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ORIGINAL

POTENTIAL SOIL and GROUND WATER CONTAMINATION
2737 N.W. NELA STREET, BUILDING D
Phase 2 Investigation

Prepared For

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1. INTRODUCTION

1.1 Summary of Conclusions

The study confirmed that the property is underlain by incinerator ash and landfill debris of the former City of Portland landfill. Arsenic, barium, manganese and lead were found in the ground water in concentrations similar to those in the fill aquifer at Marathon's site.

The study also detected mineral spirits and diesel in the ground water. These are believed to have migrated onto the site but additional studies will be required to determine the source or sources.

1.2 Purpose of Study

Previous studies of the site, and in the site area (Figure 1), have found several potential sources of contamination, and identified some contaminants. Studies of two properties east of the site have identified heavy metals, methane and hydrocarbon contamination from the former City of Portland Garbage Incinerator and landfill. Studies at a site to the northeast found hydrocarbons and PCBs. Finally, studies at the subject site found hydrocarbons in soils. Based on this information, this assessment of potential soil and ground water contamination had four purposes.

The first purpose was to determine how much of the soil at the LCL&C site is incinerator ash and/or landfill debris from the former City of Portland landfill (Figure 2). Aerial photos indicate that the site is underlain by the former landfill. The ash contains lead and other heavy metals. At the Marathon Property, Oregon DEQ has required capping of the ash to prevent human exposure to the metals.

The second purpose was to assess the potential for site ground water contamination from previous uses of the site or other nearby properties. Most of the year, the LCL&C site is downgradient from the rest of the City landfill. The ground water data from Marathon indicate that a potential exists for metals in the ground water, in areas underlain by ash.

The third purpose is to determine the nature, extent, and origin(s) of the hydrocarbon contamination found by PSI. PSI suggested that the adjacent Nudelman junk yard is a potential source. However, the former landfill and truck terminal are also likely sources of hydrocarbons.

The fourth purpose is to assess the potential for explosive concentrations of methane in the soil beneath the paved areas and the building. Experience has shown that local areas of the old landfill contain high concentrations of methane.

1.3 Scope of Additional Phase 2 Assessment

The scope of the assessment included some tasks that would normally be included in a Phase 1 assessment, as well as a limited amount of field and analytical study of the site and samples from the site. The Phase 1 tasks were required to provide a reasonably complete review of the history of the site and adjacent properties. The study included following tasks.

* Review of Phase 1 and Phase 2 reports by PSI, Inc.;

* Examination of historic maps and aerial photographs;

* Review of historic sources (Fire Marshal's records, Business Directories, DEQ records) to assess the potential for underground hydrocarbon storage facilities or other sources of contamination on, or adjacent to, the subject property;

* Drill, log and sample 2 borings to depths of approximately 35 feet;

* Field screening of soil and water samples for temperature, volatile organic compounds (explosivity), pH and conductivity;

* Laboratory analysis of two ground water samples for heavy metals (arsenic, lead, chrome, cadmium, mercury), inorganic Primary and Secondary drinking water standards, hydrocarbons, volatile organics and PCBs;

* Laboratory analysis of 11 soil samples: 8 for hydrocarbons, 2 for volatile organics, 8 for PCBs and 5 for metals;

* Review and interpretation of results of the drilling, and the chemical analysis and field screening of samples; and

* Preparation of this report.

Drilling was performed by Geo-Tech Exploration, Inc. of Portland, Oregon. Field work was conducted according to the sampling and analysis protocol developed for the Marathon site, and approved by the DEQ. Health and Safety precautions followed OSHA guidelines.

The laboratory analysis of soil and ground water samples were done by Coffey Laboratories Inc. of Portland, Oregon.

The study did not include assessment or inspection of the building.

1.4 Previous Studies

The history of the area adjacent to the former City landfill, including property at 2737 N.W. Nela St., was assessed during the studies of the former City of Portland landfill and adjacent properties (NGS, 1988, 1989, 1990a, 1990b, 1991; Sweet-Edwards/EMCON, 1990, 1991). These studies were conducted for the present owner of most of the former landfill property, Marathon U.S. Realties, Inc., and Lincoln & Allen, owner of a parcel north of the former landfill. Additionally, an Environmental Site Assessment and Phase 2 Site Assessment (of limited scope) were conducted of the subject site by Professional Service Industries, Inc. (PSI) in March 1991 and February 1992.

In their March 1991 Phase 1 study of the site, PSI identified the Nudelman property, located immediately east of the LCL&C site, as a potential source of PCBs and hydrocarbons. PSI observed that the large quantity of electrical scrap at Nudelman included transformers, capacitors and busbars from powerhouses and substations. PSI also observed areas of oil-stained soil, and scrapyard debris that encroached upon LCL&D property. They recommended sampling of the stained soil.

PSI's Phase 2 study consisted of three shallow (7 to 9 ft.) borings along the southeast boundary of the property, and analyses of four samples for total hydrocarbons and 3 samples for PCBs. The analyses confirmed the presence of hydrocarbons (bunker fuel) in soil west of the building at the LCL&C site. Three samples contained hydrocarbons, while one did not. No PCBs were detected in the samples. The greatest hydrocarbon concentrations were found in the two borings west of the building (18,000 and 1,800 mg/kg). A lesser concentration (380 mg/kg) was found at the southwest corner of the property.

As noted previously, there are several other studies available in the public record that bear directly on the assessment of potential soil and ground water contamination at the site. Apparently these studies were not used by PSI. The most extensive are those NGS, Inc conducted of the Marathon US Realties, Inc. and the Lincoln and Allen properties. Those properties are located east and northeast of the Nudelman property (Figure 5). These studies were undertaken to investigate heavy metals and hydrocarbons in soil and ground water. The studies included extensive soil sampling and ground water monitoring. They also included a review of historic property uses of the landfill and surrounding area, including the Longview City Laundry & Cleaners, Inc. property. The results of these studies are summarized in Section 2.2.

2. SITE FEATURES

2.1 Site Location and Setting

The site consists of about 0.9 acres, located in the Northwest Industrial District of Portland, at the east end of NW Nela St. (Figures 1 and 5). The area is zoned as an industrial reserve. Except for a narrow strip along the east boundary, the site is paved and/or covered by Building D.

The paved part of the site is nearly flat, and has an average elevation of 33 ft (USCE, 1977). Precipitation drains to the catchbasins in alley to the north, and in NW Nela St on the south. Some precipitation likely runs onto the site from the property to the west, which is at a slightly higher elevation. An unused rail spur crosses the east part of the property (Figure 6).

Combined sewer (storm/sanitary), power, gas, telephone and water services are buried at various locations on the site. PSI states that storm water drains to the municipal sewer. However, we suspect that like other buildings in the area, the roof drains connect to dry wells near the building.

Debris and scrap from the S.J. Nudelman & Son scrapyard encroaches on the LCL&D property (Figure 9). PSI noted a similar condition during their study.

2.2 Site History

Historic studies (NGS, 1989, 1990, 1991) indicate that a City landfill included the LCL&C, Nudelman and Marathon US Realties properties. The landfill received ash from the City Garbage Incinerator (Figure 8). It also received unburned garbage and debris. The landfill and incinerator were operated by the City of Portland from about 1900 until the late 1940s. Figure 2 shows the extent of the landfill in 1940 and the location of the subject property, at the northwest corner of the landfill. In 1940, a small lake was present. Several such lakes existed in various locations during the life of the landfill. All were ultimately buried by the landfill. The work at Marathon indicates that the water in the lakes was surface runoff and subsurface discharge from the landfill, and that hydrocarbon contamination accumulated in the soils of the lake bottoms and banks.

Heavy metals are present in high concentrations in the ash that originated from ash from the garbage incinerator. The ash deposit underlies much of the Marathon property and several acres to the west. The ash has been found to be a hazardous material, and DEQ has ordered areas shown to be underlain by ash (Marathon and Lincoln & Allen properties, to date) to be capped.

The City of Portland has assumed financial responsibility for the scientific studies, cap design, and cap installation including replacement of utilities beneath the cap.

A truck terminal occupied the landfill site from 1950 until 1978, after the landfill closed. The terminal users included System Tank Lines, and PIE Express and Tank Division, both haulers of bulk petroleum products. An aerial photo taken 4 May 1957 (Figure 3) shows a row of tank-truck trailers parked along the present location of the property line between the Nudelman and LCL&C properties.

Figure 4 is an enlargement of an Oregon Journal photo, taken 29 December 1957. It also shows the truck terminal and the warehouse immediately west of the LCL&C property (at 2801 NW Nela). The December 1957 photo (Figure 4) shows several tank trucks and trailers parked in the same general location as on Figure 3.

2.2.1 2737 N.W. Nela St (Building D)

Aerial photos indicate that sometime between December 1963 and February 1966 the S.J. Nudelman & Son, and the LCL&C properties were separated from the terminal. The LCL&C building was constructed, as were the rail spur, and several small structures for the scrapyard. Aerial photos also indicate that the small office structure was added to the northwest corner of Building D between 1968 and 1971.

A complete list of former tenants is not available. However, business directories indicate the following businesses occupied 2737 N.W. Nela.

Name	Date	Business
No city directory listing	1966	
Tristates Mill Supply	1967-1971	Industrial Electric dstr.
Alcon Industries, Inc.	1972-1975	Alum. sash & door sales
Medallion Industries	1976-1981	Aluminum sales
Harrison & Crossfield Pacific (Harcross Chemical)	1983-1991	Aluminum and pigment dstr.

In our experience the previous tenants listed could have used or stored several hazardous or toxic materials. These could include

* heavy metals (electrical equipment and paint pigments),
* PCB electrical cooling/insulating oils (transformers etc for mill equipment)
* solvents (for paint)
* degreasers (to prepare metal for painting)
* formaldehyde (glue and resin)

The city directories in the 1970's show listings for an address 2731 NW. Nela, which would have been located either on the site or between the site and Nudelman's. The City of

Portland was unable to clarify this matter. Business directory lists United Foam Corp. as the occupant of 2731 in 1970. United Foam, which manufactured polyurethane foam, went out of business in 1986.

2.2.2 S.J. Nudelman & Son Scrapyard

Structures at the scrap yard, 2707 N.W. Nela, include an office and two sheds. The site is mostly covered with scrap and/or a thick overgrowth of weeds and blackberries. As previously discussed, scrap at the yard includes electrical gear (transformers, busbars, capacitors). Considerable electrical equipment (computers, telephones, appliances) is also present, and appears to comprise a large part of the business at present. The south 3/4 of the site is almost completely overgrown, and it is difficult to impossible see what is under the brush and vines. However, some scrap vehicles and heavy construction equipment appear to be present.

Fire Marshall's records indicate that PEMCO installed two underground fuel tanks, and two pumps on an island, for S.J. Nudelman in 1966. The permit indicates the tanks were 1000 and 2000 gallons to be used for gas and diesel. The tanks are not registered with DEQ, and there is no record of removal of these tanks at the Fire Marshall's office or DEQ. Location of the tanks is not known. However, the aerial photos taken in 1968 and 1971 suggest that they were probably in the extreme north or northwest part of the scrap yard, near the office. No other parts of the site were accessible to normal vehicles during these years.

2.3 Other Adjacent Properties

Neighboring properties (Figure 8) other than S.J. Nudelman & Son (see section 2.2) include Kelly-Goodwin Co., 2728 N.W. Nela, to the south (distributor of flooring materials and finishes). General Electric Co., 2800 N.W. Nela, is located to the southwest (warehouse and service center). Medallion Industries, 3245 N.W. Yeon, (wood products manufacturing), Anthro Technology, 3221 N.W. Yeon, (furniture mfg.), and Storables, 3201 N.W. Yeon, (office and warehouse) are located north and northeast of the site. Fred Bay News Co., 3155 N.W. Yeon, (magazine and newspaper distributor) is located northeast of the Nudelman & Son property.

The building at 2801 N.W. Nela is located immediately west of the site. The occupants listed in the city directory for the building include:

Name	Date	Business
Folgers	1952-1960	Coffee and tea - roaster and dstr.
MJB	1965-1975	Same
Fisher Flour	1980-1981	Warehouse
WDI	1980-1981	Wholesale furniture
Bushnell Bros.	1980-1987	Warehouse
B&D Sales	1988-1992	Furniture sales and manufacturing

2.4 Underground Storage Tanks (USTs)

Table 3 lists 32 UST installations (1 or more tanks) within 2 to 3 blocks of the site. Most are tanks are old, and recorded only with the Fire Marshall. Only four of the UST installations are permitted with DEQ.

3. SITE GEOLOGY AND HYDROGEOLOGY

In general, the site is underlain by 31 to 36 feet of fills that are underlain by progressively older deposits of alluvium, sands and gravels of the Troutdale Formation, and the Columbia River Basalt. The following paragraphs describe these units.

3.1 Bedrock

The bedrock in the Portland area consists of the basaltic lava flows of the Columbia River Basalt and, in the Portland Basin, the Troutdale Formation. The basalt is composed of numerous flows of hard, dense basalt. The flows were erupted from fissures in southeast Washington and northeast Oregon about 12 to 20 million years ago. They reached Portland by flowing down, and repeatedly blocking, the ancestral Columbia drainage. Many flows are separated by cindery rubble zones which developed as the flows spread and cooled. The rubble zones contain and transmit abundant quantities of ground water. The Columbia River Basalt is probably about 700 to 800 ft in thickness near the site (Brown, 1963).

The Troutdale Formation, which overlies the basalt, consists of up to several hundred feet of sandstone, sandy gravel, and conglomerate. The sediments were deposited into the Portland Basin by the ancestral Columbia, Willamette, Clackamas, and Sandy Rivers as the surrounding hills were uplifted relative to the basin. The sandy gravel intervals are excellent aquifers. In the site area, the Troutdale is thought to be about 100 ft in thickness.

Ground water flow in the bedrock aquifers is from the highlands surrounding the Portland Basin towards the Basin. Velocity of flow has not been measured, but flows are likely similar to those in the Basalt in eastern Oregon and Washington: up to several hundred ft/yr (Newcomb, 1969, Foxworthy and Bryant, 1967). Both the Troutdale and Basalt aquifer appear to have artesian heads within the central area of the Portland Basin. Thus, discharge from the basalt is upwards to the overlying Troutdale, and discharge from the Troutdale is through leakage to the overlying alluvium.

3.2 Alluvium

The site area is underlain by about 100 to 140 ft of silt, silty sand, sand and gravel that were deposited by the Willamette River (NGS, 1990b, 1991). The top of the alluvium formed the bed of Guilds Lake before the various fills were placed in the area.

Samples were analyzed from several of the wells and borings at the Marathon site that penetrated the alluvium (NGS, Inc., 1990a). Lead in the sampled alluvium at the Marathon site varied from 6.6 to 290 mg/kg. The analyses of alluvial samples from four Marathon borings appear to indicate contamination of only the top few inches of the clayey silt alluvium by lead from the overlying incinerator ash and landfill debris.

Cadmium, chromium, and manganese were also detected in the alluvium of the Marathon site (NGS, INc., 1990a). Analyses indicate that cadmium in most of the alluvium is less than 0.5 mg/kg. Maximum depths of migration of cadmium below the ash/alluvium contact ranged between 2.0 and 5.5 ft. Chromium concentrations found in alluvial samples are presumed to represent migration from the overlying ash, but were well below mean background concentrations. Manganese in the Marathon alluvium is considered to be within the range of background. Mercury was not detected in the alluvial deposits under the Marathon site.

3.3 Fill

Borings along the eastern margin of the LCL&C site (Figures 5 and 6), indicate the area is paved with approximately 2" of asphaltic concrete over about 8" of gravel base fill. This surficial pavement is underlain by 29 to 30 feet of fill. The borings (see Figures 7/201 and 7/202), show that the site fill consists of ash and mixed ash and landfill debris. The ash generally consists of brown, black, red, and tan silt- to gravel-size fragments, of cinders, glass, metal, and ceramic. The landfill debris consist of larger fragments of brick, concrete, asphalt, wood, and glass in a matrix of fine ash and organic silt. The ash and the landfill debris locally contains variable quantities of petroleum hydrocarbons.

In the southeast corner of the site, the mixed ash and landfill debris rests directly on alluvial sediments consisting of soft clayey silt with a trace of fine sand and occasional wood fragments, which formed the bottom of the former Guilds Lake (see subsurface cross sections, Figure 8). In the northeast corner of the site, the mixed ash and landfill debris is separated from the silty alluvium by about 6 ft of dredge fill consisting of dark grey fine to medium sand with some ash. This dredge fill probably represents the southern toe of a dike paralleling the approximate northern site boundary. These deposits are consistent with those observed during our study of the Marathon site, immediately east of the Nudelman property (Figure 5).

There are no borings in the west, north or center parts of the site, so subsurface conditions in these areas must be inferred from other information. Based on historic photographs of the area, the western boundary of the site appears to approximate the western limit of the City landfill. This boundary was formed by dikes of sand dredged from the Willamette

River and placed as fill in the former lake. Thus, the western boundary of the site, and beyond, is likely to be underlain primarily by dredge fill, with progressively thicker deposits of incinerator ash and landfill debris eastward across the site. However, at the Lincoln and Allen property (NGS, Inc., 1991), some ash and landfill debris occurs under the north dredge fill dikes and extends about 150 ft beyond. Thus there is a potential that some ash was deposited west of the landfill before the western dike was constructed.

As discussed in sections 4.1.4 and 5.1, the ash and landfill debris typically have high concentrations of lead and manganese. Cadmium and chromium concentrations average about four and two times natural background, respectively. The toxicity of the ash appears to be limited to the lead, which is environmentally available (NGS, 1990).

3.4 Hydrogeology

No monitoring wells were installed at the site. However, water was encountered 17.3 ft below the ground surface in both borings (elevation 15.7 ft). These observations, which were made inside the hollow stem augers during drilling, appear to be generally consistent with water levels recorded in monitoring wells on the nearby Marathon property, and are less than 2 ft lower than the projected water level from the nearest Marathon well, some 365 ft to the east (Figure 8). This minor discrepancy is believed to be the result of recording the water levels inside the hollow stem augers after a relatively brief (30 minute) period to allow for equilibrium to static conditions. Ground water conditions are inferred from the materials encountered in the borings, the extensive studies at the nearby Marathon site, and aerial photos of the landfill taken while it operated.

3.4.1 Shallow Aquifer (Fill)

Based on the experience gained through work at the Marathon site, the water table in the shallow aquifer rises to approximately elevation 21.8 ft in March and falls to approximately 19.8 ft elevation in late September (NGS, 1991). The ground water gradient is quite flat, and ground water velocities in the fill aquifer were estimated to range from 0.02 to about 110 feet per year, with a average velocity of about 1.5 feet per year. The direction of flow changes seasonally, as water levels rise and fall. However, the average flow direction in the fill aquifer is west to northwest towards the Nudelman and LCL&C properties.

Quality of water in the fill is fair. High concentrations of several ions are present. Chloride, sulfate, iron, manganese, barium, lead and arsenic have all leached from the incinerator ash, and are well above background concentrations for the area. However, at present, only the concentrations of lead,

iron and manganese exceed drinking water standards at the Marathon site.

Low concentrations of hydrocarbons (1 mg/l to 5 mg/l) are present in most of the 7 monitor wells in the fill aquifer at the Marathon Site. However much higher concentrations (up to 100 mg/l of diesel) were found in 2 wells in the northwest part of the site, in the area of one of the former landfill lakes.

Occasional traces of tetrachloroethene have been detected (0.7 ug/l to 1.5 ug/l) in three wells in the north part of the Marathon site, and a trace of benzene was detected in one well. However, overall, there has been a remarkable lack of volatile organic compounds and halocarbons in samples from Marathon.

3.4.2 Deep Aquifer (Alluvium)

Ground water occurs in the alluvium, but yields to wells are generally low (Brown, 1969; NGS, 1991). In most of the area, water in the alluvium flows from the Hills west of the Willamette towards the river. However, the three alluvial monitor wells at the Marathon site, immediately east ot the LCL&C site, indicate flow to the southeast (NGS, 1991).

The quality of water in the alluvial aquifer on the Marathon property, is generally good except for a high concentration of iron and manganese. Traces of arsenic, barium, lead, and selenium, were also detected below EPA limits in the alluvial aquifer. Calcium, magnesium, nitrate, fluoride, chloride, and sulfate were also detected at variable levels below EPA limits.

4. RESULTS OF SAMPLING AND ANALYSES

As previously discussed, on 13 April 1992 two borings (Figure 7) were drilled to depths of 34.0 and 36.5 feet below the ground surface. The location of the borings are shown on Figure 6. Soil samples were collected as shown on the logs of borings (Figure 7). One ground water sample was collected from each boring for laboratory analyses. Results of the analyses of soil and ground water samples are discussed below, and summarized on Tables 1 and 2. Coffey Laboratories Inc.'s reports are Appendix C.

4.1 Subsurface Soils

Samples from the borings indicate that incinerator ash and mixed ash and landfill debris underlies the site at shallow to moderate depths (1 to 30 ft, Figures 7 and 8). The ash and mixed ash and landfill debris are similar in appearance and chemistry to the ash and mixed ash/debris on the Marathon property (Table 1 and Appendix B). Additionally, the aerial photos taken in 1940 and 1957 (Figures 2 and 4) show that the landfill extended to the west boundary of the subject site.

4.1.1 PCBs in Soils

As shown on Table 2, a total of 6 soil samples from the two site borings were analyzed for PCBs. Sample B-201/3B contained a trace (4 mg/kg) of Aroclor 1260. The remaining five samples were below the laboratory's limit of detection for PCBs (4 mg/kg).

4.1.2 Hydrocarbons in Soils

Eight soil samples from the two LCL&C borings were tested for hydrocarbons (Table 2). Diesel was found in five of the eight samples tested, in concentrations ranging between 200 and 3200 mg/kg. Mineral spirits[1] were present in sample B-201/5B at a concentration of 460 mg/kg. Mineral spirits may also be present in sample B-201/3B, but could not be detected in concentrations below 1500 mg/kg due to the masking influence of diesel. Gasoline was not detected. However, the laboratory limits of detection for gas varied from less than 10 to less than 600 mg/kg, depending on the concentrations of diesel present (Table 1).

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1. Mineral Spirits (C_9 to C_{13}) overlap the DEQ definitions of Diesel (C_{10} to C_{28}) and Gasoline (C_4 to C_{10}). Gasoline actually ranges from C_4 to C_{10}. Diesel overlaps gasoline and can range from C_{10} to C_{16} or heavier. Kerosene generally ranges from C_{10} to C_{16}. However, because mineral spirits are refined to contain a limited range, their peak is distinct from that of gas, diesel and kerosene, but may be masked by high concentrations of these other hydrocarbons. Mineral spirits are commonly used as paint thinner and cleaning solvent.

4.1.3 Volatile Organic Compounds in Soils

Two soil samples were analyzed for purgeable halocarbons and aromatics (Table 2). One sample (B-201/2B) was collected from a depth of 10 ft, well above the water table. The second (B-202/7A) was collected from the base of the landfill deposit. No volatile organic compounds were found (detection limit of 0.2 mg/kg).

4.1.4 Inorganic Compounds in Soils

Five soil samples of incinerator ash from the two site borings were analyzed of heavy metals (Table 1). The samples included relatively pure incinerator ash and ash mixed with landfill debris (Table 1). The depths range from well above the water table, to just above the water table to the bottom of the landfill (Table 1).

Arsenic in the landfill deposit ranges from below the laboratory limit of detection (two samples) to 47 mg/kg. Cadmium varies from below detection (one sample) to 12 mg/kg. Lead varies from 17 mg/kg to 2200 mg/kg. Chrome varies from 16 mg/kg to 44 mg/kg. Manganese varies from 190 mg/kg to 1400 mg/kg. Arsenic, cadmium, chromium, lead and manganese are all in excess of the background concentrations recommended for the Marathon site (Table 1).

As shown on Table 1, metal concentrations in the ash and debris at the LCL&C site are consistent with those found at the Marathon site. Additional discussions of metal concentrations in site soils are presented in section 5.2.

4.1.5 Soil Acidity

The pH of all soil samples was measured in the field. Results are shown on the logs (Figure 7). The ash and landfill debris are slightly alkaline, with pH generally between 7.5 and 8.5. Only one of the samples at the LCL&C site was acid: soil from 10.5 ft in B-201 had a pH of 5.2. Boring B-202 was located about 20 ft west of the scrap batteries shown in Figure 9.

4.2 Ground Water

Three ground water samples were collected one from boring B-201 and two (duplicate samples) from boring B-202. The DEQ-approved sampling protocols developed for studies of the Marathon study were followed (see Appendix A).

4.2.1 PCBs in Water

Although a trace of PCB was detected in one soil sample (Aroclor 1260), no PCBs were found in the site ground water (detection limit of 4.0 ug/l).

4.2.2 Hydrocarbons in Ground Water

Diesel was found in both ground water samples: B-201/W1 had 40,000 ug/l, and the duplicates from B-202 had 12,000 and 15,000 ug/l. Mineral spirits also were detected in the ground water from B-201 (6800 ug/l). Mineral spirits may also be present in B-202, but the diesel in the B-202 sample precludes detection of concentrations of mineral spirits less than 2500 ug/l.

Gasoline was not identified in either of the ground water samples. However, the diesel present in the water raised the detection limit for gasoline to 600 ug/l.

4.2.3 Aromatic Compounds and Purgeable Halocarbons in Ground Water

The aromatic hydrocarbons benzene, toluene, ethylbenzene, and xylene were all present in the ground water sample from B-201, and traces of benzene and xylene also were detected in the sample from B-202 (Table 2). The relatively high proportion of light aromatics in B-201/W1 suggests a relatively fresh release (74 ug/l benzene, 5.2 ug/l toluene, 20 ug/l ethylbenzene, and 76 ug/l total xylene).

The concentrations of benzene (1.2 ug/l) and total xylene (0.8 ug/l) in B-202, are much less than in B-201/W1. Concentrations of the straight-chain diesel hydrocarbons are also much lower in B-202, however they are not lower by the same proportion as the aromatics. Boring B-202 was drilled 116 ft south of boring B-201 (Figure 6). In that distance the straight chains decrease to 40 percent of their concentration in B-201, but aromatics decrease to about 1 percent of their concentration in B-201.

No other aromatics or purgeable halocarbons were detected in the ground water samples. However, analyses for polynuclear aromatic hydrocarbons (PNAs) should find several of these compounds, which are present in diesel.

4.2.4 Inorganic Compounds in Ground Water

Both ground water samples were analyzed for heavy metals and Oregon primary and secondary drinking water standards (Table 1). Heavy metals concentrations are comparable to those found at Marathon. They are as follows (in mg/l):

Metal	B-201	B-202	Maximum at Marathon	EPA MCL
arsenic	0.018	0.059	0.05	0.05
barium	0.088	0.28	0.812	1.0
cadmium	<0.002	<0.002	0.001	0.01
chromium	0.002	<0.002	0.004	0.05
lead	0.042	0.022	0.048	0.02
iron	1.2	1.0	28.7	0.3
manganese	0.19	0.15	0.66	0.05

Other primary and secondary compounds and ions are listed in Table 2.

The EPA maximum concentration limits for drinking water (MCLs) are exceeded for arsenic, lead, iron and manganese. The standards for iron and manganese are to protect water systems from corrosion - not public health - so these exceedances are not particularly significant. The solubilities of lead and arsenic are increased by the presence of organic compounds. Thus, the high lead and arsenic may be in part caused by the abundant hydrocarbon in the water.

4.3 Methane

Methane was found to be present at the Marathon and Lincoln and Allen properties as a result of buried landfill debris. Essentially identical landfill debris is present at the LCL&C site as discussed in section 4.1. Volatile organic vapors were monitored during drilling and sampling on 13 April 1992; field VOC testing yielded maximum results of 500 ppm and 6% of lower explosive limits. Because of the relatively low concentrations, no air samples were collected or analyzed for methane.

5. INTERPRETATION

In section 4.1, we noted that the soils from the borings looked like incinerator ash, and have the chemical properties of the ash. We also noted that the aerial photos taken in 1940 and 1957 (Figures 2 and 4) show that the landfill extended to the west boundary of the subject site. The only reasonable geologic interpretation of these various data is that ash and debris from the incinerator extend to the LCL&C site, as shown on Figure 8. Thus the interpretation of the heavy metals analyses is simple, as discussed in section 5.1, below.

Explanation of the hydrocarbons is less straight forward. There are several potential sources, including nearby USTs, the former landfill and the former truck terminal. The available information is not adequate to eliminate most of the potential sources, as discussed in section 5.2.

5.1 Heavy Metals in Soils and Ground Water

Heavy metals found in the soil samples are, in our experience, from the buried incinerator ash and landfill debris under the LCL&C site. No samples from the site were assessed by the EP Toxicity or TCLP tests. However, several ash samples from the Marathon site were tested for EP Toxicity. In our opinion, the concentrations of lead in samples from B-202 are high enough so that the samples would probably have toxic concentrations of leachable lead.

Lead in the ground water from the site borings had concentrations of 0.042 and 0.022 mg/l. These are consistent with the lead concentrations observed in the fill aquifer in the areas of the Marathon property that are underlain by relative pure ash. Arsenic, barium and manganese concentrations from B-201 and B-202 are also similar to those of ground water in the ash at Marathon.

Given the similarities of the materials at the Marathon and LCL&C properties, and their common origin, the similarities of the contaminants in soil and ground water is no surprise. The similarities between the sites indicate that the mitigation selected for the Marathon site is appropriate for the LCL&C site.

5.2 Hydrocarbons and in Soils and Ground Water

As discussed in Section 2, there are numerous potential sources in the neighborhood for the diesel and mineral spirit contamination found in the soil and ground water. These include the numerous nearby USTs, the former City of Portland landfill, former on-site truck terminal, and several present and former nearby truck terminal and truck parking facilities.

Mineral spirits are used as cleaning solvent and paint thinner. Consequently, any of the present or past manufacturing operations, the scrapyard, the paint supply or warehouses, truck terminals, or other vehicle service facilities could be source for mineral spirits.

However, there is a slightly shorter list of potential sources of the benzene, toluene, ethylbenzene, and xylene. BTEX are major components of gasoline, diesel and mineral spirits. However, they vaporize faster than the paraffins [2] that make the remainder of these products. A spill that contains a large amount of BTEX when new will contain progressively less as time passes. In the case of the City landfill, analyses of ground water found no toluene, ethylbenzene or xylene, and little or no benzene (section 3.4.1). This lack of aromatics prevails even in the areas of the old landfill where the fuel tanks, service areas and truck wash for the former truck terminal were located.

Aromatics (BTEX) occur together with the hydrocarbons identified as diesel and mineral spirits in the ground water from B-201. The presence of aromatics indicates that these products are not as old as the hydrocarbons from City landfill facility (1900 - 1948), or as old as those from the truck terminal (1950 - 1979). It appears more likely to us that the hydrocarbons in soil and ground water from boring B-201 originated from a nearby leaking UST, and/or nearby surface release or releases. An alternate explanation is that the diesel fraction of the contamination is old, and that the BTEX are associated with a fairly recent release of mineral spirits. Either explanation requires a relatively recent release, either of mineral spirit or mineral spirit and diesel.

Neither aromatics (BTEX), diesel nor mineral spirits were found in the soil sample collected from 10 ft in B-201. The lack of hydrocarbons in the soil just above ground water contaminated by hydrocarbons eliminates the possibility that a surface spill near B-201 migrated downward to the ground water.

Aromatics migrate through unsaturated soils by vapor transport. Because of this, aromatics are generally present in soil near the source of a fuel spill, and concentrations drop off away from the source. The decline in concentration is generally slower beneath buildings and pavement, where loss to the atmosphere is retarded. The lack of aromatics in the soil in B-201 suggests to us that the hydrocarbons and aromatics in the ground water migrated from some distance from the point(s) of release to B-201 and B-202.

The nearest known potential sources are the Nudelman's scrapyard and the site building. The scrapyard had, and may still have two USTs, and is assumed to have used solvent (probably mineral spirits) to clean salvaged equipment. Some of the

---

2. Paraffins, including cycloparaffins and branched paraffins.

site tenants may also have used, stored and/or sold paint thinner.

Ground water monitoring at Marathon shows the average flow in the fill is from east to west, east of the Nudelman property. If this flow direction continues west of Marathon, then the site building would be downgradient of the hydrocarbons detected in B-201 and B-202. However, the most active part of Nudelman's site -- the northwest corner -- is directly upgradient of B-201, where the highest concentrations of diesel, mineral spirit and aromatics were found.

6. CONCLUSIONS AND RECOMMENDATIONS

Incinerator ash and mixed ash and landfill debris are present beneath the eastern part of the LCL&C property. Both the ash and the landfill debris are similar in appearance and chemistry to the incinerator ash and landfill debris at the adjacent Marathon site. In our opinion, these fill materials are likely to underlie most of the remainder of the site, including the LCL&C building. However, additional borings will be required to confirm the extent of the old landfill.

Studies of the ash and landfill debris on the adjacent Marathon and Lincoln & Allen properties indicate that there are some potential long-term risks to workers from inhalation of lead in the ash. These risks, however, can and will be mitigated by paving the sites and constructing new buildings on the Marathon property in unpaved parts of the former landfill. Methane from the landfill deposit beneath the Marathon site will be mitigated by installation of a methane-collection system. The City of Portland has agreed to indemnify the present owners of the affected sites (Marathon and Lincoln & Allen) for the costs of studies and mitigation. We recommend that the City of Portland's selected mitigation for the former landfill (Marathon property) be extended to include the LCL&C site.

It is very unlikely that the diesel, mineral spirits and aromatics (BTEX) found in ground water at the site originated from the landfill or former truck terminal. However, some fraction of the diesel found in the soil samples (Table 2) could be from the landfill or the truck terminal, because similar hydrocarbons have been found in the landfill (NGS, Inc., 1990).

Mineral spirits may have been used in the site building (section 2.2.1). However, several other potential sources are present, and available information on the ground water flow suggests that the building is not the most likely source of the mineral spirits.

The ground water gradient extrapolated from Marathon indicates ground water flows towards the site from the Nudelman property. Thus the most likely sources of diesel and mineral spirits appear to be a releases at the adjacent scrap yard, or from a conjectural source north or northeast of the scrapyard. However, the available information does not prove that the most likely sources are responsible. There are numerous other potential sources in the area. The ground water gradient may change west of Marathon.

Defining the source and extent of the hydrocarbons and aromatic hydrocarbons in the ground water will require additional study. These studies should include additional borings, the installation of 3 to 4 monitor wells, sampling of the wells and measurement of water levels to define the gradient west of the Marathon site. Volatile and hydrocarbon analyses should be

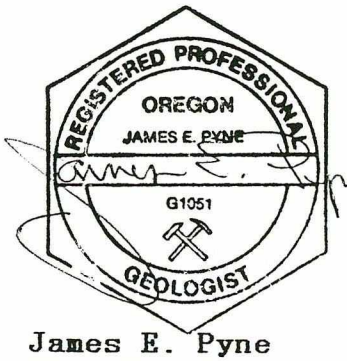
supplemented by analyses for PNAs, to assist in discriminating between new and old diesel.

Little methane was detected. However, methane associated with the buried landfill debris may be present in higher concentrations under other parts of the site. Methane should be monitored during the additional studies.

7. LIMITATIONS

This report is intended exclusively for your use for the specific purpose stated herein. This study was performed and this report prepared, in accordance with the degree of care and skill ordinarily exercised under similar conditions by members of our profession as described in Paragraph 7 of the General Conditions and Fee Schedule (dated 1/92). No other Warranty or representation, expressed or implied, is made or intended in our proposal, written, or oral reports, or any other presentation of our work.\

Yours very truly,
Northwest Geological Services, Inc.



James E. Pyne
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TABLE 1: LONGVIEW CITY LAUNDRY AND CLEANERS - ADDITONAL PHASE 2
Summary of Results of Metals Analysis - Soil

Location	Sample	Depth	Arsenic	Cadmium	Chromium	Lead	Iron	Manganese	Mercury	Field pH
B-201	2B Ash	10.5'	<8	<2	17	170	31000	220	.	5.12
B-201	3A Mixed	15.5'	8	12	18	510	18000	390	.	7.91
B-202	2B Ash	10.9'	30	3	44	2200	13000	1400	.	8.40
B-202	3B Ash	15.7'	<8	3	16	1200	21000	190	.	7.80
B-202	7A Ash	30.3'	47	7	20	1400	85000	800	.	8.05
Detection Limits			8	2	1	5	1000	4		

Soil results are in mg/kg

Summary of Metals Analyses - Marathon Property

	Arsenic	Cadmium	Chromium	Lead	Iron	Manganese	Mercury	Field pH
Recommended Background at Marathon	21.6	0.5	13.7	50	na	1020	<0.2	
Incinerator Ash								
Maximum at Marathon	43	8.4	55.4	6400	na	2910	0.7	
Minimum at Marathon	6	<1	13	340	na	1.22	<0.2	
Mean at Marathon	23	3.6	21.5	3595	na	856	0.3	

Results are in mg/kg

Summary of Oregon Primaries and Secondaries - Ground Water

Location	Sample	Depth	Arsenic	Cadmium	Chromium	Lead	Iron	Manganese	Mercury	Barium	Selenium	Silver	Nitrate	Calcium	Copper	Magnesium	Zinc	Hardness	Fluoride	Chloride	Sulfate	Color	Field pH	Lab pH	Sand	Total Solids
B-201	W1	17.3'	0.018	<0.002	0.002	0.042	1.2	0.19		0.088	<0.01	<0.002	<0.1	29	0.08	33	<0.0	210	0.02	47	177	<5000	8.30	8.62	56400	57500
B-202	W1	17.3'	0.059	<0.002	<0.002	0.022	1.0	0.15		0.28	<0.01	<0.002	<0.1	30	<0.05	23	<0.0	170	<0.02	24	83	<5000	8.20	8.10	32800	36300
Detection Limits			0.005	0.002	0.002	0.001	0.05	0.01	0.0005	0.005	0.01	0.002	0.1	0.05	0.05	0.5	0.05	---	0.02	0.1	0.5	5		---	1	1
EPA Limits			0.05	0.01	0.05	0.015	0.3	0.05	0.002	1.0	0.05	0.05	10	---	1.0	---	5.0	250	4	250	250	15		6.5-8.5	2	500

NOTES: 1. Ground water results in mg/l.
2. "<" followed by number denotes below method detection limit stated.

Summary of Fill Monitoring Wells - Marathon Property

	Arsenic	Cadmium	Chromium	Lead	Iron	Manganese	Mercury	Barium	Selenium	Silver	Nitrate	Calcium	Copper	Magnesium	Zinc	Hardness	Fluoride	Chloride	Sulfate	Color	Field pH	Lab pH	Sand	Total Solids
Maximum at Marathon	0.05	0.001	0.004	0.048	28.7	0.66	<.0005	0.812	0.008	<0.001	0.78	165	<0.05	92	0.58	634	1.2	95	259	200	9.74	10.34	8225	6630
Minimum at Marathon	<0.001	<0.001	<0.001	<0.001	<0.01	0.008	<.0005	0.033	<0.001	<0.001	<0.05	6.42	<0.05	0.008	<0.05	56	<0.1	3.88	0.6	<1	6.00	6.55	53.3	9.64

Note: Results are in mg/l

TABLE 2: LONGVIEW CITY LAUNDRY AND CLEANERS - ADDITIONAL PHASE 2
Purgable Halocarbons, Aromatics, HCID and PBCs - Soil

Location	Sample	Depth	Benzene	Toluene	Ethyl-benzene	Total Xylene	Gasoline	Diesel	Mineral Spirits	PCB Aroclor 1260
B-201	1B	5.5'	-	-	-	-	-	-	-	<0.1
B-201	2B	10.5'	<0.2	<0.2	<0.2	<0.2	<10	<25	<35	<0.1
B-201	3B	16.0'	-	-	-	-	<600	3200	<1500	4.0 (trace)
B-201	5B	25.3'	-	-	-	-	<60	850	460	<1.0
B-201	7A	35.5'	-	-	-	-	<10	~~<25~~ 100	~~<35~~ 40	-
B-202	3B	15.7'	-	-	-	-	<60	200	<200	<0.1
B-202	6B	27.3'	-	-	-	-	<60	300	<200	-
B-202	7A	30.3'	<0.2	<0.2	<0.2	<0.2	<60	300	<200	<1.0
B-202	8A	33.2'	-	-	-	-	<10	<25	<35	-
Detection limits (mg/kg)			0.2	0.2	0.2	0.2	10-600	25-1200	35-1500	0.1

8010/8020

Purgable Halocarbons, Aromatics, HCID and PBCs - Ground Water

Location	Sample	Depth	Benzene	Toluene	Ethyl-benzene	Total Xylene	Gasoline	Diesel	Mineral Spirits	PCB Aroclor
B-201	W1	17.3'	74	5.2	20	76	<600	40000	6800	<4.0
B-202	W1	17.3'	1.2	<0.2	<0.2	0.8	<600	12000	<2500	<4.0
B-202	W2	17.3'						15000		
VOC detection limits (ug/l)			0.2	0.2	0.2	0.2	600	2000	2500	4.0

NOTES :
1. All concentrations for soils in mg/kg; for ground water in ug/l.
2. "<" followed by number denotes below detection limits stated; "-" denotes not tested for parameter listed.
3. HCID is Oregon DEQ hydrocarbon scan (modified EPA 8014, GC/FID)
4. No organic compounds other than those listed were found in soil or water samples.

TABLE 3: UNDERGROUND STORAGE TANKS REGISTERED WITH THE DEQ AND FIRE DEPT.

ID NUMBER	FACILITY NAME	ADDRESS	OREGON DEQ		PORTLAND FIRE BUREAU			
			PERMIT	ACTIVE DECOMM	DATE INSTALLED	NUMBER OF TANKS	SIZE	DECOMM
1956	Fred N. Bay News Co.	3155 NW Yeon	5	5				
6643					19-Oct-61	1	2000	
8413					31-Dec-74	1	1750	
10106					14-Jun-78	3	6000	
							4000	
							500	
7146	S.J. Nudelman Co.	2707 NW Nela St.			24-Mar-66	2	1000	
							2000	
6303	Schnitzer Investment	3200 NW Yeon		5				
26316	Industrial Air Products				23-Dec-46	1	1000	
2123	Schnitzer Steel Co.				12-Mar-47	1	550	
4066	Industrial Air Products				26-Nov-51	1	12000	
4281	Signal Oil Co.				21-Aug-52	1	5000	
5429	Industrial Air Products				14-Dec-56	1	10000	
6855	Industrial Air Products				06-May-63	1	4000	
10167	Schnitzer Investment				21-Mar-79	2	10000	1988?
							5000	1988?
8277	Terminal Transfer	3106 NW Yeon	6	6				
7274					18-May-67	5	12000	
							12000	
							7000	
							2000	
							1000	
49134	Kleenair Products	3055 NW Yeon			30-Jun-49	1	675	
49135					30-Jun-49	1	675	
49136					30-Jun-49	1	675	
71154					23-Oct-52	1	675	
8939	United Beer Distrib.	2916 NW Industrial	2	2				
61674	Systems Terminal	2800 NW 25th			14-Jan-51	1	3000	
3694					15-Jan-51	1	10000	
3695					15-Jan-51	1	10000	
3696					15-Jan-51	1	3000	
3697					15-Jan-51	1	3000	
3698					15-Jan-51	1	3000	
3699					15-Jan-51	1	10000	
61735					08-Feb-51	1	3000	
78717	J.K. Gill Co.	2725 NW Industrial			03-Aug-54	1	8000	
4991					02-Jun-55	1	275	
59187	J.K. Gill Co.	2801 NW Industrial			26-Sep-50	1	8000	
95756	Wetland ?	2623 NW Industrial			18-Jan-61	1	1000	
6741	Berenson Hdwe.	2625 NW Industrial			20-Feb-68	1	40 bbl	

TABLE 4

Mon 3 June 1991 Update of Ore DEQ LUST Cleanup List; Zipcodes 97001 to 97217
Edited by Northwest Geological Services Inc on 12 April 1991
Portland Oregon 503-249-1093

Searching 691lus1.lst for files in Zipcode 97210 Search Date: 05-06-1992

Trumball Asphalt Fume line, 3570 NW Yeon Ave, Portland; Multnomah Co. 97210
26-88- 54 = DEQ NWR File # -- Cleanup: no start date, no PRP, no finish date

Terminal Transfer Inc, 3601 NW Yeon Ave, Portland; Multnomah Co. 97210
26-89- 13 = DEQ NWR File # -- Cleanup: no start date, no PRP, no finish date

Terminal Transfer Inc, 3601 NW Yeon Ave, Portland; Multnomah Co. 97210
26-89- 13 = DEQ NWR File # -- Cleanup: no start date, no PRP, no finish date

White GMC Trucks of Portland Inc, 2705 NW Nicolai St, Portland; Multnomah Co. 97210
26-90- 45 = DEQ NWR File # -- Cleanup started 30 Jan 90 by: RP, ended: 10 May 90

FRED N BAY NEWS CO., 3155 NW Yeon, Portland; Multnomah Co. 97210
26-90- 160 = DEQ NWR File # -- Cleanup started 12 Mar 90 by: RP, ended: 12 Mar 90

Sealy Mattress Co., 3100 NW Industrial, Portland; Multnomah Co. 97210
26-90- 277 = DEQ NWR File # -- Cleanup started 4 Aug 90 by: RP, ended: 14 Aug 90

ABF FREIGHT SYSTEM, 2825 NW Yeon Ave, Portland; Multnomah Co. 97210
26-90- 314 = DEQ NWR File # -- Cleanup: no start date, no PRP, no finish date

Schnitzer Investment Property, 3400 NW Yeon Ave, Portland; Multnomah Co. 97210
26-90- 487 = DEQ NWR File # -- Cleanup: no start date, no PRP, no finish date

Transcon Lines, 3182 NW 26th Ave, Portland; Multnomah Co. 97210
26-91- 113 = DEQ NWR File # -- Cleanup started 12 Mar 91 by: RP, no finish date

S E Rykoff & Co, 3232 NW Industrial, Portland; Multnomah Co. 97210
26-91- 130 = DEQ NWR File # -- Cleanup started 18 Mar 91 by: RP, no finish date

Searching 691lus2.lst for files in Zipcode 97210 Search Date: 05-06-1992

Searching 691lus3.lst for files in Zipcode 97210 Search Date: 05-06-1992

Searching Nozip.691 for files in Zipcode 97210 Search Date: 05-06-1992

Humke Co, 2211 NW Nicolai, Portland; Multnomah Co. 97210
26-91- 190 = DEQ NWR File # -- Cleanup: no start date, no PRP, no finish date
NGS Comments: no DEQ Zip

Searching 1024lust.upd for files in Zipcode 97210 Search Date: 05-06-1992

SEARCH REPORT:
3014 records were searched in 5 files
66 LUSTS were found by the search and 11 were printed

Mon 3 June 1991 Update of Ore DEQ LUST Cleanup List; Zipcodes 97001 to 97217

Edited by Northwest Geological Services Inc on 12 April 1991
Portland Oregon 503-249-1093

Searching 691lus1.lst for files in Zipcode 97210 Search Date: 05-06-1992

COLUMBIA DISTRIBUTING CO., 2448 NW 28th, Portland; Multnomah Co. 97210
26-90- 158 = DEQ NWR File # -- Cleanup started 2 Apr 90 by: RP, ended: 30 Apr 90

FRED N BAY NEWS CO., 155 NW Yeon, Portland; Multnomah Co. 97210
26-90- 160 = DEQ NWR File # -- Cleanup started 12 Mar 90 by: RP, ended 12 Mar 90

ABF FREIGHT SYSTEM, 2825 NW Yeon Ave, Portland; Multnomah Co. 97210
26-90- 314 = DEQ NWR File # -- Cleanup: no start date, no PRP, no finish date

Searching 691lus2.lst for files in Zipcode 97210 Search Date: 05-06-1992

Searching 691lus3.lst for files in Zipcode 97210 Search Date: 05-06-1992

Searching Nozip.691 for files in Zipcode 97210 Search Date: 05-06-1992

Humke Co, 2211 NW Nicolai, Portland; Multnomah Co. 97210
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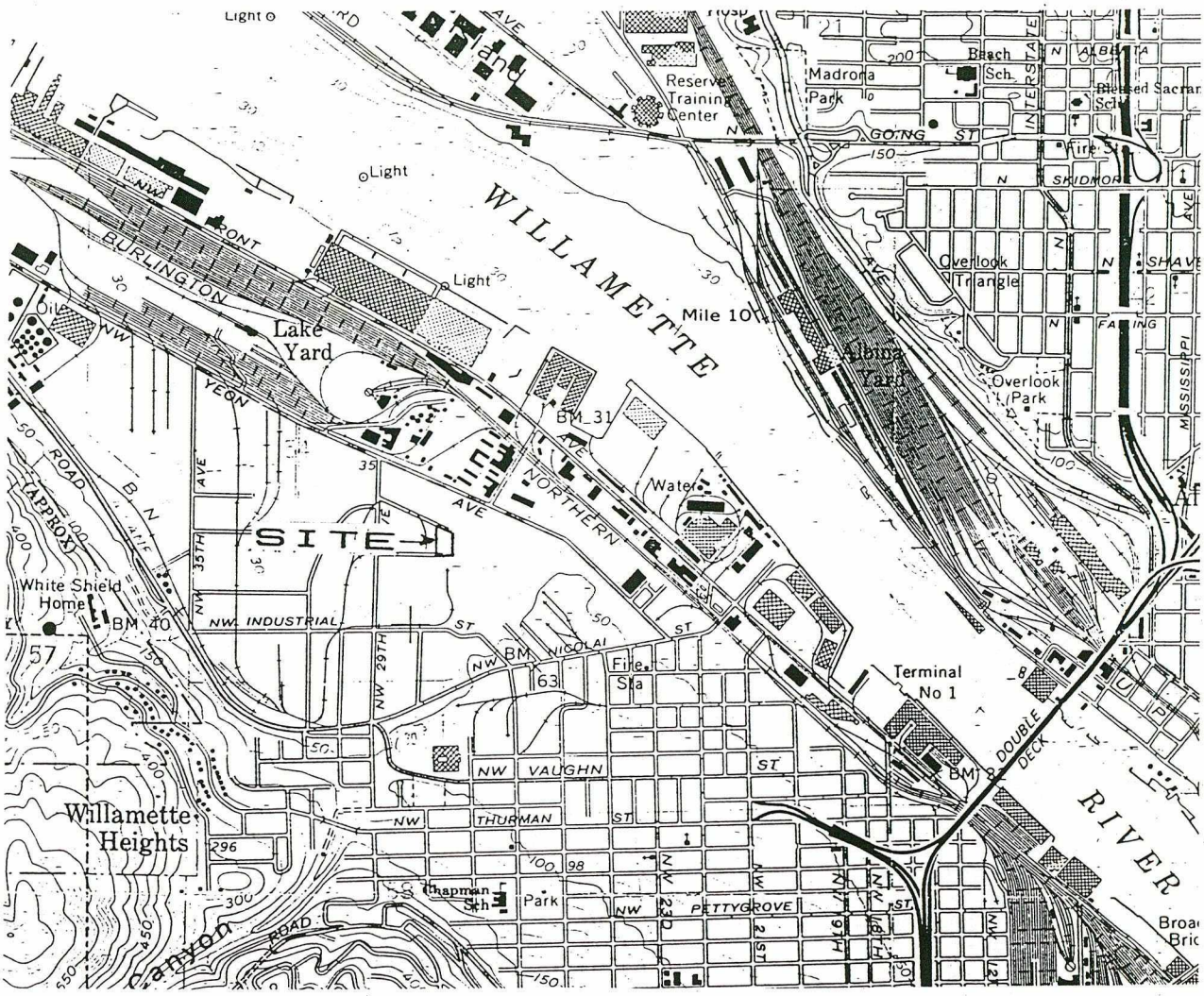
NGS Comments: no DEQ Zip

Searching 1024lust.upd for files in Zipcode 97210 Search Date: 05-06-1992

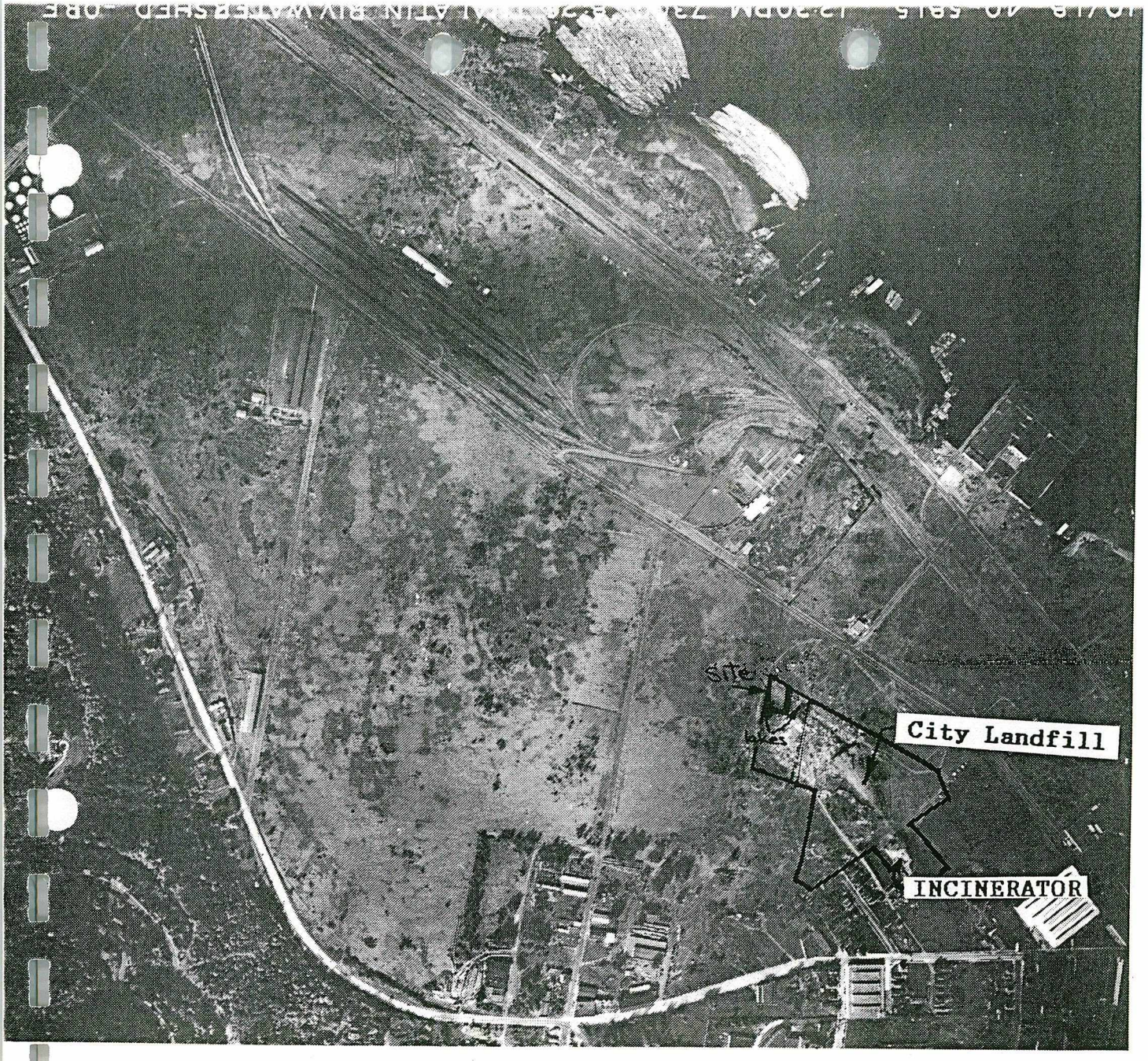
SEARCH REPORT:
3014 records were searched in 5 files
67 LUSTS were found by the search and 4 were printed



From: U.S.G.S. 7.5 minute series topographic maps, Portland, Oregon, 1961 photorevised 1970 and 1977, scale 1:24,000.

NORTH

2737 N.W. Nela St., Bldg D. Northwest Portland, Oregon	NGS, Inc.	March 1992	Figure 1



From: U.S. Army Corps of Engineers

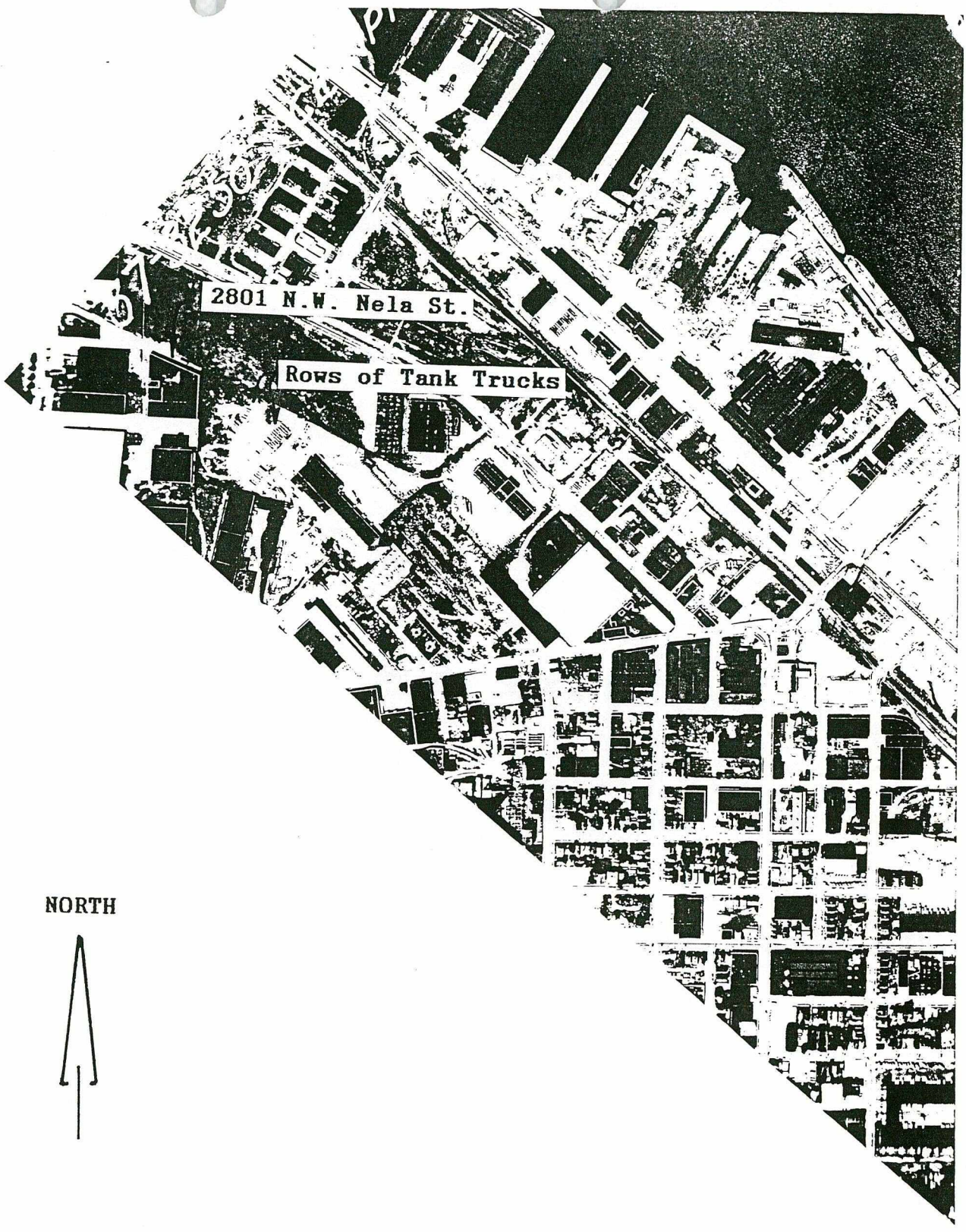
Note: Fan of ash northwest of incinerator, small lakes, and garbage pile

NORTH

Approximate boundary of the site in relationship to the former City of Portland Landfill site.

From: U.S.A.C.E. aerial photograph, 18 Oct. 1940, #5816.

2737 N.W. Nela St., Bldg D. Northwest Portland, Oregon	NGS, Inc.	April 1992	Figure 2

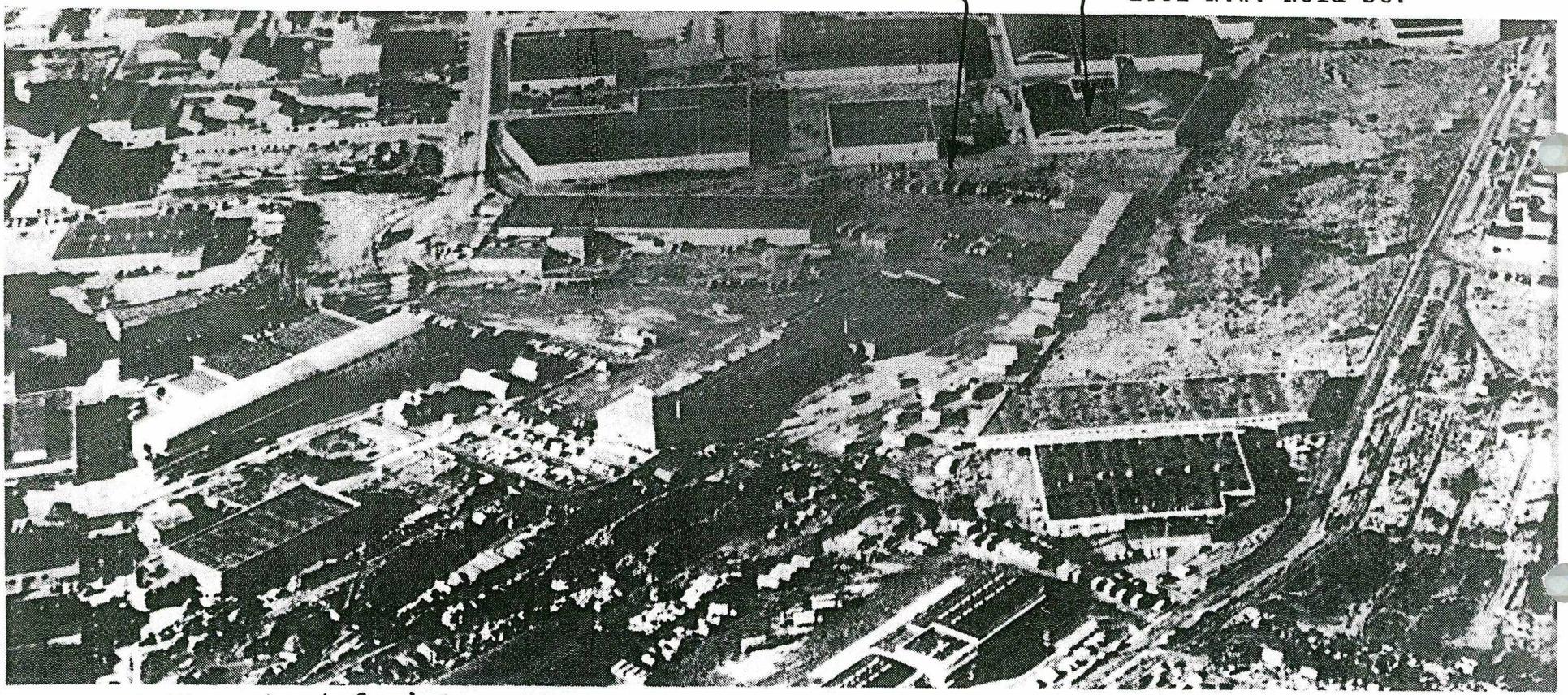


Aerial photograph showing truck parking for the nearby terminal operations.

From: U.S.Army Corps of Engineers, 1957.

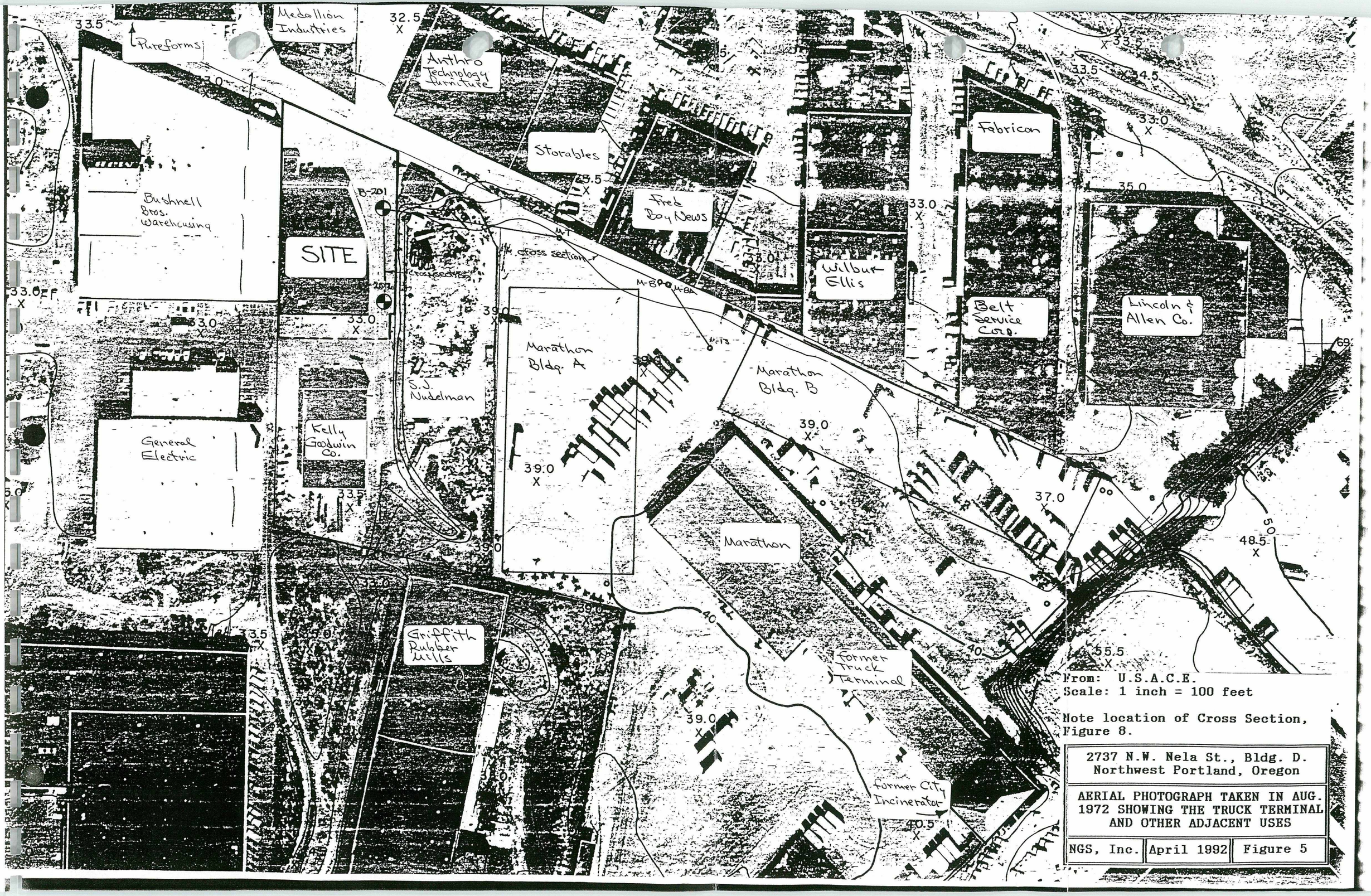
2737 N.W. Nela St., Bldg D. Northwest Portland, Oregon	NGS, Inc.	April 1992	Figure 3

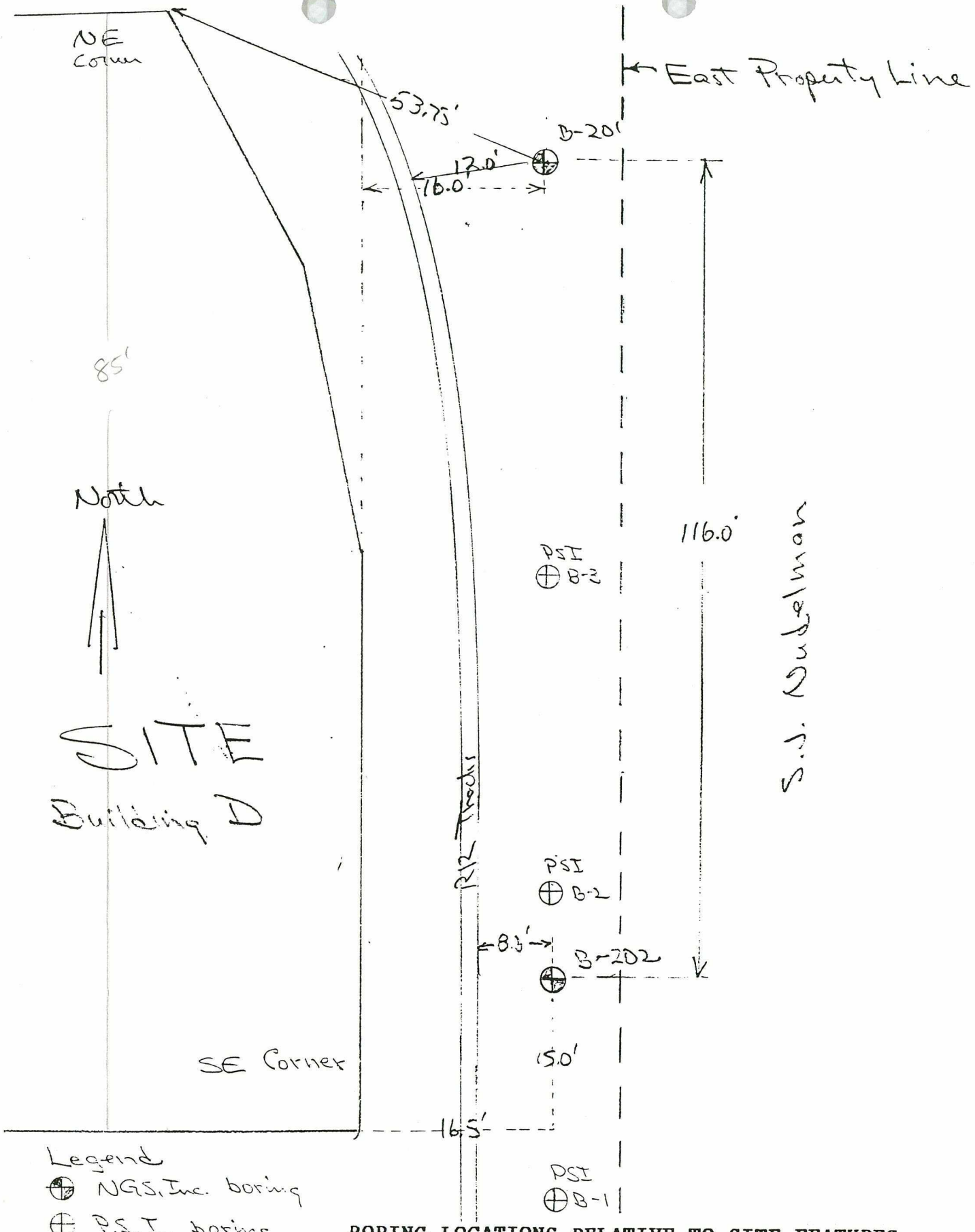
$\frac{85}{1.75} = \frac{x}{1.0}$



From: OR Historical Society
Photo by: Alfred A. Monner for the Oregon Journal 29 December 1957
Caption: Guild's Lake Area - A highly successful example of post war planned industrial development in Portland, at Northwest corner of the City.

2737 N.W. Nela St., Bldg D. Northwest Portland, Oregon	NGS, Inc.	April 1992	Figure 4


Medallion Industries
Pureforms
Anthro Technology Furniture
Storables
Fred Boy News
Fabricon
Bushnell Bros. Warehousing
SITE
B-201
cross section
Wilbur Ellis
Belt Service Corp.
Lincoln & Allen Co.
Marathon Bldg. A
Marathon Bldg. B
S.J. Nudelman
Kelly Goodwin Co.
General Electric
Marathon
Griffith Rubber Mills
Former Truck Terminal
Former City Incinerator
From: U.S.A.C.E.
Scale: 1 inch = 100 feet
Note location of Cross Section, Figure 8.
2737 N.W. Nela St., Bldg. D.
Northwest Portland, Oregon
AERIAL PHOTOGRAPH TAKEN IN AUG. 1972 SHOWING THE TRUCK TERMINAL AND OTHER ADJACENT USES
NGS, Inc.
April 1992
Figure 5



BORING LOCATIONS RELATIVE TO SITE FEATURES
NOT TO SCALE

2737 N.W. Nela St., Bldg D. Northwest Portland, Oregon	NGS, Inc.	March 1992	Figure 6

Northwest Geologic[illegible] Services, Inc.
Consulting Geologists and Hydrogeologists
2505 N.E. 42nd Ave. Portland, Oregon

LOG OF BORING NUMBER B-201

PROJECT: Longview City Laundry and Cleaners	JOB #: 162-1-1	SHEET: 1 OF 2
CLIENT:	DRILLER: GeoTech Explorations	
MFGR. DESIGNATION OF DRILL RIG: Cantero 150 Hollow Stem Auger	location sketch	
BIT: HSA	SIZE: 7¼ OD ; 3¼ ID	
LOCATION (coordinates) ELEVATION:		
TOTAL DEPTH: 36.5'	FT. CORE: 0	FT. SOIL: 36.5'
DEPTH WATER: 17.3' (est)	INSPECTOR(s): R. Kienle/J. Pyne	DATE STARTED: 13 April 1992 — DATE COMPLETED: 13 April 1992

DEPTH (ft)	GRAPHIC LOG	DESCRIPTION/CLASSIFICATION OF SOIL AND ROCK	SAMP #	REC RQD	BOX #	REMARKS
		Asphalt pavement over gravel base 0 to 1.0'				09:01 Began drilling
		Gravel and ash in cuttings 1.0 to 5.0'				
5	Mixed Ash & Landfill Debris	Brown ash with gravel and some landfill debris (brick, asphalt); moist	09:13 B-201/1 6/10/8	10"		pH = 8.11 GTA = 150 ppm; GTS = 10 ppm Jar spl/1A 5.2 to 5.5' " " /1B 5.5 to 5.8' bag spl 5.0 to 5.2'
10	Ash	Red-brown med to fine ash w/ some gravel to 10.5'; wet	09:27 B-201/2 2/10/12	14"		GTA at 10' = < 5 ppm pH = 5.12 GTA at 11.5' = 200 ppm GTS = 30 ppm Jar spl /2A 10.2 to 10.5' " " /2B 10.5 to 11.0' bag spl 10.0 to 10.2'
15	Mixed Ash & Landfill Debris	Rust-brown landfill debris mixed w/ ash 15.0 to 16.0'; wet Grades w/ heavy oil at 16.0' ▽ Ground water at 17.3' (on rods)	09:38 B-201/3 10/33/23	16"		pH = 7.91 GTA = 25 ppm; GTS = 15 ppm Jar spl /3A 15.5 to 16.0' " " /3B 16.0 to 16.3' bag spl 15.0 to 15.5'
20		Dark grey silty fine sand; oily - 3" of fine ash at base of sample	09:50 B-201/4 5/13/20	11"		pH = 9.0 GTS = 45 ppm Jar spl. /4A 20.0 to 20.3' " " /4B 20.3 to 20.6' bag spl 20.6 to 20.9'
25						GTA at 25' = 450 ppm

FIGURE 7/201

Northwest Geological Services, Inc. BORING #: B-201

PROJECT	JOB #	SHEET	OF
Longview City Laundry and Cleaners	162.1-1	2	2

CLIENT

INSPECTOR(s) R. Kreinke / J. Payne

DEPTH (ft)	GRAPHIC LOG	DESCRIPTION/CLASSIFICATION OF SOIL AND ROCK	SAMP #	REC RQD	BOX #	REMARKS
25	Mixed Ash and Landfill Debris	Black fine to med. ash w/ landfill debris (metal scraps, wood); trace oily soil (looks and smells oily	10:10 B-201/5 4/16/8	8"		pH = 8.86 GTA = 250 ppm Jar spl /5A 25.0 to 25.3' " " /5B 25.3 to 25.6' no bag spl.
30	Dredge Fill	Dark grey medium sand w/ some fine ash; oily	11:06 B-201/6 11/20 for 10"	16"		prior to sampling, B-201/6, the whole hand 3.5'; actual sample drive was 26.5 to 28.0' pH = 8.2 GTS = 125 ppm Jar spl /6A 30.0 to 30.5' " " /6B 30.5 to 31.0' bag spl 31.0 to 31.3'
35		Grades with some fine to med rounded gvl below 35.0'	11:33 B-201/7 0/0/6	13"		pH = 8.05 GTS = 15 ppm Jar spl /7A 35.5 to 35.9' " " /7B 35.9 to 36.0' bag spl 35.4 to 35.5'
	Alluvium	Brown fine sandy silt w/ some clay 35.9 to 36.5'				
40		Boring completed at 36.5' Ground water sample collected for lab. analyses Initial soil test program: Sample /1B: PCB. " /2B: PCB, metals, mod 8015 and 8010-8020 " /3A: metals " /3B: PCB; mod 8015 " /5B: PCB; mod 8015 " /7A: mod 8015				

FIGURE 7/201

Northwest Geological Services, Inc.
Consulting Geologists and Hydrogeologists
2505 N.E. 42nd Ave. Portland, Oregon

LOG OF BORING NUMBER B-202

PROJECT	JOB #	SHEET OF
Longview City Laundry and Cleaners	162.1-1	1 2

CLIENT	DRILLER
	Geotech Explorations

MFGR. DESIGNATION OF DRILL RIG	location sketch
Contero 150 Hollow Stem Auger	
BIT: HSA — SIZE: 7¼ OD ; 3¼ ID	
LOCATION (coordinates) ELEVATION	

TOTAL DEPTH	FT. CORE	FT. SOIL
34.0	0	34.0

DEPTH WATER	INSPECTOR(s)	DATE STARTED	DATE COMPLETED
14.1 (est)	R. Kienle / J. Pyne	13 April 1992	13 April 1992

DEPTH (ft)	GRAPHIC LOG	DESCRIPTION/CLASSIFICATION OF SOIL AND ROCK	SAMP #	REC RQD	BOX #	REMARKS
		Asphalt pavement over gravel base 0 to 1.0'				
		Brown ash and gravel w/ fragments of brick and concrete 1.0 to 5.0'				
5	Mixed Ash	Grey, red, & brown mixed ash and landfill debris (brick, wood, rock) damp	13:50 B-202/1	12"		pH = 8.8 GTA = 240 ppm ; GTS = <10 ppm Jar spl /1A 5.0 to 5.3' " " /1B 5.3 to 5.6' bag " 5.6 to 6.0'
10		Red to black and white incinerator ash with traces of metal and brick	13:57 B-202/2	16"		pH = 8.4 GTA = 50 ppm ; GTS = <10 ppm Jar spl /2A 10.5 to 10.9' " " /2B 10.9 to 11.3' bag " 10.0 to 10.5'
15	Ash	Red fine to med. ash with zones of tan ash, and some brick and white mineral	14:04 B-202/3	12"		pH = 7.8 GTA = <10 ppm ; GTS = <20 ppm Jar spl /3A 15.4 to 15.7' " " /3B 15.7 to 16.0' bag " 15.0 to 15.4'
20		Dark grey medium ash with fragments of white, grey, and red ash	14:23 B-202/4	12"		pH = 8.7 GTA = 0 Jar spl /4A 20.0 to 20.3' " " /4B 20.3 to 20.6' bag " 20.6 to 21.0'
25						

FIGURE 7/202

Northwest Geological Services, Inc. BORING # : B-202

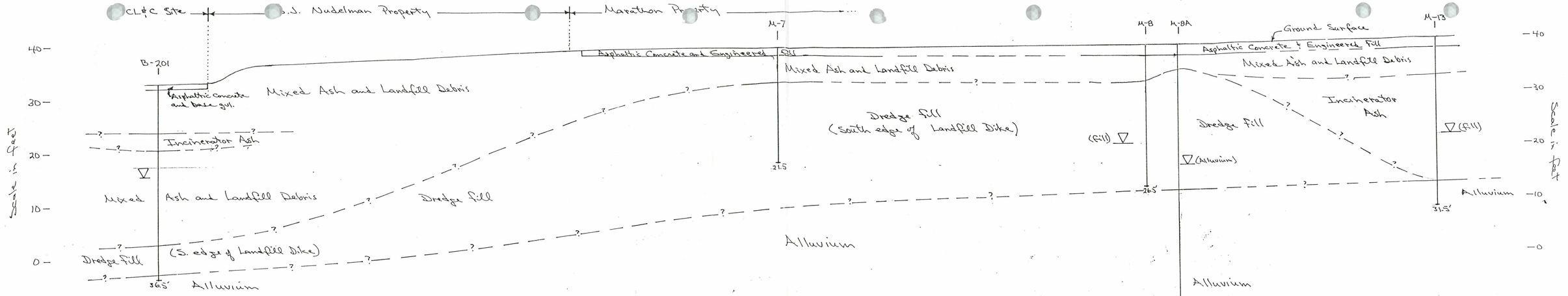
PROJECT	JOB #	SHEET	OF
Longview City Laundry and Cleaners	162.1-1	2	2

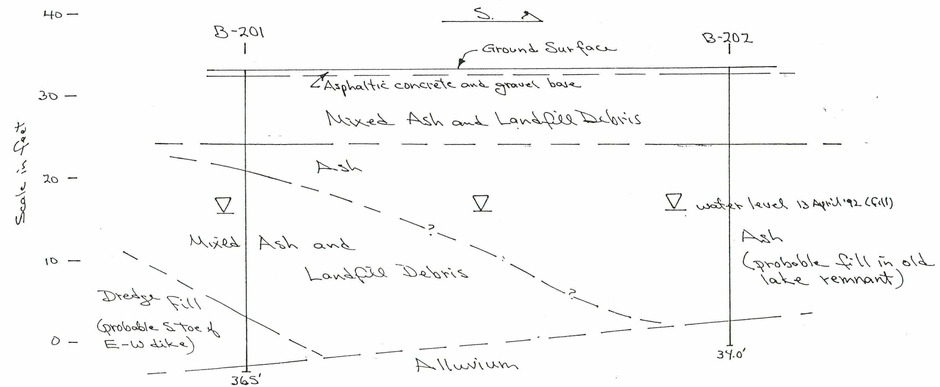
CLIENT

INSPECTOR(s)

DEPTH (ft)	GRAPHIC LOG	DESCRIPTION/CLASSIFICATION OF SOIL AND ROCK	SAMP # 14:32	REC RQD	BOX #	REMARKS
25	Ash	Dark grey medium ash, trace of oil	B-202/5 25/25	0"		
			14:45 B-202/6 14/26/30	8"		pH = 8.84; GTA = 500 ppm; 6% LEL Jar spl /6A 27.0 to 27.3' " " /6B 27.3 to 27.6' bag " 27.6 to 27.75
30		Black medium ash w/ frags. of wood and rock, oily	14:58 B-202/7 13/8/7	18"		pH = 8.70; GTS = 0 GTA = 14% LEL Jar spl. /7A 30.3 to 30.7' " " /7B 31.2 to 31.5' bag " 30.7 to 31.0'
	Alluvium	Greenish-grey clayey silt w/ trace of metal fragments at top; grades clean downward; trace of fine sand; soft	16:00 B-202/8 11/14/19	18"		pH = 7.85 Jar spl /8A 33.2 to 33.6' " " /8B 33.6 to 34.0' bag " 32.8 to 33.2'
35		Boring completed at 34.0' Water sample taken for lab analyses Initial soil test program: spl. /2B : metals " /3B : PCB, metals, mod 8015 " /6B : mod 8015 " /7A : PCB, metals, mod 8015, and 8010-8020 " /8A : mod. 8015				

FIGURE 7/202





Logs for Boring M-7, 8, 8A and 13 are found in NGS, Inc., 1990 V. 2.
Vertical Scale: 1 inch = 10 feet
Horizontal Scale: 1 inch = 20 feet

2737 N.W. Nela St., Bldg. D. Northwest Portland, Oregon		
CROSS SECTIONS		
NGS, Inc.	April 1992	Figure 8

APPENDIX A
FIELD METHODS AND PROCEDURES

APPENDIX A - FIELD METHODS AND PROCEDURES

Drilling

The soil borings were drilled with a trailer-mounted, Centro 150 drill rig using a 7.25-inch outside diameter and 3.25-inch inside diameter hollow stem auger. Borehole depth for the two soil borings were 34.0 and 36.5 ft, approximately 0.6 to 3.0 feet below the depth of the landfill. Drilling operations were performed by GeoTech Explorations, licensed in the State of Oregon, and under the supervision of NGS, Inc. geologists, also registered in the State of Oregon.

Soil samples were collected form the borings at intervals of 5 ft or less, and at changes in stratigraphy by driving a 3-inch inside diameter split barrel sampler for a distance of 18 inches. A 180 pound hammer falling a distance of 30 inches was used to drive the sampler. Blow counts were recorded for each 6-inch interval of penetration by the sampler.

Based on sample observation, drill cuttings, and action of the drilling equipment, a boring log was prepared by the supervising geologists. The log included a description of subsurface materials and the depth intervals where encountered, time and depth of the sampled intervals, inches of sample obtained, depth of the samples retained for observation and\or analyses, pH, conductivity, volatile organic content, relative moisture content of samples and water levels in the boreholes. In addition, the log records the project name, driller, drill rig, bit size, total depth, water depth, date completed, and supervising geologists. A summary of the samples selected for laboratory analyses and the testing program are also listed.

Soil Sample Recovery

The following procedures were used:

- Obtain soil sample from depth discrete interval using sampler.
- Place sample on plastic-covered table, designated the "dirty" table.
- Open sampler on "dirty" table.
- Push soil sample from the sampler into a sample jar taken from the "clean" table; return jar to "clean" table.
- Check that a polytetrafluoroethylene liner is present in the cap. Secure cap tightly.
- Make sure jar is labelled correctly and fill out proper documentation.
- Store jar in cooler located on clean table.
- Change plastic cover on "dirty" table after each sample.

Ground Water Sampling

Samples will be collected with a stainless steel bailer and placed in EPA recommended containers supplied by Coffey Labs. The bailer will be decontaminated between samples.

Analysis Procedures

As noted, all subsurface soil samples were field screened for pH, and VOAs. Laboratory analyses were performed by Coffey Laboratories. QA/QC procedures and laboratory test reports are presented in Appendix C.

Samples will be transported from the site to the contract laboratory (Coffey Laboratories), by NGS, Inc. Shipment procedures will be as follows:

* Individual sample containers will be packed to prevent breakage and transported in a sealed ice chest or other suitable container. Care will be taken to secure the drainage hole at the bottom of the cooler in case of sample container leakage.

* A sticker containing consultant's office name and address will be placed on the container.

* Glass bottles will be separated in the shipping container by cushioning (i.e., Styrofoam or absorbent material) to prevent breakage.

* Plastic containers usually do not require cushioning, but will require protection from punctures.

* Ice will consist of "blue ice" in sealed bags.

* The Chain-of-Custody form will be taped to the lid of the cooler, and delivered to the lab with a cooler.

* Signed and dated Chain-of-Custody seals will be placed on all coolers prior to removal from site.

APPENDIX B
CHEMICAL DATA FROM MARATHON REMEDIAL INVESTIGATION

SUMMARY OF CHEMICAL ANALYSIS - SUBSURFACE SOILS

BORING & SAMPLE TEST PIT NUMBER NUMBERS	SAMPLE DEPTH (feet)	DATE TAKEN	GEOLOGIC UNIT	TOTAL METALS					
				ARSENIC	CADMIUM	CHROMIUM	LEAD	MERCURY	MANGANESE
DREDGE FILL									
B-4 3	15-16.5	08 Sept	dredge fill		-1	22.3	5010		778
B-4 comp 1,2,3	5-16	08 Sept	ash/dr. fill		-1	19.6	4120		1070
B-7 3	15-16.5	09 Sept	dredge fill		0.6	5.6	5.4		118
B-7 4	20-21.5	09 Sept	dredge fill		0.4	5.0	8.9		102
B-8 4	20-21.5	10 Sept	dredge fill		0.3	4.3	5.9		62.7
B-8 5	25-26.5	10 Sept	dredge fill		0.4	4.4	5.3		74.0
B-8A 1	13-14.5	14 June	dredge fill	4	-0.5	4.9	4	-0.2	154
B-8A 2	25-26.5	14 June	dredge fill	4	-0.5	8.2	102	-0.2	209
B-10 3	20-21.5	10 Sept	dredge fill		0.3	5.0	4.8		76.7
mean "clean" dredge fill			dredge fill	4	0.29	5.34	19.47		113.77
1 std deviation (clean fill does not include B-4)					0.20	1.23	33.72		48.41
LANDFILL DEBRIS									
B-12 7A split	30-31.0	21 Nov	debris		na	na	257		na
B-12 7A split	30-31.0	21 Nov	debris		0.8	5.5	610		125
B-14 5	24.5-26	28 Feb	debris	14	1.1	12	690	6.8	200
B-14 6	27-28.5	28 Feb	debris	14	3.9	28	1200	4.2	1300
B-14 7	32-33.5	28 Feb	debris	12	1.4	15	1200	5.0	260
mean Landfill Debris			debris	13.3	1.8	15.1	791.4	5.3	471.3
1 std deviation					1.23	8.19	364.1		480.9
INCINERATOR ASH MIXED WITH LANDFILL DEBRIS									
B-1 comp 2,4,6,7	10-25	06 Sept	ash/debris		3.06	32.2	694		756
B-2 comp 4,5	20-26.5	06 Sept	ash/debris		1.49	25.9	6870		391
B-6 2	10-11.5	08 Sept	ash/debris	8	-1	5.77	1340	4.7	368
B-6 3	15-16.5	08 Sept	ash/debris	13	-1	12.5	396	7.8	768
B-6 comp 2,3	10-16.5	08 Sept	ash/debris		-1	9.1	868		568
B-11 comp 5,6	25-31.5	21 Nov	ash/debris		na	na	7700		na
B-14 2	4.5-6	28 Feb	ash/debris	11	11	15	6200	1.6	590
B-16 1	5.0-6.5	01 Mar	ash/debris(7)		2.0	16.9	490		554
B-16 2	9-10.5	01 Mar	ash/debris		3.7	67.2	2700		1230
B-16 3	15-16.1	01 Mar	ash/debris		1.3	10.7	1200		408
TP-9 1	0.4	6 July	ash/debris(7)		4.3	50	21000		1800
TP-9 1 silt	0.4	6 July	ash/debris(7)		6.7	70	2500		1370
mean ash/debris (excludes TP-9, S-1)				10.7	2.93	24.1	2814	4.7	700.3
1 std deviation					3.34	22.6	2632		328.5

NOTES: 1) units: mg/kg soil
2) "-" indicates compound below limit of detection for method
3) "na" indicates no analysis of sample for compound
4) "comp x,y,z" denotes analysis conducted on sample composited from samples x,y,z sample
5) Geologic Units
ash = incinerator ash
debris = landfill debris
ash/deb = mixed incinerator ash and landfill debris
6) "nac" indicates measurement not applicable to composite samples
7) Samples are mixed ash and debris placed in an engineered fill.
8) See laboratory reports and chain of custody forms in Appendix B.

SUMMARY OF CHEMICAL ANALYSIS - SUBSURFACE SOILS

BORING & SAMPLE TEST PIT NUMBER NUMBERS	SAMPLE DEPTH (feet)	DATE TAKEN	GEOLOGIC UNIT	TOTAL METALS					
				ARSENIC	CADMIUM	CHROMIUM	LEAD	MERCURY	MANGANESE
INCINERATOR ASH									
B-3 4	16.5-18	07 Sept	ash		4.3	23.5	733		342
B-4 1	5-6.5	08 Sept	ash		-1	14.4	3210		1220
B-4 2	10-11.5	08 Sept	ash		2.57	22.1	4150		1.22
B-5 comp 2,3,4,5	10-26.5	07 Sept	ash		4.5	21.9	6160		712
B-9 5	20-21.5	10 Sept	ash		3.8	19.9	6400		734
B-9 6	25-25.8	10 Sept	ash		5.9	19.5	3200		945
B-9 7	30-31.5	10 Sept	ash		4.9	28.9	3800		709
B-11 comp 1,3,4	5-21.5	21 Nov	ash		na	na	756		na
B-12 comp 1,3,6	5-28	21 Nov	ash		na	na	5170		na
B-13 comp 1,2,3,4	5-21.5	22 Nov	ash		na	na	2100		na
B-15 1	4.5-5.9	01 Mar	ash	6	1.6	55.4	340	0.2	2910
B-15 2	9.5-11	01 Mar	ash	17	3.7	21.4	4100	0.3	1020
B-15 3	14.5-16	01 Mar	ash	19	3.7	20.9	4100	0.3	1200
B-15 4	19.5-21	01 Mar	ash		2.3	43.3	1900		629
B-16 4	20-21.5	01 Mar	ash	24	2.5	13	6000	0.7	521
B-17 2	10-11.5	14 Aug	ash	29	2.7	29	4800	-0.2	6.9
B-17 4B	21.5-23	14 Aug	ash	43	8.4	25	4200	0.3	890
mean ash			ash	23.0	3.6	21.5	3595	0.3	846
1 std deviation				11.4	1.9	10.9	1841	0.2	678

NOTES: 1) units: mg/kg soil
2) "-" indicates compound below limit of detection for method
3) "na" indicates no analysis of sample for compound
4) "comp x,y,z" denotes analysis conducted on sample composited from samples x,y,z sample
5) Geologic Units
ash = incinerator ash
debris = landfill debris
ash/deb = mixed incinerator ash and landfill debris
6) "nac" indicates measurement not applicable to composite samples
7) Samples are mixed ash and debris placed in an engineered fill.
8) See laboratory reports and chain of custody forms in Appendix B.

SUMMARY OF CHEMICAL ANALYSIS - SUBSURFACE SOILS

BORING & TEST PIT NUMBERS	SAMPLE NUMBER	SAMPLE DEPTH (feet)	DATE TAKEN	GEOLOGIC UNIT	TOTAL METALS				
					ARSENIC	CADMIUM	CHROMIUM	LEAD	MERCURY	MANGANESE
ALLUVIUM										
B-1	10	36.5-38	06 Sept	alluvium		-1	9.76	6.6		102
B-2	7	35-36.5	06 Sept	alluvium		1.1	7.8	290		194
B-2	8	40-41.5	06 Sept	alluvium		-1	7.42	7.92		1020
B-4	4 split	20-21.5	08 Sept	alluvium		-1	15.1	13.2		206
B-4	4 split	20-21.5	08 Sept	alluvium		0.8	12.0	16		251
B-5	7	35-36.5	07 Sept	alluvium		-0.5	12	7.6		na
B-6	8	31.5-33	08 Sept	alluvium		0.3	6.7	13		40.9
B-6A	5	36.5-38	13 June	alluvium	3	-0.5	10.7	10	-0.2	186
B-6A	6	41.5-43	14 June	alluvium	9	-0.5	10.9	11	-0.2	793
B-6A	7	46.5-48	14 June	alluvium		-0.5	4.4	6		277
B-6A	8	51.5-53	14 June	alluvium		-0.5	7.3	8		432
B-6A	9	56.5-58	14 June	alluvium		-0.5	4.9	7		404
B-8A	3	35.5-36	14 June	alluvium	2	-0.5	4.8	52	-0.2	99
B-8A	4	40-41.5	14 June	alluvium	3	-0.5	3.2	7	-0.2	79
B-8A	5	45-46.5	14 June	alluvium		-0.5	11.6	7		72
B-8A	6a	50-51.5	14 June	alluvium		-0.5	8.6	5		111
B-8A	6b	50-51.5	14 June	alluvium		-0.5	11.2	6		67
B-8A	7	55-56.5	15 June	alluvium		-0.5	11.5	14		215
B-8A	8	60-61.5	15 June	alluvium		-0.5	5.7	6		266
B-11	7 split	35-36.5	22 Nov	alluvium		na	na	73.5		na
B-11	7 split	35-36.5	22 Nov	alluvium		0.6	8	250		92.9
B-12	7B split	31-31.5	21 Nov	alluvium		na	na	9.00		na
B-12	7B split	31-31.5	21 Nov	alluvium		0.6	7.7	11		128
B-13	6 split	27.5-29	22 Nov	alluvium		0.7	10.9	26		215
B-13	7 split	30-31.5	22 Nov	alluvium		0.4	5.9	8		104
B-14	8	35.3-36	28 Feb	alluvium	2	0.3	6.6	6.3	-0.2	75
B-14	9	39-40.5	28 Feb	alluvium	3	0.7	11.7	10.7	-0.2	163
B-14	9d	39-40.5	28 Feb	alluvium		0.7	11.4	9.0		160
B-15	5	24.5-26	01 Mar	alluvium		1.1	11.9	18		427
B-15A	2	26-27.5	16 June	alluvium	9	-0.5	10	14	-0.2	649
B-15	6	27-28.5	01 Mar	alluvium		1.0	13.3	16		429
B-15A	3	31-32.5	16 June	alluvium	4	-0.5	6.7	16	-0.2	468
B-15A	4	36-36.8	16 June	alluvium		-0.5	5.6	46		299
B-15A	5	41-41.5	16 June	alluvium		-0.5	4.4	86		261
B-15A	6	46-46.6	16 June	alluvium		-0.5	7.1	50		231
B-16	5	25-26.5	01 Mar	alluvium		1.0	10.9	11		498
B-17	6	32.5-34	14 Aug	alluvium	2	-0.5	7.4	4.5	-0.2	85
B-17	7	35-36.5	14 Aug	alluvium	2	-0.5	9.8	5.8	-0.2	88
TP-12	3	10.0	7 July	alluvium		-1	8.9	20		500
mean	all samples			all alluvium	4	0.3	8.8	30	-0.2	262
1 std deviation					3	0.4	2.9	59		219
mean	"clean" samples			"clean" alluvium	4	0.2	8.8	16	-0.2	261
1 std deviation					3	0.4	2.9	17		224
95% CI (UPPER)				"clean" alluvium	9	0.8	13.7	45	-0.2	640

NOTES: Refer to page 1 and 2 of this Table

9) clean alluvium excludes B-2, S-7 and B-11, S-7 both splits

SUMMARY OF CHEMICAL ANALYSIS - GROUNDWATER

BORING NUMBER	SAMPLE NUMBER	SAMPLE DEPTH (feet)	DATE TAKEN	GEOLOGIC UNIT	EPA INORGANIC PRIMARY & SECONDARY ANALYSIS (in mg/L) ARSENIC	BARIUM	CADMIUM	CHROMIUM	LEAD	MERCURY	SELENIUM	SILVER
	FILL MONITORING WELLS											
B-6	W/1	12.0-30.2	10-Sep-88	water			-0.02	-0.05	-0.001	-0.0005		
B-6	W/2		28-Nov-88	water					-0.001			
B-6	W/3		06-Mar-89	water	0.004	0.29	-0.001	0.001	-0.001	-0.0005	-0.001	-0.001
B-6	W/4		22-Jun-89	water	-0.001	0.397	-0.001	-0.001	-0.001	-0.0005	-0.001	-0.001
B-6	W/5		15-Aug-89	water	-0.005	0.32	-0.001	-0.001	-0.001	-0.0005	-0.001	-0.001
B-6	W/6		14-Feb-90	water	0.002	0.544		-0.001	0.003	-0.0005	-0.002	
B-8	W/1	12.8-26.5	10-Sep-88	water					-0.001			
B-8	W/2		28-Nov-88	water					-0.001			
B-8	W/3		06-Mar-89	water	0.008	0.21	-0.001	0.001	-0.001	-0.0005	0.001	-0.001
B-8	W/4		21-Jun-89	water	0.002	0.051	-0.001	-0.001	0.002	-0.0005	-0.001	-0.001
B-8	W/5		15-Aug-89	water	-0.005	0.040	-0.001	-0.001	-0.001	-0.0005	-0.001	-0.001
B-8	W/6		13-Feb-90	water	-0.001	0.044		-0.001	-0.001	-0.0005	-0.002	
B-8	W/6D		13-Feb-90	water	-0.001	0.044		-0.001	-0.001		-0.002	
B-9	W/1	13.0-31.5	10-Sep-88	water					0.003			
B-9	W/2		28-Nov-88	water					0.0028			
B-9	W/3		06-Mar-89	water	0.004	0.071	0.001	-0.001	0.004	-0.0005	0.002	-0.001
B-9	W/4		21-Jun-89	water	0.003	0.131	-0.001	-0.001	0.004	-0.0005	-0.001	-0.001
B-9	W/5		15-Aug-89	water	-0.005	0.14	-0.001	-0.001	0.005	-0.0005	-0.001	-0.001
B-9	W/6		14-Feb-90	water	-0.001	0.109		-0.001	0.006	-0.0005	-0.002	
B-11	W/1	14.0-32.0	28-Nov-88	water					0.001			
B-11	W/2		06-Mar-89	water	0.004	0.20	-0.001	-0.001	0.001	-0.0005	-0.001	-0.001
B-11	W/3		22-Jun-89	water	0.008	0.199	-0.001	-0.001	-0.001	-0.0005	-0.001	-0.001
B-11	W/4		15-Aug-89	water	0.01	0.18	-0.001	-0.001	-0.001	-0.0005	-0.001	-0.001
B-11	W/5		12-Feb-90	water	0.003	0.301		-0.001	-0.001	-0.0005	-0.002	
B-11	W/5D		12-Feb-90	water	0.003	0.314		-0.001	0.001	-0.0005	-0.002	
B-11(20)	W/5		12-Feb-90	water	0.002	0.304		0.004	-0.001	-0.0005	-0.002	
B-12	W/1	12.0-31.5	28-Nov-88	water					-0.001			
B-12	W/2		06-Mar-89	water	-0.001	0.81	-0.001	-0.001	0.001	-0.0005	-0.001	-0.001
B-12	W/3		21-Jun-89	water	0.004	0.083	-0.001	-0.001	0.001	-0.0005	-0.001	-0.001
B-12	W/4		15-Aug-89	water	0.01	0.076	-0.001	-0.001	0.002	-0.0005	-0.001	-0.001
B-12	W/5		12-Feb-90	water	0.006	0.141		-0.001	0.001	-0.0005	-0.002	
B-13	W/1	14.0-27.0	28-Nov-88	water					-0.001			
B-13	W/2		06-Mar-89	water	-0.001	0.49	-0.001	-0.001	0.003	-0.0005	0.002	-0.001
B-13	W/3		22-Jun-89	water	0.008	0.118	-0.001	-0.001	0.01	-0.0005	-0.001	-0.001
B-13	W/4		16-Aug-89	water	0.01	0.22	-0.001	0.001	0.002	-0.0005	-0.001	-0.001
B-13	W/5		14-Feb-90	water	0.005	0.106		0.002	0.002	-0.0005	-0.002	
B-14	W/1	15.0-31.9	06-Mar-89	water	-0.001	0.44	-0.001	-0.001	0.001	-0.0005	-0.001	-0.001
B-14	W/2		22-Jun-89	water	0.011	0.538	-0.001	-0.001	-0.001	-0.0005	0.002	-0.001
B-14	W/3		16-Aug-89	water	0.02	0.52	-0.001	0.001	-0.001	-0.0005	-0.001	-0.001
B-14	W/4		14-Feb-90	water	0.004	0.812		-0.001	-0.001	-0.0005	-0.002	
B-15	W/1	11.5-24.0	06-Mar-89	water	-0.001	0.067	-0.001	-0.001	-0.001	-0.0005	-0.001	-0.001
B-15	W/2		21-Jun-89	water	0.002	0.108	-0.001	-0.001	-0.001	-0.0005	0.001	-0.001
B-15	W/3		16-Aug-89	water	-0.005	0.079	-0.001	0.001	-0.001	-0.0005	-0.001	-0.001
B-15	W/4		13-Feb-90	water	0.002	0.137		-0.001	0.002	-0.0005	-0.002	
B-17	W/1	13.2-30.0	16-Aug-89	water	0.05	0.056	-0.001	0.001	0.008	-0.0005	0.008	-0.001
B-17	W/2		14-Feb-90	water	0.033	0.033		0.002	0.046	-0.0005	-0.002	
EPA LIMIT				water	0.050	1.0	0.010	0.050	0.050	0.002	0.010	0.050
DETECTION LIMIT (10)			1988-89	water	0.001	0.005	0.001	0.001	0.001	0.0005	0.001	0.001
			1990(10)	water		0.001					0.002	

1) See notes following alluvial monitoring wells.

SUMMARY OF CHEMICAL ANALYSIS - GROUNDWATER

BORING NUMBER	SAMPLE NUMBER	SAMPLE DEPTH (feet)	DATE TAKEN	GEOLOGIC UNIT	EPA INORGANIC PRIMARY & SECONDARY ANALYSIS (in mg/L) ARSENIC	BARIUM	CADMIUM	CHROMIUM	LEAD	MERCURY	SELENIUM	SILVER
	ALLUVIAL MONITORING WELLS											
B-6A	W/1	40.8-58.0	22-Jun-89	water	-0.001	0.177	-0.001	-0.001	-0.001	-0.0005	-0.001	-0.001
B-6A	W/2		15-Aug-89	water	-0.005	0.13	-0.001	-0.001	-0.001	-0.0005	-0.001	-0.001
B-6A	W/3		14-Feb-90	water	0.003	0.177		-0.001	-0.001	-0.0005	-0.002	
B-8A	W/1	46.9-63.5	21-Jun-89	water	0.005	0.048	-0.001	-0.001	-0.001	-0.0005	-0.001	-0.001
B-8A	W/2		15-Aug-89	water	-0.005	0.017	-0.001	-0.001	-0.001	-0.0005	-0.001	-0.001
B-8A	W/3		13-Feb-90	water	0.006	0.12		-0.001	-0.001	-0.0005	-0.002	
B-15A	W/1	35.1-46.7	21-Jun-89	water	0.003	0.048	-0.001	-0.001	-0.001	-0.0005	0.003	-0.001
B-15A	W/2		16-Aug-89	water	0.007	0.043	-0.001	-0.001	0.006	-0.0005	-0.001	-0.001
B-15A	W/2		13-Feb-90	water	0.004	0.039		-0.001	-0.001	-0.0005	-0.002	
Trip Blank			22-Jun-89	water	-0.001	-0.005	-0.001	-0.001	-0.001	-0.0005	-0.001	-0.001
B-21			February	water	-0.001	-0.001		-0.001	-0.001	-0.0005	-0.002	
B-22			February	water	-0.001	-0.001		-0.001	0.002	-0.0005	-0.002	
EPA LIMIT				water	0.050	1.0	0.010	0.050	0.050	0.002	0.010	0.050
DETECTION	LIMIT		1988-89	water	0.001	0.005	0.001	0.001	0.001	0.0005	0.001	0.001
				water	0.005(2)		0.02(3)	0.05(3)				
			1990(8)	water		0.001					0.002	

1) Results in mg/l.
2) Detection limit for Arsenic changed to 0.005 for August samples.
3) See Appendix A for sampling method, Appendix B for laboratory reports.
4) Samples B-6 W/1 and W/2, B-8 W/1 and W/2, B-9 W/1 and W/2, B-10 W/1, B-11 W/1, B-12 W/1, and B-13 W/1 were analyzed for total metals not primary and secondary drinking water standards.
5) Blank spaces denote no analysis
6) "-" indicates compound below limit of detection for the method.
7) Resample B-15 W/2 on 30 March 1989, pH=7.5-7.8, R=60 and T=56.
8) Alkalinity is reported as CaCO3
9) "D" denotes laboratory duplicate, B-11(20) denotes field split.
10) Detection limits that changed or were new on the February 1990 reports.

SUMMARY OF CHEMICAL ANALYSIS - GROUNDWATER

BORING NUMBER	EPA INORGANIC PRIMARY & SECONDARY ANALYSIS (in mg/L)											
	CALCIUM	COPPER	IRON	MAGNESIUM	MANGANESE	POTASSIUM	SODIUM	ZINC	HARDNESS	ALKALINITY	NITRATE	NITRITE
FILL MONITORING WELLS												
B-6					4.49							
B-6												
B-6	140	-0.05	14.7	42	0.24			-0.05	520		-0.05	
B-6	165	-0.05	22.9	54	0.38			-0.05	634		-0.05	
B-6	151	-0.05	18.7	58.7	0.63			-0.05	620		-0.05	
B-6	138		21.8	49.5	0.304	64.5	53.1	0.012		830	-0.2	-0.2
B-8												
B-8												
B-8	40	-0.05	0.08	14	0.16			-0.05	160		0.78	
B-8	44.8	-0.05	-0.01	13.9	0.26			-0.05	169		0.28	
B-8	40.6	-0.05	-0.01	12.3	0.29			-0.05	150		0.11	
B-8	41.0		0.025	11.9	0.104	18.2	27.5	0.012		170	0.8	-0.2
B-8	41.8		0.023	12.1	0.105	18.7	27.7	0.012				
B-9												
B-9												
B-9	130	-0.05	0.06	25	0.67			0.58	430		0.14	
B-9	50.4	-0.05	-0.01	8.4	0.27			0.21	160		-0.05	
B-9	37.3	-0.05	-0.01	5.9	0.2			-0.05	120		-0.05	
B-9	104		0.047	23.1	0.123	56.2	104	0.491		445	0.5	-0.2
B-11												
B-11	56	-0.05	0.05	82	0.41			-0.05	480		0.11	
B-11	66	-0.05	2.4	90	0.35			-0.05	535		-0.05	
B-11	55.4	-0.05	1.68	64.7	0.43			-0.05	400		-0.05	
B-11	70.2		3.31	88.9	0.577	221	263	0.02		1220	-0.2	-0.2
B-11	73.1		3.54	90.7	0.610	218	261	0.021		1210	-0.2	-0.2
B-11(20)	59.3		3.82	92.0	0.391	236	278	0.012		1260	-0.2	-0.2
B-12												
B-12	50	-0.05	-0.01	31	0.61			-0.05	250		0.12	
B-12	48.7	-0.05	-0.01	30	0.37			-0.05	245		0.05	
B-12	44.8	-0.05	-0.01	28.0	0.29			-0.05	230		-0.05	
B-12	50.9		0.276	32.2	0.392	79.2	102	0.007		430	-0.2	-0.2
B-13												
B-13	48	-0.05	-0.01	5.0	0.18			0.08	140		0.09	
B-13	97	-0.05	0.16	10.4	0.58			-0.05	285		-0.05	
B-13	90	-0.05	0.51	11.2	0.65			-0.05	270		-0.05	
B-13	53.8		0.12	5.12	0.056	8.29	27.4	0.028		160	-0.2	-0.2
B-14	72	-0.05	9.0	63	0.12			-0.05	440		-0.05	
B-14	103	-0.05	27.2	75	0.52			-0.05	566		-0.05	
B-14	86.6	-0.05	28.7	62.4	0.58			-0.05	470		-0.05	
B-14	81.1		20.1	78.8	0.364	137	163	0.01		1100	-0.2	-0.2
B-15	61	-0.05	-0.01	16	0.55			0.09	220		-0.05	
B-15	73.1	-0.05	-0.01	13.6	0.57			-0.05	239		-0.05	
B-15	68.6	-0.05	0.14	10.8	0.38			-0.05	220		-0.05	
B-15	75.8		0.504	12.7	0.246	51.4	87.1	0.032		440	-0.2	-0.2
B-17	14.5	-0.05	0.14	4.8	0.05			-0.05	56		0.30	
B-17	6.42		0.334	0.844	0.008	94.7	301	0.031		740	-0.2	-0.2
EPA LIMIT	none	1.0	0.3	none	0.03			5.0	250		10	
DETECTION	0.01	0.05	0.01	0.1	0.05			0.05	1		0.05	
			0.004	0.002	0.001	0.5	0.02	0.001		1	0.2	0.2

SUMMARY OF CHEMICAL ANALYSIS - GROUNDWATER

BORING NUMBER	EPA INORGANIC PRIMARY & SECONDARY ANALYSIS (in mg/L)											
	CALCIUM	COPPER	IRON	MAGNESIUM	MANGANESE	POTASSIUM	SODIUM	ZINC	HARDNESS	ALKALINITY	NITRATE	NITRITE
	ALLUVIAL MONITORING WELLS											
B-6A	179	-0.05	0.26	81	3.5			-0.05	781		-0.05	
B-6A	161	-0.05	0.09	69.6	2.98			-0.05	690		-0.05	
B-6A	158		1.58	79.8	2.97	10.1	173	0.09		910	-0.2	-0.2
B-8A	94.6	-0.05	1.5	47.2	2.1			-0.05	431		-0.05	
B-8A	112	-0.05	1.82	52.7	2.47			-0.05	500		-0.05	
B-8A	221		19.1	134	5.36	9.72	210	0.035		1000	-0.2	-0.2
B-15A	17.8	-0.05	-0.01	6.2	0.54			-0.05	70		-0.05	
B-15A	14.7	-0.05	-0.01	4.6	0.53			-0.05	56		0.41	
B-15A	14.6		0.026	4.52	0.629	79.7	184	0.003		480	-0.2	-0.2
Trip Blank	nd	-0.05	-0.01	-0.1	-0.05			-0.05	-1		-0.05	
B-21	0.019		0.006	0.005	-0.001	-0.5	0.344	0.002		-1	-0.2	-0.2
B-22	0.033		0.005	0.01	-0.001	-0.5	0.062	0.03		-1	-0.2	-0.2
EPA LIMIT	none	1.0	0.3	none	0.03			5.0	250		10	
DETECTION	0.01	0.05	0.01	0.1	0.05			0.05	1		0.05	
			0.004	0.002	0.001	0.5	0.02	0.001		1	0.2	0.2

SUMMARY OF CHEMICAL ANALYSIS - GROUNDWATER

BORING NUMBER	EPA INORGANIC PRIMARY & SECONDARY ANALYSIS											
	FLUORIDE	CHLORIDE	SULFATE	COLOR	LAB pH	CONDUCTIVITY (umhos/cm)	SAND	TOTAL SOLIDS	TOTAL CYANIDE	FREE CYANIDE	SETTLED LEAD	pH
FILL MONITORING WELLS												
B-6												7.8
B-6												8.0
B-6	-0.1	18.5	1.0	200	7.04		516	1680				7.8
B-6	-0.1	20	6.98	30	6.86		*	*	0.089			7.7
B-6	-0.1	19.9	50.1	30	7.01		205	956	0.235		0.53	7.3
B-6	0.5	21	0.6		6.97	1530			0.15	-0.01		6.54
B-8												7.0
B-8												7.0
B-8	0.12	6.22	54.9	10	7.05		280	724				6.6-6.8
B-8	0.20	9.12	54.8	5	6.73		*	*	0.019			6.6-6.7
B-8	-0.1	3.88	29.4	25	6.98		53.3	236	0.011			6.2
B-8	-0.2	6.2	57.6		6.55	494			0.01	-0.01		6.6
B-8					6.58							
B-9												6.5-6.8
B-9												7.2
B-9	0.16	14.4	259	-1	7.11		3600	6630				7.5
B-9	0.09	9.97	26.3	-1	7.12		*	*	-0.01			7.0
B-9	-0.1	9.23	16.9	20	7.56		377	403	-0.01			6.3
B-9	0.6	22.3	200		7.49	1100			0.01	-0.01		6.86
B-11												7.9
B-11	0.23	61.4	140	20	7.37		590	2440				7.7
B-11	-0.1	79.6	311	20	7.13		*	*	-0.01			7.5-8.0
B-11	-0.1	57.7	191	30	7.29		870	1430	0.016			7.3
B-11	1.2	58.5	136		7.33	2580			0.01	-0.01		7.32
B-11	1.2	57	135		6.58				-0.01			
B-11(20)	1.2	61	155		7.33	2590			0.01	-0.01		
B-12												8.0
B-12	0.17	20.5	98.4	-1	7.78		340	1180				7.5
B-12	-0.1	6.6	38.6	-1	7.83		*	*	-0.01			6.8
B-12	-0.1	14.1	67.9	20	7.88		480	500	-0.01			6.3
B-12	0.4	18	70.2		7.76	1040			-0.01	-0.01		7.47
B-13												6.9
B-13	0.5	8.49	55.7	10	7.59		720	1180				6.0
B-13	0.4	7.68	103	5	7.23		*	*	-0.01			7.3
B-13	0.2	7.09	34.5	25	7.28		220	408	-0.01			6.3-6.7
B-13	0.4	5.84	61.2		7.84	454			-0.01	-0.01		6.86
B-14	0.10	51.5	4.93	200	6.87		790	2280				7.7
B-14	-0.1	95	16.0	40	6.78		*	*	0.18			none
B-14	-0.1	62.1	28.9	40	6.84		235	1020	0.181			7.1
B-14	0.8	55.8	1.7		6.81	2310			0.12	-0.01		6.46
B-15	0.14	17.9	42.4	-1	7.28		290	9.64				8.0
B-15	-0.1	6.93	45.1	-1	7.41		*	*	0.042			7.8(8)
B-15	-0.1	5.07	25.7	15	7.38		883	407	-0.01			6.2
B-15	0.4	15	63.8		7.56	9.62			-0.01	-0.01		6.92
B-17	0.63	42.1	199	70	9.17		8225	557	-0.01			7.6
B-17	0.6	17.6	65.6		10.34	1340			-0.01	-0.01		9.74
EPA LIMIT	1.4-2.4	250	250	15	6.5 min		2	500	none		none	
DETECTION	0.1	0.05	0.25	1	none		0.4	1.0	0.01		0.1	
	0.2	0.2	0.2			2				0.01		

SUMMARY OF CHEMICAL ANALYSIS - GROUNDWATER

BORING NUMBER	EPA INORGANIC PRIMARY & SECONDARY ANALYSIS											
	FLUORIDE	CHLORIDE	SULFATE	COLOR	LAB pH	CONDUCTIVITY (umhos/cm)	SAND	TOTAL SOLIDS	TOTAL CYANIDE	FREE CYANIDE	SETTLED LEAD	pH
ALLUVIAL MONITORING WELLS												
B-6A	-0.1	127	2.72	5	6.62		*	*	0.138			7.6
B-6A	-0.1	148	8.42	20	6.73		3460	1060	0.189			7.0-7.5
B-6A	0.9	88.5	3.2		6.72	1970			0.15	-0.01		6.67
B-8A	-0.1	287	14.5	5	6.73		*	*	-0.01			7.5-8.0
B-8A	-0.1	173	1.95	25	7.02		258	1110	0.022			7.5
B-8A	1.52	326	29.1		6.97	3100			-0.01	-0.01		6.59
B-15A	0.25	16.1	74.6	-1	7.59		*	*	-0.01			7.8
B-15A	0.25	14.5	66.2	20	7.58		1930	650	-0.01			7.1
B-15A	0.5	11.9	49.3		7.91	1050			-0.01	-0.01		7.38
Trip Blank	-0.1	-0.05	-0.25	-1	8.20		*	*				
B-21	-0.2	-0.2	-0.2		8.54	-2			-0.01	-0.01		
B-22	-0.2	-0.2	-0.2		8.65	-2			-0.01	-0.01		
EPA LIMIT	1.4-2.4	250	250	15	6.5 min		2	500	none		none	
DETECTION	0.1	0.05	0.25	1	none		0.4	1.0	0.01		0.1	
	0.2	0.2	0.2			2				0.01		

SUMMARY OF CHEMICAL ANALYSIS - GROUNDWATER

BORING NUMBER	FIELD PERAMETERS		
	RESISTANCE 1000 ohms/cm	CONDUCTIVITY (umhos/cm)	TEMPERATURE (F)
B-6	28		none
B-6	75		56
B-6	50		56
B-6	32		59
B-6	33		58.5
B-6		1480	53
B-8	45		none
B-8	60		60
B-8	65		56
B-8	35		63
B-8	50		62
B-8		504	59
B-8			
B-9	35		none
B-9	65		54
B-9	75		54
B-9	33		60
B-9	40		58
B-9		1148	54.5
B-11	60		50
B-11	40		58
B-11	18		64
B-11	29		61.5
B-11		2512	60
B-11			
B-11(20)			
B-12	60		55
B-12	52		56
B-12	18		58.5
B-12	46		57.5
B-12		1102	54.5
B-13	90		52
B-13	55		52
B-13	30		58
B-13	62		57
B-13		462	47
B-14	40		60
B-14	none		none
B-14	40		60.5
B-14		1940	56.5
B-15	58		58
B-15	35		60
B-15	63		56.5
B-15		970	54
B-17	45		58.5
B-17		1460	51.5
EPA LIMIT DETECTION			

SUMMARY OF CHEMICAL ANALYSIS - GROUNDWATER

BORING NUMBER	FIELD PERAMETERS: RESISTANCE 1000 ohms/cm	CONDUCTIVITY (umhos/cm)	TEMPERATURE (F)
B-6A	30		60
B-6A	29		59.5
B-6A		1670	52
B-8A	28		63
B-8A	35		60
B-8A		2600	54.5
B-15A	35		60
B-15A	55		58
B-15A		1074	54.5
Trip Blank			
B-21			
B-22			
EPA LIMIT DETECTION			

MONITORING WELL SAMPLING RESULTS
ROUND ONE and TWO

BORING NUMBER	SAMPLE NUMBER	DATE SAMPLED	ALKALINITY (mg/L)	SULFATE (mg/L)	ARSENIC (mg/L)	IRON (mg/L)	LEAD (mg/L)	MANGANESE (mg/L)
FILL MONITORING WELLS								
B-6	S-1	27-Sep-90	1100	2.7	-0.005	23.4	-0.002	0.663
	S-2	28-Mar-91	918	1.2	-0.005	6.26	-0.002	0.285
B-8	S-1	27-Sep-90	120	56.1	-0.005	0.04	-0.002	0.274
	S-2	28-Mar-91	142	51.8	-0.005	-0.02	-0.002	0.084
B-14	S-1	28-Sep-90	1220	2.4	0.005	21.5	-0.002	0.286
B-24(14D)		28-Sep-90	1200	2.0	0.005	21.6	-0.002	0.290
	S-2	28-Mar-91	1100	2.8	0.005	14.7	-0.002	0.345
B-15	S-1	28-Sep-90	420	20.0	-0.005	0.66	-0.002	0.234
	S-2	28-Mar-91	396	47.5	-0.005	0.62	0.002	0.187
B-17	S-1	28-Sep-90	440	27.9	0.014	0.21	0.032	0.028
	S-2	28-Mar-91	561	44.1	0.024	0.16	0.042	0.011
B-37(17D)		28-Mar-91	550	46.7	0.021	0.019	0.048	0.012
ALLUVIAL MONITORING WELLS								
B-6A	S-1	27-Sep-90	623	2.3	-0.005	0.87	-0.002	2.200
	S-2	28-Mar-91	902	1.8	-0.005	0.72	-0.002	2.68
B-8A	S-1	27-Sep-90	1070	24.8	0.006	20.2	-0.002	5.570
	S-2	28-Mar-91	925	11.3	0.006	21.1	-0.002	5.65
B-15A	S-2	28-Mar-91	459	60.4	0.005	0.07	-0.002	0.670
BLANK		ROUND ONE	-20	-0.2	-0.005	-0.02	-0.002	-0.005
		ROUND TWO	-20	-0.2	-0.005	-0.02	-0.002	-0.005
RINSATE		27-Sep-90	-20	-0.2	-0.005	-0.02	-0.002	-0.005
METHOD #			310.1	300.0	7060	6010	7421	6010
DETECTION LIMIT			20	0.2	0.005	0.02	0.002	0.005

APPENDIX C
LABORATORY TEST RESULTS

Report Date: May 5, 1992
Job#: GE-920414N-14
PO#: None
Project#: None
Project: Longview City Laundry & Cleaners

Attention: Rick Kienle
NW Geological Services, Inc.
2505 NE 42nd Ave.
Portland, OR 97213

SAMPLE INFORMATION:
Date Samples Were Received By Laboratory: 04/14/92

Lab No.	Field Identification	Sample Matrix	Date	Time
1	B-201/W1	Ground Water	04-13-92	1040
2	B-202/W1/W2	Ground Water	04-13-92	1530
3	Decon Blank	Water	04-13-92	1040
4	B-201/1B	Soil	04-13-92	0913
5	B-201/2B	Soil	04-13-92	0927
6	B-201/3A	Soil	04-13-92	0938
7	B-201/3B	Soil	04-13-92	0938
8	B-201/5B	Soil	04-13-92	1010
9	B-201/7A	Soil	04-13-92	1133
10	B-202/2B	Soil	04-13-92	1357
11	B-202/3B	Soil	04-13-92	1404
12	B-202/6B	Soil	04-13-92	1445
13	B-202/7A	Soil	04-13-92	1458
14	B-202/8A	Soil	04-13-92	1600

ANALYTICAL RESULTS ARE ON THE FOLLOWING PAGE(S)

Sincerely,

Renee Chauvin
Technical Director

RJC/mlh

This report is for the sole and exclusive use of the above-named client. Samples are retained 15 days from the report date, or until holding time expires. Results pertain only to samples submitted.

Analysis Performed: EPA Drinking Water Parameters

PARAMETER	METHOD	DETECTION LIMIT	B-201/W1 RESULTS	EPA LIMIT
Dissolved:				
Arsenic	EPA 206.2	0.005	0.018	0.050
Barium	EPA 200.7	0.005	0.088	1.0
Cadmium	EPA 213.2	0.002	ND	0.010
Chromium	EPA 218.2	0.002	0.002	0.050
Lead	EPA 239.2	0.001	0.042	**
Mercury*	EPA 245.1	0.001	ND	0.002
Selenium	EPA 270.2	0.01	ND	0.010
Silver	EPA 272.2	0.002	ND	0.050
Calcium	EPA 200.7	1	29	---
Copper	EPA 200.7	0.05	0.08	**
Iron	EPA 200.7	0.05	1.2	0.3
Magnesium	EPA 200.7	0.1	33	---
Manganese	EPA 200.7	0.01	0.19	0.050
Zinc	EPA 200.7	0.1	ND	5.0
Hardness	SM 314A	---	210	250
Nitrate	EPA 300.0	0.4	ND	10.0
Fluoride	EPA 340.2	0.2	0.2	1.4-2.4
Chloride	EPA 300.0	0.1	47	250
Sulfate	EPA 300.0	0.5	177	250
Color(C.U.)	EPA 110.2	5	>5,000	15
pH (S.U.)	EPA 150.1	---	8.26	6.5 min.
Sand	EPA 160.4	1	56,400	2
Total Solids	EPA 160.3	1	57,500	500

Results are expressed as mg/L unless otherwise noted.
ND indicates "None Detected" at the detection limits listed for each parameter.
The detection limit is the minimum concentration of a substance that can be measured and reported in the given method.
The EPA Limit is the regulatory limit which the given parameters should not exceed.

**The EPA recommended maximum contaminant level for lead is zero. Water purveyors are required to take action if the lead concentration is 0.015 mg/L or greater. For private wells, the maximum contaminant level is 0.02 mg/L.
For copper, the EPA suggested maximum contaminant level is 1 mg/L. For water purveyors, the action level is 1.3 mg/L.
The ">" symbol indicates greater than.

*The samples analyzed for dissolved Mercury indicated no Mercury present. However, QC spike results were unacceptable (14%). There is no sample left for re-analysis.

REPORT CONTINUES

Analysis Performed: EPA Drinking Water Parameters

PARAMETER	METHOD	DETECTION LIMIT	B-202/W1/W2 RESULTS	EPA LIMIT
Dissolved:				
Arsenic	EPA 206.2	0.005	0.059	0.050
Barium	EPA 200.7	0.005	0.28	1.0
Cadmium	EPA 213.2	0.002	ND	0.010
Chromium	EPA 218.2	0.002	ND	0.050
Lead	EPA 239.2	0.001	0.022	**
Mercury*	EPA 245.1	0.001	ND	0.002
Selenium	EPA 270.2	0.01	ND	0.010
Silver	EPA 272.2	0.002	ND	0.050
Calcium	EPA 200.7	1	30	---
Copper	EPA 200.7	0.05	ND	**
Iron	EPA 200.7	0.05	1.0	0.3
Magnesium	EPA 200.7	0.1	23	---
Manganese	EPA 200.7	0.01	0.15	0.050
Zinc	EPA 200.7	0.1	ND	5.0
Hardness	SM 314A	---	170	250
Nitrate	EPA 300.0	0.4	ND	10.0
Fluoride	EPA 340.2	0.2	ND	1.4-2.4
Chloride	EPA 300.0	0.1	24	250
Sulfate	EPA 300.0	0.5	83	250
Color(C.U.)	EPA 110.2	5	>5,000	15
pH (S.U.)	EPA 150.1	---	8.10	6.5 min.
Sand	EPA 160.4	1	32,800	2
Total Solids	EPA 160.3	1	36,300	500

Results are expressed as mg/L unless otherwise noted.
ND indicates "None Detected" at the detection limits listed for each parameter.
The detection limit is the minimum concentration of a substance that can be measured and reported in the given method.
The EPA Limit is the regulatory limit which the given parameters should not exceed.

**The EPA recommended maximum contaminant level for lead is zero. Water purveyors are required to take action if the lead concentration is 0.015 mg/L or greater. For private wells, the maximum contaminant level is 0.02 mg/L.
For copper, the EPA suggested maximum contaminant level is 1 mg/L. For water purveyors, the action level is 1.3 mg/L.
The ">" symbol indicates greater than.

*The samples analyzed for dissolved Mercury indicated no Mercury present. However, QC spike results were unacceptable (14%). There is no sample left for re-analysis.

REPORT CONTINUES

Job#: GE-920414N-14

PARAMETER	METHOD	DETECTION LIMITS	B-201/2B RESULTS	B-201/3A RESULTS
Arsenic	**	8	ND	8
Cadmium	**	2	ND	12
Chromium	**	1	17	18
Iron	**	1000	31,000	18,000
Lead	**, 7420	5	170	510
Manganese	**	4	220	390
Mercury	EPA 7471	0.5	ND	ND

PARAMETER	METHOD	B-202/2B RESULTS	B-202/3B RESULTS	B-202/7A RESULTS
Arsenic	**	30	ND	47
Cadmium	**	3	3	7
Chromium	**	44	16	20
Iron	**	13,000	21,000	85,000
Lead	**, 7420	2,200	1,200	1,400
Manganese	**	1,400	190	800
Mercury	EPA 7471	ND	ND	2

Results expressed as mg/kg unless otherwise noted.

ND means none detected at or above the detection limit listed.

** Sample preparation by EPA SW 846 Method 3050. Analysis by EPA SW 846 Method 6010, ICP, unless otherwise noted.

REPORT CONTINUES

Job#: GE-920414N-14

NW Geological Services, Inc.
Page 5

Analysis Performed: Purgeable Halocarbons and Aromatics in ground water by EPA Methods 8010/8020, GC/PID/HED.

ANALYTE	DETECTION LIMITS	LABORATORY BLANK	B-201/W1 RESULTS	B-202/W1/W2 RESULTS
Benzene	0.2	ND	74	1.2
Bromodichloromethane	0.2	ND	ND	ND
Bromoform	0.2	ND	ND	ND
Bromomethane	0.8	ND	ND	ND
Carbon tetrachloride	0.2	ND	ND	ND
Chlorobenzene	0.2	ND	ND	ND
Chloroethane	0.4	ND	ND	ND
2-Chloroethylvinylether	0.8	ND	ND	ND
Chloroform	0.2	ND	ND	ND
Chloromethane	1.2	ND	ND	ND
Dibromochloromethane	0.2	ND	ND	ND
1,2-Dichlorobenzene	0.2	ND	ND	ND
1,3-Dichlorobenzene	0.2	ND	ND	ND
1,4-Dichlorobenzene	0.2	ND	ND	ND
Dichlorodifluoromethane	1.2	ND	ND	ND
1,1-Dichloroethane	0.2	ND	ND	ND
1,2-Dichloroethane	0.2	ND	ND	ND
1,1-Dichloroethene	0.2	ND	ND	ND
trans-1,2-Dichloroethene	0.2	ND	ND	ND
1,2-Dichloropropane	0.2	ND	ND	ND
cis-1,3-Dichloropropene	0.2	ND	ND	ND
trans-1,3-Dichloropropene	0.2	ND	ND	ND
Ethylbenzene	0.2	ND	20	ND
Methylene chloride	0.2	ND	ND	ND
Toluene	0.2	ND	5.2	ND
1,1,2,2-Tetrachloroethane	0.2	ND	ND	ND
Tetrachloroethene	0.2	ND	ND	ND
1,1,1-Trichloroethane	0.2	ND	ND	ND
1,1,2-Trichloroethane	0.2	ND	ND	ND
Trichloroethene	0.2	ND	ND	ND
Trichlorofluoromethane	0.8	ND	ND	ND
Vinyl chloride	0.8	ND	ND	ND
Total Xylenes	0.2	ND	76	0.8

Results expressed as ug/L unless otherwise noted.

ND means none detected at or above the detection limit listed.

REPORT CONTINUES

Job#: GE-920414N-14

NW Geological Services, Inc.

Analysis Performed: Purgeable Halocarbons and Aromatics in ground water by EPA Methods 8010/8020, GC/PID/HED.

ANALYTE	DETECTION LIMITS	LABORATORY BLANK	Decon Blank RESULTS	Decon Blank DUPLICATE
Benzene	0.2	ND	ND	ND
Bromodichloromethane	0.2	ND	ND	ND
Bromoform	0.2	ND	ND	ND
Bromomethane	0.8	ND	ND	ND
Carbon tetrachloride	0.2	ND	ND	ND
Chlorobenzene	0.2	ND	ND	ND
Chloroethane	0.4	ND	ND	ND
2-Chloroethylvinylether	0.8	ND	ND	ND
Chloroform	0.2	ND	7.9	8.0
Chloromethane	1.2	ND	ND	ND
Dibromochloromethane	0.2	ND	ND	ND
1,2-Dichlorobenzene	0.2	ND	ND	ND
1,3-Dichlorobenzene	0.2	ND	ND	ND
1,4-Dichlorobenzene	0.2	ND	ND	ND
Dichlorodifluoromethane	1.2	ND	ND	ND
1,1-Dichloroethane	0.2	ND	ND	ND
1,2-Dichloroethane	0.2	ND	ND	ND
1,1-Dichloroethene	0.2	ND	ND	ND
trans-1,2-Dichloroethene	0.2	ND	ND	ND
1,2-Dichloropropane	0.2	ND	ND	ND
cis-1,3-Dichloropropene	0.2	ND	ND	ND
trans-1,3-Dichloropropene	0.2	ND	ND	ND
Ethylbenzene	0.2	ND	ND	ND
Methylene chloride	0.2	ND	ND	ND
Toluene	0.2	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.2	ND	ND	ND
Tetrachloroethene	0.2	ND	ND	ND
1,1,1-Trichloroethane	0.2	ND	ND	ND
1,1,2-Trichloroethane	0.2	ND	ND	ND
Trichloroethene	0.2	ND	ND	ND
Trichlorofluoromethane	0.8	ND	ND	ND
Vinyl chloride	0.8	ND	ND	ND
Total Xylenes	0.2	ND	ND	ND

Results expressed as ug/L unless otherwise noted.

ND means none detected at or above the detection limit listed.

REPORT CONTINUES

Job#: GE-920414N-14

NW Geological Services, Inc.
Page 7

Analysis Performed: Purgeable Halocarbons and Aromatics in soil by EPA Methods 8010/8020, GC/PID/HED.

ANALYTE	DETECTION LIMITS	LABORATORY BLANK	B-201/2B RESULTS	B-202/7A RESULTS
Benzene	0.2	ND	ND	ND
Bromodichloromethane	0.2	ND	ND	ND
Bromoform	0.2	ND	ND	ND
Bromomethane	0.8	ND	ND	ND
Carbon tetrachloride	0.2	ND	ND	ND
Chlorobenzene	0.2	ND	ND	ND
Chloroethane	0.4	ND	ND	ND
2-Chloroethylvinylether	0.8	ND	ND	ND
Chloroform	0.2	ND	ND	ND
Chloromethane	1.2	ND	ND	ND
Dibromochloromethane	0.2	ND	ND	ND
1,2-Dichlorobenzene	0.2	ND	ND	ND
1,3-Dichlorobenzene	0.2	ND	ND	ND
1,4-Dichlorobenzene	0.2	ND	ND	ND
Dichlorodifluoromethane	1.2	ND	ND	ND
1,1-Dichloroethane	0.2	ND	ND	ND
1,2-Dichloroethane	0.2	ND	ND	ND
1,1-Dichloroethene	0.2	ND	ND	ND
trans-1,2-Dichloroethene	0.2	ND	ND	ND
1,2-Dichloropropane	0.2	ND	ND	ND
cis-1,3-Dichloropropene	0.2	ND	ND	ND
trans-1,3-Dichloropropene	0.2	ND	ND	ND
Ethylbenzene	0.2	ND	ND	ND
Methylene chloride	0.2	ND	ND	ND
Toluene	0.2	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.2	ND	ND	ND
Tetrachloroethene	0.2	ND	ND	ND
1,1,1-Trichloroethane	0.2	ND	ND	ND
1,1,2-Trichloroethane	0.2	ND	ND	ND
Trichloroethene	0.2	ND	ND	ND
Trichlorofluoromethane	0.8	ND	ND	ND
Vinyl chloride	0.8	ND	ND	ND
Total Xylenes	0.2	ND	ND	ND

Results expressed as mg/kg unless otherwise noted.

ND means none detected at or above the detection limit listed.

REPORT CONTINUES

ANALYSIS PERFORMED: Hydrocarbon Scan of ground water by modified EPA Method 8015, GC/FID

COMPOUND	DETECTION LIMIT	B-201/W1 RESULTS
Gasoline	600	ND
Diesel	2000	40,000
Mineral Spirits	2500	6,800

COMPOUND	DETECTION LIMIT	LABORATORY BLANK	B-202/W1/W2 RESULTS	B-202/W1/W2 DUPLICATE
Gasoline	300	ND	ND	ND
Diesel	1000	ND	12,000	15,000
Mineral Spirits	1200	ND	ND	ND

Results expressed as ug/L unless otherwise noted.

ND means none detected at or above the detection limit listed.

ANALYSIS PERFORMED: Hydrocarbon Scan of soil by modified EPA Method 8015, GC/FID

COMPOUND	DETECTION LIMIT	B-201/2B RESULTS	B-201/7A RESULTS	B-202/8A RESULTS
Gasoline	10	ND	ND	ND
Diesel	25	ND	100	ND
Mineral Spirits	35	ND	40	ND

COMPOUND	DETECTION LIMIT	B-202/8A DUPLICATE
Gasoline	10	ND
Diesel	25	ND
Mineral Spirits	35	ND

Results expressed as mg/kg unless otherwise noted.

ND means none detected at or above the detection limit listed.

REPORT CONTINUES

Job#: GE-920414N-14

NW Geological Services, Inc.
Page 9

ANALYSIS PERFORMED: Hydrocarbon Scan of soil by modified EPA Method 8015, GC/FID

COMPOUND	DETECTION LIMIT	B-201/3B RESULTS
Gasoline	800	ND
Diesel	1200	3,200
Mineral Spirits	1500	ND

COMPOUND	DETECTION LIMIT	B-201/5B RESULTS	B-202/3B RESULTS	B-202/6B RESULTS
Gasoline	60	ND	ND	ND
Diesel	120	850	200	300
Mineral Spirits	200	460	ND	ND

COMPOUND	DETECTION LIMIT	B-202/7A RESULTS
Gasoline	60	ND
Diesel	120	300
Mineral Spirits	200	ND

Results expressed as mg/kg unless otherwise noted.

ND means none detected at or above the detection limit listed.

REPORT CONTINUES

Job#: GE-920414N-14

NW Geological Services, Inc.

Analysis Performed: Polychlorinated Biphenyls (PCBs) in ground water by modified EPA Method 608,GC/ECD.

SAMPLE ID	PCB	AROCLOR
B-201/W1	ND	---
B-202/W1/W2	ND	---
B-202/W1/W2/duplicate	ND	---

Detection Limit: 4.0 ug/L

Results expressed as ug/L unless otherwise noted.

ND means none detected at or above the detection limit listed.

Analysis Performed: Polychlorinated Biphenyls (PCBs) in soil by modified EPA Method 8080,GC/ECD.

SAMPLE ID	PCB	AROCLOR
B-201/1B	ND	---
B-201/1B/Duplicate	ND	---
B-201/2B	ND	---
B-201/3B	trace	1260
B-201/5B	ND, <1	---
B-202/3B	ND	---
B-202/7A	ND, <1	---

Detection Limit: 0.1 mg/kg

Results expressed as mg/kg unless otherwise noted.

ND means none detected at or above the detection limit listed.

The less than "<" symbol means none detected at or above the indicated value and represents the detection limit for the method.