS, HHRA Protocol: UMCDF ADULT RESIDENT

INDIRECT EXPOSURES Calculation of cancer risks

Consumption rate of soil, CR(soil)=	0.0001 kg/day
Fraction of soil impacted, F(soil)=	1 unitless
Consumption rate of abv grd veg, CR(ag)=	0.024 kg/day
Fraction of abv grd veg impacted, F(ag)=	0.25 unitless
Consumption rate of root veg, CR(bg)=	0.0063 kg/day
Fraction of root veg impacted, F(bg)=	0.25 unitless
Exposure duration, ED=	30 yr
Exposure frequency, EF=	350 day/yr
Body weight, BW=	70 kg
Averaging time, AT=	70 yr

I(tot) = Total daily intake of substance
Sc = Soil concentration after total time period of deposition
I(soil) = Daily intake of substance from soil
Pd + Pv = Concentration in plant
I(ag) = Daily intake of substance from above ground vegetables
Pr(bg) = Concentration in below ground plant parts due to root uptake
I(bg) = Daily intake of substance from below ground vegetables
CSF = Carcinogenic slope factor

Substances of Potential Concern	Sc (mg/kg)	I(soil) (mg/day)	Pd+Pv (mg/kg)	I(ag) (mg/day)	Pr(bg) (mg/kg)	I(bg) (mg/day)	I(tot) (mg/day)	CSF (per mg/kg-day)	Cancer Risk
Antimony	3.31E-03	3.31E-07	1.78E-05	1.07E-07	2.48E-08	3.91E-11	4.37E-07		
Arsenic	2.85E-03	2.85E-07	1.53E-05	9.19E-08	3.94E-10	6.20E-13	3.77E-07	1.50E+00	**3.32E-09**
Barium	4.23E-03	4.23E-07	2.36E-05	1.42E-07	5.99E-11	9.43E-14	5.65E-07		
Beryllium	9.34E-04	9.34E-08	5.21E-06	3.12E-08	1.00E-11	1.58E-14	1.25E-07	4.30E+00	**3.15E-09**
bis (2-Ethylhexyl) Phthalate	5.91E-03	5.91E-07	1.27E-06	7.64E-09	3.38E-09	5.32E-12	5.98E-07	1.40E-02	**4.92E-11**
Cadmium	1.04E-03	1.04E-07	5.80E-06	3.48E-08	1.04E-10	1.64E-13	1.39E-07		
Chromium	1.07E-03	1.07E-07	5.95E-06	3.57E-08	1.33E-10	2.10E-13	1.42E-07		
2,4-Dinitrotoluene	3.50E-04	3.50E-08	2.11E-09	1.27E-11	3.82E-07	6.02E-10	3.56E-08	6.80E-01	**1.42E-10**
2,6-Dinitrotoluene	3.50E-04	3.50E-08	1.83E-09	1.10E-11	4.44E-07	6.99E-10	3.57E-08	6.80E-01	**1.43E-10**
Di-n-octyl Phthalate	6.08E-03	6.08E-07	1.25E-06	7.47E-09	3.48E-09	5.47E-12	6.16E-07		
GB	7.36E-05	7.36E-09	8.60E-12	5.16E-14	1.07E-06	1.68E-09	9.04E-09		
HD/HT	7.36E-03	7.36E-07	6.05E-11	3.63E-13	3.53E-06	5.55E-09	7.41E-07	9.50E+00	**4.13E-08**
Lead	2.22E-03	2.22E-07	1.24E-05	7.43E-08	NA	NA	2.96E-07		
Mercury	6.68E-03	6.68E-07	6.18E-06	3.71E-08	NA	NA	7.05E-07		
Nickel	1.68E-03	1.68E-07	9.35E-06	5.61E-08	4.09E-11	6.44E-14	2.24E-07		
Total PCBs	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.70E+00	**0.00E+00**
Selenium	2.25E-03	2.25E-07	1.21E-05	7.24E-08	5.23E-09	8.24E-12	2.97E-07		
Silver	3.04E-03	3.04E-07	1.70E-05	1.02E-07	3.80E-07	5.99E-10	4.06E-07		
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.43E-07	1.43E-11	5.53E-10	3.32E-12	6.08E-12	9.58E-15	1.76E-11	1.50E+05	**1.55E-08**
Thallium	6.40E-03	6.40E-07	3.57E-05	2.14E-07	1.73E-11	2.73E-14	8.55E-07		
VX	7.36E-05	7.36E-09	6.71E-09	4.03E-11	4.54E-07	7.14E-10	8.11E-09		
Di-n-butyl Phthalate	6.08E-03	6.08E-07	1.29E-06	7.77E-09	3.42E-04	5.39E-07	1.15E-06		
Diethyl Phthalate	5.59E-03	5.59E-07	1.20E-06	7.20E-09	3.49E-06	5.49E-09	5.72E-07		
Manganese	1.05E-03	1.05E-07	5.86E-06	3.52E-08	2.28E-09	3.60E-12	1.40E-07		
4-Methylphenol	7.34E-03	7.34E-07	5.06E-09	3.04E-11	1.29E-05	2.03E-08	7.54E-07		
RDX	3.50E-04	3.50E-08	1.40E-12	8.39E-15	2.67E-07	4.20E-10	3.54E-08	1.10E-01	**2.29E-11**
2,4,6-Trinitrotoluene	3.50E-04	3.50E-08	3.27E-09	1.96E-11	7.06E-08	1.11E-10	3.51E-08	3.00E-02	**6.19E-12**
Vanadium	1.67E-03	1.67E-07	9.33E-06	5.60E-08	8.36E-10	1.32E-12	2.23E-07		

Total cancer risk= **6E-08**

Table A-2.3.6 Case 3. With PFS, HHRA Protocol: UMCDF ADULT RESIDENT
INDIRECT EXPOSURES

Calculation of hazard quotients, and hazard indices

Consumption rate of soil, CR(soil)=	0.0001	kg/day
Fraction of soil impacted, F(soil)=	1	unitless
Consumption rate of abv grd veg, CR(ag)=	0.024	kg/day
Fraction of abv grd veg impacted, F(ag)=	0.25	unitless
Consumption rate of root veg, CR(bg)=	0.0063	kg/day
Fraction of root veg impacted, F(bg)=	0.25	unitless
Body weight, BW=	70	kg

I(tot) = Total daily intake of substance
Sc = Soil concentration after total time period of deposition
I(soil) = Daily intake of substance from soil
Pd + Pv = Concentration in plant
I(ag) = Daily intake of substance from above ground vegetables
Pr(bg) = Concentration in below ground plant parts due to root uptake
I(bg) = Daily intake of substance from below ground vegetables
RfD = Reference dose
HI = Hazard Index

Substances of Potential Concern	Sc (mg/kg)	I(soil) (mg/day)	Pd+Pv (mg/kg)	I(ag) (mg/day)	Pr(bg) (mg/kg)	I(bg) (mg/day)	I(tot) (mg/day)	RfD (mg/kg-day)	Hazard Index Liver	Hazard Index Neuro	Hazard Quotient
Antimony	3.31E-03	3.31E-07	1.78E-05	1.07E-07	2.48E-08	3.91E-11	4.37E-07	4.00E-04			1E-05
Arsenic	2.85E-03	2.85E-07	1.53E-05	9.19E-08	3.94E-10	6.20E-13	3.77E-07	3.00E-04			2E-05
Barium	4 23E-03	4.23E-07	2.36E-05	1.42E-07	5.99E-11	9.43E-14	5.65E-07	7.00E-02			1E-07
Beryllium	9.34E-04	9.34E-08	5 21E-06	3.12E-08	1.00E-11	1.58E-14	1.25E-07	5.00E-03			3E-07
bis (2-Ethylhexyl) Phthalate	5.91E-03	5.91E-07	1.27E-06	7.64E-09	3.38E-09	5.32E-12	5.98E-07	2.00E-02	4.27E-07		4E-07
Cadmium	1.04E-03	1.04E-07	5.80E-06	3.48E-08	1.04E-10	1.64E-13	1.39E-07	1.00E-03			2E-06
Chromium	1 07E-03	1.07E-07	5.95E-06	3.57E-08	1.33E-10	2.10E-13	1.42E-07	5.00E-03			4E-07
2,4-Dinitrotoluene	3.50E-04	3.50E-08	2 11E-09	1.27E-11	3.82E-07	6.02E-10	3.56E-08	2.00E-03		2.54E-07	2E-07
2,6-Dinitrotoluene	3.50E-04	3.50E-08	1.83E-09	1.10E-11	4.44E-07	6.99E-10	3.57E-08	1.00E-03		5.10E-07	5E-07
Di-n-octyl Phthalate	6.08E-03	6.08E-07	1.25E-06	7.47E-09	3.48E-09	5.47E-12	6.16E-07	2.00E-02	4.40E-07		4E-07
GB	7.36E-05	7.36E-09	8.60E-12	5.16E-14	1.07E-06	1.68E-09	9.04E-09	4.30E-05		3.00E-06	3E-06
HD/HT	7.36E-03	7.36E-07	6.05E-11	3.63E-13	3.53E-06	5.55E-09	7.41E-07				
Lead	2.22E-03	2.22E-07	1.24E-05	7.43E-08	NA	NA	2.96E-07				
Mercury	6.68E-03	6.68E-07	6.18E-06	3.71E-08	NA	NA	7.05E-07	1.00E-04		1.01E-04	1E-04
Nickel	1.68E-03	1.68E-07	9.35E-06	5.61E-08	4.09E-11	6.44E-14	2.24E-07	2.00E-02	1.60E-07		2E-07
Total PCBs	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Selenium	2.25E-03	2.25E-07	1.21E-05	7.24E-08	5.23E-09	8.24E-12	2.97E-07	5.00E-03			8E-07
Silver	3.04E-03	3.04E-07	1.70E-05	1.02E-07	3.80E-07	5.99E-10	4.06E-07	5.00E-03			1E-06
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.43E-07	1.43E-11	5.53E-10	3.32E-12	6.08E-12	9.58E-15	1.76E-11				
Thallium	6.40E-03	6.40E-07	3.57E-05	2.14E-07	1.73E-11	2.73E-14	8.55E-07	8.00E-05	1.53E-04		1E-04
VX	7.36E-05	7.36E-09	6.71E-09	4.03E-11	4.54E-07	7.14E-10	8.11E-09	4.30E-05		2.69E-06	3E-06
Di-n-butyl Phthalate	6.08E-03	6.08E-07	1.29E-06	7.77E-09	3.42E-04	5.39E-07	1.15E-06	1.00E-01			2E-07
Diethyl Phthalate	5.59E-03	5.59E-07	1.20E-06	7.20E-09	3.49E-06	5.49E-09	5.72E-07	8.00E-01			1E-08
Manganese	1.05E-03	1.05E-07	5.86E-06	3.52E-08	2.28E-09	3.60E-12	1.40E-07	1.40E-01		1.43E-08	1E-08
4-Methylphenol	7.34E-03	7.34E-07	5.06E-09	3.04E-11	1.29E-05	2.03E-08	7.54E-07	5.00E-03		2.15E-06	2E-06
RDX	3.50E-04	3.50E-08	1.40E-12	8.39E-15	2.67E-07	4.20E-10	3.54E-08	3.00E-03			2E-07
2,4,6-Trinitrotoluene	3.50E-04	3.50E-08	3.27E-09	1.96E-11	7.06E-08	1.11E-10	3.51E-08	5.00E-04	1.00E-06		1E-06
Vanadium	1.67E-03	1.67E-07	9 33E-06	5.60E-08	8.36E-10	1.32E-12	2.23E-07	7.00E-03			4E-07
								HI=	0.00015	0.00011	0.0003

Table A-2.3.7 Case 3. With PFS, HHRA Protocol: UMCDF CHILD RESIDENT

INDIRECT EXPOSURES

Calculation of cancer risks

Consumption rate of soil, CR(soil)=	0.0002	kg/day
Fraction of soil impacted, F(soil)=	1	unitless
Consumption rate of abv grd veg, CR(ag)=	0.005	kg/day
Fraction of abv grd veg impacted, F(ag)=	0.25	unitless
Consumption rate of root veg, CR(bg)=	0.0014	kg/day
Fraction of root veg impacted, F(bg)=	0.25	unitless
Exposure duration, ED=	6	yr
Exposure frequency, EF=	350	day/yr
Body weight, BW=	15	kg
Averaging time, AT=	70	yr

I(tot) = Total daily intake of substance
Sc = Soil concentration after total time period of deposition
I(soil) = Daily intake of substance from soil
Pd + Pv = Concentration in plant
I(ag) = Daily intake of substance from above ground vegetables
Pr(bg) = Concentration in below ground plant parts due to root uptake
I(bg) = Daily intake of substance from below ground vegetables
CSF = Carcinogenic slope factor

Substances of Potential Concern	Sc (mg/kg)	I(soil) (mg/day)	Pd+Pv (mg/kg)	I(ag) (mg/day)	Pr(bg) (mg/kg)	I(bg) (mg/day)	I(tot) (mg/day)	CSF (per mg/kg-day)	Cancer Risk
Antimony	3.31E-03	6.61E-07	1.78E-05	2.22E-08	2.48E-08	8.68E-12	6.84E-07		
Arsenic	2.85E-03	5.71E-07	1.53E-05	1.91E-08	3.94E-10	1.38E-13	5.90E-07	1.50E+00	4.85E-09
Barium	4.23E-03	8.46E-07	2.36E-05	2.95E-08	5.99E-11	2.10E-14	8.76E-07		
Beryllium	9 34E-04	1.87E-07	5.21E-06	6.51E-09	1.00E-11	3.50E-15	1.93E-07	4.30E+00	4.55E-09
bis (2-Ethylhexyl) Phthalate	5.91E-03	1.18E-06	1.27E-06	1.59E-09	3.38E-09	1.18E-12	1.18E-06	1.40E-02	9.08E-11
Cadmium	1.04E-03	2.08E-07	5.80E-06	7.25E-09	1.04E-10	3.64E-14	2.15E-07		
Chromium	1.07E-03	2.13E-07	5.95E-06	7.44E-09	1.33E-10	4.67E-14	2.21E-07		
2,4-Dinitrotoluene	3.50E-04	7.00E-08	2.11E-09	2.64E-12	3.82E-07	1.34E-10	7.01E-08	6.80E-01	2.61E-10
2,6-Dinitrotoluene	3.50E-04	7.00E-08	1.83E-09	2.29E-12	4.44E-07	1.55E-10	7.01E-08	6.80E-01	2.61E-10
Di-n-octyl Phthalate	6.08E-03	1.22E-06	1.25E-06	1.56E-09	3.48E-09	1.22E-12	1.22E-06		
GB	7.36E-05	1.47E-08	8.60E-12	1.07E-14	1.07E-06	3.74E-10	1.51E-08		
HD/HT	7.36E-03	1.47E-06	6.05E-11	7.56E-14	3.53E-06	1.23E-09	1.47E-06	9.50E+00	7.67E-08
Lead	2.22E-03	4.44E-07	1.24E-05	1.55E-08	NA	NA	4.59E-07		
Mercury	6.68E-03	1.34E-06	6.18E-06	7.73E-09	NA	NA	1.34E-06		
Nickel	1.68E-03	3.35E-07	9.35E-06	1.17E-08	4.09E-11	1.43E-14	3.47E-07		
Total PCBs	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.70E+00	0.00E+00
Selenium	2.25E-03	4.50E-07	1.21E-05	1.51E-08	5.23E-09	1.83E-12	4.65E-07		
Silver	3.04E-03	6.08E-07	1.70E-05	2.12E-08	3.80E-07	1.33E-10	6.30E-07		
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.43E-07	2.86E-11	5.53E-10	6.92E-13	6.08E-12	2.13E-15	2.93E-11	1.50E+05	2.40E-08
Thallium	6.40E-03	1.28E-06	3.57E-05	4.46E-08	1.73E-11	6.06E-15	1.33E-06		
VX	7.36E-05	1.47E-08	6.71E-09	8.39E-12	4.54E-07	1.59E-10	1.49E-08		
Di-n-butyl Phthalate	6.08E-03	1.22E-06	1.29E-06	1.62E-09	3.42E-04	1.20E-07	1.34E-06		
Diethyl Phthalate	5.59E-03	1.12E-06	1.20E-06	1.50E-09	3.49E-06	1.22E-09	1.12E-06		
Manganese	1.05E-03	2.10E-07	5 86E-06	7.32E-09	2.28E-09	8.00E-13	2.18E-07		
4-Methylphenol	7.34E-03	1.47E-06	5.06E-09	6.33E-12	1.29E-05	4.52E-09	1.47E-06		
RDX	3.50E-04	7.00E-08	1.40E-12	1.75E-15	2.67E-07	9.34E-11	7.01E-08	1.10E-01	4.22E-11
2,4,6-Trinitrotoluene	3.50E-04	7.00E-08	3.27E-09	4.09E-12	7.06E-08	2.47E-11	7.00E-08	3.00E-02	1.15E-11
Vanadium	1.67E-03	3.35E-07	9.33E-06	1.17E-08	8.36E-10	2.93E-13	3.46E-07		

Total cancer risk= 1E-07

Table A-2.3.8 Case 3. With PFS, HHRA Protocol: UMCDF CHILD RESIDENT
INDIRECT EXPOSURES

Calculation of hazard quoti[illegible] indices

Consumption rate of soil, CR(soil)=	0.0002	kg/day
Fraction of soil impacted, F(soil)=	1	unitless
Consumption rate of abv grd veg, CR(ag)=	0.005	kg/day
Fraction of abv grd veg impacted, F(ag)=	0.25	unitless
Consumption rate of root veg, CR(bg)=	0.0014	kg/day
Fraction of root veg impacted, F(bg)=	0.25	unitless
Body weight, BW=	15	kg

I(tot) = Total daily intake of substance
Sc = Soil concentration after total time period of deposition
I(soil) = Daily intake of substance from soil
Pd + Pv = Concentration in plant
I(ag) = Daily intake of substance from above ground vegetables
Pr(bg) = Concentration in below ground plant parts due to root uptake
I(bg) = Daily intake of substance from below ground vegetables
RfD = Reference dose
HI = Hazard Index

Substances of Potential Concern	Sc (mg/kg)	I(soil) (mg/day)	Pd+Pv (mg/kg)	I(ag) (mg/day)	Pr(bg) (mg/kg)	I(bg) (mg/day)	I(tot) (mg/day)	RfD (mg/kg-day)	Hazard Index Liver	Hazard Index Neuro	Hazard Quotient
Antimony	3.31E-03	6.61E-07	1.78E-05	2.22E-08	2.48E-08	8.68E-12	6.84E-07	4.00E-04			1E-04
Arsenic	2.85E-03	5.71E-07	1.53E-05	1.91E-08	3.94E-10	1.38E-13	5.90E-07	3.00E-04			1E-04
Barium	4.23E-03	8.46E-07	2.36E-05	2.95E-08	5.99E-11	2.10E-14	8.76E-07	7.00E-02			8E-07
Beryllium	9.34E-04	1.87E-07	5.21E-06	6.51E-09	1.00E-11	3.50E-15	1.93E-07	5.00E-03			2E-06
bis (2-Ethylhexyl) Phthalate	5.91E-03	1.18E-06	1.27E-06	1.59E-09	3.38E-09	1.18E-12	1.18E-06	2.00E-02	8.45E-07		4E-06
Cadmium	1.04E-03	2.08E-07	5.80E-06	7.25E-09	1.04E-10	3.64E-14	2.15E-07	1.00E-03			1E-05
Chromium	1.07E-03	2.13E-07	5.95E-06	7.44E-09	1.33E-10	4.67E-14	2.21E-07	5.00E-03			3E-06
2,4-Dinitrotoluene	3.50E-04	7.00E-08	2.11E-09	2.64E-12	3.82E-07	1.34E-10	7.01E-08	2.00E-03		5.01E-07	2E-06
2,6-Dinitrotoluene	3.50E-04	7.00E-08	1.83E-09	2.29E-12	4.44E-07	1.55E-10	7.01E-08	1.00E-03		1.00E-06	4E-06
Di-n-octyl Phthalate	6.08E-03	1.22E-06	1.25E-06	1.56E-09	3.48E-09	1.22E-12	1.22E-06	2.00E-02	8.70E-07		4E-06
GB	7.36E-05	1.47E-08	8.60E-12	1.07E-14	1.07E-06	3.74E-10	1.51E-08	4.30E-05		5.01E-06	2E-05
HD/HT	7.36E-03	1.47E-06	6.05E-11	7.56E-14	3.53E-06	1.23E-09	1.47E-06				
Lead	2.22E-03	4.44E-07	1.24E-05	1.55E-08	NA	NA	4.59E-07				
Mercury	6.68E-03	1.34E-06	6.18E-06	7.73E-09	NA	NA	1.34E-06	1.00E-04		1.92E-04	9E-04
Nickel	1.68E-03	3.35E-07	9.35E-06	1.17E-08	4.09E-11	1.43E-14	3.47E-07	2.00E-02	2.48E-07		1E-06
Total PCBs	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Selenium	2.25E-03	4.50E-07	1.21E-05	1.51E-08	5.23E-09	1.83E-12	4.65E-07	5.00E-03			6E-06
Silver	3.04E-03	6.08E-07	1.70E-05	2.12E-08	3.80E-07	1.33E-10	6.30E-07	5.00E-03			8E-06
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.43E-07	2.86E-11	5.53E-10	6.92E-13	6.08E-12	2.13E-15	2.93E-11				
Thallium	6.40E-03	1.28E-06	3.57E-05	4.46E-08	1.73E-11	6.06E-15	1.33E-06	8.00E-05	2.37E-04		1E-03
VX	7.36E-05	1.47E-08	6.71E-09	8.39E-12	4.54E-07	1.59E-10	1.49E-08	4.30E-05		4.94E-06	2E-05
Di-n-butyl Phthalate	6.08E-03	1.22E-06	1.29E-06	1.62E-09	3.42E-04	1.20E-07	1.34E-06	1.00E-01			9E-07
Diethyl Phthalate	5.59E-03	1.12E-06	1.20E-06	1.50E-09	3.49E-06	1.22E-09	1.12E-06	8.00E-01			9E-08
Manganese	1.05E-03	2.10E-07	5.86E-06	7.32E-09	2.28E-09	8.00E-13	2.18E-07	1.40E-01		2.22E-08	1E-07
4-Methylphenol	7.34E-03	1.47E-06	5.06E-09	6.33E-12	1.29E-05	4.52E-09	1.47E-06	5.00E-03		4.20E-06	2E-05
RDX	3.50E-04	7.00E-08	1.40E-12	1.75E-15	2.67E-07	9.34E-11	7.01E-08	3.00E-03			1E-06
2,4,6-Trinitrotoluene	3.50E-04	7.00E-08	3.27E-09	4.09E-12	7.06E-08	2.47E-11	7.00E-08	5.00E-04	2.00E-06		9E-06
Vanadium	1.67E-03	3.35E-07	9.33E-06	1.17E-08	8.36E-10	2.93E-13	3.46E-07	7.00E-03			3E-06
								HI=	0.0002	0.0002	0.002

Table A-2.3.9 Case 3. With PFS, HHRA Protocol: UMCDF RESIDENT

DIRECT INHALATION EXPOSURES

Exposure parameter	Exposure Scenario			
	Subsistence Farmer	Subsistence Fisher	Adult Resident	Child Resident
Inhalation rate, IR (m3/hr)	0.8	0.8	0.8	0.2
Exposure duration, ED (yr)	3.2	3.2	3.2	3.2
Body weight, BW (kg)	70	70	70	15
Exposure time, ET (hr/day)			24	24
Exposure frequency, EF (day/yr)			350	350
Carcinogenic averaging time, LT (day)			25550	25550
Noncancer averaging time, LT (day)			1168	1168

CSF = Cancer Slope Factor
RfD = Reference Dose
HI = Hazard Index

CDD = Chlorinated dibenzo-p-dioxin
CDF = Chlorinated dibenzo-p-furan

Substances of Potential Concern	Respirable Concentration (ug/m3)	Cancer Inh. Intake-Adult (mg/kg-day)	Cancer Inh. Intake-Child (mg/kg-day)	Inhalation CSF (per mg/kg-day)	Cancer Risk Adult	Cancer Risk Child	Inhalation RfD (mg/kg/day)	Hazard Quotient Adult	Hazard Quotient Child
Tetra CDD	2.17E-10	2.72E-15	3.05E-15	1.16E+05	3.15E-10	3.53E-10			
Penta CDD	1.07E-09	1.34E-14	1.50E-14	5.80E+04	7.78E-10	8.72E-10			
Hexa CDD	1.06E-09	1.33E-14	1.49E-14	1.53E-06	2.04E-20	2.28E-20			
Hepta CDD	1.06E-09	1.33E-14	1.49E-14	1.53E-07	2.03E-21	2.28E-21			
Octa CDD	2.12E-09	2.65E-14	2.97E-14	1.53E-08	4.06E-22	4.55E-22			
Tetra CDF	2.19E-10	2.74E-15	3.07E-15	1.53E-06	4.19E-21	4.70E-21			
Penta CDF	1.08E-09	1.35E-14	1.51E-14	7.66E-06	1.03E-19	1.16E-19			
Hexa CDF	1.06E-09	1.33E-14	1.49E-14	1.53E-06	2.04E-20	2.29E-20			
Hepta CDF	1.06E-09	1.33E-14	1.49E-14	1.53E-07	2.03E-21	2.28E-21			
Octa CDF	2.12E-09	2.65E-14	2.97E-14	1.53E-08	4.06E-22	4.55E-22			
2,3,7,8-TCDD TEQ	1.55E-09	1.94E-14	2.18E-14	1.50E+05	2.92E-09	3.27E-09			
Antimony	1.04E-04	1.30E-09	1.46E-09						
Arsenic	8.97E-05	1.12E-09	1.26E-09	5.00E+01	5.62E-08	6.29E-08			
Barium	1.33E-04	1.66E-09	1.86E-09				1.45E-03	2.51E-05	2.81E-05
Beryllium	2.92E-05	3.66E-10	4.09E-10	8.40E+00	3.07E-09	3.44E-09			
Boron	1.25E-04	1.56E-09	1.75E-09				5.60E-03	5.89E-06	6.59E-06
Cadmium	3.25E-05	4.07E-10	4.56E-10	6.30E+00	2.57E-09	2.87E-09			
Chromium	3.34E-05	4.19E-10	4.69E-10	4.10E+01	1.72E-08	1.92E-08			
Cobalt	5.24E-05	6.56E-10	7.35E-10						
Copper	5.66E-05	7.09E-10	7.94E-10						
Lead	6.99E-05	8.75E-10	9.80E-10						
Manganese	3.32E-05	4.16E-10	4.66E-10				1.40E-05	6.49E-04	7.27E-04
Mercury	3.23E-05	4.04E-10	4.53E-10				8.60E-05	1.03E-04	1.15E-04
Nickel	5.26E-05	6.58E-10	7.37E-10	8.40E-01	5.53E-10	6.19E-10			
Phosphorus	1.25E-04	1.56E-09	1.75E-09						
Selenium	7.08E-05	8.87E-10	9.94E-10						
Silver	9.56E-05	1.20E-09	1.34E-09						
Thallium	2.00E-04	2.50E-09	2.80E-09						
Tin	9.59E-05	1.20E-09	1.35E-09						
Vanadium	5.23E-05	6.55E-10	7.34E-10						
Zinc	7.08E-05	8.87E-10	9.94E-10						
Acetone	5.32E-06	6.66E-11	7.46E-11						
Benzene	9.56E-06	1.20E-10	1.34E-10	2.90E-02	3.47E-12	3.89E-12			
Bromodichloromethane	4.27E-06	5.34E-11	5.98E-11						
Bromoform	4.27E-06	5.34E-11	5.98E-11	3.85E-03	2.06E-13	2.30E-13			
2-Butanone	7.41E-06	9.28E-11	1.04E-10				2.90E-01	7.00E-09	7.84E-09
Carbon Disulfide	7.41E-06	9.28E-11	1.04E-10				2.90E-03	7.00E-07	7.84E-07
Carbon Tetrachloride	4.27E-06	5.34E-11	5.98E-11	5.30E-02	2.83E-12	3.17E-12			
Chlorobenzene	4.27E-06	5.34E-11	5.98E-11				5.80E-03	2.02E-07	2.26E-07
Chloroform	4.27E-06	5.34E-11	5.98E-11	8.10E-02	4.33E-12	4.85E-12			
Chloromethane	4.27E-06	5.34E-11	5.98E-11	6.30E-03	3.37E-13	3.77E-13			
Dibromochloromethane	4.27E-06	5.34E-11	5.98E-11						
1,1-Dichloroethane	4.27E-06	5.34E-11	5.98E-11				1.45E+00	8.06E-10	9.03E-10
1,2-Dichloropropane	4.27E-06	5.34E-11	5.98E-11				3.80E-03	3.08E-07	3.45E-07
cis-1,3-Dichloropropene	4.27E-06	5.34E-11	5.98E-11	1.30E-01	6.95E-12	7.78E-12	5.80E-03	2.02E-07	2.26E-07
trans-1,3-Dichloropropene	4.27E-06	5.34E-11	5.98E-11	1.30E-01	6.95E-12	7.78E-12	5.70E-03	2.05E-07	2.30E-07
Ethylbenzene	4.27E-06	5.34E-11	5.98E-11				2.90E-01	4.03E-09	4.51E-09
2-Hexanone	4.27E-06	5.34E-11	5.98E-11						
Methylene Chloride	4.27E-06	5.34E-11	5.98E-11	1.70E-03	9.08E-14	1.02E-13	8.70E-01	1.34E-09	1.50E-09
4-Methyl-2-pentanone	4.27E-06	5.34E-11	5.98E-11				2.30E-01	5.08E-09	5.69E-09
Styrene	4.27E-06	5.34E-11	5.98E-11				8.70E-01	1.34E-09	1.50E-09
1,1,2,2-Tetrachloroethane	4.27E-06	5.34E-11	5.98E-11	2.00E-01	1.07E-11	1.20E-11			
Tetrachloroethene	4.27E-06	5.34E-11	5.98E-11						
Toluene	4.27E-06	5.34E-11	5.98E-11				1.10E-01	1.06E-08	1.19E-08
1,1,1-Trichloroethane	5.32E-06	6.66E-11	7.46E-11						
Vinyl Acetate	3.22E-06	4.03E-11	4.51E-11				5.70E-02	1.55E-08	1.73E-08
Vinyl Chloride	9.56E-06	1.20E-10	1.34E-10	3.00E-01	3.59E-11	4.02E-11			
Xylenes	4.27E-06	5.34E-11	5.98E-11						
Benzoic Acid	3.90E-05	4.89E-10	5.47E-10						
Benzyl Alcohol	3.55E-05	4.44E-10	4.97E-10						
Diethyl Phthalate	3.23E-05	4.05E-10	4.53E-10						
Dimethyl Phthalate	3.23E-05	4.05E-10	4.53E-10						
Di-n-butyl Phthalate	3.51E-05	4.40E-10	4.93E-10						
Di-n-octyl Phthalate	3.51E-05	4.40E-10	4.93E-10						
bis(2-Ethylhexyl)-Phthalate	3.41E-05	4.27E-10	4.79E-10						
2-Methylphenol	3.55E-05	4.44E-10	4.97E-10						
3-Methylphenol	3.44E-05	4.31E-10	4.83E-10						
4-Methylphenol	3.55E-05	4.44E-10	4.97E-10						
Naphthalene	3.26E-05	4.08E-10	4.57E-10						
GB	3.56E-07	4.45E-12	4.99E-12				8.67E-07	1.12E-04	1.26E-04
HD/HT	3.56E-05	4.45E-10	4.99E-10	9.50E+00	4.23E-09	4.74E-09	2.90E-05	3.36E-04	3.76E-04
VX	3.56E-07	4.45E-12	4.99E-12				8.67E-07	1.12E-04	1.26E-04
Chlorine	6.43E-02	8.06E-07	9.02E-07						
Hydrogen Chloride	3.77E-01	4.72E-06	5.29E-06				5.80E-03	1.78E-02	1.99E-02
Hydrogen Fluoride	2.88E-01	3.61E-06	4.05E-06						
Nitroglycerine	0.00E+00	0.00E+00	0.00E+00						
PCB	0.00E+00	0.00E+00	0.00E+00						
Particulate	1.04E-01	1.30E-06	1.46E-06						
2,4-Dinitrotoluene	1.69E-06	2.12E-11	2.37E-11						
2,6-Dinitrotoluene	1.69E-06	2.12E-11	2.37E-11						
2,4,6-Trinitrotoluene	1.69E-06	2.12E-11	2.37E-11						
RDX	1.69E-06	2.12E-11	2.37E-11						
HMX	1.69E-06	2.12E-11	2.37E-11						
					9E-08	1E-07	Total HI=	0.02	0.02

Table A-2.3.10 Case 3. With PFS, HHRA Protocol: UMCDF ADULT RESIDENT

	Risk UMCDF	HI-Liver UMCDF	HI-Neuro UMCDF	HQ		Risk-Inh. UMCDF	HI-Inh. UMCDF
Indirect					**Inhalation**		
Antimony				1.50E-05	Tetra CDD	3.15E-10	
Arsenic	3.32E-09			1.72E-05	Penta CDD	7.78E-10	
Barium				1.10E-07	Hexa CDD	2.04E-20	
Beryllium	3.15E-09			3.41E-07	Hepta CDD	2.03E-21	
bis (2-Ethylhexyl) Phthalate	4.92E-11	4.27E-07		4.10E-07	Octa CDD	4.06E-22	
Cadmium				1.90E-06	Tetra CDF	4.19E-21	
Chromium				3.90E-07	Penta CDF	1.03E-19	
2,4-Dinitrotoluene	1.42E-10		2.54E-07	2.44E-07	Hexa CDF	2.04E-20	
2,6-Dinitrotoluene	1.43E-10		5.10E-07	4.89E-07	Hepta CDF	2.03E-21	
Di-n-octyl Phthalate		4.40E-07		4.22E-07	Octa CDF	4.06E-22	
GB			3.00E-06	2.88E-06	2,3,7,8-TCDD TEQ	2.92E-09	
HD/HT	4.13E-08				Antimony		
Lead					Arsenic	5.62E-08	
Mercury			1.01E-04	9.65E-05	Barium		2.51E-05
Nickel				1.53E-07	Beryllium	3.07E-09	
Total PCBs					Boron		5.89E-06
Selenium				8.14E-07	Cadmium	2.57E-09	
Silver				1.11E-06	Chromium	1.72E-08	
2,3,7,8-TCDD & Others	1.55E-08				Cobalt		
Thallium		1.53E-04		1.46E-04	Copper		
VX			2.69E-06	2.58E-06	Lead		
Di-n-butyl Phthalate				1.58E-07	Manganese		6.49E-04
Diethyl Phthalate				9.80E-09	Mercury		1.03E-04
Manganese			1.43E-08	1.37E-08	Nickel	5.53E-10	0.00E+00
4-Methylphenol			2.15E-06	2.07E-06	Phosphorus		
RDX	2.29E-11			1.62E-07	Selenium		
2,4,6-Trinitrotoluene	6.19E-12	1.00E-06		9.62E-07	Silver		
Vanadium				4.37E-07	Thallium		
					Tin		
					Vanadium		
					Zinc		
					Acetone		
					Benzene	3.47E-12	
					Bromodichloromethane		
					Bromoform	2.06E-13	
					2-Butanone		7.00E-09
					Carbon Disulfide		7.00E-07
					Carbon Tetrachloride	2.83E-12	
					Chlorobenzene		2.02E-07
					Chloroform	4.33E-12	
					Chloromethane	3.37E-13	
					Dibromochloromethane		
					1,1-Dichloroethane		8.06E-10
					1,2-Dichloropropane		3.08E-07
					cis-1,3-Dichloropropene	6.95E-12	2.02E-07
					trans-1,3-Dichloropropene	6.95E-12	2.05E-07
					Ethylbenzene		4.03E-09
					2-Hexanone		
					Methylene Chloride	9.08E-14	1.34E-09
					4-Methyl-2-pentanone		
					Styrene		1.34E-09
					1,1,2,2-Tetrachloroethane	1.07E-11	
					Tetrachloroethene		
					Toluene		1.06E-08
					1,1,1-Trichloroethane		
					Vinyl Acetate		1.55E-08
					Vinyl Chloride	3.59E-11	
					Xylenes		
					Benzoic Acid		
					Benzyl Alcohol		
					Diethyl Phthalate		
					Dimethyl Phthalate		
					Di-n-butyl Phthalate		
					Di-n-octyl Phthalate		
					bis(2-Ethylhexyl)-Phthalate		
					2-Methylphenol		
					3-Methylphenol		
					4-Methylphenol		
					Naphthalene		
					GB		1.12E-04
					HD/HT	4.23E-09	3.36E-04
					VX		1.12E-04
					Chlorine		
					Hydrogen Chloride		1.78E-02
					Hydrogen Fluoride		
					Nitroglycerine		
					PCB		
					Particulates		
					2,4-Dinitrotoluene		
					2,6-Dinitrotoluene		
					2,4,6-Trinitrotoluene		
					RDX		
					HMX		
Total	6.37E-08	1.54E-04	1.09E-04			8.67E-08	1.91E-02
Grand Total	2E-07	0.000154	0.00011			9E-08	0.02

Table A-2.3.11 Case 3. With PFS, HHRA Protocol: UMCDF CHILD RESIDENT

	Risk UMCDF	HI-Liver UMCDF	HI-Neuro UMCDF	HQ		Risk-Inh. UMCDF	HI-Inh. UMCDF
Indirect					**Inhalation**		
Antimony				1.09E-04	Tetra CDD	3.53E-10	
Arsenic	4.85E-09			1.26E-04	Penta CDD	8.72E-10	
Barium				8.00E-07	Hexa CDD	2.28E-20	
Beryllium	4.55E-09			2.47E-06	Hepta CDD	2.28E-21	
bis (2-Ethylhexyl) Phthalate	9.08E-11	8.45E-07		3.78E-06	Octa CDD	4.55E-22	
Cadmium				1.38E-05	Tetra CDF	4.70E-21	
Chromium				2.82E-06	Penta CDF	1.16E-19	
2,4-Dinitrotoluene	2.61E-10		5.01E-07	2.24E-06	Hexa CDF	2.29E-20	
2,6-Dinitrotoluene	2.61E-10		1.00E-06	4.48E-06	Hepta CDF	2.28E-21	
Di-n-octyl Phthalate		8.70E-07		3.89E-06	Octa CDF	4.55E-22	
GB			5.01E-06	2.24E-05	2,3,7,8-TCDD TEQ	3.27E-09	
HD/HT	7.67E-08				Antimony		
Lead					Arsenic	6.29E-08	
Mercury			1.92E-04	8.58E-04	Barium		2.81E-05
Nickel				1.11E-06	Beryllium	3.44E-09	
Total PCBs					Boron		6.59E-06
Selenium				5.94E-06	Cadmium	2.87E-09	
Silver				8.05E-06	Chromium	1.92E-08	
2,3,7,8-TCDD & Others	2.40E-08				Cobalt		
Thallium		2.37E-04		1.06E-03	Copper		
VX			4.94E-06	2.21E-05	Lead		
Di-n-butyl Phthalate				8.55E-07	Manganese		7.27E-04
Diethyl Phthalate				8.96E-08	Mercury		1.15E-04
Manganese			2.22E-08	9.93E-08	Nickel	6.19E-10	
4-Methylphenol			4.20E-06	1.88E-05	Phosphorus		
RDX	4.22E-11			1.49E-06	Selenium		
2,4,6-Trinitrotoluene	1.15E-11	2.00E-06		8.95E-06	Silver		
Vanadium				3.16E-06	Thallium		
					Tin		
					Vanadium		
					Zinc		
					Acetone		
					Benzene	3.89E-12	
					Bromodichloromethane		
					Bromoform	2.30E-13	
					2-Butanone		7.84E-09
					Carbon Disulfide		7.84E-07
					Carbon Tetrachloride	3.17E-12	
					Chlorobenzene		2.26E-07
					Chloroform	4.85E-12	
					Chloromethane	3.77E-13	
					Dibromochloromethane		
					1,1-Dichloroethane		9.03E-10
					1,2-Dichloropropane		3.45E-07
					cis-1,3-Dichloropropene	7.78E-12	2.26E-07
					trans-1,3-Dichloropropene	7.78E-12	2.30E-07
					Ethylbenzene		4.51E-09
					2-Hexanone		
					Methylene Chloride	1.02E-13	1.50E-09
					4-Methyl-2-pentanone		
					Styrene		1.50E-09
					1,1,2,2-Tetrachloroethane	1.20E-11	
					Tetrachloroethene		
					Toluene		1.19E-08
					1,1,1-Trichloroethane		
					Vinyl Acetate		1.73E-08
					Vinyl Chloride	4.02E-11	
					Xylenes		
					Benzoic Acid		
					Benzyl Alcohol		
					Diethyl Phthalate		
					Dimethyl Phthalate		
					Di-n-butyl Phthalate		
					Di-n-octyl Phthalate		
					bis(2-Ethylhexyl)-Phthalate		
					2-Methylphenol		
					3-Methylphenol		
					4-Methylphenol		
					Naphthalene		
					GB		1.26E-04
					HD/HT	4.74E-09	3.76E-04
					VX		1.26E-04
					Chlorine		
					Hydrogen Chloride		1.99E-02
					Hydrogen Fluoride		
					Nitroglycerine		
					PCB		
					Particulates		
					2,4-Dinitrotoluene		
					2,6-Dinitrotoluene		
					2,4,6-Trinitrotoluene		
					RDX		
					HMX		
Total	1.11E-07	2.40E-04	2.08E-04			9.72E-08	2.14E-02
Grand Total	**2E-07**	**0.00024**	**0.00021**			1E-07	**0.02**

Table A-2.3.12 Case 3. With PFS, HHRA Protocol: UMCDF SUBSISTENCE FARMER

CONCENTRATIONS AND DEPOSITIONS: Calculated depos[illegible] exposure pathways

Substances of Potential Concern	Particulate Dry Deposition Pdd (g/m2)/yr	Particulate Wet Deposition Pwd (g/m2)/yr	Vapor Wet Deposition Vwd (g/m2)/yr	Vapor Concentration Vc (ug/m3)	Toxicity Equivalency Factor	2,3,7,8-TCDD Toxicity Equivalents Pdd (ug/m3)	2,3,7,8-TCDD Toxicity Equivalents Pwd (g/m2-yr)	2,3,7,8-TCDD Toxicity Equivalents Vwd (g/m2-yr)	2,3,7,8-TCDD Toxicity Equivalents Vc (ug/m3)
Tetra CDD	1.29E-11	1.28E-12	2.89E-12	1.22E-10	1.000	1.29E-11	1.28E-12	2.89E-12	1.22E-10
Penta CDD	1.06E-10	1.05E-11	6.83E-12	2.88E-10	0.500	5.29E-11	5.25E-12	3.42E-12	1.44E-10
Hexa CDD	1.33E-10	1.32E-11	1.84E-12	7.75E-11	0.100	1.33E-11	1.32E-12	1.84E-13	7.75E-12
Hepta CDD	1.40E-10	1.39E-11	5.26E-13	2.21E-11	0.010	1.40E-12	1.39E-13	5.26E-15	2.21E-13
Octa CDD	2.86E-10	2.83E-11	1.05E-14	4.43E-13	0.001	2.86E-13	2.83E-14	1.05E-17	4.43E-16
Tetra CDF	8.29E-12	8.22E-13	3.73E-12	1.57E-10	0.100	8.29E-13	8.22E-14	3.73E-13	1.57E-11
Penta CDF	8.29E-11	8.22E-12	1.10E-11	4.65E-10	0.500	4.14E-11	4.11E-12	5.52E-12	2.33E-10
Hexa CDF	1.27E-10	1.26E-11	2.89E-12	1.22E-10	0.100	1.27E-11	1.26E-12	2.89E-13	1.22E-11
Hepta CDF	1.37E-10	1.36E-11	1.05E-12	4.43E-11	0.010	1.37E-12	1.36E-13	1.05E-14	4.43E-13
Octa CDF	2.85E-10	2.83E-11	1.05E-13	4.43E-12	0.001	2.85E-13	2.83E-14	1.05E-16	4.43E-15
					Total =	1.37E-10	1.36E-11	1.27E-11	5.35E-10
Antimony	1.41E-05	1.39E-06	0.00E+00	0.00E+00					
Arsenic	1.22E-05	1.20E-06	0.00E+00	0.00E+00					
Barium	1.81E-05	1.78E-06	0.00E+00	0.00E+00					
Beryllium	3.99E-06	3.91E-07	0.00E+00	0.00E+00					
bis (2-Ethylhexyl) Phthalate	8.84E-07	8.82E-08	6.54E-07	2.75E-05					
Cadmium	4.44E 06	4.35E-07	0.00E+00	0.00E+00					
Chromium	4.55E-06	4.47E-07	0.00E+00	0.00E+00					
2,4-Dinitrotoluene	0.00E+00	0.00E+00	4.01E-08	1.69E-06					
2,6-Dinitrotoluene	0.00E+00	0.00E+00	4.01E-08	1.69E-06					
Di-n-octyl Phthalate	9.10E-07	9.08E-08	6.73E-07	2.84E-05					
GB	4.03E-15	4.01E-16	8.44E-09	3.56E-07					
HD/HT	1.04E-11	1.04E-12	8.44E-07	3.56E-05					
Lead	9.47E-06	9.36E-07	0.00E+00	0.00E+00					
Mercury	0.00E+00	0.00E+00	7.64E-07	3.23E-05					
Nickel	7.15E-06	7.04E-07	0.00E+00	0.00E+00					
PCB	0.00E+00	0.00E+00	0.00E+00	0.00E+00					
Selenium	9.59E-06	9.49E-07	0.00E+00	0.00E+00					
Silver	1.30E-05	1.28E-06	0.00E+00	0.00E+00					
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.37E-10	1.36E-11	1.27E-11	5.35E-10					
Thallium	2.73E-05	2.67E-06	1.65E-15	6.98E-14					
VX	1.27E-11	1.26E-12	8.44E-09	3.55E-07					
Di-n-butyl Phthalate	9.10E-07	9.08E-08	6.73E-07	2.84E-05					
Diethyl Phthalate	8.43E-07	8.35E-08	6.19E-07	2.61E-05					
Manganese	4.48E-06	4.45E-07	0.00E+00	0.00E+00					
4-Methlyphenol	7.94E-12	7.92E-13	8.42E-07	3.55E-05					
RDX	0.00E+00	0.00E+00	4.01E-08	1.69E-06					
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	4.01E-08	1.69E-06					
Vanadium	7.14E-06	7.00E-07	0.00E+00	0.00E+00					

CDD = Chlorinated dibenzo-p-dioxin
CDF = Chlorinated dibenzo-p-furan

Table A-2.3.13 Case 3. With PFS, HHRA Protocol: UMCDF SUBSISTENCE FARMER

SOIL INGESTION: Calculation of soil concentration due to deposition

Soil mixing depth, Z=	1	cm
Soil bulk density, BD=	1.5	g/cm3
Total deposition time period, Tc=	3.2	yrs
Dry deposition velocity of vapor phase, Vdv=	3	cm/s

Sc = Soil concentration after total time period of deposition
Ds = Deposition term
Pdd = Yearly dry deposition from particle phase
Pwd = Yearly wet deposition from particle phase
Vwd = Yearly wet deposition from vapor phase
Vc = Vapor phase air concentration

Substances of Potential Concern	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Vwd (g/m2-yr)	Vc (µg/m3)	Ds (1/yr)	Sc (mg/kg)
Antimony	1.41E-05	1.39E-06	0.00E+00	0.00E+00	**1.03E-03**	**3.31E-03**
Arsenic	1.22E-05	1.20E-06	0.00E+00	0.00E+00	**8.92E-04**	**2.85E-03**
Barium	1.81E-05	1.78E-06	0.00E+00	0.00E+00	**1.32E-03**	**4.23E-03**
Beryllium	3.99E-06	3.91E-07	0.00E+00	0.00E+00	**2.92E-04**	**9.34E-04**
bis (2-Ethylhexyl) Phthalate	8.84E-07	8.82E-08	6.54E-07	2.75E-05	**1.85E-03**	**5.91E-03**
Cadmium	4.44E-06	4.35E-07	0.00E+00	0.00E+00	**3.25E-04**	**1.04E-03**
Chromium	4.55E-06	4.47E-07	0.00E+00	0.00E+00	**3.33E-04**	**1.07E-03**
2,4-Dinitrotoluene	0.00E+00	0.00E+00	4.01E-08	1.69E-06	**1.09E-04**	**3.50E-04**
2,6-Dinitrotoluene	0.00E+00	0.00E+00	4.01E-08	1.69E-06	**1.09E-04**	**3.50E-04**
Di-n-octyl Phthalate	9.10E-07	9.08E-08	6.73E-07	2.84E-05	**1.90E-03**	**6.08E-03**
GB	4.03E-15	4.01E-16	8.44E-09	3.56E-07	**2.30E-05**	**7.36E-05**
HD/HT	1.04E-11	1.04E-12	8.44E-07	3.56E-05	**2.30E-03**	**7.36E-03**
Lead	9.47E-06	9.36E-07	0.00E+00	0.00E+00	**6.94E-04**	**2.22E-03**
Mercury	0.00E+00	0.00E+00	7.64E-07	3.23E-05	**2.09E-03**	**6.68E-03**
Nickel	7.15E-06	7.04E-07	0.00E+00	0.00E+00	**5.24E-04**	**1.68E-03**
PCB	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**	**0.00E+00**
Selenium	9.59E-06	9.49E-07	0.00E+00	0.00E+00	**7.03E-04**	**2.25E-03**
Silver	1.30E-05	1.28E-06	0.00E+00	0.00E+00	**9.50E-04**	**3.04E-03**
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.37E-10	1.36E-11	1.27E-11	5.35E-10	**4.46E-08**	**1.43E-07**
Thallium	2.73E-05	2.67E-06	1.65E-15	6.98E-14	**2.00E-03**	**6.40E-03**
VX	1.27E-11	1.26E-12	8.44E-09	3.55E-07	**2.30E-05**	**7.36E-05**
Di-n-butyl Phthalate	9.10E-07	9.08E-08	6.73E-07	2.84E-05	**1.90E-03**	**6.08E-03**
Diethyl Phthalate	8.43E-07	8.35E-08	6.19E-07	2.61E-05	**1.75E-03**	**5.59E-03**
Manganese	4.48E-06	4.45E-07	0.00E+00	0.00E+00	**3.28E-04**	**1.05E-03**
4-Methylphenol	7.94E-12	7.92E-13	8.42E-07	3.55E-05	**2.29E-03**	**7.34E-03**
RDX	0.00E+00	0.00E+00	4.01E-08	1.69E-06	**1.09E-04**	**3.50E-04**
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	4.01E-08	1.69E-06	**1.09E-04**	**3.50E-04**
Vanadium	7.14E-06	7.00E-07	0.00E+00	0.00E+00	**5.23E-04**	**1.67E-03**

Table A-2.3.14 Case 3. With PFS, HHRA Protocol: UMCDF SUBSISTENCE FARMER

CONSUMPTION OF ABOVE-GROUND VEGETABLES:

Calculation of above-ground vegetable concentration due to direct deposition
Calculation of above-ground vegetable concentration due to air-to-plant transfer

Interception fraction of edible portion, Rp=	0.04	unitless
Plant surface loss coefficient, kp=	18	1/yr
Time between rainfalls, t-rain=	14	days
Length of plant exposure per harvest, Tp=	0.16	yrs
Standing crop biomass, Yp=	1.7	kg DW/m2
Density of air, p=	1200	g/m3
Above ground veg. correction factor, VGab=	0.01	unitless

Pd = Concentration in plant due to direct deposition
Pv = Concentration in plant due to air-to-plant transfer
Pd + Pv = Concentration in plant due to direct deposition and air-to-plant transfer
Fw = Fraction of wet deposition of particles that adheres to plant
Bv = Air-to-plant bioconcentration factor

Substances of Potential Concern	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Fw	Pd (mg/kg)	Vc (µg/m3)	Bv (mg/kg)/(ug/g)	Pv (mg/kg)	Pd+Pv (mg/kg)
Antimony	1.41E-05	1.39E-06	0.2	**1.78E-05**	0.00E+00	NA	**0.00E+00**	**1.78E-05**
Arsenic	1.22E-05	1.20E-06	0.2	**1.53E-05**	0.00E+00	NA	**0.00E+00**	**1.53E-05**
Barium	1.81E-05	1.78E-06	0.6	**2.36E-05**	0.00E+00	NA	**0.00E+00**	**2.36E-05**
Beryllium	3.99E-06	3.91E-07	0.6	**5.21E-06**	0.00E+00	NA	**0.00E+00**	**5.21E-06**
bis (2-Ethylhexyl) Phthalate	8.84E-07	8.82E-08	0.6	**1.16E-06**	2.75E-05	5.11E+02	**1.17E-07**	**1.27E-06**
Cadmium	4.44E-06	4.35E-07	0.6	**5.80E-06**	0.00E+00	NA	**0.00E+00**	**5.80E-06**
Chromium	4.55E-06	4.47E-07	0.6	**5.95E-06**	0.00E+00	NA	**0.00E+00**	**5.95E-06**
2,4-Dinitrotoluene	0.00E+00	0.00E+00	0.6	**0.00E+00**	1.69E-06	1.50E+02	**2.11E-09**	**2.11E-09**
2,6-Dinitrotoluene	0.00E+00	0.00E+00	0.6	**0.00E+00**	1.69E-06	1.30E+02	**1.83E-09**	**1.83E-09**
Di-n-octyl Phthalate	9.10E-07	9.08E-08	0.6	**1.19E-06**	2.84E-05	2.32E+02	**5.48E-08**	**1.25E-06**
GB	4.03E-15	4.01E-16	0.6	**5.28E-15**	3.56E-07	2.90E+00	**8.59E-12**	**8.60E-12**
HD/HT	1.04E-11	1.04E-12	0.6	**1.36E-11**	3.56E-05	1.58E-01	**4.68E-11**	**6.05E-11**
Lead	9.47E-06	9.36E-07	0.6	**1.24E-05**	0.00E+00	NA	**0.00E+00**	**1.24E-05**
Mercury	0.00E+00	0.00E+00	0.6	**0.00E+00**	3.23E-05	2.30E+04	**6.18E-06**	**6.18E-06**
Nickel	7.15E-06	7.04E-07	0.6	**9.35E-06**	0.00E+00	NA	**0.00E+00**	**9.35E-06**
PCB	0.00E+00	0.00E+00	0.6	**0.00E+00**	0.00E+00	1.72E+03	**0.00E+00**	**0.00E+00**
Selenium	9.59E-06	9.49E-07	0.2	**1.21E-05**	0.00E+00	NA	**0.00E+00**	**1.21E-05**
Silver	1.30E-05	1.28E-06	0.6	**1.70E-05**	0.00E+00	NA	**0.00E+00**	**1.70E-05**
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.37E-10	1.36E-11	0.6	**1.80E-10**	5.35E-10	8.39E+04	**3.74E-10**	**5.53E-10**
Thallium	2.73E-05	2.67E-06	0.6	**3.57E-05**	6.98E-14	NA	**0.00E+00**	**3.57E-05**
VX	1.27E-11	1.26E-12	0.6	**1.66E-11**	3.55E-07	2.26E+03	**6.70E-09**	**6.71E-09**
Di-n-butyl Phthalate	9.10E-07	9.08E-08	0.6	**1.19E-06**	2.84E-05	4.40E+02	**1.04E-07**	**1.29E-06**
Diethyl Phthalate	8.43E-07	8.35E-08	0.6	**1.10E-06**	2.61E-05	4.48E+02	**9.74E-08**	**1.20E-06**
Manganese	4.48E-06	4.45E-07	0.6	**5.86E-06**	0.00E+00	NA	**0.00E+00**	**5.86E-06**
4-Methylphenol	7.94E-12	7.92E-13	0.6	**1.04E-11**	3.55E-05	1.71E+01	**5.05E-09**	**5.06E-09**
RDX	0.00E+00	0.00E+00	0.6	**0.00E+00**	1.69E-06	9.92E-02	**1.40E-12**	**1.40E-12**
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	0.6	**0.00E+00**	1.69E-06	2.32E+02	**3.27E-09**	**3.27E-09**
Vanadium	7.14E-06	7.00E-07	0.6	**9.33E-06**	0.00E+00	NA	**0.00E+00**	**9.33E-06**

Table A-2.3.15 Case 3. With PFS, HHRA Protocol: UMCDF SUBSISTENCE FARMER
CONSUMPTION OF ROOT VEGETABLES:

Calculation of soil concentration due to deposition
Calculation of root vegetable concentration due to root uptake

Soil mixing depth, Z=	20	cm
Soil bulk density, BD=	1.5	g/cm3
Total deposition time period, Tc=	3.2	yrs
Below ground veg. correction factor, VGbg=	0.01	unitless
Dry deposition velocity of vapor phase, Vdv=	3	cm/s

Pr(bg) = Root vegetable concentration due to root uptake
Sc = Soil concentration after total time period of deposition
Ds = Deposition term
Kds = Soil-water partition coefficient
RCF = Ratio of concentration in roots to concentration in soil pore water

Substances of Potential Concern	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Vwd (g/m2-yr)	Vc (µg/m3)	Ds (1/yr)	Sc (mg/kg)	Kds mL/g	RCF (mg/kg)/(ug/mL)	Pr(bg) (mg/kg)
Antimony	1.41E-05	1.39E-06	0.00E+00	0.00E+00	5.17E-05	1.65E-04	2	3.00E-02	2.48E-08
Arsenic	1.22E-05	1.20E-06	0.00E+00	0.00E+00	4.46E-05	1.43E-04	29	8.00E-03	3.94E-10
Barium	1.81E-05	1.78E-06	0.00E+00	0.00E+00	6.61E-05	2.12E-04	530	1.50E-02	5.99E-11
Beryllium	3.99E-06	3.91E-07	0.00E+00	0.00E+00	1.46E-05	4.67E-05	70	1.50E-03	1.00E-11
bis (2-Ethylhexyl) Phthalate	8.84E-07	8.82E-08	6.54E-07	2.75E-05	9.23E-05	2.95E-04	280000	3.20E+02	3.38E-09
Cadmium	4.44E-06	4.35E-07	0.00E+00	0.00E+00	1.63E-05	5.20E-05	160	3.20E-02	1.04E-10
Chromium	4.55E-06	4.47E-07	0.00E+00	0.00E+00	1.67E-05	5.34E-05	18	4.50E-03	1.33E-10
2,4-Dinitrotoluene	0.00E+00	0.00E+00	4.01E-08	1.69E-06	5.47E-06	1.75E-05	0.87	1.90E+00	3.82E-07
2,6-Dinitrotoluene	0.00E+00	0.00E+00	4.01E-08	1.69E-06	5.47E-06	1.75E-05	0.67	1.70E+00	4.44E-07
Di-n-octyl Phthalate	9.10E-07	9.08E-08	6.73E-07	2.84E-05	9.50E-05	3.04E-04	280000	3.20E+02	3.48E-09
GB	4.03E-15	4.01E-16	8.44E-09	3.56E-07	1.15E-06	3.68E-06	0.032	9.30E-01	1.07E-06
HD/HT	1.04E-11	1.04E-12	8.44E-07	3.56E-05	1.15E-04	3.68E-04	1.2	1.16E+00	3.53E-06
Lead	9.47E-06	9.36E-07	0.00E+00	0.00E+00	3.47E-05	1.11E-04	600	NA	NA
Mercury	0.00E+00	0.00E+00	7.64E-07	3.23E-05	1.04E-04	3.34E-04	57000	NA	NA
Nickel	7.15E-06	7.04E-07	0.00E+00	0.00E+00	2.62E-05	8.38E-05	82	4.00E-03	4.09E-11
PCB	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4300	2.10E+03	0.00E+00
Selenium	9.59E-06	9.49E-07	0.00E+00	0.00E+00	3.51E-05	1.12E-04	4.3	2.00E-02	5.23E-09
Silver	1.30E-05	1.28E-06	0.00E+00	0.00E+00	4.75E-05	1.52E-04	0.4	1.00E-01	3.80E-07
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.37E-10	1.36E-11	1.27E-11	5.35E-10	2.23E-09	7.14E-09	142000	1.21E+04	6.08E-12
Thallium	2.73E-05	2.67E-06	1.65E-15	6.98E-14	1.00E-04	3.20E-04	74	4.00E-04	1.73E-11
VX	1.27E-11	1.26E-12	8.44E-09	3.55E-07	1.15E-06	3.68E-06	0.15	1.85E+00	4.54E-07
Di-n-butyl Phthalate	9.10E-07	9.08E-08	6.73E-07	2.84E-05	9.50E-05	3.04E-04	1.6	1.80E+02	3.42E-04
Diethyl Phthalate	8.43E-07	8.35E-08	6.19E-07	2.61E-05	8.74E-05	2.80E-04	5.3	6.56E+00	3.49E-06
Manganese	4.48E-06	4.45E-07	0.00E+00	0.00E+00	1.64E-05	5.25E-05	23	1.00E-01	2.28E-09
4-Methylphenol	7.94E-12	7.92E-13	8.42E-07	3.55E-05	1.15E-04	3.67E-04	0.50	1.76E+00	1.29E-05
RDX	0.00E+00	0.00E+00	4.01E-08	1.69E-06	5.47E-06	1.75E-05	0.63	9.61E-01	2.67E-07
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	4.01E-08	1.69E-06	5.47E-06	1.75E-05	11	4.44E+00	7.06E-08
Vanadium	7.14E-06	7.00E-07	0.00E+00	0.00E+00	2.61E-05	8.36E-05	100	1.00E-01	8.36E-10

Table A-2.3.16 Case 3. With PFS, HHRA Protocol: UMCDF SUBSISTENCE FARMER

CONSUMPTION OF BEEF AND MILK:

USING TIME-AVERAGED SOIL CONCENTRATIONS

Calculation of beef concentration due to plant and soil ingestion
Calculation of milk concentration due to plant and soil ingestion

Interception fraction of edible portion, Rp=	0.44	unitless
Plant surface loss coefficient, kp=	18	1/yr
Time between rainfalls, t-rain=	14	days
Length of plant exposure per harvest, Tp=	0.12	yrs
Yield or standing crop biomass, Yp=	0.2	kgDW/m2
Fraction grown on impacted soil, F=	1	unitless
Quantity eaten by beef cattle, Qpb=	8.8	kg DW/day
Quantity soil eaten by beef cattle, Qsb=	0.4	kg soil/day
Quantity eaten by dairy cattle, Qpm=	13.2	kg DW/day
Quantity soil eaten by dairy cattle, Qsm=	0.4	kg soil/day
Density of air, p=	1200	g/m3

A(beef) = Concentration in beef
A(milk) = Concentration in milk
Sc = Soil concentration after total time period of deposition
Pd = Concentration in plant due to direct deposition
Pv = Concentration in plant due to air-to-plant transfer
Pd + Pv = Concentration in plant due to direct deposition and air-to-plant transfer
Vc = Concentration in air due to direct emissions
Bv = Air-to-Plant biotransfer factor
Ba(beef) = Biotransfer factor for beef
Ba(milk) = Biotransfer factor for milk

Substances of Potential Concern	Sc (mg/kg)	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Fw	Pd (mg/kg)	Vc (µg/m3)	Bv (mg/kg)/(ug/g)	Pv (mg/kg)	Pv+Pd (mg/kg)	Ba(beef) (day/kg)	A(beef) (mg/kg)	Ba(milk) (day/kg)	A(milk) (mg/kg)
Antimony	3.31E-03	1.41E-05	1.39E-06	0.2	1.56E-03	0.00E+00	NA	0.00E+00	1.56E-03	1.00E-03	1.50E-05	1.00E-04	2.19E-06
Arsenic	2.85E-03	1.22E-05	1.20E-06	0.2	1.34E-03	0.00E+00	NA	0.00E+00	1.34E-03	2.00E-03	2.59E-05	6.00E-03	1.13E-04
Barium	4.23E-03	1.81E-05	1.78E-06	0.6	2.07E-03	0.00E+00	NA	0.00E+00	2.07E-03	1.50E-04	2.98E-06	3.50E-04	1.01E-05
Beryllium	9.34E-04	3.99E-06	3.91E-07	0.6	4.56E-04	0.00E+00	NA	0.00E+00	4.56E-04	1.00E-03	4.39E-06	9.00E-07	5.76E-09
bis (2-Ethylhexyl) Phthalate	5.91E-03	8.84E-07	8.82E-08	0.6	1.01E-04	2.75E-05	5.11E+02	1.17E-05	1.13E-04	NA	NA	NA	NA
Cadmium	1.04E-03	4.44E-06	4.35E-07	0.6	5.08E-04	0.00E+00	NA	0.00E+00	5.08E-04	1.20E-01	5.87E-04	7.60E-03	5.42E-05
Chromium	1.07E-03	4.55E-06	4.47E-07	0.6	5.21E-04	0.00E+00	NA	0.00E+00	5.21E-04	5.50E-03	2.76E-05	1.50E-03	1.10E-05
2,4-Dinitrotoluene	3.50E-04	0.00E+00	0.00E+00	0.6	0.00E+00	1.69E-06	1.50E+02	2.11E-07	2.11E-07	2.50E-06	3.55E-10	7.90E-07	1.13E-10
2,6-Dinitrotoluene	3.50E-04	0.00E+00	0.00E+00	0.6	0.00E+00	1.69E-06	1.30E+02	1.83E-07	1.83E-07	1.90E-06	2.69E-10	6.10E-07	8.69E-11
Di-n-octyl Phthalate	6.08E-03	9.10E-07	9.08E-08	0.6	1.04E-04	2.84E-05	2.32E+02	5.48E-06	1.10E-04	NA	NA	NA	NA
GB	7.36E-05	4.03E-15	4.01E-16	0.6	4.62E-13	3.56E-07	2.90E+00	8.59E-10	8.60E-10	1.30E-07	3.63E-12	4.20E-08	1.24E-12
HD/HT	7.36E-03	1.04E-11	1.04E-12	0.6	1.20E-09	3.56E-05	1.58E-01	4.68E-09	5.88E-09	5.89E-07	1.73E-09	1.86E-07	5.47E-10
Lead	2.22E-03	9.47E-06	9.36E-07	0.6	1.08E-03	0.00E+00	NA	0.00E+00	1.08E-03	NA	NA	NA	NA
Mercury	6.68E-03	0.00E+00	0.00E+00	0.6	0.00E+00	3.23E-05	2.30E+04	6.18E-04	6.18E-04	8.00E-05	6.49E-07	4.00E-04	4.33E-06
Nickel	1.68E-03	7.15E-06	7.04E-07	0.6	8.19E-04	0.00E+00	NA	0.00E+00	8.19E-04	6.00E-03	4.73E-05	1.00E-03	1.15E-05
PCB	0.00E+00	0.00E+00	0.00E+00	0.6	0.00E+00	0.00E+00	1.72E+03	0.00E+00	0.00E+00	5.00E-02	0.00E+00	1.60E-02	0.00E+00
Selenium	2.25E-03	9.59E-06	9.49E-07	0.2	1.06E-03	0.00E+00	NA	0.00E+00	1.06E-03	1.50E-02	1.53E-04	4.00E-03	5.94E-05
Silver	3.04E-03	1.30E-05	1.28E-06	0.6	1.49E-03	0.00E+00	NA	0.00E+00	1.49E-03	3.00E-03	4.29E-05	2.00E-02	4.17E-04
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.43E-07	1.37E-10	1.36E-11	0.60	1.57E-08	5.35E-10	8.39E+04	3.74E-08	5.31E-08	4.00E-02	2.10E-08	7.00E-03	5.31E-09
Thallium	6.40E-03	2.73E-05	2.67E-06	0.6	3.13E-03	6.98E-14	NA	0.00E+00	3.13E-03	4.00E-02	1.20E-03	2.00E-03	8.78E-05
VX	7.36E-05	1.27E-11	1.26E-12	0.6	1.45E-09	3.55E-07	2.26E+03	6.70E-07	6.71E-07	2.45E-06	8.65E-11	7.76E-07	2.97E-11
Di-n-butyl Phthalate	6.08E-03	9.10E-07	9.08E-08	0.6	1.04E-04	2.84E-05	4.40E+02	1.04E-05	1.15E-04	NA	NA	NA	NA
Diethyl Phthalate	5.59E-03	8.43E-07	8.35E-08	0.6	9.66E-05	2.61E-05	4.48E+02	9.74E-06	1.06E-04	NA	NA	NA	NA
Manganese	1.05E-03	4.48E-06	4.45E-07	0.6	5.13E-04	0.00E+00	NA	0.00E+00	5.13E-04	1.20E-01	5.93E-04	2.00E-02	1.44E-04
4-Methylphenol	7.34E-03	7.94E-12	7.82E-13	0.6	9.10E-10	3.55E-05	1.71E+01	5.05E-07	5.06E-07	2.19E-06	6.44E-09	6.92E-07	2.04E-09
RDX	3.50E-04	0.00E+00	0.00E+00	0.6	0.00E+00	1.69E-06	9.92E-02	1.40E-10	1.40E-10	1.86E-07	2.60E-11	5.89E-08	8.24E-12
2,4,6-Trinitrotoluene	3.50E-04	0.00E+00	0.00E+00	0.6	0.00E+00	1.69E-06	2.32E+02	3.27E-07	3.27E-07	1.26E-05	1.80E-09	3.98E-06	5.74E-10
Vanadium	1.67E-03	7.14E-06	7.00E-07	0.6	8.18E-04	0.00E+00	NA	0.00E+00	8.18E-04	1.20E-01	9.44E-04	2.00E-02	2.29E-04

Table A-2.3.17 Case 3. With PFS, HHRA Protocol: UMCDF SUBSISTENCE FARMER

INDIRECT EXPOSURES: Calculation of cancer risks

Consumption rate of soil, CR(soil)=	0.0001	kg/day
Fraction of soil impacted, F(soil)=	1	unitless
Consumption rate of abv grd veg, CR(ag)=	0.024	kg/day
Fraction of abv grd veg impacted, F(ag)=	0.95	unitless
Consumption rate of root veg, CR(bg)=	0.0063	kg/day
Fraction of root veg impacted, F(bg)=	0.95	unitless
Consumption rate of beef, CR(beef)=	0.1	kg/day
Fraction of beef impacted, F(beef)=	0.44	unitless
Consumption rate of milk, CR(milk)=	0.3	kg/day
Fraction of milk impacted, F(milk)=	0.4	unitless
Exposure duration, ED=	40	yr
Exposure frequency, EF=	350	day/yr
Body weight, BW=	70	kg
Averaging time, AT=	70	yr

I(tot) = Total daily intake of substance
Sc = Soil concentration after total time period of deposition
I(soil) = Daily intake of substance from soil
Pd + Pv = Concentration in plant
I(ag) = Daily intake of substance from above ground vegetables
Pr(bg) = Concentration in below ground plant parts due to root uptake
I(bg) = Daily intake of substance from below ground vegetables
A(beef) = Concentration in beef
I(beef) = Daily intake of substance from beef
A(milk) = Concentration in milk
I(milk) = Daily intake of substance from milk
CSF = Carcinogenic slope factor

Substances of Potential Concern	Sc (mg/kg)	**I(soil) (mg/day)**	Pd+Pv (mg/kg)	**I(ag) (mg/day)**	Pr(bg) (mg/kg)	**I(bg) (mg/day)**	A(beef) (mg/kg)	**I(beef) (mg/day)**	A(milk) (mg/kg)	**I(milk) (mg/day)**	**I(tot) (mg/day)**	CSF (per mg/kg-day)	**Cancer Risk**
Antimony	3.31E-03	**3.31E-07**	1.78E-05	**4.05E-07**	2.48E-08	**1.48E-10**	1.50E-05	**6.61E-07**	2.19E-06	**2.62E-07**	**1.66E-06**		
Arsenic	2.85E-03	**2.85E-07**	1.53E-05	**3.49E-07**	3.94E-10	**2.36E-12**	2.59E-05	**1.14E-06**	1.13E-04	**1.36E-05**	**1.54E-05**	1.50E+00	**1.80E-07**
Barium	4.23E-03	**4.23E-07**	2.36E-05	**5.38E-07**	5.99E-11	**3.58E-13**	2.98E-06	**1.31E-07**	1.01E-05	**1.22E-06**	**2.31E-06**		
Beryllium	9.34E-04	**9.34E-08**	5.21E-06	**1.19E-07**	1.00E-11	**5.99E-14**	4.39E-06	**1.93E-07**	5.76E-09	**6.91E-10**	**4.06E-07**	4.30E+00	**1.37E-08**
bis (2-Ethylhexyl) Phthalate	5.91E-03	**5.91E-07**	1.27E-06	**2.90E-08**	3.38E-09	**2.02E-11**	NA	**NA**	NA	**NA**	**6.20E-07**	1.40E-02	**6.79E-11**
Cadmium	1.04E-03	**1.04E-07**	5.80E-06	**1.32E-07**	1.04E-10	**6.23E-13**	5.87E-04	**2.58E-05**	5.42E-05	**6.50E-06**	**3.26E-05**		
Chromium	1.07E-03	**1.07E-07**	5.95E-06	**1.36E-07**	1.33E-10	**7.98E-13**	2.76E-05	**1.21E-06**	1.10E-05	**1.32E-06**	**2.77E-06**		
2,4-Dinitrotoluene	3.50E-04	**3.50E-08**	2.11E-09	**4.82E-11**	3.82E-07	**2.29E-09**	3.55E-10	**1.56E-11**	1.13E-10	**1.35E-11**	**3.74E-08**	6.80E-01	**1.99E-10**
2,6-Dinitrotoluene	3.50E-04	**3.50E-08**	1.83E-09	**4.18E-11**	4.44E-07	**2.66E-09**	2.69E-10	**1.18E-11**	8.69E-11	**1.04E-11**	**3.77E-08**	6.80E-01	**2.01E-10**
Di-n-octyl Phthalate	6.08E-03	**6.08E-07**	1.25E-06	**2.84E-08**	3.48E-09	**2.08E-11**	NA	**NA**	NA	**NA**	**6.37E-07**		
GB	7.36E-05	**7.36E-09**	8.60E-12	**1.96E-13**	1.07E-06	**6.40E-09**	3.83E-12	**1.68E-13**	1.24E-12	**1.48E-13**	**1.38E-08**		
HD/HT	7.36E-03	**7.36E-07**	6.05E-11	**1.38E-12**	3.53E-06	**2.11E-08**	1.73E-09	**7.63E-11**	5.47E-10	**6.57E-11**	**7.57E-07**	9.50E+00	**5.63E-08**
Lead	2.22E-03	**2.22E-07**	1.24E-05	**2.82E-07**	NA	**NA**	NA	**NA**	NA	**NA**	**NA**		
Mercury	6.68E-03	**6.68E-07**	6.18E-06	**1.41E-07**	NA	**NA**	6.49E-07	**2.86E-08**	4.33E-06	**5.20E-07**	**1.36E-06**		
Nickel	1.68E-03	**1.68E-07**	9.35E-06	**2.13E-07**	4.09E-11	**2.45E-13**	4.73E-05	**2.08E-06**	1.15E-05	**1.38E-06**	**3.84E-06**		
PCB	0.00E+00	**0.00E+00**	0.00E+00	**0.00E+00**	0.00E+00	**0.00E+00**	0.00E+00	**0.00E+00**	0.00E+00	**0.00E+00**	**0.00E+00**	7.70E+00	**0.00E+00**
Selenium	2.25E-03	**2.25E-07**	1.21E-05	**2.75E-07**	5.23E-09	**3.13E-11**	1.53E-04	**6.74E-06**	5.94E-05	**7.13E-06**	**1.44E-05**		
Silver	3.04E-03	**3.04E-07**	1.70E-05	**3.87E-07**	3.80E-07	**2.28E-09**	4.29E-05	**1.89E-06**	4.17E-04	**5.00E-05**	**5.26E-05**		
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.43E-07	**1.43E-11**	5.53E-10	**1.26E-11**	6.08E-12	**3.64E-14**	2.10E-08	**9.23E-10**	5.31E-09	**6.37E-10**	**1.59E-09**	1.50E+05	**1.86E-06**
Thallium	6.40E-03	**6.40E-07**	3.57E-05	**8.14E-07**	1.73E-11	**1.04E-13**	1.20E-03	**5.30E-05**	8.78E-05	**1.05E-05**	**6.50E-05**		
VX	7.36E-05	**7.36E-09**	6.71E-09	**1.53E-10**	4.54E-07	**2.71E-09**	8.65E-11	**3.81E-12**	2.97E-11	**3.56E-12**	**1.02E-08**		
Di-n-butyl Phthalate	6.08E-03	**6.08E-07**	1.29E-06	**2.95E-08**	3.42E-04	**2.05E-06**	NA	**NA**	NA	**NA**	**2.69E-06**		
Diethyl Phthalate	5.59E-03	**5.59E-07**	1.20E-06	**2.73E-08**	3.49E-06	**2.09E-08**	NA	**NA**	NA	**NA**	**6.08E-07**		
Manganese	1.05E-03	**1.05E-07**	5.86E-06	**1.34E-07**	2.28E-09	**1.37E-11**	5.93E-04	**2.61E-05**	1.44E-04	**1.73E-05**	**4.36E-05**		
4-Methylphenol	7.34E-03	**7.34E-07**	5.06E-09	**1.15E-10**	1.29E-05	**7.73E-08**	6.44E-09	**2.83E-10**	2.04E-09	**2.44E-10**	**8.11E-07**		
RDX	3.50E-04	**3.50E-08**	1.40E-12	**3.19E-14**	2.67E-07	**1.60E-09**	2.60E-11	**1.15E-12**	8.24E-12	**9.89E-13**	**3.66E-08**	1.10E-01	**3.15E-11**
2,4,6-Trinitrotoluene	3.50E-04	**3.50E-08**	3.27E-09	**7.46E-11**	7.06E-08	**4.23E-10**	1.80E-09	**7.92E-11**	5.74E-10	**6.89E-11**	**3.56E-08**	3.00E-02	**8.37E-12**
Vanadium	1.67E-03	**1.67E-07**	9.33E-06	**2.13E-07**	8.36E-10	**5.01E-12**	9.44E-04	**4.15E-05**	2.29E-04	**2.75E-05**	**6.94E-05**		

Total cancer risk= 2E-06

Table A-2.3.18 Case 3. With PFS, HHRA Protocol: UMCDF SUBSISTENCE FARMER

INDIRECT EXPOSURES: Calculation of hazard quotients, and hazard indices

Consumption rate of soil, CR(soil)=	0.0001	kg/day
Fraction of soil impacted, F(soil)=	1	unitless
Consumption rate of abv grd veg, CR(ag)=	0.024	kg/day
Fraction of abv grd veg impacted, F(ag)=	0.95	unitless
Consumption rate of root veg, CR(bg)=	0.0063	kg/day
Fraction of root veg impacted, F(bg)=	0.95	unitless
Consumption rate of beef, CR(beef)=	0.1	kg/day
Fraction of beef impacted, F(beef)=	0.44	unitless
Consumption rate of milk, CR(milk)=	0.3	kg/day
Fraction of milk impacted, F(milk)=	0.4	unitless
Body weight, BW=	70	kg

I(tot) = Total daily intake of substance
Sc = Soil concentration after total time period of deposition
I(soil) = Daily intake of substance from soil
Pd + Pv = Concentration in plant
I(ag) = Daily intake of substance from above ground vegetables
Pr(bg) = Concentration in below ground plant parts due to root uptake
I(bg) = Daily intake of substance from below ground vegetables
A(beef) = Concentration in beef
I(beef) = Daily intake of substance from beef
A(milk) = Concentration in milk
I(milk) = Daily intake of substance from milk
RfD = Reference dose
HI = Hazard index

Substances of Potential Concern	Sc (mg/kg)	I(soil) (mg/day)	Pd+Pv (mg/kg)	I(ag) (mg/day)	Pr(bg) (mg/kg)	I(bg) (mg/day)	A(beef) (mg/kg)	I(beef) (mg/day)	A(milk) (mg/kg)	I(milk) (mg/day)	I(tot) (mg/day)	RfD (mg/kg-day)	Hazard Index	Hazard Index	Hazard Quotient
													Liver	Neuro	
Antimony	3.31E-03	3.31E-07	1.78E-05	4.05E-07	2.48E-08	1.48E-10	1.50E-05	6.61E-07	2.19E-06	2.62E-07	1.66E-06	4.00E-04			6E-05
Arsenic	2.85E-03	2.85E-07	1.53E-05	3.49E-07	3.94E-10	2.36E-12	2.59E-05	1.14E-06	1.13E-04	1.36E-05	1.54E-05	3.00E-04			7E-04
Barium	4.23E-03	4.23E-07	2.36E-05	5.38E-07	5.99E-11	3.58E-13	2.98E-06	1.31E-07	1.01E-05	1.22E-06	2.31E-06	7.00E-02			5E-07
Beryllium	9.34E-04	9.34E-08	5.21E-06	1.19E-07	1.00E-11	5.99E-14	4.39E-06	1.93E-07	5.76E-09	6.91E-10	4.06E-07	5.00E-03			1E-06
bis (2-Ethylhexyl) Phthalate	5.91E-03	5.91E-07	1.27E-06	2.90E-08	3.38E-09	2.02E-11	NA	NA	NA	NA	6.20E-07	2.00E-02	4.24E-07		4E-07
Cadmium	1.04E-03	1.04E-07	5.80E-06	1.32E-07	1.04E-10	6.23E-13	5.87E-04	2.58E-05	5.42E-05	6.50E-06	3.26E-05	1.00E-03			4E-04
Chromium	1.07E-03	1.07E-07	5.95E-06	1.36E-07	1.33E-10	7.98E-13	2.76E-05	1.21E-06	1.10E-05	1.32E-06	2.77E-06	5.00E-03			8E-06
2,4-Dinitrotoluene	3.50E-04	3.50E-08	2.11E-09	4.82E-11	3.82E-07	2.29E-09	3.55E-10	1.56E-11	1.13E-10	1.35E-11	3.74E-08	2.00E-03		2.56E-07	3E-07
2,6-Dinitrotoluene	3.50E-04	3.50E-08	1.83E-09	4.18E-11	4.44E-07	2.66E-09	2.69E-10	1.18E-11	8.69E-11	1.04E-11	3.77E-08	1.00E-03		5.17E-07	5E-07
Di-n-octyl Phthalate	6.08E-03	6.08E-07	1.25E-06	2.84E-08	3.48E-09	2.08E-11	NA	NA	NA	NA	6.37E-07	2.00E-02	4.36E-07		4E-07
GB	7.36E-05	7.36E-09	8.60E-12	1.96E-13	1.07E-06	6.40E-09	3.83E-12	1.68E-13	1.24E-12	1.48E-13	1.38E-08	4.30E-05		4.38E-06	4E-06
HD/HT	7.36E-03	7.36E-07	6.05E-11	1.38E-12	3.53E-06	2.11E-08	1.73E-09	7.63E-11	5.47E-10	6.57E-11	7.57E-07				
Lead	2.22E-03	2.22E-07	1.24E-05	2.82E-07	NA	NA	NA	NA	NA	NA	5.04E-07				
Mercury	6.68E-03	6.68E-07	6.18E-06	1.41E-07	NA	NA	6.49E-07	2.86E-08	4.33E-06	5.20E-07	1.36E-06	1.00E-04		1.86E-04	2E-04
Nickel	1.68E-03	1.68E-07	9.35E-06	2.13E-07	4.09E-11	2.45E-13	4.73E-05	2.08E-06	1.15E-05	1.38E-06	3.84E-06	2.00E-02	2.63E-06		3E-06
PCB	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Selenium	2.25E-03	2.25E-07	1.21E-05	2.75E-07	5.23E-09	3.13E-11	1.53E-04	6.74E-06	5.94E-05	7.13E-06	1.44E-05	5.00E-03			4E-05
Silver	3.04E-03	3.04E-07	1.70E-05	3.87E-07	3.80E-07	2.28E-09	4.29E-05	1.89E-06	4.17E-04	5.00E-05	5.26E-05	5.00E-03			1E-04
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.43E-07	1.43E-11	5.53E-10	1.26E-11	6.08E-12	3.64E-14	2.10E-08	9.23E-10	5.31E-09	6.37E-10	1.59E-09				
Thallium	6.40E-03	6.40E-07	3.57E-05	8.14E-07	1.73E-11	1.04E-13	1.20E-03	5.30E-05	8.78E-05	1.05E-05	6.50E-05	8.00E-05	1.11E-02		1E-02
VX	7.36E-05	7.36E-09	6.71E-09	1.53E-10	4.54E-07	2.71E-09	8.65E-11	3.81E-12	2.97E-11	3.56E-12	1.02E-08	4.30E-05		3.26E-06	3E-06
Di-n-butyl Phthalate	6.08E-03	6.08E-07	1.29E-06	2.95E-08	3.42E-04	2.05E-06	NA	NA	NA	NA	2.69E-06	1.00E-01			4E-07
Diethyl Phthalate	5.59E-03	5.59E-07	1.20E-06	2.73E-08	3.49E-06	2.09E-08	NA	NA	NA	NA	6.08E-07	8.00E-01			1E-08
Manganese	1.05E-03	1.05E-07	5.86E-06	1.34E-07	2.28E-09	1.37E-11	5.93E-04	2.61E-05	1.44E-04	1.73E-05	4.36E-05	1.40E-01		4.26E-06	4E-06
4-Methylphenol	7.34E-03	7.34E-07	5.06E-09	1.15E-10	1.29E-05	7.73E-08	6.44E-09	2.83E-10	2.04E-09	2.44E-10	8.11E-07	5.00E-03		2.22E-06	2E-06
RDX	3.50E-04	3.50E-08	1.40E-12	3.19E-14	2.67E-07	1.60E-09	2.60E-11	1.15E-12	8.24E-12	9.89E-13	3.66E-08	3.00E-03			2E-07
2,4,6-Trinitrotoluene	3.50E-04	3.50E-08	3.27E-09	7.46E-11	7.06E-08	4.23E-10	1.80E-09	7.92E-11	5.74E-10	6.89E-11	3.56E-08	5.00E-04	9.76E-07		1E-06
Vanadium	1.67E-03	1.67E-07	9.33E-06	2.13E-07	8.36E-10	5.01E-12	9.44E-04	4.15E-05	2.29E-04	2.75E-05	6.94E-05	7.00E-03			1E-04
												HI=	0.0111	0.0002	0.01

Table A-2.3.19 Case 3. With PFS, HHRA Protocol: UMCDF SUBSISTENCE FARMER

DIRECT INHALATION EXPOSURES:

Exposure Parameter	Exposure Scenario			
	Subsistence Farmer	Subsistence Fisher	Adult Resident	Child Resident
Inhalation rate, IR (m3/hr)	0.8	0.8	0.8	0.2
Exposure duration, ED (yr)	3.2	3.2	3.2	3.2
Body weight, BW (kg)	70	70	70	15
Exposure time, ET (hr/day)	24			
Exposure frequency, EF (day/yr)	350			
Carcinogenic averaging time, LT (day)	25550			
Noncancer averaging time, LT(day)	1168			

CSF = Cancer Slope Factor
RfD = Reference Dose
HI = Hazard Index

CDD = Chlorinated dibenzo-p-dioxin
CDF = Chlorinated dibenzo-p-furan

Substances of Potential Concern	Respirable Concentration (ug/m3)	Cancer Inh. Intake-Farmer (mg/kg-day)	Inhalation CSF (per mg/kg-day)	Cancer Risk Farmer	Inhalation RfD (mg/kg/day)	Hazard Quotient Farmer
Tetra CDD	2.17E-10	2.72E-15	1.16E+05	3.15E-10		
Penta CDD	1.07E-09	1.34E-14	5.80E+04	7.78E-10		
Hexa CDD	1.06E-09	1.33E-14	1.16E+04	1.54E-10		
Hepta CDD	1.06E-09	1.33E-14	1.16E+03	1.54E-11		
Octa CDD	2.12E-09	2.65E-14	1.16E+02	3.08E-12		
Tetra CDF	2.19E-10	2.74E-15	1.16E+04	3.18E-11		
Penta CDF	1.08E-09	1.35E-14	5.80E+04	7.84E-10		
Hexa CDF	1.06E-09	1.33E-14	1.16E+04	1.55E-10		
Hepta CDF	1.06E-09	1.33E-14	1.16E+03	1.54E-11		
Octa CDF	2.12E-09	2.65E-14	1.16E+02	3.08E-12		
2,3,7,8-TCDD TEQ	1.55E-09	1.94E-14	1.50E+05	2.92E-09		
Antimony	1.04E-04	1.30E-09				
Arsenic	8.97E-05	1.12E-09	5.00E+01	5.62E-08		
Barium	1.33E-04	1.66E-09			1.45E-03	2.51E-05
Beryllium	2.92E-05	3.66E-10	8.40E+00	3.07E-09		
Boron	1.25E-04	1.56E-09			5.80E-03	5.89E-06
Cadmium	3.25E-05	4.07E-10	6.30E+00	2.57E-09		
Chromium	3.34E-05	4.19E-10	4.10E+01	1.72E-08		
Cobalt	5.24E-05	6.56E-10				
Copper	5.66E-05	7.09E-10				
Lead	6.99E-05	8.75E-10				
Manganese	3.32E-05	4.16E-10			1.40E-05	6.49E-04
Mercury	3.23E-05	4.04E-10			8.60E-05	1.03E-04
Nickel	5.26E-05	6.58E-10	8.40E-01	5.53E-10		
Phosphorus	1.25E-04	1.56E-09				
Selenium	7.08E-05	8.87E-10				
Silver	9.56E-05	1.20E-09				
Thallium	2.00E-04	2.50E-09				
Tin	9.59E-05	1.20E-09				
Vanadium	5.23E-05	6.55E-10				
Zinc	7.08E-05	8.87E-10				
Acetone	5.32E-06	6.66E-11				
Benzene	9.56E-06	1.20E-10	2.90E-02	3.47E-12		
Bromodichloromethane	4.27E-06	5.34E-11				
Bromoform	4.27E-06	5.34E-11	3.85E-03	2.06E-13		
2-Butanone	7.41E-06	9.28E-11			2.90E-01	7.00E-09
Carbon Disulfide	7.41E-06	9.28E-11			2.90E-03	7.00E-07
Carbon Tetrachloride	4.27E-06	5.34E-11	5.30E-02	2.83E-12		
Chlorobenzene	4.27E-06	5.34E-11			5.80E-03	2.02E-07
Chloroform	4.27E-06	5.34E-11	8.10E-02	4.33E-12		
Chloromethane	4.27E-06	5.34E-11	6.30E-03	3.37E-13		
Dibromochloromethane	4.27E-06	5.34E-11				
1,1-Dichloroethane	4.27E-06	5.34E-11			1.45E+00	8.06E-10
1,2-Dichloropropane	4.27E-06	5.34E-11			3.80E-03	3.08E-07
cis-1,3-Dichloropropene	4.27E-06	5.34E-11	1.30E-01	6.95E-12	5.80E-03	2.02E-07
trans-1,3-Dichloropropene	4.27E-06	5.34E-11	1.30E-01	6.95E-12	5.70E-03	2.05E-07
Ethylbenzene	4.27E-06	5.34E-11			2.90E-01	4.03E-09
2-Hexanone	4.27E-06	5.34E-11				
Methylene Chloride	4.27E-06	5.34E-11	1.70E-03	9.08E-14	8.70E-01	1.34E-09
4-Methyl-2-pentanone	4.27E-06	5.34E-11			2.30E-01	5.08E-09
Styrene	4.27E-06	5.34E-11			8.70E-01	1.34E-09
1,1,2,2-Tetrachloroethane	4.27E-06	5.34E-11	2.00E-01	1.07E-11		
Tetrachloroethene	4.27E-06	5.34E-11				
Toluene	4.27E-06	5.34E-11			1.10E-01	1.06E-08
1,1,1-Trichloroethane	5.32E-06	6.66E-11				
Vinyl Acetate	3.22E-06	4.03E-11			5.70E-02	1.55E-08
Vinyl Chloride	9.56E-06	1.20E-10	3.00E-01	3.59E-11		
Xylenes	4.27E-06	5.34E-11				
Benzoic Acid	3.90E-05	4.89E-10				
Benzyl Alcohol	3.55E-05	4.44E-10				
Diethyl Phthalate	3.23E-05	4.05E-10				
Dimethyl Phthalate	3.23E-05	4.05E-10				
Di-n-butyl Phthalate	3.51E-05	4.40E-10				
Di-n-octyl Phthalate	3.51E-05	4.40E-10				
bis(2-Ethylhexyl)-Phthalate	3.41E-05	4.27E-10				
2-Methylphenol	3.55E-05	4.44E-10				
3-Methylphenol	3.44E-05	4.31E-10				
4-Methylphenol	3.55E-05	4.44E-10				
Naphthalene	3.26E-05	4.08E-10				
GB	3.56E-07	4.45E-12			8.67E-07	1.12E-04
HD/HT	3.56E-05	4.45E-10	9.50E+00	4.23E-09	2.90E-05	3.36E-04
VX	3.56E-07	4.45E-12			8.67E-07	1.12E-04
Chlorine	6.43E-02	8.06E-07				
Hydrogen Chloride	3.77E-01	4.72E-06			5.80E-03	1.78E-02
Hydrogen Fluoride	2.88E-01	3.61E-06				
Nitroglycerine	0.00E+00	0.00E+00				
PCB	0.00E+00	0.00E+00				
Particulate	1.04E-01	1.30E-06				
2,4-Dinitrotoluene	1.69E-06	2.12E-11				
2,6-Dinitrotoluene	1.69E-06	2.12E-11				
2,4,6-Trinitrotoluene	1.69E-06	2.12E-11				
RDX	1.69E-06	2.12E-11				
HMX	1.69E-06	2.12E-11				
				9E-08	Total HI=	0.02

Table A-2.3.20 Case 3. With PFS, HHRA Protocol: UMCDF SUBSISTENCE FARMER

	Risk UMCDF	HI-Liver UMCDF	HI-Neuro UMCDF	HQ		Risk-Inh. UMCDF	HI-Inh. UMCDF
Indirect					**Inhalation**		
Antimony				5.68E-05	Tetra CDD	3.15E-10	
Arsenic	1.80E-07			7.01E-04	Penta CDD	7.78E-10	
Barium				4.52E-07	Hexa CDD	1.54E-10	
Beryllium	1.37E-08			1.11E-06	Hepta CDD	1.54E-11	
bis (2-Ethylhexyl) Phthalate	6.79E-11	4.24E-07		4.24E-07	Octa CDD	3.08E-12	
Cadmium				4.46E-04	Tetra CDF	3.18E-11	
Chromium				7.59E-06	Penta CDF	7.84E-10	
2,4-Dinitrotoluene	1.99E-10		2.56E-07	2.56E-07	Hexa CDF	1.55E-10	
2,6-Dinitrotoluene	2.01E-10		5.17E-07	5.17E-07	Hepta CDF	1.54E-11	
Di-n-octyl Phthalate		4.36E-07		4.36E-07	Octa CDF	3.08E-12	
GB			4.38E-06	4.38E-06	2,3,7,8-TCDD TEQ	2.92E-09	
HD/HT	5.63E-08				Antimony		
Lead					Arsenic	5.62E-08	
Mercury			1.86E-04	1.86E-04	Barium		2.51E-05
Nickel				2.63E-06	Beryllium	3.07E-09	
PCB					Boron		5.89E-06
Selenium				3.94E-05	Cadmium	2.57E-09	
Silver				1.44E-04	Chromium	1.72E-08	
2,3,7,8-TCDD&Others	1.86E-06				Cobalt		
Thallium		1.11E-02		1.11E-02	Copper		
VX			3.26E-06	3.26E-06	Lead		
Di-n-butyl Phthalate				3.68E-07	Manganese		6.49E-04
Diethyl Phthalate				1.04E-08	Mercury		1.03E-04
Manganese			4.26E-06	4.26E-06	Nickel	5.53E-10	
4-Methylphenol			2.22E-06	2.22E-06	Phosphorus		
RDX	3.15E-11			1.67E-07	Selenium		
2,4,6-Trinitrotoluene	8.37E-12	9.76E-07		9.76E-07	Silver		
Vanadium				1.36E-04	Thallium		
					Tin		
					Vanadium		
					Zinc		
					Acetone		
					Benzene	3.47E-12	
					Bromodichloromethane		
					Bromoform	2.06E-13	
					2-Butanone		7.00E-09
					Carbon Disulfide		7.00E-07
					Carbon Tetrachloride	2.83E-12	
					Chlorobenzene		2.02E-07
					Chloroform	4.33E-12	
					Chloromethane	3.37E-13	
					Dibromochloromethane		
					1,1-Dichloroethane		8.06E-10
					1,2-Dichloropropane		3.08E-07
					cis-1,3-Dichloropropene	6.95E-12	2.02E-07
					trans-1,3-Dichloropropene	6.95E-12	2.05E-07
					Ethylbenzene		4.03E-09
					2-Hexanone		
					Methylene Chloride	9.08E-14	1.34E-09
					4-Methyl-2-pentanone		
					Styrene		1.34E-09
					1,1,2,2-Tetrachloroethane	1.07E-11	
					Tetrachloroethene		
					Toluene		1.06E-08
					1,1,1-Trichloroethane		
					Vinyl Acetate		1.55E-08
					Vinyl Chloride	3.59E-11	
					Xylenes		
					Benzoic Acid		
					Benzyl Alcohol		
					Diethyl Phthalate		
					Dimethyl Phthalate		
					Di-n-butyl Phthalate		
					Di-n-octyl Phthalate		
					bis(2-Ethylhexyl)-Phthalate		
					2-Methylphenol		
					3-Methylphenol		
					4-Methylphenol		
					Naphthalene		
					GB		1.12E-04
					HD/HT	4.23E-09	3.36E-04
					VX		1.12E-04
					Chlorine		
					Hydrogen Chloride		1.78E-02
					Hydrogen Fluoride		
					Nitroglycerine		
					PCB		
					Particulates		
					2,4-Dinitrotoluene		
					2,6-Dinitrotoluene		
					2,4,6-Trinitrotoluene		
					RDX		
					HMX		
Total	2.11E-06	1.11E-02	2.01E-04			8.67E-08	1.91E-02
Grand Total	2E-06	0.011	0.000			9E-08	0.02

Table A-2.3.21 Case 3. With PFS, HHRA Protocol: UMATILLA RIVER SUBSISTENCE FISHER

CONCENTRATIONS AND DEPOSITIONS: Calculated depositions and concentrations for indirect exposure pathways

Substances of Potential Concern	Particulate Dry Deposition Pdd (g/m2)/yr	Particulate Wet Deposition Pwd (g/m2)/yr	Vapor Wet Deposition Vwd (g/m2)/yr	Vapor Concentration Vc (ug/m3)	Toxicity Equivalency Factor	2,3,7,8-TCDD Toxicity Equivalents Pdd (ug/m3)	2,3,7,8-TCDD Toxicity Equivalents Pwd (g/m2)	2,3,7,8-TCDD Toxicity Equivalents Vwd (g/m2)	2,3,7,8-TCDD Toxicity Equivalents Vc (ug/m3)
Tetra CDD	1.85E-13	2.90E-13	6.10E-13	9.60E-12	1.000	1.85E-13	2.90E-13	6.10E-13	9.60E-12
Penta CDD	1.52E-12	2.38E-12	1.44E-12	2.27E-11	0.500	7.60E-13	1.19E-12	7.21E-13	1.13E-11
Hexa CDD	1.91E-12	2.99E-12	3.88E-13	6.11E-12	0.100	1.91E-13	2.99E-13	3.88E-14	6.11E-13
Hepta CDD	2.01E-12	3.15E-12	1.11E-13	1.75E-12	0.010	2.01E-14	3.15E-14	1.11E-15	1.75E-14
Octa CDD	4.11E-12	6.43E-12	2.22E-15	3.49E-14	0.001	4.11E-15	6.43E-15	2.22E-18	3.49E-17
Tetra CDF	1.19E-13	1.87E-13	7.88E-13	1.24E-11	0.100	1.19E-14	1.87E-14	7.88E-14	1.24E-12
Penta CDF	1.19E-12	1.87E-12	2.33E-12	3.67E-11	0.500	5.96E-13	9.33E-13	1.17E-12	1.83E-11
Hexa CDF	1.83E-12	2.86E-12	6.10E-13	9.60E-12	0.100	1.83E-13	2.86E-13	6.10E-14	9.60E-13
Hepta CDF	1.97E-12	3.09E-12	2.22E-13	3.49E-12	0.010	1.97E-14	3.09E-14	2.22E-15	3.49E-14
Octa CDF	4.10E-12	6.42E-12	2.22E-14	3.49E-13	0.001	4.10E-15	6.42E-15	2.22E-17	3.49E-16
					Total =	**1.98E-12**	**3.09E-12**	**2.68E-12**	**4.21E-11**
Antimony	2.00E-07	3.16E-07	0.00E+00	0.00E+00					
Arsenic	1.73E-07	2.73E-07	0.00E+00	0.00E+00					
Barium	2.54E-07	4.04E-07	0.00E+00	0.00E+00					
Beryllium	5.57E-08	8.89E-08	0.00E+00	0.00E+00					
bis (2-Ethylhexyl) Phthalate	1.29E-08	2.00E-08	1.38E-07	2.21E-06					
Cadmium	6.20E-08	9.91E-08	0.00E+00	0.00E+00					
Chromium	6.40E-08	1.02E-07	0.00E+00	0.00E+00					
2,4-Dinitrotoluene	0.00E+00	0.00E+00	8.50E-09	1.27E-07					
2,6-Dinitrotoluene	0.00E+00	0.00E+00	8.50E-09	1.27E-07					
Di-n-octyl Phthalate	1.33E-08	2.06E-08	1.42E-07	2.27E-06					
GB	5.83E-17	9.10E-17	1.78E-09	2.82E-08					
HD/HT	1.51E-13	2.35E-13	1.78E-07	2.82E-06					
Lead	1.35E-07	2.13E-07	0.00E+00	0.00E+00					
Mercury	0.00E+00	0.00E+00	1.62E-07	2.46E-06					
Nickel	1.01E-07	1.60E-07	0.00E+00	0.00E+00					
Total PCBs	0.00E+00	0.00E+00	0.00E+00	0.00E+00					
Selenium	1.37E-07	2.15E-07	0.00E+00	0.00E+00					
Silver	1.84E-07	2.91E-07	0.00E+00	0.00E+00					
2,3,7,8-TCDD & Dioxin-Like SOPCs	**1.98E-12**	**3.09E-12**	**2.68E-12**	**4.21E-11**					
Thallium	3.80E-07	6.09E-07	3.51E-16	5.27E-15					
VX	1.83E-13	2.86E-13	1.78E-09	2.81E-08					
Di-n-butyl Phthalate	1.33E-08	2.06E-08	1.42E-07	2.27E-06					
Diethyl Phthalate	1.21E-08	1.90E-08	1.31E-07	2.04E-06					
Manganese	6.44E-08	1.01E-07	0.00E+00	0.00E+00					
4-Methylphenol	1.16E-13	1.80E-13	1.78E-07	2.83E-06					
RDX	0.00E+00	0.00E+00	8.50E-09	1.27E-07					
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	8.50E-09	1.27E-07					
Vanadium	9.98E-08	1.59E-07	0.00E+00	0.00E+00					

CDD = Chlorinated dibenzo-p-dioxin
CDF = Chlorinated dibenzo-p-furan

Table A-2.3.22 Case 3. With PFS, HHRA Protocol: UMATILLA RIVER SUBSISTENCE FISHER

SOIL INGESTION: Calculation of soil concentration due to deposition

Soil mixing depth, Z=	1	cm
Soil bulk density, BD=	1.5	g/cm3
Total deposition time period, Tc=	3.2	yrs
Dry deposition velocity of vapor phase, Vdv=	3	cm/s

Sc = Soil concentration after total time period of deposition
Ds = Deposition term
Pdd = Yearly dry deposition from particle phase
Pwd = Yearly wet deposition from particle phase
Vwd = Yearly wet deposition from vapor phase
Vc = Vapor phase air concentration

Substances of Potential Concern	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Vwd (g/m2-yr)	Vc (µg/m3)	Ds (1/yr)	Sc (mg/kg)
Antimony	2.00E-07	3.16E-07	0.00E+00	0.00E+00	3.44E-05	**1.10E-04**
Arsenic	1.73E-07	2.73E-07	0.00E+00	0.00E+00	2.97E-05	**9.51E-05**
Barium	2.54E-07	4.04E-07	0.00E+00	0.00E+00	4.39E-05	**1.40E-04**
Beryllium	5.57E-08	8.89E-08	0.00E+00	0.00E+00	9.64E-06	**3.08E-05**
bis (2-Ethylhexyl) Phthalate	1.29E-08	2.00E-08	1.38E-07	2.21E-06	1.51E-04	**4.82E-04**
Cadmium	6.20E-08	9.91E-08	0.00E+00	0.00E+00	1.07E-05	**3.44E-05**
Chromium	6.40E-08	1.02E-07	0.00E+00	0.00E+00	1.10E-05	**3.54E-05**
2,4-Dinitrotoluene	0.00E+00	0.00E+00	8.50E-09	1.27E-07	8.60E-06	**2.75E-05**
2,6-Dinitrotoluene	0.00E+00	0.00E+00	8.50E-09	1.27E-07	8.60E-06	**2.75E-05**
Di-n-octyl Phthalate	1.33E-08	2.06E-08	1.42E-07	2.27E-06	1.55E-04	**4.95E-04**
GB	5.83E-17	9.10E-17	1.78E-09	2.82E-08	1.89E-06	**6.06E-06**
HD/HT	1.51E-13	2.35E-13	1.78E-07	2.82E-06	1.89E-04	**6.06E-04**
Lead	1.35E-07	2.13E-07	0.00E+00	0.00E+00	2.32E-05	**7.41E-05**
Mercury	0.00E+00	0.00E+00	1.62E-07	2.46E-06	1.66E-04	**5.30E-04**
Nickel	1.01E-07	1.60E-07	0.00E+00	0.00E+00	1.74E-05	**5.56E-05**
Total PCBs	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Selenium	1.37E-07	2.15E-07	0.00E+00	0.00E+00	2.35E-05	**7.52E-05**
Silver	1.84E-07	2.91E-07	0.00E+00	0.00E+00	3.16E-05	**1.01E-04**
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.98E-12	3.09E-12	2.68E-12	4.21E-11	3.17E-09	**1.02E-08**
Thallium	3.80E-07	6.09E-07	3.51E-16	5.27E-15	6.59E-05	**2.11E-04**
VX	1.83E-13	2.86E-13	1.78E-09	2.81E-08	1.89E-06	**6.06E-06**
Di-n-butyl Phthalate	1.33E-08	2.06E-08	1.42E-07	2.27E-06	1.55E-04	**4.95E-04**
Diethyl Phthalate	1.21E-08	1.90E-08	1.31E-07	2.04E-06	1.40E-04	**4.47E-04**
Manganese	6.44E-08	1.01E-07	0.00E+00	0.00E+00	1.10E-05	**3.53E-05**
4-Methylphenol	1.16E-13	1.80E-13	1.78E-07	2.83E-06	1.91E-04	**6.10E-04**
RDX	0.00E+00	0.00E+00	8.50E-09	1.27E-07	8.60E-06	**2.75E-05**
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	8.50E-09	1.27E-07	8.60E-06	**2.75E-05**
Vanadium	9.98E-08	1.59E-07	0.00E+00	0.00E+00	1.73E-05	**5.53E-05**

Table A-2.3.23 Case 3. With PFS, HHRA Protocol: UMATILLA RIVER SUBSISTENCE FISHER

CONSUMPTION OF ABOVE-GROUND VEGETABLES:

Calculation of above-ground vegetable concentration due to direct deposition
Calculation of above-ground vegetable concentration due to air-to-plant transfer

Interception fraction of edible portion, Rp=	0.04 unitless
Plant surface loss coefficient, kp=	18 1/yr
Time between rainfalls, t-rain=	14 days
Length of plant exposure per harvest, Tp=	0.16 yrs
Standing crop biomass, Yp=	1.7 kg DW/m2
Density of air, p=	1200 g/m3
Above ground veg. correction factor, VGab=	0.01 unitless

Pd = Concentration in plant due to direct deposition
Pv = Concentration in plant due to air-to-plant transfer
Pd + Pv = Concentration in plant due to direct deposition and air-to-plant transfer
Fw = Fraction of wet deposition of particles that adheres to plant
Bv = Air-to-plant bioconcentration factor

Substances of Potential Concern	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Fw	**Pd (mg/kg)**	Vc (ug/m3)	Bv (mg/kg)/(ug/g)	**Pv (mg/kg)**	**Pd+Pv (mg/kg)**
Antimony	2.00E-07	3.16E-07	0.2	**3.24E-07**	0.00E+00	NA	**0.00E+00**	**3.24E-07**
Arsenic	1.73E-07	2.73E-07	0.2	**2.81E-07**	0.00E+00	NA	**0.00E+00**	**2.81E-07**
Barium	2.54E-07	4.04E-07	0.6	**6.12E-07**	0.00E+00	NA	**0.00E+00**	**6.12E-07**
Beryllium	5.57E-08	8.89E-08	0.6	**1.35E-07**	0.00E+00	NA	**0.00E+00**	**1.35E-07**
bis (2-Ethylhexyl) Phthalate	1.29E-08	2.00E-08	0.6	**3.07E-08**	2.21E-06	5.11E+02	**9.39E-09**	**4.01E-08**
Cadmium	6.20E-08	9.91E-08	0.6	**1.50E-07**	0.00E+00	NA	**0.00E+00**	**1.50E-07**
Chromium	6.40E-08	1.02E-07	0.6	**1.54E-07**	0.00E+00	NA	**0.00E+00**	**1.54E-07**
2,4-Dinitrotoluene	0.00E+00	0.00E+00	0.6	**0.00E+00**	1.27E-07	1.50E+02	**1.59E-10**	**1.59E-10**
2,6-Dinitrotoluene	0.00E+00	0.00E+00	0.6	**0.00E+00**	1.27E-07	1.30E+02	**1.38E-10**	**1.38E-10**
Di-n-octyl Phthalate	1.33E-08	2.06E-08	0.6	**3.16E-08**	2.27E-06	2.32E+02	**4.38E-09**	**3.60E-08**
GB	5.83E-17	9.10E-17	0.6	**1.39E-16**	2.82E-08	2.90E+00	**6.80E-13**	**6.81E-13**
HD/HT	1.51E-13	2.35E-13	0.6	**3.60E-13**	2.82E-06	1.58E-01	**3.71E-12**	**4.07E-12**
Lead	1.35E-07	2.13E-07	0.6	**3.24E-07**	NA	NA	**0.00E+00**	**3.24E-07**
Mercury	0.00E+00	0.00E+00	0.6	**0.00E+00**	2.46E-06	2.30E+04	**4.71E-07**	**4.71E-07**
Nickel	1.01E-07	1.60E-07	0.6	**2.43E-07**	0.00E+00	NA	**0.00E+00**	**2.43E-07**
Total PCBs	0.00E+00	0.00E+00	0.6	**0.00E+00**	0.00E+00	1.72E+03	**0.00E+00**	**0.00E+00**
Selenium	1.37E-07	2.15E-07	0.2	**2.22E-07**	0.00E+00	NA	**0.00E+00**	**2.22E-07**
Silver	1.84E-07	2.91E-07	0.6	**4.42E-07**	0.00E+00	NA	**0.00E+00**	**4.42E-07**
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.98E-12	3.09E-12	0.6	**4.73E-12**	4.21E-11	8.39E+04	**2.95E-11**	**3.42E-11**
Thallium	3.80E-07	6.09E-07	0.6	**9.20E-07**	5.27E-15	NA	**0.00E+00**	**9.20E-07**
VX	1.83E-13	2.86E-13	0.6	**4.37E-13**	2.81E-08	2.26E+03	**5.30E-10**	**5.31E-10**
Di-n-butyl Phthalate	1.33E-08	2.06E-08	0.6	**3.16E-08**	2.27E-06	4.40E+02	**8.31E-09**	**3.99E-08**
Diethyl Phthalate	1.21E-08	1.90E-08	0.6	**2.89E-08**	2.04E-06	4.48E+02	**7.63E-09**	**3.65E-08**
Manganese	6.44E-08	1.01E-07	0.6	**1.54E-07**	0.00E+00	NA	**0.00E+00**	**1.54E-07**
4-Methylphenol	1.16E-13	1.80E-13	0.6	**2.76E-13**	2.83E-06	1.71E+01	**4.04E-10**	**4.04E-10**
RDX	0.00E+00	0.00E+00	0.6	**0.00E+00**	1.27E-07	9.92E-02	**1.05E-13**	**1.05E-13**
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	0.6	**0.00E+00**	1.27E-07	2.32E+02	**2.46E-10**	**2.46E-10**
Vanadium	9.98E-08	1.59E-07	0.6	**2.41E-07**	0.00E+00	NA	**0.00E+00**	**2.41E-07**

Table A-2.3.24 Case 3. With PFS, HHRA Protocol: UMATILLA RIVER SUBSISTENCE FISHER

CONSUMPTION OF ROOT VEGETABLES:

Calculation of soil concentration due to deposition
Calculation of root vegetable concentration due to root uptake

Soil mixing depth, Z=	20	cm
Soil bulk density, BD=	1.5	g/cm3
Total deposition time period, Tc=	3.2	yrs
Below ground veg. correction factor, VGbg=	0.01	unitless
Dry deposition velocity of vapor phase, Vdv=	3	cm/s

Pr(bg) = Root vegetable concentration due to root uptake
Sc = Soil concentration after total time period of deposition
Ds = Deposition term
Kds = Soil-water partition coefficient
RCF = Ratio of concentratio
Vwd = Yearly wet deposition from vapor phase

Substances of Potential Concern	Pdd	Pwd	Vwd	Vc	Ds	Sc	Kds	RCF	Pr(bg)
	(g/m2-yr)	(g/m2-yr)	(g/m2-yr)	(µg/m3)	(1/yr)	(mg/kg)	(cm3/g)	(mg/kg)/(ug/mL)	(mg/kg)
Antimony	2.00E-07	3.16E-07	0.00E+00	0.00E+00	1.72E-06	5.50E-06	2	3.00E-02	**8.25E-10**
Arsenic	1.73E-07	2.73E-07	0.00E+00	0.00E+00	1.49E-06	4.75E-06	29	8.00E-03	**1.31E-11**
Barium	2.54E-07	4.04E-07	0.00E+00	0.00E+00	2.19E-06	7.02E-06	530	1.50E-02	**1.99E-12**
Beryllium	5.57E-08	8.89E-08	0.00E+00	0.00E+00	4.82E-07	1.54E-06	70	1.50E-03	**3.30E-13**
bis (2-Ethylhexyl) Phthalate	1.29E-08	2.00E-08	1.38E-07	2.21E-06	7.53E-06	2.41E-05	280000	3.20E+02	**2.75E-10**
Cadmium	6.20E-08	9.91E-08	0.00E+00	0.00E+00	5.37E-07	1.72E-06	160	3.20E-02	**3.44E-12**
Chromium	6.40E-08	1.02E-07	0.00E+00	0.00E+00	5.52E-07	1.77E-06	18	4.50E-03	**4.42E-12**
2,4-Dinitrotoluene	0.00E+00	0.00E+00	8.50E-09	1.27E-07	4.30E-07	1.38E-06	0.87	1.90E+00	**3.01E-08**
2,6-Dinitrotoluene	0.00E+00	0.00E+00	8.50E-09	1.27E-07	4.30E-07	1.38E-06	0.67	1.70E+00	**3.49E-08**
Di-n-octyl Phthalate	1.33E-08	2.06E-08	1.42E-07	2.27E-06	7.74E-06	2.48E-05	280000	3.20E+02	**2.83E-10**
GB	5.83E-17	9.10E-17	1.78E-09	2.82E-08	9.47E-08	3.03E-07	0.032	9.30E-01	**8.81E-08**
HD/HT	1.51E-13	2.35E-13	1.78E-07	2.82E-06	9.47E-06	3.03E-05	1.2	1.16E+00	**2.91E-07**
Lead	1.35E-07	2.13E-07	0.00E+00	0.00E+00	1.16E-06	3.70E-06	600	NA	**NA**
Mercury	0.00E+00	0.00E+00	1.62E-07	2.46E-06	8.28E-06	2.65E-05	57000	NA	**NA**
Nickel	1.01E-07	1.60E-07	0.00E+00	0.00E+00	8.69E-07	2.78E-06	82	4.00E-03	**1.36E-12**
Total PCBs	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4300	2.10E+03	**0.00E+00**
Selenium	1.37E-07	2.15E-07	0.00E+00	0.00E+00	1.17E-06	3.76E-06	4.3	2.00E-02	**1.75E-10**
Silver	1.84E-07	2.91E-07	0.00E+00	0.00E+00	1.58E-06	5.06E-06	0.4	1.00E-01	**1.27E-08**
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.98E-12	3.09E-12	2.68E-12	4.21E-11	1.59E-10	5.08E-10	142000	1.21E+04	**4.33E-13**
Thallium	3.80E-07	6.09E-07	3.51E-16	5.27E-15	3.30E-06	1.05E-05	74	4.00E-04	**5.70E-13**
VX	1.83E-13	2.86E-13	1.78E-09	2.81E-08	9.47E-08	3.03E-07	0.15	1.85E+00	**3.74E-08**
Di-n-butyl Phthalate	1.33E-08	2.06E-08	1.42E-07	2.27E-06	7.74E-06	2.48E-05	1.6	1.80E+02	**2.79E-05**
Diethyl Phthalate	1.21E-08	1.90E-08	1.31E-07	2.04E-06	6.98E-06	2.23E-05	5.3	6.56E+00	**2.79E-07**
Manganese	6.44E-08	1.01E-07	0.00E+00	0.00E+00	5.51E-07	1.76E-06	23	1.00E-01	**7.66E-11**
4-Methylphenol	1.16E-13	1.80E-13	1.78E-07	2.83E-06	9.53E-06	3.05E-05	0.50	1.76E+00	**1.07E-06**
RDX	0.00E+00	0.00E+00	8.50E-09	1.27E-07	4.30E-07	1.38E-06	0.63	9.61E-01	**2.10E-08**
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	8.50E-09	1.27E-07	4.30E-07	1.38E-06	11	4.44E+00	**5.55E-09**
Vanadium	9.98E-08	1.59E-07	0.00E+00	0.00E+00	8.64E-07	2.76E-06	100	1.00E-01	**2.76E-11**

Table A-2.3.25 Case 3. With PFS, HHRA Protocol: UMATILLA RIVER SUBSISTENCE FISHER

CONSUMPTION OF FISH FROM THE UMATILLA RIVER:

USING TIME-AVERAGED SOIL CONCENTRATIONS

Water body area, WA(w)=	9.80E+06	m2
Impervious watershed area, WA(I)=	1.35E+08	m2
Average annual runoff, R=	0.0	cm/yr
Soil bulk density, BD=	1.5	g/cm3
Soil mixing depth, Z=	1	cm
Total deposition time period, Tc=	3.2	yrs
Total watershed area, WA(L)=	2.70E+09	m2
Volumetric soil water content, Os=	0.2	cm3/cm3
USLE rainfall (or erosivity) factor, RF=	20	1/yr
USLE erodability factor, K=	0.36	tons/acre
USLE length-slope factor, LS=	1.5	unitless
USLE cover management factor, C=	0.1	unitless
USLE supporting practice factor, P=	1	unitless
Unit soil loss, Xe=	0.24	kg/m2-yr
Empirical intercept coefficient, a=	0.6	unitless
Watershed sediment delivery ratio, SD=	3.97E-02	unitless
Soil enrichment ratio, ER=	3	unitless
Average volumetric flow rate, Vf(x)=	4.14E+08	m3/yr
Total suspended solids, TSS=	10	mg/L
Depth of water column, d(w)=	0.50	m
Depth of upper benthic layer, d(b)=	0.03	m
Bed sediment porosity, O(bs)=	0.5	LH20/L
Bed sediment concentration, BS=	1.0	g/cm3
Fish lipid content, f(lipid)=	0.07	unitless
Fraction organic carbon, OC(sed)=	0.04	unitless
deposition velocity of vapor phase, Vdv=	3	cm/s

1042.47 sq.mile

L(T) = Total substance load to the water body
L(dep) = Deposition of particle bound substance to the water body
L(RI) = Runoff load from impervious surfaces
L(R) = Runoff load from pervious surfaces
L(E) - Soil erosion load
Sc = Soil concentration after total exposure period
Pddw = Yearly average dry deposition rate onto the watershed
Pwdw = Yearly average wet deposition rate onto the watershed
Pdds = Yearly dry deposition rate onto surface water body
Pwds = Yearly wet deposition rate onto surface water body
Kds = Soil-water partition coefficient
Ds = Deposition term

Substances of Potential Concern	Pdds (g/m2-yr)	Pdws (g/m2-yr)	Vwds (g/m2-yr)	Vcs (µg/m3)	Ds (1/yr)	Sc (mg/kg)	Pddb (g/m2-yr)	Pwdb (g/m2-yr)	Vwdb (g/m2-yr)	L(dep) (g/yr)	L(RI) (g/yr)	Kds (L/kg)	L(R) (g/yr)	L(E) (g/yr)	L(T) (g/yr)
Antimony	1.20E-07	5.48E-08	0.00E+00	0.00E+00	1.16E-05	3.72E-05	1.91E-07	1.81E-07	0.00E+00	3.64E+00	2.35E+01	2	0.00E+00	2.58E+00	2.98E+01
Arsenic	1.12E-07	5.77E-08	0.00E+00	0.00E+00	1.13E-05	3.62E-05	1.75E-07	1.72E-07	0.00E+00	3.40E+00	2.29E+01	29	0.00E+00	2.67E+00	2.90E+01
Barium	2.69E-07	1.77E-07	0.00E+00	0.00E+00	2.97E-05	9.51E-05	3.76E-07	4.47E-07	0.00E+00	8.07E+00	6.02E+01	530	0.00E+00	7.04E+00	7.53E+01
Beryllium	3.73E-08	1.64E-08	0.00E+00	0.00E+00	3.58E-06	1.15E-05	5.80E-08	5.87E-08	0.00E+00	1.14E+00	7.25E+00	70	0.00E+00	8.46E-01	9.24E+00
bis (2-Ethylhexyl) Phthalate	7.43E-09	4.72E-09	2.35E-08	7.66E-07	5.07E-05	1.62E-04	1.19E-08	1.07E-08	7.71E-08	9.77E-01	4.81E+00	280000	0.00E+00	1.20E+01	1.78E+01
Cadmium	4.57E-08	2.20E-08	0.00E+00	0.00E+00	4.51E-06	1.44E-05	6.92E-08	7.30E-08	0.00E+00	1.39E+00	9.13E+00	160	0.00E+00	1.07E+00	1.16E+01
Chromium	9.78E-08	7.31E-08	0.00E+00	0.00E+00	1.14E-05	3.64E-05	1.29E-07	1.68E-07	0.00E+00	2.91E+00	2.31E+01	18	0.00E+00	2.68E+00	2.87E+01
2,4-Dinitrotoluene	0.00E+00	0.00E+00	8.14E-10	4.54E-08	2.92E-06	9.34E-06	0.00E+00	0.00E+00	4.81E-09	4.71E-02	1.10E-01	0.87	0.00E+00	5.99E-01	7.57E-01
2,6-Dinitrotoluene	0.00E+00	0.00E+00	8.14E-10	4.54E-08	2.92E-06	9.34E-06	0.00E+00	0.00E+00	4.81E-09	4.71E-02	1.10E-01	0.67	0.00E+00	5.77E-01	7.34E-01
Di-n-octyl Phthalate	7.64E-09	4.78E-09	2.39E-08	7.88E-07	5.21E-05	1.67E-04	1.22E-08	1.10E-08	7.95E-08	1.01E+00	4.90E+00	280000	0.00E+00	1.24E+01	1.83E+01
GB	8.39E-17	1.33E-16	2.26E-09	2.33E-08	1.62E-06	5.19E-06	1.20E-16	1.24E-16	2.52E-09	2.47E-02	3.06E-01	0.032	0.00E+00	7.43E-02	4.05E-01
HD/HT	2.17E-13	3.43E-13	2.26E-07	2.33E-06	1.62E-04	5.19E-04	3.09E-13	3.20E-13	2.52E-07	2.47E+00	3.06E+01	1.2	0.00E+00	3.46E+01	6.76E+01
Lead	1.60E-07	1.16E-07	0.00E+00	0.00E+00	1.84E-05	5.89E-05	2.18E-07	2.67E-07	0.00E+00	4.76E+00	3.73E+01	600	0.00E+00	4.36E+00	4.64E+01
Mercury	0.00E+00	0.00E+00	3.23E-08	1.09E-06	7.10E-05	2.27E-04	0.00E+00	0.00E+00	1.22E-07	1.19E+00	4.36E+00	57000	0.00E+00	1.68E+01	2.24E+01
Nickel	1.15E-07	7.88E-08	0.00E+00	0.00E+00	1.29E-05	4.13E-05	1.59E-07	1.93E-07	0.00E+00	3.44E+00	2.62E+01	82	0.00E+00	3.06E+00	3.27E+01
Total PCBs	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4300	0.00E+00	0.00E+00	0.00E+00
Selenium	8.41E-08	4.44E-08	0.00E+00	0.00E+00	8.57E-06	2.74E-05	1.33E-07	1.26E-07	0.00E+00	2.54E+00	1.73E+01	4.3	0.00E+00	1.97E+00	2.19E+01
Silver	1.11E-07	5.22E-08	0.00E+00	0.00E+00	1.09E-05	3.47E-05	1.76E-07	1.67E-07	0.00E+00	3.37E+00	2.20E+01	0.4	0.00E+00	1.93E+00	2.73E+01
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.13E-12	6.19E-13	4.03E-13	1.47E-11	1.07E-09	3.43E-09	1.82E-12	1.66E-12	1.50E-12	4.88E-05	2.91E-04	142000	0.00E+00	2.54E-04	5.94E-04
Thallium	2.26E-07	7.71E-08	4.09E-17	1.97E-15	2.02E-05	6.48E-05	3.64E-07	3.51E-07	2.11E-16	7.01E+00	4.10E+01	74	0.00E+00	4.79E+00	5.28E+01
VX	2.63E-13	4.17E-13	2.26E-09	2.33E-08	1.62E-06	5.18E-06	3.76E-13	3.89E-13	2.52E-09	2.47E-02	3.06E-01	0.15	0.00E+00	2.03E-01	5.34E-01
Di-n-butyl Phthalate	7.64E-09	4.78E-09	2.39E-08	7.88E-07	5.21E-05	1.67E-04	1.22E-08	1.10E-08	7.95E-08	1.01E+00	4.90E+00	1.6	0.00E+00	1.14E+01	1.73E+01
Diethyl Phthalate	6.91E-09	3.55E-09	1.87E-08	7.16E-07	4.71E-05	1.51E-04	1.11E-08	1.02E-08	7.35E-08	9.29E-01	3.93E+00	5.3	0.00E+00	1.09E+01	1.58E+01
Manganese	6.00E-08	4.21E-08	0.00E+00	0.00E+00	6.80E-06	2.18E-05	8.55E-08	9.67E-08	0.00E+00	1.79E+00	1.38E+01	23	0.00E+00	1.60E+00	1.72E+01
4-Methylphenol	6.67E-14	4.17E-14	2.98E-08	9.85E-07	6.41E-05	2.05E-04	1.07E-13	9.60E-14	9.93E-08	9.73E-01	4.03E+00	0.50	0.00E+00	1.20E+01	1.70E+01
RDX	0.00E+00	0.00E+00	8.14E-10	4.54E-08	2.92E-06	9.34E-06	0.00E+00	0.00E+00	4.81E-09	4.71E-02	1.10E-01	0.63	0.00E+00	5.71E-01	7.28E-01
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	8.14E-10	4.54E-08	2.92E-06	9.34E-06	0.00E+00	0.00E+00	4.81E-09	4.71E-02	1.10E-01	11	0.00E+00	6.83E-01	8.40E-01
Vanadium	9.69E-08	5.86E-08	0.00E+00	0.00E+00	1.04E-05	3.32E-05	1.38E-07	1.61E-07	0.00E+00	2.93E+00	2.10E+01	100	0.00E+00	2.45E+00	2.64E+01

Table A-2.3.25 Case 3. With PFS, HHRA Protocol: UMATILLA RIVER SUBSISTENCE FISHER (continued)

CONSUMPTION OF FISH FROM THE FISH HATCHERY:

USING TIME-AVERAGED SOIL CONCENTRATIONS

Calculation of fish concentration from dissolved water concentration, C1(fish)
Calculation of fish concentration from total water column concentration, C2(fish)
Calculation of fish concentration from bed sediments, C3(fish)

Water body area, WA(w)=	9.80E+06	m2	
Impervious watershed area, WA(I)=	1.35E+08	m2	
Average annual runoff, R=	0.0	cm/yr	
Soil bulk density, BD=	1.5	g/cm3	
Soil mixing depth, Z=	1	cm	
Total deposition time period, Tc=	3.2	yrs	
Total watershed area, WA(L)=	2.70E+09	m2	1042.47 sq.mile
Volumetric soil water content, Os=	0.2	cm3/cm3	
USLE rainfall (or erosivity) factor, RF=	20	1/yr	
USLE erodability factor, K=	0.36	tons/acre	
USLE length-slope factor, LS=	1.5	unitless	
USLE cover management factor, C=	0.1	unitless	
USLE supporting practice factor, P=	1	unitless	
Unit soil loss, Xe=	0.24	kg/m2-yr	
Empirical intercept coefficient, a=	0.6	unitless	
Watershed sediment delivery ratio, SD=	3.97E-02	unitless	
Soil enrichment ratio, ER=	3	unitless	
Average volumetric flow rate, Vl(x)=	4.14E+08	m3/yr	
Total suspended solids, TSS=	10	mg/L	
Depth of water column, d(w)=	0.50	m	
Depth of upper benthic layer, d(b)=	0.03	m	
Bed sediment porosity, O(bs)=	0.5	LH20/L	
Bed sediment concentration, BS=	1.0	g/cm3	
Fish lipid content, f(lipid)=	0.07	unitless	
Fraction organic carbon, OC(sed)=	0.04	unitless	
Dry deposition velocity of vapor phase, Vdv=	3	cm/s	

C(fish) = Concentration in fish
f(water) = Fraction of total water body substance concentration that occurs in the water column
C(wtot) = Total water body concentration, including water column and bed sediment
C(wt) = Total concentration in water column
C(dw) = Dissolved phase water concentration
f(benthic) = Fraction of total water body substance concentration that occurs in the bed sediment
kwt = Total water body dissipation rate constant
C(sb) = Concentration sorbed to bed sediments
Kd(sw) = Suspended sediment/surface water partition coefficient
Kd(bs) = Bed sediment/sediment pore water partition coefficient
BCF = Bioconcentration factor
BAF = Bioaccumulation factor
BSAF = Biota to sediment accumulation factor

Substances of Potential Concern	Kd(sw) (L/kg)	Kd(bs) (L/kg)	f(water)	C(wtot) (mg/L)	C(wt) (mg/L)	C(dw) (mg/L)	f(benth)	kwt (1/yr)	C(sb) (mg/kg)	BCF (L/kg)	C1(fish) (mg/kg)	BAF (L/kg)	C2(fish) (mg/kg)	BSAF	C3(fish) (mg/kg)	C(fish) (mg/kg)
Antimony	15	8	6.62E-01	1.02E-07	7.18E-08	7.18E-08	3.38E-01	2.51E-02	5.75E-07	1.0E+00	7.18E-08	NA	NA	NA	NA	7.18E-08
Arsenic	220	120	1.22E-01	5.39E-07	6.96E-08	6.94E-08	8.78E-01	6.52E-02	8.33E-06	4.4E+01	3.06E-06	NA	NA	NA	NA	3.06E-06
Barium	4000	2100	8.18E-03	1.89E-05	1.64E-07	1.58E-07	9.92E-01	7.37E-02	3.32E-04	NA	NA	4.0E+00	6.58E-07	NA	NA	6.58E-07
Beryllium	525	280	5.64E-02	3.68E-07	2.20E-08	2.19E-08	9.44E-01	7.01E-02	6.12E-06	2.0E+01	4.37E-07	NA	NA	NA	NA	4.37E-07
bis (2-Ethylhexyl) Phthalate	2100000	1100000	3.33E-04	3.35E-05	1.18E-08	5.37E-10	1.00E+00	7.42E-02	5.91E-04	NA	NA	1.2E+02	1.42E-06	NA	NA	1.42E-06
Cadmium	1200	640	2.57E-02	9.97E-07	2.71E-08	2.68E-08	9.74E-01	7.24E-02	1.71E-05	6.4E+01	1.71E-06	NA	NA	NA	NA	1.71E-06
Chromium	140	70	1.91E-01	3.40E-07	6.90E-08	6.89E-08	8.09E-01	6.01E-02	4.82E-06	1.6E+01	1.10E-06	NA	NA	NA	NA	1.10E-06
2,4-Dinitrotoluene	6.5	3.5	8.06E-01	2.14E-09	1.83E-09	1.83E-09	1.94E-01	1.44E-02	6.39E-09	3.2E+00	5.85E-09	NA	NA	NA	NA	5.85E-09
2,6-Dinitrotoluene	5	2.7	8.39E-01	1.99E-09	1.77E-09	1.77E-09	1.61E-01	1.20E-02	4.78E-09	2.6E+00	4.61E-09	NA	NA	NA	NA	4.61E-09
Di-n-octyl Phthalate	2100000	1100000	3.33E-04	3.43E-05	1.21E-08	5.51E-10	1.00E+00	7.42E-02	6.06E-04	NA	NA	1.2E+02	1.45E-06	NA	NA	1.45E-06
GB	0.24	0.13	9.64E-01	9.57E-10	9.77E-10	9.77E-10	3.64E-02	2.71E-03	1.27E-10	1.4E+00	1.37E-09	NA	NA	NA	NA	1.37E-09
HD/HT	9.1	4.8	7.59E-01	2.03E-07	1.63E-07	1.63E-07	2.41E-01	1.79E-02	7.84E-07	4.8E+00	7.84E-07	NA	NA	NA	NA	7.84E-07
Lead	4500	2400	7.20E-03	1.31E-05	1.00E-07	9.57E-08	9.93E-01	7.37E-02	2.30E-04	NA	NA	NA	NA	NA	NA	NA
Mercury	95000	160000	2.03E-04	4.71E-05	1.01E-08	5.20E-09	1.00E+00	7.43E-02	8.32E-04	NA	NA	1.3E+05	1.32E-03	NA	NA	1.32E-03
Nickel	620	330	4.83E-02	1.51E-06	7.75E-08	7.71E-08	9.52E-01	7.07E-02	2.54E-05	4.7E+01	3.62E-06	NA	NA	NA	NA	3.62E-06
Total PCBs	32000	17000	1.29E-03	0.00E+00	0.00E+00	0.00E+00	9.99E-01	7.42E-02	0.00E+00	NA	NA	NA	NA	1.6E+00	0.00E+00	0.00E+00
Selenium	32	17	4.88E-01	1.02E-07	5.27E-08	5.27E-08	5.12E-01	3.80E-02	8.96E-07	6.0E+00	3.16E-07	NA	NA	NA	NA	3.16E-07
Silver	3	2	8.70E-01	7.15E-08	6.59E-08	6.59E-08	1.30E-01	9.69E-03	1.32E-07	5.0E-01	3.29E-08	NA	NA	NA	NA	3.29E-08
2,3,7,8-TCDD & Dioxin-Like SOPCs	1070000	570000	3.42E-04	1.11E-09	4.02E-13	3.44E-14	1.00E+00	7.42E-02	1.96E-08	NA	NA	NA	NA	6.7E-02	2.30E-09	2.30E-09
Thallium	560	300	5.28E-02	2.24E-06	1.26E-07	1.25E-07	9.47E-01	7.03E-02	3.74E-05	1.2E+02	1.50E-05	NA	NA	NA	NA	1.50E-05
VX	1.1	0.60	9.38E-01	1.30E-09	1.29E-09	1.29E-09	6.19E-02	4.60E-03	7.73E-10	1.5E+01	1.93E-08	NA	NA	NA	NA	1.93E-08
Di-n-butyl Phthalate	12	6.4	7.07E-01	5.57E-08	4.18E-08	4.18E-08	2.93E-01	2.17E-02	2.67E-07	NA	NA	3.0E+04	1.25E-03	NA	NA	1.25E-03
Diethyl Phthalate	39	21	4.37E-01	8.21E-08	3.80E-08	3.80E-08	5.63E-01	4.18E-02	7.98E-07	NA	NA	4.3E+02	1.63E-05	NA	NA	1.63E-05
Manganese	170	93	1.52E-01	2.57E-07	4.13E-08	4.12E-08	8.48E-01	6.30E-02	3.83E-06	1.2E+02	4.94E-06	NA	NA	NA	NA	4.94E-06
4-Methylphenol	3.8	2.0	8.70E-01	4.45E-08	4.10E-08	4.10E-08	1.30E-01	9.69E-03	8.21E-08	1.4E+01	5.75E-07	NA	NA	NA	NA	5.75E-07
RDX	4.7	2.5	8.47E-01	1.96E-09	1.76E-09	1.76E-09	1.53E-01	1.13E-02	4.39E-09	1.9E+00	3.34E-09	NA	NA	NA	NA	3.34E-09
2,4,6-Trinitrotoluene	83	44	2.73E-01	7.01E-09	2.02E-09	2.02E-09	7.27E-01	5.40E-02	8.90E-08	5.4E+01	1.09E-07	NA	NA	NA	NA	1.09E-07
Vanadium	750	400	4.02E-02	1.46E-06	6.24E-08	6.19E-08	9.60E-01	7.13E-02	2.48E-05	1.2E+02	7.43E-06	NA	NA	NA	NA	7.43E-06

Table A-2.3.26 Case 3. With PFS, HHRA Protocol: UMATILLA RIVER SUBSISTENCE FISHER INDIRECT EXPOSURES

Calculation of cancer risks

Consumption rate of soil, CR(soil)=	0.0001	kg/day
Fraction of soil impacted, F(soil)=	1	unitless
Consumption rate of abv grd veg, CR(ag)=	0.024	kg/day
Fraction of abv grd veg impacted, F(ag)=	0.25	unitless
Consumption rate of root veg, CR(bg)=	0.0063	kg/day
Fraction of root veg impacted, F(bg)=	0.25	unitless
Consumption rate of fish, CR(fish)=	0.140	kg/day
Fraction of fish impacted, F(fish)=	1	unitless
Exposure duration, ED=	30	yr
Exposure frequency, EF=	350	day/yr
Body weight, BW=	70	kg
Averaging time, AT=	70	yr

I(tot) = Total daily intake of substance
Sc = Soil concentration after total time period of deposition
I(soil) = Daily intake of substance from soil
Pd + Pv = Concentration in plant
I(ag) = Daily intake of substance from above ground vegetables
Pr(bg) = Concentration in below ground plant parts due to root uptake
I(bg) = Daily intake of substance from below ground vegetables
C(fish) = Concentration in fish
I(fish) = Daily intake of substance from fish
CSF = Carcinogenic slope factor

Substances of Potential Concern	Sc (mg/kg)	I(soil) (mg/day)	Pd+Pv (mg/kg)	I(ag) (mg/day)	Pr(bg) (mg/kg)	I(bg) (mg/day)	C(fish) (mg/kg)	I(fish) (mg/day)	I(tot) (mg/day)	CSF (per mg/kg-day)	Cancer Risk
Antimony	1.10E-04	1.10E-08	3.24E-07	1.95E-09	8.25E-10	1.30E-12	7.18E-08	1.01E-08	2.30E-08		
Arsenic	9.51E-05	9.51E-09	2.81E-07	1.68E-09	1.31E-11	2.07E-14	3.06E-06	4.28E-07	4.39E-07	1.50E+00	3.87E-09
Barium	1.40E-04	1.40E-08	6.12E-07	3.67E-09	1.99E-12	3.13E-15	6.58E-07	9.21E-08	1.10E-07		
Beryllium	3.08E-05	3.08E-09	1.35E-07	8.07E-10	3.30E-13	5.20E-16	4.37E-07	6.12E-08	6.51E-08	4.30E+00	1.64E-09
bis (2-Ethylhexyl) Phthalate	4.82E-04	4.82E-08	4.01E-08	2.41E-10	2.75E-10	4.34E-13	1.42E-06	1.99E-07	2.47E-07	1.40E-02	2.03E-11
Cadmium	3.44E-05	3.44E-09	1.50E-07	8.99E-10	3.44E-12	5.41E-15	1.71E-06	2.40E-07	2.44E-07		
Chromium	3.54E-05	3.54E-09	1.54E-07	9.26E-10	4.42E-12	6.96E-15	1.10E-06	1.54E-07	1.59E-07		
2,4-Dinitrotoluene	2.75E-05	2.75E-09	1.59E-10	9.55E-13	3.01E-08	4.73E-11	5.85E-09	8.18E-10	3.62E-09	6.80E-01	1.44E-11
2,6-Dinitrotoluene	2.75E-05	2.75E-09	1.38E-10	8.28E-13	3.49E-08	5.50E-11	4.61E-09	6.45E-10	3.45E-09	6.80E-01	1.38E-11
Di-n-octyl Phthalate	4.95E-04.	4.95E-08	3.60E-08	2.16E-10	2.83E-10	4.46E-13	1.45E-06	2.04E-07	2.53E-07		
GB	6.06E-06	6.06E-10	6.81E-13	4.08E-15	8.81E-08	1.39E-10	1.37E-09	1.92E-10	9.37E-10		
HD/HT	6.06E-04	6.06E-08	4.07E-12	2.44E-14	2.91E-07	4.58E-10	7.84E-07	1.10E-07	1.71E-07	9.50E+00	9.53E-09
Lead	7.41E-05	7.41E-09	3.24E-07	1.94E-09	NA	NA	NA	NA	9.35E-09		
Mercury	5.30E-04	5.30E-08	4.71E-07	2.82E-09	NA	NA	1.32E-03	1.85E-04	1.85E-04		
Nickel	5.56E-05	5.56E-09	2.43E-07	1.46E-09	1.36E-12	2.14E-15	3.62E-06	5.07E-07	5.14E-07		
Total PCBs	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.70E+00	0.00E+00
Selenium	7.52E-05	7.52E-09	2.22E-07	1.33E-09	1.75E-10	2.75E-13	3.16E-07	4.43E-08	5.31E-08		
Silver	1.01E-04	1.01E-08	4.42E-07	2.65E-09	1.27E-08	1.99E-11	3.29E-08	4.61E-09	1.74E-08		
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.02E-08	1.02E-12	3.42E-11	2.05E-13	4.33E-13	6.82E-16	2.30E-09	3.21E-10	3.23E-10	1.50E+05	2.84E-07
Thallium	2.11E-04	2.11E-08	9.20E-07	5.52E-09	5.70E-13	8.98E-16	1.50E-05	2.10E-06	2.12E-06		
VX	6.06E-06	6.06E-10	5.31E-10	3.18E-12	3.74E-08	5.89E-11	1.93E-08	2.71E-09	3.37E-09		
Di-n-butyl Phthalate	4.95E-04	4.95E-08	3.99E-08	2.39E-10	2.79E-05	4.39E-08	1.25E-03	1.76E-04	1.76E-04		
Diethyl Phthalate	4.47E-04	4.47E-08	3.65E-08	2.19E-10	2.79E-07	4.39E-10	1.63E-05	2.29E-06	2.33E-06		
Manganese	3.53E-05	3.53E-09	1.54E-07	9.25E-10	7.66E-11	1.21E-13	4.94E-06	6.92E-07	6.96E-07		
4-Methylphenol	6.10E-04	6.10E-08	4.04E-10	2.43E-12	1.07E-06	1.69E-09	5.75E-07	8.05E-08	1.43E-07		
RDX	2.75E-05	2.75E-09	1.05E-13	6.32E-16	2.10E-08	3.31E-11	3.34E-09	4.67E-10	3.25E-09	1.10E-01	2.10E-12
2,4,6-Trinitrotoluene	2.75E-05	2.75E-09	2.46E-10	1.48E-12	5.55E-09	8.75E-12	1.09E-07	1.53E-08	1.81E-08	3.00E-02	3.18E-12
Vanadium	5.53E-05	5.53E-09	2.41E-07	1.45E-09	2.76E-11	4.35E-14	7.43E-06	1.04E-06	1.05E-06		

Total cancer risk= 3E-07

LIC	Liquid Incinerator
MLD	Master Logic Diagram
MPF	Metal Parts Furnace
NRC	National Research Council
ODEQ	Oregon Department of Environmental Quality
ONC	onsite containers
OSW	other site worker
PAS	pollution abatement system
PCDF	pentachlorodibenzofuran
PFS	PAS filter system
PIC	product of incomplete combustion
PMCD	Program Manager for Chemical Demilitarization
POD	process operational diagram
PPE	personal protective equipment
QRA	quantitative risk assessment
RAC	risk assessment code
RCRA	Resource Conservation and Recovery Act
SAIC	Science Applications International Corporation
SLERA	Screening Level Ecological Risk Assessment
SSMP	System Safety Management Plan
SSRA	System Safety Risk Assessment
TCDD	tetrachlorodibenzo-p-dioxin
TEF	toxicity equivalence factor
TOCDF	Tooele Chemical Agent Disposal Facility
UMCDF	Umatilla Chemical Agent Disposal Facility
UPA	unpack area
USNRC	U.S. Nuclear Regulatory Commission
VX	O-ethyl S-(2-diisopropylaminoethyl) methylphosphonothiolate

Glossary

ASC	allowable stack concentration
CDF	Chemical Agent Disposal Facility
CHB	Container Handling Building
CHPPM	Center for Health Promotion and Preventive Medicine
CMP	Change Management Process
COPC	constituent of potential concern
COPEC	constituent of potential ecological concern
Cr	chromium
DFS	Deactivation Furnace System
DL	detection limit
DOE	U.S. Department of Energy
DRW	Disposal-related Worker
DUN	Dunnage Incinerator
E&E	Ecology and Environment, Inc.
EPA	U.S. Environmental Protection Agency
ERA	ecological risk assessment
ERDEC	Edgewood Research, Development, and Engineering Center
GB	Isopropyl methyl phosphonofluoridate (also know as sarin)
HD	Bis(2-chloroethyl) sulfide (or sulfur mustard)
HE	hazard evaluation
HEAST	Health Effects Assessment Summary Tables
HEPA	high-efficiency particulate air
HHRA	human health risk assessment
HI	hazard index
HQ	hazard quotient
HRA	health risk assessment
HVAC	heating, ventilating and air conditioning
ID	induced draft
IRIS	Integrated Risk Information System
JACADS	Johnston Atoll Chemical Agent Disposal System

matter) is emitted at 20 percent of the ASC. This leads to a lower respirable mustard concentration for Case 3 as compared to Case 1. For Cases 2 and 4, the mustard emission rate is the same (i.e., 20 percent of the ASC). The small difference in the resulting cancer risk (from mustard only) is probably due primarily to errors in the air dispersion analysis rather than due to the effect of the carbon filters. The same is true for the difference in the calculated cancer risk for Cases 3 and 4. The resulting effect of the difference on the calculated excess cancer risk for the "with PFS" and "without PFS" cases is further magnified by the use of a much higher cancer slope factor.

Table B-5. Effect on Cancer Risk to Subsistence Farmer of Revised Cancer Slope Factors for Mustard (HD/HT)

Excess Cancer Risk	Case 1 without PFS, HHRA Protocol	Case 2 without PFS, Actual Program Factors	Case 3 with PFS, HHRA Protocol	Case 4 with PFS, Actual Program Factors
Cancer Risk from HD/HT (Original HHRA Cancer Slope Factor)	2.7E-07	1.4E-08	6.1E-08	8.1E-09
Total Cancer Risk (all COPCs)	3.6E-06	5.5E-08	2.2E-06	3.2E-08
Cancer Risk from HD/HT (New Cancer Slope Factor)	3.1E-06	1.6E-07	5.9E-07	9.3E-08
Total Cancer Risk (all COPCs)	6.5E-06	2.0E-07	2.7E-06	1.2E-07

References and Notes for Tables B-2 and B-3

1. Environmental Protection Agency, *Exposure Factors Handbook*, EPA 600.8-89-043, July 1989.
2. Environmental Protection Agency, *Implementation Guidance for Conducting Indirect Exposure Analysis at RCRA Combustion Units,* Draft Revised 22 April 1994.
3. Linak, William P., Jeffery V. Ryan (Air Pollution Prevention and Control Division, National Risk Management Research Laboratory, U.S. EPA, Research Triangle Park, NC 27711), and Jost O. L. Wendt (Department of Chemical and Environmental Engineering, University of Arizona, Tucson, AZ 85721), "Formulation and Destruction of Hexavalent Chromium in a Laboratory Swirl Flame Incinerator," (Prepared for presentation at the 4th International Congress on Toxic Combustion Byproducts, Berkeley, CA June 5–7 1995 and publication in *Combustion Science and Technology* [submitted 26 June 1995, revised 7 November 1995]).
4. Average value of experimental results reported in Reference 3 (Mitretek Internal Memorandum from J. Fernando to R. Kutzman, 19 September 1996).
5. Adjusted TCDD toxicity equivalency values based on selected percentages of the PCDF being 2,3,4,7,8 PCDF, the more toxic of the two congeners for which Reference C provides TCDD toxicity equivalence factors. The adjustments made here were based on the information available in the Case 1 Subsistence Farmer Table (Table B-1) provided by CHPPM on the relative proportions of the various congeners, and TCDD equivalence values were recalculated for the entire range of congeners, with selected ratios of the two PCDFs. The value provided in the HRA is 100 percent 2,3,4,7,8 PCDF and 0 percent 1,2,3,7,8 PCDF; the minimum possible range value is for 0 percent 2,3,4,7,8 PCDF and 100 percent 1,2,3,7,8 PCDF; a reasonable average value is for 50 percent 2,3,4,7,8 PCDF and 50 percent 1,2,3,7,8 PCDF.
6. The source of metals in the feed materials for the incinerators should be verified. If the DL is being used to develop the emission concentration value, the respirable concentrations could be substantially less than that used to calculate risk.
7. Selected references suggest more conservative values for this parameter, see Reference 1.

Effects of New Cancer Standards for Mustard

The Army's Office of the Surgeon General recently issued interim chronic toxicological criteria for chemical warfare compounds (DASG, 1996). Those criteria included oral and inhalation cancer unit risk values from which cancer slope factors for HD (sulfur mustard) could be derived. Table B-4 compares the new standards with those used in the UMCDF HRA.

Table B-4. Cancer Slope Factor Values for Mustard (HD/HT)

	Oral Cancer Slope Factor (for Soil Ingestion) [per mg/kg-day]	Inhalation Cancer Slope Factor (for Direct Exposure) [per mg/kg-day]
From (DASG, 1996)	95.0	298.0
UMCDF HHRA	9.5	9.5

Table B-5 presents the estimated excess cancer risk to the subsistence farmer using the revised cancer slope factors for HD for the four HRA cases analyzed. Even with the use of these (and much greater) cancer slope factors for HD, the excess cancer risk to the subsistence farmer for Case 1 (without PFS, conservative) is still below the regulatory threshold value of 1.0E-05 (1 in 10 thousand) excess cancer risk. Thus, although the magnitude of the estimated risk values are understandably greater, the overall conclusion remains that the PFS has insignificant effect on risk. This conclusion is further emphasized by the results obtained for the "actual program factors" cases (Cases 2 and 4), whereby the "without PFS" case leads to about 20 to 100 million chance of contracting cancer and the "with PFS" case leads to about 12 in 100 million chance of contracting cancer. Use of the much greater cancer slope factors for mustard makes this COPC the predominant contributor to risk.

In considering the significance of the calculated values presented in Table B-5, it is important to emphasize the assumptions made in the HHRA for each of the four cases analyzed. No agent emissions were actually detected during the trial burn tests at JACADS. However, the UMCDF HHRA protocol requires that agent emissions be assumed equal to the ASC level. Although addition of the PFS would not lead to further reduction in mustard emissions during normal operations, the slight reduction in risk is primarily due to the assumption in the "with PFS" HHRA protocol case that mustard (and other agents for that

Table B-3. (Concluded)

PARAMETER	HHRA Value	Reasonable Values	References/ Notes
Amilk-soil (mg/kg)=concentration in milk resulting from contaminated soil	8.35E-07	8.35E-07	
CRmilk (kg/day)=consumption rate of milk	3.00E-01	3.00E-01	Ref. 1, Ref. 7
Fmilk (unitless) fraction of milk from contaminated source	4.00E-01	4.00E-01	Ref. 1
As milk Cancer Risk	1.94E-08	2.63E-09	
TCDD TEQ Cancer Risk-milk			
Cyv (µg/m^3)=Vapor phase air concentration	3.97E-11	3.85E-11	Ref. 5
Dywv (g/m^2-yr)=Yearly wet deposition from vapor phase	9.47E-13	9.20E-13	Ref. 5
Dydp (g/m^2-yr)=Yearly dry deposition from particle phase	9.87E-12	9.63E-12	Ref. 5
Dywp (g/m^2-yr)=Yearly wet deposition from particle phase	1.01E-12	9.86E-13	Ref. 5
Pd (mg/kg)=Conc. in plant due to direct deposition	1.13E-09	1.10E-09	See Appendix A.
Pv (mg/kg)=Above ground plant concentration due to air-to-plant transfer	2.78E-09	2.70E-09	See Appendix A.
Amilk-plant	3.61E-10	3.51E-10	See Appendix A.
EDmilk-plant	4.00E+01	3.20E+00	
Tc (yr)=Total time period over which deposition occurs	3.20E+00	3.20E+00	
Sc (mg/kg)=soil concentration due to direct deposition	1.05E-08	1.02E-08	See Appendix A.
Amilk-soil	2.95E-11	2.87E-11	See Appendix A.
CRmilk (kg/day)=consumption rate of milk	3.00E-01	3.00E-01	Ref. 1
Fmilk (unitless) fraction of milk from contaminated source	4.00E-01	4.00E-01	Ref. 1
TCDD TEQ milk Cancer Risk	5.50E-08	8.00E-09	

Table B-3. (Continued)

PARAMETER	HHRA Value	Reasonable Value	References/ Notes
CRbeef (kg/day)=consumption rate of beef	1.00E-01	1.00E-01	Ref. 1,2
Fbeef (unitless) fraction of beef from contaminated source	4.40E-01	4.40E-01	Ref. 1,2
As beef Cancer Risk	1.63E-09	2.62E-10	
TCDD TEQ Cancer Risk-beef			
Cyv (µg/m^3)=Vapor phase air concentration	3.97E-11	3.85E-11	Ref. 5
Dywv (g/m^2-yr)=Yearly wet deposition from vapor phase	9.47E-13	9.20E-13	Ref. 5
Dydp (g/m^2-yr)=Yearly dry deposition from particle phase	9.87E-12	9.63E-12	Ref. 5
Dywp (g/m^2-yr)=Yearly wet deposition from particle phase	1.01E-12	9.86E-13	Ref. 5
Pd (mg/kg)=Conc. in plant due to direct deposition	1.13E-09	1.10E-09	See Appendix A.
Pv (mg/kg)=Above ground plant concentration due to air-to-plant transfer	2.78E-09	2.70E-09	See Appendix A.
Abeef-plant	1.38E-09	1.34E-09	See Appendix A.
EDbeef-plant	4.00E+01	3.20E+00	
Tc (yr)=Total time period over which deposition occurs	3.20E+00	3.20E+00	
Sc (mg/kg)=soil concentration due to direct deposition	1.05E-08	1.02E-08	See Appendix A.
Abeef-soil	1.69E-10	1.64E-10	See Appendix A.
CRbeef (kg/day)=consumption rate of beef	1.00E-01	1.00E-01	Ref. 1,2
Fbeef (unitless) fraction of beef from contaminated source	4.40E-01	4.40E-01	Ref. 1,2
TCDD TEQ beef Cancer Risk	7.97E-08	5.53E-09	
As Cancer Risk-milk			
EDmilk-plant	4.00E+01	3.20E+00	
Tc (yr)=Total time period over which deposition occurs	3.20E+00	3.20E+00	
Sc (mg/kg)=soil concentration due to direct deposition	3.48E-04	3.48E-04	See Appendix A.

Table B-3. Cancer Parameter Data for Case 4 Sensitivity Analysis

PARAMETER	HHRA Value	Reasonable Value	References/ Notes
INHALATION EXPOSURE			
Cr+6 Inhalation			
IRair (m3/d)=Inhalation rate	2.00E+01	2.00E+01	Ref. 1,2
ED (yr.)=Exposure duration	3.20E+00	3.20E+00	
F(Cr+6) (unitless)= fraction of total Cr that is hexavalent Cr	1.00E+00	3.50E-02	Ref. 3,4
Respirable Concentration (μg/m^3)	3.49E-06	1.22E-07	Ref. 6
Cr+6 Inhalation Cancer Risk	1.79E-09	6.27E-11	
Arsenic Inhalation			
IRair (m3/d)=Inhalation rate	2.00E+01	2.00E+01	Ref. 1,2
ED (yr.)=Exposure duration	3.20E+00	3.20E+00	
iCSF (per mg/kg-day)=inhalation cancer slope factor	5.00E+01	1.51E+01	CSF = 50 (HEAST) CSF = 15.1 (IRIS)
As Inhalation Cancer Risk	7.01E-09	2.12E-09	
TCDD TEQ Inhalation			
RespConc. (μg/m^3)	1.15E-10	1.12E-10	Ref. 5
IRair (m3/d)=Inhalation rate	2.00E+01	2.00E+01	Ref. 1,2
ED (yr.)=Exposure duration	3.20E+00	3.20E+00	
TCDD TEQ Inhalation Cancer Risk	2.16E-10	2.10E-10	
INDIRECT EXPOSURE			
As Cancer Risk-beef			
EDbeef-plant	4.00E+01	3.20E+00	
Tc (yr)=Total time period over which deposition occurs	3.20E+00	3.20E+00	
Sc (mg/kg)=soil concentration due to direct deposition	3.48E-04	3.48E-04	See Appendix A.
Abeef-soil (mg/kg)=concentration in beef resulting from contaminated soil	2.78E-07	2.78E-07	See Appendix A.

Table B-2. (Concluded)

PARAMETER	HHRA Value	Reasoable Value	References/ Notes
Amilk-soil (mg/kg)=concentration in milk resulting from contaminated soil	9.88E-07	9.88E-07	
CRmilk (kg/day)=consumption rate of milk	3.00E-01	3.00E-01	Ref. 1
Fmilk (unitless) fraction of milk from contaminated source	4.00E-01	4.00E-01	Ref. 1
As milk Cancer Risk	2.29E-08	3.11E-09	
TCDD TEQ Cancer Risk-milk			
Cyv (µg/m^3)=Vapor phase air concentration	6.97E-11	6.77E-11	Ref. 5
Dywv (g/m^2-yr)=Yearly wet deposition from vapor phase	1.92E-12	1.86E-12	Ref. 5
Dydp (g/m^2-yr)=Yearly dry deposition from particle phase	2.03E-11	1.98E-11	Ref. 5
Dywp (g/m^2-yr)=Yearly wet deposition from particle phase	2.20E-12	2.15E-12	Ref. 5
Pd (mg/kg)=Conc. in plant due to direct deposition	2.33E-09	2.28E-09	See Appendix A.
Pv (mg/kg)=Above ground plant concentration due to air-to-plant transfer	4.87E-09	4.73E-09	See Appendix A.
Amilk-plant	6.66E-10	6.48E-10	See Appendix A.
EDmilk-plant	4.00E+01	3.20E+00	
Tc (yr)=Total time period over which deposition occurs	3.20E+00	3.20E+00	
Sc (mg/kg)=soil concentration due to direct deposition	1.93E-08	1.87E-08	See Appendix A.
Amilk-soil	5.40E-11	5.25E-11	See Appendix A.
CRmilk (kg/day)=consumption rate of milk	3.00E-01	3.00E-01	Ref. 1
Fmilk (unitless) fraction of milk from contaminated source	4.00E-01	4.00E-01	Ref. 1
TCDD TEQ milk Cancer Risk	1.01E-07	1.47E-08	

Table B-2. (Continued)

PARAMETER	HHRA Value	Reasonable Value	References/ Notes
CRbeef (kg/day)=consumption rate of beef	1.00E-01	1.00E-01	Ref. 1,2
Fbeef (unitless) fraction of beef from contaminated source	4.40E-01	4.40E-01	Ref. 1,2
As beef Cancer Risk	1.92E-09	3.10E-10	
TCDD TEQ Cancer Risk-beef			
Cyv (μg/m^3)=Vapor phase air concentration	6.97E-11	6.77E-11	Ref. 5
Dywv (g/m^2-yr)=Yearly wet deposition from vapor phase	1.92E-12	1.86E-12	Ref. 5
Dydp (g/m^2-yr)=Yearly dry deposition from particle phase	2.03E-11	1.98E-11	Ref. 5
Dywp (g/m^2-yr)=Yearly wet deposition from particle phase	2.20E-12	2.15E-12	Ref. 5
Pd (mg/kg)=Conc. in plant due to direct deposition	2.33E-09	2.28E-09	See Appendix A.
Pv (mg/kg)=Above ground plant concentration due to air-to-plant transfer	4.87E-09	4.73E-09	See Appendix A.
Abeef-plant	2.54E-09	2.47E-09	See Appendix A.
EDbeef-plant	4.00E+01	3.20E+00	
Tc (yr)=Total time period over which deposition occurs	3.20E+00	3.20E+00	
Sc (mg/kg)=soil concentration due to direct deposition	1.93E-08	1.87E-08	See Appendix A.
Abeef-soil	3.08E-10	3.08E-10	See Appendix A.
CRbeef (kg/day)=consumption rate of beef	1.00E-01	1.00E-01	Ref. 1,2
Fbeef (unitless) fraction of beef from contaminated source	4.40E-01	4.40E-01	Ref. 1,2
TCDD TEQ beef Cancer Risk	1.47E-07	1.02E-08	
As Cancer Risk-milk			
EDmilk-plant	4.00E+01	3.20E+00	
Tc (yr)=Total time period over which deposition occurs	3.20E+00	3.20E+00	
Sc (mg/kg)=soil concentration due to direct deposition	4.12E-04	4.12E-04	See Appendix A.

Table B-2. Cancer Parameter Data for Case 2 Sensitivity Analysis

PARAMETER	HHRA Value	Reasonable Value	References/ Notes
INHALATION EXPOSURE			
Cr+6 Inhalation			
Irair (m3/d)=Inhalation rate	2.00E+01	2.00E+01	Ref. 1,2
ED (yr.)=Exposure duration	3.20E+00	3.20E+00	
F(Cr+6) (unitless)=fraction of total Cr that is hexavalent Cr	1.00E+00	3.50E-02	Ref. 3,4
Respirable Concentration (ug/m^3)	1.77E-05	6.20E-07	Ref. 6
Cr+6 Inhalation Cancer Risk	9.09E-09	3.18E-10	
Arsenic Inhalation			
Irair (m3/d)=Inhalation rate	2.00E+01	2.00E+01	Ref. 1,2
ED (yr.)=Exposure duration	3.20E+00	3.20E+00	
iCSF (per mg/kg-day)=inhalation cancer slope factor	5.00E+01	1.51E+01	CSF = 50 (HEAST)* CSF = 15.1 (IRIS)
As Inhalation Cancer Risk	7.26E-09	2.19E-09	
TCDD TEQ Inhalation			
RespConc. (µg/m^3)	2.11E-10	2.05E-10	Ref. 5
Irair (m3/d)=Inhalation rate	2.00E+01	2.00E+01	Ref. 1,2
ED (yr.)=Exposure duration	3.20E+00	3.20E+00	
TCDD TEQ Inhalation Cancer Risk	3.96E-10	3.85E-10	
INDIRECT EXPOSURE			
As Cancer Risk-beef			
Edbeef-plant	4.00E+01	3.20E+00	
Tc (yr)=Total time period over which deposition occurs	3.20E+00	3.20E+00	
Sc (mg/kg)=soil concentration due to direct deposition	4.12E-04	4.12E-04	See Appendix A.
Abeef-soil (mg/kg)=concentration in beef resulting from contaminated soil	3.29E-07	3.29E-07	See Appendix A.

* HEAST = Health Effects Assessment Summary Tables

The methodology used to estimate the concentration of COPCs (primarily TCDD equivalent and arsenic) in beef and milk was evaluated. The method used would provide a reasonable estimate of emission chemical concentrations in beef and milk during the period of incinerator operation. However, the method used assumed that livestock would continue to accumulate chemicals deposited on plants from airborne emissions for 40 years, rather than limiting this pathway to the duration of incineration operation (maximum of 6 years).

The set of reasonable values for the above parameters is presented in Table B-2 for Case 2 of the sensitivity analysis and in Table B-3 for Case 4. Note that the HHRA protocol parameters for HD/HT were not changed for Cases 2 and 4.

Table B-1. Excess Cancer Risk to Subsistence Farmer for Major Chemical Contributors

Excess Cancer Risk	Case 1 without PFS, HHRA Protocol	Case 2 without PFS, Actual Program Factors	Case 3 with PFS, HHRA Protocol	Case 4 with PFS, Actual Program Factors
TCDD TEQ				
Indirect	2.9E-06	3.0E-08	1.9E-06	1.6E-08
Direct	4.1E-09	3.9E-10	2.9E-09	2.1E-10
Total	2.9E-06	3.0E-08	1.9E-06	1.6E-08
Arsenic				
Indirect	2.8E-07	4.5E-09	1.8E-07	3.9E-09
Direct	7.6E-08	2.2E-09	5.6E-08	2.1E-09
Total	3.6E-07	6.7E-09	2.4E-07	6.0E-09
HD/HT				
Indirect	2.6E-07	1.3E-08	5.6E-08	7.5E-09
Direct	2.0E-08	9.6E-10	4.2E-09	5.7E-10
Total	2.7E-07	1.4E-08	6.1E-08	8.1E-09
Chromium				
Indirect	0	0	0	0
Direct	2.8E-08	3.2E-10	1.7E-08	6.3E-11
Total	2.8E-08	3.2E-10	1.7E-08	6.3E-11
*All other COPCs**				
Indirect	2.5E-08	2.3E-09	1.4E-08	1.5E-09
Direct	1.2E-08	1.2E-09	6.2E-09	6.1E-10
Total	3.7E-08	3.5E-09	2.0E-08	2.1E-09
Total Cancer Risk	3.6E-06	5.5E-08	2.2E-06	3.2E-08

* For cases 2 and 4, the risk parameter values for other COPCs were the same as the HRA protocol (i.e., conservative)

Based on a limited review of available literature[2], there is sufficient basis to assume that only 50 percent of the PCDF is present as the 2,3,4,7,8-PCDF congener (with TEF = 0.5). Thus, this adjustment is made to the calculation of excess cancer risk from PCDF.

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[2] Hsia, S., personal communication, Mitretek Systems, Inc., August 1, 1996.

Appendix B

HHRA Results: Sensitivity to Cancer Risk Parameters

This appendix describes the approach used for applying more reasonable values for various risk parameters, specifically to the subsistence farmer in Cases 2 and 4. This method results in more accurate estimates of cancer risk than those arrived at using the UMCDF HHRA protocol.

The exposure parameters evaluated include those post-deposition phenomena that would affect all non-inhalation doses of emission chemicals and those that impact the inhaled dose of airborne emission chemicals. Focus was directed toward those chemicals and exposure pathways that resulted in the greatest risk because the same sensitivities generally would be applicable to all other chemicals affecting receptors by the same pathways. Table B-1 provides a summary of the results for all four cases analyzed.

The species (valence/organic complexes) of emission chemicals were also evaluated because these can have a substantial effect on the toxicity of the chemical. The assumption that all of the chromium detected in the emissions from the facility was chromium (+6) was evaluated. Cr (+6) is not particularly stable under most environmental conditions, and a study on the species of Cr (+6 vs. +3) emitted from an incinerator has been made.[1] The results of that study were used to evaluate the effect of alternative assumptions on the cancer risk results.

Additionally, the impact of the assumption that all of the pentachlorodibenzofuran (PCDF) detected in the emissions was 2,3,4,7,8-PCDF instead of a mixture of 1,2,3,7,8- and 2,3,4,7,8-PCDFs was evaluated. This has important implications because of the EPA's procedure for assessing the risks associated with exposures to the many congeners of dioxins and furans. A Toxicity Equivalence Factor (TEF) between zero and 1.0 is assigned to each dioxin and furan congener based on its toxicity relative to 2,3,7,8-TCDD. The EPA's guidance lists two TEFs for the 2,3,7,8 chlorine-substituted PCDF because the location of the fifth chlorine molecule determines the toxicity of the PCDF. The original HHRA assumed that 100 percent of the PCDF in the emissions is the more toxic (TEF = 0.5) 2,3,4,7,8-PCDF.

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[1] Linak, W.P., J.V. Ryan, and J.O.L. Wendt, "Formulation and Destruction of Hexavalent Chromium in a Laboratory Swirl Flame Incinerator," presented at the 4th International Congress on Toxic Combustion Byproducts, Berkeley, CA, June 5-7, 1995.

Table A-2.4.29 Case 4. With PFS, Actual Program Factors: UMATILLA RIVER SUBSISTENCE FISHER

	Risk UMCDF	HI-Liver UMCDF	HI-Neuro UMCDF	HQ		Risk-Inh. UMCDF	HI-Inh. UMCDF
Indirect					Inhalation		
Antimony				1.17E-07	Tetra CDD	2.09E-12	
Arsenic	1.12E-09			5.79E-06	Penta CDD	5.24E-12	
Barium				1.12E-08	Hexa CDD	1.05E-12	
Beryllium	4.60E-10			4.99E-08	Hepta CDD	1.05E-13	
bis (2-Ethylhexyl) Phthalate	2.49E-12	2.17E-08		2.08E-08	Octa CDD	2.10E-14	
Cadmium				1.23E-06	Tetra CDF	2.08E-13	
Chromium				3.12E-07	Penta CDF	5.23E-12	
2,4-Dinitrotoluene	8.20E-13		1.47E-09	1.41E-09	Hexa CDF	1.05E-12	
2,6-Dinitrotoluene	7.82E-13		2.80E-09	2.69E-09	Hepta CDF	1.05E-13	
Di-n-octyl Phthalate		2.19E-08		2.10E-08	Octa CDF	2.10E-14	
GB			9.01E-08	8.64E-08	2,3,7,8-TCDD TEQ	1.95E-11	
HD/HT	5.23E-09				Antimony		
Lead					Arsenic	6.25E-10	
Mercury			8.53E-03	8.18E-03	Barium		2.29E-07
Nickel				2.20E-07	Beryllium	2.47E-11	
Total PCBs					Boron		3.86E-08
Selenium				3.37E-08	Cadmium	2.01E-11	
Silver				6.41E-09	Chromium	1.54E-10	
2,3,7,8-TCDD & Others	2.76E-08				Cobalt		
Thallium		6.22E-05		5.96E-05	Copper		
VX			7.54E-07	7.23E-07	Lead		
Di-n-butyl Phthalate				3.00E-06	Manganese		8.56E-06
Diethyl Phthalate				4.03E-09	Mercury		6.44E-07
Manganese			3.89E-08	3.73E-08	Nickel	5.06E-12	
4-Methylphenol			4.81E-08	4.62E-08	Phosphorus		
RDX	1.19E-13			8.43E-10	Selenium		
2,4,6-Trinitrotoluene	1.81E-13	2.93E-08		2.81E-08	Silver		
Vanadium				1.13E-06	Thallium		
					Tin		
					Vanadium		
					Zinc		
					Acetone		
					Benzene	3.06E-14	
					Bromodichloromethane		
					Bromoform	2.03E-15	
					2-Butanone		1.24E-10
					Carbon Disulfide		1.24E-08
					Carbon Tetrachloride	2.80E-14	
					Chlorobenzene		1.99E-09
					Chloroform	4.27E-14	
					Chloromethane	3.32E-15	
					Dibromochloromethane		
					1,1-Dichloroethane		7.96E-12
					1,2-Dichloropropane		3.04E-09
					cis-1,3-Dichloropropene	6.86E-14	1.99E-09
					trans-1,3-Dichloropropene	6.86E-14	2.02E-09
					Ethylbenzene		3.98E-11
					2-Hexanone		
					Methylene Chloride	8.97E-16	1.33E-11
					4-Methyl-2-pentanone		
					Styrene		1.33E-11
					1,1,2,2-Tetrachloroethane	1.05E-13	
					Tetrachloroethene		
					Toluene		1.05E-10
					1,1,1-Trichloroethane		
					Vinyl Acetate		5.93E-11
					Vinyl Chloride	3.16E-13	
					Xylenes		
					Benzoic Acid		
					Benzyl Alcohol		
					Diethyl Phthalate		
					Dimethyl Phthalate		
					Di-n-butyl Phthalate		
					Di-n-octyl Phthalate		
					bis(2-Ethylhexyl)-Phthalate		
					2-Methylphenol		
					3-Methylphenol		
					4-Methylphenol		
					Naphthalene		
					GB		1.31E-06
					HD/HT	4.94E-11	3.92E-06
					VX		1.31E-06
					Chlorine		
					Hydrogen Chloride		4.66E-04
					Hydrogen Fluoride		
					Nitroglycerine		
					PCB		
					Particulates		
					2,4-Dinitrotoluene		
					2,6-Dinitrotoluene		
					2,4,6-Trinitrotoluene		
					RDX		
					HMX		
Total	3.44E-08	6.22E-05	8.53E-03			8.99E-10	4.82E-04
Grand Total	4E-08	0.00006	0.0085			9E-10	0.0005

Table A-2.4.28 Case 4. With PFS, Actual Program Factors: UMATILLA RIVER SUBSISTENCE FISHER

DIRECT INHALATION EXPOSURES:

Exposure parameter	Exposure Scenario			
	Subsistence Farmer	Subsistence Fisher	Adult Resident	Child Resident
Inhalation rate, IR (m3/hr)	0.8	0.8	0.8	0.2
Exposure duration, ED (yr)	3.2	3.2	3.2	3.2
Body weight, BW (kg)	70	70	70	15
Exposure time, ET (hr/day)		24		
Exposure frequency, EF (day/yr)		350		
Carcinogenic averaging time, LT (day)		25550		
Noncancer averaging time, LT (day)		1168		

CSF = Cancer Slope Factor
RfD = Reference Dose
HI = Hazard Index

CDD = Chlorinated dibenzo-p-dioxin
CDF = Chlorinated dibenzo-p-furan

Substances of Potential Concern	Respirable Concentration (ug/m3)	Cancer Inh. Intake Fisher-Umatilla River (mg/kg-day)	Inhalation CSF (per mg/kg-day)	Cancer Risk Fisher-Umatilla River	Inhalation RfD (mg/kg/day)	Hazard Quotient Fisher-Umatilla River
Tetra CDD	1.44E-12	1.80E-17	1.16E+05	2.09E-12		
Penta CDD	7.21E-12	9.03E-17	5.80E+04	5.24E-12		
Hexa CDD	7.23E-12	9.05E-17	1.16E+04	1.05E-12		
Hepta CDD	7.23E-12	9.06E-17	1.16E+03	1.05E-13		
Octa CDD	1.45E-11	1.81E-16	1.16E+02	2.10E-14		
Tetra CDF	1.43E-12	1.80E-17	1.16E+04	2.08E-13		
Penta CDF	7.20E-12	9.01E-17	5.80E+04	5.23E-12		
Hexa CDF	7.22E-12	9.05E-17	1.16E+04	1.05E-12		
Hepta CDF	7.23E-12	9.05E-17	1.16E+03	1.05E-13		
Octa CDF	1.45E-11	1.81E-16	1.16E+02	2.10E-14		
2,3,7,8-TCDD TEQ	1.04E-11	1.30E-16	1.50E+05	1.95E-11		
Antimony	9.90E-07	1.24E-11				
Arsenic	9.98E-07	1.25E-11	5.00E+01	6.25E-10		
Barium	1.21E-06	1.52E-11			1.45E-03	2.29E-07
Beryllium	2.34E-07	2.94E-12	8.40E+00	2.47E-11		
Boron	8.17E-07	1.02E-11			5.80E-03	3.86E-08
Cadmium	2.55E-07	3.19E-12	6.30E+00	2.01E-11		
Chromium	3.01E-07	3.77E-12	4.10E+01	1.54E-10		
Cobalt	4.88E-07	6.11E-12				
Copper	5.86E-07	7.34E-12				
Lead	8.16E-07	1.02E-11				
Manganese	4.37E-07	5.48E-12			1.40E-05	8.56E-06
Mercury	2.02E-07	2.53E-12			8.60E-05	6.44E-07
Nickel	4.81E-07	6.02E-12	8.40E-01	5.06E-12		
Phosphorus	8.17E-07	1.02E-11				
Selenium	8.39E-07	1.05E-11				
Silver	9.19E-07	1.15E-11				
Thallium	1.57E-06	1.97E-11				
Tin	7.62E-07	9.54E-12				
Vanadium	4.43E-07	5.54E-12				
Zinc	8.39E-07	1.05E-11				
Acetone	7.19E-08	9.00E-13				
Benzene	8.42E-08	1.05E-12	2.90E-02	3.06E-14		
Bromodichloromethane	4.21E-08	5.27E-13				
Bromoform	4.21E-08	5.27E-13	3.85E-03	2.03E-15		
2-Butanone	1.31E-07	1.65E-12			2.90E-01	1.24E-10
Carbon Disulfide	1.31E-07	1.65E-12			2.90E-03	1.24E-08
Carbon Tetrachloride	4.21E-08	5.27E-13	5.30E-02	2.80E-14		
Chlorobenzene	4.21E-08	5.27E-13			5.80E-03	1.99E-09
Chloroform	4.21E-08	5.27E-13	8.10E-02	4.27E-14		
Chloromethane	4.21E-08	5.27E-13	6.30E-03	3.32E-15		
Dibromochloromethane	4.21E-08	5.27E-13				
1,1-Dichloroethane	4.21E-08	5.27E-13			1.45E+00	7.96E-12
1,2-Dichloropropane	4.21E-08	5.27E-13			3.80E-03	3.04E-09
cis-1,3-Dichloropropene	4.21E-08	5.27E-13	1.30E-01	6.86E-14	5.80E-03	1.99E-09
trans-1,3-Dichloropropene	4.21E-08	5.27E-13	1.30E-01	6.86E-14	5.70E-03	2.02E-09
Ethylbenzene	4.21E-08	5.27E-13			2.90E-01	3.98E-11
2-Hexanone	4.21E-08	5.27E-13				
Methylene Chloride	4.21E-08	5.27E-13	1.70E-03	8.97E-16	8.70E-01	1.33E-11
4-Methyl-2-pentanone	4.21E-08	5.27E-13			2.30E-01	5.02E-11
Styrene	4.21E-08	5.27E-13			8.70E-01	1.33E-11
1,1,2,2-Tetrachloroethane	4.21E-08	5.27E-13	2.00E-01	1.05E-13		
Tetrachloroethene	4.21E-08	5.27E-13				
Toluene	4.21E-08	5.27E-13			1.10E-01	1.05E-10
1,1,1-Trichloroethane	7.19E-08	9.00E-13				
Vinyl Acetate	1.23E-08	1.54E-13			5.70E-02	5.93E-11
Vinyl Chloride	8.42E-08	1.05E-12	3.00E-01	3.16E-13		
Xylenes	4.21E-08	5.27E-13				
Benzoic Acid	4.13E-07	5.17E-12				
Benzyl Alcohol	3.12E-07	3.91E-12				
Diethyl Phthalate	2.32E-07	2.90E-12				
Dimethyl Phthalate	2.32E-07	2.90E-12				
Di-n-butyl Phthalate	3.13E-07	3.91E-12				
Di-n-octyl Phthalate	3.13E-07	3.91E-12				
bis(2-Ethylhexyl)-Phthalate	3.09E-07	3.87E-12				
2-Methylphenol	3.12E-07	3.91E-12				
3-Methylphenol	3.08E-07	3.86E-12				
4-Methylphenol	3.12E-07	3.91E-12				
Naphthalene	2.31E-07	2.89E-12				
GB	4.15E-09	5.20E-14			8.67E-07	1.31E-06
HD/HT	4.15E-07	5.20E-12	9.50E+00	4.94E-11	2.90E-05	3.92E-06
VX	4.15E-09	5.20E-14			8.67E-07	1.31E-06
Chlorine	2.57E-04	3.22E-09				
Hydrogen Chloride	9.86E-03	1.24E-07			5.80E-03	4.56E-04
Hydrogen Fluoride	5.09E-03	6.37E-08				
Nitroglycerine	0.00E+00	0.00E+00				
PCB	0.00E+00	0.00E+00				
Particulate	1.83E-03	2.29E-08				
2,4-Dinitrotoluene	7.23E-09	9.06E-14				
2,6-Dinitrotoluene	7.23E-09	9.06E-14				
2,4,6-Trinitrotoluene	7.23E-09	9.06E-14				
RDX	7.23E-09	9.06E-14				
HMX	7.23E-09	9.06E-14				
				9E-10 (1-49)	Total HI=	0.0005 (1-50)

Table A-2.4.27 Case 4. With PFS, Actual Program Factors: UMATILLA RIVER SUBSISTENCE FISHER

INDIRECT EXPOSURES **Calculation of hazard quotients, and hazard indices**

Consumption rate of soil, CR(soil)=	0.0001	kg/day
Fraction of soil impacted, F(soil)=	1	unitless
Consumption rate of abv grd veg, CR(ag)=	0.024	kg/day
Fraction of abv grd veg impacted, F(ag)=	0.25	unitless
Consumption rate of root veg, CR(bg)=	0.0063	kg/day
Fraction of root veg impacted, F(bg)=	0.25	unitless
Consumption rate of fish, CR(fish)=	0.140	kg/day
Fraction of fish impacted, F(fish)=	1	unitless
Body weight, BW=	70	kg

I(tot) = Total daily intake of substance
Sc = Soil concentration after total time period of deposition
I(soil) = Daily intake of substance from soil
Pd + Pv = Concentration in plant
I(ag) = Daily intake of substance from above ground vegetables
Pr(bg) = Concentration in below ground plant parts due to root uptake
I(bg) = Daily intake of substance from below ground vegetables
C(fish) = Concentration in fish
I(fish) = Daily intake of substance from fish
RfD = Reference dose
HI = Hazard Index

Substances of Potential Concern	Sc (mg/kg)	I(soil) (mg/day)	Pd+Pv (mg/kg)	I(ag) (mg/day)	Pr(bg) (mg/kg)	I(bg) (mg/day)	C(fish) (mg/kg)	I(fish) (mg/day)	I(tot) (mg/day)	RfD (mg/kg-day)	Hazard Index Liver	Hazard Index Neuro	Hazard Quotient
Antimony	1.19E-05	1.19E-09	3.58E-08	2.15E-10	8.95E-11	1.41E-13	1.43E-08	2.00E-09	3.41E-09	4.00E-04			1E-07
Arsenic	1.20E-05	1.20E-09	3.61E-08	2.16E-10	1.66E-12	2.61E-15	8.95E-07	1.25E-07	1.27E-07	3.00E-04			6E-06
Barium	1.49E-05	1.49E-09	6.54E-08	3.93E-10	2.11E-13	3.33E-16	3.94E-07	5.52E-08	5.71E-08	7.00E-02			1E-08
Beryllium	2.97E-06	2.97E-10	1.30E-08	7.79E-11	3.18E-14	5.01E-17	1.27E-07	1.78E-08	1.82E-08	5.00E-03			5E-08
bis (2-Ethylhexyl) Phthalate	5.34E-05	5.34E-09	4.21E-09	2.53E-11	3.05E-11	4.81E-14	1.78E-07	2.50E-08	3.03E-08	2.00E-02	2.17E-08		2E-08
Cadmium	3.24E-06	3.24E-10	1.42E-08	8.50E-11	3.24E-13	5.10E-16	6.36E-07	8.91E-08	8.95E-08	1.00E-03			1E-06
Chromium	3.73E-06	3.73E-10	1.63E-08	9.79E-11	4.66E-13	7.34E-16	8.11E-07	1.14E-07	1.14E-07	5.00E-03			3E-07
2,4-Dinitrotoluene	1.56E-06	1.56E-10	9.04E-12	5.42E-14	1.71E-09	2.69E-12	3.32E-10	4.65E-11	2.05E-10	2.00E-03		1.47E-09	1E-09
2,6-Dinitrotoluene	1.56E-06	1.56E-10	7.83E-12	4.70E-14	1.98E-09	3.12E-12	2.61E-10	3.66E-11	1.96E-10	1.00E-03		2.80E-09	3E-09
Di-n-octyl Phthalate	5.41E-05	5.41E-09	3.69E-09	2.21E-11	3.09E-11	4.87E-14	1.80E-07	2.52E-08	3.06E-08	2.00E-02	2.19E-08		2E-08
GB	8.88E-07	8.88E-11	1.00E-13	6.02E-16	1.29E-08	2.03E-11	1.16E-09	1.62E-10	2.71E-10	4.30E-05		9.01E-08	9E-08
HD/HT	8.88E-05	8.88E-09	5.96E-13	3.57E-15	4.26E-08	6.71E-11	6.06E-07	8.48E-08	9.37E-08				
Lead	9.70E-06	9.70E-10	4.27E-08	2.56E-10	NA	NA	NA	NA	1.23E-09				
Mercury	4.35E-05	4.35E-09	3.87E-08	2.32E-10	NA	NA	4.27E-04	5.97E-05	5.97E-05	1.00E-04		8.53E-03	8E-03
Nickel	5.87E-06	5.87E-10	2.58E-08	1.55E-10	1.43E-13	2.26E-16	2.29E-06	3.20E-07	3.21E-07	2.00E-02			2E-07
Total PCBs	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Selenium	9.94E-06	9.94E-10	3.00E-08	1.80E-10	2.31E-11	3.64E-14	7.95E-08	1.11E-08	1.23E-08	5.00E-03			3E-08
Silver	1.10E-05	1.10E-09	4.83E-08	2.90E-10	1.37E-09	2.16E-12	6.78E-09	9.49E-10	2.34E-09	5.00E-03			6E-09
2,3,7,8-TCDD & Dioxin-Like SOPCs	8.20E-10	8.20E-14	2.77E-12	1.66E-14	3.49E-14	5.50E-17	2.23E-10	3.12E-11	3.13E-11				
Thallium	2.04E-05	2.04E-09	8.89E-08	5.33E-10	5.51E-14	8.67E-17	2.47E-06	3.46E-07	3.48E-07	8.00E-05	6.22E-05		6E-05
VX	8.88E-07	8.88E-11	7.82E-11	4.69E-13	5.48E-09	8.62E-12	1.55E-08	2.17E-09	2.27E-09	4.30E-05		7.54E-07	7E-07
Di-n-butyl Phthalate	5.41E-05	5.41E-09	4.12E-09	2.47E-11	3.04E-06	4.79E-09	1.56E-04	2.19E-05	2.19E-05	1.00E-01			3E-06
Diethyl Phthalate	4.02E-05	4.02E-09	3.13E-09	1.88E-11	2.50E-08	3.94E-11	1.65E-06	2.31E-07	2.35E-07	8.00E-01			4E-09
Manganese	5.13E-06	5.13E-10	2.26E-08	1.36E-10	1.12E-11	1.76E-14	2.72E-06	3.81E-07	3.81E-07	1.40E-01		3.89E-08	4E-08
4-Methylphenol	6.67E-05	6.67E-09	4.45E-11	2.67E-13	1.17E-07	1.85E-10	7.14E-08	1.00E-08	1.68E-08	5.00E-03		4.81E-08	5E-08
RDX	1.56E-06	1.56E-10	5.98E-15	3.59E-17	1.19E-09	1.88E-12	1.90E-10	2.65E-11	1.85E-10	3.00E-03			8E-10
2,4,6-Trinitrotoluene	1.56E-06	1.56E-10	1.40E-11	8.39E-14	3.15E-10	4.97E-13	6.20E-09	8.68E-10	1.02E-09	5.00E-04	2.93E-08		3E-08
Vanadium	5.59E-06	5.59E-10	2.44E-08	1.47E-10	2.80E-12	4.40E-15	4.13E-06	5.79E-07	5.79E-07	7.00E-03			1E-06
										HI=	0.0001	0.009	0.008

Table A-2.4.26 Case 4. With PFS, Actual Program Factors: UMATILLA RIVER SUBSISTENCE FISHER

INDIRECT EXPOSURES Calculation of cancer risks

Consumption rate of soil, CR(soil)=	0.0001	kg/day
Fraction of soil impacted, F(soil)=	1	unitless
Consumption rate of abv grd veg, CR(ag)=	0.024	kg/day
Fraction of abv grd veg impacted, F(ag)=	0.25	unitless
Consumption rate of root veg, CR(bg)=	0.0063	kg/day
Fraction of root veg impacted, F(bg)=	0.25	unitless
Consumption rate of fish, CR(fish)=	0.140	kg/day
Fraction of fish impacted, F(fish)=	1	unitless
Exposure duration, ED=	30	yr
Exposure frequency, EF=	350	day/yr
Body weight, BW=	70	kg
Averaging time, AT=	70	yr

I(tot) = Total daily intake of substance
Sc = Soil concentration after total time period of deposition
I(soil) = Daily intake of substance from soil
Pd + Pv = Concentration in plant
I(ag) = Daily intake of substance from above ground vegetables
Pr(bg) = Concentration in below ground plant parts due to root uptake
I(bg) = Daily intake of substance from below ground vegetables
C(fish) = Concentration in fish
I(fish) = Daily intake of substance from fish
CSF = Carcinogenic slope factor

Substances of Potential Concern	Sc (mg/kg)	I(soil) (mg/day)	Pd+Pv (mg/kg)	I(ag) (mg/day)	Pr(bg) (mg/kg)	I(bg) (mg/day)	C(fish) (mg/kg)	I(fish) (mg/day)	I(tot) (mg/day)	CSF (per mg/kg-day)	Cancer Risk
Antimony	1.19E-05	1.19E-09	3.58E-08	2.15E-10	8.95E-11	1.41E-13	1.43E-08	2.00E-09	3.41E-09		
Arsenic	1.20E-05	1.20E-09	3.61E-08	2.16E-10	1.66E-12	2.61E-15	8.95E-07	1.25E-07	1.27E-07	1.50E+00	1.12E-09
Barium	1.49E-05	1.49E-09	6.54E-08	3.93E-10	2.11E-13	3.33E-16	3.94E-07	5.52E-08	5.71E-08		
Beryllium	2.97E-06	2.97E-10	1.30E-08	7.79E-11	3.18E-14	5.01E-17	1.27E-07	1.78E-08	1.82E-08	4.30E+00	4.60E-10
bis (2-Ethylhexyl) Phthalate	5.34E-05	5.34E-09	4.21E-09	2.53E-11	3.05E-11	4.81E-14	1.78E-07	2.50E-08	3.03E-08	1.40E-02	2.49E-12
Cadmium	3.24E-06	3.24E-10	1.42E-08	8.50E-11	3.24E-13	5.10E-16	6.36E-07	8.91E-08	8.95E-08		
Chromium	3.73E-06	3.73E-10	1.63E-08	9.79E-11	4.66E-13	7.34E-16	8.11E-07	1.14E-07	1.14E-07		
2,4-Dinitrotoluene	1.56E-06	1.56E-10	9.04E-12	5.42E-14	1.71E-09	2.69E-12	3.32E-10	4.65E-11	2.05E-10	6.80E-01	8.20E-13
2,6-Dinitrotoluene	1.56E-06	1.56E-10	7.83E-12	4.70E-14	1.98E-09	3.12E-12	2.61E-10	3.66E-11	1.96E-10	6.80E-01	7.82E-13
Di-n-octyl Phthalate	5.41E-05	5.41E-09	3.69E-09	2.21E-11	3.09E-11	4.87E-14	1.80E-07	2.52E-08	3.06E-08		
GB	8.88E-07	8.88E-11	1.00E-13	6.02E-16	1.29E-08	2.03E-11	1.16E-09	1.62E-10	2.71E-10		
HD/HT	8.88E-05	8.88E-09	5.96E-13	3.57E-15	4.26E-08	6.71E-11	6.06E-07	8.48E-08	9.37E-08	9.50E+00	5.23E-09
Lead	9.70E-06	9.70E-10	4.27E-08	2.56E-10	NA	NA	NA	NA	1.23E-09		
Mercury	4.35E-05	4.35E-09	3.87E-08	2.32E-10	NA	NA	4.27E-04	5.97E-05	5.97E-05		
Nickel	5.87E-06	5.87E-10	2.58E-08	1.55E-10	1.43E-13	2.26E-16	2.29E-06	3.20E-07	3.21E-07		
Total PCBs	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.70E+00	0.00E+00
Selenium	9.94E-06	9.94E-10	3.00E-08	1.80E-10	2.31E-11	3.64E-14	7.95E-08	1.11E-08	1.23E-08		
Silver	1.10E-05	1.10E-09	4.83E-08	2.90E-10	1.37E-09	2.16E-12	6.78E-09	9.49E-10	2.34E-09		
2,3,7,8-TCDD & Dioxin-Like SOPCs	8.20E-10	8.20E-14	2.77E-12	1.66E-14	3.49E-14	5.50E-17	2.23E-10	3.12E-11	3.13E-11	1.50E+05	2.76E-08
Thallium	2.04E-05	2.04E-09	8.89E-08	5.33E-10	5.51E-14	8.67E-17	2.47E-06	3.46E-07	3.48E-07		
VX	8.88E-07	8.88E-11	7.82E-11	4.69E-13	5.48E-09	8.62E-12	1.55E-08	2.17E-09	2.27E-09		
Di-n-butyl Phthalate	5.41E-05	5.41E-09	4.12E-09	2.47E-11	3.04E-06	4.79E-09	1.56E-04	2.19E-05	2.19E-05		
Diethyl Phthalate	4.02E-05	4.02E-09	3.13E-09	1.88E-11	2.50E-08	3.94E-11	1.65E-06	2.31E-07	2.35E-07		
Manganese	5.13E-06	5.13E-10	2.26E-08	1.36E-10	1.12E-11	1.76E-14	2.72E-06	3.81E-07	3.81E-07		
4-Methylphenol	6.67E-05	6.67E-09	4.45E-11	2.67E-13	1.17E-07	1.85E-10	7.14E-08	1.00E-08	1.68E-08		
RDX	1.56E-06	1.56E-10	5.98E-15	3.59E-17	1.19E-09	1.88E-12	1.90E-10	2.65E-11	1.85E-10	1.10E-01	1.19E-13
2,4,6-Trinitrotoluene	1.56E-06	1.56E-10	1.40E-11	8.39E-14	3.15E-10	4.97E-13	6.20E-09	8.68E-10	1.02E-09	3.00E-02	1.81E-13
Vanadium	5.59E-06	5.59E-10	2.44E-08	1.47E-10	2.80E-12	4.40E-15	4.13E-06	5.79E-07	5.79E-07		

Total cancer risk= 3E-08

Table A-2.4.25 Case 4. With PFS, Actual Program Factors: UMATILLA RIVER SUBSISTENCE FISHER (continued)

CONSUMPTION OF FISH FROM THE UMATILLA RIVER:

USING TIME-AVERAGED SOIL CONCENTRATIONS·

Calculation of fish concentration from dissolved water concentration, C1(fish)
Calculation of fish concentration from total water column concentration, C2(fish)
Calculation of fish concentration from bed sediments, C3(fish)

Water body area, WA(w)=	9.80E+06 m2
Impervious watershed area, WA(I)=	1.35E+08 m2
Average annual runoff, R=	0.0 cm/yr
Soil bulk density, BD=	1.5 g/cm3
Soil mixing depth, Z=	1 cm
Total deposition time period, Tc=	3.2 yrs
Total watershed area, WA(L)=	2.70E+09 m2
Volumetric soil water content, Os=	0.2 cm3/cm3
USLE rainfall (or erosivity) factor, RF=	20 1/yr
USLE erodability factor, K=	0.36 tons/acre
USLE length-slope factor, LS=	1.5 unitless
USLE cover management factor, C=	0.1 unitless
USLE supporting practice factor, P=	1 unitless
Unit soil loss, Xe=	0.24 kg/m2-yr
Empirical intercept coefficient, a=	0.6 unitless
Watershed sediment delivery ratio, SD=	3.97E-02 unitless
Soil enrichment ratio, ER=	3 unitless
Average volumetric flow rate, Vf(x)=	4.14E+08 m3/yr
Total suspended solids, TSS=	10 mg/L
Depth of water column, d(w)=	0.50 m
Depth of upper benthic layer, d(b)=	0.03 m
Bed sediment porosity, O(bs)=	0.5 LH20/L
Bed sediment concentration, BS=	1.0 g/cm3
Fish lipid content, f(lipid)=	0.07 unitless
Fraction organic carbon, OC(sed)=	0.04 unitless
Dry deposition velocity of vapor phase, Vdv=	3 cm/s

1042.47 sq.mile

C(fish) = Concentration in fish
f(water) = Fraction of total water body substance concentration that occurs in the water column
C(wtot) = Total water body concentration, including water column and bed sediment
C(wt) = Total concentration in water column
C(dw) = Dissolved phase water concentration
f(benthic) = Fraction of total water body substance concentration that occurs in the bed sediment
kwt = Total water body dissipation rate constant
C(sb) = Concentration sorbed to bed sediments
Kd(sw) = Suspended sediment/surface water partition coefficient
Kd(bs) = Bed sediment/sediment pore water partition coefficient
BCF = Bioconcentration factor
BAF = Bioaccumulation factor
BSAF = Biota to sediment accumulation factor

Substances of Potential Concern	Kd(sw) (L/kg)	Kd(bs) (L/kg)	f(water)	C(wtot) (mg/L)	C(wt) (mg/L)	C(dw) (mg/L)	f(benth)	kwt (1/yr)	C(sb) (mg/kg)	BCF (L/kg)	C1(fish) (mg/kg)	BAF (L/kg)	C2(fish) (mg/kg)	BSAF	C3(fish) (mg/kg)	C(fish) (mg/kg)
Antimony	15	8	6.62E-01	2.04E-08	1.43E-08	1.43E-08	3.38E-01	2.51E-02	1.15E-07	1.0E+00	1.43E-08	NA	NA	NA	NA	1.43E-08
Arsenic	220	120	1.22E-01	1.58E-07	2.04E-08	2.03E-08	8.78E-01	6.52E-02	2.44E-06	4.4E+01	8.95E-07	NA	NA	NA	NA	8.95E-07
Barium	4000	2100	8.18E-03	1.14E-05	9.85E-08	9.47E-08	9.92E-01	7.37E-02	1.99E-04	NA	NA	4.0E+00	3.94E-07	NA	NA	3.94E-07
Beryllium	525	280	5.64E-02	1.07E-07	6.40E-09	6.37E-09	9.44E-01	7.01E-02	1.78E-06	2.0E+01	1.27E-07	NA	NA	NA	NA	1.27E-07
bis (2-Ethylhexyl) Phthalate	2100000	1100000	3.33E-04	4.21E-06	1.49E-09	6.76E-11	1.00E+00	7.42E-02	7.43E-05	NA	NA	1.2E+02	1.78E-07	NA	NA	1.78E-07
Cadmium	1200	640	2.57E-02	3.70E-07	1.01E-08	9.94E-09	9.74E-01	7.24E-02	6.36E-06	6.4E+01	6.36E-07	NA	NA	NA	NA	6.36E-07
Chromium	140	70	1.91E-01	2.50E-07	5.08E-08	5.07E-08	8.09E-01	6.01E-02	3.55E-06	1.6E+01	8.11E-07	NA	NA	NA	NA	8.11E-07
2,4-Dinitrotoluene	6.5	3.5	8.06E-01	1.21E-10	1.04E-10	1.04E-10	1.94E-01	1.44E-02	3.63E-10	3.2E+00	3.32E-10	NA	NA	NA	NA	3.32E-10
2,6-Dinitrotoluene	5	2.7	8.39E-01	1.13E-10	1.01E-10	1.01E-10	1.61E-01	1.20E-02	2.72E-10	2.6E+00	2.61E-10	NA	NA	NA	NA	2.61E-10
Di-n-octyl Phthalate	2100000	1100000	3.33E-04	4.25E-06	1.50E-09	6.82E-11	1.00E+00	7.42E-02	7.50E-05	NA	NA	1.2E+02	1.80E-07	NA	NA	1.80E-07
GB	0.24	0.13	9.64E-01	8.10E-10	8.28E-10	8.28E-10	3.64E-02	2.71E-03	1.08E-10	1.4E+00	1.16E-09	NA	NA	NA	NA	1.16E-09
HD/HT	9.1	4.8	7.59E-01	1.57E-07	1.26E-07	1.26E-07	2.41E-01	1.79E-02	6.06E-07	4.8E+00	6.06E-07	NA	NA	NA	NA	6.06E-07
Lead	4500	2400	7.20E-03	8.59E-06	6.56E-08	6.28E-08	9.93E-01	7.37E-02	1.51E-04	NA	NA	NA	NA	NA	NA	NA
Mercury	95000	160000	2.03E-04	1.52E-05	3.28E-09	1.68E-09	1.00E+00	7.43E-02	2.69E-04	NA	NA	1.3E+05	4.27E-04	NA	NA	4.27E-04
Nickel	620	330	4.83E-02	9.57E-07	4.90E-08	4.87E-08	9.52E-01	7.07E-02	1.61E-05	4.7E+01	2.29E-06	NA	NA	NA	NA	2.29E-06
Total PCBs	32000	17000	1.29E-03	0.00E+00	0.00E+00	0.00E+00	9.99E-01	7.42E-02	0.00E+00	NA	NA	NA	NA	1.6E+00	0.00E+00	0.00E+00
Selenium	32	17	4.88E-01	2.56E-08	1.33E-08	1.33E-08	5.12E-01	3.80E-02	2.25E-07	6.0E+00	7.95E-08	NA	NA	NA	NA	7.95E-08
Silver	3	2	8.70E-01	1.47E-08	1.36E-08	1.36E-08	1.30E-01	9.69E-03	2.71E-08	5.0E-01	6.78E-09	NA	NA	NA	NA	6.78E-09
2,3,7,8-TCDD & Dioxin-Like SOPCs	1070000	570000	3.42E-04	1.08E-10	3.90E-14	3.33E-15	1.00E+00	7.42E-02	1.90E-09	NA	NA	NA	NA	6.7E-02	2.23E-10	2.23E-10
Thallium	560	300	5.28E-02	3.69E-07	2.07E-08	2.06E-08	9.47E-01	7.03E-02	6.17E-06	1.2E+02	2.47E-06	NA	NA	NA	NA	2.47E-06
VX	1.1	0.60	9.38E-01	1.04E-09	1.03E-09	1.03E-09	6.19E-02	4.60E-03	6.20E-10	1.5E+01	1.55E-08	NA	NA	NA	NA	1.55E-08
Di-n-butyl Phthalate	12	6.4	7.07E-01	6.95E-09	5.21E-09	5.21E-09	2.93E-01	2.17E-02	3.33E-08	NA	NA	3.0E+04	1.56E-04	NA	NA	1.56E-04
Diethyl Phthalate	39	21	4.37E-01	8.30E-09	3.84E-09	3.84E-09	5.63E-01	4.18E-02	8.07E-08	NA	NA	4.3E+02	1.65E-06	NA	NA	1.65E-06
Manganese	170	93	1.52E-01	1.41E-07	2.27E-08	2.27E-08	8.48E-01	6.30E-02	2.11E-06	1.2E+02	2.72E-06	NA	NA	NA	NA	2.72E-06
4-Methylphenol	3.8	2.0	8.70E-01	5.53E-09	5.10E-09	5.10E-09	1.30E-01	9.69E-03	1.02E-08	1.4E+01	7.14E-08	NA	NA	NA	NA	7.14E-08
RDX	4.7	2.5	8.47E-01	1.11E-10	9.98E-11	9.98E-11	1.53E-01	1.13E-02	2.49E-10	1.9E+00	1.90E-10	NA	NA	NA	NA	1.90E-10
2,4,6-Trinitrotoluene	83	44	2.73E-01	3.98E-10	1.15E-10	1.15E-10	7.27E-01	5.40E-02	5.05E-09	5.4E+01	6.20E-09	NA	NA	NA	NA	6.20E-09
Vanadium	750	400	4.02E-02	8.14E-07	3.47E-08	3.44E-08	9.60E-01	7.13E-02	1.38E-05	1.2E+02	4.13E-06	NA	NA	NA	NA	4.13E-06

Table A-2.4.25 Case 4. With PFS, Actual Program Factors: UMATILLA RIVER SUBSISTENCE FISHER

CONSUMPTION OF FISH FROM THE UMATILLA RIVER:

USING TIME-AVERAGED SOIL CONCENTRATIONS

Water body area, WA(w)=	9.80E+06	m2
Impervious watershed area, WA(I)=	1.35E+08	m2
Average annual runoff, R=	0.0	cm/yr
Soil bulk density, BD=	1.5	g/cm3
Soil mixing depth, Z=	1	cm
Total deposition time period, Tc=	3.2	yrs
Total watershed area, WA(L)=	2.70E+09	m2
Volumetric soil water content, Os=	0.2	cm3/cm3
USLE rainfall (or erosivity) factor, RF=	20	1/yr
USLE erodability factor, K=	0.36	tons/acre
USLE length-slope factor, LS=	1.5	unitless
USLE cover management factor, C=	0.1	unitless
USLE supporting practice factor, P=	1	unitless
Unit soil loss, Xe=	0.24	kg/m2-yr
Empirical intercept coefficient, a=	0.6	unitless
Watershed sediment delivery ratio, SD=	3.97E-02	unitless
Soil enrichment ratio, ER=	3	unitless
Average volumetric flow rate, Vf(x)=	4.14E+08	m3/yr
Total suspended solids, TSS=	10	mg/L
Depth of water column, d(w)=	0.50	m
Depth of upper benthic layer, d(b)=	0.03	m
Bed sediment porosity, O(bs)=	0.5	LH20/L
Bed sediment concentration, BS=	1.0	g/cm3
Fish lipid content, f(lipid)=	0.07	unitless
Fraction organic carbon, OC(sed)=	0.04	unitless
deposition velocity of vapor phase, Vdv=	3	cm/s

1042.47 sq mile

L(T) = Total substance load to the water body
L(dep) = Deposition of particle bound substance to the water body
L(RI) = Runoff load from impervious surfaces
L(R) = Runoff load from pervious surfaces
L(E) = Soil erosion load
Sc = Soil concentration after total exposure period
Pddw = Yearly average dry deposition rate onto the watershed
Pwdw = Yearly average wet deposition rate onto the watershed
Pdds = Yearly dry deposition rate onto surface water body
Pwds = Yearly wet deposition rate onto surface water body
Kds = Soil-water partition coefficient
Ds = Deposition term

Substances of Potential Concern	Pdds (g/m2-yr)	Pdws (g/m2-yr)	Vwds (g/m2-yr)	Vcs (µg/m3)	Ds (1/yr)	Sc (mg/kg)	Pddb (g/m2-yr)	Pwdb (g/m2-yr)	Vwdb (g/m2-yr)	L(dep) (g/yr)	L(RI) (g/yr)	Kds (L/kg)	L(R) (g/yr)	L(E) (g/yr)	L(T) (g/yr)
Antimony	1.88E-08	1.71E-08	0.00E+00	0.00E+00	2.40E-06	7.67E-06	2.70E-08	2.84E-08	0.00E+00	5.43E-01	4.86E+00	2	0.00E+00	5.33E-01	5.93E+00
Arsenic	2.66E-08	2.46E-08	0.00E+00	0.00E+00	3.42E-06	1.09E-05	3.59E-08	4.28E-08	0.00E+00	7.72E-01	6.92E+00	29	0.00E+00	8.06E-01	8.50E+00
Barium	1.40E-07	1.32E-07	0.00E+00	0.00E+00	1.81E-05	5.81E-05	1.67E-07	2.52E-07	0.00E+00	4.10E+00	3.67E+01	530	0.00E+00	4.30E+00	4.51E+01
Beryllium	8.87E-09	7.23E-09	0.00E+00	0.00E+00	1.07E-06	3.44E-06	1.15E-08	1.52E-08	0.00E+00	2.62E-01	2.17E+00	70	0.00E+00	2.54E-01	2.69E+00
bis (2-Ethylhexyl) Phthalate	8.17E-10	9.73E-10	4.28E-09	8.21E-08	5.58E-06	1.79E-05	1.25E-09	1.04E-09	7.53E-09	9.63E-02	8.19E-01	280000	0.00E+00	1.32E+00	2.24E+00
Cadmium	1.39E-08	1.19E-08	0.00E+00	0.00E+00	1.72E-06	5.51E-06	1.74E-08	2.44E-08	0.00E+00	4.10E-01	3.49E+00	160	0.00E+00	4.07E-01	4.30E+00
Chromium	6.54E-08	6.19E-08	0.00E+00	0.00E+00	8.49E-06	2.72E-05	7.61E-08	1.19E-07	0.00E+00	1.91E+00	1.72E+01	18	0.00E+00	2.00E+00	2.11E+01
2,4-Dinitrotoluene	0.00E+00	0.00E+00	4.62E-11	2.58E-09	1.66E-07	5.30E-07	0.00E+00	0.00E+00	2.73E-10	2.68E-03	6.24E-03	0.87	0.00E+00	3.40E-02	4.29E-02
2,6-Dinitrotoluene	0.00E+00	0.00E+00	4.62E-11	2.58E-09	1.66E-07	5.30E-07	0.00E+00	0.00E+00	2.73E-10	2.68E-03	6.24E-03	0.67	0.00E+00	3.27E-02	4.16E-02
Di-n-octyl Phthalate	8.27E-10	9.76E-10	4.30E-09	8.32E-08	5.65E-06	1.81E-05	1.27E-09	1.06E-09	7.64E-09	9.76E-02	8.24E-01	280000	0.00E+00	1.34E+00	2.26E+00
GB	5.52E-17	1.19E-16	2.05E-09	1.49E-08	1.07E-06	3.44E-06	7.34E-17	8.13E-17	1.65E-09	1.62E-02	2.77E-01	0.032	0.00E+00	4.93E-02	3.43E-01
HD/HT	1.43E-13	3.07E-13	2.05E-07	1.49E-06	1.07E-04	3.44E-04	1.90E-13	2.10E-13	1.65E-07	1.62E+00	2.77E+01	1.2	0.00E+00	2.29E+01	5.23E+01
Lead	9.36E-08	9.03E-08	0.00E+00	0.00E+00	1.23E-05	3.92E-05	1.11E-07	1.67E-07	0.00E+00	2.72E+00	2.48E+01	600	0.00E+00	2.90E+00	3.04E+01
Mercury	0.00E+00	0.00E+00	1.67E-08	2.91E-07	1.95E-05	6.23E-05	0.00E+00	0.00E+00	3.74E-08	3.67E-01	2.26E+00	57000	0.00E+00	4.61E+00	7.24E+00
Nickel	6.40E-08	6.05E-08	0.00E+00	0.00E+00	8.30E-06	2.66E-05	7.54E-08	1.15E-07	0.00E+00	1.87E+00	1.68E+01	82	0.00E+00	1.96E+00	2.06E+01
Total PCBs	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4300	0.00E+00	0.00E+00	0.00E+00
Selenium	1.68E-08	1.66E-08	0.00E+00	0.00E+00	2.22E-06	7.12E-06	2.37E-08	2.53E-08	0.00E+00	4.81E-01	4.50E+00	4.3	0.00E+00	5.11E-01	5.49E+00
Silver	1.79E-08	1.69E-08	0.00E+00	0.00E+00	2.32E-06	7.41E-06	2.55E-08	2.70E-08	0.00E+00	5.14E-01	4.69E+00	0.4	0.00E+00	4.11E-01	5.62E+00
2,3,7,8-TCDD & Dioxin-Like SOPCs	9.14E-14	9.72E-14	5.47E-14	1.16E-12	8.94E-11	2.86E-10	1.41E-13	1.20E-13	1.09E-13	3.63E-06	3.28E-05	142000	0.00E+00	2.12E-05	5.76E-05
Thallium	3.24E-08	1.88E-08	9.95E-18	2.75E-16	3.41E-06	1.09E-05	4.71E-08	5.30E-08	3.18E-17	9.81E-01	6.91E+00	74	0.00E+00	8.07E-01	8.70E+00
VX	1.74E-13	3.73E-13	2.05E-09	1.49E-08	1.07E-06	3.44E-06	2.31E-13	2.56E-13	1.65E-09	1.62E-02	2.77E-01	0.15	0.00E+00	1.35E-01	4.28E-01
Di-n-butyl Phthalate	8.27E-10	9.76E-10	4.30E-09	8.32E-08	5.65E-06	1.81E-05	1.27E-09	1.06E-09	7.64E-09	9.76E-02	8.24E-01	1.6	0.00E+00	1.24E+00	2.16E+00
Diethyl Phthalate	6.16E-10	6.20E-10	2.80E-09	6.24E-08	4.21E-06	1.35E-05	9.58E-10	8.18E-10	5.91E-09	7.53E-02	5.45E-01	5.3	0.00E+00	9.72E-01	1.59E+00
Manganese	2.88E-08	2.83E-08	0.00E+00	0.00E+00	3.81E-06	1.22E-05	3.51E-08	5.01E-08	0.00E+00	8.34E-01	7.71E+00	23	0.00E+00	8.97E-01	9.44E+00
4-Methylphenol	7.21E-15	8.51E-15	5.37E-09	1.04E-07	6.91E-06	2.21E-05	1.11E-14	9.21E-15	9.55E-09	9.36E-02	7.25E-01	0.50	0.00E+00	1.29E+00	2.11E+00
RDX	0.00E+00	0.00E+00	4.62E-11	2.58E-09	1.66E-07	5.30E-07	0.00E+00	0.00E+00	2.73E-10	2.68E-03	6.24E-03	0.63	0.00E+00	3.24E-02	4.13E-02
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	4.62E-11	2.58E-09	1.66E-07	5.30E-07	0.00E+00	0.00E+00	2.73E-10	2.68E-03	6.24E-03	11	0.00E+00	3.88E-02	4.77E-02
Vanadium	4.62E-08	4.21E-08	0.00E+00	0.00E+00	5.89E-06	1.88E-05	5.52E-08	8.30E-08	0.00E+00	1.35E+00	1.19E+01	100	0.00E+00	1.39E+00	1.47E+01

Table A-2.4.24 Case 4. With PFS, Actual Program Factors: UMATILLA RIVER SUBSISTENCE FISHER

CONSUMPTION OF ROOT VEGETABLES:

Calculation of soil concentration due to deposition
Calculation of root vegetable concentration due to root uptake

Soil mixing depth, Z=	20	cm
Soil bulk density, BD=	1.5	g/cm3
Total deposition time period, Tc=	3.2	yrs
Below ground veg. correction factor, VGbg=	0.01	unitless
Dry deposition velocity of vapor phase, Vdv=	3	cm/s

Pr(bg) = Root vegetable concentration due to root uptake
Sc = Soil concentration after total time period of deposition
Ds = Deposition term
Kds = Soil-water partition coefficient
RCF = Ratio of concentratio
Vwd = Yearly wet deposition from vapor phase

Substances of Potential Concern	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Vwd (g/m2-yr)	Vc (µg/m3)	Ds (1/yr)	Sc (mg/kg)	Kds (cm3/g)	RCF (mg/kg)/(ug/mL)	Pr(bg) (mg/kg)
Antimony	2.23E-08	3.36E-08	0.00E+00	0.00E+00	1.86E-07	5.96E-07	2	3.00E-02	8.95E-11
Arsenic	2.25E-08	3.39E-08	0.00E+00	0.00E+00	1.88E-07	6.01E-07	29	8.00E-03	1.66E-12
Barium	2.76E-08	4.24E-08	0.00E+00	0.00E+00	2.33E-07	7.46E-07	530	1.50E-02	2.11E-13
Beryllium	5.42E-09	8.49E-09	0.00E+00	0.00E+00	4.64E-08	1.48E-07	70	1.50E-03	3.18E-14
bis (2-Ethylhexyl) Phthalate	1.37E-09	2.00E-09	1.38E-08	2.47E-07	8.35E-07	2.67E-06	280000	3.20E+02	3.05E-11
Cadmium	5.91E-09	9.27E-09	0.00E+00	0.00E+00	5.06E-08	1.62E-07	160	3.20E-02	3.24E-13
Chromium	6.87E-09	1.06E-08	0.00E+00	0.00E+00	5.82E-08	1.86E-07	18	4.50E-03	4.66E-13
2,4-Dinitrotoluene	0.00E+00	0.00E+00	4.82E-10	7.23E-09	2.44E-08	7.81E-08	0.87	1.90E+00	1.71E-09
2,6-Dinitrotoluene	0.00E+00	0.00E+00	4.82E-10	7.23E-09	2.44E-08	7.81E-08	0.67	1.70E+00	1.98E-09
Di-n-octyl Phthalate	1.39E-09	2.02E-09	1.40E-08	2.50E-07	8.45E-07	2.70E-06	280000	3.20E+02	3.09E-11
GB	8.19E-18	1.21E-17	2.37E-10	4.15E-09	1.39E-08	4.44E-08	0.032	9.30E-01	1.29E-08
HD/HT	2.12E-14	3.13E-14	2.37E-08	4.15E-07	1.39E-06	4.44E-06	1.2	1.16E+00	4.26E-08
Lead	1.82E-08	2.72E-08	0.00E+00	0.00E+00	1.52E-07	4.85E-07	600	NA	NA
Mercury	0.00E+00	0.00E+00	1.28E-08	2.02E-07	6.80E-07	2.18E-06	57000	NA	NA
Nickel	1.09E-08	1.66E-08	0.00E+00	0.00E+00	9.17E-08	2.94E-07	82	4.00E-03	1.43E-13
Total PCBs	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4300	2.10E+03	0.00E+00
Selenium	1.87E-08	2.79E-08	0.00E+00	0.00E+00	1.55E-07	4.97E-07	4.3	2.00E-02	2.31E-11
Silver	2.06E-08	3.09E-08	0.00E+00	0.00E+00	1.72E-07	5.50E-07	0.4	1.00E-01	1.37E-09
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.54E-13	2.28E-13	1.98E-13	3.45E-12	1.28E-11	4.10E-11	142000	1.21E+04	3.49E-14
Thallium	3.68E-08	5.87E-08	3.38E-17	5.14E-16	3.18E-07	1.02E-06	74	4.00E-04	5.51E-14
VX	2.57E-14	3.80E-14	2.37E-10	4.15E-09	1.39E-08	4.44E-08	0.15	1.85E+00	5.48E-09
Di-n-butyl Phthalate	1.39E-09	2.02E-09	1.40E-08	2.50E-07	8.45E-07	2.70E-06	1.6	1.80E+02	3.04E-06
Diethyl Phthalate	1.04E-09	1.55E-09	1.07E-08	1.85E-07	6.27E-07	2.01E-06	5.3	6.56E+00	2.50E-08
Manganese	9.70E-09	1.44E-08	0.00E+00	0.00E+00	8.02E-08	2.57E-07	23	1.00E-01	1.12E-11
4-Methylphenol	1.21E-14	1.77E-14	1.75E-08	3.12E-07	1.04E-06	3.33E-06	0.50	1.76E+00	1.17E-07
RDX	0.00E+00	0.00E+00	4.82E-10	7.23E-09	2.44E-08	7.81E-08	0.63	9.61E-01	1.19E-09
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	4.82E-10	7.23E-09	2.44E-08	7.81E-08	11	4.44E+00	3.15E-10
Vanadium	1.02E-08	1.60E-08	0.00E+00	0.00E+00	8.74E-08	2.80E-07	100	1.00E-01	2.80E-12

Table A-2.4.23 Case 4. With PFS, Actual Program Factors: UMATILLA RIVER SUBSISTENCE FISHER

CONSUMPTION OF ABOVE-GROUND VEGETABLES:

Calculation of above-ground vegetable concentration due to direct deposition
Calculation of above-ground vegetable concentration due to air-to-plant transfer

Interception fraction of edible portion, Rp=	0.04	unitless
Plant surface loss coefficient, kp=	18	1/yr
Time between rainfalls, t-rain=	14	days
Length of plant exposure per harvest, Tp=	0.16	yrs
Standing crop biomass, Yp=	1.7	kg DW/m2
Density of air, p=	1200	g/m3
Above ground veg. correction factor, VGab=	0.01	unitless

Pd = Concentration in plant due to direct deposition
Pv = Concentration in plant due to air-to-plant transfer
Pd + Pv = Concentration in plant due to direct deposition and air-to-plant transfer
Fw = Fraction of wet deposition of particles that adheres to plant
Bv = Air-to-plant bioconcentration factor

Substances of Potential Concern	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Fw	Pd (mg/kg)	Vc (ug/m3)	Bv (mg/kg)/(ug/g)	Pv (mg/kg)	Pd+Pv (mg/kg)
Antimony	2.23E-08	3.36E-08	0.2	3.58E-08	0.00E+00	NA	0.00E+00	3.58E-08
Arsenic	2.25E-08	3.39E-08	0.2	3.61E-08	0.00E+00	NA	0.00E+00	3.61E-08
Barium	2.76E-08	4.24E-08	0.6	6.54E-08	0.00E+00	NA	0.00E+00	6.54E-08
Beryllium	5.42E-09	8.49E-09	0.6	1.30E-08	0.00E+00	NA	0.00E+00	1.30E-08
bis (2-Ethylhexyl) Phthalate	1.37E-09	2.00E-09	0.6	3.16E-09	2.47E-07	5.11E+02	1.05E-09	4.21E-09
Cadmium	5.91E-09	9.27E-09	0.6	1.42E-08	0.00E+00	NA	0.00E+00	1.42E-08
Chromium	6.87E-09	1.06E-08	0.6	1.63E-08	0.00E+00	NA	0.00E+00	1.63E-08
2,4-Dinitrotoluene	0.00E+00	0.00E+00	0.6	0.00E+00	7.23E-09	1.50E+02	9.04E-12	9.04E-12
2,6-Dinitrotoluene	0.00E+00	0.00E+00	0.6	0.00E+00	7.23E-09	1.30E+02	7.83E-12	7.83E-12
Di-n-octyl Phthalate	1.39E-09	2.02E-09	0.6	3.21E-09	2.50E-07	2.32E+02	4.82E-10	3.69E-09
GB	8.19E-18	1.21E-17	0.6	1.91E-17	4.15E-09	2.90E+00	1.00E-13	1.00E-13
HD/HT	2.12E-14	3.13E-14	0.6	4.93E-14	4.15E-07	1.58E-01	5.46E-13	5.96E-13
Lead	1.82E-08	2.72E-08	0.6	4.27E-08	NA	NA	0.00E+00	4.27E-08
Mercury	0.00E+00	0.00E+00	0.6	0.00E+00	2.02E-07	2.30E+04	3.87E-08	3.87E-08
Nickel	1.09E-08	1.66E-08	0.6	2.58E-08	0.00E+00	NA	0.00E+00	2.58E-08
Total PCBs	0.00E+00	0.00E+00	0.6	0.00E+00	0.00E+00	1.72E+03	0.00E+00	0.00E+00
Selenium	1.87E-08	2.79E-08	0.2	3.00E-08	0.00E+00	NA	0.00E+00	3.00E-08
Silver	2.06E-08	3.09E-08	0.6	4.83E-08	0.00E+00	NA	0.00E+00	4.83E-08
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.54E-13	2.28E-13	0.6	3.59E-13	3.45E-12	8.39E+04	2.41E-12	2.77E-12
Thallium	3.68E-08	5.87E-08	0.6	8.89E-08	5.14E-16	NA	0.00E+00	8.89E-08
VX	2.57E-14	3.80E-14	0.6	5.99E-14	4.15E-09	2.26E+03	7.81E-11	7.82E-11
Di-n-butyl Phthalate	1.39E-09	2.02E-09	0.6	3.21E-09	2.50E-07	4.40E+02	9.15E-10	4.12E-09
Diethyl Phthalate	1.04E-09	1.55E-09	0.6	2.44E-09	1.85E-07	4.48E+02	6.90E-10	3.13E-09
Manganese	9.70E-09	1.44E-08	0.6	2.26E-08	0.00E+00	NA	0.00E+00	2.26E-08
4-Methylphenol	1.21E-14	1.77E-14	0.6	2.80E-14	3.12E-07	1.71E+01	4.44E-11	4.45E-11
RDX	0.00E+00	0.00E+00	0.6	0.00E+00	7.23E-09	9.92E-02	5.98E-15	5.98E-15
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	0.6	0.00E+00	7.23E-09	2.32E+02	1.40E-11	1.40E-11
Vanadium	1.02E-08	1.60E-08	0.6	2.44E-08	0.00E+00	NA	0.00E+00	2.44E-08

Table A-2.4.22 Case 4. With PFS, Actual Program Factors: UMATILLA RIVER SUBSISTENCE FISHER

SOIL INGESTION:

Calculation of soil concentration due to deposition

Soil mixing depth, Z=	1	cm
Soil bulk density, BD=	1.5	g/cm3
Total deposition time period, Tc=	3.2	yrs
Dry deposition velocity of vapor phase, Vdv=	3	cm/s

Sc = Soil concentration after total time period of deposition
Ds = Deposition term
Pdd = Yearly dry deposition from particle phase
Pwd = Yearly wet deposition from particle phase
Vwd = Yearly wet deposition from vapor phase
Vc = Vapor phase air concentration

Substances of Potential Concern	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Vwd (g/m2-yr)	Vc (µg/m3)	Ds (1/yr)	Sc (mg/kg)
Antimony	2.23E-08	3.36E-08	0.00E+00	0.00E+00	3.73E-06	**1.19E-05**
Arsenic	2.25E-08	3.39E-08	0.00E+00	0.00E+00	3.76E-06	**1.20E-05**
Barium	2.76E-08	4.24E-08	0.00E+00	0.00E+00	4.67E-06	**1.49E-05**
Beryllium	5.42E-09	8.49E-09	0.00E+00	0.00E+00	9.28E-07	**2.97E-06**
bis (2-Ethylhexyl) Phthalate	1.37E-09	2.00E-09	1.38E-08	2.47E-07	1.67E-05	**5.34E-05**
Cadmium	5.91E-09	9.27E-09	0.00E+00	0.00E+00	1.01E-06	**3.24E-06**
Chromium	6.87E-09	1.06E-08	0.00E+00	0.00E+00	1.16E-06	**3.73E-06**
2,4-Dinitrotoluene	0.00E+00	0.00E+00	4.82E-10	7.23E-09	4.88E-07	**1.56E-06**
2,6-Dinitrotoluene	0.00E+00	0.00E+00	4.82E-10	7.23E-09	4.88E-07	**1.56E-06**
Di-n-octyl Phthalate	1.39E-09	2.02E-09	1.40E-08	2.50E-07	1.69E-05	**5.41E-05**
GB	8.19E-18	1.21E-17	2.37E-10	4.15E-09	2.78E-07	**8.88E-07**
HD/HT	2.12E-14	3.13E-14	2.37E-08	4.15E-07	2.78E-05	**8.88E-05**
Lead	1.82E-08	2.72E-08	0.00E+00	0.00E+00	3.03E-06	**9.70E-06**
Mercury	0.00E+00	0.00E+00	1.28E-08	2.02E-07	1.36E-05	**4.35E-05**
Nickel	1.09E-08	1.66E-08	0.00E+00	0.00E+00	1.83E-06	**5.87E-06**
Total PCBs	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**
Selenium	1.87E-08	2.79E-08	0.00E+00	0.00E+00	3.11E-06	**9.94E-06**
Silver	2.06E-08	3.09E-08	0.00E+00	0.00E+00	3.44E-06	**1.10E-05**
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.54E-13	2.28E-13	1.98E-13	3.45E-12	2.56E-10	**8.20E-10**
Thallium	3.68E-08	5.87E-08	3.38E-17	5.14E-16	6.37E-06	**2.04E-05**
VX	2.57E-14	3.80E-14	2.37E-10	4.15E-09	2.77E-07	**8.88E-07**
Di-n-butyl Phthalate	1.39E-09	2.02E-09	1.40E-08	2.50E-07	1.69E-05	**5.41E-05**
Diethyl Phthalate	1.04E-09	1.55E-09	1.07E-08	1.85E-07	1.25E-05	**4.02E-05**
Manganese	9.70E-09	1.44E-08	0.00E+00	0.00E+00	1.60E-06	**5.13E-06**
4-Methylphenol	1.21E-14	1.77E-14	1.75E-08	3.12E-07	2.08E-05	**6.67E-05**
RDX	0.00E+00	0.00E+00	4.82E-10	7.23E-09	4.88E-07	**1.56E-06**
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	4.82E-10	7.23E-09	4.88E-07	**1.56E-06**
Vanadium	1.02E-08	1.60E-08	0.00E+00	0.00E+00	1.75E-06	**5.59E-06**

Table A-2.4.21 Case 4. With PFS, Actual Program Factors: UMATILLA RIVER SUBSISTENCE FISHER

CONCENTRATIONS AND DEPOSITIONS: **Calculated depositions and concentrations for indirect exposure pathways**

Substances of Potential Concern	Particulate Dry Deposition Pdd (g/m2)/yr	Particulate Wet Deposition Pwd (g/m2)/yr	Vapor Wet Deposition Vwd (g/m2)/yr	Vapor Concentration Vc (ug/m3)	Toxicity Equivalency Factor	2,3,7,8-TCDD Toxicity Equivalents Pdd (ug/m3)	2,3,7,8-TCDD Toxicity Equivalents Pwd (g/m2)	2,3,7,8-TCDD Toxicity Equivalents Vwd (g/m2)	2,3,7,8-TCDD Toxicity Equivalents Vc (ug/m3)
Tetra CDD	1.44E-14	2.14E-14	4.51E-14	7.86E-13	1.000	1.44E-14	2.14E-14	4.51E-14	7.86E-13
Penta CDD	1.19E-13	1.76E-13	1.07E-13	1.86E-12	0.500	5.93E-14	8.79E-14	5.33E-14	9.29E-13
Hexa CDD	1.49E-13	2.21E-13	2.87E-14	5.00E-13	0.100	1.49E-14	2.21E-14	2.87E-15	5.00E-14
Hepta CDD	1.57E-13	2.33E-13	8.20E-15	1.43E-13	0.010	1.57E-15	2.33E-15	8.20E-17	1.43E-15
Octa CDD	3.21E-13	4.75E-13	1.64E-16	2.86E-15	0.001	3.21E-16	4.75E-16	1.64E-19	2.86E-18
Tetra CDF	9.30E-15	1.38E-14	5.82E-14	1.01E-12	0.100	9.30E-16	1.38E-15	5.82E-15	1.01E-13
Penta CDF	9.30E-14	1.38E-13	1.72E-13	3.00E-12	0.500	4.65E-14	6.89E-14	8.61E-14	1.50E-12
Hexa CDF	1.43E-13	2.11E-13	4.51E-14	7.86E-13	0.100	1.43E-14	2.11E-14	4.51E-15	7.86E-14
Hepta CDF	1.54E-13	2.28E-13	1.64E-14	2.86E-13	0.010	1.54E-15	2.28E-15	1.64E-16	2.86E-15
Octa CDF	3.20E-13	4.74E-13	1.64E-15	2.86E-14	0.001	3.20E-16	4.74E-16	1.64E-18	2.86E-17
					Total =	1.54E-13	2.28E-13	1.98E-13	3.45E-12
Antimony	2.23E-08	3.36E-08	0.00E+00	0.00E+00					
Arsenic	2.25E-08	3.39E-08	0.00E+00	0.00E+00					
Barium	2.76E-08	4.24E-08	0.00E+00	0.00E+00					
Beryllium	5.42E-09	8.49E-09	0.00E+00	0.00E+00					
bis (2-Ethylhexyl) Phthalate	1.37E-09	2.00E-09	1.38E-08	2.47E-07					
Cadmium	5.91E-09	9.27E-09	0.00E+00	0.00E+00					
Chromium	6.87E-09	1.06E-08	0.00E+00	0.00E+00					
2,4-Dinitrotoluene	0.00E+00	0.00E+00	4.82E-10	7.23E-09					
2,6-Dinitrotoluene	0.00E+00	0.00E+00	4.82E-10	7.23E-09					
Di-n-octyl Phthalate	1.39E-09	2.02E-09	1.40E-08	2.50E-07					
GB	8.19E-18	1.21E-17	2.37E-10	4.15E-09					
HD/HT	2.12E-14	3.13E-14	2.37E-08	4.15E-07					
Lead	1.82E-08	2.72E-08	0.00E+00	0.00E+00					
Mercury	0.00E+00	0.00E+00	1.28E-08	2.02E-07					
Nickel	1.09E-08	1.66E-08	0.00E+00	0.00E+00					
Total PCBs	0.00E+00	0.00E+00	0.00E+00	0.00E+00					
Selenium	1.87E-08	2.79E-08	0.00E+00	0.00E+00					
Silver	2.06E-08	3.09E-08	0.00E+00	0.00E+00					
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.54E-13	2.28E-13	1.98E-13	3.45E-12					
Thallium	3.68E-08	5.87E-08	3.38E-17	5.14E-16					
VX	2.57E-14	3.80E-14	2.37E-10	4.15E-09					
Di-n-butyl Phthalate	1.39E-09	2.02E-09	1.40E-08	2.50E-07					
Diethyl Phthalate	1.04E-09	1.55E-09	1.07E-08	1.85E-07					
Manganese	9.70E-09	1.44E-08	0.00E+00	0.00E+00					
4-Methylphenol	1.21E-14	1.77E-14	1.75E-08	3.12E-07					
RDX	0.00E+00	0.00E+00	4.82E-10	7.23E-09					
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	4.82E-10	7.23E-09					
Vanadium	1.02E-08	1.60E-08	0.00E+00	0.00E+00					

CDD = Chlorinated dibenzo-p-dioxin
CDF = Chlorinated dibenzo-p-furan

Table A-2.4.20 Case 4. With PFS, Actual Program Factors: UMCDF SUBSISTENCE FARMER

	Risk UMCDF	HI-Liver UMCDF	HI-Neuro UMCDF	HQ		Risk-Inh. UMCDF	HI-Inh. UMCDF
Indirect					**Inhalation**		
Antimony				5.92E-06	Tetra CDD	2.34E-11	
Arsenic	2.20E-08			8.54E-05	Penta CDD	5.78E-11	
Barium				4.67E-08	Hexa CDD	1.15E-11	
Beryllium	1.29E-09			1.05E-07	Hepta CDD	1.14E-12	
bis (2-Ethylhexyl) Phthalate	6.81E-12	4.26E-08		4.26E-08	Octa CDD	2.29E-13	
Cadmium				4.14E-05	Tetra CDF	2.36E-12	
Chromium				7.80E-07	Penta CDF	5.83E-11	
2,4-Dinitrotoluene	1.13E-11		1.45E-08	1.45E-08	Hexa CDF	1.15E-11	
2,6-Dinitrotoluene	1.14E-11		2.93E-08	2.93E-08	Hepta CDF	1.15E-12	
Di-n-octyl Phthalate		4.31E-08		4.31E-08	Octa CDF	2.29E-13	
GB			5.87E-07	5.87E-07	2,3,7,8-TCDD TEQ	2.17E-10	
HD/HT	7.54E-09				Antimony		
Lead					Arsenic	7.02E-09	
Mercury			1.47E-05	1.47E-05	Barium		2.64E-06
Nickel				2.68E-07	Beryllium	2.94E-10	
PCB					Boron		4.79E-07
Selenium				4.97E-06	Cadmium	2.41E-10	
Silver				1.50E-05	Chromium	1.79E-09	
2,3,7,8-TCDD&Others	1.37E-07				Cobalt		
Thallium		1.07E-03		1.07E-03	Copper		
VX			4.36E-07	4.36E-07	Lead		
Di-n-butyl Phthalate				3.64E-08	Manganese		9.31E-05
Diethyl Phthalate				8.57E-10	Mercury		8.12E-06
Manganese			5.92E-07	5.92E-07	Nickel	5.77E-11	
4-Methylphenol			2.20E-07	2.20E-07	Phosphorus		
RDX	1.79E-12			9.48E-09	Selenium		
2,4,6-Trinitrotoluene	4.75E-13	5.54E-08		5.54E-08	Silver		
Vanadium				1.35E-05	Thallium		
					Tin		
					Vanadium		
					Zinc		
					Acetone		
					Benzene	3.39E-13	
					Bromodichloromethane		
					Bromoform	2.25E-14	
					2-Butanone		1.30E-09
					Carbon Disulfide		1.30E-07
					Carbon Tetrachloride	3.10E-13	
					Chlorobenzene		2.20E-08
					Chloroform	4.73E-13	
					Chloromethane	3.68E-14	
					Dibromochloromethane		
					1,1-Dichloroethane		8.81E-11
					1,2-Dichloropropane		3.36E-08
					cis-1,3-Dichloropropene	7.59E-13	2.20E-08
					trans-1,3-Dichloropropene	7.59E-13	2.24E-08
					Ethylbenzene		4.41E-10
					2-Hexanone		
					Methylene Chloride	9.93E-15	1.47E-10
					4-Methyl-2-pentanone		
					Styrene		1.47E-10
					1,1,2,2-Tetrachloroethane	1.17E-12	
					Tetrachloroethene		
					Toluene		1.16E-09
					1,1,1-Trichloroethane		
					Vinyl Acetate		7.87E-10
					Vinyl Chloride	3.50E-12	
					Xylenes		
					Benzoic Acid		
					Benzyl Alcohol		
					Diethyl Phthalate		
					Dimethyl Phthalate		
					Di-n-butyl Phthalate		
					Di-n-octyl Phthalate		
					bis(2-Ethylhexyl)-Phthalate		
					2-Methylphenol		
					3-Methylphenol		
					4-Methylphenol		
					Naphthalene		
					GB		1.50E-05
					HD/HT	5.66E-10	4.50E-05
					VX		1.50E-05
					Chlorine		
					Hydrogen Chloride		4.74E-03
					Hydrogen Fluoride		
					Nitroglycerine		
					PCB		
					Particulates		
					2,4-Dinitrotoluene		
					2,6-Dinitrotoluene		
					2,4,6-Trinitrotoluene		
					RDX		
					HMX		
Total	1.68E-07	1.07E-03	1.66E-05			1.02E-08	4.92E-03
Grand Total	2E-07	0.001	0.000			1E-08	0.005

Table A-2.4.19 Case 4. With PFS, Actual Program Factors: UMCDF SUBSISTENCE FARMER

DIRECT INHALATION EXPOSURES:

Exposure Parameter	Exposure Scenario			
	Subsistence Farmer	Subsistence Fisher	Adult Resident	Child Resident
Inhalation rate, IR (m3/hr)	0.8	0.8	0.8	0.2
Exposure duration, ED (yr)	3.2	3.2	3.2	3.2
Body weight, BW (kg)	70	70	70	15
Exposure time, ET (hr/day)	24			
Exposure frequency, EF (day/yr)	350			
Carcinogenic averaging time, LT (day)	25550			
Noncancer averaging time, LT(day)	1168			

CSF = Cancer Slope Factor
RfD = Reference Dose
HI = Hazard Index

CDD = Chlorinated dibenzo-p-dioxin
CDF = Chlorinated dibenzo-p-furan

Substances of Potential Concern	Respirable Concentration (ug/m3)	Cancer Inh. Intake-Farmer (mg/kg-day)	Inhalation CSF (per mg/kg-day)	Cancer Risk Farmer	Inhalation RfD (mg/kg/day)	Hazard Quotient Farmer
Tetra CDD	1.61E-11	2.02E-16	1.16E+05	2.34E-11		
Penta CDD	7.96E-11	9.97E-16	5.80E+04	5.78E-11		
Hexa CDD	7.89E-11	9.89E-16	1.16E+04	1.15E-11		
Hepta CDD	7.88E-11	9.86E-16	1.16E+03	1.14E-12		
Octa CDD	1.57E-10	1.97E-15	1.16E+02	2.29E-13		
Tetra CDF	1.63E-11	2.04E-16	1.16E+04	2.36E-12		
Penta CDF	8.02E-11	1.00E-15	5.80E+04	5.83E-11		
Hexa CDF	7.91E-11	9.90E-16	1.16E+04	1.15E-11		
Hepta CDF	7.88E-11	9.87E-16	1.16E+03	1.15E-12		
Octa CDF	1.57E-10	1.97E-15	1.16E+02	2.29E-13		
2,3,7,8-TCDD TEQ	1.15E-10	1.44E-15	1.50E+05	2.17E-10		
Antimony	1.11E-05	1.39E-10				
Arsenic	1.12E-05	1.40E-10	5.00E+01	7.02E-09		
Barium	1.40E-05	1.75E-10			1.45E-03	2.64E-06
Beryllium	2.79E-06	3.50E-11	8.40E+00	2.94E-10		
Boron	1.01E-05	1.27E-10			5.80E-03	4.79E-07
Cadmium	3.05E-06	3.82E-11	6.30E+00	2.41E-10		
Chromium	3.49E-06	4.37E-11	4.10E+01	1.79E-09		
Cobalt	5.59E-06	7.00E-11				
Copper	6.60E-06	8.27E-11				
Lead	9.01E-06	1.13E-10				
Manganese	4.76E-06	5.96E-11			1.40E-05	9.31E-05
Mercury	2.55E-06	3.19E-11			8.60E-05	8.12E-06
Nickel	5.49E-06	6.87E-11	8.40E-01	5.77E-11		
Phosphorus	1.01E-05	1.27E-10				
Selenium	9.24E-06	1.16E-10				
Silver	1.02E-05	1.28E-10				
Thallium	1.93E-05	2.41E-10				
Tin	8.98E-06	1.12E-10				
Vanadium	5.26E-06	6.59E-11				
Zinc	9.24E-06	1.16E-10				
Acetone	7.69E-07	9.63E-12				
Benzene	9.33E-07	1.17E-11	2.90E-02	3.39E-13		
Bromodichloromethane	4.66E-07	5.84E-12				
Bromoform	4.66E-07	5.84E-12	3.85E-03	2.25E-14		
2-Butanone	1.37E-06	1.72E-11			2.90E-01	1.30E-09
Carbon Disulfide	1.37E-06	1.72E-11			2.90E-03	1.30E-07
Carbon Tetrachloride	4.66E-07	5.84E-12	5.30E-02	3.10E-13		
Chlorobenzene	4.66E-07	5.84E-12			5.80E-03	2.20E-08
Chloroform	4.66E-07	5.84E-12	8.10E-02	4.73E-13		
Chloromethane	4.66E-07	5.84E-12	6.30E-03	3.68E-14		
Dibromochloromethane	4.66E-07	5.84E-12				
1,1-Dichloroethane	4.66E-07	5.84E-12			1.45E+00	8.81E-11
1,2-Dichloropropane	4.66E-07	5.84E-12			3.80E-03	3.36E-08
cis-1,3-Dichloropropene	4.66E-07	5.84E-12	1.30E-01	7.59E-13	5.80E-03	2.20E-08
trans-1,3-Dichloropropene	4.66E-07	5.84E-12	1.30E-01	7.59E-13	5.70E-03	2.24E-08
Ethylbenzene	4.66E-07	5.84E-12			2.90E-01	4.41E-10
2-Hexanone	4.66E-07	5.84E-12				
Methylene Chloride	4.66E-07	5.84E-12	1.70E-03	9.93E-15	8.70E-01	1.47E-10
4-Methyl-2-pentanone	4.66E-07	5.84E-12			2.30E-01	5.55E-10
Styrene	4.66E-07	5.84E-12			8.70E-01	1.47E-10
1,1,2,2-Tetrachloroethane	4.66E-07	5.84E-12	2.00E-01	1.17E-12		
Tetrachloroethene	4.66E-07	5.84E-12				
Toluene	4.66E-07	5.84E-12			1.10E-01	1.16E-09
1,1,1-Trichloroethane	7.69E-07	9.63E-12				
Vinyl Acetate	1.64E-07	2.05E-12			5.70E-02	7.87E-10
Vinyl Chloride	9.33E-07	1.17E-11	3.00E-01	3.50E-12		
Xylenes	4.66E-07	5.84E-12				
Benzoic Acid	4.54E-06	5.68E-11				
Benzyl Alcohol	3.51E-06	4.40E-11				
Diethyl Phthalate	2.67E-06	3.34E-11				
Dimethyl Phthalate	2.67E-06	3.34E-11				
Di-n-butyl Phthalate	3.48E-06	4.36E-11				
Di-n-octyl Phthalate	3.48E-06	4.36E-11				
bis(2-Ethylhexyl)-Phthalate	3.43E-06	4.30E-11				
2-Methylphenol	3.51E-06	4.40E-11				
3-Methylphenol	3.46E-06	4.34E-11				
4-Methylphenol	3.51E-06	4.40E-11				
Naphthalene	2.69E-06	3.37E-11				
GB	4.76E-08	5.96E-13			8.67E-07	1.50E-05
HD/HT	4.76E-06	5.96E-11	9.50E+00	5.66E-10	2.90E-05	4.50E-05
VX	4.76E-08	5.96E-13			8.67E-07	1.50E-05
Chlorine	3.25E-03	4.06E-08				
Hydrogen Chloride	1.00E-01	1.26E-06			5.80E-03	4.74E-03
Hydrogen Fluoride	5.25E-02	6.58E-07				
Nitroglycerine	0.00E+00	0.00E+00				
PCB	0.00E+00	0.00E+00				
Particulate	1.97E-02	2.47E-07				
2,4-Dinitrotoluene	9.60E-08	1.20E-12				
2,6-Dinitrotoluene	9.60E-08	1.20E-12				
2,4,6-Trinitrotoluene	9.60E-08	1.20E-12				
RDX	9.60E-08	1.20E-12				
HMX	9.60E-08	1.20E-12				
				1E-08	Total HI=	0.005

Table A-2.4.18 Case 4. With PFS, Actual Program Factors: UMCDF SUBSISTENCE FARMER

INDIRECT EXPOSURES: Calculation of hazard quotients, and hazard indices

Consumption rate of soil, CR(soil)=	0.0001	kg/day
Fraction of soil impacted, F(soil)=	1	unitless
Consumption rate of abv grd veg, CR(ag)=	0.024	kg/day
Fraction of abv grd veg impacted, F(ag)=	0.95	unitless
Consumption rate of root veg, CR(bg)=	0.0063	kg/day
Fraction of root veg impacted, F(bg)=	0.95	unitless
Consumption rate of beef, CR(beef)=	0.1	kg/day
Fraction of beef impacted, F(beef)=	0.44	unitless
Consumption rate of milk, CR(milk)=	0.3	kg/day
Fraction of milk impacted, F(milk)=	0.4	unitless
Body weight, BW=	70	kg

I(tot) = Total daily intake of substance
Sc = Soil concentration after total time period of deposition
I(soil) = Daily intake of substance from soil
Pd + Pv = Concentration in plant
I(ag) = Daily intake of substance from above ground vegetables
Pr(bg) = Concentration in below ground plant parts due to root uptake
I(bg) = Daily intake of substance from below ground vegetables
A(beef) = Concentration in beef
I(beef) = Daily intake of substance from beef
A(milk) = Concentration in milk
I(milk) = Daily intake of substance from milk
RfD = Reference dose
HI = Hazard Index

Substances of Potential Concern	Sc (mg/kg)	I(soil) (mg/day)	Pd+Pv (mg/kg)	I(ag) (mg/day)	Pr(bg) (mg/kg)	I(bg) (mg/day)	A(beef) (mg/kg)	I(beef) (mg/day)	A(milk) (mg/kg)	I(milk) (mg/day)	I(tot) (mg/day)	RfD (mg/kg-day)	Hazard Index Liver	Hazard Index Neuro	Hazard Quotient
Antimony	3.45E-04	3.45E-08	1.85E-06	4.21E-08	2.59E-09	1.55E-11	1.56E-06	6.88E-08	2.28E-07	2.73E-08	1.73E-07	4.00E-04			6E-06
Arsenic	3.48E-04	3.48E-08	1.86E-06	4.25E-08	4.80E-11	2.87E-13	3.15E-06	1.39E-07	1.38E-05	1.65E-06	1.87E-06	3.00E-04			9E-05
Barium	4.38E-04	4.38E-08	2.44E-06	5.56E-08	6.19E-12	3.71E-14	3.08E-07	1.36E-08	1.05E-06	1.26E-07	2.39E-07	7.00E-02			5E-08
Beryllium	8.85E-05	8.85E-09	4.93E-07	1.12E-08	9.48E-13	5.67E-15	4.16E-07	1.83E-08	5.45E-10	6.54E-11	3.84E-08	5.00E-03			1E-07
bis (2-Ethylhexyl) Phthalate	5.93E-04	5.93E-08	1.24E-07	2.83E-09	3.39E-10	2.03E-12	NA	NA	NA	NA	6.22E-08	2.00E-02	4.26E-08		4E-08
Cadmium	9.67E-05	9.67E-09	5.39E-07	1.23E-08	9.67E-12	5.79E-14	5.45E-05	2.40E-06	5.03E-06	6.04E-07	3.03E-06	1.00E-03			4E-05
Chromium	1.10E-04	1.10E-08	6.11E-07	1.39E-08	1.37E-11	8.20E-14	2.83E-06	1.25E-07	1.13E-06	1.35E-07	2.85E-07	5.00E-03			8E-07
2,4-Dinitrotoluene	1.99E-05	1.99E-09	1.20E-10	2.74E-12	2.17E-08	1.30E-10	2.01E-11	8.86E-13	6.40E-12	7.68E-13	2.12E-09	2.00E-03		1.45E-08	1E-08
2,6-Dinitrotoluene	1.99E-05	1.99E-09	1.04E-10	2.37E-12	2.52E-08	1.51E-10	1.53E-11	6.72E-13	4.93E-12	5.92E-13	2.14E-09	1.00E-03		2.93E-08	3E-08
Di-n-octyl Phthalate	6.02E-04	6.02E-08	1.19E-07	2.72E-09	3.44E-10	2.06E-12	NA	NA	NA	NA	6.29E-08	2.00E-02	4.31E-08		4E-08
GB	9.85E-06	9.85E-10	1.15E-12	2.62E-14	1.43E-07	8.57E-10	5.12E-13	2.25E-14	1.66E-13	1.99E-14	1.84E-09	4.30E-05		5.87E-07	6E-07
HD/HT	9.85E-04	9.85E-08	8.04E-12	1.83E-13	4.72E-07	2.83E-09	2.32E-10	1.02E-11	7.33E-11	8.80E-12	1.01E-07				
Lead	2.78E-04	2.78E-08	1.55E-06	3.53E-08	NA	NA	NA	NA	NA	NA	6.32E-08				
Mercury	5.27E-04	5.27E-08	4.89E-07	1.11E-08	NA	NA	5.13E-08	2.26E-09	3.42E-07	4.11E-08	1.07E-07	1.00E-04		1.47E-05	1E-05
Nickel	1.71E-04	1.71E-08	9.54E-07	2.18E-08	4.18E-12	2.50E-14	4.83E-06	2.12E-07	1.17E-06	1.41E-07	3.92E-07	2.00E-02	2.68E-07		3E-07
PCB	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Selenium	2.85E-04	2.85E-08	1.52E-06	3.48E-08	6.62E-10	3.96E-12	1.93E-05	8.51E-07	7.51E-06	9.01E-07	1.82E-06	5.00E-03			5E-06
Silver	3.17E-04	3.17E-08	1.76E-06	4.02E-08	3.96E-08	2.37E-10	4.46E-06	1.96E-07	4.33E-05	5.20E-06	5.47E-06	5.00E-03			1E-05
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.05E-08	1.05E-12	4.07E-11	9.28E-13	4.49E-13	2.69E-15	1.55E-09	6.80E-11	3.91E-10	4.69E-11	1.17E-10				
Thallium	6.16E-04	6.16E-08	3.43E-06	7.83E-08	1.66E-12	9.96E-15	1.16E-04	5.09E-06	8.43E-06	1.01E-06	6.24E-06	8.00E-05	1.07E-03		1E-03
VX	9.85E-06	9.85E-10	8.99E-10	2.05E-11	6.07E-08	3.63E-10	1.16E-11	5.10E-13	3.98E-12	4.77E-13	1.37E-09	4.30E-05		4.36E-07	4E-07
Di-n-butyl Phthalate	6.02E-04	6.02E-08	1.24E-07	2.83E-09	3.39E-05	2.03E-07	NA	NA	NA	NA	2.66E-07	1.00E-01			4E-08
Diethyl Phthalate	4.61E-04	4.61E-08	9.63E-08	2.20E-09	2.88E-07	1.72E-09	NA	NA	NA	NA	5.00E-08	8.00E-01			9E-10
Manganese	1.46E-04	1.46E-08	8.13E-07	1.85E-08	3.17E-10	1.90E-12	8.22E-05	3.62E-06	2.00E-05	2.40E-06	6.05E-06	1.40E-01		5.92E-07	6E-07
4-Methylphenol	7.27E-04	7.27E-08	5.01E-10	1.14E-11	1.28E-06	7.65E-09	6.38E-10	2.81E-11	2.02E-10	2.42E-11	8.04E-08	5.00E-03		2.20E-07	2E-07
RDX	1.99E-05	1.99E-09	7.94E-14	1.81E-15	1.52E-08	9.07E-11	1.48E-12	6.50E-14	4.68E-13	5.62E-14	2.08E-09	3.00E-03			9E-09
2,4,6-Trinitrotoluene	1.99E-05	1.99E-09	1.86E-10	4.23E-12	4.01E-09	2.40E-11	1.02E-10	4.50E-12	3.26E-11	3.91E-12	2.02E-09	5.00E-04	5.54E-08		6E-08
Vanadium	1.66E-04	1.66E-08	9.27E-07	2.11E-08	8.32E-11	4.98E-13	9.38E-05	4.13E-06	2.28E-05	2.73E-06	6.90E-06	7.00E-03			1E-05
												HI=	0.0011	0.0000	0.001

Table A-2.4.17 Case 4. With PFS, Actual Program Factors: UMCDF SUBSISTENCE FARMER

INDIRECT EXPOSURES: Calculation of cancer risks

Consumption rate of soil, CR(soil)=	0.0001 kg/day
Fraction of soil impacted, F(soil)=	1 unitless
Consumption rate of abv grd veg, CR(ag)=	0.024 kg/day
Fraction of abv grd veg impacted, F(ag)=	0.95 unitless
Consumption rate of root veg, CR(bg)=	0.0063 kg/day
Fraction of root veg impacted, F(bg)=	0.95 unitless
Consumption rate of beef, CR(beef)=	0.1 kg/day
Fraction of beef impacted, F(beef)=	0.44 unitless
Consumption rate of milk, CR(milk)=	0.3 kg/day
Fraction of milk impacted, F(milk)=	0.4 unitless
Exposure duration, ED=	40 yr
Exposure frequency, EF=	350 day/yr
Body weight, BW=	70 kg
Averaging time, AT=	70 yr

I(tot) = Total daily intake of substance
Sc = Soil concentration after total time period of deposition
I(soil) = Daily intake of substance from soil
Pd + Pv = Concentration in plant
I(ag) = Daily intake of substance from above ground vegetables
Pr(bg) = Concentration in below ground plant parts due to root uptake
I(bg) = Daily intake of substance from below ground vegetables
A(beef) = Concentration in beef
I(beef) = Daily intake of substance from beef
A(milk) = Concentration in milk
I(milk) = Daily intake of substance from milk
CSF = Carcinogenic slope factor

Substances of Potential Concern	Sc (mg/kg)	I(soil) (mg/day)	Pd+Pv (mg/kg)	I(ag) (mg/day)	Pr(bg) (mg/kg)	I(bg) (mg/day)	A(beef) (mg/kg)	I(beef) (mg/day)	A(milk) (mg/kg)	I(milk) (mg/day)	I(tot) (mg/day)	CSF (per mg/kg-day)	Cancer Risk
Antimony	3.45E-04	3.45E-08	1.85E-06	4.21E-08	2.59E-09	1.55E-11	1.56E-06	6.88E-08	2.28E-07	2.73E-08	1.73E-07		
Arsenic	3.48E-04	3.48E-08	1.86E-06	4.25E-08	4.80E-11	2.87E-13	3.15E-06	1.39E-07	1.38E-05	1.65E-06	1.67E-06	1.50E+00	2.20E-08
Barium	4.38E-04	4.38E-08	2.44E-06	5.56E-08	6.19E-12	3.71E-14	3.08E-07	1.36E-08	1.05E-06	1.26E-07	2.39E-07		
Beryllium	8.85E-05	8.85E-09	4.93E-07	1.12E-08	9.48E-13	5.67E-15	4.16E-07	1.83E-08	5.45E-10	6.54E-11	3.84E-08	4.30E+00	1.29E-09
bis (2-Ethylhexyl) Phthalate	5.93E-04	5.93E-08	1.24E-07	2.83E-09	3.39E-10	2.03E-12	NA	NA	NA	NA	6.22E-08	1.40E-02	6.81E-12
Cadmium	9.67E-05	9.67E-09	5.39E-07	1.23E-08	9.67E-12	5.79E-14	5.45E-05	2.40E-06	5.03E-06	6.04E-07	3.03E-06		
Chromium	1.10E-04	1.10E-08	6.11E-07	1.39E-08	1.37E-11	8.20E-14	2.83E-06	1.25E-07	1.13E-06	1.35E-07	2.85E-07		
2,4-Dinitrotoluene	1.99E-05	1.99E-09	1.20E-10	2.74E-12	2.17E-08	1.30E-10	2.01E-11	8.86E-13	6.40E-12	7.68E-13	2.12E-09	6.80E-01	1.13E-11
2,6-Dinitrotoluene	1.99E-05	1.99E-09	1.04E-10	2.37E-12	2.52E-08	1.51E-10	1.53E-11	6.72E-13	4.93E-12	5.92E-13	2.14E-09	6.80E-01	1.14E-11
Di-n-octyl Phthalate	6.02E-04	6.02E-08	1.19E-07	2.72E-09	3.44E-10	2.06E-12	NA	NA	NA	NA	6.29E-08		
GB	9.85E-06	9.85E-10	1.15E-12	2.62E-14	1.43E-07	8.57E-10	5.12E-13	2.25E-14	1.66E-13	1.99E-14	1.84E-09		
HD/HT	9.85E-04	9.85E-08	8.04E-12	1.83E-13	4.72E-07	2.83E-09	2.32E-10	1.02E-11	7.33E-11	8.80E-12	1.01E-07	9.50E+00	7.54E-09
Lead	2.78E-04	2.78E-08	1.55E-06	3.53E-08	NA	NA	NA	NA	NA	NA	6.32E-08		
Mercury	5.27E-04	5.27E-08	4.89E-07	1.11E-08	NA	NA	5.13E-08	2.26E-09	3.42E-07	4.11E-08	1.07E-07		
Nickel	1.71E-04	1.71E-08	9.54E-07	2.18E-08	4.18E-12	2.50E-14	4.83E-06	2.12E-07	1.17E-06	1.41E-07	3.92E-07		
PCB	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.70E+00	0.00E+00
Selenium	2.85E-04	2.85E-08	1.52E-06	3.48E-08	6.62E-10	3.96E-12	1.93E-05	8.51E-07	7.51E-06	9.01E-07	1.82E-06		
Silver	3.17E-04	3.17E-08	1.76E-06	4.02E-08	3.96E-08	2.37E-10	4.46E-06	1.96E-07	4.33E-05	5.20E-06	5.47E-06		
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.05E-08	1.05E-12	4.07E-11	9.28E-13	4.49E-13	2.69E-15	1.55E-09	6.80E-11	3.91E-10	4.69E-11	1.17E-10	1.50E+05	1.37E-07
Thallium	6.16E-04	6.16E-08	3.43E-06	7.83E-08	1.66E-12	9.96E-15	1.16E-04	5.09E-06	8.43E-06	1.01E-06	6.24E-06		
VX	9.85E-06	9.85E-10	8.99E-10	2.05E-11	6.07E-08	3.63E-10	1.16E-11	5.10E-13	3.98E-12	4.77E-13	1.37E-09		
Di-n-butyl Phthalate	6.02E-04	6.02E-08	1.24E-07	2.83E-09	3.39E-05	2.03E-07	NA	NA	NA	NA	2.66E-07		
Diethyl Phthalate	4.61E-04	4.61E-08	9.63E-08	2.20E-09	2.88E-07	1.72E-09	NA	NA	NA	NA	5.00E-08		
Manganese	1.46E-04	1.46E-08	8.13E-07	1.85E-08	3.17E-10	1.90E-12	8.22E-05	3.62E-06	2.00E-05	2.40E-06	6.05E-06		
4-Methylphenol	7.27E-04	7.27E-08	5.01E-10	1.14E-11	1.28E-06	7.65E-09	6.38E-10	2.81E-11	2.02E-10	2.42E-11	8.04E-08		
RDX	1.99E-05	1.99E-09	7.94E-14	1.81E-15	1.52E-08	9.07E-11	1.48E-12	6.50E-14	4.68E-13	5.62E-14	2.08E-09	1.10E-01	1.79E-12
2,4,6-Trinitrotoluene	1.99E-05	1.99E-09	1.86E-10	4.23E-12	4.01E-09	2.40E-11	1.02E-10	4.50E-12	3.26E-11	3.91E-12	2.02E-09	3.00E-02	4.75E-13
Vanadium	1.66E-04	1.66E-08	9.27E-07	2.11E-08	8.32E-11	4.98E-13	9.38E-05	4.13E-06	2.28E-05	2.73E-06	6.90E-06		

Total cancer risk= 2E-07

Table A-2.4.16 Case 4. With PFS, Actual Program Factors: UMCDF SUBSISTENCE FARMER

CONSUMPTION OF BEEF AND MILK:

USING TIME-AVERAGED SOIL CONCENTRATIONS

Calculation of beef concentration due to plant and soil ingestion
Calculation of milk concentration due to plant and soil ingestion

Interception fraction of edible portion, Rp=	0.44 unitless
Plant surface loss coefficient, kp=	18 1/yr
Time between rainfalls, t-rain=	14 days
Length of plant exposure per harvest, Tp=	0.12 yrs
Yield or standing crop biomass, Yp=	0.2 kgDW/m2
Fraction grown on impacted soil, F=	1 unitless
Quantity eaten by beef cattle, Qpb=	8.8 kg DW/day
Quantity soil eaten by beef cattle, Qsb=	0.4 kg soil/day
Quantity eaten by dairy cattle, Qpm=	13.2 kg DW/day
Quantity soil eaten by dairy cattle, Qsm=	0.4 kg soil/day
Density of air, p=	1200 g/m3

A(beef) = Concentration in beef
A(milk) = Concentration in milk
Sc = Soil concentration after total time period of deposition
Pd = Concentration in plant due to direct deposition
Pv = Concentration in plant due to air-to-plant transfer
Pd + Pv = Concentration in plant due to direct deposition and air-to-plant transfer
Vc = Concentration in air due to direct emissions
Bv = Air-to-Plant biotransfer factor
Ba(beef) = Biotransfer factor for beef
Ba(milk) = Biotransfer factor for milk

Substances of Potential Concern	Sc (mg/kg)	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Fw	Pd (mg/kg)	Vc (µg/m3)	Bv (mg/kg)/(ug/g)	Pv (mg/kg)	Pv+Pd (mg/kg)	Ba(beef) (day/kg)	A(beef) (mg/kg)	Ba(milk) (day/kg)	A(milk) (mg/kg)
Antimony	3.45E-04	1.47E-06	1.49E-07	0.2	1.62E-04	0.00E+00	NA	0.00E+00	1.62E-04	1.00E-03	1.56E-06	1.00E-04	2.28E-07
Arsenic	3.48E-04	1.48E-06	1.50E-07	0.2	1.63E-04	0.00E+00	NA	0.00E+00	1.63E-04	2.00E-03	3.15E-06	6.00E-03	1.38E-05
Barium	4.38E-04	1.86E-06	1.87E-07	0.6	2.14E-04	0.00E+00	NA	0.00E+00	2.14E-04	1.50E-04	3.08E-07	3.50E-04	1.05E-06
Beryllium	8.85E-05	3.77E-07	3.74E-08	0.6	4.32E-05	0.00E+00	NA	0.00E+00	4.32E-05	1.00E-03	4.16E-07	9.00E-07	5.45E-10
bis (2-Ethylhexyl) Phthalate	5.93E-04	8.56E-08	8.89E-09	0.6	9.83E-06	2.77E-06	5.11E+02	1.18E-06	1.10E-05	NA	NA	NA	NA
Cadmium	9.67E-05	4.12E-07	4.09E-08	0.6	4.72E-05	0.00E+00	NA	0.00E+00	4.72E-05	1.20E-01	5.45E-05	7.60E-03	5.03E-06
Chromium	1.10E-04	4.67E-07	4.68E-08	0.6	5.35E-05	0.00E+00	NA	0.00E+00	5.35E-05	5.50E-03	2.83E-06	1.50E-03	1.13E-06
2,4-Dinitrotoluene	1.99E-05	0.00E+00	0.00E+00	0.6	0.00E+00	9.60E-08	1.50E+02	1.20E-08	1.20E-08	2.50E-06	2.01E-11	7.90E-07	6.40E-12
2,6-Dinitrotoluene	1.99E-05	0.00E+00	0.00E+00	0.6	0.00E+00	9.60E-08	1.30E+02	1.04E-08	1.04E-08	1.90E-06	1.53E-11	6.10E-07	4.93E-12
Di-n-octyl Phthalate	6.02E-04	8.69E-08	9.02E-09	0.6	9.98E-06	2.81E-06	2.32E+02	5.43E-07	1.05E-05	NA	NA	NA	NA
GB	9.85E-06	5.22E-16	5.38E-17	0.6	6.00E-14	4.76E-08	2.90E+00	1.15E-10	1.15E-10	1.30E-07	5.12E-13	4.20E-08	1.66E-13
HD/HT	9.85E-04	1.35E-12	1.39E-13	0.6	1.55E-10	4.76E-06	1.58E-01	6.27E-10	7.82E-10	5.89E-07	2.32E-10	1.86E-07	7.33E-11
Lead	2.78E-04	1.18E-06	1.21E-07	0.6	1.36E-04	0.00E+00	NA	0.00E+00	1.36E-04	NA	NA	NA	NA
Mercury	5.27E-04	0.00E+00	0.00E+00	0.6	0.00E+00	2.55E-06	2.30E+04	4.89E-05	4.89E-05	8.00E-05	5.13E-08	4.00E-04	3.42E-07
Nickel	1.71E-04	7.29E-07	7.36E-08	0.6	8.36E-05	0.00E+00	NA	0.00E+00	8.36E-05	6.00E-03	4.83E-06	1.00E-03	1.17E-06
PCB	0.00E+00	0.00E+00	0.00E+00	0.6	0.00E+00	0.00E+00	1.72E+03	0.00E+00	0.00E+00	5.00E-02	0.00E+00	1.60E-02	0.00E+00
Selenium	2.85E-04	1.21E-06	1.24E-07	0.2	1.34E-04	0.00E+00	NA	0.00E+00	1.34E-04	1.50E-02	1.93E-05	4.00E-03	7.51E-06
Silver	3.17E-04	1.35E-06	1.37E-07	0.6	1.55E-04	0.00E+00	NA	0.00E+00	1.55E-04	3.00E-03	4.46E-06	2.00E-02	4.33E-05
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.05E-08	9.87E-12	1.01E-12	0.60	1.13E-09	3.97E-11	8.39E+04	2.78E-09	3.91E-09	4.00E-02	1.55E-09	7.00E-03	3.91E-10
Thallium	6.16E-04	2.63E-06	2.58E-07	0.6	3.01E-04	6.73E-15	NA	0.00E+00	3.01E-04	4.00E-02	1.16E-04	2.00E-03	8.43E-06
VX	9.85E-06	1.64E-12	1.69E-13	0.6	1.88E-10	4.76E-08	2.26E+03	8.96E-08	8.98E-08	2.45E-06	1.16E-11	7.76E-07	3.98E-12
Di-n-butyl Phthalate	6.02E-04	8.69E-08	9.02E-09	0.6	9.98E-06	2.81E-06	4.40E+02	1.03E-06	1.10E-05	NA	NA	NA	NA
Diethyl Phthalate	4.61E-04	6.74E-08	6.90E-09	0.6	7.74E-06	2.15E-06	4.48E+02	8.04E-07	8.54E-06	NA	NA	NA	NA
Manganese	1.46E-04	6.21E-07	6.38E-08	0.6	7.12E-05	0.00E+00	NA	0.00E+00	7.12E-05	1.20E-01	8.22E-05	2.00E-02	2.00E-05
4-Methylphenol	7.27E-04	7.58E-13	7.86E-14	0.6	8.71E-11	3.51E-06	1.71E+01	5.00E-08	5.01E-08	2.19E-06	6.38E-10	6.92E-07	2.02E-10
RDX	1.99E-05	0.00E+00	0.00E+00	0.6	0.00E+00	9.60E-08	9.92E-02	7.94E-12	7.94E-12	1.86E-07	1.48E-12	5.89E-08	4.68E-13
2,4,6-Trinitrotoluene	1.99E-05	0.00E+00	0.00E+00	0.6	0.00E+00	9.60E-08	2.32E+02	1.86E-08	1.86E-08	1.26E-05	1.02E-10	3.98E-06	3.26E-11
Vanadium	1.66E-04	7.09E-07	7.05E-08	0.6	8.13E-05	0.00E+00	NA	0.00E+00	8.13E-05	1.20E-01	9.38E-05	2.00E-02	2.28E-05

Table A-2.4.15 Case 4. With PFS, Actual Program Factors: UMCDF SUBSISTENCE FARMER
CONSUMPTION OF ROOT VEGETABLES:

Calculation of soil concentration due to deposition
Calculation of root vegetable concentration due to root uptake

Soil mixing depth, Z=	20 cm
Soil bulk density, BD=	1.5 g/cm3
Total deposition time period, Tc=	3.2 yrs
Below ground veg. correction factor, VGbg=	0.01 unitless
Dry deposition velocity of vapor phase, Vdv=	3 cm/s

Pr(bg) = Root vegetable concentration due to root uptake
Sc = Soil concentration after total time period of deposition
Ds = Deposition term
Kds = Soil-water partition coefficient
RCF = Ratio of concentration in roots to concentration in soil pore water

Substances of Potential Concern	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Vwd (g/m2-yr)	Vc (µg/m3)	Ds (1/yr)	Sc (mg/kg)	Kds mL/g	RCF (mg/kg)/(ug/mL)	Pr(bg) (mg/kg)
Antimony	1.47E-06	1.49E-07	0.00E+00	0.00E+00	**5.39E-06**	**1.73E-05**	2	3.00E-02	**2.59E-09**
Arsenic	1.48E-06	1.50E-07	0.00E+00	0.00E+00	**5.44E-06**	**1.74E-05**	29	8.00E-03	**4.80E-11**
Barium	1.86E-06	1.87E-07	0.00E+00	0.00E+00	**6.84E-06**	**2.19E-05**	530	1.50E-02	**6.19E-12**
Beryllium	3.77E-07	3.74E-08	0.00E+00	0.00E+00	**1.38E-06**	**4.42E-06**	70	1.50E-03	**9.48E-13**
bis (2-Ethylhexyl) Phthalate	8.56E-08	8.89E-09	6.61E-08	2.77E-06	**9.27E-06**	**2.97E-05**	280000	3.20E+02	**3.39E-10**
Cadmium	4.12E-07	4.09E-08	0.00E+00	0.00E+00	**1.51E-06**	**4.83E-06**	160	3.20E-02	**9.67E-12**
Chromium	4.67E-07	4.68E-08	0.00E+00	0.00E+00	**1.71E-06**	**5.48E-06**	18	4.50E-03	**1.37E-11**
2,4-Dinitrotoluene	0.00E+00	0.00E+00	2.27E-09	9.60E-08	**3.10E-07**	**9.93E-07**	0.87	1.90E+00	**2.17E-08**
2,6-Dinitrotoluene	0.00E+00	0.00E+00	2.27E-09	9.60E-08	**3.10E-07**	**9.93E-07**	0.67	1.70E+00	**2.52E-08**
Di-n-octyl Phthalate	8.69E-08	9.02E-09	6.70E-08	2.81E-06	**9.40E-06**	**3.01E-05**	280000	3.20E+02	**3.44E-10**
GB	5.22E-16	5.38E-17	1.13E-09	4.76E-08	**1.54E-07**	**4.93E-07**	0.032	9.30E-01	**1.43E-07**
HD/HT	1.35E-12	1.39E-13	1.13E-07	4.76E-06	**1.54E-05**	**4.93E-05**	1.2	1.16E+00	**4.72E-07**
Lead	1.18E-06	1.21E-07	0.00E+00	0.00E+00	**4.35E-06**	**1.39E-05**	600	NA	**NA**
Mercury	0.00E+00	0.00E+00	6.05E-08	2.55E-06	**8.24E-06**	**2.64E-05**	57000	NA	**NA**
Nickel	7.29E-07	7.36E-08	0.00E+00	0.00E+00	**2.68E-06**	**8.56E-06**	82	4.00E-03	**4.18E-12**
PCB	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**	**0.00E+00**	4300	2.10E+03	**0.00E+00**
Selenium	1.21E-06	1.24E-07	0.00E+00	0.00E+00	**4.45E-06**	**1.42E-05**	4.3	2.00E-02	**6.62E-10**
Silver	1.35E-06	1.37E-07	0.00E+00	0.00E+00	**4.95E-06**	**1.58E-05**	0.4	1.00E-01	**3.96E-08**
2,3,7,8-TCDD & Dioxin-Like SOPCs	9.87E-12	1.01E-12	9.47E-13	3.97E-11	**1.65E-10**	**5.27E-10**	142000	1.21E+04	**4.49E-13**
Thallium	2.63E-06	2.58E-07	1.59E-16	6.73E-15	**9.62E-06**	**3.08E-05**	74	4.00E-04	**1.66E-12**
VX	1.64E-12	1.69E-13	1.13E-09	4.76E-08	**1.54E-07**	**4.92E-07**	0.15	1.85E+00	**6.07E-08**
Di-n-butyl Phthalate	8.69E-08	9.02E-09	6.70E-08	2.81E-06	**9.40E-06**	**3.01E-05**	1.6	1.80E+02	**3.39E-05**
Diethyl Phthalate	6.74E-08	6.90E-09	5.13E-08	2.15E-06	**7.21E-06**	**2.31E-05**	5.3	6.56E+00	**2.88E-07**
Manganese	6.21E-07	6.38E-08	0.00E+00	0.00E+00	**2.28E-06**	**7.30E-06**	23	1.00E-01	**3.17E-10**
4-Methylphenol	7.58E-13	7.86E-14	8.38E-08	3.51E-06	**1.14E-05**	**3.63E-05**	0.50	1.76E+00	**1.28E-06**
RDX	0.00E+00	0.00E+00	2.27E-09	9.60E-08	**3.10E-07**	**9.93E-07**	0.63	9.61E-01	**1.52E-08**
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	2.27E-09	9.60E-08	**3.10E-07**	**9.93E-07**	11	4.44E+00	**4.01E-09**
Vanadium	7.09E-07	7.05E-08	0.00E+00	0.00E+00	**2.60E-06**	**8.32E-06**	100	1.00E-01	**8.32E-11**

Table A-2.4.14 Case 4. With PFS, Actual Program Factors: UMCDF SUBSISTENCE FARMER

CONSUMPTION OF ABOVE-GROUND VEGETABLES:

Calculation of above-ground vegetable concentration due to direct deposition
Calculation of above-ground vegetable concentration due to air-to-plant transfer

Interception fraction of edible portion, Rp=	0.04	unitless
Plant surface loss coefficient, kp=	18	1/yr
Time between rainfalls, t-rain=	14	days
Length of plant exposure per harvest, Tp=	0.16	yrs
Standing crop biomass, Yp=	1.7	kg DW/m2
Density of air, p=	1200	g/m3
Above ground veg. correction factor, VGab=	0.01	unitless

Pd = Concentration in plant due to direct deposition
Pv = Concentration in plant due to air-to-plant transfer
Pd + Pv = Concentration in plant due to direct deposition and air-to-plant transfer
Fw = Fraction of wet deposition of particles that adheres to plant
Bv = Air-to-plant bioconcentration factor

Substances of Potential Concern	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Fw	Pd (mg/kg)	Vc (μg/m3)	Bv (mg/kg)/(ug/g)	**Pv (mg/kg)**	Pd+Pv (mg/kg)
Antimony	1.47E-06	1.49E-07	0.2	**1.85E-06**	0.00E+00	NA	**0.00E+00**	**1.85E-06**
Arsenic	1.48E-06	1.50E-07	0.2	**1.86E-06**	0.00E+00	NA	**0.00E+00**	**1.86E-06**
Barium	1.86E-06	1.87E-07	0.6	**2.44E-06**	0.00E+00	NA	**0.00E+00**	**2.44E-06**
Beryllium	3.77E-07	3.74E-08	0.6	**4.93E-07**	0.00E+00	NA	**0.00E+00**	**4.93E-07**
bis (2-Ethylhexyl) Phthalate	8.56E-08	8.89E-09	0.6	**1.12E-07**	2.77E-06	5.11E+02	**1.18E-08**	**1.24E-07**
Cadmium	4.12E-07	4.09E-08	0.6	**5.39E-07**	0.00E+00	NA	**0.00E+00**	**5.39E-07**
Chromium	4.67E-07	4.68E-08	0.6	**6.11E-07**	0.00E+00	NA	**0.00E+00**	**6.11E-07**
2,4-Dinitrotoluene	0.00E+00	0.00E+00	0.6	**0.00E+00**	9.60E-08	1.50E+02	**1.20E-10**	**1.20E-10**
2,6-Dinitrotoluene	0.00E+00	0.00E+00	0.6	**0.00E+00**	9.60E-08	1.30E+02	**1.04E-10**	**1.04E-10**
Di-n-octyl Phthalate	8.69E-08	9.02E-09	0.6	**1.14E-07**	2.81E-06	2.32E+02	**5.43E-09**	**1.19E-07**
GB	5.22E-16	5.38E-17	0.6	**6.84E-16**	4.76E-08	2.90E+00	**1.15E-12**	**1.15E-12**
HD/HT	1.35E-12	1.39E-13	0.6	**1.77E-12**	4.76E-06	1.58E-01	**6.27E-12**	**8.04E-12**
Lead	1.18E-06	1.21E-07	0.6	**1.55E-06**	0.00E+00	NA	**0.00E+00**	**1.55E-06**
Mercury	0.00E+00	0.00E+00	0.6	**0.00E+00**	2.55E-06	2.30E+04	**4.89E-07**	**4.89E-07**
Nickel	7.29E-07	7.36E-08	0.6	**9.54E-07**	0.00E+00	NA	**0.00E+00**	**9.54E-07**
PCB	0.00E+00	0.00E+00	0.6	**0.00E+00**	0.00E+00	1.72E+03	**0.00E+00**	**0.00E+00**
Selenium	1.21E-06	1.24E-07	0.2	**1.52E-06**	0.00E+00	NA	**0.00E+00**	**1.52E-06**
Silver	1.35E-06	1.37E-07	0.6	**1.76E-06**	0.00E+00	NA	**0.00E+00**	**1.76E-06**
2,3,7,8-TCDD & Dioxin-Like SOPCs	9.87E-12	1.01E-12	0.6	**1.29E-11**	3.97E-11	8.39E+04	**2.78E-11**	**4.07E-11**
Thallium	2.63E-06	2.58E-07	0.6	**3.43E-06**	6.73E-15	NA	**0.00E+00**	**3.43E-06**
VX	1.64E-12	1.69E-13	0.6	**2.15E-12**	4.76E-08	2.26E+03	**8.96E-10**	**8.99E-10**
Di-n-butyl Phthalate	8.69E-08	9.02E-09	0.6	**1.14E-07**	2.81E-06	4.40E+02	**1.03E-08**	**1.24E-07**
Diethyl Phthalate	6.74E-08	6.90E-09	0.6	**8.83E-08**	2.15E-06	4.48E+02	**8.04E-09**	**9.63E-08**
Manganese	6.21E-07	6.38E-08	0.6	**8.13E-07**	0.00E+00	NA	**0.00E+00**	**8.13E-07**
4-Methylphenol	7.58E-13	7.86E-14	0.6	**9.93E-13**	3.51E-06	1.71E+01	**5.00E-10**	**5.01E-10**
RDX	0.00E+00	0.00E+00	0.6	**0.00E+00**	9.60E-08	9.92E-02	**7.94E-14**	**7.94E-14**
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	0.6	**0.00E+00**	9.60E-08	2.32E+02	**1.86E-10**	**1.86E-10**
Vanadium	7.09E-07	7.05E-08	0.6	**9.27E-07**	0.00E+00	NA	**0.00E+00**	**9.27E-07**

Table A-2.4.13 Case 4. With PFS, Actual Program Factors: UMCDF SUBSISTENCE FARMER

SOIL INGESTION: Calculation of soil concentration due to deposition

Soil mixing depth, Z= 1 cm
Soil bulk density, BD= 1.5 g/cm3
Total deposition time period, Tc= 3.2 yrs
Dry deposition velocity of vapor phase, Vdv= 3 cm/s

Sc = Soil concentration after total time period of deposition
Ds = Deposition term
Pdd = Yearly dry deposition from particle phase
Pwd = Yearly wet deposition from particle phase
Vwd = Yearly wet deposition from vapor phase
Vc = Vapor phase air concentration

Substances of Potential Concern	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Vwd (g/m2-yr)	Vc (µg/m3)	**Ds (1/yr)**	**Sc (mg/kg)**
Antimony	1.47E-06	1.49E-07	0.00E+00	0.00E+00	**1.08E-04**	**3.45E-04**
Arsenic	1.48E-06	1.50E-07	0.00E+00	0.00E+00	**1.09E-04**	**3.48E-04**
Barium	1.86E-06	1.87E-07	0.00E+00	0.00E+00	**1.37E-04**	**4.38E-04**
Beryllium	3.77E-07	3.74E-08	0.00E+00	0.00E+00	**2.76E-05**	**8.85E-05**
bis (2-Ethylhexyl) Phthalate	8.56E-08	8.89E-09	6.61E-08	2.77E-06	**1.85E-04**	**5.93E-04**
Cadmium	4.12E-07	4.09E-08	0.00E+00	0.00E+00	**3.02E-05**	**9.67E-05**
Chromium	4.67E-07	4.68E-08	0.00E+00	0.00E+00	**3.43E-05**	**1.10E-04**
2,4-Dinitrotoluene	0.00E+00	0.00E+00	2.27E-09	9.60E-08	**6.21E-06**	**1.99E-05**
2,6-Dinitrotoluene	0.00E+00	0.00E+00	2.27E-09	9.60E-08	**6.21E-06**	**1.99E-05**
Di-n-octyl Phthalate	8.69E-08	9.02E-09	6.70E-08	2.81E-06	**1.88E-04**	**6.02E-04**
GB	5.22E-16	5.38E-17	1.13E-09	4.76E-08	**3.08E-06**	**9.85E-06**
HD/HT	1.35E-12	1.39E-13	1.13E-07	4.76E-06	**3.08E-04**	**9.85E-04**
Lead	1.18E-06	1.21E-07	0.00E+00	0.00E+00	**8.70E-05**	**2.78E-04**
Mercury	0.00E+00	0.00E+00	6.05E-08	2.55E-06	**1.65E-04**	**5.27E-04**
Nickel	7.29E-07	7.36E-08	0.00E+00	0.00E+00	**5.35E-05**	**1.71E-04**
PCB	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**	**0.00E+00**
Selenium	1.21E-06	1.24E-07	0.00E+00	0.00E+00	**8.90E-05**	**2.85E-04**
Silver	1.35E-06	1.37E-07	0.00E+00	0.00E+00	**9.90E-05**	**3.17E-04**
2,3,7,8-TCDD & Dioxin-Like SOPCs	9.87E-12	1.01E-12	9.47E-13	3.97E-11	**3.29E-09**	**1.05E-08**
Thallium	2.63E-06	2.58E-07	1.59E-16	6.73E-15	**1.92E-04**	**6.16E-04**
VX	1.64E-12	1.69E-13	1.13E-09	4.76E-08	**3.08E-06**	**9.85E-06**
Di-n-butyl Phthalate	8.69E-08	9.02E-09	6.70E-08	2.81E-06	**1.88E-04**	**6.02E-04**
Diethyl Phthalate	6.74E-08	6.90E-09	5.13E-08	2.15E-06	**1.44E-04**	**4.61E-04**
Manganese	6.21E-07	6.38E-08	0.00E+00	0.00E+00	**4.56E-05**	**1.46E-04**
4-Methylphenol	7.58E-13	7.86E-14	8.38E-08	3.51E-06	**2.27E-04**	**7.27E-04**
RDX	0.00E+00	0.00E+00	2.27E-09	9.60E-08	**6.21E-06**	**1.99E-05**
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	2.27E-09	9.60E-08	**6.21E-06**	**1.99E-05**
Vanadium	7.09E-07	7.05E-08	0.00E+00	0.00E+00	**5.20E-05**	**1.66E-04**

Table A-2.4.12 Case 4. With PFS, Actual Program Factors: UMCDF SUBSISTENCE FARMER

CONCENTRATIONS AND DEPOSITIONS: **Calculated depositions and concentrations for indirect exposure pathways**

Substances of Potential Concern	Particulate Dry Deposition Pdd (g/m2)/yr	Particulate Wet Deposition Pwd (g/m2)/yr	Vapor Wet Deposition Vwd (g/m2)/yr	Vapor Concentration Vc (ug/m3)	Toxicity Equivalency Factor	2,3,7,8-TCDD Toxicity Equivalents Pdd (ug/m3)	2,3,7,8-TCDD Toxicity Equivalents Pwd (g/m2-yr)	2,3,7,8-TCDD Toxicity Equivalents Vwd (g/m2-yr)	2,3,7,8-TCDD Toxicity Equivalents Vc (ug/m3)
Tetra CDD	9.24E-13	9.50E-14	2.16E-13	9.05E-12	1.000	9.24E-13	9.50E-14	2.16E-13	9.05E-12
Penta CDD	7.60E-12	7.81E-13	5.10E-13	2.14E-11	0.500	3.80E-12	3.91E-13	2.55E-13	1.07E-11
Hexa CDD	9.55E-12	9.82E-13	1.37E-13	5.76E-12	0.100	9.55E-13	9.82E-14	1.37E-14	5.76E-13
Hepta CDD	1.01E-11	1.03E-12	3.92E-14	1.65E-12	0.010	1.01E-13	1.03E-14	3.92E-16	1.65E-14
Octa CDD	2.05E-11	2.11E-12	7.85E-16	3.29E-14	0.001	2.05E-14	2.11E-15	7.85E-19	3.29E-17
Tetra CDF	5.95E-13	6.12E-14	2.79E-13	1.17E-11	0.100	5.95E-14	6.12E-15	2.79E-14	1.17E-12
Penta CDF	5.95E-12	6.12E-13	8.24E-13	3.46E-11	0.500	2.98E-12	3.06E-13	4.12E-13	1.73E-11
Hexa CDF	9.14E-12	9.40E-13	2.16E-13	9.05E-12	0.100	9.14E-13	9.40E-14	2.16E-14	9.05E-13
Hepta CDF	9.86E-12	1.01E-12	7.85E-14	3.29E-12	0.010	9.86E-14	1.01E-14	7.85E-16	3.29E-14
Octa CDF	2.05E-11	2.11E-12	7.85E-15	3.29E-13	0.001	2.05E-14	2.11E-15	7.85E-18	3.29E-16
					Total =	9.87E-12	1.01E-12	9.47E-13	3.97E-11
Antimony	1.47E-06	1.49E-07	0.00E+00	0.00E+00					
Arsenic	1.48E-06	1.50E-07	0.00E+00	0.00E+00					
Barium	1.86E-06	1.87E-07	0.00E+00	0.00E+00					
Beryllium	3.77E-07	3.74E-08	0.00E+00	0.00E+00					
bis (2-Ethylhexyl) Phthalate	8.56E-08	8.89E-09	6.61E-08	2.77E-06					
Cadmium	4.12E-07	4.09E-08	0.00E+00	0.00E+00					
Chromium	4.67E-07	4.68E-08	0.00E+00	0.00E+00					
2,4-Dinitrotoluene	0.00E+00	0.00E+00	2.27E-09	9.60E-08					
2,6-Dinitrotoluene	0.00E+00	0.00E+00	2.27E-09	9.60E-08					
Di-n-octyl Phthalate	8.69E-08	9.02E-09	6.70E-08	2.81E-06					
GB	5.22E-16	5.38E-17	1.13E-09	4.76E-08					
HD/HT	1.35E-12	1.39E-13	1.13E-07	4.76E-06					
Lead	1.18E-06	1.21E-07	0.00E+00	0.00E+00					
Mercury	0.00E+00	0.00E+00	6.05E-08	2.55E-06					
Nickel	7.29E-07	7.36E-08	0.00E+00	0.00E+00					
PCB	0.00E+00	0.00E+00	0.00E+00	0.00E+00					
Selenium	1.21E-06	1.24E-07	0.00E+00	0.00E+00					
Silver	1.35E-06	1.37E-07	0.00E+00	0.00E+00					
2,3,7,8-TCDD & Dioxin-Like SOPCs	9.87E-12	1.01E-12	9.47E-13	3.97E-11					
Thallium	2.63E-06	2.58E-07	1.59E-18	6.73E-15					
VX	1.64E-12	1.69E-13	1.13E-09	4.76E-08					
Di-n-butyl Phthalate	8.69E-08	9.02E-09	6.70E-08	2.81E-06					
Diethyl Phthalate	6.74E-08	6.90E-09	5.13E-08	2.15E-06					
Manganese	6.21E-07	6.38E-08	0.00E+00	0.00E+00					
4-Methlyphenol	7.58E-13	7.86E-14	8.38E-08	3.51E-06					
RDX	0.00E+00	0.00E+00	2.27E-09	9.60E-08					
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	2.27E-09	9.60E-08					
Vanadium	7.09E-07	7.05E-08	0.00E+00	0.00E+00					

CDD = Chlorinated dibenzo-p-dioxin
CDF = Chlorinated dibenzo-p-furan

Table A-2.4.11 Case 4. With PFS, Actual Program Factors: UMCDF CHILD RESIDENT

	Risk UMCDF	HI-Liver UMCDF	HI-Neuro UMCDF	HQ		Risk-Inh. UMCDF	HI-Inh. UMCDF
Indirect					Inhalation		
Antimony				1.14E-05	Tetra CDD	2.63E-11	
Arsenic	5.91E-10			1.53E-05	Penta CDD	6.48E-11	
Barium				8.27E-08	Hexa CDD	2.06E-22	
Beryllium	4.31E-10			2.34E-07	Hepta CDD	2.06E-23	
bis (2-Ethylhexyl) Phthalate	9.12E-12	8.49E-08		3.80E-07	Octa CDD	4.12E-24	
Cadmium				1.28E-06	Tetra CDF	4.25E-23	
Chromium				2.90E-07	Penta CDF	1.05E-21	
2,4-Dinitrotoluene	1.48E-11		2.84E-08	1.27E-07	Hexa CDF	2.07E-22	
2,6-Dinitrotoluene	1.48E-11		5.69E-08	2.55E-07	Hepta CDF	2.06E-23	
Di-n-octyl Phthalate		8.61E-08		3.85E-07	Octa CDF	4.12E-24	
GB			6.71E-07	3.00E-06	2,3,7,8-TCDD TEQ	2.43E-10	
HD/HT	1.03E-08				Antimony		
Lead					Arsenic	7.86E-09	
Mercury			1.52E-05	6.78E-05	Barium		2.96E-06
Nickel				1.13E-07	Beryllium	3.29E-10	
Total PCBs					Boron		5.37E-07
Selenium				7.52E-07	Cadmium	2.70E-10	
Silver				8.38E-07	Chromium	2.01E-09	
2,3,7,8-TCDD & Others	1.78E-09				Cobalt		
Thallium		2.27E-05		1.02E-04	Copper		
VX			6.62E-07	2.96E-06	Lead		
Di-n-butyl Phthalate				8.46E-08	Manganese		1.04E-04
Diethyl Phthalate				7.39E-09	Mercury		9.10E-06
Manganese			3.08E-09	1.38E-08	Nickel	6.47E-11	
4-Methylphenol			4.17E-07	1.86E-06	Phosphorus		
RDX	2.40E-12			8.48E-08	Selenium		
2,4,6-Trinitrotoluene	6.53E-13	1.14E-07		5.08E-07	Silver		
Vanadium				3.14E-07	Thallium		
					Tin		
					Vanadium		
					Zinc		
					Acetone		
					Benzene	3.79E-13	
					Bromodichloromethane		
					Bromoform	2.52E-14	
					2-Butanone		1.45E-09
					Carbon Disulfide		1.45E-07
					Carbon Tetrachloride	3.47E-13	
					Chlorobenzene		2.47E-08
					Chloroform	5.30E-13	
					Chloromethane	4.12E-14	
					Dibromochloromethane		
					1,1-Dichloroethane		9.87E-11
					1,2-Dichloropropane		3.77E-08
					cis-1,3-Dichloropropene	8.50E-13	2.47E-08
					trans-1,3-Dichloropropene	8.50E-13	2.51E-08
					Ethylbenzene		4.93E-10
					2-Hexanone		
					Methylene Chloride	1.11E-14	1.64E-10
					4-Methyl-2-pentanone		
					Styrene		1.64E-10
					1,1,2,2-Tetrachloroethane	1.31E-12	
					Tetrachloroethene		
					Toluene		1.30E-09
					1,1,1-Trichloroethane		
					Vinyl Acetate		8.82E-10
					Vinyl Chloride	3.92E-12	
					Xylenes		
					Benzoic Acid		
					Benzyl Alcohol		
					Diethyl Phthalate		
					Dimethyl Phthalate		
					Di-n-butyl Phthalate		
					Di-n-octyl Phthalate		
					bis(2-Ethylhexyl)-Phthalate		
					2-Methylphenol		
					3-Methylphenol		
					4-Methylphenol		
					Naphthalene		
					GB		1.68E-05
					HD/HT	6.34E-10	5.04E-05
					VX		1.68E-05
					Chlorine		
					Hydrogen Chloride		5.31E-03
					Hydrogen Fluoride		
					Nitroglycerine		
					PCB		
					Particulates		
					2,4-Dinitrotoluene		
					2,6-Dinitrotoluene		
					2,4,6-Trinitrotoluene		
					RDX		
					HMX		
Total	1.31E-08	2.30E-05	1.70E-05			1.14E-08	5.51E-03
Grand Total	2E-08	0.00002	0.00002			1E-08	0.006

Table A-2.4.10 Case 4. With PFS, Actual Program Factors: UMCDF ADULT RESIDENT

	Risk UMCDF	HI-Liver UMCDF	HI-Neuro UMCDF	HQ		Risk-Inh. UMCDF	HI-Inh. UMCDF
Indirect					**Inhalation**		
Antimony				1.56E-06	Tetra CDD	2.34E-11	
Arsenic	4.05E-10			2.10E-06	Penta CDD	5.78E-11	
Barium				1.14E-08	Hexa CDD	1.84E-22	
Beryllium	2.98E-10			3.23E-08	Hepta CDD	1.84E-23	
bis (2-Ethylhexyl) Phthalate	4.94E-12	4.29E-08		4.12E-08	Octa CDD	3.68E-24	
Cadmium				1.77E-07	Tetra CDF	3.80E-23	
Chromium				4.01E-08	Penta CDF	9.37E-22	
2,4-Dinitrotoluene	8.07E-12		1.44E-08	1.38E-08	Hexa CDF	1.85E-22	
2,6-Dinitrotoluene	8.09E-12		2.90E-08	2.78E-08	Hepta CDF	1.84E-23	
Di-n-octyl Phthalate		4.35E-08		4.17E-08	Octa CDF	3.68E-24	
GB			4.02E-07	3.86E-07	2,3,7,8-TCDD TEQ	2.17E-10	
HD/HT	5.54E-09				Antimony		
Lead					Arsenic	7.02E-09	
Mercury			7.95E-06	7.63E-06	Barium		2.64E-06
Nickel				1.56E-08	Beryllium	2.94E-10	
Total PCBs					Boron		4.79E-07
Selenium				1.03E-07	Cadmium	2.41E-10	
Silver				1.16E-07	Chromium	1.79E-09	
2,3,7,8-TCDD & Others	1.14E-09				Cobalt		
Thallium		1.47E-05		1.41E-05	Copper		
VX			3.61E-07	3.46E-07	Lead		
Di-n-butyl Phthalate				1.56E-08	Manganese		9.31E-05
Diethyl Phthalate				8.08E-10	Mercury		8.12E-06
Manganese			1.99E-09	1.91E-09	Nickel	5.77E-11	0.00E+00
4-Methylphenol			2.13E-07	2.05E-07	Phosphorus		
RDX	1.30E-12			9.18E-09	Selenium		
2,4,6-Trinitrotoluene	3.51E-13	5.70E-08		5.46E-08	Silver		
Vanadium				4.34E-08	Thallium		
					Tin		
					Vanadium		
					Zinc		
					Acetone		
					Benzene	3.39E-13	
					Bromodichloromethane		
					Bromoform	2.25E-14	
					2-Butanone		1.30E-09
					Carbon Disulfide		1.30E-07
					Carbon Tetrachloride	3.10E-13	
					Chlorobenzene		2.20E-08
					Chloroform	4.73E-13	
					Chloromethane	3.68E-14	
					Dibromochloromethane		
					1,1-Dichloroethane		8.81E-11
					1,2-Dichloropropane		3.36E-08
					cis-1,3-Dichloropropene	7.59E-13	2.20E-08
					trans-1,3-Dichloropropene	7.59E-13	2.24E-08
					Ethylbenzene		4.41E-10
					2-Hexanone		
					Methylene Chloride	9.93E-15	1.47E-10
					4-Methyl-2-pentanone		
					Styrene		1.47E-10
					1,1,2,2-Tetrachloroethane	1.17E-12	
					Tetrachloroethene		
					Toluene		1.16E-09
					1,1,1-Trichloroethane		
					Vinyl Acetate		7.87E-10
					Vinyl Chloride	3.50E-12	
					Xylenes		
					Benzoic Acid		
					Benzyl Alcohol		
					Diethyl Phthalate		
					Dimethyl Phthalate		
					Di-n-butyl Phthalate		
					Di-n-octyl Phthalate		
					bis(2-Ethylhexyl)-Phthalate		
					2-Methylphenol		
					3-Methylphenol		
					4-Methylphenol		
					Naphthalene		
					GB		1.50E-05
					HD/HT	5.66E-10	4.50E-05
					VX		1.50E-05
					Chlorine		
					Hydrogen Chloride		4.74E-03
					Hydrogen Fluoride		
					Nitroglycerine		
					PCB		
					Particulates		
					2,4-Dinitrotoluene		
					2,6-Dinitrotoluene		
					2,4,6-Trinitrotoluene		
					RDX		
					HMX		
Total	7.41E-09	1.48E-05	8.98E-06			1.02E-08	4.92E-03
Grand Total	2E-08	0.000015	0.00001			1E-08	0.005

Table A-2.4.9 Case 4. With PFS, Actual Program Factors: UMCDF RESIDENT

DIRECT INHALATION EXPOSURES

Exposure parameter	Exposure Scenario Subsistence Farmer	Subsistence Fisher	Adult Resident	Child Resident
Inhalation rate, IR (m3/hr)	0.8	0.8	0.8	0.2
Exposure duration, ED (yr)	3.2	3.2	3.2	3.2
Body weight, BW (kg)	70	70	70	15
Exposure time, ET (hr/day)			24	24
Exposure frequency, EF (day/yr)			350	350
Carcinogenic averaging time, LT (day)			25550	25550
Noncancer averaging time, LT (day)			1168	1168

CSF = Cancer Slope Factor
RfD = Reference Dose
HI = Hazard Index

CDD = Chlorinated dibenzo-p-dioxin
CDF = Chlorinated dibenzo-p-furan

Substances of Potential Concern	Respirable Concentration (ug/m3)	Cancer Inh. Intake-Adult (mg/kg-day)	Cancer Inh. Intake-Child (mg/kg-day)	Inhalation CSF (per mg/kg-day)	Cancer Risk Adult	Cancer Risk Child	Inhalation RfD (mg/kg/day)	Hazard Quotient Adult	Hazard Quotient Child
Tetra CDD	1.61E-11	2.02E-16	2.26E-16	1.16E+05	2.34E-11	2.63E-11			
Penta CDD	7.96E-11	9.97E-16	1.12E-15	5.80E+04	5.78E-11	6.48E-11			
Hexa CDD	7.89E-11	9.89E-16	1.11E-15	1.86E-07	1.84E-22	2.06E-22			
Hepta CDD	7.88E-11	9.86E-16	1.10E-15	1.86E-08	1.84E-23	2.06E-23			
Octa CDD	1.57E-10	1.97E-15	2.21E-15	1.86E-09	3.68E-24	4.12E-24			
Tetra CDF	1.63E-11	2.04E-16	2.28E-16	1.86E-07	3.80E-23	4.25E-23			
Penta CDF	8.02E-11	1.00E-15	1.13E-15	9.32E-07	9.37E-22	1.05E-21			
Hexa CDF	7.91E-11	9.90E-16	1.11E-15	1.86E-07	1.85E-22	2.07E-22			
Hepta CDF	7.88E-11	9.87E-16	1.11E-15	1.86E-08	1.84E-23	2.06E-23			
Octa CDF	1.57E-10	1.97E-15	2.21E-15	1.86E-09	3.68E-24	4.12E-24			
2,3,7,8-TCDD TEQ	1.15E-10	1.44E-15	1.62E-15	1.50E+05	2.17E-10	2.43E-10			
Antimony	1.11E-05	1.39E-10	1.56E-10						
Arsenic	1.12E-05	1.40E-10	1.57E-10	5.00E+01	7.02E-09	7.86E-09			
Barium	1.40E-05	1.75E-10	1.96E-10				1.45E-03	2.64E-06	2.96E-06
Beryllium	2.79E-06	3.50E-11	3.92E-11	8.40E+00	2.94E-10	3.29E-10			
Boron	1.01E-05	1.27E-10	1.42E-10				5.80E-03	4.79E-07	5.37E-07
Cadmium	3.05E-06	3.82E-11	4.28E-11	6.30E+00	2.41E-10	2.70E-10			
Chromium	3.49E-06	4.37E-11	4.90E-11	4.10E+01	1.79E-09	2.01E-09			
Cobalt	5.59E-06	7.00E-11	7.84E-11						
Copper	6.60E-06	8.27E-11	9.26E-11						
Lead	9.01E-06	1.13E-10	1.26E-10						
Manganese	4.76E-06	5.96E-11	6.67E-11				1.40E-05	9.31E-05	1.04E-04
Mercury	2.55E-06	3.19E-11	3.58E-11				8.60E-05	8.12E-06	9.10E-06
Nickel	5.49E-06	6.87E-11	7.70E-11	8.40E-01	5.77E-11	6.47E-11			
Phosphorus	1.01E-05	1.27E-10	1.42E-10						
Selenium	9.24E-06	1.16E-10	1.30E-10						
Silver	1.02E-05	1.28E-10	1.44E-10						
Thallium	1.93E-05	2.41E-10	2.70E-10						
Tin	8.98E-06	1.12E-10	1.26E-10						
Vanadium	5.28E-06	6.59E-11	7.38E-11						
Zinc	9.24E-06	1.16E-10	1.30E-10						
Acetone	7.69E-07	9.63E-12	1.08E-11						
Benzene	9.33E-07	1.17E-11	1.31E-11	2.90E-02	3.39E-13	3.79E-13			
Bromodichloromethane	4.66E-07	5.84E-12	6.54E-12						
Bromoform	4.66E-07	5.84E-12	6.54E-12	3.85E-03	2.25E-14	2.52E-14			
2-Butanone	1.37E-06	1.72E-11	1.93E-11				2.90E-01	1.30E-09	1.45E-09
Carbon Disulfide	1.37E-06	1.72E-11	1.93E-11				2.90E-03	1.30E-07	1.45E-07
Carbon Tetrachloride	4.66E-07	5.84E-12	6.54E-12	5.30E-02	3.10E-13	3.47E-13			
Chlorobenzene	4.66E-07	5.84E-12	6.54E-12				5.80E-03	2.20E-08	2.47E-08
Chloroform	4.66E-07	5.84E-12	6.54E-12	8.10E-02	4.73E-13	5.30E-13			
Chloromethane	4.66E-07	5.84E-12	6.54E-12	6.30E-03	3.68E-14	4.12E-14			
Dibromochloromethane	4.66E-07	5.84E-12	6.54E-12						
1,1-Dichloroethane	4.66E-07	5.84E-12	6.54E-12				1.45E+00	8.81E-11	9.87E-11
1,2-Dichloropropane	4.66E-07	5.84E-12	6.54E-12				3.80E-03	3.36E-08	3.77E-08
cis-1,3-Dichloropropene	4.66E-07	5.84E-12	6.54E-12	1.30E-01	7.59E-13	8.50E-13	5.80E-03	2.20E-08	2.47E-08
trans-1,3-Dichloropropene	4.66E-07	5.84E-12	6.54E-12	1.30E-01	7.59E-13	8.50E-13	5.70E-03	2.24E-08	2.51E-08
Ethylbenzene	4.66E-07	5.84E-12	6.54E-12				2.90E-01	4.41E-10	4.93E-10
2-Hexanone	4.66E-07	5.84E-12	6.54E-12						
Methylene Chloride	4.66E-07	5.84E-12	6.54E-12	1.70E-03	9.93E-15	1.11E-14	8.70E-01	1.47E-10	1.64E-10
4-Methyl-2-pentanone	4.66E-07	5.84E-12	6.54E-12				2.30E-01	5.55E-10	6.22E-10
Styrene	4.66E-07	5.84E-12	6.54E-12				8.70E-01	1.47E-10	1.64E-10
1,1,2,2-Tetrachloroethane	4.66E-07	5.84E-12	6.54E-12	2.00E-01	1.17E-12	1.31E-12			
Tetrachloroethene	4.66E-07	5.84E-12	6.54E-12						
Toluene	4.66E-07	5.84E-12	6.54E-12				1.10E-01	1.16E-09	1.30E-09
1,1,1-Trichloroethane	7.69E-07	9.63E-12	1.08E-11						
Vinyl Acetate	1.64E-07	2.05E-12	2.30E-12				5.70E-02	7.87E-10	8.82E-10
Vinyl Chloride	9.33E-07	1.17E-11	1.31E-11	3.00E-01	3.50E-12	3.92E-12			
Xylenes	4.66E-07	5.84E-12	6.54E-12						
Benzoic Acid	4.54E-06	5.68E-11	6.37E-11						
Benzyl Alcohol	3.51E-06	4.40E-11	4.93E-11						
Diethyl Phthalate	2.67E-06	3.34E-11	3.74E-11						
Dimethyl Phthalate	2.67E-06	3.34E-11	3.74E-11						
Di-n-butyl Phthalate	3.48E-06	4.36E-11	4.88E-11						
Di-n-octyl Phthalate	3.48E-06	4.36E-11	4.88E-11						
bis(2-Ethylhexyl)-Phthalate	3.43E-06	4.30E-11	4.82E-11						
2-Methylphenol	3.51E-06	4.40E-11	4.93E-11						
3-Methylphenol	3.46E-06	4.34E-11	4.86E-11						
4-Methylphenol	3.51E-06	4.40E-11	4.93E-11						
Naphthalene	2.69E-06	3.37E-11	3.77E-11						
GB	4.76E-08	5.96E-13	6.68E-13				8.67E-07	1.50E-05	1.68E-05
HD/HT	4.76E-06	5.96E-11	6.68E-11	9.50E+00	5.66E-10	6.34E-10	2.90E-05	4.50E-05	5.04E-05
VX	4.76E-08	5.96E-13	6.68E-13				8.67E-07	1.50E-05	1.68E-05
Chlorine	3.25E-03	4.06E-08	4.55E-08						
Hydrogen Chloride	1.00E-01	1.26E-06	1.41E-06				5.80E-03	4.74E-03	5.31E-03
Hydrogen Fluoride	5.25E-02	6.58E-07	7.37E-07						
Nitroglycerine	0.00E+00	0.00E+00	0.00E+00						
PCB	0.00E+00	0.00E+00	0.00E+00						
Particulate	1.97E-02	2.47E-07	2.76E-07						
2,4-Dinitrotoluene	9.60E-08	1.20E-12	1.35E-12						
2,6-Dinitrotoluene	9.60E-08	1.20E-12	1.35E-12						
2,4,6-Trinitrotoluene	9.60E-08	1.20E-12	1.35E-12						
RDX	9.60E-08	1.20E-12	1.35E-12						
HMX	9.60E-08	1.20E-12	1.35E-12						
					1E-08	1E-08	Total HI=	0.005	0.006

Table A-2.4.8 Case 4. With PFS, Actual Program Factors: UMCDF CHILD RESIDENT
INDIRECT EXPOSURES

Calculation of hazard quotients, and hazard Indices

Consumption rate of soil, CR(soil)=	0.0002	kg/day
Fraction of soil impacted, F(soil)=	1	unitless
Consumption rate of abv grd veg, CR(ag)=	0.005	kg/day
Fraction of abv grd veg impacted, F(ag)=	0.25	unitless
Consumption rate of root veg, CR(bg)=	0.0014	kg/day
Fraction of root veg impacted, F(bg)=	0.25	unitless
Body weight, BW=	15	kg

I(tot) = Total daily intake of substance
Sc = Soil concentration after total time period of deposition
I(soil) = Daily intake of substance from soil
Pd + Pv = Concentration in plant
I(ag) = Daily intake of substance from above ground vegetables
Pr(bg) = Concentration in below ground plant parts due to root uptake
I(bg) = Daily intake of substance from below ground vegetables
RfD = Reference dose
HI = Hazard Index

Substances of Potential Concern	Sc (mg/kg)	I(soil) (mg/day)	Pd+Pv (mg/kg)	I(ag) (mg/day)	Pr(bg) (mg/kg)	I(bg) (mg/day)	I(tot) (mg/day)	RfD (mg/kg-day)	**Hazard Index Liver**	**Hazard Index Neuro**	**Hazard Quotient**
Antimony	3.45E-04	**6.90E-08**	1.85E-06	**2.31E-09**	2.59E-09	**9.06E-13**	7.13E-08	4.00E-04			**1E-05**
Arsenic	3.48E-04	**6.96E-08**	1.86E-06	**2.33E-09**	4.80E-11	**1.68E-14**	7.20E-08	3.00E-04			**2E-05**
Barium	4.38E-04	**8.75E-08**	2.44E-06	**3.05E-09**	6.19E-12	**2.17E-15**	9.06E-08	7.00E-02			**8E-08**
Beryllium	8.85E-05	**1.77E-08**	4.93E-07	**6.16E-10**	9.48E-13	**3.32E-16**	1.83E-08	5.00E-03			**2E-07**
bis (2-Ethylhexyl) Phthalate	5.93E-04	**1.19E-07**	1.24E-07	**1.55E-10**	3.39E-10	**1.19E-13**	1.19E-07	2.00E-02	8.49E-08		**4E-07**
Cadmium	9.67E-05	**1.93E-08**	5.39E-07	**6.74E-10**	9.67E-12	**3.38E-15**	2.00E-08	1.00E-03			**1E-06**
Chromium	1.10E-04	**2.19E-08**	6.11E-07	**7.64E-10**	1.37E-11	**4.80E-15**	2.27E-08	5.00E-03			**3E-07**
2,4-Dinitrotoluene	1.99E-05	**3.97E-09**	1.20E-10	**1.50E-13**	2.17E-08	**7.59E-12**	3.98E-09	2.00E-03		2.84E-08	**1E-07**
2,6-Dinitrotoluene	1.99E-05	**3.97E-09**	1.04E-10	**1.30E-13**	2.52E-08	**8.82E-12**	3.98E-09	1.00E-03		5.69E-08	**3E-07**
Di-n-octyl Phthalate	6.02E-04	**1.20E-07**	1.19E-07	**1.49E-10**	3.44E-10	**1.20E-13**	1.21E-07	2.00E-02	8.61E-08		**4E-07**
GB	9.85E-06	**1.97E-09**	1.15E-12	**1.44E-15**	1.43E-07	**5.01E-11**	2.02E-09	4.30E-05		6.71E-07	**3E-06**
HD/HT	9.85E-04	**1.97E-07**	8.04E-12	**1.00E-14**	4.72E-07	**1.65E-10**	1.97E-07				
Lead	2.78E-04	**5.57E-08**	1.55E-06	**1.94E-09**	NA	**NA**	5.76E-08				
Mercury	5.27E-04	**1.05E-07**	4.89E-07	**6.11E-10**	NA	**NA**	1.06E-07	1.00E-04		1.52E-05	**7E-05**
Nickel	1.71E-04	**3.42E-08**	9.54E-07	**1.19E-09**	4.18E-12	**1.46E-15**	3.54E-08	2.00E-02	2.53E-08		**1E-07**
Total PCBs	0.00E+00	**0.00E+00**	0.00E+00	**0.00E+00**	0.00E+00	**0.00E+00**	0.00E+00				
Selenium	2.85E-04	**5.69E-08**	1.52E-06	**1.91E-09**	6.62E-10	**2.32E-13**	5.89E-08	5.00E-03			**8E-07**
Silver	3.17E-04	**6.33E-08**	1.76E-06	**2.21E-09**	3.96E-08	**1.39E-11**	6.56E-08	5.00E-03			**8E-07**
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.05E-08	**2.11E-12**	4.07E-11	**5.09E-14**	4.49E-13	**1.57E-16**	2.16E-12				
Thallium	6.16E-04	**1.23E-07**	3.43E-06	**4.29E-09**	1.66E-12	**5.82E-16**	1.27E-07	8.00E-05	2.27E-05		**1E-04**
VX	9.85E-06	**1.97E-09**	8.99E-10	**1.12E-12**	6.07E-08	**2.13E-11**	1.99E-09	4.30E-05		6.62E-07	**3E-06**
Di-n-butyl Phthalate	6.02E-04	**1.20E-07**	1.24E-07	**1.55E-10**	3.39E-05	**1.18E-08**	1.32E-07	1.00E-01			**8E-08**
Diethyl Phthalate	4.61E-04	**9.23E-08**	9.63E-08	**1.20E-10**	2.88E-07	**1.01E-10**	9.25E-08	8.00E-01			**7E-09**
Manganese	1.46E-04	**2.92E-08**	8.13E-07	**1.02E-09**	3.17E-10	**1.11E-13**	3.02E-08	1.40E-01		3.08E-09	**1E-08**
4-Methylphenol	7.27E-04	**1.45E-07**	5.01E-10	**6.27E-13**	1.28E-06	**4.48E-10**	1.46E-07	5.00E-03		4.17E-07	**2E-06**
RDX	1.99E-05	**3.97E-09**	7.94E-14	**9.92E-17**	1.52E-08	**5.30E-12**	3.98E-09	3.00E-03			**8E-08**
2,4,6-Trinitrotoluene	1.99E-05	**3.97E-09**	1.86E-10	**2.32E-13**	4.01E-09	**1.40E-12**	3.97E-09	5.00E-04	1.14E-07		**5E-07**
Vanadium	1.66E-04	**3.33E-08**	9.27E-07	**1.16E-09**	8.32E-11	**2.91E-14**	3.44E-08	7.00E-03			**3E-07**
								HI=	**0.00002**	**0.00002**	0.0002

Table A-2.4.7 Case 4. With PFS, Actual Program Factors: UMCDF CHILD RESIDENT INDIRECT EXPOSURES

Calculation of cancer risks

Consumption rate of soil, CR(soil)=	0.0002	kg/day
Fraction of soil impacted, F(soil)=	1	unitless
Consumption rate of abv grd veg, CR(ag)=	0.005	kg/day
Fraction of abv grd veg impacted, F(ag)=	0.25	unitless
Consumption rate of root veg, CR(bg)=	0.0014	kg/day
Fraction of root veg impacted, F(bg)=	0.25	unitless
Exposure duration, ED=	6	yr
Exposure frequency, EF=	350	day/yr
Body weight, BW=	15	kg
Averaging time, AT=	70	yr

I(tot) = Total daily intake of substance
Sc = Soil concentration after total time period of deposition
I(soil) = Daily intake of substance from soil
Pd + Pv = Concentration in plant
I(ag) = Daily intake of substance from above ground vegetables
Pr(bg) = Concentration in below ground plant parts due to root uptake
I(bg) = Daily intake of substance from below ground vegetables
CSF = Carcinogenic slope factor

Substances of Potential Concern	Sc (mg/kg)	I(soil) (mg/day)	Pd+Pv (mg/kg)	I(ag) (mg/day)	Pr(bg) (mg/kg)	I(bg) (mg/day)	I(tot) (mg/day)	CSF (per mg/kg-day)	Cancer Risk
Antimony	3.45E-04	6.90E-08	1.85E-06	2.31E-09	2.59E-09	9.06E-13	7.13E-08		
Arsenic	3.48E-04	6.96E-08	1.86E-06	2.33E-09	4.80E-11	1.68E-14	7.20E-08	1.50E+00	5.91E-10
Barium	4.38E-04	8.75E-08	2.44E-06	3.05E-09	6.19E-12	2.17E-15	9.06E-08		
Beryllium	8.85E-05	1.77E-08	4.93E-07	6.16E-10	9.48E-13	3.32E-16	1.83E-08	4.30E+00	4.31E-10
bis (2-Ethylhexyl) Phthalate	5.93E-04	1.19E-07	1.24E-07	1.55E-10	3.39E-10	1.19E-13	1.19E-07	1.40E-02	9.12E-12
Cadmium	9.67E-05	1.93E-08	5.39E-07	6.74E-10	9.67E-12	3.38E-15	2.00E-08		
Chromium	1.10E-04	2.19E-08	6.11E-07	7.64E-10	1.37E-11	4.80E-15	2.27E-08		
2,4-Dinitrotoluene	1.99E-05	3.97E-09	1.20E-10	1.50E-13	2.17E-08	7.59E-12	3.98E-09	6.80E-01	1.48E-11
2,6-Dinitrotoluene	1.99E-05	3.97E-09	1.04E-10	1.30E-13	2.52E-08	8.82E-12	3.98E-09	6.80E-01	1.48E-11
Di-n-octyl Phthalate	6.02E-04	1.20E-07	1.19E-07	1.49E-10	3.44E-10	1.20E-13	1.21E-07		
GB	9.85E-06	1.97E-09	1.15E-12	1.44E-15	1.43E-07	5.01E-11	2.02E-09		
HD/HT	9.85E-04	1.97E-07	8.04E-12	1.00E-14	4.72E-07	1.65E-10	1.97E-07	9.50E+00	1.03E-08
Lead	2.78E-04	5.57E-08	1.55E-06	1.94E-09	NA	NA	5.76E-08		
Mercury	5.27E-04	1.05E-07	4.89E-07	6.11E-10	NA	NA	1.06E-07		
Nickel	1.71E-04	3.42E-08	9.54E-07	1.19E-09	4.18E-12	1.46E-15	3.54E-08		
Total PCBs	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.70E+00	0.00E+00
Selenium	2.85E-04	5.69E-08	1.52E-06	1.91E-09	6.62E-10	2.32E-13	5.89E-08		
Silver	3.17E-04	6.33E-08	1.76E-06	2.21E-09	3.96E-08	1.39E-11	6.56E-08		
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.05E-08	2.11E-12	4.07E-11	5.09E-14	4.49E-13	1.57E-16	2.16E-12	1.50E+05	1.78E-09
Thallium	6.16E-04	1.23E-07	3.43E-06	4.29E-09	1.66E-12	5.82E-16	1.27E-07		
VX	9.85E-06	1.97E-09	8.99E-10	1.12E-12	6.07E-08	2.13E-11	1.99E-09		
Di-n-butyl Phthalate	6.02E-04	1.20E-07	1.24E-07	1.55E-10	3.39E-05	1.18E-08	1.32E-07		
Diethyl Phthalate	4.61E-04	9.23E-08	9.63E-08	1.20E-10	2.88E-07	1.01E-10	9.25E-08		
Manganese	1.46E-04	2.92E-08	8.13E-07	1.02E-09	3.17E-10	1.11E-13	3.02E-08		
4-Methylphenol	7.27E-04	1.45E-07	5.01E-10	6.27E-13	1.28E-06	4.48E-10	1.46E-07		
RDX	1.99E-05	3.97E-09	7.94E-14	9.92E-17	1.52E-08	5.30E-12	3.98E-09	1.10E-01	2.40E-12
2,4,6-Trinitrotoluene	1.99E-05	3.97E-09	1.86E-10	2.32E-13	4.01E-09	1.40E-12	3.97E-09	3.00E-02	6.53E-13
Vanadium	1.66E-04	3.33E-08	9.27E-07	1.16E-09	8.32E-11	2.91E-14	3.44E-08		

Total cancer risk= 1E-08

Table A-2.4.6 Case 4. With PFS, Actual Program Factors: UMCDF ADULT RESIDENT
INDIRECT EXPOSURES

Calculation of hazard quotients, and hazard indices

Consumption rate of soil, CR(soil)=	0.0001	kg/day
Fraction of soil impacted, F(soil)=	1	unitless
Consumption rate of abv grd veg, CR(ag)=	0.024	kg/day
Fraction of abv grd veg impacted, F(ag)=	0.25	unitless
Consumption rate of root veg, CR(bg)=	0.0063	kg/day
Fraction of root veg impacted, F(bg)=	0.25	unitless
Body weight, BW=	70	kg

I(tot) = Total daily intake of substance
Sc = Soil concentration after total time period of deposition
I(soil) = Daily intake of substance from soil
Pd + Pv = Concentration in plant
I(ag) = Daily intake of substance from above ground vegetables
Pr(bg) = Concentration in below ground plant parts due to root uptake
I(bg) = Daily intake of substance from below ground vegetables
RfD = Reference dose
HI = Hazard Index

Substances of Potential Concern	Sc (mg/kg)	I(soil) (mg/day)	Pd+Pv (mg/kg)	I(ag) (mg/day)	Pr(bg) (mg/kg)	I(bg) (mg/day)	I(tot) (mg/day)	RfD (mg/kg-day)	Hazard Index Liver	Hazard Index Neuro	Hazard Quotient
Antimony	3.45E-04	3.45E-08	1 85E-06	1.11E-08	2.59E-09	4.08E-12	4.56E-08	4.00E-04			2E-06
Arsenic	3.48E-04	3.48E-08	1 86E-06	1.12E-08	4.80E-11	7.56E-14	4.60E-08	3.00E-04			2E-06
Barium	4.38E-04	4.38E-08	2.44E-06	1.46E-08	6.19E-12	9.75E-15	5.84E-08	7.00E-02			1E-08
Beryllium	8.85E-05	8.85E-09	4.93E-07	2.96E-09	9.48E-13	1.49E-15	1.18E-08	5.00E-03			3E-08
bis (2-Ethylhexyl) Phthalate	5.93E-04	5.93E-08	1.24E-07	7.44E-10	3.39E-10	5.34E-13	6.01E-08	2.00E-02	4.29E-08		4E-08
Cadmium	9.67E-05	9.67E-09	5 39E-07	3.23E-09	9.67E-12	1.52E-14	1.29E-08	1.00E-03			2E-07
Chromium	1 10E-04	1.10E-08	6.11E-07	3.67E-09	1.37E-11	2.16E-14	1.46E-08	5.00E-03			4E-08
2,4-Dinitrotoluene	1.99E-05	1.99E-09	1.20E-10	7.20E-13	2 17E-08	3.42E-11	2.02E-09	2.00E-03		1.44E-08	1E-08
2,6-Dinitrotoluene	1.99E-05	1.99E-09	1.04E-10	6.24E-13	2.52E-08	3.97E-11	2.03E-09	1.00E-03		2.90E-08	3E-08
Di-n-octyl Phthalate	6.02E-04	6.02E-08	1.19E-07	7.16E-10	3.44E-10	5.42E-13	6.09E-08	2.00E-02	4.35E-08		4E-08
GB	9.85E-06	9.85E-10	1.15E-12	6.91E-15	1.43E-07	2.25E-10	1.21E-09	4.30E-05		4.02E-07	4E-07
HD/HT	9.85E-04	9.85E-08	8.04E-12	4.82E-14	4.72E-07	7.44E-10	9.93E-08				
Lead	2.78E-04	2.78E-08	1.55E-06	9.30E-09	NA	NA	3.71E-08				
Mercury	5.27E-04	5.27E-08	4.89E-07	2.93E-09	NA	NA	5.57E-08	1.00E-04		7.95E-06	8E-06
Nickel	1.71E-04	1.71E-08	9.54E-07	5.72E-09	4.18E-12	6.58E-15	2.28E-08	2.00E-02	1.63E-08		2E-08
Total PCBs	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Selenium	2.85E-04	2.85E-08	1.52E-06	9.15E-09	6.62E-10	1.04E-12	3.76E-08	5.00E-03			1E-07
Silver	3.17E-04	3.17E-08	1.76E-06	1.06E-08	3.96E-08	6.24E-11	4.23E-08	5.00E-03			1E-07
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.05E-08	1.05E-12	4.07E-11	2.44E-13	4.49E-13	7.08E-16	1.30E-12				
Thallium	6.16E-04	6.16E-08	3.43E-06	2.06E-08	1.66E-12	2.62E-15	8.21E-08	8.00E-05	1.47E-05		1E-05
VX	9.85E-06	9.85E-10	8.99E-10	5.39E-12	6.07E-08	9.57E-11	1.09E-09	4.30E-05		3.61E-07	3E-07
Di-n-butyl Phthalate	6.02E-04	6.02E-08	1.24E-07	7.45E-10	3.39E-05	5.33E-08	1.14E-07	1.00E-01			2E-08
Diethyl Phthalate	4.61E-04	4.61E-08	9.63E-08	5.78E-10	2.88E-07	4.53E-10	4.72E-08	8.00E-01			8E-10
Manganese	1.46E-04	1.46E-08	8.13E-07	4.88E-09	3.17E-10	5.00E-13	1.95E-08	1.40E-01		1.99E-09	2E-09
4-Methylphenol	7.27E-04	7.27E-08	5.01E-10	3.01E-12	1.28E-06	2.01E-09	7.47E-08	5.00E-03		2.13E-07	2E-07
RDX	1.99E-05	1.99E-09	7.94E-14	4.76E-16	1.52E-08	2.39E-11	2.01E-09	3.00E-03			9E-09
2,4,6-Trinitrotoluene	1.99E-05	1.99E-09	1.86E-10	1.11E-12	4.01E-09	6.31E-12	1.99E-09	5.00E-04	5.70E-08		5E-08
Vanadium	1.66E-04	1.66E-08	9.27E-07	5.56E-09	8.32E-11	1.31E-13	2.22E-08	7.00E-03			4E-08
								HI=	0.00001	0.00001	0.00003

Table A-2.4.5 Case 4. With PFS, Actual Program Factors: UMCDF ADULT RESIDENT
INDIRECT EXPOSURES

Calculation of cancer risks

Consumption rate of soil, CR(soil)=	0.0001	kg/day
Fraction of soil impacted, F(soil)=	1	unitless
Consumption rate of abv grd veg, CR(ag)=	0.024	kg/day
Fraction of abv grd veg impacted, F(ag)=	0.25	unitless
Consumption rate of root veg, CR(bg)=	0.0063	kg/day
Fraction of root veg impacted, F(bg)=	0.25	unitless
Exposure duration, ED=	30	yr
Exposure frequency, EF=	350	day/yr
Body weight, BW=	70	kg
Averaging time, AT=	70	yr

I(tot) = Total daily intake of substance
Sc = Soil concentration after total time period of deposition
I(soil) = Daily intake of substance from soil
Pd + Pv = Concentration in plant
I(ag) = Daily intake of substance from above ground vegetables
Pr(bg) = Concentration in below ground plant parts due to root uptake
I(bg) = Daily intake of substance from below ground vegetables
CSF = Carcinogenic slope factor

Substances of Potential Concern	Sc (mg/kg)	I(soil) (mg/day)	Pd+Pv (mg/kg)	I(ag) (mg/day)	Pr(bg) (mg/kg)	I(bg) (mg/day)	I(tot) (mg/day)	CSF (per mg/kg-day)	Cancer Risk
Antimony	3.45E-04	3.45E-08	1.85E-06	1.11E-08	2.59E-09	4.08E-12	4.56E-08		
Arsenic	3.48E-04	3.48E-08	1.86E-06	1.12E-08	4.80E-11	7.56E-14	4.60E-08	1.50E+00	**4.05E-10**
Barium	4.38E-04	4.38E-08	2.44E-06	1.46E-08	6.19E-12	9.75E-15	5.84E-08		
Beryllium	8.85E-05	8.85E-09	4.93E-07	2.96E-09	9.48E-13	1.49E-15	1.18E-08	4.30E+00	**2.98E-10**
bis (2-Ethylhexyl) Phthalate	5.93E-04	5.93E-08	1.24E-07	7.44E-10	3.39E-10	5.34E-13	6.01E-08	1.40E-02	**4.94E-12**
Cadmium	9.67E-05	9.67E-09	5.39E-07	3.23E-09	9.67E-12	1.52E-14	1.29E-08		
Chromium	1.10E-04	1.10E-08	6.11E-07	3.67E-09	1.37E-11	2.16E-14	1.46E-08		
2,4-Dinitrotoluene	1.99E-05	1.99E-09	1.20E-10	7.20E-13	2.17E-08	3.42E-11	2.02E-09	6.80E-01	**8.07E-12**
2,6-Dinitrotoluene	1.99E-05	1.99E-09	1.04E-10	6.24E-13	2.52E-08	3.97E-11	2.03E-09	6.80E-01	**8.09E-12**
Di-n-octyl Phthalate	6.02E-04	6.02E-08	1.19E-07	7.16E-10	3.44E-10	5.42E-13	6.09E-08		
GB	9.85E-06	9.85E-10	1.15E-12	6.91E-15	1.43E-07	2.25E-10	1.21E-09		
HD/HT	9.85E-04	9.85E-08	8.04E-12	4.82E-14	4.72E-07	7.44E-10	9.93E-08	9.50E+00	**5.54E-09**
Lead	2.78E-04	2.78E-08	1.55E-06	9.30E-09	NA	NA	3.71E-08		
Mercury	5.27E-04	5.27E-08	4.89E-07	2.93E-09	NA	NA	5.57E-08		
Nickel	1.71E-04	1.71E-08	9.54E-07	5.72E-09	4.18E-12	6.58E-15	2.28E-08		
Total PCBs	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.70E+00	**0.00E+00**
Selenium	2.85E-04	2.85E-08	1.52E-06	9.15E-09	6.62E-10	1.04E-12	3.76E-08		
Silver	3.17E-04	3.17E-08	1.76E-06	1.06E-08	3.96E-08	6.24E-11	4.23E-08		
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.05E-08	1.05E-12	4.07E-11	2.44E-13	4.49E-13	7.08E-16	1.30E-12	1.50E+05	**1.14E-09**
Thallium	6.16E-04	6.16E-08	3.43E-06	2.06E-08	1.66E-12	2.62E-15	8.21E-08		
VX	9.85E-06	9.85E-10	8.99E-10	5.39E-12	6.07E-08	9.57E-11	1.09E-09		
Di-n-butyl Phthalate	6.02E-04	6.02E-08	1.24E-07	7.45E-10	3.39E-05	5.33E-08	1.14E-07		
Diethyl Phthalate	4.61E-04	4.61E-08	9.63E-08	5.78E-10	2.88E-07	4.53E-10	4.72E-08		
Manganese	1.46E-04	1.46E-08	8.13E-07	4.88E-09	3.17E-10	5.00E-13	1.95E-08		
4-Methylphenol	7.27E-04	7.27E-08	5.01E-10	3.01E-12	1.28E-06	2.01E-09	7.47E-08		
RDX	1.99E-05	1.99E-09	7.94E-14	4.76E-16	1.52E-08	2.39E-11	2.01E-09	1.10E-01	**1.30E-12**
2,4,6-Trinitrotoluene	1.99E-05	1.99E-09	1.86E-10	1.11E-12	4.01E-09	6.31E-12	1.99E-09	3.00E-02	**3.51E-13**
Vanadium	1.66E-04	1.66E-08	9.27E-07	5.56E-09	8.32E-11	1.31E-13	2.22E-08		

Total cancer risk= 7E-09

Table A-2.4.4 Case 4. With PFS, Actual Program Factors: UMCDF RESIDENT

CONSUMPTION OF ROOT VEGETABLES:

USING TIME-AVERAGED SOIL CONCENTRATIONS **Calculation of soil concentration due to deposition**
Calculation of root vegetable concentration due to root uptake

Soil mixing depth, Z=	20	cm
Soil bulk density, BD=	1.5	g/cm3
Total deposition time period, Tc=	3.2	yrs
Below ground veg. correction factor, VGbg=	0.01	unitless
Dry deposition velocity of vapor phase, Vdv=	3	cm/s

Pr(bg) = Root vegetable concentration due to root uptake
Sc = Soil concentration after total time period of deposition
Ds = Deposition term
Kds = Soil-water partition coefficient
RCF = Ratio of concentration in roots to concentration in soil pore water
Vwd = Yearly wet deposition from vapor phase

Substances of Potential Concern	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Vwd (g/m2-yr)	Vc (µg/m3)	Ds (1/yr)	Sc (mg/kg)	Kds mL/g	RCF (mg/kg)/(ug/mL)	Pr(bg) (mg/kg)
Antimony	1.47E-06	1.49E-07	0.00E+00	0.00E+00	5.39E-06	1.73E-05	2	3.00E-02	**2.59E-09**
Arsenic	1.48E-06	1.50E-07	0.00E+00	0.00E+00	5.44E-06	1.74E-05	29	8.00E-03	**4.80E-11**
Barium	1.86E-06	1.87E-07	0.00E+00	0.00E+00	6.84E-06	2.19E-05	530	1.50E-02	**6.19E-12**
Beryllium	3.77E-07	3.74E-08	0.00E+00	0.00E+00	1.38E-06	4.42E-06	70	1.50E-03	**9.48E-13**
bis (2-Ethylhexyl) Phthalate	8.56E-08	8.89E-09	6.61E-08	2.77E-06	9.27E-06	2.97E-05	280000	3.20E+02	**3.39E-10**
Cadmium	4.12E-07	4.09E-08	0.00E+00	0.00E+00	1.51E-06	4.83E-06	160	3.20E-02	**9.67E-12**
Chromium	4.67E-07	4.68E-08	0.00E+00	0.00E+00	1.71E-06	5.48E-06	18	4.50E-03	**1.37E-11**
2,4-Dinitrotoluene	0.00E+00	0.00E+00	2.27E-09	9.60E-08	3.10E-07	9.93E-07	0.87	1.90E+00	**2.17E-08**
2,6-Dinitrotoluene	0.00E+00	0.00E+00	2.27E-09	9.60E-08	3.10E-07	9.93E-07	0.67	1.70E+00	**2.52E-08**
Di-n-octyl Phthalate	8.69E-08	9.02E-09	6.70E-08	2.81E-06	9.40E-06	3.01E-05	280000	3.20E+02	**3.44E-10**
GB	5.22E-16	5.38E-17	1.13E-09	4.76E-08	1.54E-07	4.93E-07	0.032	9.30E-01	**1.43E-07**
HD/HT	1.35E-12	1.39E-13	1.13E-07	4.76E-06	1.54E-05	4.93E-05	1.2	1.16E+00	**4.72E-07**
Lead	1.18E-06	1.21E-07	0.00E+00	0.00E+00	4.35E-06	1.39E-05	600	NA	**NA**
Mercury	0.00E+00	0.00E+00	6.05E-08	2.55E-06	8.24E-06	2.64E-05	57000	NA	**NA**
Nickel	7.29E-07	7.36E-08	0.00E+00	0.00E+00	2.68E-06	8.56E-06	82	4.00E-03	**4.18E-12**
Total PCBs	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4300	2.10E+03	**0.00E+00**
Selenium	1.21E-06	1.24E-07	0.00E+00	0.00E+00	4.45E-06	1.42E-05	4.3	2.00E-02	**6.62E-10**
Silver	1.35E-06	1.37E-07	0.00E+00	0.00E+00	4.95E-06	1.58E-05	0.4	1.00E-01	**3.96E-08**
2,3,7,8-TCDD & Dioxin-Like SOPCs	9.87E-12	1.01E-12	9.47E-13	3.97E-11	1.65E-10	5.27E-10	142000	1.21E+04	**4.49E-13**
Thallium	2.63E-06	2.58E-07	1.59E-16	6.73E-15	9.62E-06	3.08E-05	74	4.00E-04	**1.66E-12**
VX	1.64E-12	1.69E-13	1.13E-09	4.76E-08	1.54E-07	4.92E-07	0.15	1.85E+00	**6.07E-08**
Di-n-butyl Phthalate	8.69E-08	9.02E-09	6.70E-08	2.81E-06	9.40E-06	3.01E-05	1.6	1.80E+02	**3.39E-05**
Diethyl Phthalate	6.74E-08	6.90E-09	5.13E-08	2.15E-06	7.21E-06	2.31E-05	5.3	6.56E+00	**2.88E-07**
Manganese	6.21E-07	6.38E-08	0.00E+00	0.00E+00	2.28E-06	7.30E-06	23	1.00E-01	**3.17E-10**
4-Methylphenol	7.58E-13	7.86E-14	8.38E-08	3.51E-06	1.14E-05	3.63E-05	0.50	1.76E+00	**1.28E-06**
RDX	0.00E+00	0.00E+00	2.27E-09	9.60E-08	3.10E-07	9.93E-07	0.63	9.61E-01	**1.52E-08**
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	2.27E-09	9.60E-08	3.10E-07	9.93E-07	11	4.44E+00	**4.01E-09**
Vanadium	7.09E-07	7.05E-08	0.00E+00	0.00E+00	2.60E-06	8.32E-06	100	1.00E-01	**8.32E-11**

Table A-2.4.3 Case 4. With PFS, Actual Program Factors: UMCDF RESIDENT

CONSUMPTION OF ABOVE-GROUND VEGETABLES:

Calculation of above-ground vegetable concentration due to direct deposition
Calculation of above-ground vegetable concentration due to air-to-plant transfer

Interception fraction of edible portion, Rp=	0.04	unitless
Plant surface loss coefficient, kp=	18	1/yr
Time between rainfalls, t-rain=	14	days
Length of plant exposure per harvest, Tp=	0.16	yrs
Standing crop biomass, Yp=	1.7	kg DW/m2
Density of air, p=	1200	g/m3
Above ground veg. correction factor, VGab=	0.01	unitless

Pd = Concentration in plant due to direct deposition
Pv = Concentration in plant due to air-to-plant transfer
Pd + Pv = Concentration in plant due to direct deposition and air-to-plant transfer
Fw = Fraction of wet deposition of particles that adheres to plant
Bv = Air-to-plant bioconcentration factor

Substances of Potential Concern	Pdd (g/m2-yr)	Pwd (g/m2-yr)	Fw	**Pd (mg/kg)**	Vc (ug/m3)	Bv (mg/kg)/(ug/g)	**Pv (mg/kg)**	**Pd+Pv (mg/kg)**
Antimony	1.47E-06	1.49E-07	0.2	**1.85E-06**	0.00E+00	NA	**0.00E+00**	1.85E-06
Arsenic	1.48E-06	1.50E-07	0.2	**1.86E-06**	0.00E+00	NA	**0.00E+00**	1.86E-06
Barium	1.86E-06	1.87E-07	0.6	**2.44E-06**	0.00E+00	NA	**0.00E+00**	2.44E-06
Beryllium	3.77E-07	3.74E-08	0.6	**4.93E-07**	0.00E+00	NA	**0.00E+00**	4.93E-07
bis (2-Ethylhexyl) Phthalate	8.56E-08	8.89E-09	0.6	**1.12E-07**	2.77E-06	5.11E+02	**1.18E-08**	1.24E-07
Cadmium	4.12E-07	4.09E-08	0.6	**5.39E-07**	0.00E+00	NA	**0.00E+00**	5.39E-07
Chromium	4.67E-07	4.68E-08	0.6	**6.11E-07**	0.00E+00	NA	**0.00E+00**	6.11E-07
2,4-Dinitrotoluene	0.00E+00	0.00E+00	0.6	**0.00E+00**	9.60E-08	1.50E+02	**1.20E-10**	1.20E-10
2,6-Dinitrotoluene	0.00E+00	0.00E+00	0.6	**0.00E+00**	9.60E-08	1.30E+02	**1.04E-10**	1.04E-10
Di-n-octyl Phthalate	8.69E-08	9.02E-09	0.6	**1.14E-07**	2.81E-06	2.32E+02	**5.43E-09**	1.19E-07
GB	5.22E-16	5.38E-17	0.6	**6.84E-16**	4.76E-08	2.90E+00	**1.15E-12**	1.15E-12
HD/HT	1.35E-12	1.39E-13	0.6	**1.77E-12**	4.76E-06	1.58E-01	**6.27E-12**	8.04E-12
Lead	1.18E-06	1.21E-07	0.6	**1.55E-06**	0.00E+00	NA	**0.00E+00**	1.55E-06
Mercury	0.00E+00	0.00E+00	0.6	**0.00E+00**	2.55E-06	2.30E+04	**4.89E-07**	4.89E-07
Nickel	7.29E-07	7.36E-08	0.6	**9.54E-07**	0.00E+00	NA	**0.00E+00**	9.54E-07
Total PCBs	0.00E+00	0.00E+00	0.6	**0.00E+00**	0.00E+00	1.72E+03	**0.00E+00**	0.00E+00
Selenium	1.21E-06	1.24E-07	0.2	**1.52E-06**	0.00E+00	NA	**0.00E+00**	1.52E-06
Silver	1.35E-06	1.37E-07	0.6	**1.76E-06**	0.00E+00	NA	**0.00E+00**	1.76E-06
2,3,7,8-TCDD & Dioxin-Like SOPCs	9.87E-12	1.01E-12	0.60	**1.29E-11**	3.97E-11	8.39E+04	**2.78E-11**	4.07E-11
Thallium	2.63E-06	2.58E-07	0.6	**3.43E-06**	6.73E-15	NA	**0.00E+00**	3.43E-06
VX	1.64E-12	1.69E-13	0.6	**2.15E-12**	4.76E-08	2.26E+03	**8.96E-10**	8.99E-10
Di-n-butyl Phthalate	8.69E-08	9.02E-09	0.6	**1.14E-07**	2.81E-06	4.40E+02	**1.03E-08**	1.24E-07
Diethyl Phthalate	6.74E-08	6.90E-09	0.6	**8.83E-08**	2.15E-06	4.48E+02	**8.04E-09**	9.63E-08
Manganese	6.21E-07	6.38E-08	0.6	**8.13E-07**	0.00E+00	NA	**0.00E+00**	8.13E-07
4-Methylphenol	7.58E-13	7.86E-14	0.6	**9.93E-13**	3.51E-06	1.71E+01	**5.00E-10**	5.01E-10
RDX	0.00E+00	0.00E+00	0.6	**0.00E+00**	9.60E-08	9.92E-02	**7.94E-14**	7.94E-14
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	0.6	**0.00E+00**	9.60E-08	2.32E+02	**1.86E-10**	1.86E-10
Vanadium	7.09E-07	7.05E-08	0.6	**9.27E-07**	0.00E+00	NA	**0.00E+00**	9.27E-07

Table A-2.4.2 Case 4. With PFS, Actual Program Factors: UMCDF RESIDENT

SOIL INGESTION:

Calculation of soil concentration due to deposition

Soil mixing depth, Z=	1 cm
Soil bulk density, BD=	1.5 g/cm3
Total deposition time period, Tc=	3.2 yrs
Dry deposition velocity of vapor phase, Vdv=	3 cm/s

Sc = Soil concentration after total time period of deposition
Ds = Deposition term
Pdd = Yearly dry deposition from particle phase
Pwd = Yearly wet deposition from particle phase
Vwd = Yearly wet deposition from vapor phase
Vc = Vapor phase air concentration

Substances of Potential Concern	Pdd (g/m2)/yr	Pwd (g/m2)/yr	Vwd (g/m2)/yr	Vc (ug/m3)	Ds (1/yr)	Sc (mg/kg)
Antimony	1.47E-06	1.49E-07	0.00E+00	0.00E+00	**1.08E-04**	**3.45E-04**
Arsenic	1.48E-06	1.50E-07	0.00E+00	0.00E+00	**1.09E-04**	**3.48E-04**
Barium	1.86E-06	1.87E-07	0.00E+00	0.00E+00	**1.37E-04**	**4.38E-04**
Beryllium	3.77E-07	3.74E-08	0.00E+00	0.00E+00	**2.76E-05**	**8.85E-05**
bis (2-Ethylhexyl) Phthalate	8.56E-08	8.89E-09	6.61E-08	2.77E-06	**1.85E-04**	**5.93E-04**
Cadmium	4.12E-07	4.09E-08	0.00E+00	0.00E+00	**3.02E-05**	**9.67E-05**
Chromium	4.67E-07	4.68E-08	0.00E+00	0.00E+00	**3.43E-05**	**1.10E-04**
2,4-Dinitrotoluene	0.00E+00	0.00E+00	2.27E-09	9.60E-08	**6.21E-06**	**1.99E-05**
2,6-Dinitrotoluene	0.00E+00	0.00E+00	2.27E-09	9.60E-08	**6.21E-06**	**1.99E-05**
Di-n-octyl Phthalate	8.69E-08	9.02E-09	6.70E-08	2.81E-06	**1.88E-04**	**6.02E-04**
GB	5.22E-16	5.38E-17	1.13E-09	4.76E-08	**3.08E-06**	**9.85E-06**
HD/HT	1.35E-12	1.39E-13	1.13E-07	4.76E-06	**3.08E-04**	**9.85E-04**
Lead	1.18E-06	1.21E-07	0.00E+00	0.00E+00	**8.70E-05**	**2.78E-04**
Mercury	0.00E+00	0.00E+00	6.05E-08	2.55E-06	**1.65E-04**	**5.27E-04**
Nickel	7.29E-07	7.36E-08	0.00E+00	0.00E+00	**5.35E-05**	**1.71E-04**
Total PCBs	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**0.00E+00**	**0.00E+00**
Selenium	1.21E-06	1.24E-07	0.00E+00	0.00E+00	**8.90E-05**	**2.85E-04**
Silver	1.35E-06	1.37E-07	0.00E+00	0.00E+00	**9.90E-05**	**3.17E-04**
2,3,7,8-TCDD & Dioxin-Like SOPCs	9.87E-12	1.01E-12	9.47E-13	3.97E-11	**3.29E-09**	**1.05E-08**
Thallium	2.63E-06	2.58E-07	1.59E-16	6.73E-15	**1.92E-04**	**6.16E-04**
VX	1.64E-12	1.69E-13	1.13E-09	4.76E-08	**3.08E-06**	**9.85E-06**
Di-n-butyl Phthalate	8.69E-08	9.02E-09	6.70E-08	2.81E-06	**1.88E-04**	**6.02E-04**
Diethyl Phthalate	6.74E-08	6.90E-09	5.13E-08	2.15E-06	**1.44E-04**	**4.61E-04**
Manganese	6.21E-07	6.38E-08	0.00E+00	0.00E+00	**4.56E-05**	**1.46E-04**
4-Methylphenol	7.58E-13	7.86E-14	8.38E-08	3.51E-06	**2.27E-04**	**7.27E-04**
RDX	0.00E+00	0.00E+00	2.27E-09	9.60E-08	**6.21E-06**	**1.99E-05**
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	2.27E-09	9.60E-08	**6.21E-06**	**1.99E-05**
Vanadium	7.09E-07	7.05E-08	0.00E+00	0.00E+00	**5.20E-05**	**1.66E-04**

Table A-2.4.1 Case 4. With PFS, Actual Program Factors: UMCDF RESIDENT

CONCENTRATIONS AND DEPOSITIONS: Calculated depositions and concentrations for indirect exposure pathways

Substances of Potential Concern	Particulate Dry Deposition Pdd (g/m2)/yr	Particulate Wet Deposition Pwd (g/m2)/yr	Vapor Wet Deposition Vwd (g/m2)/yr	Vapor Concentration Vc (ug/m3)	Toxicity Equivalency Factor	2,3,7,8-TCDD Toxicity Equivalents Particulate, Conc. (ug/m3)	2,3,7,8-TCDD Toxicity Equivalents Dry Deposition (g/m2)	2,3,7,8-TCDD Toxicity Equivalents Wet Deposition (g/m2)	2,3,7,8-TCDD Toxicity Equivalents Vapor Conc. (ug/m3)
Tetra CDD	9.24E-13	9.50E-14	2.16E-13	9.05E-12	1.000	9.24E-13	9.50E-14	2.16E-13	9.05E-12
Penta CDD	7.60E-12	7.81E-13	5.10E-13	2.14E-11	0.500	3.80E-12	3.91E-13	2.55E-13	1.07E-11
Hexa CDD	9.55E-12	9.82E-13	1.37E-13	5.76E-12	0.100	9.55E-13	9.82E-14	1.37E-14	5.76E-13
Hepta CDD	1.01E-11	1.03E-12	3.92E-14	1.65E-12	0.010	1.01E-13	1.03E-14	3.92E-16	1.65E-14
Octa CDD	2.05E-11	2.11E-12	7.85E-16	3.29E-14	0.001	2.05E-14	2.11E-15	7.85E-19	3.29E-17
Tetra CDF	5.95E-13	6.12E-14	2.79E-13	1.17E-11	0.100	5.95E-14	6.12E-15	2.79E-14	1.17E-12
Penta CDF	5.95E-12	6.12E-13	8.24E-13	3.46E-11	0.500	2.98E-12	3.06E-13	4.12E-13	1.73E-11
Hexa CDF	9.14E-12	9.40E-13	2.16E-13	9.05E-12	0.100	9.14E-13	9.40E-14	2.16E-14	9.05E-13
Hepta CDF	9.86E-12	1.01E-12	7.85E-14	3.29E-12	0.010	9.86E-14	1.01E-14	7.85E-16	3.29E-14
Octa CDF	2.05E-11	2.11E-12	7.85E-15	3.29E-13	0.001	2.05E-14	2.11E-15	7.85E-18	3.29E-16
					Total =	9.87E-12	1.01E-12	9.47E-13	3.97E-11
Antimony	1.47E-06	1.49E-07	0.00E+00	0.00E+00					
Arsenic	1.48E-06	1.50E-07	0.00E+00	0.00E+00					
Barium	1.86E-06	1.87E-07	0.00E+00	0.00E+00					
Beryllium	3.77E-07	3.74E-08	0.00E+00	0.00E+00					
bis (2-Ethylhexyl) Phthalate	8.56E-08	8.89E-09	6.61E-08	2.77E-06					
Cadmium	4.12E-07	4.09E-08	0.00E+00	0.00E+00					
Chromium	4.67E-07	4.68E-08	0.00E+00	0.00E+00					
2,4-Dinitrotoluene	0.00E+00	0.00E+00	2.27E-09	9.60E-08					
2,6-Dinitrotoluene	0.00E+00	0.00E+00	2.27E-09	9.60E-08					
Di-n-octyl Phthalate	8.69E-08	9.02E-09	6.70E-08	2.81E-06					
GB	5.22E-16	5.38E-17	1.13E-09	4.76E-08					
HD/HT	1.35E-12	1.39E-13	1.13E-07	4.76E-06					
Lead	1.18E-06	1.21E-07	0.00E+00	0.00E+00					
Mercury	0.00E+00	0.00E+00	6.05E-08	2.55E-06					
Nickel	7.29E-07	7.36E-08	0.00E+00	0.00E+00					
Total PCBs	0.00E+00	0.00E+00	0.00E+00	0.00E+00					
Selenium	1.21E-06	1.24E-07	0.00E+00	0.00E+00					
Silver	1.35E-06	1.37E-07	0.00E+00	0.00E+00					
2,3,7,8-TCDD & Dioxin-Like SOPCs	9.87E-12	1.01E-12	9.47E-13	3.97E-11					
Thallium	2.63E-06	2.58E-07	1.59E-16	6.73E-15					
VX	1.64E-12	1.69E-13	1.13E-09	4.76E-08					
Di-n-butyl Phthalate	8.69E-08	9.02E-09	6.70E-08	2.81E-06					
Diethyl Phthalate	6.74E-08	6.90E-09	5.13E-08	2.15E-06					
Manganese	6.21E-07	6.38E-08	0.00E+00	0.00E+00					
4-Methylphenol	7.58E-13	7.86E-14	8.38E-08	3.51E-06					
RDX	0.00E+00	0.00E+00	2.27E-09	9.60E-08					
2,4,6-Trinitrotoluene	0.00E+00	0.00E+00	2.27E-09	9.60E-08					
Vanadium	7.09E-07	7.05E-08	0.00E+00	0.00E+00					

CDD = Chlorinated dibenzo-p-dioxin.
CDF = Chlorinated dibenzo-p-furan

Table A-2.3.29 Case 3. With PFS, HHRA Protocol: UMATILLA RIVER SUBSISTENCE FISHER

	Risk UMCDF	HI-Liver UMCDF	HI-Neuro UMCDF	HQ		Risk-Inh. UMCDF	HI-Inh. UMCDF
Indirect					**Inhalation**		
Antimony				7.88E-07	Tetra CDD	2.56E-11	
Arsenic	3.87E-09			2.00E-05	Penta CDD	6.42E-11	
Barium				2.15E-08	Hexa CDD	1.29E-11	
Beryllium	1.64E-09			1.78E-07	Hepta CDD	1.29E-12	
bis (2-Ethylhexyl) Phthalate	2.03E-11	1.76E-07		1.69E-07	Octa CDD	2.58E-13	
Cadmium				3.35E-06	Tetra CDF	2.55E-12	
Chromium				4.35E-07	Penta CDF	6.41E-11	
2,4-Dinitrotoluene	1.44E-11		2.58E-08	2.48E-08	Hexa CDF	1.29E-11	
2,6-Dinitrotoluene	1.38E-11		4.93E-08	4.73E-08	Hepta CDF	1.29E-12	
Di-n-octyl Phthalate		1.81E-07		1.74E-07	Octa CDF	2.58E-13	
GB			3.11E-07	2.98E-07	2,3,7,8-TCDD TEQ	2.40E-10	
HD/HT	9.53E-09				Antimony		
Lead					Arsenic	4.64E-09	
Mercury			2.64E-02	2.53E-02	Barium		2.05E-06
Nickel				3.52E-07	Beryllium	2.49E-10	
Total PCBs					Boron		4.74E-07
Selenium				1.46E-07	Cadmium	2.08E-10	
Silver				4.77E-08	Chromium	1.40E-09	
2,3,7,8-TCDD & Others	2.84E-07				Cobalt		
Thallium		3.79E-04		3.64E-04	Copper		
VX			1.12E-06	1.07E-06	Lead		
Di-n-butyl Phthalate				2.41E-05	Manganese		5.44E-05
Diethyl Phthalate				4.00E-08	Mercury		7.82E-06
Manganese			7.11E-08	6.81E-08	Nickel	4.54E-11	
4-Methylphenol			4.09E-07	3.92E-07	Phosphorus		
RDX	2.10E-12			1.49E-08	Selenium		
2,4,6-Trinitrotoluene	3.18E-12	5.16E-07		4.95E-07	Silver		
Vanadium				2.05E-06	Thallium		
					Tin		
					Vanadium		
					Zinc		
					Acetone		
					Benzene	2.79E-13	
					Bromodichloromethane		
					Bromoform	1.67E-14	
					2-Butanone		6.19E-10
					Carbon Disulfide		6.19E-08
					Carbon Tetrachloride	2.29E-13	
					Chlorobenzene		1.63E-08
					Chloroform	3.51E-13	
					Chloromethane	2.73E-14	
					Dibromochloromethane		
					1,1-Dichloroethane		6.53E-11
					1,2-Dichloropropane		2.49E-08
					cis-1,3-Dichloropropene	5.63E-13	1.63E-08
					trans-1,3-Dichloropropene	5.63E-13	1.66E-08
					Ethylbenzene		3.26E-10
					2-Hexanone		
					Methylene Chloride	7.36E-15	1.09E-10
					4-Methyl-2-pentanone		
					Styrene		1.09E-10
					1,1,2,2-Tetrachloroethane	8.66E-13	
					Tetrachloroethene		
					Toluene		8.61E-10
					1,1,1-Trichloroethane		
					Vinyl Acetate		1.16E-09
					Vinyl Chloride	2.89E-12	
					Xylenes		
					Benzoic Acid		
					Benzyl Alcohol		
					Diethyl Phthalate		
					Dimethyl Phthalate		
					Di-n-butyl Phthalate		
					Di-n-octyl Phthalate		
					bis(2-Ethylhexyl)-Phthalate		
					2-Methylphenol		
					3-Methylphenol		
					4-Methylphenol		
					Naphthalene		
					GB		8.90E-06
					HD/HT	3.35E-10	2.66E-05
					VX		8.90E-06
					Chlorine		
					Hydrogen Chloride		1.72E-03
					Hydrogen Fluoride		
					Nitroglycerine		
					PCB		
					Particulates		
					2,4-Dinitrotoluene		
					2,6-Dinitrotoluene		
					2,4,6-Trinitrotoluene		
					RDX		
					HMX		
Total	2.99E-07	3.80E-04	2.64E-02			7.13E-09	1.83E-03
Grand Total	3E-07	0.00038	0.0264			7E-09	0.002

Table A-2.3.28 Case 3. With PFS, HHRA Protocol: UMATILLA RIVER SUBSISTENCE FISHER

DIRECT INHALATION EXPOSURES:

Exposure parameter	Exposure Scenario			
	Subsistence Farmer	Subsistence Fisher	Adult Resident	Child Resident
Inhalation rate, IR (m3/hr)	0.8	0.8	0.8	0.2
Exposure duration, ED (yr)	3.2	3.2	3.2	3.2
Body weight, BW (kg)	70	70	70	15
Exposure time, ET (hr/day)		24		
Exposure frequency, EF (day/yr)		350		
Carcinogenic averaging time, LT (day)		25550		
Noncancer averaging time, LT (day)		1168		

CSF = Cancer Slope Factor
RfD = Reference Dose
HI = Hazard Index

CDD = Chlorinated dibenzo-p-dioxin
CDF = Chlorinated dibenzo-p-furan

Substances of Potential Concern	Respirable Concentration (ug/m3)	Cancer inh. intake Fisher-Umatilla River (mg/kg-day)	Inhalation CSF (per mg/kg-day)	Cancer Risk Fisher-Umatilla River	Inhalation RfD (mg/kg/day)	Hazard Quotient Fisher-Umatilla River
Tetra CDD	1.76E-11	2.20E-16	1.16E+05	2.56E-11		
Penta CDD	8.84E-11	1.11E-15	5.80E+04	6.42E-11		
Hexa CDD	8.87E-11	1.11E-15	1.16E+04	1.29E-11		
Hepta CDD	8.88E-11	1.11E-15	1.16E+03	1.29E-12		
Octa CDD	1.78E-10	2.23E-15	1.16E+02	2.58E-13		
Tetra CDF	1.75E-11	2.20E-16	1.16E+04	2.55E-12		
Penta CDF	8.82E-11	1.10E-15	5.80E+04	6.41E-11		
Hexa CDF	8.87E-11	1.11E-15	1.16E+04	1.29E-11		
Hepta CDF	8.88E-11	1.11E-15	1.16E+03	1.29E-12		
Octa CDF	1.78E-10	2.23E-15	1.16E+02	2.58E-13		
2,3,7,8-TCDD TEQ	1.28E-10	1.60E-15	1.50E+05	2.40E-10		
Antimony	8.55E-06	1.07E-10				
Arsenic	7.42E-06	9.29E-11	5.00E+01	4.64E-09		
Barium	1.09E-05	1.36E-10			1.45E-03	2.05E-06
Beryllium	2.37E-06	2.97E-11	8.40E+00	2.49E-10		
Boron	1.00E-05	1.26E-10			5.80E-03	4.74E-07
Cadmium	2.64E-06	3.30E-11	6.30E+00	2.08E-10		
Chromium	2.73E-06	3.42E-11	4.10E+01	1.40E-09		
Cobalt	4.29E-06	5.38E-11				
Copper	4.66E-06	5.84E-11				
Lead	5.80E-06	7.26E-11				
Manganese	2.78E-06	3.48E-11			1.40E-05	5.44E-05
Mercury	2.46E-06	3.08E-11			8.60E-05	7.82E-06
Nickel	4.31E-06	5.40E-11	8.40E-01	4.54E-11		
Phosphorus	1.00E-05	1.26E-10				
Selenium	5.90E-06	7.39E-11				
Silver	7.89E-06	9.88E-11				
Thallium	1.61E-05	2.02E-10				
Tin	7.80E-06	9.77E-11				
Vanadium	4.25E-06	5.32E-11				
Zinc	5.90E-06	7.39E-11				
Acetone	4.49E-07	5.62E-12				
Benzene	7.70E-07	9.64E-12	2.90E-02	2.79E-13		
Bromodichloromethane	3.46E-07	4.33E-12				
Bromoform	3.46E-07	4.33E-12	3.85E-03	1.67E-14		
2-Butanone	6.55E-07	8.21E-12			2.90E-01	6.19E-10
Carbon Disulfide	6.55E-07	8.21E-12			2.90E-03	6.19E-08
Carbon Tetrachloride	3.46E-07	4.33E-12	5.30E-02	2.29E-13		
Chlorobenzene	3.46E-07	4.33E-12			5.80E-03	1.63E-08
Chloroform	3.46E-07	4.33E-12	8.10E-02	3.51E-13		
Chloromethane	3.46E-07	4.33E-12	6.30E-03	2.73E-14		
Dibromochloromethane	3.46E-07	4.33E-12				
1,1-Dichloroethane	3.46E-07	4.33E-12			1.45E+00	6.53E-11
1,2-Dichloropropane	3.46E-07	4.33E-12			3.80E-03	2.49E-08
cis-1,3-Dichloropropene	3.46E-07	4.33E-12	1.30E-01	5.63E-13	5.80E-03	1.63E-08
trans-1,3-Dichloropropene	3.46E-07	4.33E-12	1.30E-01	5.63E-13	5.70E-03	1.66E-08
Ethylbenzene	3.46E-07	4.33E-12			2.90E-01	3.26E-10
2-Hexanone	3.46E-07	4.33E-12				
Methylene Chloride	3.46E-07	4.33E-12	1.70E-03	7.36E-15	8.70E-01	1.09E-10
4-Methyl-2-pentanone	3.46E-07	4.33E-12			2.30E-01	4.12E-10
Styrene	3.46E-07	4.33E-12			8.70E-01	1.09E-10
1,1,2,2-Tetrachloroethane	3.46E-07	4.33E-12	2.00E-01	8.66E-13		
Tetrachloroethene	3.46E-07	4.33E-12				
Toluene	3.46E-07	4.33E-12			1.10E-01	8.61E-10
1,1,1-Trichloroethane	4.49E-07	5.62E-12				
Vinyl Acetate	2.42E-07	3.03E-12			5.70E-02	1.16E-09
Vinyl Chloride	7.70E-07	9.64E-12	3.00E-01	2.89E-12		
Xylenes	3.46E-07	4.33E-12				
Benzoic Acid	3.18E-06	3.99E-11				
Benzyl Alcohol	2.83E-06	3.55E-11				
Diethyl Phthalate	2.56E-06	3.21E-11				
Dimethyl Phthalate	2.56E-06	3.21E-11				
Di-n-butyl Phthalate	2.84E-06	3.56E-11				
Di-n-octyl Phthalate	2.84E-06	3.56E-11				
bis(2-Ethylhexyl)-Phthalate	2.77E-06	3.47E-11				
2-Methylphenol	2.83E-06	3.55E-11				
3-Methylphenol	2.76E-06	3.45E-11				
4-Methylphenol	2.83E-06	3.55E-11				
Naphthalene	2.55E-06	3.20E-11				
GB	2.82E-08	3.53E-13			8.67E-07	8.90E-06
HD/HT	2.82E-06	3.53E-11	9.50E+00	3.35E-10	2.90E-05	2.66E-05
VX	2.82E-08	3.53E-13			8.67E-07	8.90E-06
Chlorine	4.90E-03	6.13E-08				
Hydrogen Chloride	3.64E-02	4.55E-07			5.80E-03	1.72E-03
Hydrogen Fluoride	2.62E-02	3.28E-07				
Nitroglycerine	0.00E+00	0.00E+00				
PCB	0.00E+00	0.00E+00				
Particulate	8.81E-03	1.10E-07				
2,4-Dinitrotoluene	1.27E-07	1.60E-12				
2,6-Dinitrotoluene	1.27E-07	1.60E-12				
2,4,6-Trinitrotoluene	1.27E-07	1.60E-12				
RDX	1.27E-07	1.60E-12				
HMX	1.27E-07	1.60E-12				
				7E-09	Total HI=	0.002

Table A-2.3.27 Case 3. With PFS, HHRA Protocol: UMATILLA RIVER SUBSISTENCE FISHER
INDIRECT EXPOSURES

Calculation of hazard quotients, and hazard indices

Consumption rate of soil, CR(soil)=	0.0001	kg/day
Fraction of soil impacted, F(soil)=	1	unitless
Consumption rate of abv grd veg, CR(ag)=	0.024	kg/day
Fraction of abv grd veg impacted, F(ag)=	0.25	unitless
Consumption rate of root veg, CR(bg)=	0.0063	kg/day
Fraction of root veg impacted, F(bg)=	0.25	unitless
Consumption rate of fish, CR(fish)=	0.140	kg/day
Fraction of fish impacted, F(fish)=	1	unitless
Body weight, BW=	70	kg

I(tot) = Total daily intake of substance
Sc = Soil concentration after total time period of deposition
I(soil) = Daily intake of substance from soil
Pd + Pv = Concentration in plant
I(ag) = Daily intake of substance from above ground vegetables
Pr(bg) = Concentration in below ground plant parts due to root uptake
I(bg) = Daily intake of substance from below ground vegetables
C(fish) = Concentration in fish
I(fish) = Daily intake of substance from fish
RfD = Reference dose
HI = Hazard index

Substances of Potential Concern	Sc (mg/kg)	I(soil) (mg/day)	Pd+Pv (mg/kg)	I(ag) (mg/day)	Pr(bg) (mg/kg)	I(bg) (mg/day)	C(fish) (mg/kg)	I(fish) (mg/day)	I(tot) (mg/day)	RfD (mg/kg-day)	Hazard Index Liver	Hazard Index Neuro	Hazard Quotient
Antimony	1.10E-04	1.10E-08	3.24E-07	1.95E-09	8.25E-10	1.30E-12	7.18E-08	1.01E-08	2.30E-08	4.00E-04			8E-07
Arsenic	9.51E-05	9.51E-09	2.81E-07	1.68E-09	1.31E-11	2.07E-14	3.06E-06	4.28E-07	4.39E-07	3.00E-04			2E-05
Barium	1.40E-04	1.40E-08	6.12E-07	3.67E-09	1.99E-12	3.13E-15	6.58E-07	9.21E-08	1.10E-07	7.00E-02			2E-08
Beryllium	3.08E-05	3.08E-09	1.35E-07	8.07E-10	3.30E-13	5.20E-16	4.37E-07	6.12E-08	6.51E-08	5.00E-03			2E-07
bis (2-Ethylhexyl) Phthalate	4.82E-04	4.82E-08	4.01E-08	2.41E-10	2.75E-10	4.34E-13	1.42E-06	1.99E-07	2.47E-07	2.00E-02	1.76E-07		2E-07
Cadmium	3.44E-05	3.44E-09	1.50E-07	8.99E-10	3.44E-12	5.41E-15	1.71E-06	2.40E-07	2.44E-07	1.00E-03			3E-06
Chromium	3.54E-05	3.54E-09	1.54E-07	9.26E-10	4.42E-12	6.96E-15	1.10E-06	1.54E-07	1.59E-07	5.00E-03			4E-07
2,4-Dinitrotoluene	2.75E-05	2.75E-09	1.59E-10	9.55E-13	3.01E-08	4.73E-11	5.85E-09	8.18E-10	3.62E-09	2.00E-03		2.58E-08	2E-08
2,6-Dinitrotoluene	2.75E-05	2.75E-09	1.38E-10	8.28E-13	3.49E-08	5.50E-11	4.61E-09	6.45E-10	3.45E-09	1.00E-03		4.93E-08	5E-08
Di-n-octyl Phthalate	4.95E-04	4.95E-08	3.60E-08	2.16E-10	2.83E-10	4.46E-13	1.45E-06	2.04E-07	2.53E-07	2.00E-02	1.81E-07		2E-07
GB	6.06E-06	6.06E-10	6.81E-13	4.08E-15	8.81E-08	1.39E-10	1.37E-09	1.92E-10	9.37E-10	4.30E-05		3.11E-07	3E-07
HD/HT	6.06E-04	6.06E-08	4.07E-12	2.44E-14	2.91E-07	4.58E-10	7.84E-07	1.10E-07	1.71E-07				
Lead	7.41E-05	7.41E-09	3.24E-07	1.94E-09	NA	NA	NA	NA	9.35E-09				
Mercury	5.30E-04	5.30E-08	4.71E-07	2.82E-09	NA	NA	1.32E-03	1.85E-04	1.85E-04	1.00E-04		2.64E-02	3E-02
Nickel	5.56E-05	5.56E-09	2.43E-07	1.46E-09	1.36E-12	2.14E-15	3.62E-06	5.07E-07	5.14E-07	2.00E-02			4E-07
Total PCBs	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00				
Selenium	7.52E-05	7.52E-09	2.22E-07	1.33E-09	1.75E-10	2.75E-13	3.16E-07	4.43E-08	5.31E-08	5.00E-03			1E-07
Silver	1.01E-04	1.01E-08	4.42E-07	2.65E-09	1.27E-08	1.99E-11	3.29E-08	4.61E-09	1.74E-08	5.00E-03			5E-08
2,3,7,8-TCDD & Dioxin-Like SOPCs	1.02E-08	1.02E-12	3.42E-11	2.05E-13	4.33E-13	6.82E-16	2.30E-09	3.21E-10	3.23E-10				
Thallium	2.11E-04	2.11E-08	9.20E-07	5.52E-09	5.70E-13	8.98E-16	1.50E-05	2.10E-06	2.12E-06	8.00E-05	3.79E-04		4E-04
VX	6.06E-06	6.06E-10	5.31E-10	3.18E-12	3.74E-08	5.89E-11	1.93E-08	2.71E-09	3.37E-09	4.30E-05		1.12E-06	1E-06
Di-n-butyl Phthalate	4.95E-04	4.95E-08	3.99E-08	2.39E-10	2.79E-05	4.39E-08	1.25E-03	1.76E-04	1.76E-04	1.00E-01			2E-05
Diethyl Phthalate	4.47E-04	4.47E-08	3.65E-08	2.19E-10	2.79E-07	4.39E-10	1.63E-05	2.29E-06	2.33E-06	8.00E-01			4E-08
Manganese	3.53E-05	3.53E-09	1.54E-07	9.25E-10	7.66E-11	1.21E-13	4.94E-06	6.92E-07	6.96E-07	1.40E-01		7.11E-08	7E-08
4-Methylphenol	6.10E-04	6.10E-08	4.04E-10	2.43E-12	1.07E-06	1.69E-09	5.75E-07	8.05E-08	1.43E-07	5.00E-03		4.09E-07	4E-07
RDX	2.75E-05	2.75E-09	1.05E-13	6.32E-16	2.10E-08	3.31E-11	3.34E-09	4.67E-10	3.25E-09	3.00E-03			1E-08
2,4,6-Trinitrotoluene	2.75E-05	2.75E-09	2.46E-10	1.48E-12	5.55E-09	8.75E-12	1.09E-07	1.53E-08	1.81E-08	5.00E-04	5.16E-07		5E-07
Vanadium	5.53E-05	5.53E-09	2.41E-07	1.45E-09	2.76E-11	4.35E-14	7.43E-06	1.04E-06	1.05E-06	7.00E-03			2E-06
										HI=	0.0004	0.026	0.03

Staff Jennings Appeal

Oral Remarks Before
Environmental Quality Commission

March 19, 1999

May it please the Commission

My name is Chris Reive and I am appearing on behalf Staff Jennings, Inc., which has appealed the Hearings Officer's award assessing Staff Jennings a civil penalty in the amount of $8,400. And, having read the Hearing's Officer's Order, the Department's briefs, and reread the Order - I must admit I remain confused. I am confused by the Department's approach in this case, and to the extent I thought I understood it when we filed our initial brief, it now appears I am wrong.

Let me explain -

The Department's Notice of Assessment of Civil Penalty, located at Tab 4 in your materials, states on Page 1 that:

"The Department imposes a civil penalty of $8,400 for Violation 1 in Section II above."

Violation 1, on the same page, states:

"On or about October 19, 1988 to at least February 19, 1997, Respondent caused pollution of waters of the state in violation of ORS 468B.025(1)(a)..."

The penalty assessment expressly did not include any amount for, nor any allegation subject to proof or appeal *of the penalty* for, failing to initiate and complete the investigation or cleanup of a petroleum release from an underground storage tank. That alleged violation was identified as Violation 2 in Section II, and was not the subject of penalty assessment.

Staff Jennings appealed the Hearings Officer's findings of violations, and the assessment of the penalty. We concede that ORS 468B.025 was inadvertently violated - in 1988, but we assert that the Department's statutory claim is now time barred because the act causing the claim was complete in 1989 and the penalty is thus inappropriate. We also assert that a finding of regulatory violation relating to alleged delays in the investigation and cleanup is not appropriate in this case because all conduct began before adoption of the alleged regulation, the investigation and remediation begun in 1988 was done in accord with the regulations in effect at the time, and no notice was ever given to Staff Jennings that different regulations would be applied. However, the penalty amount is our key concern here, and I will rely on the briefs as to the regulatory issues because no penalty is at issue for that claim.

The Department has responded to our appeal by ignoring the action it took when it assessed the civil penalty. The Department's Notice clearly and at least procedurally appropriately differentiated between spilling or releasing and cleaning up contamination. In its brief, however, the Department has read into ORS 468B.025 language which is not there to conform to its proof. This is not appropriate, and should result in the penalty assessment being reversed.

ORS 468B.025(1)(a), as alleged by the Department in its Notice, prohibits someone from 'causing pollution of waters of the state'. The Department asserted in support of that allegation that:

"Respondent caused pollution by allowing a continuous discharge of petroleum, from an underground storage tank spill or release, to enter the Willamette River, waters of the State ..."   NOV

But, what the Department believes it proved at the hearing is described in its brief at Page 3:

"When Staff Jennings did not make active progress toward installing a remedial system or installing groundwater monitoring wells, the Department issued a Notice of Noncompliance on November 7, 1996, which resulted in a Notice of Civil Penalty Assessment and Remedial Action Order, issued March 7, 1999."

The Department goes on to say at Page 5:

"Fundamentally, Staff Jennings had a duty to install a remedial system capable of preventing the ongoing discharge of petroleum into the Willamette River."

That is the crux of this case - and the confusion now before this Commission. The Department wants this Commission to assess a civil penalty for *causing* pollution - without evidence of a new cause or release, based on the claim that a regulated entity isn't moving fast enough for them.

The regulation requiring investigation, remedial action, and reporting to DEQ does not cite ORS 468B.025 as statutory authority and is not at issue in this penalty! But, the Department - after recognizing this distinction in its Notice - now ignores that fact.

The Facts are undisputed here - a leak occurred from an underground storage tank and was discovered in 1988. The leak was repaired almost immediately, and the tank itself was decommissioned by removal in 1994. There is no evidence in the record or anywhere else of additional leaks or releases from this or any other UST or any other source. Petroleum remains in the soil and the groundwater adjacent to the Willamette River, and remediation and investigation is ongoing.

Again, all petroleum that remains at the site got there on or before 1988. At that time it was either in the groundwater, which is water of the State, or in the ground threatening to be released. It is either one or the other - there is nothing in between, and both circumstances are expressly addressed in ORS 468B.025.

In other words, and in the words of ORS 468B.025 - All of the conduct giving rise to a cause of action under that statute occurred in 1988 or before. Pollution of water was either caused, or waste (in this case petroleum) was placed in a location where it threatened to escape to water in 1988.

There is no requirement under that statute, either express or implied, for any other element of proof. The violation was complete, and was not enhanced or renewed by any other action since all of the contaminant at issue in this case was there and fully accounted for under the statute in 1988. The petroleum in the soil, of which the Department now complains, was as much a subject of that statute as anything in the water in 1988.

And so, the Department's proof that an investigation and remediation did not progress at what it deemed to be a reasonable pace - although that opinion varied from time to time - is not proof of a violation of ORS 468B.025. There was no offer of proof of migration of contaminant from soil into groundwater at any specific time. There was no attempt to confirm recent movement of petroleum into soil - that was assumed. Indeed, that specific concern was not on the Department's mind when it issued the penalty, as evidenced by the quotes I have excerpted from its brief. Moreover, even if the Department had proved such movement of the petroleum, it could not have given rise to a new claim under the statute. All such claims were complete in 1988.

Now more than 10 years after all events occurred that gave rise to a claim in this case - the Department wants to assess civil penalty. Staff Jennings asserts that such action on these legal grounds at this late date is inappropriate under any analysis. And, in any event, the action is time barred under every statute of limitation you could name as reasonably applicable. We have cited you to several such statutes in our brief.

The Department asserts that such statues of limitaion do not apply to it, and cite in support of that contention ORS 12.250 and a 1988 case (City of Medford) for the proposition that : "statutes of limitation do not apply against government bodies unless they are included expressly or by necessary implication is still in force". Yet, as we have briefed, the Department has ignored the language of the City of Medford case that expressly declares that the statutes of limitations of ORS 12.100, 12.110, and 12.130 all *apply to the government*.

In particular, ORS 12.110(2) applies to:

> actions 'upon a statute for a forfeiture or for penalties to the state or county' and they 'shall be commenced within two years'.

Any claim by the Department in this case was complete and could have been asserted in 1988. There has been no new act, no new circumstance, and no new violation of ORS 468B.025 since that date. In fact, the Department's Notice expressly cites back to events in 1988 according to its terms. This claim - which is the only claim giving rise to a civil penalty - is time barred. We respectfully submit that the Order assessing the penalty should be reversed.

State of Oregon

Department of Environmental Quality Memorandum

Date: February 24, 1999

To: Environmental Quality Commission

From: Langdon Marsh, Director Langdon Marsh

Subject: Agenda Item G, Appeal of Hearing Officer's Findings of Fact, Conclusions of Law and Final Order in the Matter of Staff Jennings, Case No. UT-NWR-96-274A, EQC Meeting: March 19, 1999

Statement of Purpose

Staff Jennings Inc. (hereinafter "Staff Jennings") appealed from the Hearing Officer's Findings of Fact and Conclusions of Law, dated March 18, 1998. In that order, the hearing officer found that Staff Jennings violated ORS 468B.025 and OAR 340-122-242 and was liable for a civil penalty in the amount of $8,400.

Background

The Findings of Fact made by the hearing officer are summarized as follows:
Staff Jennings owns a marina located on the west bank of the Willamette River. In 1988, there were two underground storage tanks located on the property. On or about October 18, 1988, an unknown quantity of petroleum discharged from the underground storage tanks. Cleanup operations were undertaken and the spill was reported to the Department on October 19, 1988.

Staff Jennings had the underground storage tanks inspected, tested and repaired, along with hiring a consultant to make recommendations to address the problem. A report was issued on April 3, 1989 and contained a remediation plan. Based on contacts with the Department over the next several years, Staff Jennings was under the opinion that the remediation was not a high priority, thus they did not move forward with the remediation plan.

In October 1994, the underground storage tanks were decommissioned and soil samples were conducted. Contamination was detected beyond the confines of the excavation site. In December 1994, the Department asked Staff Jennings to submit a schedule for implementation of a groundwater investigation. At this time, a Department inspector indicated that Staff Jennings needed to install a remediation system prior to October 1996.

When the remediation system was not installed by November 1996, a Notice of Noncompliance was issued. On March 7, 1997, a Notice of Assessment of Civil Penalty was issued which assessed a civil penalty in the amount of $8,400.

On March 24, 1997, Staff Jennings appealed the Notice and requested a hearing. A hearing was held on December 3, 1997.

The hearing officer held that Staff Jennings (1) caused pollution of waters of the state and (2) failed to complete the investigation and cleanup of a petroleum release for an underground storage tank. Staff Jennings argued that no penalty should be imposed since the Department did not convey a sense of urgency to the remediation. The hearing officer held that, while in the early years following the release this was true, in 1995, the Department informed Staff Jennings that implementation of the remediation plan needed to be completed. As of the date of the Assessment of Civil Penalty, Staff Jennings had not done so.

On April 17, 1998, Staff Jennings filed a timely appeal of the Hearing Officer's Findings of Fact, Conclusions of Law and Final Order. Staff Jennings filed the following exceptions to the Order:

(1) The assessment of civil penalty is barred by the statute of limitations since the release occurred in 1988.
(2) OAR 340-122-242 does not apply to the allegations in this matter because that regulation was not in effect at the time of the release in 1988.
(3) Staff Jennings did not fail to initiate and complete the investigation and cleanup of the spill under the applicable regulations at the time of the release since:
    (a) Staff Jennings 'initiated' an investigation by hiring a consulting firm and
    (b) 'completed' as much of the response as it could pending the Departmental determination of a cleanup standard and a schedule for cleanup.

The Department responded that the statute of limitations does not apply since the civil penalty and remedial order statutory authority contains no reference to a statute of limitations. Furthermore even if the statute of limitations did apply, the civil penalty assessment is not barred since the violation was ongoing and not limited to the initial release in 1988. Staff Jennings regulatory duty is not limited to the regulations in effect at the time of the 1988 release since (1) the pollution to the waters of the state was ongoing, (2) Staff Jennings knew that OAR 340-122-242 applied to the site since at least 1994, (3) Staff Jennings knew the cleanup standard to be applied since OAR 340-122-242 sets specific numeric groundwater cleanup standards and (4) Staff Jennings failed to initiate and complete the specific activities the Department required under OAR 340-122-242.

Authority of the Commission with Respect to the Issue

The Commission has the authority to hear this appeal under OAR 340-11-132.

Alternatives

The Commission can:

(1) Reverse the Hearing Order Regarding Violation and Assessment of Civil Penalty as requested by Staff Jennings;
(2) Uphold the Hearing Order; or
(3) Remand the matter to the hearing officer for more proceedings as determined necessary by the Commission.

Attachments

A. Letter from Susan Greco, dated January 8, 1999
B. Staff Jennings Response
C. Letter from Carol Whipple, dated November 24, 1998
D. Letter from Susan Greco, dated November 2, 1998
E. Letter from Christopher Rich, dated November 2, 1998
F. Department's Reply to Appellant's Brief
G. Letter from Carol Whipple, dated September 28, 1998
H. Letter from Susan Greco, dated September 1, 1998
I. Staff Jennings Brief
J. Letter from Carol Whipple, dated July 9, 1998
K. Letter from Carol Whipple, dated June 16, 1998
L. Letter from Susan Greco, dated April 29, 1998
M. Staff Jennings Notice of Appeal, dated April 17, 1998
N. Hearing Order Regarding Violations and Assessment of Civil Penalty and Final Order and Judgment, dated March 18, 1998
O. Exhibits from Hearing of December 3, 1997, (numbered 1-20)
    1. Notice of Hearing
    2. Letter from Donald B. Bowerman, dated July 30, 1997
    3. Answer to Notice of Civil Penalty, Request for Contested Case Hearing and Request for Informal Discussion, dated March 24, 1997
    4. Notice of Assessment of Civil Penalty, dated March 7, 1997
    5. Petroleum Release Incident Form, dated October 19, 1988
    6. Map
    7. Report of Findings/Preliminary Field Investigation, dated March 27, 1989
    8. Map
    9. Remediation Design, dated January 3, 1990
    10. Letter from James M. Doesburg, Golder Associates Inc., dated April 4, 1990
    11. Telephone Use Report, dated February 9, 1993
    12. Telephone Use Report, dated October 11, 1993
    13. Limited Subsurface Soil and Groundwater Investigation, dated March 31, 1994

14. Letter from Rick Silverman, dated April 5, 1994
15. Letter from Jeff Jennings, dated May 27, 1994
16. Underground Storage Tank Decommissioning, dated December 13, 1994
17. Letter from Rick Silverman, dated December 21, 1994
18. NWR UST Field Inspection Report, dated November 21, 1995
19. Notice of Noncompliance, dated November 7, 1996
20. Focused Soil and Groundwater Investigation, dated May 7, 1996

Reference Documents (available upon request)

OAR Chapter 340, Division 11, 12, and 122; Chapter ORS 468 and 468B

Report Prepared By: Susan M. Greco
Phone: (503) 229-5213
Date Prepared: February 24, 1999

Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
811 SW Sixth Avenue
Portland, OR 97204-1390
(503) 229-5696
TDD (503) 229-6993

January 8, 1999

Via Certified Mail

Christopher L. Reive
Bogle & Gates
200 S.W. Market Street, Suite 600
Portland OR 97201-5793

Chris Rich
Department of Environmental Quality
2020 S.W. 4th Avenue
Portland OR 97201

RE: Staff Jennings, Inc.
Case No. UT-NWR-96-274A

The appeal in the above referenced matter has been set for the regularly scheduled Environmental Quality Commission meeting on Friday, March 19, 1999. The meeting will convene at 9:00 a.m. and this matter will be heard in the regular course of the meeting. The meeting will be held at the Department's headquarters at 811 S.W. 6th Avenue, Room 3A, Portland, Oregon. As soon as the agenda and record is available, I will forward the same to you.

If you should have any questions or should need special accommodations, please feel free to call me at (503) 229-5213 or (800) 452-4011 ex. 5213 within the state of Oregon.

Sincerely,

Susan M. Greco

Susan M. Greco
Rules Coordinator

Attachment A - 1 page

BOGLE & GATES P.L.L.C.
A Professional Limited Liability Company

LAW OFFICES

CHRISTOPHER L. REIVE

200 S.W. Market Street
Suite 600
Portland, Oregon 97201-5793

Direct Dial: (503) 721-3653
Main Office: (503) 222-1515
Facsimile: (503) 721-3666
Internet Email: creive@bogle.com

Anchorage
Bellevue
Seattle
Tacoma
Vancouver, B.C.

73312/00001

December 1, 1998

VIA HAND DELIVERY

Environmental Quality Commission
811 S.W. Sixth Avenue
Portland, Oregon 97204

Re: *In the Matter of Department of Environmental Quality v. Staff Jennings, Inc.*, Civil Penalty No. UT-NWR-98-274A

Dear Sir/Madam:

Enclosed for filing is an original and copy of APPELLANT STAFF JENNINGS, INC.'S RESPONSE, Case No. UT NWR-98-274A in the above-referenced matter.

Please call me if you have any questions.

Very truly yours,

BOGLE & GATES P.L.L.C.

Christopher L. Reive

DEC 01 1998

CR2/48sm6
Enclosures

cc: (w/ Encl.)
Susan Greco, Rules Coordinator, DEQ (via Hand Delivery)
Christopher W. Rich, Enforcement Section, DEQ (via Hand Delivery)
Jeff Jennings, Staff Jennings Boating Centers (via Regular Mail)

Attachment B - 26 pages

48\SM6\C:\MY DOCUMENTS\REIVE, CHRISTOPHER L\73312\00001\LTR 02 OREGON ENVIRONMENTAL QUALITY COMMISSION--STAFF JENNINGS, INC.DOC

BEFORE THE ENVIRONMENTAL QUALITY COMMISSION
OF THE STATE OF OREGON

IN THE MATTER OF: Department of Environmental Quality, Appellee, v. STAFF JENNINGS, INC., Appellant.	Case No. UT-NWR-98-274A APPELLANT STAFF JENNINGS, INC.'S RESPONSE MULTNOMAH COUNTY

INTRODUCTION

Staff Jennings responds to the Department of Environmental Quality's (DEQ) Reply to Appellant's Brief and repeats its request that the Environmental Quality Commission (Commission) reverse the Hearing Officer's Final Order.

1. DEQ's Statutory Claim is Time Barred.

DEQ is barred from assessing a civil penalty pursuant to ORS 465.025(1)(a) because such an action is simply too late. All conduct giving rise to a cause of action in favor of the State occurred no later than 1989 and DEQ's claim is governed by at least one of several applicable statutes of limitation that barred such enforcement action years ago.

2. DEQ's Statutory Claim Was Complete When the Leaking UST Was Repaired or Removed.

The release in question occurred on approximately October 18, 1988, and the leaking line was discovered and repaired by early 1989. DEQ proceeds in this action under ORS 468B.025(1)(a) which states:

///

BOGLE & GATES P.L.L.C.
A Professional Limited Liability Company
200 S.W. Market Street
Suite 600
Portland, Oregon 97201-5793
(503) 222-1515

> "(1) Except as provided in ORS 468B.0050 or 468B.053, no person shall:
>
> (a) *Cause* pollution of any waters of the state or *place or cause to be placed* any wastes in a location where such wastes are likely to escape or be carried into waters of the state by any means." (emphasis added).

DEQ asserts in its Reply that the penalty at issue here was imposed not because Staff Jennings "caused" pollution within the recent past (in the event The Commission agrees that appropriate statutes of limitation *do* apply against the State), but because Staff Jennings has failed to remediate the contamination to DEQ's current satisfaction and that alleged failure continued through the date the DEQ acted in assessing this penalty. This assertion ignores: 1) the plain language of the statute upon which it relies, and 2) that DEQ has also elected to act (however appropriately) pursuant a regulation specifically related to remediation issues which is not based on the above statutory authority. In other words, DEQ often has numerous enforcement options available to it when it elects to pursue an entity for bad acts. When it does choose to act, however, it is incumbent on DEQ to select the right tool. Its reliance on ORS 468B.025(1)(a) in this case is misplaced.

ORS 468.025(1)(a) imposes liability for *causing* a waste ". . . to be placed . . . in a location where such wastes are likely to escape or be carried into the waters of the state by any means." Such language is clear in the action it describes and prohibits, and there is no debate that all petroleum at issue in this case was "placed" where it may enter waters of the state (the soil and groundwater adjacent to the river) in 1988. There is no language in the statute that imposes liability arising from remediation responsibilities that may otherwise arise elsewhere by statute or rule. As a result, DEQ's cause of action under this statute matured in 1988, and for the reasons stated before, and below, is now time barred.

3. The Statutes of Limitation Upon Which Staff Jennings Relies Apply To DEQ.

In its Reply, DEQ also attached a brief from the Oregon Department of Justice (DOJ) which asserts that ORS Chapter 12 statute of limitations do not apply to the government unless they apply "expressly" or by "necessary implication." Staff Jennings has never argued otherwise, and agrees that is the law. However, the DOJ goes further by stating that the ORS Chapter 12 provisions upon which

Staff Jennings relies, i.e., ORS 12.110(2), 12.100(2), and 12.130, do not expressly or by implication include the government, and that "*all* case law precedent" contradicts Staff Jennings' position. On this issue, the DOJ is simply wrong. The DOJ ignores the statutes at issue and relies on two cases, neither of which address ORS 12.100, 12.110, or 12.130.

The statutory provisions upon which Staff Jennings' relies apply to the government by their express terms. ORS 12.100(2) applies to:

> "[a]n action upon a statute for penalty or forfeiture, where the action is given to the party aggrieved, or to such party *and the state*, excepting those actions mentioned in ORS 12.110, shall be commenced within three years. (emphasis added)"

> ORS 12.110(2) applies to:

> "[a]n action upon a statute for a forfeiture or *for penalties to the state* or county shall be commenced within two years. (emphasis added)"

> ORS 12.130 applies to:

> "[a]n action upon a statute for a penalty given in whole or in part to the person who will prosecute for the same, shall be commenced within one year after commission of the offense; and if the action is not commenced within one year by a private party, it may be commenced within two years thereafter, *in behalf of the state, by the district attorney* of the county where the offense was committed or is triable. (emphasis added)"

Each also apply to the government by "necessary implication" because the government, except in rare circumstances (*see e.g.*, ORS 12.130) has sole jurisdiction over the imposition of penalties.

Moreover, the DOJ knows, or should know, that the above provisions apply to the State because DOJ cites the leading case which explains that the provision in ORS Chapter 12 upon which it relies for the claimed restriction, ORS 12.250, was amended in 1953 to add the phrase "unless otherwise made applicable thereto" for the express purpose of clarifying that the three provisions upon which Staff Jennings relies apply to the government. *See City of Medford v. BudgeMcHugh*, 91 Or. App. 213, 218. (1988). The *City of Medford* court states:

> The phrase 'unless otherwise made applicable thereto' now in ORS 12.250 was added . . . as part of the 1953 general recodification of Oregon statutes 'because of the affect of the 1903 amendment [statute of limitations do not

> generally apply to the government] *and in view of the language of ORS 12.100, 12.110, 12.130.'*

City of Medford, pg. 218, citing the Reviser's Notes [explanatory text in brackets] (*emphasis* added).

In addition to its misplaced reliance on *City of Medford,* the DOJ then incorrectly asserts that "*all case precedent*, contradicts [Staff Jennings] argument. (emphasis added)" DOJ Memo pg. 1, ll 13 -14. In fact, a simple Westlaw search for cases referencing ORS 12.110(2) reveals four cases, three of which are relevant to this matter. *See, State of Oregon v Charles*, 52 Or. App. 451 (1981)(attached); *State of Oregon v. Renteria*, 59 Or. App. 619 (1982) (attached) (loss of drivers license is not a forfeiture for purposes of ORS 12.110(2)); *State of Oregon v. Norton*, 57 Or. App. 679 (1982) (attached) (loss of drivers license under the Habitual Traffic Offenders Act constitutes forfeiture for purposes of ORS 12.110(2)). In each of these cases, neither the DOJ nor the court questioned whether ORS 12.110(2) applied to the government - it only addressed the scope of the application of ORS 12.110(2) to government, i.e., what constitutes a penalty and a "forfeiture " for purposes of applying the provision to the government.

In contrast, the cases cited in the DOJ brief are not relevant. They address a breach of contract claim (*State Land Board v. Lee,* 84 Or 431 (1917)) and a negligence claim (*City of Medford*). Neither case, one of which is from 1917, considers a circumstance where the state is exercising its police power, i.e., assessment of a civil penalty, and neither mentions the ORS Chapter 12 provisions (ORS 12.100, 12.110, 12.130) which are the subject of this appeal.

The issue here is basic, and the result is clear. The limitation provisions of ORS 12.100(2), 12.110(2) and 12.130 have expressly applied to actions by the state since 1953. Under any of these provisions, DEQ's enforcement action for penalties based on an alleged violation ORS 468B.025(1) is time barred.

4. Allegations of Violation of a Remedial Action Order Are Not Before The Commission.

The Department of Justice, on behalf of the Department, also asserts:

> "The Remedial Action Order was issued pursuant to ORS 465.250(4) and 465.255. None of these statutes or regulations contains any statutes of limitations, neither do they indicate that any limitations should apply.

> There fore, no statutes of limitations apply to DEQ's actions against Staff Jennings."

Nowhere in the Hearing Officer's Final Order, nor in the Department's Notice of Violation, is there any allegation that Staff Jennings violated a remedial action order. While we assume that this assertion is simply an error by an overzealous but misinformed advocate, Staff Jennings believe it is important to keep the record clear. If there is a new allegation of which Staff Jennings is unaware, of course Staff Jennings strongly objects to the assertion of a new claim.

5. DEQ's Administration of Cleanup Programs Is Inconsistent With Its Claim In This Case.

The Department asserts that, in November 1988 (one month after discovery of the release), Staff Jennings was automatically transferred, without notice, from either no cleanup program, or from the environmental cleanup program, to the UST cleanup program. It also asserts that again, in 1992, Staff Jennings became subject to the then newly adopted OAR 340-122-242. The Department's prior stated position in the *In re Hanna* case, cited by Staff Jennings in its initial brief, clearly states that UST petroleum remediations can, and have been, administered by DEQ under different and often inconsistent programs. Moreover, because the differences between such programs sometimes lead to inconsistent results, parties who are functioning within such a program are not routinely shifted from one to another, and when that happens it is not done without notice to the affected party.

The Department argues that, even if the Department failed to notify Staff Jennings it was transferring administration of the cleanup to another program, Staff Jennings was allegedly on constructive notice of the switch because the Department asked Staff Jennings to conduct certain remedial activities that were in compliance with OAR 340-122-242. However, this assertion ignores the DEQ's routine and appropriate practice of considering analytical methods, cleanup standards, remedial techniques from one or more programs as guidance in deciding how to effect a cleanup in another program. For example, the DEQ routinely applies the UST petroleum program cleanup standards at sites where the petroleum release is being conducted under a different programs, i.e., sites where the petroleum release is from an aboveground tank, the petroleum release is being remediated under the environmental cleanup (Superfund) program , or the petroleum release is being conducted under the hazardous waste program. The fact that DEQ may have asked Staff Jennings to abide by or apply selected remedial techniques or standards from other programs is not unusual and does not constitute notice, either express or constructive, of a change of program.

Finally, if DEQ really believes that OAR 340-122-242 applied retroactively in 1992 for enforcement purposes, DEQ will place itself in the position of re-evaluating each closed or on-going remediation project in 1992 to determine if the remedial action complied with the new regulations. Staff Jennings is unaware of any evidence to indicate that DEQ has opened closed remedial projects, or re-evaluated ongoing projects, to determine if cleanups completed or underway in 1992 or thereafter complied with the new regulations. Indeed, there is no evidence that DEQ re-evaluated Staff Jennings' then approved 1990 Remedial Action Plan in 1992 to determine if it then satisfied the new regulations.

Indeed, such action by DEQ without actual notice to Staff Jennings is contrary to basic principles of fairness, DEQ's past practices, and Constitutional prohibitions against the retroactive enforcement of new punitive laws and regulations. The Commission is free to adopt and refine new regulations anytime it feels it is appropriate. However, no form of government, state or federal, can enforce those regulations retroactively through punitive measures, i.e., if the county puts up a new stop sign at an intersection it cannot begin citing all the individuals who did not stop at the intersection during the period *before* the sign was put up.

CONCLUSION

For the above reasons, Staff Jennings repeats its requests that the Commission reverse the Hearing Officers Final Order.

Respectfully submitted this 1st day of December, 1998.

BOGLE & GATES P.L.L.C.

Christopher L. Reive, OSB NO. 83305
Attorneys for Respondent Staff Jennings, Inc.

CERTIFICATE OF SERVICE

I hereby certify that on December 1, 1998, I served a copy of **APPELLANT STAFF JENNINGS, INC.'S RESPONSE ON CIVIL PENALTY NO. UT-NWR-98-274A**, on:

Susan Greco Rules Coordinator Oregon Department of Environmental Quality 811 SW Sixth Avenue Portland, OR 97204	Via:	[ ] [X] [ ] [ ]	U.S. Mail Hand Delivery Overnight Express Facsimile
Christopher L. Rich Enforcement Section Oregon Department of Environmental Quality 2020 SW Fourth Avenue, 4th Floor Portland, OR 97201-4987	Via:	[ ] [X] [ ] [ ]	U.S. Mail Hand Delivery Overnight Express Facsimile

the foregoing being the last known business addresses.

BOGLE & GATES P.L.L.C.

Christopher L. Reive, OSB #83305
Of Attorneys for Respondent
Staff Jennings, Inc.

STATE of Oregon, Appellant,
v.
Raymond Toledo CHARLES, Respondent.

No. 12239; CA 18360.

Court of Appeals of Oregon.

Argued and Submitted April 29, 1981.

Decided May 26, 1981.

Defendant was charged with being an habitual traffic offender. The Circuit Court, Crook County, Thomas Mosgrove, J., sustained defendant's demurrer to the complaint on the ground that the proceeding was barred by the statute of limitations. Appeal was taken. The Court of Appeals, Gillette, P. J., held that proceeding was not barred by two-year statute of limitations.

Reversed and remanded.

CRIMINAL LAW 147
110k147
Habitual traffic offender proceeding was not barred by two-year statute of limitations where proceeding was brought less than two years after defendant's latest traffic conviction. ORS 12.110(2), 484.705.

***451 **755** Gary S. Thompson, Dist. Atty., Prineville, argued the cause for appellant. On the brief was John K. Knight, Deputy Dist. Atty., Prineville.

No appearance for respondent Raymond Toledo Charles.

Before GILLETTE, P. J., and ROBERTS and YOUNG, JJ.

***453** GILLETTE, Presiding Judge.

Defendant was charged with being an habitual traffic offender. ORS 484.705. [FN1] ****756** The trial court sustained defendant's demurrer to the complaint on the ground that the proceeding was barred by the statute of limitations. The state appeals. We reverse.

The complaint in this case alleged that the defendant had been convicted of three or more offenses involving the operation of a motor vehicle within a five year period, which violations were required to be reported to the Oregon Motor Vehicles Division. These convictions were:

(1) Driving under the influence of intoxicants on November 17, 1976;
(2) Driving under the influence of intoxicants on December 6, 1976;
(3) Driving while suspended on October 24, 1977; and
(4) Driving under the influence of intoxicants on April 17, 1980.

The matter came on for hearing on June 23, 1980. After certain testimony had been introduced, the trial court entered an opinion which is recorded in the journal as follows:

***454** "The court found that an action to declare the defendant an habitual (offender) could have been commenced after his conviction for Driving While Suspended on October 24, 1977. However, based on the fact that the court could declare a forfeiture of the defendant's driver's license in this matter under ORS 484.730, the court held the action was barred by the two year statute of limitations set forth in ORS 12.110. * * * "

The "forfeiture" statute to which the trial court

FN1. ORS 484.705 provides in pertinent part: "(1) As used in ORS 484.700 to 484.750, unless the context requires otherwise, 'habitual offender' means any person, resident or nonresident, who within a five-year period, has been convicted of or forfeited bail for the number and kinds of traffic offenses described by paragraph (a) or (b) of this subsection, as evidenced by the records maintained by the division. "(a) Three or more of any one or more of the following offenses: "(A) Manslaughter or criminally negligent homicide resulting from the operation of a motor vehicle; "(B) Driving while under the influence of intoxicants as defined by ORS 487.540; "(C) Driving a motor vehicle while his license, permit or privilege to drive has been suspended or revoked as defined by ORS 487.560; "(D) Reckless driving as defined in ORS 487.550; "(E) Failure of the driver of a motor vehicle involved in an accident resulting in the death of or injury to any person or damage to any vehicle being driven or attended by a person to perform the duties required by subsections (1) and (2) of ORS 483.602; * * * " * * * * * "

was referring is ORS 484.730, which provides:

> "If the court finds that the person before the court is not the person named in the abstract, or that he is not a habitual offender, the proceeding shall be dismissed; but if the court finds that the person before the court is the person named in the abstract and that the person is a habitual offender, the court shall so find and by appropriate order direct the person not to operate a motor vehicle on the highways of this state and to surrender to the court all licenses or permits to operate a motor vehicle on the highways of this state for disposal in accordance with ORS 482.470. The clerk of the court shall file with the division a copy of the order whereupon the division shall forthwith revoke the license of the person to operate motor vehicles." (Emphasis supplied.)

The court was of the view that the surrender of a driver's license provided for in that statute makes the statute a "forfeiture" statute to which a two year statute of limitations is applicable under ORS 12.110(2):

> " * * * * *
>
> "(2) An action upon a statute for a forfeiture or penalty to the state or county shall be commenced within two years.
>
> " * * * * *."

We need not, in this opinion, decide the question of whether the trial court was correct in characterizing ORS 484.730 as a "forfeiture" statute in view of the fact that, even if it were a forfeiture statute, this habitual traffic offender proceeding was nonetheless timely because defendant's latest conviction of driving under the influence was on April 17, 1980. This proceeding was brought well within two years after that conviction and, therefore, was timely in any event.

***455** The judgment of the trial court dismissing the habitual traffic offender proceeding in this case is reversed, and the matter is remanded for further proceedings consistent with this opinion.

Reversed and remanded.

END OF DOCUMENT

STATE of Oregon, Respondent,
v.
Alex A. RENTERIA, Appellant.

No. C 81-06-32739; CA A22499.

Court of Appeals of Oregon,
In Banc [FN*].

FN* Thornton, J., did not participate in this decision.

Argued and Submitted May 14, 1982.
Resubmitted In Banc Sept. 8, 1982.
Decided Oct. 13, 1982.

The Circuit Court, Multnomah County, Robert Paul Jones, J., declared defendant to be a habitual traffic offender. Defendant appealed. The Court of Appeals, Buttler, J., held that although status of habitual offender imposes severe restrictions on offender's right to drive automobile, such restrictions do not amount to "forfeiture" or "penalty" within statute providing that action upon statute for forfeiture or penalty to state or county shall be commenced within two years.

Affirmed.

Warren, J., dissented and filed statement in which Warden and Rossman, JJ., joined.

[1] AUTOMOBILES 144.1(3)
48Ak144.1(3)
Function of Habitual Traffic Offenders Act is to determine status of one who fits statutory definition of habitual offender. ORS 484.700-484.750.

[2] AUTOMOBILES 351.1
48Ak351.1
Formerly 48Ak351
Although status of habitual offender imposes severe restrictions on offender's right to drive automobile, such restrictions do not amount to "forfeiture" or "penalty" within statute providing that action upon statute for forfeiture or penalty to state or county shall be commenced within two years; overruling State v. Norton , 57 Or.App. 679, 646 P.2d 53 (1982). ORS 12.110(2), 484.700-484.750.

See publication Words and Phrases for other judicial constructions and definitions.

[3] INDICTMENT AND INFORMATION 144.1(1)
210k144.1(1)
Under section of Habitual Traffic Offenders Act, proceedings under the Act can be dismissed only if person before court is not person named in abstract or if he is not habitual offender, and nothing authorizes court to dismiss for failure to commence proceedings within specified time or within reasonable time. ORS 484.705(1)(a), 484.710(2), 484.715, 484.720, 484.720(1, 2), 484.730, 484.735.

***620 **1362** Michael T. Garone, Portland, argued the cause for appellant. On the brief was Robert A. Sacks, Portland.

Virginia L. Linder, Asst. Atty. Gen., Salem, argued the cause for respondent. With her on the brief were Dave Frohnmayer, Atty. Gen., and William F. Gary, Sol. Gen., Salem.

***621** BUTTLER, Judge.

In this proceeding under the Habitual Traffic Offenders Act, ORS 484.700--484.750, defendant appeals from the trial court's order declaring him to be a habitual traffic offender. He was convicted of driving under the influence of intoxicants on April 18, 1977, and of the same crime on September 20, 1977; on June 8, 1978, he was convicted of driving while suspended. On June 4, 1981, a complaint seeking to declare him a habitual traffic offender was filed. Because more than two years had expired between defendant's last conviction and the filing of the complaint in this proceeding, defendant contended that the two-year limitation period provided by ORS 12.110(****1363** 2) [FN1] was a bar to this action. The trial court held that the action was not barred, and the sole question on appeal is whether the trial court erred in that ruling.

After the trial of this case, this court held in State v. Norton, 57 Or.App. 679, 646 P.2d 53 (1982), with one judge dissenting, that the two-year limitation in ORS 12.110(2) was applicable, because the Habitual Traffic Offenders Act imposed either a "penalty" or a "forfeiture." A majority of the court,

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FN1. ORS 12.110(2) provides: "(2) An action upon a statute for a forfeiture or penalty to the state or county shall be commenced within two years."

sitting in banc, now concludes that Norton was decided wrongly; it is overruled.

[1] Reading the Act as a whole makes it clear that its function is to determine the status of one who fits the statutory definition of a habitual offender. Once a driver has been judicially determined to have that status, his right to operate motor vehicles in this state is suspended for ten years, but is subject to the control and supervision of the Department of Motor Vehicles. ORS 484.735 provides in relevant part:

> "(2) A one-year, renewable probationary license may be issued to a habitual offender if he:
> "(a) Successfully completes a defensive driving course conducted by the division;
> "(b) Continually satisfies the conditions of the probationary license; and
> ***622** "(c) Submits a report of a diagnostic examination conducted by a private physician showing to the satisfaction of the State Health Officer that he is physically and mentally competent to drive.
> "(3) The conditions of a probationary license shall include that if a habitual offender is convicted of more than one moving violation within any 12-month period the probationary license shall be revoked and may not be reinstated for one year from the date of last conviction.
> "(4) The division may establish by rule additional conditions of a probationary license."

[2] Although the status of habitual offender imposes severe restrictions on the offender's right to drive an automobile, those restrictions do not amount to a forfeiture. It may well be, as appears to be the case here, that the offender's driver's license has already been suspended at the time his status as a habitual offender is determined. Here, the defendant's third conviction within the relevant five-year period was for driving with a suspended operator's license, so it is particularly difficult to consider that this defendant "forfeited" his license as a result of this proceeding. ORS 484.730 requires that after a determination that the driver is a habitual offender, he surrender to the court all licenses or permits to operate a motor vehicle on the highways of this state. Here, it appears that defendant had none to surrender.

It is equally difficult to characterize this proceeding as an action for a penalty. The Act does not provide a fine or imprisonment as a result of a determination that the driver is a habitual offender:

> " * * * The Act is not intended to punish habitual offenders; there is no such crime as being a habitual offender. The purpose of the Act is to protect the public. * * * " State v. Wells, 27 Or.App. 537, 540, 556 P.2d 727 (1976).

The majority in Norton, in concluding that the legislature intended some statute of limitations to apply to proceedings under the Act, emphasized the provisions of ***623** ORS 484.715 [FN2] and 484.720, [FN3] both of which indicate ****1364** that prompt action be taken at different stages in the enforcement of the Act. However, ORS 484.715 requires prompt action by DMV when it receives an abstract of the second conviction described in ORS 484.705(1)(a) to notify the licensee and to offer the licensee an opportunity to meet with a representative of the division, with two purposes in mind: (1) to make sure the licensee is aware of the Act so that he will be aware of the consequences which may flow from an additional serious traffic offense, and (2) to advise the licensee of the availability of educational programs for driver improvement. It is apparent that the purpose of that statutory requirement is to obviate the necessity of proceeding against the driver as a habitual offender. The Act requires that the notice be given, but it does not require that the licensee accept the invitation to meet with a representative of DMV. That section has nothing to do with the time within which a proceeding must be commenced if the licensee is convicted of the third offense. ***624** The prompt action required by ORS 484.720 applies to the district attorney after he receives the abstract of the driving record of the alleged offender from DMV. Subsection (2) of that statute requires the district attorney to file a complaint under the Act "forthwith." However, there is no such requirement in subsection (1) of that statute with respect to DMV. Perhaps there should be, but there is not. This case involves the delay of DMV in transmitting the abstract to the district attorney. There is no contention that the district attorney did not proceed "forthwith" after receiving it.

FN2. ORS 484.715 provides in pertinent part: "(1) When the division receives an abstract of the conviction or bail forfeiture, under ORS 153.625, and the conviction or bail forfeiture is the second one of those described by ORS 484.705(1)(a) for the convicted person, the division immediately shall notify the licensee and offer the licensee any opportunity of an advisory meeting with a representative of the division. "(2) If the licensee requests a meeting under subsection (1) of this section, the meeting shall be held in the county wherein the licensee resides. At the meeting, the division shall advise the licensee of the provisions of ORS 484.700 to 484.750 and of the availability of educational programs for driver improvement."

FN3. ORS 484.720 provides: "(1) The administrator of the division shall certify in triplicate an abstract of the operating record as maintained by the division, of a habitual offender to the district attorney of the county in which the person resides, as his residence is shown by the records of the division. If the person is not a resident of this state, the record shall be certified to the Attorney General. The certified abstract may be admitted in evidence and shall be prima facie evidence that the person named therein was duly convicted of each offense shown by the abstract. If such person denies any of the facts as stated therein, he shall have the burden of proving that the fact is untrue. "(2) The district attorney upon receiving the abstract shall forthwith file a complaint against the person named therein in the circuit court for the county in which such person resides, charging him with being a habitual offender. If the person is a nonresident of this state, the Attorney General shall file such complaint in the Circuit Court for Marion County."

[3] Whether the legislature intended not to have a period of limitation applicable to proceedings under the Act, or whether the absence of such a limitation period is an oversight, is not so clear as the majority in Norton assumed. Under ORS 484.730, [FN4] there are only two bases on which the court may dismiss the proceedings: (1) if the person before the court is not the person named in the abstract, or (2) if he is not a habitual offender. There is nothing authorizing the court to dismiss for failure to commence the proceedings within a specified time or within a reasonable time.

FN4. ORS 484.730 provides: "If the court finds that the person before the court is not the person named in the abstract, or that he is not a habitual offender, the proceeding shall be dismissed; but if the court finds that the person before the court is the person named in the abstract and that the person is a habitual offender, the court shall so find and by appropriate order direct the person not to operate a motor vehicle on the highways of this state and to surrender to the court all licenses or permits to operate a motor vehicle on the highways of this state for disposal in accordance with ORS 482.470. The clerk of the court shall file with the division a copy of the order whereupon the division shall forthwith revoke the license of the person to operate motor vehicles."

If the failure to include a period of limitations within which proceedings under the ****1365** Act must be commenced is a legislative oversight, we should leave it to the legislature to fill that void. Certainly, it is inappropriate to make a judicial determination that proceedings under the Act are either penal or effect a forfeiture, or both, in order to impose what we think is a reasonable limitation period. [FN5] ***625** To date, such proceedings have been treated as civil proceedings, see State v. Wells, supra; to hold that they are penal in nature in order to impose a two-year statute of limitations may be a case where the medicament is worse than the disease. See Brown v. Multnomah County Dist. Ct., 280 Or. 95, 570 P.2d 52 (1977).

FN5. Notwithstanding the absence of an express limitation period in the Act, there may be circumstances under which the court may determine that it would not effectuate the purposes of the Act to determine that the driver is a habitual offender, because the driver, for a period of more than ten years, for example, after his last conviction has not demonstrated his indifference to the safety and welfare of others and his disrespect for the laws of the state. ORS 484.710(2). That question, however, is not before us here.

Affirmed.

WARREN, Judge, dissenting.

I dissent for the reasons stated in my opinion in State v. Norton, 57 Or.App. 679, 646 P.2d 53 (1982). Warden, Judge, and Rossman, Judge, join in this dissent.

END OF DOCUMENT

STATE of Oregon, Respondent,
v.
Michael Gene NORTON, Appellant.

No. 16-80-06153; CA 19992.

Court of Appeals of Oregon.

Submitted on Records and Briefs Oct. 2, 1981.

Decided June 9, 1982.

In proceeding under Habitual Traffic Offenders Act, the District Court, Lane County, William A. Beckett, J., ruled that defendant was an habitual offender and was barred from operating motor vehicle, and he appealed. The Court of Appeals, Warren, J., held that two-year statute of limitation for actions on a statute for forfeiture or penalty to state or county was applicable to the proceeding.

Reversed.

Buttler, P. J., dissented and filed opinion.

[1] FORFEITURES 1
180k1
"Forfeiture" can be loss of position or personal right, as well as property.
See publication Words and Phrases for other judicial constructions and definitions.

[2] AUTOMOBILES 351.1
48Ak351.1
Formerly 48Ak351
Two-year statute of limitation for actions on a statute for forfeiture or penalty to state or county was applicable to proceeding to bar defendant from operating motor vehicle on ground that he was habitual traffic offender. ORS 12.110(2), 12.250, 484.710, 484.715, 484.720.

***679 **53** Robert T. Chandler and Cornacchia & Chandler, Springfield, filed the brief for appellant.

Dave Frohnmayer, Atty. Gen., William F. Gary, Sol. Gen. and William F. Nessly, Jr., Asst. Atty. Gen., Salem, filed the brief for respondent.

Before BUTTLER, P. J., and WARDEN and WARREN, JJ.

WARREN, Judge.

In this proceeding under the Habitual Traffic Offenders Act, ORS 484.700 to 484.750, defendant appeals from the trial court's ruling that he is a habitual offender.

Under ORS 484.705, a habitual offender is a person who, within a five-year period, accumulates three convictions for any of certain listed traffic offenses, including driving while suspended.

ORS 484.720 provides:

> "(1) The administrator of the division shall certify in triplicate an abstract of the operating record as maintained by the division, of a habitual offender to the district attorney of the county in which the person resides, * * *.
> "(2) The district attorney upon receiving the abstract shall forthwith file a complaint against the person named therein in the circuit court for the county in which such person resides, charging him with being a habitual offender. * * * "

Defendant was convicted of driving while suspended on October 18, 1974, May 15, 1975, and July 5, 1978. It was not until July 7, 1980, that a complaint was filed requesting that defendant be ordered to show cause why he should not be barred as a habitual offender from operating a motor vehicle in Oregon and why his driver's license should not be surrendered to the court. The record before us shows that, despite the fact that the third conviction occurred on July 5, 1978, the abstract was not received by the district attorney until June 25, 1980. There is no explanation for ****54** the Motor Vehicle Division's delay in forwarding the abstract.

Defendant moved to dismiss the complaint on the ground that the action was barred by the statute of limitations. He assigns as error the denial of that motion. He argues that two-year limitation in ORS 12.110(2) should apply to actions brought under the Habitual Traffic Offenders Act. He contends that the loss of driving privileges should be considered a penalty or forfeiture and, because an action under the act accrues upon a person's third conviction within a five-year period, it should be required to be brought within two years of that conviction. The action against defendant was not brought within two years ***682** of his third conviction; therefore, he argues, it should be barred.

The state argues that the loss of driving privileges under the Habitual Traffic Offenders Act is intended to protect the public and lies well beyond the traditional fine, penalty and forfeiture actions contemplated by ORS 12.110(2) and, therefore, should not apply to these actions. Instead, according to the state, under ORS 12.250 there is no statute of limitations applicable to actions under ORS 484.720. ORS 12.250 provides:

> "Unless otherwise made applicable thereto, the limitations prescribed in this chapter shall not apply to actions brought in the name of the state, or any county, or other public corporation therein, or for its benefit."

To accept the state's argument would be to concede that defendant, whose last conviction was on July 5, 1978, could be found to be a habitual offender in the year 2000 or beyond. This position is untenable, particularly in light of the indication in both ORS 484.715 [FN1] and 484.720 that prompt action in the enforcement of the Habitual Traffic Offenders Act is contemplated.

> FN1. ORS 484.715 provides, in pertinent part: "(1) When the division receives an abstract of the conviction or bail forfeiture, under ORS 153.625, and the conviction or bail forfeiture is the second one of those described by ORS 484.705(1)(a) for the convicted person, the division immediately shall notify the licensee and offer the licensee an opportunity of an advisory meeting with a representative of the division.

In State v. Rhoades, 54 Or.App. 254, 634 P.2d 806, rev. den. 292 Or. 232 (1981), we stated that the sanction imposed by the Habitual Traffic Offenders Act was regulatory rather than punitive. In that case, the issue on appeal was whether a defendant in a habitual offender proceeding was entitled to court-appointed counsel. See Brown v. Multnomah County Dist. Ct., 280 Or. 95, 570 P.2d 52 (1977). This court's analysis was, therefore, limited to whether the sanction should be considered to be a criminal sanction, despite the civil nature of the proceeding.

In this case, the issue is not whether or not the sanction is sufficiently punitive in nature to qualify as a *683 criminal sanction, but, rather, whether there are aspects of penalty or forfeiture which would bring the act under the limitations of ORS 12.110(2). This is a different question from the one addressed in Rhoades and the determination in that case does not preclude a finding that the Habitual Traffic Offenders Act does effect a forfeiture or penalty, despite its having a purpose which is, in part, regulatory.

The purpose of the Habitual Traffic Offenders Act is set forth in ORS 484.710:

> "(1) To provide maximum safety for all persons who travel or otherwise use the public highways of this state;
>
> "(2) To deny the privilege of operating motor vehicles on the public highways to persons who by their conduct and record have demonstrated their indifference for the safety and welfare of others and their disrespect for the laws of the state, the orders of her courts and the statutorily required acts of her administrative agencies; and
>
> "(3) To discourage repetition of criminal acts by individuals against the peace and dignity of the state and her political subdivisions and to impose increased and added deprivation of the privilege to operate motor vehicles upon habitual offenders who have been convicted repeatedly **55 of violations of traffic laws." (Emphasis added.)

We do not accept the argument that delay, no matter how extended, will never constitute a bar to an action having these goals. Substantial delay in bringing actions under the Act would subvert its declared purposes. Furthermore, it is apparent that this law does have punitive aspects and can be considered as effecting the forfeiture of an important privilege.

(1, 2) Generally, forfeiture has been defined as divestiture without compensation of property used in a manner contrary to law. See United States v. Eight (8) Rhodesian Stone Statues, 449 F.Supp. 193 (CD Cal.1978). Licenses have not been considered property. However, forfeiture can be loss of position or personal right, as well as property, and the distinction between a right and privilege has been eroded to the point where it is doubtful that any meaningful distinction exists. See Sherbert v. Verner, 374 U.S. 398, 83 S.Ct. 1790, 10 L.Ed.2d 965 (1963); Goldberg v. Kelly, 397 U.S. 254, 90 S.Ct. 1011, 25 L.Ed.2d 287 (1970). Furthermore, the *684 United States Supreme Court has recognized that a licensee has a substantial personal interest in his license to operate a motor vehicle and that loss of that license can work a great hardship. Bell v. Burson, 402 U.S. 535, 539, 91 S.Ct. 1586, 29 L.Ed.2d 90 (1970). Oregon has also recognized that the loss of driving privileges can be a form of regulation or a form of punishment, depending on the legislative purpose. See Brown v. Multnomah County Dist. Ct., supra, 280 Or. at 105, 570 P.2d 52. The loss of driving privileges pursuant to a proceeding under the Habitual Traffic Offenders Act effects both a regulatory and punitive legislative purpose and forfeiture of an important personal privilege. Whether loss of driving privileges under the Habitual Traffic Offenders Act is analyzed as a penalty or a forfeiture, ORS 12.210 is the applicable statute of limitations.

Reversed.

BUTTLER, Presiding Judge, dissenting.

The majority are rightly concerned with the lack of an express period of limitations during which an habitual traffic offender proceeding may be commenced against one who comes within the statutory definition of an habitual offender. ORS 484.705(1). To avoid that "untenable" (at 54) result, they wrench the Habitual Traffic Offender Act into a posture where they can determine that it imposes either a "penalty" or a "forfeiture," or both, thereby bringing into play the two year statute of limitation provided by ORS 12.110(2) for an action on a statute for a penalty or a forfeiture to the state. I do not think the Act imposes either a penalty or a forfeiture, and for this court to hold that it does, in order to cure a perceived defect, may be a case where the medicament is worse than the disease. Accordingly, I dissent.

Reading the Habitual Traffic Offenders Act (ORS 484.700-484.750) as a whole makes it clear that the function of the Act is to determine the status of one who fits the statutory definition of an habitual offender. Once a driver has been judicially determined to have that status, his right to operate motor vehicles in this state is controlled and supervised by the Department of Motor Vehicles. ORS 484.735 provides, in relevant part:

> ***685** "(2) A one-year, renewable probationary license may be issued to a habitual offender if he:
> "(a) Successfully completes a defensive driving course conducted by the division;
> "(b) Continually satisfies the conditions of the probationary license; and
> "(c) Submits a report of a diagnostic examination conducted by a private physician showing to the satisfaction of the State Health Officer that he is physically and mentally competent to drive."
> "(3) The conditions of a probationary license shall include that if a habitual offender is convicted of more than one moving violation within any 12-month period the probationary license shall be revoked and may not be reinstated for one year from the date of last conviction.
> ****56** "(4) The division may establish by rule additional conditions of a probationary license."

Although the status of habitual offender imposes severe restrictions on the offender's right to drive an automobile, those restrictions do not amount to a forfeiture. It may well be, as appears to be the case here, that the offender's driver's license has already been suspended at the time his status as an habitual offender is determined. Here, the defendant's three convictions within the relevant five year period were all for driving with a suspended operator's license, so it is particularly difficult to consider that this defendant "forfeited" his license as a result of this proceeding. ORS 484.730 requires that after a determination that the driver is an habitual offender, he surrender to the court all licenses or permits to operate a motor vehicle on the highways of this state. Here, it appears that defendant had none to surrender.

It is equally difficult to characterize this proceeding as an action for a penalty. The Act does not provide a fine or imprisonment as a result of a determination that the driver is an habitual offender:

> " * * * The Act is not intended to punish habitual offenders; there is no such crime as being a habitual offender. The purpose of the Act is to protect the public. * * * " State v. Wells, 27 Or.App. 537, 540, 556 P.2d 727 (1976).

The majority, in concluding that the legislature intended some statute of limitations to apply to proceedings ***686** under the Act, emphasize the provisions of ORS 484.715 and 484.720, both of which indicate that prompt action be taken at different stages in the enforcement of the Act. However, ORS 484.715 requires prompt action by DMV when it receives an abstract of the second conviction described in ORS 484.705(1)(a) to notify the licensee and to offer the licensee an opportunity to meet with a representative of the division, with two purposes in mind: (1) to make sure the licensee is aware of the Habitual Offenders Act so that he will be aware of the consequences which may flow from an additional serious traffic offense, and (2) to advise the licensee of the availability of educational programs for driver improvement. It is apparent that the purpose of that statutory requirement is to obviate the necessity of proceeding against the driver as an habitual offender. The Act requires that the notice be given, but it does not require that the licensee accept the invitation to meet with a representative of DMV. That section has nothing to do with the time within which a proceeding must be commenced if the licensee is convicted of the third offense.

The prompt action required by ORS 484.720 applies to the district attorney after he receives the abstract of the driving record of the alleged offender from DMV. Subsection (2) of that statute requires the district attorney to file a complaint under the Act "forthwith." However, there is no such requirement in subsection (1) of that statute with respect to DMV. Perhaps there should be, but there is not. This case involves the delay of DMV in transmitting the abstract to the district attorney. The district attorney did proceed "forthwith" after receiving it.

Whether the legislature intended not to have a period of limitation applicable to proceedings under the Act, or whether the absence of such a limitation period is an oversight, is not so clear as the majority assume. Under ORS 484.730, there are only two bases on which the court may dismiss the proceedings: (1) if the person before the court is not the person named in the abstract, or (2) if he is not an habitual offender. There is nothing authorizing the court to dismiss for failure to commence the proceedings within a specified time or within a reasonable time.

If the failure to include a period of limitations within which proceedings under the Act must be commenced *687 is a legislative oversight, we should leave it to the legislature to fill that void. Certainly, it is inappropriate to make a judicial determination that proceedings under the Act are either penal or effect a forfeiture, or both, in order to impose what we think is a reasonable limitation period. To date, such proceedings **57 have been treated as civil proceedings, see State v. Wells, supra ; if the court's opinion today holds that they are penal in nature, the result may be more than the majority bargain for. See Brown v. Multnomah County Dist. Ct., 280 Or. 95, 570 P.2d 52 (1977).

Notwithstanding the absence of an express limitation period in the Act, there may be circumstances under which the court may determine that it would not effectuate the purposes of the Act to determine that the driver is an habitual offender because the driver, for a period of more, say, than 20 years after his last conviction (at 54) has not demonstrated his indifference to the safety and welfare of others and his disrespect for the laws of the state. ORS 484.710(2). That question, however, is not before us here.

As a coda, I should mention that if there has been any prejudice in this case, it has been to the public, not the defendant.

Accordingly, I respectfully dissent.

END OF DOCUMENT

STATE LAND BOARD
v.
LEE ET AL.

Supreme Court of Oregon.

June 6, 1917.

In Banc. Appeal from Circuit Court, Union County; J. W. Knowles, Judge.

Suit by the State Land Board against Mary E. Osborn Lee, formerly Mary E. Osborn, and others. From a decree awarding partial relief, the State Land Board appeals. Decree modified.

****372 *431** This is a suit to foreclose a note and mortgage given to the state land board by George H. Osborn and his wife, Mary E. Osborn. The note is dated October 13, 1902, recites that it is for $700 "borrowed on account ***432** of the irreducible school fund," bears interest at the rate of 6 per cent. per annum, and by its express terms became due "one year after date." The note was secured by a mortgage on 480 acres of land in sections 10 and 15 of a designated township. No payments were made on the principal of the note. Payments were made on the interest from time to time, the last payment being on March 19, 1913, when the interest was satisfied to August 5, 1912.

The land in section 15 was conveyed to E. T. Kaster and C. J. Forsstrom on August 7, 1911, while the remainder of the mortgaged premises was acquired by Ed Lee and F. M. Lee prior to December 20, 1915, when this suit was commenced by the state land board. The present owners of the land purchased with notice of the mortgage; and hence, if the mortgage is enforceable against the mortgagors, it is likewise enforceable against the subsequent purchasers of the land.

The defendants resisted the attempt to foreclose the mortgage by interposing chapter 304, Laws 1913. The statute reads thus:

"Section 1. No mortgage upon real estate now, heretofore or hereafter given, shall be a lien or incumbrance, or of any effect or validity for any purpose whatsoever, after the expiration of 10 years from the date of the maturity of the obligation or indebtedness secured or evidenced by such mortgage, or from the date to which the payment thereof has been extended by agreement of record. If the date of the maturity of such obligation or indebtedness is not disclosed by the mortgage itself, then the date of the execution of such mortgage shall be deemed the date of the maturity of the obligation or indebtedness secured or evidenced by such mortgage.

"Sec. 2. After 10 years have elapsed from the date of the maturity of any mortgage upon real estate, as herein provided in section 1 of this act, such mortgage ***433** shall conclusively be presumed to be paid, satisfied and discharged, and no action, suit or other proceeding shall be maintainable for the foreclosure of the same.

"Sec. 3. This act shall not take effect until the first day of January, A. D. 1914; after which date the same shall be in full force."

The trial court awarded a judgment against the makers of the note for the principal and interest due, an attorney's fee and costs and disbursements; but a decree foreclosing the mortgage was refused on the theory that the lien of the mortgage was released on January 1, 1914. The state land board appealed.

[1] STATES 201
360k201
A state is not bound by statutes of limitation unless express words or necessary implication make it subject to their provisions or restrictions.

[1] **LIMITATION OF ACTIONS 11(1)**
241k11(1)
A state is not bound by statutes of limitation unless express words or necessary implication make it subject to their provisions or restrictions.

[2] **STATES 201**
360k201
Although state is not named, if it appears that it is real party in interest, a limitation statute which does not expressly or by necessary implication include state will not be permitted to operate.

[2] **LIMITATION OF ACTIONS 11(1)**
241k11(1)
Although state is not named, if it appears that it is real party in interest, a limitation statute which does not expressly or by necessary implication include

state will not be permitted to operate.

[3] CONSTITUTIONAL LAW 121(1)
92k121(1)
The state, like a private person, is prohibited from impairing the obligation of a contract entered into by it.

[4] CONSTITUTIONAL LAW 171
92k171
A pure statute of limitation affects remedy, and not debt, and does not impair any obligation imposed by contract.

[5] STATES 201
360k201
Under Laws 1913, pp. 580, 581, §§ 1, 2, 3, ORS 88.110, providing that no mortgage upon real estate shall be a lien or incumbrance after expiration of ten years, etc., does not apply to foreclosure by state land board of mortgage given to secure moneys borrowed from irreducible school fund.

See publication Words and Phrases for other judicial constructions and definitions.

[5] LIMITATION OF ACTIONS 11(1)
241k11(1)
Under Laws 1913, pp. 580, 581, §§ 1, 2, 3, ORS 88.110, providing that no mortgage upon real estate shall be a lien or incumbrance after expiration of ten years, etc., does not apply to foreclosure by state land board of mortgage given to secure moneys borrowed from irreducible school fund.

See publication Words and Phrases for other judicial constructions and definitions.

Colon R. Eberhard, of La Grande, and Geo. M. Brown, Atty. Gen. (I. H. Van Winkle, Asst. Atty. Gen., on the brief), for appellant. C. H. Finn, of La Grande (R. J. Kitchen, of La Grande, on the brief), for respondents.

**373 HARRIS, J. (after stating the facts as above).

It is conceded that the payment of interest tolled the statute of limitations as against the note, and that therefore the plaintiff is entitled to a judgment for whatever sums may be due on the note. Section 25, L. O. L. The defendants contend, however, that chapter 304, Laws 1913, bars the plaintiff from enforcing the lien of the mortgage. The parties did not make any agreement of record extending the time for payment; more than 10 years expired from the date of the *434 maturity of the note before the commencement of this suit; and hence the mortgage cannot be foreclosed if chapter 304, Laws 1913, is available to the defendants, although the note which the mortgage was designed to secure can be reduced to a money judgment. The question for final decision is whether the statute applies to mortgages given to secure moneys borrowed from the irreducible school fund. The defendants argue that chapter 304 is a statute of limitation, and that the language of the enactment is sufficiently comprehensive to embrace mortgages given to the state land board to secure money borrowed from the irreducible school fund. The plaintiff contends that this is in reality a suit by the state, and that, if chapter 304 is assumed to be a statute of limitation, it does not embrace the state for the reason that the state is neither expressly mentioned nor included by necessary implication.

[1] Stated in broad terms, it is a rule of universal recognition that the government is not included in a general statute of limitation, unless it is expressly or by necessary implication included. This rule is said to be founded upon the legal fiction expressed in the maxim, "Nullum tempus occurrit regi." However, it is not necessary to predicate this salutary precept upon any fiction, since sound reason for the rule is found in the fact that as a matter of public policy it is necessary to preserve public rights, revenues, and property from injury and loss by the negligence of public officers. State v. Warner Valley Stock Co., 56 Or. 283, 308, 106 Pac. 780, 108 Pac. 861; United States v. Nashville, C. & St. L. Ry. Co., 118 U. S. 120, 6 Sup. Ct. 1006, 30 L. Ed. 81; Catlett v. People, 151 Ill. 16, 37 N. E. 855; State v. Fleming, 19 Mo. 607; Blazier v. Johnson, 11 Neb. 404, 9 N. W. 543; Gibson v. Chouteau, *435 13 Wall. 92, 20 L. Ed. 534; State v. School Dist., 34 Kan. 237, 8 Pac. 208; Buswell on Limitations and Adverse Possession, § 97; 19 A. & E. Ency. Law (2d Ed.) 188; 25 Cyc. 1006; 36 Cyc. 1171.

For the purpose of avoiding the common-law rule exempting the government from limitation statutes, the Legislature passed a statute in 1862 which provided that:

"The limitations prescribed in this title, shall apply to actions brought in the name of the state, or any county or other public corporation therein, or for its benefit, in the same manner as to actions by private parties." Section 13, Deady's Code.

This statute remained unchanged until 1903, when the Legislature amended it so as to read thus:

"The limitation prescribed in this title shall not apply to actions brought in the name of the state, or any county, or other public corporation therein, or for its benefit. * * *" Section 13, L. O. L.

Another section provided that a suit shall only be commenced within the time limited to commence an action. Section 391, L. O. L. From 1862 until 1903 statutes of limitation applied to the state and private persons alike, for the sole reason that the state, acting through its Legislature, had expressly consented that limitation statutes be made applicable to the commonwealth.

That the Legislature recognized the existence of the common-law rule exempting the government is conclusively proved by the passage of the act of 1862, because, if the common-law rule did not at that time prevail in this jurisdiction, then the enactment of the statute of 1862, so far as made applicable to the state, was a work of supererogation; and, moreover, whenever the courts applied the bar of a statute of limitation to an action *436 prosecuted by the state, they did so only because the limitation statute had been made applicable to the state by an express legislative enactment. State v. Baker, 24 Or. 141, 146, 33 Pac. 530; Schneider v. Hutchinson, 35 Or. 253, 254, 57 Pac. 324, 76 Am. St. Rep. 474; Wallowa County v. Wade, 43 Or. 253, 260, 72 Pac. 793; State v. Portland Gen. Elec. Co., 52 Or. 502, 515, 95 Pac. 722, 98 Pac. 160; State v. Warner Val. Stock Co., 56 Or. 283, 308, 106 Pac. 780, 108 Pac. 861; Silverton v. Brown, 63 Or. 418, 424, 128 Pac. 45; State v. Warner Val. Stock Co., 68 Or. 466, 471, 137 Pac. 746. Had the Legislature merely repealed section 13 in 1903, the repeal would of itself have restored the common-law rule which had been suspended since 1862 (State ex rel. Goodman v. Halter, 149 Ind. 292, 47 N. E. 665, 49 N. E. 7); but the common-law rule was first revived and then reinforced by an express legislative declaration that statutes of limitation shall not apply to actions brought in the name of the state or for its benefit. The history of section 13 is helpful in ascertaining the legislative purpose concerning the statute of 1913. In 1862 the state adopted the policy of submitting itself to limitation statutes, but subsequently in 1903 the state concluded that a different policy would be better and accordingly declared that it would no longer submit itself to limitation statutes. Chapter 304, Laws 1913, does not contain any words expressly including the state nor does its language necessarily imply that the state is included. When viewed in the light of the previously declared policy of the state, the act of 1913 is devoid of any suggestion whatever, and much less a necessary implication that the state is included.

**374 [2] Although the state is not a party plaintiff eo nomine, nevertheless, if the suit is in truth for the benefit of *437 the state, and if it is the real party in interest, a statute of limitation will not operate against the commonwealth. Even in the absence of a statute like section 13, L. O. L., the court will examine the record, and if it appears that the state is the real party in interest, a limitation statute which does not expressly or by necessary implication include the government will not be permitted to operate against the state. State Bank v. Brown, 1 Scam. (2 Ill.) 106; Commonwealth v. Baldwin, 1 Watts (Pa.) 54, 26 Am. Dec. 33; Glover v. Wilson, 6 Pa. 290; Eastern State Hospital v. Graves, 105 Va. 151, 52 S. E. 837, 3 L. R. A. (N. S.) 746, 8 Ann. Cas. 701; Black v. Chicago, B. & Q. R. Co., 237 Ill. 500, 86 N. E. 1065; People v. Kerber, 152 Cal. 731, 93 Pac. 878, 125 Am. St. Rep. 93; Sixth Dist. Agr. Ass'n v. Wright, 154 Cal. 119, 97 Pac. 144; United States v. Beebe, 127 U. S. 338, 8 Sup. Ct. 1083, 32 L. Ed. 121; State ex rel. Goodman v. Halter, 149 Ind. 292, 47 N. E. 665, 49 N. E. 7; Hill v. Josselyn, 13 Smedes & M. (Miss.) 597; Wasteney v Schott, 58 Ohio St. 410, 51 N. E. 34.

Having determined that chapter 304, Laws 1913, does not include the state, and having concluded that, if the state is the real party in interest, the statute is not available to the defendants, even though the state land board is the nominal plaintiff, we must now direct attention to the origin and functions of the state land board and to the history of the irreducible school fund in order to discover whether this suit is for the benefit of the state.

The act of Congress approved February 14, 1859,

c. 33, 11 Stat. 383, admitting Oregon to statehood, offered to the commonwealth sections 16 and 36 in every township of public lands in the state for the use of schools. Article 8, § 2, of the state Constitution provides that:

> "The proceeds of all the lands which have been, or hereafter ***438** may be, granted to this state, for educational purposes; * * * all the moneys and clear proceeds of all property which may accrue to the state by escheat or forfeiture;" and all moneys derived from other specified sources "shall be set apart as a separate and irreducible fund, to be called the common school fund, the interest of which, together with all other revenues derived from the school land mentioned in this section, shall be exclusively applied to the support and maintenance of common schools in each school district, and the purchase of suitable libraries and apparatus therefor."

Section 3 of the same article directs the Legislature to provide by law for the establishment of a uniform and general system of common schools. Section 4 commands that provision shall be made by law for the distribution of the income of the common school fund among the several counties of the state; and section 5, so far as material here, reads thus:

> "The Governor, secretary of state, and state treasurer shall constitute a board of commissioners for the sale of school * * * lands, and for the investment of the funds arising therefrom, and their powers and duties shall be such as may be prescribed by law. * * *"

By the terms of section 3882, L. O. L., the Legislature declared that the Governor, secretary of state, and state treasurer "are hereby made a board of commissioners for the sale of state lands, and for the investment of the funds arising therefrom, and shall be styled the 'state land board."' Section 3913, L. O. L., provides that the irreducible school fund of this state shall be composed of moneys derived from specified sources. The state land board is required by sections 3914, 3915, L. O. L., to loan all moneys belonging to the irreducible school fund, and the board is commanded ***439** to secure such loans by notes and mortgages "to the state land board on real estate in this state." Section 3926, L. O. L., makes it the duty of the state land board to foreclose all mortgages taken to secure loans from the school fund whenever more than one year's interest is due and unpaid.

By the terms of the Constitution the Governor, secretary of state, and state treasurer are made a board of commissioners for the sale of school lands and for the investment of the funds arising from such lands; and the powers and duties of the board "shall be such as may be prescribed by law." The Legislature has given the board a name by calling it the state land board, and, acting on the authority of the Constitution, has prescribed the powers and duties of the board. Every power conferred upon the board and every duty imposed upon it, whether conferred or imposed by the Constitution or legislative enactment, is for the direct benefit of the state. The state land board exists for the sole purpose of serving the state. Every attribute given to it and every function performed by it is for the benefit of the commonwealth. The state land board is the land department of the state. It is not an inferior board, but it is created by the Constitution and is a co-ordinate department of the state government. Corpe v. Brooks, 8 Or. 223, 225; Robertson v. State Land Board, 42 Or. 183, 187, 189, 70 Pac. 614; Miller v. Wattier, 44 Or. 347, 351, 75 Pac. 209; Warner Val. Stock Co. v. Morrow, 48 Or. 258, 262, 86 Pac. 369; State v. Warner Val. Stock Co., 56 Or. 283, 303, 106 Pac. 780, 108 Pac. 861; De Laittre v. State Land Board (C. C.) 149 Fed. 800. Manifestly the state land board is acting for the benefit of the state, and the latter is the real party in interest.

***440** The defendants proceed with their argument by contending that, even though it is assumed that the state is the real party in interest, nevertheless, when the state loans money, it strips itself of the prerogatives attaching to sovereignty and acts in a purely proprietary capacity, subject to all the rules governing private parties. The defendants ****375** are relying upon precedents which do not apply to the instant case. If it be assumed that the state land board is a private corporation and that the state is a mere creditor of the board, then cases like Calloway v. Cossart, 45 Ark. 81, might be available to the defendants. Cases where the state is the real party in interest are widely different from those where the state is a mere creditor of a party who is both the nominal and real party to a legal proceeding. Bank of United States v. Planters' Bank, 9 Wheat. 904, 6 L. Ed. 244; Bank of United States v. McKenzie, Fed. Cas. No. 927. See, however, Glover v.

Wilson, 6 Pa. 290; State ex rel. Goodman v. Halter, 149 Ind. 292, 47 N. E. 665, 49 N. E. 7; and Buswell on Limitations and Adverse Possession, 150. Again, if it be assumed that, prior to the time fixed by the note as the date of its maturity, the Legislature had passed a statute shortening the period for the maturity of the note, or if a law had been enacted prescribing that the interest should be paid monthly instead of semiannually as stipulated in the note, then the defendant might be able to rely upon adjudications like Davis v. Gray, 16 Wall. 203, 21 L. Ed. 447; Hall v. Wisconsin, 103 U. S. 5, 26 L. Ed. 302; Patton v. Gilmer, 42 Ala. 548, 94 Am. Dec. 665; Chapman v. State, 104 Cal. 690, 38 Pac. 457, 43 Am. St. Rep. 158; Carr v. State, 127 Ind. 204, 26 N. E. 778, 11 L. R. A. 370, 22 Am. St. Rep. 624; People v. Stephens, 71 N. Y. 527; Boston Molasses Co. v. ***441** Commonwealth, 193 Mass. 390, 79 N. E. 827.

[3][4] The state, like a private person, is prohibited from impairing the obligation of a contract entered into by it. A pure limitation statute does not operate upon the contract itself, and hence does not impair any obligation imposed by a contract; but a statute of limitation only affects the remedy and does not act upon the debt. Anderson v. Baxter, 4 Or. 105, 113; Kaiser v. Idleman, 57 Or. 224, 228, 108 Pac. 193, 28 L. R. A. (N. S.) 169; Sturges v. Crowninshield, 4 Wheat. 122, 4 L. Ed. 529; Bronson v. Kinzie, 1 How. 311, 11 L. Ed. 143; Waltermire v. Westover, 14 N. Y. 16; 6 R. C. L. 367. Cases where, independent of any statute of limitation, the equitable defense of laches has been recognized, are also distinguishable from questions arising out of chapter 304, Laws 1913.

[5] When the state loans money belonging to the irreducible school fund, it does not act in a proprietary capacity stripped of the attributes of sovereignty; but, on the contrary, it is performing a duty enjoined upon it by law and is acting for the public. The state is expressly commanded by the Constitution to provide for the establishment of a uniform and general system of common schools; and, furthermore, the Constitution commands that the school funds derived from specified sources shall be irreducible, and that the interest shall be applied exclusively to the support of the common schools. The state does not loan the money for a private purpose, but the moneys are loaned in order that revenue may be obtained to educate the children, upon whom in after years will largely depend the welfare and stability of the commonwealth. This is a public purpose of the highest type. The title to the funds is vested in the state in its sovereign capacity; the state is not a mere dry trustee, but it holds the ***442** funds in trust for the common schools of the state, and hence in trust for a public purpose; and therefore chapter 304, Laws 1913, cannot bar the foreclosure of mortgages given to secure moneys borrowed from the irreducible school fund. State v. Chadwick, 10 Or. 423, 428; Lawrey v. Sterling, 41 Or. 518, 531, 69 Pac. 460; Alexander v. Knox, 6 Sawyer, 54, 59, Fed. Cas. No. 170; Black v. Chicago, B. & Q. R. Co., 237 Ill. 500, 505, 86 N. E. 1065; United States v. Beebe, 127 U. S. 338, 342, 8 Sup. Ct. 1083, 32 L. Ed. 121; State ex rel. Goodman v. Halter, 149 Ind. 292, 297, 47 N. E. 665, 49 N. E. 7; Hill v. Josselyn, 13 Smedes & M. (Miss.) 597; United States v. Nashville, etc., Ry. Co., 118 U. S. 120, 6 Sup. Ct. 1006, 30 L. Ed. 81.

The plaintiff is entitled to the money judgment awarded by the trial court, and also to a decree foreclosing the mortgage. The decree appealed from will be modified to conform to the conclusions herein expressed.

END OF DOCUMENT

Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
811 SW Sixth Avenue
Portland, OR 97204-1390
(503) 229-5696
TDD (503) 229-6993

State of Oregon
Department of Environmental Quality
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OFFICE OF THE DIRECTOR

November 24, 1998

Christopher L. Reive
Bogle & Gates
200 S.W. Market Street, Suite 600
Portland OR 97201-5793

RE: Staff Jennings, Inc.
Case No. UT-NWT-96-274A

Dear Mr. Reive:

Per your request dated November 17, 1998, your request for an extension to the deadline to submit your reply brief in the above referenced matter has been approved. The deadline for the submittal is now December 1, 1998.

If you should have any questions, please feel free to contact Susan Greco at (503) 229-5213.

Sincerely,

Carol Whipple
Carol Whipple
Chair, Environmental Quality Commission

cc: Chris Rich, NWR

Attachment C - 1 page.

1859

Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
811 SW Sixth Avenue
Portland, OR 97204-1390
(503) 229-5696
TDD (503) 229-6993

November 2, 1998

Christopher L. Reive
Bogle & Gates
200 S.W. Market Street, Suite 600
Portland OR 97201-593

RE: Case No. UT-NWR-98-274A

Dear Mr. Reive:

On October 30, 1998, the Environmental Quality Commission received the Department's Answering Brief in the above referenced matter. Pursuant to OAR 340-11-132(4)(c), you may file a reply brief within twenty days (November 19, 1998). Once you file your reply brief, this matter will be scheduled for Commission consideration at a regularly scheduled meeting.

If you should have any questions regarding these procedures, please feel free to call me at (503) 229-5213 or (800) 452-4011 ext. 5213 within the state of Oregon.

Sincerely,

Susan M Greco

Susan M. Greco
Rules Coordinator

cc: Chris Rich, NWR

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1859

Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
Northwest Region
2020 SW Fourth Avenue
Suite 400
Portland, OR 97201-4987
(503) 229-5263 Voice
TTY (503) 229-5471

November 2, 1998

Susan Greco, Rules Coordinator
811 S.W. 6th Avenue
Portland, Oregon 97204

Dear Ms. Greco:

Upon reviewing the final draft of the Department's Reply Brief that was filed with the Commission last week in the Staff Jennings matter, I identified one or two non-substantive clerical errors in the Background section that should have been corrected prior to filing. To make sure the Department's points are clear, please replace this section with the enclosed pages. Thank you.

Sincerely,

Christopher W. Rich
Environmental Law Specialist

cc: Christopher Reive, Bogle & Gates

State of Oregon
Department of Environmental Quality
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Attachment E- 4 pages

BEFORE THE ENVIRONMENTAL QUALITY COMMISSION

OF THE STATE OF OREGON

IN THE MATTER OF: STAFF JENNINGS, INC., Appellant.	)	REPLY TO APPELLANT'S BRIEF No. UT-NWR-98-274A MULTNOMAH COUNTY

INTRODUCTION

The Department of Environmental Quality ("Department" or "DEQ"), replies to Appellant Staff Jennings, Inc.'s ("Staff Jennings") Brief, and asks the Environmental Quality Commission ("Commission") to uphold the Hearing Officer's Final Order and Judgment (Hearing Order) in the above matter. The Department bases this request on the following points:

1. The Hearing Officer correctly found that Staff Jennings violated ORS 468B.025 by causing pollution of waters of the state, and properly upheld the $8,400 civil penalty.

2. The Hearing Officer correctly found that Staff Jennings failed to initiate and complete the investigation or cleanup of a petroleum release from an underground storage tank (UST).

3. The statute(s) of limitations cited by Appellant do not apply to the violations cited in the above referenced enforcement action. Even if the Commission determines that a statute of limitations applies, the violations occurred well within the two or three year time frame contained in the statutes.

BACKGROUND

On October 20, 1988, Staff Jennings notified the Department of a petroleum release from an UST at the Staff Jennings Marina, a retail boat sales and maintenance facility located on the west bank of the Willamette River.[1] The report indicated that petroleum from this release caused soil contamination and resulted in a discharge of free petroleum product to the Willamette River. In

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[1] *See* Hearing Exhibit 5: October 20, 1988 DEQ Petroleum Release Form.

March of 1989, Staff Jennings' consultant, Golder Associates, submitted a "Report of Findings, Preliminary Field Investigation" which confirmed significant downgradient contamination in the soils and groundwater in contact with the Willamette River, and recommended a remediation plan to clean up the contaminaiton.[2] DEQ Engineer, Loren Garner, visited the Staff Jennings Marina in November of 1989 and met with Golder Associates to discuss options for a remedial system capable of cleaning up the contamination.[3]

In January of 1990, Golder Associates submitted a report to DEQ confirming the presence of free product in groundwater at the Staff Jennings Marina, and proposing a specific design for a remedial system to clean up the contamination and prevent further migration of petroleum into the Willamette River.[4] DEQ staff reviewed the proposed plans, provided comments, and agreed to the proposed remedial approach. Staff Jennings' consultant acknowledged DEQ's comments and notified the agency in April of 1990 that Staff Jennings planned to move forward with implementation of the remedial system.[5] At this time, DEQ had only one field staff position to address cleanup of contaminated UST sites in the region. Because Staff Jennings gave every indication that it intended to move forward with a remedial system in 1990, the Department concentrated its limited resources on other sites at that time.

Staff Jennings did not move forward and install a remedial system in 1990.[6] In fact, Staff Jennings did not conducted further investigation or cleanup activities between April of 1990 and March of 1994.[7] During this period, the Department contacted Staff Jennings at least five times to discuss the need to conduct remediation and additional investigation since the contamination

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[2] *See* p.14 of Golder Associates' 1989 report "Report of Findings," attached.

[3] Note that by this time the more specific UST Cleanup rule requirements of OAR 340-122-205 through 340-122-260 had been in effect since November 9, 1988.

[4] *See* Golder Associates' 1989 report "Report of Findings," attached.

[5] *See* April 4, 1990 letter from Golder Associates to Loren Garner, DEQ, (Hearing Exhibit 10). *See also* Hearing Transcript, p. 90, lines 10-14 (indicating Staff Jennings knew in 1990 that a remediation system was necessary to abate further discharges into the Willamette River).

[6] See Hearing Transcript, p. 90, lines 10-24 (indicating Staff Jennings chose not to move forward primarily because it did not believe that the site was a high priority for DEQ).

[7] Note that the investigation requirements of OAR 340-122-242 were effective as of October of 1992)

plume might have changed/migrated during the preceding years.[8] The Department specifically raised the need to conduct investigation and cleanup activities in compliance with the UST groundwater cleanup provisions in Oregon Administrative Rule (OAR) 340-122-242.[9]

In March of 1994, Staff Jennings' consultant, De Minimis, Inc., submitted a "Limited Subsurface Soil and Groundwater Investigation" report that confirmed existing high levels of soil and groundwater contamination at the site. DEQ notified Staff Jennings in April and December of 1994 that Staff Jennings must conduct site investigation and corrective action under OAR 340-122-242.[10] In response to DEQ's April 5, 1994 letter Staff Jennings informed DEQ that it intended to decommission tanks and conduct remediation between October 15, 1994 and February of 1995.[11] In November of 1995, DEQ Environmental Specialist, Rick Silverman, met with Staff Jennings' President and consultant at the Staff Jennings Marina. DEQ clearly informed Staff Jennings that petroleum contamination continued to enter the Willamette River from the site, and that groundwater monitoring wells must be installed in the winter of 1995 and that a remedial system to abate the discharge must be installed by October of 1996.[12]

When Staff Jennings did not make active progress toward installing a remedial system[13] or installing groundwater monitoring wells, the Department issued a Notice of Noncompliance on November 7, 1996, which resulted in a Notice of Civil Penalty Assessment and Remedial Action Order, issued on March 7, 1997.

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[8] *See, e.g.,* Hearing Exhibit 11; Hearing Exhibit 12; Testimony of Tom Roick, Hearing Transcript, p. 27, lines 11-28; Testimony of Rich Rose, Hearing Transcript, p. 30, lines 11-28, and p. 31, lines 1-15.

[9] OAR 340-122-242 (filed & effective on October 1, 1992); *See also* Testimony of Rich Rose, Hearing Transcript, p. 30, lines 11-28, and p. 31, lines 1-15.

[10] *See* Hearing Exhibit 17: December 21, 1994 letter from Rick Silverman to Staff Jennings; Hearing Exhibit 14: April 5, 1994 letter from Rick Silverman to Staff Jennings.

[11] *See* Hearing Exhibit 15.

[12] *See* Hearing Exhibit 18.

[13] Staff Jennings, on page 3 of in its Brief, indicates that it was delayed from complying with the deadlines for investigation and installation of a remedial system because it had difficulty obtaining access to adjacent properties. It should be noted that the presence or lack of off-site contamination did not prevent Staff Jennings from installing a remedial system to address known contamination from Staff Jennings' confirmed release.

BEFORE THE ENVIRONMENTAL QUALITY COMMISSION

OF THE STATE OF OREGON

IN THE MATTER OF: **STAFF JENNINGS, INC.**, Appellant.	REPLY TO APPELLANT'S BRIEF No. UT-NWR-98-274A MULTNOMAH COUNTY

INTRODUCTION

The Department of Environmental Quality ("Department" or "DEQ"), replies to Appellant Staff Jennings, Inc.'s ("Staff Jennings") Brief, and asks the Environmental Quality Commission ("Commission") to uphold the Hearing Officer's Final Order and Judgment (Hearing Order) in the above matter. The Department bases this request on the following points:

1. The Hearing Officer correctly found that Staff Jennings violated ORS 468B.025 by causing pollution of waters of the state, and properly upheld the $8,400 civil penalty.

2. The Hearing Officer correctly found that Staff Jennings failed to initiate and complete the investigation or cleanup of a petroleum release from an underground storage tank (UST).

3. The statute(s) of limitations cited by Appellant do not apply to the violations cited in the above referenced enforcement action. Even if the Commission determines that a statute of limitations applies, the violations occurred well within the two or three year time frame contained in the statutes.

BACKGROUND

On October 20, 1988, Staff Jennings notified the Department of a petroleum release from an UST at the Staff Jennings Marina, a retail boat sales and maintenance facility located on the west bank of the Willamette River.[1] The report indicated that petroleum from this release caused soil contamination and resulted in a discharge of free petroleum product to the Willamette River. In

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[1] *See* Hearing Exhibit 5: October 20, 1988 DEQ Petroleum Release Form.

Attachment F - 109 pages

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Staff Jennings did not move forward and install a remedial system in 1990.[6] In fact, Staff Jennings did not conducted further investigation or cleanup activities between April of 1990 and March of 1994.[7] During this period, the Department contacted Staff Jennings at least five times to discuss the need to conduct remediation and additional investigation since the contamination

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[6] See Hearing Transcript, p. 90, lines 10-24 (indicating Staff Jennings chose not to move forward primarily because it did not believe that the site was a high priority for DEQ).

[7] Note that the investigation requirements of OAR 340-122-242 were effective as of October of 1992

plume might have changed/migrated during the preceding years.[8] The Department specifically raised the need to conduct investigation and cleanup activities in compliance with the UST groundwater cleanup provisions in Oregon Administrative Rule (OAR) 340-122-242.[9]

In March of 1994, Staff Jennings' consultant, De Minimis, Inc., submitted a "Limited Subsurface Soil and Groundwater Investigation" report that confirmed existing high levels of soil and groundwater contamination at the site. DEQ notified Staff Jennings in April and December of 1994 letter that Staff Jennings must conduct site investigation and corrective action under OAR 340-122-242.[10] In response to DEQ's April 5, 1994 Staff Jennings informed DEQ that it intended to decommission tanks and conduct remediation between October 15, 1994 and February of 1995.[11] In November of 1995, DEQ Environmental Specialist, Rick Silverman, met with Staff Jennings' President and consultant at the Staff Jennings Marina. DEQ clearly informed Staff Jennings that petroleum contamination continued to enter the Willamette River from the site, and that groundwater monitoring wells must be installed in the winter of 1995 and that a remedial system to abate the discharge must be installed by October of 1996.[12]

When Staff Jennings did not make active progress toward installing a remedial system[13] or installing groundwater monitoring wells, the Department issued a Notice of Noncompliance on November 7, 1997, which resulted in a Notice of Civil Penalty Assessment and Remedial Action Order, issued on March 7, 1997.

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[9] OAR 340-122-242 (filed & effective on October 1, 1992); *See also* Testimony of Rich Rose, Hearing Transcript, p. 30, lines 11-28, and p. 31, lines 1-15.

[10] *See* Hearing Exhibit 17: December 21, 1994 letter from Rick Silverman to Staff Jennings; Hearing Exhibit 14: April 5, 1994 letter from Rick Silverman to Staff Jennings.

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DISCUSSION

A. Staff Jennings Violated ORS 468B.025(1)(a) by Causing Pollution of Waters of the State.

In its Brief, Staff Jennings argues that the discharge of petroleum into the Willamette River from the adjacent contaminated soil and groundwater at the Staff Jennings Marina did not constitute repeated/daily violations of ORS 468B.025(1)(a).[14] Staff Jennings claims that the violation was complete after the initial release occurred in October of 1988 because the waste had already been "placed...in a location where such wastes are likely to escape or be carried into the waters of the state by any means.[15]" This argument raises a statute of limitations claim (which is address in section C of this Reply Brief), and an assertion that the violation was not repeated between 1988 and 1997. These arguments fail as a matter of law for the reasons set forth below.

Staff Jennings mischaracterizes the Department's application of ORS 468B.025(1)(a). This statute reads:

> "**468B.025 Prohibited Activities.** (1) Except as provided in ORS 468B.050, no person shall:
> (a) Cause pollution of any waters of the state ***or*** cause to be placed any wastes in a location where such wastes are likely to escape or be carried into the waters of the state by any means." (emphasis added).

The Department cited Staff Jennings for "[*causing*] pollution of...waters of the state," not for causing waste "...to be *placed*...in a location likely to escape into waters of the state" which is a distinct violation included in ORS 468B.025(1)(a). Thus, Staff Jennings' focus on placement of waste is not relevant to this action.

The Hearing Officer ultimately concluded that "Staff Jennings caused the pollution of state waters"[16] because it allowed the ongoing discharge of dissolved petroleum into the Willamette River. ORS 468B.025(1)(a) is a strict liability statute, and thus Staff Jennings was

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[14] Appellant's Brief, p.4, footnote No. 17.

[15] Citing, in part, ORS 468B.025(1)(a), in effect since the initial 1988 release.

[16] Hearing Order, p. 3, attached.

strictly responsible for "causing" the discharge (i.e., producing the result or consequence). Staff Jennings admits that it was responsible for the UST from which the initial release occurred. The hearing record provides a magnitude of evidence that, after 1988, dissolved petroleum from the Staff Jennings Marina entered the Willamette River on an ongoing basis.[17] Staff Jennings does not dispute the fact that a petroleum discharge constitutes "pollution" under ORS 468B.005(3).[18] The Willamette River clearly qualifies as "waters of the state" as defined by ORS 468B.005(8).[19]

Fundamentally, Staff Jennings had a duty to install a remedial system capable of preventing the ongoing discharge of petroleum into the Willamette River. As early as 1989 and 1990, Staff Jennings' consultant, Golder Associates, designed a remedial system capable capturing petroleum before it entered the river, and notified DEQ that Staff Jennings intended to install this system.[20] In November of 1995, DEQ gave Staff Jennings a reasonable deadline to install a system by October of 1996.[21] Despite this notice, Staff Jennings failed to install a remedial system and thus continued releasing petroleum into the Willamette River. For these reasons, the Hearing Officer concluded that:

> **"Clearly, Staff Jennings was responsible for maintaining its property in such a manner so as to avoid causing pollution of state waters."** Hearing Order, p. 4 (emphasis added).
>
> **"As of February 1989, Staff Jennings was on notice that there was petroleum comtamination in the soil that was discharging in the Willamette River. Despite**

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[17] *See* Transcript of Hearing, testimony of Loren Garner, pp. 15-16, lines 12-43 and lines 1-21, respectively; Transcript of Hearing, testimony of Tom Roick, p. 27, lines 17-42; Transcript of Hearing, testimony of Rick Silverman, p. 39, lines 7-27. *See also*, Golder Associates' "Report of Findings," pp. 3, 6, 9, 14, attached; Golder Associates' "Remediation Design for Sellwood Marina," pp. 2 & 3, attached.

[18] "Pollution" includes the "discharge of any...substance...which will or tends to render such waters harmful, detrimental or injurious...wildlife, fish or other aquatic life or the habitat thereof." ORS 468B.005(3).

[19] The definition of "the waters of the state" includes "rivers." 468B.005(8).

[20] *See* April 4, 1990 letter from Golder Associates, attached; 1989 Golder Associates' 1989 report "Report of Findings," attached; Golder Associates' 1990 report "Remediation Design for Sellwood Marina."

[21] Hearing Exhibit 18: November 11, 1995 Field Inspection Log prepared by Rick Silverman.

> **this information, it failed to take reasonable action, e.g., remediation, to avoid contamination of the river."** Hearing Order, p. 4 (emphasis added).
>
> **"However, in 1995, Staff Jennings was put on notice that it needed to move forward with the implementation of a remediation plan. As of March 7, 1997, the date of the Notice of Civil Penalty Assessment and Remedial Action Order, Staff Jennings had not complied with its statutory obligation. Given the circumstances, a penalty is warranted."** Hearing Order, p. 4 (emphasis added).
>
> **"DEQ has the burden of establishing a violation by a preponderance of the evidence. Based on the evidence presented, DEQ has met its burden. The penalty assessed is appropriate.** Hearing Order, p. 4 (emphasis added).

The Hearing Officer, after reviewing all evidence on the record, correctly found that Staff Jennings repeatedly and negligently caused pollution of waters of the state for years after the initial release. The $8,400 civil penalty is clearly warranted in this case.

B. Staff Jennings failed to Complete the Investigation or Cleanup of a Petroleum Release from an Underground Storage Tank.

In its Brief, Staff Jennings argues that it did not fail to initiate or complete investigation or cleanup activities under the UST Cleanup rules (OAR 340-122-242). Appellant's argument breaks down into the following four points: 1) a claim that Staff Jennings regulatory duty was limited to the rules in effect at the time of the 1988 initial release, 2) a claim tha DEQ never informed Staff Jennings that it was being reviewed under the UST petroleum release regulations (OAR 340-122-242) as opposed to the Environmental Cleanup Regulations (OAR 340-122-020), 3) a claim that Staff Jennings complied with the applicable rules to the extent it could without a cleanup standard and schedule set by DEQ, and 4) a claim that Staff Jennings did not fail to "initiate" or "complete" the investigaton or cleanup of the release. Each claim fails to merit reversal of the Hearing Officer's finding of violation for the reasons set forth below.

1. Staff Jennings regulatory duty was not limited to regulations in effect at the time of the initial release.

In its Brief, Staff Jennings asserts that the only regulations which controlled the investigation and remediation of the release "were the regulations in effect in 1988" (citing the

"1988 Environmental Cleanup Rules, OAR 340-150-130"[22]). Although Staff Jennings had a duty to comply with OAR 340-150-130 in October of 1988, it was not excused from compliance with all subsequently adopted regulations. Appellant had a regulatory duty to comply with *all* applicable rules of the Commission when "effective. [23]"

The Oregon Administrative Procedures Act (APA), at ORS 183.355(2), states that administrative rules are effective as of the date filed with the Secretary of State, unless otherwise specified in the rule. Thus, the groundwater investigation and cleanup requirements of OAR 340-122-242 applied to Staff Jennings site when effective on October 1, 1992.[24] It is significant to note that Staff Jennings violation of OAR 340-122-242 was not based on a single event that occurred in 1988, but on the site conditions after 1992 (i.e., existing petroleum groundwater contamination[25]) which triggered investigation and cleanup requirements under OAR 340-122-242. Staff Jennings' focus on the initial 1988 release is, therefore, misplaced. Appellants' position that its duty is limited to 1988 rules would effectively nullify the Commission's ability to adopt and refine rules over time, and thus contradicts applicable law.

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[22] Appellant's Brief, p. 8. Appellant incorrectly states that OAR 340-130-150 was an earlier version of the Environmental Cleanup Rules. OAR 340-150-130 was actually part of the general Underground Storage Tank compliance rules in 1988. Staff Jennings also incorrectly states in its Brief, at footnote No. 20, that OAR 340-150-130 was later renumbered to OAR 340-122-020 to 340-122-110 (Environmental Cleanup Rules). In fact, OAR 340-150-130 was replaced in June of 1990 by federal rules (40 CFR 280.70 through 280.74) adopted by reference in the amended OAR 340-150-130. These amendments were essentially identical to provisions of earlier UST Cleanup Rules, OAR 340-122-205 to 340-122-260, adopted in November of 1988, just one month after the initial petroleum release in October of 1988.

[23] "Effective" means that the rule requirements apply to all regulated entities as of the "effective date."

[24] DEQ acknowledges an error in dating the timeframe of the violation of OAR 340-122-242 back to 1988 in the Notice of Assessment of Civil Penalty, as OAR 340-122-242 was not adopted until 1992. However, the Hearings Officer based her finding of violation primarily on Staff Jennings failure to complete investigation activities after receiving Notice from DEQ in 1994 and 1995, and, thus, the finding of violation is valid. *See* also Section C of this Reply Brief, Statute of Limitations discussion.

[25] *See* Hearing Exhibit 13: De Minimis, Inc. March 31, 1994 "Limited Subsurface Soil and Groundwater Investigation," p. 11 (citing significant existing groundwater contamination at the Staff Jennings Marina as of 1994, attached.

2. Staff Jennings Knew that the Investigation and Cleanup Requirements of OAR 340-122-242 Applied to the Release at the Staff Jennings Marina.

Staff Jennings argues in its Brief that "[a]t no time did the DEQ inform Staff Jennings that the release was no longer being reviewed under the Environmental Cleanup Rules OAR 340-122-020] (as opposed to the UST petroleum release regulations including OAR 340-122-242)"[26] and therefore it lacked direction as to its regulatory duties. Staff Jennings' contention lacks both legal and factual bases. First, DEQ never informed Staff Jennings that the Staff Jennings Marina was regulated under the 1988 Environmental Cleanup Rules (OAR 340-122-010 to OAR 340-122-110). This point is significant, because the UST Cleanup Rules (OAR 340-122-205 through 340-122-260) automatically applied to all UST cleanup sites unless DEQ made a specific determination that the Environmental Cleanup Rules should control.[27] Because DEQ made no such determination, Staff Jennings should have known by operation of law that the UST Cleanup Rules applied to investigation and cleanup at the Staff Jennings Marina.

Second, DEQ repeatedly put Staff Jennings on notice that the UST Cleanup Rules (specifically OAR 340-122-242) covered the Staff Jennings Marina investigation and cleanup. In a December 21, 1994 letter, the Department told Staff Jennings it must determine the "lateral and horizontal extent of contamination as outlined in Oregon Administrative Rules (340-122-242)," develop a "corrective action plan (CAP)," and implement a groundwater investigation "including installation of at least three groundwater monitoring wells."[28] The Department also informed Staff Jennings, in an April 5, 1994 letter, to conduct a site investigation as required by OAR 340-122-242.[29] Staff Jennings' own consultant stated in a March 31, 1994 report to Staff Jennings that "[s]ince gasoline contamination was detected in soil samples collected at a depth greater than or equal to the depth of the water table; the

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[26] Appellant's Brief, p. 8.

[27] OAR 340-122-020 (Environmental Cleanup Rules, circa 1988) which were in effect at the time of the Staff Jennings release. DEQ did not notify Staff Jennings that these rules applied to the Staff Jennings cleanup and did not generally apply these rules to UST cleanup sites in 1988.

[28] Hearing Exhibit 17: December 21, 1994 letter from Rick Silverman to Staff Jennings.

[29] Hearing Exhibit 14: April 5, 1994 letter from Rick Silverman to Staff Jennings.

groundwater samples were analyzed...per OAR 340-122-242(3)(a)(A)."[30] Appellant's assertion that it lacked notice of its duty to comply with OAR 340-122-242 is directly contradicted by the facts on record.

3. Staff Jennings did not lack a Cleanup Standard and Schedule.

Staff Jennings also argues in its Brief that it was under no obligation, after notifying DEQ of the release in 1988 and submitting a report to DEQ in 1989, to proceed with further investigation or cleanup. Appellant argues that it complied with the 1988 provisions of OAR 340-150-130(a) and (b), and it could not proceed further without a DEQ determination of a cleanup standard or selected remedial action.[31] The applicable regulations and facts contradict this argument.

As discussed in section 1, above, Staff Jennings' regulatory duty was not limited to the 1988 requirements in OAR 340-150-130, but extended to subsequently adopted regulations. Staff Jennings' sole focus on the 1988 regulations is, therefore, misplaced.[32] The applicable UST Cleanup Rules (OAR 340-122-242, effective October of 1992) set specific numeric groundwater cleanup standards for petroleum UST contaminated sites.[33] Accordingly, as of October 1992, the regulations provided cleanup standards, independent of DEQ direction. Additionally, DEQ repeatedly informed Staff Jennings in writing that it had to comply with OAR 340-122-242, which included numeric cleanup standards.[34] Staff Jennings' consultant prepared a report for Staff Jennings in March of 1994 that identified and listed out the "...basic numeric groundwater cleanup levels for petroleum-contaminated UST sites, as specified in

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[30] Hearing Exhibit 13: March 31, 1994 De Minimis Report, pp. 13-14, attached.

[31] Appellant's Brief, p.5.

[32] Note that even under OAR 340-150-130 (circa 1988), this rule does not state that the responsible party must comply with the four main requirements (i.e., (a) notify DEQ of the release, (b) assess the source and extent of the release, (c) meet with DEQ to set up a cleanup standard and a schedule, (d)and cleanup the release) in linear or chronological order. Nothing in that rule prevented Staff Jennings from moving forward with cleanup while later determine a cleanup standard or schedule.

[33] OAR 340-122-242(4)(a).

[34] *See* footnote nos. 15 & 16, infra.

OAR 340-122-242(4a)."[35] Accordingly, Staff Jennings has no basis to claim that it lacked specific cleanup standards from at lease 1992 forward.

Concerning a schedule for investigation and cleanup, the Hearing Officer found that DEQ gave Staff Jennings deadlines, including: a deadline to schedule the groundwater investigation (by January 23, 1995), a deadline to take borings and groundwater samples (by winter of 1995), and a deadline to install a remedial system (by October 1996).[36] Therefore, Staff Jennings had sufficient notice of an investigation or cleanup schedule.

Independent of DEQ direction, OAR 340-122-242 required Staff Jennings to conduct groundwater investigation and cleanup activities if it found petroleum contaminated groundwater.[37] Staff Jennings' consultants documented groundwater contamination at the site in a series of reports dating from 1989 to 1996,[38] and therefore Staff Jennings should have proceeded forward with investigation and cleanup activities on its own volition.

4. Staff Jennings Failed to "Initiate" and "Complete" Required Investigation and Cleanup Activities.

In its Brief, Staff Jennings argues that it did not "fail to initiate" an investigation of the petroleum release because, in some *general* sense of the term, it "initiated" certain activities including hiring a consulting firm to investigate the 1988 leak from the UST, and submitting a report to DEQ.[39] The Department, however, cited a violation[40] for Staff Jennings' failure to

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[35] See Hearing Exhibit 13: De Minimis, Inc. March 31, 1994 report, p. 14, attached.

[36] Hearing Order, pp. 2-3, paragraph 8, states "In a letter from DEQ, dated December 21, 1994, Staff Jennings was asked to submit a proposed schedule of events for the implementation of the groundwater investigation, ***including the installation of at least three monitoring wells*** by January 23, 1995. As of November 1995, the DEQ representative told Jeff Jennings and the consultant that as long as they were making active progress toward addressing the impact of the release he would not proceed with a notice of noncompliance with a recommendation for civil penalty. He indicated ***the time frame for getting the borings and groundwater samples was during that winter (1995).*** He indicated ***the time frame for installing a remedial system was prior to the following year's rainy season, by October 1996.***" (emphasis added)

[37] OAR 340-122-240(3).

[38] *See* 1989 Golder Associates' 1989 report "Report of Findings," attached; Golder Associates' 1990 report "Remediation Design for Sellwood Marina"; Hearing Exhibit 14: 1994 De Minimis Report, attached; 1996 De Minimis Report, attached.

[39] Appellant's Brief, p.6.

[40] *See* March 7, 1997 Notice of Assessment of Civil Penalty, attached.

both initiate and complete *specific* investigation and cleanup activities required by the UST Cleanup Rules (OAR 340-122-242), including failure to install groundwater monitoring wells, failure to define the extent of contamination, and failure to develop a Corrective Action Plan. It is undisputed that Staff Jennings had not installed groundwater monitoring wells capable of fully defining the extent of contamination, and had not developed a Corrective Action Plan by November 7, 1996, when DEQ issued the Notice of Noncompliance .

The Hearing Officer properly concluded that "[Staff Jennings] failed to ***complete*** the investigation or cleanup of a petroleum release from an underground storage tank"[41] after DEQ gave Staff Jennings adequate notice and deadlines in 1994 and 1995 to conduct certain investigation and cleanup activites. The record fully supports the Hearing Officer's finding that Staff Jennings "failed to initiate" and "failed to complete" requirements of OAR 340-122-242. The Department respectfully requests that the Commission uphold this finding.

C. DEQ's Actions are not Barred by a Statute of Limitations:

In its Brief, Staff Jennings argues that the violation assessed against Staff Jennings under ORS 468B.025, for causing pollution of waters of the state, is barred due to statutes of limitations in ORS chapter 12 (either ORS 12.100(2), ORS 12.110(2) or ORS 12.130). As discussed in the attached Department of Justice "Memorandum of Authorities in Support of DEQ's Reply Brief," the statues of limitations do not apply to this violation as a matter of law.

Even if a two or three year statute of limitations applied to this case, both violations cited in the Departments enforcement action[42] occurred well within the two or three year time frame. The hearing record shows that the violation for causing pollution of waters of the state in violation of ORS 468B.025(1)(a) occurred on an ongoing basis from the 1988 initial release up to and including 1997 when DEQ issued the Notice of Assessment of Civil Penalty.[43] Accordingly, this violation occurred repeatedly within a two or three year time frame. The

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[41] Hearing Order, p. 3.

[42] *See* March 7, 1997 Notice of Assessment of Civil Penalty, attached, which was based on a November 7, 1996 Notice of Noncompliance, attached.

[43] *See* section A of this Reply Brief, p. 5, and footnote no. 17, infra.

Hearing Officer found that, in 1994 and 1995, DEQ directed Staff Jennings to perform certain investigation, cleanup, and abatement tasks, or risk a Notice of Noncompliance.[44] The Hearing Officer ultimately found that Staff Jennings did not meet these deadlines and therefore upheld both violations. This demonstrates that conduct constituting both violations occurred between the time DEQ gave Staff Jennings notice of its regulatory obligations (in December 1994 and November 1995) and the date of the November 7, 1996 Notice of Noncompliance. Accordingly, even if the Commission determines that a two or three year statute of limitations applies to these violations, the actions are not time barred.

CONCLUSIONS

The contested case record clearly demonstrates that Staff Jennings failed to meet its regulatory duty to conduct investigation and cleanup activities as required by the UST Cleanup Rules, OAR 340-122-242, despite reasonable notice and opportunity. Accordingly, the Hearing Officer correctly found that Staff Jennings failed to complete the investigation or cleanup of a petroleum release from an underground storage tank in violation of OAR 340-122-242.

The record also shows that Staff Jennings allowed petroleum from a known source of contamination to enter the Willamette River on an ongoing basis since 1988, despite repeated notice that the law required remediation and prevention of this release. Accordingly, the Heaings Officer correctly found that Staff Jennings negligently caused pollution to waters of the state in violation of ORS 468B.025(1)(a).

For these reasons, the Department respectfully asks that the Commission uphold the Hearing Officers Ultimate Findings and Conclusions.

10/30/98
Date

Christopher W. Rich
Environmental Law Specialist

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[44] Hearing Order, pp. 2-3, section 8.

BEFORE THE ENVIRONMENTAL QUALITY COMMISSION

OF THE STATE OF OREGON

IN THE MATTER OF: STAFF JENNINGS, INC. An Oregon Corporation. Respondent.	)	MEMORANDUM OF AUTHORITIES IN SUPPORT OF DEQ'S BRIEF No. UT-NWR-96-274A Multnomah County

DEQ has requested that the Department of Justice respond on its behalf to a legal issue raised by Respondent regarding the application of statutes of limitations to DEQ's actions against the Respondent.

Specifically, Respondent Staff Jennings, Inc. argues that actions brought against Staff Jennings by DEQ under ORS 468B.025 and OAR 340-122-242 are barred due to statutes of limitations in ORS chapter 12 (either ORS 12.100(2), ORS 12.110(2) or ORS 12.130). Respondent cites no authority for this case proposition. In fact, the statute itself, and all case precedent, contradict Respondent's argument.

In short, the statutes of limitations found in ORS chapter 12 do not apply against the state, unless such limitations are otherwise made applicable to the state's action. The statutes under which DEQ issues civil penalties and remedial orders do not include any statutes of limitations, nor do they make any of the statutes of limitations found in ORS chapter 12 applicable to such actions. Therefore, no statutes of limitations apply against DEQ civil penalty or remedial order actions.

Oregon law exempts state actions from statutes of limitations unless the government is expressly, or by necessary implication, included in the statute. There is a rule of "universal recognition that the government is not included in a general statute of limitations unless it is expressly, or by necessary implication, included." ***State Land Board v. Lee***, 84 Or 431, 434, 165 P 372, 383 (1917). The rule supports the public policy of preserving public rights, revenues and property from injury and loss by the negligence of public officers. *Id.*

ORS 12.250 incorporates this common law rule by providing as follows:

> Unless otherwise made applicable thereto, the limitations prescribed in this chapter shall not apply to actions brought in the name of the state, or any county, or other public corporation therein, or for its benefit.

ORS 12.250.[1]

Referring to ORS 12.250, the Oregon Court of Appeals stated that "the common law rule that statutes of limitations do not apply against government bodies unless they are included expressly or by necessary implication is still in force." ***City of Medford v. Budge-McHugh Supply Co.***, 91 Or App 213, 218, 754 P2d 607, 608 (1988) (holding that the city's product liability claim against a water pipe manufacturer was not barred by the statute of limitations even though the pipes were purchased in 1972 and the complaint was filed in 1986). Thus, unless the statute under which the state proceeds includes a time limitation, the rule expressed in ORS 12.250 against application of statutes of limitations remains operative.

ORS 468B.025 includes no statute of limitations. Similarly, the statutes upon which OAR 340-122-242 are based, primarily ORS chapters 465 and 466, include no pertinent statute of limitations. In addition, none of these key statutes incorporates any of the statutes of limitations found in ORS chapter 12. DEQ issued the civil penalty against Staff Jennings pursuant to ORS 468.126 through 468.140, ORS 183, and OAR 340, Divisions 11 and 12. The Remedial Action Order was issued pursuant to ORS 465.260(4) and 465.255. None of these statutes or regulations contains any statutes of limitations, neither do they

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[1] The Oregon Attorney General has echoed the same position numerous times. *See* 47 Op Atty Gen 214 (1994) (the state sought repayment of lottery monies and the Attorney General found the claim to be one of assumpsit or money had and received to which no laches or time limitations should govern based on general exemption under ORS 12.250); 1985 Opinion Request OP-5845, May 15, 1985 (the state lacks authority to waive collection of past license fees; ORS 12.250 prevents any time limitations against collection); Opinion Request OP 5836, June 27, 1985 (recovering a state tax debt, including penalty and interest, is not subject to any statute of limitations).

indicate that any limitations found in ORS chapter 12 should apply. Therefore, no statutes of limitations apply to DEQ's actions against Staff Jennings.

DATED this 29th day of October, 1998.

Michael B Huston

Michael B. Huston #75189
Assistant Attorney General

MH:kt/MBH0209.PLE

L 4445

STATEWIDE ENFORCEMENT SECT
DEPARTMENT OF ENVIRONMENTAL QUAL
RECEIVE
MAR 19 1998

Hearing Order

BEFORE THE ENVIRONMENTAL QUALITY COMMISSION OF THE STATE OF OREGON

IN THE MATTER OF: **Department of Environmental Quality,** **Department**	)	**HEARING ORDER REGARDING VIOLATION AND ASSESSMENT OF CIVIL PENALTY** **NO. UT-NWR-96-274A**
vs.	)	
Staff Jennings, Inc. **Respondent**	)	**MULTNOMAH COUNTY**

BACKGROUND

The Department of Environmental Quality issued a Notice of Civil Penalty Assessment on March 7, 1997, under Oregon Revised Statutes (ORS) Chapter 183 and 468.126 through 468.140, and Oregon Administrative Rules (OAR) Chapter 340, Divisions 11 and 12. On March 24, 1997, Jeffrey S. Jones, attorney for respondent, Staff Jennings Inc., appealed the Notice and requested a hearing.

A hearing was held on December 3, 1997, in the Department of Environmental Quality (DEQ) offices in Portland, Oregon before hearings officer, Linda B. Lee. Jeff Jennings, President of Staff Jennings, appeared with one witness and was represented by his attorney, Jeff Jones. Christopher Rich, environmental law specialist, represented DEQ, with four witnesses.

ISSUES

Did respondent cause pollution by allowing a continuous discharge of petroleum from an underground storage tank spill or release to enter waters of the state in violation of ORS 468B.025(1)(a)?

Is the respondent subject to a civil penalty for this violation pursuant to OAR 340-12-069(f), OAR 340-12-042(2) and OAR 340-12-045?

Did the respondent fail to initiate and complete the investigation or clean up of a petroleum release from an underground storage tank, in violation of OAR 340-122-242?

FINDINGS OF FACT

1. The Staff Jennings Marina is located at 8240 S.W. Macadam Avenue in Portland, Oregon. It is bordered to the north by undeveloped river front acreage located on the west bank of the Willamette River. It is bordered to the east by the Willamette River. It is bordered to the south by an access road leading to a Multnomah County boat ramp located beneath the Sellwood

proceed with a notice of noncompliance with a recommendation for civil penalty. He indicated the time frame for getting the borings and ground water samples was during that winter (1995). He indicated the time frame for installing a remedial system was prior to the following year's rainy season, by October 1996.

9. When a remedial system was not installed by November 7, 1996, a Notice of Noncompliance was issued. The matter was referred to the DEQ Enforcement Section and on March 7, 1997, the Notice of Assessment of Civil Penalty was issued.

10. DEQ imposed a civil penalty of $8,400 based on a finding that Staff Jennings caused pollution of waters of the state in violation of ORS 468B.025. A copy of the Findings and Determination of the Respondent's Civil Penalty is attached to this decision as Exhibit (1). DEQ considered also imposing an additional penalty amount of $52,207 for economic benefit but opted not to do so. Instead, DEQ requested that Staff Jennings meet the terms and conditions of a remedial action order that was not subject to appeal.

11. The February 1989 report prepared by Golder and Associates as well as subsequent reports prepared by De Minimis, Inc. in 1994 and 1996 indicated high level BTEX (benzene, toluene, ethylbenzene and total xylenes) contamination in the soil. This contamination was an ongoing source of petroleum contamination discharging into the Willamette River.

ULTIMATE FINDINGS

Respondent Staff Jennings caused the pollution of state waters.

Respondent Staff Jennings failed to complete the investigation or cleanup of a petroleum release from an underground storage tank.

APPLICABLE LAW

ORS 468B.025 (1) (a) states:

> (1) Except as provided in ORS 468B.050, no person shall:
> (a) Cause pollution of any waters of the state or place or cause to be placed any wastes in a location where such wastes are likely to escape or be carried into the waters of the state by any means.

ORS 468B.005(3) states:

> "Pollution" or "water pollution" means such alteration of the physical, chemical or biological properties of any waters of the state, including change in temperature, taste, color, turbidity, silt or odor of the waters, or such discharge of any liquid, gaseous, solid, radioactive or other substance into any waters of the state, which will or tends to either by itself or in connection with any other substance, create a public nuisance or which will or tends to render such waters harmful, detrimental or injurious to public health, safety or welfare, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate

DEQ has the burden of establishing a violation by a preponderance of the evidence. Based on the evidence presented, DEQ has met its burden. The penalty as assessed is appropriate.

CIVIL PENALTY

The Respondent, Staff Jennings is liable for a civil penalty of $8,400.

Dated this 18 th day of March, 1998.

ENVIRONMENTAL QUALITY COMMISSION

Linda B. Lee

Linda B. Lee
Hearings Officer

EXHIBIT (1)

FINDINGS AND DETERMINATION OF RESPONDENT'S CIVIL PENALTY PURSUANT TO OREGON ADMINISTRATIVE RULE (OAR) 340-12-045

VIOLATION: Causing pollution of waters of the state.

CLASSIFICATION: This is a Class I violation pursuant to OAR 340-12-069(1)(f).

MAGNITUDE: Absent any other finding, the magnitude of the violation is determined to be moderate pursuant to OAR 340-12-045(1)(a)(ii).

CIVIL PENALTY FORMULA: The formula for determining the amount of penalty of each violation is:

BP + [(0.1 x BP) x (P + H + O + R + C)] + EB

"BP" is the base penalty which is $3,000 for a Class I moderate magnitude violation in the matrix listed in OAR 340-12-042(1). Pursuant to OAR 340-12-042(2) the base penalty is doubled (to $6,000) because Respondent caused the spill of oil, as defined by OAR 340-108-002(11), through a negligent act.

"P" is Respondent's prior significant action(s) and receives a value of 0 because the Department has not taken any prior significant actions against Respondent.

"H" is the past history of Respondent in taking all feasible steps or procedures necessary to correct any prior significant action(s) and receives a value of 0 because the Department has not taken any prior significant actions against Respondent.

"O" is whether or not the violation was a single occurrence or was repeated or continuous during the period of the violation and receives a value of 2 because the illegal discharge was repeated for many days between October of 1988 and January of 1997.

"R" is the cause of the violation and receives a value of 2 because Respondent was negligent. Respondent failed to take reasonable care to immediately clean up a spill or release of petroleum, and thereby avoid the foreseeable risk of causing pollution to waters of the state.

"C" is Respondent's cooperativeness in correcting the violation and receives a value of 0 because Respondent was neither cooperative not uncooperative.

"EB" is the approximate dollar sum of the economic benefit that the Respondent gained through noncompliance, and receives a value of $0.

STATEMENT OF MAILING

AGENCY CASE NO. UT-NWR-96-274A
HEARINGS CASE NO. G60061

I certify that the attached Final Order was served through the mail to the following parties in envelopes addressed to each at their respective addresses, with postage fully prepaid.

Staff Jennings **(Certified)**
c/o Jeffrey S. Jones, Attorney
1001 Molalla Avenue , Suite 208
Oregon City, OR 97045-3768
(Sent with Jeffrey S. Jones' certified copy)

Jeffrey S. Jones, Attorney **(Certified)**
1001 Molalla Avenue , Suite 208
Oregon City, OR 97045-3768

Chris Rich
DEQ Enforcement Section
2020 SW Fourth, 4th Floor
Portland, OR 97201-4987

Susan Greco
DEQ
811 SW Sixth Avenue
Portland, OR 97204

Mailing/Delivery Date: 3/18/98
Hearings Clerk: ll

F

Oregon

DEPARTMENT OF
ENVIRONMENTAL
QUALITY

NORTHWEST REGIC

Notice of Noncompliance

November 7, 1996

STAFF JENNINGS, INC.
C/O DONALD B BOWERMAN - REGISTERED AGENT
1001 MOLALLA AVENUE SUITE 208
OREGON CITY OR 97045

Re: Staff Jenning's Marina
File No.: 26-88-078
NWR-UST-96-171
NOTICE OF NONCOMPLIANCE

Dear Mr. Bowerman:

This notice is being sent to you as the registered agent for Staff Jennings, Inc. (Staff Jennings). These violations came to the Department's attention due to a file review.

This notice is a result of four violations of Oregon Administrative Rules (OARs) and Oregon Revised Statutes (ORS) governing Underground Storage Tanks, Water Quality, and Spill rules at the above referenced site located at 8240 SW Macadam Avenue, Portland, Oregon.

The following violations have been documented at the Staff Jennings Marina.

1. Failure to comply with ORS 466.645 which requires any person liable for a spill or release of oil or threatened spill or release under ORS 466.640 shall immediately clean up the spill or release. Any person liable for a spill or release or a threatened spill or release shall immediately initiate cleanup, whether or not the department has directed the cleanup. The department may require the responsible person to undertake such investigations, monitoring, surveys, testing and other information gathering as the department considers necessary.

2. Violation of ORS 468B.025(1)(a) which prohibits a person from causing pollution of any waters of the state or place or cause to be placed any wastes in a location where such wastes are likely to escape or be carried into the waters of the state by any means.

John A. Kitzhaber
Governor

2020 SW Fourth Avenue
Suite 400
Portland, OR 97201-4987
(503) 229-5263 Voice
TTY (503) 229-5471

If you have any questions concerning this matter or need assistance in resolving the problems associated with this site, please contact me at (503) 229-5477.

Sincerely,

Rick Silverman

Rick Silverman
Environmental Specialist

Enclosures

cc: Jeff Jennings
Staff Jennings Marina
P.O. Box 82206
Portland, OR 97282-8206

sub file

Oregon

DEPARTMENT OF
ENVIRONMENTAL
QUALITY

MAR 07 1997

CERTIFIED MAIL Z 076 234 278

Staff Jennings, Inc.
c/o Donald Bowerman, Registered Agent
1001 Molalla Avenue, Suite 208
Oregon City, Oregon 97045

Re: Notice of Civil Penalty
Assessment No. UT-NWR-96-274A and
Remedial Action Order No. UT-NWR-96-274B
Multnomah County

On or about October 18, 1988, a release of petroleum contamination resulting from a broken fuel distribution line from an underground storage tank (UST), occurred at the Staff Jennings Marina, located at 8240 S.W. Macadam Avenue, in Portland, Oregon. This release, which was reported to the Department of Environmental Quality (Department or DEQ) on or about October 19, 1988, indicated that petroleum from the release impacted the fuel tank area, caused significant soil contamination on Staff Jennings property adjacent to the Willamette River, and resulted in a discharge of free petroleum product into the river. Subsequent consultant reports and Department inspections have confirmed that significant concentrations of petroleum currently remain in the soil adjacent to the Willamette River. This contamination has been the source of an ongoing release of petroleum to the river since October of 1988.

Although initial measures were taken to abate the direct discharge of free product into the river, adequate steps were not taken to clean up the contaminated soils adjacent to the river. Golder Associates, a consulting firm, prepared a January 3, 1990, report for Staff Jennings that discussed options for remediation of contaminated soil and groundwater at the Staff Jennings facility, including installation of a system to prevent further petroleum migration into the river.

On November 21, 1995, Rick Silverman, of the Department's UST Section, directed Staff Jennings to define the horizontal extent of soil and groundwater contamination, obtain off-site boring samples, and make active progress towards installation of a remedial system to capture petroleum before it reaches the river. Mr. Silverman notified Staff Jennings that it was in violation of water quality regulations, and would need to install a remedial system by no later than October of 1996.

811 SW Sixth Avenue
Portland, OR 97204-1390
(503) 229-5696
TDD (503) 229-6993

ex 4

On November 7, 1996, the Department sent Staff Jennings a Notice of Noncompliance (NON) for 1) failing immediately clean up a spill or release of oil, 2) causing pollution of waters of the state, 3) violating conditions of Staff Jennings NPDES Permit, and 4) failing to initiate and complete the investigation or cleanup of a release of petroleum from an UST, including failure to install monitoring wells and develop a Corrective Action Plan. Although Staff Jennings has taken some steps to identify sources of contamination, Staff Jennings has allowed a recurring discharge of petroleum into the Willamette River, and has not fully complied with the Department's UST, Spill, and Water Quality regulations.

Petroleum contaminated soil and groundwater pose a serious threat to human health and the environment, and can require expensive cleanup. Unreasonable delays in performing necessary investigation and cleanup of contaminated sites can result in greater contamination as petroleum migrates through groundwater, and poses a threat of contamination to surface water and adjacent properties.

Enclosed is a Notice of Assessment of Civil Penalty, No. UT-NWR-96-274A (Notice), related to the discharge of petroleum into the Willamette River. I have assessed a total civil penalty of $8,400 for Staff Jennings' violation of the Department's Spill rules. In determining the amount of the penalty, I used the procedures set forth in OAR 340-12-045. The Department's findings and civil penalty determination are attached to the Notice as Exhibit 1. If you fail to either pay or appeal the civil penalty within twenty (20) days, a Default Order will be entered against you. I have chosen not to assess a penalty for Violation 2 in the enclosed Notice.

I have also included a Remedial Action Order, No. UT-NWR-96-274B (Order). The Order requires Staff Jennings to 1) install a remedial system capable of preventing additional petroleum contamination entering the Willamette River, 2) conduct water treatment in conformance with the NPDES Permit 1500A 3) obtain an off-site access agreement from the City of Portland to install monitoring wells to determine the lateral and horizontal extent of off-site petroleum contamination, 4) submit reports of work performed under the Order, 5) submit a Corrective Action Plan for addressing any long term cleanup of soil and groundwater, and 6) pay all past due oversight costs.

The civil penalty formula allows the Department to calculate an economic benefit gained through noncompliance. In this case, the Department calculated an economic benefit in the amount $52,207 that Staff Jennings gained by avoiding the cost of installing and maintaining a petroleum remediation system to clean up the release. The Department is not seeking the economic benefit amount in this action. However, if you fail to meet all terms and conditions of the enclosed Order, DEQ will assess an additional civil penalty for violating the Order and include the $52,207 economic benefit, and any additional economic benefit if applicable.

If you wish to discuss this matter, or if you believe there are mitigating factors which the Department might not have considered in assessing the civil penalty, you may request an informal discussion by attaching your request to your appeal. Your request to discuss this matter with the Department will not waive your right to a contested case hearing on the civil penalty. Please note that the Order is non-appealable. I understand that you have contacted a consultant to address the issues contained in the attached actions, and I encourage you to continue this work pursuant to the terms of the enclosed Order.

I look forward to your cooperation and efforts to comply with the UST, Spill, and Water Quality rules in the future. However, if you fail to comply with the enclosed Order, or if additional violations occur, you may be subject to further action by the Department.

Copies of referenced rules are enclosed. I have also enclosed a copy of the Department's internal management directive on Supplemental Environmental Projects (SEPs) which provide environmental enhancement in local areas. If you have any questions about this action, please contact Chris Rich with the Department's Enforcement Section in Portland at 229-6775.

Sincerely,

Langdon Marsh

Langdon Marsh
Director

cr
Enclosures
cc: Northwest Region, UST Section, DEQ
Waste Management Cleanup Division, DEQ
Department of Justice
Environmental Protection Agency
Environmental Quality Commission
Multnomah County District Attorney

BEFORE THE ENVIRONMENTAL QUALITY COMMISSION

OF THE STATE OF OREGON

IN THE MATTER OF: STAFF JENNINGS, INC. an Oregon Corporation Respondent.	))))	NOTICE OF ASSESSMENT OF CIVIL PENALTY No. UT-NWR-96-274A MULTNOMAH COUNTY

I. AUTHORITY

This Notice of Assessment of Civil Penalty (Notice) is issued to Respondent, Staff Jennings, Inc., by the Department of Environmental Quality (Department) pursuant to Oregon Revised Statutes (ORS) 468.126 through 468.140, ORS Chapter 183 and Oregon Administrative Rules (OAR) Chapter 340, Divisions 11 and 12.

II. VIOLATIONS

1. On or about October 19, 1988, to at least February 19, 1997, Respondent caused pollution of waters of the state in violation of ORS 468B.025(1)(a). Specifically, Respondent caused pollution by allowing a continuous discharge of petroleum, from an underground storage tank spill or release, to enter the Willamette River, waters of the state as defined by ORS 468B.005(8). This is a Class I violation pursuant to OAR 340-12-069(f).

2. On or about October 19, 1988 to at least February 19, 1997, Respondent failed to initiate and complete the investigation or cleanup of a petroleum release from an underground storage tank, in violation of OAR 340-122-242. Specifically, Respondent failed to initiate immediate abatement of petroleum discharge adjacent to the Willamette River, install monitoring wells as required by the Department, define the extent of on-site and off-site contamination, and develop a Corrective Action Plan to cleanup petroleum contamination.

III. ASSESSMENT OF CIVIL PENALTIES

The Department imposes a civil penalty of $8,400 for Violation 1 in Section II above. The findings and determination of Respondent's civil penalty, pursuant to OAR 340-12-042(2) and OAR 340-12-045 are attached and incorporated as Exhibit No. 1.

IV. OPPORTUNITY FOR CONTESTED CASE HEARING

Respondent has the right to have a formal contested case hearing before the Environmental Quality Commission (Commission) or its hearings officer regarding the matters set out above, at which time Respondent may be represented by an attorney and subpoena and cross-examine witnesses. **The request for hearing must be made in writing, must be received by the Department's Rules Coordinator within twenty (20) days from the date of service of this Notice, and must be accompanied by a written "Answer" to the charges contained in this Notice.**

In the written Answer, Respondent shall admit or deny each allegation of fact contained in this Notice, and shall affirmatively allege any and all affirmative claims or defenses to the assessment of this civil penalty that Respondent may have and the reasoning in support thereof. Except for good cause shown:

1. Factual matters not controverted shall be presumed admitted;
2. Failure to raise a claim or defense shall be presumed to be a waiver of such claim or defense;
3. New matters alleged in the Answer shall be presumed to be denied unless admitted in subsequent pleading or stipulation by the Department or Commission.

Send the request for hearing and Answer to: **DEQ Rules Coordinator, Office of the Director, 811 S.W. Sixth Avenue, Portland, Oregon 97204.** Following receipt of a request for hearing and an Answer, Respondent will be notified of the date, time and place of the hearing.

Failure to file a timely request for hearing and Answer may result in the entry of a Default Order for the relief sought in this Notice.

Failure to appear at a scheduled hearing or meet a required deadline may result in a dismissal of the request for hearing and also an entry of a Default Order.

The Department's case file at the time this Notice was issued may serve as the record for purposes of entering the Default Order.

V. OPPORTUNITY FOR INFORMAL DISCUSSION

In addition to filing a request for a contested case hearing, Respondent may also request an informal discussion with the Department by attaching a written request to the hearing request and Answer.

VI. PAYMENT OF CIVIL PENALTY

The civil penalty is due and payable ten (10) days after an Order imposing the civil penalty becomes final by operation of law or on appeal. Respondent may pay the penalty before that time. Respondent's check or money order in the amount of $8,400 should be made payable to "State Treasurer, State of Oregon" and sent to the **Business Office, Department of Environmental Quality, 811 S.W. Sixth Avenue, Portland, Oregon 97204.**

3·7·97
Date

Langdon Marsh
Langdon Marsh, Director

EXHIBIT (1)

FINDINGS AND DETERMINATION OF RESPONDENT'S CIVIL PENALTY PURSUANT TO OREGON ADMINISTRATIVE RULE (OAR) 340-12-045

VIOLATION: Causing pollution of waters of the state.

CLASSIFICATION: This is a Class I violation pursuant to OAR 340-12-069(1)(f).

MAGNITUDE: Absent any other finding, the magnitude of the violation is determined to be moderate pursuant to OAR 340-12-045(1)(a)(ii).

CIVIL PENALTY FORMULA: The formula for determining the amount of penalty of each violation is:

BP + [(0.1 x BP) x (P + H + O + R + C)] + EB

"BP" is the base penalty which is $3,000 for a Class I moderate magnitude violation in the matrix listed in OAR 340-12-042(1). Pursuant to OAR 340-12-042(2) the base penalty is doubled (to $6,000) because Respondent caused the spill of oil, as defined by OAR 340-108-002(11), through a negligent act.

"P" is Respondent's prior significant action(s) and receives a value of 0 because the Department has not taken any prior significant actions against Respondent.

"H" is the past history of Respondent in taking all feasible steps or procedures necessary to correct any prior significant action(s) and receives a value of 0 because the Department has not taken any prior significant actions against Respondent.

"O" is whether or not the violation was a single occurrence or was repeated or continuous during the period of the violation and receives a value of 2 because the illegal discharge was repeated for many days between October of 1988 and January of 1997.

"R" is the cause of the violation and receives a value of 2 because Respondent was negligent. Respondent failed to take reasonable care to immediately clean up a spill or release of petroleum, and thereby avoid the foreseeable risk of causing pollution to waters of the state.

"C" is Respondent's cooperativeness in correcting the violation and receives a value of 0 because Respondent was neither cooperative not uncooperative.

"EB" is the approximate dollar sum of the economic benefit that the Respondent gained through noncompliance, and receives a value of $0.

PENALTY CALCULATION:

$$\begin{aligned}
\text{Penalty} &= \text{BP} + [(0.1 \text{ x BP}) \text{ x } (\text{P} + \text{H} + \text{O} + \text{R} + \text{C})] + \text{EB} \\
&= \$6{,}000 + [(0.1 \text{ x } \$6{,}000) \text{ x } (0 + 0 + 2 + 2 + 0)] + \$0 \\
&= \$6{,}000 + [(\$600) \text{ x } (4)] + \$0 \\
&= \$6{,}000 + \$2{,}400 + \$0 \\
&= \$8{,}400
\end{aligned}$$

BEFORE THE ENVIRONMENTAL QUALITY COMMISSION

OF THE STATE OF OREGON

IN THE MATTER OF: STAFF JENNINGS, INC., an Oregon Corporation, Respondent	)))))	REMEDIAL ACTION ORDER No. UT-NWR-96-274B MULTNOMAH COUNTY

I. AUTHORITY

This Remedial Action Order (Order), is issued to Respondent, Staff Jennings, Inc., an Oregon Corporation, by the Department of Environmental Quality (Department) pursuant to Oregon Revised Statutes (ORS) 465.260(4) and ORS 465.255(1).

II. PURPOSE

The purpose of this Order is to cause proper investigation and cleanup of a release of hazardous substances at Respondent's underground storage tank (UST) facility, Staff Jennings Marina, located at 8240 SW Macadam Avenue, in Portland, Oregon.

III. FINDINGS OF FACT

1. Between 1988 and the date of this Order, Respondent owned or controlled the Staff Jennings Marina.

2. On October 19, 1988, a release of petroleum contamination from an UST at the Staff Jennings Marina was reported to the Department. An unknown quantity of petroleum contamination released from the Staff Jennings Marina entered the Willamette River as a result of this release.

3. A report by Respondent's consultant, Golder Associates, Inc., prepared in February of 1989, indicated high level BTEX (benzene, toluene, ethylbenzene, and total xylenes), on the portion of the Staff Jennings Marina, adjacent to the Willamette River, as follows: benzene (2,000 parts per billion[ppb]), toluene (61,000 ppb), ethylbenzene (49,000 ppb), and total xylenes (402,000 ppb).

4. DeMinimis, Inc., a consultant for Staff Jennings, prepared a soil analysis report dated March 31, 1994, which indicatated high level BTEX (16,100 to 27,000 ppb) contamination in soil borings taken from the Staff Jennings Marina property below the USTs.

5. DeMinimis Inc.'s UST decommissioning report dated December 13, 1994, indicated moderate to high level gasoline and diesel in soil from the UST excavation pits, ranging from 42 parts per million (ppm) TPH-G to 3552 ppm TPH-G, and non-detect to 3750 ppm for TPH 418.1 (diesel).

6. Based upon the contamination reports submitted to the Department, Rick Silverman, of the DEQ Northwest Region UST Section, conducted an inspection of the Staff Jennings Marina on November 21, 1996. During this inspection, Mr. Silverman informed Jeff Jennings of Staff Jennings, that Staff Jennings would need to complete off-site investigation of contamination, and install a petroleum recovery system by no later than the end of 1996. Jeff Jennings verbally informed Rick Silverman that Staff Jennings would comply with this deadline.

7. Based upon the levels of contamination reported on the Staff Jennings property adjacent to the Willamette River, consultants reports of discharges to the river system, and observations by DEQ, the Department concludes that the Staff Jennings facility has been, since October of 1988, and continues to be, a source of petroleum contamination discharging directly into the Willamette River.

8. Deminimis, Inc.'s February 26, 1996, report indicated off-site petroleum contamination ranging from non-detect to 5700 ppm TPH-G, and non-detect to 1000 ppm TPH 418.1 in the soil. The February 26, 1996 report also indicated benzene ranging from 340 ppb to 16,200 ppb and napthalene ranging from 5.1 to 188 ppb in groundwater at the Staff Jennings Marina.

9. As of November 1, 1996, the Department had not received confirmation of off-site investigation or installation of a petroleum recovery system.

10. On November 7, 1996, the Department issued Staff Jennings a Notice of Noncompliance (NON) for 1) failing immediately clean up a spill or release of oil, 2) causing pollution of waters of the state, 3) violating conditions of Staff Jennings NPDES Permit, and 4) failing to initiate

and complete the investigation or cleanup of a release of petroleum from an UST, including failure to install monitoring wells and develop a Corrective Action Plan.

11. As of February 19, 1997, Staff Jennings has not submitted evidence of compliance with the violations identified in the November 7, 1996 NON.

IV. CONCLUSIONS OF LAW

1. Respondent is a "person" under ORS 465.200(20).

2. At all relevant times, Respondent's facility (or facilities) was a facility as defined in ORS 465.200(12).

3. The materials described in Section III, paragraphs 2, 3, 4, 5, 7 and 8 are "hazardous substances" under ORS 465.200(15).

4. The discharges of hazardous substances as described in Section III, paragraphs 4, 5, and 6 constitute a "release" into the environment under ORS 465.200(21).

5. Respondent is an owner or operator as defined in ORS 456.200(19).

6. Respondent is strictly liable, pursuant to ORS 465.255(1), for those remedial action costs incurred by the state or any other person that are attributable to, or associated with, a facility and for damages for injury to or destruction of any natural resource caused by a release.

7. The Director may require Respondent to conduct any removal, remedial action, or related actions necessary to protect public health, safety, welfare and the environment, pursuant to ORS 465.260(4).

8. The work required by this Order is necessary to protect public health, safety, welfare, and the environment.

V. ORDER

Based upon the foregoing FINDINGS OF FACT and CONCLUSIONS OF LAW, Respondents are hereby ORDERED:

1. Within ninety (90) days of receipt of this Order, Respondent shall, subject to Department approval, install a remedial system capable of preventing additional petroleum

contamination from the Staff Jennings Property from entering the Willamette River. Within forty-five (45) days of installation of the remedial system required by this paragraph, Respondent shall submit a report outlining the remedial action plan to the Department.

2. Upon installation of a water treatment system, pursuant to Section V, paragraph 1, above, Respondent shall conduct such water treatment in conformance with Staff Jennings' NPDES Permit 1500A, including submittal of weekly discharge monitoring reports.

3. Within ninety (90) days of receipt of this Order, Respondent shall obtain an off-site access agreement from the City of Portland Parks and Recreation Department to install monitoring wells to determine the lateral and horizontal extent of off-site petroleum contamination from the Staff Jennings Property.

4. Within forty-five (45) days of determining the lateral and horizontal extent of contamination, as required by Section V, paragraph 3, above, Respondent shall submit an off-site investigation report to the Department

5. Within ninety (90) days of completion of the off-site investigation and installation of monitoring wells, required by Section V, paragraph 3, above, Respondent shall submit a Corrective Action Plan, pursuant to OAR 340-122-250(1), for responding to contaminated soils and groundwater in a manner that protects public health, safety, welfare, and the environment.

6. Within thirty (30) days of receipt of this Order, Respondent shall pay in full all past due oversight costs, in the amount of $1,691, or enter into a payment plan approved by the Department.

VI. FAILURE TO COMPLY

1. Upon Respondent's failure to comply with this Order, DEQ may seek any available remedy to enforce this Order, including but not limited to penalties and injunctive relief.

2. Pursuant to ORS 465.260(8), upon Respondent's failure to comply with this Order, Respondent shall be liable for any costs incurred by the State in conducting the work required under this Order and for punitive damages up to three times the amount of the State's costs.

3. Pursuant to ORS 465.260(6), Respondent may not seek administrative appeal or judicial review of this Order

VII. SATISFACTION OF THIS ORDER

Upon completion of the work under this Order, including receipt by the Department of all submittals and reports required under Section V, the Department shall issue a Certification of Completion of activities under this Order. Issuance of a Certificate of Completion shall deem the Order satisfied and terminated.

3.7.97
Date

Langdon Marsh
Langdon Marsh, Director

Golder Associates Inc.
CONSULTING ENGINEERS

26-88-078

REPORT OF FINDINGS
PRELIMINARY FIELD INVESTIGATION
OF SELLWOOD MARINA,
PORTLAND, OREGON

PREPARED FOR
STAFF JENNINGS, INC.

March 27, 1989

893-1031

1989 Golder Report

ASSOCIATES INC. • 4104 - 148TH AVENUE N.E., REDMOND (SEATTLE), WASHINGTON, U.S.A. 98052 • TEL. (206) 883-0777 • FACSIMILE (206) 882-5498 • TELEX 5106002944

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1. SCOPE OF WORK

1.1 Site Description

The Sellwood Marina site occupies two levels on the west bank of the Willamette River. Much of the site is constructed on a flattened bench which has been excavated into the fluvial clayey silts to silty clays of the river bank. Additional space has been gained at this main level of the marina facilities by constructing a piling-supported concrete platform which extends out over the river bank. This primary level of the facilities is approximately 20-25 feet above the water level of the river. Additional floating docks, etc. have been constructed in the river, adjacent to the showroom and service facilities. A drawing of the approximate site layout is attached as Figure 1.

a part of the marina facilities, two underground storage tanks were installed to supply boat fuel. The tanks are of 10,000 and 4,000 gallon capacity, respectively, and their approximate locations are shown on Figure 1. Based on information provided by Staff Jennings, the 4,000 gallon tank is about 25 years old, and is currently in use. The 10,000 gallon tank is 10-12 years old and is also in use.

1.2 Site History

On October 18, 1989, the marina manager observed a slick of petroleum fuel in the river, down slope from the fuel tanks. Following this observation, it is our understanding that Staff Jennings, took the following steps to mitigate the existing spill, and to prevent further release of product:

- October 18, 1988. Following his observation of the spill, Staff Jennings' marina manager contacted SRH Associates, Inc., of Portland, Oregon, to perform cleanup operations.

- October 18, 1988. SRH Associates deployed a floating boom in the river to contain the slick, and placed pads to absorb the floating product. SRH Associates also collected soil samples in the spill area to confirm that the material in question was gasoline from the marina. Staff Jennings personnel worked to trace the spill to its origin, and halted use of the fuel tanks.

- October 19, 1988. SRH Associates notified the Oregon Department of Environmental Quality, the U.S. Coast Guard, and the local fire department of the spill.

- October 20, 1989. Staff Jennings personnel determined that the primary source of spilled fuel was leakage from a cracked elbow located near the fuel turbine pump for the 10,000 gallon tank. They contacted Fullman Plumbing Company, of Portland, Oregon, to perform repairs.

- October 25-28, 1989. Fullman Plumbing Company, repaired the broken elbow. Tanks were removed from service until testing could be done.

- Once repaired, no further fuel release was observed.

- February (4±), 1989. Pacific Tank and Construction Company, performed tank tightness tests on the two storage tanks. The results of the testing were inconclusive because the tanks could not be isolated from the attached distribution lines. Additional testing was planned.

- February 15-17, 1989. Pacific Tank and Construction Company uncovered the tanks and related fuel distribution lines, isolated the systems, and performed a second series of tank and line tightness tests. Minor leaks were located and repaired in distribution lines, and the system was returned to service.

- February 16-17, 1989. Golder Associates conducted a preliminary soils investigation to determine the extent and quantity of contamination present in the tank field and along the adjacent river bank.

The field investigation conducted by SRH Associates, determined that fuel residues were present beneath the concrete boat platform identified on Figure 1. Their initial study indicated that fuel leaking from the broken elbow (although this source had not yet been identified) had migrated from the gravel backfill around the underground storage tank and distribution lines, and into the silty sands of the river bank. The contaminant plume eventually entered the river at this location.

1.3 Current Investigation

Golder Associates was contracted by Staff Jennings, to conduct a soil sampling survey in the area immediately surrounding the fuel tanks, and extending eastward toward the river. Soil samples were also collected west of the on-site fuel tanks, at an area hydraulically up- gradient from any potential fuel leakage into the groundwater system. A total of 12 soil borings were completed at the project site, with 10 soil samples collected and analyzed for petroleum residues.

2. PRELIMINARY FIELD INVESTIGATION

Investigation of the site began on the afternoon of February 16, 1989, and continued through February 17, 1989. The investigation was intended to determine the nature and extent of fuel release from the tank field and associated fuel distribution lines. This initial investigation consisted of drilling 12 soil borings with a 3-inch hand auger to allow the collection of soil samples at depth. Soil samples from each boring were sent to a commercial analytical laboratory for analysis of petroleum hydrocarbon content. Selected test holes which intercepted groundwater were left open and protected from rainwater intrusion overnight to determine the approximate groundwater surface elevations and localized flow direction. When completed, the soil borings were abandoned by backfilling to the surface with bentonite pellets.

2.1 Soil Sampling and Collection

As soil borings were performed, the soil's engineering characteristics were described for each change in soil type, and the soil was classified using the Unified Soil Classification System. Soil cuttings removed from the hole were also screened with a TIPP II photovoltaic organic vapor monitor (OVM) to provide a vertical profile of the aromatic organic constituents within the borehole. This screening was also used to identify samples to be collected for chemical analysis. Readings from the OVM were recorded on the soils logs.

In reference to the field screening, the OVM detects hydrocarbons in the vapor phase, and is calibrated to isobutylene. Aromatic petroleum constituents generally show a response on the OVM similar to isobutylene, but aliphatic components do not. Elevated readings in the vicinity of soils are an indication of the presence of hydrocarbons in the soil. However, care must be taken in the interpretation of these results. OVM readings, expressed as concentrations in parts-per-million in the vapor phase, should not be used to directly infer concentrations in soil. Although a correlation does exist, it is quite sensitive to a number of factors, including the volatility of the

hydrocarbons present, the nature of the soil (e.g., moisture and natural organic content), and the method used to sample the soil vapors. Adverse ambient weather conditions may also affect the functioning of the equipment (e.g., the investigation was performed during a rainstorm; high ambient humidity can elevate OVM readings to some extent). It is therefore possible for soils with relatively low hydrocarbon concentrations to exhibit high readings; the reverse is also true. Because of this variability, the OVM should only be viewed as a semi-quantitative, first order screening tool for hydrocarbon contamination.

2.2 Laboratory Analysis

Based on OVM readings, degree of hydrocarbon staining, and in some cases, petroleum odor, samples were collected from most boreholes for analytical testing. The soil samples for analysis were transferred to clean glass jars fitted with Teflon lids, supplied by Pacific Analytical Laboratory, Inc., of Beaverton, Oregon. Samples were subsequently transported to that laboratory for testing at the conclusion of the field investigation. Analysis was performed on all samples for aromatic hydrocarbons and total petroleum hydrocarbons, using USEPA methods 8020 (8240), and 418.1. Selected samples were also analyzed for total lead, and fuel fingerprint testing (USEPA method 8015, modified) was performed to determine the source of the organic constituents (gasoline, diesel, or other). The results from this testing are summarized in Appendix 1.

3. CONCLUSIONS

Based on our field investigation and the results of analytical testing, it is apparent that gasoline and gasoline-derived compounds have been released into the soils in the vicinity of the Sellwood Marina tank field, and that petroleum has migrated downgradient to the vicinity of the Willamette River. Further, based on the results of the investigation and the possible courses of action for eventual remediation, it is expedient to define two zones affected by the release for reference. The first zone (Zone 1) surrounds the fuel tanks, including the tank backfill and the immediately adjacent native soil. The second zone (Zone 2) comprises the river bank, and the adjacent area of river bed between the high and low water marks of the Willamette River. The boundary between these zones is not clearly defined, however any plans for remediation of either of the zones may be modified to further investigate this transitional area.

3.1 Subsurface Conditions

Two native soil types were encountered at the Staff Jennings site. On the upper level of the site (Zone 1), generally surrounding the fuel tanks, the native soil is a plastic silty clay to clayey silt. The soil exposed adjacent to the Willamette River (Zone 2), to a depth of approximately two feet, is silty fine sand to sandy silt.

Sand and gravel was also encountered in Zone 1. This granular material was identified in soils borings adjacent to the tank field and distribution pipes, and probably represents backfill around the tank system components. Gravel was also used to varying depths as a base course beneath the asphalt paving located in Zone 1.

Table 1 lists relative borehole surface and groundwater elevations for the soil borings. These elevations are based on a hand level survey, using 50 feet as an assumed datum. The accuracy of the survey is assumed to be plus or minus 0.1 foot. Water depths were measured in open test holes, and are also

assumed to be accurate to plus or minus 0.1 foot. Groundwater flow at the site, based on limited observations of groundwater levels in soil borings, appears to be easterly, toward the Willamette River. On a smaller scale, the groundwater flow may be locally complicated by the presence of the sand and gravel backfill surrounding the fuel tanks and distribution lines. Considering that the backfill is a more permeable material than the native soil, groundwater may tend to preferentially migrate along distribution lines or locally flow toward the tanks, whose backfill may act a sump. These local variations in flow direction should be considered tentative, as the differences in water level between test borings varied only a few tenths of a foot, approaching the limits of accuracy of the survey.

TABLE 1
BOREHOLE AND GROUNDWATER ELEVATIONS

TH 1	50.0	-
TH2	49.9	46.9
TH 3b	50.1	-
TH 4	49.9	47.3
TH 5	50.1	47.1
TH 6a	50.7	50.1
TH 6b	51.4	-
TH 10	50.1	46.8

3.2 Environmental Conditions

Zone 1 - Fuel Tank Area

The area surrounding the fuel tanks was sampled extensively, as described in section 2. Test holes TH1 through TH5, and TH10, were situated throughout the tank field as shown on Figure 1. TH6 was located upgradient of the tank field, to intercept possible contaminants entering the site.

Results of the analyses (USEPA method 8020 [8240]) of soil from TH1 and TH5 indicate elevated levels of benzene, toluene, ethyl benzene, and xylene. A fuel fingerprint test performed on the sample from TH1 suggested the source of the release was gasoline-based fuel. These two test holes are adjacent to the location of the ruptured fuel elbow on the 10,000 gallon tank. It seems likely that most, if not all, of the hydrocarbons present at these test holes are due to the damaged fuel distribution line. Test holes 2, 3, and 4 were also drilled in close proximity to the storage tanks, but did not exhibit high concentrations of aromatic hydrocarbons, indicating that, although there may have been some petroleum residue in the backfill surrounding the tanks, the bulk of the release moved downgradient toward the river. TH10 was placed near an existing pipe manifold near a former gasoline pump site. The Pacific Tank and Construction Company investigation indicated that some leakage may have occurred at this location, and the elevated levels of hydrocarbons at this location support their findings. TH6 exhibited low concentrations for all constituents measured, indicating that the groundwater flow and the hydrocarbon release migrated away from this area.

Zone 2 - River Bank and River Bed

Zone 2 is located at the toe of the moderately steep river bank, and at the time of testing, extended to the edge of the Willamette River, 20 to 50 feet east. Testing at this location consisted of three soil borings, shown on Figure 1 as TH7, TH8, and TH9. Of the three test holes, TH7 shows the highest concentrations of hydrocarbons, approximately 2-3 times higher than the test holes near the damaged fuel distribution line. According to Staff Jennings personnel the petroleum release was abated as soon as the broken pipe elbow was repaired. This suggests that the petroleum moved quickly through the relatively permeable silty sands of the river bank. It is not known at this time whether the movement took place on the surface of the existing groundwater table, or in the unsaturated zone above. It appears that the petroleum product is concentrated at the groundwater surface. The field evidence also suggests that the affected area is fairly limited in lateral extent, as TH8 and TH9 exhibited minimal concentrations of hydrocarbons. The

full depth or vertical thickness of Zone 2 was not determined for the contaminated zone during this investigation.

General

The data described above suggest the following overall conclusions regarding soil contamination at the Sellwood Marina site

- Hydrocarbons are present in soil, both within the tank field, and along the edge of the Willamette River directly downslope from the field,
- The hydrocarbons are likely due to the release of gasoline,
- Low concentrations of hydrocarbons in the vicinity of TH10 are attributable to leakage at a pipe manifold which has also been repaired,
- The highest concentrations of hydrocarbons are located at the north end of the 10,000 gallon fuel tank, where the broken pipe elbow was located, and in the river bank directly downslope.

Based on our preliminary investigation, the area impacted is approximately 40 by 50 feet in Zone 1, and 50 by 60 feet in Zone 2. The total depth to which hydrocarbon residues have penetrated was not determined during our investigation.

4. RECOMMENDATIONS

We anticipate that contaminated soils at the Sellwood Marina site will require treatment to remove fuel residue. Although our final recommendations for remediation plans will be dependent upon Oregon Department of Environmental Quality target values for contaminant abatement, we believe that one or more of the following alternatives will achieve the desired result.

Zone 1 - Fuel Tank Area

Based on our soils investigation within Zone 1, we recommend that the fuel tanks be removed from service, the affected soils removed and aerated on site, the tanks be retrofitted to meet current standards (or replaced), and the aerated soil replaced in the tank excavation as backfill if suitable. This method will provide the best assurance that the affected soils have been removed, and will allow sampling of the surrounding soils for confirmation that hydrocarbon residues remaining do not exceed the proposed Oregon DEQ matrix values for cleanup. Excavation and treatment of the soils on site will reduce the potential long-term liabilities for Staff Jennings, both by insuring that Zone 1 has been remediated to DEQ standards, and by avoiding the shared liabilities which are assumed when material is landfilled at a hazardous waste site.

Removal and replacement of affected soils would interfere with daily operations at the site for a period of time ranging up to several days, and would require removal and replacement of the existing tanks and fuel distribution lines, but would require no ongoing remediation effort or system maintenance.

Alternatives to the above recommendation exist. It is our understanding that the Pacific Tank and Construction Company stated that the present UST system may be brought into compliance with current regulations without replacement of the existing tanks. If such an upgrade is planned, it would be possible to remediate the site by soil venting and installation of extraction wells, if

needed. The soil venting system could be installed at the same time that other upgrades (such as overfill or corrosion protection systems) are performed. These installations may restrict the active usage of the site for a period of up to several weeks, and would require periodic maintenance and monitoring to assure that the remediation progressed as planned. It should be understood that we do not regard this alternative to be as comprehensive as the physical removal, treatment, and replacement of the affected soils. It is possible that residual pockets of hydrocarbons might remain in the soil using soil venting methods, and verification of final hydrocarbon concentrations remaining in the soil following cleanup will be more difficult.

Optimum performance of a soil venting system would be realized during the summer months, when the local groundwater table is depressed. If remediation is to take place when the water table is high, an extraction well and pump might also be required to remove any free product which may be floating at the groundwater surface. Installation of an air venting system will generally produce satisfactory results in the granular backfill surrounding the tanks, where the major levels of contamination were identified within Zone 1. Poorer results may be expected if hydrocarbons have penetrated silty clays or other less-permeable soil types to a significant extent.

Zone 2 - River Bank and River Bed

We recommend excavating the contaminated soils in Zone 2 and treating them on site. The groundwater beneath Zone 2 will probably require treatment as well. We recommend that either a well point system or a french drain system be installed to intercept and draw floating petroleum.

Site remediation in Zone 2 will be complicated by several factors, including:

- Access to the areas within Zone 2, only occurs during periods of low water level,
- The close working quarters under the boat storage platform,

- The geotechnical aspects of maintaining stability of the boat storage structure if affected soils must be removed to any significant depth around the supporting pile, and
- The environmental concerns of releasing hydrocarbons into the Willamette River during the soils cleanup.

We believe that these potential problems may be avoided by using a small, track-mounted (low ground pressure) backhoe to remove the soil to the base of Zone 2, if possible. Although further investigation must be done to verify the actual thickness of this zone, we believe that the depth of soil containing hydrocarbons should not extend much deeper than the lowest groundwater surface sustained at the site since the spill incident. The water table at this location is closely tied to fluctuations in level of the Willamette River. Based on records supplied by the U.S. Geological Survey from their Morrison Bridge gaging station, the level of the Willamette River varied from .8 to 10.7 feet above base level in the interval from September 1, 1988 to March 18, 1989. This suggests that hydrocarbons, which tend to float on water, will be concentrated in a zone 2-3 feet thick. Excavation is possible to this depth by the equipment suggested.

Once excavated, the soil can be stockpiled and aerated on site. The location selected for the stockpile should be covered by plastic sheets to prevent infiltration of the subgrade, and suitably bermed to prevent runoff from entering the river. Installation of venting pipes in the stockpile is recommended to speed the aeration process. Fluids draining from the pile due to rainfall or draining of interstitial water, should be contained and tested for hydrocarbon concentration. Treatment of this water will be necessary before it can be discharged into the river. A holding tank may be located on site and an oil/water separator installed for this purpose. During the excavation process, it is suggested that the river adjacent to the work area be protected by containment booms should hydrocarbons be released from the soil.

A permit will be required for the discharge of treated water into the Willamette River. This must be obtained from the Oregon State Water Resource DIvision. Additional permitting will be required from the U.S. Army Corps of Engineers for excavation of soil adjacent to the river.

The areal extent and volume of affected soil, and the relative concentrations of hydrocarbons can be better defined during the actual remediation process, using on-site screening techniques with confirmation by commercial laboratory analysis. Based on the limited sampling done in this investigation, the total volume of potentially contaminated soil adjacent to the river is estimated to range from 100 to 500 cubic yards.

We believe that excavation will remove all or most of the affected soil from Zone 2. If the depth of hydrocarbon migration proves excessive, or if high groundwater conditions prevent effective excavation, a secondary means of remediation may be possible. This approach involves installation of a series of well points and extraction pumps, or a French drain, collection sump, and pump, to remove any remaining petroleum from soil lying below the water table, and will also intercept any residual hydrocarbons from the beheaded plume originating in Zone 1. The spacing, depth, and configuration of this groundwater extraction system, if required, must be determined after the excavation is completed. Treatment of extracted water could be accomplished in a holding tank, as outlined above.

5. SUMMARY

An investigation, including soil borings, on-site screening, and laboratory analytical methods, was conducted at the site of a fuel spill from an existing underground storage tank at the Sellwood Marina facility. The investigation confirmed that contaminated soils were present adjacent to and down-gradient from the underground tank, and that contaminated soils exist in areas which are adjacent to and at some times inundated by the Willamette River. The results of testing, and sample locations, are shown on the attached figures.

We believe that the soils containing hydrocarbons may be suitably remediated in the following manner:

Zone 1 - Fuel Tank Area

Removal, aeration, and replacement of the soils and existing tanks is the recommended method. This can be done simultaneously with a tank upgrade/retrofit program. An alternative is to utilize soil venting and extraction wells, if needed, to reduce concentrations of hydrocarbons to acceptable levels. This method, if selected, may be done simultaneously with retrofitting of the existing tanks.

Zone 2 - River Bank and River Bed

Removal, aeration, and replacement of the affected soils is recommended. Remediation of residue petroleum hydrocarbons in groundwater or soils below the groundwater table should be accomplished by installing extraction wells or a French drain, if needed.

Design of remediation approaches should be done in consultation with the Oregon Department of Environmental Quality, following their review of this report.

APPENDIX A

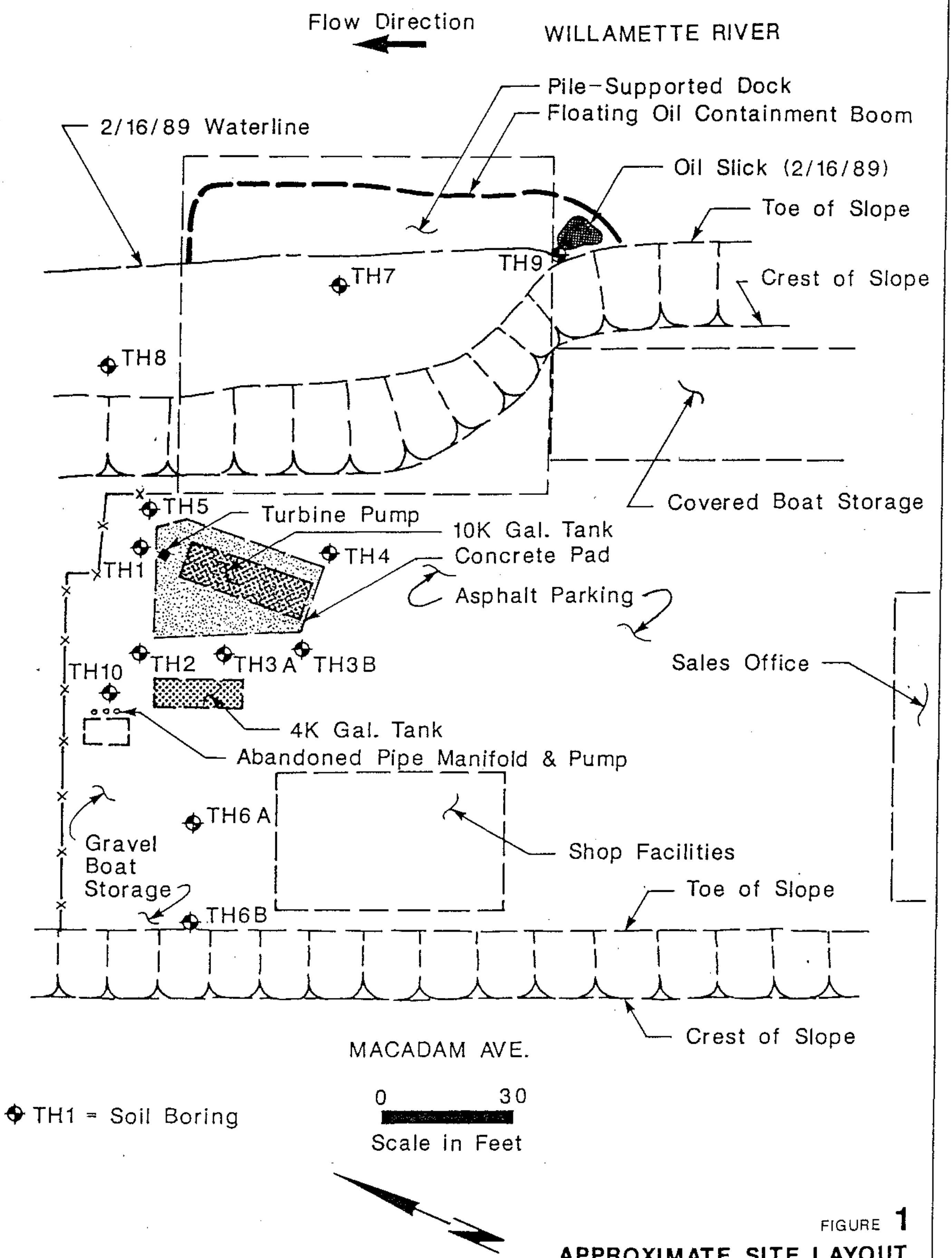

FIGURE 1

APPROXIMATE SITE LAYOUT

STAFF JENNINGS - SELLWOOD MARINA

PROJECT NO 893-1030 DWG. NO 13242 DATE 3/27/89 DRAWN RLM APPROVED ML

Golder Associates Inc.

PACIFIC ANALYTICAL LABORATORY Inc.
9405 S.W. Nimbus Ave. Beaverton, OR 97005 (503) 644-0660

RECEIVED
MAR [illegible]
Golder Associates

February 24, 1989

Golder Associates
4104 148th Ave. NE
Redmond, WA 98052

PAL REPORT NUMBER: 89-0127
P.O./JOB NUMBER: 09163
DATE RECEIVED: 2/17/89
ITEMS: Eleven Samples

ANALYSIS

METHOD:		Detection Limit
	BTEX per EPA 8240 (GC/MS)	5ug/kg
	Gasoline per EPA 8015 (GC/FID)	100ug/kg
	TPH per EPA 418.1 (IR)	20mg/kg
	Lead per EPA 3050/7420 (AA)	1mg/kg

	#1	#2	#3	#4	#5
Benzene,ug/kg	<2,000	<5	<5	25	360
Toluene,ug/kg	61,000	27	<5	<5	2,500
Ethyl Benzene,ug/kg	49,000	<5	<5	<5	2,700
Xylene,ug/kg	402,000	150	<5	65	14,000
Gasoline,mg/kg	1,600	--	--	--	--
Lead,mg/kg	7	--	--	--	--
TPH,mg/kg	990	830	630	1,100	980

	#6B	#7	#8	#9	#10
Benzene,ug/kg	<5	273,000	<5	<5	3,400
Toluene,ug/kg	<5	685,000	<5	<5	17,000
Ethyl Benzene,ug/kg	<5	562,000	<5	<5	22,000
Xylene,ug/kg	<5	1,530,000	<5	15	84,000
Gasoline,mg/kg	--	9,200	--	--	--
Lead,mg/kg	--	16	--	--	--
TPH,mg/kg	25	11,600	80	32	490

All calculations based on dry weight

Respectfully,

Philip Nerenberg
Philip Nerenberg
Chemist

Golder Associates Inc.
CONSULTING ENGINEERS

26-88-078

REMEDIATION DESIGN
FOR SELLWOOD MARINA

Prepared by

Golder Associates Inc.

Michael D. Lubrecht
Senior Engineering Geologist

James M. Doesburg
Associate

January 3, 1990

893-1215

GOLDER ASSOCIATES INC. • 4104 - 148TH AVENUE N.E., REDMOND (SEATTLE), WASHINGTON, U.S.A. 98052 • TEL. (206) 883-0777 • FACSIMILE (206) 882-5498 • TELEX 5106002944

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1. INTRODUCTION

A release of gasoline occurred at the Sellwood Marina site on or about October 18, 1988, resulting from a failed elbow in fuel distribution lines from an underground storage tank. Investigation of the release by SRH Consultants and Golder Associates revealed that petroleum hydrocarbons were detectable in the backfill surrounding the tank, and along the river bank of the Willamette River, directly adjacent to the release.

Immediate action was instituted to contain the release to surface waters, by placing a containment boom and absorbent pads within a fuel-slicked area of the river. Usage of the fuel tank was halted until repairs could be made. The broken elbow was subsequently replaced and the tank and distribution lines were pressure tested to assure that no further releases would occur. The fuel system was returned to service, and is currently in use.

The purpose of this report is to provide a design, work plan, and specifications for the installation of systems to remediate soils and groundwater contaminated by the fuel release. In previous reports, we have divided the site into two separate areas, Zones 1 and 2, based on site topography and type of soil encountered. This report will also address the remedial work as it pertains to those two locations. Zone 1 is located on the upper level of the marina facilities, encompassing the fuel storage tanks and related equipment. Zone 2 is adjacent to the Willamette River, on the lower level of the marina facilities.

2. ZONE 1 - FUEL TANK AREA REMEDIATION DESIGN

Investigation of the area surrounding the point of petroleum release at the underground storage tank was completed on February 16 and 17, 1989, and results were presented in our report dated April 3, 1989. Our investigation identified an area of elevated hydrocarbon concentrations in granular backfill materials near the location of the damaged distribution line, and at the site of a pipe manifold which had been previously used for gasoline pumps. Concentrations of petroleum hydrocarbons within granular materials of the type constituting the backfill may be effectively reduced using an air venting system.

We recommend that a length of four-inch perforated PVC pipe be placed within the tank backfill, in the area where the concrete pad was removed for tank testing. The pipe should be buried at a depth of one to two feet, if possible, and the breach in the concrete should be sealed with an impervious material. Either concrete or asphalt may be used for a permanent seal. If the access through the concrete pad is needed for future tank upgrade, then plastic sheeting and bentonite may be used to cap the area to maintain a surface seal. The perforated pipe should be attached to a solid riser pipe, and routed to a vacuum blower with a minimum 100 scfm capacity. Discharge from the blower should be through a stack with a minimum stack height to disperse petroleum concentrations, and the local fire marshall should be consulted to determine any additional requirements before construction.

Our conversation with Loren Garner of Oregon DEQ indicated that no permit will be required for emissions from this control device.

3. ZONE 2 - RIVER BANK REMEDIATION DESIGN

Investigation of the areal and vertical extent of the contaminated zone was performed on November 3, 1989, by excavating a series of shallow test holes with a posthole digger. The locations of the test holes, and the general site layout for Zone 2 are shown on Figure 1. The excavated soils were visually examined, and were screened with an Organic Vapor Monitor (OVM) to obtain semi-quantitative measurements of volatile organic compounds. Readings on the OVM varied from non-detectable to over 1,400 ppm, with the highest concentrations being in the vicinity of test holes 4, 6, 7, and 8.

Depth to groundwater at this location varies with fluctuations in the Willamette River. The approximate location of the river's edge on November 11 is shown on Figure 2. At the time of the investigation the groundwater surface varied from a depth of one foot in TH-1, adjacent to the river, to approximately three feet in TH-8. Petroleum hydrocarbons were concentrated within a zone approximately eight inches below the ground surface to a depth of approximately two feet below the current water table. The areal extent and thickness of this zone is believed to be a function of the volume of gasoline released, vertical spreading of the petroleum due to the seasonally fluctuating water table, and diffusion of gasoline constituents into the upper part of the groundwater table.

Several options for remediation of this area were considered. The options included removal and aeration of the affected soils, excavation of an interceptor/extraction trench to prevent further fuel migration into the river system, installation of a large-bore extraction well, and placement of well points to remove free product from the groundwater. The last option, well point installation, was selected for the following reasons: ✗

1. Physical removal and aeration of the soil would require the use of heavy equipment, which is not feasible in the tight working space defined by the piling-supported crane dock.
2. Any method requiring soil removal increases the risk of remobilizing gasoline or decomposition products directly to the river.
3. Although an interceptor/extraction trench would also work to remove free product, we believe that more complete remediation, and better control of the remediation process, can be achieved using a system of well points.
4. A large bore extraction well would generate large volumes of water that would require treatment.
5. By utilizing a system which allows for sequential pumping from different arrays of well points, flushing and cleaning of soil presently above the water table can be accomplished as the river level rises.

Our design calls for placement of a grid of well points at intervals throughout the affected area, as shown on Figure 2. It is anticipated that 15 points will be required to provide sufficient coverage of the affected area. The screened interval of each well point must intersect the groundwater table at each location in order to intercept floating product. Because the water table fluctuates considerably, depending on the stage of the Willamette River, the screened sections of the well points extend from just below the ground surface to the total depth of each well point, or an interval of five feet. A tightly-fitting cap must be available for each well point, so that the casings can be sealed to prevent release of floating product directly to the river if river levels rise to the point where some of the points are overtopped.

Floating free product and some groundwater will be withdrawn from the upper part of the groundwater table, using a two-inch diameter lift (skimmer) pump which is specifically designed for this purpose. The pump (an SHP Pump or equivalent) can be operated by on-site Staff Jennings personnel, and is moved from point to point in a sequential fashion to extract small quantities (approximately 10 gallons of product/groundwater) from each well point on a regular schedule, as determined during the startup operation.

Fluids (water and gasoline) extracted from each well point will be pumped to a 1,000-gallon holding tank. Groundwater will be treated in an oil-water separator, to remove gross contamination, and the treated water will be passed through an air stripper or carbon absorption canister to bring volatile organic concentrations within allowable limits for discharge back into the river. Either method for secondary treatment is acceptable, and equipment cost will likely drive the decision for this equipment acquisition. We recommend that recovered petroleum product be disposed through local recyclers. A schematic of the treatment process is shown on Figure 3. The treatment equipment should be of sufficient capacity to treat an average flow of 100 gallons per day.

We anticipate that it will take several weeks of operation in order to remove the petroleum concentrations. Due to surface tension and other factors, it will not be possible to remove all petroleum from the contaminated area. We propose that system operation continue until screening of the groundwater indicates that no free product remains, and that sampling of soil and groundwater then be performed to determine residual concentrations. At that time, we suggest that DEQ be contacted to determine if site closure is possible, or if other measures are required.

4. SYSTEM INSTALLATION

The extraction system for Zone 2 consists of 15 well points, driven to a nominal depth of five feet. As shown on Figure 2, the points will be driven at intervals of ten feet, in five rows spaced ten feet apart. These spacings have been calculated based upon the permeability of the soil, determined by laboratory testing, and the pumping rate desired to achieve the most effective flushing of the soil. Well points should be two-inch diameter, with a five-foot long screened interval.

5. OPERATION AND MONITORING

Operation and monitoring of the system will include several steps. These pertain to monitoring of the extracted and discharge water from the system, control of the pumping operation, and routine maintenance of pumps and water treatment equipment.

In order to monitor long-term system performance, it will be necessary to periodically sample and analyze the water extracted from the well points at each location. The schedule for this monitoring can be best developed after the system has been installed, and after monitoring the system performance during the initial startup period. When the hydrocarbon concentrations in extracted water indicates that hydrocarbons in a particular area have been abated, then extraction efforts may be concentrated on residual pockets of contamination.

Monitoring of the discharge water from the secondary treatment system will also be required to assure that petroleum hydrocarbon concentrations do not exceed the limitations provided on the discharge permit. Based on the monitoring, operation of the system can be adjusted to maintain compliance with the permit requirements.

Routine maintenance of pumps, separator equipment, and air stripping devices may be necessary. This maintenance should be performed at the intervals suggested by the manufacturer, and may be done either by the contractor who installs the equipment, or by Staff Jennings personnel.

6. SITE CLOSURE

Closure of the site must be approved by the DEQ, subsequent to submission of documentation (including sample analyses) which indicate that remediation of the site has met the target goals. Sampling procedures and laboratory analyses for site closure must meet the requirements set forth in the recently proposed Numeric Soil Cleanup Levels (OAR 340-122-301 to 340-122-360) and any other requirements made at the time this design is approved.

7. CONCLUSIONS

The procedures described above are intended to reduce petroleum hydrocarbon levels in soil and groundwater to levels where natural processes (biodegradation) can eliminate residual concentrations. For this reason, it is not expected that the systems will work with 100 percent efficiency. We recommend that a contractor, experienced in petroleum remediation and recovery, be retained for assistance in selecting and installing specific water treatment equipment and the vacuum blower system.

We further recommend that Golder Associates personnel monitor system installation, to provide documentation of contraction details, and to perform documentation of construction details, and to perform on-site screening and sampling during system setup and adjustment. Regular monitoring of the system operation will be required to assure that the remediation is proceeding properly.

Oregon DEQ has specific requirements regarding soil and groundwater sampling for site closure at the conclusion of remedial efforts such as this one. It is important that these be met, and that regular communication is made with DEQ representatives to ensure that the procedures used for remediation and sampling meet with agency approval.

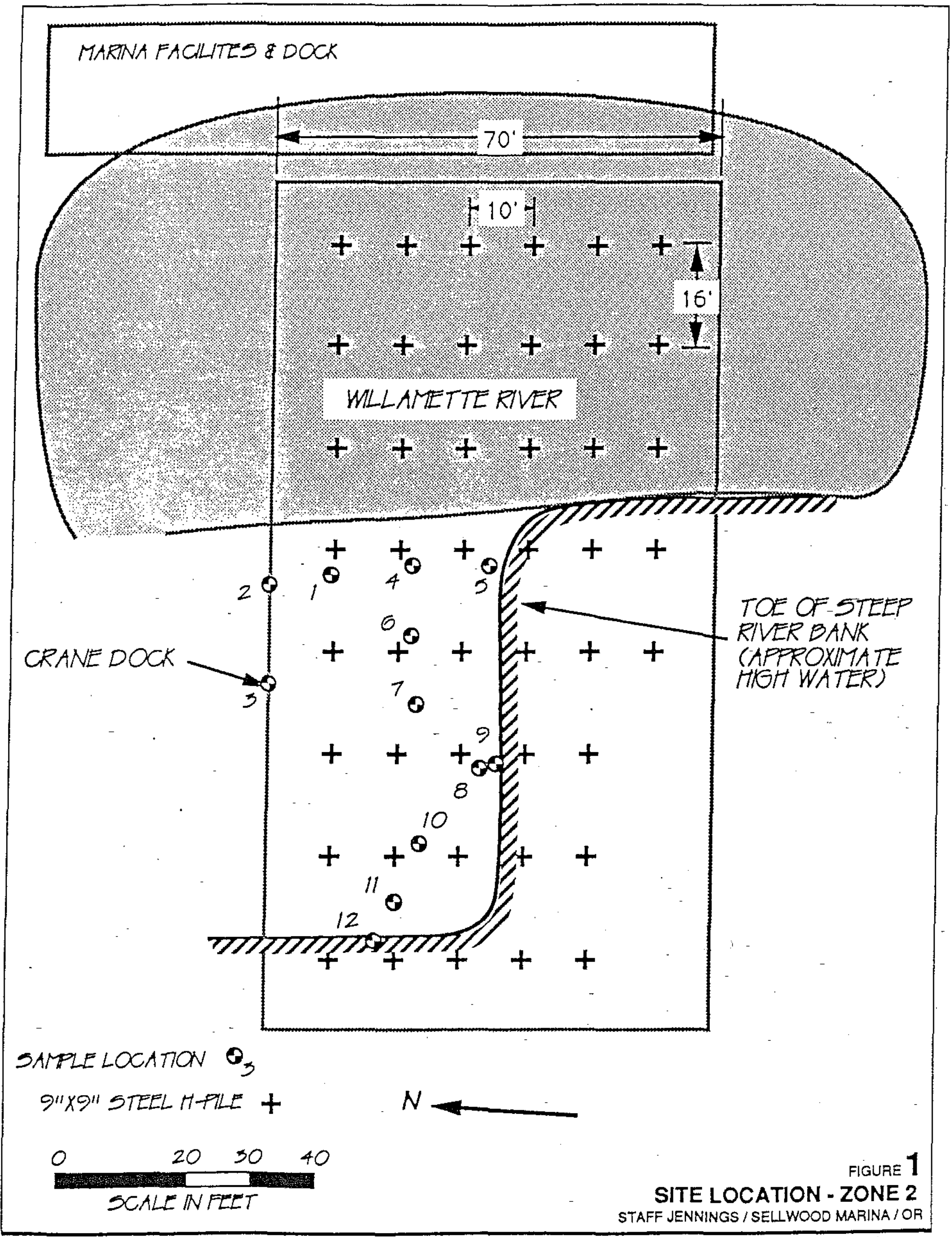

FIGURE **1**

SITE LOCATION - ZONE 2

STAFF JENNINGS / SELLWOOD MARINA / OR

PROJECT NO. 893-1215.001 DWG. NO. 20596 DATE 11/20/89 DRAWN MDL APPROVED MDL

Golder Associates

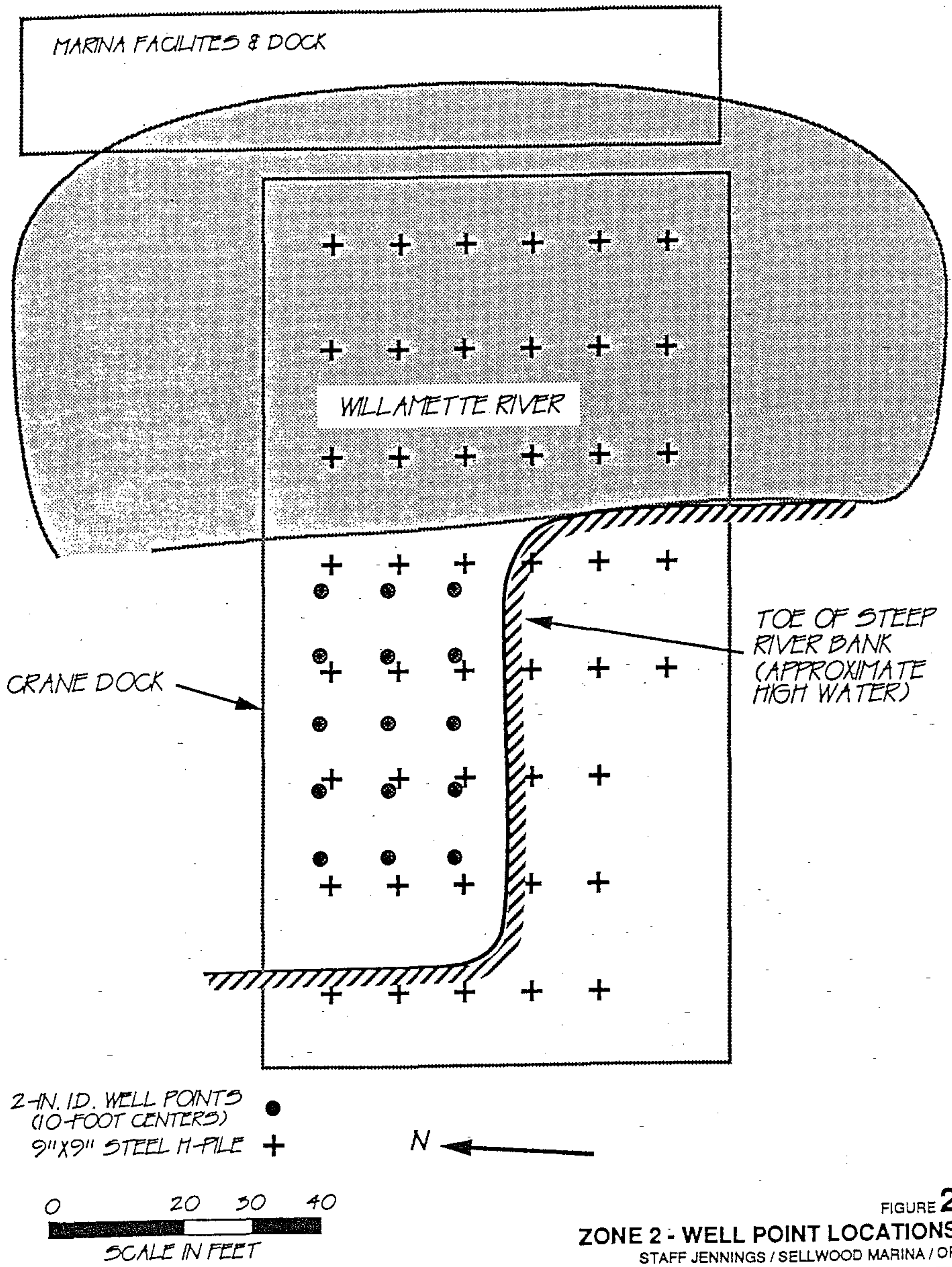

FIGURE 2

ZONE 2 - WELL POINT LOCATIONS

STAFF JENNINGS / SELLWOOD MARINA / OR

PROJECT NO. 893-1215.001 DWG. NO. 20597 DATE 11/20/89 DRAWN MDL APPROVED MDL

Golder Associates

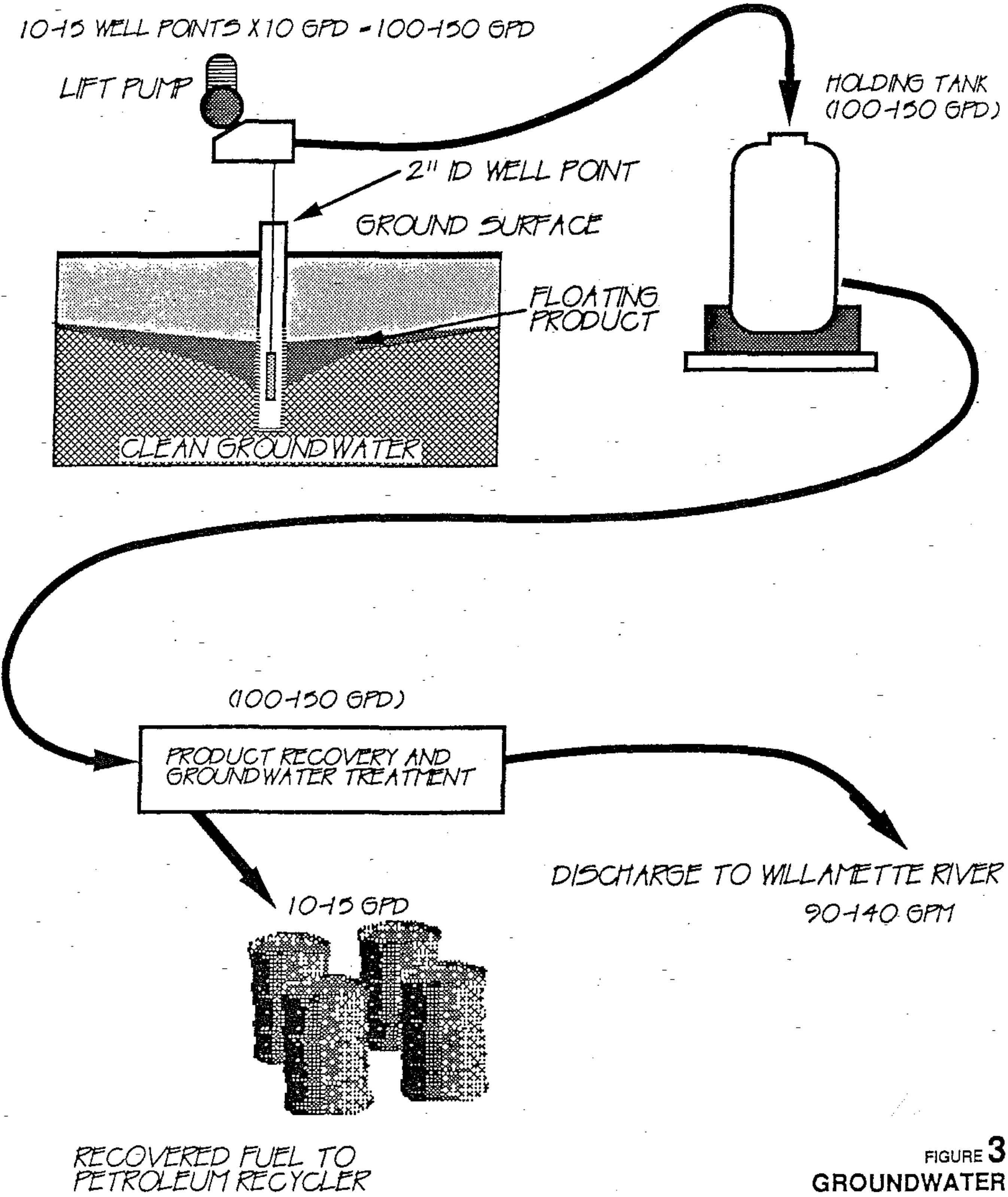

FIGURE 3

GROUNDWATER TREATMENT SYSTEM

STAFF JENNINGS / SELLWOOD MARINA / OR

PROJECT NO. 893-1216.001 DWG. NO. 20598 DATE 12/15/89 DRAWN MDL APPROVED MDL

Golder Associates

26-88-010

1994 De Minimis Report

LIMITED SUBSURFACE SOIL AND GROUNDWATER INVESTIGATION

Staff Jennings, Inc.
Retail Facility and Marina
8240 SW Macadam Avenue
Portland, Oregon 97219

UST Cleanup List #26-88-0078

Project # 00226-1293

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED
MAR 31 1994
NORTHWEST REGION

Prepared For:

Staff Jennings, Inc.
8240 SW Macadam Avenue
Portland, Oregon 97219

March 31, 1994

De Minimis Inc. Environmental Management
34 N.W. First Avenue • Suite 101 • Portland, Oregon • (503) 295-4074

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FIGURES and MAPS

APPENDICES

1.0 INTRODUCTION

At the request of the Staff Jennings, Inc., De Minimis Inc. (DMI) Environmental Management was contracted to provide Project Management services for a Limited Subsurface Soil and Groundwater Investigation of the Retail Facility and Marina located at 8240 SW Macadam Avenue, Portland, Oregon, 97219.

The project consisted of two tasks: 1) collect and analyze soil samples from portable-augered soil borings, and 2) collect and analyze groundwater samples from the soil borings. Project activities occurred on March 15, 1994. The activities, analytical results, and interpretations of this project are described in this report.

The two tasks were performed as a direct result of the recommendations made in the report titled Level I Environmental Site Assessment of Staff Jennings, Inc., Retail Facility and Marina, Portland, Oregon, dated November 30, 1993, prepared by DMI. The Oregon Department of Environmental Quality (DEQ) has also requested additional investigation into the release from the on-site UST system which occurred on October 18, 1988 (DEQ UST Cleanup List #26-88-0078).

2.0 SITE DESCRIPTION AND BACKGROUND

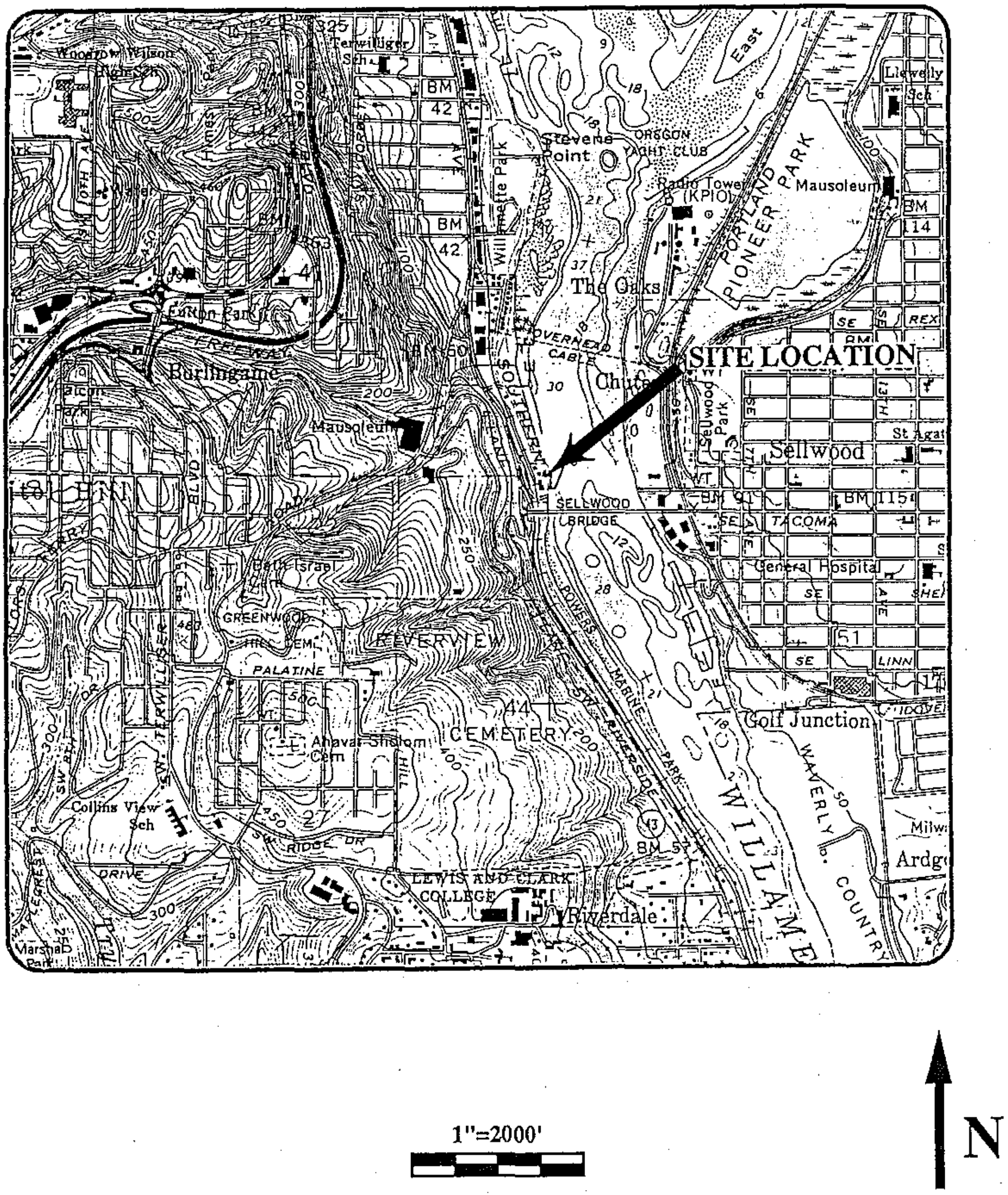
2.1 Site Description

The subject property is located at 8240 SW Macadam Avenue in a commercial corridor approximately 3-1/2 miles south of downtown Portland, Oregon (See Figure 1-Site Location). The subject property is 2.36 acres in area. The geographic location of the subject property is Section 22, Township 1 South, Range 1 East of the Willamette Meridian, in the County of Multnomah and State of Oregon. The subject property has been owned by the Jennings family since it was purchased by Stafford H. and Dorothea Jennings in August 1937. The original building was constructed on the subject property in October 1939.

The subject property is bordered to the north by undeveloped river front acreage located on the west bank of the Willamette River. The subject property is bordered to the east by the Willamette River which flows to the north. The subject property is bordered to the south by an access road leading to a Multnomah County boat ramp (formerly a ferry crossing ramp) located beneath the Sellwood Bridge. The subject property is bordered on the west by a railroad track, an access road, and SW Macadam Avenue. Undeveloped, forested acreage is located to the west of SW Macadam Avenue.

The subject property occupies two levels on the west bank of the Willamette River at the base of a moderately steep slope. The majority of the site (main level) is located on the upper terrace which has been excavated into the river bank approximately 20-30 feet above the Willamette River. The retail, repair, rigging, and storage buildings are located on the main level. The remainder of the main level is paved with asphalt or concrete. A crane dock, an elevated concrete platform supported by steel beams, is located on the northern portion of the main level and extends to the east over the Willamette River. The subject property slopes steeply from the main level down to the bank of the Willamette River. Two floating docks are located below the main level on the river.

The subject facility retails gasoline for water craft and is registered with the Oregon Department of Environmental Quality (DEQ) Registered Underground Storage Tank (UST) Facilities as Staff Jennings, Inc., DEQ Facility I.D. Number 3105. Two active, permitted USTs (one 4,000-gallon gasoline UST and one 10,000-gallon gasoline UST)



Base Map from U.S. Geological Survey 7.5 Minute Lake Oswego Quadrangle

PROJECT NO. 00226-1293 March 1994	**DE MINIMIS INC.** ENVIRONMENTAL MANAGEMENT 34 N.W. FIRST AVENUE, SUITE 101 PORTLAND, OREGON 97209 503/295-4074	**Site Location** Subsurface Soil and Groundwater Investigation Staff Jennings, Inc. 8240 SW Macadam Avenue Portland, Oregon 97219	**FIGURE** **1**

are registered for the subject facility. On March 17, 1994, Mr. Jeffrey S. Jennings, President, Staff Jennings, Inc., stated that both USTs are currently in use. Mr. Jennings had previously stated that the USTs contained a mixture of 50% regular leaded gasoline and 50% supreme unleaded gasoline.

2.2 Site Background

The following information regarding the UST release was supplied or confirmed by Mr. Jennings:

- On October 18, 1988, the Staff Jennings marina manager observed a petroleum fuel slick on the Willamette River downgradient from the on-site USTs. The marina manager contacted SRH Associates, Inc., Portland, Oregon, to perform cleanup operations. SRH Associates deployed a floating boom on the Willamette River to contain the slick. Pads were used to absorb the floating product. Additionally, soil samples were collected in the spill area to confirm that the released material was gasoline from the subject facility. Staff Jennings discontinued use of the USTs. SRH Associates notified the Oregon DEQ (DEQ UST Cleanup #26-88-0078), the U.S. Coast Guard, and the Portland Fire Department of the release on October 19, 1988. The primary source of the released fuel was leakage from the UST piping (a cracked elbow) located near the fuel turbine pump for the 10,000-gallon UST. The cracked elbow and other minor leaks in the product distribution lines were subsequently repaired.

- On February 16-17, 1989, Golder Associates, Inc. (GAI), conducted a preliminary soils investigation (See GAI Report of Findings Preliminary Field Investigation of Sellwood Marina, Portland, Oregon, March 27, 1989) to determine the extent and quantity of contamination due to the release from the on-site UST. This investigation confirmed that petroleum hydrocarbon contamination (gasoline) existed adjacent to the USTs and extended downgradient to the edge of the Willamette River. Elevated contaminant levels for gasoline, benzene, toluene, ethylbenzene, xylene, and lead were reported for soil samples collected adjacent to and downgradient from the USTs. Maximum contaminant levels were collected from the river bank (contaminants reported in parts per million, ppm, or parts per billion, ppb): 11,600 ppm total petroleum hydrocarbon (TPH); 9,200 ppm gasoline; 273,000 ppb benzene; 685,000 ppb toluene; 562,000 ppb ethylbenzene; 1,530,000 ppb xylene; and 16 ppm lead. Groundwater was encountered in the soil borings at depths ranging from 0.6-3.3 feet below ground surface (bgs).

3.0 SOIL AND GROUNDWATER INVESTIGATION

3.1 Limited Investigation Objectives

DMI personnel discussed the Limited Soil and Groundwater Investigation objectives on several occasions with Mr. Rich Rose and Mr. Rick Silverman, Oregon DEQ Underground Storage Tank Section. Mr. Rose had formerly been assigned the subject site file and Mr. Silverman is currently assigned this file. Oregon DEQ has requested further investigation of the release from the on-site UST system. DMI personnel had recommended a Limited Soil and Groundwater Investigation to determine if any further investigation would be required due to the amount of time since the release from the UST system occurred (approximately 5-1/2 years) and the logistical problems with installing groundwater monitoring wells due to site configuration and topography.

3.2 Site Preparations

Prior to on-site activities, a utility locate check (Ticket #33478) was ordered from the Utility Notification Service on March 11, 1994, and was completed on or before March 15, 1994. Utilities notified included Northwest Natural Gas, Portland General Electric, City of Portland Water, U.S. West Communications, and Paragon Cable. No utility markings were observed in the project area on the subject property.

The fill pipes for the USTs were located on the northwest corner of the subject property. During the Level I Environmental Site Assessment, Mr. Al Anshen, Service Manager, Staff Jennings, Inc., stated that the product dispensing lines run from the USTs to the adjacent pump house before being piped off to the active gasoline pumps located on the southeastern portion of the subject property. The product dispensing pipes are primarily buried; however, the pipes are also suspended beneath the elevated concrete platform. One gasoline dispensing pump is located on the main level near the steps leading down to the floating docks and one gasoline dispensing is located on a floating dock on the river.

3.3 Site Safety Meeting and Safety Preparations

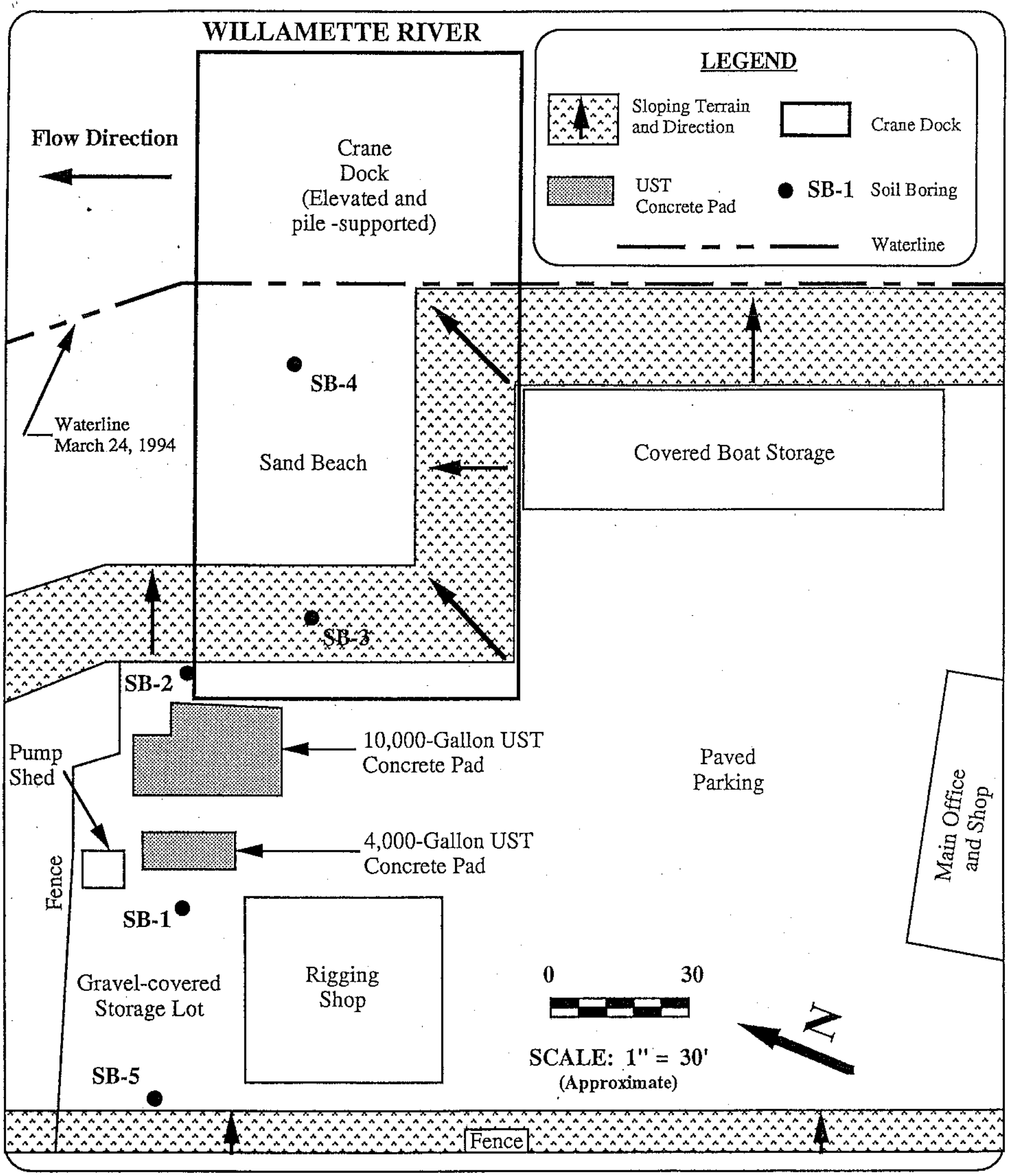
A Site Health and Safety meeting was conducted prior to initiating site work on March 15, 1994, to review site-specific health and safety hazards associated with this project. A copy of the Site Health and Safety plan was distributed to the field personnel.

3.4 Subsurface Soil Borings and Soil Sampling

Five subsurface soil borings (SB) were drilled with a hand-held drilling unit at the subject site. The soil borings were drilled to depths ranging from 3-15 feet below ground surface (bgs) depending on the depth to groundwater or drilling refusal. The soil borings were drilled under the direct supervision of Mr. Neil Shaw, State of Oregon Registered Professional Geologist (License #G-1176) and State of Oregon Water Resources Department licensed Water/Monitor Well Constructor (License #10286). The soil borings were drilled in the areas of previously delineated gasoline contamination, as reported in the GAI Report of Findings Preliminary Field Investigation of Sellwood Marina, and upgradient of the USTs (See Figure 2-Site Map for soil boring and groundwater sampling locations).

The soil borings were drilled with a 1-1/8 inch outside diameter (O.D.), stainless steel core bit (1-inch inside diameter-I.D.) mounted on internally-threaded, 1-inch O.D., stainless steel bit extension rods. The drill bit was advanced utilizing an electric Bosch Rotohammer powered by a portable generator. Distilled water was utilized when needed to facilitate drilling through dense materials. The drill bit and bit extension rods were decontaminated prior to each boring and sampling by thoroughly washing with a solution of tap water and Alconox (a laboratory-grade detergent) and rinsing with distilled water.

The following sampling procedure was followed by DMI personnel to obtain each discrete soil sample. Soil samples downgradient of the USTs were collected when visual or olfactory evidence of contamination was first observed. Sampling personnel, wearing clean, surgical-type, latex gloves, collected the soil samples into pre-cleaned, 4-ounce, Environmental Sampling Supply® glass sample bottles fitted with Teflon™-lined lids. The soil samples were collected from the hollow core bit and were rapidly transferred to the sampling jars. The sample containers were sealed, labeled, and stored on ice in a cooler until shipped to Hughes Analytical Laboratory (HAL), an off-site, independent, laboratory, via chain of custody for analyses. The chain of custody documentation and HAL laboratory reports are presented in Appendix A, Laboratory Analytical Results and Chain of Custody.



PROJECT NO. **00226-1293**	**DE MINIMIS INC.** **ENVIRONMENTAL MANAGEMENT** **34 N.W. FIRST AVENUE, SUITE 101** **PORTLAND, OREGON 97209** **503/295-4074**	**Site Map** **Subsurface Soil and Groundwater Investigation** **Staff Jennings, Inc.** **8240 SW Macadam Avenue** **Portland, Oregon 97219**	**FIGURE** **2**
March 1994			

The soil samples collected from the soil borings were logged by a DMI Geologist, according to geologic description. The soil samples were screened in the field for visual and olfactory indications of contamination. Field sheen tests were performed by placing a portion of the soil samples into clean sample jars filled with water. The amount of petroleum sheen produced during the sheen test or observed on the surface of a wet soil sample was observed as a qualitative estimate of the degree of contamination.

SB-1 was drilled approximately 8 feet west (presumed upgradient) of the 4,000-gallon gasoline UST. Drilling refusal, possibly due to a boulder, was encountered at approximately 3 feet bgs. Soil sample SB1-3′ was a wet (due to the addition of distilled water during drilling), mottled dark gray and brown, silty fine sand. The gray mottling in this soil sample appeared to be visually contaminated. A slight odor of degraded gasoline was detected in this sample. A slight petroleum sheen was observed during the field sheen test. Groundwater was not encountered in SB-1.

SB-2 was drilled approximately 14 feet east-northeast (presumed downgradient) of the 10,000-gallon gasoline UST. Soil sample SB2-6′ was a damp, gray, micaceous, silty fine sand. This soil sample appeared to be visually contaminated. A slight odor of degraded gasoline was detected in this sample. An abundant petroleum sheen was observed on the surface of this soil sample. Groundwater was encountered at approximately 10 feet bgs. Groundwater samples were collected from this boring (See Section 3.5 Groundwater Sampling).

SB-3 was drilled on the slope located beneath the elevated crane dock, and downgradient and east of the 10,000-gallon gasoline UST. Soil sample SB3-6′ was a wet, gray, micaceous, silty fine sand. This soil sample appeared to be visually contaminated. A moderate to strong gasoline odor was detected in this sample. An abundant petroleum sheen was observed on the surface of this soil sample. Groundwater was encountered at approximately 4 feet bgs. Groundwater samples were collected from this boring (See Section 3.5 Groundwater Sampling).

SB-4 was drilled on the beach located beneath the elevated crane dock and downgradient of the USTs. SB-4 was located approximately 18 feet west of the Willamette River waterline. Soil sample SB4-4′ was a wet, gray, micaceous, silty, fine to medium sand. This soil sample appeared to be visually contaminated. A moderately strong gasoline odor was detected in this sample. An abundant petroleum sheen was observed during the field sheen test. Groundwater was encountered at approximately 2 feet bgs. Groundwater samples were collected from this boring (See Section 3.5 Groundwater Sampling).

SB-5 was drilled approximately 49 feet west (presumed upgradient) of the 4,000-gallon gasoline UST. Soil sample SB5-5′ was a wet (due to the addition of distilled water during drilling), medium brown, silty fine sand. No visual or olfactory evidence of petroleum contamination was observed in this sample or during drilling this boring. No petroleum sheen was observed during the field sheen test. Drilling refusal, possibly due to a boulder or bedrock, was encountered at approximately 8.5 feet bgs. Groundwater was not encountered in SB-5.

3.5 Groundwater Sampling

Representative groundwater samples were collected from the soil borings where groundwater was encountered (SB-2, SB-3, and SB-4) on March 15, 1994. Since groundwater samples were collected from three soil borings, these soil borings were considered groundwater monitoring wells and required State of Oregon Water Resources Department monitoring well start cards. The monitoring well start card numbers were: SB-2, Start Card #63640; SB-3, Start Card #63641; and SB-4, Start Card #63642. The groundwater monitoring wells were drilled to the specifications given by the DMI Geologist and licensed Monitoring Well Constructor. The monitoring wells were utilized for sampling purposes, were temporary, and were not completed. The soil borings and temporary groundwater monitoring wells were subsequently abandoned the same day. The borings were filled with 8-20 mesh bentonite chips and hydrated.

Representative groundwater samples were obtained utilizing a decontaminated Nalgene hand pump. Prior to collecting each groundwater sample, the hand pump was decontaminated by thoroughly washing with a solution of tap water and Alconox (a laboratory-grade detergent) and rinsing with distilled water. The following sampling protocol was utilized by DMI personnel for each groundwater sample collected. DMI personnel, wearing clean, surgical-type, latex gloves, collected one groundwater sample from each well and rapidly transferred this sample into three sterile, 40-milliliter (ml) septum, glass bottles for Volatile Organic Analysis (VOA). One additional groundwater sample was collected from each well and rapidly transferred into a 500-ml, high density polyethylene Nalgene® sample bottle fitted with a polypropylene screw cap lid. The groundwater samples were carefully transferred into the sample bottles with no headspace, thus minimizing the loss of volatile organic compounds. The sample containers were sealed, labeled, and stored on ice in a cooler until shipped to HAL via chain of custody for laboratory analyses (See Appendix A-Laboratory Analytical Results and Chain of Custody for the complete analytical results).

The groundwater samples (GW2-1 and GW2-2) collected from SB-2 contained grayish-brown silt. A moderately strong gasoline odor was detected and abundant petroleum sheen was observed on the surface of this sample. No free product was observed.

The groundwater samples (GW3-1 and GW3-2) collected from SB-3 contained brownish-gray silt. A moderate to strong gasoline odor was detected and abundant petroleum sheen was observed on the surface of this sample. No free product was observed.

The groundwater samples (GW4-1 and GW4-2) collected from SB-4 contained black silt. A moderately strong gasoline odor was detected and abundant petroleum sheen was observed on the surface of this sample. No free product was observed.

4.0 LABORATORY ANALYTICAL RESULTS

4.1 Analytical Methods

Soil and groundwater samples were collected by DMI personnel from the soil borings and the temporary groundwater monitoring wells utilizing Oregon DEQ and EPA-approved methods.

A total of five soil samples were obtained from the subsurface soil borings. The soil samples were analyzed by HAL for Total Petroleum Hydrocarbon-Gasoline utilizing the Oregon DEQ-approved method TPH-G by gas chromatograph/photoionization detector (GC/PID).

A total of six groundwater samples were obtained from the temporary groundwater monitoring wells. The groundwater samples were analyzed by HAL for: benzene, toluene, ethylbenzene, and xylenes (BTEX per EPA Method 8240), dissolved lead (per EPA 7421), and ethylene dibromide (EDB) and ethylene dichloride (EDC) (per EPA Method 8240).

4.2 Soil Sample Analytical Results

Gasoline contamination (reported in parts per million-ppm) was detected in the following soil samples: SB1-3′ (25 ppm), SB2-6′ (450 ppm), SB3-6′ (3300 ppm), and SB4-4′ (2800 ppm). No petroleum hydrocarbons were detected in the soil sample collected from SB5-5′.

The results of the soil sample analyses are tabulated in Table 1 (See Appendix A-Laboratory Analytical Results and Chain of Custody for complete laboratory documentation).

TABLE 1

SOIL SAMPLE ANALYTICAL RESULTS
TOTAL PETROLEUM HYDROCARBON-GASOLINE
(TPH-G by GC/PID)
March 15, 1994

SOIL SAMPLE I.D.	TPH-G
SB1-3′	25
SB2-6′	450
SB3-6′	3300
SB4-4′	2800
SB5-5′	ND
Lab Blank	ND
Detection Limit	10

Results reported in mg/kg (milligrams per kilogram) or ppm (parts per million).
ND = Not Detected at or above the test method detection limits.

4.3 Groundwater Sample Analytical Results

Since gasoline was detected in soil samples collected at a depth greater than or equal to the depth of the water table; the groundwater samples were analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX), per OAR 340-122-242 (3)(a)(A). Concentrations of BTEX, reported in parts per billion (ppb), were identified in groundwater samples GW2-2, GW3-2, and GW4-2. Benzene (16,100 ppb), toluene (60,100 ppb), ethylbenzene (27,900 ppb), and total xylenes (143,000 ppb) were detected in sample GW2-2. Benzene (22,300 ppb), toluene (46,100 ppb), ethylbenzene (5,700 ppb), and total xylenes (29,700 ppb) were detected in sample GW3-2. Benzene (27,000 ppb), toluene (52,900 ppb), ethylbenzene (11,300 ppb), and total xylenes (59,000 ppb) were detected in sample GW4-2.

Since leaded gasoline was released at the subject site and TPH levels greater than 40 ppm for gasoline were detected in soil samples collected at a depth greater than or equal to the depth of the water table; groundwater samples were analyzed for ethylene dibromide (EDB or 1,2-Dibromoethane), ethylene dichloride (EDC or 1,2-Dichloroethane), and dissolved lead, as per OAR 340-122-242 (3)(a)(C-D).

Due to the high concentrations of fuel hydrocarbons present in the groundwater samples which necessitated sample dilution; the detection limits for EDB and EDC were raised to 1.0 ppb for samples GW2-2 and GW3-2, and raised to 2.5 ppb for sample GW4-2. EDB and EDC were not detected at or above the raised detection limits in any of the groundwater samples.

Dissolved lead was detected in groundwater samples GW2-1 at 6 ppb and in GW4-1 at 23 ppb. Dissolved lead was not detected at or above the test method detection limit (1 ppb) in groundwater sample GW3-1.

The results of the groundwater sample analyses are tabulated in Tables 2 and 3 (See Appendix A-Laboratory Analytical Results and Chain of Custody for complete laboratory documentation).

TABLE 2

GROUNDWATER ANALYTICAL RESULTS
BENZENE, TOLUENE, ETHYLBENZENE, and XYLENES (BTEX), ETHYLENE DIBROMIDE (EDB or 1,2-Dibromoethane), and ETHYLENE DICHLORIDE (EDC or 1,2-Dichloroethane)
(per EPA 8240)
March 15, 1994

DESCRIPTION	GW2-2*	GW3-2*	GW4-2**	LAB BLANK	DETECTION LIMIT
Benzene	16,100	22,300	27,000	ND	0.5
Toluene	60,100	46,100	52,900	ND	0.5
Ethylbenzene	27,900	5,700	11,300	ND	0.5
Total Xylenes	143,000	29,700	59,000	ND	1.0
Ethylene Dibromide	ND	ND	ND	ND	0.5
Ethylene Dichloride	ND	ND	ND	ND	0.5

Results reported in ppb (parts per billion) or µg/L (micrograms per liter).
ND = Not Detected at or above the test method detection limits.

* The detection limits for this sample are higher by a factor of 2 due to sample dilution.
** The detection limits for this sample are higher by a factor of 5 due to sample dilution.

TABLE 3

GROUNDWATER ANALYTICAL RESULTS
DISSOLVED LEAD
(per EPA 7421)
March 15, 1994

GROUNDWATER SAMPLE I.D.	DISSOLVED LEAD
GW2-1	6
GW3-1	ND
GW4-1	23
Lab Blank	ND
Detection Limits	1

Dissolved lead results reported in ppb (parts per billion) or µg/L (micrograms per liter).
ND = Not Detected at or above the test method detection limits.

4.4 Quality Assurance Data

A total of five soil samples and six groundwater samples were received by Hughes Analytical Laboratory (HAL) under a chain of custody. The samples were received in containers consistent with U.S. EPA protocol.

Standard Quality Assurance/Quality Control (QA/QC) procedures were performed as stated in "EPA Test Methods for Evaluating Solid Waste (SW-846)", 3rd Edition, and "Standard Methods for the Examination of Water and Wastewater", 17th Edition. The EPA laboratory protocols followed by HAL included sample holding times, laboratory method blanks, laboratory matrix spikes, replicate samples, and calibration standards. HAL reported no significant variations from these protocols that would invalidate the analytical data. High recoveries for one Volatile Organic Analysis (VOA) surrogate reflect a problem with this particular compound; however, sample results are not affected.

Test methods may include minor modifications of detection limits or lists of parameters for the published methods. Raised detection limits for 1,2-Dibromoethane (EDB) and 1,2-Dichloroethane (EDC) are due to the high concentrations of fuel hydrocarbons, which necessitated sample dilutions and interfere with mass spectral evaluation of 1,2-Dichloroethane (EDC). Solid samples were reported on a wet weight basis unless otherwise noted.

5.0 ANALYTICAL RESULTS AND CLEANUP STANDARDS

5.1 Soil Analytical Results and Soil Matrix Cleanup Standards

Since this petroleum hydrocarbon contamination is due to a release from the on-site UST system, site-specific evaluation parameters could be used to determine the Numeric Soil Cleanup Standards for the subject property, as per OAR 340-122-325. Gasoline contamination in excess of the least stringent DEQ Numeric Soil Cleanup Standards (Level 3 Cleanup) is present on the subject property. The least stringent DEQ Numeric Soil Cleanup Standard, a Level 3 Cleanup Standard, for the subject site requires the soils to be cleaned up to at least 130 ppm gasoline (OAR 340-122-335). Gasoline concentrations in soils analyzed from the subject site range from "Not Detected" in SB-5 (presumed upgradient from the USTs) to 3300 ppm gasoline in SB-3 (located downgradient from the USTs).

The Level 3 Cleanup Standard is used only as a reference to the level of contamination observed on the subject property and the DEQ Soil Cleanup Standards. A Soil Matrix Score was not determined for the subject property. A Level 3 Cleanup Standard may not be considered the appropriate Soil Cleanup Standard.

However, since groundwater at the subject property is impacted by gasoline; the DEQ Numeric Soil Cleanup Standards would not be applicable for the subject property. The DEQ may require the investigation and remediation of the subject property to proceed as per the Environmental Cleanup Rules (OAR 340-122-010 through 110).

5.2 Groundwater Analytical Results and Numeric Groundwater Cleanup Levels

Groundwater samples were collected from the three soil borings where groundwater was encountered (temporary groundwater monitoring wells) at the subject site to determine if groundwater had been impacted by the release from the UST system, as per OAR 340-122-240 (3).

Since gasoline contamination was detected in soil samples collected at a depth greater than or equal to the depth of the water table; the groundwater samples were analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX), per OAR 340-122-242 (3)(a)(A).

The basic numeric groundwater cleanup levels for petroleum-contaminated UST sites, as specified in OAR 340-122-242 (4a), for volatile aromatic hydrocarbons (BTEX) are: benzene, 5 ppb; toluene, 1000 ppb; ethylbenzene, 700 ppb; and total xylenes, 10,000 ppb.

Laboratory analytical results for BTEX in groundwater samples GW2-2, GW3-2, and GW4-2 exceed Oregon DEQ groundwater cleanup levels. Benzene (16,100 ppb), toluene (60,100 ppb), ethylbenzene (27,900 ppb), and total xylenes (143,000 ppb) were detected in sample GW2-2. Benzene (22,300 ppb), toluene (46,100 ppb), ethylbenzene (5,700 ppb), and total xylenes (29,700 ppb) were detected in sample GW3-2. Benzene (27,000 ppb), toluene (52,900 ppb), ethylbenzene (11,300 ppb), and total xylenes (59,000 ppb) were detected in sample GW4-2.

Since TPH levels greater than 40 ppm for gasoline were detected in soil samples collected at a depth greater than or equal to the depth of the water table; groundwater samples were analyzed for ethylene dibromide (EDB or 1,2-Dibromoethane), ethylene dichloride (EDC or 1,2-Dichloroethane), and dissolved lead (as per OAR 340-122-242 (3)(a)(C-D)). As per OAR 340-122-242 (4a), the basic numeric groundwater cleanup level for the following gasoline additives is: ethylene dibromide (EDB), 1 ppb; ethylene dichloride (EDC), 5 ppb; and dissolved lead, 5 ppb.

Due to the high concentrations of fuel hydrocarbons present in the groundwater samples which necessitated sample dilution; the detection limits for EDB and EDC were raised to 1.0 ppb for samples GW2-2 and GW3-2, and raised to 2.5 ppb for sample GW4-2. These raised detection limits for EDB equal or exceed the basic numeric groundwater cleanup level for EDB. EDB and EDC were not detected at or above the raised detection limits in any of the groundwater samples.

Dissolved lead exceeding the groundwater cleanup level was detected in groundwater sample GW2-1 at 6 ppb and in GW4-1 at 23 ppb. Dissolved lead was not detected at or above the test method detection limit, 1 ppb, groundwater sample GW3-1.

6.0 GEOLOGY AND HYDROGEOLOGY

Examination of published and unpublished geological and hydrogeological reports for the Macadam Avenue area have allowed us to characterize the geology and hydrology of the site.

The subject site is located on the west bank of the Willamette River adjacent to the Sellwood Bridge and approximately 3-1/2 miles south of downtown Portland, Oregon. The subject property is approximately 15-40 feet above Mean Sea Level (MSL). The subject property occupies two levels on the west bank of the Willamette River at the base of a moderately steep slope. The majority of the site (main level) is located on the upper terrace which has been excavated into the river bank approximately 20-30 feet above the Willamette River. The subject property slopes steeply from the main level down to the bank of the Willamette River. Surface drainage for the subject property is to the east into the adjacent Willamette River, which flows to the north.

The soil underneath the subject site is classified as Urban Land, 0 to 3 percent slopes, by the Soil Survey of Multnomah County, Oregon.. This miscellaneous map unit is found throughout central Multnomah County and mainly occurs in Portland along the flood plains of the Willamette River. Areas of this map unit are used mainly for commercial purposes. The original soils were gravelly loam, silt loam, or silty clay loam with some sandy materials. The soils in areas of this unit have been graded, cut, filled, or otherwise severely altered due to construction that mapping the soil units was not practical. Approximately ninety-five percent or more of the soils are covered with concrete, pavement, buildings, and other structures.

Immediately underlying the site are the highly permeable sands and gravels of the Willamette River flood plain deposits (Quaternary Alluvium). The alluvium has been deposited by constant flooding of the river since about 10,000 years ago, at the end of the last Ice Age. Since that time, the position of the Willamette River has remained relatively constant. This alluvial unit is overlain in turn by a thin veneer of silts and sands derived from wind deposition and weathering of the river deposits.

Our experience from drilling projects in the area indicates that underlying the alluvial deposits at a depth of 20 feet or less are the dense basalt flows of the Columbia River Basalt. These lava flows erupted approximately 15 to 20 million years ago. The Columbia River Basalts are visible in the local road cuts, and in the banks and channel of the Willamette River.

Examination of water well logs, City of Portland groundwater exploration reports, and U.S. Geological Survey groundwater information for the project area indicates the depth to the uppermost aquifer beneath the site is approximately 20 feet or less. This level coincides with the stage of the adjacent river and represents a layer of water perched on top of the underlying basalt flows. The level to groundwater can be expected to fluctuate on a seasonal basis in response to recharge from local rainfall runoff. The direction of movement of the uppermost groundwater aquifer is to the east toward the Willamette River.

On November 12, 1993, Ms. Jo Miller, U.S. Geological Survey (USGS), found no records of water wells on the subject property or for the subject property address.

7.0 SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

7.1 Summary and Conclusions

Based on data collected and field observations made by DMI, the following summaries and conclusions are presented:

Subsurface Soil Investigation

- Gasoline contamination in excess of the least stringent DEQ Numeric Soil Cleanup Standards (Level 3 Cleanup) is present on the subject property. The least stringent DEQ Numeric Soil Cleanup Standard, a Level 3 Cleanup Standard, for the subject site requires the soils to be cleaned up to at least 130 ppm gasoline (OAR 340-122-335). Gasoline concentrations in soils analyzed from the subject site range from "Not Detected" in SB-5 (presumed upgradient from the USTs) to 3300 ppm gasoline in SB-3 (located downgradient from the USTs).

- The Level 3 Cleanup Standard is used only as a reference to the level of contamination observed on the subject property and the DEQ Soil Cleanup Standards. A Soil Matrix Score was not determined for the subject property. A Level 3 Cleanup Standard may not be considered the appropriate Soil Cleanup Standard.

- However, since groundwater at the subject property is impacted by gasoline; the DEQ Numeric Soil Cleanup Standards would not be applicable for the subject property. The DEQ may require the investigation and remediation of the subject property to proceed as per the Environmental Cleanup Rules (OAR 340-122-010 through 110).

Groundwater Investigation

- Groundwater samples were collected from the three soil borings where groundwater was encountered (temporary groundwater monitoring wells) at the subject site to determine if groundwater had been impacted by the release from the UST system, as per OAR 340-122-240 (3).

- Since gasoline contamination was detected in soil samples collected at a depth greater than or equal to the depth of the water table; the groundwater samples were analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX), per OAR 340-122-242 (3)(a)(A). The basic numeric groundwater cleanup levels for petroleum-contaminated UST sites, as specified in OAR 340-122-242 (4a), for volatile aromatic hydrocarbons (BTEX) are: benzene, 5 ppb; toluene, 1000 ppb; ethylbenzene, 700 ppb; and total xylenes, 10,000 ppb.

- Laboratory analytical results for BTEX in groundwater samples GW2-2, GW3-2, and GW4-2 exceed Oregon DEQ groundwater cleanup levels. Benzene (16,100 ppb), toluene (60,100 ppb), ethylbenzene (27,900 ppb), and total xylenes (143,000 ppb) were detected in sample GW2-2. Benzene (22,300 ppb), toluene (46,100 ppb), ethylbenzene (5,700 ppb), and total xylenes (29,700 ppb) were detected in sample GW3-2. Benzene (27,000 ppb), toluene (52,900 ppb), ethylbenzene (11,300 ppb), and total xylenes (59,000 ppb) were detected in sample GW4-2.

- Since TPH levels greater than 40 ppm for gasoline were detected in soil samples collected at a depth greater than or equal to the depth of the water table; groundwater samples were analyzed for ethylene dibromide (EDB or 1,2-Dibromoethane), ethylene dichloride (EDC or 1,2-Dichloroethane), and dissolved lead (as per OAR 340-122-242 (3)(a)(C-D)). As per OAR 340-122-242 (4a), the basic numeric groundwater cleanup level for the following gasoline additives is: ethylene dibromide (EDB), 1 ppb; ethylene dichloride (EDC), 5 ppb; and dissolved lead, 5 ppb.

- Due to the high concentrations of fuel hydrocarbons present in the groundwater samples which necessitated sample dilution; the detection limits for EDB and EDC were raised to 1.0 ppb for samples GW2-2 and GW3-2, and raised to 2.5 ppb for sample GW4-2. These raised detection limits for EDB equal or exceed the basic numeric groundwater cleanup level for EDB. EDB and EDC were not detected at or above the raised detection limits in any of the groundwater samples.

- Dissolved lead exceeding the groundwater cleanup level was detected in groundwater sample GW2-1 at 6 ppb and in GW4-1 at 23 ppb. Dissolved lead was not detected at or above the test method detection limit, 1 ppb, groundwater sample GW3-1.

7.2 Recommendations

DMI presents the following recommendations for the subject site:

- A copy of this report should be forwarded to the Oregon DEQ.

- A copy of this report must remain on file at the subject property for a period of ten years following the first change of ownership pursuant to Oregon Administrative Rules (OAR) 340-122-360 (2).

The data presented in this report was collected, analyzed, and interpreted following the standards of care, skill, and diligence ordinarily provided by a professional in the performance of similar services as of the time the services were performed.

The observations, interpretations, and recommendations presented in this report are based on the assumption that the conditions do not vary from those found during the course of the investigation at the project site. If any variations are encountered during any further investigations for this site, De Minimis Inc. (DMI) Environmental Management should be notified so that supplemental interpretations can be made. The observations and interpretations of this report are intended only for the subject site and the sampling conditions described. The observations and interpretations of this report must not be extended to adjacent areas.

The findings of this report are valid for the dates and under the conditions of the sampling, observations, and testing. However, changes in the conditions of the subject property, neighboring properties, or changes in applicable standards can occur with broadening of knowledge. Accordingly, the observations and findings presented in this report may be invalidated by changes outside of our control.

DMI does not offer any legal opinion, representation, or interpretation of environmental laws, rules, regulations, or policies of federal, state, or local governmental agencies.

If you have any questions or require further clarification regarding the information in this report, please feel free to contact DMI at your convenience. Thank you for allowing DMI to be of service and to present this information.

Respectfully submitted,

Dale L. Haar
Project Manager
Environmental Scientist

Reviewed by Rick I. Johnson, Principal

8.0 GLOSSARY OF ABBREVIATIONS

BTEX	benzene, toluene, ethylbenzene, and xylenes
bgs	below ground surface
CFR	Code of Federal Regulations
DEQ	Oregon Department of Environmental Quality
DMI	De Minimis Inc., Environmental Management
DOGAMI	Department of Geology and Mineral Industries
EDB	ethylene dibromide or 1,2-Dibromoethane
EDC	ethylene dichloride or 1,2-dichloroethane
EPA	U.S. Environmental Protection Agency
GC/PID	gas chromatograph/photoionization detector
HAL	Hughes Analytical Laboratory
LUST	leaking underground storage tank
µg/kg	micrograms/kilogram
µg/L	micrograms/liter
mg/kg	milligram/kilogram
mg/L	milligram/liter
OAR	Oregon Administrative Rules
ppm	parts per million
ppb	parts per billion
SB	soil boring
TPH-G	Total Petroleum Hydrocarbon-Gasoline
USGS	United States Geological Survey
UST	underground storage tank
VOA	volatile organic analysis

9.0 REFERENCES

Staff Jennings, Inc.
Mr. Jeffrey S. Jennings, President
Mr. Al Anshen, Service Manager

Level I Environmental Site Assessment of Staff Jennings, Inc., Retail Facility and Marina, Oregon; De Minimis Inc., Environmental Management, November 30, 1993.

Report of Findings Preliminary Field Investigation of Sellwood Marina, Portland, Oregon; Golder Associates, Inc., March 27, 1989.

Soil Survey of Multnomah County, Oregon; U.S. Department of Agriculture, Soil Conservation Service; August, 1983; 225p.

Maps utilized:
USGS topographic - Lake Oswego, Oregon 7.5 minute quadrangle.
Oregon Department of Geology and Mineral Industries (DOGAMI) Open File Report 0-90-2, , 1990, 21p.
DOGAMI Geologic Map of the Lake Oswego Quadrangle, GMS-59, 1989.

Environmental Cleanup Manual; Oregon Department of Environmental Quality, October 1992; 116p.

Madin, I.P., 1990, Earthquake-hazard geology maps of the Portland metropolitan area, Oregon: text and map explanation: Oregon Department of Geology and Mineral Industries Open File Report 0-90-2, 21p.

Trimble, D.E., 1963, Geology of Portland, Oregon and adjacent areas: U.S. Geological Survey Bulletin 1119, 119p.

Shannon and Wilson, 1979, Drainage sump capacity study: Consulting report to the City of Portland Department of Environmental Services, 61p.

Shannon and Wilson, 1978, Geologic and engineering slope hazard studies unincorporated Multnomah County, Oregon: Private consulting report to Multnomah County, 37p.

Piper, A.M., 1942, Ground-water resources of the Willamette Valley, Oregon: U.S. Geological Survey Water-Supply Paper 890, 194p.

Willis, R.F., 1977, A report on the ground water exploration program: City of Portland Bureau of Water Works report, 282p.

APPENDIX A

LABORATORY ANALYTICAL RESULTS
AND
CHAIN OF CUSTODY

HUGHES
ANALYTICAL LABORATORY

March 29, 1994

Mr. Dale Haar
DeMinimis, Inc.
34 N.W. 1st Ave., Suite 101
Portland, OR 97209

Dear Mr. Haar:

Enclosed is a revised lab report for your samples which were received on March 15, 1994. The Hughes Report # is 94-0109 and the Client Project is 00226-1293, SJM.

Five soil samples and six water samples were received under a chain of custody. The samples were received in containers consistent with U.S. EPA (United States Environmental Protection Agency) protocol.

Standard Quality Assurance/Quality Control (QA/QC) procedures were performed as stated in "EPA Test Methods for Evaluating Solid Waste (SW-846)", 3rd Edition and "Standard Methods for the Examination of Water and Wastewater", 17th Edition. The EPA laboratory protocols followed include sample holding times, laboratory method blanks, laboratory matrix spikes, replicate samples and calibration standards. There were no significant variations from these protocols that would invalidate the analytical data. **High recoveries for one VOA surrogate reflect a problem with this particular compound. Sample results are not affected.**

Test methods may include minor modifications of detection limits or lists of parameters for the published methods. Raised **detection limits for 1,2-Dibromoethane and 1,2-Dichloroethane are due to the high concentrations of fuel hydrocarbons, which necessitated sample dilutions and interfere with mass spectral evaluation of 1,2-Dichloroethane.**

Solid samples are reported on a wet weight basis unless otherwise noted. Compounds not detected are listed under results as ND.

Sincerely,

Kim Hughes

Kim Hughes
Lab Director

4110 NE 122nd ▪ Suite 130 ▪ Portland, Oregon 97230 ▪ (503) 254-4049 ▪ FAX (503) 253-9019

HUGHES REPORT #: 94-0109
CLIENT: DeMinimis, Inc.
DATE: March 29, 1994
ITEMS: Five Soil Samples

CLIENT JOB: SJM
00226-1293

METHOD: TPH-G by GC/PID
per Oregon DEQ
Results in mg/Kg (ppm)

Extraction: 03/16/94
Analysis: 03/16/94

SAMPLE I.D.	RESULT	SURROGATE RECOVERY, %
SB1-3′	25	62
SB2-6′	450	95
SB3-6′	3300	101
SB4-4′	2800	99
SB5-5′	ND	60
Lab Blank	ND	81
Detection Limit	10	

ND = Not Detected

HUGHES REPORT #: 94-0109
CLIENT: DeMinimis, Inc.
DATE: March 29, 1994
ITEMS: Three Water Samples

CLIENT JOB: SJM
00226-1293

METHOD: Dissolved Lead per EPA 7421
Results in ug/L (ppb)

Preparation: 03/17/94
Analysis: 03/17/94

SAMPLE I.D.	**RESULT**
GW2-1	6
GW3-1	ND
GW4-1	23
Detection Limit	1

ND = Not Detected

HUGHES REPORT #:	94-0109	CLIENT JOB:	SJM 00226-1293
CLIENT:	DeMinimis, Inc.		
DATE:	March 29, 1994		
ITEMS:	Three Water Samples		

METHOD: BTEX/EDB/EDC
per EPA 8240
Results in ug/L (ppb)

Analysis: 03/22/94

DESCRIPTION	GW2-2*	GW3-2*	GW4-2**	LAB BLANK	DETECTION LIMIT
Benzene	16,100	22,300	27,000	ND	0.5
Toluene	60,100	46,100	52,900	ND	0.5
Ethylbenzene	27,900	5,700	11,300	ND	0.5
Total Xylenes	143,000	29,700	59,000	ND	1.0
1,2-Dibromoethane	ND	ND	ND	ND	0.5
1,2-Dichloroethane	ND	ND	ND	ND	0.5

Surrogate Recovery, %					Acceptance Limits
d4-1,2-Dichloroethane	119	124	121	137	86-115
d8-Toluene	97	98	98	99	76-114

*The detection limits for this sample are higher by a factor of 2 due to sample dilution.

**The detection limits for this sample are higher by a factor of 5 due to sample dilution.

ND = Not Detected

HUGHES
ANALYTICAL LABORATORY

21920 N.E. Glisan
Gresham, Oregon 97030
503/669-3745
FAX: 503/669-4165

Chain of Custody Record

Lab Project Number 94-0109 Date 3/15/94 Page 1 of 1

Project Information

Project Number: #00226-1293
Project Name: SJM
Company: De Minimis Inc. (DMI)
Project Manager: Dale L. Haar
Collected by: Dale L. Haar (DLH)
P.O. Number:

Reporting Request

☒ FAX: 295-0112
☒ PHONE: 295-4074

TURNAROUND TIME
☒ Standard ☐ RUSH
☐ Other

Special Instructions

Please call if any questions

☒ Samples received at 4° C
☒ EPA Jars/Vials with teflon lids
☐ WA Methods ☒ OR Methods

LAB ID	SAMPLE ID	DATE	TIME	MATRIX: SOIL	MATRIX: WATER	MATRIX: OTHER	NO. OF CONTAINERS	TPH-HCID	TPH-Gas	TPH-Diesel	TPH-418.1 m	HCID-Fuel Scan	TPH-418.1	BTEX/8020	Volatiles/8010	Volatiles/8240	PAH/8310	Semivolatiles/8270	PCB	Pesticides/8080	Metals	Dissolved lead	EDB/EDC	REMARKS/SAMPLE CONDITION
01	SB1-3'	3/15/94	0912	X			1		X															Dissolved lead samples
02	SB2-6'	3/15/94	0941	X			1		X															filtered upon receipt
03	SB3-6'	3/15/94	1051	X			1		X															3-15-94 KB
04	SB4-4'	3/15/94	1149	X			1		X															
05	SB5-5'	3/15/94	1506	X			1		X															
06	GW2-1	3/15/94	1313		X		1															X		
07	GW2-2	3/15/94	1338		X		3							X						DLH			X DLH	BTEX and EDB/EDC
08	GW3-1	3/15/94	1126		X		1															X		
09	GW3-2	3/15/94	1132		X		3							X									X	
10	GW4-1	3/15/94	1219		X		1															X		
11	GW4-2	3/15/94	1225		X		3							X									X	

RELINQUISHED BY (Sign and Print)	DATE/TIME	RECEIVED BY (Sign)	DATE/TIME
Dale L. Haar / Dale L. Haar	3-15-94 1649	Kim Hughes	3/15/94 4:45
/			
/			

PLEASE NOTE:
SAMPLES WILL BE DISPOSED OF AFTER 30 DAYS.

CHAIN OF CUSTODY SEALS Y/N/NA
SHIPPED VIA: UPS Fed-Ex Bus Courier

APPENDIX B

SUBSURFACE SOIL BORING
AND
MONITORING WELL LOGS

STATE OF OREGON
MONITORING WELL REPORT
(as required by ORS 537.765 & OAR 690-240-095)

Instructions for completing this report are on the last page of this form.

Start Card # 63640

(1) OWNER/PROJECT:
WELL NO. SB-2

Name Staff Jennings, Inc

Address 8240 SW Macadam Ave

City Portland State Oregon Zip 97219

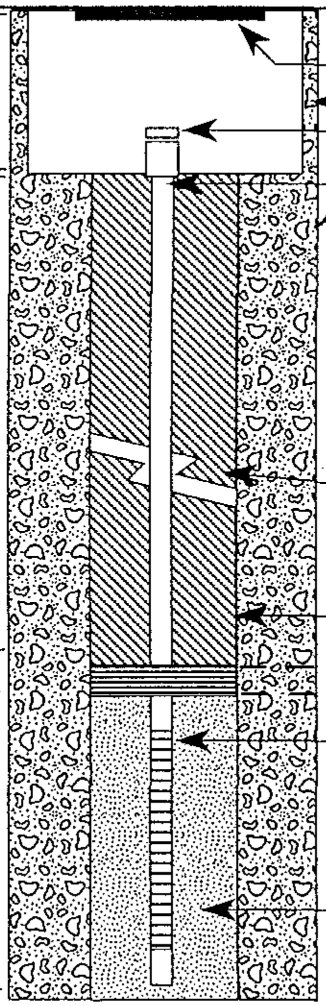
(2) TYPE OF WORK:
☒ New construction ☐ Alteration (Repair/Recondition)

☐ Conversion ☐ Deepening ☒ Abandonment

(3) DRILLING METHOD
☐ Rotary Air ☐ Rotary Mud ☐ Cable

☐ Hollow Stem Auger ☒ Other rotohammer core drill

(4) BORE HOLE CONSTRUCTION
Special Standards Yes ☒ No ☐ Depth of completed well 15 ft.



Land surface

Vault NA ft. TO NA ft.

Water-tight cover

Surface flush vault

Locking cap

Casing diameter NA in.

material NA

Welded ☐ Threaded ☐ Glued ☐

water sampled from 1" dia. boring they abandoned with bentonite chip

Seal NA ft. TO NA ft.

Liner diameter NA in.

material NA

Welded ☐ Threaded ☐ Glued ☐

Well seal:

Material NA

Amount NA

Grout weight NA

Borehole diameter ____ in.

Bentonite plug at least 3 ft. thick

Filter pack NA ft. TO NA ft.

Screen material NA

interval(s):

From NA To ____

From NA To ____

Slot size NA in.

Filter pack:

Material NA

Size ____ in.

(5) WELL TEST: none
☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Permeability ____ Yield NA GPM

Conductivity ____ PH ____

Temperature of water ____ °F/C Depth artesian flow found ____ ft.

Was water analysis done? ☐ Yes ☐ No

By whom? ____

Depth of strata to be analyzed. From ____ ft. to ____ ft.

Remarks: ____

Name of supervising [✓ Geologist]/Engineer Neil Shaw

(6) LOCATION OF WELL By legal description
Well Location: County Multnomah

Township T1S (N or S) Range R1E (E or W) Section 22

1. SE 1/4 of SE 1/4 of above section.

2. **Either** Street address of well location 8240 SW Macadam Av

Portland, Oregon 97219

or Tax lot number of well location TL-10

3. ATTACH MAP WITH LOCATION IDENTIFIED. Map shall include approximate scale and north arrow.

(7) STATIC WATER LEVEL:
10 Ft. below land surface. Date 3/15/94

Artesian Pressure NA lb/sq. in. Date NA

(8) WATER BEARING ZONES:
Depth at which water was first found 10 ft.

From	To	Est. Flow Rate	SWL
10 ft	15 ft	NA	10 ft.

(9) WELL LOG:
Ground elevation ± 50 ft

Material	From	To	SWL
silty sand	0 ft.	15 ft	10 ft.

Date started 3/15/94 Completed 3/15/94

(unbonded) Monitor Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to the best knowledge and belief.

MWC Number ____

Signed NA Date NA

(bonded) Monitor Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

MWC Number 10286

Signed ____ Date 03/28/94

ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER

STATE OF OREGON

MONITORING WELL REPORT

(as required by ORS 537.765 & OAR 690-240-095)

Instructions for completing this report are on the last page of this form.

Start Card # ~~6341~~ 63641 (OL#)

(1) OWNER/PROJECT:

WELL NO. SB-3

Stahl Jennings Inc.

Address 8240 SW Macadam Ave

City Portland State OR Zip 97219

(2) TYPE OF WORK:

☒ New construction ☐ Alteration (Repair/Recondition)

☐ Conversion ☐ Deepening ☒ Abandonment

(3) DRILLING METHOD

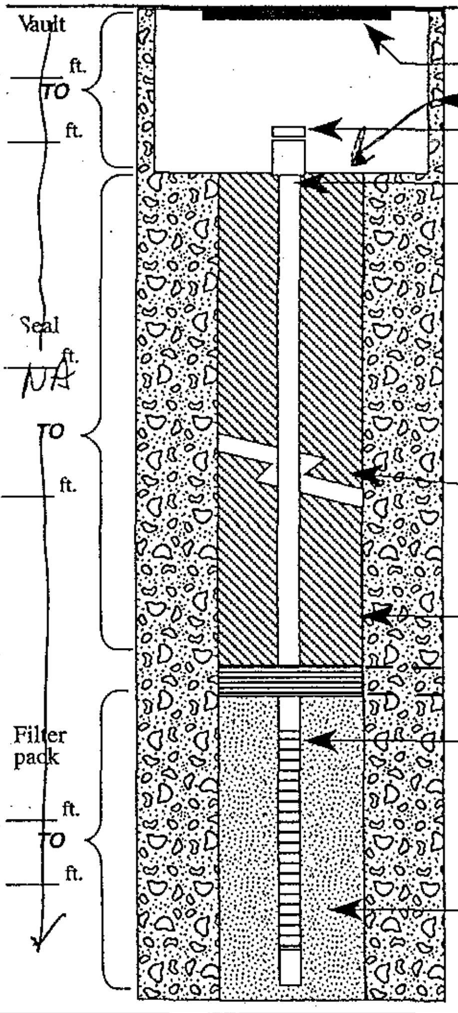
☐ Rotary Air ☐ Rotary Mud ☐ Cable

☐ Hollow Stem Auger ☒ Other w/hammer core drill

(4) BORE HOLE CONSTRUCTION

Special Standards Yes ☒ No ☐

Depth of completed well 10 ft.



groundwater sampled from boring, then abandoned with bentonite

Water-tight cover

Surface flush vault

Locking cap

Casing diameter ______ in.

material ______

Welded ☐ Threaded ☐ Glued ☐

Liner diameter NA in.

material ______

Welded ☐ Threaded ☐ Glued ☐

Well seal:

Material ______

Amount ______

Grout weight ______

Borehole diameter ______ in.

Bentonite plug at least 3 ft. thick

Screen material ______

interval(s):

From ______ To ______

From ______ To ______

Slot size ______ in.

Filter pack:

Material ______

Size ______ in.

(5) WELL TEST: none NA

☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Permeability ______ Yield ______ GPM

Conductivity ______ PH ______

Temperature of water ______ °F/C Depth artesian flow found ______ ft.

Was water analysis done? ☐ Yes ☐ No

By whom? ______

Depth of strata to be analyzed. From ______ ft. to ______ ft.

Remarks: ______

Name of supervising Geologist/Engineer Neil Shaw

(6) LOCATION OF WELL By legal description

Well Location: County Multnomah

Township 1S (N or S) Range 1E (E or W) Section 22

1. SE 1/4 of SE 1/4 of above section.

2. Either Street address of well location tax lot 10 8240 SW Macadam Ave 97219

or Tax lot number of well location ______

3. ATTACH MAP WITH LOCATION IDENTIFIED. Map shall include approximate scale and north arrow.

(7) STATIC WATER LEVEL:

4 Ft. below land surface. Date 8/15/94

Artesian Pressure NA lb/sq. in. Date NA

(8) WATER BEARING ZONES:

Depth at which water was first found 4 ft.

From	To	Est. Flow Rate	SWL
4	10	NA	4 ft.

(9) WELL LOG:

Ground elevation ≈50 ft.

Material	From	To	SWL
silt, sand	0 ft	10 ft	4 ft.

Date started 3/15/94 Completed 3/15/94

(unbonded) Monitor Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to the best knowledge and belief.

MWC Number ______

Signed NA Date NA

(bonded) Monitor Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

MWC Number 10206

Signed Date 3/28/94

ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER

STATE OF OREGON

MONITORING WELL REPORT

(As required by ORS 537.765 & OAR 690-240-095)

Instructions for completing this report are on the last page of this form.

Start Card # 63642

(1) OWNER/PROJECT:

WELL NO. SB-4

Name Staff Jennings, Inc

Address 8240 SW Macadam Ave

City Portland State Oregon Zip 97219

(2) TYPE OF WORK:

☒ New construction ☐ Alteration (Repair/Recondition)

☐ Conversion ☐ Deepening ☒ Abandonment

(3) DRILLING METHOD

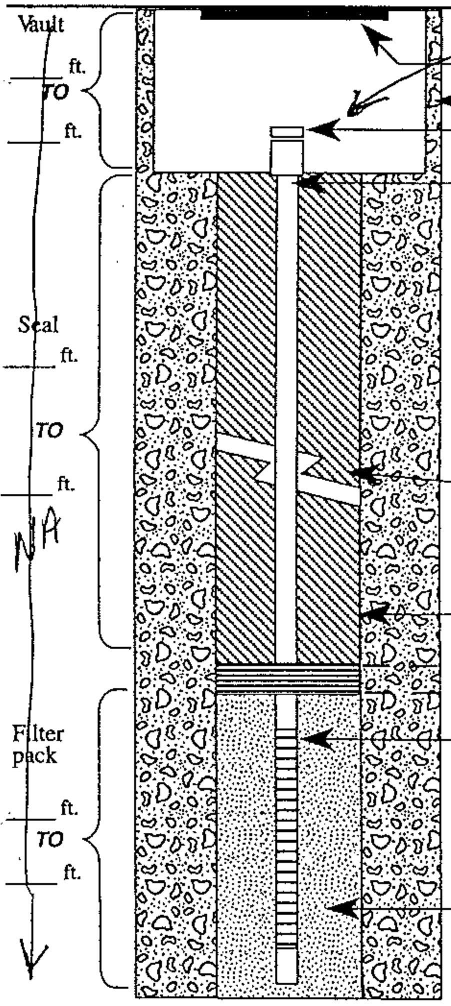
☐ Rotary Air ☐ Rotary Mud ☐ Cable

☐ Hollow Stem Auger ☐ Other rotohammer core drill

(4) BORE HOLE CONSTRUCTION

Special Standards Yes ☒ No ☐

Depth of completed well 9 ft.



groundwater sampled from open borehole, then abandoned with bentonite

Casing diameter ______ in.

material ______

Welded ☐ Threaded ☐ Glued ☐

Liner diameter ______ in.

material ______ NA

Welded ☐ Threaded ☐ Glued ☐

Well seal:

Material ______

Amount ______

Grout weight ______

Borehole diameter ______ in.

Bentonite plug at least 3 ft. thick

Screen material ______

interval(s):

From ______ To ______

From ______ To ______

Slot size ______ in.

Filter pack:

Material ______

Size ______ in.

NA

(5) WELL TEST:

none NA

☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Permeability ______ Yield ______ GPM

Conductivity ______ PH ______

Temperature of water ______ °F/C Depth artesian flow found ______ ft.

Was water analysis done? ☐ Yes ☐ No

By whom? ______

Depth of strata to be analyzed. From ______ ft. to ______ ft.

Remarks: ______

Name of supervising [✓ Geologist]/Engineer Neil Shaw

(6) LOCATION OF WELL By legal description

Well Location: County Multnomah

Township T1S (N or S) Range R1E (E or W) Section 22

1. SE 1/4 of SE 1/4 of above section.

2. Either Street address of well location 8240 SW Macadam Ave
Portland, Oregon 97219

or Tax lot number of well location Tax lot 10

✓ 3. **ATTACH MAP WITH LOCATION IDENTIFIED. Map shall include approximate scale and north arrow.**

(7) STATIC WATER LEVEL:

2 Ft. below land surface. Date 3/15/94

Artesian Pressure NA lb/sq. in. Date NA

(8) WATER BEARING ZONES:

Depth at which water was first found 2 ft.

From	To	Est. Flow Rate	SWL
2	9	NA	2

(9) WELL LOG:

Ground elevation ≅30 ft msl

Material	From	To	SWL
silty sand	0 ft	9 ft	2 ft

Date started 3/15/94 Completed 3/16/94

(unbonded) Monitor Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to the best knowledge and belief.

MWC Number NA

Signed NA Date NA

(bonded) Monitor Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

MWC Number 10286

Signed ______ Date 3/28/94

ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER

FOR WATER RESOURCES DEPARTMENT USE ONLY

Date Postmarked ______ W 63640
Date Hand-delivered ______ WRD Receipt ______
Watermaster Initials ______ Date Fee Received ______

Check No. ______

START CARD

NOTICE OF BEGINNING OF WELL CONSTRUCTION

(as required by ORS 537.762)

This form must be completed, signed by both the owner (or authorized agent) and constructor, and the original mailed or delivered to the Water Resources Department, 3850 Portland Road NE, Salem, OR 97310, no later than the day construction, alteration, conversion or abandonment work begins. A $75 fee shall accompany all notices for new well construction or conversion of an existing hole not previously used to obtain water (make checks payable to the Water Resources Department). Notices meeting this requirement but received without the required fee will not be accepted as properly and timely filed. In addition, the constructor shall provide the "Watermaster Copy" of this notice to the office of the district watermaster within which the well is being constructed, altered, converted or abandoned using one of the following options: (a) by regular mail no later than three (3) calendar days (72 hours) prior to commencement of work; or, (b) by hand delivery, during regular office hours, no later than the day work is commenced; or, (c) by FAX no later than the day work is commenced. If this method is used, the original "Watermaster copy" of this notice shall also be mailed or delivered to the office of the district watermaster no later than the day work is commenced. The Water Resources Commission has authority to impose civil penalties for failure to submit the required $75 fee with the start card and for failure to submit cards prior to beginning any construction, alteration, conversion or abandonment work.

Owner's name and mailing address: Staff Jennings, Inc.

Mo Co. law

Creson

Check type of work: Fee Required ☒ New construction ☐ Conversion

No Fee Required ☐ Alteration (Repair/Recondition) ☐ Deepening ☐ Abandonment

Original Start Card Number ______

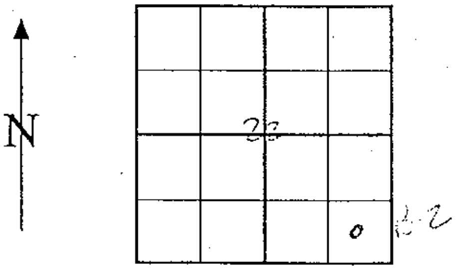
Proposed Commencement Date 3/15/94 Existing or Proposed Well Depth 10 ft. Diameter 1"

Check Use: ☐ Domestic ☐ Community ☐ Industrial ☐ Irrigation ☒ Monitoring ☐ Thermal ☐ Injection ☐ Other ______

Proposed Well Location: County Multnomah County Owner's Well Id. No. B-2

Township T1S (N or S) Range R1E (E or W) Section 22

1. SE 1/4 of SE 1/4 of above section
2. Street address of well location 8240 S.W. McAdam Ave Portland
3. Tax lot number of well location TL 10
4. Attach map with location identified. See reverse of this form for approved maps.
5. Show well location within 1/4, 1/4 of section grid at left.



We hereby certify that we have read the back of this form, and that to the best of our knowledge the information provided herein is accurate and the well is being properly located from septic tanks, septic drain fields and other hazards. (See #2 on back)

for Staff Jennings Inc.
Owner's signature or authorized agent

Bonded Water/Monitor Well Constructor

same
Home phone

(206) 253-9030
Work phone

License No. 10286

Company NSCG

NOTE: This is not a water right application. The owner is responsible for obtaining a water right through the Water Resources Department, if required.

THIS COPY TO CUSTOMER

FOR WATER RESOURCES DEPARTMENT USE ONLY

Date Postmarked ____ W63641

Date Hand-delivered ____ WRD Receipt ____

Watermaster Initials ____ Date Fee Received ____

Check No. ____

START CARD

NOTICE OF BEGINNING OF WELL CONSTRUCTION

(as required by ORS 537.762)

This form must be completed, signed by both the owner (or authorized agent) and constructor, and the original mailed or delivered to the Water Resources Department, 3850 Portland Road NE, Salem, OR 97310, no later than the day construction, alteration, conversion or abandonment work begins. A $75 fee shall accompany all notices for new well construction or conversion of an existing hole not previously used to obtain water (make checks payable to the Water Resources Department). Notices meeting this requirement but received without the required fee will not be accepted as properly and timely filed. In addition, the constructor shall provide the "Watermaster Copy" of this notice to the office of the district watermaster within which the well is being constructed, altered, converted or abandoned using one of the following options: (a) by regular mail no later than three (3) calendar days (72 hours) prior to commencement of work; or, (b) by hand delivery, during regular office hours, no later than the day work is commenced; or, (c) by FAX no later than the day work is commenced. If this method is used, the original "Watermaster copy" of this notice shall also be mailed or delivered to the office of the district watermaster no later than the day work is commenced. The Water Resources Commission has authority to impose civil penalties for failure to submit the required $75 fee with the start card and for failure to submit cards prior to beginning any construction, alteration, conversion or abandonment work.

Owner's name and mailing address: Staff Jennings, Inc.
8240 SW McAdam Ave
Portland, Oregon

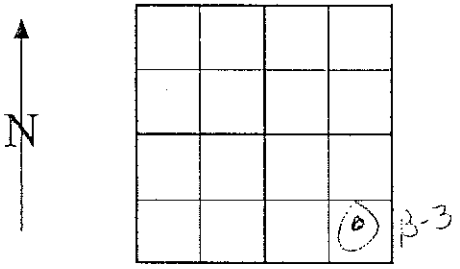
Check type of work: Fee Required { ☒ New construction ☐ Conversion } No Fee Required { ☐ Alteration (Repair/Recondition) ☐ Deepening ☐ Abandonment } Original Start Card Number ____

Proposed Commencement Date 3/15/94 Existing or Proposed Well Depth 10 ft. Diameter 1 inch

Check Use: ☐ Domestic ☐ Community ☐ Industrial ☐ Irrigation ☒ Monitoring ☐ Thermal ☐ Injection ☐ Other ____

Proposed Well Location: County Multnomah Owner's Well Id. No. B-3

Township T1S (N or S) Range R1E (E or W) Section 22



1. SE 1/4 of SE 1/4 of above section
2. Street address of well location 8240 SW McAdam Ave Portland, Oregon
3. Tax lot number of well location Tax lot 10
4. Attach map with location identified. See reverse of this form for approved maps.
5. Show well location within 1/4, 1/4 of section grid at left.

We hereby certify that we have read the back of this form, and that to the best of our knowledge the information provided herein is accurate and the well is being properly located from septic tanks, septic drain fields and other hazards. (See #2 on back)

for Staff Jennings, Inc.
Owner's signature or authorized agent

Bonded Water/Monitor Well Constructor

Same
Home phone

(206) 253-9030
Work phone

License No. 10286

Company WSCG

NOTE: This is not a water right application. The owner is responsible for obtaining a water right through the Water Resources Department, if required.

THIS COPY TO CUSTOMER

FOR WATER RESOURCES DEPARTMENT USE ONLY

Date Postmarked ____________ W 63642

Date Hand-delivered ____________ WRD Receipt ____________

Watermaster Initials ____________ Date Fee Received ____________

Check No. ____________

START CARD

NOTICE OF BEGINNING OF WELL CONSTRUCTION

(as required by ORS 537.762)

This form must be completed, signed by both the owner (or authorized agent) and constructor, and the original mailed or delivered to the Water Resources Department, 3850 Portland Road NE, Salem, OR 97310, no later than the day construction, alteration, conversion or abandonment work begins. A $75 fee shall accompany all notices for new well construction or conversion of an existing hole not previously used to obtain water (make checks payable to the Water Resources Department). Notices meeting this requirement but received without the required fee will not be accepted as properly and timely filed. In addition, the constructor shall provide the "Watermaster Copy" of this notice to the office of the district watermaster within which the well is being constructed, altered, converted or abandoned using one of the following options: (a) by regular mail no later than three (3) calendar days (72 hours) prior to commencement of work; or, (b) by hand delivery, during regular office hours, no later than the day work is commenced; or, (c) by FAX no later than the day work is commenced. If this method is used, the original "Watermaster copy" of this notice shall also be mailed or delivered to the office of the district watermaster no later than the day work is commenced. The Water Resources Commission has authority to impose civil penalties for failure to submit the required $75 fee with the start card and for failure to submit cards prior to beginning any construction, alteration, conversion or abandonment work.

Owner's name and mailing address: Staff Jennings, Inc.
8240 SW McAdam Ave
Portland, Oregon

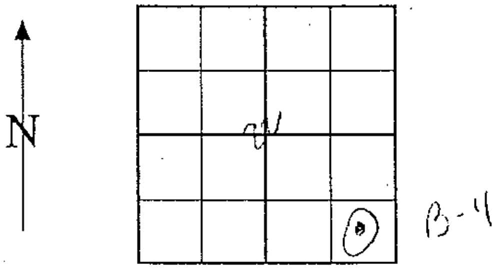
Check type of work: Fee Required { ☒ New construction ☐ Conversion   No Fee Required { ☐ Alteration (Repair/Recondition) ☐ Deepening ☐ Abandonment   Original Start Card Number ____________

Proposed Commencement Date 3/15/94   Existing or Proposed Well Depth 10 ft.   Diameter 1 inch

Check Use: ☐ Domestic ☐ Community ☐ Industrial ☐ Irrigation ☒ Monitoring ☐ Thermal ☐ Injection ☐ Other ____________

Proposed Well Location: County Multnomah   Owner's Well Id. No. B-4

Township T1S (N or S)   Range R1E (E or W)   Section 22



1. SE 1/4 of SE 1/4 of above section
2. Street address of well location 8240 SW Macadam Av. Portland, Oregon
3. Tax lot number of well location tax lot 10
4. Attach map with location identified. See reverse of this form for approved maps.
5. Show well location within 1/4, 1/4 of section grid at left.

We hereby certify that we have read the back of this form, and that to the best of our knowledge the information provided herein is accurate and the well is being properly located from septic tanks, septic drain fields and other hazards. (See #2 on back)

for Staff Jennings, Inc.
Owner's signature or authorized agent

Bonded Water/Monitor Well Constructor

Same
Home phone

(206) 253-9030
Work phone

License No. 10286

Company NSCG

NOTE: This is not a water right application. The owner is responsible for obtaining a water right through the Water Resources Department, if required.

THIS COPY TO CUSTOMER

APPENDIX C

LICENSES AND RECEIPTS

UST SERVICE PROVIDER LICENSE

This License is Issued by The Oregon Department of Environmental Quality to:

De Minimis Inc.
34 NE 1st Ave., Suite 101
Portland, OR 97209

You are Licensed to Offer the Following Underground Storage Tank Services:

License Type	License Number	Issued	Expires
Service Provider	13383	April 16, 1993	May 07, 1995
Soil Matrix Cleanup Prov.	11123	December 04, 1993	December 04, 1995

A Licensed Underground Storage Tank Supervisor Must be Present at a Site to Perform These Services

Issued: RE ID: 7630

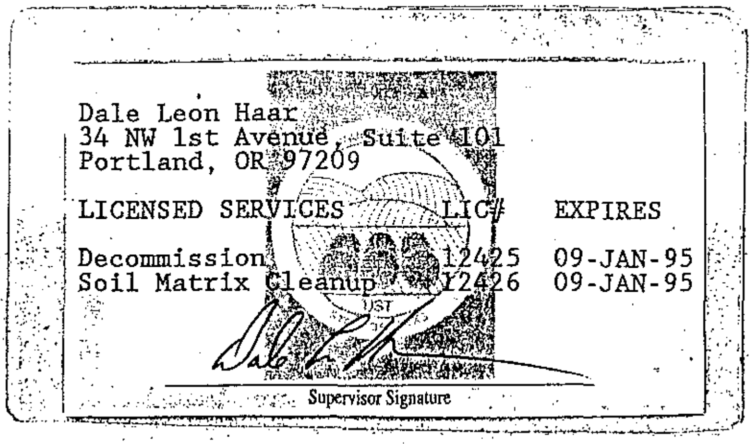
Expires ADDR ID: 111881

Authorized:

Richard P. Reiter
UST Compliance Manager

1859

A Copy of This License Shall Be Available for Inspection At All Sites Involving UST Work



Dale Leon Haar
34 NW 1st Avenue, Suite 101
Portland, OR 97209

LICENSED SERVICES	LIC#	EXPIRES
Decommission	12425	09-JAN-95
Soil Matrix Cleanup	12426	09-JAN-95

Supervisor Signature

1859

Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
811 SW Sixth Avenue
Portland, OR 97204-1390
(503) 229-5696
TDD (503) 229-6993

September 28, 1998

Christopher W. Rich
Department of Environmental Quality
2020 S.W. 4th Avenue, Suite 400
Portland OR 97201-4987

RE: Staff Jennings Inc.
Case No. UT-NWR-96-274A

Dear Mr. Rich:

Per your request dated September 24, 1998, your request for an extension to the deadline to submit your reply brief in the above referenced matter has been approved. The deadline for the submittal is now October 30, 1998.

If you should have any questions, please feel free to contact Susan Greco at (503) 229-5213.

Sincerely,
Carol Whipple
Carol Whipple
Chair, Environmental Quality Commission

Cc: Christopher Reive, Bogle & Gates

Attachment G - 1 page

Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
811 SW Sixth Avenue
Portland, OR 97204-1390
(503) 229-5696
TDD (503) 229-6993

September 1, 1998

Christopher I. Reive
Bogle & Gates
200 S.W. Market Street, Suite 600
Portland OR 97201-5793

RE: Staff Jennings, Inc.
Case No. UT-NWR-98-274A

Dear Mr. Reive:

On September 1, 1998, the Environmental Quality Commission received Staff Jennings's Brief in the above referenced matter. Pursuant to OAR 340-11-132(4)(b), the Department must file an answering brief within thirty days (September 30, 1998). Once the Department files its brief, Staff Jennings may file a reply, which will be due 20 days after filing of the Department's brief.

If you should have any questions regarding these procedures, please feel free to call me at (503) 229-5213 or (800) 452-4011 ext. 5213 within the state of Oregon.

Sincerely,

Susan M. Greco

Susan M. Greco
Rules Coordinator

cc: Chris Rich, NWR

Attachment H - 1 page

BOGLE & GATES P.L.L.C.
A Professional Limited Liability Company

LAW OFFICES

CHRISTOPHER L. REIVE

200 S.W. Market Street
Suite 600
Portland, Oregon 97201-5793

Direct Dial: (503) 721-3653
Main Office: (503) 222-1515
Facsimile: (503) 721-3666
Internet Email: creive@bogle.com

Anchorage
Bellevue
Seattle
Tacoma
Vancouver, B.C.

73312/00001

September 1, 1998

VIA HAND DELIVERY

Environmental Quality Commission
811 S.W. Sixth Avenue
Portland, Oregon 97204

Re: *In the Matter of Department of Environmental Quality v. Staff Jennings, Inc.*, Civil Penalty No. UT-NWR-98-274A

Dear Sir/Madam:

Enclosed for filing is an original and copy of APPELLANT STAFF JENNINGS, INC.'S BRIEF, Case No. UT NWR-98-274A in the above-referenced matter.

Please call me if you have any questions.

Very truly yours,

BOGLE & GATES P.L.L.C.

Christopher L. Reive

CR2/48sm6
Enclosures

cc: (w/ Encl.)
Susan Greco, Rules Coordinator, DEQ (via Hand Delivery)
Christopher W. Rich, Enforcement Section, DEQ (via Hand Delivery)
Jeff Jennings, Staff Jennings Boating Centers (via Regular Mail)

Attachment I - 224 pages

BEFORE THE ENVIRONMENTAL QUALITY COMMISSION

OF THE STATE OF OREGON

IN THE MATTER OF: Department of Environmental Quality, Department, v. STAFF JENNINGS, INC., Respondent.	Case No. UT-NWR-98-274A APPELLANT STAFF JENNINGS, INC.'S BRIEF MULTNOMAH COUN TY

INTRODUCTION

Staff Jennings, Inc. ("Staff Jennings"), Respondent in the underlying enforcement action and Appellant herein, asks that the Environmental Quality Commission ("Commission") reverse the Hearings Officer's Final Order in the above matter. It bases its request on the following legal points:

1. The statute of limitations period for the alleged violations of ORS 468B.025 expired years ago. Claims based on this statute and arising from the release of October 18, 1988 are no longer actionable;

2. OAR 340-122-242 is not applicable to this action because the Commission did not adopt that regulation until years after the petroleum release occurred and the underground storage tank (UST) leak was repaired; and

3. The hearing record is clear that Staff Jennings repaired the leak causing a petroleum release and timely initiated an investigation of appropriate environmental remediation actions as was required by the regulations in effect at the time of the leak. Moreover, Staff Jennings has complied with those regulations by proceeding at the pace set by DEQ for subsequent action.

BACKGROUND

Staff Jennings operates a boat sales and maintenance facility located on the west bank of the Willamette River, near the Sellwood Bridge. In October 1988, Staff Jennings discovered a leak from a pipe leading from a UST.[1] Staff Jennings immediately fixed the leaking pipe[2], and in compliance with the regulations in effect in 1988, Staff Jennings notified DEQ of the release and investigated the source and extent of the contamination.[3] To perform that investigative work, Staff Jennings hired Golder & Associates, an international engineering firm.[4] Golder's investigation resulted in a report entitled "Report of Findings, Preliminary Field Investigation," which was submitted to DEQ.[5]

After the Golder report was filed with DEQ, Staff Jennings awaited DEQ's response. This action was expressly contemplated by the regulations in effect at that time, now cited as OAR 340-122-020 through 340-122-110. These regulations, then known as the Environmental Cleanup Rules, had been adopted just that year (1988) to implement the recently adopted Oregon Superfund statute.[6] Later in that same year, the Commission adopted a second set of regulations which were specific to cleanup of petroleum releases from USTs.[7] It is important to note, however, that the regulation at issue in this case, OAR 340-122-242, was not included in that initial set of UST regulations. (*See* discussion below.) The fact that either of two sets of regulations could be applied by DEQ to leaking USTs was, and has always been, acknowledged by DEQ since the duplicate regulations were adopted.[8] Staff Jennings' actions

---

[1] *See* p. 1 of Golder Associates' report, "Report of Findings," attached.
[2] *See* pp. 1-2 of Golder Associates' report, "Report of Findings," attached.
[3] *See* p. 2 of Golder Associates' report, "Report of Findings," attached.
[4] *See* p. 3 of Golder Associates' report, "Report of Findings," attached.
[5] *See* Transcript of Hearing, Testimony of Loren Garner, p. 10, lns. 4-20.
[6] The regulations became effective January 27, 1988.
[7] On November 4, 1988, the EQC adopted a set of regulations specific to remediating *petroleum* releases from USTs (OAR 340-122-205 through 340-122-360).
[8] "Two sets of regulations also may be applied to leaking USTs. The first are known as the Environmental Cleanup Rules, OAR 340-122-020 through 230-122-110. These rules were adopted to implement the state Superfund statute. The second set of regulations are the Cleanup Rules for Leaking UST Systems, OAR 340-122-205 through 340-122-360. The UST Cleanup Rules were adopted under authority both of the state Superfund and the UST statute. They are usually applied to govern the investigation and cleanup of petroleum UST leaks, unless the magnitude or complexity of the contamination leads DEQ to apply the Environmental Cleanup Rules instead. *See* OAR 340-122-215(2)." *In re Daniel C. Hanna, et al. (debtor(s));* Gull Industries, Inc. and BP Oil Company, plaintiffs, v. John Mitchell, Inc., Defendant, United States Bankruptcy Court for The District of Oregon Case Nos. 390-33990-S11; 390-34210-S11; and 390-34211-S11 (administratively consolidated); Adversary Proceeding No. 90-3388S, Memorandum of Law of Oregon Department of Environmental Quality - *Amicus Curiae*, October 14, 1992.

complied with the only regulations in effect at the time it discovered the leak, The Environmental Cleanup Rules, and its actions remained in compliance with those rules.

It is a fact that "in the early years following the discharge of the petroleum, DEQ did not aggressively pursue the matter."[9] In fact, DEQ informed Staff Jennings the leak was a low priority matter and Staff Jennings reasonably believed DEQ would eventually get back to it regarding its approval for a remedial action standard and schedule.[10] In the meantime, Staff Jennings continued to monitor the situation. In 1994, Staff Jennings decommissioned the two USTs by excavation and removal.[11] It prepared and submitted a decommissioning report regarding the contamination detected in the tank pit.[12]

It now appears that in November 1995, DEQ concluded it needed additional information from the site and adjacent facilities. DEQ instructed Staff Jennings to perform additional investigation, including searching for upgradient sources and possible downgradient offsite migration.[13] Staff Jennings diligently proceeded with this further investigation, which resulted in various reports. In order to investigate both upgradient and downgradient of the site of the leak, Staff Jennings needed permission from third parties, including the City of Portland, to access adjacent properties.

The City of Portland delayed more than a year before granting Staff Jennings authority to enter its property. During this period, Staff Jennings asked DEQ to help it obtain access to the City's property.[14] DEQ chose not to assist, which was consistent with its statement that it considered this a low priority matter.

In 1998, DEQ issued a NON to Staff Jennings alleging that Staff Jennings had violated OAR 340-122-242, a regulation adopted years after the release occurred.[15] In relevant part, OAR 340-122-242

---

[9] Hearing Order Regarding Violation and Assessment of Civil Penalty, p. 4.
[10] *See* Transcript of Hearing, Testimony of Jeff Jennings, p. 79, lns. 3-11.
[11] *See* December 13, 1994 De Minimis Report titled "Underground Storage Tank Decommissioning."
[12] *See* December 13, 1994 De Minimis Report titled "Underground Storage Tank Decommissioning."
[13] *See* "NWR UST Field Inspection Report," dated November 21, 1995, attached.
[14] *See* Transcript of Hearing, Testimony of Jeff Jennings, p. 84, lns. 2-26.
[15] *See* "Notice of Noncompliance," dated February 5,1998, attached.

requires persons who discover a petroleum release from an underground storage tank (UST) to take action to investigate, and if necessary, remediate that petroleum release. DEQ also alleged that Staff Jennings violated ORS 468B.025(1)(a). In relevant part, ORS 468B.025(1)(a) imposes liability on persons who 'cause' pollution or 'cause to be placed' any waste in a location where such waste may enter waters of the state, e.g., soils adjacent to groundwater and surface waters. At the hearing, DEQ staff testified that the 1988 petroleum release entered the Willamette River, and that it entered soil and groundwater at the site where releases could (and were) entering the Willamette River.[16]

DISCUSSION

DEQ's Claim is Barred by the Applicable Statute of Limitation.

The release in question occurred on approximately October 18, 1988, and the leaking line was discovered and repaired by early 1989. ORS 468B.025(1)(a) states:

> "(1) Except as provided in ORS 468B.0050 or 468B.053, no person shall:
>
> (a) *Cause* pollution of any waters of the state or *place or cause to be placed* any wastes in a location where such wastes are likely to escape or be carried into waters of the state by any means." (emphasis added).

The liability imposed by ORS 468.025(1)(a) is for *causing* a waste ". . . to be placed . . . in a location where such wastes are likely to escape or be carried into the waters of the state by any means." The DEQ staff testimony is clear that, as of 1988, the petroleum release was already placed where it may enter waters of the state, i.e., the soil and groundwater adjacent to the river. Testimony of Loren Garner, p. 9. lns. 20-26. As a result, if ORS 468B.025 was violated at all, the violation was complete at the time the UST leak was located and repaired. At that time, all action required by the statute had occurred and the violation was complete[17]. At that time, DEQ's cause of action matured and the applicable statue of limitation began to run.

---

[16] *See* Transcript of Testimony of Loren Garner, p. 8, lns. 26-34 and p. 9, lns. 20-26.

[17] The movement of petroleum within waters of the state does not give rise to a new violation each day. Once the petroleum entered the waters of the state the violation is complete, unless of course, the UST continued to leak new petroleum to where it could enter waters of the state. For example, if a sheen on (continued...)

The possible statutes of limitation that apply to agency action pursuant to ORS 468B.025 are ORS 12.100(2) (two years), ORS 12.110(2) (two years), and ORS 12.130 (three years). The two year statutes of ORS 12.100(2) and ORS 12.110(2) are for "[a]n action upon a statute for penalty or forfeiture" and "[a]n action upon a statute for a forfeiture or penalty to the state or county," respectively. The three year statute of ORS 12.130 applies to "[a]n action upon a statute for a penalty given in whole or in part to the person who will prosecute the same." For purposes of this analysis, Staff Jennings conservatively assumes that the appropriate statute of limitation is three years, although the two year limitation period is more likely.

Because the alleged violation of ORS 468B.025 was complete before the end of the decade of the 1980s, the claims period for DEQ to assess a penalty under that statute expired many years ago.

For the reasons stated below, the claim asserted under OAR 340-122-242 does not properly apply to this case. However, even if it did, the statute of limitation analysis is the same. DEQ cannot exceed its statutory authority to adopt an appropriate regulation by expanding the time frame to assert actionable claims.

OAR 340-122-242 Does Not Apply to DEQ's Allegations.

The Hearings Officer ruled that Staff Jennings "failed to initiate and complete the investigation or cleanup of a petroleum release from an underground storage tank, in violation of OAR 340-122-242." However, on these specific points, the hearings record has undisputed evidence that Staff Jennings both "initiated" an investigation under the regulations in effect at the time of the release in 1988, and Staff Jennings "completed" as much of the response as it could without DEQ's pending determination of cleanup standards and selection of a remedial action. In fact, that process is still underway today.

DEQ does not dispute that Staff Jennings hired a consulting firm to investigate the 1988 leak from the UST, which resulted in a report that the consultant submitted to DEQ. Therefore, the Hearings

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(...continued)
surface waters continues to move downstream for a number of days, each day the sheen migrates downstream is not a new violation of ORS 468B.025. It may be a violation of spill response regulations if the applicable response actions have not been followed, but that is not the case here.

Officer's conclusion that Staff Jennings failed to "initiate" an investigation of the release, regardless of the applicability of OAR 340-122-242, cannot be upheld. As a matter of law, Staff Jennings did not "fail to initiate" anything, and therefore did not violate any applicable statute or rule for that reason.

The real dispute between DEQ and Staff Jennings is whether Staff Jennings was required to have "completed" its investigation "or" cleanup of contamination pursuant to OAR 340-122-242. It is undisputed that OAR 340-122-242 was not adopted by the Commission for several years after the UST was repaired. As a result, Staff Jennings' remedial activities were conducted in compliance with the regulations that were in effect at the time of the release occurred [18] Those regulations, the Environmental Cleanup Rules, then pertained to leaks from USTs containing any type of substance. The leak was discovered on October 18, 1988[19]. The 1988 Environmental Cleanup Rules stated that Staff Jennings was required to:

(a) Notify the DEQ of the release within 24 hours of discovery;

(b) Assess the source and extent of the release;

(c) Meet with the DEQ to set up a cleanup standard and a schedule for cleanup; and

(d) Cleanup the release.

OAR 340-150-130, circa 1988.

The hearings record is clear that Staff Jennings complied with (a) and (b), above, and submitted its report to DEQ to establish the cleanup standard and schedule. Staff Jennings then waited for DEQ to make a determination. What was then OAR 340-150-130[20] required DEQ to determine the cleanup standard and the compliance schedule for the site. This was because those regulations applied to all types of contaminant releases and there were no pre-determined cleanup standards in 1988. As a result, without DEQ reaching a conclusion regarding whether the release in question needed to be remediated,

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[18] *See* footnote No. 6, *infra*.

[19] *See* footnote No. 1, *infra*.

[20] OAR 340-150-130 was later renumbered to OAR 340-122-020 - 340-122-110.

and if so, to what standards, Staff Jennings was under no obligation to proceed after it had complied with (a) and (b) above.

Why DEQ did not promptly set a standard for the Staff Jennings site is not clear. However, DEQ has stated, and the Hearing Officer has found, that DEQ believed this to be a low priority site for many years.

Staff Jennings continued to monitor the situation, and otherwise complied with the Environmental Cleanup Rules to the extent it could without further instruction from DEQ until 1994, when Staff Jennings voluntarily decommissioned two USTs on it property. At that time, DEQ took a renewed interest in the site. DEQ appears to have remained aware it needed to adopt a cleanup standard for the site and make a cleanup determination. However, DEQ decided it needed additional information before it could make those decisions, and it asked Staff Jennings to gather that additional information. Staff Jennings diligently sought to obtain that information, including obtaining access to adjacent off-site properties. During this time, DEQ never informed Staff Jennings, and there is no evidence in the record, that DEQ had formally transferred administration of Staff Jennings case from OAR 340-122-020 Environmental Cleanup Regulations to the UST petroleum release regulations, OAR 340-122-205 *et. seq.* (including OAR 340-122-242).

CONCLUSION

Staff Jennings has fully complied with the regulations that are applicable to this site and has attempted to comply in good faith with all of DEQ's requests and Orders related to those regulations. DEQ does not dispute this claim because it does not allege a violation of those applicable regulations or any Order. Instead, DEQ relies on a general statute that, if violated at all, was violated almost 10 years ago, and on a regulation that was not in force at the time of the critical event that gave rise to these claims. Due process and common sense dictate that, before a civil penalty can be properly assessed, the subject claim can not be time-barred by statute, and the victim (Staff Jennings) should be given notice of the ground rules DEQ will allege are in force. These reasonable precursors to a civil penalty assessment did not occur in this case. For these reasons, Staff Jennings asks that the Commission make the following findings:

(1) The release from the UST in question (Leak) occurred in 1988 and was ceased at the time the UST was repaired;

(2) Based upon the testimony of DEQ staff, in 1988 the Leak discharged petroleum to soil where it "may" have entered waters of the state;

(3) The regulations which controlled the investigation and remediation of the Leak were those regulations which were in affect in 1988;

(4) The applicable 1988 regulations require the DEQ to set the cleanup standard and cleanup schedule before Staff Jennings had an affirmative obligation to implement a remedial option;

(5) Staff Jennings complied with the 1988 regulations;

(6) At no time did the DEQ inform Staff Jennings that the release was no longer being reviewed under the Environmental Cleanup Rules (as opposed to the UST petroleum release regulations including OAR 340-122-242);

(7) By its terms ORS 468B.025 imposes liability on certain classes of persons, i.e., those persons responsible for *causing* a hazardous substance to be placed so it may enter waters of the state. ORS 468B.025 does not address the investigation or "remediation" of the releases;

(8) The statute of limitations for the alleged violations of OAR 340-122-242 and ORS 468B.025(1)(a) is, at most, three years. Any alleged violation which occurred more than three years prior to the Notice of Civil Penalty are not actionable; and

(9) Staff Jennings is not liable for any amount of civil penalties.

Staff Jennings also requests whatever additional relief the Commission believes is appropriate, including an award of attorney fees.

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Respectfully submitted this 31st day of August, 1998.

BOGLE & GATES P.L.L.C.

Christopher L. Reive, OSB NO. 83305
Attorneys for Respondent Staff Jennings, Inc.

CERTIFICATE OF SERVICE

I hereby certify that on September 1, 1998, I served a copy of **APPELLANT STAFF JENNINGS, INC.'S BRIEF ON CIVIL PENALTY NO. UT-NWR-98-274A,** on:

Susan Greco Rules Coordinator Oregon Department of Environmental Quality 811 SW Sixth Avenue Portland, OR 97204	Via:	☐ U.S. Mail ☒ Hand Delivery ☐ Overnight Express ☐ Facsimile
Christopher L. Rich Enforcement Section Oregon Department of Environmental Quality 2020 SW Fourth Avenue, 4th Floor Portland, OR 97201-4987	Via:	☐ U.S. Mail ☒ Hand Delivery ☐ Overnight Express ☐ Facsimile

the foregoing being the last known business addresses.

BOGLE & GATES P.L.L.C.

Christopher L. Reive, OSB #83305
Of Attorneys for Respondent
Staff Jennings, Inc.

Golder Associates Inc.
CONSULTING ENGINEERS

26-88-078

REPORT OF FINDINGS
PRELIMINARY FIELD INVESTIGATION
OF SELLWOOD MARINA,
PORTLAND, OREGON

PREPARED FOR
STAFF JENNINGS, INC.

March 27, 1989

893-1031

EXHIBIT
7

PENGAD-Bayonne,

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1. SCOPE OF WORK

1.1 Site Description

The Sellwood Marina site occupies two levels on the west bank of the Willamette River. Much of the site is constructed on a flattened bench which has been excavated into the fluvial clayey silts to silty clays of the river bank. Additional space has been gained at this main level of the marina facilities by constructing a piling-supported concrete platform which extends out over the river bank. This primary level of the facilities is approximately 20-25 feet above the water level of the river. Additional floating docks, etc. have been constructed in the river, adjacent to the showroom and service facilities. A drawing of the approximate site layout is attached as Figure 1.

As a part of the marina facilities, two underground storage tanks were installed to supply boat fuel. The tanks are of 10,000 and 4,000 gallon capacity, respectively, and their approximate locations are shown on Figure 1. Based on information provided by Staff Jennings, the 4,000 gallon tank is about 25 years old, and is currently in use. The 10,000 gallon tank is 10-12 years old and is also in use.

1.2 Site History

On October 18, 1989, the marina manager observed a slick of petroleum fuel in the river, down slope from the fuel tanks. Following this observation, it is our understanding that Staff Jennings, took the following steps to mitigate the existing spill, and to prevent further release of product:

- October 18, 1988. Following his observation of the spill, Staff Jennings' marina manager contacted SRH Associates, Inc., of Portland, Oregon, to perform cleanup operations.

- October 18, 1988. SRH Associates deployed a floating boom in the river to contain the slick, and placed pads to absorb the floating product. SRH Associates also collected soil samples in the spill area to confirm that the material in question was gasoline from the marina. Staff Jennings personnel worked to trace the spill to its origin, and halted use of the fuel tanks.

- October 19, 1988. SRH Associates notified the Oregon Department of Environmental Quality, the U.S. Coast Guard, and the local fire department of the spill.

- October 20, 1989. Staff Jennings personnel determined that the primary source of spilled fuel was leakage from a cracked elbow located near the fuel turbine pump for the 10,000 gallon tank. They contacted Fullman Plumbing Company, of Portland, Oregon, to perform repairs.

- October 25-28, 1989. Fullman Plumbing Company, repaired the broken elbow. Tanks were removed from service until testing could be done.

- Once repaired, no further fuel release was observed.

- February (4±), 1989. Pacific Tank and Construction Company, performed tank tightness tests on the two storage tanks. The results of the testing were inconclusive because the tanks could not be isolated from the attached distribution lines. Additional testing was planned.

- February 15-17, 1989. Pacific Tank and Construction Company uncovered the tanks and related fuel distribution lines, isolated the systems, and performed a second series of tank and line tightness tests. Minor leaks were located and repaired in distribution lines, and the system was returned to service.

- February 16-17, 1989. Golder Associates conducted a preliminary soils investigation to determine the extent and quantity of contamination present in the tank field and along the adjacent river bank.

The field investigation conducted by SRH Associates, determined that fuel residues were present beneath the concrete boat platform identified on Figure 1. Their initial study indicated that fuel leaking from the broken elbow (although this source had not yet been identified) had migrated from the gravel backfill around the underground storage tank and distribution lines, and into the silty sands of the river bank. The contaminant plume eventually entered the river at this location.

1.3 Current Investigation

Golder Associates was contracted by Staff Jennings, to conduct a soil sampling urvey in the area immediately surrounding the fuel tanks, and extending eastward toward the river. Soil samples were also collected west of the on-site fuel tanks, at an area hydraulically up- gradient from any potential fuel leakage into the groundwater system. A total of 12 soil borings were completed at the project site, with 10 soil samples collected and analyzed for petroleum residues.

2. PRELIMINARY FIELD INVESTIGATION

Investigation of the site began on the afternoon of February 16, 1989, and continued through February 17, 1989. The investigation was intended to determine the nature and extent of fuel release from the tank field and associated fuel distribution lines. This initial investigation consisted of drilling 12 soil borings with a 3-inch hand auger to allow the collection of soil samples at depth. Soil samples from each boring were sent to a commercial analytical laboratory for analysis of petroleum hydrocarbon content. Selected test holes which intercepted groundwater were left open and protected from rainwater intrusion overnight to determine the approximate groundwater surface elevations and localized flow direction. When completed, the soil borings were abandoned by backfilling to the surface with bentonite pellets.

2.1 Soil Sampling and Collection

As soil borings were performed, the soil's engineering characteristics were described for each change in soil type, and the soil was classified using the Unified Soil Classification System. Soil cuttings removed from the hole were also screened with a TIPP II photovoltaic organic vapor monitor (OVM) to provide a vertical profile of the aromatic organic constituents within the borehole. This screening was also used to identify samples to be collected for chemical analysis. Readings from the OVM were recorded on the soils logs.

In reference to the field screening, the OVM detects hydrocarbons in the vapor phase, and is calibrated to isobutylene. Aromatic petroleum constituents generally show a response on the OVM similar to isobutylene, but aliphatic components do not. Elevated readings in the vicinity of soils are an indication of the presence of hydrocarbons in the soil. However, care must be taken in the interpretation of these results. OVM readings, expressed as concentrations in parts-per-million in the vapor phase, should not be used to directly infer concentrations in soil. Although a correlation does exist, it is quite sensitive to a number of factors, including the volatility of the

hydrocarbons present, the nature of the soil (e.g., moisture and natural organic content), and the method used to sample the soil vapors. Adverse ambient weather conditions may also affect the functioning of the equipment (e.g., the investigation was performed during a rainstorm; high ambient humidity can elevate OVM readings to some extent). It is therefore possible for soils with relatively low hydrocarbon concentrations to exhibit high readings; the reverse is also true. Because of this variability, the OVM should only be viewed as a semi-quantitative, first order screening tool for hydrocarbon contamination.

2.2 Laboratory Analysis

Based on OVM readings, degree of hydrocarbon staining, and in some cases, petroleum odor, samples were collected from most boreholes for analytical testing. The soil samples for analysis were transferred to clean glass jars fitted with Teflon lids, supplied by Pacific Analytical Laboratory, Inc., of Beaverton, Oregon. Samples were subsequently transported to that laboratory for testing at the conclusion of the field investigation. Analysis was performed on all samples for aromatic hydrocarbons and total petroleum hydrocarbons, using USEPA methods 8020 (8240), and 418.1. Selected samples were also analyzed for total lead, and fuel fingerprint testing (USEPA method 8015, modified) was performed to determine the source of the organic constituents (gasoline, diesel, or other). The results from this testing are summarized in Appendix 1.

3. CONCLUSIONS

Based on our field investigation and the results of analytical testing, it is apparent that gasoline and gasoline-derived compounds have been released into the soils in the vicinity of the Sellwood Marina tank field, and that petroleum has migrated downgradient to the vicinity of the Willamette River. Further, based on the results of the investigation and the possible courses of action for eventual remediation, it is expedient to define two zones affected by the release for reference. The first zone (Zone 1) surrounds the fuel tanks, including the tank backfill and the immediately adjacent native soil. The second zone (Zone 2) comprises the river bank, and the adjacent area of river bed between the high and low water marks of the Willamette River. The boundary between these zones is not clearly defined, however any plans for remediation of either of the zones may be modified to further investigate this transitional area.

3.1 Subsurface Conditions

Two native soil types were encountered at the Staff Jennings site. On the upper level of the site (Zone 1), generally surrounding the fuel tanks, the native soil is a plastic silty clay to clayey silt. The soil exposed adjacent to the Willamette River (Zone 2), to a depth of approximately two feet, is silty fine sand to sandy silt.

Sand and gravel was also encountered in Zone 1. This granular material was identified in soils borings adjacent to the tank field and distribution pipes, and probably represents backfill around the tank system components. Gravel was also used to varying depths as a base course beneath the asphalt paving located in Zone 1.

Table 1 lists relative borehole surface and groundwater elevations for the soil borings. These elevations are based on a hand level survey, using 50 feet as an assumed datum. The accuracy of the survey is assumed to be plus or minus 0.1 foot. Water depths were measured in open test holes, and are also

assumed to be accurate to plus or minus 0.1 foot. Groundwater flow at the site, based on limited observations of groundwater levels in soil borings, appears to be easterly, toward the Willamette River. On a smaller scale, the groundwater flow may be locally complicated by the presence of the sand and gravel backfill surrounding the fuel tanks and distribution lines. Considering that the backfill is a more permeable material than the native soil, groundwater may tend to preferentially migrate along distribution lines or locally flow toward the tanks, whose backfill may act a sump. These local variations in flow direction should be considered tentative, as the differences in water level between test borings varied only a few tenths of a foot, approaching the limits of accuracy of the survey.

TABLE 1

BOREHOLE AND GROUNDWATER ELEVATIONS

TH 1	50.0	-
TH2	49.9	46.9
TH 3b	50.1	-
TH 4	49.9	47.3
TH 5	50.1	47.1
TH 6a	50.7	50.1
TH 6b	51.4	-
TH 10	50.1	46.8

3.2 Environmental Conditions

Zone 1 - Fuel Tank Area

The area surrounding the fuel tanks was sampled extensively, as described in section 2. Test holes TH1 through TH5, and TH10, were situated throughout the tank field as shown on Figure 1. TH6 was located upgradient of the tank field, to intercept possible contaminants entering the site.

Results of the analyses (USEPA method 8020 [8240]) of soil from TH1 and TH5 indicate elevated levels of benzene, toluene, ethyl benzene, and xylene. A fuel fingerprint test performed on the sample from TH1 suggested the source of the release was gasoline-based fuel. These two test holes are adjacent to the location of the ruptured fuel elbow on the 10,000 gallon tank. It seems likely that most, if not all, of the hydrocarbons present at these test holes are due to the damaged fuel distribution line. Test holes 2, 3, and 4 were also drilled in close proximity to the storage tanks, but did not exhibit high concentrations of aromatic hydrocarbons, indicating that, although there may have been some petroleum residue in the backfill surrounding the tanks, the bulk of the release moved downgradient toward the river. TH10 was placed near an existing pipe manifold near a former gasoline pump site. The Pacific Tank and Construction Company investigation indicated that some leakage may have occurred at this location, and the elevated levels of hydrocarbons at this location support their findings. TH6 exhibited low concentrations for all constituents measured, indicating that the groundwater flow and the hydrocarbon release migrated away from this area.

Zone 2 - River Bank and River Bed

Zone 2 is located at the toe of the moderately steep river bank, and at the time of testing, extended to the edge of the Willamette River, 20 to 50 feet east. Testing at this location consisted of three soil borings, shown on Figure 1 as TH7, TH8, and TH9. Of the three test holes, TH7 shows the highest concentrations of hydrocarbons, approximately 2-3 times higher than the test holes near the damaged fuel distribution line. According to Staff Jennings personnel the petroleum release was abated as soon as the broken pipe elbow was repaired. This suggests that the petroleum moved quickly through the relatively permeable silty sands of the river bank. It is not known at this time whether the movement took place on the surface of the existing groundwater table, or in the unsaturated zone above. It appears that the petroleum product is concentrated at the groundwater surface. The field evidence also suggests that the affected area is fairly limited in lateral extent, as TH8 and TH9 exhibited minimal concentrations of hydrocarbons. The

full depth or vertical thickness of Zone 2 was not determined for the contaminated zone during this investigation.

General

The data described above suggest the following overall conclusions regarding soil contamination at the Sellwood Marina site

- Hydrocarbons are present in soil, both within the tank field, and along the edge of the Willamette River directly downslope from the field,
- The hydrocarbons are likely due to the release of gasoline,
- Low concentrations of hydrocarbons in the vicinity of TH10 are attributable to leakage at a pipe manifold which has also been repaired,
- The highest concentrations of hydrocarbons are located at the north end of the 10,000 gallon fuel tank, where the broken pipe elbow was located, and in the river bank directly downslope.

Based on our preliminary investigation, the area impacted is approximately 40 by 50 feet in Zone 1, and 50 by 60 feet in Zone 2. The total depth to which hydrocarbon residues have penetrated was not determined during our investigation.

4. RECOMMENDATIONS

We anticipate that contaminated soils at the Sellwood Marina site will require treatment to remove fuel residue. Although our final recommendations for remediation plans will be dependent upon Oregon Department of Environmental Quality target values for contaminant abatement, we believe that one or more of the following alternatives will achieve the desired result.

Zone 1 - Fuel Tank Area

Based on our soils investigation within Zone 1, we recommend that the fuel tanks be removed from service, the affected soils removed and aerated on site, the tanks be retrofitted to meet current standards (or replaced), and the aerated soil replaced in the tank excavation as backfill if suitable. This method will provide the best assurance that the affected soils have been removed, and will allow sampling of the surrounding soils for confirmation that hydrocarbon residues remaining do not exceed the proposed Oregon DEQ matrix values for cleanup. Excavation and treatment of the soils on site will reduce the potential long-term liabilities for Staff Jennings, both by insuring that Zone 1 has been remediated to DEQ standards, and by avoiding the shared liabilities which are assumed when material is landfilled at a hazardous waste site.

Removal and replacement of affected soils would interfere with daily operations at the site for a period of time ranging up to several days, and would require removal and replacement of the existing tanks and fuel distribution lines, but would require no ongoing remediation effort or system maintenance.

Alternatives to the above recommendation exist. It is our understanding that the Pacific Tank and Construction Company stated that the present UST system may be brought into compliance with current regulations without replacement of the existing tanks. If such an upgrade is planned, it would be possible to remediate the site by soil venting and installation of extraction wells, if

needed. The soil venting system could be installed at the same time that other upgrades (such as overfill or corrosion protection systems) are performed. These installations may restrict the active usage of the site for a period of up to several weeks, and would require periodic maintenance and monitoring to assure that the remediation progressed as planned. It should be understood that we do not regard this alternative to be as comprehensive as the physical removal, treatment, and replacement of the affected soils. It is possible that residual pockets of hydrocarbons might remain in the soil using soil venting methods, and verification of final hydrocarbon concentrations remaining in the soil following cleanup will be more difficult.

Optimum performance of a soil venting system would be realized during the summer months, when the local groundwater table is depressed. If remediation is to take place when the water table is high, an extraction well and pump might also be required to remove any free product which may be floating at the groundwater surface. Installation of an air venting system will generally produce satisfactory results in the granular backfill surrounding the tanks, where the major levels of contamination were identified within Zone 1. Poorer results may be expected if hydrocarbons have penetrated silty clays or other less-permeable soil types to a significant extent.

Zone 2 - River Bank and River Bed

We recommend excavating the contaminated soils in Zone 2 and treating them on site. The groundwater beneath Zone 2 will probably require treatment as well. We recommend that either a well point system or a french drain system be installed to intercept and draw floating petroleum.

Site remediation in Zone 2 will be complicated by several factors, including:

- Access to the areas within Zone 2, only occurs during periods of low water level,
- The close working quarters under the boat storage platform,

- The geotechnical aspects of maintaining stability of the boat storage structure if affected soils must be removed to any significant depth around the supporting pile, and

- The environmental concerns of releasing hydrocarbons into the Willamette River during the soils cleanup.

We believe that these potential problems may be avoided by using a small, track-mounted (low ground pressure) backhoe to remove the soil to the base of Zone 2, if possible. Although further investigation must be done to verify the actual thickness of this zone, we believe that the depth of soil containing hydrocarbons should not extend much deeper than the lowest groundwater surface sustained at the site since the spill incident. The water table at this location is closely tied to fluctuations in level of the Willamette River. Based on records supplied by the U.S. Geological Survey from their Morrison Bridge gaging station, the level of the Willamette River varied from .8 to 10.7 feet above base level in the interval from September 1, 1988 to March 18, 1989. This suggests that hydrocarbons, which tend to float on water, will be concentrated in a zone 2-3 feet thick. Excavation is possible to this depth by the equipment suggested.

Once excavated, the soil can be stockpiled and aerated on site. The location selected for the stockpile should be covered by plastic sheets to prevent infiltration of the subgrade, and suitably bermed to prevent runoff from entering the river. Installation of venting pipes in the stockpile is recommended to speed the aeration process. Fluids draining from the pile due to rainfall or draining of interstitial water, should be contained and tested for hydrocarbon concentration. Treatment of this water will be necessary before it can be discharged into the river. A holding tank may be located on site and an oil/water separator installed for this purpose. During the excavation process, it is suggested that the river adjacent to the work area be protected by containment booms should hydrocarbons be released from the soil.

A permit will be required for the discharge of treated water into the Willamette River. This must be obtained from the Oregon State Water Resource DIvision. Additional permitting will be required from the U.S. Army Corps of Engineers for excavation of soil adjacent to the river.

The areal extent and volume of affected soil, and the relative concentrations of hydrocarbons can be better defined during the actual remediation process, using on-site screening techniques with confirmation by commercial laboratory analysis. Based on the limited sampling done in this investigation, the total volume of potentially contaminated soil adjacent to the river is estimated to range from 100 to 500 cubic yards.

We believe that excavation will remove all or most of the affected soil from Zone 2. If the depth of hydrocarbon migration proves excessive, or if high groundwater conditions prevent effective excavation, a secondary means of remediation may be possible. This approach involves installation of a series of well points and extraction pumps, or a French drain, collection sump, and pump, to remove any remaining petroleum from soil lying below the water table, and will also intercept any residual hydrocarbons from the beheaded plume originating in Zone 1. The spacing, depth, and configuration of this groundwater extraction system, if required, must be determined after the excavation is completed. Treatment of extracted water could be accomplished in a holding tank, as outlined above.

5. SUMMARY

An investigation, including soil borings, on-site screening, and laboratory analytical methods, was conducted at the site of a fuel spill from an existing underground storage tank at the Sellwood Marina facility. The investigation confirmed that contaminated soils were present adjacent to and down-gradient from the underground tank, and that contaminated soils exist in areas which are adjacent to and at some times inundated by the Willamette River. The results of testing, and sample locations, are shown on the attached figures.

We believe that the soils containing hydrocarbons may be suitably remediated in the following manner:

Zone 1 - Fuel Tank Area

Removal, aeration, and replacement of the soils and existing tanks is the recommended method. This can be done simultaneously with a tank upgrade/retrofit program. An alternative is to utilize soil venting and extraction wells, if needed, to reduce concentrations of hydrocarbons to acceptable levels. This method, if selected, may be done simultaneously with retrofitting of the existing tanks.

Zone 2 - River Bank and River Bed

Removal, aeration, and replacement of the affected soils is recommended. Remediation of residue petroleum hydrocarbons in groundwater or soils below the groundwater table should be accomplished by installing extraction wells or a French drain, if needed.

Design of remediation approaches should be done in consultation with the Oregon Department of Environmental Quality, following their review of this report.

APPENDIX A

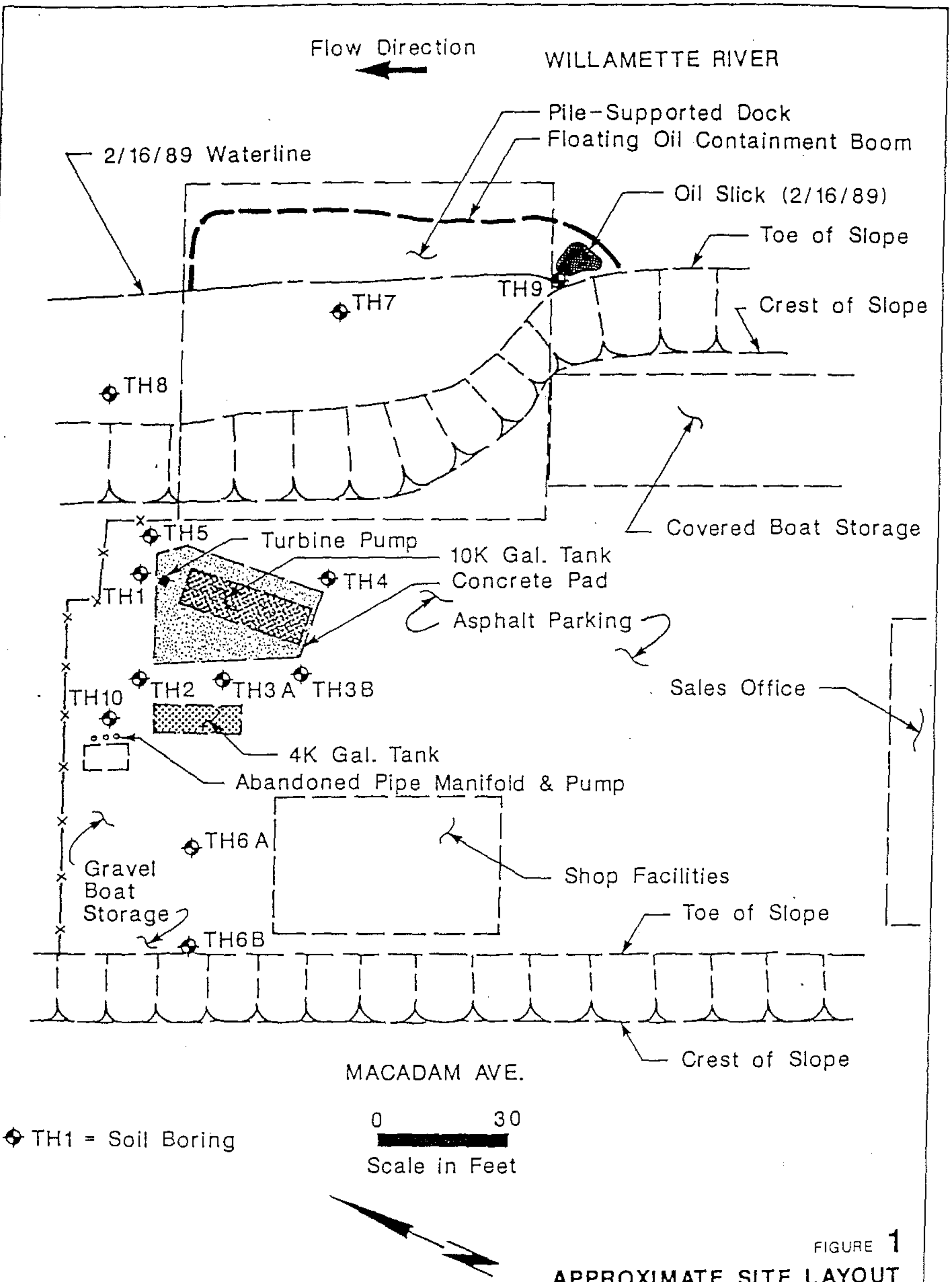

FIGURE 1

APPROXIMATE SITE LAYOUT

STAFF JENNINGS - SELLWOOD MARINA

PROJECT NO 892-1030 DWG NO 13242 DATE 3/27/89 DRAWN RLM APPROVED ML

Golder Associates Inc.

PACIFIC ANALYTICAL LABORATORY INC.
9405 S.W. Nimbus Ave. Beaverton, OR 97005 (503) 644-0660

MAR
Golder Associates

February 24, 1989

Golder Associates
4104 148th Ave. NE
Redmond, WA 98052

PAL REPORT NUMBER: 89-0127
P.O./JOB NUMBER: 09163
DATE RECEIVED: 2/17/89
ITEMS: Eleven Samples

ANALYSIS

METHOD:	Detection Limit
BTEX per EPA 8240 (GC/MS)	5ug/kg
Gasoline per EPA 8015 (GC/FID)	100ug/kg
TPH per EPA 418.1 (IR)	20mg/kg
Lead per EPA 3050/7420 (AA)	1mg/kg

	#1	#2	#3	#4	#5
Benzene,ug/kg	<2,000	<5	<5	25	360
Toluene,ug/kg	61,000	27	<5	<5	2,500
Ethyl Benzene,ug/kg	49,000	<5	<5	<5	2,700
Xylene,ug/kg	402,000	150	<5	65	14,000
Gasoline,mg/kg	1,600	--	--	--	--
Lead,mg/kg	7	--	--	--	--
TPH,mg/kg	990	830	630	1,100	980

	#6B	#7	#8	#9	#10
Benzene,ug/kg	<5	273,000	<5	<5	3,400
Toluene,ug/kg	<5	685,000	<5	<5	17,000
Ethyl Benzene,ug/kg	<5	562,000	<5	<5	22,000
Xylene,ug/kg	<5	1,530,000	<5	15	84,000
Gasoline,mg/kg	--	9,200	--	--	--
Lead,mg/kg	--	16	--	--	--
TPH,mg/kg	25	11,600	80	32	490

All calculations based on dry weight

Respectfully,

Philip Nerenberg
Philip Nerenberg
Chemist

TRANSCRIPT OF HEARING

CONCERNING STAFF JENNINGS, INC.

HEARING DATE: DECEMBER 3, 1997

Tape 01, Side 1

Judge Hearing for the State of Oregon concerning Staff Jennings Incorporated and the Department of Environmental Quality, Wednesday, December 3, 1997, it's approximately 9:00am. The hearing is being held in person at 2020 SW Sports Avenue, Portland, Oregon. The assigned Hearings Officer Administrative Law Judge is Linda V. Lee. Present in the hearing room at this time is the attorney for Staff Jennings, Jack Jones. The President of Staff Jennings, Jeff Jennings, and also Adel L. Ayre, Project Manager. Present for DEQ is Chris Rich, an Environmental Law Specialist, and two parties who have yet to be identified. And I understand that you have some preliminary matter, Mr. Rich.

Rich Yes, Judge. One question that I would like to resolve before we get started is that I have two observers, and I would like to know if there are any objections to these observers being present in the hearing room today.

Male Who are they?

Rich This Dave LeBruan who is currently a law student at Lewis and Clark Law School who is clerking with DEQ. And also we have a new employee, …

Female Jane Hickman.

Rich Yes, Jane Hickman, right. And Jane wishes just to observe the contested case hearing.

Male That's fine. There's no objection to that.

Rich There's no objection to them. The second preliminary issue is I have intended to call four witnesses today, and I wanted to know if there was any objection to them being present in the hearing room while the proceedings are going on, or whether there would be a request to have them excluded.

Male As long as Dale Harpin sits in, I have no objection to having them sit in.

Rich Okay. And Dave, could you let them know that they can be in the room.

Additionally, Judge, I would request just as a procedural matter to have an opportunity to give a brief opening statement to put some of the case in context. And again I intend to call four witnesses and I would like to give a brief closing argument.

Judge Okay, that's fine with me. No objection. Okay, continuing on with my introductory remarks. As indicated in the Notice of Hearing, the issues to be considered today are, did the appellant cause pollution by allowing a continuous discharge of petroleum, an underground storage tank spill or release to any waters of the state in violation of ORS. 468B0251A is the appellant subject to a civil penalty to this violation pursuant to OAR 340-12-069 App., 0AR 340-12-042, and OAR 340-12-045. And did the appellant fail to initiate and complete the investigation or cleanup of petroleum released from an underground storage tank in violation of OAR 340-122-242. I have some jurisdictional documents in my file at this point that I will go ahead and identify. I have and will be marking as Exhibit 1 a copy of the Notice of Hearing mailed on November 26, 1997 scheduling the hearing for today. As Exhibit 2, I have a confirmation of hearing request letter signed by Mr. Jones and dated July 30, 1997. As Exhibit 3, I have a copy of the March 24, 1997 letter signed by a Donald E. Bauerman consisting of the appellant's answer to the notice of assessment of civil penalties, request for a contested case hearing, some requests for informal discussion, a cover letter of that transmittal as March 24, 1997. And as Exhibit 4, I have a copy of the Notice of Civil Penalty Assessment. Signed on the last page and dated March 7, 1997. Are you familiar with these documents, Mr. Jones?

Jones Yes.

Judge Do you have any objections to them being admitted into the record?

Jones No objection.

Judge Are you familiar with the documents, Mr. Rich?

Rich Yes.

Judge And do you have any objections to them being admitted?

Rich No objection.

Judge And then I'll go ahead at this time and admit into the record Exhibits 1, 2, 3 and 4. They are admitted and will be presented.

As I recall the last time that I did one of these hearings I actually requested that the agents go forward first, and we're supposed to do that in this case, unless there's some strenuous objection.

Male That's what I was assuming.

Judge Okay.

Male Now we're prepared to do so.

Judge Okay. Are you prepared to start with the opening?

Male Just requesting another few moments to allow the witnesses to round up so it's not too disruptive. Give them just a minute.

Judge Okay. Fine.

Okay, with no further record, that we've been joined by the DEQ witnesses, so we'll go forward at this time, Mr. Rich.

Rich Thank you, Judge, I'm Christopher Rich, an Environmental Law Specialist, representing the Department of Environmental Quality in the matter of Staff Jennings, Case No. UT-NWR-96-274. This case arises out of Notice of Assessment of Civil Penalty issued by the Department on March 7, 1997. In that notice two violations were cited. Violation one was cited for negligently causing pollution of waters of the state, specifically the violation was assessed for Staff Jennings allowing an ongoing discharge of petroleum contamination to enter the Willamette River from contaminated soils and ground water from a known release of petroleum at the Staff Jennings Marina. A violation two arises from failure to initial and complete the investigation or clean-up of petroleum release as required by DEQ rules. Specifically, Staff Jennings failed to initiate immediate abatement of petroleum discharge to the Willamette River. They failed to install ground water monitoring wells as required by the Department and failed to fully define the extent of onsite and offsite contamination and they further failed to develop a corrective action plan. A civil penalties was assessed for just one of these violations. Violations one causing pollution of waters of the state. Now this was an $8,400 civil penalty. The Department intends to submit the following facts in support of their action. Staff Jennings Marina is a retail boat sales operation adjacent to the Sellwood Bridge and has property that actually fronts the Willamette River. In 1988, Staff Jennings operated two retail gasoline underground storage tanks or USTs. There was a $4,000 gallon and a $10,000 gallon UST. On or about October 18th of 1988 a release from a broken pipe elbow on the $10,000 gallon UST caused a release of unknown quantity of gasoline to saturate soil and groundwater immediately below the UST area and caused a plume of free petroleum product to enter the Willamette River. Although Staff Jennings took some measures as required by law to capture this free product with some booms and absorbent pads, Staff Jennings did not take measures in 1988 at the time of the release to actually remove the contaminated soil and remediate the contaminated groundwater which was in contact with the Willamette River. The Department will show that Staff Jennings was on notice as early as 1989 and 1990 through it's own consultant's opinions that they had significant contamination in the groundwater and soils adjacent to the Willamette River and that this petroleum was discharging into the Willamette River. Despite this notice, Staff Jennings failed to install a remedial system capable of abating this discharge. The Department worked for a significant period of time to try to move Staff Jennings forward on completing their requirements under law, and despite some starts and stops on the Department's part due to staffing and resource limitations, Staff Jennings still failed to meet it's legal duty to install the remedial system until approximately 1997. The Department issued a civil penalty in this action because Staff Jennings had independent legal duty to abate the discharge of petroleum and to clean-up and fully characterize and investigate the release of petroleum dating back to 1988. Staff Jennings had quite a bit of opportunity to do so. They were on notice early on that this was a necessary task, and yet despite this, they may have done some other related task but they failed to do a key issue here for the civil penalty which was to actually abate the discharge. Because of this the Department issued a civil penalty of $8,400 which it requests that you uphold in this hearing today. Additionally we ask that you uphold the finding that they failed to initiate and complete the investigation of onsite and offsite contamination as required by law. Thank you.

Judge And were you prepared to go forth with your own ______.

Male Yes.

Judge Okay, please do.

Male Judge, this is a case about the DEQ going off cold, actually in this case it's more cold than hot. What I mean by that, is that Staff Jennings has been working with the DEQ for a number of years and has cooperated on a good faith basis to do what was necessary according to the DEQ's focus and suggestions. Mr. Rich says that this case goes back to 1988. He's correct in the sense that Staff Jennings found the initial evidence of the release and then they took the steps to work with DEQ in order to remedy the problem. Staff Jennings, going back to 1988 and 1989, followed the DEQ lead. And the DEQ way back then was not the aggressive one that you are hearing from this morning. The DEQ way back in the late 80s was, this is not a significant event, this release from the underground storage tanks. I think in the words of Jeff Jennings, he'll testify that Loren Garner told him that this is no big deal. And it is perfectly acceptable for Staff Jennings to wait for approval of a financial assistance application which Staff Jennings had applied for in order to receive financial assistance and take steps to address the situation. That application process went on for a long time and again the DEQ said you don't need to take any steps at this time. Just wait for the financial assistance for him to be approved. Then, several years later, it becomes clear that the financial assistance program is not available to Staff Jennings and at that point, the DiMinimus Incorporated who is the consultant for Staff Jennings, represented by Mr. Har, they then entered the picture and measures were taken to address the situation out of the Staff Jennings property. And that included the removal of underground storage tanks in October of 1994. From that point on, Staff Jennings and DEQ have been working together to try to formulate the right approach to addressing the problem, reducing any releases, but most significantly to look at what is the extent of the release at that area. And when I say area, I don't just mean the Staff Jennings property but adjacent properties as well. So, the cooperation with Staff Jennings following the DEQ lead then steps up in 1994 when it becomes clear that the financial assistance program isn't going to be available to Staff Jennings. So Staff follows what DEQ requires at that point. An investigation begins, and that's headed by Mr. Har. The ____ underground storage tanks are removed. And then a very significant issue comes up which is how far does this contamination go and what's the source of the contamination. And it becomes clear that there is contamination off of the Staff Jennings property to the north of the Staff Jennings block. And in order to find the extent of that contamination, Staff Jennings needed to obtain a permit from the City of Portland to enter onto the Portland Park properly to find out what is the extent of the contamination. That process believe it or not took one year in order to get an application approved and obtain the permit from the City of Portland. It also was discovered that there may have been a contamination source to the west of the property from an old service station that's up gradient from the Staff Jennings property. And efforts were made by Staff Jennings to contact the Oregon Department of Transportation to find out whether or not that was the source of contamination. So you had this, not just one leak from a broken elbow pipe back in 1988, you had this big picture that Staff Jennings was trying to address, along with DEQ, on what appears to be a completely cooperative effort between DEQ and Staff Jennings in 1994, 1995, and 1996. Now again, following the DEQ lead, Staff Jennings was looking at formulating a corrective action plan which wouldn't just result in a bandage type approach to minimizing any release from an isolated area on the Staff property, but looking at the overall area. And that corrective action plan was the focus for DEQ and therefore the focus for Staff Jennings and there the mind set by both parties was to determine the extent of the contamination off the property to the west and more significantly off the property to the north. So the mind set was to look at a corrective action plan and so Staff followed the advise of Mr. Har who was looking at the DEQ manual which requires that a corrective action plan be formulated and adopted once it's determined what the extent of the contamination is. And they didn't know that the extent of the contamination was until they could get onto these adjacent properties and they were held up in doing that by the permit process for the City of Portland and also with some administrative difficulties with the Oregon Department of Transportation.

No in late 1996 it became clear that DEQ was, for some reason, was shifting gears on Staff Jennings and they wanted, in addition to a corrective action plan, they had mentioned that they would like to have some wells put on the Staff Jennings property. And by May of 1997, those wells were put in place on the Staff

Jennings property, both the monitoring well and a recovery well. In summary, Judge, what the case is about, is Staff Jennings working with the Department of Environmental Quality in a cooperative way in 1994, 1995 and 1996, trying with both parties focusing on formulating a corrective action plan and doing that after they determined the extent of the contamination on offsite properties. And the other overall thing that I want to leave with you is Staff Jennings was not negligent throughout the course of these proceedings. They worked with the DEQ. They were cooperative. And they made a good faith effort to do what DEQ requested. Again with the focus on formulating a corrective action plan in light of these developments on adjacent properties.

Judge And why don't you call your first witness?

Male Thank you. The first witness for the Department of Environmental Quality is Loren Garner.

Judge I'll need to swear you in so please remain standing. Raise your right hand. Do you solemnly swear or affirm as requested on the statements you are about to give as that will be the truth, the whole truth, and nothing but the truth.

Garner Yes.

Judge Please be seated. For the record state your name.

Garner Loren Garner.

Judge and spell your name.

Garner L-O-R-E-N G-A-R-N-E-R.

Judge Now go ahead with your questions, Mr. Rich.

Rich Thank you, Judge. Mr. Garner how long have you been employed at DEQ?

Garner For nine-and-a-half years.

Rich And what is your educational background prior to that?

Garner I'm a licensed civil engineer. I have a Bachelor's and Master's Degrees in Civil Engineering, specializing in all resources of environmental engineering. And I had a year of _____ towards the doctorate with emphasis on hydrology, ground waterage.

Rich Do you have any background in remediation of petroleum contaminated sites?

Garner Yes, I do. About the first five years with DEQ, I worked primarily with underground storage ground clean-ups. And those are, the vast majority of those are petroleum related and so I dealt with various aspects, literally hundreds, of sites.

Rich Okay, going back to 1988, what were your duties at DEQ at that time?

Garner I was an in an engineer position, working with underground storage clean-up issues.

Rich Okay. In your official capacity as DEQ UST clean-up specialist, in about October of 1988, did you receive any reports or information concerning Staff Jennings Marina?

Garner Yes. I received the initial notification of the release that was discovered there. And then I did coordinate on that project for ______ periods.

Rich Do you recognize this document?

Garner Yes, I do.

Rich Please tell us what it is.

Garner This is basically the initial tracking forms for the tank program. The top one has been updated. Documents go in – the one that I am directly familiar with. It's the second page. This was the initial form. I – in my handwriting _________ wherein I took that initial report and information.

Rich Okay. Was this document made at or near the date shown?

Garner Yes, it was.

Rich And was this kept in the regular course of business at DEQ?

Garner Yes.

Rich To the best of your knowledge, is this a true and correct copy of the original?

Garner Yes, it is.

Rich If there's no objections, I'd like to admit this document as Exhibit 5.

Man No objections.

Judge	Okay. It is admitted as such. The petroleum release form.

Rich	Okay, Mr. Garner, could you please describe the contents of this document?

Garner	This was a – a notification that was received on October 20, 1988. I was contacted by Steve Locke of SRH, who was acting as a consultant for staff changes. He was reporting that on the 19th of October, 1988 they had discovered gasoline had been released from the underground tank system at the Staff Jennings site, next to this north bridge.

Rich	Okay, after receiving this Notice of Release, did you have an opportunity to inspect the Staff Jennings Marina in person?

Garner	Yes, I did.

Rich	For purposes of demonstration, Mr. Garner, I have here a map depicting Staff Jennings Marina. If you could please take a look at that. Can you tell us, is that a fair and accurate representation of the layout of the Staff Jennings Marina?

Garner	Yes, _______.

Rich	Okay. Using this map as a guide, would you please describe generally the layout of the facility.

Garner	Yes. The facility is located along a steep hillside along the edge of the Willamette River. The Willamette River is in this area close to the north. The facility is on the west bank of the river. The hillside comes down very steep. McAdam Avenue is cut into the side, and there's additional hill slope between McAdam Avenue and the access road, that comes down to a fairly flat area where the majority of the facility is located. This area here is an elevated concrete platform, basically, that extends out over the – the shoreline here at the facility. This is the underground storage tank area, this is the 4,000 gallon tank, and this is the 10,000 gallon tank that is particularly in question.

Rich	Okay. When you inspected the facility, could you describe any other observations that you made at that time?

Garner	At – at the time I visited, there was – work had been done in the tank area. We took a look at some of the high beam discussed with Staff Jennings and their consultant. The situation that they found here – we also came out to where we could see underneath the dock area, and we discussed some of their findings that they had found as far as contamination beneath this area. And we discussed a variety of options, questions, and some of those type of things _________.

Rich Could you be specific in terms of the options and questions that you discussed?

Garner Uhm . . .

Rich And who you had – I'm sorry, excuse me – and who you had those discussions with?

Garner Okay. It was with the – I'm trying to recall his name right now. It was the consultant with – my mind's a blank. They wrote the – the two ______ reports.

Rich Would you like to refresh your memory?

Garner The Golder Associates, and it was – I'm not finding his name here. The primary consultant with Golder through that time frame was there.

Rich Okay, that's – that's fine, thank you. And please discuss what you – the substance of your conversations with the Golder Associates consultant.

Garner Okay. A lot of the concern was how to try to address the contamination that had moved sub-surface through the bank and had, in the past, and was continuing to _________. They had found elevated levels of gasoline contamination, basically right at the ground water level, along with the river bank. And we were discussing some of the – the options and possibilities. As I recall, we considered the possibility of a trench, possibilities of well points, those types of things, to be able to try to capture ______ contaminated water and fuel ________.

Rich Okay, thank you. If there's no objection, I'd like to enter this demonstrative evidence as Exhibit 6.

Man No objection.

Judge It is admitted as such.

Rich Well, Mr. Garner, did you have continued oversight of the Staff Jennings Marina in your course of work at DEQ?

Garner Yes, I did, for a period of time.

Rich And how long was that period of time?

Garner Through 1988 and '89, and extended perhaps a little less formally into 1992.

Rich Okay. Do you recognize this document?

Garner	Yes, I do.
Rich	And could you please tell us what it is?
Garner	This is the report of findings from Golder Associates. It's dated March 27, 1989.
Rich	Was this document, to the best of your knowledge, made at or near the date shown on page 1?
Garner	Yes, it was.
Rich	Was this report kept in the regular course of business at DEQ?
Garner	Yes.
Rich	To the best of your knowledge, is this a true and correct copy of the original document?
Garner	Yes.
Rich	I move to admit the document if there's no objection.
Judge	Any objection?
Man	No objection.
Judge	It is admitted.
Rich	Mr. Garner, who prepared this document?
Garner	This was prepared by Golder Associates, who were acting as consultants for Staff Jennings.
Rich	Does it indicate on the document who it was prepared for?
Garner	Yes, for Staff Jennings.
Rich	Okay. Please turn to the last page of the report and describe the information contained therein.
Garner	The last page here is a summary of the analytical results from samples that were taken from soil borings. Basically, ________ take a subsurface sample at the time.

Rich Okay, and could you please describe the findings in that analytical data.

Garner Basically, it showed that several of the borings had elevated levels of contamination that's very consistent with gasoline. That's based on the high levels of benzene ________ and ethyl benzene and xylene. The particular borings that showed the highest levels of contamination were near the release area by the 10,000 gallon tank, and then on down the slope along the ______.

Rich Okay. For demonstrative purposes, I have an enlarged copy of the map found on the page preceding the analytical data. Is this map a very accurate copy of the map in the Golder report?

Garner Yes, it is.

Rich Okay. Using that map as a guide, could you please explain what is indicated by the TH markers on there. And if you can, please also correlate that to contamination documented in the report.

Garner Okay. The TH -- the test holds or the boring location, where they went in and took soil samples. They sampled particularly in the area of the 10,000 gallon tank and down in this area. They also took some test borings up hill to see if there was contamination evident coming onto the property. There was basically no gasoline contamination identified uphill. There was contamination identified here near a ______ manifold where there apparently had been a previous fuel dispenser, and that seemed to be an isolated incident separate from this area, which is – basically, this is the _____ and the piping area where the cracked elbow was found in 1988. And these two borings had very significant levels. The highest level of contamination that was found in that series of borings was in Test Hold 7, which is beneath the – you know, the dock, and along the banks of the river.

Rich Okay, using the analytical data, could you please mark what the most likely path of petroleum migration was, relating to that 1988 release?

Garner Based on the data, my estimation of where the contamination appeared to be would be something like that.

Rich Okay, thank you. If there's no objection . . .

Garner You know, these two tests both showed very little contamination.

Rich Okay, thank you. If there's no objection, I'd like to enter this as Exhibit 7 for the record.

Man No objection.

Judge I'm showing Exhibit 8.

Rich All right.

Judge And the new map is admitted as Exhibit 8.

Rich Well, Mr. Garner, going back to the Golder report that you have before you, previously marked as Exhibit 7, could you please turn to page 3 and read the d portion of that report? I'm sorry, page 2.

Garner I have a highlighted portion on page 2. Now, this is the March 22 ________?

Rich I'm sorry, it is page 3. I stand corrected.

Garner The second paragraph there says, "The field investigations conducted by SRH Associates, determined that fuel residues were present beneath the concrete bull flap ____ identified on Figure 1. Their initial study indicated that fuel was leaving from the broken elbow – although its source had not yet been identified – had migrated from the gravel backdoor on the underground storage tank and distribution lines. And the reason was the soaky sands of the river bank. The contaminant will eventually enter the river at this location.

Rich Mr. Garner, do you agree with that assessment?

Garner Yes, I do.

Rich So is it correct that – well, actually, let me ask you this way. Based upon your experience, do you agree that petroleum contamination could discharge into the Willamette River from that location?

Garner Yes, I do.

Rich Okay, and would this be a reasonable conclusion at the time, based upon the data available in 1989?

Garner Yes.

Rich Okay. At the time of the initial petroleum spill in 1988, was Staff Jennings required by DEQ rules or statutes to take any steps to minimize the amount of free product entering the Willamette River?

Garner Yes, it was.

Rich And are you aware if Staff Jennings took any steps to do that?

Garner As the figure depicted, they did place boons, which basically tried to capture any product under the surface of the water, and the absorbency – we tried to remove those. And so that type of a response ______ river was taking that I know of no major _____________ the problem within the main.

Rich Okay, so we're clear. Does putting booms and absorbent pads – does that remediate any contamination that's contained in the soil or groundwater?

Garner No.

Rich Okay. Would the boons and pads, once they were removed, would they – would there nonetheless be the potential for further discharge in the river?

Garner Yes, there would.

Rich Okay. Could you please turn to page 6 of the report. And would you read the highlighted portion there.

Garner This is in your conclusion section. It says, "Based on our field investigation and the results of analytical testing, it is apparent that gasoline and gasoline-derived compounds have been released into the soils in the vicinity of the Sellwood Marina Tank Field, and that petroleum has migrated down______ to the vicinity of the Willamette River.

Rich And do you agree with that conclusion?

Garner Yes, I do.

Rich Okay. If there's no objection, let's see – we've already – we've already admitted that on into the record. So, what I'd like to do is – Mr. Garner, have you – did you receive any other reports from Staff Jennings Consultants regarding the Staff Jennings Marina petroleum contamination?

Garner Yes, there was one _______.

Rich Do you recognize this document?

Garner Yes, I do.

Rich Please state what it is for the record.

Garner	This is a report dated January 3, 1990, from Golder Associates. ________ consultants for Staff Jennings.

Rich	To the best of your knowledge, was this document made or – at or near the date shown on page 1?

Garner	Yes.

Rich	Was this report kept in the regular course of business at the _____?

Garner	Yes, it was.

Rich	And to the best of your knowledge, is this a true and correct copy of the original report?

Garner	Yes.

Rich	If there's no objections, move to admit the document as Exhibit 9?

Man	No objection.

Judge	It is admitted as such.

Rich	Okay. Mr. Garner, please describe, briefly, what the purpose for preparing this report was?

Garner	This report was presented as a remedial design for the Sellwood Marina, meaning that this was a proposed methodology to remediate the – the problem.

Rich	Okay, could you please turn to page two and read the highlighted section?

Garner	Several options for remediation of this area were considered. The options included removal and aeration of the affected soil, excavation of the interceptor extraction ______ to prevent further fuel migration in the river system, insulation of a large lower extraction well, and placement of _________ groundwater.

Rich	Could you please explain what these options are intended to do?

Garner	Basically what they're intended to do – removal and aeration of the affected soils. That would basically be to surgically remove the soils that were contaminated. The interceptor or extraction trench would basically be if – if this is the hill slope, and the groundwater is moving through, it would be to put a trench between the river and that groundwater that was moving. And the trench would be able to

	capture that water and be able to flood out the treatment to remove the contaminants ________.
Rich	Okay. I'm sorry, go ahead.
Garner	The large bore extraction well would basically be to put in a – a recovery well, and you would try to use the principals of just the natural flow of water into a well to capture the contaminants _______. And finally the idea of well points would be that you would use multiple small wells that could, in a more localized way, remove that contamination from _________ in, with all _________.
Rich	So, is it fair to say that in this 1990 report Golder & Associates is specifically recommending a remediation system to prevent further migration of fuel into the Willamette River?
Garner	Definitely.
Rich	Okay. Based on the available data at that time, was this a reasonable conclusion and recommendation?
Garner	Yes, it was.
Man	I object to that question. It calls for an improper opinion.
Rich	Well, Judge, the Department's action is based upon a finding of negligence, which uses a reasonable person's standard, and therefore I think the Department's opinion as to whether or not a party was negligent goes directly to the substance of the violation.
Judge	Okay, the objection is noted for the record. I'll go ahead and allow the question to be asked and answered.
Garner	Okay. It's my opinion that that was an appropriate measure to be taken at that time.
Rich	Okay, thank you. Based upon the levels of contamination documented in these reports, do you have an opinion as to whether or not petroleum or dissolved petroleum hydrocarbons discharged into the Willamette River on an ongoing basis?
Garner	They would have continued to discharge on an ongoing basis. That would be affected by river level, by the amount of rainfall, and recharged to the groundwater. Basically, it's a dynamic system – well under gravity to the river.

And so there's things that affect it but, yes, the overall movement would be _______________.

Rich Is the surface river water in the Willamette in contact with the soils in the back of the Willamette River?

Garner Yes.

Rich Would it have been in contact with the contaminated soils at Staff Jennings Marina?

Garner Yes.

Rich Would it have been in contact with groundwater that was contaminated by the Staff Jennings Marina?

Garner Yes.

Rich Do you have any doubts that this discharge occurred . . .

Garner No, I don't.

Rich . . . on an ongoing basis?

Garner _________.

Rich Mr. Garner, are you aware whether or not petroleum contamination is harmful to aquatic species?

Garner It – it is.

Rich Okay. And even in small amounts can it still be harmful?

Garner Yes, it can.

Rich Are there any cumulative impacts of contamination that need to be considered in this context?

Garner It seems that – it's ______ part of the goal of deregulation.

Rich And have there been any efforts that you're aware of to clean up the Willamette River?

Garner Yes, there have been some pretty major efforts over a number of years to improve water quality.

Rich Okay. Mr. Garner, do you recognize this document?

Garner Yes, I do.

Rich Would you please state what it is for the record?

Garner Its a letter from Golder and Associates to me, dated April 4, 1990.

Rich Okay, was this document made at or about the date shown?

Garner Yes, it was.

Rich Was this record kept in the regular course of business at the [DEO?]. And to the best of your know, is this a true and correct copy of the original letter?

Garner Yes.

Rich And do you recall, in fact, receiving this letter?

Garner Yes.

Rich Okay, I move to admit the document if there's no objection.

Man No objection.

Judge Okay, it is admitted as Exhibit 10.

Rich Thank you. Please generally describe the – well, actually, would you – yeah, just please read the middle paragraph of the letter. That body of that letter, please.

Garner Okay. Mr. Jeff Jennings of Staff Jennings Inc. has asked me to forward a copy of our remedial design of petroleum hydrocarbon ______ to you _______. I appreciated your comments regarding ______ remediation for the Marina during our conversation at the site, and have incorporated your suggestions into the design. It's my understanding that Mr. Jennings is in the process of securing the necessary permits for construction of an extraction system and for discharge of treated water.

Rich Okay. What is the extraction system that's referred to in this letter?

Garner The . . .

Rich	Or what is mean by extraction systems.

Garner	That would be the system to remove groundwater – contaminated ground water _______.

Rich	Would this extraction system be for the purpose of moving that contamination to prevent it from migrating to the Willamette River.

Garner	Yes.

Rich	After receiving this letter in April of 1990, did you have any expectations as to work that would take place at Staff Jennings?

Garner	Yes, I did. I expected that they would continue forward with – with necessary measures to address the problems.

Rich	Okay. Based upon your experience at different sites, can you estimate, even roughly, how much time Staff Jennings reasonably needed . . .

Tape 01, Side 2

Judge?	This is Tape 1, Side 2, and why don't you begin again with your question, Mr. Rich?

Rich	Thank you. Mr. Garner, based on your experience at DEQ, can you estimate how much time Staff Jennings reasonably needed subsequent to this April 4, 1990 letter to implement the remedial system to begin abatement of petroleum discharges into the Willamette River.

Man	I object. It calls for speculation.

Rich	Again, Judge my – my original response is the same here. The action is substantially based on whether or not Staff Jennings was reasonable, and the Department did form opinions on that. And I'm providing direct evidence as to the finding of negligence.

Man	We believe that that decision is for you to make, not the witness.

Judge	Okay, we'll go ahead and allow the witness to answer the question, keeping in mind that I'm not bound by his response.

Garner	Okay.

Rich Would you like me to repeat the question?

Garner I think I recall. Typically, this type of a system that's proposed within a matter of several months normally would be able to be installed and in operation.

Rich Did Staff Jennings install your remedial system, to the best of your knowledge, in 1990?

Garner No.

Rich Did they install a system in 1991?

Garner No.

Rich Did they install a system in 1992?

Garner No.

Rich Okay, Mr. Garner in your work at DEQ, do you routinely interpret and apply administrative rules and statutes relating to petroleum contamination and discharges as to water in the state?

Garner Yes, I do.

Rich I have a copy here, of Oregon Revised Statutes, Vol. 8, Chapters 426 to 470. Judge, I'd request judicial notice for purpose of foundation.

Judge Fine.

Rich Mr. Garner, could you please turn to page 672, and could you please read ORS 466645.

Garner This first paragraph?

Rich Yes.

Garner It's titled "Clean-up – Failure to Complete Clean-up." Any person liable for a spill or release, or threatened spill or release, under ORS 466.640 shall immediately clean-up the spill or release under the direction of the Department. Any person liable for a spill or release or threatened spill or release shall immediately initiate clean up, whether or not the Department has directed the clean-up. The Department may require a responsible person to undertake such investigations, monitorings, surveys, testing and other information gathering as the Department considers necessary or appropriate to…do you want me to read the additional part?

Rich No thank you. That's sufficient. Mr. Garner, based on what you read there, then is it correct that the Department statutes that we function under requires parties to take steps to remediate contamination regardless of whether or not the Department has directed them to do so?

Garner Yes.

Male I object to that question on the same basis as stated earlier.

Judge Objection is noted.

Rich Mr. Garner, could you please turn to page 70. And could you please read section, excuse me, ORS 468B.0251A.

Garner Okay. This is entitled "Prohibited Activities." Except as provided in ORS 468B.050, no person shall (a) cause pollution of any waters of the state or place, or constitute place, any waste or allocation where such waste are likely to escape or be carried into the waters of the state by any means.

Rich Okay. Thank you. And were the statutory sections that you read in effect in 1988?

Garner Yes they were.

Rich And do they remain in effect now?

Garner Yes.

Rich Okay. Is it correct that the Staff Jennings Marina project file was transferred to another person at DEQ sometime in 1992?

Garner Yes. The exact date on that I'm not sure.

Rich Okay. But during your tenure as overseeing the project, are you aware of any other activities that Staff Jennings took to either remediate contamination or to initiate investigation of the contamination subsequent to the 1990 letter from Golder Associates?

Garner I'm not aware of it.

Rich Okay. I have no further questions at this time.

Judge Mr. Jones.

Jones It's true that Staff Jennings through their agent, discovered the initial release and reported it to DEQ.

Garner Right.

Jones And they did take measures in response to conversations with their agent and with DEQ for specifically to put the boom on the water. Correct?

Garner Yes.

Jones And did you or anyone in your Department in writing notify Staff Jennings that those measures were insufficient?

Garner I'm not aware of anything in writing.

Jones And do you recall having several discussions with Jeff Jennings during that period of time?

Garner Yes I do.

Jones And did you talk to Mr. Jennings about the possibility of his company filing an application for financial assistance with the financial assistance program?

Garner I don't recall any discussion of that early on. Later on that question came up. There were many questions about the financial assistance program.

Jones And would you agree that you had no objections to Staff Jennings filing an application with that program?

Garner No. Their application is open to anyone who fills ________.

Jones And to the best of your memory, can you recall what year that application was made?

Garner I don't know.

Jones Do you recall at some point that the financial assistance program was not available to Staff Jennings?

Garner I know that the program generally was prohibited because of a number of issues that _____ disappeared, whether Staff Jennings withdrawal was based on whether they qualified or that the program was withdrawn, I don't know.

Jones And during that period of time when you were working with Staff Jennings, can you recall notifying Mr. Jennings that he could continue with the plan that was in effect while he pursued his application for financial assistance?

Garner I'm not sure I recall specific discussions with him on how the financial assistance affected it. I know that there were a lot of questions from ________ tank owners as far as how the financial assistance program affected their ongoing clean-ups. Normally we encourage them to continue with all measures that they could. There were some revisions in the law that allowed certain situations to, you know certain aspects of clean-up work to be delayed pending the financial assistance. Certain aspects of things that were more direct _____ that were not delayed.

Jones And at no time though during this application process did you or anyone at DEQ notify Staff Jennings that they needed to do anything differently than what they were doing?

Garner I know there's nothing in writing in the file. What may have been included in any of the communications from the financial assistance program side, I don't know. And so whether the wording of the letters concerning that application process, the specific wording of those letters, I can't testify to.

Jones I'm talking though...

Garner I know from the clean-up perspective, I'm not aware of anything that was issued in writing.

Jones All right. Nothing further.

Rich I just have a couple of questions on redirect.

Judge Okay.

Rich Mr. Garner, is there any requirement that you are aware of under DEQ law or statute that requires us to notify or direct the Department in writing to clean-up our remediate contamination at the site?

Garner I'm not aware of anything. I do know that early on with the tank program, there was a lot of tank activity, and many sites went into less active oversight just because of competing priorities. Again we literally had hundreds of sites a year being identified and reported with all varying types of urgency, and so many sites,

	even some that were considered significant did not receive a lot of direct oversight for a period of time.
Rich	Okay. Mr. Jones made reference to the plan in effect at Staff Jennings. Based upon the correspondences, what did you believe the plan in effect was, say in 1990?
Garner	That they would go ahead and proceed with remediation in what had been proposed _______.
Rich	Mr. Garner, is it correct that Senate Bill 1215 as a matter of record, which was the financial assistance program, went into effect in October of 1991?
Garner	As I've said, I'm not sure on the date, but it was somewhere around that time.
Rich	Okay. Just so you believe in your reflection, it's somewhere in that timeframe.
Garner	That makes sense, but I don't have, I'm not certain on the date myself, but that sounds about correct.
Rich	When was the initial release of petroleum at the Staff Jennings facility?
Garner	October of 1988.
Rich	So from October of 1988 to October of 1991, if you accept that date as a reasonable estimate of the financial assistance program, was there any reason that Staff Jennings would have to believe that they would be able to put anything on hold pending a financial assistance application.
Male	Question is totally improper, I object.
Rich	On which basis?
Male	You are asking for an invalid, an improper opinion.
Judge	Okay, could you state or re-ask the question?
Rich	Yes, I certainly feel free to re-ask the question for good of the order. Mr. Garner, was there any financial assistance program available at DEQ between 1988, October and October of 1991?
Garner	No.

Rich	Could there have been any belief by any party that they would have some deferral during that period of time?
Male	I object again. He's asking the witness to speculate as to the knowledge of another party.
Rich	Judge, I'm simply asking if...All right, I mean I'd be happy to ask it if the Department had ever received any applications for financial assistance between 1988 and 1991.
Garner	No.
Rich	And why wouldn't they?
Garner	Because that option was not available during that time.
Rich	Okay. Is it correct then that you testified that you believed that Staff Jennings was preceding on a remedial system in 1990?
Garner	Yes.
Rich	Okay. I have no further questions.
Jones	One other question is, during the time that you worked with Staff Jennings, they were, specifically Jeff Jennings, was cooperative with you and your Department.
Garner	Yes.
Jones	Nothing further.
Rich	I have one last question, excuse me if I may. Mr. Garner, you made a reference to the workload at the time, that this letter in 1990 was issued. Could you explain briefly what the workload was at DEQ?
Male	I object. That's beyond the scope of my question.
Judge	Okay. I'm going to go ahead and allow the question to be answered.
Garner	Basically when I started in June of 1988, I was the first person hired as the, in the underground storage tank in a program. Law had just been brought in just previous to that required the reporting of the releases and you know, basically the whole clean-up rules began at that point. As more and more sites were identified in _____ at the time for the staff resources to be increased, then even still today, there are more tank sites than we have staff to be able to do active over site _____.

Rich Okay, if you believe that a facility is going to do forward audits. Excuse me, in 1989 and 1990, did you have reason to believe that facility was moved forward with remediation, would you have given that priority oversight?

Garner It will depend on the specifics of the case, but if someone seemed to be moving forward on their own, we would tend more to go to sites where nothing is being done, ________.

Rich Okay. Thank you.

Judge Anything further on this witness?

Rich No, nothing further.

Male Okay, the Department would like to call as it's next witness, Thomas Roick.

Judge Do you solemnly swear or affirm that the testimony and statements that you are about to give in this matter will be the truth, the whole truth and nothing but the truth?

Roick I do.

Judge Please be seated. For the record state your name.

Roick Thomas Roick.

Judge And spell your name.

Roick T-O-M R-O-I-C-K.

Judge Go ahead, Mr. Rich.

Male Mr. Roick, how long have you been employed at DEQ?

Roick Five years.

Male Could you briefly discuss your educational background.

Roick I have a Bachelors Degree in Chemistry, specialization in earth science.

Male When did you become involved in the DEQ underground storage tank program?

Roick I started work for the tank underground in December of '92.

Male	In your work as a DEQ underground storage tank inspector, did you have any duties regarding Staff Jennings Marina?
Roick	Yes, I was assigned to that project.
Male	For what period of time?
Roick	From February to well, until I left the program in March of '93.
Male	Okay, so we're clear. What is the complete period of time?
Roick	February of '93 until I left the program in March of '93.
Male	Okay, during this period of time, did you discuss any clean-up activities with any staff at Staff Jennings?
Roick	Yes, I believe I discussed the clean-up proposal that had been submitted by Golder Associates to Jack Jennings.
Male	Mr. Roick in your capacity as a DEQ underground storage tank inspector, did you act as the custodian of records for any records related to the Staff Jennings facility?
Roick	Yes, I would have a file, the DEQ files were private.
Male	Okay. Do you recognize this document from them?
Roick	Uhm, hum.
Male	Was this document made at or about the date shown?
Roick	Yes.
Male	Was this kept in the regular course of business, at DEQ?
Roick	Yes.
Male	Is this a true and correct copy of the original document?
Roick	Yes.
Male	There's no objection to admit the document?

Roick	No objection.
Judge	Then it is admitted as Exhibit 11.
Male	Mr. Roick, what was the purpose for making this document?
Roick	It was to document the phone conversation between myself and Jeff Jennings.
Male	Okay. Could you please read the highlighted portion of this phone memorandum?
Roick	Remediation assessment may be performed in conjunction with tank removal. I suggested some kind of sampling soil/ground water monitoring to determine current contaminant levels since it has been greater than two years since work was done on the site and the proximity to ______ Webber, they allowed in quotes "flushing of the contaminated soil."
Male	Mr. Roick, what are you referring to by the term remediation?
Roick	Remediation is clean-up the area that was impacted by petroleum release.
Male	Okay, and could you please explain why, or what you mean by the term flushing in quotes.
Roick	Well, I was aware that some of the contamination at the site had been identified in soils that would proportionately be underground water because of fluctuations in the water table, and therefore there would be ground river water in contact with the contaminants in the soil or sediments, and there would be an expectation that the contaminants would then be released from the soil into the water.
Male	Are you aware of the specific contaminant involved at this site?
Roick	Well, gasoline was of concern, as well as constituents of gasoline.
Male	Okay, how does gasoline and its constituents react in a wet environment.
Roick	Well they do tend, a lot of the constituents of gasoline are very soluble in water, so some of them would dissolve into the groundwater.
Male	Okay, is it in your professional opinion, do you believe that that in fact occurred at the Staff Jennings Marina?
Roick	I believe so.
Male	Nothing further.

Jones	Sir, do you set forth any specifics in terms of remediation in this document?

Roick	I don't believe so. I believe we discussed the remediation that had been proposed by the Golder Associates.

Jones	There's no threat of fine if the remediation steps aren't taken?

Roick	No.

Jones	Nothing further.

Rich	Nothing further.

Judge	Thank you.

Male	Thank you Mr. Roick.

Male	Request a 60 second break to bring in the next witness please.
Are we back on the record?

Judge	Yes we are.

Male	Okay, the Department would like to call Rich Rose as it's next witness. Rose, stand.

Judge	Do you solemnly swear or affirm that the testimony and statements that you are about to give in this matter will be the truth, the whole truth and nothing but the truth?

Rose	I do.

Judge	Please be seated. For the record, state your name.

Rose	Richard Rose.

Judge	Mr. Rich.

Rich	Mr. Rose, how long have you been employed at DEQ?

Rose	Five and a half years.

Rich	And when did you become involved in the underground storage tank program?

Rose Four years ago, four and a half years ago.

Rich And what was your position?

Rose I started as a clean-up specialist.

Rich Okay, in your work as a DEQ underground storage tank clean-up specialist, did you have any duties regarding the Staff Jennings Marina?

Rose Yes I did.

Rich And what period of time did you oversee the facility?

Rose Well, I believe it was when I first started in the UST clean-up program back in '93, late '92, thereabouts.

Rich Okay, do you recall ever discussing investigation or clean-up activities with anyone at Staff Jennings in 1993?

Rose I spoke with Mr. Jennings, Jack Jennings I believe his name is.

Rich In your capacity as a DEQ clean-up specialist, did you act as the custodian of any records relating to the Staff Jennings facility?

Rose A custodian?

Rich Custodian of records, did you keep records related to the facility?

Rose I maintained my conversations with a lot of subjects that were involved in the project, we're interested in what was happening there at the site.

Rich Okay. Do you recognize this document?

Rose Yes. It is a telephone use report of October 11, '93.

Rich And was this…

Rose That's my handwriting.

Rich And was this document made at or near the date shown in front?

Rose Definitely.

Rich Was this record kept in the regular course of business at DEQ?

Rose Yes.

Rich To the best of your knowledge, is this a true and correct copy of the original telephone report?

Rose Yes.

Rich I move to admit the document.

Jones No objection.

Judge It is admitted as Exhibit 12.

Rich Mr. Rose, what was the purpose for making this document?

Rose To record contents of the conversation I had with Mr. Jennings on that date in the morning.

Rich And could you please read the highlighted portion of this record?

Rose He will hire DeMenis, that's Jeff Jennings of Staff Jennings, to hire, to investigate contamination. We reviewed the DEQ requirements for obtaining a no further action letter. He understands that the pre-ground water monitoring well requirements and the decommissioning confirming _____ sampling needs, so we went over that. And then he plans on installing pre-ground water monitoring wells and will replace the US ___ in the spring of '94.

Rich Mr. Rose, in that document you refer to GWMW. Are those ground water monitoring wells?

Rose Yes sir.

Rich Okay. Thank you. And could you please explain what the purpose of installing ground water monitoring wells would be in this context?

Rose Well it's by regulation that you have two down-gradient and one up-gradient at monitoring wells. The up-gradient well is to determine background conditions of the groundwater and the two down-gradient wells are to determine any impacts of any sources or contaminants in between.

Rich So is it correct that the purpose of these monitoring wells is to define the extent of contamination?

Rose Well they can be used as part of the definition.

Rich Okay, you mentioned that they are required by rule, is that correct?

Rose Yes. Under 3-242…340-242…Oregon Administrative for Groundwater Impacted Sites.

Rich Okay, so for Oregon, I'm sorry, for groundwater sites, that was Oregon Administrative Rule 340-122-242, is that correct?

Rose Right.

Rich Is that a requirement that applies to all facilities with impacted groundwater?

Rose Yes.

Rich Okay. Are you aware whether or not Staff Jennings in fact installed the three groundwater monitoring wells referred to in this telephone conversation?

Rose No. I'm not familiar with the aspects of the projects that have occurred since that when I was _______ on the site.

Rich Based upon this conversation, did you have any expectations as to what work would be performed at the Staff Jennings Marina relating to groundwater monitoring wells?

Rose Well as it stated there, I believe that they were moving ahead with the investigation of impacted groundwater, with the installation of these three wells, at a minimum. And then later when they replace the tanks in 1994, more information would be available at that time.

Rich Okay, thank you, Mr. Rose, nothing further.

Male NFA stands for No Further Action, is that right?

Male2 In a letter, enclosure documents.

Male And what do you recall reviewing with Mr. Jennings about the DEQ requirements for an NFA?

Rose Well, I don't recall any specifics. The gentlemen would just speak about the generalities of what it takes to get a closure. They look for compliance monitoring episodes, and what is necessary to obtain if No Further Action letter. At this point on this site, there was not a lot of information that would get into a lot of detail about what was necessary to close the site, so all I could speak on were really the conditions that we obtained to be able to close the site. So it is just more of a general overview.

Male And when you wrote that, you informed him of the extension of 1215, without funds available for Staff Jennings, what are you referring to there?

Rose Well, at the time, there was that Senate Bill 1215, an enforcement deferral. I really have lost a lot of my recollection on that, the conditions on the 1215. So I'm not sure what I'm really talking about there.

Male Well, what is an extension of 1215?

Rose Well the Legislature went on and extended it after this date I believe with House Bill 2776, if I'm not mistaken. So this was just in the forefront before that was extended. And they did go ahead and extend that program.

Male So that's a financial assistance program, right?

Rose Yes, I believe it is. So I was trying to convey the information that I knew at the time regarding what was in the works.

Male Did you, when you spoke with Mr. Jennings, did you tell him that the work that was ongoing out at the site was unacceptable with DEQ?

Rose Well I don't recall that.

Male Nothing further.

Male2 Nothing further.

Judge Thank you.

Male Mr. Rose.

The Department would now like to call as it's last witness, Rich Silverman.

Judge I'm wondering if this might be an appropriate time to take a brief ten minute break.

Male Wholeheartedly.

Judge Okay.

[break]

Judge	Okay, we're back on the record after a ten minute break. As I recall you were going to call your next witness.

Male	Yes, the Department calls Rick Silverman.

Judge	Do you solemnly swear or affirm that the testimony and statements that you are about to give in this matter will be the truth, the whole truth and nothing but the truth?

Silverman	I do.

Judge	Please be seated.

Male	Yes, excuse me, Judge, if I may for the record we have another observer, Van Kolias, the manager of the Enforcement Section, if there is no objection to his presence in the room.

Male2	No objection.

Judge	Okay. And I'll lead the witness, please state your name.

Silverman	Rick Silverman. S-I-L-V-E-R-M-A-N.

Judge	And go ahead, Mr. Rich.

Rich	Mr. Silverman, how long have you been employed by DEQ?

Silverman	Nearly eight years. I started in February of '90.

Rich	And what is your educational background?

Silverman	I have a Bachelor of Science in Geology from the University of Oregon.

Rich	From 1994 to the present, please describe your duties with DEQ.

Silverman	I've been original underground storage tank clean-up project manager.

Rich	And in your course of work as a UST project manager, did you have oversight at the Staff Jennings Marina?

Silverman	I did.

Rich	And what period of time, or are you responsible for that?
Silverman	I took over responsibility for the facility when I came over to the region in December of '93 and I am currently still the project manager.
Rich	Okay, why was this case assigned to you?
Silverman	It was an environmental high priority based on our ______ code which is the system that we use to prioritize more critical sites based on environmental information that we know of, at the time of ranking.
Rich	When you took over as the project manager, did you review past consultant reports, correspondences and field notes?
Silverman	Yes sir.
Rich	Were you aware of the past release in 1988 of petroleum contamination?
Silverman	Yes sir.
Rich	Were you aware of the subsequent reports of contamination or other consultant's reports related to the site?
Silverman	Yes sir.
Rich	Based on your knowledge of the Staff Jennings Marina, could you please describe the geologic conditions of the site?
Silverman	The Staff Jennings Marina is located on the west bank of the Willamette River adjacent to the southern bridge just north of it. It is basically located on a bench above the river, the primary facility is about 15 feet above the ______. And then there's a lower portion of the property that is actually in contact with the water where there's a floating dock of refueling boats and next to that there's a public boat launch.
Rich	Could you describe the soils and geologic conditions?
Silverman	The underlying subsurfaces has Columbia River basalt which has been extruded about a million and a half years ago. And as _____ by alluvial deposits which are _____ by the river and are primarily silt, sand and some finer clay.
Rich	Could you describe the characteristics of the Columbia River basalt?

Silverman	The flows are generally ____ in nature and they tend to have flow characteristics. Some of the flows are too very _____ to permit the hydration of groundwater. Other flows actually have a lot of floods or floor space that allows prime order migration, so there's not necessarily a preventive system that will prevent prime order migration.
Rich	And could you describe the hydro-geologic characteristics or the characteristics of how the surface water in the Willamette River reacts with the geologic conditions on site?
Silverman	Yes. As well as it indicated, it's a dynamic system. As the water _____ rises and lowers depending on the recharge from the surrounding areas based on rainfall, when it's high leveled water in the winter, you're going to have, the river level is going to be high, and there'll be a decrease in the gradient of the groundwater flowing to the river. In dry season, the summertime when there's little remote groundwater to recharge the system, the water table will drop level will drop, there will be steeper gradients in the groundwater and there will be a higher flow to the river. So the system does fluctuate seasonally for facility and also there is significant elevation change in the river level itself, from the dry season to the high season that may exceed 15 feet.
Rich	Is there any connection between what might be characterized as groundwater along the shore and the river water in the Willamette?
Silverman	Yes, groundwater hydraulically drains through gravity to the river, that is the ultimate discharge point per groundwater.
Rich	So is it fair to say that the groundwater underneath the bank of the Willamette River and the Willamette River surface water are effectively connected?
Silverman	Yes, definitely.
Rich	Okay, in the course of your work as the project manager for Staff Jennings, do you recall reviewing a report prepared by Staff Jennings' consultant, DeMinimus Inc. and dated March 31 of 1994?
Silverman	I do.
Rich	Do you recognize this document?
Silverman	Yes sir.
Rich	In your duties at DEQ, do you access a custodian of public records related to Staff Jennings facilities?

Silverman	Yes I do.
Rich	Okay. And was this document made at or near the date shown on page 1?
Silverman	Yes, I noticed its date stamped March 31st which correlates the _____.
Rich	Thank you. Was this report kept in the regular business at DEQ?
Silverman	Yes it was.
Rich	To the best of your knowledge, is this the true and correct copy of the original report?
Silverman	Yes I believe it is.
Rich	Does the report, or do you have any knowledge of who prepared this report?
Silverman	Dale Hart of DeMinimus Inc.
Rich	And who is DeMinimus Inc.?
Silverman	They are the environmental consultants for Staff Jennings at the time that I took over the project manager _____.
Rich	Okay. Does your report indicate for whom it was prepared?
Silverman	Prepared for Staff Jennings Inc.
Rich	Okay. Please generally describe the purpose for which this report was prepared?
Silverman	Basically I picked up the report, the Staff Jennings file, that had Golder Associates Reports from 1988, excuse me, 1989 and 1990 that indicated that there was ____ in getting to the Willamette River and that there was high level as a result of gasoline constituents, BTEX, the baltan constituents of gas present in the groundwater on site, and there's impacted the soil. Not knowing the current conditions from the 1990 reports to the time that I picked up the project four years later, directed Staff Jennings to conduct the groundwater investigation to the current extent of their problems. And that's what this report is about.
Rich	Based upon your experience generally with underground storage tank contamination, are these sites subject to any change over time?

Silverman Oh, certainly. Could groundwater migrations live in an affected form, it's going to disperse the contaminants and lower the dissolved concentration of the contamination based on the fusion by degradation and what we call natural accumulation. Yes sir.

Rich Okay, could you please look at, briefly review pages 10, 11 and 12 of this report, and describe what information is contained therein.

Silverman On pages 10, 11 and 12, respectively, are Tables 1, 2 and 3, which describe: Table 1, the soil sampling; Table 2, the groundwater analysis, same ones; and Table 3, selective ___ analysis which was not a constituent of gasoline, on Table 3.

Rich Okay. And going through each table briefly do you describe what's indicated by the data?

Silverman Yes. Table 1, which is the soil contamination indicates that there is low ______ contact contamination into the monitoring wells and three wells had elevated levels of gasoline constituents in the soil. Table 2 indicates for the three samples that were taken in groundwater samples, 2, 3, and 4, there had levels of dissolved gasoline constituent BTE, ___ benzine, taline, upper benzine and benxylene. Table 3 indicates the presence of lead in two of the three samples, some exceeding the actual number per lead and _____.

Rich Is the contamination that is reported in this 1994 report consistent with a release of petroleum in 1988?

Silverman I'd say yes, ______ with gasoline constituents still present relatively ______ as reported pre-product _______.

Rich How do the levels documented in 1994 compare to the basic clean-up standards that the Department requires to call the site clean?

Silverman As I indicated, one level was actually close to the clean-up standards. The soil criteria in Table 1, what we use is applicable and reasonable standards for groundwater so that we have soil matrix criteria for sites that low groundwater impact but strictly have soil impact. This typically would be a level two site which would have 80 parts per million TPHG, tropetroleum hydrocarbonis gas as a clean-up criteria. So we have three of the five samples exceeding the clean-up criteria based on that.

Rich And what levels are those samples indicating?

Silverman 450 part per million. 3,300 parts per million. And 2,800 parts per million.

Rich And that's compared to a clean-up standard of 80 parts per million?

Silverman 80. That's correct.

Rich Okay.

Silverman The groundwater criteria, as I indicated earlier had a very high level of dissolved gasoline constituents. If we had benzene on these three samples here, from essentially 16,100 to 27,000 parts per million, clean-up criteria is 5 parts per million; benzene is a known carcinogen. Tiliene we had ranging from 4,000 to 6,100 parts per billion to 60,100. The actual level for Tiliene is 700 parts per million. Ethylbenzene we have from 5,700 to 27,900 parts per million. The actual level for ethylbenzene is _____ per million. And totalzylines range from 29,700 bpb to 140,000. And the actual level for totalzylines is 10,000 parts per million. Again, all these numbers significantly exceed the claim of criteria for total ______ water.

Rich And has it indicated what the location of these samples were.

Silverman Yes sir. Yes, I'm sorry, they _____, and the report indicates where the soil blends were taken, onsite on Staff Jennings property.

Rich And can you describe the locations of contamination in relation to either groundwater or soil that might be in contact with the Willamette River?

Silverman Yes. There was one level, there was no detected contamination of up-gradient in STP5 so going to number 5 which is the furthest west which has upgraded the property sloping form the west to the east, so that's up gradient. SP1, ____1, had minor contamination that three feet duct which is just below the surface, ____ which is just above the tank, there ____ 4,000 gallon US tank. SP2, ____2, had 150 parts per million gasoline at six feet depth which is just down graded from the underground storage tank, the 10,000 gallon underground storage tank, ____ to the bank of the river. STP is actually located in the bank of the river, the samples taken at the three, it's six feet, excuse me, and there's 3,300 parts per million gasoline detected there. And SP4 on the beach or the shoreline of the Willamette had 2,800 parts per million gasoline at a depth of four feet.

Rich Based upon the data in that report, in 1994, do you have a professional opinion as to whether or not that contamination groundwater and soil was in contact with the Willamette River?

Silverman No sir.

Rich Don't have an opinion?

Silverman Oh, no. I mean I have an opinion. I'm sorry ____.

Rich Can you please explain.

Silverman Yes. The lower portion of the property is submerged seasonally by the river itself and the wells contamination that you are seeing in the soil ____ as well as the groundwater analysis indicates the fact that there have dissolved gasoline still remaining in borings 2, 3 and 4 as far as the dissolved groundwater is concerned, which basically what that says is if there is ____ of dissolved gasoline constituents up in the source area which was the tank ___ area down through the steep shoreline and also underneath the ____ which is obviously underwater seasonally. So, no there's no question that this was in contact with the River.

Rich And by being in contact with the river, would it have a tendency to discharge into the surface water upriver?

Silverman Yes it would.

Rich Would this have been on an ongoing basis?

Silverman Yes it is.

Rich Would this have been potentially on a daily basis?

Silverman It is, yes.

Rich After you reviewed this report, did you form any opinions as to whether environmental hazards existed on the site?

Silverman Yes I did.

Judge Excuse me.

[End of Tape 1]

Tape 02, Side 1

Judge This is the Staff Jennings hearing tape 2 side 3. Maybe you want to ask an answer to the last question

Rich Ah, Yes. This is Chris Rich with the Department of Environmental Quality, direct examination of Rick Silverman, continuation of testimony. Mr. Silverman, after reviewing this March 1994 De Minimis report, did you determine whether any hazards continue to exist at the Staff Jennings site?

Silverman Yes, I did.

Rich Can you please explain.

Silverman Ah, based on the evaluation of the contamination, there is a high level of gasoline constituents present at the facility in contact with the water ________ of the state, I made a determination that ___________ hazard does exist as defined by the Department's operating policies and that an immediate action is needed to be taken to ___________ site contamination.

Rich And what immediate action did you determine needed to be taken?

Silverman A ___________ system needs to be installed to prevent the continued discharge of ____________.

Rich Were there any investigations that needed to be completed in conjunction with this?

Silverman Yes, there were.

Rich Please explain.

Silverman Ahh, the _______________ require that a full delineation of the extent of the ___________. This includes lateral as well as horizontal definition based on the presence of the contamination of the ___________ and the concentrations we're seeing, we don't have any definition ________________ extent of the contamination on the property. All we know is if we have a high __________ of contamination present on the site. So we need to define the extent of the contamination _____________ site in the ground which is required under 242, or excuse me, the Oregon Administrative Rule 340-122-242.

Rich Mr. Silverman, did you review the Golden Associate Reports of this facility that were in 1989 and 90?

Silverman Yes, sir.

Rich Did the contamin..., the extent of contamination that was documented in those facilities match what you saw at least at this point in 1994?

Silverman Yes, sir.

Rich	Okay. And were there still significant levels of hydrocarbons present?
Silverman	Yes, sir. ____________________.
Rich	Do you recognize this document?
Judge	I'm sorry, just as a procedural point with it, your intention to offer, ______ if not offer it or admit it according to ___________.
Rich	Ah, yes it was and is. I would move that the 1994 De Minimis Report be offered in evidence if there's no objection.
Man	No objection.
Judge	Okay then, it is admitted as Exhibit 13.
Rich	Okay Mr. Silverman, do you recognize this document?
Silverman	Yes, sir.
Rich	Was this document made at or near the date shown in the front?
Silverman	Yes, sir.
Rich	Was this document kept in the regular course of business at DEQ?
Silverman	Yes, sir.
Rich	Is this a true and correct copy of the original document?
Silverman	Yes, sir.
Rich	Move to admit paper of 5/19/94 letter, if there's no objection?
Man	No objection.
Judge	And is admitted as Exhibit 14.
Rich	Mr. Silverman, could you please read the large paragraph, the larger paragraph in that letter?
Silverman	The first paragraph reads "The department has completed the review of the _____________ March 31, 1994 site investigation _____________ located at 8240 SW Macadam Avenue, in Portland. This information indicates that soil and ground water contamination remains at the site. We concur that additional clean-

up activities are necessary in order to mitigate the environmental hazards at the site. The ________________________ hydrocarbon fumes must be defined per Oregon Administrative Rule OAR 340-122-242(1) before the Department can improve the corrective action plans. _________ an off-site investigation may be needed to determine the extent of the _________ to the __________ and the potential discharge of contaminants to the water ____________ River which will entail site investigation under Oregon Administrative Rule 340-122-242."

Rich	What hazards are you referring to in this letter?

Silverman	I'm referring to the dissolved gasoline constituents that are being discharged to the ____________.

Rich	Okay, could you please read the paragraph that immediately follows that one?

Silverman	The second paragraph reads "Please submit an outline of the required site investigation and the time frame in which this work will take place. If this work will consist , coincide with removal of the existing tank system, please let me know of this too. Please submit the outline by June 6, 1994."

Rich	Okay, after sending this letter, did you have any expectations of what work would be performed at Staff Jennings marina?

Silverman	Yes, sir.

Rich	Did you have ah, an opinion of, excuse me, did you intend in this letter to put Staff Jennings upon notice of any environmental concerns at the site?

Silverman	Yes, sir.

Rich	Can you please explain?

Silverman	Basically, at this point, we had the information from Golden Associates in ________ that __________________. Ahh, subsequent investigations by Dale Hart de Minimis in 94, four years, three years later, ahh indicates that there is still high level of dissolved gasoline constituents present at the ________ are and that full delineation of the extent of the problem should be made and ahh, defined, based on the cited statute.

Rich	Okay, and could you please ahh, just generally describe, you make a reference to ahh, OAR 340-122-240 and 242, can you please generally describe what those rules require?

Silverman Sure. Ahh, subsection or 340-122-240 is the ground water portion of the underground storage tank clean-up rules and basically that says when you ___________ ground water, you need to make a determination of the fact that it's been impacted. In general, what that means is when people decommission the tank in the confines of the tank pit, if you , actually kind of _______ contact with the ground water, you need to take a sample to determine if there's any ________ to the water, much as to the soil. Oregon Administrative Rule 340-122-242 is a continuation of the ground water rules outside the tank pit confines. Essentially once it releases, left the immediate area of the tank, you need to define the full __________ contamination and included in the 242 rules are ahh, the requirements for monitoring all installation and regular sampling and the primers that need to be sampled for the constituents, ahh that need to be analyzed on account of ____________ basis. So, ahh, this is the main operating portion of the ground water section for the _________ underground storage tank program, are these two rules, 240 and 242.

Rich Okay, so the work that you just discussed, is it accurate to say that that's what you're requesting to be performed in this water?

Silverman Yes, sir.

Rich Do you recognize this letter?

Silverman Ahh, yes sir.

Rich What is it?

Silverman It's a letter from Staff Jennings signed by Jeff Jennings to myself dated May 27, 1994.

Rich Was this document, to the best of your knowledge, may ________ shown?

Silverman Yes, sir it was.

Rich Was this document kept in the regular course of business at DEQ?

Silverman Yes, sir.

Rich Is this a true and correct copy of the original?

Silverman I believe so, yes.

Rich And do you recall receiving this letter?

Silverman Yes, sir.

Rich I move to admit this letter if there's no objection?

Man None.

Judge It is admitted as Exhibit 15.

Rich Okay, Mr. Silverman, could you please read the highlighted portion of this letter?

Silverman The first paragraph reads "In response to your letter dated April 5, 1994, the outline for the required site investigation that will take place is as follows: we are currently awaiting for two more quotes. We should receive these by June 10, 1994. At this time, we will determine who to use for remediation and upgrade. Our plan is to install two new tanks at a different location on the site. Once it is completed, we will be commissioned and remediate the existing contamination. Because of the limited space on site and that this time of year is our busiest, we plan to start the work after October 15, 1994, when our facility will ____ allow construction to take place and the marina is closed until February 1995."

Rich After receiving this letter, did you expect that specific work would be performed at the Staff Jennings Marina?

Silverman That's what's indicated in the letter, yes sir. And that was my expectation.

Rich Okay, do you know if Staff Jennings did in fact decommission the underground storage tanks?

Silverman Yes, they did.

Rich And there's a reference to ahh, remediation, I think it said remediate or remediation in that letter?

Silverman Yes, sir.

Rich Ahh, what would be your expectation as to what that meant? How did you interpret that?

Silverman Ahh, remediation in my opinion is the removal of contaminated material that they would encounter in the decommission of the underground storage tanks in the storage area of the document released in 1988 by a Staff Jennings staff and confirmed by Golden Associates Report.

Rich	Would this also possibly include remediation of other contaminated source of ground water?
Silverman	I would anticipate that that would be associated, could be an associated activity with the tank decommission, yes, sir.
Rich	Okay, ahh, subsequent to the decommissioning, did Staff Jennings submit a report regarding this decommissioning?
Silverman	Excuse me, I'm sorry, would you repeat that?
Rich	Subsequent to the decommissioning of the two underground storage tanks, did Staff Jennings consultants submit a report?
Silverman	Oh yeah, yes they did.
Rich	Do you recognize this document?
Silverman	Yes, sir.
Rich	What is it please?
Silverman	It's ah, titled "The Underground Storage Tank Decommissioning for Staff Jennings, Inc. Dated December 13, 1994."
Rich	To the best of your knowledge, was this made at or near the date shown on the document?
Silverman	Yes, sir, on the date stamped December 15, 1994, received by the Department.
Rich	Is this record kept in the regular course of business of DEQ?
Silverman	Yes, sir.
Rich	To the best of your knowledge, is this a true and correct copy of the original report?
Silverman	Yes, sir I believe it is.
Rich	Move to admit the 1994 De Minimis Report if there's no objection.
Man	No objection.
Judge	And is admitted as Exhibit 16.

Rich Mr. Silverman, could you please generally describe what the purpose for preparing this report was?

Silverman Ahh, De Minimis ______________ remove the underground storage tanks and they were giving us the summary of the field activities that have been performed in the __________ and results that were obtained after the decommissioning of the underground storage tanks as __________ property.

Rich I'd like to refer you to page 11 of the report, would you please describe what's indicated on that page.

Silverman Page 11 has Table 1 which is __________ results that were taken October 10, 1994.

Rich And what do those indicate?

Silverman Ahh, that there's a presence of gasoline constituents and longer chain hydrocarbons _________. The test methods are TPHG which is Total Petroleum Hydrocarbon for Gasoline and TPH 14.1 modified which is used for longer chain hydrocarbons past the gasoline range, which includes diesel, kerosene, ahh, _____________.

Rich Mr. Silverman, because of the finding of diesel, do you have an opinion as to how that constituent relates to the 1988 Release from the Gasoline ________?

Silverman At this point in time, we're currently ____________ in my opinion about that.

Rich Well let's go, let's do both. In 1994, do you recall forming an opinion?

Silverman The presence of that constituent maybe a bleed over in the ________ gram of the gasoline constituent except that the concentrations found in the two positive results for the 14.1 are higher than the gasoline constituent so that would not be what it is indicated and obviously would surmise that the fact it was diesel _________________. Beside the fact that the tanks were reported to be gasoline.

Rich Do you have any indication, do you have any documentation in the file, of other diesel release?

Silverman No, sir. I, there's ___________ information in the file that indicates that Jeff Jennings reported to, I believe, Dale Harr, in one of the reports that he thought that diesel had been distributed at the facility but there was no indication that there was _____ loose from the former system and I don't believe that there was significant information known about the former tank or the probable use of diesel fuel at the facility.

Rich	Does this report confirm that there is contaminants above clean-up levels in the area of US ___________?

Silverman	Yes, sir, it does indicate that.

Rich	Do you recall sending any correspondences following your review of this report to Staff Jennings?

Silverman	Yes, sir, I did.

Rich	Do you recognize this document?

Silverman	Yes, sir, I do.

Rich	What is it?

Silverman	It's a letter that I sent to Jeff Jennings, dated December 21, 1994.

Rich	To the best of your knowledge was this document made either about the date shown on the front?

Silverman	Yes, sir, it was.

Rich	Was this document kept in the regular course of business at DEQ?

Silverman	Yes, sir, it was.

Rich	Is this a true and correct copy of the original document?

Silverman	I believe it is.

Rich	Do you recall drafting this letter?

Silverman	I do.

Rich	Move to admit the document if there's no objection.

Man	No objection.

Judge	It's admitted as Exhibit 17.

Rich	Mr. Silverman, could you please read the middle paragraph of that letter?
Silverman	The second paragraphs reads as follows: "The site is covered by __________ 12/15 from which he signed a consent agreement which states that the Department may require the applicant to determine whether an imminent hazard exists through adequate investigation and testing. Due to the extent of contamination found in the subsurface and dissolved into the groundwater at this site, the Department is requiring an investigation to determine the full vital and horizontal extent of contamination is outlined in Oregon Administrative Rule ___340-122-242. Excuse me. Due to location of this site next to a surface body of water (________). _________________ a Corrected Action Plan, their capped C-A-P, for the safe outline in ________ Administrative Rule 340-122-215.
Rich	Okay, you mention the need to delineate contamination. Were you aware as to how far potentially the contamination from the Staff Jennings site had migrated? Did you have any indication?
Silverman	No, sir.
Rich	Does Staff Jen, do you know if Staff Jennings had access to the property immediately, either downstream or north of the property?
Silverman	I know they didn't have access to the property.
Rich	And do you know who owns that property?
Silverman	City of Portland, parts of ___________.
Rich	Did you, were you aware that Staff Jennings was making an effort to access that property?
Silverman	I know that they had made significant effort at this point in time. I can't say whether that I recall that specifically, no. I can't say that.
Rich	Subsequent, let's say, in 1995, are you aware of whether Staff Jennings . . .
Silverman	Definitely. I helped participate in gaining access to that property ____________________________ the City of Portland's legal staff.
Rich	Okay, and what was the purpose you were cleared for obtaining access to the City of Portland property?
Silverman	The purpose was to define the lateral and horizontal extent of the dissolved groundwater plume, that it was emanating from the Staff Jennings facility.

Primarily from the release of the tanks and the release that was reported in the piping over by the pump shed.

Rich Did you have cause to visit the Staff Jennings facility in November of 1995?

Silverman Yes, sir. I did.

Rich Do you recognize this document?

Silverman Yes, sir. I do.

Rich What is it?

Silverman This is a field log that I filled out on November 21, 1995 for the Staff Jennings _______________.

Rich Was this document made at or near the date shown on the front?

Silverman Yes, sir. It was.

Rich Was this document kept in the regular course of business at DEQ?

Silverman Yes, sir. It was.

Rich To the best of your knowledge is this a true and correct copy of the original document?

Silverman Yes, sir. It's my handwriting.

Rich Move to admit the document?

Judge It is admitted as Exhibit 18.

Rich Mr. Silverman, please generally describe why this document was prepared?

Silverman I had been informed by Dale Harr that they'd obtained access of to conduct safe investigation on the Portland, excuse me, City of Portland property _________, the property north of Staff Jennings. The purpose of the meeting was to discuss locations of trying to install the borings ________________ extent of the dissolved hydrocarbon contamination and the discussion was basically ________ about the difficulty of actually installing borings through the ________, to try to actually obtain groundwater samples through the unique nature of this particular soil.

Rich Could you please read the highlighted portion on the front page there?

Silverman I talked with Jeff and Dale about conducting additional investigation in the lateral and horizontal extent of the contamination at the site. Off-site borings are needed. In addition, for remedial system or approach was discussed which includes VES and cutoff trenches to capture infected water before it reaches the river. The two borings off-site, excuse me.

Rich Mr. Silverman, who are Jeff and Dale that you refer to?

Silverman Jeff Jennings is Jeff and Dale Harr ________________ is Dale.

Rich And the remedial system that you're referring, what does that reference?

Silverman We'd discussed two approaches, two potential approaches for addressing the dissolved groundwater that was getting to the river, VES is a vapor extraction system which entails injecting air into the subsurface to try and break down the hydrocarbon contamination that adds to the biodegradation as well by providing oxygen. A cutoff trench is just that. An interceptor trench that would prevent the migration of groundwater to the down gradient source which would be the river.

Rich Could you please turn over to the back side of this report and read the highlighted portion there?

Silverman I indicated that the concentration of ________ in the water sample from the beach, indicated the ________ contamination is getting to the river and that corrective action must, note that was underlined three times, be taken. This is a violation of water quality regulations. I told both Jeff and Dale, excuse me, I told both Jeff and Dale that as long as they are making active, that's underlined three times as well, progress for redressing the impact of the release I would not, underlined three times as well, proceed with an NOM with a recommendation for civil penalty. The time frame for getting the borings and groundwater samples is during this winter. The time frame for installing the remedial system, cutoff trench and vapor extraction or other option is prior to next year's rainy season, i.e., by approximately October 1996.

Rich Mr. Silverman, is that an accurate account of the conversation that you had with Jeff Jennings and Dale Harr on November 21, 1995?

Silverman The discussion for the time frame was left in the general sense, I said prior to next year's rainy season, it was my concept of October would be the compliance point in '96. But I wanted to _________ the continuing additional groundwater migration of the contaminant to the river and yes, this is a very accurate description of the discussion that occurred at the beach.

Rich	You mention that you wanted these borings to occur this winter, is that correct?

Silverman	Yes, sir. That's '97.

Rich	And then you mention that the remedial system must be in place. Can you describe what this approach is of these two different things.

Silverman	Right, yes. We call a safe investigation in this manner a phased approach. And what we do is we try to gather as much information in each step of the process so it will lead to more accurate installation in the next portion of the investigation, i.e., if you put in wells and you find the extent of the groundwater is farther, has extended farther than you anticipated then the next phase will be to put in more wells so that you actually capture all the information that we need without going out and just putting in wells that would be wasteful. In the phased approach, one conducts the initial work trying to define what the actual extent of the problem is and then come up with corrective action plan that would appropriately address that. And that's why I'm talking about doing, excuse me, delineation of the dissolved contamination and then the development of a corrective action plan. Because at this point in time we don't know the extent of the contamination. We know that it extends off-site and that we've got high levels of dissolved contamination but we don't know how extensive the plume is.

Rich	Did Jeff Jennings and Dale Harr appear to understand these deadlines?

Silverman	Yes. I asked specifically that they understood that at the beach at the time that we had this discussion in November of 1995.

Rich	Did Jeff Jennings and his consultant agree to meet these deadlines?

Silverman	Sure. The option was that I would go to enforcement with a water quality violation at that point and they agreed that they would like to cooperate and complete the investigation without enforcement action.

Rich	Did Staff Jennings install a remedial system to abate the discharge of petroleum contamination into the Willamette River by the rainy season of 1996?

Silverman	No, sir.

Rich	Did Staff Jennings completely delineate the extent of contamination on-site and off-site?

Silverman	Subsequent to the investigation they put in geo-probe borings and delineated the extent of the contamination on the _________________________ property to _________.
Rich	Was this investigation sufficient for you to be able to determine that they had fully defined the site?
Silverman	That's a difficult question. The point was they had installed geo-probes which are temporary borings and they obtained groundwater samples from those borings to find the lateral extent of the dissolved groundwater contamination, yes. Monitoring wells were not installed which are needed to get regular quarterly data from the dissolved contamination to determine what's historically going on with the plume, i.e., is it expanding, is it decreasing, what kind of effect are we having on it with the remedial system. That did not occur.
Rich	Had the Department ever specifically require the groundwater monitoring wells be installed at the site?
Silverman	Yes, sir. That's required under 242, OVR 341-22-242.
Rich	Did we, did the Department notify Staff Jennings in writing of the requirement to install groundwater monitoring wells and I'd like to make reference to the December 21, 1994 letter, last paragraph. Is there any indication that DEQ expected groundwater monitoring wells to be installed?
Silverman	Yes. My letter to Jeff Jennings in December of '94, December 21st, I had indicated specifically that the program requires an investigation to determine the full lateral and horizontal extent of the contamination as outlined in the Oregon Administrative Rule, OVR 341-22-242 and I also required the corrective action plan be outlined and I said in the last paragraph of this letter, please submit a post-schedule of events for making notation of the groundwater investigation including the installation of at least three monitoring wells, one upgrade and two downgrade by January 23, 1995. This work plan should include access and investigation of the adjacent property to the north, owned by the City of Portland Department of Parks and Recreation.
Rich	To the best of your knowledge as of October or November of 1996, did Staff Jennings install the groundwater monitoring wells that you directed ought to include in their plan?
Silverman	As I indicated they put in the geo-probe borings which were temporary monitoring wells and they were removed subsequent within 24 hours of the monitoring ________________ installed that.

Rich Based upon your expectation of what the Staff, of what you expected Staff Jennings to do by the rainy season of 1996, did you issue any notice of noncompliance?

Silverman Yes, sir. I did.

Rich Do you recognize this document?

Silverman Yes, sir. I do.

Rich And what is it?

Silverman It's a notice of noncompliance that I issued to Staff Jennings on November 7, 1996.

Rich Was this document made at or near the date shown?

Silverman Yes, sir. It was.

Rich Was this document prepared and kept in the regular course of business of DEQ?

Silverman Yes, sir.

Rich Does this appear to be a true and correct copy of the original document?

Silverman Yes, sir. It does.

Rich Do you recall in fact preparing this document?

Silverman I do in fact recall it.

Rich I move to admit the document, if there's no objection.

Man No objection.

Judge It is admitted as Exhibit 19.

Rich Would you please describe the contents of the notice of noncompliance and the purpose for which it was prepared.

Silverman The notice of noncompliance is issued to a responsible party when Department rules have not been met or violations of those rules have occurred. The purpose of this letter was to inform Jeff Jennings and Staff Jennings Inc. that in fact the Department cited them for violations of Department rules for ________ those expectations that we discussed in '95. I cited the following violations. Do you want me to ________?

Rich Please.

Silverman The first violation was failure to comply with ORS, that's Oregon Revised Statute, 466.645 which requires any person liable for a spill or a release of oil or a threatened spill or release under ORS 466.640 still shall immediately clean up the spill or release, any person liable for the spill or release or the threatened spill or release shall immediately initiate clean up. Whether or not the Department has directed the clean up, the Department may require the responsible person to undertake such investigation, monitoring, surveys, testing and other information gathering as the Department considers necessary.

Violation two: Violation of ORS 468E.025(1)(a) which prohibits a person from causing pollution of any waters of the State or placing or causing to be placed any waste in the location where such waste will likely to escape or to be carried into the waters of the state by any means.

Violation three: Violation of NPDES, for your clarification that's National Pollution Discharge Elimination System, it's a federal permit. A general permit, Permit No. 1500A, (a) schedule A number 1, (b) schedule B both minimum monitoring and recording procedures, (c) section A standard conditions number 3, (d) section B standard conditions number 1, and (e) section C standard conditions number 5. Although a release was documented in 1988, a National Pollution Discharge Elimination System, NPDES, was not sought until May 20, 1994. The NPDES permit has never been used or complied with.

Violation 4: Failure to initiate and complete the investigation for a cleanup of a release from an underground storage tank including failure to install monitoring levels as required by OAR 340.122.242(1)(a) and ______________ developed ______________ action plan as required by filling out a 340.122.250(1).

Rich Mr. Silverman, why did you issue a notice of noncompliance to Staff Jennings?

Silverman The reason I issued a notice of noncompliance was the lack of progress that was being made to actually remediate the discharge and the contamination that occurred in 1998, excuse me, 1988, and which I then picked up as Project Manager in '94, directed activity to be taken in '95, due to delays through off-site access issues, an extension was made to '96, and delineation of the plumage progressed in '96 with no remedial system or full delineation through monitoring wells was established at that point.

Rich	In your opinion and issue of this NON had you given Staff Jennings a reasonable and fair opportunity to perform the work that you required?
Man	I object, that calls for an improper opinion as well.
Judge	Objection noted for the record. Go ahead and answer the question.
Silverman	I'm sorry would you repeat the question?
Rich	The question is in your opinion did you believe that Staff Jennings had a reasonable period of time from your visit in 1995 until approximately the same time next year in 1996 to complete the work that you requested in 1995?
Silverman	Yes, sir.
Rich	In your opinion did Staff Jennings have a reasonable period of time to complete this work since the initial release in 1988?
Silverman	Oh, yes, definitely.
Rich	Did that factor into your decision to refer the action for enforcement?
Silverman	Yes, it did.
Rich	Was it a requirement that the Department specifically notify Staff Jennings that they needed to perform clean up and abatement of petroleum contamination?
Silverman	No, the responsibility lies with the responsible entity under the Oregon statutes. They are required as a permitee to be in full compliance with the underground storage tank rules which include the full delineation and investigation of the release of the plumes.
Rich	Based upon your full review and your full knowledge of all the records available in this case, did you form an opinion as to whether, did you form an opinion or do you have an opinion now as to whether Staff Jennings reasonably knew that significant petroleum contamination existed in the groundwater and soils adjacent to the Willamette River?
Silverman	Yes, I have that opinion.
Rich	And did the reports and documents submitted to Staff Jennings based upon those, could they reasonably have concluded that there was an ongoing discharge of petroleum contamination of dissolved petroleum hydrocarbons to the river?

Silverman That was documented by the consultants, yes.

Rich Following the notice of noncompliance, did the Department issue any formal enforcement?

Silverman Yes, we did.

Rich Request about a thirty second delay, to get an extra copy for view purposes. Thank you. This is already part of the record, I believe. This is, Mr. Silverman, do you recognize this document?

Silverman Yes, sir.

Rich And what is this?

Silverman This a Notice of Civil Penalties, enforcement process ______________, Notice of Noncompliance ______________.

Rich To the best of your knowledge, is this a true and correct copy of the original action?

Silverman Yes, sir.

Rich And is this kept in the regular course of business of the DEQ?

Silverman Yes, it is.

Rich Move to, actually, I don't need a move to admit it since I believe it is already part of the record.

Man ______________.

Rich Mr. Silverman, could you please . . .

Man ______________.

Rich Yes, I believe so. Could you please refer to the Notice of Assessment of Civil Penalty, page one, that includes violations?

Silverman ______________. All right.

Rich Mr. Silverman, in looking at violation 1 which states the respondent caused pollution of waters of the state, is this consistent with your referral due to Notice of Noncompliance?

Silverman Yes, sir. It is.

Rich And do you agree with the conclusions in this violation?

Silverman Yes, I do.

Rich Okay, in looking at violation 2, is this consistent with the violations cited in the Notice of Noncompliance?

Silverman Yes, sir.

Rich And could you please specify on violation 2, why this violation was issued?

Silverman The underground storage tank rules requires that monitoring wells are installed so that we can define the extent of the contamination and monitor after the plume has been defined. The point of the monitoring wells is that we can gather historical information about the extent of the contamination and its migration. Is the plume expanding, is it retracting, are we seeing discharge in this case going to the river? So we need information that we can continuously refer to at a specific point in physical point so that we can gather data. The information that we had at this point is that geo-probe borings that had defined the lateral extent of contamination on a one-time basis. So we had, if you will, a one-time picture of the extent of the contamination that ______________ defined the extent of the problem. But as you could see from the earlier reports from Gold & Associates the plume was limited to just directly downgrade from the underground storage tank in 1988 and as ______________ further work in '96 indicates the extent of the contamination had migrated off-site about 160 feet. So that's the reason for installing monitoring wells. So we got a handle on watching those plumes over time.

Rich And did Staff Jennings meet that requirement?

Silverman No, sir. They did not.

Rich I would like to refer to Exhibit 1 which is attached to this document.

Silverman Yes, sir.

Rich This is a civil penalty matrix, is that correct?

Silverman Yes, sir. It is.

Rich And what was, what violation was the civil penalty issued for in this case?

Silverman Violation causing pollution into the waters of the state.

Rich And what was the total amount of the civil penalty assessed in this action? Which might be on the second page.

Silverman Total came to $8,400.

Rich Okay, Mr. Silverman, I'd like to go through a couple of points here to establish the Department's case.

Silverman Yes sir.

Rich Ah, in looking at the BP, which is the base penalty. . .

Silverman Um hum.

Rich section on there. This indicates that pursuant to Oregon Administrative Rule 34012042(2) that a base penalty is doubled $6,000 because respondent caused the spill of oil due to a negligent act. Mr. Silverman are you aware how the Department defines oil in 340108002? Refresh your memory I'd like to. . . .

Silverman Ah, I believe it's defined in the Oregon Revised Statutes ORSs with the _______ West program.

Rich Okay, do you ever. . .

Silverman Yeah, here it is.

Rich To refresh your memory could you please read what the definition of what it includes?

Silverman Ah, under definitions of 34180002 it's subsection 11 oil in parentheses includes gasoline, crude oil, fuel oil, ________ oil, lubricating oil, sludge, oil refuge and any other petroleum related products, product.

Rich Is the petroleum contamination that the Department asserts discharged into the river oil under this definition?

Silverman Yes sir.

Rich Okay. The Department also asserts that this action occurred due to negligence. Are you aware how the Department defines negligence in this action?

Silverman Without reference, no.

Rich Okay. I have in front of you Oregon Administrative Rule Division 12, which is what is cited here. Could you please read the definition of negligence.

Silverman Yes. OAR 340 12-12-028, subsection 11 "negligence", "negligent" means _______ take reasonable care to avoid a foreseeable risk of committing an act or omission constituting a violation.

Rich Okay, Mr. Silverman, the civil penalty action is based on essentially allowing petroleum to discharge into the waters of the state, is that correct?

Silverman Yes, that's correct.

Rich And based upon your opinion, based upon your review of this case and as the party who ultimately referred the case for enforcement, do you have an opinion as to whether Staff Jennings took reasonable care between release of 1988 to the time that this action was issued as to whether they took reasonable care to remediate or abate that discharge pollution?

Man Same objection as stated before.

Judge Objection noted for the record. Go ahead and answer the question.

Silverman My opinion is that no, they didn't take appropriate action from the time __________.

Rich And did they take reasonable care?

Silverman I believe they did not.

Rich Okay, do you have an opinion as to whether this was a foreseeable risk, i.e., whether discharging petroleum into the river was a foreseeable risk based upon the data available.

Silverman Yes, I believe it was foreseeable based upon the information provided by Golden Associates report in 1989 and _________ indicated in the legal system __________.

Rich Negligence in that definition under the Department's rules includes acts or omissions. Do you have an opinion, do you have an opinion as to whether or not there was an act or omission in this case that warranted this penalty?

Man Objections passed and answered.

Rich	I'm specifically looking to determine if there is an act or an omission just to establish all criteria for negligence, I don't believe I've asked that question.
Judge	Okay, object overruled, go ahead and answer the question.
Silverman	Yes, I believe an omission occurred.
Rich	And what was that omission?
Silverman	The failure to take a timely action to debate the discharge of the dissolved constituents to the Willamette River and ____________________ in a timely manner.
Rich	Okay, but specifically for this civil penalty is that latter issue relevant to this penalty?
Silverman	Ah no, not for the discharge of the contaminants ______________________.
Rich	Okay. Um, in looking at the O factor for currents. . .
Silverman	Okay.
Rich	Um, what is the, the Department asserts that the violation was repeated for many days, is this an accurate assessment based on the facts?
Silverman	Yes sir.
Rich	And can you briefly explain why?
Silverman	Ah, yes. A document release was reported to the Department in October of 98'. A continuation of the discharge has occurred since that date and it's still actually occurring today even though a remedial system's been installed, there's dissolved constituents down at the. . .
Man	I object, that's not relevant.
Rich	Ah, it's a tractor that went into the calculation of the civil penalty. I believe that's significantly relevant.
Judge	Objection overruled.
Rich	Please answer the question again. The question was based upon all the data available did this violation occur on more than one day?

Silverman Yes, the, the report of release occurred in October of 1998 and based on dissolved constituents present in those latest sampling results there is a continuing discharge of dissolved constituents to the Willamette River.

Rich Okay, Mr. Silverman I don't see any assessment of economic benefit in this case, can you explain why that is?

Silverman Yes sir. Ah, I made an economic benefits calculation as to what the expenses that Staff Jennings did not occur due to the failure to investigate from 1998 through the time of the civil penalty of 96'. The economic benefit was for sampling of monitoring wells that didn't occur. It was for installation of the monitoring wells that would be required to find the extent of the problem and the basic calculation on a reasonable maintenance clause to maintain an operating system for treatment of the dissolved ___________ contamination. The reason that the economic benefit was, ah, not included in the civil penalty was an internal discussion within the Department. We determined that it would be more prudent and appropriate that the expenses or the economic benefit be spent by Staff Jennings for the actual remediation needed and delineation of the extent of the problem at the facility and that would be more prudent expenditures so we did not ask for economic benefit calculations although I had quite a few of the processes actually developing that for the civil penalty.

Rich And what do you recall what figure you derived at?

Silverman I believe it was something in the neighborhood of $55,800.

Rich Okay, thank you, no further questions.

Man Ah, Mr. Silverman would you agree that the flow of contaminants to the property north of the Staff Jennings lot is a valid concern?

Silverman Yes sir, I would.

Man Okay. And, ah,

End of Tape 2 (no side B)

Tape 03, Side 4

Female And go ahead with your second question.

Male All right. Would you go so far as to say that the 401 of the northern lot is intimately intertwined with the contamination on the Staff Jennings property.

Male 2 Yes, I would.

Male Would you agree that any off-site pollution is a legitimate concern.

Male 2 Yes, sir, I would.

Male Now, in the April 5, 1994 letter that Mr. Rich showed you earlier, do you still have that available _________? Would you agree that the focus on that letter is on a corrective action plan?

Male 2 At this point in time, yes, that's exactly what the letter is focused on. We have information from Golder & Associates in 1990 indicating _______________ contamination of what I call the beach, the bank of the Willamette River.

Male Well I'm not asking you about Golder & Associates, I'm asking you what the focus of the April 94' is on corrective action plan.

Male 2 Yes it's on, delineating the lateral study ________________________ contamination ___________________.

Male Okay, and then in the letter that Jeff Jennings wrote to you dated May 27, 1994, he indicated that work would start after October 15, 1994, correct?

Male 2 Yes sir, he did.

Male And, in fact, work was done in October 1994, correct?

Male 2 Yes sir, ah, yes, we're.....

Male And that was the removal of the underground storage tank?

Male 2 Yes sir.

Male Correct. Do you remember how many tons of dirt was hauled out of the property during that project?

Male 2 Ah, it was estimated 100 cubic yards and I believe it was 133 tons.

Male Okay.

Male 2 ___________________________ as I recall.

Male Now, referring to your November 1995 report, Mr. Rich highlighted certain portions of the report, but not others. I want you to look on the second page, the

	second sentence and that reads, does it not, I indicated we needed more information on the extent of both soil and ground contamination before we could determine what approach should be taken. Did I read that correction?
Male 2	Yes it was correct.
Male	And, ah, by December of 1995, ah, the Staff Jennings representatives had obtained a permit from the city in order to enter the City of Portland property north of the, of the site, correct?
Male 2	Yes sir.
Male	Okay, so an investigation began in December of 1995 on the City of Portland property?
Male 2	Ah, December 20th ________ not to believe, yes.
Male	Of 1995.
Male 2	95; yes sir.
Male	And the application for that permit was one year earlier, correct?
Male 2	Ah, I wasn't included on the specifics of the permit and I actually never saw the actual permit issued by the city, I was involved in obtaining access to that property and the difficulties of getting the city to allow access to that property was extensive I acknowledge that and I was involved in the process to obtain, I don't know when the actual permit was signed, I've never seen it.
Male	Okay. And in your December 1994 report, which was referred to earlier, here again, ah, discussing a corrective action plan.
Male 2	Yes sir.
Male	Okay. Now, one thing that, ah, wasn't mentioned during the questioning of you by Mr. Rich, there was another offsite concern in addition to the City of Portland property, correct?
Male 2	There was a concern raised by Jeff Jennings and Dale _________, yes sir.
Male	Okay, and that concern was. . .
Male 2	That there was a suspicion in the Palmer gas station located on the property immediately north of the Staff Jennings' property up by Macadam Avenue.

Male North or west?

Male 2 Both.

Male Northwest?

Male 2 Well, it's, it's the, it's the property, it's immediately, it's, it's up. . .

Male It's more west than north?

Male 2 Yes, it's up by the new Macadam, there's some property about 200 yards away and it's, the location of the station is probably 75 to 100 feet further north of the Staff Jennings' property line.

Male Okay, and, ha, Statt Jennings and its representatives notified you of their discovery?

Male 2 Yes sir.

Male Okay, and, ah, the discovery was that there may have been a service station located up gratings that may have been the source of contamination in that area.

Male 2 That was the ____________ presented to me, yes sir.

Male Okay, and, ah, that is significant information isn't it?

Male 2 Yes sir, it ____________ source of contamination _________ release that has occurred in this area.

Male Okay. And in order to form a corrective action plan that's the type of data that you would want to know about?

Male 2 ____________________, yes if there was an additional contribution to the pooling, yes I would want to know about that information.

Male Okay, and, ah, in fact the Oregon DEQUSD Cleanup Manual provides that a corrective action plan should not be submitted until it has been determined that the full magnitude and extent of contamination, ah, has been determined both on and off-site?

Male 2 Yeah, ah, ___________ administrative rules for the corporate action plan 340123250 say that, yes, the department also encourages people to take initial abatement actions prior to the approval of a corporate action plan which can include treatment of the contaminate source area without full delineation of the problem.

Male And that's a requirement though or it's not a require though. . .

Male 2 Well, that's strong encouraged.

Male Does it say strong encouraged or does it say encouraged?

Male 2 It's encouraged, I don't know why _____________.

Male With that, however, is the provision in the clean-up manual which also states that any pre____ action that plaintiff submitted without first determining the full extent of the contamination will be considered incomplete.

Male 2 That's correct.

Male Did you have discussions with Jeff Jennings or with Dale Harr about digging a trench which might have some remedial effect on the Staff Jennings site?

Male 2 We were discussing a _________ in '95 when we were _______.

Male Right. And did they tell you at that time or at any other time that that was not practical?

Male 2 Yes sir, they did. They based that information on the sites ________ boulders that are present at the facility.

Male That was, go ahead.

Male 2 Those boulders are extensive in size, I'd say they range from probably 4-6 feet in diameter, and in fact _______________ investigations ________.

Male So that was a reasonable position that they were taking, wasn't it? A reasonable statement that didn't entrench with the impractical?

Male 2 Yeah, again based on relative punctuations that's questionable, I mean they couldn't put in as ________ issues; it would be under water for significant period of the seasons so we'd have to ___________, so yeah, in a practical sense, there is a technical problem with ______________.

Male And wells, both monitoring wells and recovery wells were installed in May, 1997.

Male 2	There was two recovery wells and one monitoring well installed on site on the Staff Jennings property in '97 or so, I believe it was ____________.
Male	That concludes.
Male	Mr. Silverman, were you ever presented with any data of the fact confirm an off-site release of petroleum on what is referred to as the Rudolph property?
Silverman	The suspected service station _______________ adjacent property?
Male	Yes.
Silverman	Dale Harr conducted a magna tomiter survey of that property has indicated some subsurface and anomalies i.e., that there was metal in the subsurface did not obtain or was not granted a permit from either ______ or City of Portland parks and recreation to install investigative _________ gather together on the actual release from that facility so why ___________ on the suspected release from the suspected gas station.
Male	So Mr. Silverman, is it fair to say that this was a supposition based on the presence of, the potential presence of metal in the soil?
Silverman	The supposition was made before there was a magna tomiter analysis of the, Staff Jennings was looking for additional off-site source so the contamination that was found by the partner _________ property north of their facility and the magna tomiter information was just added more data to that supposition.
Male	Mr. Silverman, are you aware of data that Staff Jennings did collect regarding contamination on the property immediately down gradient of the ODOT property? In other words, did Staff Jennings take any samples on the City of Portland property that was down gradient from the Odot property?
Silverman	Yes, the geoplot line, yes.
Male	And is this, do you recognize this document?
Silverman	Right, yes I do.
Male	And what is that document?
Silverman	This is from the middle sinc investigations called ____________ investigations, City of Portland Park and Recreation Undeveloped Property dated May 7, 1996. Preparer, Mr. Jeff Jones, federal inspection.

Male Okay, was this document made on or about the date shown?

Silverman Yes, sir, it was, and we received it on the 9th of May _________.

Male Is this document ___________ the regular course of business ________?

Silverman Yes sir, it _______.

Male To the best of your knowledge, is this a true and correct copy of the original document?

Silverman Yes, sir, I believe it is.

Male Okay I move to admit the 1996 report if there's no objection?

Male No objection.

Female It is admitted as Exhibit 20.

Male Now, Mr. Silverman does this report that you have in front of you indicate any contamination on the off-site property which we'll call the City of Portland property north of the Staff Jennings facility?

Silverman Yeah, the reports on _________ install the prior 6 geopro install on the park's land are also indicated on this site's ________ and was contamination, this report then in May of '96 is the follow-up delineation of the extent of the result in which is ________ and those points which were cleaned.

Male Okay. Do you have knowledge generally of what contamination that was discovered on the site including ___________ work?

Silverman Yes, sir.

Male Okay, using the map that I have up there, first of all, is that a fair and accurate representation of the City of Portland property?

Silverman Yes sir, that's a copy of this __________.

Male Okay, could you describe what was documented in the contamination glue that's shown by the blurb on that site?

Silverman Yes, sir. To the extent the contamination is basically described is basically the same up to and through points PR 6 to the north, the Staff Jennings facility, points 7 and 8 have little of what's called poly________________carbons and PAH's.

	We call them long-change hydrocarbons and they're basically associated with diesel fuel but sometimes you do find them with gasoline and the definition of these ____________ basically points 7 and 8 have dissolved the total constituents __________ below the maximum for the clean-up, so we call that basically the _________ based on that, but there is overall constituents on the petroleum in those conforms.
Male	Okay. Did the data that you received regarding these borings, was that consistent with the migration of petroleum from the known release on Staff Jennings property?
Silverman	Yes, it is.
Male	In fact, was there not evidence of diesel release that had not been reported to the department on the Staff Jennings property?
Silverman	I suspect ______________ based on the BPA score 14.1 modified how long the results of the discussed earlier and based on the presence of PAH constituents in the groundwater off-site.
Male	Is it reasonable to assume that data of the migrating petroleum contamination ______ there is a combination of the 1988 release and the subsequently documented diesel contamination from the Staff Jennings property?
Silverman	In my opinion, yes there is.
Male	Okay.
Silverman	The documentation indicates that the plume spread out since the initial report is over 90 _________ specify again in this report.
Male	Could you please point on that map where the Odot property with the magna tomiter was.
Silverman	The portion of the property is about here, up by Macadam of an entry coming down the Staff Jennings property above the train tracks _________.
Male	Okay. Could Staff Jennings have determined whether or not there were sources of contamination from an upgrading of source while still remaining on the City of Portland property?
Silverman	Yes, sir.
Male	And could you explain how that might have happened?

Silverman: You got contamination down at the railroad portion of the, on the bank of, this is above the bank, this is up on the plateau, about 15 feed on the river. You've got this all constituents, gasoline decreasing in concentration as you move in more _________ which ___________ groundwater. Based on this constituent contaminations that they were looking for is sources of contamination by leading downhill from the up gradient source in the last few __________ along here ________ or to show who was, in fact, migration ___________ constituents coming from an outside source.

Male: So is it your testimony that, let me ask this, in your opinion did Staff Jennings have a reasonable time frame, an opportunity if they wanted to determine if there were up-gradient sources to install those wells between 1995 and 1996?

Male: Same objection as before.

Female: Added for the record. Please answer the question.

Silverman: Staff Jennings did not obtain a permit for ______ park and recreations land where the service station is located as _______ could not be installed without the portion of the property if they were granted permission to install geotechnical investigatory lines on the lower portion of the parks and recreation plan and yes, it's my opinion that they in fact ______ install the wells _________ downtown.

Male: Okay. Thank you. And you testified that petroleum decreases from approximately the border of the Willamette, the Staff Jennings property as it moves downstream, is that correct?

Silverman: Yes, the concentration in dissolved constituents _________ in the site investigation are indicative of dissolved polluting and spreading __________ It's about 160 feet long from the Staff Jennings property, probably about 180 feet from the source of __________ and the contamination decreases in concentration as you move away from the ________ Staff Jennings property.

Male: And is that a typical way for hydrocarbon contamination to react, in other words, moving from a higher to a lower concentration?

Silverman: Yes, sir, it is. That's the typical _________ driving caused by a line constituents dissolving the contamination in the remaining contact with the __________.

Male: Okay. Thank you. Regarding an interceptor trench, you were asked if you believed whether or not this was practical. Were there any other options for remediating a contaminated soil, other than a trench?

Silverman Ah, yes.

Male Were these options discussed between you and Staff Jennings?

Silverman Yes.

Male Based upon the reports going back to 1989 and 1990, were these options discussed with Staff Jennings by its previous consultant?

Silverman Yes, Golden Associates did recommend that sparks plugs down the beach to address the ___________ in 1990 and deal with the dissolved constituent, might bring down from the source is there a tank release at that point in time.

Male Has Staff Jennings actually installed, subsequent to this enforcement notice of assessment of simple penalty, a recovery system?

Silverman Yes, they have. An off-site system.

Male And what kind of recovery system is it?

Silverman We have a puppet tree system, which entails groundwater is removed from the recovery wells, there's two of them on-site and in the association with the source area of contamination around the 10,000 gallon tank and that water is pumped to what we call an air-stripping tower, which basically drives the water from the top of this system down to the bottom, and the air is driven in the opposite direction, and in this process strips or removes dissolved hydrocarbon constituents into the air and that's a form of treatment and the water is then discharged on the permanent to the river, the Willamette River. But which is again, this control mechanism is permanent as far as what concentrations can be discharged into the river.

Male Okay. Is the system that they actually installed, is it limited to just the Staff Jennings property, or could it be expanded if the extent of the remediation was deemed to be appropriate and necessary?

Silverman This system was designed specifically with the anticipation of expanding the system to the north for groundwater treatment. Yes, the system is scaleable, so that it can be used for treating more groundwater.

Male Is this a novel technology, just available in 1997?

Silverman Yes, sir.

Male Was this technology in this approach available in 1995?

Silverman Yes, sir.

Male Was this approach and technology available in 1988 after the initial release?

Silverman Yes, sir.

Male So, Mr. Silverman, could Staff Jennings have installed a remedial system to start abatement of a known release and continued to define the lateral extent of contamination?

Male I object, that's not relevant, the issue isn't whether the system in place was feasible or not.

Male I believe that goes to the reasonableness and failure to take due care, which is a factor in this violation.

Female Okay, objection overruled.

Male Mr. Silverman, just to clarify, Mr. Jones made reference to corrective action plan OAR32122250, uhm, I've somewhat highlighted a section there, could you please read that?

Silverman Subsection 6 of the corrective action plan for administrative rule 341.215, says, subsection 6 ____________ use a responsible person may in the interest of minimizing environmental contamination and promoting more effective cleanup begin cleanup of soil and groundwater before the corrective action plan is approved provided that they, do you want me to go . . .

Male No, that, that's sufficient. Uhm, so is it correct to say that a corrective action plan must be completed before remediation or cleanup can happen?

Silverman No. That's not required.

Male So does this rule indicate that it's certainly an option for a party with a known release to take action to remediate that and there's nothing ______________ that statute or any other rule that prohibits that, is that correct?

Silverman That's correct. The department encourages taking prompt action to minimize the extent of contamination caused by a release of petroleum, yes.

Male Okay. Nothing further.

Male But it's not a requirement.

Silverman	No, sir, it's not a requirement.
Male	Okay. Uhm, did you know that in September of 1996, uh, DMI notified Staff Jennings that it needed to identify the offsite source of the contamination to the west?
Silverman	Uhm, I believe I have it on, I can't specifically speak to ____________________ refresh my memory.
Male	Did you receive a copy of the, of the __________ October 28, 1996, report to Staff Jenning? Have you looked at that?
Silverman	Yes, I believe I have.
Male	Okay. And, uh, do you remember this portion of the letter, it is our opinion that this potential source of contamination be delineated prior to completing the corrective action plan since the contaminant plume appears to extend further to the north than would be expected if the release occurs solely from the Staff Jennings USD system.
Silverman	That's Dale's conclusion, yes sir.
Male	Okay. That's all, thank you.
Male	Mr. Silverman, did you agree with that conclusion?
Silverman	Uhm, I don't necessarily agree with that conclusion, no.
Male	Did you believe it was supported by sufficient data based upon your professional judgment?
Silverman	I don't know that there's a release from the suspect service station up above it, so I don't know that there's continuing discharge from, from that source. I do know that there is a ____________________ property and I do know that the concentration of the dissolved plume was indicative of __________ plumes that I deal with ____ remediating ____________________ the concentration was highest in the __________ and decreases in the ______________________________ in this case following the ____ north.
Male	Okay. You're an expert in your field, right?
Silverman	I believe I am, sir.

Male	And, uh, Mr. __________'s an expert in his field, correct?

Silverman	I believe he is.

Male	And, uh, experts can have, uh, reasonable differences, correct?

Silverman	Yes sir.

Male	And that's what you have with Mr. __________, don't you, on that issue?

Silverman	In this particular instance, yes sir.

Male	Nothing further.

Female	Do you have anything else, Mr. __________.

Male	Nothing further.

Female	I notice it is noon. Do we want to take our lunch break now or at some later time?

Male	Whatever you prefer.

Male	The state does not have any more witnesses to, uh, put on at this time, so, uh, I certainly say this might be an appropriate time.

Female	I think I agree, so why don't we take a break. Plan to be back and ready to go at 1:15.

Female	Okay, this is a continuation of the Staff Jennings hearings we're back on record after a lunch recess. My notes indicate that just before we went to lunch Mr. Rich you indicated that you had completed your presentation of witnesses. Is that correct?

Rich	That's correct.

Female	Who will you be calling as your first witness, Mr. Jones.

Jones	Jeff Jennings.

Female	I'm going to ask you to stand. Do you solemnly swear or affirm that the testimony and statements that you're about to give in this matter will be the truth, the whole truth, and nothing but the truth.

Jennings ____________________

Female Please be stated. __________ to keep you voice up for purposes of the recording. For the record, state your name.

Jennings Jeffrey Stafford Jennings.

Female And spell your name, first, middle, and last.

Jennings J-E-F-F-R-E-Y S-T-A-F-F-O-R-D J-E-N-N-I-N-G-S.

Female Okay, go ahead with your questions, Mr. Jones. Just a reminder, I need to record you, so keep your voice up.

Jones Mr. Jennings, where do you work?

Jennings Staff Jennings.

Jones What's your position there.

Jennings President and General Manager.

Jones How long have you been the president?

Jennings Uh, since, uh, about 1988.

Jones Okay. Did you take the business over from your father?

Jennings Yes.

Jones What, generally, what's the nature of the Staff Jennings business?

Jennings Marine retail sales, uh, family pleasure boats, parts and accessories and servicing for those that we sell.

Jones Okay. How long has the business been there?

Jennings Since 1929.

Jones In the same location?

Jennings Yes.

Jones Okay. And that's just north of the Sellwood Bridge.

Jennings	Yes. On McAdams Avenue.

Jones	Okay. Uhm, I want to ask you a series of questions about the history of the, uh, your contact with the Department of Environmental Quality, uhm, on this case. Uh, do you recall what year it was when you, uh, first got in touch with DEQ regarding a possible contamination, uh, release at the Staff Jennings site?

Jennings	It was in 1988.

Jones	Okay. And what prompted the, uh, meeting between Staff Jennings and DEQ.

Jennings	Uh, an employee of ours, Jack Stiles, was on the dock in the morning and saw a little bit of a sheen on the water underneath the crane dock down at the south end of it and at that point put some booms in, came up, notified me of the contact DEQ, uh, and I believe the Coast Guard also, or __________ entities __________ contacted.

Jones	And was it you that contacted DEQ?

Jennings	I, I think initially Jack Stiles did.

Jones	But, uh, within a short period of time you were in touch with representatives of DEQ?

Jennings	Yes.

Jones	And do you remember who you spoke with?

Jennings	No, I don't.

Jones	Uh, do you remember eventually speaking with a gentleman by the name of Loren Gardner.

Jennings	I do remember, uh, working with Loren, yes.

Jones	Okay, he wasn't the first person you spoke with?

Jennings	I don't really recall.

Jones	Okay. To the best of your memory, what were the initial discussions about with DEQ?

Jennings Well, the first item was, uh, which we had already gotten in the direction that was to find the problem which __________ found very quickly was the elbow that was leaking at the top of the __________. And from that point on it was a matter of getting in touch with somebody to, uh, do some testing to find out what type of contamination, if any, there was.

Jones How did you find out that the leak was at this elbow?

Jennings Uh, we hired or brought in some people that had done some work on the tanks. I want to say it's __________ & Company, but I could be wrong, but they came in and, uh, ____________________

Jones And then, uh, after your discussions with DEQ did your business contact Golder Associates?

Jennings That's right.

Jones Did you, did your business get in touch with Golder Associates.

Jennings Yes, I was referred to them by another employee, uhm, and the person's name was Mike Schlender with Golder.

Jones Okay.

Jennings That was my ____________________

Jones Okay. And, uh, what game plan was formed with Golder when you first met with them?

Jennings Uhm, to do the soil samples, uhm, that were needed to determine the extent of the contamination.

Jones And to the best of your memory what did Golder do?

Jennings Uh, they actually, I don't know if they actually did the work themselves or if they hired people to actually do the drilling, but they compiled the reports necessary that were required by DEQ to show the different, basically __________________ handed out earlier.

Jones Okay. Uh, has it been some time since you've seen those reports?

Jennings Uh, yes.

Jones Okay.

Jennings Quite a long time.

Jones And, uh, do you remember what Golder had, uh, recommended to Staff Jennings as an ongoing plan of action?

Jennings Not until today.

Jones Okay. Uh, did these documents refresh your memory then?

Jennings Yes.

Jones Okay, and what, after your memory's been refreshed, what do you recall the game plan being?

Jennings Uh, there was talk about a trench which if I remember correctly back then it was something that wasn't real feasible with our location, uh, and there was talk about moving soil, moving all the soil which because of the crane dock and some structures, uhm, that that wasn't feasible and there was talk about installing wells.

Jones Okay. And, uh, why wasn't, you say the trench really wasn't feasible because of the location, what do you mean by that?

Jennings We're right on the Willamette River, the west bend, the west side of the Willamette River and, uh, the property slopes down to water and there's a crane dock which would be just east of the tank. You have the problem and the structure will being, I guess ____________________ kind of go inland and, uh, there was concern that it would injure the structural integrity of that plus the river fluctuates, uh, quite a bit __________ time of year.

Jones Okay. Uhm, how often do you recall in the years 1988, 89, and 90, uh, meeting with someone from Golder Associates?

Jennings How often?

Jones Uhm hmm.

Jennings Numerous times, I mean not on a weekly basis, but at first there was communication with them, you know, probably weekly but then as time would go by ____________________ generated.

Jones And how often were you in touch with someone from DEQ during those years?

Jennings Uhm, initially there was communication, uhm, with them, uh, more by phone than by letter. Uh, kind of ____________________ what we were doing and getting the information they need to see what the contamination was.

Jones And, uhm, did anyone from DEQ, uhm, give you instructions or tell you that certain requirements had to be met within a particular period of time?

Jennings No.

Jones Uhm, then do you recall when it was that you last had, uh, a working, uh, relationship with Golder Associates?

Jennings If I remember the correct date, after the reports __________ generated, uhm, there was a __________ either they had moved north or the person I was dealing moved north up to Seattle.

Jones Uhm hmm.

Jennings And at that point the communication kind of tapered off.

Jones And uhm, at that point had you to the best of your memory had Staff Jennings been following the recommendations of Golder Associates?

Jennings Yes.

Jones And do you recall what you were doing that was, uh, in, uh, in compliance with their recommendations?

Jennings Well first __________ getting the reports that were required, __________ required but asked by DEQ to determine, uhm, the level of contamination to do the reports that they needed ______________________________

Jones Uhm hmm.

Jennings Uhm, and then also we started working on a remediation plan and if I remember correctly there was, I was recommended to find somebody to install the system or a system and if I remember correctly it was kind of a three phased approach. The concern was to find someone that was reputable to do the work, we had a bad experience with somebody __________ marine drive property ________________ ripped us off. So they had given me some names of some people, uh, to get in touch with and so that was kind of the direction I was going.

Jones Okay. And it sound like, what, uh, year do you recall that being, approximately?

Jennings 89, 90, somewhere in there.

Jones Okay. Is it fair to say that you had a lot more contact with Golder Associates than you did with DEQ?

Jennings Yes.

Jones Okay. And did anybody from DEQ express any urgency towards, uh, taking remedial measures of any kind?

Jennings No.

Jones Then after Golder Associates, uh, left the area, uh, what, uh, and you were looking for someone to, uh, to work with on the project, uh, what did you do?

Jennings Well, uhm, I remember talking with __________ and he was he was, he had come out to the site a few times, uhm, since we first met, and it was to my understanding that it wasn't a high priority, uhm, and so with, with that we said that right now you know, I can't ______________________________ basically it was my understanding __________ it's not a high priority and __________ went on.

Jones Okay. And what, give as much detail as you can, about what had been done there step, at the __________ property, uhm, in terms of, uh, following up on any inspections that had been done and testing.

Jennings __________

Jones Well had, you remember at some point where a, a, uh, boom had been put out?

Jennings Right.

Jones Elaborate on that if you would.

Jennings Well when, when Jack had first noticed the sheen on the water, and it wasn't a sheen that was 30 or 40 feet out in the river, and it was actually a dock that parallels the bank and it's, runs into the crane dock, it looked to be almost like a start of a sheen, it was coming from the shore between the rip rap and rocks that are under the crane dock. And he, we keep some booms down at the boat house because of the ____________________ we have down there __________ so at that point he immediately got the equipment that he felt was needed to contain that. How long they were down there, I don't recall, but they were down there for quite a while until, I think it was recommended that we keep them down there until the sheen no longer exists.

Jones Uhm hmm.

Jennings Uh, so that's ____________________ they were there for quite a while and they were __________ periodically ____________________

Jones Okay. And did, uh, anybody from DEQ indicate to you that that was, uhm, an inadequate, uh, system, and uh, did anybody from Golder indicate to you that more should be done?

Jennings No, actually there was comment that they were appreciative that we had taken such quick action.

Jones Okay. All right, then after Golder leaves the area in touch with Loren Gardner and, uh, he indicates to you, uh, that this isn't a high priority item, what do you recall as the next significant event?

Jennings I remember ____________________ time of year it was __________ a conversation, uhm, and then there was communication with various people who do that type of work which were not being

Jones __________ contractors?

Jennings Right. And not being an engineer or even remotely familiar with this type of thing. It wasn't something that happened in a very short period of time along with business ____________________ time and very frustrated really, uh, do too much in the direction of hiring anyone ____________________ periodically and there's a timeframe that went by and then there was, uh, information about financial assistance that was becoming available, it wasn't actually available it was coming available.

Jones Uhm, hmm. And why was that, uh, attractive to you?

Jennings Well from talking with Golder what I understand is the expense, well the expense that I incurred was endless, quite large, but also just the expense for remediation, uh, was going to run quite high in a seasonable business, uh, it __________ __________ that we go in that direction.

Jones Okay. Do you know how much you paid Golder?

Jennings I want to say close to 35,000.

Jones Okay. And did you, uhm, tell Loren Gardner that you were going to be seeking financial assistance through this available program?

Jennings Yes.

Jones Okay. And did he express any, uh, reservation ____________________ that?

Jennings No.

Jones Uh, so what steps did you take next?

Jennings Well, ___________________ program was available there was a meeting that was downtown at 7:30, I remember going down there to a building downtown which when I got down there it was canceled. And that was __________ meeting to be made aware that ____________________ people who were dealing with the situation ____________________

Jones Uhm hmm.

Jennings Uhm, to be aware of how to go after or how to go forward in getting this financial _________________________________ program.

Jones Uhm hmm.

Jennings Uhm, I don't remember how, you know it might have been through Mike Schlender at Golder that I contacted him to find out how I would be able to get onto the program. Nevertheless I did somehow get a number and I called and it took me quite a while to even get the information that was needed to fill out __________ for the program.

Jones And, uh, did, uh, anyone indicate to you while that application was pending for financial assistance that Staff Jennings needed to do anything else in terms of remedial action at your property?

Jennings No.

Jones Uhm, how much time do you recall went by until you heard that the financial assistance program would not be available to you?

Jennings Oh, well there was quite a long time actually. Because my last conversation with Loren was that being on this program at this point let's wait until the program comes into effect at that time he wasn't aware it wasn't going to be in effect, but it was either I want to say it was Rich Rose that actually I spoke with, uhm, where he told me that it looks like this program was not, there was not funding available for it and it would be the timeframe ______________________________

Jones Uhm, does a year or a little over a year sound about right in terms of the, uh, waiting time until you heard.

Jennings __________

Jones Then after you received work, uh, about the unavailability of the program, what happened next.

Jennings Uh, that's when I believe that I started __________ Dale __________ done some other work for us __________ properties, uhm, and at that time I think that's when I got a little involved with ____________________

Jones Okay, you're talking about Dale __________.

Jennings Dale __________.

Jones And, uh, he's with which company?

Jennings Diminimus.

Jones All right. And does, can you recall about what time it was what year it was when you contacted Dale regarding this project?

Jennings No, I think __________ documentation __________ today ____________________ late December that, uh, I spoke with somebody ____________________.

Jones Okay. December of which year?

Jennings 1993.

Jones Okay. And ______________________________ discussion __________ generally with Dale regarding what should be done, if anything, out ____ property.

Jennings Well, pretty much ____________________ financial assistance program, which he was aware that the system, assuming he was aware that the whole program was not even available, and, uh, that I needed to, that this had become an issue now with DEQ __________ no longer going to be on the program, they want me to move forth, and, uh, I think initially the program was that basically start all over again from square one __________ to a degree of ____________________

Jones Okay. And during that application period had you, uhm, anybody expressed, uh, conveyed to you an urgency in doing something different than what you had already been doing?

Jennings No.

Jones Then to the best of your memory, what, uh, did Diminimus indicate to you were their recommendations as to what should be done?

Jennings Uhm, they simply __________ extent of the contamination, north or southeast or what ____ in doing so, uhm, would be soil samples and groundwater samples to determine how far the contamination was.

Jones And was that done?

Jennings ____________________

Jones Okay, what do you mean?

Jennings Well, it's still not done yet, but if start

Jones Did they begin that process?

Jennings Yes, they began the process.

Jones Okay. And, uh, do you recall in addition to the, uhm, the actual, uhm, testing and investigation what, uh, steps that Diminimus took to remove __________, uh, potential source of contamination at the site?

Jennings Do you mean like soil or

Jones Well, did, in October of 1994, where underground storage tanks removed?

Jennings Yes. After the new tanks were put in.

Jones Okay. And

END OF SIDE 4

Female Okay. This is tape three, side 5.

Jones And, uhm, around that period of time, uh, did Dale notify you that there may have been, uh, some flow of, uh, pollutant to the north of your property?

Jennings Well, I can't remember exactly but __________ conversation that __________ __________ contamination that could have ____________________, yes.

Jones Okay. And what, uh, do you recall being done in light of the fact that there might have been some contamination on the city of Portland's property?

Jennings Uh, well, we had, first he, ____________________ property and I was aware that we still had not ____________________ property ____________________ had to ____________________ to the __________ property, so the next step __________ get permits. So we went ____________________ and requested, in the summer of 94, I guess, to request from the city of Portland to __________ permit to go onto the property __________ be some contamination and we wanted to go over and do some soil sampling and determine the extent ____________________ after a period of time and a comedy of errors and communication with Dale and this person, and

Jones This person meaning the city of Portland?

Jennings Yes. And, uh, ____________________ finally got a permit and were basically ____________________ middle of the river ____________________ soil samples ______________________________ and so we had to __________ ____________________ almost exactly 12 months to the date after there was __________ permit to go onto the property.

Jones And, uh, were you working with, uh __________ Silverman of __________ during that time?

Jennings Oh yes, they were instrumental in ____________________

Jones Okay. And, uhm, did he or anyone from DEQ have any objection to you trying to obtain this permit through the city of Portland in order to, uh, get onto their property.

Jennings Did he object to it?

Jones Yeah __________

Jennings No. In fact he went along with it and encouraged it.

Jones Yes. Okay. Uhm, then what do you recall based on your discussions with Rick and with ____________________ as to why it was necessary to, uhm, determine, uh, whether or not there was contamination on the city property?

Jennings Well my understanding was ____________________ in all directions unless knowing that a corrective action plan be put together which was as I understand required by DEQ to make sure that __________ implement __________, uhm, and also knowing how far ____________________ talk the same language as they do, but just ____________________ inadequate to do the job.

Jones And during this, uhm, time period of almost a year, were you trying to get a permit from the city of Portland, what is being done at the Staff Jennings site in terms of preventing, uh, any contamination from spreading towards the river? You mentioned removal of the underground storage tanks and putting in new ones. Anything else?

Jennings Uh, well there was quite a bit of soil removed and hauled away.

Jones Okay. And during that period of time from what was called the fall of 94 to the fall of 1995, uhm, did individuals from DEQ, uh, indicate to you that they were not satisfied with what Staff Jennings was doing?

Jennings __________

Jones All right. Then you obtain the permit from the city of Portland and Diminimus then, uh, is able to, uh, inspect the property on the city of Portland's part, is that correct?

Jennings Correct. It was, I believe, it wasn't a permit that was ____________________ very short window that we had ____________________ 30 day __________

Jones Okay. All right. And then, uh, did Dale report back to you what his findings were?

Jennings Uhm, they did some soil sampling and notified me that there was, you know, high levels of contamination.

Jones Okay. And what was the game plan at that point after you learned that?

Jennings Well I believe right about that time everything got put on hold because ____________________ first part of February so everything was kind of on hold, permit expired, but we still had not determined, he was concerned because we still had not, I guess, ____________________ where we had a __________

Jones Uhm hmm.

Jennings And he even told me that he was concerned, you know, not concerned with ____________________ I believe because of the timing of the year and the elements we were dealing with we weren't able to, and also the timeframe that the permit was good for, and there was ______________________________ also said that we need to ______________________________ or go out far enough to no contamination which we weren't able to do until I believe later that spring when we were kind of, we were flooded out so we were kind of shut down for a while.

Jones How far does the flood waters go?

Jennings Uh, this year, in 96 it was four feet ____________________

Jones Okay, so that was actually in the Staff Jennings show room and into the offices.

Jennings Show room, service yards, back lot.

Jones When did the river water subside enough to where you were able to do business.

Jennings Uh, we, well we didn't open again until, uhm, Memorial Day, May of 96.

Jones And, uh, what do you recall happening in terms of your work with the Department of Environmental Quality at that point.

Jennings Well at that point I believe that we went out to, we got another permit from the city which was, uh, done a lot quicker and, uh, did more soil samplings. Uhm, and they were getting concerned that it was so far north they didn't quite understand how that could be so far away and still getting fixed. And then it came to our attention, actually through a picture in the showroom, that there used to be a gas station right above the dealership.

Jones Uhm hmm.

Jennings And so with that in mind, uh, we thought well maybe there could be a contributing source and so we tried to do other soil samples, uhm, I guess you could say up-gradient to the west to the west of the shore __________ done, uh, was pretty silty, but everywhere else between the shore and the silt __________ pretty ____

Jones All right. And during the spring and summer of 96, did you receive any hint that what you were doing was not enough?

Jennings __________

Jones Okay. When do you recall being first notified that determining the extent of contamination on off-site properties, uh, pursuant to a corrective action plan, was, uh insufficient, that you needed to do more?

Jennings I was understanding that we needed to determine the kind of contamination that's why I hired somebody to do the __________________ test where the station was.

Jones Uhm hmm.

Jennings And I know that there was some frustration DEQ __________________ you know kind of like not dragging their feet, but I heard the terminology spoken __________________ is kind of like we were buying time. And, uh, I guess it really wasn't until ___________________________ got the notice of non-compliance __________________

Jones So the fall of what year? 96?

Jennings 97.

Jones November 96?

Jennings 96, yes.

Jones Okay. All right. Now, after you received the notice of non-compliance, what did you and Dale Hard talk about?

Jennings He told me this is pretty serious, first thing. And, uhm, and so I guess at that time, uhm, personally __________________ and, uhm, the decision was made to get the wells put in, I think there was some communication with DEQ that made the assumption that yes there is some of the contamination to the north of us is your responsibility, we've gone this far, what we'll do at this point and we feel strongly, very strongly there is some tanks above us, or west, up-gradient. At this point we'll put in the wells, we'll put in a system and this is going to be adequate to take care of all this and then we will go in the direction to see if there are some other sources and if so, we'll worry about that then.

Jones Okay. And how soon were you, uh, able to, uh, put in the, uh, the wells which were, that DEQ had, uh, suggested? Do you remember how soon?

Jennings I don't remember, I don't __________________ non-compliance __________ which because of the time of year I don't think we were able to do it __________ January of 97 the water was at the showroom again, not in, but it was six inches of coming in.

Jones Uhm hmm.

Jennings The problem that we had this time of year sometimes, we have lots of years where our service entrance is lower than the showroom so you can't get to our back lot if the river comes up. So there's no way of getting equipment or vehicles or even boats off the back lot. So I believe, anyway the water was high this last January so we were pretty restricted from doing anything I want to say probably the spring.

Jones __________ up the first time the earliest opportunity for that to be done, right?

Jennings __________

Jones Uh, during some testimony by witnesses with the DEQ they mentioned the diesel leak. Do you remember that, uh, issue coming up throughout your years of discussion with DEQ representatives?

Jennings No.

Jones Have you, uhm, had a chance to look at the findings and determinations, uhm, that have been submitted by DEQ and specifically their formula for, uh, calculating a penalty?

Jennings Yes.

Jones And under base penalty they have, uhm, argued that the base penalty should be doubled because the cause, uh, was through a negligent act. Do you believe that Staff Jennings acted negligently at any time?

Jennings No.

Jones Nothing further.

Female Mr. Rich.

Rich Mr. Jennings, you stated that in 1988 you were the president of Staff Jennings, Inc.

Jennings Well I may have been president, I was general manager.

Rich You basically run the show, managing the facility.

Jennings Right.

Rich Did this put you in a position of essentially ____________________ the person at Staff Jennings related to the 1988 ____________________

Jennings Oh yes.

Rich Okay. Uhm, you hired Golder Associates, you stated, uhm, do you recall receiving any reports relating to the 1988 release and subsequent investigation from Golder Associates.

Jennings Yes.

Rich To refresh your memory, were these reports look like copies of those reports that you received?

Jennings Yes.

Rich As the general manager of the facility, is it likely that you read those reports?

Jennings I, well, yes back then I did. Uhm, I read what I could understand. Some of the stuff, some of these reports are a little over my head.

Rich Okay. Uhm, you stated earlier that DEQ never really directed you to do anything specific. Do you recall if your own consultants ever directed you to do anything specific to remediate the contamination of the groundwater and the soil?

Jennings Well based on the reports there is some recommendations that they had in there, yes.

Rich Okay. And I think we had some testimony __________ on page 2 there is in fact a specific recommendation looking at the number of examples, __________ look at the number of options to install the vapor extraction system or recovery system to clean up the soil and groundwater, is that correct?

Jennings Uhm hmm.

Rich In fact, doesn't it also say that the purpose of this, ____________________ choosing, the purpose of these options is to prevent further fuel migration to the river system, is that correct?

Jennings __________

Rich On, if DEQ didn't, uh, you don't feel DEQ directed you, uhm, in 1990 when Golder made its recommendations, do you recall why you didn't follow up on them?

Jennings Uhm, __________ the recommendations as far as ____________________

Rich	Yes, as far as actually installing a remedial system.
Jennings	Well, if I remember correctly after getting this from them, uhm, that the recommendation was for me to find a contractor to go forth and wish them, I believe and DEQ, ____________________ put together this system and have them install it and that's when I was kind of going through the process of trying to find somebody to do this work.
Rich	Okay. Very good. So it's fair to say that you knew in 1990 at least from your own consultant that a remediation system was necessary to abate further discharges to the Willamette River.
Jennings	__________ based on the recommendation, correct.
Rich	Uhm, you said that it took you some time and that there was a sort of a frustrated period in finding a consultant. Uhm, how long after you received this report did that period of time __________?
Jennings	Between this time here and or during this time after, the time after I received this and the time that I was working on talking with different people and I would have to say it wasn't like on a daily basis, uhm, is when it was my understanding that it was not a high priority with DEQ __________ and so that's why I guess at that point I didn't escalate my efforts.
Rich	When Golder, uh, excuse me, I think it was actually when your consultant SRH made sure that there were booms and pads in to try and soak up that sheen, did they indicate to you at the time that that was sufficient to actually clean up contaminated soil and groundwater?
Jennings	No.
Rich	Did Golder Associates ever indicate that that was going to clean up soil and groundwater contamination at the site?
Jennings	__________
Rich	You stated that there was a period of approximately a year that you have applied for financial assistance and then subsequently discovered that it wasn't going to be available. Which year was that, approximately?
Jennings	I think the system or program was available in 91. And it took me quite a long time to even get, I guess, the application you call it, which I believe was actually

applied for in August of 92. And it wasn't until 93 or so when I talked with Rich __________, I'm not sure of the date.

Rich Okay. Do you know when you first became aware of the existence of a potential financial assistance program?

Jennings If I remember correctly the program was to start in October or so in 91 and I was made aware the program was becoming available like in the spring of 91.

Rich Okay, and so is it fair to say that subsequent to 1990 when you got this report to the spring of 1991 no significant activity occurred at the Staff Jennings site as far as remediation or clean-up.

Jennings Correct, and solely because I was told that it wasn't a top priority. Or wasn't a high priority.

Rich Uhm, did DEQ tell you that there was not petroleum contamination discharge to the river or that there was not a threat of a hazard from this site?

Jennings ____________________

Rich Is it possible that the priority that Mr. Garner did make that statement was referring to, is it possible that he might have been referring to how your site ranked among other sites?

Jennings I __________ it's possible, but,

Rich Do you have any, do you know for sure?

Jennings No. My focus was on Staff Jennings.

Rich Okay, uhm, you stated that, uhm, it was Mr. Hard who first told you that a remedial system needed to be installed. Is that correct?

Jennings ____________________

Rich In your previous testimony, uh, with Mr. Jones, you stated that the first time that you heard about the need to put in wells for a remedial system was from discussions with Mr. Hard. Is that your testimony?

Jennings Well I think that that was my, he was the first person after, uh, they kind of, ____________________ case resurfaced that it was actually discussed ____________________ Golder report.

Rich So it was, that might have been the second time you discussed the remedial system.

Jennings Right.

Rich Uhm, you mentioned that the flood interfered with the, uh, your ability to perform work, uh, at the site and to move forward on that. Is that correct?

Jennings Yes.

Rich And approximately how long was the water level from __________ February of 96 flood, how long was that water level up at your property line, and again I'm talking about the, uhm, the showroom and the back work area.

Jennings Well, the water was four feet in the showroom for about, from four feet, from the time it entered the crest didn't came down for about four days, but as far as covering the access to get to the back lot, I want to say that the water was high, uhm, I would say probably the later part of January we had no access to our back lot.

Rich And then when did that, when did the water subside sufficiently so that you could get access again?

Jennings I don't recall, I __________, my best guess is probably going to be the latter part of February, but then after the water went down there was six inches of mud over our whole dealership, the entrance out front, the trestle.

Rich Okay, in, in what __________ work that you were, uh, that you were trying to do, did you do any work on the site, uh, during the period that the flood was infecting the property?

Jennings Did I do any work on,

Rich Or did you, or I should say did you have, uh, Mr. Hard perform any tasks ____________________

Jennings During the flood, no.

Rich during the flood. Uhm, do you recall sending or telling Mr. Hard in February 26th preparing a, uh, report concerning the soil and groundwater investigation on ____________________ property?

Jennings Uh, I believe that might have been from the first time we went over, either December or early January.

Rich	Okay. Is it fair to say that by March of 96 there was access to the property again?
Jennings	Most likely, yes.
Rich	Do you recall having a meeting on November 21, 1995, with Red Silverman when he came to your site?
Jennings	Yes.
Rich	And do you recall him discussing the need to put in a remedial system __________
Jennings	Well, yeah, we discussed, things were kind of talked about in phone conversation and that I believe was the first time when he came down the topic was always some kind of a catch basin or a trench. And then after coming down actually seeing the facility and seeing the shoreline it was agreed upon that that wasn't going to work because it would be under water a majority time of the year and that he said numerous times that this is a very difficult facility and we really didn't have an answer. Uh, there was talk about getting an engineer down because I think we talked about the trench but also some type of a, uh, air type system that would go into shore and have tubes coming up __________________ anyway the bottom line was having an engineer come out and take a look at it, the facility, the location, and make some recommendations which we did.
Rich	Okay. So you do recall __________ conversation. Uhm, what kind of system, remedial system did you end up installing?
Jennings	Well right now we have extraction wells.
Rich	Extraction well? Uhm,
Jennings	Wells.
Rich	Extraction wells, yeah. Uhm, is extraction wells essentially what Golder recommended you do in 1990?
Jennings	They have ____________________
Rich	In their preferred recommendation?
Jennings	__________
Rich	Okay thank you. No further questions.

Male How much, uh, as of November 96, do you know how much you had paid, uh, Diminimus for their work __________ at this site? Approximately.

Jennings From November of 96 to date?

Male No, no, no. Uh, from the time they first came aboard until November of 96.

Jennings Oh, no I don't __________

Male Do you know how much you've paid them to date, total? Approximately?

Jennings $30,000.

Male Okay.

Jennings I'm not sure.

Male Okay. Thank you. That's all.

Female And your next witness?

Male Mr. __________.

Female Do you solemnly swear or affirm that the testimony or statements that you are about to give in this matter will be the truth, the whole truth, and nothing but the truth.

Male Yes I do.

Female Please be seated. For the record, state your name.

Haar Dale Haar.

Female And spell your first and last names.

Haar D-A-L-E H-A-A-R.

Female Mr. Jones.

Jones Mr. Haar, what do you do for a living?

Haar I'm a ____________________

Jones And, uh, would you share with the judge what your education and background is to be an environmental consultant.

Haar Yes, I, uh, got a degree, a bachelor of science degree in geology from the University of Kansas. Uh, I've been employed ____________________ for approximately __________ years and prior to that I was a geologist with, uh, an oil well company.

Jones What, uh, just give us kind of a description of, uh, what type of work you do.

Haar We do, environmental consulting, the aspect that I'm involved with are mainly subsurface investigations, uh, soil and groundwater, underground storage tank __________, my firm also does ____________________ environmental ____________________ for property ____________________ that's how we ____

Jones Okay. Do you remember when, uh, he first contacted you about the site on the __________ property?

Haar Yes, I do. It was in, uh, would have been either late 93, early 94, and he had mentioned to me, uh, Rich Rhodes contacted him, uh, requesting __________ ____________________ investigation at the property.

Jones And did you bring your file with you?

Haar I brought some of it.

Jones Would that help you refresh your memory about dates and places?

Haar I have some dates down here. I, that's late December, early 93 or early 94. I'm basing on when the, we did our first investigation for ____________________.

Jones What was your understanding as to why you were brought on board at that time.

Haar That the __________ plume was not ______________________________ eventually when we ____________________ expired ____________________ dispute with soil and groundwater investigation.

Jones Meaning the financial assistance program.

Haar Yes, that's correct.

Jones All right. And, uh, __________ share with us some chronological order what you did during that first year after meeting with Jeff Jennings.

Haar Well my first concern was is this stuff ______________________________ brought on site ____________________ looking at it by now in early 94 it had been 5-1/2 years since the release and, uh, you know, the first step, uh, ____________________ approach ____________________ approach and you would use an instrument like a geoprobe to __________ soil samples ____________________ at the site as opposed to installing the monitoring ____. Uh, we did that survey for Jeff I believe it was in March of 94 and, uh, focused on site, focused upgradient from the USTs and downgradient from the USTs and we began to gather or discover the characteristics of the site ____________________ numerous __________ attempts programs ____________________ due to large boulders __________ anything ______________________________.

Jones Were you in touch with DEQ during this time.

Haar I was. I talked to Rich.

Jones Silverman?

Haar __________

Jones __________. Uh, and uh, did they approve of the approach that you were taking.

Haar Uh, no I don't think initially that was and I may be wrong I'd have to look at my notes, but, you know, we probably said this is what we're going to do, let's establish a baseline, I mean ____________________

Jones Um hmm.

Haar And, uh, ____________________ looking in the wrong ____________________ which ____________________ pretty straight forward being the river bank was right there, with a steep slope, we pretty much knew __________ perform our investigation. So, uhm, if we looked for approval ____________________ ____________________ but this was mainly just establish a baseline.

Jones Did anybody from DEQ state that that was not necessary?

Haar I do not recall.

Jones Okay. And what'd you do next?

Haar We completed the investigation, we did find, were able to get some soil samples and groundwater samples ____________________ sufficient to confirm that contamination ____

Jones What ____________________

Haar Uh, __________ I know in that timeframe we were also talking about it __________ UST system required UST owners __________ and he had selected October of 94 to be the time when we would upgrade the system and decommission the old tanks and, uh, once the new tank was on-line, logically you'd take the old ones off-line so there wouldn't ____________________ facility. In October of 94 we ____________________ the USTs at the site and ____________________ soil contamination ____________________

Jones And were you working with DEQ during this removal process?

Haar Uh, yes we were. They were notified, I know ____________________ as they do on some ____________________ observe some of the site activities. Uhm,

Jones After the contaminants were discovered in the soil during this removal process, uh, did you meet with Jeff about taking any other steps to, uh, to reduce those contamination levels?

Haar __________ remove the soil, uh, ____________________ tanks in initially I wasn't involved in the installation, it was readily apparent that there was quite a bit of large boulders, bedrock, you know we weren't certain __________ the bottom of the excavation ____________________ the tank was, the tank excavation was probably carved our ____________________ and, uh, you know, from a feasibility standpoint ____________________ when we can we like to remove as much as the, uh, the secondary __________ the contaminated soil as we can, uh, this site was different ____________________ boulders and bedrock and also from the fact of ____________________ maps, do you have those maps? The proximity of the 10,000 gallon tank, it's adjacent, immediately adjacent to the crane dock. And we didn't know what type of, uh, potential slope stability or structural integrity issues, uh, we would encounter by continuing to over-excavate the excavation. Uhm, the last thing as a consultant you want to do is make the evening news. I did not want to see a crane dock fall over into the river. I did not want to be responsible. So we at that time ceased the, uh, ceased the over-excavation.

Jones Okay. Now were you working not only with Jeff but with, uh, in conjunction with DEQ representatives during that time?

Haar Yes we were.

Jones Okay. And what was discussed between the three of you as to what should occur after this removal process ____________________

Haar __________ I believe by that time __________ was on board, uhm, the project manager, and, uhm, I know that Jeff had called me, uh, probably through a letter, I'm a little fuzzy here on all the, uh, on all the chronology __________ but the gist of it was we would need to, and this was part of our recommendations to Jeff, we need to delineate the contamination on-site, off-site and based on the proximity to the parks property it was the logical conclusion on my part that there probably was contaminant ____________________ off of Jeff's property and that we need ____________________ investigation __________

Jones And did you discuss this with Rick Silverman, then?

Haar __________ I know Rick and I had numerous conversations __________ became involved ____________________

Jones All right. And, uh, so was it your idea that the extent of contamination to the north should be determined?

Haar I'd have to look at the report to see if that was actually our recommendations but I do see, uh, in some of Rick's letters, April 5th of 94 and, uh, December 21, 94, which was then prior to and after the ____________________ we did address the delineation ____________________ April of 94 ____________________ of-site investigation ____________________ determine the ____________________ and I agreed with that.

Jones Okay. All right. Now I want to ask you an important question. At that point in time when you are speaking with Rick Silverman, is there any indication from him or somebody from DEQ that you need to take immediate remedial steps to stop the contamination of pollutants at the Staff Jennings site?

Haar Not in, and I'd have to look at my __________ log, ____________________ but I never got the sense that there was an immediate need to do anything. Uhm, there was discussion over the years of ____________________ of the, uhm, the potential for impact to the river and ____________________ again it's very straight-forward __________ adjacent to the river ____________________ so, uh, it wasn't, uh, this is something that needs to be addressed right out of the gate. Now I know we talked about potential ways to, uh, __________ entering the __________ stop that contamination to the river and for some time Rick is talking __________ bring up a trench and, uh, it became apparent to me that maybe he hadn't been to the site and needed to see the site and, uh, you know, to understand what it is that we were, uh, what we were facing, uh, the steep banks, the rocks, the inaccessibility, uh, the on-site and off-site locations where we suspected the contamination __________.

Jones And what do you recall his reaction when he did come out and look at the site?

Haar He agreed it was a difficult site and, uh, I repeatedly said, you know, that logistically it's going to be difficult and had no real suggestions, I think on, uhm, what we would do on a normal or an easier site, a flat urban site, you know a bank lot or something like that. This is, this is, I would characterize it as __________.

Jones Now regardless of the fact that nobody from the DEQ expressed any urgency in stopping the contamination towards the river, based on your own experience and education, did you have, uh, the opinion that there needed to be some sort of immediate remedial action taken to prevent flow into the river?

Haar Not based on what we were seeing from DEQ. All the correspondence, uh, even though Rick had talked about it ____________________ at the site, all the correspondence was always in the framework of a corrective action plan, and looking at the corrective action plan was required __________ delineation and this is not a thorough covering __________ but you have to delineate your source or sources, vertically, horizontally and then you propose, uhm, remediation options, uhm, so that __________ not only __________ that one but one of the other remediation plans would not be capable for a site and with this facility, uh, you know, and we repeated request for corrective action plan, we were, we didn't want to, uh, jump ahead of ourselves and install something or drill wells and then come back later and have to drill another well five feet away or something like that, the costs were going to be, uhm, quite a bit higher ____________________.

Jones Okay. So at the time period where the decision was made to, uh, inspect the City of Portland property to the north of the Staff Jenning site, uh, and it appears that there is a consensus that that's the wise thing to do, does anybody from DEQ say, hey, look, if this, uh, __________ going clear back to 1990 where there's been a recommendation of, of, uh, a remedial system being put in, we need to have that done now. Did anybody give you any type of a statement like that?

Haar Not __________ and I wouldn't ____________________ immediate, uhm, emergency responses ____________________ like that and all.

Jones So then what do you do, go ahead and give us some detail as to what you do to begin the steps of formulating the corrective action plan.

Haar Well the first thing ______________________________ had to know, uhm, how far off-site ____________________ looking to ____________________ and, uh, I know when Rick came out, it's difficult to visualize the site, but right as you come off the Staff Jennings property there is a little remnant of a creek or something like that, uhm, we had discussed quite possibly where we all thought the contamination __________ and we came up on the north side of that ____________________ little bog area, uhm, __________ go ahead and perform that, perform that ______________________________

Jones How long did that take?

Haar To get the permit to get on? As been stated, nearly a year. Uhm, the city was, uhm, we would have no response from them, actually, __________ attorney __________ notified the city initially and you know I was told through ____________________ permit __________ what we need, you know, let's get it moving, and, uh, we didn't hear from them for the longest time. Finally when I know that Rick Silverman did contact the city, I believe he went to her supervisor a little higher and, uh, threatened to name them as a responsible party if they could not allow us to proceed it appeared that we had angered the city and, uh, we started getting the permits ____________________ unacceptable, I mean they would have us drilling, uh, within three feet of the __________ fence. Well anybody who knows anything about contamination is not going to move __________ three feet and then stop so eventually we were able to get the permits and, uh, as soon as we got it I see here in my notes we received the permit on December 11th and then we were on the site

Male Of 95?

Haar Yes, I'm sorry, 95. And, uh, we were on the site December 27th and 28th of 95.

Jones And during that year's period of time, uh, were there any steps taken to, uh, uhm, remediate any problem on the Staff Jennings site?

Haar No there were not. Again, we

Jones Were in consultation with DEQ during that time?

Haar I'm certain we were.

Jones Okay. Did they ever tell you that you needed to do something that you weren't doing during that one year period of time?

Haar At that time, I think and I'm still thinking __________ Rick agreed that we needed to delineate before we could do anything, uh, in regard to the collective action plan. You know, he was, he had discussed, uh, you know, __________ abatement, uh, again given the just the cost ____________________ doing something at the site, uhm, we didn't want to duplicate our efforts. We didn't want to, uh, I guess ____________________ or something like that and then immediately, you know, after we get our results ____________________ we need to put more wells in. These are very ______________________________ equipment, uh, several times higher than installing wells ____________________ would not work on the facility. They would not penetrate boulders. I think the largest boulder that we encountered was seven feet in diameter.

Jones Now when,

Female I'm sorry, excuse me. I'm going to change the tape.

END OF SIDE 5

COPELAND, LANDYE,
BENNETT AND WOLF
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FILE

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CHARLES S. CROOKHAM, OSB #52016
Attorney General
KURT BURKHOLDER, OSB #80465
Assistant Attorney General
1515 SW Fifth Avenue, Suite 410
Portland, OR 97201
(503) 229-5725

Of Attorneys for Oregon Department of
Environmental Quality

UNITED STATES BANKRUPTCY COURT

DISTRICT OF OREGON

In re DANIEL C. HANNA, et al., (Debtor(s)).	Case Nos. 390-33990-S11; 390-34210-S11; and 390-34211-S11 (administratively consolidated)
GULL INDUSTRIES, INC., a Washington corporation and BP OIL COMPANY, an Ohio corporation, Plaintiffs, v. JOHN MITCHELL, INC., Defendant.	Adversary Proceeding No. 90-3388S MEMORANDUM OF LAW OF OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY, AMICUS CURIAE

This case poses issues concerning the ability of private parties to recover remedial action costs under the state superfund statute. Defendant argues that plaintiffs may not pursue such cause of action here, because:

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(1) A cost-recovery plaintiff must be liable under the statute and therefore have a duty to perform the remedial measures for which it seeks reimbursement, Defendant's Response to Plaintiffs' Post-Trial Brief, pp. 14-15;

(2) A plaintiff's remedial measures must comply with state rules regarding cleanup standards and procedures, *id.*, pp. 8-14; and

(3) Every investigative and cleanup step taken by a plaintiff must have oversight and approval by the Oregon Department of Environmental Quality (DEQ). *Id.* pp. 12-14.

DEQ disagrees that these conditions are prerequisites to the ability of a private party to maintain a cost-recovery suit under the state superfund statute. No such prerequisites are imposed by statute or rule. Moreover, if these prerequisites were imposed--for example, to require prior DEQ approval for every private investigation or cleanup--the number of private cleanups would be reduced significantly. This would defeat the purpose of the state superfund statute of remedying environmental conditions at polluted sites by a combination of public and private efforts.

1. A Person Need Not be Liable in Order to Seek Cost Recovery

The state superfund statute, ORS 465.200 *et seq.*, authorizes "any person" who incurs remedial action costs to sue persons liable for those costs. ORS 465.255(1).

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If there is any doubt that this provision creates a private cause of action, a line of federal cases construing identical wording in the federal Comprehensive Environmental Response, Compensation and Liability Act (CERCLA or Superfund) puts this doubt to rest. Those cases have held that the federal statute authorizes private cost-recovery suits. See, e.g., Wickland Oil Terminals v. ASARCO, Inc., 792 F.2d 887, 890 (9th Cir. 1986); N.L. Industries, Inc. v. Kaplan, 792 F.2d 896, 898 (9th Cir. 1986); Walls v. Waste Resource Corp., 761 F.2d 311, 318 (6th Cir. 1985).[1] The state statute was modeled in many respects on the federal statute, including the cost recovery provision. Compare ORS 465.255(1) with 42 U.S.C. § 9607(a)(4)(B).[2] When a state statute is modeled on a federal statute, state courts will interpret the state law as federal courts have interpreted the federal law. University of

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[1] As recognized by the court in Bulk Distribution Centers v. Monsanto Co., 589 F. Supp. 1437 (S.D. Fl. 1984), private cost-recovery suits are necessary because the federal Superfund "will not provide sufficient funds for the clean up of the existing dump sites," and that "permitting a private cause of action under [CERCLA] effectuates the legislative purpose of abating environmental hazards promptly, safely, and efficiently." 589 F. Supp. at 1444.

[2] The legislative history for the state statute also includes statements by the DEQ director that the drafters' intent was to "parallel[s] very very closely the federal program." Testimony of Fred Hansen (SB 122), Senate Agriculture and Natural Resources Committee, March 23, 1987; Accord, Minutes, Senate Agriculture and Natural Resources Committee (SB 122), Exhib. D at 3, February 29, 1987; Staff Analysis of SB 122, Oregon House of Representatives ["SB 122 establishes a state superfund program similar to the federal Superfund program."]

Oregon Co-Operative Store v. Dept. of Revenue, 273 Or. 539, 544, 542 P.2d 900 (1975).

The private right created under the state statute does not hinge on the cost-recovery plaintiff itself being liable for the contamination. This prerequisite simply is not found anywhere in the state statute. Again, the statute provides that "any person" incurring remedial action costs may sue the entities who are liable for the release of hazardous substances. ORS 465.255(1).

Defendant links a private person's right to recover costs under ORS 465.255(1) with DEQ's enforcement authority under ORS 465.260(4). Defendant implies that, unless the person has a duty to clean up a site because he or she is liable for the contamination and therefore potentially subject to a DEQ enforcement order, the person has no right to seek costs for remedial activities performed voluntarily. Defendant's Response, pp. 14-15. However, the extent of DEQ's enforcement authority is one thing under the statute, the cost-recovery right of a private person is another. There is no link between the two that makes a duty to clean up a prerequisite to cost recovery. See also General Electric Co. v. Litton Business Systems, Inc., 715 F. Supp. 949, 956 (W.D. Mo. 1989) [property owner may recover response costs under CERCLA even if a "volunteer" rather than liable under the statute.]

In reality, many property owners undertake remedial activities for reasons not directly motivated by personal liability--for example, to make their property more marketable. They elect to investigate the environmental condition of the property, and, if necessary, to take cleanup actions, even if they are not liable for the cleanup. These activities, whatever the motive, might have the effect of cleaning up contaminated soils and groundwater and protecting public health and the environment--the very goals of the state superfund statute. The likelihood of these private remedial activities being undertaken would be diminished if the property owner had no prospect of recovering costs from the party responsible for the contamination.

2. <u>A Person's Remedial Activities Need Not be Performed in Compliance with State Rules in Order to Bring a Cost-Recovery Action</u>

Defendant argues that the plaintiffs in this case failed to follow DEQ regulations applicable to the cleanup of petroleum releases from underground storage tanks. It is DEQ's position that, while regulatory compliance might be relevant to the "reasonableness" of plaintiffs' costs and therefore the amount owed plaintiffs by defendant, compliance is not a prerequisite to plaintiffs' threshold ability to file and pursue a cost-recovery claim.

First, an overview of the statutes and regulations involved might assist the court. Two state statutes directly govern the release of petroleum products from underground storage tanks (USTs). The state superfund statute, as discussed above, provides both DEQ cleanup authority and a private cause of action. The UST statute, ORS 466.705 et seq., gives DEQ authority to order the owner or permittee of an UST to undertake investigations and cleanup of leaking USTs. This statute does not contain a cost-recovery provision for private parties.[3]

Two sets of regulations also may be applied to leaking USTs. The first are known as the Environmental Cleanup Rules, OAR 340-122-020 through 340-122-110. These rules were adopted to implement the state superfund statute. The second set of regulations are the Cleanup Rules for Leaking UST Systems, OAR 340-122-205 through 340-122-360. The UST Cleanup Rules were adopted under authority both of the state superfund statute and the UST statute. They are usually applied to govern the investigation and cleanup of petroleum UST leaks, unless the magnitude or complexity of the contamination leads DEQ to apply the Environmental Cleanup Rules instead. See OAR 340-122-215(2).

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[3] However, a person investigating or cleaning up an UST petroleum leak, even if ostensibly in accordance with the UST statute, may seek cost recovery under the state superfund statute. The definition of "hazardous substances" under the latter includes petroleum products, ORS 465.200(9), and, as discussed infra, UST regulations were adopted under the state superfund statute as well as under the UST statute.

Also, the UST statute does authorize private cost recovery in the specific instance when an owner or permittee of a nonleaking UST undertakes investigations to determine which tank was the source of a release. ORS 466.825.

The UST Cleanup Rules do establish a number of requirements with which the owner or permittee or other person responsible for a leaking UST must comply in investigating and remediating a petroleum release. See OAR 340-122-230 through 340-122-250. If the responsible party fails to follow the regulations, he or she is subject to assessment of civil penalties or other enforcement action by DEQ. See ORS 466.810, 466.895. The same is true under the Environmental Cleanup Rules, if DEQ has elected to apply those rules to a leaking UST. See ORS 465.900.

However, a person's obligation to follow the UST or Environmental Cleanup Rules, as a regulatory matter or in an enforcement context, does not constitute an obligation to follow the rules as a cost-recovery prerequisite. Unlike the cost-recovery prerequisite under CERCLA that cleanups must be "consistent with the National Contingency Plan," and contrary to defendant's assertion on page 10 of its Response, there is no state requirement that remedial actions be "consistent" with state regulations.[4] Instead, the state superfund statute only requires that the costs claimed by a plaintiff be:

(1) "Attributable to or associated with a removal or remedial action"; and

(2) "Reasonable."

ORS 465.200(16).

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[4] But see, Metropolitan Service District v. Oregon Metal Finishers, 32 ERC 1102 (D. Or. 1990), where, in conjunction with dismissal of CERCLA claim for failure to comply with NCP, court also dismissed state superfund claim without analysis.

The definitions for "removal" and "remedial action" are broad, encompassing the range of investigative and cleanup activities at a site--from initial site characterization to soils excavation to groundwater pumping and treatment. *See* ORS 465.200(15) and (17). The removal or remedial action must have the purpose of preventing, minimizing, or mitigating harm to public health or the environment posed by a release of hazardous substances. *Id.*; ORS 465.315(1)(a).

These definitions and requirements do not include the requirement that the removal or remedial action be performed in accordance with DEQ regulations. *Id.* But such compliance or noncompliance might be relevant to whether a plaintiff's remedial action costs were "reasonable." Thus, for example, a court could examine whether a plaintiff's collection and analysis of groundwater samples conformed to the protocol and testing parameters established under the UST Cleanup Rules at OAR 340-122-242(2) and (3)--as evidence that the plaintiff's investigative costs were scientifically proper and therefore "reasonable." Or, as another example, a court could consider standards applicable to DEQ's selection of a remedial action under the Environmental Cleanup Rules, such as cost effectiveness under OAR 340-122-090(1)(b)(B)--in determining whether the plaintiff's remedial action costs were "reasonable." Finally, in whatever way a plaintiff's costs are approached analytically (i.e., whether they are evaluated under the "reasonable" criterion or under the definition of "removal" or "remedial action"), those costs must have been incurred for activities having the purpose of preventing, minimizing, or mitigating a release of hazardous substances.

In sum, DEQ suggests that the UST and Environmental Cleanup Rules not be applied as a prerequisite to a cost-recovery action, but as one guide in determining the amount of costs that may be recovered in such action. A plaintiff's case that its costs were "reasonable" and constituted "remedial action costs" might be stronger if plaintiff complied with the regulations; however, regulatory compliance is not mandated by statute as a necessary prerequisite to the ability to seek costs.

This application of the state statute would serve two purposes. First, it would maintain an incentive for private parties to undertake their own cleanup activities. Second, the weight accorded compliance with the regulations' substantive criteria should discourage shoddy cleanup efforts.

3. DEQ Oversight and Approval are not Prerequisites to a Cost-Recovery Action

Defendant argues that state regulations "require DEQ oversight and approval at every step," that "[c]leanup costs are just cleanup costs unless and until they have received the mandatory DEQ scrutiny," and that plaintiffs are not entitled to pursue a private cost-recovery claim absent such DEQ oversight and approval. Defendant's Response, pp. 13-14.

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Defendant misapplies the requirement of DEQ oversight and approval. DEQ's regulations, by their own terms, do not require DEQ oversight and approval in every instance. For example, the Environmental Cleanup Rules requiring DEQ approval of a remedial investigation, a feasibility study, and a proposed remedial action expressly apply to determinations that are made by the director of DEQ. <u>See</u> OAR 340-122-080(1) and 340-122-090(1). In practice, this DEQ involvement occurs in three situations: (1) When DEQ itself is performing a site investigation or cleanup; (2) When DEQ orders a private party to perform a site investigation or cleanup; or (3) When DEQ provides oversight of a private party's site investigation or cleanup by consensual arrangement. This DEQ involvement does not occur, and the rules do not require it, when a person elects for whatever reason to proceed with remedial activities on its own.

Similarly, the UST Cleanup Rules' requirement cited by defendant that a corrective action plan be submitted for DEQ approval is not triggered until DEQ determines that a corrective action plan is necessary. OAR 340-122-250(1). The same rule allows a person to commence corrective action prior to DEQ approval, provided certain conditions are met, "in the interest of minimizing environmental contamination and promoting more effective cleanup." OAR 340-122-250(6).

Again, failure ultimately to obtain DEQ approval ~~of~~ a corrective action plan might expose a person to regulatory sanctions by DEQ, or affect the strength of a plaintiff's cost-recovery case, but it does not bar pursuit of cost recovery. The definitions of "removal" and "remedial action" do not include the requirement that the activities first be approved by DEQ. ORS 465.200(15) and (17). DEQ approval might be relevant to whether remedial action costs were "reasonable," but does not constitute a procedural prerequisite.

Federal court decisions under CERCLA support this interpretation. The Ninth Circuit has held that prior governmental approval is not necessary for cost recovery under CERCLA. *Cadillac Fairview/California, Inc. v. Dow Chemical Co.*, 840 F.2d 691, 695 (9th Cir. 1988).[5] The court was unwilling to force agencies to "devote their limited resources" to the burden of such a procedure, especially when not required to do so by statute. *Id.* Similarly, in its preamble to the 1985 revised NCP, the EPA stated that "no Federal approval of any kind is a prerequisite to cost recovery under [CERCLA]." 50 Fed. Reg. 47912, 47934 (November 20, 1985). EPA explained that the costs and delays of the approval process could

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[5] *Accord* *Tanglewood East Homeowners v. Charles-Thomas, Inc.*, 849 F.2d 1568, 1575 (5th Cir. 1988); *New York v. Shore Realty Corp.*, 648 F. Supp. 255, 263 (E.D. N.Y. 1986); *Homart Development Co. v. Bethlehem Steel Corp.*, 22 Env. Rept. Cases (BNA) 1357 (N.D. Ca. 1984); *General Electric Co. v. Litton Business Systems, Inc.*, 715 F. Supp. 949, 959 (W.D. Mo. 1989); *But see*, *Artesian Water Co. v. New Castle County*, 605 F. Supp. 1348, 1357, 1360 (D. Del. 1985), *modified*, 659 F. Supp. 1269 (D. Del. 1987), *aff'd on other grounds*, 851 F.2d 643 (3rd Cir. 1988) [prior EPA approval not required by CERCLA, but by NCP]; *Bulk Distribution Centers v. Monsanto Co.*, 589 F. Supp. 1437, 1450 (S.D. Fl. 1984).

significantly reduce the number and scope of private cleanups. *Id.*[6] The state superfund statute should be interpreted in the same way as its federal model.

In light of this federal precedent, as well as the state statute's facial terms, prior DEQ approval should not be read as a cost-recovery prerequisite. It also should not be made a prerequisite for policy reasons. DEQ will never have the capacity to review and approve every investigative step and every cleanup measure that are needed at each of the thousands of hazardous waste and leaking tank sites in the state. The state fisc by itself will never be sufficient to clean up each of these sites. Private money and remedial activities are an important engine in driving cleanups. Requiring prior DEQ approval as a cost-recovery prerequisite for private efforts would either place an administrative burden on DEQ it could not

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[6] The preamble to the most recent revision to the NCP does not contain the same discussion, but does state:

> "[I]t is important to note that CERCLA section 107(a)(4)(B) does not require private parties to conduct cleanups consistent with the NCP; rather, it establishes a right of action under CERCLA for cost recovery in those cases where non-governmental parties have incurred necessary response costs consistent with the NCP. The result of not meeting the standard is that cost recovery under CERCLA may not be available; however, this does not mean that the action may not proceed, or that cost recovery may not be available under other federal or state law."

55 Fed. Reg. 8796 (March 8, 1990).

handle, or dissuade private parties from performing cleanups because of the prospect of indefinite delay in procuring agency approval. Prior approval as a procedural prerequisite therefore could hinder state and private efforts to clean up hazardous waste and tank sites. Cleanups protective of health and the environment would continue to be encouraged, however, by application of DEQ's rules as a measuring stick for the merits of cost-recovery claims.

DATED this 28th day of September, 1992.

KURT BURKHOLDER
Assistant Attorney General
Of Attorneys for Oregon
Department of Environmental
Quality

CERTIFICATE OF SERVICE BY MAIL

I certify that on September 28th, 1992, I served the foregoing MEMORANDUM OF LAW OF OREGON DEPARTMENT OF ENVIORNMENTAL QUALITY, AMICUS CURIAE upon the parties by mailing, regular mail, postage prepaid, a true copy to:

Leon Simson
Ball, Janik & Novack
101 SW Main, Suite 1100
Portland, OR 97204

John Cahalan
Dunn, Carney, et al.
851 SW Sixth Avenue, Suite 1500
Portland, OR 97204

Ron Adams
Black, Helterline
707 SW Washington, Suite 1200
Portland, OR 97205

Kurt Burkholder
KURT BURKHOLDER
Assistant Attorney General

BEFORE THE ENVIRONMENTAL QUALITY COMMISSION
OF THE STATE OF OREGON

IN THE MATTER OF: Department of Environmental Quality, Department	)	HEARING ORDER REGARDING VIOLATION AND ASSESSMENT OF CIVIL PENALTY NO. UT-NWR-96-274A
vs.	)	
Staff Jennings, Inc. Respondent	)	MULTNOMAH COUNTY

BACKGROUND

The Department of Environmental Quality issued a Notice of Civil Penalty Assessment on March 7, 1997, under Oregon Revised Statutes (ORS) Chapter 183 and 468.126 through 468.140, and Oregon Administrative Rules (OAR) Chapter 340, Divisions 11 and 12. On March 24, 1997, Jeffrey S. Jones, attorney for respondent, Staff Jennings Inc., appealed the Notice and requested a hearing.

A hearing was held on December 3, 1997, in the Department of Environmental Quality (DEQ) offices in Portland, Oregon before hearings officer, Linda B. Lee. Jeff Jennings, President of Staff Jennings, appeared with one witness and was represented by his attorney, Jeff Jones. Christopher Rich, environmental law specialist, represented DEQ, with four witnesses.

ISSUES

Did respondent cause pollution by allowing a continuous discharge of petroleum from an underground storage tank spill or release to enter waters of the state in violation of ORS 468B.025(1)(a)?

Is the respondent subject to a civil penalty for this violation pursuant to OAR 340-12-069(f), OAR 340-12-042(2) and OAR 340-12-045?

Did the respondent fail to initiate and complete the investigation or clean up of a petroleum release from an underground storage tank, in violation of OAR 340-122-242?

FINDINGS OF FACT

1. The Staff Jennings Marina is located at 8240 S.W. Macadam Avenue in Portland, Oregon. It is bordered to the north by undeveloped river front acreage located on the west bank of the Willamette River. It is bordered to the east by the Willamette River. It is bordered to the south by an access road leading to a Multnomah County boat ramp located beneath the Sellwood

Bridge. It is bordered on the west by a railroad track, and access road, and SW Macadam Avenue.

2. As of October 1988 there were two underground storage tanks (UST) located on the Staff Jennings property. One was a 4,000 gallon gasoline UST, the other a 10,000 gallon gasoline UST.

3. On or about October 18, 1988, an unknown quality of petroleum discharged which saturated the soil and ground water and discharged a plume of free petroleum into the Willamette River. The Staff Jennings marina manager observed a slick of petroleum fuel and contacted a company to begin clean-up activities. Clean-up operations were undertaken. Soil samples were taken and it was determined that the source of the spill was one of the USTs. Staff Jennings personnel discontinued use of both the USTs. It was subsequently determined that the spill resulted due to a broken fuel distribution line on the larger UST.

4. On October 19, 1988 the release of petroleum contamination was reported to the Department of Environmental Quality, the Coast Guard and the local fire department.

5. Over the next several months, Staff Jennings made arrangements to have the USTs inspected, tested and repaired. Staff Jennings also hired a consultant, Golder Associates Inc., to study the situation and offer recommendations to address the problem and prevent future occurrences. On April 3, 1989, a report of findings regarding the site was prepared (See Exhibit 7). That report contained recommendations for remediation plans. On January 3, 1990, Golder Associates Inc. submitted a remediation plan (See Exhibit 9). Suggested remediation options were: removal and aeration of the affected soils, excavation of an interceptor/extraction trench to prevent further fuel migration into the river system, installation of a large bore extraction well, and placement of well points to remove free product from the ground water. The well point installation was the recommended option.

6. Over the next several years, Staff Jennings was in contact with DEQ regarding the situation but Staff Jennings did not immediately move forward with the remediation plan. Based on its contacts with DEQ representatives from 1988 until 1995, Staff Jennings was of the opinion that remediation was not a high priority matter. Sporadic actions were initiated by Staff Jennings including applying for financial assistance, hiring a different consultant, making arrangements and obtaining permits to conduct testing on adjacent properties, conducting tests at the marina.

7. In October 1994, the old USTs were decommissioned. Soil sampling was conducted and contamination was detected beyond the confines of the excavation site. A report regarding the underground storage tank decommissioning was prepared by De Minimis Inc. Environmental Management, the replacement consultant hired by Staff Jennings. A copy of this report was forwarded to DEQ (Exhibit 16).

8. In a letter from DEQ, dated December 21, 1994, Staff Jennings was asked to submit a proposed schedule of events for the implementation of the groundwater investigation, including the installation of at least three monitoring wells by January 23, 1995. As of November 1995, the DEQ representative told Jeff Jennings and the consultant that as long as they were making active progress toward addressing the impact of the release he would not

proceed with a notice of noncompliance with a recommendation for civil penalty. He indicated the time frame for getting the borings and ground water samples was during that winter (1995). He indicated the time frame for installing a remedial system was prior to the following year's rainy season, by October 1996.

9. When a remedial system was not installed by November 7, 1996, a Notice of Noncompliance was issued. The matter was referred to the DEQ Enforcement Section and on March 7, 1997, the Notice of Assessment of Civil Penalty was issued.

10. DEQ imposed a civil penalty of $8,400 based on a finding that Staff Jennings caused pollution of waters of the state in violation of ORS 468B.025. A copy of the Findings and Determination of the Respondent's Civil Penalty is attached to this decision as Exhibit (1). DEQ considered also imposing an additional penalty amount of $52,207 for economic benefit but opted not to do so. Instead, DEQ requested that Staff Jennings meet the terms and conditions of a remedial action order that was not subject to appeal.

11. The February 1989 report prepared by Golder and Associates as well as subsequent reports prepared by De Minimis, Inc. in 1994 and 1996 indicated high level BTEX (benzene, toluene, ethylbenzene and total xylenes) contamination in the soil. This contamination was an ongoing source of petroleum contamination discharging into the Willamette River.

ULTIMATE FINDINGS

Respondent Staff Jennings caused the pollution of state waters.

Respondent Staff Jennings failed to complete the investigation or cleanup of a petroleum release from an underground storage tank.

APPLICABLE LAW

ORS 468B.025 (1) (a) states:

> (1) Except as provided in ORS 468B.050, no person shall:
> (a) Cause pollution of any waters of the state or place or cause to be placed any wastes in a location where such wastes are likely to escape or be carried into the waters of the state by any means.

ORS 468B.005(3) states:

> "Pollution" or "water pollution" means such alteration of the physical, chemical or biological properties of any waters of the state, including change in temperature, taste, color, turbidity, silt or odor of the waters, or such discharge of any liquid, gaseous, solid, radioactive or other substance into any waters of the state, which will or tends to either by itself or in connection with any other substance, create a public nuisance or which will or tends to render such waters harmful, detrimental or injurious to public health, safety or welfare, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate

beneficial uses or to livestock, wildlife, fish or other aquatic life or the habitat thereof.

ORS 468B.005(7) states:

> "Wastes" means sewage, industrial wastes, and all other liquid, gaseous, solid, radioactive or other substances which will or may cause pollution or tend to cause pollution of any waters of this state.

ORS 468B.005(8) states:

> "Water" or "the waters of this state" include lakes, bays, ponds, impounding reservoirs, springs, wells, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Pacific Ocean within the territorial limits of the State of Oregon and all other bodies of surface or underground waters, natural or artificial, inland or coastal, fresh or salt, public or private . . . which are wholly or partially within or bordering the state or within its jurisdiction.

CONCLUSIONS AND REASONS

The fact that an UST on Staff Jennings property began leaking and discharged petroleum into the soil and later into the Willamette river is not in dispute. Clearly, Staff Jennings was responsible for maintaining its property in such a manner so as to avoid causing pollution of state waters. Staff Jennings argues that no penalty should be imposed because DEQ did not convey a sense of urgency.

It is true that in the early years following the discharge of the petroleum, DEQ did not aggressively pursue the matter. However, in 1995, Staff Jennings was put on notice in writing, that it needed to move forward with the implementation of a remediation plan. As of March 7, 1997, the date the Notice of Civil Penalty Assessment and Remedial Action Order were issued. Staff Jennings had not complied with its statutory obligation. Given the circumstances, a penalty is warranted.

As outlined in the Findings and Determination of Respondent's Civil Penalty (Exhibit 1), causing pollution of waters of the state is a Class I violation pursuant to OAR 340-12-069 (1)(f). The magnitude of the violation is determined to be moderate pursuant to OAR 340-10-045 (1)(a)(ii). In its penalty assessment, DEQ found that Respondent caused the spill of oil through a negligent act.

Negligence is defined in OAR 340-12-030 (11) which states: "Negligence" or "negligent" means failure to take reasonable care to avoid a foreseeable risk of committing an act or omission constituting a violation.

As of February 1989, Staff Jennings was on notice that there was petroleum contamination in the soil that was discharging in the Willamette River. Despite this information, it failed to take reasonable actions, e.g. remediation, to avoid the contamination of the river.

DEQ has the burden of establishing a violation by a preponderance of the evidence. Based on the evidence presented, DEQ has met its burden. The penalty as assessed is appropriate.

CIVIL PENALTY

The Respondent, Staff Jennings is liable for a civil penalty of $8,400.

Dated this 18 th day of March, 1998.

ENVIRONMENTAL QUALITY COMMISSION

Linda B. Lee

Linda B. Lee
Hearings Officer

BEFORE THE ENVIRONMENTAL QUALITY COMMISSION
OF THE STATE OF OREGON

IN THE MATTER OF:
Department of Environmental Quality,
Department

vs.

Staff Jennings, Inc.
Respondent

FINAL ORDER
AND JUDGMENT
NO. UT-NWR-96-274A

MULTNOMAH COUNTY

The Commission, through its hearings officer, orders that Staff Jennings is liable to the state of Oregon in the sum of $8,400 and that the state has judgment for and to recover that amount pursuant to the civil penalty assessment dated March 7, 1997.

Review of this order is by appeal to the Environmental Quality Commission pursuant to OAR 340-11-132. A request for review must be filed within 30 days following the mailing date of this order.

Dated this 18 th day of March, 1998.

ENVIRONMENTAL QUALITY COMMISSION

Linda B Lee
Linda B. Lee
Hearings Officer

Appeal Rights

If you are not satisfied with this decision, you have 30 days, following the mailing date of the order to appeal it to the Environmental Quality Commission. See Oregon Administrative Rule (OAR) 340-11-132. If you wish to appeal the Commission's decision, you have 60 days to file a petition for review with the Oregon Court of Appeals from the date of service of the order by the Environmental Quality Commission. See, ORS 183.480 et seq.

STATEMENT OF MAILING

AGENCY CASE NO. UT-NWR-96-274A
HEARINGS CASE NO. G60061

I certify that the attached Final Order was served through the mail to the following parties in envelopes addressed to each at their respective addresses, with postage fully prepaid.

Staff Jennings **(Certified)**
c/o Jeffrey S. Jones, Attorney
1001 Molalla Avenue, Suite 208
Oregon City, OR 97045-3768
(Sent with Jeffrey S. Jones' certified copy)

Jeffrey S. Jones, Attorney **(Certified)**
1001 Molalla Avenue, Suite 208
Oregon City, OR 97045-3768

Chris Rich
DEQ Enforcement Section
2020 SW Fourth, 4th Floor
Portland, OR 97201-4987

Susan Greco
DEQ
811 SW Sixth Avenue
Portland, OR 97204

Mailing/Delivery Date: 3/18/98
Hearings Clerk: DD

EXHIBIT (1)

FINDINGS AND DETERMINATION OF RESPONDENT'S CIVIL PENALTY PURSUANT TO OREGON ADMINISTRATIVE RULE (OAR) 340-12-045

<u>VIOLATION</u>: Causing pollution of waters of the state.

<u>CLASSIFICATION</u>: This is a Class I violation pursuant to OAR 340-12-069(1)(f).

<u>MAGNITUDE</u>: Absent any other finding, the magnitude of the violation is determined to be moderate pursuant to OAR 340-12-045(1)(a)(ii).

<u>CIVIL PENALTY FORMULA</u>: The formula for determining the amount of penalty of each violation is:

$$BP + [(0.1 \times BP) \times (P + H + O + R + C)] + EB$$

"BP" is the base penalty which is $3,000 for a Class I moderate magnitude violation in the matrix listed in OAR 340-12-042(1). Pursuant to OAR 340-12-042(2) the base penalty is doubled (to $6,000) because Respondent caused the spill of oil, as defined by OAR 340-108-002(11), through a negligent act.

"P" is Respondent's prior significant action(s) and receives a value of 0 because the Department has not taken any prior significant actions against Respondent.

"H" is the past history of Respondent in taking all feasible steps or procedures necessary to correct any prior significant action(s) and receives a value of 0 because the Department has not taken any prior significant actions against Respondent.

"O" is whether or not the violation was a single occurrence or was repeated or continuous during the period of the violation and receives a value of 2 because the illegal discharge was repeated for many days between October of 1988 and January of 1997.

"R" is the cause of the violation and receives a value of 2 because Respondent was negligent. Respondent failed to take reasonable care to immediately clean up a spill or release of petroleum, and thereby avoid the foreseeable risk of causing pollution to waters of the state.

"C" is Respondent's cooperativeness in correcting the violation and receives a value of 0 because Respondent was neither cooperative not uncooperative.

"EB" is the approximate dollar sum of the economic benefit that the Respondent gained through noncompliance, and receives a value of $0.

PENALTY CALCULATION:

Penalty = BP + [(0.1 x BP) x (P + H + O + R + C)] + EB
= \$6,000 + [(0.1 x \$6,000) x (0 + 0 + 2 + 2 + 0)] + \$0
= \$6,000 + [(\$600) x (4)] + \$0
= \$6,000 + \$2,400 + \$0
= \$8,400

COPY

UNDERGROUND STORAGE TANK DECOMMISSIONING

Staff Jennings, Inc.
Retail Facility and Marina
8240 SW Macadam Avenue
Portland, Oregon 97219

UST Cleanup List #26-88-0078

Project # 00317-0994

Prepared For:

Staff Jennings, Inc.
8240 SW Macadam Avenue
Portland, Oregon 97219

December 13, 1994

De Minimis Inc. Environmental Management
34 N.W. First Avenue • Suite 101 • Portland, Oregon • (503) 295-4074

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FIGURES and MAPS

APPENDICES

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1.0 INTRODUCTION

At the request of Staff Jennings, Inc. (Client), De Minimis Inc. (DMI) Environmental Management provided project management services for the decommissioning and removal of two, out-of-service, gasoline underground storage tanks (USTs) from the Retail Facility and Marina located at 8240 SW Macadam Avenue, Portland, Oregon, 97219. The USTs were decommissioned by removal on October 10 and 11, 1994, after an upgraded UST system was installed by others at the subject facility in September 1994.

The project consisted of three tasks: 1) excavation, removal, and disposal of two gasoline USTs; 2) site characterization soil sampling and analyses for the presence of petroleum hydrocarbons; and 3) contaminated soil disposal. The activities, analytical results, and interpretations of this project are described in this report.

2.0 SITE DESCRIPTION AND BACKGROUND

2.1 Site Description

The subject property is located at 8240 SW Macadam Avenue in a commercial corridor approximately 3-1/2 miles south of downtown Portland, Oregon (See Figure 1-Site Location). The subject property is 2.36 acres in area. The geographic location of the subject property is Section 22, Township 1 South, Range 1 East of the Willamette Meridian, in the County of Multnomah and State of Oregon. The subject property has been owned by the Jennings family since it was purchased in August 1937.

The subject property is bordered to the north by undeveloped river front acreage located on the west bank of the Willamette River. The subject property is bordered to the east by the Willamette River, which flows to the north. The subject property is bordered to the south by an access road leading to a Multnomah County boat ramp (formerly a ferry crossing ramp) located beneath the Sellwood Bridge. The subject property is bordered on the west by a railroad track, an access road, and SW Macadam Avenue. Undeveloped, forested acreage is located to the west of SW Macadam Avenue.

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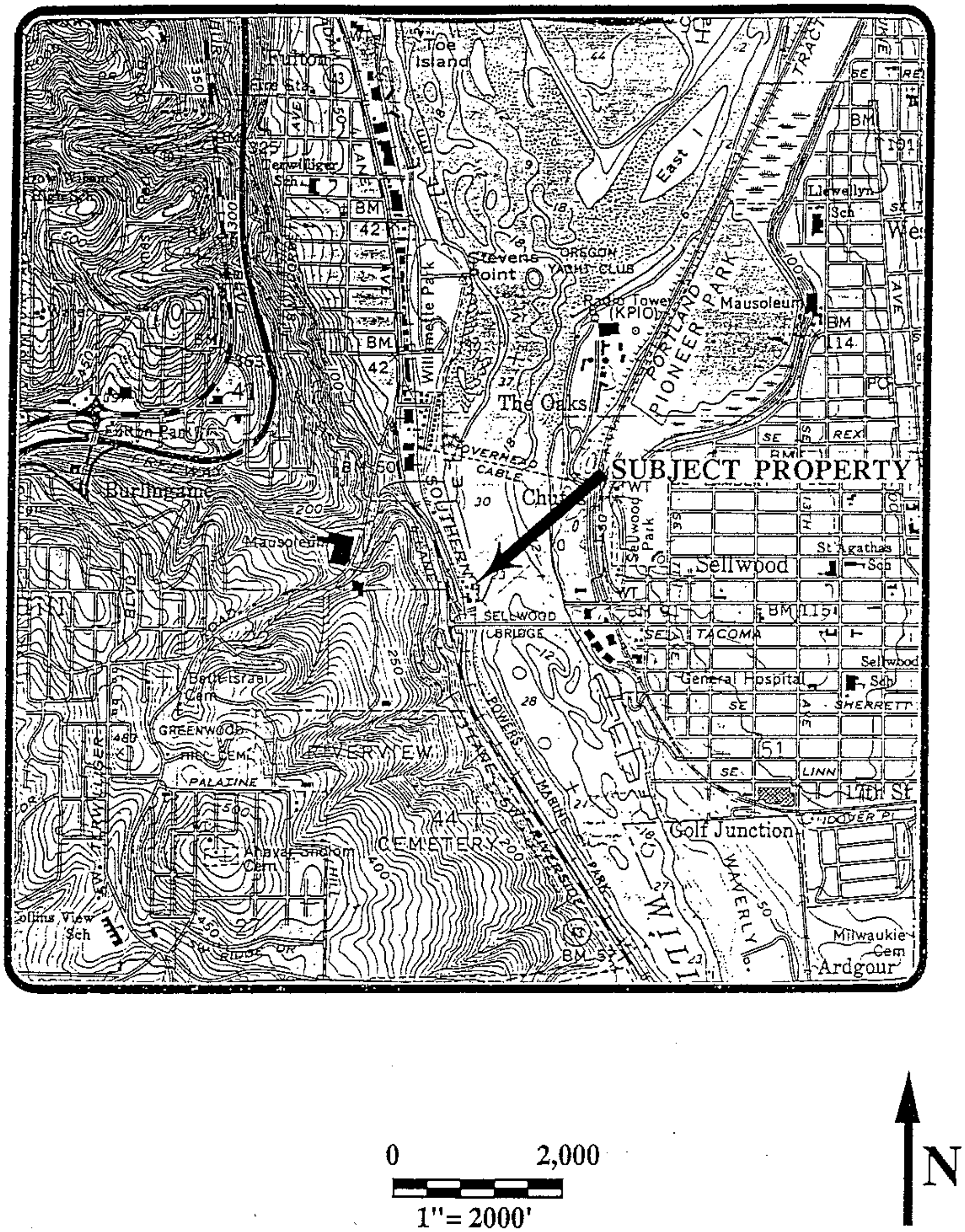


Base Map from U.S. Geological Survey 7.5 Minute Lake Oswego Quadrangle

PROJECT NO. 00317-0994 October 1994	**DE MINIMIS INC.** ENVIRONMENTAL MANAGEMENT 34 N.W. FIRST AVENUE, SUITE 101 PORTLAND, OREGON 97209 503/295-4074	**Site Location** Underground Storage Tank (UST) Decommissioning Staff Jennings, Inc. 8240 SW Macadam Avenue Portland, Oregon 97219	FIGURE 1

The subject property occupies two levels on the west bank of the Willamette River at the base of a moderately steep slope. The majority of the site (the main level) is located on a terrace which has been excavated into the river bank approximately 20-30 feet above the Willamette River. The main building (housing the retail facility, administrative offices, and repair shop), the rigging shop, the boat storage building, the out-of-service USTs, the UST pump shed, and the upgraded UST system are located on the main level. The remainder of the main level is paved with asphalt or concrete. The crane dock, an elevated concrete platform supported by steel beams, is located on the northern portion of the main level and extends to the east over the bank of the Willamette River. The subject property slopes steeply from the main level down to the west bank of the Willamette River. Two floating docks are located below the main level on the river.

The subject facility retails gasoline for watercraft. The subject facility is registered with the Oregon Department of Environmental Quality (DEQ) as Staff Jennings, Inc., (DEQ Facility I.D. Number 3105). Two active, permitted USTs are registered for the subject facility:

UST #	DEQ UST I.D.	Capacity (gallons)	Contents
#1	EAHK	4,000	Gasoline
#2	EAHA	10,000	Gasoline

Oregon DEQ files reported that UST #1 was installed in 1971 and UST #2 was installed in 1981. Mr. Jeff Jennings, President, Staff Jennings, Inc., previously stated that the USTs contained a mixture of 50 percent regular leaded gasoline and 50 percent supreme unleaded gasoline. Mr. Jennings also stated that " years ago" diesel fuel was stored on-site in a UST and was pumped from the crane dock.

2.2 Site Background

The following information regarding the UST release was supplied or confirmed by Mr. Jennings:

- On October 18, 1988, the Staff Jennings marina manager observed a petroleum fuel slick on the Willamette River downgradient from the on-site USTs. The marina manager contacted SRH Associates, Inc., Portland, Oregon, to perform cleanup operations. SRH Associates deployed a floating boom on the Willamette River to contain the slick. Pads were used to absorb the floating product. Additionally, soil samples were collected in the spill area to confirm that the released material was gasoline from the subject facility. Staff Jennings temporarily discontinued use of the USTs. SRH Associates notified the Oregon DEQ (DEQ UST Cleanup #26-88-0078), the U.S. Coast Guard, and the Portland Fire Department of the release on October 19, 1988. The primary source of the released fuel was reportedly a cracked elbow in the UST piping located near the fuel turbine pump for the 10,000-gallon UST. The cracked elbow and other minor leaks in the product distribution lines were subsequently repaired.

- On February 16-17, 1989, Golder Associates, Inc. (GAI), conducted a preliminary soils investigation to determine the extent and quantity of contamination due to the release from the on-site UST (See GAI *Report of Findings Preliminary Field Investigation of Sellwood Marina, Portland, Oregon,* March 27, 1989). This investigation confirmed that petroleum hydrocarbon contamination (gasoline) existed adjacent to the USTs and extended downgradient to the edge of the Willamette River. Elevated contaminant levels for gasoline, benzene, toluene, ethylbenzene, xylene, and lead were reported for soil samples collected adjacent to and downgradient from the USTs. Maximum soil contaminant levels (contaminants reported in parts per million, ppm, or parts per billion, ppb) collected from the river bank were: 11,600 ppm total petroleum hydrocarbon (TPH); 9,200 ppm gasoline; 273,000 ppb benzene; 685,000 ppb toluene; 562,000 ppb ethylbenzene; 1,530,000 ppb xylene; and 16 ppm lead. Groundwater was encountered in the soil borings at depths ranging from 0.6 to 3.3 feet below ground surface (bgs).

- A soil and groundwater investigation was conducted by DMI on March 15, 1994 (See *Limited Subsurface Soil and Groundwater Investigation, Staff Jennings, Inc., Retail Facility and Marina*, March 31, 1994). Gasoline contamination (TPH-G) was detected in soils adjacent to and downgradient from the on-site USTs and ranged from "Not Detected" (presumed upgradient from the USTs) to 3,300 ppm TPH-G (located downgradient from the USTs).

Since gasoline contamination was detected in soil samples collected at a depth greater than or equal to the depth of the water table; three downgradient groundwater samples were analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX). The basic numeric groundwater cleanup levels for petroleum-contaminated UST sites for BTEX are: 1) benzene, 5 ppb; 2) toluene, 1,000 ppb; 3) ethylbenzene, 700 ppb; and 4) total xylenes, 10,000 ppb. Groundwater contaminant concentrations detected during March

1994 exceeded the basic numeric groundwater cleanup levels: benzene (16,100-27,000 ppb), toluene (46,100-60,100 ppb), ethylbenzene (5,700-27,900 ppb), and total xylenes (29,700-143,000 ppb).

The groundwater samples were also analyzed for ethylene dibromide (EDB or 1,2-dibromoethane), ethylene dichloride (EDC or 1,2-dichloroethane), and dissolved lead. The basic numeric groundwater cleanup levels for the following gasoline additives are: 1) ethylene dibromide (EDB), 1 ppb; 2) ethylene dichloride (EDC), 5 ppb; and 3) dissolved lead, 5 ppb. Due to the high concentrations of fuel hydrocarbons present in the groundwater samples which necessitated sample dilution; the detection limits for EDB and EDC were raised to 1.0-2.5 ppb. These raised detection limits for EDB equaled or exceeded the basic numeric groundwater cleanup level for EDB. EDB and EDC were not detected at or above the raised detection limits in any of the groundwater samples. Two groundwater samples had dissolved lead concentrations ranging from 6-23 ppb, in excess of the DEQ groundwater cleanup level of 5 ppb lead.

3.0 ON-SITE ACTIVITIES

3.1 Permits and Licenses

Since the USTs were registered with the Oregon DEQ, the Notice of Underground Storage Tank Permanent Decommissioning/Service Change was submitted to the DEQ on September 7, 1994, 30 days prior to the start of work. The Three Day Advance Notice Before Work Begins (#26-3D-94-180) was authorized by Mr. Greg Toran, DEQ Northwest Region, on October 10, 1994. A UST decommissioning permit was obtained from the City of Portland, Fire Prevention Division, on October 5, 1994 (See Appendix C - Permits, Receipts, and Licenses for Permit #T941246).

De Minimis Inc. (DMI) was the DEQ-licensed UST Service Provider (license #13383) and Soil Matrix Cleanup Provider (license #11123) (See Appendix C - Permits, Receipts, and Licenses). Mr. Dale L. Haar, DMI Environmental Scientist, was the on-site DEQ-licensed UST Decommissioning Supervisor (license #12425) and the UST Soil Matrix Cleanup Supervisor (license #12426).

Northwest Field Services, Inc. (NWFS), Portland, Oregon, provided UST cleaning, excavation, removal, and disposal services. Northwest Field Services, Inc. is also a DEQ-licensed UST Service Provider (license #10653) and Soil Matrix Cleanup Provider (license #1478).

3.2 UST Preparations and Site Safety

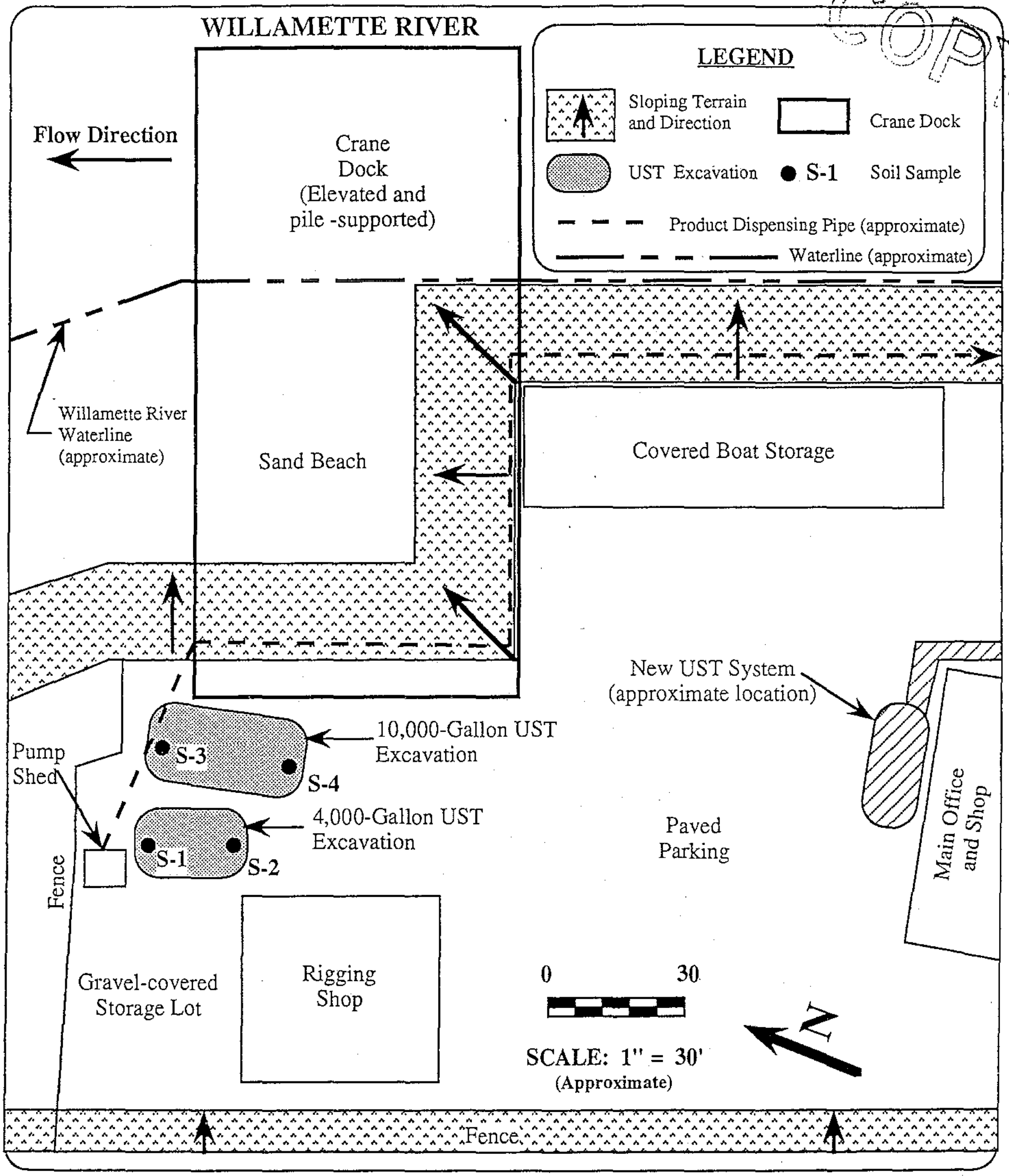
A utility locate was performed prior to excavation activities on or before October 6, 1994. No subsurface utilities were marked in the proposed areas of excavation.

Excavation activities commenced on October 10, 1994, to decommission by removal the two USTs not currently in use. A Site Health and Safety meeting was conducted prior to initiating all site work to review site-specific health and safety hazards associated with this project. Copies of the Site Health and Safety plan were distributed to all field personnel and to the Client.

The product levels were measured in the USTs. UST #1 (4,000 gallons) contained approximately one inch of water and 15-16 inches of gasoline. UST #2 (10,000 gallons) contained approximately 10 inches of gasoline and no water. Approximately 1,100 gallons of gasoline was vacuum-pumped by NWFS from the old USTs and transferred into the newly installed UST system, as per the instructions of the Client. Staff Jennings personnel confirmed electricity to the UST pump shed had been switched off.

3.3. Underground Storage Tank Decommissioning

The concrete slabs covering the USTs were removed. The tops of the USTs (approximately 2 to 3 feet below ground surface-bgs) were exposed by excavating the overlying soil with a trackhoe. Two excavations, one for each UST, were excavated. Product dispensing lines were drained into the USTs. When sufficient soil had been removed, the fill pipes and the product dispensing lines adjacent to the USTs and the pump shed were detached and removed. The UST vent lines were left intact to facilitate venting during the UST inerting process. Pipes and connections appeared to be secure and in generally good condition. Gray soils and strong gasoline odors (visual and olfactory evidence of contamination) were observed above and adjacent to each UST.



PROJECT NO. 00317-0994	**DE MINIMIS INC.**	**Site Map**	FIGURE
October 10, 1994	ENVIRONMENTAL MANAGEMENT 34 N.W. FIRST AVENUE, SUITE 101 PORTLAND, OREGON 97209 503/295-4074	Underground Storage Tank (UST) Decommissioning Staff Jennings, Inc. 8240 SW Macadam Avenue Portland, Oregon 97219	2

Contaminated soil was immediately stockpiled on polyvinyl sheeting for disposal pending analytical results.

The USTs were triple-rinsed with water to remove product residue. Approximately 390 gallons of rinsate was initially vacuum-pumped from the USTs on October 10, 1994. Two uncapped pipes located adjacent to the former dispensing pump island on the east side of the building were also vacuum-pumped; however, NWFS personnel were unable to completely drain one of these lines. An additional 142 gallons of the remaining rinsate was vacuum-pumped from the USTs on October 11, 1994, after the USTs were removed from the excavation. The rinsate was delivered to Harbor Oil, Inc., Portland, Oregon, for recycling on October 10 and 13, 1994 (See Appendix C - Permits, Receipts, and Licenses for receipts #20614 and #20652, respectively).

The USTs were inerted with dry ice and gasoline vapors were vented through the vent lines. An ISC MX-251 combustible gas detector and oxygen meter was utilized to monitor the lower explosive limit (LEL) present in the tanks. After inerting, the vent lines were removed from the USTs and the openings were capped.

When the USTs were fully excavated around their ends and sides, NWFS removed each UST from the excavation. The USTs were set on the ground and chocked to prevent rolling. Upon removal, the exterior of the USTs were visually inspected for holes and evidence of leakage. The USTs were slightly to moderately corroded; however, no corrosion holes were observed. The remaining pipes leading from the USTs to the pump shed were removed. A warning label with former contents information was spray painted onto the USTs. One end of each UST was cut out thus rendering the USTs unusable. Approximately one-half inch of sludge was removed from UST #1 and approximately one-quarter inch of sludge was removed from UST #2. The sludge was stored in a sealed 55-gallon drum pending future disposal at a permitted hazardous waste disposal facility. Concrete plugs were installed in the product dispensing lines leading to the dispensing pumps.

Mr. Michael Bell, Special Hazards Inspector, City of Portland, Oregon, Fire Prevention Division, gave final site approval for the UST decommissioning on October 11, 1994. The USTs and piping were secured on a trailer and transported to Schnitzer Steel Products Co., Portland, Oregon, for recycling on October 11, 1994 (See Appendix C - Permits, Receipts, and Licenses for Bill of Sale #FE-355418).

Two product dispensing pumps were formerly connected to the out-of-service UST system. One dispensing pump was located on the marina and one pump was formerly located at the top of the slope above the marina and on the east side of the main building. These dispensing pumps had previously been disconnected from the out-of-service UST system and had been connected to the recently installed UST system by the contractor installing the new UST system. The product dispensing line from the out-of-service USTs led from the pump shed to the crane dock, was attached beneath the crane dock, and paralleled the east side of the boat storage building. On the east side of the boat storage building, the product dispensing line was partially buried on a steep slope and was inaccessible due to dense vegetation.

During the installation of the new UST system, the dispensing pump formerly located to the east of the main building had been moved adjacent to the new UST system (at the northeast corner of the main building) and the product dispensing line connected to this dispensing pump had been capped below the former dispensing pump island. The marina product dispensing pump had also been connected to the new UST system. Two uncapped pipes with a valve (former function undetermined as per the Client), a rubber hose, and additional, partially buried pipes leading to the marina were located adjacent to and downgradient from the former dispensing pump island. Soil staining was observed in this area in the disturbed soil.

3.4 Excavation Observations and Characterization

At the ground surface, the excavation for UST #1 was approximately 25 feet long by 15 feet wide and 9 feet deep and the excavation for UST #2 was approximately 35 feet long by 17 feet wide and 11 feet deep. The soils surrounding the USTs consisted of a damp to wet, dark gray, slightly clayey, fine sandy, silt. Boulders to 4 feet or more in diameter were encountered at the bottom of the UST excavations. Neither groundwater nor evidence of free product were encountered during UST decommissioning activities on October 10-11, 1994.

Heavily contaminated soils were observed in all four sidewalls and at the bottoms of both UST excavations. Approximately 100 cubic yards of contaminated soils were stockpiled on and beneath polyvinyl sheeting for disposal pending laboratory analyses.

3.5 Soil Sampling Procedures

After removal of the USTs and the associated piping, one soil sample was collected from beneath each end of each UST (four total samples) (See Figure 2 - Site Map for soil sampling locations).

Each discrete soil sample was collected from the bucket of the backhoe by DMI personnel wearing sterile, surgical-type, latex gloves. Three inches of exposed soil was rapidly removed from the center of the backhoe bucket and the sample container was inserted into the soil until the jar was full. The soil was rapidly transferred into the sample bottles with minimal headspace, thus minimizing the loss of volatile organic compounds. Sample containers were precleaned 8-ounce, Environmental Sampling Supply® glass jars with Teflon™-lined lids provided by Hughes Analytical Laboratory (HAL), Gresham, Oregon.

The sample containers were sealed, labeled, and stored on ice in a cooler until shipped to HAL, an off-site independent laboratory, via chain of custody for analyses. The chain of custody documentation and HAL laboratory reports are presented in Appendix B, Chain of Custody and Laboratory Results.

3.6 Soil Sampling Observations

Soil samples S-1 and S-2 were collected at 9 feet bgs, approximately one foot beneath the northern and southern ends of UST #1, respectively. Soil samples S-1 and S-2 were moist, dark gray, slightly clayey, fine sandy silts. Soil samples S-1 and S-2 appeared heavily contaminated and a strong gasoline odor was detected.

Soil samples S-3 and S-4 were collected at 11 feet bgs, approximately one foot beneath the northern and southern ends of UST #2, respectively. Soil sample S-3 was damp, dark gray, fine sandy, clayey silt. Soil sample S-4 was wet, dark gray, fine sandy silt. Heavy sheen was observed on the surface of soil sample S-4 as it was packed into the sample jar. Soil samples S-3 and S-4 appeared heavily contaminated and a strong gasoline odor was detected.

3.7 Initial Response Reporting

Since petroleum-contaminated soils were observed in the UST excavations, a release from the UST system was reported to Mr. Andree Pollock, UST Duty Officer, DEQ Northwest Region, on October 10, 1994, (pursuant to OAR 340-122-220) by Mr. Dale L. Haar, DMI Project Manager. However, this site had previously been assigned a UST Cleanup List number (#26-88-0078) for the original release in October 1988. Groundwater contamination had been previously reported from the original release and confirmed in subsequent investigations.

3.8 Contaminated Soil Disposal

On October 28, 1994, 133.96 tons (approximately 100 cubic yards) of petroleum-contaminated soils were removed from the subject site by NWFS and transferred to Oregon Hydrocarbon, Inc. (OHI), Portland, Oregon, for remediation and recycling by thermal desorption to approved regulatory standards (See Appendix C - Permits, Receipts, and Licenses for Manifests).

3.9 Excavation Backfilling

The excavation pit for UST #1 was backfilled to the original grade on November 8, 1994, with the clean, stockpiled, original soils and crushed rock (3/4-inch minus gravel). The fill materials were compacted in 12-inch lifts. Temporary fencing was erected around the excavation pit for UST #2 pending future site activities.

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4.0 LABORATORY ANALYTICAL RESULTS

4.1 Analytical Methods

A total of four soil samples were collected from the subsurface UST excavations. Soil samples were collected from the excavations utilizing Oregon DEQ- and EPA-approved methods.

The soil samples were analyzed by Hughes Analytical Laboratory (HAL), Gresham, Oregon, for Total Petroleum Hydrocarbon-Hydrocarbon Identification utilizing the Oregon DEQ-approved method TPH-HCID. If petroleum hydrocarbons were detected in a soil sample, the sample was analyzed with the appropriate Oregon DEQ quantification method: Total Petroleum Hydrocarbon-Gasoline (TPH-G) for gasoline or TPH-418.1 Modified for diesel and other non-gasoline fraction hydrocarbons.

4.2 Soil Sample Analytical Results

Total petroleum hydrocarbons (TPH-HCID) in the gasoline to diesel carbon range were detected in soil samples S-1 and S-3. Contamination in the gasoline carbon range were detected in TPH-HCID analyses for soil samples S-2, S-4, and S-4 replicate. The results of the soil sample analyses are tabulated in Table 1 (See Appendix A - Laboratory Analytical Results and Chain of Custody for complete laboratory documentation).

Gasoline contamination was quantified utilizing TPH-G for the following soil samples: S-1 (278 ppm), S-1 replicate (263 ppm), S-2 (3,552 ppm), S-3 (42 ppm), S-3 replicate (44 ppm), and S-4 (2,900 ppm). Diesel and other non-gasoline fraction hydrocarbons were quantified utilizing TPH-418.1 Modified for the following soil samples: S-1 (3,750 ppm) and S-3 (93 ppm).

4.3 Quality Assurance Data

Four soil samples collected from the UST excavation were received by Hughes Analytical Laboratory (HAL), Gresham, Oregon, under a chain of custody. The samples were received in containers consistent with U.S. EPA protocol. Replicate samples and laboratory blanks were also analyzed by HAL.

Standard Quality Assurance/Quality Control (QA/QC) procedures were performed as stated in "EPA Test Methods for Evaluating Solid Waste (SW-846)", 3rd Edition and "Standard Methods for the Examination of Water and Wastewater", 17th Edition. The EPA laboratory protocols followed by HAL included sample holding times, laboratory method blanks, laboratory matrix spikes, replicate samples, and calibration standards. No significant variations from these protocols were reported that would invalidate the analytical data. Test methods may include minor modifications of detection limits or lists of parameters for the published methods. Solid samples are reported on a wet weight basis unless otherwise noted. Compounds not detected are listed under results as ND.

TABLE 1

SOIL SAMPLE ANALYTICAL RESULTS

Total Petroleum Hydrocarbon-Hydrocarbon Identification (TPH-HCID by GC/FID) and Quantification (TPH-G by GC/PID or TPH-418.1 Modified)

October 10, 1994

		QUANTIFICATION	
SOIL SAMPLE I.D.	TPH-HCID	TPH-G	TPH-418.1 M
S-1	C_{07}-C_{35}*	278	3,750
S-1 replicate	--	263	--
S-2	C_{07}-C_{16}**	3,552	--
S-3	C_{09}-C_{35}*	42	93
S-3 replicate	--	44	--
S-4	C_{07}-C_{16}**	2,900	--
S-4 replicate	C_{07}-C_{16}**	--	--
Lab Blanks	ND	ND	ND

Results reported in mg/kg (milligrams per kilogram) or ppm (parts per million).
ND = Not Detected at or above the test method detection limits.

TPH-HCID Detection Limits: Gasoline - 20 ppm
Diesel - 50 ppm
Heavy Oil - 100 ppm.
TPH-G Detection Limit: 10 ppm.
TPH-418.1 Modified Detection Limit: 25 ppm.

* Carbon range corresponds to gasoline and diesel.
** Carbon range corresponds to gasoline.

5.0 GEOLOGY AND HYDROGEOLOGY

Examination of published and unpublished geological and hydrogeological reports for the Macadam Avenue area have allowed us to characterize the geology and hydrology of the site.

The subject site is located on the west bank of the Willamette River adjacent to the Sellwood Bridge and approximately 3-1/2 miles south of downtown Portland, Oregon. The subject property is approximately 15-40 feet above Mean Sea Level (MSL). The subject property occupies two levels on the west bank of the Willamette River at the base of a moderately steep slope. The majority of the site (main level) is located on the upper terrace which has been excavated into the river bank approximately 20-30 feet above the Willamette River. The subject property slopes steeply from the main level down to the bank of the Willamette River. Surface drainage for the subject property is to the east into the adjacent Willamette River, which flows to the north.

The soil underneath the subject site is classified as Urban Land, 0 to 3 percent slopes, by the <u>Soil Survey of Multnomah County, Oregon</u>. This miscellaneous map unit is found throughout central Multnomah County and mainly occurs in Portland along the flood plains of the Willamette River. Areas of this map unit are used mainly for commercial purposes. The original soils were gravelly loam, silt loam, or silty clay loam with some sandy materials. The soils in areas of this unit have been graded, cut, filled, or otherwise severely altered due to construction that mapping the soil units was not practical. Approximately ninety-five percent or more of the soils are covered with concrete, pavement, buildings, and other structures.

Immediately underlying the site are the highly permeable sands and gravels of the Willamette River flood plain deposits (Quaternary Alluvium). The alluvium has been deposited by constant flooding of the river since about 10,000 years ago, at the end of the last Ice Age. Since that time, the position of the Willamette River has remained relatively constant. This alluvial unit is overlain in turn by a thin veneer of silts and sands derived from wind deposition and weathering of the river deposits.

Our experience from drilling projects in the area indicates that underlying the alluvial deposits at a depth of 20 feet or less are the dense basalt flows of the Columbia River

Basalt.. These lava flows erupted approximately 15 to 20 million years ago. The Columbia River Basalts are visible in the local road cuts, and in the banks and channel of the Willamette River.

Examination of water well logs, City of Portland groundwater exploration reports, and U.S. Geological Survey groundwater information for the project area indicates the depth to the uppermost aquifer beneath the site is approximately 20 feet or less. Groundwater was encountered at approximately 10 feet bgs on the main terrace adjacent to UST #2 during the Limited Subsurface Soil and Groundwater Investigation conducted on March 15, 1994. On the bank of the Willamette River beneath the crane dock, groundwater was encountered at 2 to 4 feet bgs. This level coincides with the stage of the adjacent river and represents a layer of water perched on top of the underlying basalt flows. The level to groundwater can be expected to fluctuate on a seasonal basis in response to recharge from local rainfall runoff. The direction of movement of the uppermost groundwater aquifer is to the east toward the Willamette River.

6.0 SUMMARY AND CONCLUSIONS

- On October 10-11, 1994, one 10,000-gallon gasoline underground storage tank (UST) and one 4,000-gallon gasoline UST were decommissioned by removal from the Staff Jennings, Inc., Retail Facility and Marina. The USTs were out-of-service and were decommissioned due to the recent installation of a new UST system by others.

- Visual and olfactory evidence of contamination was observed in the UST excavations. Groundwater or free product were not encountered during the decommissioning activities on October 10-11, 1994. Since potential petroleum-contaminated soils were observed in the excavation, the release from the UST system was reported to the Oregon DEQ Northwest Region on October 10, 1994. However, this facility had previously been assigned a UST Cleanup List number (#26-88-0078) for the original release in October 1988. Groundwater contamination had been previously reported from the original release and confirmed in a subsequent investigation.

- Total petroleum hydrocarbons (TPH-HCID) in the gasoline to diesel carbon range were detected in soil samples collected from the UST excavations. Gasoline contamination was detected in soil samples collected beneath UST #1 (S-1, 278 ppm; S-1 replicate, 263 ppm; and S-2, 3,552 ppm) and in soil samples collected beneath UST #2 (S-3, 42 ppm; S-3 replicate, 44 ppm; and S-4, 2,900 ppm). Diesel contamination was also detected in soil samples S-1 (3,750 ppm) and S-3 (93 ppm).

- Gasoline and diesel contamination in excess of the least stringent Oregon DEQ Numeric Soil Cleanup Standards (Level 3 Cleanup) are present at the subject facility. The Level 3 Numeric Cleanup Standards requires the soils to be cleaned up to at least 130 ppm gasoline and 1,000 ppm diesel (as per OAR 340-122-335). Since groundwater contamination in excess of the Oregon DEQ Basic Numeric Groundwater Cleanup Levels had previously been confirmed at the subject property; the DEQ Numeric Soil Cleanup Standards would not be applicable for the subject property. The Level 3 Cleanup Standards are used only as references for the levels of contamination observed on the subject property. A Soil Matrix Score was not determined for the subject property and a Level 3 Cleanup Standard may not be the appropriate soil cleanup standard.

- Approximately 100 cubic yards of petroleum-contaminated soils were excavated adjacent to and beneath the USTs. The petroleum-contaminated soils were transferred to

Oregon Hydrocarbon, Inc. (OHI) for remediation and recycling by thermal desorption to approved regulatory standards.

- The excavation for UST #1 has been backfilled and temporary fencing has been erected around the excavation for UST #2 pending future site activities.

7.0 RECOMMENDATIONS

DMI presents the following recommendations for the subject site:

- Since soil and groundwater contamination exist beyond the confines of the UST excavations, additional investigation would be required to delineate the nature, magnitude, and extent of the soil and groundwater contamination, as per Oregon Administrative Rules (OAR) 340-122-240. The Groundwater Investigation and Cleanup would proceed under OAR 340-122-242 and would require the installation and monitoring of groundwater monitoring wells.

- Based on the results of the investigation, the owners, permittees, or responsible persons shall propose in a Corrective Action Plan (CAP), prepared pursuant to OAR 340-122-250, what actions, if any, are necessary to monitor and/or remediate soil and groundwater contamination found at the site, as per OAR 340-122-242 (3)(b). The CAP should provide for the adequate protection of public health, safety, welfare, and the environment as determined by the Oregon DEQ. Once the CAP is approved by the Oregon DEQ, the owners, permittees, or responsible persons shall implement the CAP, and monitor, evaluate, and report the results of implementing the plan in accordance with a schedule and in a format established by the Oregon DEQ.

- The owner, permittee, or responsible person shall retain a copy of this report until the time of first transfer of the property plus ten years, pursuant to OAR 340-122-360 (2).

The data presented in this report was collected, analyzed, and interpreted following the standards of care, skill, and diligence ordinarily provided by a professional in the performance of similar services as of the time the services were performed.

The observations, interpretations, and recommendations presented in this report are based on the assumption that the conditions do not vary from those found during the course of the investigation at the project site. If any variations are encountered during any further investigations for this site, De Minimis Inc. (DMI) Environmental Management should be notified so that supplemental interpretations can be made. The observations and interpretations of this report are intended only for the subject site and the sampling conditions described. The observations and interpretations of this report must not be extended to adjacent areas.

The findings of this report are valid for the dates and under the conditions of the sampling, observations, and testing. However, changes in the conditions of the subject property, neighboring properties, or changes in applicable standards can occur with broadening of knowledge. Accordingly, the observations and findings presented in this report may be invalidated by changes outside of our control.

DMI does not offer any legal opinion, representation, or interpretation of environmental laws, rules, regulations, or policies of federal, state, or local governmental agencies.

If you have any questions or require further clarification regarding the information in this report, please feel free to contact DMI at your convenience. Thank you for allowing DMI to be of service and to present this information.

Respectfully submitted,

Dale L. Haar
Project Manager
Environmental Scientist

Reviewed by: Rick I. Johnson
Principal

8.0 GLOSSARY OF ABBREVIATIONS

bgs	below ground surface
CAP	Corrective Action Plan
DEQ	Oregon Department of Environmental Quality
DMI	De Minimis, Inc., Environmental Management
EPA	U.S. Environmental Protection Agency
GC/FID	gas chromatograph/flame ionization detector
HAL	Hughes Analytical Laboratory
LEL	lower explosive limit
LUST	leaking underground storage tank
mg/kg	milligrams/kilograms
NWFS	Northwest Field Services, Inc.
OAR	Oregon Administrative Rules
OHI	Oregon Hydrocarbon, Inc.
ppb	parts per billion
ppm	parts per million
TPH-G	Total Petroleum Hydrocarbon-Gasoline
TPH-HCID	Total Petroleum Hydrocarbon-Hydrocarbon Identification
TPH-418.1 M	Total Petroleum Hydrocarbon-418.1 Modified
UST	underground storage tank

9.0 REFERENCES

Staff Jennings, Inc.
Jeff Jennings, President

Oregon Department of Environmental Quality, Northwest Region
Andree Pollock, UST Duty Officer
Greg Toran, UST Duty Officer
Eldean Williams, Office Specialist, UST Compliance

Hughes Analytical Laboratory
Laboratory Analytical Results

Bureau of Fire, City of Portland, Oregon
Michael Bell, Special Hazards Inspector, Fire Prevention Division

Soil Survey of Multnomah County, Oregon; U.S. Department of Agriculture, Soil Conservation Service; August 1983; 225 p.

Maps utilized:
USGS topographic - Lake Oswego, Oregon 7.5 minute quadrangle
Soil Survey of Multnomah County, Oregon

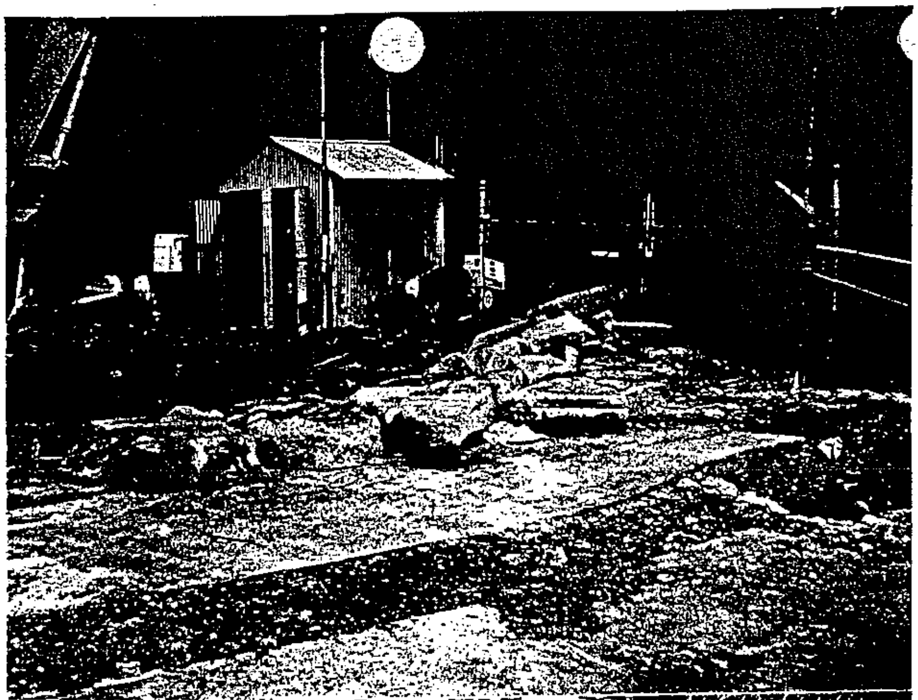
Limited Subsurface Soil and Groundwater Investigation, Staff Jennings, Inc., Retail Facility and Marina, De Minimis Inc. (DMI) Environmental Management, March 31, 1994.

Report of Findings Preliminary Field Investigation of Sellwood Marina, Portland, Oregon, Golder Associates, Inc. (GAI), March 27, 1989.

Environmental Cleanup Manual, Oregon Department of Environmental Quality, June 1994.

APPENDIX A

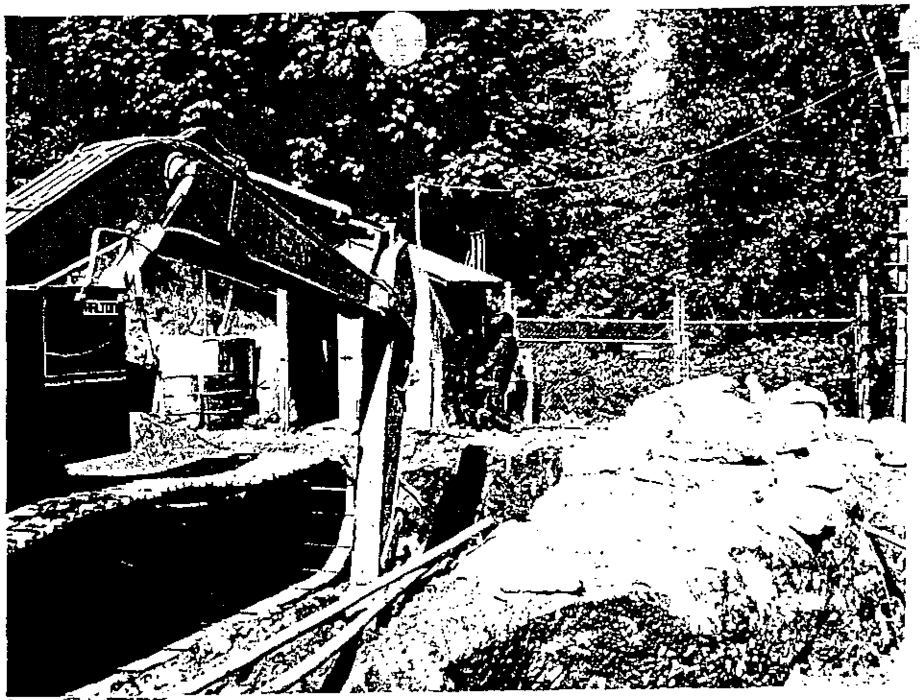
Site Photographs



Subject site, view to t
northwest. UST #1 in
ground, UST #2 in fo
ground, and pump sh

Soil contamination obs
in UST #1 excavation,
to the north.

Soil contamination obs
in UST #2 excavation,
to the south.



Disconnecting UST dispensing piping at th shed.

Transporting USTs to recycling facility. US been labeled and rende unusable.

UST #1 excavation (to was backfilled. UST # excavation is awaiting pending future site acti

APPENDIX B

Laboratory Analytical Results

and

Chain of Custody

UGHES
ANALYTICAL LABORATORY

October 26, 1994

Mr. Dale Haar
DeMinimis Inc.
34 NW 1st Ave., Suite 101
Portland,OR 97209

Dear Mr. Haar,

Enclosed is the lab report for your samples which were received on October 10, 1994. The Hughes Report # is 94-0479a and the Client Project is SJM.

Six soil samples were received under a chain of custody. The samples were received in containers consistent with U.S. EPA (United States Environmental Protection Agency) protocol.

Standard Quality Assurance/Quality Control (QA/QC) procedures were performed as stated in "EPA Test Methods for Evaluating Solid Waste (SW-846)", 3rd Edition and "Standard Methods for th Examination of Water and Wastewater", 17th Edition. The EPA laboratory protocols followed include sample holding times, laboratory method blanks, laboratory matrix spikes, replicate samples and calibration standards. There were no significant variations from these protocols that would invalidate the analytical data.

Test methods may include minor modifications of detection limit or lists of parameters for the published methods. Solid sample are reported on a wet weight basis unless otherwise noted.

Compounds not detected are listed under results as ND.

Sincerely,

Kim Hughes

Kim Hughes
Lab Director

21920 N.E. Glisan ■ Gresham, Oregon 97030 ■ (503) 669-3745 ■ FAX (503) 669-4165

HUGHES REPORT #: 94-0479a CLIENT JOB: SJM
CLIENT: DeMinimis Inc.
DATE: October 26, 1994
ITEMS: Four Soil Samples

METHOD: TPH-HCID by GC/FID
Per Oregon DEQ

Extraction: 10/10/
Analysis: 10/10/

SAMPLE I.D.	RESULT	SURROGATE RECOVERY, %
S-1	C_{07} - C_{35}*	90
S-2	C_{07} - C_{16}**	96
Lab Blank	ND	97

Detection Limits:
Gasoline - 20 mg/kg
Diesel - 50 mg/kg
Heavy Oil - 100 mg/kg

*Carbon range corresponds to gas and diesel.
**Carbon range corresponds to gas.

ND = Not Detected

HUGHES REPORT #: 94-0479a CLIENT JOB: SJM
CLIENT: DeMinimis Inc.
DATE: October 26, 1994
ITEMS: Two Soil Samples

METHOD: TPH-418.1 Modified
per Oregon DEQ
Results in mg/Kg (ppm)

Extraction: 10/12/
Analysis: 10/12/

SAMPLE I.D.	RESULT
S-1	3750
Lab Blank	ND
Detection Limit	25

METHOD: TPH-G by GC/PID
per Oregon DEQ
Results in mg/Kg (ppm)

Extraction: 10/10/
Analysis: 10/10/

SAMPLE I.D.	RESULT	SURROGATE RECOVERY, %
S-1	278	93
S-1 Replicate	263	100
S-2	3552	105
Lab Blank	ND	98
Detection Limit	10	

ND = Not Detected

Gresham, Oregon 97030
503/669-3745
FAX: 503/669-4165

Lab Project Number 94-0479 Date 10-10-94 Page 1 of 1

Project Information

Project Number: 00317-0994
Project Name: SJM
Company: De Minimis Inc.
Project Manager: Dale L. Haar
Collected by: Dale L. Haar (DLH)
P.O. Number:

Reporting Request

☒ PHONE: 295-4074
☒ FAX: 295-0112

TURNAROUND TIME

☒ Standard ☐ RUSH
☐ Other

☒ Rec'd at 4° C
☒ EPA Jars/Vials
☒ OR Methods
☐ WA Methods

Special Instructions

Please call ASAP when preliminaries get back.

Sample S-1 and S-2 are heavily contaminated with gasoline and will both need to be quantified ASAP.

				MATRIX					ANALYSIS REQUEST																	
LAB ID	SAMPLE ID	DATE	TIME	SOIL	WATER GRAB	WATER COMP	OTHER	NO. OF CONTAINERS	TPH-HCID	TPH-Gas	TPH-Diesel	TPH-418.1 m	EPA418.1	Oil & Grease	BTEX/8020	Volatiles/8010	Volatiles/8240	PAH/8310	Semivolatiles/8270	PCB	Pesticides/8080	Metals (Specify)	TCLP Metals (8)			REMARKS/SAMPLE CONDITION
01	SP1-A	10-10-94	1226	1				1	X	✱	B.	X			✱ add					✱	✱		✱ phone		by	Dale Haar
02	SP1-B		1227	1				1	X								✱				10/12/94					Archive.
03	SP2-A		1257	1				1	X	✱	R	✱														
04	SP2-B		1259	1				1	X																	Archive.
05	S-1		1309	1				1	X	X		X				added					by	phone			by	Dale Haar
06	S-2		1317	1				1	X	X																10/11
																										✱ Added per Dale 14Oct94
																										SP1-A ⇒ 8080 PCB/~~Pest~~
																										SP1-A ⇒ TCLP 8 metals
																										SP1-B ⇒ 8240 standard TAT
																										Dale added Pest to
																										Sample SP1-A 17Oct94

RELINQUISHED BY (Sign / Print) DATE/TIME

HUGHES
ANALYTICAL LABORATORY

October 21, 1994

Mr. Dale Haar
DeMinimis Inc.
34 NW 1st Ave., Suite 101
Portland,OR 97209

Dear Mr. Haar,

Enclosed is the lab report for your samples which were received on October 11, 1994. The Hughes Report # is 94-0487 and the Client Project is SJM.

Two soil samples were received under a chain of custody. The samples were received in containers consistent with U.S. EPA (United States Environmental Protection Agency) protocol.

Standard Quality Assurance/Quality Control (QA/QC) procedures were performed as stated in "EPA Test Methods for Evaluating Solid Waste (SW-846)", 3rd Edition and "Standard Methods for th Examination of Water and Wastewater", 17th Edition. The EPA laboratory protocols followed include sample holding times, laboratory method blanks, laboratory matrix spikes, replicate samples and calibration standards. There were no significant variations from these protocols that would invalidate the analytical data.

Test methods may include minor modifications of detection limit or lists of parameters for the published methods. Solid sample are reported on a wet weight basis unless otherwise noted.

Compounds not detected are listed under results as ND.

Sincerely,

Kim Hughes

Kim Hughes
Lab Director

21920 N.E. Glisan ▪ Gresham, Oregon 97030 ▪ (503) 669-3745 ▪ FAX (503) 669-4165

HUGHES REPORT #: 94-0487 CLIENT JOB: SJM
CLIENT: DeMinimis Inc.
DATE: October 21, 1994
ITEMS: Two Soil Samples

METHOD: TPH-G by GC/PID
per Oregon DEQ
Results in mg/Kg (ppm)

Extraction: 10/12/
Analysis: 10/13/

SAMPLE I.D.	RESULT	SURROGATE RECOVERY, %
S-3	42	79
S-3 (replicate)	44	71
S-4	2900	85
Lab Blank	ND	92
Detection Limit	10	

METHOD: TPH-HCID by GC/FID
Per Oregon DEQ

Extraction: 10/13/
Analysis: 10/13/

SAMPLE I.D.	RESULT	SURROGATE RECOVERY, %
S-3	C_{09}-C_{35}*	100
S-4	C_{07}-C_{16}**	98
S-4 Replicate	C_{07}-C_{16}**	101
Lab Blank	ND	98

*Carbon range corresponds to gasoline and diesel.

**Carbon range corresponds to gasoline.

ND = Not Detected

HUGHES REPORT #: 94-0487 CLIENT JOB: SJM
CLIENT: DeMinimis Inc.
DATE: October 21, 1994
ITEMS: One Soil Sample

METHOD: TPH-418.1 Modified
per Oregon DEQ
Results in mg/Kg (ppm)

Extraction: 10/14/
Analysis: 10/14/

SAMPLE I.D.	RESULT
S-3	93
Lab Blank	ND
Detection Limit	25

ND = Not Detected

Gresham, Oregon 97030
503/669-3745
FAX: 503/669-4165

Lab Project Number 94-0487 Date 10-11-94 Page 1 of 1

Project Information

Project Number: 00317-0994
Project Name: SJM
Company: De Minimis Inc. (DMI)
Project Manager: Dale L. Haar
Collected by: Dale L. Haar (DLH)
P.O. Number:

Reporting Request

☒ PHONE: 295-4074
☒ FAX: 295-0112

TURNAROUND TIME

☒ Standard ☐ RUSH
☐ Other

☒ Rec'd at 4° C
☒ EPA Jars/Vials
☒ OR Methods
☐ WA Methods

Special Instructions

Please call as soon as preliminaries are back.

Samples S-3 and S-4 are heavily contaminated with gasoline and will need to be quantified ASAP. Thanks!

				MATRIX					ANALYSIS REQUEST																	
LAB ID	SAMPLE ID	DATE	TIME	SOIL	WATER GRAB	WATER COMP	OTHER	NO. OF CONTAINERS	TPH-HCID	TPH-Gas	TPH-Diesel	TPH-418.1 m	EPA418.1	Oil & Grease	BTEX/8020	Volatiles/8010	Volatiles/8240	PAH/8310	Semivolatiles/8270	PCB	Pesticides/8080	Metals (Specify)	TCLP Metals			REMARKS/SAMPLE CONDITION
01	S-3	10-10-94	1538	✓				1	X	X		X				by phone by Dale Haar										
02	S-4	10-10-94	1546	✓				1	X	X												10/13/94 BO				

RELINQUISHED BY (Sign / Print)	DATE/TIME	RECEIVED BY (Sign / Print)	DATE/TIME	PLEASE NOTE:

APPENDIX C

Permits, Receipts,

and

Licenses

N

Oregon Department of Environmental Quality

TICE OF UNDERGROUND STORAGE TANK PERMANENT DECOMMISSIONING/SERVICE CHAN

CILITY (Location of Tanks)
ame: Staff Jennings, Inc.
ddress: 8240 S.W. Macadam Ave
Portland OR 97219
one: 244-7505

TANK OWNER
Name: Staff Jennings, Inc.
Address: P.O. Box 82206
Portland OR 97282-0
Phone: 244-7505

EQ Facility I.D. Number: 3105

ork To Be Performed By: De Minimis Inc. (Owner or Licensed Service Provider) License # 13383

one: 295-4074 Mobile Phone: 970-0823

FORM MUST BE SUBMITTED BY UST OWNER OR OPERATOR 30 DAYS BEFORE START OF WOR

YOU MUST CONTACT YOUR LOCAL DEQ REGIONAL OFFICE 3-DAYS BEFORE STARTING AN DECOMMISSIONING WORK. (Phone numbers are listed on reverse)

Will tank removal or potential cleanup affect adjacent property or Right-of-Way property? Yes _____ No ✓

Date decommissioning is scheduled to begin: 10-6-94

k	DEQ UST Permit	Tank Size in (Gallons)	Product: Gasoline, Diesel, Used Oil, Other?		Closure or Service Change?			Tank Rep
			Present	New	Tank Removal	Closure∞ Inplace	New ∞ Product	Yes
	EAHK	4,000	Gasoline		✓			✓
	EAHA	10,000	Gasoline		✓			✓

* If decommissioned tank(s) are to be replaced by new underground storage tanks you must submit a new perr application containing information on the new tanks 30 days before placing them in service.

∞ Submit a soil sampling plan to the DEQ regional office and receive plan approval prior to starting work if tank is to be decommissioned in-place, 2) tank contents are changed to a non-regulated substance, or 3) tar contains a regulated substance other than petroleum.

Signature: [illegible] Jennings (Owner or Operator) Date: 9/7/94

RECEIVE
SEP 7 19[illegible]
Wast Management & Cleanup Di

City of Portland
FIRE PREVENTION DIVISION
55 S.W. Ash Street
Portland, OR 97204   Phone: 823-3712

PERMIT NUMBER: T941246
FEE AMOUNT: $157.80
CODE: 19D(2)

Subject to the compliance with the ordinances of the City of Portland, permission is hereby granted for the installation of:

___ NEW INSTALLATION	___ ADDITION	___ ALTERATION	___ REPAIR	___ ABANDON	_x_ REMOVE
_x_ LIQUIDS/TANKS	___ L.P.G.	___ COMPRESSED GASES	___ PAINT SPRAY BOOTHS	___ CRYOGENS	___ OTHER

Located at: 8240 SW MACADAM AV - STAFF JENNINGS

Contractor: NW FIELD SERVICES

Permit Issued: 10/05/94   By: MIKE BELL   Fire Marshal's Office

---

INSPECTION RECORD:

	DATE	INSPECTOR	OTHER
APPROVE TANK/CYLINDER LOCATION			
APPROVE PIPING AND VALVES			
PRESSURE TEST WITNESSED			
OK TO COVER			

FINAL APPROVAL

INSPECTOR:
DATE: 10-11-94

NOTE: Keep card conspicuously posted on premises until job is completed and final inspection made. Request for final inspection must be made within 14 days after completion of work.   Permit valid for 180 days only

---

Received of: NW FIELD SERVICES   The sum of: ONE HUNDRED FIFTY SEVEN DOLLARS & 80/100----------

Date: 10/05/94   By: Norma Scott   Paid Amount: $ 157.80   ___ Cash   _X_ Check 12250

HarborOil, Inc.

№ 20652

2416 N. MARINE DR., SUITE 200
(503) 285-4648 PORTLAND, OR 97217

INDUSTRIAL FUEL OILS
DIESEL

DUST OIL ASPHALTS
DISTRIBUTOR - SERVICE

CONSIGNEE Harbor Oil

DATE 10/13/94

DESTINATION Portland, Or

CARRIER NWFS

SHIPPER Northwest Field Services

PURCHASE NO. JOB 7277

CONTENTS
SHIPPING NAME: Non Hazardous Liquid
CLASSIFICATION:
I.D. NO.: NO
PLACARD NO.: Placards

TRK NO. 22
TRL NO. 0
PRODUCT: Gassy H2O
GALS LOADED

EMERGENCY CONTACT
1-800-473-2042

NET GALS
BBLS
TONS

API
TOTALS 142

WEIGHT
TEMP
GROSS
CORR FACTOR
TARE
WT GAL
NET

LOADING
TIME DUE
TIME START
TIME FINISH

UNLOADING
TIME DUE
TIME START
TIME FINISH

REMARKS

EPA# ORD 071003985

Office Use Only

UNIT PRICE

PRODUCT SUB TOTAL

FREIGHT SUB TOTAL

TAX SUB TOTAL

HOURS SUB TOTAL

TOTAL

HarborOil, Inc.

№ 20614

INDUSTRIAL FUEL OILS
DIESEL

2416 N. MARINE DR., SUITE 200
(503) 285-4648 PORTLAND, OR 97217

DUST OIL ASPHALTS
DISTRIBUTOR - SERVICE

CONSIGNEE Harbor Oil

DATE 10/10/94

DESTINATION Portland, Or.

CARRIER NW FS

SHIPPER Northwest Field Services

PURCHASE NO.

	SHIPPING NAME	CLASSIFICATION	I.D. NO.	PLACARD NO.
CONTENTS	Non Hazardous Liquid		NO	Placards

	PRODUCT	GALS LOADED	
TRK NO. 6	Gassy		EMERGENCY CONTACT 1-800-473-2042
TRL NO. ~~0~~	H2O		NET GALS / BBLS / TONS
API	TOTALS	390	

	WEIGHT	LOADING	UNLOADING
TEMP	GROSS	TIME DUE	TIME DUE
CORR FACTOR	TARE	TIME START	TIME START
WT GAL	NET	TIME FINISH	TIME FINISH

REMARKS

EPA# ORD 071603985

Office Use Only	
UNIT PRICE	
PRODUCT	SUB TOTAL
FREIGHT	SUB TOTAL
TAX	SUB TOTAL
HOURS	SUB TOTAL
TOTAL	

7277

N.W. Field Services

SCHNITZER STEEL PRODUCTS CO.
INTERNATIONAL TERMINAL
12005 N. BURGARD. PORTLAND. OR 97203
(503) 286-5771

BILL OF SALE NO.
FE- 355418

CONTRACT NUMBER

VENDOR NUMBER		COMMODITY NUMBER	103	COMM. DESC.	Tanks

```
G   N   30620   6 lb 03:11 PM 10/11/94   ◀ G
T   A   17760   G lb 03:38 PM 10/11/94   ◀ T
N       12860                            ◀ N
```

PRICE 75	EXTENDED 482.25	WEIGHER
CARRIER	TRACTOR NO.	TIME

I REPRESENT AND WARRANT THAT THIS MATERIAL DOES NOT CONTAIN A HAZARDOUS SUBSTANCE AS DEFINED BY FEDERAL OR STATE LAW. AND I AGREE TO INDEMNIFY SCHNITZER STEEL PROD. CO. AGAINST ALL CLAIMS.

FURTHER. IF YOU SELL US CAR BODIES. REFRIGERATORS. AIR CONDITIONERS OR OTHER MANUFACTURED ITEMS THAT CONTAIN CFC'S OR FREONS. YOU CERTIFY THAT THE CFC'S OR FREONS HAVE BEEN REMOVED IN ACCORDANCE WITH THE CLEAN AIR ACT. AND. THAT "SEALED UNITS" AND COMPRESSORS HAVE BEEN EMPTIED OF ALL OIL OR OIL PRODUCTS.

I hereby state that I am the lawful owner of the material described hereon, that I have a right to sell same and that for payment received in full, hereby acknowledged. I sell and convey title of same to SCHNITZER STEEL PRODUCTS CO.

X

S1009 (Rev 10-92)

CUSTOMER

ER REPORT OF Gasoline

er Name: : DEMINIMIS/JENNINGS

ing FROM : 10-28-94 00:00 TO : 10-31-94 23:59

DATE :
TIME :

anifest No.:	Transporter:	Driver's Name:	Gross lb	Tare lb	Net lb	Net Tons :
07-00950	CELORIE	RANDY AREGGER	63340	23980	39360	19.68
07-00950	CELORIE	DOUG MEIER	57540	24220	33320	16.66
07-00950	CELORIE	ROGER MOORE	57060	24140	32920	16.46
07-00950	CELORIE	RANDY AREGGER	55380	23800	31580	15.79
07-00950	CELORIE	DOUG MEIER	54020	24240	29780	14.89
07-00950	CELORIE	ROGER MOORE	58180	24040	34140	17.07
07-00950	CELORIE	RANDY AREGGER	57860	23760	34100	17.05
07-00950	CELORIE	DOUG MEIER	56940	24220	32720	16.36
			460320	192400	257920	133.96

Oregon Department of Environmental Quality

UNDERGROUND STORAGE TANK DECOMMISSIONING/SERVICE CHANGE REP

EQ FACILITY NUMBER: 3105 DATE: 10-10-9

FACILITY NAME: Staff Jennings, Inc.

FACILITY ADDRESS: 8240 S.W. Macadam Avenue
Portland OR 97219

PHONE: 244-7505

ollowing information MUST be submitted by the underground storage tank owner, operator or licensed DEQ Supe ys following completion of the tank decommissioning or changing tank contents to a non-regulated substance. (O, hough -150)

ttached supplemental checklist should be prepared by the person performing the decommissioning or service c list should be provided to DEQ and the tank owner to demonstrate that all required practices were followed.

arily the checklist is filled out by the DEQ licensed Service Provider or Supervisor. Owners who wish t nmission a tank or change service must follow all DEQ and other applicable standards. The owner should cont nal Office prior to starting the work to receive current copies of underground storage tank regulations.

ATES:

mmissioning/Service Change Notice - Date Submitted: 9-7-94 (30 days before work starts)

Work Start Telephone Notice - Date Submitted: 10-4-94 (3 working days before work starts)

DEQ Person Notified: Greg Toran #26-3

Date Work Started: 10-10-94

Date Work Completed: On-going.

: Provide the following information if any soil or water contamination is found during the decommissioning or ser amination must be reported by the UST owner or operator within 24 hours. The licensed service provider mination within 72 hours after discovery unless previously reported.

Date Contamination Reported: 10-10-94 By: Dale L. Haar

DEQ Person Notified: Andree. Pollock.

kfill Telephone Notice - Date Called: N/A. (before backfilling) Not required as per

DEQ Person Notified: N/A. Pollock since Groundwater i

ERMITS:

: DEQ permits or an addendum to the UST permit(s) may be needed where soil or water cleanup is required.

DEQ Water Discharge Permit #: N/A.. Date: N/A.

Disposed to (Location): N/A.

DEQ Solid Waste Disposal Permit #: N/A. Date: N/A.

ERMITS (Continued)

UST Soil Treatment Permit Addendum - Type: N/A. Date: N/A.

Soil Disposal or Treatment Location: N/A.

ANK INFORMATION:

ık	DEQ UST Permit	Tank Size in (Gallons)	Product: Gasoline, Diesel, Used Oil, Other?		Closure or Service Change?			Tank Repl
			Present	New	Tank Removal	Closure∞ Inplace	Other∞ Use	Yes*
	EAHK	4,000	Gasoline		✓			✓
	EAHA	10,000	Gasoline		✓			✓

* Where decommissioned tank(s) are replaced by new underground storage tanks the UST owner or operator n submit a new permit application containing information on the new tanks 30 days before placing them ~~in-serv~~

∞ Submit a soil sampling plan to the DEQ regional office and receive plan approval prior to starting work i tank is to be decommissioned in-place, 2) tank contents are changed to a non-regulated substance, 3) tank cont: a regulated substance other than petroleum, or 4) tank changed to non-regulated use.

ISPOSAL INFORMATION:

ank #	Tank & Piping Disposal Method				Disposal Location of Tank Content	
	Scrap	Land-fill	Other	Identify Location & Property Owner	Liquids	Sludges
1	✓			Schnitzer Steel Products Co. 12005 N. Burgard Portland OR 97203	Harbor Oil 11535 N. Force Ave. Portland OR	To be determined.
2	✓			Same.	Same.	Same.

* Note: The tank contents, the tank and the piping may be subject to the requirements of Hazardous W regulations. If you have questions, contact the DEQ Hazardous Waste Section at (503) 229-5913 or DEQ regi office hazardous waste staff.

ONTAMINATION INFORMATION:

Tank #	Ground* water in pit?	Product odor in soil?	Product stains in soil?	Number of Samples	Laboratory (Name, City, State, Phone)
1	No	Yes	Yes	2	Hughes Analytical Laboratory ~~Portland OR~~ DH Gresham OR 669-
2	No	Yes	Yes	2	Same.

* Note: Sampling is required if groundwater is encountered. See cleanup rules.

SITE SKETCH:

(Show location of adjacent roads, property lines, structures, dispenser, & all USTs) North, general direction of ground slope and soil sample locations. Sketch does not nee drawn to scale. You may attach a separate drawing.)

See attached maps

ORK PERFORMED BY:

DEQ Service Provider's License #: 13383 Construction Contractors License #: 0846

Name: De Minimis Inc.

Telephone: 295-4074

Q Decommissioning Supervisor's License #: 12425

Name: Dale Leon Haar

Telephone: 295-4074

Q Soil Matrix Service Provider's License #: 11123 (If applicable)

Name: De Minimis Inc.

Telephone: 295-4074

DEQ Soil Matrix Supervisor's License #: 12426 (If applicable)

Name: Dale Leon Haar

Telephone: 295-4074

TACHMENTS TO THIS REPORT:

ach a copy of the laboratory report showing the results of all tests on all soil and water samples. The laborator fy sample collection methods, sample location, sample depth, sample type (soil or water), type of sample conta rature during transportation, types of tests, and copies of analytical laboratory reports, including QA/QL informat tory name, address and copies of chain-of-custody forms.

contamination is detected and a Level 2 or Level 3 soil matrix cleanup standard is selected attach a copy of th sis for the site including methods of determining soil type, depth to groundwater, and sensitivity of uppermost a

PORT FILING:

report, signed by the tank owner or operator, complete with all applicable attachments must be filed with DEQ 30 days after the excavation is backfilled or change-in-service is complete. Contact the DEQ regional office p eport where special circumstances exist at the site (such as water in pit, remaining pockets or contamination, etc.

E: If contamination was found during site assessment at decommissioning or change-in-service and repor nal office, this report may be submitted with either the first interim cleanup report or the final cleanup report st.

Return Completed and Signed Form to:

Department of Environmental Quality
UST Program - Decommissioning Report
811 S.W. Sixth Ave.
Portland, Oregon 97204

Or FAX Completed and Signed Form to: (503) 229-6954

I have personally reviewed this report and the attachments and find them to be true and complete.

Signature: [illegible] Jennings Date: 12/12/94
(Owner or Operator)

information: (503) 229-5733 or Toll Free in Oregon UST HELPLINE 1-800-742-7878

Oregon Department of Environmental Quality

UNDERGROUND STORAGE TANK DECOMMISSIONING CHECKLIST

DEQ FACILITY NUMBER: 3105 DATE: 10-10-94

FACILITY NAME: Staff Jennings, Inc

FACILITY ADDRESS: 8240 S.W. Macadam Avenue
Portland OR 97219

PHONE: 294-7505

AFETY EQUIPMENT ON JOB SITE:

Fire Extinguisher: Type/Size: Dry Chemical 40-A:80-B:C Recharge Date: New

Combustible Gas Detector: Model: Industrial Scientific Corporation MX 251 Calibration Date: 10-

Oxygen Analyzer: Model: Same as above Calibration Date: 10-

ECOMMISSIONING: All Tanks: (Unk. = Unknown, N/A = Not Applicable) (Check Appropriate Box)	Yes	No	Unk
ll electrical equipment grounded and explosion proof?	✓		
afety equipment on job site?	✓		
verhead electrical lines located?	✓		
ubsurface electrical lines off or disconnected?	✓		
atural gas lines off or disconnected?	~~✓~~ NCH		
o open fires or smoking material in area?	✓		
ehicle and pedestrian traffic controlled?	✓		
xcavation material area cleared?	✓		
ainwater runoff directed to treatment area?			
Drained and collected product from lines?	✓		
Removed product and residual from tank?	✓		
Cleaned tank?	✓		
Excavated to top of tank?	✓		
Removed tank fixtures? (pumps, leak detection equip.	✓		
Removed product, fill and vent lines?	✓		

ANK ABANDONMENT IN-PLACE:

Sampling plan approved by DEQ? ate: ____________ DEQ Staff: ______________________			

ECOMMISSIONING: All Tanks: (Unk.= Unknown, N/A = Not Applicable) (Check Appropriate Box)	Yes	No	Unk
Contamination concerns fully resolved?			
Fill Material? Type: ______			
ANK REMOVAL:			
Tank placement area cleared, chocks placed?	✓		
Purged or ventilated tank to prevent explosion? lethod used: Dry Ice Meter reading: 1% ; 125%	✓		
No chains or steel cables wrapped around tank for removal?	✓		
Tank removed, set on ground, blocked to prevent movement?	✓		
Tank set on truck and secured with strap(s)?	✓		
Tank labeled before leaving site?	✓		
ITE ASSESSMENT:			
Site assessed for contamination? See OAR 340-122-340	✓		
Soil samples taken and analyzed?	✓		
Decommissioning/Change-in-Service report sent to DEQ?	✓		
Was contamination found? Date/Time: 10-10-94 / 1156	✓		
Was contamination reported to DEQ? By: Dale L. Haar ate/Time: 10-10-94 / 1610 DEQ Staff: Andree Pollock	✓		
Was hazardous waste determination made for tank contents (Liquids/sludges)?		✓	

Disposal location of tank(s) contents.

Name: Harber Oil, Inc. Date: 10-10-94 and 10-13-94

Address: 11535 N. Force Ave.
Portland OR 97203

Attach disposal receipt.

Disposal or recycling location of removed tank(s) and associated piping.

Name: Schnitzer Steel Products Co. Date: 10-11-94

Address: 12005 N. Burgard
Portland OR 97203

Attach disposal receipt.

If tank(s) are intended to be reused, identify new tank site.

Name: N/A. Date: N/A.

Address: N/A.

Purpose of Reuse: N/A.

ORK PERFORMED BY:

DEQ Service Provider's License #: 13383
Name: De Minimis Inc.
Telephone: 295-4074

EQ Decommissioning Supervisor's License #: 12425
Name: Dale Leon Haar
Telephone: 295-4074

HECKLIST FILING:

rovide copy of checklist to the UST owner and operator.

end completed checklist to the DEQ headquarters within 30 days after the excavation is backfilled.

TE: If contamination was found during decommissioning and reported to DEQ regional office, this re
nitted with either the first interim cleanup report or the final cleanup report, whichever is first.

Send Completed Form to:

Department of Environmental Quality
UST Program - Decommissioning Checklist
811 S.W. Sixth Ave.
Portland, Oregon 97204

I have personally reviewed this decommissioning checklist and find it to be true and complete.

Signature: Date: 12-12-94
(Licensed Supervisor)

Signature: Jennings Date: 12/12/94
(Owner or Operator)

information: (503) 229-5559 or Toll Free in Oregon 1-800-452-4011
NW Region 229-5489

UST SERVICE PROVIDER LICENSE

This License is Issued by The Oregon Department of Environmental Quality to:

De Minimis Inc.
34 NE 1st Ave., Suite 101
Portland, OR 97209

You are Licensed to Offer the Following Underground Storage Tank Services:

License Type	License Number	Issued	Expires
Service Provider	13383	April 16, 1993	May 07, 1995
Soil Matrix Cleanup Prov.	11123	December 04, 1993	December 04, 1995

A Licensed Underground Storage Tank Supervisor Must be Present at a Site to Perform These Services

~~Issued:~~ XXXXXX RE ID: 7630

~~Expires~~xx ADDR ID: 111881

Authorized: ______________________________

Richard P. Reiter
UST Compliance Manager

1859

Dale Leon Haar
34 NW 1st Avenue, Suite 101
Portland, OR 97209

LICENSED SERVICES	LIC#	EXPIRES
Decommission	12425	09-JAN-95
Soil Matrix Cleanup	12426	09-JAN-95

Supervisor Signature

WATER ADDED AT
CUSTOMER'S REQUEST

________gals. to full load
________gals. to ⅔ load
________gals. to ⅓ load

TAKEN
☐ YES
☐ YES
☐ YES

FREE UNLOADING TIME ALLOWED ON FULL LOADS.
Additional unloading time charged at current hourly truck rate.

JOB # 157 BID #
SOLD TO NORTHWEST FIELD SERVICES-INC

DELIVERY POINT STAFF JENNINGS
8240 SW MACADAM

DATE 11/08/9 P.O.# 8613-7277
TIME 13:05 PLANT 10 PIT 00
DRIVER JK CONST/MIKE
GROSS 25.31 TRUCK # 36 TRLR #
TARE 10.81 WEIGHMASTER EDYE
NET 14.50 LOADS: 6 ACCM.: 83.89

DELIVERY SLIP

ADDITIONAL WATER ADDED TO THIS CONCRETE WILL REDUCE STRENGTH. ANY WATER ADDED IS AT CUSTOMER'S OWN RISK.

WATER REQUESTED BY: ________

REASON FOR DELAY TIME:
☐ JOB NOT READY
☐ LACK OF HELP
☐ WHEEL BARROW JOB
☐ WAITING FOR TRUCK TO UNLOAD
☐ ADDING WATER
☐ ARRIVED JOB EARLY
☐ OTHER________

SPECIAL INSTRUCTIONS:

MATERIAL	MIX DESIGN, SSD	MOISTURE CORRECTION	DESIRED AMOUNT	ACTUAL AMOUNT	SSD CORRECTED AMOUNT

TRIM WATER GAL./YD.
WATER/ CEMENT RATIO
MAXIMUM ADD WATER GALS.

PRODUCT #	PRODUCT DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	AMOUNT
100034	3/4-0 CRUSHED	14.50	TONS		

TERMS: NET — DUE AND PAYABLE BY 15TH OF MONTH FOLLOWING PURCHASE. A finance charge of 1½% per month, or a minimum of $1.00, will be made on the unpaid balance at the end of the following month's billing cycle. This is an ANNUAL PERCENTAGE RATE OF 18%. PERSONAL NOTICE: We reserve the right to claim lien for all labor and

RECEIVED BY

TOTAL
TICKET # 48870

WATER ADDED AT
JSTOMER'S REQUEST
______gals. to full load
______gals. to ⅔ load
______gals. to ⅓ load

TEST CYL.
TAKEN
☐ YES
☐ YES
☐ YES

8 MINUTES PER YARD
FREE UNLOADING
TIME ALLOWED ON
FULL LOADS.
Additional unloading
time charged at current
hourly truck rate.

CUSTOMER ACCOUNT # CODE
JOB # 157 BID #

SOLD TO NORTHWEST FIELD SERVICES INC

DELIVERY POINT STAFF JENNINGS
8240 SW MACADAM

DELIVERY SLIP

ADDITIONAL WATER
ADDED TO THIS
INCRETE WILL REDUCE
STRENGTH. ANY
W[illegible] ADDED IS
AT CUSTOMER'S
OWN RISK.

ATER REQUESTED BY:

REASON FOR DELAY TIME:
☐ JOB NOT READY
☐ LACK OF HELP
☐ WHEEL BARROW JOB
☐ WAITING FOR TRUCK TO UNLOAD
☐ ADDING WATER
☐ ARRIVED JOB EARLY
☐ OTHER________

DATE 11/08/94 P.O.# 0613-7277
TIME 11:53 PLANT 10 PIT 00
DRIVER JK CONST/MIKE
GROSS 24.63 TRUCK # 36 TRLR #
TARE 10.81 WEIGHMASTER EDYE
NET 13.82 LOADS: 4 ACCM.: 55.51

SPECIAL INSTRUCTIONS:

ATERIAL	MIX DESIGN, SSD	MOISTURE CORRECTION	DESIRED AMOUNT	ACTUAL AMOUNT	SSD CORRECTED AMOUNT

TRIM WATER GAL./YD.

WATER/ CEMENT RATIO

MAXIMUM ADD WATER GALS.

PRODUCT #	PRODUCT DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	AMOUNT
100034	3/4-0 CRUSHED	13.82	TONS		

IS: NET — DUE AND PAYABLE BY 15TH OF MONTH FOLLOWING PURCHASE. A
ce charge of **1½%** per month, or a minimum of **$1.00,** will be made on the unpaid
ce at the end of the following month's billing cycle. This is an **ANNUAL PERCENTAGE**
OF **18%**. **PERSONAL NOTICE:** We reserve the right to claim lien for all labor and

RECEIVED BY

TOTAL

TICKET # 48843

CUSTOMER'S REQUEST

	TAKEN
________gals. to full load	☐ YES
________gals. to ⅔ load	☐ YES
________gals. to ⅓ load	☐ YES

FREE UNLOADING TIME ALLOWED ON FULL LOADS.
Additional unloading time charged at current hourly truck rate.

ADDITIONAL WATER ADDED TO THIS CONCRETE WILL REDUCE STRENGTH. ANY WATER ADDED IS AT CUSTOMER'S OWN RISK.

WATER REQUESTED BY: ____________

REASON FOR DELAY TIME:

- ☐ JOB NOT READY
- ☐ LACK OF HELP
- ☐ WHEEL BARROW JOB
- ☐ WAITING FOR TRUCK TO UNLOAD
- ☐ ADDING WATER
- ☐ ARRIVED JOB EARLY
- ☐ OTHER____________

JOB # 157 BID #

SOLD TO NORTHWEST FIELD SERVICES INC

DELIVERY POINT STAFF JENNINGS
8240 SW MACADAM

DATE 11/08/9 P.O.# 8613-7277
TIME 10:52 PLANT 10 PIT 00
DRIVER JK CONST/MIKE
GROSS 24.02 TRUCK # 36 TRLR #
TARE 10.81 WEIGHMASTER EDYE
NET 13.21 LOADS: 2 ACCM.: 27.41

SPECIAL INSTRUCTIONS:

MATERIAL	MIX DESIGN, SSD	MOISTURE CORRECTION	DESIRED AMOUNT	ACTUAL AMOUNT	SSD CORRECTED AMOUNT

TRIM WATER GAL./

WATER/ CEMENT RATIO

MAXIMUM ADD WATER GAL

PRODUCT #	PRODUCT DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	AMOUNT
100034	3/4-0 CRUSHED	13.21	TONS		

TERMS: NET — DUE AND PAYABLE BY 15TH OF MONTH FOLLOWING PURCHASE. A finance charge of **1½%** per month, or a minimum of **$1.00,** will be made on the unpaid balance at the end of the following month's billing cycle. This is an **ANNUAL PERCENTAGE RATE OF 18%. PERSONAL NOTICE:** We reserve the right to claim lien for all labor and material furnished on this job according to OREGON REVISED STATUTE 87.021

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TOTAL

TICKET # 48813

CUSTOMER'S REQUEST

________gals. to full load

________gals. to ⅔ load

________gals. to ⅓ load

TAKEN

☐ YES

☐ YES

☐ YES

FREE UNLOADING TIME ALLOWED ON FULL LOADS.

Additional unloading time charged at current hourly truck rate.

JOB # 157 BID #

SOLD TO NORTHWEST FIELD SERVICES INC

DELIVERY POINT
STAFF JENNINGS
8240 SW MACADAM

DATE	11/08/94	P.O.#	8613-7277
TIME	09:44	PLANT	10 / PIT 00
		DRIVER	JK CONST/MIKE
GROSS	25.01	TRUCK #	36 TRLR #
TARE	10.81	WEIGHMASTER	EDYE
NET	14.20	LOADS:	1 ACCM.: 14.20

SPECIAL INSTRUCTIONS:

ADDITIONAL WATER ADDED TO THIS CONCRETE WILL REDUCE STRENGTH. ANY WATER ADDED IS AT CUSTOMER'S OWN RISK.

WATER REQUESTED BY:

____

REASON FOR DELAY TIME:

☐ JOB NOT READY
☐ LACK OF HELP
☐ WHEEL BARROW JOB
☐ WAITING FOR TRUCK TO UNLOAD
☐ ADDING WATER
☐ ARRIVED JOB EARLY
☐ OTHER______________________

MATERIAL	MIX DESIGN, SSD	MOISTURE CORRECTION	DESIRED AMOUNT	ACTUAL AMOUNT	SSD CORRECTED AMOUNT

TRIM WATER GA

WATER/ CEMENT RATIO

MAXIMUM ADD WATER

PRODUCT #	PRODUCT DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	AMOUN
100034	3/4-0 CRUSHED	14.20	TONS		

TERMS: NET — DUE AND PAYABLE BY 15TH OF MONTH FOLLOWING PURCHASE. A finance charge of **1½%** per month, or a minimum of **$1.00,** will be made on the unpaid balance at the end of the following month's billing cycle. This is an **ANNUAL PERCENTAGE RATE OF 18%. PERSONAL NOTICE:** We reserve the right to claim lien for all labor and material furnished on this job according to OREGON REVISED STATUTE 87.021

RECEIVED BY

TOTAL

TICKET # 4878

CUSTOMER'S REQUEST

________gals. to full load

________gals. to ⅔ load

________gals. to ⅓ load

TAKEN

☐ YES

☐ YES

☐ YES

FREE UNLOADING TIME ALLOWED ON FULL LOADS.

Additional unloading time charged at current hourly truck rate.

ADDITIONAL WATER ADDED TO THIS CONCRETE WILL REDUCE STRENGTH. ANY WATER ADDED IS AT CUSTOMER'S OWN RISK.

WATER REQUESTED BY:

REASON FOR DELAY TIME:

- ☐ JOB NOT READY
- ☐ LACK OF HELP
- ☐ WHEEL BARROW JOB
- ☐ WAITING FOR TRUCK TO UNLOAD
- ☐ ADDING WATER
- ☐ ARRIVED JOB EARLY
- ☐ OTHER________________

JOB # 157 BID #

SOLD TO NORTHWEST FIELD SERVICES INC

DELIVERY POINT STAFF JENNINGS
8240 SW MACADAM

DATE 11/08/94 P.O.# 8613-7277

TIME 12:39 PLANT 10 PIT 00

DRIVER TOM ANDROSKY

GROSS 24.99 TRUCK # 82 TRLR #

TARE 11.11 WEIGHMASTER EDYE

NET 13.88 LOADS: 5 ACCM.: 69.39

SPECIAL INSTRUCTIONS:

MATERIAL	MIX DESIGN, SSD	MOISTURE CORRECTION	DESIRED AMOUNT	ACTUAL AMOUNT	SSD CORRECTED AMOUNT

TRIM WATER GAL./

WATER/ CEMENT RATIO

MAXIMUM ADD WATER GAL

PRODUCT #	PRODUCT DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	AMOUNT
100034	3/4-0 CRUSHED	13.88	TONS		

TERMS: NET — DUE AND PAYABLE BY 15TH OF MONTH FOLLOWING PURCHASE. A finance charge of **1½%** per month, or a minimum of **$1.00,** will be made on the unpaid balance at the end of the following month's billing cycle. This is an **ANNUAL PERCENTAGE RATE OF 18%. PERSONAL NOTICE:** We reserve the right to claim lien for all labor and material furnished on this job according to OREGON REVISED STATUTE 87.021.

RECEIVED BY

TOTAL

TICKET # 48864

CUSTOMER'S REQUEST

________gals. to full load
________gals. to ⅔ load
________gals. to ⅓ load

TAKEN

☐ YES
☐ YES
☐ YES

FREE UNLOADING TIME ALLOWED ON FULL LOADS.
Additional unloading time charged at current hourly truck rate.

ADDITIONAL WATER ADDED TO THIS CONCRETE WILL REDUCE STRENGTH. ANY WATER ADDED IS AT CUSTOMER'S OWN RISK.

WATER REQUESTED BY: ____________

REASON FOR DELAY TIME:

- ☐ JOB NOT READY
- ☐ LACK OF HELP
- ☐ WHEEL BARROW JOB
- ☐ WAITING FOR TRUCK TO UNLOAD
- ☐ ADDING WATER
- ☐ ARRIVED JOB EARLY
- ☐ OTHER____________

DELIVERY SLIP

JOB # 157 BID #

SOLD TO NORTHWEST FIELD SERVICES INC

DELIVERY POINT STAFF JENNINGS
8240 SW MACADAM

DATE 11/08/94 P.O.# 8613-7277
TIME 11:24 PLANT 10 PIT 00
DRIVER TOM ANDROSKY
GROSS 25.39 TRUCK # 82 TRLR #
TARE 11.11 WEIGHMASTER EDYE
NET 14.28 LOADS: 3 ACCM.: 41.69

SPECIAL INSTRUCTIONS:

MATERIAL	MIX DESIGN, SSD	MOISTURE CORRECTION	DESIRED AMOUNT	ACTUAL AMOUNT	SSD CORRECTED AMOUNT

l.SK
TERWEY
R-TERW
L-Taylors Ferry
R-Macadam

TRIM WATER GAL./YD.

WATER/CEMENT RATIO

MAXIMUM ADD WATER GALS.

PRODUCT #	PRODUCT DESCRIPTION	QUANTITY	UNITS	UNIT PRICE	AMOUNT
100034	3/4-0 CRUSHED	14.28	TONS		

ERMS: NET — DUE AND PAYABLE BY 15TH OF MONTH FOLLOWING PURCHASE. A inance charge of 1½% per month, or a minimum of $1.00, will be made on the unpaid alance at the end of the following month's billing cycle. This is an ANNUAL PERCENTAGE ATE OF 18%. PERSONAL NOTICE: We reserve the right to claim lien for all labor and material furnished on this job according to OREGON REVISED STATUTE 87.021

RECEIVED BY

TOTAL

TICKET # 48831

)RD 981771264
)29089

STRAIGHT BILL OF LADING

ORIGINAL – NOT NEGOTIABLE
NORTHWEST FIELD SERVICES, INC.
5315 NW St. Helens Rd.
Portland, OR 97210
Phone (503) 241-3827 FAX (503) 241-8259

Shipper No. 72
Carrier No. 502
Date 10-

HARBOR OIL	**FROM:** Shipper [illegible]
1535 N. FORBES AVE	Street [illegible]
PORTLAND OR Zip Code 97217	Origin [illegible]
	Vehicle Number

HM*	Kind of Packaging, Description of Articles, Special Marks and Exceptions	Weight (subject to correction)	Rate	
X	GASOLINE MIXTURE (WITH WATER) –			
	3, UN 1203 PG II, MARINE POLLUTANT			
	If spill should occur, dike and contain material, then call Northwest Field Services 24 hour spill response at (503) 241-3827.			

COD Amt: $

C.O.D. FEE:
PREPAID ☐
COLLECT ☐

rate is dependent on value, shippers specifically in writing the agreed or property.
ared value of the property is hereby y the shipper to be not exceeding
per

This is to certify that the above named materials are properly classified, described, packaged, marked, and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.
Signature

Subject to Section 7 of the conditions, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement:
The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.
(Signature of Consignor)

TOTAL CHARGES:
FREIGHT
FREIGHT PREPAID except when box at right is checked

subject to the classifications and lawfully filed tariffs in effect on the date of the ll of Lading, the property described above in apparent good order, except as noted condition of contents of packages unknown), marked, consigned, and destined ove which said carrier (the word carrier being understood throughout this contract y person or corporation in possession of the property under the contract) agrees usual place of delivery at said destination, if on its route, otherwise to deliver rier on the route to said destination. It is mutually agreed as to each carrier of all or any of, said property over all or any portion of said route to destinatio party at any time interested in all or any said property, that every service to be per shall be subject to all the bill of lading terms and conditions in the governing the date of shipment.

Shipper hereby certifies that he is familiar with all the bill of lading terms the governing classification and the said terms and conditions are hereby agreec and accepted for himself and his assigns.

N/A	CARRIER **NORTHWEST FIELD SERVICES, INC.**
	PER
	DATE 10/10/94

)RD 981771264
)29089

STRAIGHT BILL OF LADING

ORIGINAL – NOT NEGOTIABLE
NORTHWEST FIELD SERVICES, INC.
5315 NW St. Helens Rd.
Portland, OR 97210
Phone (503) 241-3827 FAX (503) 241-8259

Shipper No. [illegible]
Carrier No. 502
Date [illegible]

[illegible]	**FROM:** Shipper [illegible]
[illegible]	Street [illegible]
[illegible] Zip Code	Origin
	Vehicle Number

HM*	Kind of Packaging, Description of Articles, Special Marks and Exceptions	Weight (subject to correction)	Rate	
[illegible]	[illegible]			
	[illegible]			
	If spill should occur, dike and contain material, then call Northwest Field Services 24 hour spill response at (503) 241-3827.			

COD Amt: $

C.O.D. FEE:
PREPAID ☐
COLLECT ☐

e rate is dependent on value, shippers e specifically in writing the agreed or e property. :lared value of the property is hereby by the shipper to be not exceeding

_______ per _______

This is to certify that the above named materials are properly classified, described, packaged, marked, and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

_______________ Signature

Subject to Section 7 of the conditions, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement:
The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.

_______________ (Signature of Consignor) _______________

TOTAL CHARGES:

FREIGH
FREIGHT PREPAID except when box at right is checked

subject to the classifications and lawfully filed tariffs in effect on the date of the ill of Lading, the property described above in apparent good order, except as noted condition of contents of packages unknown), marked, consigned, and destined bove which said carrier (the word carrier being understood throughout this contract ny person or corporation in possession of the property under the contract) agrees usual place of delivery at said destination, if on its route, otherwise to deliver rrier on the route to said destination. It is mutually agreed as to each carrier of all or any of, said property over all or any portion of said route to destinati party at any time interested in all or any said property, that every service to be pe shall be subject to all the bill of lading terms and conditions in the governir the date of shipment.

Shipper hereby certifies that he is familiar with all the bill of lading terms the governing classification and the said terms and conditions are hereby agree and accepted for himself and his assigns.

[illegible]	CARRIER **NORTHWEST FIELD SERVICES, INC.**
[illegible]	PER
	DATE

3

E

YR UST FIELD INSPECTION REPORT

Inspection Date: 11/21/95

Site Name: Staff Jennings Marina

Site Address: 8240 SW Macadam, Portland

File/Facility No.: 26-88-078
(both UST & UST Cleanup file #'s as appropriate)

Others Onsite: Jeff Jennings
include company name: Dale Haar

Supervisor License No.: Exp. date
(note name with ** that Lic. No. applies to)

Time Begin 9^{00} am End 12^{00} pm Total* 3
*Include inspection, travel, paperwork

Inspector: R Silverman

Inspection Type (check one)

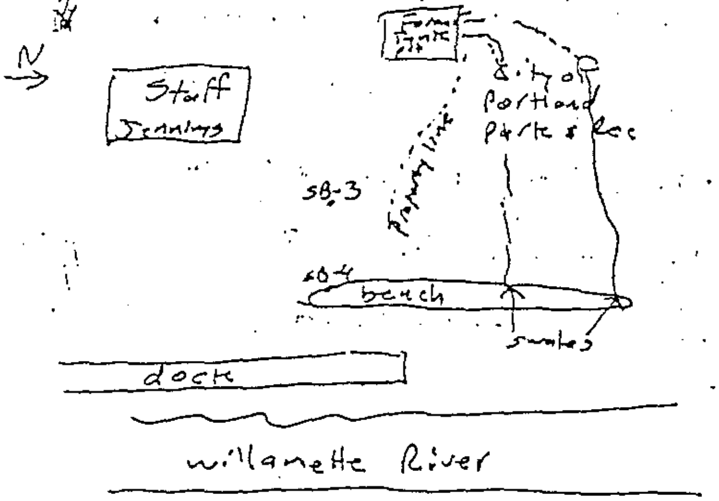
- ☐ Install (New/Retro/StII)
- ☐ Decommission
- ☐ UST Facility - Full
- ☐ UST Facility - Partial
- ☑ Cleanup
- ☐ Soil Treatment
- ☐ Complaint
- ☐ Distrib. Audit
- ☐ Service Provider Audit
- ☐ Leak Detection
- ☐ Fuels (StI/StII/Tanker)

Potential Site Hazards

ards Appraised? Y / [✓ N]
hotos Taken? Y / [✓ N] (attach)
Samples Taken? Y / [✓ N] (attach results)

INSPECTION RESULTS - IN COMPLIANCE? Y / N / [✓ NA]

SITE SKETCH (Plan View)



Notes (use back of form as necessary)

I talked with Jeff & Dale about conducting addition investigation into lateral & horizontal extent of contamination @ this site. Off-site borings are needed. In addition, a remedial system or approach was discussed, which included VES & cut-off trenchs to capture impacted water before it reachs the river The two borings on-site

EXHIBIT
18

INSPECTION NOTES: (cont.)

along the beach had elevated BTEX concentrations ≃ 29,000 to 35,000 ppb benzene. I indicated we needed more information on extent of both soil & groundwater contamination before we could determine what approach should be taken. If soil is removed from the beach the Corp of Engineers will need to approve it. Also, any collection trench on the City's property will need the approval of the City Commissioners. I indicated that the concentration of BTEX in the water samples from the beach indicate that petroleum contamination is getting to the river & that corrective action must be taken, this is a violation of water quality regulations. I told both Jeff & Dale that as long as they are making active progress towards addressing the impact of the release I would not proceed with a NON with a recomendation for civil penalty. The time frame for getting the borings & GW samples is during this winter. The time frame for installing a remedial system (cutoff trench & VES or other options) is prior to next years rainy season i.e. by ≃ October '96

Rich Silverman

F

Oregon

DEPARTMENT OF
ENVIRONMENTAL
QUALITY

NORTHWEST REGION

November 7, 1996

STAFF JENNINGS, INC.
C/O DONALD B BOWERMAN - REGISTERED AGENT
1001 MOLALLA AVENUE SUITE 208
OREGON CITY OR 97045

Re: Staff Jenning's Marina
File No.: 26-88-078
NWR-UST-96-171
<u>NOTICE OF NONCOMPLIANCE</u>

Dear Mr. Bowerman:

This notice is being sent to you as the registered agent for Staff Jennings, Inc. (Staff Jennings). These violations came to the Department's attention due to a file review.

This notice is a result of four violations of Oregon Administrative Rules (OARs) and Oregon Revised Statutes (ORS) governing Underground Storage Tanks, Water Quality, and Spill rules at the above referenced site located at 8240 SW Macadam Avenue, Portland, Oregon.

The following violations have been documented at the Staff Jennings Marina.

1. Failure to comply with ORS 466.645 which requires any person liable for a spill or release of oil or threatened spill or release under ORS 466.640 shall immediately clean up the spill or release. Any person liable for a spill or release or a threatened spill or release shall immediately initiate cleanup, whether or not the department has directed the cleanup. The department may require the responsible person to undertake such investigations, monitoring, surveys, testing and other information gathering as the department considers necessary.

2. Violation of ORS 468B.025(1)(a) which prohibits a person from causing pollution of any waters of the state or place or cause to be placed any wastes in a location where such wastes are likely to escape or be carried into the waters of the state by any means.

John A. Kitzhaber
Governor

2020 SW Fourth Avenue
Suite 400
Portland, OR 97201-4987
(503) 229-5263 Voice
TTY (503) 229-5471
DEQ-1

Exhibit 19

If you have any questions concerning this matter or need assistance in resolving the problems associated with this site, please contact me at (503) 229-5477.

Sincerely,

Rick Silverman

Rick Silverman
Environmental Specialist

Enclosures

cc: Jeff Jennings
Staff Jennings Marina
P.O. Box 82206
Portland, OR 97282-8206

1859

Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
811 SW Sixth Avenue
Portland, OR 97204-1390
(503) 229-5696
TDD (503) 229-6993

JUL 17 1998
OFFICE OF [illegible] DIRECTOR

July 9, 1998

Christopher L. Reive
Bogle & Gates
200 S.W. Market Street, Suite 600
Portland OR 97201-5793

RE: Staff Jennings Inc.
Case No. UT-NWR-96-274A

Dear Mr. Reive:

Per your request dated July 1, 1998, your request for an extension to the deadline to submit your brief in the above referenced matter has been approved. The deadline for submittal is now September 1, 1998.

If you should have any questions, please feel free to contact Susan Greco at (503) 299-5213.

Sincerely,

Carol A. Whipple

Carol Whipple
Chair, Environmental Quality Commission

cc: Chris Rich, NWR

Attachment J - 1 page

Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
811 SW Sixth Avenue
Portland, OR 97204-1390
(503) 229-5696
TDD (503) 229-6993

June 16, 1998

Christopher L. Reive
Bogle & Gates
200 S.W. Market Street, Suite 600
Portland OR 97201-5793

RE: Staff Jennings Inc.
Case No. UT-NWR-96-274A

Dear Mr. Reive:

Per your request dated May 7, 1998, your request for an extension to the deadline to submit your brief in the above referenced matter has been approved. The deadline for submittal is now July 1, 1998.

If you should have any questions, please feel free to contact Susan Greco at (503) 229-5213.

Sincerely,

Carol Whipple
Carol Whipple
Chair, Environmental Quality Commission

cc: Chris Rich, NWR

Attachment K - 1 page

1859

Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
811 SW Sixth Avenue
Portland, OR 97204-1390
(503) 229-5696
TDD (503) 229-6993

April 29, 1998

Debra Ann Olson
Bogle & Gates
200 S.W. Market Street, Suite 600
Portland OR 97201-5793

RE: Appeal to Environmental Quality Commission

Dear Ms. Olson:

On April 17, 1998, the Environmental Quality Commission received Staff Jenning's timely request for administrative review by the Commission in DEQ Case No. UT-NWR-97-274A.

Pursuant to OAR 340-11-132(4)(a), you must file exceptions and brief within thirty days from the filing of the Notice of Appeal (May 17, 1998). The exceptions must specify those findings and conclusions that you object to and include alternative proposed findings. Once your exceptions have been received, the Department may file an answer brief. I have enclosed a copy of the applicable administrative rules.

To file exceptions and brief, please send to Susan Greco, on behalf of the Environmental Quality Commission, at 811 S.W. 6th Avenue, Portland, Oregon, 97204, with a copy to Chris Rich, Department of Environmental Quality, 2020 S.W. 4th Avenue, Suite 400, Portland, Oregon, 97201.

After the parties file exceptions and briefs, this item will be set for Commission consideration at a regularly scheduled Commission meeting, and the parties will be notified of the date and location. If you have any questions on this process, or need additional time to file exceptions and briefs, please call me at 229-5213 or (800) 452-4011 ext. 5213 within the state of Oregon.

Sincerely,

Susan M. Greco

Susan M. Greco
Rules Coordinator

cc: Chris Rich, Enforcement Section

Attachment L - 1 page

BOGLE & GATES P.L.L.C.

A Professional Limited Liability Company

LAW OFFICES

DEBRA ANN OLSON

200 S.W. Market Street
Suite 600
Portland, Oregon 97201-5793

Direct Dial: (503) 721-3644
Main Office: (503) 222-1515
Facsimile: (503) 721-3666
Internet Email: dolson@bogle.com

Anchorage
Bellevue
Seattle
Tacoma
Vancouver, B.C.

State of Oregon
Department of Environmental Quality
RECEIVED
APR 17 1998
OFFICE OF THE DIRECTOR

00001/00054

April 17, 1998

Environmental Quality Commission
State of Oregon
811 S.W. Sixth Avenue
Portland, Oregon 97204

VIA HAND DELIVERY

Re: *In the Matter of Department of Environmental Quality v. Staff Jennings, Inc.*,
Civil Penalty No. UT-NWR-96-274A

Dear Sir/Madam:

Enclosed is an original and copy of the Notice of Appeal to be filed with the Environmental Quality Commission in the above-referenced matter. Please conform (date stamp) the copy of the Notice and return same with our messenger today.

If you have any questions, please call me at 721-3644.

Very truly yours,

BOGLE & GATES P.L.L.C.

Debra Ann Olson

DAO/48sm6
Enclosure(s)

cc: Jeff Jennings, Staff Jennings Boating Centers (w/enc. via regular mail)
Christopher W. Rich, Enforcement Section, DEQ (w/enc. via messenger)
Susan Greco, Rules Coordinator, DEQ (w/enc. via hand delivery)

Attachment M - 12 pages

BEFORE THE ENVIRONMENTAL QUALITY COMMISSION
OF THE STATE OF OREGON

IN THE MATTER OF: Department of Environmental Quality, Department, v. STAFF JENNINGS, INC., Respondent.	NOTICE OF APPEAL OF FINAL ORDER AND JUDGMENT/ORDER REGARDING VIOLATION AND ASSESSMENT OF CIVIL PENALTY DATED MARCH 18, 1998 NO. UT-NWR-96-274A

Defendant Staff Jennings, Inc., Respondent in this matter, hereby files and serves this Notice of Appeal pursuant to OAR 340-011-0132, and requests that the Environmental Quality Commission review the Hearing Officer's *Final Order and Judgment*, dated March 18, 1998, and the Hearing Officer's *Order Regarding Violation and Assessment of Civil Penalty*, dated March 18, 1998, in this matter (copies attached).

DATED this 17th day of April, 1998.

BOGLE & GATES P.L.L.C.

Christopher L. Reive, OSB No. 83305
Debra Ann Olson, OSB No. 86256
Attorneys for Staff Jennings, Inc.

CERTIFICATE OF SERVICE

I hereby certify that on April 17, 1998, I served a copy of **NOTICE OF APPEAL OF FINAL ORDER AND JUDGMENT/ORDER REGARDING VIOLATION AND ASSESSMENT OF CIVIL PENALTY DATED MARCH 18, 1998, NO. UT-NWR-96-274A,** on:

Jeff Jennings, President
Staff Jennings Boating Centers
P.O. Box 82206
Portland, OR 97282-8206

Via:
[X] U.S. Mail
[ ] Hand Delivery
[ ] Overnight Express
[ ] Facsimile

Christopher W. Rich
Enforcement Section
Oregon Department of Environmental Quality
2020 SW Fourth Avenue, 4th Floor
Portland, OR 97201-4987

Via:
[ ] U.S. Mail
[X] Hand Delivery
[ ] Overnight Express
[ ] Facsimile

Susan Greco
Rules Coordinator
Oregon Department of Environmental Quality
811 SW Sixth Avenue
Portland, OR 97204

Via:
[ ] U.S. Mail
[X] Hand Delivery
[ ] Overnight Express
[ ] Facsimile

the foregoing being the last known business addresses.

BOGLE & GATES P.L.L.C.

Debra Ann Olson
Debra Ann Olson, OSB No. 86256
Attorneys for Staff Jennings, Inc.

BEFORE THE ENVIRONMENTAL QUALITY COMMISSION
OF THE STATE OF OREGON

IN THE MATTER OF:	)	
Department of Environmental Quality,	)	**HEARING ORDER REGARDING**
Department	)	**VIOLATION AND ASSESSMENT**
	)	**OF CIVIL PENALTY**
vs.	)	**NO. UT-NWR-96-274A**
	)	
Staff Jennings, Inc.	)	**MULTNOMAH COUNTY**
Respondent	)	

BACKGROUND

The Department of Environmental Quality issued a Notice of Civil Penalty Assessment on March 7, 1997, under Oregon Revised Statutes (ORS) Chapter 183 and 468.126 through 468.140, and Oregon Administrative Rules (OAR) Chapter 340, Divisions 11 and 12. On March 24, 1997, Jeffrey S. Jones, attorney for respondent, Staff Jennings Inc., appealed the Notice and requested a hearing.

A hearing was held on December 3, 1997, in the Department of Environmental Quality (DEQ) offices in Portland, Oregon before hearings officer, Linda B. Lee. Jeff Jennings, President of Staff Jennings, appeared with one witness and was represented by his attorney, Jeff Jones. Christopher Rich, environmental law specialist, represented DEQ, with four witnesses.

ISSUES

Did respondent cause pollution by allowing a continuous discharge of petroleum from an underground storage tank spill or release to enter waters of the state in violation of ORS 468B.025(1)(a)?

Is the respondent subject to a civil penalty for this violation pursuant to OAR 340-12-069(f), OAR 340-12-042(2) and OAR 340-12-045?

Did the respondent fail to initiate and complete the investigation or clean up of a petroleum release from an underground storage tank, in violation of OAR 340-122-242?

FINDINGS OF FACT

1. The Staff Jennings Marina is located at 8240 S.W. Macadam Avenue in Portland, Oregon. It is bordered to the north by undeveloped river front acreage located on the west bank of the Willamette River. It is bordered to the east by the Willamette River. It is bordered to the south by an access road leading to a Multnomah County boat ramp located beneath the Sellwood

Bridge. It is bordered on the west by a railroad track, and access road, and SW Macadam Avenue.

2. As of October 1988 there were two underground storage tanks (UST) located on the Staff Jennings property. One was a 4,000 gallon gasoline UST, the other a 10,000 gallon gasoline UST.

3. On or about October 18, 1988, an unknown quality of petroleum discharged which saturated the soil and ground water and discharged a plume of free petroleum into the Willamette River. The Staff Jennings marina manager observed a slick of petroleum fuel and contacted a company to begin clean-up activities. Clean-up operations were undertaken. Soil samples were taken and it was determined that the source of the spill was one of the USTs. Staff Jennings personnel discontinued use of both the USTs. It was subsequently determined that the spill resulted due to a broken fuel distribution line on the larger UST.

4. On October 19, 1988 the release of petroleum contamination was reported to the Department of Environmental Quality, the Coast Guard and the local fire department.

5. Over the next several months, Staff Jennings made arrangements to have the USTs inspected, tested and repaired. Staff Jennings also hired a consultant, Golder Associates Inc., to study the situation and offer recommendations to address the problem and prevent future occurrences. On April 3, 1989, a report of findings regarding the site was prepared (See Exhibit 7). That report contained recommendations for remediation plans. On January 3, 1990, Golder Associates Inc. submitted a remediation plan (See Exhibit 9). Suggested remediation options were: removal and aeration of the affected soils, excavation of an interceptor/extraction trench to prevent further fuel migration into the river system, installation of a large bore extraction well, and placement of well points to remove free product from the ground water. The well point installation was the recommended option.

6. Over the next several years, Staff Jennings was in contact with DEQ regarding the situation but Staff Jennings did not immediately move forward with the remediation plan. Based on its contacts with DEQ representatives from 1988 until 1995, Staff Jennings was of the opinion that remediation was not a high priority matter. Sporadic actions were initiated by Staff Jennings including applying for financial assistance, hiring a different consultant, making arrangements and obtaining permits to conduct testing on adjacent properties, conducting tests at the marina.

7. In October 1994, the old USTs were decommissioned. Soil sampling was conducted and contamination was detected beyond the confines of the excavation site. A report regarding the underground storage tank decommissioning was prepared by De Minimis Inc. Environmental Management, the replacement consultant hired by Staff Jennings. A copy of this report was forwarded to DEQ (Exhibit 16).

8. In a letter from DEQ, dated December 21, 1994, Staff Jennings was asked to submit a proposed schedule of events for the implementation of the groundwater investigation, including the installation of at least three monitoring wells by January 23, 1995. As of November 1995, the DEQ representative told Jeff Jennings and the consultant that as long as they were making active progress toward addressing the impact of the release he would not

proceed with a notice of noncompliance with a recommendation for civil penalty. He indicated the time frame for getting the borings and ground water samples was during that winter (1995). He indicated the time frame for installing a remedial system was prior to the following year's rainy season, by October 1996.

9. When a remedial system was not installed by November 7, 1996, a Notice of Noncompliance was issued. The matter was referred to the DEQ Enforcement Section and on March 7, 1997, the Notice of Assessment of Civil Penalty was issued.

10. DEQ imposed a civil penalty of $8,400 based on a finding that Staff Jennings caused pollution of waters of the state in violation of ORS 468B.025. A copy of the Findings and Determination of the Respondent's Civil Penalty is attached to this decision as Exhibit (1). DEQ considered also imposing an additional penalty amount of $52,207 for economic benefit but opted not to do so. Instead, DEQ requested that Staff Jennings meet the terms and conditions of a remedial action order that was not subject to appeal.

11. The February 1989 report prepared by Golder and Associates as well as subsequent reports prepared by De Minimis, Inc. in 1994 and 1996 indicated high level BTEX (benzene, toluene, ethylbenzene and total xylenes) contamination in the soil. This contamination was an ongoing source of petroleum contamination discharging into the Willamette River.

ULTIMATE FINDINGS

Respondent Staff Jennings caused the pollution of state waters.

Respondent Staff Jennings failed to complete the investigation or cleanup of a petroleum release from an underground storage tank.

APPLICABLE LAW

ORS 468B.025 (1) (a) states:

> (1) Except as provided in ORS 468B.050, no person shall:
> (a) Cause pollution of any waters of the state or place or cause to be placed any wastes in a location where such wastes are likely to escape or be carried into the waters of the state by any means.

ORS 468B.005(3) states:

> "Pollution" or "water pollution" means such alteration of the physical, chemical or biological properties of any waters of the state, including change in temperature, taste, color, turbidity, silt or odor of the waters, or such discharge of any liquid, gaseous, solid, radioactive or other substance into any waters of the state, which will or tends to either by itself or in connection with any other substance, create a public nuisance or which will or tends to render such waters harmful, detrimental or injurious to public health, safety or welfare, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate

beneficial uses or to livestock, wildlife, fish or other aquatic life or the habitat thereof.

ORS 468B.005(7) states:

> "Wastes" means sewage, industrial wastes, and all other liquid, gaseous, solid, radioactive or other substances which will or may cause pollution or tend to cause pollution of any waters of this state.

ORS 468B.005(8) states:

> "Water" or "the waters of this state" include lakes, bays, ponds, impounding reservoirs, springs, wells, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Pacific Ocean within the territorial limits of the State of Oregon and all other bodies of surface or underground waters, natural or artificial, inland or coastal, fresh or salt, public or private . . . which are wholly or partially within or bordering the state or within its jurisdiction.

CONCLUSIONS AND REASONS

The fact that an UST on Staff Jennings property began leaking and discharged petroleum into the soil and later into the Willamette river is not in dispute. Clearly, Staff Jennings was responsible for maintaining its property in such a manner so as to avoid causing pollution of state waters. Staff Jennings argues that no penalty should be imposed because DEQ did not convey a sense of urgency.

It is true that in the early years following the discharge of the petroleum, DEQ did not aggressively pursue the matter. However, in 1995, Staff Jennings was put on notice in writing, that it needed to move forward with the implementation of a remediation plan. As of March 7, 1997, the date the Notice of Civil Penalty Assessment and Remedial Action Order were issued. Staff Jennings had not complied with its statutory obligation. Given the circumstances, a penalty is warranted.

As outlined in the Findings and Determination of Respondent's Civil Penalty (Exhibit 1), causing pollution of waters of the state is a Class I violation pursuant to OAR 340-12-069 (1)(f). The magnitude of the violation is determined to be moderate pursuant to OAR 340-10-045 (1)(a)(ii). In its penalty assessment, DEQ found that Respondent caused the spill of oil through a negligent act.

Negligence is defined in OAR 340-12-030 (11) which states: "Negligence" or "negligent" means failure to take reasonable care to avoid a foreseeable risk of committing an act or omission constituting a violation.

As of February 1989, Staff Jennings was on notice that there was petroleum contamination in the soil that was discharging in the Willamette River. Despite this information, it failed to take reasonable actions, e.g. remediation, to avoid the contamination of the river.

DEQ has the burden of establishing a violation by a preponderance of the evidence. Based on the evidence presented, DEQ has met its burden. The penalty as assessed is appropriate.

CIVIL PENALTY

The Respondent, Staff Jennings is liable for a civil penalty of $8,400.

Dated this 18 th day of March, 1998.

ENVIRONMENTAL QUALITY COMMISSION

Linda B. Lee
Linda B. Lee
Hearings Officer

BEFORE THE ENVIRONMENTAL QUALITY COMMISSION
OF THE STATE OF OREGON

IN THE MATTER OF:	)	
Department of Environmental Quality,	)	**FINAL ORDER**
Department	)	**AND JUDGMENT**
	)	**NO. UT-NWR-96-274A**
vs.	)	
	)	**MULTNOMAH COUNTY**
Staff Jennings, Inc.	)	
Respondent	)	

The Commission, through its hearings officer, orders that Staff Jennings is liable to the state of Oregon in the sum of $8,400 and that the state has judgment for and to recover that amount pursuant to the civil penalty assessment dated March 7, 1997.

Review of this order is by appeal to the Environmental Quality Commission pursuant to OAR 340-11-132. A request for review must be filed within 30 days following the mailing date of this order.

Dated this 18 th day of March, 1998.

ENVIRONMENTAL QUALITY COMMISSION

Linda B Lee
Linda B. Lee
Hearings Officer

Appeal Rights

If you are not satisfied with this decision, you have 30 days, following the mailing date of the order to appeal it to the Environmental Quality Commission. See Oregon Administrative Rule (OAR) 340-11-132. If you wish to appeal the Commission's decision, you have 60 days to file a petition for review with the Oregon Court of Appeals from the date of service of the order by the Environmental Quality Commission. See, ORS 183.480 et seq.

STATEMENT OF MAILING

AGENCY CASE NO. UT-NWR-96-274A
HEARINGS CASE NO. G60061

I certify that the attached Final Order was served through the mail to the following parties in envelopes addressed to each at their respective addresses, with postage fully prepaid.

Staff Jennings **(Certified)**
c/o Jeffrey S. Jones, Attorney
1001 Molalla Avenue , Suite 208
Oregon City, OR 97045-3768
(Sent with Jeffrey S. Jones' certified copy)

Jeffrey S. Jones, Attorney **(Certified)**
1001 Molalla Avenue , Suite 208
Oregon City, OR 97045-3768

Chris Rich
DEQ Enforcement Section
2020 SW Fourth, 4th Floor
Portland, OR 97201-4987

Susan Greco
DEQ
811 SW Sixth Avenue
Portland, OR 97204

Mailing/Delivery Date: 3/18/98
Hearings Clerk: DD

EXHIBIT (1)

FINDINGS AND DETERMINATION OF RESPONDENT'S CIVIL PENALTY PURSUANT TO OREGON ADMINISTRATIVE RULE (OAR) 340-12-045

VIOLATION: Causing pollution of waters of the state.

CLASSIFICATION: This is a Class I violation pursuant to OAR 340-12-069(1)(i).

MAGNITUDE: Absent any other finding, the magnitude of the violation is determined to be moderate pursuant to OAR 340-12-045(1)(a)(ii).

CIVIL PENALTY FORMULA: The formula for determining the amount of penalty of each violation is:

BP + [(0.1 x BP) x (P + H + O + R + C)] + EB

"BP" is the base penalty which is $3,000 for a Class I moderate magnitude violation in the matrix listed in OAR 340-12-042(1). Pursuant to OAR 340-12-042(2) the base penalty is doubled (to $6,000) because Respondent caused the spill of oil, as defined by OAR 340-108-002(11), through a negligent act.

"P" is Respondent's prior significant action(s) and receives a value of 0 because the Department has not taken any prior significant actions against Respondent.

"H" is the past history of Respondent in taking all feasible steps or procedures necessary to correct any prior significant action(s) and receives a value of 0 because the Department has not taken any prior significant actions against Respondent.

"O" is whether or not the violation was a single occurrence or was repeated or continuous during the period of the violation and receives a value of 2 because the illegal discharge was repeated for many days between October of 1988 and January of 1997.

"R" is the cause of the violation and receives a value of 2 because Respondent was negligent. Respondent failed to take reasonable care to immediately clean up a spill or release of petroleum, and thereby avoid the foreseeable risk of causing pollution to waters of the state.

"C" is Respondent's cooperativeness in correcting the violation and receives a value of 0 because Respondent was neither cooperative not uncooperative.

"EB" is the approximate dollar sum of the economic benefit that the Respondent gained through noncompliance, and receives a value of $0.

PENALTY CALCULATION:

$$
\begin{aligned}
\text{Penalty} &= BP + [(0.1 \times BP) \times (P + H + O + R + C)] + EB \\
&= \$6{,}000 + [(0.1 \times \$6{,}000) \times (0 + 0 + 2 + 2 + 0)] + \$0 \\
&= \$6{,}000 + [(\$600) \times (4)] + \$0 \\
&= \$6{,}000 + \$2{,}400 + \$0 \\
&= \$8{,}400
\end{aligned}
$$

Department

MAR 19 1998

OFFICE OF THE DIRECTOR

BEFORE THE ENVIRONMENTAL QUALITY COMMISSION OF THE STATE OF OREGON

IN THE MATTER OF:
Department of Environmental Quality,
Department

vs.

Staff Jennings, Inc.
Respondent

HEARING ORDER REGARDING VIOLATION AND ASSESSMENT OF CIVIL PENALTY NO. UT-NWR-96-274A

MULTNOMAH COUNTY

BACKGROUND

The Department of Environmental Quality issued a Notice of Civil Penalty Assessment on March 7, 1997, under Oregon Revised Statutes (ORS) Chapter 183 and 468.126 through 468.140, and Oregon Administrative Rules (OAR) Chapter 340, Divisions 11 and 12. On March 24, 1997, Jeffrey S. Jones, attorney for respondent, Staff Jennings Inc., appealed the Notice and requested a hearing.

A hearing was held on December 3, 1997, in the Department of Environmental Quality (DEQ) offices in Portland, Oregon before hearings officer, Linda B. Lee. Jeff Jennings, President of Staff Jennings, appeared with one witness and was represented by his attorney, Jeff Jones. Christopher Rich, environmental law specialist, represented DEQ, with four witnesses.

ISSUES

Did respondent cause pollution by allowing a continuous discharge of petroleum from an underground storage tank spill or release to enter waters of the state in violation of ORS 468B.025(1)(a)?

Is the respondent subject to a civil penalty for this violation pursuant to OAR 340-12-069(f), OAR 340-12-042(2) and OAR 340-12-045?

Did the respondent fail to initiate and complete the investigation or clean up of a petroleum release from an underground storage tank, in violation of OAR 340-122-242?

FINDINGS OF FACT

1. The Staff Jennings Marina is located at 8240 S.W. Macadam Avenue in Portland, Oregon. It is bordered to the north by undeveloped river front acreage located on the west bank of the Willamette River. It is bordered to the east by the Willamette River. It is bordered to the south by an access road leading to a Multnomah County boat ramp located beneath the Sellwood

Attachment N- 9 pages

Bridge. It is bordered on the west by a railroad track, and access road, and SW Macadam Avenue.

2. As of October 1988 there were two underground storage tanks (UST) located on the Staff Jennings property. One was a 4,000 gallon gasoline UST, the other a 10,000 gallon gasoline UST.

3. On or about October 18, 1988, an unknown quality of petroleum discharged which saturated the soil and ground water and discharged a plume of free petroleum into the Willamette River. The Staff Jennings marina manager observed a slick of petroleum fuel and contacted a company to begin clean-up activities. Clean-up operations were undertaken. Soil samples were taken and it was determined that the source of the spill was one of the USTs. Staff Jennings personnel discontinued use of both the USTs. It was subsequently determined that the spill resulted due to a broken fuel distribution line on the larger UST.

4. On October 19, 1988 the release of petroleum contamination was reported to the Department of Environmental Quality, the Coast Guard and the local fire department.

5. Over the next several months, Staff Jennings made arrangements to have the USTs inspected, tested and repaired. Staff Jennings also hired a consultant, Golder Associates Inc., to study the situation and offer recommendations to address the problem and prevent future occurrences. On April 3, 1989, a report of findings regarding the site was prepared (See Exhibit 7). That report contained recommendations for remediation plans. On January 3, 1990, Golder Associates Inc. submitted a remediation plan (See Exhibit 9). Suggested remediation options were: removal and aeration of the affected soils, excavation of an interceptor/extraction trench to prevent further fuel migration into the river system, installation of a large bore extraction well, and placement of well points to remove free product from the ground water. The well point installation was the recommended option.

6. Over the next several years, Staff Jennings was in contact with DEQ regarding the situation but Staff Jennings did not immediately move forward with the remediation plan. Based on its contacts with DEQ representatives from 1988 until 1995, Staff Jennings was of the opinion that remediation was not a high priority matter. Sporadic actions were initiated by Staff Jennings including applying for financial assistance, hiring a different consultant, making arrangements and obtaining permits to conduct testing on adjacent properties, conducting tests at the marina.

7. In October 1994, the old USTs were decommissioned. Soil sampling was conducted and contamination was detected beyond the confines of the excavation site. A report regarding the underground storage tank decommissioning was prepared by De Minimis Inc. Environmental Management, the replacement consultant hired by Staff Jennings. A copy of this report was forwarded to DEQ (Exhibit 16).

8. In a letter from DEQ, dated December 21, 1994, Staff Jennings was asked to submit a proposed schedule of events for the implementation of the groundwater investigation, including the installation of at least three monitoring wells by January 23, 1995. As of November 1995, the DEQ representative told Jeff Jennings and the consultant that as long as they were making active progress toward addressing the impact of the release he would not

proceed with a notice of noncompliance with a recommendation for civil penalty. He indicated the time frame for getting the borings and ground water samples was during that winter (1995). He indicated the time frame for installing a remedial system was prior to the following year's rainy season, by October 1996.

9. When a remedial system was not installed by November 7, 1996, a Notice of Noncompliance was issued. The matter was referred to the DEQ Enforcement Section and on March 7, 1997, the Notice of Assessment of Civil Penalty was issued.

10. DEQ imposed a civil penalty of $8,400 based on a finding that Staff Jennings caused pollution of waters of the state in violation of ORS 468B.025. A copy of the Findings and Determination of the Respondent's Civil Penalty is attached to this decision as Exhibit (1). DEQ considered also imposing an additional penalty amount of $52,207 for economic benefit but opted not to do so. Instead, DEQ requested that Staff Jennings meet the terms and conditions of a remedial action order that was not subject to appeal.

11. The February 1989 report prepared by Golder and Associates as well as subsequent reports prepared by De Minimis, Inc. in 1994 and 1996 indicated high level BTEX (benzene, toluene, ethylbenzene and total xylenes) contamination in the soil. This contamination was an ongoing source of petroleum contamination discharging into the Willamette River.

ULTIMATE FINDINGS

Respondent Staff Jennings caused the pollution of state waters.

Respondent Staff Jennings failed to complete the investigation or cleanup of a petroleum release from an underground storage tank.

APPLICABLE LAW

ORS 468B.025 (1) (a) states:

> (1) Except as provided in ORS 468B.050, no person shall:
> (a) Cause pollution of any waters of the state or place or cause to be placed any wastes in a location where such wastes are likely to escape or be carried into the waters of the state by any means.

ORS 468B.005(3) states:

> "Pollution" or "water pollution" means such alteration of the physical, chemical or biological properties of any waters of the state, including change in temperature, taste, color, turbidity, silt or odor of the waters, or such discharge of any liquid, gaseous, solid, radioactive or other substance into any waters of the state, which will or tends to either by itself or in connection with any other substance, create a public nuisance or which will or tends to render such waters harmful, detrimental or injurious to public health, safety or welfare, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate

> beneficial uses or to livestock, wildlife, fish or other aquatic life or the habitat thereof.

ORS 468B.005(7) states:

> "Wastes" means sewage, industrial wastes, and all other liquid, gaseous, solid, radioactive or other substances which will or may cause pollution or tend to cause pollution of any waters of this state.

ORS 468B.005(8) states:

> "Water" or "the waters of this state" include lakes, bays, ponds, impounding reservoirs, springs, wells, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Pacific Ocean within the territorial limits of the State of Oregon and all other bodies of surface or underground waters, natural or artificial, inland or coastal, fresh or salt, public or private . . . which are wholly or partially within or bordering the state or within its jurisdiction.

CONCLUSIONS AND REASONS

The fact that an UST on Staff Jennings property began leaking and discharged petroleum into the soil and later into the Willamette river is not in dispute. Clearly, Staff Jennings was responsible for maintaining its property in such a manner so as to avoid causing pollution of state waters. Staff Jennings argues that no penalty should be imposed because DEQ did not convey a sense of urgency.

It is true that in the early years following the discharge of the petroleum, DEQ did not aggressively pursue the matter. However, in 1995, Staff Jennings was put on notice in writing, that it needed to move forward with the implementation of a remediation plan. As of March 7, 1997, the date the Notice of Civil Penalty Assessment and Remedial Action Order were issued. Staff Jennings had not complied with its statutory obligation. Given the circumstances, a penalty is warranted.

As outlined in the Findings and Determination of Respondent's Civil Penalty (Exhibit 1), causing pollution of waters of the state is a Class I violation pursuant to OAR 340-12-069 (1)(f). The magnitude of the violation is determined to be moderate pursuant to OAR 340-10-045 (1)(a)(ii). In its penalty assessment, DEQ found that Respondent caused the spill of oil through a negligent act.

Negligence is defined in OAR 340-12-030 (11) which states: "Negligence" or "negligent" means failure to take reasonable care to avoid a foreseeable risk of committing an act or omission constituting a violation.

As of February 1989, Staff Jennings was on notice that there was petroleum contamination in the soil that was discharging in the Willamette River. Despite this information, it failed to take reasonable actions, e.g. remediation, to avoid the contamination of the river.

DEQ has the burden of establishing a violation by a preponderance of the evidence. Based on the evidence presented, DEQ has met its burden. The penalty as assessed is appropriate.

CIVIL PENALTY

The Respondent, Staff Jennings is liable for a civil penalty of $8,400.

Dated this 18 th day of March, 1998.

ENVIRONMENTAL QUALITY COMMISSION

Linda B. Lee

Linda B. Lee
Hearings Officer

BEFORE THE ENVIRONMENTAL QUALITY COMMISSION
OF THE STATE OF OREGON

IN THE MATTER OF:)
Department of Environmental Quality,) **FINAL ORDER**
Department) **AND JUDGMENT**
) **NO. UT-NWR-96-274A**
vs.)
) **MULTNOMAH COUNTY**
Staff Jennings, Inc.)
Respondent)

The Commission, through its hearings officer, orders that Staff Jennings is liable to the state of Oregon in the sum of $8,400 and that the state has judgment for and to recover that amount pursuant to the civil penalty assessment dated March 7, 1997.

Review of this order is by appeal to the Environmental Quality Commission pursuant to OAR 340-11-132. A request for review must be filed within 30 days following the mailing date of this order.

Dated this 18 th day of March, 1998.

ENVIRONMENTAL QUALITY COMMISSION

Linda B. Lee
Linda B. Lee
Hearings Officer

Appeal Rights

If you are not satisfied with this decision, you have 30 days, following the mailing date of the order to appeal it to the Environmental Quality Commission. See Oregon Administrative Rule (OAR) 340-11-132. If you wish to appeal the Commission's decision, you have 60 days to file a petition for review with the Oregon Court of Appeals from the date of service of the order by the Environmental Quality Commission. See, ORS 183.480 et seq.

EXHIBIT (1)

FINDINGS AND DETERMINATION OF RESPONDENT'S CIVIL PENALTY PURSUANT TO OREGON ADMINISTRATIVE RULE (OAR) 340-12-045

VIOLATION: Causing pollution of waters of the state.

CLASSIFICATION: This is a Class I violation pursuant to OAR 340-12-069(1)(f).

MAGNITUDE: Absent any other finding, the magnitude of the violation is determined to be moderate pursuant to OAR 340-12-045(1)(a)(ii).

CIVIL PENALTY FORMULA: The formula for determining the amount of penalty of each violation is:

$$BP + [(0.1 \times BP) \times (P + H + O + R + C)] + EB$$

"BP" is the base penalty which is $3,000 for a Class I moderate magnitude violation in the matrix listed in OAR 340-12-042(1). Pursuant to OAR 340-12-042(2) the base penalty is doubled (to $6,000) because Respondent caused the spill of oil, as defined by OAR 340-108-002(11), through a negligent act.

"P" is Respondent's prior significant action(s) and receives a value of 0 because the Department has not taken any prior significant actions against Respondent.

"H" is the past history of Respondent in taking all feasible steps or procedures necessary to correct any prior significant action(s) and receives a value of 0 because the Department has not taken any prior significant actions against Respondent.

"O" is whether or not the violation was a single occurrence or was repeated or continuous during the period of the violation and receives a value of 2 because the illegal discharge was repeated for many days between October of 1988 and January of 1997.

"R" is the cause of the violation and receives a value of 2 because Respondent was negligent. Respondent failed to take reasonable care to immediately clean up a spill or release of petroleum, and thereby avoid the foreseeable risk of causing pollution to waters of the state.

"C" is Respondent's cooperativeness in correcting the violation and receives a value of 0 because Respondent was neither cooperative not uncooperative.

"EB" is the approximate dollar sum of the economic benefit that the Respondent gained through noncompliance, and receives a value of $0.

PENALTY CALCULATION:

Penalty` = BP + [(0.1 x BP) x (P + H + O + R + C)] + EB
= $6,000 + [(0.1 x $6,000) x (0 + 0 + 2 + 2 + 0)] + $0
= $6,000 + [($600) x (4)] + $0
= $6,000 + $2,400 + $0
= $8,400

STATEMENT OF MAILING

AGENCY CASE NO. UT-NWR-96-274A
HEARINGS CASE NO. G60061

I certify that the attached Final Order was served through the mail to the following parties in envelopes addressed to each at their respective addresses, with postage fully prepaid.

Staff Jennings **(Certified)**
c/o Jeffrey S. Jones, Attorney
1001 Molalla Avenue , Suite 208
Oregon City, OR 97045-3768
(Sent with Jeffrey S. Jones' certified copy)

Jeffrey S. Jones, Attorney **(Certified)**
1001 Molalla Avenue , Suite 208
Oregon City, OR 97045-3768

Chris Rich
DEQ Enforcement Section
2020 SW Fourth, 4th Floor
Portland, OR 97201-4987

Susan Greco
DEQ
811 SW Sixth Avenue
Portland, OR 97204

Mailing/Delivery Date: 3/18/98
Hearings Clerk: ll

Attachment O – Exhibits 1-20

Issued By PORTLAND
Hearings Section
Telephone:1-888-577-2422
Mailed By: TAM

STATE OF OREGON

Date Mailed: 11/26/97
Case Type: DEQ
Ref No: G60061
Agency Case No: UT-NWR-96274

NOTICE OF HEARING

STAFF JENNINGS, INC.

DEPARTMENT OF ENVIRONMENTAL QUALITY
811 SW 6TH AVE
PORTLAND OR 97204 1334

503-229-6775

JEFFREY S. JONES, ATTORNEY
1001 MOLALLA AVE STE 208

OREGON CITY OR 97045 3768

503-650-0700

CHRIS RICH
DEPT OF ENVIRONMENTAL QUALITY
2020 SW 4TH AVE STE 400
PORTLAND OR 97201 4959

503-229-6775

HEARING DATE AND TIME	*HEARING PLACE*	*ADMINISTRATIVE LAW JUDGE*
WEDNESDAY, DECEMBER 3, 1997 9:00 AM PST	TELEPHONE	LEE LB

If you have questions prior to your hearing, call toll-free: 1-888-577-2422.
If you are calling from the Salem area, please use: 378-2329.

ANY CALL BLOCKING FEATURE ON YOUR PHONE MUST BE ENTIRELY DISABLED PRIOR TO THE TIME OF YOUR HEARING.

ON THE DATE OF YOUR HEARING WE WILL CALL YOU AT THE TELEPHONE NUMBER LISTED BELOW YOUR ADDRESS. IF YOU NEED TO GIVE A DIFFERENT NUMBER FOR THE HEARING OR IF YOU ARE NOT CALLED WITHIN 15 MINUTES AFTER THE TIME SET FOR HEARING, CALL THE ABOVE NUMBER IMMEDIATELY.

The issue(s) to be considered are:

DID THE APPELLANT CAUSE POLLUTION BY ALLOWING A CONTINUOUS DISCHARGE OF PETROLEUM FROM AN UNDERGROUND STORAGE TANK SPILL OR RELEASE TO ENTER WATERS OF THE STATE IN VIOLATION OF ORS 468b.025(1)(a)? IS THE APPELLANT SUBJECT TO A CIVIL PENALTY FOR THIS VIOLATION PURSUANT TO OAR 340-12-069(f), OAR 340-12-042(2) AND OAR 340-12-045? DID THE APPELLANT FAIL TO INITIATE AND COMPLETE THE INVESTIGATION OR CLEAN UP OF A PETROLEUM RELEASE FROM AN UNDERGROUND STORAGE TANK, IN VIOLATION OF OAR 340-122-242?

Exhibit 1

DONALD B. BOWERMAN
ATTORNEY AT LAW

RODERICK A. BOUTIN
Attorney, Of Counsel

ROGER D. DILTS
Law Clerk

JANICE L. EPPERSON
Legal Assistant

1001 Molalla Avenue, Suite 208
Mailing Address: P.O. Box 100
Oregon City, Oregon 97045

(503) 650-0700
FAX (503) 650-0053

[illegible] ENFORCEMENT SECTION
DEPARTMENT OF ENVIRONMENTAL QUALITY
RECEIVED
JUL 31 1997

Our File No:
94-485

July 30, 1997

Christopher Rich
Oregon Dept. of Environmental Quality
2020 SW Fourth Ave., Ste. 400
Portland, OR 97201-4987

Re: Staff Jennings - Civil Penalty
Assessment No: UT-NWR-96-274A

Dear Mr. Rich:

This confirms that Staff Jennings requests a hearing rather than to accept a DEQ settlement demand. This also confirms that DEQ does not intend to seek an economic benefit penalty against Staff Jennings.

Very truly yours,

Jeffrey S. Jones

JSJ:skw

cc: Jeff Jennings

2

DONALD B. BOWERMAN
ATTORNEY AT LAW

1001 Molalla Avenue, Suite 208
Mailing Address: P.O. Box 100
Oregon City, Oregon 97045

(503) 650-0700
FAX (503) 650-0053

RODERICK A. BOUTIN
Attorney, Of Counsel

ROGER D. DILTS
Law Clerk

JANICE L. EPPERSON
Legal Assistant

March 24, 1997

Our File No:
94-485

EWIDE ENFORCEMENT SECTION
RTMENT OF ENVIRONMENTAL QUALITY
RECEIVED
MAR 26 1997

DEQ Rules Coordinator
Office of the Director
811 SW Sixth Avenue
Portland, OR 97204

Re: In the Matter of Staff Jennings, Inc.
No: UT-NWR-96-274A

Dear Coordinator:

In the referenced matter we are enclosing:

1. Answer to Notice of Civil Penalty
2. Request for Contested Case Hearing on Assessment of Civil Penalty.
3. Request for Informal Discussion of Assessment of Civil Penalty.

We appreciate your cooperation in coordinating the informal discussion at a mutually convenient time.

Very truly yours,

Donald B. Bowerman

DBB:skw
Enclosures

cc: Staff Jennings, Inc. (w/encl)
Dale Haar (w/encl)

State of Oregon
Department of Environmental Quality
RECEIVED
MAR 25 1997
FFICE OF THE DEPUTY DIRECTOR

BEFORE THE ENVIRONMENTAL QUALITY COMMISSION

OF THE STATE OF OREGON

IN THE MATTER OF: STAFF JENNINGS, INC., an Oregon Corporation, Respondent.	))))))	ANSWER TO NOTICE OF ASSESSMENT OF CIVIL PENALTY NO. UT-NWR-96-274A MULTNOMAH COUNTY

Respondent Staff Jennings, Inc., answers as follows:

1.

Denies that Respondent caused a continuous discharge of petroleum from an underground storage tank spill or release to enter the Willamette River from October 19, 1988 to February 19, 1997.

2.

Denies that Respondent failed to initiate and complete the investigation or cleanup of a petroleum release from an underground storage tank.

3.

Denies that Respondent failed to initiate immediate abatement of a petroleum discharge.

4.

Denies that the installation of monitoring wells was required by DEQ.

5.

Denies that Respondent failed to define the extent of on-site contamination.

6.

Denies that Respondent failed to define the extent of off-site contamination.

7.

Admits that Respondent did not develop an Corrective Action Plan.

8.

Denies that Respondent caused a spill of oil through a negligent act.

9.

Denies that Respondent failed to take reasonable care to immediately clean up a spill or release of petroleum.

FIRST AFFIRMATIVE DEFENSE

Off-site contamination to the north of the facility was caused solely by acts and omissions of third parties, not agents or employees of Respondent. Off-site sampling has shown petroleum contamination to the north of Respondent's property, which is not down-gradient. Investigation has revealed the existence of an abandoned gasoline station site, with storage tanks in place, off the Respondent's site. The gasoline station tanks are a more likely source of the petroleum contamination north of Respondent's property, than is any release on Respondent's property.

SECOND AFFIRMATIVE DEFENSE

Complete investigation of potential contamination from off-site sources has been precluded because adjacent property owners have prevented or restricted access. The property to the north of Respondent's site is owned by the City of Portland Parks and Recreation Department, which delayed access to its property and limited investigational techniques. The abandoned gasoline station site is owned by the Oregon Department of Transportation, but the management of the surface was turned over to the City Parks Department. This complex situation has prevented complete delineation of off-site sources.

THIRD AFFIRMATIVE DEFENSE

The alleged violation had neither a potential for, nor an actual, adverse impact on the environment, nor did it pose any threat to public health, or other environmental receptors.

Therefore, the alleged violation is "minor," not "moderate" under OAR 340-12-045(1)(a)(ii)(B).

RESPECTFULLY SUBMITTED this 25 day of March, 1997.

Donald B. Bowerman, OSB #59011
Attorney for Respondent Staff Jennings, Inc.

BEFORE THE ENVIRONMENTAL QUALITY COMMISSION

OF THE STATE OF OREGON

IN THE MATTER OF:
STAFF JENNINGS, INC.,
an Oregon Corporation,

Respondent.

REQUEST FOR CONTESTED CASE HEARING ON ASSESSMENT OF CIVIL PENALTY NO. UT-NWR-96-274A MULTNOMAH COUNTY

Pursuant to ORS 183.090(3), Respondent hereby requests a formal contested case hearing on the above-encaptioned matter.

RESPECTFULLY SUBMITTED this 25 day of March, 1997.

Donald B. Bowerman, OSB #59011
Attorney for Respondent

BEFORE THE ENVIRONMENTAL QUALITY COMMISSION

OF THE STATE OF OREGON

IN THE MATTER OF:)
STAFF JENNINGS, INC.,)
an Oregon Corporation,) REQUEST FOR INFORMAL
) DISCUSSION OF
) ASSESSMENT OF CIVIL PENALTY
Respondent.) NO. UT-NWR-96-274A
) MULTNOMAH COUNTY

Respondent in the above-encaptioned action hereby requests an informal discussion of the of the matter.

RESPECTFULLY SUBMITTED this 23 day of March, 1997.

Donald B. Bowerman, OSB #59011
Attorney for Respondent

off site

Oregon

DEPARTMENT OF
ENVIRONMENTAL
QUALITY

MAR 07 1997

CERTIFIED MAIL Z 076 234 278

Staff Jennings, Inc.
c/o Donald Bowerman, Registered Agent
1001 Molalla Avenue, Suite 208
Oregon City, Oregon 97045

Re: Notice of Civil Penalty
Assessment No. UT-NWR-96-274A and
Remedial Action Order No. UT-NWR-96-274B
Multnomah County

On or about October 18, 1988, a release of petroleum contamination resulting from a broken fuel distribution line from an underground storage tank (UST), occurred at the Staff Jennings Marina, located at 8240 S.W. Macadam Avenue, in Portland, Oregon. This release, which was reported to the Department of Environmental Quality (Department or DEQ) on or about October 19, 1988, indicated that petroleum from the release impacted the fuel tank area, caused significant soil contamination on Staff Jennings property adjacent to the Willamette River, and resulted in a discharge of free petroleum product into the river. Subsequent consultant reports and Department inspections have confirmed that significant concentrations of petroleum currently remain in the soil adjacent to the Willamette River. This contamination has been the source of an ongoing release of petroleum to the river since October of 1988.

Although initial measures were taken to abate the direct discharge of free product into the river, adequate steps were not taken to clean up the contaminated soils adjacent to the river. Golder Associates, a consulting firm, prepared a January 3, 1990, report for Staff Jennings that discussed options for remediation of contaminated soil and groundwater at the Staff Jennings facility, including installation of a system to prevent further petroleum migration into the river.

On November 21, 1995, Rick Silverman, of the Department's UST Section, directed Staff Jennings to define the horizontal extent of soil and groundwater contamination, obtain off-site boring samples, and make active progress towards installation of a remedial system to capture petroleum before it reaches the river. Mr. Silverman notified Staff Jennings that it was in violation of water quality regulations, and would need to install a remedial system by no later than October of 1996.

Exhibit 4

811 SW Sixth Avenue
Portland, OR 97204-1390
(503) 229-5696
TDD (503) 229-6993

On November 7, 1996, the Department sent Staff Jennings a Notice of Noncompliance (NON) for 1) failing immediately clean up a spill or release of oil, 2) causing pollution of waters of the state, 3) violating conditions of Staff Jennings NPDES Permit, and 4) failing to initiate and complete the investigation or cleanup of a release of petroleum from an UST, including failure to install monitoring wells and develop a Corrective Action Plan. Although Staff Jennings has taken some steps to identify sources of contamination, Staff Jennings has allowed a recurring discharge of petroleum into the Willamette River, and has not fully complied with the Department's UST, Spill, and Water Quality regulations.

Petroleum contaminated soil and groundwater pose a serious threat to human health and the environment, and can require expensive cleanup. Unreasonable delays in performing necessary investigation and cleanup of contaminated sites can result in greater contamination as petroleum migrates through groundwater, and poses a threat of contamination to surface water and adjacent properties.

Enclosed is a Notice of Assessment of Civil Penalty, No. UT-NWR-96-274A (Notice), related to the discharge of petroleum into the Willamette River. I have assessed a total civil penalty of $8,400 for Staff Jennings' violation of the Department's Spill rules. In determining the amount of the penalty, I used the procedures set forth in OAR 340-12-045. The Department's findings and civil penalty determination are attached to the Notice as Exhibit 1. If you fail to either pay or appeal the civil penalty within twenty (20) days, a Default Order will be entered against you. I have chosen not to assess a penalty for Violation 2 in the enclosed Notice.

I have also included a Remedial Action Order, No. UT-NWR-96-274B (Order). The Order requires Staff Jennings to 1) install a remedial system capable of preventing additional petroleum contamination entering the Willamette River, 2) conduct water treatment in conformance with the NPDES Permit 1500A 3) obtain an off-site access agreement from the City of Portland to install monitoring wells to determine the lateral and horizontal extent of off-site petroleum contamination, 4) submit reports of work performed under the Order, 5) submit a Corrective Action Plan for addressing any long term cleanup of soil and groundwater, and 6) pay all past due oversight costs.

The civil penalty formula allows the Department to calculate an economic benefit gained through noncompliance. In this case, the Department calculated an economic benefit in the amount $52,207 that Staff Jennings gained by avoiding the cost of installing and maintaining a petroleum remediation system to clean up the release. The Department is not seeking the economic benefit amount in this action. However, if you fail to meet all terms and conditions of the enclosed Order, DEQ will assess an additional civil penalty for violating the Order and include the $52,207 economic benefit, and any additional economic benefit if applicable.

If you wish to discuss this matter, or if you believe there are mitigating factors which the Department might not have considered in assessing the civil penalty, you may request an informal discussion by attaching your request to your appeal. Your request to discuss this matter with the Department will not waive your right to a contested case hearing on the civil penalty. Please note that the Order is non-appealable. I understand that you have contacted a consultant to address the issues contained in the attached actions, and I encourage you to continue this work pursuant to the terms of the enclosed Order.

I look forward to your cooperation and efforts to comply with the UST, Spill, and Water Quality rules in the future. However, if you fail to comply with the enclosed Order, or if additional violations occur, you may be subject to further action by the Department.

Copies of referenced rules are enclosed. I have also enclosed a copy of the Department's internal management directive on Supplemental Environmental Projects (SEPs) which provide environmental enhancement in local areas. If you have any questions about this action, please contact Chris Rich with the Department's Enforcement Section in Portland at 229-6775.

Sincerely,

Langdon Marsh

Langdon Marsh
Director

cr
Enclosures
cc: Northwest Region, UST Section, DEQ
Waste Management Cleanup Division, DEQ
Department of Justice
Environmental Protection Agency
Environmental Quality Commission
Multnomah County District Attorney

BEFORE THE ENVIRONMENTAL QUALITY COMMISSION

OF THE STATE OF OREGON

IN THE MATTER OF:)
STAFF JENNINGS, INC.)
an Oregon Corporation)
Respondent.)

NOTICE OF ASSESSMENT
OF CIVIL PENALTY
No. UT-NWR-96-274A
MULTNOMAH COUNTY

I. AUTHORITY

This Notice of Assessment of Civil Penalty (Notice) is issued to Respondent, Staff Jennings, Inc., by the Department of Environmental Quality (Department) pursuant to Oregon Revised Statutes (ORS) 468.126 through 468.140, ORS Chapter 183 and Oregon Administrative Rules (OAR) Chapter 340, Divisions 11 and 12.

II. VIOLATIONS

1. On or about October 19, 1988, to at least February 19, 1997, Respondent caused pollution of waters of the state in violation of ORS 468B.025(1)(a). Specifically, Respondent caused pollution by allowing a continuous discharge of petroleum, from an underground storage tank spill or release, to enter the Willamette River, waters of the state as defined by ORS 468B.005(8). This is a Class I violation pursuant to OAR 340-12-069(f).

2. On or about October 19, 1988 to at least February 19, 1997, Respondent failed to initiate and complete the investigation or cleanup of a petroleum release from an underground storage tank, in violation of OAR 340-122-242. Specifically, Respondent failed to initiate immediate abatement of petroleum discharge adjacent to the Willamette River, install monitoring wells as required by the Department, define the extent of on-site and off-site contamination, and develop a Corrective Action Plan to cleanup petroleum contamination.

III. ASSESSMENT OF CIVIL PENALTIES

The Department imposes a civil penalty of $8,400 for Violation 1 in Section II above. The findings and determination of Respondent's civil penalty, pursuant to OAR 340-12-042(2) and OAR 340-12-045 are attached and incorporated as Exhibit No. 1.

Exhibit 3

IV. OPPORTUNITY FOR CONTESTED CASE HEARING

Respondent has the right to have a formal contested case hearing before the Environmental Quality Commission (Commission) or its hearings officer regarding the matters set out above, at which time Respondent may be represented by an attorney and subpoena and cross-examine witnesses. **The request for hearing must be made in writing, must be received by the Department's Rules Coordinator within twenty (20) days from the date of service of this Notice, and must be accompanied by a written "Answer" to the charges contained in this Notice.**

In the written Answer, Respondent shall admit or deny each allegation of fact contained in this Notice, and shall affirmatively allege any and all affirmative claims or defenses to the assessment of this civil penalty that Respondent may have and the reasoning in support thereof. Except for good cause shown:

1. Factual matters not controverted shall be presumed admitted;
2. Failure to raise a claim or defense shall be presumed to be a waiver of such claim or defense;
3. New matters alleged in the Answer shall be presumed to be denied unless admitted in subsequent pleading or stipulation by the Department or Commission.

Send the request for hearing and Answer to: **DEQ Rules Coordinator, Office of the Director, 811 S.W. Sixth Avenue, Portland, Oregon 97204.** Following receipt of a request for hearing and an Answer, Respondent will be notified of the date, time and place of the hearing.

Failure to file a timely request for hearing and Answer may result in the entry of a Default Order for the relief sought in this Notice.

Failure to appear at a scheduled hearing or meet a required deadline may result in a dismissal of the request for hearing and also an entry of a Default Order.

The Department's case file at the time this Notice was issued may serve as the record for purposes of entering the Default Order.

V. OPPORTUNITY FOR INFORMAL DISCUSSION

In addition to filing a request for a contested case hearing, Respondent may also request an informal discussion with the Department by attaching a written request to the hearing request and Answer.

VI. PAYMENT OF CIVIL PENALTY

The civil penalty is due and payable ten (10) days after an Order imposing the civil penalty becomes final by operation of law or on appeal. Respondent may pay the penalty before that time. Respondent's check or money order in the amount of $8,400 should be made payable to "State Treasurer, State of Oregon" and sent to the **Business Office, Department of Environmental Quality, 811 S.W. Sixth Avenue, Portland, Oregon 97204.**

3·7·97
Date

Langdon Marsh
Langdon Marsh, Director

EXHIBIT (1)

FINDINGS AND DETERMINATION OF RESPONDENT'S CIVIL PENALTY PURSUANT TO OREGON ADMINISTRATIVE RULE (OAR) 340-12-045

VIOLATION: Causing pollution of waters of the state.

CLASSIFICATION: This is a Class I violation pursuant to OAR 340-12-069(1)(f).

MAGNITUDE: Absent any other finding, the magnitude of the violation is determined to be moderate pursuant to OAR 340-12-045(1)(a)(ii).

CIVIL PENALTY FORMULA: The formula for determining the amount of penalty of each violation is:

BP + [(0.1 x BP) x (P + H + O + R + C)] + EB

"BP" is the base penalty which is $3,000 for a Class I moderate magnitude violation in the matrix listed in OAR 340-12-042(1). Pursuant to OAR 340-12-042(2) the base penalty is doubled (to $6,000) because Respondent caused the spill of oil, as defined by OAR 340-108-002(11), through a negligent act.

"P" is Respondent's prior significant action(s) and receives a value of 0 because the Department has not taken any prior significant actions against Respondent.

"H" is the past history of Respondent in taking all feasible steps or procedures necessary to correct any prior significant action(s) and receives a value of 0 because the Department has not taken any prior significant actions against Respondent.

"O" is whether or not the violation was a single occurrence or was repeated or continuous during the period of the violation and receives a value of 2 because the illegal discharge was repeated for many days between October of 1988 and January of 1997.

"R" is the cause of the violation and receives a value of 2 because Respondent was negligent. Respondent failed to take reasonable care to immediately clean up a spill or release of petroleum, and thereby avoid the foreseeable risk of causing pollution to waters of the state.

"C" is Respondent's cooperativeness in correcting the violation and receives a value of 0 because Respondent was neither cooperative not uncooperative.

"EB" is the approximate dollar sum of the economic benefit that the Respondent gained through noncompliance, and receives a value of $0.

PENALTY CALCULATION:

$$\begin{aligned}
\text{Penalty} &= BP + [(0.1 \text{ x } BP) \text{ x } (P + H + O + R + C)] + EB \\
&= \$6{,}000 + [(0.1 \text{ x } \$6{,}000) \text{ x } (0 + 0 + 2 + 2 + 0)] + \$0 \\
&= \$6{,}000 + [(\$600) \text{ x } (4)] + \$0 \\
&= \$6{,}000 + \$2{,}400 + \$0 \\
&= \$8{,}400
\end{aligned}$$

BEFORE THE ENVIRONMENTAL QUALITY COMMISSION

OF THE STATE OF OREGON

IN THE MATTER OF: STAFF JENNINGS, INC., an Oregon Corporation, Respondent	)))))	REMEDIAL ACTION ORDER No. UT-NWR-96-274B MULTNOMAH COUNTY

I. AUTHORITY

This Remedial Action Order (Order), is issued to Respondent, Staff Jennings, Inc., an Oregon Corporation, by the Department of Environmental Quality (Department) pursuant to Oregon Revised Statutes (ORS) 465.260(4) and ORS 465.255(1).

II. PURPOSE

The purpose of this Order is to cause proper investigation and cleanup of a release of hazardous substances at Respondent's underground storage tank (UST) facility, Staff Jennings Marina, located at 8240 SW Macadam Avenue, in Portland, Oregon.

III. FINDINGS OF FACT

1. Between 1988 and the date of this Order, Respondent owned or controlled the Staff Jennings Marina.

2. On October 19, 1988, a release of petroleum contamination from an UST at the Staff Jennings Marina was reported to the Department. An unknown quantity of petroleum contamination released from the Staff Jennings Marina entered the Willamette River as a result of this release.

3. A report by Respondent's consultant, Golder Associates, Inc., prepared in February of 1989, indicated high level BTEX (benzene, toluene, ethylbenzene, and total xylenes), on the portion of the Staff Jennings Marina, adjacent to the Willamette River, as follows: benzene (2,000 parts per billion[ppb]), toluene (61,000 ppb), ethylbenzene (49,000 ppb), and total xylenes (402,000 ppb).

4. DeMinimis, Inc., a consultant for Staff Jennings, prepared a soil analysis report dated March 31, 1994, which indicatated high level BTEX (16,100 to 27,000 ppb) contamination in soil borings taken from the Staff Jennings Marina property below the USTs.

5. DeMinimis Inc.'s UST decommissioning report dated December 13, 1994, indicated moderate to high level gasoline and diesel in soil from the UST excavation pits, ranging from 42 parts per million (ppm) TPH-G to 3552 ppm TPH-G, and non-detect to 3750 ppm for TPH 418.1 (diesel).

6. Based upon the contamination reports submitted to the Department, Rick Silverman, of the DEQ Northwest Region UST Section, conducted an inspection of the Staff Jennings Marina on November 21, 1996. During this inspection, Mr. Silverman informed Jeff Jennings of Staff Jennings, that Staff Jennings would need to complete off-site investigation of contamination, and install a petroleum recovery system by no later than the end of 1996. Jeff Jennings verbally informed Rick Silverman that Staff Jennings would comply with this deadline.

7. Based upon the levels of contamination reported on the Staff Jennings property adjacent to the Willamette River, consultants reports of discharges to the river system, and observations by DEQ, the Department concludes that the Staff Jennings facility has been, since October of 1988, and continues to be, a source of petroleum contamination discharging directly into the Willamette River.

8. Deminimis, Inc.'s February 26, 1996, report indicated off-site petroleum contamination ranging from non-detect to 5700 ppm TPH-G, and non-detect to 1000 ppm TPH 418.1 in the soil. The February 26, 1996 report also indicated benzene ranging from 340 ppb to 16,200 ppb and napthalene ranging from 5.1 to 188 ppb in groundwater at the Staff Jennings Marina.

9. As of November 1, 1996, the Department had not received confirmation of off-site investigation or installation of a petroleum recovery system.

10. On November 7, 1996, the Department issued Staff Jennings a Notice of Noncompliance (NON) for 1) failing immediately clean up a spill or release of oil, 2) causing pollution of waters of the state, 3) violating conditions of Staff Jennings NPDES Permit, and 4) failing to initiate

and complete the investigation or cleanup of a release of petroleum from an UST, including failure to install monitoring wells and develop a Corrective Action Plan.

11. As of February 19, 1997, Staff Jennings has not submitted evidence of compliance with the violations identified in the November 7, 1996 NON.

IV. CONCLUSIONS OF LAW

1. Respondent is a "person" under ORS 465.200(20).

2. At all relevant times, Respondent's facility (or facilities) was a facility as defined in ORS 465.200(12).

3. The materials described in Section III, paragraphs 2, 3, 4, 5, 7 and 8 are "hazardous substances" under ORS 465.200(15).

4. The discharges of hazardous substances as described in Section III, paragraphs 4, 5, and 6 constitute a "release" into the environment under ORS 465.200(21).

5. Respondent is an owner or operator as defined in ORS 456.200(19).

6. Respondent is strictly liable, pursuant to ORS 465.255(1), for those remedial action costs incurred by the state or any other person that are attributable to, or associated with, a facility and for damages for injury to or destruction of any natural resource caused by a release.

7. The Director may require Respondent to conduct any removal, remedial action, or related actions necessary to protect public health, safety, welfare and the environment, pursuant to ORS 465.260(4).

8. The work required by this Order is necessary to protect public health, safety, welfare, and the environment.

V. ORDER

Based upon the foregoing FINDINGS OF FACT and CONCLUSIONS OF LAW, Respondents are hereby ORDERED:

1. Within ninety (90) days of receipt of this Order, Respondent shall, subject to Department approval, install a remedial system capable of preventing additional petroleum

contamination from the Staff Jennings Property from entering the Willamette River. Within forty-five (45) days of installation of the remedial system required by this paragraph, Respondent shall submit a report outlining the remedial action plan to the Department.

2. Upon installation of a water treatment system, pursuant to Section V, paragraph 1, above, Respondent shall conduct such water treatment in conformance with Staff Jennings' NPDES Permit 1500A, including submittal of weekly discharge monitoring reports.

3. Within ninety (90) days of receipt of this Order, Respondent shall obtain an off-site access agreement from the City of Portland Parks and Recreation Department to install monitoring wells to determine the lateral and horizontal extent of off-site petroleum contamination from the Staff Jennings Property.

4. Within forty-five (45) days of determining the lateral and horizontal extent of contamination, as required by Section V, paragraph 3, above, Respondent shall submit an off-site investigation report to the Department

5. Within ninety (90) days of completion of the off-site investigation and installation of monitoring wells, required by Section V, paragraph 3, above, Respondent shall submit a Corrective Action Plan, pursuant to OAR 340-122-250(1), for responding to contaminated soils and groundwater in a manner that protects public health, safety, welfare, and the environment.

6. Within thirty (30) days of receipt of this Order, Respondent shall pay in full all past due oversight costs, in the amount of $1,691, or enter into a payment plan approved by the Department.

VI. FAILURE TO COMPLY

1. Upon Respondent's failure to comply with this Order, DEQ may seek any available remedy to enforce this Order, including but not limited to penalties and injunctive relief.

2. Pursuant to ORS 465.260(8), upon Respondent's failure to comply with this Order, Respondent shall be liable for any costs incurred by the State in conducting the work required under this Order and for punitive damages up to three times the amount of the State's costs.

3. Pursuant to ORS 465.260(6), Respondent may not seek administrative appeal or judicial review of this Order

VII. SATISFACTION OF THIS ORDER

Upon completion of the work under this Order, including receipt by the Department of all submittals and reports required under Section V, the Department shall issue a Certification of Completion of activities under this Order. Issuance of a Certificate of Completion shall deem the Order satisfied and terminated.

3.7.97
Date

Langdon Marsh
Langdon Marsh, Director

< MORE ON BACK >

UPDATES:

PETROLEUM RELEASE FORM
Please Check All That Apply

INCIDENT INFORMATION

LOG NBR: 26-88-0078 RECEIVED BY: LGG

UST FAC NBR: ______ DATE REPORTED: 10/20/88

SITE NAME: STAFF JENNINGS INC.

SITE ADDRESS: 8240 S.W. MACADAM

SITE CITY: PDX ZIP: 97219

SITE COUNTY: ______ PHONE: ______

PROJECT MANAGER: ______

☐ REGULATED UST
☐ NON-REGULATED UST
☐ HEATING OIL TANK

FUNDING

FUND COD
1215

☐ LUST
☐ OHC
☐ HSRAF
☐ FINANCIAL ASST
☐ INVOICE START
☐ INVOICE STOP
☐ NFA SENT

MAIL CONTACTS

REPORTED BY

NAME: Steve Locke
COMPANY: SRH
RESS: ______
CITY: ______ ZIP: ______
STATE: ______ PHONE: 252-8316

RESPONSIBLE PARTY

NAME: Steve Locke
COMPANY: SRH Assoc.
ADDRESS: PO BOX 301008
CITY: PDX ZIP: 97230
STATE: ______ PHONE: 255-7038

INVOICE CONTACT

NAME: ______
COMPANY: ______
ADDRESS: ______
CITY: ______ ZIP: ______
STATE: ______ PHONE: ______

OTHER CONTACT(S)

NAME: ______
COMPANY: ______
ADDRESS: ______
CITY: ______ ZIP: ______
STATE: ______ PHONE: ______

SITE ASSESSMENT

DATE DISCOVERED: 10/19/88

☐ EMERGENCY RESP.
☐ ENFORCEMENT

☐ FUTHER CLEANUP REQ.
☐ NO FURTHER CLEANUP REQ.
☐ OFFSITE MIGRATION

______ L.I.P.S. SCORE (Region)

CONFIRMATION:

☐ SI) STAFF

DISCOVERY:

☐ RM) ROUTINE MONITORING
☐ DC) DECOMMISSIONING
☐ CP) COMPLAINT
☐ IC) INVENTORY CONTROL
☐ SA) SITE ASSESSMENT
☐ TT) TANK TEST
☒ OT) OTHER

CAUSE:

☐ TL) TANK LEAK
☒ PL) PIPE LEAK
☐ OF) OVERFILL
☐ SS) SURFACE SPILL
☐ PV) PUMP/VALVE LEAK
☐ OT) OTHER ______
☐ UN) UNKNOWN

EXHIBIT
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PENGAD-Bayonne, N. J.

CONTAMINANTS - IMPACTS

CONTAMINANTS:

☐ UG) UNLEADED GASOLINE
☐ LG) LEADED GASOLINE
☒ MG) MISC. GASOLINE
☐ DS) DIESEL
☐ FO) FUEL OIL
☐ WO) WASTE OIL
☐ LB) LUBRICANT

☐ SV) SOLVENT
☐ BF) BUNKER FUEL
☐ OP) OTHER PET. DIST.
☐ CH) CHEMICAL
☐ HO) HEATING OIL
☐ UN) UNKNOWN
☐ OT) OTHER ____________

MEDIA/IMPACT:

SL) SOIL
☐ GW) GROUNDWATER
SW) SURFACE WATER
☒ DW) DRINKING WATER
☐ FV) FACILITY (VAPOR)
☐ FP) FACILITY (FREE PROD.)

SITE - MANAGEMENT

RELEASE STOPPED: 10 / 20 / 88

FINAL REQUEST INVOICE DATE: ____ / ____ / ____

CLEANUP STARTED: ____ / ____ / ____

NO FURTHER ACTION: ____ / ____ / ____

SOIL - MANAGEMENT

SWLA PERMIT NUMBER: ____________

DATE ISSUED: ____ / ____ / ____

AMOUNT OF SOIL (yds 3) TREATED ON SITE: ____________

AMOUNT OF SOIL (yds 3) TREATED OFF SITE: ____________

TREATMENT METHOD:
☐ AREATION
☐ THERMAL
☐ BIOLOGICAL
☐ OTHER ____________

AMOUNT OF SOIL (yds 3) DISPOSED OF: ____________ ☐ TREATED ☐ UNTREATED

FINAL DISPOSITION OF SOIL:
☐ ONSITE
☐ LANDFILL
☐ ROAD BASE
☐ OTHER ____________

NOTES/COMMENTS: ____________

This Space Provided For Regional Use

(LUST106/FEB-97)

Staff Jennings Marina

* * * OREGON DEQ LUST REPORT * * * EMD # 88-853 (200

INITIAL INFORMATION

UST FACILITY I.D. #: 3105 EMERGENCY RESPONSE TAKEN: [✓ Y] N

LUST INCIDENT #: County 26 - Year 88 - Number 078

DATE RECEIVED: 10/20/88 RECEIVED BY: LGG Jeff Jennings.

LEAK REPORTED BY:	TANK LOCATION:	LUST CONTACT:	RP: Mike Morland
Steve Locke	8240 SW Macadam		~~Jack Styles~~
SRH	(Staff Jennings)		Staff Jennings Marina
252-8316	Portland 97219		P.O. Box 02 76-[illegible] 97202
Ph#: ~~232-9824~~	Ph#:	Ph#:	Ph#: ~~[illegible]~~ 244-7505 Sellwood str

CONFIRMATION OF RELEASE: Date Release Confirmed: _/_/_

☐ Staff Site Inspection (Name: ________)

☐ Lab Sample: DEQ RP Other (Results: ________)

☐ Written Report by RP

☐ Other(________)

SITE ASSESSMENT

HOW DISCOVERED: Date Release Discovered: 10/19/88

☐ Routine Monitoring ☐ Inventory Control ☐ Decommissioning

☐ Site Assessment ☐ Complaint(________) ☐ Other(________)

AMOUNT RELEASED: 500-1000 TYPE OF MATERIAL RELEASED: gasoline

SOURCE OF RELEASE: ☐ Tank Leak ☐ Overfill

Cracked elbow ☒ Pipe Leak ☐ Other(________)

EXTENT OF CONTAMINATION: ☐ Minor ☐ Moderate ☐ Major PRIORITY: ___

POTENTIAL IMPACTS:

AQ/SW/WQ: Soil	[✓ Y]	N	%	?
AQ: Vapors	Y	N	%	?
Fire: Vapors or Free Product	Y	N	%	?
WQ: Groundwater	Y	N	%	?
WQ: Surface Water or Storm Drain	[✓ Y]	N	%	?
WQ: Drinking Water (________)	Y	[✓ N]	%	?

EXPOSURE ASSESSMENT RESULTS: ________

SITE MANAGEMENT

DATE RELEASE STOPPED: 10/20/88 GUIDELINE: Matrix Non-Matrix

DISPOSAL OF MATERIAL REMOVED:	Free Product	Soil
Estimated Quantity:		
Party Responsible:		
Location of Disposal:		
Date of Evacuation:		

ENFORCEMENT ACTION UNDERTAKEN: Y N

Action Date: Notice of Violation: _/_/_ NOI: _/_/_

Administrative Order: _/_/_ Court Action: _/_/_

CLEANUP ACTIVITY:

Date Cleanup Started: _/_/_ Date Site Under Control: _/_/_

Date Cleanup Finished: _/_/_ Contractor's Name: ________

SOURCE OF PAYMENT FOR CLEANUP ACTIVITY:

☐ Responsible Party ☐ State With Trust ☐ State Without Trust

COST RECOVERY INITIATED: Y N OFF-SITE MIGRATION: Y N ?

ESTIMATIONS: Cost of Cleanup: ______ Staff Time On Project: ______

COMMENTS:

at top of ≈ 30' high bank.

11/6/89 Visited w/ Mike Labrecht - looking at well points/aeration. Sent NPDES Permit Applications.

PAPER TRAIL:

INCOMING	Suspense	Received
*Spill Report		
*Assessment/ Remedial Action Plan		
*Notification to Off-Site Owners		
*Monitoring Permit Request		
*Progress/ Final Report		
*Other		

OUTGOING	Suspense	Date
*Confirmation Letter		
*Compliance Agreement		
*Monitoring Permit		
*Closeout Letter		
*Other		

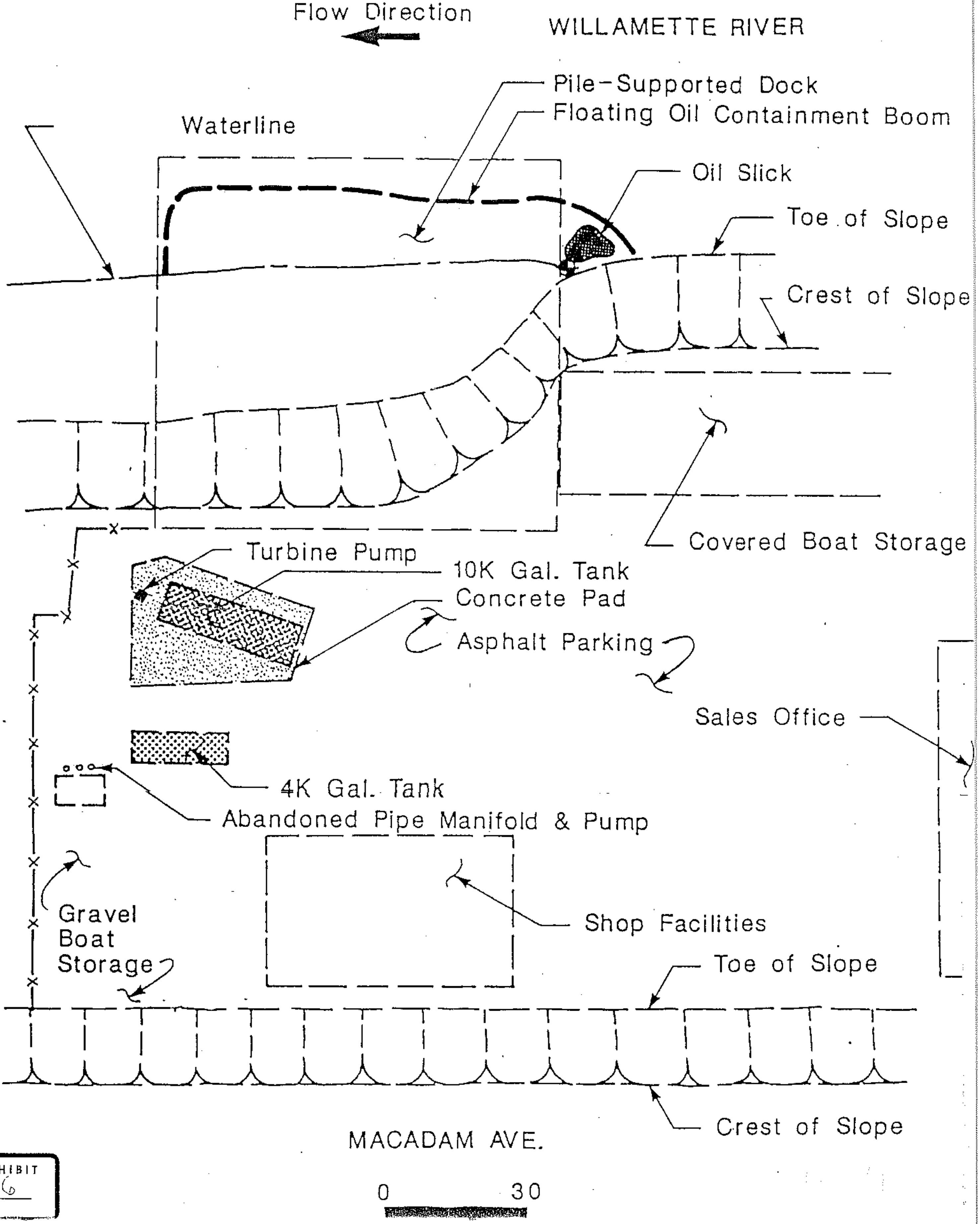
Flow Direction
WILLAMETTE RIVER
Pile-Supported Dock
Floating Oil Containment Boom
Waterline
Oil Slick
Toe of Slope
Crest of Slope
Covered Boat Storage
Turbine Pump
10K Gal. Tank
Concrete Pad
Asphalt Parking
Sales Office
4K Gal. Tank
Abandoned Pipe Manifold & Pump
Shop Facilities
Gravel Boat Storage
Toe of Slope
Crest of Slope
MACADAM AVE.
0
30

EXHIBIT
6

Golder Associates Inc.
CONSULTING ENGINEERS

26-88-078

REPORT OF FINDINGS
PRELIMINARY FIELD INVESTIGATION
OF SELLWOOD MARINA,
PORTLAND, OREGON

PREPARED FOR
STAFF JENNINGS, INC.

March 27, 1989

893-1031

XHIBIT
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PENGAD-Bayonne,

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1. SCOPE OF WORK

1.1 Site Description

The Sellwood Marina site occupies two levels on the west bank of the Willamette River. Much of the site is constructed on a flattened bench which has been excavated into the fluvial clayey silts to silty clays of the river bank. Additional space has been gained at this main level of the marina facilities by constructing a piling-supported concrete platform which extends out over the river bank. This primary level of the facilities is approximately 20-25 feet above the water level of the river. Additional floating docks, etc. have been constructed in the river, adjacent to the showroom and service facilities. A drawing of the approximate site layout is attached as Figure 1.

As a part of the marina facilities, two underground storage tanks were installed to supply boat fuel. The tanks are of 10,000 and 4,000 gallon capacity, respectively, and their approximate locations are shown on Figure 1. Based on information provided by Staff Jennings, the 4,000 gallon tank is about 25 years old, and is currently in use. The 10,000 gallon tank is 10-12 years old and is also in use.

1.2 Site History

On October 18, 1989, the marina manager observed a slick of petroleum fuel in the river, down slope from the fuel tanks. Following this observation, it is our understanding that Staff Jennings, took the following steps to mitigate the existing spill, and to prevent further release of product:

- October 18, 1988. Following his observation of the spill, Staff Jennings' marina manager contacted SRH Associates, Inc., of Portland, Oregon, to perform cleanup operations.

- October 18, 1988. SRH Associates deployed a floating boom in the river to contain the slick, and placed pads to absorb the floating product. SRH Associates also collected soil samples in the spill area to confirm that the material in question was gasoline from the marina. Staff Jennings personnel worked to trace the spill to its origin, and halted use of the fuel tanks.

- October 19, 1988. SRH Associates notified the Oregon Department of Environmental Quality, the U.S. Coast Guard, and the local fire department of the spill.

- October 20, 1989. Staff Jennings personnel determined that the primary source of spilled fuel was leakage from a cracked elbow located near the fuel turbine pump for the 10,000 gallon tank. They contacted Fullman Plumbing Company, of Portland, Oregon, to perform repairs.

- October 25-28, 1989. Fullman Plumbing Company, repaired the broken elbow. Tanks were removed from service until testing could be done.

- Once repaired, no further fuel release was observed.

- February (4±), 1989. Pacific Tank and Construction Company, performed tank tightness tests on the two storage tanks. The results of the testing were inconclusive because the tanks could not be isolated from the attached distribution lines. Additional testing was planned.

- February 15-17, 1989. Pacific Tank and Construction Company uncovered the tanks and related fuel distribution lines, isolated the systems, and performed a second series of tank and line tightness tests. Minor leaks were located and repaired in distribution lines, and the system was returned to service.

- February 16-17, 1989. Golder Associates conducted a preliminary soils investigation to determine the extent and quantity of contamination present in the tank field and along the adjacent river bank.

The field investigation conducted by SRH Associates, determined that fuel residues were present beneath the concrete boat platform identified on Figure 1. Their initial study indicated that fuel leaking from the broken elbow (although this source had not yet been identified) had migrated from the gravel backfill around the underground storage tank and distribution lines, and into the silty sands of the river bank. The contaminant plume eventually entered the river at this location.

1.3 Current Investigation

Golder Associates was contracted by Staff Jennings, to conduct a soil sampling survey in the area immediately surrounding the fuel tanks, and extending eastward toward the river. Soil samples were also collected west of the on-site fuel tanks, at an area hydraulically up- gradient from any potential fuel leakage into the groundwater system. A total of 12 soil borings were completed at the project site, with 10 soil samples collected and analyzed for petroleum residues.

2. PRELIMINARY FIELD INVESTIGATION

Investigation of the site began on the afternoon of February 16, 1989, and continued through February 17, 1989. The investigation was intended to determine the nature and extent of fuel release from the tank field and associated fuel distribution lines. This initial investigation consisted of drilling 12 soil borings with a 3-inch hand auger to allow the collection of soil samples at depth. Soil samples from each boring were sent to a commercial analytical laboratory for analysis of petroleum hydrocarbon content. Selected test holes which intercepted groundwater were left open and protected from rainwater intrusion overnight to determine the approximate groundwater surface elevations and localized flow direction. When completed, the soil borings were abandoned by backfilling to the surface with bentonite pellets.

2.1 Soil Sampling and Collection

As soil borings were performed, the soil's engineering characteristics were described for each change in soil type, and the soil was classified using the Unified Soil Classification System. Soil cuttings removed from the hole were also screened with a TIPP II photovoltaic organic vapor monitor (OVM) to provide a vertical profile of the aromatic organic constituents within the borehole. This screening was also used to identify samples to be collected for chemical analysis. Readings from the OVM were recorded on the soils logs.

In reference to the field screening, the OVM detects hydrocarbons in the vapor phase, and is calibrated to isobutylene. Aromatic petroleum constituents generally show a response on the OVM similar to isobutylene, but aliphatic components do not. Elevated readings in the vicinity of soils are an indication of the presence of hydrocarbons in the soil. However, care must be taken in the interpretation of these results. OVM readings, expressed as concentrations in parts-per-million in the vapor phase, should not be used to directly infer concentrations in soil. Although a correlation does exist, it is quite sensitive to a number of factors, including the volatility of the

hydrocarbons present, the nature of the soil (e.g., moisture and natural organic content), and the method used to sample the soil vapors. Adverse ambient weather conditions may also affect the functioning of the equipment (e.g., the investigation was performed during a rainstorm; high ambient humidity can elevate OVM readings to some extent). It is therefore possible for soils with relatively low hydrocarbon concentrations to exhibit high readings; the reverse is also true. Because of this variability, the OVM should only be viewed as a semi-quantitative, first order screening tool for hydrocarbon contamination.

2.2 Laboratory Analysis

Based on OVM readings, degree of hydrocarbon staining, and in some cases, petroleum odor, samples were collected from most boreholes for analytical testing. The soil samples for analysis were transferred to clean glass jars fitted with Teflon lids, supplied by Pacific Analytical Laboratory, Inc., of Beaverton, Oregon. Samples were subsequently transported to that laboratory for testing at the conclusion of the field investigation. Analysis was performed on all samples for aromatic hydrocarbons and total petroleum hydrocarbons, using USEPA methods 8020 (8240), and 418.1. Selected samples were also analyzed for total lead, and fuel fingerprint testing (USEPA method 8015, modified) was performed to determine the source of the organic constituents (gasoline, diesel, or other). The results from this testing are summarized in Appendix 1.

3. CONCLUSIONS

Based on our field investigation and the results of analytical testing, it is apparent that gasoline and gasoline-derived compounds have been released into the soils in the vicinity of the Sellwood Marina tank field, and that petroleum has migrated downgradient to the vicinity of the Willamette River. Further, based on the results of the investigation and the possible courses of action for eventual remediation, it is expedient to define two zones affected by the release for reference. The first zone (Zone 1) surrounds the fuel tanks, including the tank backfill and the immediately adjacent native soil. The second zone (Zone 2) comprises the river bank, and the adjacent area of river bed between the high and low water marks of the Willamette River. The boundary between these zones is not clearly defined, however any plans for remediation of either of the zones may be modified to further investigate this transitional area.

3.1 Subsurface Conditions

Two native soil types were encountered at the Staff Jennings site. On the upper level of the site (Zone 1), generally surrounding the fuel tanks, the native soil is a plastic silty clay to clayey silt. The soil exposed adjacent to the Willamette River (Zone 2), to a depth of approximately two feet, is silty fine sand to sandy silt.

Sand and gravel was also encountered in Zone 1. This granular material was identified in soils borings adjacent to the tank field and distribution pipes, and probably represents backfill around the tank system components. Gravel was also used to varying depths as a base course beneath the asphalt paving located in Zone 1.

Table 1 lists relative borehole surface and groundwater elevations for the soil borings. These elevations are based on a hand level survey, using 50 feet as an assumed datum. The accuracy of the survey is assumed to be plus or minus 0.1 foot. Water depths were measured in open test holes, and are also

assumed to be accurate to plus or minus 0.1 foot. Groundwater flow at the site, based on limited observations of groundwater levels in soil borings, appears to be easterly, toward the Willamette River. On a smaller scale, the groundwater flow may be locally complicated by the presence of the sand and gravel backfill surrounding the fuel tanks and distribution lines. Considering that the backfill is a more permeable material than the native soil, groundwater may tend to preferentially migrate along distribution lines or locally flow toward the tanks, whose backfill may act a sump. These local variations in flow direction should be considered tentative, as the differences in water level between test borings varied only a few tenths of a foot, approaching the limits of accuracy of the survey.

TABLE 1

BOREHOLE AND GROUNDWATER ELEVATIONS

TH 1	50.0	-
TH2	49.9	46.9
TH 3b	50.1	-
TH 4	49.9	47.3
TH 5	50.1	47.1
TH 6a	50.7	50.1
TH 6b	51.4	-
TH 10	50.1	46.8

3.2 Environmental Conditions

Zone 1 - Fuel Tank Area

The area surrounding the fuel tanks was sampled extensively, as described in section 2. Test holes TH1 through TH5, and TH10, were situated throughout the tank field as shown on Figure 1. TH6 was located upgradient of the tank field, to intercept possible contaminants entering the site.

Results of the analyses (USEPA method 8020 [8240]) of soil from TH1 and TH5 indicate elevated levels of benzene, toluene, ethyl benzene, and xylene. A fuel fingerprint test performed on the sample from TH1 suggested the source of the release was gasoline-based fuel. These two test holes are adjacent to the location of the ruptured fuel elbow on the 10,000 gallon tank. It seems likely that most, if not all, of the hydrocarbons present at these test holes are due to the damaged fuel distribution line. Test holes 2, 3, and 4 were also drilled in close proximity to the storage tanks, but did not exhibit high concentrations of aromatic hydrocarbons, indicating that, although there may have been some petroleum residue in the backfill surrounding the tanks, the bulk of the release moved downgradient toward the river. TH10 was placed near an existing pipe manifold near a former gasoline pump site. The Pacific Tank and Construction Company investigation indicated that some leakage may have occurred at this location, and the elevated levels of hydrocarbons at this location support their findings. TH6 exhibited low concentrations for all constituents measured, indicating that the groundwater flow and the hydrocarbon release migrated away from this area.

Zone 2 - River Bank and River Bed

Zone 2 is located at the toe of the moderately steep river bank, and at the time of testing, extended to the edge of the Willamette River, 20 to 50 feet east. Testing at this location consisted of three soil borings, shown on Figure 1 as TH7, TH8, and TH9. Of the three test holes, TH7 shows the highest concentrations of hydrocarbons, approximately 2-3 times higher than the test holes near the damaged fuel distribution line. According to Staff Jennings personnel the petroleum release was abated as soon as the broken pipe elbow was repaired. This suggests that the petroleum moved quickly through the relatively permeable silty sands of the river bank. It is not known at this time whether the movement took place on the surface of the existing groundwater table, or in the unsaturated zone above. It appears that the petroleum product is concentrated at the groundwater surface. The field evidence also suggests that the affected area is fairly limited in lateral extent, as TH8 and TH9 exhibited minimal concentrations of hydrocarbons. The

full depth or vertical thickness of Zone 2 was not determined for the contaminated zone during this investigation.

General

The data described above suggest the following overall conclusions regarding soil contamination at the Sellwood Marina site

- Hydrocarbons are present in soil, both within the tank field, and along the edge of the Willamette River directly downslope from the field,
- The hydrocarbons are likely due to the release of gasoline,
- Low concentrations of hydrocarbons in the vicinity of TH10 are attributable to leakage at a pipe manifold which has also been repaired,
- The highest concentrations of hydrocarbons are located at the north end of the 10,000 gallon fuel tank, where the broken pipe elbow was located, and in the river bank directly downslope.

Based on our preliminary investigation, the area impacted is approximately 40 by 50 feet in Zone 1, and 50 by 60 feet in Zone 2. The total depth to which hydrocarbon residues have penetrated was not determined during our investigation.

4. RECOMMENDATIONS

We anticipate that contaminated soils at the Sellwood Marina site will require treatment to remove fuel residue. Although our final recommendations for remediation plans will be dependent upon Oregon Department of Environmental Quality target values for contaminant abatement, we believe that one or more of the following alternatives will achieve the desired result.

Zone 1 - Fuel Tank Area

Based on our soils investigation within Zone 1, we recommend that the fuel tanks be removed from service, the affected soils removed and aerated on site, the tanks be retrofitted to meet current standards (or replaced), and the aerated soil replaced in the tank excavation as backfill if suitable. This method will provide the best assurance that the affected soils have been removed, and will allow sampling of the surrounding soils for confirmation that hydrocarbon residues remaining do not exceed the proposed Oregon DEQ matrix values for cleanup. Excavation and treatment of the soils on site will reduce the potential long-term liabilities for Staff Jennings, both by insuring that Zone 1 has been remediated to DEQ standards, and by avoiding the shared liabilities which are assumed when material is landfilled at a hazardous waste site.

Removal and replacement of affected soils would interfere with daily operations at the site for a period of time ranging up to several days, and would require removal and replacement of the existing tanks and fuel distribution lines, but would require no ongoing remediation effort or system maintenance.

Alternatives to the above recommendation exist. It is our understanding that the Pacific Tank and Construction Company stated that the present UST system may be brought into compliance with current regulations without replacement of the existing tanks. If such an upgrade is planned, it would be possible to remediate the site by soil venting and installation of extraction wells, if

needed. The soil venting system could be installed at the same time that other upgrades (such as overfill or corrosion protection systems) are performed. These installations may restrict the active usage of the site for a period of up to several weeks, and would require periodic maintenance and monitoring to assure that the remediation progressed as planned. It should be understood that we do not regard this alternative to be as comprehensive as the physical removal, treatment, and replacement of the affected soils. It is possible that residual pockets of hydrocarbons might remain in the soil using soil venting methods, and verification of final hydrocarbon concentrations remaining in the soil following cleanup will be more difficult.

Optimum performance of a soil venting system would be realized during the summer months, when the local groundwater table is depressed. If remediation is to take place when the water table is high, an extraction well and pump might also be required to remove any free product which may be floating at the groundwater surface. Installation of an air venting system will generally produce satisfactory results in the granular backfill surrounding the tanks, where the major levels of contamination were identified within Zone 1. Poorer results may be expected if hydrocarbons have penetrated silty clays or other less-permeable soil types to a significant extent.

Zone 2 - River Bank and River Bed

We recommend excavating the contaminated soils in Zone 2 and treating them on site. The groundwater beneath Zone 2 will probably require treatment as well. We recommend that either a well point system or a french drain system be installed to intercept and draw floating petroleum.

Site remediation in Zone 2 will be complicated by several factors, including:

- Access to the areas within Zone 2, only occurs during periods of low water level,
- The close working quarters under the boat storage platform,

- The geotechnical aspects of maintaining stability of the boat storage structure if affected soils must be removed to any significant depth around the supporting pile, and

- The environmental concerns of releasing hydrocarbons into the Willamette River during the soils cleanup.

We believe that these potential problems may be avoided by using a small, track-mounted (low ground pressure) backhoe to remove the soil to the base of Zone 2, if possible. Although further investigation must be done to verify the actual thickness of this zone, we believe that the depth of soil containing hydrocarbons should not extend much deeper than the lowest groundwater surface sustained at the site since the spill incident. The water table at this location is closely tied to fluctuations in level of the Willamette River. Based on records supplied by the U.S. Geological Survey from their Morrison Bridge gaging station, the level of the Willamette River varied from .8 to 10.7 feet above base level in the interval from September 1, 1988 to March 18, 1989. This suggests that hydrocarbons, which tend to float on water, will be concentrated in a zone 2-3 feet thick. Excavation is possible to this depth by the equipment suggested.

Once excavated, the soil can be stockpiled and aerated on site. The location selected for the stockpile should be covered by plastic sheets to prevent infiltration of the subgrade, and suitably bermed to prevent runoff from entering the river. Installation of venting pipes in the stockpile is recommended to speed the aeration process. Fluids draining from the pile due to rainfall or draining of interstitial water, should be contained and tested for hydrocarbon concentration. Treatment of this water will be necessary before it can be discharged into the river. A holding tank may be located on site and an oil/water separator installed for this purpose. During the excavation process, it is suggested that the river adjacent to the work area be protected by containment booms should hydrocarbons be released from the soil.

A permit will be required for the discharge of treated water into the Willamette River. This must be obtained from the Oregon State Water Resource DIvision. Additional permitting will be required from the U.S. Army Corps of Engineers for excavation of soil adjacent to the river.

The areal extent and volume of affected soil, and the relative concentrations of hydrocarbons can be better defined during the actual remediation process, using on-site screening techniques with confirmation by commercial laboratory analysis. Based on the limited sampling done in this investigation, the total volume of potentially contaminated soil adjacent to the river is estimated to range from 100 to 500 cubic yards.

We believe that excavation will remove all or most of the affected soil from Zone 2. If the depth of hydrocarbon migration proves excessive, or if high groundwater conditions prevent effective excavation, a secondary means of remediation may be possible. This approach involves installation of a series of well points and extraction pumps, or a French drain, collection sump, and pump, to remove any remaining petroleum from soil lying below the water table, and will also intercept any residual hydrocarbons from the beheaded plume originating in Zone 1. The spacing, depth, and configuration of this groundwater extraction system, if required, must be determined after the excavation is completed. Treatment of extracted water could be accomplished in a holding tank, as outlined above.

5. SUMMARY

An investigation, including soil borings, on-site screening, and laboratory analytical methods, was conducted at the site of a fuel spill from an existing underground storage tank at the Sellwood Marina facility. The investigation confirmed that contaminated soils were present adjacent to and down-gradient from the underground tank, and that contaminated soils exist in areas which are adjacent to and at some times inundated by the Willamette River. The results of testing, and sample locations, are shown on the attached figures.

We believe that the soils containing hydrocarbons may be suitably remediated in the following manner:

Zone 1 - Fuel Tank Area

Removal, aeration, and replacement of the soils and existing tanks is the recommended method. This can be done simultaneously with a tank upgrade/retrofit program. An alternative is to utilize soil venting and extraction wells, if needed, to reduce concentrations of hydrocarbons to acceptable levels. This method, if selected, may be done simultaneously with retrofitting of the existing tanks.

Zone 2 - River Bank and River Bed

Removal, aeration, and replacement of the affected soils is recommended. Remediation of residue petroleum hydrocarbons in groundwater or soils below the groundwater table should be accomplished by installing extraction wells or a French drain, if needed.

Design of remediation approaches should be done in consultation with the Oregon Department of Environmental Quality, following their review of this report.

APPENDIX A

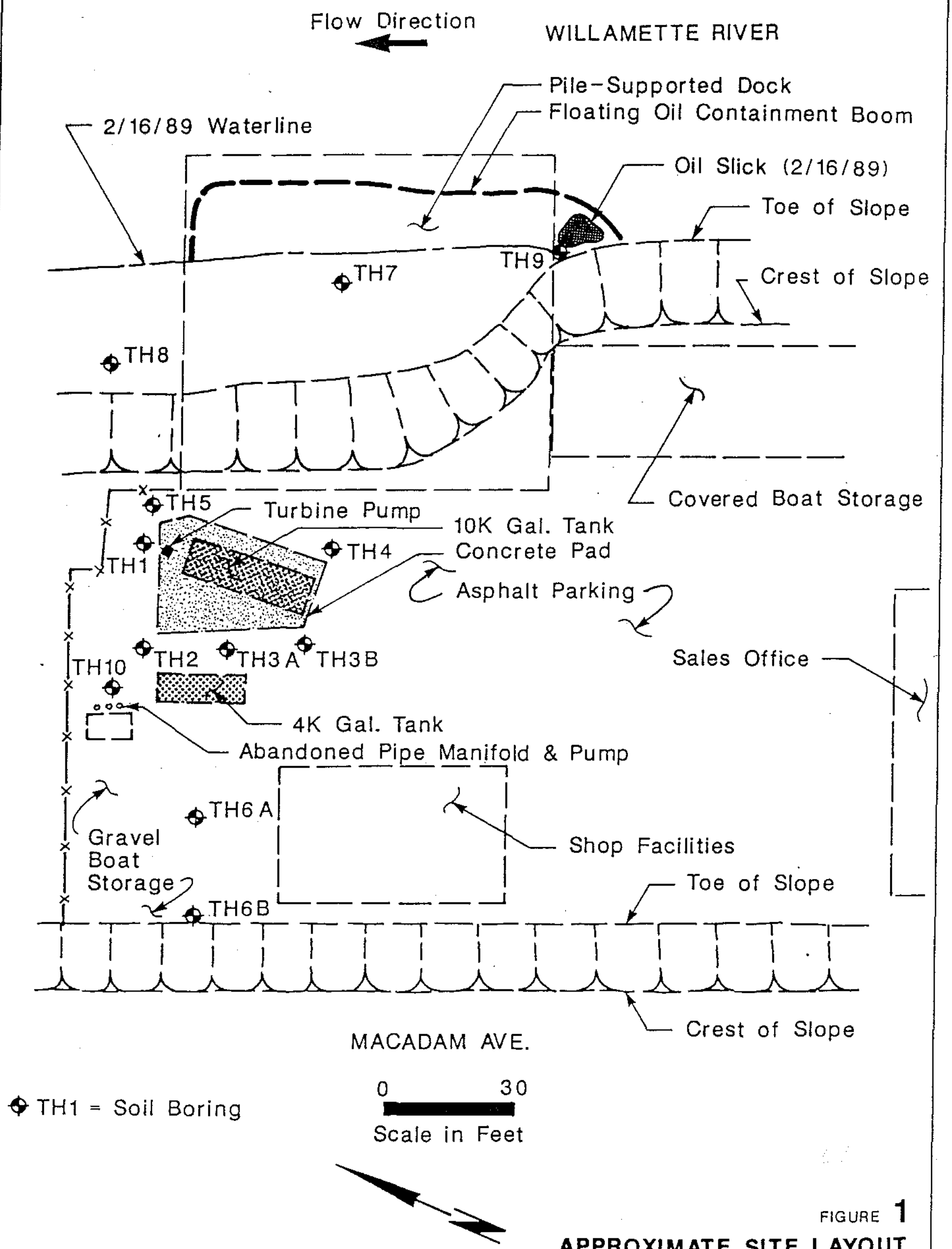

FIGURE 1

APPROXIMATE SITE LAYOUT

STAFF JENNINGS – SELLWOOD MARINA

PROJECT NO 893-1030 DWG. NO 13242 DATE 3/27/89 DRAWN RLM APPROVED ML

Golder Associates Inc.

PACIFIC ANALYTICAL LABORATORY inc.
9405 S.W. Nimbus Ave. Beaverton, OR 97005 (503) 644-0660

MAR
Golder Associates

February 24, 1989

Golder Associates
4104 148th Ave. NE
Redmond, WA 98052

PAL REPORT NUMBER: 89-0127
P.O./JOB NUMBER: 09163
DATE RECEIVED: 2/17/89
ITEMS: Eleven Samples

ANALYSIS

METHOD:		Detection Limit
	BTEX per EPA 8240 (GC/MS)	5ug/kg
	Gasoline per EPA 8015 (GC/FID)	100ug/kg
	TPH per EPA 418.1 (IR)	20mg/kg
	Lead per EPA 3050/7420 (AA)	1mg/kg

	#1	#2	#3	#4	#5
Benzene,ug/kg	<2,000	<5	<5	25	360
Toluene,ug/kg	61,000	27	<5	<5	2,500
Ethyl Benzene,ug/kg	49,000	<5	<5	<5	2,700
Xylene,ug/kg	402,000	150	<5	65	14,000
Gasoline,mg/kg	1,600	--	--	--	--
Lead,mg/kg	7	--	--	--	--
TPH,mg/kg	990	830	630	1,100	980

	#6B	#7	#8	#9	#10
Benzene,ug/kg	<5	273,000	<5	<5	3,400
Toluene,ug/kg	<5	685,000	<5	<5	17,000
Ethyl Benzene,ug/kg	<5	562,000	<5	<5	22,000
Xylene,ug/kg	<5	1,530,000	<5	15	84,000
Gasoline,mg/kg	--	9,200	--	--	--
Lead,mg/kg	--	16	--	--	--
TPH,mg/kg	25	11,600	80	32	490

All calculations based on dry weight

Respectfully,

Philip Nerenberg
Philip Nerenberg
Chemist

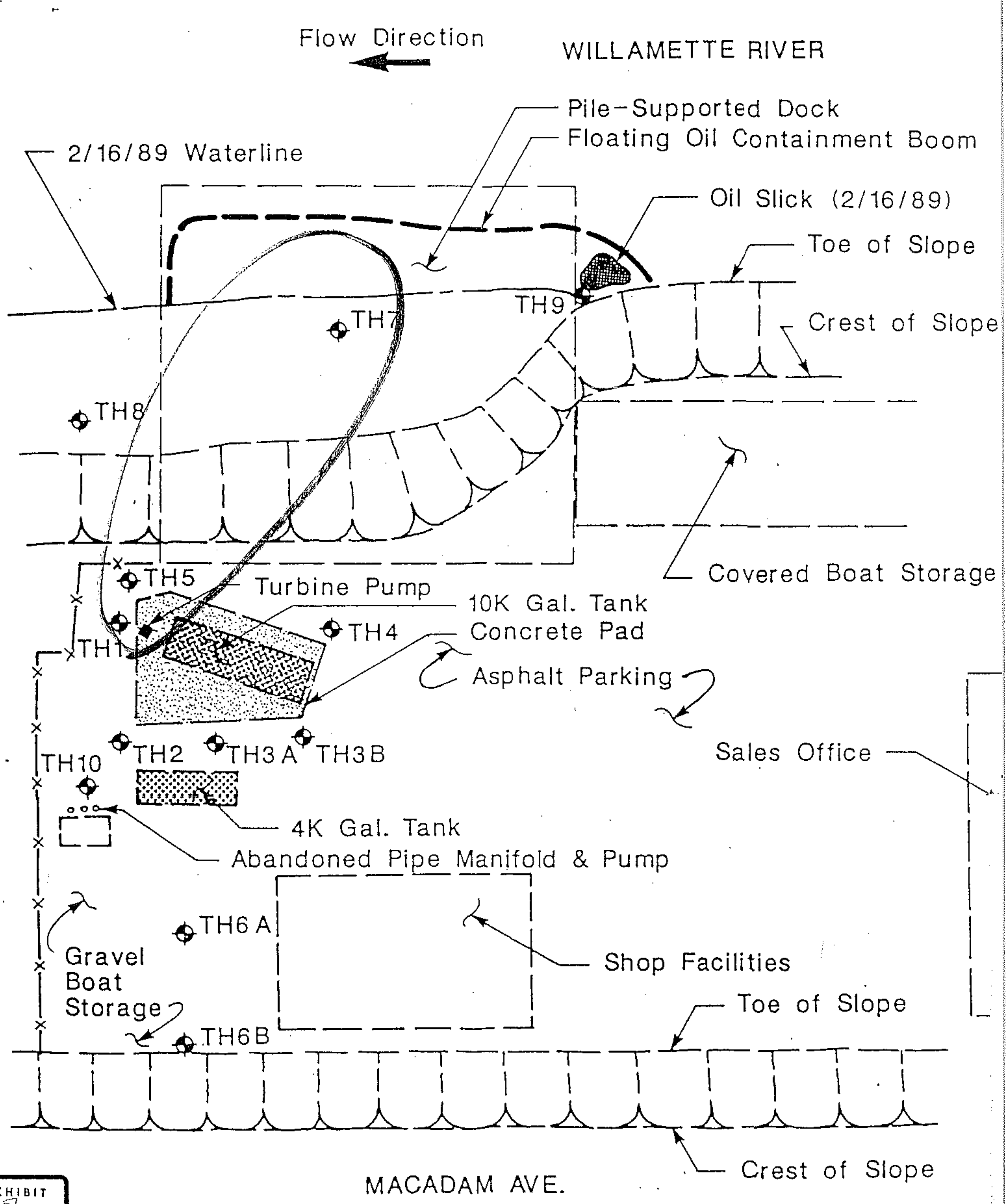
Flow Direction
WILLAMETTE RIVER
Pile-Supported Dock
Floating Oil Containment Boom
2/16/89 Waterline
Oil Slick (2/16/89)
Toe of Slope
TH9
TH7
Crest of Slope
TH8
Covered Boat Storage
TH5
Turbine Pump
10K Gal. Tank
TH4
Concrete Pad
TH1
Asphalt Parking
TH2
TH3 A
TH3 B
Sales Office
TH10
4K Gal. Tank
Abandoned Pipe Manifold & Pump
TH6 A
Shop Facilities
Gravel
Boat
Storage
Toe of Slope
TH6B
Crest of Slope
MACADAM AVE.

EXHIBIT
3

Golder Associates Inc.
CONSULTING ENGINEERS

26-88-078

REMEDIATION DESIGN
FOR SELLWOOD MARINA

Prepared by

Golder Associates Inc.

Michael D. Lubrecht
Senior Engineering Geologist

James M. Doesburg
Associate

January 3, 1990

893-1215

EXHIBIT
9
PENGAD-Bayonne, N.J.

104 · 148TH AVENUE N.E., REDMOND (SEATTLE), WASHINGTON, U.S.A. 98052 • TEL. (206) 883-0777 • FACSIMILE (206) 882-5498 • TELEX 5106002944

OFFICES IN UNITED STATES • CANADA • UNITED KINGDOM • SWEDEN • AUSTRALIA

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Page No.

1. INTRODUCTION

A release of gasoline occurred at the Sellwood Marina site on or about October 18, 1988, resulting from a failed elbow in fuel distribution lines from an underground storage tank. Investigation of the release by SRH Consultants and Golder Associates revealed that petroleum hydrocarbons were detectable in the backfill surrounding the tank, and along the river bank of the Willamette River, directly adjacent to the release.

Immediate action was instituted to contain the release to surface waters, by placing a containment boom and absorbent pads within a fuel-slicked area of the river. Usage of the fuel tank was halted until repairs could be made. The broken elbow was subsequently replaced and the tank and distribution lines were pressure tested to assure that no further releases would occur. The fuel system was returned to service, and is currently in use.

The purpose of this report is to provide a design, work plan, and specifications for the installation of systems to remediate soils and groundwater contaminated by the fuel release. In previous reports, we have divided the site into two separate areas, Zones 1 and 2, based on site topography and type of soil encountered. This report will also address the remedial work as it pertains to those two locations. Zone 1 is located on the upper level of the marina facilities, encompassing the fuel storage tanks and related equipment. Zone 2 is adjacent to the Willamette River, on the lower level of the marina facilities.

2. ZONE 1 - FUEL TANK AREA REMEDIATION DESIGN

Investigation of the area surrounding the point of petroleum release at the underground storage tank was completed on February 16 and 17, 1989, and results were presented in our report dated April 3, 1989. Our investigation identified an area of elevated hydrocarbon concentrations in granular backfill materials near the location of the damaged distribution line, and at the site of a pipe manifold which had been previously used for gasoline pumps. Concentrations of petroleum hydrocarbons within granular materials of the type constituting the backfill may be effectively reduced using an air venting system.

We recommend that a length of four-inch perforated PVC pipe be placed within the tank backfill, in the area where the concrete pad was removed for tank testing. The pipe should be buried at a depth of one to two feet, if possible, and the breach in the concrete should be sealed with an impervious material. Either concrete or asphalt may be used for a permanent seal. If the access through the concrete pad is needed for future tank upgrade, then plastic sheeting and bentonite may be used to cap the area to maintain a surface seal. The perforated pipe should be attached to a solid riser pipe, and routed to a vacuum blower with a minimum 100 scfm capacity. Discharge from the blower should be through a stack with a minimum stack height to disperse petroleum concentrations, and the local fire marshall should be consulted to determine any additional requirements before construction.

Our conversation with Loren Garner of Oregon DEQ indicated that no permit will be required for emissions from this control device.

3. ZONE 2 - RIVER BANK REMEDIATION DESIGN

Investigation of the areal and vertical extent of the contaminated zone was performed on November 3, 1989, by excavating a series of shallow test holes with a posthole digger. The locations of the test holes, and the general site layout for Zone 2 are shown on Figure 1. The excavated soils were visually examined, and were screened with an Organic Vapor Monitor (OVM) to obtain semi-quantitative measurements of volatile organic compounds. Readings on the OVM varied from non-detectable to over 1,400 ppm, with the highest concentrations being in the vicinity of test holes 4, 6, 7, and 8.

Depth to groundwater at this location varies with fluctuations in the Willamette River. The approximate location of the river's edge on November 11 is shown on Figure 2. At the time of the investigation the groundwater surface varied from a depth of one foot in TH-1, adjacent to the river, to approximately three feet in TH-8. Petroleum hydrocarbons were concentrated within a zone approximately eight inches below the ground surface to a depth of approximately two feet below the current water table. The areal extent and thickness of this zone is believed to be a function of the volume of gasoline released, vertical spreading of the petroleum due to the seasonally fluctuating water table, and diffusion of gasoline constituents into the upper part of the groundwater table.

Several options for remediation of this area were considered. The options included removal and aeration of the affected soils, excavation of an interceptor/extraction trench to prevent further fuel migration into the river system, installation of a large-bore extraction well, and placement of well points to remove free product from the groundwater. The last option, well point installation, was selected for the following reasons:

1. Physical removal and aeration of the soil would require the use of heavy equipment, which is not feasible in the tight working space defined by the piling-supported crane dock.

2. Any method requiring soil removal increases the risk of remobilizing gasoline or decomposition products directly to the river.

3. Although an interceptor/extraction trench would also work to remove free product, we believe that more complete remediation, and better control of the remediation process, can be achieved using a system of well points.

4. A large bore extraction well would generate large volumes of water that would require treatment.

5. By utilizing a system which allows for sequential pumping from different arrays of well points, flushing and cleaning of soil presently above the water table can be accomplished as the river level rises.

Our design calls for placement of a grid of well points at intervals throughout the affected area, as shown on Figure 2. It is anticipated that 15 points will be required to provide sufficient coverage of the affected area. The screened interval of each well point must intersect the groundwater table at each location in order to intercept floating product. Because the water table fluctuates considerably, depending on the stage of the Willamette River, the screened sections of the well points extend from just below the ground surface to the total depth of each well point, or an interval of five feet. A tightly-fitting cap must be available for each well point, so that the casings can be sealed to prevent release of floating product directly to the river if river levels rise to the point where some of the points are overtopped.

Floating free product and some groundwater will be withdrawn from the upper part of the groundwater table, using a two-inch diameter lift (skimmer) pump which is specifically designed for this purpose. The pump (an SHP Pump or equivalent) can be operated by on-site Staff Jennings personnel, and is moved from point to point in a sequential fashion to extract small quantities (approximately 10 gallons of product/groundwater) from each well point on a regular schedule, as determined during the startup operation.

Fluids (water and gasoline) extracted from each well point will be pumped to a 1,000-gallon holding tank. Groundwater will be treated in an oil-water separator, to remove gross contamination, and the treated water will be passed through an air stripper or carbon absorption canister to bring volatile organic concentrations within allowable limits for discharge back into the river. Either method for secondary treatment is acceptable, and equipment cost will likely drive the decision for this equipment acquisition. We recommend that recovered petroleum product be disposed through local recyclers. A schematic of the treatment process is shown on Figure 3. The treatment equipment should be of sufficient capacity to treat an average flow of 100 gallons per day.

We anticipate that it will take several weeks of operation in order to remove the petroleum concentrations. Due to surface tension and other factors, it will not be possible to remove all petroleum from the contaminated area. We propose that system operation continue until screening of the groundwater indicates that no free product remains, and that sampling of soil and groundwater then be performed to determine residual concentrations. At that time, we suggest that DEQ be contacted to determine if site closure is possible, or if other measures are required.

4. SYSTEM INSTALLATION

The extraction system for Zone 2 consists of 15 well points, driven to a nominal depth of five feet. As shown on Figure 2, the points will be driven at intervals of ten feet, in five rows spaced ten feet apart. These spacings have been calculated based upon the permeability of the soil, determined by laboratory testing, and the pumping rate desired to achieve the most effective flushing of the soil. Well points should be two-inch diameter, with a five-foot long screened interval.

5. OPERATION AND MONITORING

Operation and monitoring of the system will include several steps. These pertain to monitoring of the extracted and discharge water from the system, control of the pumping operation, and routine maintenance of pumps and water treatment equipment.

In order to monitor long-term system performance, it will be necessary to periodically sample and analyze the water extracted from the well points at each location. The schedule for this monitoring can be best developed after the system has been installed, and after monitoring the system performance during the initial startup period. When the hydrocarbon concentrations in extracted water indicates that hydrocarbons in a particular area have been abated, then extraction efforts may be concentrated on residual pockets of contamination.

Monitoring of the discharge water from the secondary treatment system will also be required to assure that petroleum hydrocarbon concentrations do not exceed the limitations provided on the discharge permit. Based on the monitoring, operation of the system can be adjusted to maintain compliance with the permit requirements.

Routine maintenance of pumps, separator equipment, and air stripping devices may be necessary. This maintenance should be performed at the intervals suggested by the manufacturer, and may be done either by the contractor who installs the equipment, or by Staff Jennings personnel.

6. SITE CLOSURE

Closure of the site must be approved by the DEQ, subsequent to submission of documentation (including sample analyses) which indicate that remediation of the site has met the target goals. Sampling procedures and laboratory analyses for site closure must meet the requirements set forth in the recently proposed Numeric Soil Cleanup Levels (OAR 340-122-301 to 340-122-360) and any other requirements made at the time this design is approved.

7. CONCLUSIONS

The procedures described above are intended to reduce petroleum hydrocarbon levels in soil and groundwater to levels where natural processes (biodegradation) can eliminate residual concentrations. For this reason, it is not expected that the systems will work with 100 percent efficiency. We recommend that a contractor, experienced in petroleum remediation and recovery, be retained for assistance in selecting and installing specific water treatment equipment and the vacuum blower system.

We further recommend that Golder Associates personnel monitor system installation, to provide documentation of contraction details, and to perform documentation of construction details, and to perform on-site screening and sampling during system setup and adjustment. Regular monitoring of the system operation will be required to assure that the remediation is proceeding properly.

Oregon DEQ has specific requirements regarding soil and groundwater sampling for site closure at the conclusion of remedial efforts such as this one. It is important that these be met, and that regular communication is made with DEQ representatives to ensure that the procedures used for remediation and sampling meet with agency approval.

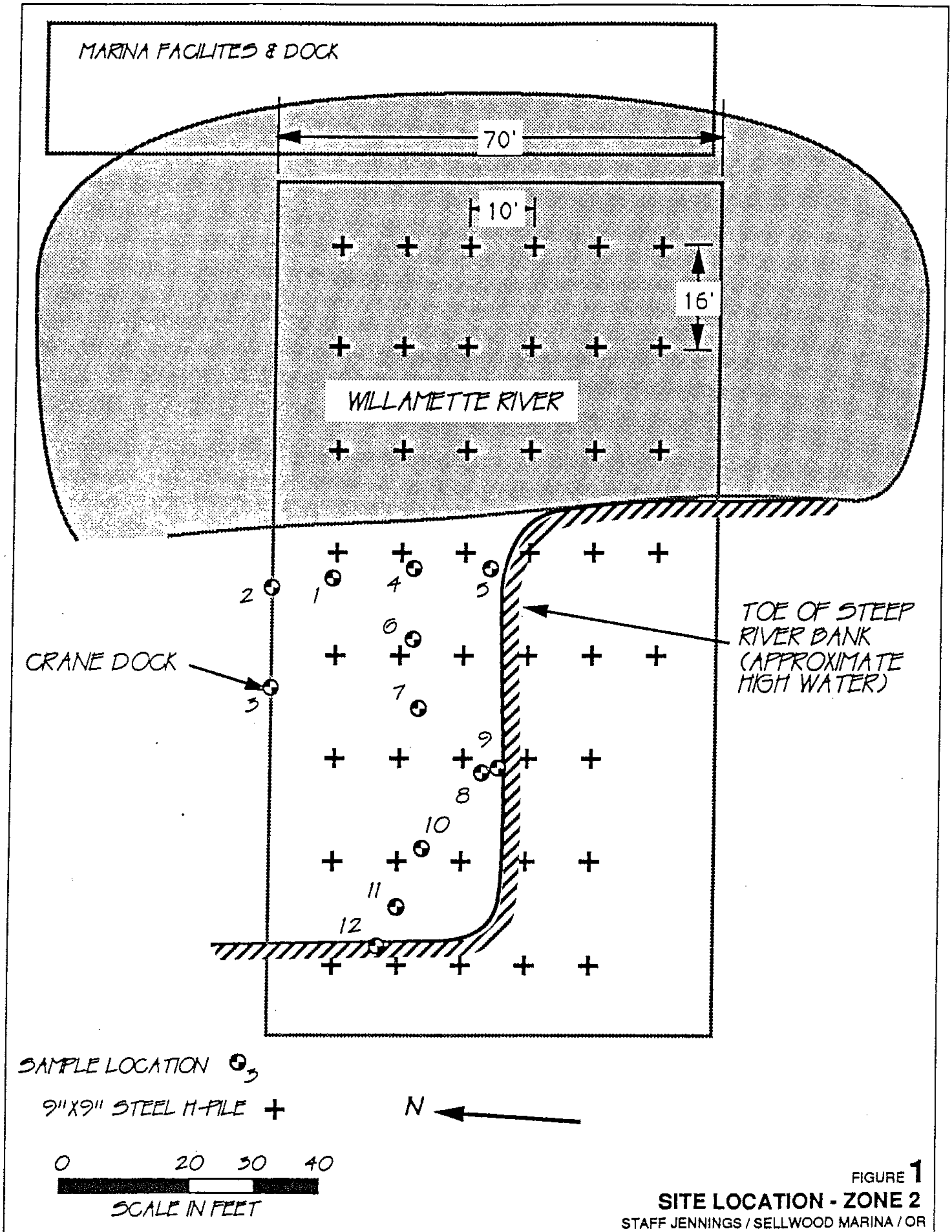

FIGURE **1**

SITE LOCATION - ZONE 2

STAFF JENNINGS / SELLWOOD MARINA / OR

PROJECT NO. 893-1215.001 DWG. NO. 20596 DATE 11/20/89 DRAWN MDL APPROVED MDL

Golder Associates

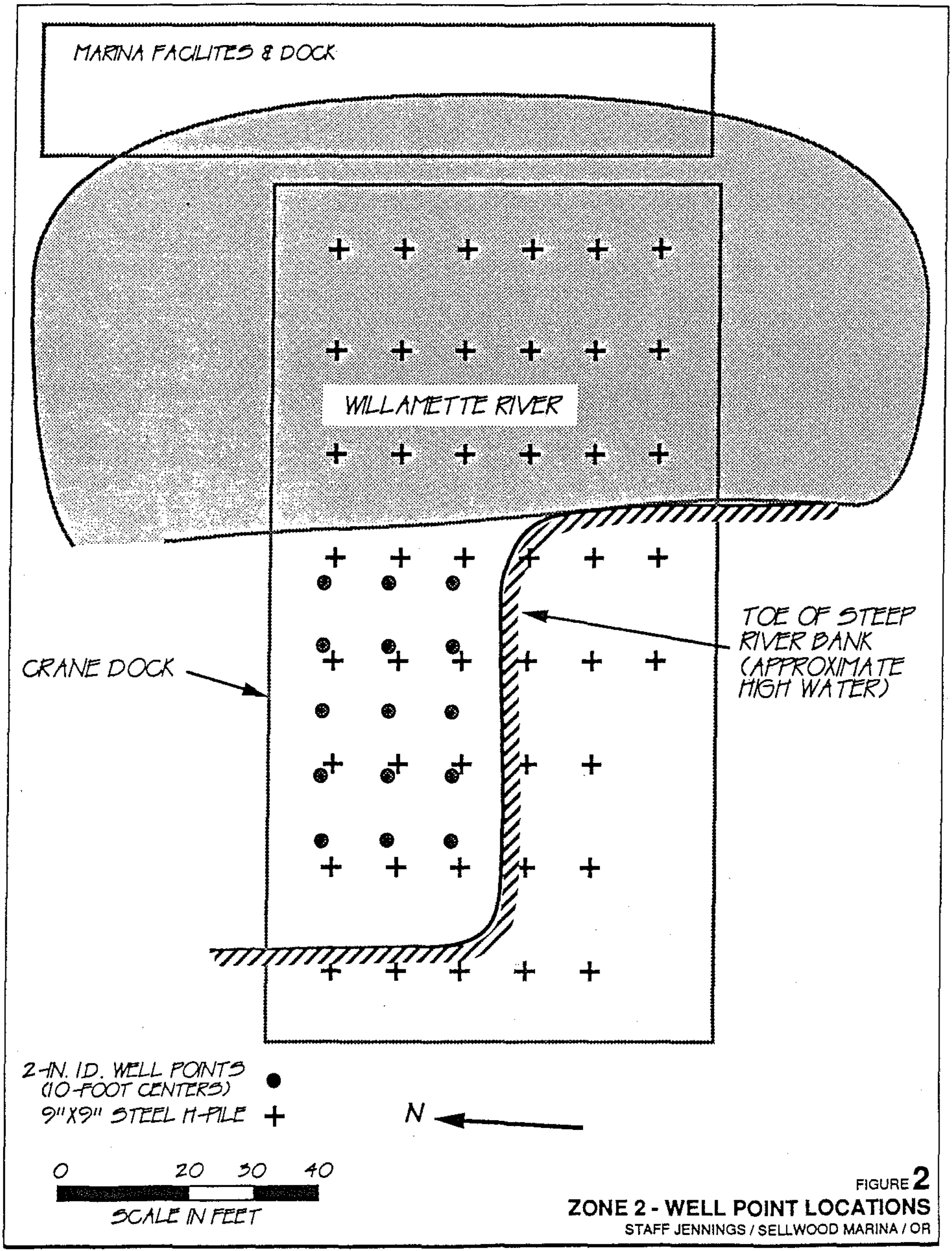

FIGURE **2**

ZONE 2 - WELL POINT LOCATIONS

STAFF JENNINGS / SELLWOOD MARINA / OR

PROJECT NO. 893-1215.001 DWG. NO. 20597 DATE 11/20/89 DRAWN MDL APPROVED MDL

Golder Associates

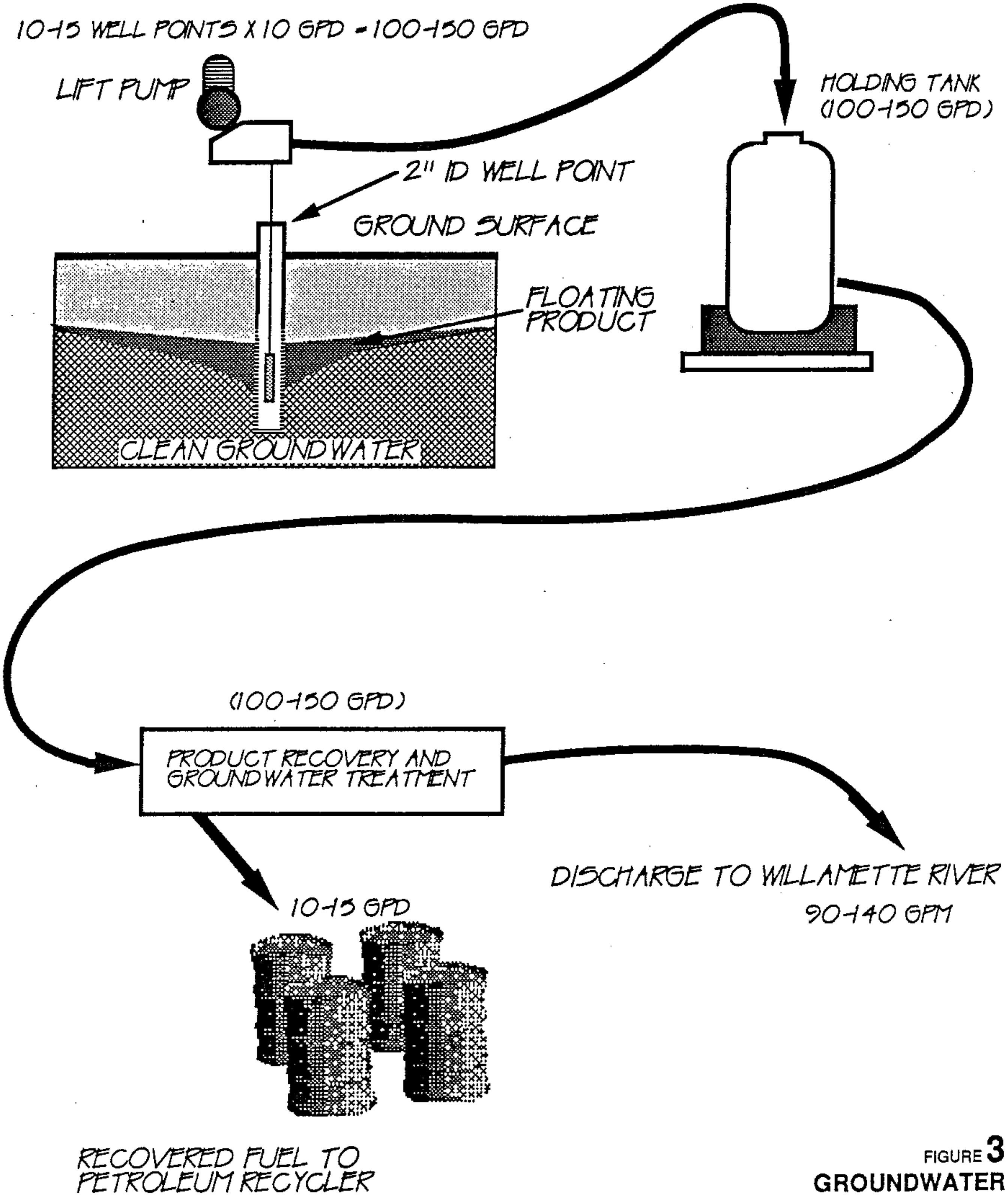

FIGURE **3**

GROUNDWATER TREATMENT SYSTEM

STAFF JENNINGS / SELLWOOD MARINA / OR

PROJECT NO. 893-1215.001 DWG. NO. 20598 DATE 12/15/89 DRAWN MDL APPROVED MDL

Golder Associates

Dept. of Environmental Quality
RECEIVED
APR 05 1990
NORTHWEST REGION

Golder Associates Inc.
CONSULTING ENGINEERS

April 4, 1990

Our ref: 893-1215

Department of Environmental Quality
811 SW Sixth Avenue
Portland, OR 97204

<u>ATTENTION: Loren Garner</u>

RE: REMEDIAL DESIGN FOR PETROLEUM HYDROCARBON ABATEMENT SELLWOOD MARINA, PORTLAND OREGON

Dear Loren:

Mr. Jeff Jennings of Staff Jennings, Inc., has asked me to forward a copy of our remedial design for petroleum hydrocarbon abatement to you for review. I appreciated your comments regarding site remediation for the Marina during our conversation at the site, and have incorporated your suggestions into the design. It is my understanding that Mr. Jennings is in the process of securing the necessary permits for construction of an extraction system and for discharge of treated water.

We are looking forward to working with you and DEQ in completing the remediation at the Sellwood Marina.

If you have any questions regarding our plans, please call.

Sincerely,

GOLDER ASSOCIATES INC.

Michael D. Lubrecht
Senior Engineering Geologist

James M. Doesburg
Associate

MDL/JMD/ln

EXHIBIT
10

PENGAD-Bayonne, N. J.

NC. • 4104 · 148TH AVENUE N.E., REDMOND (SEATTLE), WASHINGTON, U.S.A. 98052 • TEL. (206) 883-0777 • FACSIMILE (206) 882-5498 • TELEX 5106002944

TELEPHONE USE REPORT

CALL [✓ FROM]/TO: Jeff Jennings

COMPANY/TITLE: Staff Jennings, Inc.

PHONE NO.: 244-7505

CITY:

COUNTY:

DATE: 2/9/93

TIME: 12:05

(Circle for filing)

AQ Asbestos

WQ OSS

SW HW

General Spill

SUMMARY OF CALL:

Removal of existing tanks planned for the near future. They are considering the installation of above-ground tanks which would be implaced before the removal of the current UST's. Jeff expressed confusion over the mailings he has received regarding tank upgrading. Remediation/Assessment may be performed in conjunction with tank removal. I suggested some kind of sampling – soil/groundwater monitoring to determine current contaminant levels, since it has been > 2 years since work was done on the site, and proximity to the Willamette River may have allowed "flushing" of the contaminated soils. I will send Jeff our service provider list. He wishes to solicit bids from alternative contractors for performing the work.

Signature

EXHIBIT

11

PENGAD-Bayonne, N. J.

(2/86)

TELEPHONE USE REPORT

CALL FROM/[✓ TO]: Jeff Jennings

DATE: 10-11-93

COMPANY/TITLE: Staff Jennings

TIME: 1130

PHONE NO.: 244-7505

CITY: PDX COUNTY:

(Circle for filing)

AQ	Asbestos
WQ	OSS
SW	HW
General	Spill

26-88-078

SUMMARY OF CALL:

He will hire De Minimus to investigate contamination.
Reviewed DEQ requirements for an NFA.
He understands the 3 GWMW requirements
and the decom confirmatory sampling need.
Plans on installing 3 GWMW's and will
replace UST's in Spring 1994.
I informed him of extension of 1225 without
funds available for Staff Jennings, maybe
tax credits available.
The leak has evidently been located and repaired.
A broken product line elbow was the source,
not the UST's.

R Rose
Signature

PENGAD-Bayonne, N. J.
EXHIBIT
12

(2/86)

26-88-010

LIMITED SUBSURFACE SOIL AND GROUNDWATER INVESTIGATION

Staff Jennings, Inc.
Retail Facility and Marina
8240 SW Macadam Avenue
Portland, Oregon 97219

UST Cleanup List #26-88-0078

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED
MAR 31 1994
NORTHWEST REGION

Project # 00226-1293

Prepared For:

Staff Jennings, Inc.
8240 SW Macadam Avenue
Portland, Oregon 97219

March 31, 1994

De Minimis Inc. Environmental Management
34 N.W. First Avenue • Suite 101 • Portland, Oregon • (503) 295-4074

EXHIBIT
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FIGURES and MAPS

APPENDICES

1.0 INTRODUCTION

At the request of the Staff Jennings, Inc., De Minimis Inc. (DMI) Environmental Management was contracted to provide Project Management services for a Limited Subsurface Soil and Groundwater Investigation of the Retail Facility and Marina located at 8240 SW Macadam Avenue, Portland, Oregon, 97219.

The project consisted of two tasks: 1) collect and analyze soil samples from portable-augered soil borings, and 2) collect and analyze groundwater samples from the soil borings. Project activities occurred on March 15, 1994. The activities, analytical results, and interpretations of this project are described in this report.

The two tasks were performed as a direct result of the recommendations made in the report titled Level I Environmental Site Assessment of Staff Jennings, Inc., Retail Facility and Marina, Portland, Oregon, dated November 30, 1993, prepared by DMI. The Oregon Department of Environmental Quality (DEQ) has also requested additional investigation into the release from the on-site UST system which occurred on October 18, 1988 (DEQ UST Cleanup List #26-88-0078).

2.0 SITE DESCRIPTION AND BACKGROUND

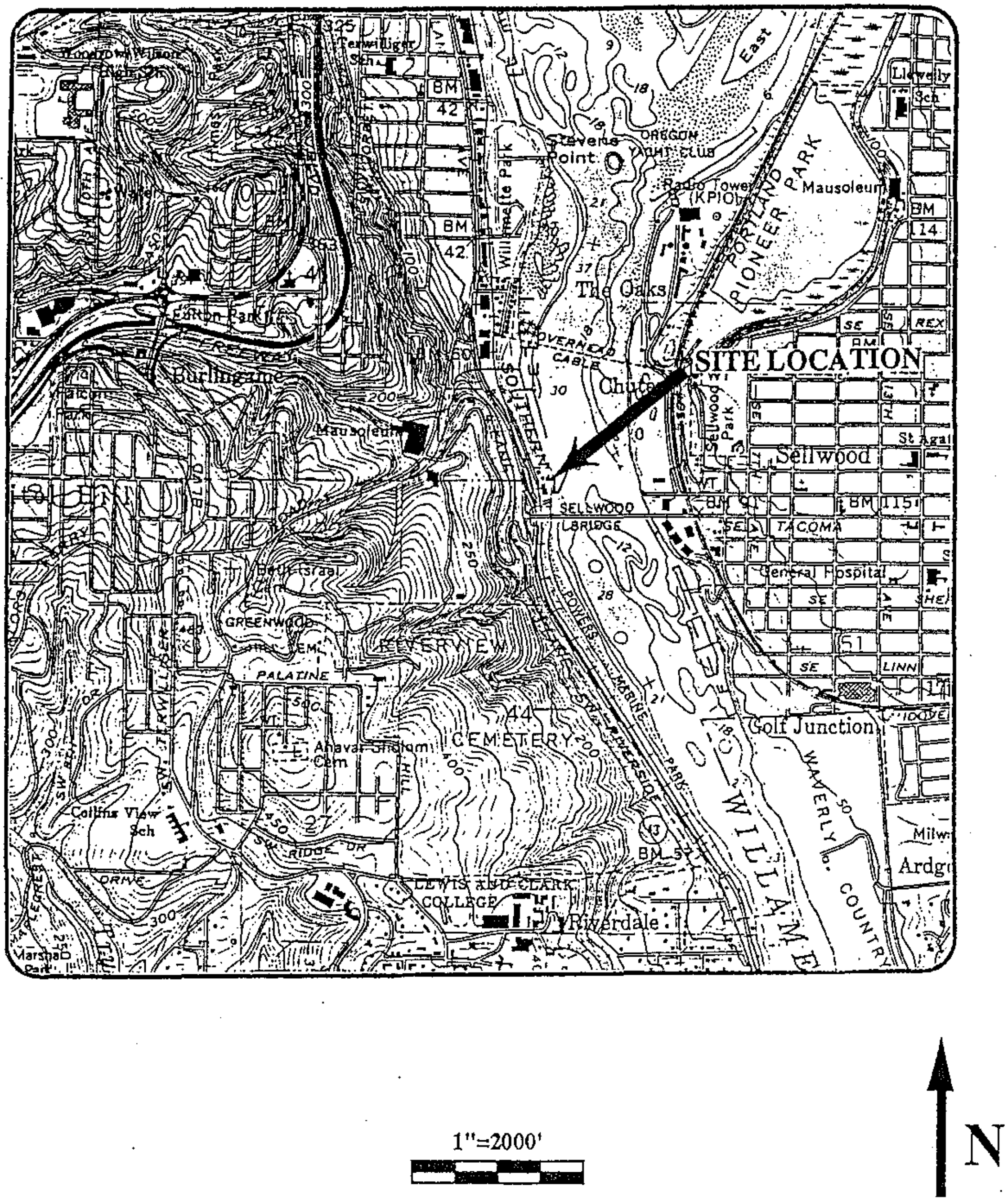
2.1 Site Description

The subject property is located at 8240 SW Macadam Avenue in a commercial corridor approximately 3-1/2 miles south of downtown Portland, Oregon (See Figure 1-Site Location). The subject property is 2.36 acres in area. The geographic location of the subject property is Section 22, Township 1 South, Range 1 East of the Willamette Meridian, in the County of Multnomah and State of Oregon. The subject property has been owned by the Jennings family since it was purchased by Stafford H. and Dorothea Jennings in August 1937. The original building was constructed on the subject property in October 1939.

The subject property is bordered to the north by undeveloped river front acreage located on the west bank of the Willamette River. The subject property is bordered to the east by the Willamette River which flows to the north. The subject property is bordered to the south by an access road leading to a Multnomah County boat ramp (formerly a ferry crossing ramp) located beneath the Sellwood Bridge. The subject property is bordered on the west by a railroad track, an access road, and SW Macadam Avenue. Undeveloped, forested acreage is located to the west of SW Macadam Avenue.

The subject property occupies two levels on the west bank of the Willamette River at the base of a moderately steep slope. The majority of the site (main level) is located on the upper terrace which has been excavated into the river bank approximately 20-30 feet above the Willamette River. The retail, repair, rigging, and storage buildings are located on the main level. The remainder of the main level is paved with asphalt or concrete. A crane dock, an elevated concrete platform supported by steel beams, is located on the northern portion of the main level and extends to the east over the Willamette River. The subject property slopes steeply from the main level down to the bank of the Willamette River. Two floating docks are located below the main level on the river.

The subject facility retails gasoline for water craft and is registered with the Oregon Department of Environmental Quality (DEQ) Registered Underground Storage Tank (UST) Facilities as Staff Jennings, Inc., DEQ Facility I.D. Number 3105. Two active, permitted USTs (one 4,000-gallon gasoline UST and one 10,000-gallon gasoline UST)



Base Map from U.S. Geological Survey 7.5 Minute Lake Oswego Quadrangle

PROJECT NO.

00226-1293

March 1994

DE MINIMIS INC.

ENVIRONMENTAL MANAGEMENT
34 N.W. FIRST AVENUE, SUITE 101
PORTLAND, OREGON 97209
503/295-4074

Site Location

Subsurface Soil and
Groundwater Investigation
Staff Jennings, Inc.
8240 SW Macadam Avenue
Portland, Oregon 97219

FIGURE

1

are registered for the subject facility. On March 17, 1994, Mr. Jeffrey S. Jennings, President, Staff Jennings, Inc., stated that both USTs are currently in use. Mr. Jennings had previously stated that the USTs contained a mixture of 50% regular leaded gasoline and 50% supreme unleaded gasoline.

2.2 Site Background

The following information regarding the UST release was supplied or confirmed by Mr. Jennings:

- On October 18, 1988, the Staff Jennings marina manager observed a petroleum fuel slick on the Willamette River downgradient from the on-site USTs. The marina manager contacted SRH Associates, Inc., Portland, Oregon, to perform cleanup operations. SRH Associates deployed a floating boom on the Willamette River to contain the slick. Pads were used to absorb the floating product. Additionally, soil samples were collected in the spill area to confirm that the released material was gasoline from the subject facility. Staff Jennings discontinued use of the USTs. SRH Associates notified the Oregon DEQ (DEQ UST Cleanup #26-88-0078), the U.S. Coast Guard, and the Portland Fire Department of the release on October 19, 1988. The primary source of the released fuel was leakage from the UST piping (a cracked elbow) located near the fuel turbine pump for the 10,000-gallon UST. The cracked elbow and other minor leaks in the product distribution lines were subsequently repaired.

- On February 16-17, 1989, Golder Associates, Inc. (GAI), conducted a preliminary soils investigation (See GAI Report of Findings Preliminary Field Investigation of Sellwood Marina, Portland, Oregon, March 27, 1989) to determine the extent and quantity of contamination due to the release from the on-site UST. This investigation confirmed that petroleum hydrocarbon contamination (gasoline) existed adjacent to the USTs and extended downgradient to the edge of the Willamette River. Elevated contaminant levels for gasoline, benzene, toluene, ethylbenzene, xylene, and lead were reported for soil samples collected adjacent to and downgradient from the USTs. Maximum contaminant levels were collected from the river bank (contaminants reported in parts per million, ppm, or parts per billion, ppb): 11,600 ppm total petroleum hydrocarbon (TPH); 9,200 ppm gasoline; 273,000 ppb benzene; 685,000 ppb toluene; 562,000 ppb ethylbenzene; 1,530,000 ppb xylene; and 16 ppm lead. Groundwater was encountered in the soil borings at depths ranging from 0.6-3.3 feet below ground surface (bgs).

3.0 SOIL AND GROUNDWATER INVESTIGATION

3.1 Limited Investigation Objectives

DMI personnel discussed the Limited Soil and Groundwater Investigation objectives on several occasions with Mr. Rich Rose and Mr. Rick Silverman, Oregon DEQ Underground Storage Tank Section. Mr. Rose had formerly been assigned the subject site file and Mr. Silverman is currently assigned this file. Oregon DEQ has requested further investigation of the release from the on-site UST system. DMI personnel had recommended a Limited Soil and Groundwater Investigation to determine if any further investigation would be required due to the amount of time since the release from the UST system occurred (approximately 5-1/2 years) and the logistical problems with installing groundwater monitoring wells due to site configuration and topography.

3.2 Site Preparations

Prior to on-site activities, a utility locate check (Ticket #33478) was ordered from the Utility Notification Service on March 11, 1994, and was completed on or before March 15, 1994. Utilities notified included Northwest Natural Gas, Portland General Electric, City of Portland Water, U.S. West Communications, and Paragon Cable. No utility markings were observed in the project area on the subject property.

The fill pipes for the USTs were located on the northwest corner of the subject property. During the Level I Environmental Site Assessment, Mr. Al Anshen, Service Manager, Staff Jennings, Inc., stated that the product dispensing lines run from the USTs to the adjacent pump house before being piped off to the active gasoline pumps located on the southeastern portion of the subject property. The product dispensing pipes are primarily buried; however, the pipes are also suspended beneath the elevated concrete platform. One gasoline dispensing pump is located on the main level near the steps leading down to the floating docks and one gasoline dispensing is located on a floating dock on the river.

3.3 Site Safety Meeting and Safety Preparations

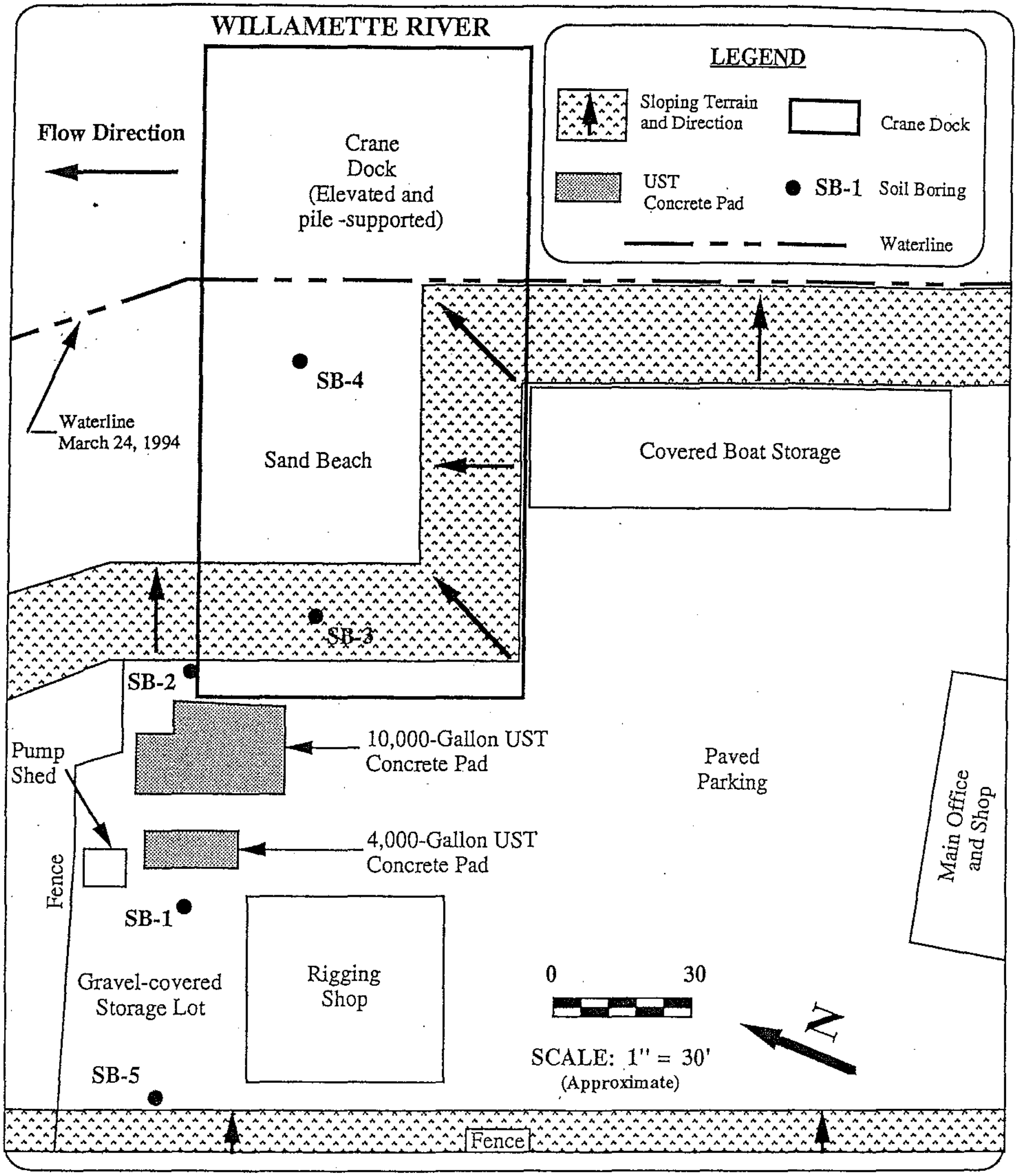
A Site Health and Safety meeting was conducted prior to initiating site work on March 15, 1994, to review site-specific health and safety hazards associated with this project. A copy of the Site Health and Safety plan was distributed to the field personnel.

3.4 Subsurface Soil Borings and Soil Sampling

Five subsurface soil borings (SB) were drilled with a hand-held drilling unit at the subject site. The soil borings were drilled to depths ranging from 3-15 feet below ground surface (bgs) depending on the depth to groundwater or drilling refusal. The soil borings were drilled under the direct supervision of Mr. Neil Shaw, State of Oregon Registered Professional Geologist (License #G-1176) and State of Oregon Water Resources Department licensed Water/Monitor Well Constructor (License #10286). The soil borings were drilled in the areas of previously delineated gasoline contamination, as reported in the GAI Report of Findings Preliminary Field Investigation of Sellwood Marina, and upgradient of the USTs (See Figure 2-Site Map for soil boring and groundwater sampling locations).

The soil borings were drilled with a 1-1/8 inch outside diameter (O.D.), stainless steel core bit (1-inch inside diameter-I.D.) mounted on internally-threaded, 1-inch O.D., stainless steel bit extension rods. The drill bit was advanced utilizing an electric Bosch Rotohammer powered by a portable generator. Distilled water was utilized when needed to facilitate drilling through dense materials. The drill bit and bit extension rods were decontaminated prior to each boring and sampling by thoroughly washing with a solution of tap water and Alconox (a laboratory-grade detergent) and rinsing with distilled water.

The following sampling procedure was followed by DMI personnel to obtain each discrete soil sample. Soil samples downgradient of the USTs were collected when visual or olfactory evidence of contamination was first observed. Sampling personnel, wearing clean, surgical-type, latex gloves, collected the soil samples into pre-cleaned, 4-ounce, Environmental Sampling Supply® glass sample bottles fitted with Teflon™-lined lids. The soil samples were collected from the hollow core bit and were rapidly transferred to the sampling jars. The sample containers were sealed, labeled, and stored on ice in a cooler until shipped to Hughes Analytical Laboratory (HAL), an off-site, independent, laboratory, via chain of custody for analyses. The chain of custody documentation and HAL laboratory reports are presented in Appendix A, Laboratory Analytical Results and Chain of Custody.



PROJECT NO.	DE MINIMIS INC.	Site Map	FIGURE
00226-1293	ENVIRONMENTAL MANAGEMENT 34 N.W. FIRST AVENUE, SUITE 101 PORTLAND, OREGON 97209 503/295-4074	Subsurface Soil and Groundwater Investigation Staff Jennings, Inc. 8240 SW Macadam Avenue Portland, Oregon 97219	2
March 1994			

The soil samples collected from the soil borings were logged by a DMI Geologist, according to geologic description. The soil samples were screened in the field for visual and olfactory indications of contamination. Field sheen tests were performed by placing a portion of the soil samples into clean sample jars filled with water. The amount of petroleum sheen produced during the sheen test or observed on the surface of a wet soil sample was observed as a qualitative estimate of the degree of contamination.

SB-1 was drilled approximately 8 feet west (presumed upgradient) of the 4,000-gallon gasoline UST. Drilling refusal, possibly due to a boulder, was encountered at approximately 3 feet bgs. Soil sample SB1-3′ was a wet (due to the addition of distilled water during drilling), mottled dark gray and brown, silty fine sand. The gray mottling in this soil sample appeared to be visually contaminated. A slight odor of degraded gasoline was detected in this sample. A slight petroleum sheen was observed during the field sheen test. Groundwater was not encountered in SB-1.

SB-2 was drilled approximately 14 feet east-northeast (presumed downgradient) of the 10,000-gallon gasoline UST. Soil sample SB2-6′ was a damp, gray, micaceous, silty fine sand. This soil sample appeared to be visually contaminated. A slight odor of degraded gasoline was detected in this sample. An abundant petroleum sheen was observed on the surface of this soil sample. Groundwater was encountered at approximately 10 feet bgs. Groundwater samples were collected from this boring (See Section 3.5 Groundwater Sampling).

SB-3 was drilled on the slope located beneath the elevated crane dock, and downgradient and east of the 10,000-gallon gasoline UST. Soil sample SB3-6′ was a wet, gray, micaceous, silty fine sand. This soil sample appeared to be visually contaminated. A moderate to strong gasoline odor was detected in this sample. An abundant petroleum sheen was observed on the surface of this soil sample. Groundwater was encountered at approximately 4 feet bgs. Groundwater samples were collected from this boring (See Section 3.5 Groundwater Sampling).

SB-4 was drilled on the beach located beneath the elevated crane dock and downgradient of the USTs. SB-4 was located approximately 18 feet west of the Willamette River waterline. Soil sample SB4-4′ was a wet, gray, micaceous, silty, fine to medium sand. This soil sample appeared to be visually contaminated. A moderately strong gasoline odor was detected in this sample. An abundant petroleum sheen was observed during the field sheen test. Groundwater was encountered at approximately 2 feet bgs. Groundwater samples were collected from this boring (See Section 3.5 Groundwater Sampling).

SB-5 was drilled approximately 49 feet west (presumed upgradient) of the 4,000-gallon gasoline UST. Soil sample SB5-5´ was a wet (due to the addition of distilled water during drilling), medium brown, silty fine sand. No visual or olfactory evidence of petroleum contamination was observed in this sample or during drilling this boring. No petroleum sheen was observed during the field sheen test. Drilling refusal, possibly due to a boulder or bedrock, was encountered at approximately 8.5 feet bgs. Groundwater was not encountered in SB-5.

3.5 Groundwater Sampling

Representative groundwater samples were collected from the soil borings where groundwater was encountered (SB-2, SB-3, and SB-4) on March 15, 1994. Since groundwater samples were collected from three soil borings, these soil borings were considered groundwater monitoring wells and required State of Oregon Water Resources Department monitoring well start cards. The monitoring well start card numbers were: SB-2, Start Card #63640; SB-3, Start Card #63641; and SB-4, Start Card #63642. The groundwater monitoring wells were drilled to the specifications given by the DMI Geologist and licensed Monitoring Well Constructor. The monitoring wells were utilized for sampling purposes, were temporary, and were not completed. The soil borings and temporary groundwater monitoring wells were subsequently abandoned the same day. The borings were filled with 8-20 mesh bentonite chips and hydrated.

Representative groundwater samples were obtained utilizing a decontaminated Nalgene hand pump. Prior to collecting each groundwater sample, the hand pump was decontaminated by thoroughly washing with a solution of tap water and Alconox (a laboratory-grade detergent) and rinsing with distilled water. The following sampling protocol was utilized by DMI personnel for each groundwater sample collected. DMI personnel, wearing clean, surgical-type, latex gloves, collected one groundwater sample from each well and rapidly transferred this sample into three sterile, 40-milliliter (ml) septum, glass bottles for Volatile Organic Analysis (VOA). One additional groundwater sample was collected from each well and rapidly transferred into a 500-ml, high density polyethylene Nalgene® sample bottle fitted with a polypropylene screw cap lid. The groundwater samples were carefully transferred into the sample bottles with no headspace, thus minimizing the loss of volatile organic compounds. The sample containers were sealed, labeled, and stored on ice in a cooler until shipped to HAL via chain of custody for laboratory analyses (See Appendix A-Laboratory Analytical Results and Chain of Custody for the complete analytical results).

The groundwater samples (GW2-1 and GW2-2) collected from SB-2 contained grayish-brown silt. A moderately strong gasoline odor was detected and abundant petroleum sheen was observed on the surface of this sample. No free product was observed.

The groundwater samples (GW3-1 and GW3-2) collected from SB-3 contained brownish-gray silt. A moderate to strong gasoline odor was detected and abundant petroleum sheen was observed on the surface of this sample. No free product was observed.

The groundwater samples (GW4-1 and GW4-2) collected from SB-4 contained black silt. A moderately strong gasoline odor was detected and abundant petroleum sheen was observed on the surface of this sample. No free product was observed.

4.0 LABORATORY ANALYTICAL RESULTS

4.1 Analytical Methods

Soil and groundwater samples were collected by DMI personnel from the soil borings and the temporary groundwater monitoring wells utilizing Oregon DEQ and EPA-approved methods.

A total of five soil samples were obtained from the subsurface soil borings. The soil samples were analyzed by HAL for Total Petroleum Hydrocarbon-Gasoline utilizing the Oregon DEQ-approved method TPH-G by gas chromatograph/photoionization detector (GC/PID).

A total of six groundwater samples were obtained from the temporary groundwater monitoring wells. The groundwater samples were analyzed by HAL for: benzene, toluene, ethylbenzene, and xylenes (BTEX per EPA Method 8240), dissolved lead (per EPA 7421), and ethylene dibromide (EDB) and ethylene dichloride (EDC) (per EPA Method 8240).

4.2 Soil Sample Analytical Results

Gasoline contamination (reported in parts per million-ppm) was detected in the following soil samples: SB1-3′ (25 ppm), SB2-6′ (450 ppm), SB3-6′ (3300 ppm), and SB4-4′ (2800 ppm). No petroleum hydrocarbons were detected in the soil sample collected from SB5-5′.

The results of the soil sample analyses are tabulated in Table 1 (See Appendix A-Laboratory Analytical Results and Chain of Custody for complete laboratory documentation).

TABLE 1

SOIL SAMPLE ANALYTICAL RESULTS
TOTAL PETROLEUM HYDROCARBON-GASOLINE
(TPH-G by GC/PID)
March 15, 1994

SOIL SAMPLE I.D.	TPH-G
SB1-3´	25
SB2-6´	450
SB3-6´ river bank	3300
SB4-4´ shore line	2800
SB5-5´ upgradient	ND
Lab Blank	ND
Detection Limit	10

Results reported in mg/kg (milligrams per kilogram) or ppm (parts per million).
ND = Not Detected at or above the test method detection limits.

4.3 Groundwater Sample Analytical Results

Since gasoline was detected in soil samples collected at a depth greater than or equal to the depth of the water table; the groundwater samples were analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX), per OAR 340-122-242 (3)(a)(A). Concentrations of BTEX, reported in parts per billion (ppb), were identified in groundwater samples GW2-2, GW3-2, and GW4-2. Benzene (16,100 ppb), toluene (60,100 ppb), ethylbenzene (27,900 ppb), and total xylenes (143,000 ppb) were detected in sample GW2-2. Benzene (22,300 ppb), toluene (46,100 ppb), ethylbenzene (5,700 ppb), and total xylenes (29,700 ppb) were detected in sample GW3-2. Benzene (27,000 ppb), toluene (52,900 ppb), ethylbenzene (11,300 ppb), and total xylenes (59,000 ppb) were detected in sample GW4-2.

Since leaded gasoline was released at the subject site and TPH levels greater than 40 ppm for gasoline were detected in soil samples collected at a depth greater than or equal to the depth of the water table; groundwater samples were analyzed for ethylene dibromide (EDB or 1,2-Dibromoethane), ethylene dichloride (EDC or 1,2-Dichloroethane), and dissolved lead, as per OAR 340-122-242 (3)(a)(C-D).

Due to the high concentrations of fuel hydrocarbons present in the groundwater samples which necessitated sample dilution; the detection limits for EDB and EDC were raised to 1.0 ppb for samples GW2-2 and GW3-2, and raised to 2.5 ppb for sample GW4-2. EDB and EDC were not detected at or above the raised detection limits in any of the groundwater samples.

Dissolved lead was detected in groundwater samples GW2-1 at 6 ppb and in GW4-1 at 23 ppb. Dissolved lead was not detected at or above the test method detection limit (1 ppb) in groundwater sample GW3-1.

The results of the groundwater sample analyses are tabulated in Tables 2 and 3 (See Appendix A-Laboratory Analytical Results and Chain of Custody for complete laboratory documentation).

TABLE 2

GROUNDWATER ANALYTICAL RESULTS
BENZENE, TOLUENE, ETHYLBENZENE, and XYLENES (BTEX), ETHYLENE DIBROMIDE (EDB or 1,2-Dibromoethane), and ETHYLENE DICHLORIDE (EDC or 1,2-Dichloroethane)
(per EPA 8240)
March 15, 1994

DESCRIPTION	GW2-2*	GW3-2*	GW4-2**	LAB BLANK	DETECTION LIMIT
Benzene	16,100	22,300	27,000	ND	0.5
Toluene	60,100	46,100	52,900	ND	0.5
Ethylbenzene	27,900	5,700	11,300	ND	0.5
Total Xylenes	143,000	29,700	59,000	ND	1.0
Ethylene Dibromide	ND	ND	ND	ND	0.5
Ethylene Dichloride	ND	ND	ND	ND	0.5

Results reported in ppb (parts per billion) or µg/L (micrograms per liter).
ND = Not Detected at or above the test method detection limits.

* The detection limits for this sample are higher by a factor of 2 due to sample dilution.
** The detection limits for this sample are higher by a factor of 5 due to sample dilution.

TABLE 3

GROUNDWATER ANALYTICAL RESULTS
DISSOLVED LEAD
(per EPA 7421)
March 15, 1994

GROUNDWATER SAMPLE I.D.	DISSOLVED LEAD
GW2-1	6
GW3-1	ND
GW4-1	23
Lab Blank	ND
Detection Limits	1

Dissolved lead results reported in ppb (parts per billion) or µg/L (micrograms per liter).
ND = Not Detected at or above the test method detection limits.

4.4 Quality Assurance Data

A total of five soil samples and six groundwater samples were received by Hughes Analytical Laboratory (HAL) under a chain of custody. The samples were received in containers consistent with U.S. EPA protocol.

Standard Quality Assurance/Quality Control (QA/QC) procedures were performed as stated in "EPA Test Methods for Evaluating Solid Waste (SW-846)", 3rd Edition, and "Standard Methods for the Examination of Water and Wastewater", 17th Edition. The EPA laboratory protocols followed by HAL included sample holding times, laboratory method blanks, laboratory matrix spikes, replicate samples, and calibration standards. HAL reported no significant variations from these protocols that would invalidate the analytical data. High recoveries for one Volatile Organic Analysis (VOA) surrogate reflect a problem with this particular compound; however, sample results are not affected.

Test methods may include minor modifications of detection limits or lists of parameters for the published methods. Raised detection limits for 1,2-Dibromoethane (EDB) and 1,2-Dichloroethane (EDC) are due to the high concentrations of fuel hydrocarbons, which necessitated sample dilutions and interfere with mass spectral evaluation of 1,2-Dichloroethane (EDC). Solid samples were reported on a wet weight basis unless otherwise noted.

5.0 ANALYTICAL RESULTS AND CLEANUP STANDARDS

5.1 Soil Analytical Results and Soil Matrix Cleanup Standards

Since this petroleum hydrocarbon contamination is due to a release from the on-site UST system, site-specific evaluation parameters could be used to determine the Numeric Soil Cleanup Standards for the subject property, as per OAR 340-122-325. Gasoline contamination in excess of the least stringent DEQ Numeric Soil Cleanup Standards (Level 3 Cleanup) is present on the subject property. The least stringent DEQ Numeric Soil Cleanup Standard, a Level 3 Cleanup Standard, for the subject site requires the soils to be cleaned up to at least 130 ppm gasoline (OAR 340-122-335). Gasoline concentrations in soils analyzed from the subject site range from "Not Detected" in SB-5 (presumed upgradient from the USTs) to 3300 ppm gasoline in SB-3 (located downgradient from the USTs).

The Level 3 Cleanup Standard is used only as a reference to the level of contamination observed on the subject property and the DEQ Soil Cleanup Standards. A Soil Matrix Score was not determined for the subject property. A Level 3 Cleanup Standard may not be considered the appropriate Soil Cleanup Standard.

However, since groundwater at the subject property is impacted by gasoline; the DEQ Numeric Soil Cleanup Standards would not be applicable for the subject property. The DEQ may require the investigation and remediation of the subject property to proceed as per the Environmental Cleanup Rules (OAR 340-122-010 through 110).

5.2 Groundwater Analytical Results and Numeric Groundwater Cleanup Levels

Groundwater samples were collected from the three soil borings where groundwater was encountered (temporary groundwater monitoring wells) at the subject site to determine if groundwater had been impacted by the release from the UST system, as per OAR 340-122-240 (3).

Since gasoline contamination was detected in soil samples collected at a depth greater than or equal to the depth of the water table; the groundwater samples were analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX), per OAR 340-122-242 (3)(a)(A).

The basic numeric groundwater cleanup levels for petroleum-contaminated UST sites, as specified in OAR 340-122-242 (4a), for volatile aromatic hydrocarbons (BTEX) are: benzene, 5 ppb; toluene, 1000 ppb; ethylbenzene, 700 ppb; and total xylenes, 10,000 ppb.

Laboratory analytical results for BTEX in groundwater samples GW2-2, GW3-2, and GW4-2 exceed Oregon DEQ groundwater cleanup levels. Benzene (16,100 ppb), toluene (60,100 ppb), ethylbenzene (27,900 ppb), and total xylenes (143,000 ppb) were detected in sample GW2-2. Benzene (22,300 ppb), toluene (46,100 ppb), ethylbenzene (5,700 ppb), and total xylenes (29,700 ppb) were detected in sample GW3-2. Benzene (27,000 ppb), toluene (52,900 ppb), ethylbenzene (11,300 ppb), and total xylenes (59,000 ppb) were detected in sample GW4-2.

Since TPH levels greater than 40 ppm for gasoline were detected in soil samples collected at a depth greater than or equal to the depth of the water table; groundwater samples were analyzed for ethylene dibromide (EDB or 1,2-Dibromoethane), ethylene dichloride (EDC or 1,2-Dichloroethane), and dissolved lead (as per OAR 340-122-242 (3)(a)(C-D)). As per OAR 340-122-242 (4a), the basic numeric groundwater cleanup level for the following gasoline additives is: ethylene dibromide (EDB), 1 ppb; ethylene dichloride (EDC), 5 ppb; and dissolved lead, 5 ppb.

Due to the high concentrations of fuel hydrocarbons present in the groundwater samples which necessitated sample dilution; the detection limits for EDB and EDC were raised to 1.0 ppb for samples GW2-2 and GW3-2, and raised to 2.5 ppb for sample GW4-2. These raised detection limits for EDB equal or exceed the basic numeric groundwater cleanup level for EDB. EDB and EDC were not detected at or above the raised detection limits in any of the groundwater samples.

Dissolved lead exceeding the groundwater cleanup level was detected in groundwater sample GW2-1 at 6 ppb and in GW4-1 at 23 ppb. Dissolved lead was not detected at or above the test method detection limit, 1 ppb, groundwater sample GW3-1.

6.0 GEOLOGY AND HYDROGEOLOGY

Examination of published and unpublished geological and hydrogeological reports for the Macadam Avenue area have allowed us to characterize the geology and hydrology of the site.

The subject site is located on the west bank of the Willamette River adjacent to the Sellwood Bridge and approximately 3-1/2 miles south of downtown Portland, Oregon. The subject property is approximately 15-40 feet above Mean Sea Level (MSL). The subject property occupies two levels on the west bank of the Willamette River at the base of a moderately steep slope. The majority of the site (main level) is located on the upper terrace which has been excavated into the river bank approximately 20-30 feet above the Willamette River. The subject property slopes steeply from the main level down to the bank of the Willamette River. Surface drainage for the subject property is to the east into the adjacent Willamette River, which flows to the north.

The soil underneath the subject site is classified as Urban Land, 0 to 3 percent slopes, by the <u>Soil Survey of Multnomah County, Oregon</u>.. This miscellaneous map unit is found throughout central Multnomah County and mainly occurs in Portland along the flood plains of the Willamette River. Areas of this map unit are used mainly for commercial purposes. The original soils were gravelly loam, silt loam, or silty clay loam with some sandy materials. The soils in areas of this unit have been graded, cut, filled, or otherwise severely altered due to construction that mapping the soil units was not practical. Approximately ninety-five percent or more of the soils are covered with concrete, pavement, buildings, and other structures.

Immediately underlying the site are the highly permeable sands and gravels of the Willamette River flood plain deposits (Quaternary Alluvium). The alluvium has been deposited by constant flooding of the river since about 10,000 years ago, at the end of the last Ice Age. Since that time, the position of the Willamette River has remained relatively constant. This alluvial unit is overlain in turn by a thin veneer of silts and sands derived from wind deposition and weathering of the river deposits.

Our experience from drilling projects in the area indicates that underlying the alluvial deposits at a depth of 20 feet or less are the dense basalt flows of the Columbia River Basalt. These lava flows erupted approximately 15 to 20 million years ago. The Columbia River Basalts are visible in the local road cuts, and in the banks and channel of the Willamette River.

Examination of water well logs, City of Portland groundwater exploration reports, and U.S. Geological Survey groundwater information for the project area indicates the depth to the uppermost aquifer beneath the site is approximately 20 feet or less. This level coincides with the stage of the adjacent river and represents a layer of water perched on top of the underlying basalt flows. The level to groundwater can be expected to fluctuate on a seasonal basis in response to recharge from local rainfall runoff. The direction of movement of the uppermost groundwater aquifer is to the east toward the Willamette River.

On November 12, 1993, Ms. Jo Miller, U.S. Geological Survey (USGS), found no records of water wells on the subject property or for the subject property address.

7.0 SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

7.1 Summary and Conclusions

Based on data collected and field observations made by DMI, the following summaries and conclusions are presented:

Subsurface Soil Investigation

- Gasoline contamination in excess of the least stringent DEQ Numeric Soil Cleanup Standards (Level 3 Cleanup) is present on the subject property. The least stringent DEQ Numeric Soil Cleanup Standard, a Level 3 Cleanup Standard, for the subject site requires the soils to be cleaned up to at least 130 ppm gasoline (OAR 340-122-335). Gasoline concentrations in soils analyzed from the subject site range from "Not Detected" in SB-5 (presumed upgradient from the USTs) to 3300 ppm gasoline in SB-3 (located downgradient from the USTs).

- The Level 3 Cleanup Standard is used only as a reference to the level of contamination observed on the subject property and the DEQ Soil Cleanup Standards. A Soil Matrix Score was not determined for the subject property. A Level 3 Cleanup Standard may not be considered the appropriate Soil Cleanup Standard.

- However, since groundwater at the subject property is impacted by gasoline; the DEQ Numeric Soil Cleanup Standards would not be applicable for the subject property. The DEQ may require the investigation and remediation of the subject property to proceed as per the Environmental Cleanup Rules (OAR 340-122-010 through 110).

Groundwater Investigation

- Groundwater samples were collected from the three soil borings where groundwater was encountered (temporary groundwater monitoring wells) at the subject site to determine if groundwater had been impacted by the release from the UST system, as per OAR 340-122-240 (3).

- Since gasoline contamination was detected in soil samples collected at a depth greater than or equal to the depth of the water table; the groundwater samples were analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX), per OAR 340-122-242 (3)(a)(A). The basic numeric groundwater cleanup levels for petroleum-contaminated UST sites, as specified in OAR 340-122-242 (4a), for volatile aromatic hydrocarbons (BTEX) are: benzene, 5 ppb; toluene, 1000 ppb; ethylbenzene, 700 ppb; and total xylenes, 10,000 ppb.

- Laboratory analytical results for BTEX in groundwater samples GW2-2, GW3-2, and GW4-2 exceed Oregon DEQ groundwater cleanup levels. Benzene (16,100 ppb), toluene (60,100 ppb), ethylbenzene (27,900 ppb), and total xylenes (143,000 ppb) were detected in sample GW2-2. Benzene (22,300 ppb), toluene (46,100 ppb), ethylbenzene (5,700 ppb), and total xylenes (29,700 ppb) were detected in sample GW3-2. Benzene (27,000 ppb), toluene (52,900 ppb), ethylbenzene (11,300 ppb), and total xylenes (59,000 ppb) were detected in sample GW4-2.

- Since TPH levels greater than 40 ppm for gasoline were detected in soil samples collected at a depth greater than or equal to the depth of the water table; groundwater samples were analyzed for ethylene dibromide (EDB or 1,2-Dibromoethane), ethylene dichloride (EDC or 1,2-Dichloroethane), and dissolved lead (as per OAR 340-122-242 (3)(a)(C-D)). As per OAR 340-122-242 (4a), the basic numeric groundwater cleanup level for the following gasoline additives is: ethylene dibromide (EDB), 1 ppb; ethylene dichloride (EDC), 5 ppb; and dissolved lead, 5 ppb.

- Due to the high concentrations of fuel hydrocarbons present in the groundwater samples which necessitated sample dilution; the detection limits for EDB and EDC were raised to 1.0 ppb for samples GW2-2 and GW3-2, and raised to 2.5 ppb for sample GW4-2. These raised detection limits for EDB equal or exceed the basic numeric groundwater cleanup level for EDB. EDB and EDC were not detected at or above the raised detection limits in any of the groundwater samples.

- Dissolved lead exceeding the groundwater cleanup level was detected in groundwater sample GW2-1 at 6 ppb and in GW4-1 at 23 ppb. Dissolved lead was not detected at or above the test method detection limit, 1 ppb, groundwater sample GW3-1.

7.2 Recommendations

DMI presents the following recommendations for the subject site:

- A copy of this report should be forwarded to the Oregon DEQ.

- A copy of this report must remain on file at the subject property for a period of ten years following the first change of ownership pursuant to Oregon Administrative Rules (OAR) 340-122-360 (2).

The data presented in this report was collected, analyzed, and interpreted following the standards of care, skill, and diligence ordinarily provided by a professional in the performance of similar services as of the time the services were performed.

The observations, interpretations, and recommendations presented in this report are based on the assumption that the conditions do not vary from those found during the course of the investigation at the project site. If any variations are encountered during any further investigations for this site, De Minimis Inc. (DMI) Environmental Management should be notified so that supplemental interpretations can be made. The observations and interpretations of this report are intended only for the subject site and the sampling conditions described. The observations and interpretations of this report must not be extended to adjacent areas.

The findings of this report are valid for the dates and under the conditions of the sampling, observations, and testing. However, changes in the conditions of the subject property, neighboring properties, or changes in applicable standards can occur with broadening of knowledge. Accordingly, the observations and findings presented in this report may be invalidated by changes outside of our control.

DMI does not offer any legal opinion, representation, or interpretation of environmental laws, rules, regulations, or policies of federal, state, or local governmental agencies.

If you have any questions or require further clarification regarding the information in this report, please feel free to contact DMI at your convenience. Thank you for allowing DMI to be of service and to present this information.

Respectfully submitted,

Dale L. Haar
Project Manager
Environmental Scientist

Reviewed by Rick I. Johnson, Principal

8.0 GLOSSARY OF ABBREVIATIONS

BTEX	benzene, toluene, ethylbenzene, and xylenes
bgs	below ground surface
CFR	Code of Federal Regulations
DEQ	Oregon Department of Environmental Quality
DMI	De Minimis Inc., Environmental Management
DOGAMI	Department of Geology and Mineral Industries
EDB	ethylene dibromide or 1,2-Dibromoethane
EDC	ethylene dichloride or 1,2-dichloroethane
EPA	U.S. Environmental Protection Agency
GC/PID	gas chromatograph/photoionization detector
HAL	Hughes Analytical Laboratory
LUST	leaking underground storage tank
µg/kg	micrograms/kilogram
µg/L	micrograms/liter
mg/kg	milligram/kilogram
mg/L	milligram/liter
OAR	Oregon Administrative Rules
ppm	parts per million
ppb	parts per billion
SB	soil boring
TPH-G	Total Petroleum Hydrocarbon-Gasoline
USGS	United States Geological Survey
UST	underground storage tank
VOA	volatile organic analysis

9.0 REFERENCES

Staff Jennings, Inc.
Mr. Jeffrey S. Jennings, President
Mr. Al Anshen, Service Manager

Level I Environmental Site Assessment of Staff Jennings, Inc., Retail Facility and Marina, Oregon; De Minimis Inc., Environmental Management, November 30, 1993.

Report of Findings Preliminary Field Investigation of Sellwood Marina, Portland, Oregon; Golder Associates, Inc., March 27, 1989.

Soil Survey of Multnomah County, Oregon; U.S. Department of Agriculture, Soil Conservation Service; August, 1983; 225p.

Maps utilized:
USGS topographic - Lake Oswego, Oregon 7.5 minute quadrangle.
Oregon Department of Geology and Mineral Industries (DOGAMI) Open File Report 0-90-2, , 1990, 21p.

DOGAMI Geologic Map of the Lake Oswego Quadrangle, GMS-59, 1989.

Environmental Cleanup Manual; Oregon Department of Environmental Quality, October 1992; 116p.

Madin, I.P., 1990, Earthquake-hazard geology maps of the Portland metropolitan area, Oregon: text and map explanation: Oregon Department of Geology and Mineral Industries Open File Report 0-90-2, 21p.

Trimble, D.E., 1963, Geology of Portland, Oregon and adjacent areas: U.S. Geological Survey Bulletin 1119, 119p.

Shannon and Wilson, 1979, Drainage sump capacity study: Consulting report to the City of Portland Department of Environmental Services, 61p.

Shannon and Wilson, 1978, Geologic and engineering slope hazard studies unincorporated Multnomah County, Oregon: Private consulting report to Multnomah County, 37p.

Piper, A.M., 1942, Ground-water resources of the Willamette Valley, Oregon: U.S. Geological Survey Water-Supply Paper 890, 194p.

Willis, R.F., 1977, A report on the ground water exploration program: City of Portland Bureau of Water Works report, 282p.

APPENDIX A

LABORATORY ANALYTICAL RESULTS
AND
CHAIN OF CUSTODY

HUGHES
ANALYTICAL LABORATORY

March 29, 1994

Mr. Dale Haar
DeMinimis, Inc.
34 N.W. 1st Ave., Suite 101
Portland, OR 97209

Dear Mr. Haar:

Enclosed is a revised lab report for your samples which were received on March 15, 1994. The Hughes Report # is 94-0109 and the Client Project is 00226-1293, SJM.

Five soil samples and six water samples were received under a chain of custody. The samples were received in containers consistent with U.S. EPA (United States Environmental Protection Agency) protocol.

Standard Quality Assurance/Quality Control (QA/QC) procedures were performed as stated in "EPA Test Methods for Evaluating Solid Waste (SW-846)", 3rd Edition and "Standard Methods for the Examination of Water and Wastewater", 17th Edition. The EPA laboratory protocols followed include sample holding times, laboratory method blanks, laboratory matrix spikes, replicate samples and calibration standards. There were no significant variations from these protocols that would invalidate the analytical data. **High recoveries for one VOA surrogate reflect a problem with this particular compound. Sample results are not affected.**

Test methods may include minor modifications of detection limits or lists of parameters for the published methods. Raised **detection limits for 1,2-Dibromoethane and 1,2-Dichloroethane are due to the high concentrations of fuel hydrocarbons, which necessitated sample dilutions and interfere with mass spectral evaluation of 1,2-Dichloroethane.**

Solid samples are reported on a wet weight basis unless otherwise noted. Compounds not detected are listed under results as ND.

Sincerely,

Kim Hughes

Kim Hughes
Lab Director

4110 NE 122nd ▪ Suite 130 ▪ Portland, Oregon 97230 ▪ (503) 254-4049 ▪ FAX (503) 253-9019

HUGHES REPORT #: 94-0109
CLIENT: DeMinimis, Inc.
DATE: March 29, 1994
ITEMS: Five Soil Samples

CLIENT JOB: SJM
00226-1293

METHOD: TPH-G by GC/PID
per Oregon DEQ
Results in mg/Kg (ppm)

Extraction: 03/16/94
Analysis: 03/16/94

SAMPLE I.D.	RESULT	SURROGATE RECOVERY, %
SB1-3′	25	62
SB2-6′	450	95
SB3-6′	3300	101
SB4-4′	2800	99
SB5-5′	ND	60
Lab Blank	ND	81
Detection Limit	10	

ND = Not Detected

HUGHES REPORT #: 94-0109
CLIENT: DeMinimis, Inc.
DATE: March 29, 1994
ITEMS: Three Water Samples

CLIENT JOB: SJM
00226-1293

METHOD: Dissolved Lead per EPA 7421
Results in ug/L (ppb)

Preparation: 03/17/94
Analysis: 03/17/94

SAMPLE I.D.	**RESULT**
GW2-1	6
GW3-1	ND
GW4-1	23
Detection Limit	1

ND = Not Detected

HUGHES REPORT #: 94-0109 CLIENT JOB: SJM 00226-1293
CLIENT: DeMinimis, Inc.
DATE: March 29, 1994
ITEMS: Three Water Samples

METHOD: BTEX/EDB/EDC
per EPA 8240
Results in ug/L (ppb) Analysis: 03/22/94

DESCRIPTION	GW2-2*	GW3-2*	GW4-2**	LAB BLANK	DETECTION LIMIT
Benzene	16,100	22,300	27,000	ND	0.5
Toluene	60,100	46,100	52,900	ND	0.5
Ethylbenzene	27,900	5,700	11,300	ND	0.5
Total Xylenes	143,000	29,700	59,000	ND	1.0
1,2-Dibromoethane	ND	ND	ND	ND	0.5
1,2-Dichloroethane	ND	ND	ND	ND	0.5
					Acceptance Limits
Surrogate Recovery, %					
d4-1,2-Dichloroethane	119	124	121	137	86-115
d8-Toluene	97	98	98	99	76-114

*The detection limits for this sample are higher by a factor of 2 due to sample dilution.

**The detection limits for this sample are higher by a factor of 5 due to sample dilution.

ND = Not Detected

HUGHES ANALYTICAL LABORATORY

21920 N.E. Glisan
Gresham, Oregon 97030
503/669-3745
FAX: 503/669-4165

Chain of Custody Record

Lab Project Number 94-0109 Date 3/15/94 Page 1 of 1

Project Information

Project Number: #00226-1293
Project Name: SJM
Company: De Minimis Inc. (DMI)
Project Manager: Dale L. Haar
Collected by: Dale L. Haar (DLH)
P.O. Number:

Reporting Request

☒ FAX: 295-0112
☒ PHONE: 295-4074

TURNAROUND TIME

☒ Standard ☐ RUSH
☐ Other

Special Instructions

Please call if any questions

☒ Samples received at 4° C
☒ EPA Jars/Vials with teflon lids
☐ WA Methods ☒ OR Methods

				MATRIX				ANALYSIS REQUEST																	
LAB ID	SAMPLE ID	DATE	TIME	SOIL	WATER	OTHER	NO. OF CONTAINERS	TPH-HCID	TPH-Gas	TPH-Diesel	TPH-418.1 m	HCID-Fuel Scan	TPH-418.1	BTEX/8020	Volatiles/8010	Volatiles/8240	PAH/8310	Semivolatiles/8270	PCB	Pesticides/8080	Metals	Dissolved lead	EDB/EDC		REMARKS/SAMPLE CONDITION
01	SB1-3'	3/15/94	0912	X			1		X																Dissolved lead samples
02	SB2-6'	3/15/94	0941	X			1		X																filtered upon receipt
03	SB3-6'	3/15/94	1051	X			1		X																3-15-94 KB
04	SB4-4'	3/15/94	1149	X			1		X																
05	SB5-5'	3/15/94	1506	X			1		X																
06	GW2-1	3/15/94	1313		X		1															X			
07	GW2-2	3/15/94	1338		X		3							X							NLH		X H		BTEX and EDB/EDC
08	GW3-1	3/15/94	1126		X		1															X			
09	GW3-2	3/15/94	1132		X		3							X									X		
10	GW4-1	3/15/94	1219		X		1															X			
11	GW4-2	3/15/94	1225		X		3							X									X		

RELINQUISHED BY (Sign and Print)	DATE/TIME	RECEIVED BY (Sign)	DATE/TIME
/ Dale L. Haar	3-15-94 1649	Kim Hughes	3/15/94 4:45
/			
/			

PLEASE NOTE:
SAMPLES WILL BE DISPOSED OF AFTER 30 DAYS.

CHAIN OF CUSTODY SEALS Y/N/NA
SHIPPED VIA: UPS Fed-Ex Bus Courier

APPENDIX B

SUBSURFACE SOIL BORING AND MONITORING WELL LOGS

STATE OF OREGON

MONITORING WELL REPORT

(as required by ORS 537.765 & OAR 690-240-095)

Start Card # 63640

Instructions for completing this report are on the last page of this form.

(1) OWNER/PROJECT:

WELL NO. SB-2

Name Staff Jennings, Inc

Address 8240 SW Macadam Ave

City Portland State Oregon Zip 97219

(2) TYPE OF WORK:

☒ New construction ☐ Alteration (Repair/Recondition)

☐ Conversion ☐ Deepening ☒ Abandonment

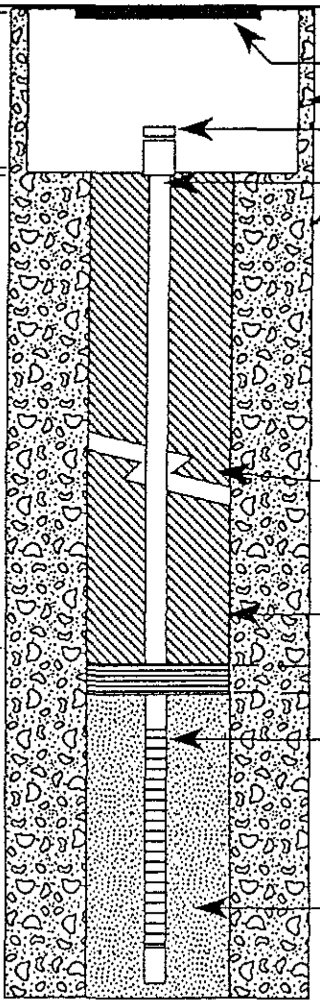
(3) DRILLING METHOD

☐ Rotary Air ☐ Rotary Mud ☐ Cable

☐ Hollow Stem Auger ☒ Other rotohammer core drill

(4) BORE HOLE CONSTRUCTION

Special Standards Yes ☒ No ☐ Depth of completed well 15 ft.



Land surface

Vault NA ft. TO NA ft.

Water-tight cover

Surface flush vault

Locking cap

Casing

diameter NA in.

material NA

Welded ☐ Threaded ☐ Glued ☐

water sampled from 1" dia. boring, then abandoned with bentonite chips

Seal NA ft. TO NA ft.

Liner

diameter NA in.

material NA

Welded ☐ Threaded ☐ Glued ☐

Well seal:

Material NA

Amount NA

Grout weight NA

Borehole diameter

_____ in.

Bentonite plug at least 3 ft. thick

Screen

material NA

interval(s):

From NA To

From NA To

Slot size NA in.

Filter pack NA ft. TO NA ft.

Filter pack:

Material NA

Size _____ in.

(5) WELL TEST: none

☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Permeability _____ Yield NA GPM

Conductivity _____ PH _____

Temperature of water _____ °F/C Depth artesian flow found _____ ft.

Was water analysis done? ☐ Yes ☐ No

By whom?

Depth of strata to be analyzed. From _____ ft. to _____ ft.

Remarks:

Name of supervising [✓ Geologist]/Engineer Neil Shaw

(6) LOCATION OF WELL By legal description

Well Location: County Multnomah

Township T1S (N or S) Range R1E (E or W) Section 22

1. SE 1/4 of SE 1/4 of above section.

2. Either Street address of well location 8240 SW Macadam Av Portland, Oregon 97219

or Tax lot number of well location TL-10

3. ATTACH MAP WITH LOCATION IDENTIFIED. Map shall include approximate scale and north arrow.

(7) STATIC WATER LEVEL:

10 Ft. below land surface. Date 3/15/94

Artesian Pressure NA lb/sq. in. Date NA

(8) WATER BEARING ZONES:

Depth at which water was first found 10 ft.

From	To	Est. Flow Rate	SWL
10 ft	15 ft	NA	10 ft

(9) WELL LOG:

Ground elevation ≈ 50 ft

Material	From	To	SWL
silty sand	0 ft.	15 ft	10 ft.

Date started 3/15/94 Completed 3/15/94

(unbonded) Monitor Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to the best knowledge and belief.

MWC Number _____

Signed NA Date NA

(bonded) Monitor Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

MWC Number 10286

Signed _____ Date 03/28/94

ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER

STATE OF OREGON
MONITORING WELL REPORT
(as required by ORS 537.765 & OAR 690-240-095)

Instructions for completing this report are on the last page of this form.

Start Card # ~~6341~~ 63641 (DL#)

(1) OWNER/PROJECT:
WELL NO. SB-3

Name Statt Testings Inc.

Address 8240 SW Macadam Ave

City Portland State OR Zip 97219

(2) TYPE OF WORK:
☒ New construction ☐ Alteration (Repair/Recondition)

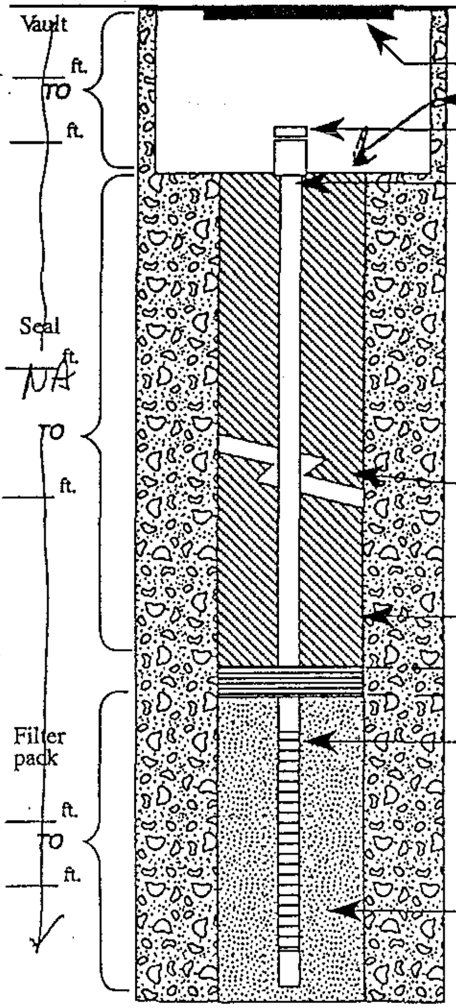
☐ Conversion ☐ Deepening ☒ Abandonment

(3) DRILLING METHOD
☐ Rotary Air ☐ Rotary Mud ☐ Cable

☐ Hollow Stem Auger ☒ Other airhammer core drill

(4) BORE HOLE CONSTRUCTION
Special Standards Yes ☒ No ☐

Depth of completed well 10 ft.



groundwater sampled from boring, then abandoned with bentonite

Casing diameter ______ in.

material ______

Welded ☐ Threaded ☐ Glued ☐

Liner diameter NA in.

material ______

Welded ☐ Threaded ☐ Glued ☐

Well seal:

Material ______

Amount ______

Grout weight ______

Borehole diameter ______ in.

Bentonite plug at least 3 ft. thick

Screen material ______

interval(s):

From ______ To ______

From ______ To ______

Slot size ______ in.

Filter pack:

Material ______

Size ______ in.

(5) WELL TEST: none NA
☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Permeability ______ Yield ______ GPM

Conductivity ______ PH ______

Temperature of water ______ °F/C Depth artesian flow found ______ ft.

Was water analysis done? ☐ Yes ☐ No

By whom? ______

Depth of strata to be analyzed. From ______ ft. to ______ ft.

Remarks: ______

Name of supervising [✓ Geologist]/Engineer Neil Shaw

(6) LOCATION OF WELL By legal description
Well Location: County Multnomah

Township T1S (N or S) Range R1E (E or W) Section 22

1. SE 1/4 of SE 1/4 of above section.

2. Either Street address of well location tax lot 10
8240 SW Macadam Ave 97219

or Tax lot number of well location ______

3. ATTACH MAP WITH LOCATION IDENTIFIED. Map shall include approximate scale and north arrow.

(7) STATIC WATER LEVEL:
4 Ft. below land surface. Date 3/15/94

Artesian Pressure NA lb/sq. in. Date NA

(8) WATER BEARING ZONES:
Depth at which water was first found 4 ft.

From	To	Est. Flow Rate	SWL
4	10	NA	4 ft.

(9) WELL LOG:
Ground elevation 350 ft.

Material	From	To	SWL
silty sand	0 ft	10 ft	4 ft.

Date started 3/15/94 Completed 3/15/94

(unbonded) Monitor Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to the best knowledge and belief.

MWC Number ______

Signed NA Date NA

(bonded) Monitor Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

MWC Number 10286

Signed ______ Date 3/28/94

ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER

STATE OF OREGON

MONITORING WELL REPORT

(as required by ORS 537.765 & OAR 690-240-095)

Instructions for completing this report are on the last page of this form.

Start Card # 63642

(1) OWNER/PROJECT:

WELL NO. SB-4

Name Staff Jennings, Inc

Address 8240 SW Macadam Ave

City Portland State Oregon Zip 97219

(2) TYPE OF WORK:

☒ New construction ☐ Alteration (Repair/Recondition)

☐ Conversion ☐ Deepening ☒ Abandonment

(3) DRILLING METHOD

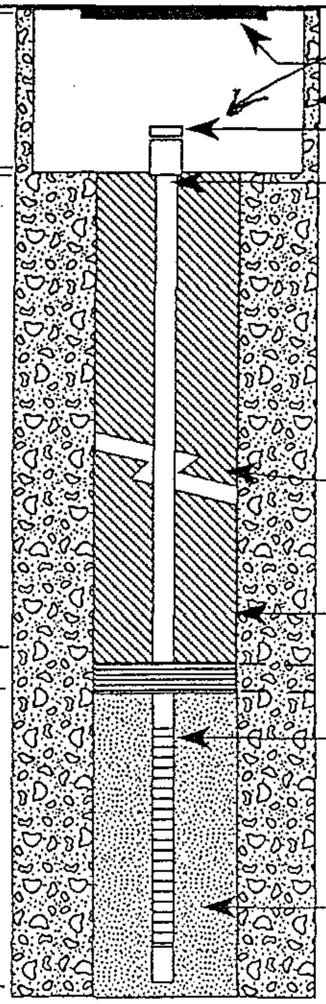
☐ Rotary Air ☐ Rotary Mud ☐ Cable

☐ Hollow Stem Auger ☐ Other vibhammer core drill

(4) BORE HOLE CONSTRUCTION

Special Standards Yes ☒ No ☐

Depth of completed well 9 ft.



Vault ___ ft. TO ___ ft.

Seal ___ ft. TO ___ ft.

Filter pack ___ ft. TO ___ ft.

NA

Land surface

Water-tight cover

Surface flush vault

Locking cap

Casing diameter ___ in.

material ___

Welded ☐ Threaded ☐ Glued ☐

Liner diameter ___ in.

material ___

NA

Welded ☐ Threaded ☐ Glued ☐

Well seal:

Material ___

Amount ___

Grout weight ___

Borehole diameter ___ in.

Bentonite plug at least 3 ft. thick

Screen material ___

interval(s):

From ___ To ___

From ___ To ___

Slot size ___ in.

Filter pack:

Material ___

Size ___ in.

NA

groundwater sampled from open borehole, then abandoned with bentonite

(5) WELL TEST:

none NA

☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Permeability ___ Yield ___ GPM

Conductivity ___ PH ___

Temperature of water ___ °F/C Depth artesian flow found ___ ft.

Was water analysis done? ☐ Yes ☐ No

By whom? ___

Depth of strata to be analyzed. From ___ ft. to ___ ft.

Remarks: ___

Name of supervising [✓ Geologist]/Engineer Neil Shaw

(6) LOCATION OF WELL By legal description

Well Location: County Multnomah

Township T1S (N or S) Range R1E (E or W) Section 2

1. SE 1/4 of SE 1/4 of above section.

2. Either Street address of well location 8240 SW Macadam Av Portland, Oregon 97219

or Tax lot number of well location Tax lot 10

✓ 3. ATTACH MAP WITH LOCATION IDENTIFIED. Map shall include approximate scale and north arrow.

(7) STATIC WATER LEVEL:

2 Ft. below land surface. Date 3/15/94

Artesian Pressure NA lb/sq. in. Date NA

(8) WATER BEARING ZONES:

Depth at which water was first found 2 ft.

From	To	Est. Flow Rate	SWL
2	9	NA	2

(9) WELL LOG:

Ground elevation ≅30 ft msl

Material	From	To	SWL
silty sand	0 ft	9 ft	2 ft

Date started 3/15/94 Completed 3/15/94

(unbonded) Monitor Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to the best knowledge and belief.

MWC Number NA

Signed NA Date NA

(bonded) Monitor Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

MWC Number 10286

Signed ___ Date 3/28/94

ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER

FOR WATER RESOURCES DEPARTMENT USE ONLY
Date Postmarked ______ W 63640
Date Hand-delivered ______ WRD Receipt ______
Watermaster Initials ______ Date Fee Received ______
Check No. ______

START CARD

NOTICE OF BEGINNING OF WELL CONSTRUCTION

(as required by ORS 537.762)

This form must be completed, signed by both the owner (or authorized agent) and constructor, and the original mailed or delivered to the Water Resources Department, 3850 Portland Road NE, Salem, OR 97310, no later than the day construction, alteration, conversion or abandonment work begins. A $75 fee shall accompany all notices for new well construction or conversion of an existing hole not previously used to obtain water (make checks payable to the Water Resources Department). Notices meeting this requirement but received without the required fee will not be accepted as properly and timely filed. In addition, the constructor shall provide the "Watermaster Copy" of this notice to the office of the district watermaster within which the well is being constructed, altered, converted or abandoned using one of the following options: (a) by regular mail no later than three (3) calendar days (72 hours) prior to commencement of work; or, (b) by hand delivery, during regular office hours, no later than the day work is commenced; or, (c) by FAX no later than the day work is commenced. If this method is used, the original "Watermaster copy" of this notice shall also be mailed or delivered to the office of the district watermaster no later than the day work is commenced. The Water Resources Commission has authority to impose civil penalties for failure to submit the required $75 fee with the start card and for failure to submit cards prior to beginning any construction, alteration, conversion or abandonment work.

Owner's name and mailing address: Stabb Jennings, Inc.

McCadam
SW
Oregon

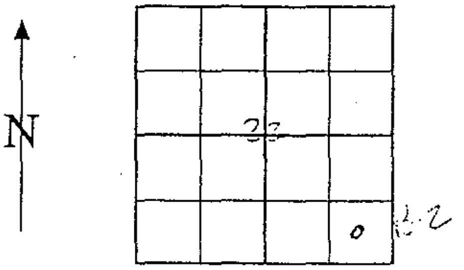
Check type of work: Fee Required { ☒ New construction ☐ Conversion   No Fee Required { ☐ Alteration (Repair/Recondition) ☐ Deepening ☐ Abandonment   Original Start Card Number ______

Proposed Commencement Date 3/15/94   Existing or Proposed Well Depth 10 ft.   Diameter 1"

Check Use: ☐ Domestic ☐ Community ☐ Industrial ☐ Irrigation ☒ Monitoring ☐ Thermal ☐ Injection ☐ Other ______

Proposed Well Location: County Multnomah County   Owner's Well Id. No. B-2

Township T1S (N or S)   Range R1E (E or W)   Section 22



1. SE 1/4 of SE 1/4 of above section
2. Street address of well location 8240 SW McAdam Ave Portland
3. Tax lot number of well location TL 10
4. Attach map with location identified. See reverse of this form for approved maps.
5. Show well location within 1/4, 1/4 of section grid at left.

We hereby certify that we have read the back of this form, and that to the best of our knowledge the information provided herein is accurate and the well is being properly located from septic tanks, septic/drain fields and other hazards. (See #2 on back)

for Stabb Jennings Inc.
Owner's signature or authorized agent   Bonded Water/Monitor Well Constructor

same (206) 253-9030
Home phone   Work phone   License No. 10286

Company NSCG

NOTE: This is not a water right application. The owner is responsible for obtaining a water right through the Water Resources Department, if required.

THIS COPY TO CUSTOMER

FOR WATER RESOURCES DEPARTMENT USE ONLY

Date Postmarked ______ W63641

Date Hand-delivered ______ WRD Receipt ______

Watermaster Initials ______ Date Fee Received ______

Check No. ______

START CARD

NOTICE OF BEGINNING OF WELL CONSTRUCTION

(as required by ORS 537.762)

This form must be completed, signed by both the owner (or authorized agent) and constructor, and the original mailed or delivered to the Water Resources Department, 3850 Portland Road NE, Salem, OR 97310, no later than the day construction, alteration, conversion or abandonment work begins. A $75 fee shall accompany all notices for new well construction or conversion of an existing hole not previously used to obtain water (make checks payable to the Water Resources Department). Notices meeting this requirement but received without the required fee will not be accepted as properly and timely filed. In addition, the constructor shall provide the "Watermaster Copy" of this notice to the office of the district watermaster within which the well is being constructed, altered, converted or abandoned using one of the following options: (a) by regular mail no later than three (3) calendar days (72 hours) prior to commencement of work; or, (b) by hand delivery, during regular office hours, no later than the day work is commenced; or, (c) by FAX no later than the day work is commenced. If this method is used, the original "Watermaster copy" of this notice shall also be mailed or delivered to the office of the district watermaster no later than the day work is commenced. The Water Resources Commission has authority to impose civil penalties for failure to submit the required $75 fee with the start card and for failure to submit cards prior to beginning any construction, alteration, conversion or abandonment work.

Owner's name and mailing address: Scott Jennings, Inc.

8240 SW McAdam Ave

Portland, Oregon

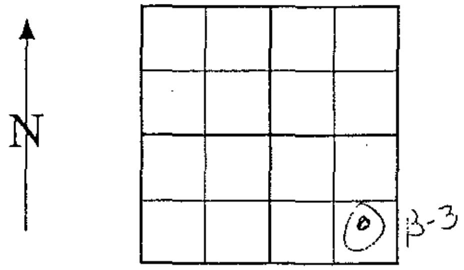
Check type of work: Fee Required ☒ New construction ☐ Conversion — No Fee Required ☐ Alteration (Repair/Recondition) ☐ Deepening ☐ Abandonment — Original Start Card Number ______

Proposed Commencement Date 3/15/94 Existing or Proposed Well Depth 10 ft. Diameter 1 inch

Check Use: ☐ Domestic ☐ Community ☐ Industrial ☐ Irrigation ☒ Monitoring ☐ Thermal ☐ Injection ☐ Other ______

Proposed Well Location: County Multnomah Owner's Well Id. No. B-3

Township T1S (N or S) Range R1E (E or W) Section 22



1. SE 1/4 of SE 1/4 of above section
2. Street address of well location 8240 SW McAdam Ave Portland, Oregon
3. Tax lot number of well location Tax lot 10
4. Attach map with location identified. See reverse of this form for approved maps.
5. Show well location within 1/4, 1/4 of section grid at left.

We hereby certify that we have read the back of this form, and that to the best of our knowledge the information provided herein is accurate and the well is being properly located from septic tanks, septic drain fields and other hazards. (See #2 on back)

for Scott Jennings, Inc.

Owner's signature or authorized agent

Bonded Water/Monitor Well Constructor

Same
Home phone

(206) 253-9030
Work phone

License No. 10266

Company WSCG

NOTE: This is not a water right application. The owner is responsible for obtaining a water right through the Water Resources Department, if required.

THIS COPY TO CUSTOMER

FOR WATER RESOURCES DEPARTMENT USE ONLY

Date Postmarked ______

Date Hand-delivered ______

Watermaster Initials ______

W 63642

WRD Receipt ______

Date Fee Received ______

Check No. ______

START CARD

NOTICE OF BEGINNING OF WELL CONSTRUCTION

(as required by ORS 537.762)

This form must be completed, signed by both the owner (or authorized agent) and constructor, and the original mailed or delivered to the Water Resources Department, 3850 Portland Road NE, Salem, OR 97310, no later than the day construction, alteration, conversion or abandonment work begins. A $75 fee shall accompany all notices for new well construction or conversion of an existing hole not previously used to obtain water (make checks payable to the Water Resources Department). Notices meeting this requirement but received without the required fee will not be accepted as properly and timely filed. In addition, the constructor shall provide the "Watermaster Copy" of this notice to the office of the district watermaster within which the well is being constructed, altered, converted or abandoned using one of the following options: (a) by regular mail no later than three (3) calendar days (72 hours) prior to commencement of work; or, (b) by hand delivery, during regular office hours, no later than the day work is commenced; or, (c) by FAX no later than the day work is commenced. If this method is used, the original "Watermaster copy" of this notice shall also be mailed or delivered to the office of the district watermaster no later than the day work is commenced. The Water Resources Commission has authority to impose civil penalties for failure to submit the required $75 fee with the start card and for failure to submit cards prior to beginning any construction, alteration, conversion or abandonment work.

Owner's name and mailing address: Staff Jennings, Inc.
8240 SW McAdam Ave
Portland, Oregon

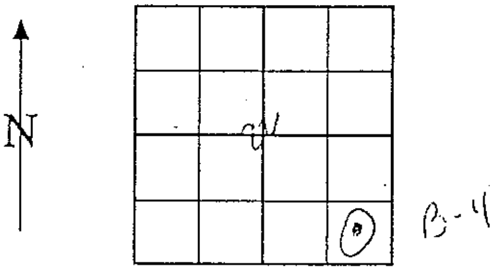
Check type of work: Fee Required ☒ New construction ☐ Conversion No Fee Required ☐ Alteration (Repair/Recondition) ☐ Deepening ☐ Abandonment Original Start Card Number ______

Proposed Commencement Date 3/15/94 Existing or Proposed Well Depth 10 ft. Diameter 1 inch

Check Use: ☐ Domestic ☐ Community ☐ Industrial ☐ Irrigation ☒ Monitoring ☐ Thermal ☐ Injection ☐ Other ______

Proposed Well Location: County Multnomah Owner's Well Id. No. B-4

Township T1S (N or S) Range R1E (E or W) Section 22



1. SE 1/4 of SE 1/4 of above section
2. Street address of well location 8240 SW Macadam Portland, Oregon
3. Tax lot number of well location tax lot 10
4. Attach map with location identified. See reverse of this form for approved maps.
5. Show well location within 1/4, 1/4 of section grid at left.

We hereby certify that we have read the back of this form, and that to the best of our knowledge the information provided herein is accurate and the well is being properly located from septic tanks, septic drain fields and other hazards. (See #2 on back)

for Staff Jennings, Inc.

Owner's signature or authorized agent

Bonded Water/Monitor Well Constructor

Same
Home phone

(206) 253-9030
Work phone

License No. 10286

Company NSCG

NOTE: This is not a water right application. The owner is responsible for obtaining a water right through the Water Resources Department, if required.

THIS COPY TO CUSTOMER

APPENDIX C

LICENSES AND RECEIPTS

UST SERVICE PROVIDER LICENSE

This License is Issued by The Oregon Department of Environmental Quality to:

De Minimis Inc.
34 NE 1st Ave., Suite 101
Portland, OR 97209

You are Licensed to Offer the Following Underground Storage Tank Services:

License Type	License Number	Issued	Expires
Service Provider	13383	April 16, 1993	May 07, 1995
Soil Matrix Cleanup Prov.	11123	December 04, 1993	December 04, 1995

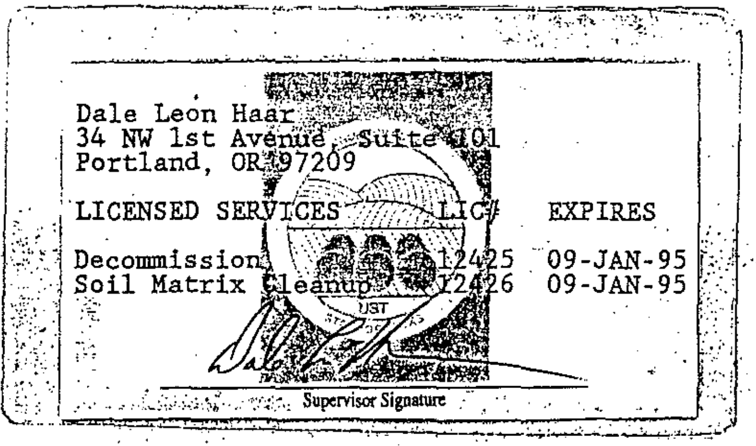
A Licensed Underground Storage Tank Supervisor Must be Present at a Site to Perform These Services

Issued: RE ID: 7630

Expires ADDR ID: 111881

Authorized:
Richard P. Reiter
UST Compliance Manager

A Copy of This License Shall Be Available for Inspection At All Sites Involving UST Work



Dale Leon Haar
34 NW 1st Avenue, Suite 101
Portland, OR 97209

LICENSED SERVICES	LIC#	EXPIRES
Decommission	12425	09-JAN-95
Soil Matrix Cleanup	12426	09-JAN-95

Supervisor Signature

Oregon

DEPARTMENT OF
ENVIRONMENTAL
QUALITY

NORTHWEST REGION

April 5, 1994

Jeff Jennings
Staff Jennings Marina
P.O. Box 82206
Portland, OR 97282-8206

Re: Staff Jennings Marina
File No. 26-88-078

Dear Mr. Jennings:

The Department has completed the review of DeMinimis Inc.'s March 31, 1994, site investigation at your marina located at 8240 SW Macadam Avenue, in Portland. This information indicates that soil and groundwater contamination remains at the site. We concur that additional cleanup activities are necessary in order to mitigate the environmental hazards at the site. The lateral extent of the dissolved hydrocarbon plume must be defined per Oregon Administrative Rules (OAR) 340-122-240(1) before the Department can approve the CAP. Strictly speaking an off-site investigation may be needed to determine the extent of the impact to the sediments and the potential discharge of contaminants to the water's of the Willamette River which would entail a site investigation under OAR 340-122-242.

Please submit an outline of the required site investigation and a time frame in which this work will take place. If this work will coincide with the removal of the existing tank system please let me know this too. Please submit this outline by June 6, 1994.

If I can be of assistance with this site's investigation please contact me at 229-5477.

Sincerely,

Rick Silverman

Rick Silverman
Environmental Specialist
Northwest Region

1859

cc Dale Haar
DeMinimis Inc. Environmental Management
34 NW First Avenue, Suite 101
Portland, OR 97209

EXHIBIT
14

2020 SW Fourth Avenue
Suite 400
Portland, OR 97201-4987
(503) 229-5263 Voice/TDD
DEQ-1

26-88-078

staff
JENNINGS
BOATING CENTERS
Right On The Water! Right On The Money!

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED
JUN 3 1994
NORTHWEST REGION

May 27, 1994

Rick Silverman
Department of Environmental Quality
2020 Southwest 4th Avenue, Suite 400
Portland, Oregon 97201-4987

Dear Rick:

In response to your letter dated April 5, 1994, the outline for the required site investigation that will take place is as follows. We are currently waiting two more quotes. We should receive these by June 10th, 1994. At that time we will determine who to use for remediation and upgrade. Our plan is to install two new tanks at a different location on the site. Once this is completed we will decommission and remediate the existing contamination. Because of the limited space on site and that this time of year is our busiest, we plan to start the work after October 15, 1994, when our facility will allow construction to take place and our marina is closed until February 1995.

Once we have chosen a bid I will make you a copy if you would like. We also still plan on using Diminimus's service as in the past.

If you have any questions, please call me at (503) 244-7505.

Sincerely,

Jeff Jennings

Jeff Jennings
President
Staff Jennings, Inc.

EXHIBIT
15

P.O. Box 82206, Portland, Oregon 97282 (503) 244-7505
2100 Cenntennial Blvd., Eugene, OR 97401 (503) 485-2555

UNDERGROUND STORAGE TANK DECOMMISSIONING

Staff Jennings, Inc.
Retail Facility and Marina
8240 SW Macadam Avenue
Portland, Oregon 97219

UST Cleanup List #26-88-0078

Project # 00317-0994

Prepared For:

Staff Jennings, Inc.
8240 SW Macadam Avenue
Portland, Oregon 97219

DEPARTMENT OF ENVIRONMENTAL QUALITY
RECEIVED

DEC 16 1994

NORTHWEST REGION

December 13, 1994

De Minimis Inc. Environmental Management
34 N.W. First Avenue • Suite 101 • Portland, Oregon • (503) 295-4074

EXHIBIT
116

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FIGURES and MAPS

APPENDICES

1.0 INTRODUCTION

At the request of Staff Jennings, Inc. (Client), De Minimis Inc. (DMI) Environmental Management provided project management services for the decommissioning and removal of two, out-of-service, gasoline underground storage tanks (USTs) from the Retail Facility and Marina located at 8240 SW Macadam Avenue, Portland, Oregon, 97219. The USTs were decommissioned by removal on October 10 and 11, 1994, after an upgraded UST system was installed by others at the subject facility in September 1994.

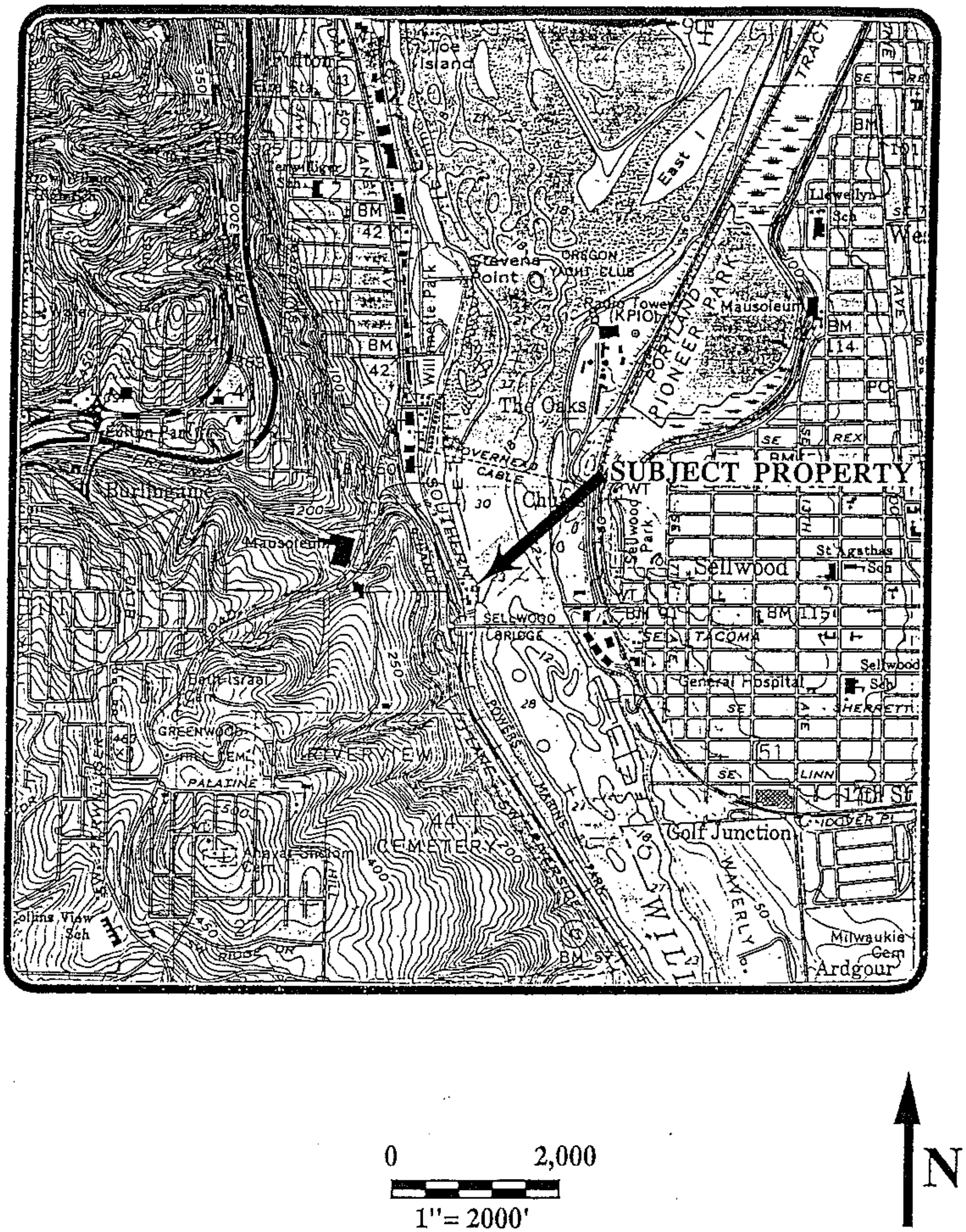
The project consisted of three tasks: 1) excavation, removal, and disposal of two gasoline USTs; 2) site characterization soil sampling and analyses for the presence of petroleum hydrocarbons; and 3) contaminated soil disposal. The activities, analytical results, and interpretations of this project are described in this report.

2.0 SITE DESCRIPTION AND BACKGROUND

2.1 Site Description

The subject property is located at 8240 SW Macadam Avenue in a commercial corridor approximately 3-1/2 miles south of downtown Portland, Oregon (See Figure 1-Site Location). The subject property is 2.36 acres in area. The geographic location of the subject property is Section 22, Township 1 South, Range 1 East of the Willamette Meridian, in the County of Multnomah and State of Oregon. The subject property has been owned by the Jennings family since it was purchased in August 1937.

The subject property is bordered to the north by undeveloped river front acreage located on the west bank of the Willamette River. The subject property is bordered to the east by the Willamette River, which flows to the north. The subject property is bordered to the south by an access road leading to a Multnomah County boat ramp (formerly a ferry crossing ramp) located beneath the Sellwood Bridge. The subject property is bordered on the west by a railroad track, an access road, and SW Macadam Avenue. Undeveloped, forested acreage is located to the west of SW Macadam Avenue.



Base Map from U.S. Geological Survey 7.5 Minute Lake Oswego Quadrangle

PROJECT NO. 00317-0994	**DE MINIMIS INC.**	**Site Location**	FIGURE
October 1994	ENVIRONMENTAL MANAGEMENT 34 N.W. FIRST AVENUE, SUITE 101 PORTLAND, OREGON 97209 503/295-4074	Underground Storage Tank (UST) Decommissioning Staff Jennings, Inc. 8240 SW Macadam Avenue Portland, Oregon 97219	1

The subject property occupies two levels on the west bank of the Willamette River at the base of a moderately steep slope. The majority of the site (the main level) is located on a terrace which has been excavated into the river bank approximately 20-30 feet above the Willamette River. The main building (housing the retail facility, administrative offices, and repair shop), the rigging shop, the boat storage building, the out-of-service USTs, the UST pump shed, and the upgraded UST system are located on the main level. The remainder of the main level is paved with asphalt or concrete. The crane dock, an elevated concrete platform supported by steel beams, is located on the northern portion of the main level and extends to the east over the bank of the Willamette River. The subject property slopes steeply from the main level down to the west bank of the Willamette River. Two floating docks are located below the main level on the river.

The subject facility retails gasoline for watercraft. The subject facility is registered with the Oregon Department of Environmental Quality (DEQ) as Staff Jennings, Inc., (DEQ Facility I.D. Number 3105). Two active, permitted USTs are registered for the subject facility:

UST #	DEQ UST I.D.	Capacity (gallons)	Contents
#1	EAHK	4,000	Gasoline
#2	EAHA	10,000	Gasoline

Oregon DEQ files reported that UST #1 was installed in 1971 and UST #2 was installed in 1981. Mr. Jeff Jennings, President, Staff Jennings, Inc., previously stated that the USTs contained a mixture of 50 percent regular leaded gasoline and 50 percent supreme unleaded gasoline. Mr. Jennings also stated that " years ago" diesel fuel was stored on-site in a UST and was pumped from the crane dock.

2.2 Site Background

The following information regarding the UST release was supplied or confirmed by Mr. Jennings:

- On October 18, 1988, the Staff Jennings marina manager observed a petroleum fuel slick on the Willamette River downgradient from the on-site USTs. The marina manager contacted SRH Associates, Inc., Portland, Oregon, to perform cleanup operations. SRH Associates deployed a floating boom on the Willamette River to contain the slick. Pads were used to absorb the floating product. Additionally, soil samples were collected in the spill area to confirm that the released material was gasoline from the subject facility. Staff Jennings temporarily discontinued use of the USTs. SRH Associates notified the Oregon DEQ (DEQ UST Cleanup #26-88-0078), the U.S. Coast Guard, and the Portland Fire Department of the release on October 19, 1988. The primary source of the released fuel was reportedly a cracked elbow in the UST piping located near the fuel turbine pump for the 10,000-gallon UST. The cracked elbow and other minor leaks in the product distribution lines were subsequently repaired.

• On February 16-17, 1989, Golder Associates, Inc. (GAI), conducted a preliminary soils investigation to determine the extent and quantity of contamination due to the release from the on-site UST (See GAI *Report of Findings Preliminary Field Investigation of Sellwood Marina, Portland, Oregon,* March 27, 1989). This investigation confirmed that petroleum hydrocarbon contamination (gasoline) existed adjacent to the USTs and extended downgradient to the edge of the Willamette River. Elevated contaminant levels for gasoline, benzene, toluene, ethylbenzene, xylene, and lead were reported for soil samples collected adjacent to and downgradient from the USTs. Maximum soil contaminant levels (contaminants reported in parts per million, ppm, or parts per billion, ppb) collected from the river bank were: 11,600 ppm total petroleum hydrocarbon (TPH); 9,200 ppm gasoline; 273,000 ppb benzene; 685,000 ppb toluene; 562,000 ppb ethylbenzene; 1,530,000 ppb xylene; and 16 ppm lead. Groundwater was encountered in the soil borings at depths ranging from 0.6 to 3.3 feet below ground surface (bgs).

• A soil and groundwater investigation was conducted by DMI on March 15, 1994 (See *Limited Subsurface Soil and Groundwater Investigation, Staff Jennings, Inc., Retail Facility and Marina*, March 31, 1994). Gasoline contamination (TPH-G) was detected in soils adjacent to and downgradient from the on-site USTs and ranged from "Not Detected" (presumed upgradient from the USTs) to 3,300 ppm TPH-G (located downgradient from the USTs).

Since gasoline contamination was detected in soil samples collected at a depth greater than or equal to the depth of the water table; three downgradient groundwater samples were analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX). The basic numeric groundwater cleanup levels for petroleum-contaminated UST sites for BTEX are: 1) benzene, 5 ppb; 2) toluene, 1,000 ppb; 3) ethylbenzene, 700 ppb; and 4) total xylenes, 10,000 ppb. Groundwater contaminant concentrations detected during March

1994 exceeded the basic numeric groundwater cleanup levels: benzene (16,100-27,000 ppb), toluene (46,100-60,100 ppb), ethylbenzene (5,700-27,900 ppb), and total xylenes (29,700-143,000 ppb).

The groundwater samples were also analyzed for ethylene dibromide (EDB or 1,2-dibromoethane), ethylene dichloride (EDC or 1,2-dichloroethane), and dissolved lead. The basic numeric groundwater cleanup levels for the following gasoline additives are: 1) ethylene dibromide (EDB), 1 ppb; 2) ethylene dichloride (EDC), 5 ppb; and 3) dissolved lead, 5 ppb. Due to the high concentrations of fuel hydrocarbons present in the groundwater samples which necessitated sample dilution; the detection limits for EDB and EDC were raised to 1.0-2.5 ppb. These raised detection limits for EDB equaled or exceeded the basic numeric groundwater cleanup level for EDB. EDB and EDC were not detected at or above the raised detection limits in any of the groundwater samples. Two groundwater samples had dissolved lead concentrations ranging from 6-23 ppb, in excess of the DEQ groundwater cleanup level of 5 ppb lead.

3.0 ON-SITE ACTIVITIES

3.1 Permits and Licenses

Since the USTs were registered with the Oregon DEQ, the Notice of Underground Storage Tank Permanent Decommissioning/Service Change was submitted to the DEQ on September 7, 1994, 30 days prior to the start of work. The Three Day Advance Notice Before Work Begins (#26-3D-94-180) was authorized by Mr. Greg Toran, DEQ Northwest Region, on October 10, 1994. A UST decommissioning permit was obtained from the City of Portland, Fire Prevention Division, on October 5, 1994 (See Appendix C - Permits, Receipts, and Licenses for Permit #T941246).

De Minimis Inc. (DMI) was the DEQ-licensed UST Service Provider (license #13383) and Soil Matrix Cleanup Provider (license #11123) (See Appendix C - Permits, Receipts, and Licenses). Mr. Dale L. Haar, DMI Environmental Scientist, was the on-site DEQ-licensed UST Decommissioning Supervisor (license #12425) and the UST Soil Matrix Cleanup Supervisor (license #12426).

Northwest Field Services, Inc. (NWFS), Portland, Oregon, provided UST cleaning, excavation, removal, and disposal services. Northwest Field Services, Inc. is also a DEQ-licensed UST Service Provider (license #10653) and Soil Matrix Cleanup Provider (license #1478).

3.2 UST Preparations and Site Safety

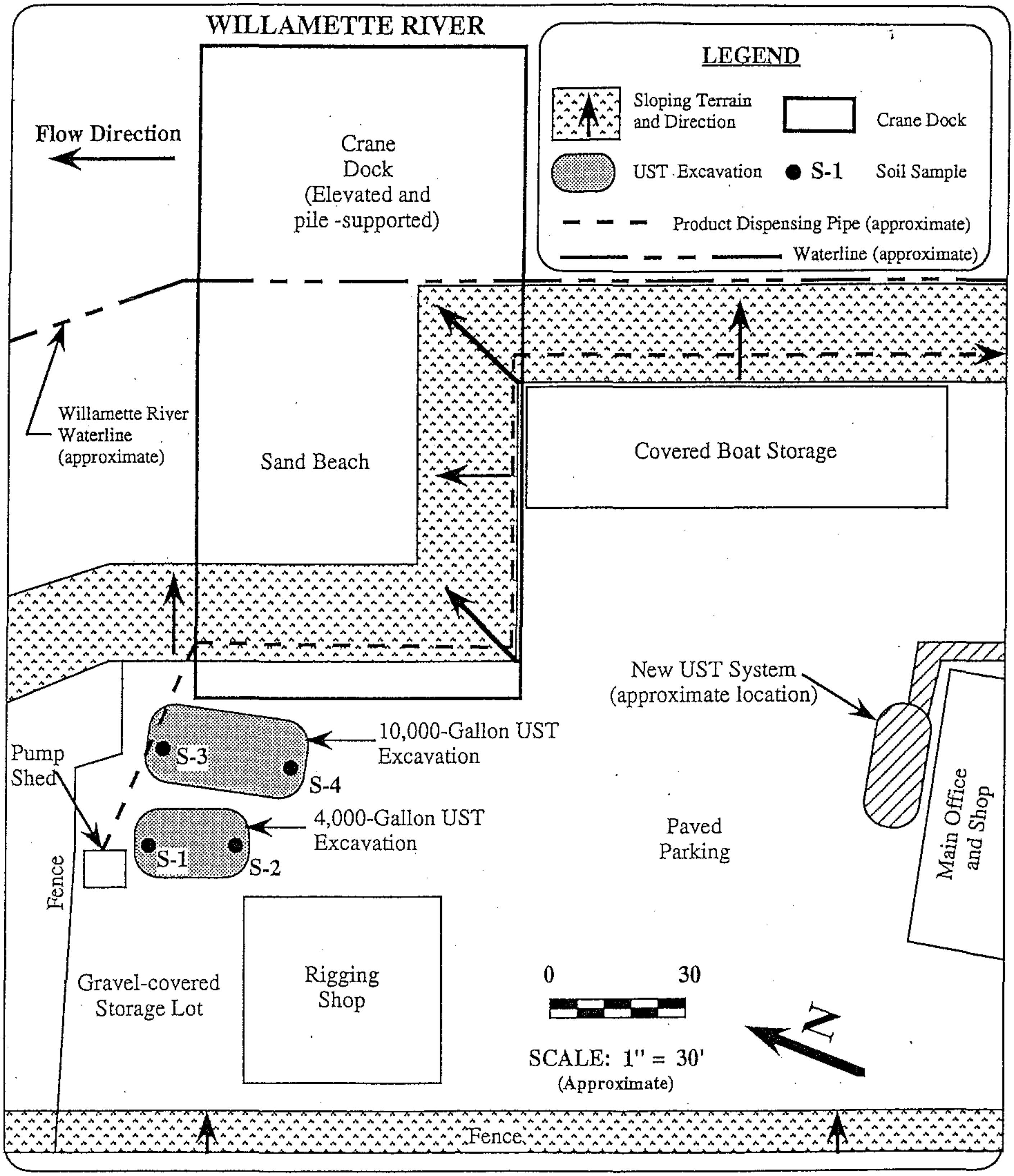
A utility locate was performed prior to excavation activities on or before October 6, 1994. No subsurface utilities were marked in the proposed areas of excavation.

Excavation activities commenced on October 10, 1994, to decommission by removal the two USTs not currently in use. A Site Health and Safety meeting was conducted prior to initiating all site work to review site-specific health and safety hazards associated with this project. Copies of the Site Health and Safety plan were distributed to all field personnel and to the Client.

The product levels were measured in the USTs. UST #1 (4,000 gallons) contained approximately one inch of water and 15-16 inches of gasoline. UST #2 (10,000 gallons) contained approximately 10 inches of gasoline and no water. Approximately 1,100 gallons of gasoline was vacuum-pumped by NWFS from the old USTs and transferred into the newly installed UST system, as per the instructions of the Client. Staff Jennings personnel confirmed electricity to the UST pump shed had been switched off.

3.3. Underground Storage Tank Decommissioning

The concrete slabs covering the USTs were removed. The tops of the USTs (approximately 2 to 3 feet below ground surface-bgs) were exposed by excavating the overlying soil with a trackhoe. Two excavations, one for each UST, were excavated. Product dispensing lines were drained into the USTs. When sufficient soil had been removed, the fill pipes and the product dispensing lines adjacent to the USTs and the pump shed were detached and removed. The UST vent lines were left intact to facilitate venting during the UST inerting process. Pipes and connections appeared to be secure and in generally good condition. Gray soils and strong gasoline odors (visual and olfactory evidence of contamination) were observed above and adjacent to each UST.



PROJECT NO. 00317-0994	DE MINIMIS INC. ENVIRONMENTAL MANAGEMENT 34 N.W. FIRST AVENUE, SUITE 101 PORTLAND, OREGON 97209 503/295-4074	Site Map Underground Storage Tank (UST) Decommissioning Staff Jennings, Inc. 8240 SW Macadam Avenue Portland, Oregon 97219	FIGURE 2
October 10, 1994			

Contaminated soil was immediately stockpiled on polyvinyl sheeting for disposal pending analytical results.

The USTs were triple-rinsed with water to remove product residue. Approximately 390 gallons of rinsate was initially vacuum-pumped from the USTs on October 10, 1994. Two uncapped pipes located adjacent to the former dispensing pump island on the east side of the building were also vacuum-pumped; however, NWFS personnel were unable to completely drain one of these lines. An additional 142 gallons of the remaining rinsate was vacuum-pumped from the USTs on October 11, 1994, after the USTs were removed from the excavation. The rinsate was delivered to Harbor Oil, Inc., Portland, Oregon, for recycling on October 10 and 13, 1994 (See Appendix C - Permits, Receipts, and Licenses for receipts #20614 and #20652, respectively).

The USTs were inerted with dry ice and gasoline vapors were vented through the vent lines. An ISC MX-251 combustible gas detector and oxygen meter was utilized to monitor the lower explosive limit (LEL) present in the tanks. After inerting, the vent lines were removed from the USTs and the openings were capped.

When the USTs were fully excavated around their ends and sides, NWFS removed each UST from the excavation. The USTs were set on the ground and chocked to prevent rolling. Upon removal, the exterior of the USTs were visually inspected for holes and evidence of leakage. The USTs were slightly to moderately corroded; however, no corrosion holes were observed. The remaining pipes leading from the USTs to the pump shed were removed. A warning label with former contents information was spray painted onto the USTs. One end of each UST was cut out thus rendering the USTs unusable. Approximately one-half inch of sludge was removed from UST #1 and approximately one-quarter inch of sludge was removed from UST #2. The sludge was stored in a sealed 55-gallon drum pending future disposal at a permitted hazardous waste disposal facility. Concrete plugs were installed in the product dispensing lines leading to the dispensing pumps.

Mr. Michael Bell, Special Hazards Inspector, City of Portland, Oregon, Fire Prevention Division, gave final site approval for the UST decommissioning on October 11, 1994. The USTs and piping were secured on a trailer and transported to Schnitzer Steel Products Co., Portland, Oregon, for recycling on October 11, 1994 (See Appendix C - Permits, Receipts, and Licenses for Bill of Sale #FE-355418).

Two product dispensing pumps were formerly connected to the out-of-service UST system. One dispensing pump was located on the marina and one pump was formerly located at the top of the slope above the marina and on the east side of the main building. These dispensing pumps had previously been disconnected from the out-of-service UST system and had been connected to the recently installed UST system by the contractor installing the new UST system. The product dispensing line from the out-of-service USTs led from the pump shed to the crane dock, was attached beneath the crane dock, and paralleled the east side of the boat storage building. On the east side of the boat storage building, the product dispensing line was partially buried on a steep slope and was inaccessible due to dense vegetation.

During the installation of the new UST system, the dispensing pump formerly located to the east of the main building had been moved adjacent to the new UST system (at the northeast corner of the main building) and the product dispensing line connected to this dispensing pump had been capped below the former dispensing pump island. The marina product dispensing pump had also been connected to the new UST system. Two uncapped pipes with a valve (former function undetermined as per the Client), a rubber hose, and additional, partially buried pipes leading to the marina were located adjacent to and downgradient from the former dispensing pump island. Soil staining was observed in this area in the disturbed soil.

3.4 Excavation Observations and Characterization

At the ground surface, the excavation for UST #1 was approximately 25 feet long by 15 feet wide and 9 feet deep and the excavation for UST #2 was approximately 35 feet long by 17 feet wide and 11 feet deep. The soils surrounding the USTs consisted of a damp to wet, dark gray, slightly clayey, fine sandy, silt. Boulders to 4 feet or more in diameter were encountered at the bottom of the UST excavations. Neither groundwater nor evidence of free product were encountered during UST decommissioning activities on October 10-11, 1994.

Heavily contaminated soils were observed in all four sidewalls and at the bottoms of both UST excavations. Approximately 100 cubic yards of contaminated soils were stockpiled on and beneath polyvinyl sheeting for disposal pending laboratory analyses.

3.5 Soil Sampling Procedures

After removal of the USTs and the associated piping, one soil sample was collected from beneath each end of each UST (four total samples) (See Figure 2 - Site Map for soil sampling locations).

Each discrete soil sample was collected from the bucket of the backhoe by DMI personnel wearing sterile, surgical-type, latex gloves. Three inches of exposed soil was rapidly removed from the center of the backhoe bucket and the sample container was inserted into the soil until the jar was full. The soil was rapidly transferred into the sample bottles with minimal headspace, thus minimizing the loss of volatile organic compounds. Sample containers were precleaned 8-ounce, Environmental Sampling Supply® glass jars with Teflon™-lined lids provided by Hughes Analytical Laboratory (HAL), Gresham, Oregon.

The sample containers were sealed, labeled, and stored on ice in a cooler until shipped to HAL, an off-site independent laboratory, via chain of custody for analyses. The chain of custody documentation and HAL laboratory reports are presented in Appendix B, Chain of Custody and Laboratory Results.

3.6 Soil Sampling Observations

Soil samples S-1 and S-2 were collected at 9 feet bgs, approximately one foot beneath the northern and southern ends of UST #1, respectively. Soil samples S-1 and S-2 were moist, dark gray, slightly clayey, fine sandy silts. Soil samples S-1 and S-2 appeared heavily contaminated and a strong gasoline odor was detected.

Soil samples S-3 and S-4 were collected at 11 feet bgs, approximately one foot beneath the northern and southern ends of UST #2, respectively. Soil sample S-3 was damp, dark gray, fine sandy, clayey silt. Soil sample S-4 was wet, dark gray, fine sandy silt. Heavy sheen was observed on the surface of soil sample S-4 as it was packed into the sample jar. Soil samples S-3 and S-4 appeared heavily contaminated and a strong gasoline odor was detected.

3.7 Initial Response Reporting

Since petroleum-contaminated soils were observed in the UST excavations, a release from the UST system was reported to Mr. Andree Pollock, UST Duty Officer, DEQ Northwest Region, on October 10, 1994, (pursuant to OAR 340-122-220) by Mr. Dale L. Haar, DMI Project Manager. However, this site had previously been assigned a UST Cleanup List number (#26-88-0078) for the original release in October 1988. Groundwater contamination had been previously reported from the original release and confirmed in subsequent investigations.

3.8 Contaminated Soil Disposal

On October 28, 1994, 133.96 tons (approximately 100 cubic yards) of petroleum-contaminated soils were removed from the subject site by NWFS and transferred to Oregon Hydrocarbon, Inc. (OHI), Portland, Oregon, for remediation and recycling by thermal desorption to approved regulatory standards (See Appendix C - Permits, Receipts, and Licenses for Manifests).

3.9 Excavation Backfilling

The excavation pit for UST #1 was backfilled to the original grade on November 8, 1994, with the clean, stockpiled, original soils and crushed rock (3/4-inch minus gravel). The fill materials were compacted in 12-inch lifts. Temporary fencing was erected around the excavation pit for UST #2 pending future site activities.

4.0 LABORATORY ANALYTICAL RESULTS

4.1 Analytical Methods

A total of four soil samples were collected from the subsurface UST excavations. Soil samples were collected from the excavations utilizing Oregon DEQ- and EPA-approved methods.

The soil samples were analyzed by Hughes Analytical Laboratory (HAL), Gresham, Oregon, for Total Petroleum Hydrocarbon-Hydrocarbon Identification utilizing the Oregon DEQ-approved method TPH-HCID. If petroleum hydrocarbons were detected in a soil sample, the sample was analyzed with the appropriate Oregon DEQ quantification method: Total Petroleum Hydrocarbon-Gasoline (TPH-G) for gasoline or TPH-418.1 Modified for diesel and other non-gasoline fraction hydrocarbons.

4.2 Soil Sample Analytical Results

Total petroleum hydrocarbons (TPH-HCID) in the gasoline to diesel carbon range were detected in soil samples S-1 and S-3. Contamination in the gasoline carbon range were detected in TPH-HCID analyses for soil samples S-2, S-4, and S-4 replicate. The results of the soil sample analyses are tabulated in Table 1 (See Appendix A - Laboratory Analytical Results and Chain of Custody for complete laboratory documentation).

Gasoline contamination was quantified utilizing TPH-G for the following soil samples: S-1 (278 ppm), S-1 replicate (263 ppm), S-2 (3,552 ppm), S-3 (42 ppm), S-3 replicate (44 ppm), and S-4 (2,900 ppm). Diesel and other non-gasoline fraction hydrocarbons were quantified utilizing TPH-418.1 Modified for the following soil samples: S-1 (3,750 ppm) and S-3 (93 ppm).

4.3 Quality Assurance Data

Four soil samples collected from the UST excavation were received by Hughes Analytical Laboratory (HAL), Gresham, Oregon, under a chain of custody. The samples were received in containers consistent with U.S. EPA protocol. Replicate samples and laboratory blanks were also analyzed by HAL.

Standard Quality Assurance/Quality Control (QA/QC) procedures were performed as stated in "EPA Test Methods for Evaluating Solid Waste (SW-846)", 3rd Edition and "Standard Methods for the Examination of Water and Wastewater", 17th Edition. The EPA laboratory protocols followed by HAL included sample holding times, laboratory method blanks, laboratory matrix spikes, replicate samples, and calibration standards. No significant variations from these protocols were reported that would invalidate the analytical data. Test methods may include minor modifications of detection limits or lists of parameters for the published methods. Solid samples are reported on a wet weight basis unless otherwise noted. Compounds not detected are listed under results as ND.

TABLE 1

SOIL SAMPLE ANALYTICAL RESULTS

Total Petroleum Hydrocarbon-Hydrocarbon Identification (TPH-HCID by GC/FID) and Quantification (TPH-G by GC/PID or TPH-418.1 Modified)

October 10, 1994

		QUANTIFICATION	
SOIL SAMPLE I.D.	TPH-HCID	TPH-G	TPH-418.1 M
S-1	C_{07}-C_{35}*	278	3,750
S-1 replicate	--	263	--
S-2	C_{07}-C_{16}**	3,552	--
S-3	C_{09}-C_{35}*	42	93
S-3 replicate	--	44	--
S-4	C_{07}-C_{16}**	2,900	--
S-4 replicate	C_{07}-C_{16}**	--	--
Lab Blanks	ND	ND	ND

Results reported in mg/kg (milligrams per kilogram) or ppm (parts per million).
ND = Not Detected at or above the test method detection limits.

TPH-HCID Detection Limits: Gasoline - 20 ppm
Diesel - 50 ppm
Heavy Oil - 100 ppm.
TPH-G Detection Limit: 10 ppm.
TPH-418.1 Modified Detection Limit: 25 ppm.

* Carbon range corresponds to gasoline and diesel.
** Carbon range corresponds to gasoline.

5.0 GEOLOGY AND HYDROGEOLOGY

Examination of published and unpublished geological and hydrogeological reports for the Macadam Avenue area have allowed us to characterize the geology and hydrology of the site.

The subject site is located on the west bank of the Willamette River adjacent to the Sellwood Bridge and approximately 3-1/2 miles south of downtown Portland, Oregon. ? The subject property is approximately 15-40 feet above Mean Sea Level (MSL). The subject property occupies two levels on the west bank of the Willamette River at the base of a moderately steep slope. The majority of the site (main level) is located on the upper terrace which has been excavated into the river bank approximately 20-30 feet above the Willamette River. The subject property slopes steeply from the main level down to the bank of the Willamette River. Surface drainage for the subject property is to the east into the adjacent Willamette River, which flows to the north.

The soil underneath the subject site is classified as Urban Land, 0 to 3 percent slopes, by the Soil Survey of Multnomah County, Oregon. This miscellaneous map unit is found throughout central Multnomah County and mainly occurs in Portland along the flood plains of the Willamette River. Areas of this map unit are used mainly for commercial purposes. The original soils were gravelly loam, silt loam, or silty clay loam with some sandy materials. The soils in areas of this unit have been graded, cut, filled, or otherwise severely altered due to construction that mapping the soil units was not practical. Approximately ninety-five percent or more of the soils are covered with concrete, pavement, buildings, and other structures.

Immediately underlying the site are the highly permeable sands and gravels of the Willamette River flood plain deposits (Quaternary Alluvium). The alluvium has been deposited by constant flooding of the river since about 10,000 years ago, at the end of the last Ice Age. Since that time, the position of the Willamette River has remained relatively constant. This alluvial unit is overlain in turn by a thin veneer of silts and sands derived from wind deposition and weathering of the river deposits.

Our experience from drilling projects in the area indicates that underlying the alluvial deposits at a depth of 20 feet or less are the dense basalt flows of the Columbia River

Basalt. These lava flows erupted approximately 15 to 20 million years ago. The Columbia River Basalts are visible in the local road cuts, and in the banks and channel of the Willamette River.

Examination of water well logs, City of Portland groundwater exploration reports, and U.S. Geological Survey groundwater information for the project area indicates the depth to the uppermost aquifer beneath the site is approximately 20 feet or less. Groundwater was encountered at approximately 10 feet bgs on the main terrace adjacent to UST #2 during the Limited Subsurface Soil and Groundwater Investigation conducted on March 15, 1994. On the bank of the Willamette River beneath the crane dock, groundwater was encountered at 2 to 4 feet bgs. This level coincides with the stage of the adjacent river and represents a layer of water perched on top of the underlying basalt flows. The level to groundwater can be expected to fluctuate on a seasonal basis in response to recharge from local rainfall runoff. The direction of movement of the uppermost groundwater aquifer is to the east toward the Willamette River.

6.0 SUMMARY AND CONCLUSIONS

- On October 10-11, 1994, one 10,000-gallon gasoline underground storage tank (UST) and one 4,000-gallon gasoline UST were decommissioned by removal from the Staff Jennings, Inc., Retail Facility and Marina. The USTs were out-of-service and were decommissioned due to the recent installation of a new UST system by others.

- Visual and olfactory evidence of contamination was observed in the UST excavations. Groundwater or free product were not encountered during the decommissioning activities on October 10-11, 1994. Since potential petroleum-contaminated soils were observed in the excavation, the release from the UST system was reported to the Oregon DEQ Northwest Region on October 10, 1994. However, this facility had previously been assigned a UST Cleanup List number (#26-88-0078) for the original release in October 1988. Groundwater contamination had been previously reported from the original release and confirmed in a subsequent investigation.

- Total petroleum hydrocarbons (TPH-HCID) in the gasoline to diesel carbon range were detected in soil samples collected from the UST excavations. Gasoline contamination was detected in soil samples collected beneath UST #1 (S-1, 278 ppm; S-1 replicate, 263 ppm; and S-2, 3,552 ppm) and in soil samples collected beneath UST #2 (S-3, 42 ppm; S-3 replicate, 44 ppm; and S-4, 2,900 ppm). Diesel contamination was also detected in soil samples S-1 (3,750 ppm) and S-3 (93 ppm).

- Gasoline and diesel contamination in excess of the least stringent Oregon DEQ Numeric Soil Cleanup Standards (Level 3 Cleanup) are present at the subject facility. The Level 3 Numeric Cleanup Standards requires the soils to be cleaned up to at least 130 ppm gasoline and 1,000 ppm diesel (as per OAR 340-122-335). Since groundwater contamination in excess of the Oregon DEQ Basic Numeric Groundwater Cleanup Levels had previously been confirmed at the subject property; the DEQ Numeric Soil Cleanup Standards would not be applicable for the subject property. The Level 3 Cleanup Standards are used only as references for the levels of contamination observed on the subject property. A Soil Matrix Score was not determined for the subject property and a Level 3 Cleanup Standard may not be the appropriate soil cleanup standard.

- Approximately 100 cubic yards of petroleum-contaminated soils were excavated adjacent to and beneath the USTs. The petroleum-contaminated soils were transferred to

Oregon Hydrocarbon, Inc. (OHI) for remediation and recycling by thermal desorption to approved regulatory standards.

- The excavation for UST #1 has been backfilled and temporary fencing has been erected around the excavation for UST #2 pending future site activities.

7.0 RECOMMENDATIONS

DMI presents the following recommendations for the subject site:

- Since soil and groundwater contamination exist beyond the confines of the UST excavations, additional investigation would be required to delineate the nature, magnitude, and extent of the soil and groundwater contamination, as per Oregon Administrative Rules (OAR) 340-122-240. The Groundwater Investigation and Cleanup would proceed under OAR 340-122-242 and would require the installation and monitoring of groundwater monitoring wells.

- Based on the results of the investigation, the owners, permittees, or responsible persons shall propose in a Corrective Action Plan (CAP), prepared pursuant to OAR 340-122-250, what actions, if any, are necessary to monitor and/or remediate soil and groundwater contamination found at the site, as per OAR 340-122-242 (3)(b). The CAP should provide for the adequate protection of public health, safety, welfare, and the environment as determined by the Oregon DEQ. Once the CAP is approved by the Oregon DEQ, the owners, permittees, or responsible persons shall implement the CAP, and monitor, evaluate, and report the results of implementing the plan in accordance with a schedule and in a format established by the Oregon DEQ.

- The owner, permittee, or responsible person shall retain a copy of this report until the time of first transfer of the property plus ten years, pursuant to OAR 340-122-360 (2).

The data presented in this report was collected, analyzed, and interpreted following the standards of care, skill, and diligence ordinarily provided by a professional in the performance of similar services as of the time the services were performed.

The observations, interpretations, and recommendations presented in this report are based on the assumption that the conditions do not vary from those found during the course of the investigation at the project site. If any variations are encountered during any further investigations for this site, De Minimis Inc. (DMI) Environmental Management should be notified so that supplemental interpretations can be made. The observations and interpretations of this report are intended only for the subject site and the sampling conditions described. The observations and interpretations of this report must not be extended to adjacent areas.

The findings of this report are valid for the dates and under the conditions of the sampling, observations, and testing. However, changes in the conditions of the subject property, neighboring properties, or changes in applicable standards can occur with broadening of knowledge. Accordingly, the observations and findings presented in this report may be invalidated by changes outside of our control.

DMI does not offer any legal opinion, representation, or interpretation of environmental laws, rules, regulations, or policies of federal, state, or local governmental agencies.

If you have any questions or require further clarification regarding the information in this report, please feel free to contact DMI at your convenience. Thank you for allowing DMI to be of service and to present this information.

Respectfully submitted,

Dale L. Haar
Project Manager
Environmental Scientist

Reviewed by: Rick I. Johnson
Principal

8.0 GLOSSARY OF ABBREVIATIONS

bgs	below ground surface
CAP	Corrective Action Plan
DEQ	Oregon Department of Environmental Quality
DMI	De Minimis, Inc., Environmental Management
EPA	U.S. Environmental Protection Agency
GC/FID	gas chromatograph/flame ionization detector
HAL	Hughes Analytical Laboratory
LEL	lower explosive limit
LUST	leaking underground storage tank
mg/kg	milligrams/kilograms
NWFS	Northwest Field Services, Inc.
OAR	Oregon Administrative Rules
OHI	Oregon Hydrocarbon, Inc.
ppb	parts per billion
ppm	parts per million
TPH-G	Total Petroleum Hydrocarbon-Gasoline
TPH-HCID	Total Petroleum Hydrocarbon-Hydrocarbon Identification
TPH-418.1 M	Total Petroleum Hydrocarbon-418.1 Modified
UST	underground storage tank

9.0 REFERENCES

Staff Jennings, Inc.
Jeff Jennings, President

Oregon Department of Environmental Quality, Northwest Region
Andree Pollock, UST Duty Officer
Greg Toran, UST Duty Officer
Eldean Williams, Office Specialist, UST Compliance

Hughes Analytical Laboratory
Laboratory Analytical Results

Bureau of Fire, City of Portland, Oregon
Michael Bell, Special Hazards Inspector, Fire Prevention Division

Soil Survey of Multnomah County, Oregon; U.S. Department of Agriculture, Soil Conservation Service; August 1983; 225 p.

Maps utilized:
USGS topographic - Lake Oswego, Oregon 7.5 minute quadrangle
Soil Survey of Multnomah County, Oregon

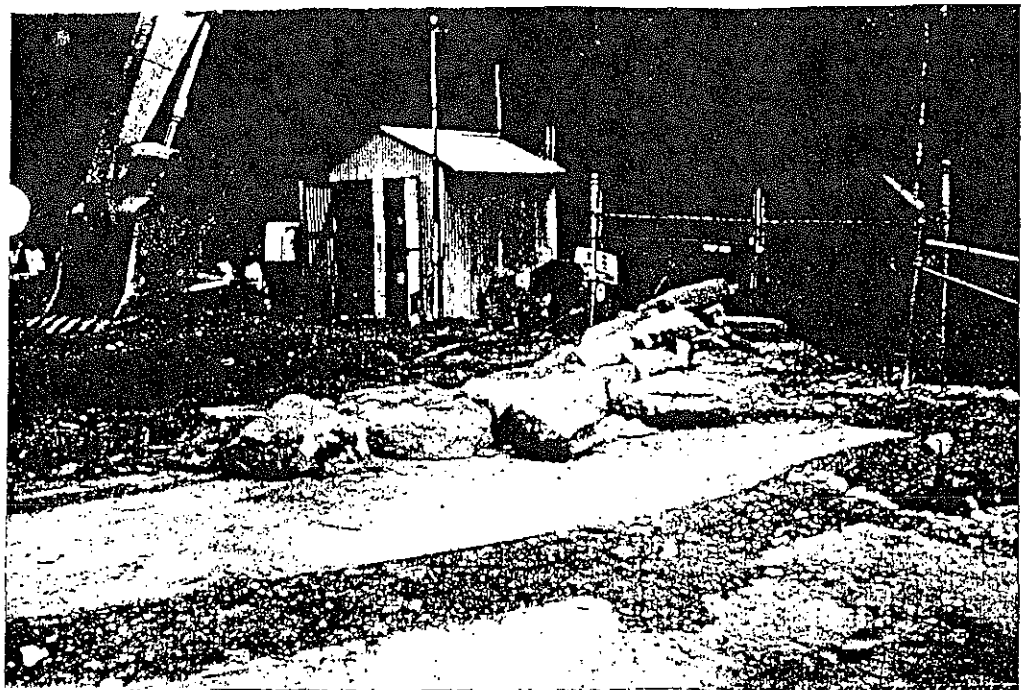
Limited Subsurface Soil and Groundwater Investigation, Staff Jennings, Inc., Retail Facility and Marina, De Minimis Inc. (DMI) Environmental Management, March 31, 1994.

Report of Findings Preliminary Field Investigation of Sellwood Marina, Portland, Oregon, Golder Associates, Inc. (GAI), March 27, 1989.

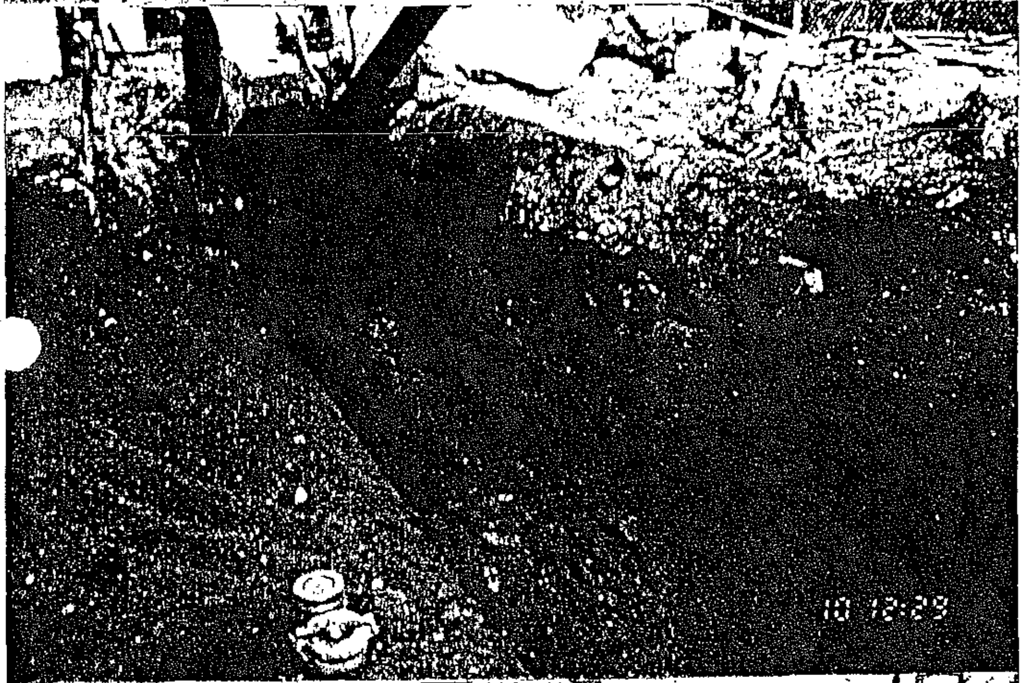
Environmental Cleanup Manual, Oregon Department of Environmental Quality, June 1994.

APPENDIX A

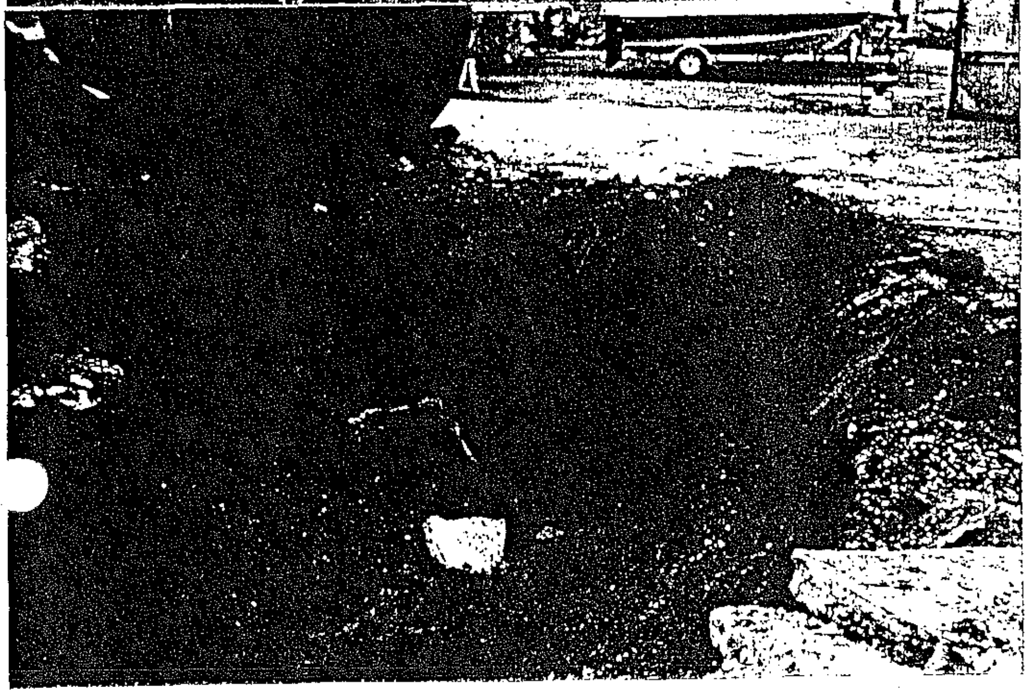
SITE PHOTOGRAPHS



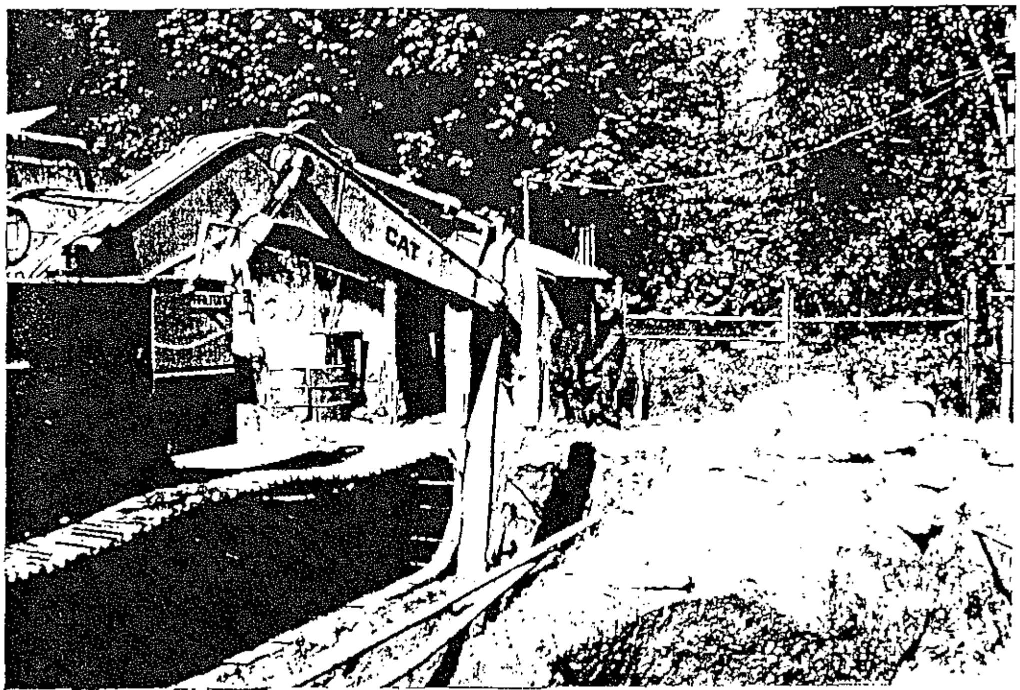
Subject site, view to the northwest. UST #1 in background, UST #2 in foreground, and pump shed.



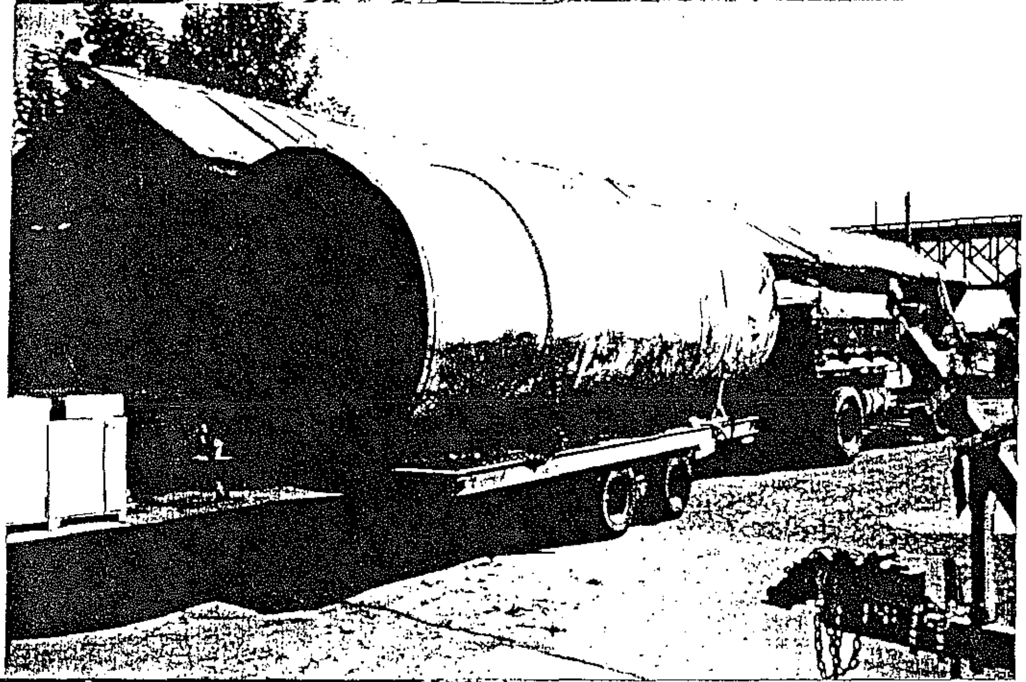
Soil contamination observed in UST #1 excavation, view to the north.



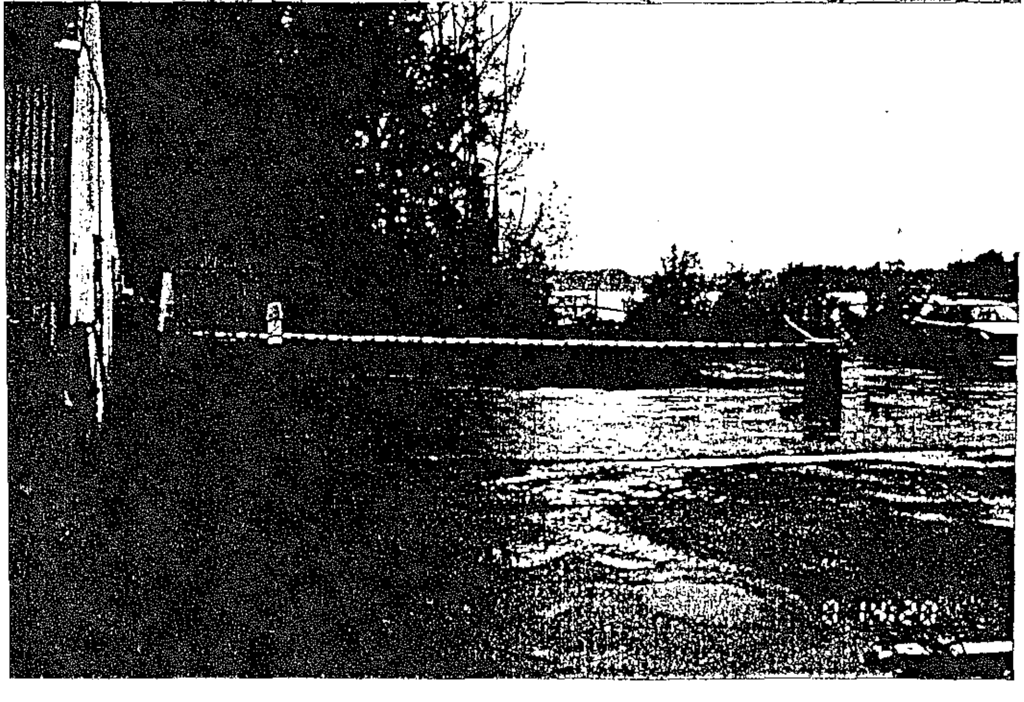
Soil contamination observed in UST #2 excavation, view to the south.



Disconnecting UST dispensing piping at the pump shed.



Transporting USTs to the recycling facility. USTs have been labeled and rendered unusable.



UST #1 excavation (to left) was backfilled. UST #2 excavation is awaiting backfill pending future site activities.

APPENDIX B

LABORATORY ANALYTICAL RESULTS
AND
CHAIN OF CUSTODY

HUGHES
ANALYTICAL LABORATORY

October 26, 1994

Mr. Dale Haar
DeMinimis Inc.
34 NW 1st Ave., Suite 101
Portland,OR 97209

Dear Mr. Haar,

Enclosed is the lab report for your samples which were received on October 10, 1994. The Hughes Report # is 94-0479a and the Client Project is SJM.

Six soil samples were received under a chain of custody. The samples were received in containers consistent with U.S. EPA (United States Environmental Protection Agency) protocol.

Standard Quality Assurance/Quality Control (QA/QC) procedures were performed as stated in "EPA Test Methods for Evaluating Solid Waste (SW-846)", 3rd Edition and "Standard Methods for the Examination of Water and Wastewater", 17th Edition. The EPA laboratory protocols followed include sample holding times, laboratory method blanks, laboratory matrix spikes, replicate samples and calibration standards. There were no significant variations from these protocols that would invalidate the analytical data.

Test methods may include minor modifications of detection limits or lists of parameters for the published methods. Solid samples are reported on a wet weight basis unless otherwise noted.

Compounds not detected are listed under results as ND.

Sincerely,

Kim Hughes

Kim Hughes
Lab Director

21920 N.E. Glisan ■ Gresham, Oregon 97030 ■ (503) 669-3745 ■ FAX (503) 669-4165

HUGHES REPORT #: 94-0479a CLIENT JOB: SJM
CLIENT: DeMinimis Inc.
DATE: October 26, 1994
ITEMS: Four Soil Samples

METHOD: TPH-HCID by GC/FID
Per Oregon DEQ

Extraction: 10/10/94
Analysis: 10/10/94

SAMPLE I.D.	RESULT	SURROGATE RECOVERY, %
S-1	C_{07} - C_{35}*	90
S-2	C_{07} - C_{16}**	96
Lab Blank	ND	97

Detection Limits:
Gasoline - 20 mg/kg
Diesel - 50 mg/kg
Heavy Oil - 100 mg/kg

*Carbon range corresponds to gas and diesel.
**Carbon range corresponds to gas.

ND = Not Detected

HUGHES REPORT #: 94-0479a
CLIENT JOB: SJM
CLIENT: DeMinimis Inc.
DATE: October 26, 1994
ITEMS: Two Soil Samples

METHOD: TPH-418.1 Modified
per Oregon DEQ
Results in mg/Kg (ppm)

Extraction: 10/12/94
Analysis: 10/12/94

SAMPLE I.D.	RESULT
S-1	3750
Lab Blank	ND
Detection Limit	25

METHOD: TPH-G by GC/PID
per Oregon DEQ
Results in mg/Kg (ppm)

Extraction: 10/10/94
Analysis: 10/10/94

SAMPLE I.D.	RESULT	SURROGATE RECOVERY, %
S-1	278	93
S-1 Replicate	263	100
S-2	3552	105
Lab Blank	ND	98
Detection Limit	10	

ND = Not Detected

HUGHES
ANALYTICAL LABORATORY

21920 N.E. Glisan
Gresham, Oregon 97030
503/669-3745
FAX: 503/669-4165

Chain of Custody Record

Lab Project Number 94-0479 Date 10-10-94 Page 1 of 1

Project Information

Project Number: 00317-0994
Project Name: SJM
Company: De Minimis Inc.
Project Manager: Dale L. Haar
Collected by: Dale L. Haar (DLH)
P.O. Number:

Reporting Request

☒ PHONE: 295-4074
☒ FAX: 295-0112

TURNAROUND TIME
☒ Standard ☐ RUSH
☐ Other

☒ Rec'd at 4° C
☒ EPA Jars/Vials
☒ OR Methods
☐ WA Methods

Special Instructions

Please call ASAP when preliminaries get back.

Sample S-1 and S-2 are heavily contamin with gasoline and will both need to be quantified ASAP.

LAB ID	SAMPLE ID	DATE	TIME	MATRIX SOIL	MATRIX WATER GRAB	MATRIX WATER COMP	MATRIX OTHER	NO. OF CONTAINERS	TPH-HCID	TPH-Gas	TPH-Diesel	TPH-418.1 m	EPA418.1	Oil & Grease	BTEX/8020	Volatiles/8010	Volatiles/8240	PAH/8310	Semivolatiles/8270	PCB	Pesticides/8080	Metals (Specify)	TCLP Metals ⑧				REMARKS/SAMPLE CONDITION
01	SP1-A	10-10-94	1226	1				1	X	*	b.	X			*	add				*	*		*	phone		by	Dale Haar
02	SP1-B	↓	1227	1				1	X						*		*				10/12/94			Bo			Archive.
03	SP2-A		1257	1				1	X	*	b	*															
04	SP2-B		1259	1				1	X																		Archive.
05	S-1		1309	1				1	X	X		X					added					by	phone			by	Dale Haar
06	S-2		1317	1				1	X	X																	B. 10/11
																											* Added per Dale 14Oct94
																											SP1-A ⇒ 8080 PCB/
																											SP1-A ⇒ TCLP 8 metals
																											SP1-B ⇒ 8240 standard TAT
																											Dale added Pest to
																											Sample SP1-A 17Oct94

RELINQUISHED BY (Sign / Print)	DATE/TIME	RECEIVED BY (Sign / Print)	DATE/TIME
/ Dale L. Haar	10-10-94 / 1323	/ B. Bowman	10/10/94 13:23
/		/	
/		/	

PLEASE NOTE:
SAMPLES WILL BE
DISPOSED OF
AFTER 30 DAYS.

SHIPPED VIA: ☐ UPS ☐ Bus ☐ FedX ☐ Courier

HUGHES
ANALYTICAL LABORATORY

October 21, 1994

Mr. Dale Haar
DeMinimis Inc.
34 NW 1st Ave., Suite 101
Portland,OR 97209

Dear Mr. Haar,

Enclosed is the lab report for your samples which were received on October 11, 1994. The Hughes Report # is 94-0487 and the Client Project is SJM.

Two soil samples were received under a chain of custody. The samples were received in containers consistent with U.S. EPA (United States Environmental Protection Agency) protocol.

Standard Quality Assurance/Quality Control (QA/QC) procedures were performed as stated in "EPA Test Methods for Evaluating Solid Waste (SW-846)", 3rd Edition and "Standard Methods for the Examination of Water and Wastewater", 17th Edition. The EPA laboratory protocols followed include sample holding times, laboratory method blanks, laboratory matrix spikes, replicate samples and calibration standards. There were no significant variations from these protocols that would invalidate the analytical data.

Test methods may include minor modifications of detection limits or lists of parameters for the published methods. Solid samples are reported on a wet weight basis unless otherwise noted.

Compounds not detected are listed under results as ND.

Sincerely,

Kim Hughes

Kim Hughes
Lab Director

21920 N.E. Glisan ■ Gresham, Oregon 97030 ■ (503) 669-3745 ■ FAX (503) 669-4165

HUGHES REPORT #: 94-0487 CLIENT JOB: SJM
CLIENT: DeMinimis Inc.
DATE: October 21, 1994
ITEMS: Two Soil Samples

METHOD: TPH-G by GC/PID
per Oregon DEQ
Results in mg/Kg (ppm)

Extraction: 10/12/94
Analysis: 10/13/94

SAMPLE I.D.	RESULT	SURROGATE RECOVERY, %
S-3	42	79
S-3 (replicate)	44	71
S-4	2900	85
Lab Blank	ND	92
Detection Limit	10	

METHOD: TPH-HCID by GC/FID
Per Oregon DEQ

Extraction: 10/13/94
Analysis: 10/13/94

SAMPLE I.D.	RESULT	SURROGATE RECOVERY, %
S-3	C_{09}-C_{35}*	100
S-4	C_{07}-C_{16}**	98
S-4 Replicate	C_{07}-C_{16}**	101
Lab Blank	ND	98

*Carbon range corresponds to gasoline and diesel.

**Carbon range corresponds to gasoline.

ND = Not Detected

HUGHES REPORT #: 94-0487 CLIENT JOB: SJM
CLIENT: DeMinimis Inc.
DATE: October 21, 1994
ITEMS: One Soil Sample

METHOD: TPH-418.1 Modified
per Oregon DEQ
Results in mg/Kg (ppm)

Extraction: 10/14/94
Analysis: 10/14/94

SAMPLE I.D.	RESULT
S-3	93
Lab Blank	ND
Detection Limit	25

ND = Not Detected

HUGHES ANALYTICAL LABORATORY

21920 N.E. Glisan
Gresham, Oregon 97030
503/669-3745
FAX: 503/669-4165

Chain of Custody Record

Lab Project Number 94-0487 Date 10-11-94 Page 1 of 1

Project Information

Project Number: 00317-0994
Project Name: SJM
Company: De Minimis Inc. (DMI)
Project Manager: Dale L. Haar
Collected by: Dale L. Haar (DLH)
P.O. Number:

Reporting Request

☒ PHONE: 295-4074
☒ FAX: 295-0112

TURNAROUND TIME

☒ Standard ☐ RUSH
☐ Other

☒ Rec'd at 4° C
☒ EPA Jars/Vials
☒ OR Methods
☐ WA Methods

Special Instructions

Please call as soon as preliminaries are back

Samples S-3 and S-4 are heavily contaminated with gasoline and will need to be quantified ASAP. Thanks!

				MATRIX					ANALYSIS REQUEST																	
					WATER																					
LAB ID	SAMPLE ID	DATE	TIME	SOIL	GRAB	COMP	OTHER	NO. OF CONTAINERS	TPH-HCID	TPH-Gas	TPH-Diesel	TPH-418.1 m	EPA418.1	Oil & Grease	BTEX/8020	Volatiles/8010	Volatiles/8240	PAH/8310	Semivolatiles/8270	PCB	Pesticides/8080	Metals (Specify)	TCLP Metals			REMARKS/SAMPLE CONDITION
01	S-3	10-10-94	1538	✓				1	X	X		X														by phone by Dale Haar
02	S-4	10-10-94	1546	✓				1	X	X																10/13/94 RO

RELINQUISHED BY (Sign / Print)	DATE/TIME	RECEIVED BY (Sign / Print)	DATE/TIME
Dale L. Haar / Dale L. Haar	10/11/94/1223	Kim Hughes / Kim Hughes	10/11/94 1223
/		/	
/		/	

PLEASE NOTE:
SAMPLES WILL BE
DISPOSED OF
AFTER 30 DAYS.

SHIPPED VIA: ☐ UPS ☐ Bus ☐ FedX ☐ Courier

APPENDIX C

PERMITS, RECEIPTS, AND LICENSES

NWR

Oregon Department of Environmental Quality

NOTICE OF UNDERGROUND STORAGE TANK PERMANENT DECOMMISSIONING/SERVICE CHANGE

FACILITY (Location of Tanks)	TANK OWNER
Name: Staff Jennings, Inc.	Name: Staff Jennings, Inc.
Address: 8240 S.W. Macadam Ave Portland OR 97219	Address: P.O. Box 82206 Portland OR 97282-0206
Phone: 244-7505	Phone: 244-7505

DEQ Facility I.D. Number: 3105

Work To Be Performed By: De Minimis Inc (Owner or Licensed Service Provider) License #: 13383

Phone: 295-4074 Mobile Phone: 970-0823

FORM MUST BE SUBMITTED BY UST OWNER OR OPERATOR 30 DAYS BEFORE START OF WORK

YOU MUST CONTACT YOUR LOCAL DEQ REGIONAL OFFICE 3-DAYS BEFORE STARTING ANY DECOMMISSIONING WORK. (Phone numbers are listed on reverse)

Will tank removal or potential cleanup affect adjacent property or Right-of-Way property? Yes ____ No ✓

Date decommissioning is scheduled to begin: 10-6-94

Tank #	DEQ UST Permit	Tank Size in (Gallons)	Product: Gasoline, Diesel, Used Oil, Other?		Closure or Service Change?			Tank to be Replaced?	
			Present	New	Tank Removal	Closure∞ Inplace	New ∞ Product	Yes*	No
1	EAHK	4,000	Gasoline		✓			✓	
2	EAHA	10,000	Gasoline		✓			✓	

* If decommissioned tank(s) are to be replaced by new underground storage tanks you must submit a new permit application containing information on the new tanks 30 days before placing them in service.

∞ Submit a soil sampling plan to the DEQ regional office and receive plan approval prior to starting work if 1) tank is to be decommissioned in-place, 2) tank contents are changed to a non-regulated substance, or 3) tank contains a regulated substance other than petroleum.

Signature: Jeff Jennings (Owner or Operator) Date: 9/7/94

RECEIVED
SEP 7 199[illegible]
Waste Management & Cleanup Division
Department of Environmental Quality

City of Portland
FIRE PREVENTION DIVISION
55 S.W. Ash Street
Portland, OR 97204 Phone: 823-3712

PERMIT NUMBER: T941246
FEE AMOUNT: $157.80
CODE: 19D(2)

Subject to the compliance with the ordinances of the City of Portland, permission is hereby granted for the installation of:

___ NEW INSTALLATION	___ ADDITION	___ ALTERATION	___ REPAIR	___ ABANDON	_x_ REMOVE
_x_ LIQUIDS/TANKS	___ L.P.G.	___ COMPRESSED GASES	___ PAINT SPRAY BOOTHS	___ CRYOGENS	___ OTHER

Located at: 8240 SW MACADAM AV - STAFF JENNINGS

Contractor: NW FIELD SERVICES

Permit Issued: 10/05/94 By: MIKE BELL Fire Marshal's Office

INSPECTION RECORD:	DATE	INSPECTOR	OTHER
APPROVE TANK/CYLINDER LOCATION			
APPROVE PIPING AND VALVES			
PRESSURE TEST WITNESSED			
OK TO COVER			

FINAL APPROVAL

INSPECTOR:
DATE: 10-11-94

NOTE: Keep card conspicuously posted on premises until job is completed and final inspection made. Request for final inspection must be made within 14 days after completion of work. Permit valid for 180 days only

Received of: NW FIELD SERVICES The sum of: ONE HUNDRED FIFTY SEVEN DOLLARS & 80/100----------

Date: 10/05/94 By: Norma Scott Paid Amount: $ 157.80 ___ Cash _X_ Check 12250

HarborOil,Inc.

№ 20614

INDUSTRIAL FUEL OILS
DIESEL

2416 N. MARINE DR., SUITE 200
(503) 285-4648 PORTLAND, OR 97217

DUST OIL ASPHALTS
DISTRIBUTOR - SERVICE

CONSIGNEE Harbor Oil
DATE 10/10/94
DESTINATION Portland, Or.
CARRIER NW FS
SHIPPER Northwest Field Services
PURCHASE NO.

	SHIPPING NAME	CLASSIFICATION	I.D. NO.	PLACARD NO.
CONTENTS	Non Hazardous	Liquid	NO	Placards

	PRODUCT	GALS LOADED		Office Use Only
TRK NO. 6	Gassy		EMERGENCY CONTACT 1-800-473-2042	UNIT PRICE
TRL NO. ~~0~~	H2O		NET GALS / BBLS / TONS	PRODUCT / SUB TOTAL
API	TOTALS	390		

	WEIGHT	LOADING	UNLOADING	
TEMP	GROSS	TIME DUE	TIME DUE	FREIGHT / SUB TOTAL
CORR FACTOR	TARE	TIME START	TIME START	TAX / SUB TOTAL
WT GAL	NET	TIME FINISH	TIME FINISH	HOURS / SUB TOTAL

REMARKS

EPA# ORD 071633585

TOTAL

DRIVER 7277 7256
REC'D BY

WHITE: Customer CANARY: Office PINK: Billing GOLDENROD: Yard

HarborOil, Inc.

№ 20652

INDUSTRIAL FUEL OILS
DIESEL

2416 N. MARINE DR., SUITE 200
(503) 285-4648 PORTLAND, OR 97217

DUST OIL ASPHALTS
DISTRIBUTOR - SERVICE

CONSIGNEE Harbor Oil DATE 10/13/94

DESTINATION Portland, Or CARRIER NWFS

SHIPPER Northwest Field Services PURCHASE NO. JOB 7277

	SHIPPING NAME	CLASSIFICATION	I.D. NO.	PLACARD NO.
CONTENTS	Non Hazardous	Liquid	NO	Placards

	PRODUCT	GALS LOADED	
TRK NO. 22	Gassy		EMERGENCY CONTACT 1-800-473-2042
TRL NO. 0	H2O		

NET GALS	BBLS	TONS

TOTALS 142

API

TEMP

CORR FACTOR

WT GAL

WEIGHT	LOADING	UNLOADING
GROSS	TIME DUE	TIME DUE
TARE	TIME START	TIME START
NET	TIME FINISH	TIME FINISH

Office Use Only

UNIT PRICE

PRODUCT	SUB TOTAL
FREIGHT	SUB TOTAL
TAX	SUB TOTAL
HOURS	SUB TOTAL
TOTAL	

REMARKS

EPA# ORD 071003985

DRIVER REC'D BY

WHITE: Customer CANARY: Office PINK: Billing GOLDENROD: Yard

\# 7277

N.W. Field Services

SCHNITZER STEEL PRODUCTS CO.
INTERNATIONAL TERMINAL
12005 N. BURGARD. PORTLAND. OR 97203
(503) 286-5771

BILL OF SALE NO.
FE- 355418

CONTRACT NUMBER

VENDOR NUMBER

COMMODITY NUMBER 103

COMM. DESC. Tanks

G	N	30620	G lb 03:11 PM 10/11/94	◀ G
T	A	17760	G lb 03:38 PM 10/11/94	◀ T
N		12860		◀ N

PRICE 75	EXTENDED 482.25	WEIGHER
CARRIER	TRACTOR NO.	TIME

I REPRESENT AND WARRANT THAT THIS MATERIAL DOES NOT CONTAIN A HAZARDOUS SUBSTANCE AS DEFINED BY FEDERAL OR STATE LAW, AND I AGREE TO INDEMNIFY SCHNITZER STEEL PROD. CO. AGAINST ALL CLAIMS.

FURTHER, IF YOU SELL US CAR BODIES, REFRIGERATORS, AIR CONDITIONERS OR OTHER MANUFACTURED ITEMS THAT CONTAIN CFC'S OR FREONS, YOU CERTIFY THAT THE CFC'S OR FREONS HAVE BEEN REMOVED IN ACCORDANCE WITH THE CLEAN AIR ACT, AND, THAT "SEALED UNITS" AND COMPRESSORS HAVE BEEN EMPTIED OF ALL OIL OR OIL PRODUCTS.

I hereby state that I am the lawful owner of the material described hereon, that I have a right to sell same and that for payment received in full, hereby acknowledged, I sell and convey title of same to SCHNITZER STEEL PRODUCTS CO.

X Brad [illegible]

S1000 (Rev 10/92)

CUSTOMER

CUSTOMER REPORT OF Gasoline

Customer Name: : DEMINIMIS/JENNINGS

Reporting FROM : 10-28-94 00:00 TO : 10-31-94 23:59

DATE : 10-31-94
TIME : 12:35:04

Date In	Manifest No.:	Transporter:	Driver's Name:	Gross lb	Tare lb	Net lb	Net Tons :
10-28-94	07-00950	CELORIE	RANDY AREGGER	63340	23980	39360	19.68
10-28-94	07-00950	CELORIE	DOUG MEIER	57540	24220	33320	16.66
10-28-94	07-00950	CELORIE	ROGER MOORE	57060	24140	32920	16.46
10-28-94	07-00950	CELORIE	RANDY AREGGER	55380	23800	31580	15.79
10-28-94	07-00950	CELORIE	DOUG MEIER	54020	24240	29780	14.89
10-28-94	07-00950	CELORIE	ROGER MOORE	58180	24040	34140	17.07
10-28-94	07-00950	CELORIE	RANDY AREGGER	57860	23760	34100	17.05
10-28-94	07-00950	CELORIE	DOUG MEIER	56940	24220	32720	16.36
TOTALS :				460320	192400	267920	133.96

Oregon Department of Environmental Quality

UNDERGROUND STORAGE TANK DECOMMISSIONING/SERVICE CHANGE REPORT

DEQ FACILITY NUMBER: 3105 DATE: 10-10-94

FACILITY NAME: Staff Jennings, Inc

FACILITY ADDRESS: 8240 S.W. Macadam Avenue
Portland OR 97219

PHONE: 244-7505

The following information MUST be submitted by the underground storage tank owner, operator or licensed DEQ Supervisor within 30 days following completion of the tank decommissioning or changing tank contents to a non-regulated substance. (OAR 340-150-001 though -150)

The attached supplemental checklist should be prepared by the person performing the decommissioning or service change. The checklist should be provided to DEQ and the tank owner to demonstrate that all required practices were followed.

Ordinarily the checklist is filled out by the DEQ licensed Service Provider or Supervisor. Owners who wish to personally decommission a tank or change service must follow all DEQ and other applicable standards. The owner should contact the DEQ Regional Office prior to starting the work to receive current copies of underground storage tank regulations.

A. DATES:

Decommissioning/Service Change Notice - Date Submitted: 9-7-94 (30 days before work starts)
Work Start Telephone Notice - Date Submitted: 10-4-94 (3 working days before work starts)
DEQ Person Notified: Greg Toran #26-3D-94-180
Date Work Started: 10-10-94
Date Work Completed: On-going.

Note: Provide the following information if any soil or water contamination is found during the decommissioning or service change. Contamination must be reported by the UST owner or operator within 24 hours. The licensed service provider must report contamination within 72 hours after discovery unless previously reported.

Date Contamination Reported: 10-10-94 By: Dale L. Haar
DEQ Person Notified: Andree. Pollock.
Backfill Telephone Notice - Date Called: N/A. (before backfilling) Not required as per Andree. Pollak since Groundwater is impacte
DEQ Person Notified: N/A.

B. PERMITS:

Note: DEQ permits or an addendum to the UST permit(s) may be needed where soil or water cleanup is required.

DEQ Water Discharge Permit #: N/A.. Date: N/A.
Disposed to (Location): N/A.
DEQ Solid Waste Disposal Permit #: N/A. Date: N/A.

B. PERMITS (Continued)

UST Soil Treatment Permit Addendum - Type: N/A. Date: N/A.

Soil Disposal or Treatment Location: N/A.

C. TANK INFORMATION:

Tank #	DEQ UST Permit	Tank Size in (Gallons)	Product: Gasoline, Diesel, Used Oil, Other?		Closure or Service Change?			Tank to be Replaced?	
			Present	New	Tank Removal	Closure∞ Inplace	Other∞ Use	Yes*	No
1	EAHX	4,000	Gasoline		✓			✓	
2	EAHA	10,000	Gasoline		✓			✓	

* Where decommissioned tank(s) are replaced by new underground storage tanks the UST owner or operator must submit a new permit application containing information on the new tanks 30 days before placing them in-service.

∞ Submit a soil sampling plan to the DEQ regional office and receive plan approval prior to starting work if 1) tank is to be decommissioned in-place, 2) tank contents are changed to a non-regulated substance, 3) tank contains a regulated substance other than petroleum, or 4) tank changed to non-regulated use.

D. DISPOSAL INFORMATION:

Tank #	Tank & Piping Disposal Method				Disposal Location of Tank Contents *	
	Scrap	Land-fill	Other	Identify Location & Property Owner	Liquids	Sludges
1	✓			Schnitzer Steel Products Co. 12005 N. Burgard Portland OR 97203	Harbor Oil 11535 N. Force Ave. Portland OR	To be determined.
2	✓			Same.	Same.	Same.

* Note: The tank contents, the tank and the piping may be subject to the requirements of Hazardous Waste regulations. If you have questions, contact the DEQ Hazardous Waste Section at (503) 229-5913 or DEQ regional office hazardous waste staff.

E. CONTAMINATION INFORMATION:

Tank #	Ground* water in pit?	Product odor in soil?	Product stains in soil?	Number of Samples	Laboratory (Name, City, State, Phone)
1	No	Yes	Yes	2	Hughes Analytical Laboratory ~~Portland OR~~ DH Gresham OR 669-3745
2	No	Yes	Yes	2	Same.

* Note: Sampling is required if groundwater is encountered. See cleanup rules.

F. SITE SKETCH: (Show location of adjacent roads, property lines, structures, dispenser, & all USTs) (Show North, general direction of ground slope and soil sample locations. Sketch does not need to be drawn to scale. You may attach a separate drawing.)

See attached maps

G. WORK PERFORMED BY:

DEQ Service Provider's License #: 13383 Construction Contractors License #: 084671

Name: De Minimis Inc.

Telephone: 295-4074

DEQ Decommissioning Supervisor's License #: 12425

Name: Dale Leon Haar

Telephone: 295-4074

DEQ Soil Matrix Service Provider's License #: 11123 (If applicable)

Name: De Minimis Inc.

Telephone: 295-4074

DEQ Soil Matrix Supervisor's License #: 12426 (If applicable)

Name: Dale Leon Haar

Telephone: 295-4074

H. ATTACHMENTS TO THIS REPORT:

1. Attach a copy of the laboratory report showing the results of all tests on all soil and water samples. The laboratory report must identify sample collection methods, sample location, sample depth, sample type (soil or water), type of sample container, sample temperature during transportation, types of tests, and copies of analytical laboratory reports, including QA/QL information. Include laboratory name, address and copies of chain-of-custody forms.

2. If contamination is detected and a Level 2 or Level 3 soil matrix cleanup standard is selected attach a copy of the soil matrix analysis for the site including methods of determining soil type, depth to groundwater, and sensitivity of uppermost aquifer.

I. REPORT FILING:

This report, signed by the tank owner or operator, complete with all applicable attachments must be filed with DEQ headquarters within 30 days after the excavation is backfilled or change-in-service is complete. Contact the DEQ regional office prior to filing this report where special circumstances exist at the site (such as water in pit, remaining pockets or contamination, etc.).

NOTE: If contamination was found during site assessment at decommissioning or change-in-service and reported to DEQ regional office, this report may be submitted with either the first interim cleanup report or the final cleanup report, whichever is first.

Return Completed and Signed Form to:

Department of Environmental Quality
UST Program - Decommissioning Report
811 S.W. Sixth Ave.
Portland, Oregon 97204

Or FAX Completed and Signed Form to: (503) 229-6954

I have personally reviewed this report and the attachments and find them to be true and complete.

Signature: (Owner or Operator) Date: 12/12/94

For information: (503) 229-5733 or Toll Free in Oregon UST HELPLINE 1-800-742-7878

Oregon Department of Environmental Quality

UNDERGROUND STORAGE TANK DECOMMISSIONING CHECKLIST

DEQ FACILITY NUMBER: 3105

DATE: 10-10-94

FACILITY NAME: Staff Jennings, Inc

FACILITY ADDRESS: 8240 S.W. Macadam Avenue
Portland OR 97219

PHONE: 244-7505

A. SAFETY EQUIPMENT ON JOB SITE:

Fire Extinguisher: Type/Size: Dry Chemical 40-A:80-B:C Recharge Date: New 03/94

Combustible Gas Detector: Model: Industrial Scientific Corporation MX 251 Calibration Date: 10-7-94

Oxygen Analyzer: Model: Same as above Calibration Date: 10-7-94

B. DECOMMISSIONING: All Tanks: (Unk. = Unknown, N/A = Not Applicable) (Check Appropriate Box)

	Yes	No	Unk	N/A
1. All electrical equipment grounded and explosion proof?	✓			
2. Safety equipment on job site?	✓			
3. Overhead electrical lines located?	✓			
4. Subsurface electrical lines off or disconnected?	✓			
5. Natural gas lines off or disconnected?	~~✓~~ ACH			✓
6. No open fires or smoking material in area?	✓			
7. Vehicle and pedestrian traffic controlled?	✓			
8. Excavation material area cleared?	✓			
9. Rainwater runoff directed to treatment area?				✓
10. Drained and collected product from lines?	✓			
11. Removed product and residual from tank?	✓			
12. Cleaned tank?	✓			
13. Excavated to top of tank?	✓			
14. Removed tank fixtures? (pumps, leak detection equip.	✓			
15. Removed product, fill and vent lines?	✓			

C. TANK ABANDONMENT IN-PLACE:

16. Sampling plan approved by DEQ? Date: ____________ DEQ Staff: ______________________				✓

B. DECOMMISSIONING: All Tanks: (Unk. = Unknown, N/A = Not Applicable)
(Check Appropriate Box)

	Yes	No	Unk	N/A
17. Contamination concerns fully resolved?				✓
18. Fill Material? Type: ____________				✓

D. TANK REMOVAL:

	Yes	No	Unk	N/A
19. Tank placement area cleared, chocks placed?	✓			
20. Purged or ventilated tank to prevent explosion? Method used: Dry Ice Meter reading: 1% ; 125%	✓			
21. No chains or steel cables wrapped around tank for removal?	✓			
22. Tank removed, set on ground, blocked to prevent movement?	✓			
23. Tank set on truck and secured with strap(s)?	✓			
24. Tank labeled before leaving site?	✓			

E. SITE ASSESSMENT:

	Yes	No	Unk	N/A
25. Site assessed for contamination? See OAR 340-122-340	✓			
26. Soil samples taken and analyzed?	✓			
27. Decommissioning/Change-in-Service report sent to DEQ?	✓			
28. Was contamination found? Date/Time: 10-10-94 / 1156	✓			
29. Was contamination reported to DEQ? By: Dale L. Haar Date/Time: 10-10-94 / 1610 DEQ Staff: Andree Pollock	✓			
30. Was hazardous waste determination made for tank contents (Liquids/sludges)?		✓		

31. Disposal location of tank(s) contents.

Name: Harbor Oil, Inc. Date: 10-10-94 and 10-13-94
Address: 11535 N. Force Ave.
Portland OR 97203
Attach disposal receipt.

32. Disposal or recycling location of removed tank(s) and associated piping.

Name: Schnitzer Steel Products Co. Date: 10-11-94
Address: 12005 N. Burgard
Portland OR 97203
Attach disposal receipt.

33. If tank(s) are intended to be reused, identify new tank site.

Name: N/A. Date: N/A.
Address: N/A.

Purpose of Reuse: N/A.

F. WORK PERFORMED BY:

DEQ Service Provider's License #: 13383
Name: De Minimis Inc.
Telephone: 295-4074

DEQ Decommissioning Supervisor's License #: 12425
Name: Dale Leon Haar
Telephone: 295-4074

E. CHECKLIST FILING:

1. Provide copy of checklist to the UST owner and operator.

2. Send completed checklist to the DEQ headquarters within 30 days after the excavation is backfilled.

NOTE: If contamination was found during decommissioning and reported to DEQ regional office, this report may be submitted with either the first interim cleanup report or the final cleanup report, whichever is first.

Send Completed Form to:

Department of Environmental Quality
UST Program - Decommissioning Checklist
811 S.W. Sixth Ave.
Portland, Oregon 97204

I have personally reviewed this decommissioning checklist and find it to be true and complete.

Signature: Dale Date: 12-12-94
(Licensed Supervisor)

Signature: Jennings Date: 12/12/94
(Owner or Operator)

For information: (503) 229-5559 or Toll Free in Oregon 1-800-452-4011
NW Region 229-5489

UST SERVICE PROVIDER LICENSE

This License is Issued by The Oregon Department of Environmental Quality to:

De Minimis Inc.
34 NE 1st Ave., Suite 101
Portland, OR 97209

You are Licensed to Offer the Following Underground Storage Tank Services:

License Type	License Number	Issued	Expires
Service Provider	13383	April 16, 1993	May 07, 1995
Soil Matrix Cleanup Prov.	11123	December 04, 1993	December 04, 1995

A Licensed Underground Storage Tank Supervisor Must be
Present at a Site to Perform These Services

Issued: XXXXXX RE ID: 7630

Expires: xxxxxx ADDR ID: 111881

Authorized:
Richard P. Reiter
UST Compliance Manager

1859

A Copy of This License Shall Be Available for Inspection At All Sites Involving UST Work

Dale Leon Haar
34 NW 1st Avenue, Suite 101
Portland, OR 97209

LICENSED SERVICES	LIC#	EXPIRES
Decommission	12425	09-JAN-95
Soil Matrix Cleanup	12426	09-JAN-95

Supervisor Signature

Oregon

DEPARTMENT OF
ENVIRONMENTAL
QUALITY

NORTHWEST REGION

December 21, 1994

JEFF JENNINGS
STAFF JENNINGS MARINA
P O BOX 82206
PORTLAND OR 97282-8206

Re: Staff Jennings Marina
File No. 26-88-078

Dear Mr. Jennings:

I have reviewed DeMinimis Inc.'s decommissioning report dated December 13, 1994; concerning the decommissioning of two underground storage tanks from 8240 SW Macadam Avenue, Portland, Oregon. The Department substantially agrees with the conclusions drawn by DeMinimis in their December 1994 decommissioning report.

This site is covered by Senate Bill 1215 in which you signed a consent agreement which states that the Department may require the applicant to determine whether an imminent hazard exists through adequate investigation and testing. Due to the extent of contamination found in the subsurface and dissolved in the groundwater at this site the Department is requiring an investigation to determine the full lateral and horizontal extent of contamination as outlined in Oregon Administrative Rules (OAR 340-122-242). Due to the location of this site next to a surface body of water (the Willamette River) the Department will further require a corrective action plan (CAP) for this site as outlined in OAR 340-122-250.

Please submit a proposed schedule of events for the implementation of the groundwater investigation, including the installation of at least three monitoring wells, one up gradient and two down gradient by January 23, 1995. This work plan should include access and investigation on the adjacent property to the North owned by the City of Portlnad's Department of Parks and Recreation.

If you have any questions or need additional information please contact me at (503) 229-5477.

Sincerely,

Rick Silverman

Rick Silverman
Environmental Specialist

1859

2020 SW Fourth Avenu
Suite 400
Portland, OR 97201-498
(503) 229-5263 Voice/TD
DEQ-1

PENGAD-Bayonne, N.J.

EXHIBIT
17

E

WR UST FIELD INSPECTION REPORT

Inspection Date: 11/21/95

Site Name: Staff Jennings Marina

Site Address: 8240 SW Macadam, Portland

File/Facility No.: 26-88-078
(both UST & UST Cleanup file #'s as appropriate)

Time Begin 9 00 am End 12 00 pm Total* 3 -
*Include inspection, travel, paperwork

Inspector: R Silverman

Others Onsite: Jeff Jennings
include company name: Dale Haal

Supervisor License No.: Exp. date
(note name with ** that Lic. No. applies to)

Inspection Type (check one)

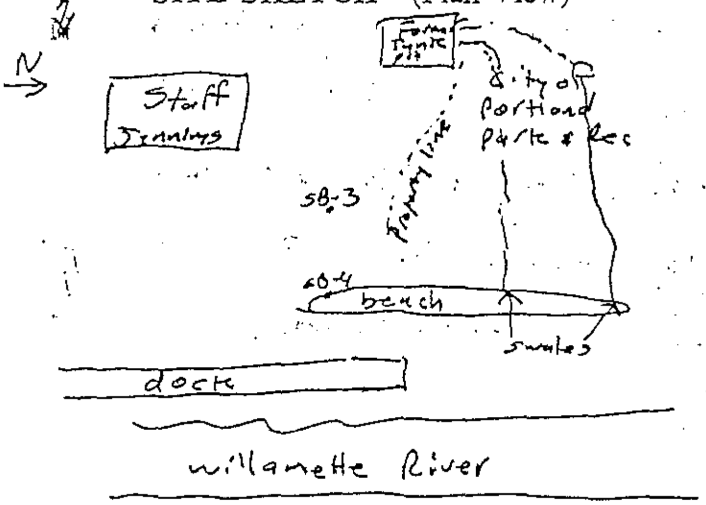
☐ Install (New/Retro/StII)
☐ Decommission
☐ UST Facility - Full
☐ UST Facility - Partial
☑ Cleanup
☐ Soil Treatment
☐ Complaint
☐ Distrib. Audit
☐ Service Provider Audit
☐ Leak Detection
☐ Fuels (StI/StII/Tanker)
☐

Potential Site Hazards

Hazards Appraised? Y / [✓ N]
otos Taken? Y / [✓ N] (attach)
Samples Taken? Y / [✓ N] (attach results)

INSPECTION RESULTS - IN COMPLIANCE? Y / N / [✓ NA]

SITE SKETCH (Plan View)



Notes (use back of form as necessary)

I talked with Jeff & Dale about conducting addition investigation into lateral & horizontal extent of contamination @ this site. Off-site borings are needed. In addition, a remedial system or approach was discussed, which included VES & cut-off trenchs to capture impacted water before it reaches the river. The two borings on-site

EXHIBIT
18

F

Oregon

DEPARTMENT OF
ENVIRONMENTAL
QUALITY

NORTHWEST REGION

November 7, 1996

STAFF JENNINGS, INC.
C/O DONALD B BOWERMAN - REGISTERED AGENT
1001 MOLALLA AVENUE SUITE 208
OREGON CITY OR 97045

Re: Staff Jenning's Marina
File No.: 26-88-078
NWR-UST-96-171
NOTICE OF NONCOMPLIANCE

Dear Mr. Bowerman:

This notice is being sent to you as the registered agent for Staff Jennings, Inc. (Staff Jennings). These violations came to the Department's attention due to a file review.

This notice is a result of four violations of Oregon Administrative Rules (OARs) and Oregon Revised Statutes (ORS) governing Underground Storage Tanks, Water Quality, and Spill rules at the above referenced site located at 8240 SW Macadam Avenue, Portland, Oregon.

The following violations have been documented at the Staff Jennings Marina.

1. Failure to comply with ORS 466.645 which requires any person liable for a spill or release of oil or threatened spill or release under ORS 466.640 shall immediately clean up the spill or release. Any person liable for a spill or release or a threatened spill or release shall immediately initiate cleanup, whether or not the department has directed the cleanup. The department may require the responsible person to undertake such investigations, monitoring, surveys, testing and other information gathering as the department considers necessary.

2. Violation of ORS 468B.025(1)(a) which prohibits a person from causing pollution of any waters of the state or place or cause to be placed any wastes in a location where such wastes are likely to escape or be carried into the waters of the state by any means.

John A. Kitzhaber
Governor

1859

2020 SW Fourth Avenue
Suite 400
Portland, OR 97201-4987
(503) 229-5263 Voice
TTY (503) 229-5471
DEQ-1

Exhibit 19

3. Violation of the NPDES, General Permit, Permit Number: 1500 A: (a) Schedule A, Number 1, (b) Schedule B both minimum monitoring and reporting procedures, (c) Section A, Standard Conditions, Number 3, (d) Section B, Standard Conditions, Number 1, and (e) Section C, Standard Conditions, Number 5. Although a release was documented in 1988, a National Pollutant Discharge Elimination System (NPDES) was not sought until May 20, 1994. The NPDES permit has never been used or complied with.

4. Failure to initiate and complete the investigation or cleanup of a release from an underground storage tank, including failure to install monitoring wells as required by OAR 340-122-242(1)(a) and failure to develop a Corrective Action Plan as required by OAR 340-122-250(1).

Staff Jennings is required to abate the discharge of petroleum to the Willamette River and has failed to take any corrective action in eight years. Staff Jennings must submit a Corrective Action Plan and initiate immediate abatement of discharge of contaminants in contact with the Willamette River before the water level rises with the fall rains. In addition, Staff Jennings is required to install a pollution elimination system immediately, including reporting on the discharge concentration as required by the 1500 A NPDES permit.

These are Class I and Class II violations and are considered to be serious violations of Oregon environmental law. Therefore, we are referring these violations to the Department's Enforcement Section with a recommendation to initiate a formal enforcement action. A formal enforcement action may include a civil penalty assessment for each day of violation.

Failure to comply with the Department's order may result in the Department conducting the removal and remedial action under ORS 465.260(1) which allows the director to undertake any removal or remedial action necessary to protect the public health, safety, welfare and the environment. In addition ORS 465.260(8) states that any person who is liable under ORS 465.255 that fails without sufficient cause to conduct a removal or remedial action as required by an order of the director, the person shall be liable to the Department for the state's remedial action costs and for punitive damages not to exceed three times the amount of the state's remedial action costs.

If you have any questions concerning this matter or need assistance in resolving the problems associated with this site, please contact me at (503) 229-5477.

Sincerely,

Rick Silverman

Rick Silverman
Environmental Specialist

Enclosures

cc: Jeff Jennings
Staff Jennings Marina
P.O. Box 82206
Portland, OR 97282-8206

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED

MAY 9 1996

NORTHWEST REGION

Focused Soil and Groundwater Investigation

City of Portland
Parks and Recreation
Undeveloped Property

Tax Lot 9, Section 22, T1S, R1E
S.W. Macadam Avenue
Portland, Oregon 97219

UST Cleanup #26-88-0078

May 7, 1996

Project # 00357-0195

Prepared For:

Mr. Jeff Jennings
President
Staff Jennings, Inc.
P.O. Box 82206
Portland, OR 97282-8206

De Minimis Inc. Environmental Management
34 N.W. First Avenue • Suite 101 • Portland, Oregon • (503) 295-4074

Exhibit 20

TABLE OF CONTENTS

1.0 Introduction

At the request of Staff Jennings, Inc., the Client, De Minimis Inc. (DMI) Environmental Management was contracted to provide project management services for a Focused Soil and Groundwater Investigation of an undeveloped property located in the 8100 to 8200 Block of S.W. Macadam in Portland, Oregon (See Figure 1, Appendix A). The subject property is owned by the City of Portland, a municipality of the State of Oregon, through its Bureau of Parks and Recreation.

The Oregon Department of Environmental Quality has required that Staff Jennings, Inc. conduct a soil and groundwater investigation in response to a release from their former on-site underground storage tank (UST) system (as per OAR 340-122-240 through 340-122-242). The nature and extent of the off-site petroleum hydrocarbon contamination potentially associated with this release (i.e. soil and groundwater contamination potentially located beneath the Portland Parks and Recreation property) is undetermined. The Focused Soil and Groundwater Investigation was requested by the Client to evaluate and identify potential contamination that may have migrated off-site due to the UST system release. This project is a continuation of a field investigation conducted in December 1995 (See *Focused Soil and Groundwater Investigation, City of Portland Parks and Recreation, Undeveloped Property*, completed by DMI on February 26, 1996).

The scope of services included:

- Install two to seven soil borings to a sufficient depth to collect groundwater samples in order to delineate the northern extent of the petroleum hydrocarbon contamination;
- Collect and archive subsurface soil samples for possible analysis, as per Oregon DEQ requirements;
- Collect and analyze groundwater samples for petroleum hydrocarbon constituents; and
- Present a report detailing this investigation.

1.1 Site Location and Description

The subject property is currently undeveloped and is located between the Willamette River and S.W. Macadam Avenue in southwest Portland, Oregon. The subject property is known as Tax Lot 9 and is located in the southeast quarter of Section 22, Township 1 South, Range 1 East of the Willamette Meridian, in the County of Multnomah, State of Oregon.

The subject property is bordered on the north by the Macadam Bay Club, a residential houseboat moorage. The site is bordered on the east by the Willamette River. The site is bordered on the south by the Staff Jennings, Inc. Retail Facility and Marina. The subject property is bordered on the west by S.W. Macadam Avenue. The property to the west of Macadam Avenue is undeveloped and forested.

2.0 Geology and Hydrogeology

Examination of published and unpublished geological and hydrogeological reports for the Macadam Avenue area have allowed us to characterize the geology and hydrology of the site.

The subject site is located on the west bank of the Willamette River, approximately 3-1/2 miles south of downtown Portland, Oregon. The subject property is approximately 15-40 feet above Mean Sea Level (MSL). The subject property slopes moderately to steeply to the east toward the Willamette River. Surface drainage for the subject property is to the east toward the adjacent Willamette River, which flows to the north.

The soil beneath the subject site is classified as Urban Land, 0 to 3 percent slopes, by the *Soil Survey of Multnomah County, Oregon.* This miscellaneous map unit is found throughout central Multnomah County and mainly occurs in Portland along the flood plains of the Willamette River. Areas of this map unit are used mainly for commercial purposes. The original soils were gravelly loam, silt loam, or silty clay loam with some sandy materials. The soils in areas of this unit have been graded, cut, filled, or otherwise severely altered due to construction that mapping the soil units was not practical. Approximately ninety-five percent or more of the soils are covered with concrete, pavement, buildings, and other structures.

Immediately underlying the site are the highly permeable sands and gravels of the Willamette River flood plain deposits (Quaternary Alluvium). The alluvium has been deposited by constant flooding of the river since about 10,000 years ago, at the end of the last Ice Age. Since that time, the position of the Willamette River has remained relatively constant. This alluvial unit is overlain in turn by a thin veneer of silts and sands derived from wind deposition and weathering of the river deposits.

Our experience from drilling projects in the area indicates that underlying the alluvial deposits at a depth of 20 feet or less are the dense basalt flows of the Columbia River Basalt. These lava flows erupted approximately 15 to 20 million years ago. The Columbia River Basalts are visible in the local road cuts, and in the banks and channel of the Willamette River.

Examination of water well logs, City of Portland groundwater exploration reports, and U.S. Geological Survey groundwater information for the project area indicates the depth to the uppermost aquifer beneath the site is approximately 20 feet or less. Groundwater was encountered at approximately 10 feet bgs on the main terrace of the Staff Jennings facility adjacent to UST #2 during the Limited Subsurface Soil and Groundwater Investigation conducted on March 15, 1994. On the bank of the Willamette River and beneath the crane dock, groundwater was previously encountered as shallow as 2 feet bgs. This level coincides with the stage of the adjacent river and represents a layer of water perched on top of the underlying basalt flows. The level to groundwater can be expected to fluctuate on a seasonal basis in response to recharge from local rainfall runoff. The direction of movement of the uppermost groundwater aquifer is to the east toward the Willamette River.

3.0 Focused Soil and Groundwater Investigation

3.1 Site Preparations

The Permit of Entry for Park Property to perform the Focused Soil and Groundwater Investigation was issued to Staff Jennings, Inc., by the City of Portland Bureau of Parks and Recreation on March 29, 1996.

On April 11, 1996, Mr. Paul Morris, Underground Utility Specialist, Bureau of Parks and Recreation, stated that there were no utilities in the area of investigation. Mr. Morris authorized the proposed sampling plan. Mr. Neil Tancre, Westmoreland District Foreman, Bureau of Parks and Recreation, was contacted by DMI personnel, as per the requirements of the Parks and Recreation Permit of Entry for Park Property. Since Mr. Tancre had reviewed the site, the utility locations, and the proposed sampling program in December 1995, Mr. Tancre authorized DMI to proceed with the sampling plan.

A utility locate check (Ticket #60023) was ordered from the Utility Notification Service and was completed by April 19, 1996. Utilities notified included: Northwest Natural Gas, Paragon Cable, Portland General Electric, U.S. West Communications, and City of Portland Water. No marked utilities were observed adjacent to the proposed boring sites.

A Site Health and Safety meeting was conducted prior to on-site activities to review site-specific health and safety hazards associated with this project. The Site Health and Safety plan was signed by all field personnel.

3.2 Subsurface Soil Borings and Sampling

Geo-Tech Explorations, Inc. (GTE), of Tualatin, Oregon, was subcontracted to advance subsurface soil borings. Mr. Thomas C. Wilson, GTE GeoProbe™ Manager, was the Oregon Water Resources Department (OWRD) Water/Monitor Well Constructor (OWRD license #10347). Mr. Dale L. Haar, DMI Project Manager, was also a licensed Oregon Monitor Well Constructor (OWRD license #10343).

Model 5400 GeoProbe™ soil boring tools were advanced with a handheld Rotohammer on April 23, 1996. Two soil borings were advanced to a sufficient depth to collect groundwater samples (See *Focused Soil and Groundwater Investigation, City of Portland Parks and Recreation, Undeveloped Property* and Appendix A, Figure 2 for soil sampling locations and Appendix B for the soil boring logs). Groundwater was encountered in both of the soil borings. Soil borings PR-7 and PR-8 were located downgradient from the former USTs and approximately 41 feet and 71 feet, respectively, to the north of Soil Boring PR-6. The soil borings were approximately 10 feet or less from the Willamette River.

The following sampling procedure was utilized to obtain each discrete soil sample. A soil sample probe was attached to 1.0-inch outside diameter (O.D.), alloy steel drive rods and was advanced with a Rotohammer. The soil sample probe and drive rods were decontaminated prior to obtaining each sample by steamcleaning and thoroughly washing with a solution of tap water and Alconox (a laboratory-grade detergent) and rinsing with clean, tap water. Soil samples were collected from the borings by advancing the 2-foot long soil sample probe to the desired sampling depth and sampling with a 1.5-inch outside diameter (O.D.), nickel-plated steel, soil sample probe. Soil samples were collected from a 1.125-inch inside diameter (I.D.), Tenite plastic tube fitted inside the soil sample probe.

DMI personnel, wearing clean, surgical-type, latex gloves, collected the soil samples into 4-ounce, pre-cleaned glass sample jars fitted with Teflon™-lined lids. The sample jars were supplied by National Environmental Testing (NET), Inc., located in Portland, Oregon. The soil samples were obtained from the barrel of the soil probe and were rapidly transferred into the sample bottles with minimal headspace, thus minimizing the loss of volatile organic compounds. The sample containers were sealed, labeled, and stored on ice in a cooler until shipped to NET, an off-site, independent laboratory, via chain of custody for analyses. Chain of custody documentation and analytical results are presented in Appendix C, Laboratory Analytical Results and Chain Of Custody.

3.3 Subsurface Soil Observations

Soil sample PR7-5 was collected from 3 to 5 feet bgs. Soil sample PR8-9 was collected from 7 to 9 feet bgs. Soil samples obtained from the borings consisted of medium brown and medium gray, fine grain sands with micaceous silts (Complete soil descriptions are included in Appendix B, Subsurface Soil Boring Logs). No visual or olfactory evidence of petroleum hydrocarbon contamination was observed in the soil samples.

3.4 Groundwater Sampling and Observations

Groundwater samples were collected from soil borings PR-7 and PR-8 for laboratory analyses. Clean, dedicated polyethylene tubing was inserted through the GeoProbe™ rods and the groundwater was pumped from within a 4-foot, 0.004-inch slotted, stainless steel screened interval. A stainless steel ball valve was attached to the end of the polyethylene tubing and the groundwater sample was obtained by inertia pumping.

DMI personnel, wearing clean, surgical-type, latex gloves, collected one groundwater sample from each well. The groundwater sample was rapidly transferred into three sterile, 40-milliliter (ml) septum, glass volatile organic analysis (VOA) bottles with hydrochloric acid (HCl) preservative and into one 1-liter amber glass sample bottle. The sample bottles were supplied by NET. The groundwater samples were carefully transferred into the sample bottles with no headspace, thus minimizing the loss of volatile organic compounds. The sample containers were sealed, labeled, and stored on ice in a cooler until shipped to NET via strict chain of custody for laboratory analyses. Chain of custody documentation and analytical results are presented in Appendix C, Laboratory Analytical Results and Chain Of Custody.

The groundwater samples were clear and colorless and contained light brown suspended silt. No visual or olfactory evidence of contamination was observed in the groundwater samples.

3.5 Soil Boring Abandonment

Immediately after obtaining the soil and groundwater samples, each boring was backfilled to the surface with #8 granular bentonite and hydrated, as per Oregon Water Resources Department specifications.

4.0 Laboratory Analyses

4.1 Laboratory Analytical Methods

Two soil samples and two groundwater samples were submitted via chain of custody to National Environmental Testing (NET), Inc., located in Portland, Oregon. Soil and groundwater samples were obtained utilizing Oregon DEQ- and EPA-approved methods. See Appendix C, Laboratory Analytical Results and Chain Of Custody for complete laboratory analytical results and documentation.

Since no visual or olfactory evidence of contamination was observed in soil samples PR7-5 or PR8-9, these samples were archived at NET, as per discussions with Mr. Rick Silverman, Oregon Department of Environmental Quality (DEQ).

Groundwater samples were analyzed for benzene, toluene, ethylbenzene, and total xylenes (BTEX) per EPA Method 8020 and for polynuclear aromatic hydrocarbons (PAHs) per EPA Method 8270M.

4.2 Groundwater Analytical Results

Benzene, Toluene, Ethylbenzene, and Total Xylenes (BTEX)

Toluene was the only BTEX compound detected above the test method detection limits in groundwater samples PRW-7 and PRW-8 (See Table 1 for groundwater BTEX analytical results).

TABLE 1

Groundwater Sample Analytical Results
Benzene, Toluene, Ethylbenzene, and Total Xylenes (BTEX)
(per EPA Method 8020)

April 23, 1996

Groundwater Sample Number	Benzene	Toluene	Ethylbenzene	Total Xylenes
PRW-7	ND	1.1	ND	ND
PRW-8	ND	1.4	ND	ND
Laboratory Blank	ND	ND	ND	ND
Detection Limit	0.5	0.5	0.5	0.5
Oregon DEQ Basic Numeric Groundwater Cleanup Level	5	1,000	700	10,000

Results reported in µg/L (micrograms per liter) or ppb (parts per billion).
ND = Not Detected at or above test method detection limits.
See Appendix C for complete laboratory analytical results and documentation.

Polynuclear Aromatic Hydrocarbons (PAHs)

Acenaphthylene, fluoranthene, pyrene, benzo (b) fluoranthene, benzo (a) pyrene, indeno (1,2,3-cd) pyrene, and benzo (g,h,i) perylene were detected in groundwater sample PRW-7 (See Table 2 for groundwater PAH analytical results). No other PAHs were detected at or above the test method detection limits in groundwater samples PRW-7 or PRW-8.

TABLE 2

Groundwater Sample Analytical Results
Polynuclear Aromatic Hydrocarbons (PAHs)
(per EPA Method 8270M)

April 23, 1996

PAHs Compound	Groundwater Sample Number		Detection Limit	Oregon DEQ Basic Numeric Groundwater Cleanup Level
	PRW-7	PRW-8		
Naphthalene	ND	ND	0.1	28
Acenaphthylene	0.20	ND	0.1	--
Acenaphthene	ND	ND	0.1	420
Fluorene	ND	ND	0.1	280
Phenanthrene	ND	ND	0.1	--
Anthracene	ND	ND	0.1	2,100
Fluoranthene	0.12	ND	0.1	280
Pyrene	0.16	ND	0.1	210
Benzo (a) anthracene	ND	ND	0.1	0.1
Chrysene	ND	ND	0.1	0.2
Benzo (b) fluoranthene	0.14	ND	0.1	0.2
Benzo (k) fluoranthene	ND	ND	0.1	0.2
Benzo (a) pyrene	0.15	ND	0.1	0.2
Dibenzo (a,h) anthracene	ND	ND	0.1	0.3
Benzo (g,h,i) perylene	0.33	ND	0.2	--
Indeno (1,2,3-cd) pyrene	0.18	ND	0.1	0.4

Results reported in µg/L (micrograms per liter) or ppb (parts per billion).
ND = Not Detected at or above test method detection limits.
-- = No Oregon DEQ Numeric Groundwater Cleanup Level reported for this compound.
See Appendix C for complete laboratory analytical results and documentation.

4.3 Quality Assurance/Quality Control and Analytical Data Review

Standard Quality Assurance/Quality Control (QA/QC) procedures performed by NET included sample holding times, continuing calibration verification, laboratory control standards, laboratory method blanks, laboratory matrix spikes and matrix spike duplicates, and surrogates.

One of the surrogate recoveries for groundwater sample PRW-8, EPA Method 8270M for 2-fluorobiphenyl, was slightly below the control limit. However, the other surrogate recoveries for this sample and groundwater sample PRW-7 were within the control limits. There were no other significant variations from the laboratory protocols that would invalidate the analytical data. Based on the QA/QC report, the analytical results are in conformance with the QA/QC data quality goals and DMI accepts the analytical results.

4.4 Oregon DEQ Groundwater Cleanup Standards and Analytical Results

The Oregon DEQ basic numeric groundwater cleanup levels for BTEX (as per OAR 340-122-242) for petroleum UST contaminated sites are: 5 ppb benzene; 1,000 ppb toluene; 700 ppb ethylbenzene; and 10,000 ppb total xylenes. None of the groundwater samples exceeded the Oregon DEQ basic numeric groundwater cleanup levels for BTEX.

The Oregon DEQ basic numeric groundwater cleanup levels for polynuclear aromatic hydrocarbons (PAHs) are listed in Table 3. None of the groundwater samples exceeded the Oregon DEQ basic numeric groundwater cleanup level for the detected PAHs.

5.0 Summary and Conclusions

Based on field observations made by DMI and laboratory analytical data, the following summary and conclusions are presented:

- Soil and groundwater samples were obtained from two subsurface soil borings on April 23, 1996. No visual or olfactory evidence of petroleum hydrocarbon contamination was observed during the field activities. Since no contamination was observed, the soil samples were archived at the laboratory, as per discussions with Oregon DEQ personnel.

- Laboratory groundwater analyses detected concentrations of toluene, acenaphthylene, fluoranthene, pyrene, benzo (b) fluoranthene, benzo (a) pyrene, indeno (1,2,3-cd) pyrene, and benzo (g,h,i) perylene. However, none of the analytes exceeded Oregon DEQ basic numeric groundwater cleanup levels.

- Based on the analytical results from this investigation and the Focused Soil and Groundwater Investigation conducted in December 1995, it appears that the northern extent of the dissolved phase of the contaminant plume has been delineated per Oregon DEQ requirements, within the constraints of the sampling plan.

6.0 Recommendations

De Minimis Inc. Environmental Management presents the following recommendations for further environmental investigation of the subject property:

- The Client should develop and submit a Corrective Action Plan (CAP), as per OAR 340-122-250, for responding to and remediating petroleum contaminated soils and groundwater. A CAP must include not only a site-specific cleanup plan, but also a discussion of the alternative cleanup methods which were considered and rejected. The CAP will also contain sufficient hydrogeological, toxicological, and environmental data to support the adequacy of the proposed plan.

- Further groundwater investigations and cleanup should proceed under OAR 340-122-242, which may require the installation and monitoring of groundwater wells.

- The Client should retain a copy of this Focused Soil and Groundwater Investigation for a minimum of ten years past the sale date of the subject property.

This assessment was conducted expressly for Staff Jennings, Inc., the Client. The use of the information provided in this report with respect to the disposition of said property is the sole responsibility of the above-named entities and/or their designees.

If you have any questions or require further clarification regarding the information in this report, please feel free to contact DMI at your convenience. Thank you for allowing DMI to serve your environmental needs and to present this information.

Respectfully submitted,

De Minimis Inc. Environmental Management

Dale L. Haar
Project Manager

Rick I. Johnson
President

7.0 Limitations

The data presented in this report was collected, analyzed, and interpreted following the standards of care, skill, and diligence ordinarily provided by a professional in the performance of similar services as of the time the services were performed.

The observations, interpretations, and recommendations presented in this report are based on the assumption that the conditions do not vary from those found during the course of the investigation at the project site. If any variations are encountered during any further investigations for this site, De Minimis Inc. (DMI) Environmental Management should be notified so that supplemental interpretations can be made. The observations and interpretations of this report are intended only for the subject site and the sampling conditions described. The observations and interpretations of this report must not be extended to adjacent areas.

Information has been gathered during this assessment from third party and agency sources. De Minimis Inc. has reported this information as supplied to them by these third parties and agencies and accepts no liability as to its accuracy.

The findings of this report are valid for the dates and under the conditions of the sampling, observations, and testing. However, changes in the conditions of the subject property, neighboring properties, or changes in applicable standards can occur with broadening of knowledge. Accordingly, the observations and findings presented in this report may be invalidated by changes outside of our control.

DMI does not offer any legal opinion, representation, or interpretation of environmental laws, rules, regulations, or policies of federal, state, or local governmental agencies.

8.0 References

Staff Jennings, Inc.
Jeff Jennings, President

Focused Soil and Groundwater Investigation, City of Portland Parks and Recreation, Undeveloped Property, February 26, 1996, De Minimis Inc. Environmental Management, 19p.

City of Portland, Bureau of Parks and Recreation
Suzanne Hathaway-Marxer
Paul Morris, Underground Utility Specialist
Neil Tancre, Westmoreland District Foreman

Department of Environmental Quality
Rick Silverman, Environmental Specialist, Underground Storage Tank Cleanup
Staff-Files

National Environmental Testing (NET), Inc.
Analytical reports

Geo-Tech Explorations, Inc.
Thomas C. Wilson, Geo-Probe Operator

Environmental Cleanup Manual, Oregon Department of Environmental Quality, June 1994, 114 p.

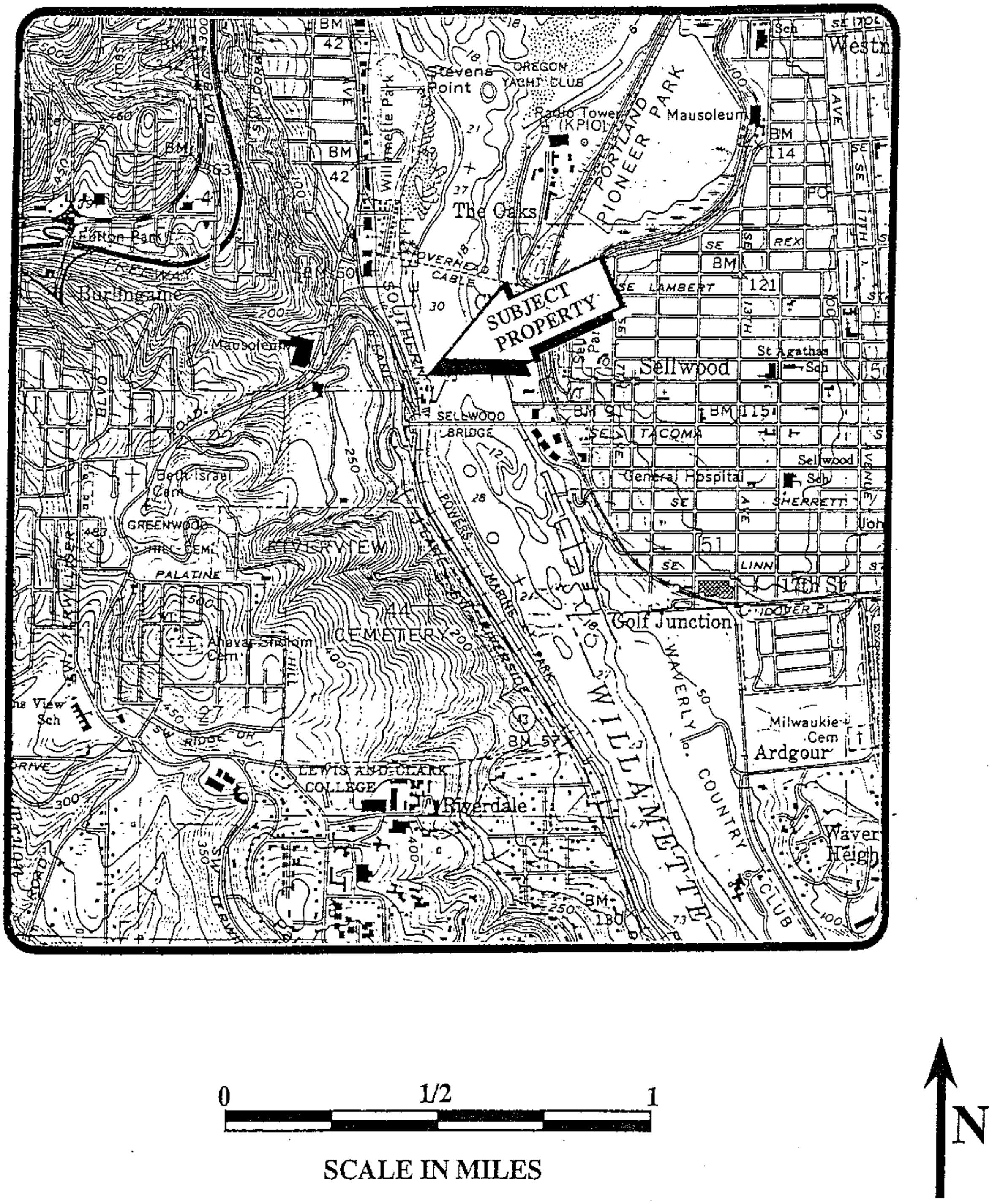
Soil Survey of Multnomah County Area, Oregon; U.S. Department of Agriculture, Soil Conservation Service; August 1983; 225 p.

Maps utilized:

- United States Geological Survey topographic - Lake Oswego, Oregon 7.5 minute quadrangle

9.0 Glossary of Abbreviations

bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and total xylenes
DEQ	Oregon Department of Environmental Quality
DMI	De Minimis Inc. Environmental Management
EPA	U.S. Environmental Protection Agency
GTE	Geo-Tech Explorations, Inc.
I.D.	inside diameter
µg/L	microgram per liter
mg/Kg	milligram per kilogram
MSL	Mean Sea Level
ND	not detected
NET	National Environmental Testing, Inc.
OAR	Oregon Administrative Rules
O.D.	outside diameter
PAH	polynuclear aromatic hydrocarbon
ppb	parts per billion
ppm	parts per million
QA/QC	Quality Assurance/Quality Control
TL	tax lot
USCS	Unified Soil Classification System
USDA	United States Department of Agriculture
USGS	United States Geological Survey
UST	underground storage tank
VOA	volatile organic analysis
VOC	volatile organic compounds



NOTE: Base Map From Lake Oswego, Oregon, U.S.G.S. Quadrangle, 7.5 Minute Series

PROJECT NO.

00357-0195

April 23, 1996

DE MINIMIS INC.

ENVIRONMENTAL MANAGEMENT
34 N.W. FIRST AVENUE, SUITE 101
PORTLAND, OREGON 97209
(503) 295-4074

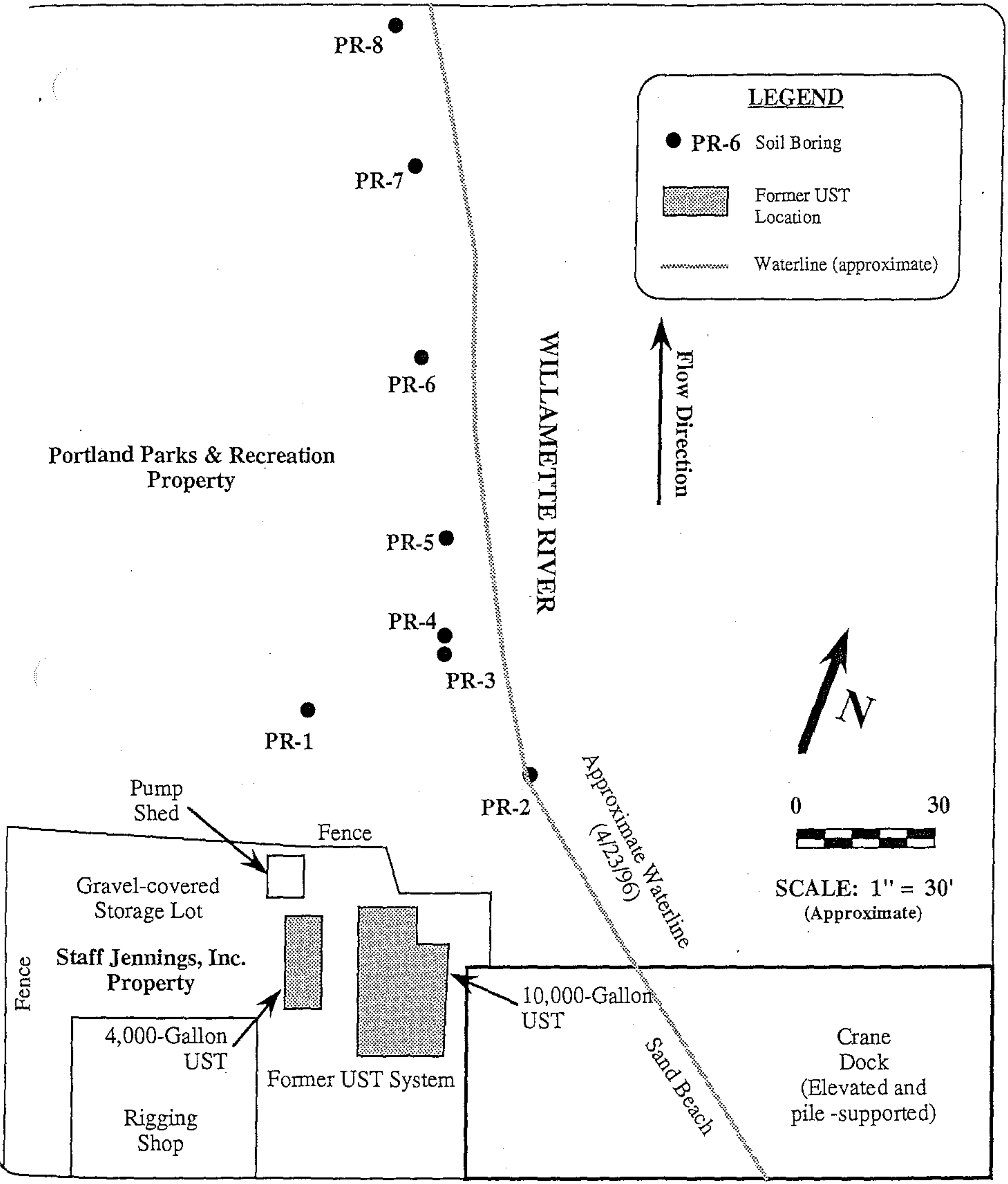
Site Location Map

Focused Soil and
Groundwater Investigation
Staff Jennings, Inc.
8240 SW Macadam Avenue
Portland, Oregon 97219

FIGURE

A

1



PROJECT NO.	DE MINIMIS INC.	Site Map	FIGURE
00357-0195	ENVIRONMENTAL MANAGEMENT 34 N.W. FIRST AVENUE, SUITE 101 PORTLAND, OREGON 97209 (503) 295-4074	Focused Soil and Groundwater Investigation Staff Jennings, Inc. 8240 SW Macadam Avenue Portland, Oregon 97219	2
April 23, 1996			

DRILLING LOG	De Minimis Inc. Environmental Management	Sheet: 1 of 1	PR-7

1. Project Name: Tax Lot 9, Undeveloped Property
City of Portland, Parks and Recreation

2. Location: 8100 Block of S.W. Macadam Avenue
Portland, OR 97219

3. Drilling Company: Geo-Tech Explorations, Inc.

4. Boring Number: PR-7 Start Card No.: N/A

5. GeoProbe Operator: Thomas C. Wilson/OWRD #10347

6. Direction of Boring
X Vertical Inclined ____________ Deg. from vert.

7. Thickness of Overburden: Topsoil

8. Total Depth of Boring: 8.0 feet

9. Size of Probe: 1.5-inch O.D. probe

10. Relative Datum Elevation: N/A

11. Manufacturer's Designation of Probe: GeoProbe Model 5400

12. Depth to Groundwater: N/A

13. Date Started: 4/23/96 Date Completed: 4/23/96

14. Well Casing Elevation: N/A

15. Project Manager/OWRD License: Dale L. Haar/#10343

16. Project Manager Signature:

Time	Depth (feet)	Sample Number/ Location	Material Classification and Description	USCS	PID (ppm)	SPT (Blows/6")	Soil Boring Construction	Remarks
1013	5	PR7-5 ☒ ▽*	Mottled, medium brown and medium gray, fine grain sand with micaceous silt (wet)	SM	N/A	N/A	▨	No visual or olfactory evidence of contamination.
	10		* Groundwater measured at 5.0 feet bgs at the time of drilling on 4/23/96. Groundwater sample PRW-7 was clear and colorless with light brown suspended silt. No visual or olfactory evidence of contamination was observed.					Soil boring filled with #8 bentonite chips to the surface and hydrated.
	15							

LEGEND

▨ Bentonite

E

DRILLING LOG	De Minimis Inc. Environmental Management	Sheet: 1 of 1	PR-8

1. Project Name: Tax Lot 9, Undeveloped Property
City of Portland, Parks and Recreation

2. Location: 8100 Block of S.W. Macadam Avenue
Portland, OR 97219

3. Drilling Company: Geo-Tech Explorations, Inc.

4. Boring Number: PR-8 Start Card No.: N/A

5. GeoProbe Operator: Thomas C. Wilson/OWRD #10347

6. Direction of Boring
X Vertical Inclined ____________ Deg. from vert.

7. Thickness of Overburden: Topsoil

8. Total Depth of Boring: 12.0 feet

9. Size of Probe: 1.5-inch O.D. probe

10. Relative Datum Elevation: N/A

11. Manufacturer's Designation of Probe: GeoProbe Model 5400

12. Depth to Groundwater: N/A

13. Date Started: 4/23/96 Date Completed: 4/23/96

14. Well Casing Elevation: N/A

15. Project Manager/OWRD License: Dale L. Haar/#10343

16. Project Manager Signature: Dale L

Time	Depth (feet)	Sample Number/ Location	Material Classification and Description	USCS	PID (ppm)	SPT (Blows/6")	Soil Boring Construction	Remarks
	5						▨	
1059		PR8-9 ∇* ☒	Medium brown, fine grain sand with micaceous silt (wet)	SM	N/A	N/A	▨	No visual or olfactory evidence of contamination. Soil boring filled with #8 bentonite chips to the surface and hydrated.
	10						▨	
	15		* Groundwater measured at 8.2 feet bgs at the time of drilling on 4/23/96. Groundwater sample PRW-8 was clear and colorless with light brown suspended silt. No visual or olfactory evidence of contamination was observed.					

LEGEND

▨ Bentonite

STATE OF OREGON
GEOTECHNICAL HOLE REPORT
(as required by OAR 690-240-035)

(1) OWNER/PROJECT: Hole Number PR-7

Name CITY OF PORTLAND PARKS

Address 1120 SW 5TH

City PORTLAND State OR Zip

(2) TYPE OF WORK

☒ New ☐ Deepening ☐ Alteration (repair/recondition) ☒ Abandonment

(3) CONSTRUCTION:

☐ Rotary Air ☐ Hand Auger ☐ Hollow Stem Auger

☐ Rotary Mud ☐ Cable Tool ☒ Push Probe ☐ Other

(4) TYPE OF HOLE:

☒ Uncased Temporary ☐ Cased Permanent

☐ Uncased Permanent ☐ Slope Stability ☐ Other

(5) USE OF HOLE: SOIL + WATER SAMPLE

(6) BORE HOLE CONSTRUCTION:

Special Construction approval ☐ Yes ☒ No Depth of Completed Hole 8 ft.

HOLE			SEAL			
Diameter	From	To	Material	From	To	Sacks or pounds
1"	0	8	BENT	0	8	2 LBS

Backfill placed from 0 ft. to 8 ft. Material BENT

Filter Pack placed from ___ ft. to ___ ft. Size of pack ___

(7) CASING/SCREEN:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Screen:	1"	4	8		☒	☐	☐	☐
					☐	☐	☐	☐

Slot size ___

(8) WELL TEST:

☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Permeability ___ Yield ___ GPM ___

Conductivity ___ PH ___

Temperature of water 51 [✓ F]/C Depth artesian flow found ___ ft.

Was water analysis done? ☐ Yes ☐ No

By whom? ___

Depth of strata analyzed. From ___ ft. to ___ ft.

Remarks:

(9) LOCATION OF HOLE by legal description:

County MULT Latitude ___ Longitude ___

Township 1 N or [✓ S] Range 1 [✓ E] or W. WM.

Section 22 SE 1/4 SE 1/4

Tax Lot ___ Lot ___ Block ___ Subdivision ___

Street Address of Well (or nearest address) 8246 SW MACADAM PORTLAND

Map with location identified must be attached.

(10) STATIC WATER LEVEL:

5 ft. below land surface. Date 4-23-96

Artesian pressure ___ lb. per square inch. Date ___

(11) SUBSURFACE LOG:

Ground Elevation ___

Material Description	From	To	SWL
SILTS	0	8	5

Date Started 4-23-96 Date Completed 4-23-96

(12) ABANDONMENT LOG:

Material Description	From	To	Sacks or Pounds
#5 BENT	0	8	2 LBS

Date started 4-23-96 Date Completed 4-23-96

Professional Certification

(to be signed by a licensed water supply or monitoring well constructor, or registered geologist or civil engineer).

I accept responsibility for the construction, alteration, or abandonment work performed on during the construction dates reported above. All work performed during this time is in compliance with Oregon geotechnical hole construction standards. This report is true to the best of my knowledge and belief.

License or Registration Number 10347

Signed Thomas C. [illegible] Date 5-7-96

Affiliation GEO-TECH

THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK

ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER

STATE OF OREGON
GEOTECHNICAL HOLE REPORT
(as required by OAR 690-240-035)

(1) OWNER/PROJECT: Hole Number PR-8
Name CITY OF PORTLAND PARKS
Address 1120 SW 5TH
City PORTLAND State OR Zip

(2) TYPE OF WORK
☒ New ☐ Deepening ☐ Alteration (repair/recondition) ☒ Abandonment

(3) CONSTRUCTION:
☐ Rotary Air ☐ Hand Auger ☐ Hollow Stem Auger
☐ Rotary Mud ☐ Cable Tool ☒ Push Probe ☐ Other

(4) TYPE OF HOLE:
☒ Uncased Temporary ☐ Cased Permanent
☐ Uncased Permanent ☐ Slope Stability ☐ Other

(5) USE OF HOLE: SOIL + WATER SAMPLE

(6) BORE HOLE CONSTRUCTION:
Special Construction approval ☐ Yes ☒ No Depth of Completed Hole 12 ft.

HOLE			SEAL			
Diameter	From	To	Material	From	To	Sacks or pounds
1"	0	12	BENT	0	12	4 LBS

Backfill placed from 0 ft. to 12 ft. Material BENT
Filter Pack placed from ft. to ft. Size of pack

(7) CASING/SCREEN:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Screen:	1"	8	12		☒	☐	☐	☐
					☐	☐	☐	☐

Slot size

(8) WELL TEST:
☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian
Permeability Yield GPM
Conductivity PH
Temperature of water 52 [✓ F]C Depth artesian flow found ft.
Was water analysis done? ☐ Yes ☐ No
By whom?
Depth of strata analyzed. From ft. to ft.
Remarks:

(9) LOCATION OF HOLE by legal description:
County MULT Latitude Longitude
Township 1 N or [✓ S] Range 1 [✓ E] or W. WM.
Section 22 SE 1/4 SE 1/4
Tax Lot Lot Block Subdivision
Street Address of Well (or nearest address) 8240 SW MACADAM, PORTLAND

Map with location identified must be attached

(10) STATIC WATER LEVEL:
8.2' ft. below land surface. Date 4-23-96
Artesian pressure lb. per square inch. Date

(11) SUBSURFACE LOG:
Ground Elevation

Material Description	From	To	SWL
SILTS	0	12	8.2'

Date Started 4-23-96 Date Completed 4-23-96

(12) ABANDONMENT LOG:

Material Description	From	To	Sacks or Pounds
#8 BENT	0	12	4 LBS

Date started 4-23-96 Date Completed 4-23-96

Professional Certification
(to be signed by a licensed water supply or monitoring well constructor, or registered geologist or civil engineer).

I accept responsibility for the construction, alteration, or abandonment work performed on during the construction dates reported above. All work performed during this time is in compliance with Oregon geotechnical hole construction standards. This report is true to the best of my knowledge and belief.

License or Registration Number 10347
Signed Date 5-7-96
Affiliation GEO-TECH

THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK

ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER

NET
NATIONAL ENVIRONMENTAL TESTING, INC.

Portland Division
17400 SW Upper Boones Ferry Rd.
Suite #260
Portland, OR 97224
Tel: (503) 624-5449
Fax: (503) 639-6889

Dale Haar
De Minimis, Inc.
34 NW 1st Ave., Suite 101
Portland, OR 97209

Date: 04/29/1996
NET Account No.: 8200
NET Job Number: 96.01125

Project: SJM
Location: SJM

Sample analysis in support of the project referenced above has been completed and results are presented on the following pages. Should you have questions regarding procedures or results, please feel welcome to contact Client Services.

Sample Number	Sample Description	Matrix Type	Date Taken	Date Received
62698	PR7-5 - HOLD	SOIL	04/23/1996	04/23/1996
62699	PR8-9 - HOLD	SOIL	04/23/1996	04/23/1996
62700	PRW-7	Water	04/23/1996	04/23/1996
62701	PRW-8	Water	04/23/1996	04/23/1996

Approved by:

Marty French
NET, INC. Division Manager

Lab

ANALYTICAL REPORT

Dale Haar
De Minimis, Inc.
34 NW 1st Ave., Suite 101
Portland, OR 97209

04/29/1996
Job No.: 96.01125

Project Name: SJM
Date Received: 04/23/1996

Sample Number	Sample Description
62700	PRW-7

PARAMETERS	METHODS	RESULTS	REPORT LIMIT	UNITS	DATE ANALYZED	FLAG
BTEX (W)						
Dilution Factor	8020	1			04/24/1996	
Benzene	8020	ND	0.5	ug/L	04/24/1996	
Toluene	8020	1.1	0.5	ug/L	04/24/1996	
Ethyl Benzene	8020	ND	0.5	ug/L	04/24/1996	
Xylenes, total	8020	ND	0.5	ug/L	04/24/1996	
PAH BY GC/MS SIM PREP		-			04/26/1996	
PAH BY GC/MS SIM (W)						
Dilution Factor	8270M	1			04/26/1996	
Naphthalene	8270M	ND	0.1	ug/L	04/26/1996	
Acenapthylene	8270M	0.20	0.1	ug/L	04/26/1996	
Acenaphthene	8270M	ND	0.1	ug/L	04/26/1996	
Fluorene	8270M	ND	0.1	ug/L	04/26/1996	
Phenanthrene	8270M	ND	0.1	ug/L	04/26/1996	
Anthracene	8270M	ND	0.1	ug/L	04/26/1996	
Fluoranthene	8270M	0.12	0.1	ug/L	04/26/1996	
Pyrene	8270M	0.16	0.1	ug/L	04/26/1996	
Benzo(a)anthracene	8270M	ND	0.1	ug/L	04/26/1996	
Chrysene	8270M	ND	0.1	ug/L	04/26/1996	
Benzo(b)fluoranthene	8270M	0.14	0.1	ug/L	04/26/1996	
Benzo(k)fluoranthene	8270M	ND	0.1	ug/L	04/26/1996	
Benzo(a)pyrene	8270M	0.15	0.1	ug/L	04/26/1996	
Indeno(1,2,3-cd)pyrene	8270M	0.18	0.1	ug/L	04/26/1996	
Dibenzo(a,h)anthracene	8270M	ND	0.1	ug/L	04/26/1996	
Benzo(g,h,i)perylene	8270M	0.33	0.1	ug/L	04/26/1996	

Sample Number	Sample Description
62701	PRW-8

PARAMETERS	METHODS	RESULTS	REPORT LIMIT	UNITS	DATE ANALYZED	FLAG
BTEX (W)						
Dilution Factor	8020	1			04/24/1996	

A sample result of ND indicates the parameter was Not Detected at the reporting limit.

ANALYTICAL REPORT

Dale Haar
De Minimis, Inc.
34 NW 1st Ave., Suite 101
Portland, OR 97209

04/29/1996
Job No.: 96.01125

Project Name: SJM
Date Received: 04/23/1996

Sample Number	Sample Description
62701	PRW-8

PARAMETERS	METHODS	RESULTS	REPORT LIMIT	UNITS	DATE ANALYZED	FLAG
Benzene	8020	ND	0.5	ug/L	04/24/1996	
Toluene	8020	1.4	0.5	ug/L	04/24/1996	
Ethyl Benzene	8020	ND	0.5	ug/L	04/24/1996	
Xylenes, total	8020	ND	0.5	ug/L	04/24/1996	
PAH BY GC/MS SIM PREP		-			04/26/1996	
PAH BY GC/MS SIM (W)						
Dilution Factor	8270M	1			04/26/1996	
Naphthalene	8270M	ND	0.1	ug/L	04/26/1996	
Acenapthylene	8270M	ND	0.1	ug/L	04/26/1996	
Acenaphthene	8270M	ND	0.1	ug/L	04/26/1996	
Fluorene	8270M	ND	0.1	ug/L	04/26/1996	
Phenanthrene	8270M	ND	0.1	ug/L	04/26/1996	
Anthracene	8270M	ND	0.1	ug/L	04/26/1996	
Fluoranthene	8270M	ND	0.1	ug/L	04/26/1996	
Pyrene	8270M	ND	0.1	ug/L	04/26/1996	
Benzo(a)anthracene	8270M	ND	0.1	ug/L	04/26/1996	
Chrysene	8270M	ND	0.1	ug/L	04/26/1996	
Benzo(b)fluoranthene	8270M	ND	0.1	ug/L	04/26/1996	
Benzo(k)fluoranthene	8270M	ND	0.1	ug/L	04/26/1996	
Benzo(a)pyrene	8270M	ND	0.1	ug/L	04/26/1996	
Indeno(1,2,3-cd)pyrene	8270M	ND	0.1	ug/L	04/26/1996	
Dibenzo(a,h)anthracene	8270M	ND	0.1	ug/L	04/26/1996	
Benzo(g,h,i)perylene	8270M	ND	0.1	ug/L	04/26/1996	

A sample result of ND indicates the parameter was Not Detected at the reporting limit.

SURROGATE REPORT

Dale Haar
De Minimis, Inc.
34 NW 1st Ave., Suite 101
Portland, OR 97209

04/29/1996
Job No.: 96.01125

Project Name: SJM
Date Received: 04/23/1996

SURROGATES	METHODS	RESULTS		DATE ANALYZED	FLAG
Sample Number 62700	Sample Description PRW-7				
aaa-TFT (Surr.)	8020	94	%	04/24/1996	
Nitrobenzene-d5 (Surr.)	8270M	74	%	04/26/1996	
2-Fluorobiphenyl (Surr.)	8270M	70	%	04/26/1996	
Terphenyl-d14 (Surr.)	8270M	55	%	04/26/1996	
Sample Number 62701	Sample Description PRW-8				
aaa-TFT (Surr.)	8020	99	%	04/24/1996	
Nitrobenzene-d5 (Surr.)	8270M	38	%	04/26/1996	
2-Fluorobiphenyl (Surr.)	8270M	41	%	04/26/1996	SR
Terphenyl-d14 (Surr.)	8270M	60	%	04/26/1996	

QUALITY CONTROL REPORT
CONTINUING CALIBRATION VERIFICATION

De Minimis, Inc.
34 NW 1st Ave., Suite 101
Portland, OR 97209

Date: 04/29/1996

NET Job Number: 96.01125

Contact: Dale Haar
Project: SJM

Analyte	CCV True Concentration	Concentration Found	Percent Recovery	Date Analyzed
BTEX (W)				
Benzene	20.0	18.8	94.0	04/24/1996
Toluene	20.0	19.6	98.0	04/24/1996
PAH BY GC/MS SIM (W)				
Naphthalene	1.0	0.99	99.0	04/26/1996
Acenapthylene	1.0	0.88	88.0	04/26/1996
Acenaphthene	1.0	1.0	100.0	04/26/1996
Fluorene	1.0	1.0	100.0	04/26/1996
Phenanthrene	1.0	1.1	110.0	04/26/1996
Anthracene	1.0	1.1	110.0	04/26/1996
Fluoranthene	1.0	1.1	110.0	04/26/1996
Pyrene	1.0	1.0	100.0	04/26/1996
Benzo(a)anthracene	1.0	1.0	100.0	04/26/1996
Chrysene	1.0	1.1	110.0	04/26/1996
Benzo(b)fluoranthene	1.0	0.74	74.0	04/26/1996
Benzo(k)fluoranthene	1.0	0.73	73.0	04/26/1996
Benzo(a)pyrene	1.0	0.73	73.0	04/26/1996
Indeno(1,2,3-cd)pyrene	1.0	0.75	75.0	04/26/1996
Dibenzo(a,h)anthracene	1.0	0.72	72.0	04/26/1996
Benzo(g,h,i)perylene	1.0	0.78	78.0	04/26/1996

CCV - Continuing Calibration Verification

Note: Recovery limits for 8240, 8260, 8270, 8010, 8020, 624, 625 specified in method.
Gasoline, Diesel, 418.1, 418.1M limits 80-120%. Metals recovery limits 80-120%.

QUALITY CONTROL REPORT
LABORATORY CONTROL STANDARD

De Minimis, Inc.
34 NW 1st Ave., Suite 101
Portland, OR 97209

Date: 04/29/1996

NET Job Number: 96.01125

Contact: Dale Haar
Project: SJM

Analyte	LCS True Concentration	Concentration Found	LCS % Recovery	Date Analyzed
BTEX (W)				
Benzene	12.7	13.4	105.5	04/24/1996
Toluene	38.4	41.2	107.3	04/24/1996
BTEX (W)				
Benzene	12.7	11.7	92.1	04/24/1996
Toluene	38.4	36.9	96.1	04/24/1996
PAH BY GC/MS SIM (W)				
Naphthalene	1.0	0.80	80.0	04/16/1996
Acenapthylene	1.0	0.79	79.0	04/16/1996
Acenaphthene	1.0	0.74	74.0	04/16/1996
Fluorene	1.0	0.77	77.0	04/16/1996
Phenanthrene	1.0	0.77	77.0	04/16/1996
Anthracene	1.0	0.72	72.0	04/16/1996
Fluoranthene	1.0	0.76	76.0	04/16/1996
Pyrene	1.0	0.82	82.0	04/16/1996
Benzo(a)anthracene	1.0	0.79	79.0	04/16/1996
Chrysene	1.0	0.77	77.0	04/16/1996
Benzo(b)fluoranthene	1.0	0.74	74.0	04/16/1996
Benzo(k)fluoranthene	1.0	0.76	76.0	04/16/1996
Benzo(a)pyrene	1.0	0.74	74.0	04/16/1996
Indeno(1,2,3-cd)pyrene	1.0	0.70	70.0	04/16/1996
Dibenzo(a,h)anthracene	1.0	0.73	73.0	04/16/1996
Benzo(g,h,i)perylene	1.0	0.72	72.0	04/16/1996
PAH BY GC/MS SIM (W)				
Naphthalene	1.0	0.73	73.0	04/16/1996
Acenapthylene	1.0	0.77	77.0	04/16/1996
Acenaphthene	1.0	0.71	71.0	04/16/1996
Fluorene	1.0	0.75	75.0	04/16/1996
Phenanthrene	1.0	0.74	74.0	04/16/1996
Anthracene	1.0	0.70	70.0	04/16/1996

LCS - Laboratory Control Standard

Note: Recovery limits for fuels 80-120%. 8010, 8020, 8240, 8260, 8270, 624, 625 specified in method.
Recovery limits for metals analyses 80-120%. 418.1 limits are 90-140%.

QUALITY CONTROL REPORT
LABORATORY CONTROL STANDARD

De Minimis, Inc.
34 NW 1st Ave., Suite 101
Portland, OR 97209

Date: 04/29/1996

NET Job Number: 96.01125

Contact: Dale Haar
Project: SJM

Analyte	LCS True Concentration	Concentration Found	LCS % Recovery	Date Analyzed
Fluoranthene	1.0	0.73	73.0	04/16/1996
Pyrene	1.0	0.79	79.0	04/16/1996
Benzo(a)anthracene	1.0	0.77	77.0	04/16/1996
Chrysene	1.0	0.77	77.0	04/16/1996
Benzo(b)fluoranthene	1.0	0.72	72.0	04/16/1996
Benzo(k)fluoranthene	1.0	0.75	75.0	04/16/1996
Benzo(a)pyrene	1.0	0.72	72.0	04/16/1996
Indeno(1,2,3-cd)pyrene	1.0	0.70	70.0	04/16/1996
Dibenzo(a,h)anthracene	1.0	0.73	73.0	04/16/1996
Benzo(g,h,i)perylene	1.0	0.72	72.0	04/16/1996

LCS - Laboratory Control Standard

Note: Recovery limits for fuels 80-120%. 8010, 8020, 8240, 8260, 8270, 624, 625 specified in method.
Recovery limits for metals analyses 80-120%. 418.1 limits are 90-140%.

QUALITY CONTROL REPORT
MATRIX SPIKE/MATRIX SPIKE DUPLICATE

De Minimis, Inc.
34 NW 1st Ave., Suite 101
Portland, OR 97209

Date: 04/29/1996

Job Number: 96.01125

Contact: Dale Haar
Project: SJM

Analyte	Matrix Spike Result	Sample Result	Spike Amount	Units	Percent Recovery	MSD Result	MSD Spike Amount	Units	Percent Recovery	MS/MSD RPD
BTEX (W)										
Benzene	1215	ND	1270	ug/L	95.7	1282	1270	ug/L	100.9	5.2
Toluene	3759	ND	3840	ug/L	97.9	3824	3840	ug/L	99.6	1.7

NOTE: Matrix Spike Samples may not be samples from this job.

MS = Matrix Spike
MSD = Matrix Spike Duplicate
RPD = Relative Percent Difference
dil.= Diluted Out

QUALITY CONTROL REPORT
BLANKS

De Minimis, Inc.
34 NW 1st Ave., Suite 101
Portland, OR 97209

Date: 04/29/1996
NET Job Number: 96.01125

Contact: Dale Haar
Project: SJM
Location: SJM

Analyte	Blank Analysis	MDL	Units	Date Analyzed
BTEX (W)				
Dilution Factor	1			04/24/1996
Benzene	ND	0.5	ug/L	04/24/1996
Toluene	ND	0.5	ug/L	04/24/1996
Ethyl Benzene	ND	0.5	ug/L	04/24/1996
Xylenes, total	ND	0.5	ug/L	04/24/1996
aaa-TFT (Surr.)	97		%	04/24/1996
PAH BY GC/MS SIM (W)				
Naphthalene	ND	0.1	ug/L	04/16/1996
Acenapthylene	ND	0.1	ug/L	04/16/1996
Acenaphthene	ND	0.1	ug/L	04/16/1996
Fluorene	ND	0.1	ug/L	04/16/1996
Phenanthrene	ND	0.1	ug/L	04/16/1996
Anthracene	ND	0.1	ug/L	04/16/1996
Fluoranthene	ND	0.1	ug/L	04/16/1996
Pyrene	ND	0.1	ug/L	04/16/1996
Benzo(a)anthracene	ND	0.1	ug/L	04/16/1996
Chrysene	ND	0.1	ug/L	04/16/1996
Benzo(b)fluoranthene	ND	0.1	ug/L	04/16/1996
Benzo(k)fluoranthene	ND	0.1	ug/L	04/16/1996
Benzo(a)pyrene	ND	0.1	ug/L	04/16/1996
Indeno(1,2,3-cd)pyrene	ND	0.1	ug/L	04/16/1996
Dibenzo(a,h)anthracene	ND	0.1	ug/L	04/16/1996
Benzo(g,h,i)perylene	ND	0.1	ug/L	04/16/1996
Nitrobenzene-d5 (Surr.)	52		%	04/16/1996
2-Fluorobiphenyl (Surr.)	68		%	04/16/1996

Advisory Control Limits for Blanks:
Metals/Wet Chemistry/ Conventionals/GC - all compounds should be less than the Reporting Limit.
GC/MS - Semi-Volatiles - all compounds should be less than the Reporting Limit except for phthalates which should be less than 5 times the reporting limit.

QUALITY CONTROL REPORT
BLANKS

De Minimis, Inc.
34 NW 1st Ave., Suite 101
Portland, OR 97209

Date: 04/29/1996
NET Job Number: 96.01125

Contact: Dale Haar
Project: SJM
Location: SJM

Analyte	Blank Analysis	MDL	Units	Date Analyzed
Terphenyl-d14 (Surr.)	95		%	04/16/1996
PAH BY GC/MS SIM (W)				
Naphthalene	ND	0.1	ug/L	04/26/1996
Acenapthylene	ND	0.1	ug/L	04/26/1996
Acenaphthene	ND	0.1	ug/L	04/26/1996
Fluorene	ND	0.1	ug/L	04/26/1996
Phenanthrene	ND	0.1	ug/L	04/26/1996
Anthracene	ND	0.1	ug/L	04/26/1996
Fluoranthene	ND	0.1	ug/L	04/26/1996
Pyrene	ND	0.1	ug/L	04/26/1996
Benzo(a)anthracene	ND	0.1	ug/L	04/26/1996
Chrysene	ND	0.1	ug/L	04/26/1996
Benzo(b)fluoranthene	ND	0.1	ug/L	04/26/1996
Benzo(k)fluoranthene	ND	0.1	ug/L	04/26/1996
Benzo(a)pyrene	ND	0.1	ug/L	04/26/1996
Indeno(1,2,3-cd)pyrene	ND	0.1	ug/L	04/26/1996
Dibenzo(a,h)anthracene	ND	0.1	ug/L	04/26/1996
Benzo(g,h,i)perylene	ND	0.1	ug/L	04/26/1996
Nitrobenzene-d5 (Surr.)	61		%	04/26/1996
2-Fluorobiphenyl (Surr.)	69		%	04/26/1996
Terphenyl-d14 (Surr.)	85		%	04/26/1996

Advisory Control Limits for Blanks:
Metals/Wet Chemistry/ Conventionals/GC - all compounds should be less than the Reporting Limit.
GC/MS - Semi-Volatiles - all compounds should be less than the Reporting Limit except for phthalates which should be less than 5 times the reporting limit.

A	This sample does not have a typical gasoline pattern.
B1	This sample does not have a typical diesel pattern.
B	The blank exhibited a positive result greater than the reporting limit for this compound.
C	The sample appears to contain a lighter hydrocarbon than gasoline.
D	The sample appears to extend to a heavier hydrocarbon range than gasoline.
E	The sample appears to extend to a lighter hydrocarbon range than diesel.
F	The sample appears to extend to a heavier hydrocarbon range than diesel.
G	The positive result for gasoline is due to single component comtamination.
H	The gasoline elution pattern for the sample is not typical.
I	The oil pattern for this sample is not typical.
J	The result for this compound is an estimated concentration.
L	The LCS recovery exceeded control limits. See the LCS page of this report.
M	MS and/or MSD percent recovery exceeds control limits.
MR	The MS/MSD RPD is greater than 20%. The sample was re-extracted and re-analyzed with similar results. This is due to a matrix interference, likely a non-homogeneity of the sample.
P	A post digestion spike was analyzed, and recoveries are within control limits.
Q	Detection limits elevated due to sample matrix.
R	The duplicate RPD was greater than 20%. The sample was re-extracted and re-analyzed with similar results. This indicates a matrix interference in the sample, likely a non-homogeneity of the sample.
SR	Surrogate recovery outside control limits. See the surrogate page of the report.
W	The duplicate RPD was greater than 20%. Due to insufficient sample, re-analysis was not possible.
X	Sample was analyzed outside recommended holding times.
Y	The result for this parameter was greater than the TCLP regulatory limit.
Z	The pattern seen for the parameter being analyzed is not typical.

96-01125

NET NATIONAL ENVIRONMENTAL TESTING, INC.

CHAIN OF CUSTODY RECORD

COMPANY De Minimis Inc. (DMI)
ADDRESS 34 NW First Avenue, Suite 101, Portland OR 97209
PHONE 295-4074 FAX 295-0112
PROJECT NAME/LOCATION SJM
PROJECT NUMBER
PROJECT MANAGER Dale L. Haar

REPORT TO: Dale L. Haar
INVOICE TO: DMI
P.O. NO.
NET QUOTE NO.

SAMPLED BY
Dale L. Haar (DLH)
(PRINT NAME)
SIGNATURE Dale L H
(PRINT NAME)
SIGNATURE

DATE	TIME	SAMPLE ID/DESCRIPTION	MATRIX	GRAB	COMP	# and Type of Containers					ANALYSES										COMMENTS
						HCl	NaOH	HNO_3	H_2SO_4	OTHER	BTEX	PAH 8270M									
4-23-96	1013	PR7-5	S	X						1											Archive
	1059	PR8-9	S	X						1											Archive
	1031	PRW-7	W	X		3			[illegible]	1	X	X									
↓	1122	PRW-8	W	X		3				1	X	X									

To assist us in selecting the proper method

Is this work being conducted for regulatory compliance monitoring? Yes ✓ No ____

Is this work being conducted for regulatory enforcement action? Yes ____ No ✓

Which regulations apply: RCRA ____ NPDES Wastewater ____
OR UST ✓ Drinking Water ____
Other ____ None ____

CONDITION OF SAMPLE: BOTTLES INTACT? [✓ YES] / NO
FIELD FILTERED? YES / [✓ NO]
COC SEALS PRESENT AND INTACT? YES / NO N/A.
VOLATILES FREE OF HEADSPACE? [✓ YES] / NO
TEMPERATURE UPON RECEIPT: 4 °C
Bottles supplied by NET? [✓ YES] / NO

SAMPLE REMAINDER DISPOSAL: RETURN SAMPLE REMAINDER TO CLIENT VIA
I REQUEST NET TO DISPOSE OF ALL SAMPLE REMAINDERS Dale L H DATE 4-23-96

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	RELINQUISHED BY:	DATE	TIME	RECEIVED FOR NET BY:
Dale L H	4-23-96	1725			4/23/96	1725	

METHOD OF SHIPMENT

REMARKS:

State of Oregon
Department of Environmental Quality

Memorandum

Date: March 4, 1999

To: Environmental Quality Commission

From: Langdon Marsh, Director Lang Marsh

Subject: Agenda Item H, Petition for Rulemaking to Regulate Recreational 2-Stroke Marine Engines, EQC Meeting: March 19, 1999

Background

The petitioner is requesting that the Department amend its rules to:
1) phase out the use of existing 2-stroke marine engines in environmentally sensitive waterways and sources of drinking water within a few years and to comprise less than 5% of all engines in marine engines within 10 years; and
2) create fairness in new engine emission control standards between automobiles and recreational marine craft within 20 years.

The petitioner cites studies that show over 4 million gallons of unburned gasoline and oil are discharged in State waters per year. Over 540,000 gallons of this amount are discharged on the lower Willamette River.

Authority of the Commission with Respect to the Issue

Under ORS 183.390, an interested person may petition an agency to adopt or amend a rule. The rules governing submission, consideration and disposition of the petition are set forth in the Attorney General's Uniform Rule 137-001-0070. Oral presentations by other affected parties are within the Commission's discretion.

Alternatives and Evaluation

The Commission must either deny the petition in writing or initiate rulemaking within 30 days of submission. If the Commission decides not to adopt the rule exactly as proposed, it may nonetheless grant the petition and begin rulemaking.

Conclusions

The Department shares the petitioner's concerns over the potential for 2-stroke marine engines to pollute both air and water resources. Although the petition requests that rules be drafted under the Department's authority under its water statutes, these engines also contribute significantly to air pollution.

In 1996 EPA finalized national requirements for marine engine manufacturers which require increasingly stringent emission requirements. The phase in of these requirements occurs until the year 2006. At that time VOC emissions from new engines will be reduced by 75 percent.

The petitioner is concerned that this phase out will occur too slowly due to the life span of the current 2-stroke engines. Furthermore, while the new fuel injected 2-stroke engines required under the regulations would reduce the emissions by 75%, current 4-stroke engines emit 95% less.

Under the Clean Air Act, states have the option of adopting the more stringent California rules regarding marine engines. The California regulations would require manufacturers to meet EPA's 2006 limits in 2001. A further reduction of 20% must occur prior to 2004 and a final reduction of 65% from the 2006 limit by the year 2008. It is unclear at this time whether these requirements will cause the disappearance of 2-stroke engines.

The petitioner has requested the Department to adopt regulations under its water pollution statutory authority. In particular they have requested that either the Department should be able to prohibit 2-stroke engines under ORS 468B.305 or at least, require a permit under ORS 468B.050.

The Department does not believe that it can, under the current regulatory scheme, require a permit for marine outboard motors. Under the NPDES program, a vessel or other floating craft is considered a point source, but any effluent from a 'properly functioning engine' is excluded from the permit requirement. Under the Department's regulations, a WPCF permit could not be required since these permits only apply to discharges which are not to navigable waters of the State.

ORS 468B.305 prohibits the entrance of oil into the waters of the state from 'floating craft of any kind.' To apply this provision to recreational marine engines, the Department would need to develop rules that outline what civil penalty would be appropriate for this type of violation. If the Department decided to do this, it would provide a 'grandfathering in' clause for those 2-stroke engines that have already been purchased.

The Department would prefer, if possible, to limit the use of 2-stroke engines on a geographic basis based on the sensitivity of the resource. This could be based on air quality concerns such as a maintenance area or water quality concerns such as a listing on the 303d list or a resident species is listed under the Endangered Species Act. Collaboration with the Oregon State Marine Board, Environmental Protection Agency and Oregon Department of Fish and Wildlife would be necessary before the Department can fully determine what approach is appropriate or possible.

Department Recommendation

It is recommended that the Commission deny the petition at this point in time. At the Commission's request, the Department's Pollution Prevention staff will conduct discussions with other affected agencies including the Oregon State Marine Board, Environmental Protection Agency and Oregon Department of Fish and Wildlife along with concerned citizens, to determine what can be done regarding this problem.

Attachments

Petition from Dan Pence, dated February 20, 1999

Report Prepared By: Susan M. Greco
Phone: (503) 229-5213

State of Oregon
Department of Environmental Quality
Received
FEB 24 1999

OFFICE OF THE DIRECTOR

Feb. 20, 1999
To: Oregon Environmental Quality Commission
C/O Susan Greco
DEQ rules coordinator

"Oregon law prohibits discharging pollution into Oregon waters without a DEQ permit"

From: Dan Pence,
SCOW, Skippers for Clean Oregon Waters

Dear Commissioners,

We, the undersigned, request that the Oregon Environmental Quality Commission review DEQ's Administrative Rules to determine if it is appropriate to regulate recreational 2-stroke marine engines under existing Oregon statutes prohibiting air and water pollution. This letter will attempt to describe the environmental impact of 2-stroke engines and the need for the State of Oregon to adopt strong goals to minimize this impact.

Each year in the State of Oregon, 75 % of the nearly 4 million annual boating "Activity days" employ 2-stroke engines and consume an average of 6.5 gallons of gasoline per day(State Marine Board). With a 2-stroke fuel discharge rate of 25 %(US EPA), this calculates out to <u>4,758,820</u> gallons of unburned gasoline and oil discharged into Oregon State waters per year(1996 survey). Or one and a half gallons of fuel dumped, per boat, per day of boating. Similar calculations for the Lower Willamette River show that every year over 540,000 gallons of unburned gasoline and oil is emitted by 2-stroke marine engines.

Consider the following:

- A 100 horsepower 2-cycle outboard motor emits <u>27 times</u> more hydrocarbon pollutants compared to a similar size 4-stroke outboard motor. Both types are currently available. (Source; Bluewater Network)

- A personal-water-craft operated for <u>seven hours</u> <u>equals</u> the smog-forming emissions of <u>100,000 miles</u> of a 1998 passenger car. (Calif. Air Resources Board)

- 2-stroke engines burn gasoline very inefficiently. As much as 30% of the gasoline is discharged unburned into the environment. (Calif. Air Resources Board)

- 2-stroke marine engines are being banned or phased out all over the world because of their high emissions of hydrocarbons, oxides of nitrogen, MTBE and other pollutants. (see: European Commission: Bodensee regulations, California State Bill AB 2439, and San Juan County, WA)

- 2-stroke engine emission studies show increased levels of mortality, cancer and mutations in salmon at levels below 1 ppm. Some compounds in gasoline may also bio-accumulate leading to higher concentrations of these toxins in birds and fish than found in the water. (Compilation of studies on file)

The lower Willamette and Columbia River ecosystems have Superfund Sites, CSO's, dams, loss of wetlands, urban run-off, farm run-off, and other stress factors. These areas also have the highest recreational boating activity in the State.

DEQ has an obligation to address this issue. In an era when virtually all sectors and activities in Oregon are making significant commitments to restoring the health of Oregon's air and water, often at great expense, dumping gasoline into the river should be illegal even when "laundered" through a 2-cycle engine.

The Oregon Revised Statutes compiled below should have applied to private boats discharging unburned gasoline and oil into Oregon waters when they were adopted back in 1972. Why weren't rules written then? Because back in the early 1970's boat emissions were a minor problem. Reality has changed:

- Total boat use in Oregon increased by 300% between 1972 and 1995
- A typical 2-stroke engines in the mid 1970's was 50 horsepower, today they average over 100 horsepower.
- The largest 2-stroke outboard in 1972 was; 120 horsepower, in 1999; 300 horsepower.
- Personal watercraft didn't exist in 1972.
- We didn't have the technology or the infrastructure(like unleaded fuel which allow catalytic convertors to operate) in 1972 to make ultra-clean burning marine engines.
- Since 1972 our society has demanded the clean-up of the most obvious sources of pollution with great success, leaving the remaining unregulated sources to comprise an ever larger share of overall emissions.

The US EPA has just begun an extremely weak 25 year phase-out of typical 2-stroke engines in favor of new fuel injected 2-strokes. These new engines are required to emit less than 25 % of current levels, which sounds significant, except that right now 4-stroke boat engines have emit 5 %, and autos have less than *5 tenths of a percent* the pollution of current 2-strokes.

The EPA's plan also fails to address the economic burden on consumers of cleaner burning engines; typical 2-strokes will remain on sale for 6 more years at lower cost than the new fuel injected 2-strokes, and the much more efficient 4-stroke engines will remain even more expensive than either 2-stroke option. Additionally, because of the rugged simplicity of the older 2-stroke design, boaters will have a strong economic incentive to keep using the older inefficient 2-stroke engines for many decades before they begin to wear out.

SCOW is proposing that the DEQ and it's Commission create rules that educate and encourage people to switch to cleaner burning marine engines and to require tougher emission standards for new marine engines sold in Oregon.

The goals of these new rules should be two-fold:

1. To phase out the use of existing 2-stroke engines in environmentally sensitive waterways and sources of drinking water within a few years, and to comprise less than 5 % of all engines on Oregon registered boats within 10 years.

2. To create fairness in new engine emission control standards between automobiles and recreational boats within 20 years. The technology that has lowered auto emissions 100 fold over the past 30 years can and should be applied to boat engines.

We ask that the DEQ work with us and other concerned Oregonians to write and implement rules to apply existing statutes to 2-stroke marine engines on recreational boats. SCOW has many suggestions for achieving the these goals and we look forward to working with the DEQ, the Commission and the Legislative Rules Committee.

Dan Pence, SCOW
pence@pacifier.com
7505 SE 36th Ave.
Portland OR 97202
(503)774-4207

Peter Wilcox, SCOW
2243 NE 20th Ave
Portland, OR 97212

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relevant 1997 Oregon Revised Statutes

relevant definitions; *"Oil", to include gasoline, diesel, etc.; "Ship", to include boat,...floating craft of any kind...*

468B.305 Entry of oil into waters of state prohibited; exceptions. (1) It shall be unlawful for oil to enter the waters of the state from any ship or any fixed or mobile facility or installation located offshore or onshore, whether publicly or privately operated, regardless of the cause of the entry or the fault of the person having control over the oil, or regardless of whether the entry is the result of intentional or negligent conduct, accident or other cause. Such entry constitutes pollution of the waters of the state.

ORS 468B.050 When permit required. (1) Except as provided in ORS 468B.053 or 468B.215, without first obtaining a permit from the Director of the Department of Environmental Quality, which permit shall specify applicable effluent limitations, no person shall:

(a) Discharge any wastes into the waters of the state from any industrial or commercial establishment or activity or any disposal system.

OAR 340-41-(basin)(2)(i): The creation of tastes or odors or toxic or other conditions that are deleterious to fish or other aquatic life or affect the potability of drinking water or the palatability of fish or shellfish shall not be allowed.

[Note] A rule which could apply to 2-stroke engines is *Oregon Administrative Rules 340-041-0442 section 2, letter p (A)* which reads in part; *toxic substances shall not be introduced above natural background levels...which may be harmful,... accumulate in sediment,... bioaccumulate in aquatic life, etc.* But this rule seems to hinge on the surface water standards in "Table 20". But, the surface water criteria in Table 20 are incredibly weak standards for hydrocarbon compounds* and contain no standards for Total Petroleum Hydrocarbon(TPH) content(which can be measured in the field). This table needs to be updated in light of recent fish studies and endangered species protection.

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* Example, fresh chronic criteria for Trichloroethylene(designated a "Priority pollutant" and "Carcinogen" in the table) is 21,900 mg/liter. To achieve this level in a large river would require a sample taken at the site of a recent tanker truck spill, according to a rep. for an oil test instrument company. Studies of salmon fry in laboratory testes have found increased fish mortality at levels below 1 mg/liter(Connell and Miller 1984).
DP

2-Stroke Engines Pollute 2-much!

Total Gasoline and oil released per year in Oregon by 2-Stroke boat engines calculation:

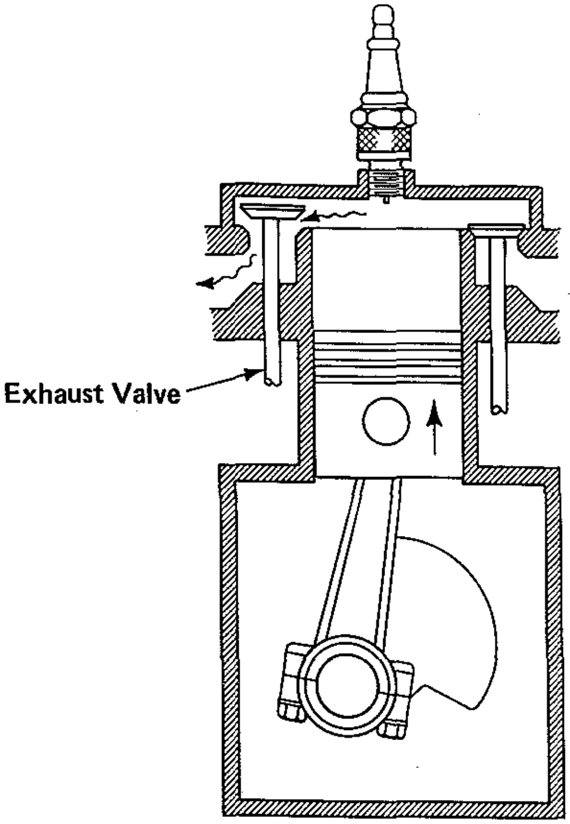
(total number of "activity days") X (percentage of boats with 2-Strokes) X (avg. gallons of fuel used per day) X (percent of fuel released by 2-Strokes into the environment)

(3,904,673 days) X (0.75) X (6.5 gallons) X (.25) =

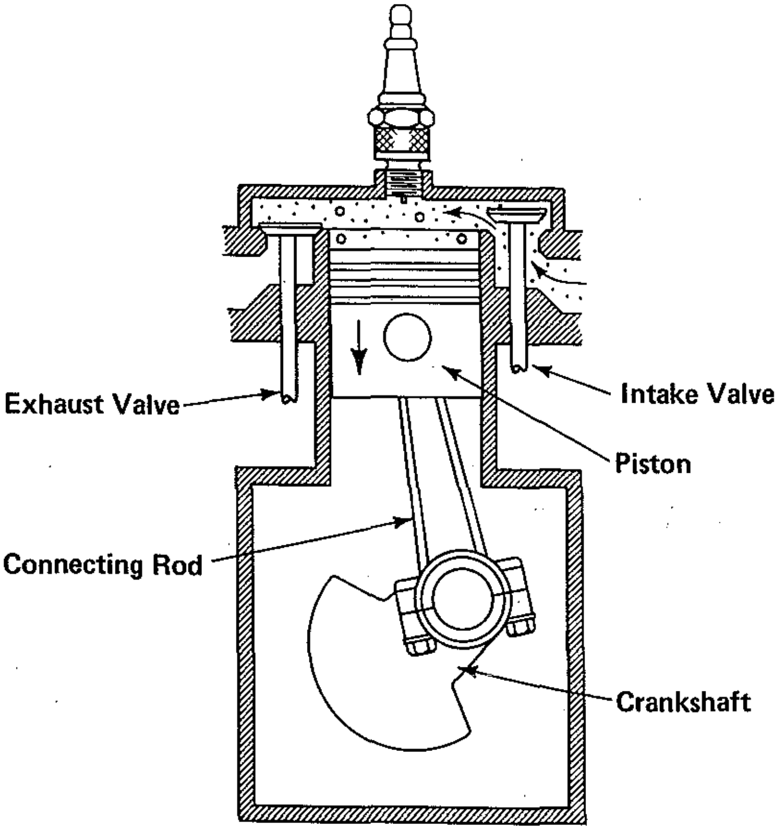
<u>4,758,820 gallons per year</u>

This calculation uses 1995 Marine Board data, but every year there are more and larger boats. If we don't do something to limit this source of pollution, this number could double in a few years.

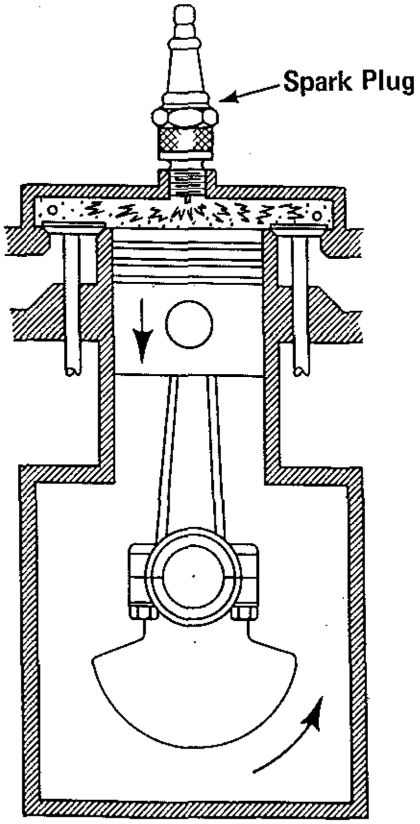
FOUR-STROKE CYCLE THEORY



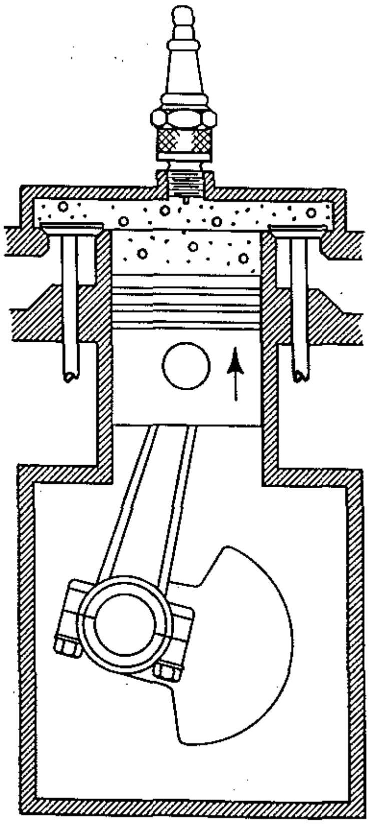
EXHAUST STROKE



INTAKE STROKE



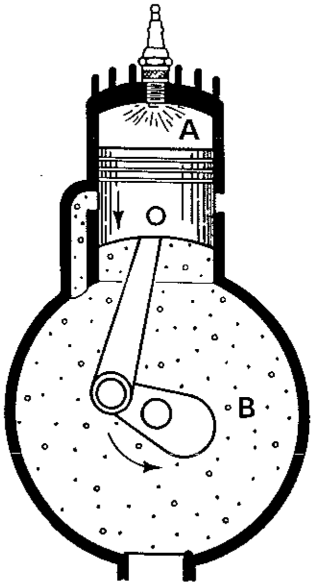
POWER STROKE



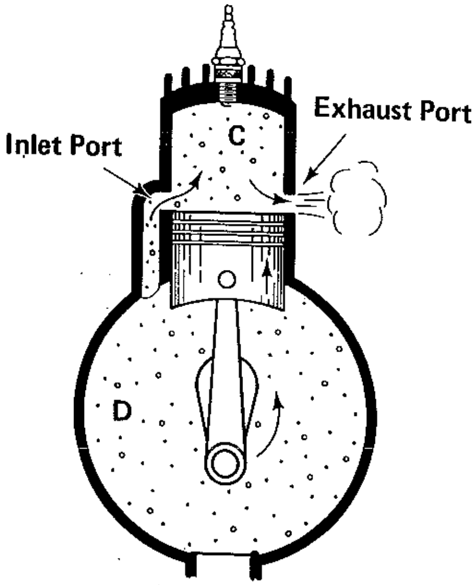
COMPRESSION STROKE

Chart 8

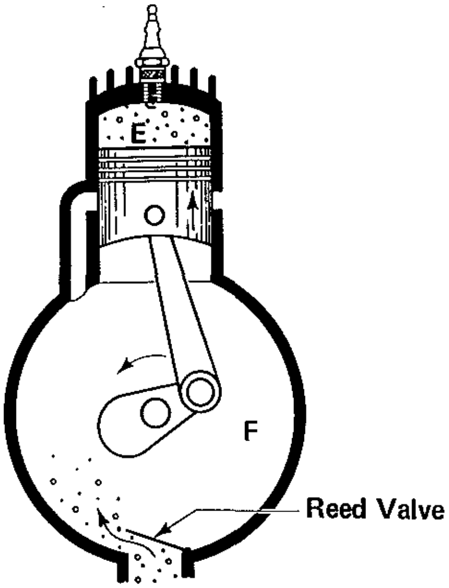
TWO-STROKE CYCLE THEORY



A. DOWN STROKE
(POWER)

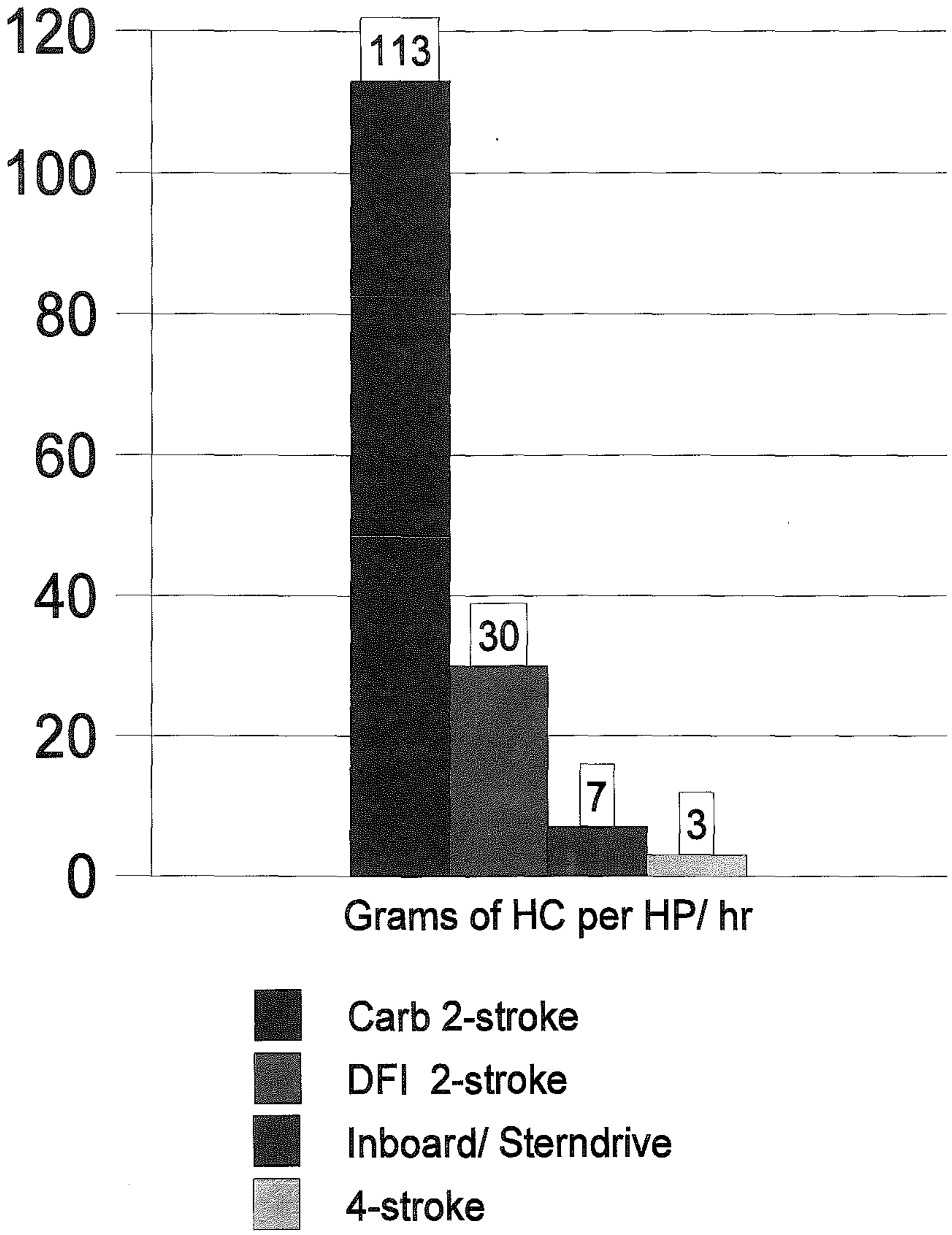


B. END OF DOWN STROKE
BEGINNING OF UP STROKE



C. UP STROKE (COMPRESSION)

MARINE ENGINE HYDROCARBON EMISSIONS



Oregon
John A. Kitzhaber, M.D., Governor

Department of Environmental Quality
811 SW Sixth Avenue
Portland, OR 97204-1390
(503) 229-5696
TDD (503) 229-6993

Memorandum

DATE: March 19, 1999
TO: Environmental Quality Commission
FROM: Langdon Marsh
RE: Director's Report

The New Carissa was the source of much activity within DEQ this month. As the State on Scene Coordinator for the incident, DEQ was responsible for working with the Coast Guard and the Responsible Party (a representative of the owners and insurers) to coordinate efforts for removal of the ship and cleanup activities related to the oil spill. Over 69 DEQ staff worked on the New Carissa—a total of 4,273 hours (18 staff worked on the incident when the ship ran aground again in Waldport—for a total of 513 additional hours). A summary of events is as follows:

On the morning of February 4, 1999, a 639-foot bulk freighter, the New Carissa, ran aground on the beach of the North Spit near Coos Bay, Oregon. She was empty of cargo, but carried 400,000 gallons of bunker fuel and diesel oil. A Unified Command representing the vessel and State and Federal agencies and interests was formed to handle the incident.

A severe storm prevented salvage efforts and weakened the vessel enough that it began leaking oil into the surf on February 8. Cleanup crews worked to recover the oil, mostly in the form of tar balls, as it came ashore. The structural integrity of the ship continued to deteriorate to the point that she clearly could never be refloated and was threatening to break up. To reduce the quantity of oil that would imminently be released, the Unified Command decided to conduct a controlled burn onboard the vessel. On February 11, the second attempt successfully ignited the heavy bunker fuel and over 200,000 gallons of oil was burned over the next three days.

The vessel was broken into two pieces by the energy of the sea during the burning, leaving the stern mired into the sand 300 yards out in the surf. More oil had spilled, and cleanup crews worked steadily on the beaches. Approximately 130,000 gallons of oil remained on the 440-foot bow section, which was found to be intact enough to float. It was determined that the least environmental threat would be to remove the bow section from the beach and sink it off shore with the oil on board. After a delay in preparations for towing allowed a non-productive effort to pump the thick oil from the bow section to tanks on the beach, the tug began pulling on February 26. After progressively better progress with each high-tide cycle, the bow section was finally free from the beach the night of March 1.

The bow section and tug encountered a severe storm, and the tow cable broke at about 5:00 PM on March 2, about 50 miles west of Coos Bay. The New Carissa was driven northwest by the storm, and was again beached about 7:30 AM March 3 near Waldport, Oregon. A limited amount of oil was released, with a response from cleanup crews along the Lincoln County shoreline.

The bow section was still viable structurally, and disposal at sea was still the preferred environmental option. At 3:16 AM on March 8, the bow section was again free of the sand and headed out to sea. Finally, at 3:52 PM on March 11 the New Carissa was sunk by the Navy in over 10,000 feet of water, 282.5 nautical miles offshore. Only a small release of oil occurred during sinking, as confirmed by a heavy sheen but no recoverable oil observed during an overflight the next morning.

Limited amounts of tarballs are still being cleaned up, and the final inspection of some beaches has begun. The impacts to wildlife and habitat are being pursued, both in immediate monitoring and rehabilitation efforts, and through long-term studies under the Natural Resource Damage Assessment and Restoration process.

Through a unified effort, wise decisions, and the cooperation of nature, over 80 percent of the oil that had threatened the shorelines of Oregon was successfully destroyed or isolated at sea. The impacts from the released oil are significant, but much more limited than was threatened when the New Carissa first came ashore

Ross Island Update: The recapping of the breached area was completed during the last week of February. This is the area previously used by the Port of Portland for the disposal of contaminated sediment, mined by Ross Island Sand and Gravel (RISG) last spring. Discussions regarding additional sampling and maintenance of the cap, pursuant to an Order on Consent, are ongoing. During the first week in March Ross Island Sand and Gravel was issued a 90 day "Special Conditions For Material Removal Permit" by the Division of State Lands. This permit allows RISG to continue their mining operations. On March 4th DEQ received the Draft "Site Investigation Work Plan for the Port of Portland Dredged Material Disposal, Ross Island Facility..." This work plan is currently under preliminary review. In addition, DEQ has received a proposal from RISG on how to integrate the Port's investigation with the other site investigation tasks RISG will be required to complete. Discussions on how to move this work forward in a timely, logical and efficient manner are under way. However, if RISG and the Port can't achieve agreement on how to jointly implement a thorough and credible investigation, by the end of March, it's likely that DEQ will implement an investigation on its own.

DEQ Hosts Annual Spring Pacific NW P2 Roundtable in Portland March 9-11 1999. DEQ hosted this year's spring P2 Roundtable for EPA Region10 partners who are interested in pollution prevention. The roundtable has been expanded to include providers of pollution prevention assistance, compliance assistance and industrial technical assistance (such as energy conservation).

McCormick & Baxter Update After three significant delays, the State of Oregon has signed a contract for Phase I soil cleanup at the McCormick & Baxter Creosoting Co. Superfund Site. The state's contractor, Wilder Construction Company, began work at the site, in late February. The work is expected to be completed by April 30, 1999.

Phase I soil cleanup includes demolition of all remaining above-ground structures, except for the former shop building, and excavation and off-site disposal of approximately 27,000 cubic yards of the most highly contaminated surface and near surface soil at the site. The former shop building will not be demolished at this time, since it is currently being used to house one of two groundwater treatment systems at the site.

Phase II soil cleanup, which will be completed as soon as possible, but no later than two years after the completion of Phase I, will consist of capping the entire 43-acre site with two-feet of clean soil. The site will be graded and seeded with native grasses.

20 distinct areas at the site are slated for soil excavation, during the Phase I cleanup. The excavations will vary in depth from a minimum of one foot to a maximum of four feet, depending upon the nature of the contamination in each area. The excavations will be expanded laterally, until contaminant concentrations in the excavation sidewalls are reduced to the "action levels" described in the Record of Decision (ROD) for the site. The ROD is the document signed by the U.S. Environmental Protection Agency (EPA) and the Oregon Department of Environmental Quality (DEQ), which formally documents the cleanup decisions for this site. Once these concentrations are attained, as determined by soil sampling, the excavations will be filled with

clean soil. These disturbed areas will be restored to existing grade and seeded with grass, as a temporary measure, prior to the implementation of Phase II cleanup.

Virtually all of the contaminated soil and wood debris that is characterized as "hazardous" under EPA's and DEQ's rules, will be removed from the site by rail car. Only non-hazardous building demolition, salvageable material such as steel railroad track, and a small amount of potentially hazardous soil located under the rail spur (which cannot be excavated until the track is removed) will be transported from the site by truck. Clean soil for filling the soil excavations will be delivered to the site by barge.

A second DEQ contractor, Ecology & Environment, Inc., (E&E) will be on-site full-time, to provide continuous oversight of the cleanup work. Among other things, E&E will conduct air quality monitoring, to assure that hazardous dust and fumes do not threaten nearby residences. In addition, E&E will conduct the soil sampling described above, to ensure that the cleanup work attains the goals set forth in the ROD.

Wilder Construction Co. will work Monday through Friday. In accordance with the contract, work can commence no earlier than 7:00 AM and must be completed no later than 7:00 PM. DEQ may authorize work on Saturday, to begin no earlier than 8:00 AM, if necessary to maintain the project schedule. The contract expressly prohibits any work on Sunday.

DEQ will conduct an informal public meeting in early March, once cleanup activities are underway. The purpose of the meeting will be to provide an opportunity for site neighbors and other interested parties to ask questions and express any concerns they may have about the cleanup work.

EPA Completes Cleanup of MLK Warehouse EPA's Superfund Response Team and contractors have completed cleanup of a North Portland warehouse after three months of intense effort. What began as a police response to a domestic dispute in October, 1988, escalated into a Portland Fire Bureau-Hazmat Team response due to a variety of hazardous chemicals and storage conditions; the Fire Bureau referred the site to DEQ. After a site inspection by Paul and Rebecca Christiansen of the NWR, EPA's highly capable team was invited to conduct the cleanup.

The warehouse was loaded with over 10,000 containers of chemicals, many unknown. Dust in the warehouse had high levels of cyanide, lead, and mercury. Ultimately, the EPA team disposed of over 6,000 containers of hazardous waste, 1,280 cubic yards of contaminated debris and 80 cubic yards of contaminated soil. The building was blasted with compressed air and some contaminated residue remains; however, the building no longer poses a threat to the community.

The cleanup process was extremely dangerous, as shock sensitive, explosive, corrosive, and highly toxic chemicals were extricated by hand from unstable debris piles. The EPA, contractor (Ecology and Environment, CET Environmental), and U.S. Coast Guard personnel who performed the cleanup were obviously highly trained and courageous.

The investigation concerning how the chemicals accumulated is still ongoing. Meanwhile, EPA has filed a lien on the property for their cleanup costs, which are currently estimated at $1.1 million. Occupancy of the building is still prohibited by the City of Portland due to building code violations.

Retiring...

Mike Eagan - WMC, 8 years
Larry Miller - NWR, 9 years
Jo Brooks - Public Affairs, 14 years
Marilyn Lindsay WR, 18 years
Mary Heath - WR, 19 years
Howard Harris - AQ, 20 years
Tom Lucas - HQ, 22 years
Dick Warkentin - Lab, 22 years
Larry Lemkau - ER, 25 years
Jim Vilendre - NWR, 31 years

Sequent Upgrade and Y2K Testing The Business Systems Development section is working with the Information Technology section and others around DEQ preparing to replace the main Sequent computer and upgrade the software that run on it. Some of the application software that we use now is obsolete, and some is not certified to work correctly for the year 2000.

Before putting new software into production, we will test our business applications to ensure they function properly. In addition, we will test them in a simulated post-2000 environment. We will ask one or more of each application's primary users to participate in testing.

Approved_____
Approved with Corrections__X__

Minutes are not final until approved by the EQC

Environmental Quality Commission
Minutes of the Two Hundred and Seventy-Fifth Meeting

March 19, 1999
Regular Meeting

On January 29, 1999, the Environmental Quality Commission met for their regular meeting at DEQ headquarters, 811 SW Sixth Avenue, Portland, Oregon 97204. The following Environmental Quality Commission members were present:

Carol Whipple, Chair
Melinda Eden, Vice Chair
Linda McMahan, Member
Tony Van Vliet, Member
Mark Reeve, Member

Also present were Larry Knudsen, Larry Edelman, and Michael Huston, Assistant Attorneys General, Oregon Department of Justice (DOJ); Langdon Marsh, Director, Department of Environmental Quality (DEQ); and other staff from DEQ.

Note: The Staff reports presented at this meeting, which contain the Department's recommendations, are on file in the Office of the Director, 811 SW Sixth Avenue, Portland, Oregon 97204. Written material submitted at this meeting is made a part of the record and is on file at the above address. These written materials are incorporated in the minutes of the meeting by reference.

Chair Whipple called the meeting to order at 8:40 a.m.

B. Approval of Tax Credits

Maggie Vandehey, Tax Credit Coordinator, presented this item.

Applications for Approval

5145 – Dean McKay Farms, Inc. and 5146 – Mark McKay Farms, Inc.

Commissioner ~~Reeve~~ *Eden* asked why the facility address for Dean McKay Farms, Inc. (#5145) and Mark McKay Farms, Inc. (#5146) were identical. Staff clarified that the McKay brothers each inherited equal halves of their father's farm and the address is the farm office address. The two tractors claimed on the respective applications are not one and the same.

5041 – HMT Technology Corporation

The Commission asked if the subtraction of HMT's ductwork from the eligible facility cost was consistent with the subtraction of Hyundai Semiconductor America, Inc.'s ductwork in December 1998. Staff stated the treatment of the HMT ductwork was consistent with the treatment of the Hyundai ductwork. The reviewer clarified that Hyundai claimed a greater portion of the ductwork as part of the pollution control system within their installation than HMT claimed.

Underground Storage Tank Reviews

The Commission asked how the reduced percentage for underground storage tanks (UST) was determined exemplifying application #5131. Staff explained the reduction in the percentage allocable to pollution control was determined factoring the 100% allocable components; the difference in the cost of the corrosion protected tank and piping system and an equivalent bare steel system as a percent of the protected system; and ninety percent of the cost of the tank-gauge system. Staff agreed to present this reduction in percentage in a manner similar to the field burning reviews in the future.

5053 - Wellons, Inc.
Questions regarding Wellons' ability to assume that their facility is principal purpose because they are meeting the requirements of Willamette Industries' ACDP were addressed. There are numerous examples to support this pr[illegible]on and the food processing industry was referenced. The Commission asked what components were claimed as p[illegible] of the air pollution control facility. Commissioner Van Vliet cautioned staff to carefully consider the inclusion of the multi-cone collector, and the conveyors and augers as this could expand the tax credit. Staff recommended postponing the approval of application #5053 until staff could modify the report and address the Commission's concerns.

Commissioner Van Vliet made a motion to approve the tax credit applications presented in Attachment B of Agenda Item B and its Addendum with the exception of application #5053 (Wellons, Inc.). Commissioner McMahan seconded the motion and it carried with five "yes" votes.

Application for Denial
Staff explained Freres Lumber Co., Inc., understood the basis of the denial of tax credit application #5119 and they did not indicate that they wished to address the Commission. Commissioner Reeve made a motion to deny the tax credit application presented in Attachment C of Agenda Item B. Commissioner Eden seconded the motion and it carried with five "yes" votes.

Commission Action by Application Number

				Commission Action		
App.No.	Applicant	Certified Cost	Percentage	Attachment B	Attachment C	Addendum
4751	PGE	$759,299	100%	Approve		
4881	PGE	$18,576	100%	Approve		
5041	HMT Technology Corp.	$1,072,469	100%			Approve
5042	HMT Technology Corp.	$5,613,466	100%			Approve
5046	Thomas Joseph, Inc.	$66,700	NA	Approve		
5053	Wellons, Inc.	$294,745	100%	Postponed		
5080	Morrow Co. Grain Growers	$33,014	100%	Approve		
5082	Morrow Co. Grain Growers	$29,697	100%	Approve		
5107	Russell Oil Company	$13,724	100%	Approve		
5108	Russell Oil Company	$5,300	100%	Approve		
5113	United Disposal Service Inc.	$42,213	100%	Approve		
5117	Capitol Rec. & Disposal, Inc.	$20,709	100%	Approve		
5119	Freres Lumber Co., Inc.	$27,962	100%		Deny	
5120	United Disposal Service Inc.	$8,814	100%	Approve		
5122	McKern's Texaco Food Mart	$92,423	94%	Approve		
5131	Carter's Service Stations, Inc.	$83,968	89%	Approve		
5145	Dean McKay Farms, Inc.	$136,817	75%	Approve		
5146	Mark McKay Farms, Inc.	$173,719	84%	Approve		

EQC Monitoring Authority
The EQC's Tax Credit Monitoring Authority was discussed. The Department of Justice indicated the Commission has the authority to provide some monitoring of certified facilities to determine if the facility is still operated in accordance with the terms of the certificate. In the simplest form an audit would consist of a letter requesting an affirmation that a certified facility is being operated in accordance with the conditions of certification. However, the tax credit program lacked resources to go into any greater detail. Director Marsh cautioned that any certificate audits could not be paid from general fund as that would impinge upon other Department programs. The Commission emphasized that any expense incurred performing a tax credit program audit function should be at the expense of tax credit beneficiaries. The Commission directed staff to develop a recommendation regarding an audit of certified facilities.

Jim Roys, Budget Manager, gave a legislative update on the bills pertaining to pollution control tax credits.

C. Action Item: National Marine Fisheries Request for a Waiver for Total Dissolved Gas for Fish Passage on the Mainstem of the Columbia River

Gene Foster, DEQ staff, Mark Schneider, National Marine Fisheries Service, and Margaret Filardo, the Fish Passage Center, presented this item. The National Marine Fisheries Service (NMFS) petitioned the Commission for a variance to the state's total dissolved gas standard to enable spill over McNary, John Day, The Dalles, and Bonneville Dams to assist juvenile outmigrating salmon and steelhead. The petition requested a waiver from the current total dissolved gas standard of 110% to 115% total dissolved gas as measured in the forebays of the dams and 120% in the tailraces of the dams. The waiver request was for the dates April 3, 1999, through August 31, 1999.

The Commissioners indicated they would like to receive information on the U.S. Army Corps of Engineers (USACE) Gas Abatement Program pinpointing the commitment from the USACE to NMFS to address total dissolved gas issues and the timetables for achieving the identified milestones. A condition was added to the Order that required NMFS to provide a report by February 27, 2000, on the status of the Columbia River Gas Abatement Program, USACE and NMFS commitments to the Gas Abatement Program, and the efforts to achieve the state water quality standard of 110%. The past year's research on total dissolved gas and the effects on migrating juvenile salmonids was also discussed.

Commissioner Van Vliet made a motion to *adopt the proposed findings to* support the waiver request with the conditions in appendix B. Commissioner Eden seconded the motion and it carried with five "yes" votes.

D. Rule Adoption: LRAPA Stationary Source (ACDP) Fee Increases and Asbestos Rule Amendments

Grecia Castro, operations Manager for Lane Regional Air Pollution Authority (LRAPA), and Dave Nordberg, DEQ staff, presented this item.

Commissioner Reeve noted that LRAPA's rules seem essentially the same as state rules and asked if there were ways in which LRAPA's rules were more stringent than the state measures. Grecia Castro indicated LRAPA's rules have a somewhat broader requirement for filing asbestos project notifications, and Dave Nordberg added that the regional authority mandates use of an asbestos removal "containment" in a circumstance where one is not specified under state provisions. The determination of any discrepancies between LRAPA and state provisions is done by staff who are experts in the area of the rules concerned, and are called to LRAPA's attention for correction as cited in the staff report attachments.

Commissioner Van Vliet moved that LRAPA's revised permit fees as a revision to the Oregon Clean Air Act State Implementation Plan (OAR 340-020-0047) be approved and to approve the revisions to LRAPA's asbestos regulations as proposed. Commissioner Reeve seconded the motion and it carried with five "yes" votes.

E. Rule Adoption: Amend OAR to Adopt New Land Disposal Restrictions (LDR) for Spent Hazardous Waste Potliner and Certain Federal Hazardous Waste Regulations

Anne Price, Manager, Hazardous Waste Policy and Program Development Section, and Gary Calaba, DEQ Staff, presented this item.

The rules are divided into three areas: new waste listings; conditional exclusions from regulations for certain wastes that are recycled; and changes to LDR requirements.

Commissioner Van Vliet asked who would be affected by the new rules conditionally excluding wood preservers from some regulation if they recycle pesticide contaminated wastewater. Staff replied that only the facilities whose water-borne wood preservation processes and who reuse the pesticide contaminated wastewater for its pesticidal properties would be conditionally excluded from complying with some hazardous waste regulation of those wastewaters.

The Department was asked how they will implement the new fertilizer standards. DEQ would work with the Oregon Department of Agriculture to implement the standards, and hazardous waste-derived fertilizer manufacturers would be responsible for ensuring that their fertilizer products meet Oregon standards.

The Commission expressed concern that by applying Phase III LDR standards, instead of the originally proposed and more stringent Phase IV standards, to fertilizers made from K061 hazardous waste baghouse dust, DEQ may not be protective enough. When asked whether the Phase III standards could be referenced in the rule as interim standards, staff replied that the Phase III standards for fertilizers made from K061 hazardous waste baghouse dust would not go into effect until March 31, 2000, in order to give the industry time to develop manufacturing technology to meet the standards and because EPA is currently working on standards. Department legal counsel suggested not stating that the Phase III standards are interim. The Department committed to returning to the Commission in the Spring of 0 to review the issue.

Commissioner Eden made a motion to adopt the proposed rules. Commissioner Van Vliet seconded the motion and it carried with five "yes" votes.

F-1. Action Item: Adoption of Order Clarifying Hazardous Waste Permit Decision for Umatilla Chemical Agent Disposal Facility

At the January 29, 1999, EQC meeting, staff was directed to prepare a draft "Order Clarifying Permit Decision" related to the Umatilla Chemical Agent Disposal Facility. Larry Edelman, legal counsel, prepared the draft and presented it to the Commission. A motion was made by Commissioner Eden to adopt the Order without change. The motion was seconded by Commissioner Van Vliet and a role call vote was taken: Commissioner Eden-yes; Commissioner Van Vliet-yes; Commissioner McMahan-yes; Chair Whipple-yes; and Commissioner Reeve-abstained. The motion carried with four "yes" votes.

Public Comment

Frank Wann presented comment on heavy metals.

F-2. Informational Item: Discussion of Future Opportunity for Update and Comment on Development of Carbon Filter Technology

Wayne Thomas, Umatilla Program Manager, and Sue Oliver, Senior Hazardous Waste Specialist, presented their recommendation for the content of an informational work session on the development of carbon filter technology. Proposed subjects for the work session included industrial applications of carbon filters, effectiveness, operational complexity, safety, and waste generation. The Commission concurred with the Department's approach, but asked that the work session focus specifically on the carbon filter system design that is being utilized at the Umatilla Chemical Agent Disposal Facility. It was agreed that the work session would be conducted during the Commission's June 99 meeting to be held in Hermiston.

A. Approval of Minutes

The following correction was made to the January 29, 1999, minutes: on page 2, section D1, last paragraph, the first line should read, "Commissioner Van Vliet moved to approve the request with the addendum *including the findings approved by staff."* Commissioner Reeve moved the minutes be approved as corrected. Commissioner Van Vliet seconded the motion and it carried with five "yes" votes.

H. Action Item: Petition for Rulemaking to Regulate Recreational 2-Stroke Marine Engines

On February 24, 1999, the Department received a Petition for Rulemaking from Dan Pence and Peter Wilcox. The petition requested the Commission to commence rulemaking to: (1) phase out the use of existing 2-stroke marine engines in environmentally sensitive waterways and sources of drinking water within a few years and to comprise less than five percent of all engines in marine engines within 10 years; and (2) create fairness in new engine emission control standards between automobiles and recreational marine craft within 20 years.

The petitioners presented information to the Commission on the environmental effects of using 2-stroke engines in waterways. They also present several possible regulatory schemes to begin the phase out of 2-stroke engines including requiring a fee when a boat owner gets a boat permit, the amount of which would be dependent on the engine size, or the prohibition of the use of the engines based on the CWA antidegradation policy.

Commissioner Reeve made a motion to deny the petition. Commissioner Eden amended the motion to include "and direct the Department to conduct discussions with other agencies and the public to determine if anything can be done to reduce the use of 2-stroke engines on Oregon waters." Commissioner Reeve approved the amendment to his motion. Commissioner Eden seconded the motion with amendment and it carried with five "yes" votes.

G. Action Item: Appeal of Hearing Order Regarding Violation and Assessment of Civil Penalty in the Matter of Staff Jennings, Inc., Case No. UT-NWR-96-274A

Staff Jennings, Inc., appealed from a hearing officer's Findings of Fact and Conclusions of Law, dated March 18, 1998. In that order, the hearing officer found that Staff Jennings violated ORS 468B.025 and OAR 340-122-242 and was liable for a civil penalty in the amount of $8,400. The hearing officer also found that Staff Jennings had failed to complete the investigation and cleanup of a petroleum release from an underground storage tank. No civil penalty was assessed by the Department for this violation.

The Department was represented by Christopher Rich, Environmental Law Specialist and Michael Huston, Assistant Attorney General. Staff Jennings was represented by Christopher Reive of Bogle & Gates.

Staff Jennings argued that the civil penalty assessment was improper for several reasons including that the statute of limitations had expired by the time the Department assessed the civil penalty, or that the Department assessed the civil penalty for the wrong violation. In essence Staff Jennings argued that the pollution was caused in 1988 when the underground storage tanks leaked. The Department should have assessed the civil penalty for the failure to complete the investigation and cleanup of a petroleum release from an underground storage tank. The Department argued that the contamination in itself along with the failure to prevent the ongoing contamination are "causing pollution" in terms of the statute.

A motion was made by Commissioner Eden to uphold the hearing officer's findings of fact and conclusions of law by finding the contamination was a continuing violation of ORS 468B.025. It was seconded by Commissioner McMahan and a role call vote was taken: Commissioner McMahan-yes; Commissioner Van Vliet-yes; Commissioner Reeve-no; Commissioner Eden-yes; and Chair Whipple-yes. The motion carried with four "yes" votes. The Commissioner directed legal counsel to draft the order to be signed by Chair Whipple.

I. Commissioners' Reports

There were no Commissioners' reports.

J. Director's Report

The New Carissa was the source of much activity within DEQ during the months of February and March. As the State On-Scene Coordinator for the incident, DEQ was responsible for working with the Coast Guard and the Responsible Party (a representative of the owners and insurers) to coordinate efforts for removal of the ship and cleanup activities related to the oil spill. Over 69 DEQ staff worked on the New Carissa for a total of 4,273 hours (18 staff worked on the incident when the ship ran aground again in Waldport for a total of 513 additional hours). Through a unified effort, wise decisions, and the cooperation of nature, over 80 percent of the oil that had threatened the shorelines of Oregon was successfully destroyed or isolated at sea. The impacts from the released oil are significant, but much more limited than was threatened when the New Carissa first came ashore

Ross Island Update: The recapping of the breached area was completed during the last week of February. This is the area previously used by the Port of Portland for the disposal of contaminated sediment, mined by Ross Island Sand and Gravel (RISG) last spring. Discussions regarding additional sampling and maintenance of the cap, pursuant to an Order of Consent, are ongoing. The Draft Site Investigation Work Plan for the Port of Portland Dredged Material Disposal, Ross Island Facility, is currently under preliminary review. In addition, DEQ has received a proposal from RISG on how to integrate the Port's investigation with the other site investigation tasks RISG will be required to complete.

DEQ hosted the annual Spring Pacific NW P2 Roundtable in Portland March 9-11,1999, for EPA Region10 partners who are interested in pollution prevention. The roundtable has been expanded to include providers of pollution prevention assistance, compliance assistance, and industrial technical assistance.

After three significant delays, the State of Oregon has signed a contract for Phase I soil cleanup at the McCormick & Baxter Creosoting Co. Superfund Site. The state's contractor, Wilder Construction Company, began work at the site, in late February. The work is expected to be completed by April 30, 1999. Twenty distinct areas at the site are slated for soil excavation, during the Phase I cleanup. A second DEQ contractor, Ecology & Environment, Inc., (E&E) will be on-site full-time, to provide continuous oversight of the cleanup work. Among other things, E&E will conduct air quality monitoring to assure that hazardous dust and fumes do not threaten nearby residences. In addition, E&E will conduct the soil sampling described above to ensure that the cleanup work attains the goals set forth in the ROD. DEQ will conduct an informal public meeting in early March, once cleanup activities are underway. The purpose of the meeting will be to provide an opportunity for site neighbors and other interested parties to ask questions and express any concerns they may have about the cleanup work.

EPA's Superfund Response Team and contractors have completed cleanup of a North Portland warehouse after three months of intense effort. What began as a police response to a domestic dispute in October, 1998, escalated into a Portland Fire Bureau-Hazmat Team response due to a variety of hazardous chemicals and storage conditions; the Fire Bureau referred the site to DEQ. After a site inspection by Paul Christiansen and Rebecca Christiansen of DEQ, EPA's highly capable team was invited to conduct the cleanup. The warehouse was loaded with over 10,000 containers of chemicals, many unknown. Dust in the warehouse had high levels of cyanide, lead, and mercury. Ultimately, the EPA team disposed of over 6,000 containers of hazardous waste, 1,280 cubic yards of contaminated debris and 80 cubic yards of contaminated soil. The building was blasted with compressed air and some contaminated residue remains; however, the building no longer poses a threat to the community.

The following DEQ employees are retiring: Mike Eagan - WMC, 8 years; Larry Miller - NWR, 9 years; Jo Brooks - Public Affairs, 14 years; Marilyn Lindsay - WR, 18 years; Mary Heath - WR, 19 years; Howard Harris - AQ, 20 years; Tom Lucas - HQ, 22 years; Dick Warkentin - Lab, 22 years; Larry Lemkau - ER, 25 years; and Jim Vilendre - NWR, 31 years.

The Business Systems Development section is working with the Information Technology section and others around DEQ preparing to replace the main Sequent computer and upgrade the software that run on it. Some of the application software that we use now is obsolete, and some is not certified to work correctly for the year 2000.

There being no further business, the meeting was adjourned at 3:35 p.m.