State of Oregon
Department of Environmental Quality

Landfill Design and Operations Plan
For
Chemical Waste Management of the Northwest, Inc.

Arlington Facility • ORD 089 452 353
17629 Cedar Springs Lane
Arlington, Oregon

Standalone Document No. 14

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LANDFILL DESIGN AND OPERATIONS PLAN

1.0 INTRODUCTION

This *Landfill Design and Operations Plan* addresses existing landfill units and permitted but not yet built landfill cells at the Chemical Waste Management of the Northwest, Inc. (CWMNW) Arlington Facility. Locations of existing and proposed landfills are shown on Permit Figure 1-1 Facility Layout Map (as contained in the Part B Permit). As shown on the figure, L-14 is the currently active landfill and ten inactive landfills, which have been completely filled and closed in accordance with an approved closure plan (L-1, L-3, L-5, L-6, L-7, L-8, L-9, and L-10, L-12 and L-13). Figure 1-1 Facility Layout Map (as contained in the Part B Permit) also shows the location of the expanded footprint of Landfill L-14.

Landfill units at the Arlington Facility are used for the permanent disposal of solid hazardous and industrial wastes. On reaching final design grades, all landfills are covered by a final cover designed to minimize soil erosion and infiltration of rainwater through the final cover. Final cover design details for the currently active and future proposed landfills are presented in the facility's *Landfill Final Cover Design Plans* in the following documents;

- *Alternative Final Cover Design Report, Landfills L-12, L-13 and L-14*, Chemical Waste Management Arlington Facility, Gilliam County, Oregon, Applied Soil Water Technologies, August, 2014.

- *Alternative Final Cover Design Modification Report, Landfills L-13 and L-14*, Chemical Waste Management Arlington Facility, Gilliam County, Oregon, Geo-Logic Associates, Inc., July 2020.

All types of commercial, industrial, and agricultural wastes, including those identified or listed as hazardous wastes in 40 CFR Part 261, are potential candidates for landfill disposal at the Arlington Facility. Wastes that are not accepted at the facility are listed in Part A (Attachment 3) of the Permit Renewal Application. In addition, bulk and containerized liquid wastes are not accepted for landfilling, unless:

- The waste has been stabilized so that free liquids no longer are present;
- The container is very small (such as an ampule) or is a lab pack, or
- The container is designed to hold free liquids for use other than storage, such as a battery.

A process flow diagram that illustrates the movement of hazardous wastes into the landfills is shown on Figure 1-2. Waste analysis procedures, which dictate what wastes will be accepted for landfilling, are presented in the facility's *Waste Analysis Plan*.

In 2010 CWMNW completed a new estimate of needed disposal capacity, which resulted in the decision to expand the disposal capacity of Landfill L-14 by adding Cell 5 which increased the capacity to approximately 6.2×10^6 cubic yards. In 2024 due to Renewal Permit authorization delays CWMNW brought in the Landfill L-14 design contained in the renewal permit adding

Cells 6 through 8 which increased the capacity to a total of approximately 10.1×10^6 cubic yards. Refer to L-14 design drawings and Engineering Design Report contained in the Class III modification.

All of the landfill units are located well above the saturated zone (i.e., the uppermost aquifer). A comprehensive description of the site geology/hydrogeology can be found in the following documents previously submitted to the Oregon Department of Environmental Quality (DEQ):

Geologic and Hydrogeologic Site Characterization Report, Part B Permit Application, prepared for Chem-Security Systems, Inc., by Dames and Moore, dated April, 1987

RCRA Facility Investigation Report for Landfill Units L-9 and L-10, prepared for Waste Management, Inc. (Arlington, Oregon), by CH2MHill and Rust Environment and Infrastructure, Inc., dated May 20, 1996; and

Hydrogeologic Investigation and Engineering Design Report for Landfill L-14, Arlington, Oregon, prepared for Chemical Waste Management of the Northwest, Inc., by Rust Environment and Infrastructure Inc., dated February, 1998.

The uppermost aquifer which may potentially be impacted as a result of the landfill activities is monitored in accordance with the facility's *Groundwater Monitoring Plan*.

1.1 Active/Proposed Landfills

This *Landfill Design and Operations Plan* focuses on design features and landfill operational procedures for currently active and future landfill cells. Supporting geotechnical studies and engineering analyses performed as part of the landfill siting/design have been previously submitted to the DEQ prior to each landfill unit construction. Currently active landfill units were constructed in accordance with approved construction drawings and technical specifications prepared specifically for that phase of construction and include Cells 1, 2, 3 and 4 of L-14. Additional cells of Landfill L-14 (Cells 5, 6, 7 and 8) will be constructed in accordance with the approved construction drawings and technical specifications, and construction quality assurance will be guided by project specific *Construction Quality Assurance Plans* prepared prior to initiating construction.

Applicable design and construction documents and key design components for the currently active landfills and the remaining unconstructed cells within Landfill L-14 are summarized in Table 1-1. The design and construction documents demonstrate compliance with 40 CFR 264.301 through 264.304, and have been previously submitted to the ODEQ. They are incorporated into this document by reference.

1.2 Closed Landfills

Ten landfill units (L-1, L-3, L-5, L-6, L-7, L-8, L-9, L-10, L-12, and L-13) have been closed, via placement of a final cover, in accordance with approved closure plan specifications at the time of closure. Table 1-2 summarizes the size and capacity of the closed landfill units. Copies of the closure certifications are maintained in the operating record.

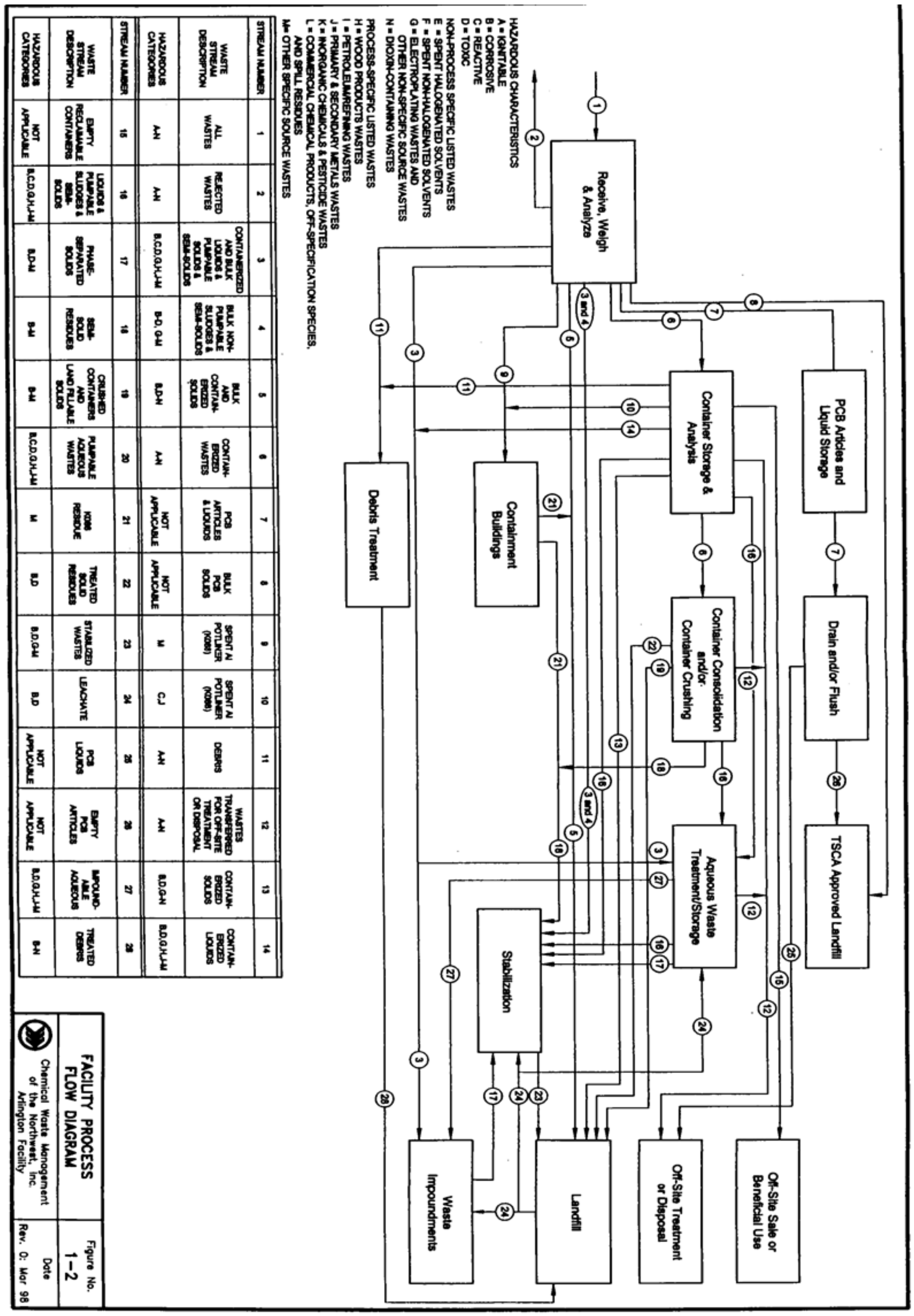


Figure 1-2 Process Flow

Table 1-1 Applicable Design and Construction Documents

Landfill Unit	Applicable Design and Construction Documents				Description of Key Design Components
	Phase	Documents	Approvals	Response Action Plan	
Landfill L-14	Design/ Construction/ CQA/ Closure	Hydrogeologic Investigation and Engineering Report, Proposed Landfill L-14, Rust Environment & Infrastructure, February, 1998	Outstanding modification submitted with Permit Renewal Application (March, 1998)	See facility's Landfill Response Action Plan document	Exceeds Minimum Technology Requirements for Landfills. Utilizes Geosynthetic Clay Liner. Third liner under leachate collection sumps.
Landfills L-12, L-13, & L-14		Revised Closure Cover Design Report, Thiel Engineering, February 2005			Redesign to steepen sideslopes.
Landfill L-14		Cell 1 Construction Drawings and Technical Specifications, Earth Tech, Inc., April 2003			
		Cell 2 Construction Documents and Technical Specifications, Earth Tech, Inc., March 2005			
		Cell 3 Construction Drawings and Technical Specifications, Environmental Information Logistics, LLC, February 2010			
		Part B Permit Modification Application, Environmental Information Logistics, LLC, October 2011		See 2010 modification to RAP as it relates to the secondary leachate collection and removal system (SLCRS)	Exceeds Minimum Technology Requirements for Landfills. Expanded footprint of landfill

Notes:
CQA - Construction Quality Assurance
LCRS/LCS - Leachate Collection and Removal System
LDCRS/LDS - Leachate Detection, Collection, and Removal System
DEQ - Oregon Department of Environmental Quality
Permit- RCRA Part B Permit Effective March 11, 1988 through March 10, 1998

Table 1-2 Size and Capacity od Closed Units

Landfill Unit	Size/Capacity	Operating Status
L-1	60' x 500' x 25' (deep)	Completely filled: July 15, 1981 Final closure cover: completed
L-3	65' x500' x 32.5' (av. depth)	Completely filled: December 1, 1981 Final closure cover: completed
L-5	160' x 350' x 34.5' (av.depth) (RCRA wastes) 160' x 150' x 31.75' (av. depth) (non-RCRA wastes)	Completely filled: May 20, 1981 Final closure cover: completed
L-6	175' x 700' x 30' (av. depth)	Completely filled: May 20, 1981 Final closure cover: completed
L-7	255' x 525' x 48' (deep) (RCRA wastes) 187' (av.) X 135' x 42' (deep) (non-RCRA wastes) Capacity 167 acre-feet (1)	Completely filled: 1990 Final closure cover: completed
L-8	120' x 600' x 30' (deep) (accepted potlining wastes) Capacity 65 acre-feet (1)	Completely filled: 1989 Final closure cover: completed
L-9	200' x 400' x 50' (deep) (RCRA wastes) 200' x 200' x 40' (deep) (non-RCRA wastes) Capacity 101 acre-feet (1)	Completely filled: 1990 Final closure cover: completed
L-10	400' x 600 x 66' (deep)Capacity 362 acre-feet	Completely filled: 2002 Final closure cover: completed
L-12	900’ X 440’ X 52’ Capacity 493 acre feet	Final closure March 2018
L-13	850’ X 900’ X 78’ Capacity 1487 acre feet	Final closure December 2020

Notes:
(1) This is the total capacity of the landfill during its active life and included mounding of waste above grade. The capacity for non-RCRA waste is not included in this amount.

2.0 ACTIVE LANDFILL DESIGN

Landfill L-14 is the Active Landfill at the facility. All landfills have received hazardous wastes after November 19, 1980 (the date when hazardous wastes were first regulated under RCRA). Detailed plans and specifications for construction of the active landfills are included in the facility's *Landfill Design Drawings* document and/or project specific construction drawings and technical specifications. Pertinent design details are summarized in Tables 2-1a through 2-1b.

2.1 Landfills L-12 and L-13 Design

Landfill L-13 was constructed prior to Landfill L-12. Both Landfill L-12 and L-13 are currently closed.

Landfill L-13 is a single-phase unit, divided into six hydraulically separated cells. The total surface area of L-13 is approximately 17.6 acres. Landfill L-13 has a total design capacity of approximately 1,252 acre-feet ($2.02x10^6$ cubic yards).

Landfill L-12 a single-phase unit, divided into two hydraulically separated cells. The total surface area of L-12 is approximately 9 acres. Landfill L-12 has a total design capacity of approximately 486 acre-feet ($0.78x10^6$ cubic yards).

2.1.1 Landfill L-12 and L-13 Foundations

Detailed engineering analyses were conducted as part of the L-12 and L-13 siting/design to evaluate settlement/heave, bearing capacity, cut slope stability under static and dynamic loading conditions, and liquefaction potential.
The results of these evaluations and other analyses presented in this section have been previously submitted to the DEQ in the following document as part of the design/siting documents required for landfill construction approval:

> *Part B Permit Application*, prepared for Chem-Security Systems, Inc., by Dames and Moore, dated 24 June, 1986 - Exhibits 7 and 19.

Foundation materials of L-12 and L-13 have relatively high strength and low compressibility characteristics. Since foundation grades at both landfills are well above (>100 feet) the groundwater table, most of the settlement/heave is elastic and will occur as the loads are applied or removed. Maximum heave was estimated to be in the range of 1 to 3 inches during landfill excavation. Net settlement after the landfills have been filled with waste is expected to be about 1 inch or less. The location of the groundwater table relative to the landfill foundation soils also precludes liquefaction of these soils.

Since the final loads on the foundation soils of the L-12 and L-13 after waste filling will be similar to the initial loads prior to the excavation, the foundation soils have an adequate factor of safety against local bearing failures. The foundation soils, which are hard/very dense, had sufficient strength to support the construction and operation equipment. Analysis also showed that the soil liner material has an adequate safety factor against local bearing failure.

Sideslopes of Landfill L-12 and L-13 were excavated at a maximum slope of 3H:1V. Stability analyses of these excavation slopes show that the landfills have adequate factors of safety under both static and dynamic loading conditions. The bottom (floor) area of the landfill units have a minimum 2 percent slope that provides drainage for the upper (primary) and lower (secondary) leachate collection systems.

2.1.2 Landfill L-12 and L-13 Liner and Leachate Collection System Design

Liner systems for Landfills L-12, and L-13 were designed in accordance with EPA guidelines to prevent leachate migration. The system design consists of upper (primary) and lower (secondary) composite liners separated by two leachate collection systems. The primary leachate collection and removal system (LCRS or LCS), located above the upper liner, prevents the buildup of excessive hydraulic pressure head on the surface of the upper synthetic liner. A secondary leachate collection system (also referred to as the leachate [or leak] detection, collection, and removal system [LDCRS or LDS]), located between the upper and lower liners, provides for the rapid collection of any leachate in the unlikely event that a leak should develop in the upper liner.

The liner system (base and sideslope) for Landfill L-13 is summarized in Table 2-2. The design of Landfill L-12 was completed prior to waste filling in L-13. The Landfill L-12 design incorporated additional features to the liner design on the base of the landfill for improved liner performance. Based on the Landfill L-12 design, additional construction was completed in Landfill L-13 to implement the Landfill L-12 modifications. The liner system (base and sideslope) for Landfill L-12 is summarized in Table 2-1.

The original base liner design of Landfill L-13 incorporated a double geomembrane/geonet system over a 3-foot thick soil/bentonite layer. The Landfill L-12 design incorporated an additional 1.5-foot thick soil/bentonite layer between the two geomembrane/geonet layers. Based on the incorporation of this additional soil/bentonite component into the Landfill L-12 design, it was decided to retrofit the Landfill L-13 liner to add the soil/bentonite component. The Landfill L-13 liner was reconstructed by removing 1-foot of the previously constructed 2-foot thick soil working layer (placed over the double geomembrane/geonet system), and then constructing a new 1.5-foot thick soil/bentonite layer overlain by a new (third) geomembrane/geonet layer.

The primary leachate collection systems of Landfills L-12 and L-13 consist of a synthetic drainage layer (geonet or geocomposite) overlain by a 1-foot thick granular drainage layer in the bottom of the landfills. A geotextile separates the drainage material from the gravel. Perforated HDPE collection pipes were placed along the bottom of the landfill cells to improve the efficiency of leachate collection and minimize the buildup of head on the upper liner. On the sideslopes, due to the 3H:1V gradient, a single layer of synthetic drainage material collects leachate.

A secondary leachate collection system consisting of a single layer of synthetic drainage material is installed between the upper and lower liners.

Leachate from the primary and secondary collection systems is channeled toward primary and secondary leachate collection sumps, respectively, located on the landfill bottom within each cell. Each primary sump is equipped with a sideslope riser to permit convenient sampling and removal of leachate during the operational and post-closure periods. In addition, the south sump has a vertical riser that acts as an alternate route for leachate removal. A vertical riser connected to the north sump was abandoned in 2003. See Section 2.2.3. The secondary leachate collection sumps are equipped with single risers located on the sideslopes. The secondary risers are sandwiched between the upper and lower liners to eliminate penetration of the geomembrane liners.

Leachate is removed from the leachate removal sump (the primary sump) once leachate levels are near or above their respective action levels. The leachate is pumped either to a portable leachate storage container located within the footprint of the lined area of the respective landfill unit or directly to dust control sprinklers or drip systems. Leachate is removed with a vacuum truck, submersible pump or equivalent. The leachate is spread through a drip or sprinkler system onto the landfill surface to control fugitive dust emissions. Leachate volumes not needed for dust control are removed via a vacuum truck to the wastewater treatment plant or a surface waste impoundment for treatment or disposal, as appropriate.

Responses required to address liquids that accumulate in the secondary leachate collection sumps are presented in the facility's *Landfill Response Action Plans* document.

Details of the liner, base materials, and leachate collection systems for Landfills L-12 and L-13 are presented in the facility's *Landfill Design Drawings* document, and are summarized in Tables 2-1 and 2-2, respectively.

2.2 Landfill L-12 and L-13 Liner Specifications and Installation

The landfill liner systems for Landfills L-12 and L-13 were installed in accordance with approved construction drawings and technical specifications prepared for each unit prior to construction. Inspections were conducted during construction as described in Section 3.4 of this document. Construction Quality Assurance (CQA) reports have been previously submitted to the DEQ (see Table 1-1) certifying that the currently active landfills were constructed in accordance with the approved technical specifications at the time of construction.

2.2.1 Synthetic Liners, Leachate Collection Systems and LCRS Collection Pipes

CWMNW uses HDPE 60-mil synthetic geomembrane liner material for hazardous waste landfills operated by the company. This material was chosen based on review of manufacturer's test data, submersion, physical testing, and prior operating experience. This information indicates that 60-mil HDPE has the best physical characteristics (particularly related to stress deformation, puncture resistance, and weatherability) and the widest range of compatibility with anticipated leachate that may be generated in landfill units at the Arlington Facility. This liner material can also be extrusion- or fusion-welded to produce stronger, more consistent seams than materials requiring solvent welding.

To further confirm the compatibility of HDPE with the type of leachate that may be generated in landfills, CWMNW has completed a program conducted by polymer chemists to determine those chemical constituents that might impact synthetic liners and the possible concentrations of these constituents in leachate from a solids-only landfill. Submersion testing and physical testing of samples following exposures have also been completed. Welded liner seams made of the same HDPE material were also tested.

Maximum stresses under which components of the liner systems may be subjected were calculated. It has been demonstrated through laboratory tests and calculations that the stresses imposed on the liner systems will not exceed the yield point of the HDPE liners. Minimum specification for HDPE liner materials for L-12 and L-13 are summarized in the respective construction documents prepared for each landfill.

Calculations were also completed to demonstrate that waste loading on the leachate collection pipes would not cause them to deform. Collection pipes and drainage layers will not deform excessively under the imposed loading conditions.

A summary of test data, engineering analyses, and laboratory tests obtained to date regarding HDPE liners, which have been performed to demonstrate the function of the leachate collection systems, have been previously submitted to the DEQ in the following document:
Part B Permit Application, prepared for Chem-Security Systems, Inc., by Dames and Moore, dated 24 June, 1986 - Exhibits 5 and 19.

2.2.2 Landfill L-12 and L-13 Soil Liner Subgrade and Soil Liners

In general, earthwork for constructing soil liner subgrade for existing landfill units L-12 and L-13 included either soil cut or fill. For portions constructed on fill, subgrade was constructed in loose lifts of approximately 6 to 8 inches thick, with each lift compacted in accordance with the approved technical specifications.

For the portions constructed by cut, the upper 12 inches of the *in-situ* soil subgrade was scarified, moisture conditioned, and re-compacted in accordance with the approved technical specifications. The finished subgrade was prepared to be free of protrusions, irregularities, or discontinuities.

The prepared subgrade was covered with at least 3 feet of compacted low permeability soil liner material that had a maximum hydraulic conductivity of 1×10^{-7} cm/sec. The soil liner provided a firm and uniform base for the installation of the synthetic liner system.

The soil liner subgrade and soil liner were completed under the direction of a professional engineer implementing the approved CQA Plan. In-place soil moisture and dry densities were determined by the Nuclear Densometer Method (ASTM Tests D-2922-81 and D-3017-78) or the Sand Cone Method (ASTM Test D-1556-64) to verify that the soil liner subgrade and soil liner were compacted to meet specified soil moisture and density.

The soil liner was constructed of *in-situ* fine grained soils mixed with at least 5 percent bentonite by dry weight to obtain a maximum permeability of 1×10^{-7} cm/sec after compaction. The soil liner material was placed on a grade of approximately 3H:1V or flatter with no abrupt changes in grade. The soil liner material was free of rock, fractured stone, debris, cobbles, rubbish, lenses, cracks, channels, root holes or other structural non-conformities that could increase its hydraulic conductivity. The foundation provided by this compacted soil liner material which rests on naturally consolidated soils and compacted subgrade soils ensures the integrity of the liner and foundation of the landfill.

Based on various subsurface explorations and laboratory testing programs, the native clayey silt soils used to construct soil liner had the following typical characteristics:

Unified soil classification: ML/CL or MH/CH
In situ moisture content: 62-99 percent (75 percent average)
In situ dry density: 45-64 pcf (52 pcf average)
Atterberg limits: 90 < LL < 120; 29 < PI < 68

Native fine-grained soils appropriate for use in preparation of the soil liner were visually inspected, segregated, and stockpiled under the direction of the Field Engineer. Additional soil index and classification tests were conducted, as necessary, to confirm the adequacy of the native soils for soil liner construction. To obtain the desired permeability, a minimum of 5 percent by dry weight of bentonite was added to the native clayey silt soils. The bentonite mixture was Custom Sealant 50 manufactured by the American Colloid Company or its equivalent, subject to approval by the Field Engineer. The bentonite spreading rate was adjusted at the time of soil liner construction, as required, to comply with the permeability specification.

The soil liner material was placed in lifts parallel to the final grade. Lifts did not exceed 6 inches in compacted depth. Care was taken to scarify, blend, and compact layers together such that weak zones or zones of high permeability did not exist within the completed soil liner. The final lift was smooth rolled to produce a smooth surface for placement of the 60 mil HDPE liner.

A series of laboratory tests were conducted to assess the potential for dispersion and piping due to the flow of liquids through the soil liner material. Tests were conducted on samples of in-place compacted soil liner material containing at least 5 percent by dry weight of bentonite. The tests consisted of a pinhole test, a crumb test, and a double hydrometer test. Test procedures and results have been previously submitted to the DEQ in the following document:
Part B Permit Application, prepared for Chem-Security Systems, Inc., by Dames and Moore, dated 24 June, 1986 - Exhibit 7A.

Results indicated that the soil/bentonite mixture shows no dispersive characteristics and that the potential for piping is very low.

2.2.3 Closure of Landfill L-12 North Primary Leachate Collection System Vertical Access Riser

The vertical access riser for the north primary LCRS sump in Landfill L-12 was damaged in March 2003. Damage to the vertical standpipe caused waste materials to slough into the access riser and fill approximately 100 feet of the pipe from the base of the sump. Since there are two riser pipes (one vertical and one along the eastern sideslope) that allow access to the LCRS sump in Landfill L-12, the vertical standpipe was closed and abandoned in place.

Procedures used for the abandonment of the vertical standpipe for the north primary LCRS sump in Landfill L-12 were outlined in the document entitled *Decommissioning Plan for the Vertical Access Riser in Landfill L-12 North Primary Leachate Collection Sump*.

2.3 Landfill L-14 Design

2.3.1 General Configuration

Landfill L-14 is designed as a multi-phase unit divided into four hydraulically separated cells. The 2013 expansion of Landfill L-14 added a fifth hydraulically separated cell to the landfill. The 2024 modification added cells 6 through 8 and reoriented Cell 5 to a North South orientation. In this configuration L-14 has a permitted planar area of approximately 84.3 acres. Landfill L-14 has a total design capacity of approximately $10.1x10^6$. Supporting geotechnical studies and engineering analyses performed in support of the currently permitted landfill siting/design have been previously submitted to the DEQ in the following documents:

> *Engineering Design Report for Landfill L-14 Expansion*, by Civil & Environmental Consultants, dated March 30, 2020
>
> *Geotechnical Evaluations for Permit Application of Landfill L-14 Cells 5 Through 8 Expansion,* by Geosyntec, dated January, 2022.
>
> *L-14 Cell 4 Cell 5 Expansion,* by Environmental Information Logistics, dated December 31, 2013.
>
> *Hydrogeologic Investigation and Engineering Design Report for Landfill L-14, Arlington, Oregon*, prepared for Chemical Waste Management of the Northwest, Inc., by Rust Environment and Infrastructure Inc., dated February, 1998 - Section 8.0 and Appendix G.

The overall design concept for L-14 remains similar to previously constructed landfill units at the Arlington Facility in that the design meets or exceeds the minimum technology requirements for landfill units. General design details for the currently permitted Landfill L-14 are summarized in Table 2-3a and Table 2-3b.

Cells 1 through 4 of Landfill L-14 were constructed as originally designed in 2003, 2005, 2010-2011, 2017-2021 respectively.

2.4 Landfill L-14 Foundation

Detailed engineering analyses were conducted as part of the original L-14 siting/design to evaluate settlement/heave, bearing capacity, and cut slope stability under static and dynamic loading conditions. The results of these evaluations and other analyses presented in this section have been previously submitted to the DEQ in the following document as part of the design/siting documents required for landfill construction approval:

> *Geotechnical Evaluations for Permit Application of Landfill L-14 Cells 5 Through 8 Expansion,* by Geosyntec, dated January, 2022. The overall geotechnical results for L-14

Cells 5-8 remains similar to previously analysis with the design meets or exceeds the requirements for landfill units.

Hydrogeologic Investigation and Engineering Design Report for Landfill L-14, Arlington, Oregon, prepared for Chemical Waste Management of the Northwest, Inc., by Rust Environment and Infrastructure Inc., dated February, 1998.

2.4.1 Foundation Settlement and Bearing Capacity

Soils beneath L-14 have relatively high strength and low compressibility characteristics. Since the landfill's foundation grades are well above (>100 feet) the groundwater table, most of the anticipated settlement is elastic and will occur as the loads are applied.

Settlement of the soils underlying the landfill (and of the soil/bentonite component of the base liner system, for Cells 1 – 3) was evaluated along a select leachate flowline within each of the five cells. Loads for each cell were calculated based on the proposed final grades of the expanded landfill.

For the five sections analyzed, the base grade slopes on the floor of L-14 meet the requirement of 40 CFR § 264.301(c)(3)(i) to be constructed at a minimum slope of 1%. Conservative estimates of post-settlement slopes show that all sections will maintain positive drainage.

Bearing capacity of the landfill was also re-evaluated to ensure that the base of the landfill would remain stable under the increased load resulting from the landfill expansion. The bearing capacity of the soils underlying the landfill was evaluated assuming that general shear failure will control since the landfill is a relatively non-rigid foundation on the subgrade soils.

Two scenarios were evaluated that cover the range of possible failure conditions. Both scenarios used long term or drained soil strength and assume the landfill is at the maximum height. A third scenario that used undrained or short term soil strength was considered but not evaluated because rapid soil loading conditions that induce undrained conditions in the soil have not occurred as the existing landfill has been filled, nor are they anticipated as part of the landfill development from expansion.

Maximum allowable waste heights were calculated under the two design scenarios and were 415 feet and 430 feet, versus the design height of 208 feet. Therefore, the soil underlying Landfill L-14 has sufficient bearing capacity to support the expanded landfill under the design conditions.

For the 2022 expansion Cells 6-8, L-14 bearing capacity was rechecked. The base of the landfill acts as a footing bearing on the native soil, please refer to previously submitted document *Geotechnical Evaluations for Permit Application of Landfill L-14 Cells 5 Through 8 Expansion,* by Geosyntec, dated January, 2022.

Since there are no soils at the site susceptible to earthquake induced liquefaction and the static factor of safety is high, separate calculations for earthquake loading were not performed.

2.5 Landfill L-14 Liner and Leachate Collection System Design

The liner system for Landfill L-14 was designed in accordance with applicable regulations and EPA guidance. The liner system in Cells 1-3 are similar to those of Landfills L-12 and L-13, however several key enhancements have been made in Cells 4-8:

> **Tertiary Sump –** Each cell within L-14 has a tertiary sump constructed beneath the primary and secondary leachate collection sump system. The tertiary sump acts as an "engineered vadose zone" in an area of the landfill with the highest likelihood of a potential release (i.e., leachate collection sumps). The tertiary sumps are designed to provide the landfill unit with the earliest possible indication of a release that can be effectively monitored.
>
> **Incorporation of Geosynthetic Clay Liner** – The liner system in all cells of L-14 utilizes a geosynthetic clay liner (GCL) in the upper composite (primary) liner, instead of the soil/bentonite liner used in Landfills L-12 and L-13. For Cells 4 through 8, Resistex plus® GCL or an approved equal were used in Cell 4 primary and secondary. Resistex plus® GCL will also be used in the construction of Cells 5-8 primary and secondary. The secondary liner in Cells 4-8 replaced the compacted soil/bentonite layer because of the lower permeability. "Resistex®" is a registered trademark name for CETCO GCL materials with chemical resistant polymers.
>
> An equivalency evaluation was conducted as part of the original Landfill L-14 permitting in 1998. It was not revised as part of this update because the design conditions have not changed. The original evaluation determined that the flux of water through the soil/bentonite liner was approximately 2.7 times greater than that for a GCL. This, along with other factors (scarcity of soil materials for soil liner, favorable weather conditions, production quality, cost, installation, repairs etc.), makes the GCL a suitable replacement to the soil/bentonite layer and will further reduce the possibility of a release from Landfill L-14.

The liner system (base and sideslope) for Landfill L-14 is summarized in Table 2-3a and Table 2-3b.

Within each cell, leachate from the primary and secondary collection systems is channeled toward primary and secondary leachate collection sumps, respectively, located on the landfill bottom. Each primary sump in Cells 1 – 3 is equipped with a sideslope riser to permit sampling and removal of leachate during the operational and post closure periods. Cells 4 through 8 have two primary sideslope risers to provide additional access for pumps and other equipment. In addition, Cells 5 through 8 include a smaller diameter monitoring conduit. This pipe is located along the spine of the herringbone pattern of the base grades, runs through the primary leachate collection sump, and up the sideslope (adjacent to the primary sump risers) to daylight at the landfill perimeter. The pipe is perforated along the floor of each cell and solid on the sideslope. See *Engineering Design Report for Landfill L-14 Expansion*, by Civil & Environmental Consultants, dated March 30, 2020.

The secondary leachate collection sumps are also equipped with a single riser for each cell located on the sideslopes. The secondary risers are sandwiched between the upper and lower liners to eliminate penetration of the geomembrane liners.

Equipment which has been approved for sampling monitoring wells pursuant to the RCRA Permit is used for sampling leachate from the secondary leachate collection sumps if the sampling is being performed to make a determination of whether the liquid is derived from hazardous waste.

Leachate is removed from the primary leachate removal sump when leachate levels are near or above the action level. The leachate is pumped to a vacuum truck and used for dust control within the landfill or transported to the on-site wastewater treatment plant for treatment.

Responses required to address liquids which accumulate in the secondary leachate collection sumps are presented in Standalone Document No. 15 *Landfill Response Action Plans* (RAP) document. The RAP was updated to reflect the changed design conditions due to expansion of the landfill. Responses required to address liquids which accumulate in the tertiary sump are presented in the facility's *Groundwater Monitoring Plan*.

2.5.1 Base Grade Configuration

The floors of Cells 1 through 3 are planar and slope between 1 and 1.5 percent, from north to south toward a collection sump located along the southern edge of each cell. The base of Cell 4 also slopes at 1.5 percent from north to south but in a herringbone configuration with a sump at the toe of the southern sideslope. The floor of Cells 5 through 8 is also configured in a herringbone pattern and also slopes at 1.5 percent toward the spine of the herringbone, and then to a sump at the toe of the northern sideslope. Cells 1 through 3 each have a shallow trench at the toe of the sideslope that directs liquids to that cell's sump. Due to the shape of and the herringbone configuration of Cells 4 through 8, a toe trench is not necessary. The lined sideslopes of the landfill are at a 3:1 (H:V) slope. Cells 1-4 have been constructed and approved by ODEQ. Expansion Base Grade Drawings for Cells 5-8 are located in the *Engineering Design Report for Landfill L-14 Expansion*, by Civil & Environmental Consultants, dated March 30, 2020.

Each cell is hydraulically separated from adjacent cells by an intercell berm. Each berm is three feet high (minimum) and is incorporated into the liner and leachate collection system.

2.5.2 LCRS Geocomposite Flow Capacity

The geocomposite layer of the primary leachate collection system was designed to remain free-draining under the maximum expected impingement rate. A design method was utilized that has been developed and refined over a number of years by several organizations within the geosynthetics industry, and is the industry standard for evaluating flow performance of geonets and geocomposites. The method accounts for various mechanisms that can impact the transmissivity of a drainage layer over time. These include: clogging due to biological and chemical activity, clogging due to sediment, and creep of the HDPE ribs of the geonet material. Conservative safety factors were used to account for all of these mechanisms in the analysis.

Calculations were performed for several scenarios using the maximum impingement rates from the HELP modeling performed as part of the 1998 permitting. Critical flow lines were analyzed for each cell to ensure that the geocomposite had sufficient flow capacity under the design impingement rate. The calculations document that a geocomposite in Cells 1 through 3 will perform satisfactorily under the loading imposed by the design waste thickness. A minimum required transmissivity was established for Cell 4 in within the *L-14 Cell 5 Expansion,* by EIL, dated December 31, 2013. Minimum required transmissivity was established for Cells 5 through 8within the CEC Design Report. The associated calculations will be used when specifying material for the construction of those cells. LCRS Geocomposite Flow Capacity Calculations for Cells 5-8 are provided in the *Engineering Design Report for Landfill L-14 Expansion*, by Civil & Environmental Consultants, dated March 30, 2020.

2.5.3 Sump Riser Pipe Structural Integrity

The structural integrity of the sump riser pipes was evaluated based on the design waste thickness. These calculations were prepared for the original L-14 Cells 1-3, Cells 4-5 2013 expansion and 2022 Cells 6-8 expansion. The expansion of the landfill did not increase the design waste thickness above the sump riser pipes, so no design modifications were required for Cells 1 – 3. For Cells 4 through 8, the diameter of the sump riser pipes was increased from 18 to 24 inches. The updated calculations for Cells 4 through 8 demonstrate that the 24-inch diameter riser pipes satisfy the established factor of safety for structural integrity. Sump Riser Pipe Structural Integrity Calculations for Cell 4 was submitted in the 2013 expansion. Cells 5-8 are provided in the *Engineering Design Report for Landfill L-14 Expansion*, by Civil & Environmental Consultants, dated March 30, 2020.

2.5.4 Slope Stability - Intermediate Slopes

Slope stability and foundation analyses were performed in the original L-14 design Cells 1-3 and updated for Cells 4 – 5 during the 2013 expansion and revisited for Cells 5-8 during the 2022 expansion to document that the design grades of Landfill L-14 meet the regulatory requirements. Analyses were performed to model conditions during construction and operation of the landfill as well as after closure of the landfill. The analyses demonstrate that landfill slopes will be stable within the target factor of safety under the design conditions over the life of the landfill and throughout the post-closure period.

The overall geotechnical results for L-14 Cells 5-8 remains similar to previously analysis with the design meets or exceeds the requirements for landfill units. The detailed geotechnical report has been submitted *Geotechnical Evaluations for Permit Application of Landfill L-14 Cells 5 Through 8 Expansion,* by Geosyntec, dated January, 2022.

Slope Stability Evaluation Methods

The stability of the landfill slopes was evaluated using the limit equilibrium method. In general terms, this method is based on balancing translational and rotational forces of a waste mass sliding along a slip surface. Forces (moments or stresses) resisting instability (resisting forces) of the mass are balanced against those that cause instability (disturbing or driving forces).

Based on industry experience and an analysis of the shear strength of the various materials, it can safely be assumed that the weakest and therefore critical material in the landfill stability is one of the interfaces within the base liner system. The soils beneath the liner system and the waste are stronger than either liner system interface with those materials. Therefore, the calculations were performed to determine the lowest allowable interface strength of the liner system that meets the established minimum factors of safety.

Interface Friction Angles and Shear Strength

Shear strength data for the base liner system of Cells 1 through 3 was taken from testing performed as part of the detailed design of Cell 3 in 2010. Since the liner system of Cells 1 through 3 are identical and similar materials were used throughout, this is representative.

For Cell 4, shear strength data from testing performed on the lining system in 2013 was used in the stability analyses. The lining system included the incorporation of GCL as a replacement for the soil/bentonite layer. Representative geosynthetic and soil materials were used in preconstruction testing for Cell 4.

Cell-specific testing can be performed prior to the construction of Cells 5 through 8 to confirm that the strength envelope of the proposed materials meets the requirements established by this analysis. Slope stability analysis were run using the limited equilibrium software program SLIDE and performed utilizing the Spencer method, please refer to *Geotechnical Evaluations for Permit Application of Landfill L-14 Cells 5 Through 8 Expansion,* by Geosyntec, dated January, 2022.

Static and Seismic Analysis Parameters

Analyses were performed for static and seismic conditions. Seismic conditions were assessed using a pseudo-static approach where a horizontal force equal to the peak design earthquake acceleration is applied to the waste mass. See *Geotechnical Evaluations for Permit Application of Landfill L-14 Cells 5 Through 8 Expansion,* by Geosyntec, dated January, 2022.
A peak ground acceleration of 0.1836g was chosen for the 2022 expansion seismic analysis Cells 5-8. For the site location, this is the value that has a 2 percent chance of being exceeded in 50 years which is roughly equivalent to the 10% probability of being exceeded in 250 years. The value was obtained from USGS Uniform Hazard Response Spectrum. The peak ground acceleration was increased by the site coefficient of 1.2 to a value of 0.22g to take into account the stiffness of soil overlying bedrock.

Stability of Intermediate Grade Slopes

Conservative configurations of intermediate waste slopes were analyzed during the 2013 expansion for the current landfill configuration. The most critical section for the intermediate filling conditions was assessed to be a north-south section through Cells 4 and 5. It represents the point at which Cells 1 through 4 are filled to their interim capacity and Cell 5 is excavated but has no waste in place.

The section was analyzed under both static and seismic conditions using conservative assumptions for waste strength, liner and final cover system strength, and earthquake forces. The analyses indicate that the stability of the proposed intermediate filling plans meet the established minimum factors of safety.

The overall geotechnical results for L-14 Cells 5-8 remains similar to previously analysis with the design meets or exceeds the requirements for landfill units. The detailed geotechnical report has been submitted to the agency (*Geotechnical Evaluations for Permit Application of Landfill L-14 Cells 5 Through 8 Expansion,* by Geosyntec, dated January, 2022).

2.6 Landfill L-14 Liner Specifications and Installation

The landfill liner systems for the existing cells of Landfill L-14 have been installed in accordance with previously approved versions of this *Landfill Design and Operations Plan,* as well as approved construction drawings and technical specifications prepared for each cell prior to construction. Quality assurance was conducted during construction as described in Section 3.4 of this document. Construction Quality Assurance (CQA) reports have been previously submitted to the DEQ (see Table 1-1) certifying that the currently active landfills were constructed in accordance with the approved technical specifications at the time of construction.

Construction of Landfill L-14 Cells 5 through 8 will be completed in accordance with approved construction drawings and technical specifications prepared for each cell prior to construction. Permit drawings are included in Standalone Document No. 18 *Landfill Design Drawings*. Future cell construction drawings, technical specifications, and quality assurance manual submitted to the Department. Construction inspection of L-14 Cells 5 through 8 will be completed in accordance with approved facility Construction Quality Assurance Plan (*Construction Quality Assurance Plan for CWMNW, Inc*., Standalone Document No. 16).

2.7 Landfill L-14 Final Cover

Final cover systems that will be constructed in Landfill L-14 at closure are presented in the following facility documents:

- *Alternative Final Cover Design Report, Landfills L-12, L-13 and L-14*, Chemical Waste Management Arlington Facility, Gilliam County, Oregon, Applied Soil Water Technologies, August 2014.
- *Alternative Final Cover Design Modification Report, Landfills L-13 and L-14*, Chemical Waste Management Arlington Facility, Gilliam County, Oregon, Geo-Logic Associates, Inc., July 2020.
- *Construction Quality Assurance (CQA) Manual For Landfill Closure Construction*, Chemical Waste Management Arlington Facility, Gilliam County, Oregon, Geo-Logic Associates Inc., January, 2022

Landfill closure procedures and post-closure maintenance of the landfill cover are described in the facility's *Closure/Post-Closure Plans*.

2.7.1 Stability of Waste Mass and Final Cover

The stability of the landfill at final grade was also reevaluated for the 2022 expansion. The critical section is a north-south line that passes through the thickest parts of the landfill and has the longest and steepest slopes with the smallest buttresses. The east-west section was also analyzed. Both sections were analyzed under both static and seismic conditions using conservative assumptions for waste strength, liner and final cover system strength, and earthquake forces. The analyses indicate that the stability of the proposed final grading plan meet or exceed the target minimum factors of safety. See *Geotechnical Evaluations for Permit Application of Landfill L-14 Cells 5 Through 8 Expansion,* by Geosyntec, dated January, 2022.

2.7.2 Final Cover Soil Erosion

The potential erosion of the upper soil layers of the final cover was evaluated to ensure that the cover will continue to perform as intended over the design period. Software developed by the U.S Department of Agriculture, Natural Resources Conservation Service was used to calculate a rate of soil erosion based on factors such as slope length, steepness, soil types, vegetative coverage, and type of vegetation.

Two scenarios were evaluated: (1) unvegetated slopes, which represents a short-term condition just after final cover construction is completed but before vegetation is established; and (2) vegetated slopes which represent the long-term scenario once vegetation has become established. The predicted soil loss rates calculated by the software for the short term condition indicate that some form of erosion protection may be required on the sideslopes (diversion berms, erosion blankets, etc.) until vegetation is established. For the long-term scenario with established vegetation, predicted soil loss rates are substantially less than the established maximum allowable rate, indicating that minimal erosion is expected and permanent erosion control features such as diversion berms are not required.

TABLE 2-1 Summary of Landfill L-12 Design

Landfill Units	Liner System Design (top to bottom)	Sideslope Design (top to bottom)	Leachate Collection Sumps	Final Cover Design	Approximate Landfill Design Capacity/Size (Total)
L-12 Cells 1 & 2	Upper (Primary) Leachate Collection System Geotextile filter 1-ft granular drain Geotextile filter Geonet (single synthetic drainage layer) Composite Upper (Primary) Liner 60-mil HPDE liner Minimum 1.5-ft soil/bentonite liner (permeability 1x10^{-7} cm/sec or less) Lower (Secondary) Leachate Collection System Geotextile filter Geonet (single synthetic drainage layer) Composite Lower (Secondary) Liner 60-mil HPDE liner Minimum 3-ft soil/bentonite liner (permeability 1x10^{-7} cm/sec or less)	100-mil HPDE protective membrane Geotextile filter Geonet 60-mil HPDE liner Geonet 60-mil HPDE liner Minimum 3-ft soil/bentonite liner (permeability 1x10^{-7} cm/sec or less)	Two primary and secondary leachate collection sumps systems are associated with Landfill L-12. One sump system is located within each cell	See facility's Landfill Final Cover Design Plans document	Size: 900' x 440' x 54' (equiv.) Capacity: 486 acre-feet (Approx. 0.78 x 106 cubic yards)

TABLE 2-2 SUMMARY OF LANDFILL L-13 DESIGN

Landfill Units	Liner System Design (top to bottom)	Sideslope Design (top to bottom)	Leachate Collection Sumps	Final Cover Design	Approximate Landfill Design Size/Capacity (Total)
L-13 Cells 1 – 6	Original design modified to include an additional liner system Additional Upper (Primary) Leachate Collection System Geotextile filter 1-ft granular drain Geotextile filter Geonet (single synthetic drainage layer) Additional Composite Upper (Primary) Liner 60-mil HDPE liner Minimum 1.5-ft soil/bentonite liner (permeability $1x10^{-7}$ cm/sec or less) Original Working Surface Typically 1-ft working surface Original Upper (Primary) Leachate Collection System Geotextile filter Geonet (single synthetic drainage layer) Original Upper (Primary) Liner 60-mil HDPE liner Original Lower (Secondary) Leachate Collection System Geonet (single synthetic drainage layer) Composite Lower (Secondary) Liner 60-mil HPDE liner Minimum 3-ft soil/bentonite liner (permeability $1x10^{-7}$ cm/sec or less)	Design modified to replace soil protective layer with 100-mil HDPE protective layer Geotextile filter 100-mil HPDE protective membrane Geotextile filter Geonet 60-mil HPDE liner Geonet 60-mil HPDE liner Minimum 3-ft soil/bentonite liner (permeability $1x10^{-7}$ cm/sec or less)	Six primary and secondary leachate collection sumps systems are associated with Landfill L-13. One sump system is located within each cell	See facility's Landfill Final Cover Design Plans document	Size: 850' x 900' x 71' (equiv.) Capacity: 1,252 acre-feet (Approx. 2.02 x 10^6 cubic yards)

TABLE 2-3a SUMMARY OF LANDFILL L-14 DESIGN CELLS 1-3

Landfill Units	Liner System Design (top to bottom)	Sideslope Design (top to bottom)	Leachate Collection Sumps	Final Cover Design	Approximate Landfill Design Size/Capacity
L-14 (Cells 1-3)	**Upper (Primary) Leachate Collection System** • Primary Protective Soil 18-inches(min.) • Primary Geocomposite LCRS Layer • Primary Liner 60-mil HDPE • Primary GCL **Lower (Secondary) Leachate Collection System** • Secondary Geocomposite LCRS Layer • Secondary Liner 60-mil HPDE • Secondary Clay Liner • Subgrade	**Upper (Primary) Leachate Collection System** • Primary Protective Soil 12-inches (min.) • Primary Geocomposite LCRS Layer • Primary Liner 60-mil HPDE **Lower (Secondary) Liner System** • Secondary Geocomposite LCRS Layer • Secondary Liner 60-mil HPDE • Secondary Clay Liner Minimum 3-ft (min.) • Subgrade	**Primary Sump** • Primary Protective Soil 18-inches (min.) • One Primary Leachate Collection Sump Riser 18" HDPE, SDR-11. 3-ft Sump Aggregate with Non-Woven Geotextile wrap. • Primary Geocomposite LCRS Layer • Primary Liner 60-mil HDPE • Primary GCL Two Layers in Sump **Secondary Sump** • One Secondary Leachate Collection Sump Riser 18" HDPE, SDR-11. 2-ft Sump Aggregate with Non-Woven Geotextile wrap. • Secondary Geocomposite LCRS Layer • Secondary Liner 60-mil HPDE • Secondary GCL (sump only) • Secondary Clay Liner (sump only) **Tertiary Sump** • One Tertiary Leachate Collection Sump Riser 18" HDPE, SDR-11. 2-ft min. Sump Aggregate or General Soil with Non-Woven Geotextile wrap. • Tertiary Geocomposite LCRS Layer • Tertiary Liner 60-mil HPDE • Tertiary GCL (sump only). • Subgrade	Approved alternative final cover design; 3 feet of onsite soils over daily cover, see Standalone Document No. 17*Landfill Final Cover Design Plans*	2013 expansion with Cells 1-5 Size: 1,260' x 1,280' x 104 Cells 1-5 Capacity: Approx. 6.3 x 10^6 cubic yards 2022 Expansion with Cells 1 through 8; Capacity approx. 10.1 x 10^6 Cubic Yards

Table 2-3b SUMMARY OF LANDFILL L-14 DESIGN CELLS 4-8

Landfill Units	Liner System Design (top to bottom)	Sideslope Design (top to bottom)	Leachate Collection Sumps	Final Cover Design	Approximate Design Size/Capacity
L-14 Cells 4-8	**Upper (Primary) Leachate Collection System** • Primary Protective Soil 18-inches(min.) • Primary Geocomposite LCRS Layer • Primary Liner 60-mil HDPE • Primary GCL (floor only) **Lower (Secondary) Leachate Collection System** • Secondary Geocomposite LCRS Layer • Secondary Liner 60-mil HPDE • Secondary GCL • Subgrade	**Upper (Primary) Leachate Collection System** • Primary Protective Soil 12-inches (min.) • Primary Geocomposite LCRS Layer • Primary Liner 60-mil HPDE **Lower (Secondary) Liner System** • Secondary Geocomposite LCRS Layer • Secondary Liner 60-mil HPDE • Secondary GCL • Subgrade	**Primary Sump** • Primary Protective Soil 18-inches (min.) • Two Primary Leachate Collection Sump Riser 24" HDPE, SDR-11. One 8" HDPE, SDR-11 monitoring conduit Cells 5-8. 3-ft (min.) Sump Aggregate with Non-Woven Geotextile wrap. • Primary Geocomposite LCRS Layer • Primary Liner 60-mil HDPE • Primary GCL Two Layers in Sump **Secondary Sump** • Secondary Leachate Collection Sump Riser 24" HDPE, SDR-11. 3-ft Sump Aggregate with Non-Woven Geotextile wrap. • Secondary Geocomposite LCRS Layer • Secondary Liner 60-mil HPDE • Secondary GCL Two Layers in Sump **Tertiary Sump** • One Tertiary Leachate Collection Sump Riser 24" HDPE, SDR-11. 3-ft min. Sump Aggregate or General Soil with Non-Woven Geotextile wrap. • Tertiary Geocomposite LCRS Layer • Tertiary Liner 60-mil HPDE • Tertiary GCL (sump only) • Subgrade	Approved alternative final cover design; 3 feet of onsite soils over daily cover, see Standalone Document No. 17 *Landfill Final Cover Design Plans*	2013 expansion with Cells 1-5 Size: 1,260' x 1,280' x 104 Cells 1-5 Capacity: Approx. 6.3 x 10^6 cubic yards 2022 Expansion with Cells 1 through 8; Capacity approx. 10.1 x 10^6 Cubic Yards

3.0 LANDFILL OPERATIONS

3.1 Waste Acceptance Procedures

Each load of containerized waste received at the Arlington Facility is analyzed in accordance with the facility's *Waste Analysis Plan*. If the waste is found to be acceptable the load is sent directly to the landfill, unless weather or operating conditions dictate otherwise (in which case the load is delivered to an appropriate storage area, provided the wastes are compatible). Containers are delivered to the landfill for disposal via both off-site and on-site trucks, and placed in rows immediately adjacent to each other.

Containers of bulk solid waste material (i.e., wastes having no free liquids) must be at least 90 percent full prior to placement in the landfill. CWMNW personnel have the option of rejecting the load (see *Waste Acceptance Plan*, Standalone Document #1) or filling the containers to the maximum extent possible prior to disposal in the landfill.

The only containers with free liquids that are landfilled are very small containers (i.e., ampules), containers of hazardous waste in overpacked drums (i.e., lab packs), and containers designed to hold free liquids for use other than storage (i.e., batteries). Each lab pack (as defined by U.S. Department of Transportation [DOT] hazardous materials regulations [40 CFR Parts 173, 178, and 179]) must be certified by the generator or packer (through the manifest system and prior approval and instructions from CWMNW) that:

Hazardous wastes are packaged in non-leaking inside containers;

> Inside containers are of a sufficient design and constructed of a material that will not dangerously react, decompose, or ignite with the contained waste;
>
> Inside containers are sealed tightly and securely;
>
> The solidification material within the lab pack is compatible with the contained wastes and will not react, ignite, or decompose on contact with the wastes;
>
> Incompatible wastes are not placed in the same lab pack; and
>
> Containers of reactive wastes other than cyanide or sulfide bearing wastes are not placed in the lab packs, unless they have been previously treated or rendered non-reactive.

Liquids that are contained in lab packs, small containers, ampules, or batteries may be disposed without stabilization and related testing and verification procedures, provided other restrictions specified in the RCRA Permit or by other laws or regulations, do not prohibit the land disposal of such wastes.

The Arlington Facility does not dispose of any waste which is generated as a liquid and subsequently stabilized by the generator (or another off-site treatment facility) unless CWMNW has conducted testing (in accordance with the *Waste Analysis Plan*) to ensure that the waste has been properly stabilized.

The Arlington Facility does not dispose of any waste which is restricted from land disposal under 40 CFR Part 268 unless the applicable treatment standards as specified in 40 CFR Part 268 have been achieved or an approved treatment variance has been received. In addition, as new wastes are specified for land disposal restriction under 40 CFR Part 268, CWMNW immediately discontinue disposing of such wastes upon the effective date of the 40 CFR Part 268 regulation, unless the treatment standard as specified in 40 CFR Part 268 has been achieved or an approved treatment variance has been received. CWMNW will accept any Corrective Action Management Units (CAMU)-eligible waste which is in compliance with the requirements contained in 40 CFR 264.555. Prior to placement of CAMU-eligible wastes by the Arlington Facility, the Oregon Department of Environmental Quality must not object to its placement.

3.2 Fill Sequencing

Wastes are placed in the landfill in a series of lifts, with each lift consisting of either a single or double layer of waste material. If containers are part of the disposal material, they are placed in the lower layer; the upper layer consists of bulk waste materials.

The filling sequence for the landfill units starts at the bottom of one cell of the landfill and moves through a series of lifts toward the landfill top, as shown schematically on Figure 3-1. The depth of the lifts will vary, depending on the material being landfilled.

Access to the working face within each landfill is over temporary haul roads constructed on covered, filled waste material. As filling progresses, a terraced embankment is developed, with the highest point near the outer edges (sides) of the landfill. As each lift is completed, the temporary haul road is extended to the next lift. When the capacity of this stage of the landfill is reached, a new series of lifts are placed beginning with the lowest lift and filling upwards and back against the previously filled lifts. The former haul road is filled as each new lift begins.

Landfill L-14 is designed as a multi-phase landfill consisting of eight hydraulically separated cells. This multi-phase design allows CWMNW flexibility with respect to operational considerations, predicted landfill disposal capacity requirements and closure. .

3.3 Control of Run-on and Run-off

The run-on prevention system at the Arlington Facility is typical for an arid climate, where the annual average rainfall is less than 10 inches and a high intensity rainfall event such as the 25-year, 24-hour storm would produce only 1.8 inches of rain. Details of the run-on and run-off control features are presented in the facility's *Surface Water Management Plan*. Standalone Document 6 *Surface Water Management Plan* has been removed from the Part B permit.

A series of ditches constructed around the perimeter of the landfills route run-on to one of two on-site surface water basins (see Figure 1-1 Facility Layout Map contained in the Part B Permit), where the water will be evaporated. The ditches are typically triangular, unlined earthen channels. The ditches are sized to convey the 25-year, 24-hour storm event and are designed with freeboard that will allow them to carry at least two times the design flow. Calculations performed as part of the surface water analysis indicate that the freeboard will allow the ditches to handle the 100-year, 24-hour storm event without overtopping. For design details reference the *Surface Water Management Plan*, Chemical Waste Management of the Northwest, Inc, Arlington, Oregon, Golder Associates, Inc., October 2019.

The berms and run-on ditches are inspected regularly, and after significant rainfall events in accordance with the facility's *Inspection Plan*. Signs of deterioration, clogging, or failure are reported and appropriate repair actions, involving standard soil placement and compaction techniques, are taken to effect the necessary repairs.

In order to prevent discharge of run-off from the landfills surface onto the adjacent ground during each phase of operation, the following plan is implemented. For the period of time during which waste elevations are below surrounding grade, precipitation is contained within the landfill by the lined sideslopes. During this phase of operation, no run-off can discharge onto the adjacent ground. Any precipitation falling inside the perimeter of the active cells of the landfill is directed to temporary, geomembrane-lined surface water basins within the Landfill L-14 footprint.

The temporary detention basins are located in each cell between the toe of the waste slope and the cell divider berms, or immediately adjacent to each cell. Each area is lined with a geomembrane to prevent infiltration into the waste. The basins are sized to contain run-off from a 25-year, 24-hour storm.

Liquid collected in the temporary basins is removed by vacuum trucks or portable pumps maintained and operated by site personnel, and routed to the facility's surface waste impoundments. Precipitation run-off is tested for toxicity in accordance with the procedures established in the facility's *Waste Analysis Plan* and the exclusion in 40 CFR § 261.3(c)(2)(i), and then treated or discharged directly as appropriate.

Once waste elevations within the landfill are above the adjacent perimeter grade, and prior to constructing final cover, precipitation falling on the outer slopes of the landfill is directed to a channel formed by the toe of the slope and the liner, which directs flow to a basin. A berm is maintained around the perimeter of the landfill to prevent overflow.

Precipitation that falls on the landfill areas with final cover in place or into cells that do not contain waste is considered uncontaminated and is discharged without testing. After final cover is in place, no contaminated run-off is allowed to flow onto the adjacent covered areas. No contaminated vehicles are allowed to operate on the final cover, and incident precipitation is directed away from these areas.

Run-off from active slope areas could flow downslope over previously covered areas during placement of subsequent lifts of waste. To prevent this from occurring, a channel is maintained along the toe of the exposed waste slope, adjacent to the cover of the previous lift. All run-off from the active slope areas is collected in the channel, which has the capacity to contain a 25-year, 24-hour storm. To minimize this occurrence, cover is placed over the active areas of the slope as soon as practical.

3.4 Construction Inspection of Landfills

During construction of new landfills, an independent Construction Quality Assurance firm is on-site to monitor and inspect material quality and installation of the materials for compliance with approved construction drawings and technical specifications.

Detailed construction quality assurance procedures are contained in the facility's *Construction Quality Assurance Plan* and project specific construction quality assurance manuals. Upon completion of landfill construction activities a CQA report is prepared by the independent engineering firm certifying that the landfill was constructed in accordance with the approved construction drawings and technical specifications.

Inspections are conducted during installation of all components of the landfill liners, leachate collection and removal systems, and protective soil and geosynthetic layers. Geomembrane liners and covers are inspected during construction and/or installation for uniformity, damage, proper seaming, and imperfections. Upon completion of installation, the geomembranes are inspected and tested to verify seam integrity, and to verify there are no tears, punctures or blisters. Other routine landfill inspection procedures are described in the facility's *Inspection Plan*.

3.5 Final Cover

Final cover systems that will be constructed after waste reaches final design grades are presented in the following facility documents: *Landfill Final Cover Design Plans* and *Alternative Final Cover Design Report, Landfills L-12, L-13 and L-14* and *Alternative Final Cover Design Modification Report, Landfills L-13 and L-14*. Landfill closure procedures and post-closure maintenance of the landfill cover are described in the facility's *Closure/Post-Closure Plans*.

3.6 Ignitable and Reactive Wastes

Reactive wastes, as defined by RCRA, are not to be landfilled prior to undergoing approved treatment. All bulk ignitable and reactive wastes accepted by the facility for storage, treatment, and/or disposal are processed to a level such that the resulting material(s) no longer meet(s) the definition of an ignitable or reactive waste under 40 CFR § 261.21 or 261.23. The resulting material(s) are analyzed per the facility's *Waste Analysis Plan* to verify that they are not ignitable or reactive wastes prior to final disposal in the landfill. Containerized solid ignitable wastes are landfilled in compliance with 40 CFR § 264.312(b) including the application of a daily cover of non-combustible wastes or inert soils.

3.7 Incompatible Wastes

Wastes placed in the landfills are assigned to one of three categories (combustibles, TSCA PCBs, and toxics) as a result of testing in accordance with the facility's *Waste Analysis Plan*. The Hazardous Waste Compatibility Chart (EPA Document 600/2-80-076) is also used to ensure that no incompatible wastes are grouped in the same category.

The wastes are assigned to a specific area or cell of the landfill based on the classification. The location of each waste load is recorded according to a three dimensional grid system. Site landfill disposal procedures specify that inert material or neutral wastes are used to segregate cells and prevent the mixing of potentially incompatible wastes.

3.8 Control of Wind Dispersal of Wastes

Potential sources of fugitive dust emissions are: 1) earthmoving activities, such as excavation and transport of material for daily cover, 2) unvegetated active areas of the landfill, such as partially completed final covers or partially excavated trenches, 3) truck traffic on haul roads and ramps, 4) waste unloading operations in the landfills, and 5) exposed waste surface in the landfills.

Fugitive dust can be a problem at the Arlington Facility because of the semi-arid climate and persistent winds. The wind is usually from the west at about 5 to 10 miles per hour (mph); however, there are occasional gusts of 20 to 40 mph. Control of fugitive dust at the landfill is accomplished by surface application of leachate. Leachate is pumped from the leachate detection sumps in an individual landfill unit either to a container located within the lined footprint of the respective landfill or directly to the leachate distribution system (sprinklers or drip hoses) for the respective landfill. No leachate leaves the landfill from which it was pumped and the leachate, at all times, remains over the lined area that collected the leachate. If not applied directly, the leachate is collected in a portable container that serves as a reservoir for times dust control is required. The leachate is piped to drip systems and sprinkler systems for dust control as required. The drip and sprinkler systems are activated during periods before and during dust generation weather. Leachate is not sprinkled on roadways to prevent potential tracking from the landfill. Sprinkler systems are configured and operated so that no leachate is allowed to drift out of the footprint of the respective landfill. Both sprinkler and drip systems are operated to prevent landfill sideslope erosion. Leachate application rates are controlled to prevent puddles, saturated soil conditions, excessive percolation, and runoff.

The wastewater treatment unit operator oversees the application of leachate to the landfill surface. The operator monitors and adjusts the system for appropriate leachate application rates, appropriate spray sizing for wind drift conditions, piping and equipment leaks and ground conditions.

Inspections of the landfill sprinkler and drip systems are conducted regularly. The inspector visually checks the leachate application area for evidence of spray leaving the footprint of the landfill, sideslope application, runoff and puddling.

Other dust control measures include:

- Application of clean water from a water truck onto the exposed surface within the landfill; and

- Spraying of clean water from a fire truck hose onto dry bulk wastes during unloading operations.

The water truck spray rate is equivalent to 0.012 inches of rain per year per application. Since the average daily evaporation rate is 0.10 inches per day, it is apparent that clean water applied in this manner will evaporate before it can percolate into the subsoils. Therefore, no groundwater contamination is possible with this method of dust control.

The procedure of spraying water via a water hose is only used when unloading dry bulk wastes such as baghouse dust. Assuming the waste has a moisture content of 5 percent, the amount of water sprayed is not sufficient to even achieve the normal moisture content (10 percent) of the soil used as clean cover in the landfills. Therefore, the additional water poses no threat to groundwater.

Dust emissions from earthmoving activities and truck haul roads and ramps are minimized on dry, windy days by periodic watering of areas being traveled and maintenance of a prepared road bed of aggregate material. Dust emissions from the active areas of the landfills are reduced with the compaction of surface materials by heavy equipment traffic.

The off-loading of container wastes in the landfills presents no dust emission problem. Most bulk solid wastes, which are end-dumped from trucks, are typically not dust-generating wastes because of their moisture content, large particles, and/or other physical properties. Stabilized wastes are non-dust generating. However, the unloading of fine particle bulk solids, such as fly ash or baghouse dust, is a potential dust emission problem. The current practice is to unload these wastes in an area of the landfill protected from wind and as close to the final disposal area as possible.

When the final cover is placed on each landfill, vegetation is established to control wind erosion of final cover soils.

3.9 Disposal of Dioxin-Containing Wastes (i.e., F020, F021, F022, F023, F026, F027, and F028)

This management plan contains procedures for disposal of dioxin-containing wastes, which satisfy the special requirements for managing these wastes identified in 40 CFR § 264.317. The following items are addressed in this management plan:

- Exposure control practices;
- Volumes, concentrations of dioxin-containing wastes, and potential to migrate; and
- Disposal procedures for land disposal.

3.9.1 Exposure Control Practices

Existing management standards under 40 CFR § 264 Subpart N are adequate to prevent the dispersion of dioxin-contaminated wastes by wind dispersal. However, as an added precaution these wastes are disposed in sealed impermeable enclosures to eliminate any potential for dispersal of waste.

In instances where waste is transferred and/or stabilized into these enclosures for disposal, personnel are provided adequate personnel protective equipment as is detailed in the facility's exposure monitoring and prevention procedures.

3.9.2 Waste Characteristics

The volumes of dioxin-containing wastes to be managed for landfill varies depending upon the process generating the waste. For example, dioxin-containing waste may be generated at large cleanup sites and transported in lined bulk containers and then landfilled in sealed bulk enclosures. In addition, these wastes may be generated and transported in small containers, such as well investigation samples to be stabilized and landfilled in one or more impermeable enclosures. The estimated volumes to be received for landfill are identified during the profile approval process for each waste stream.

The concentration of dioxin or furans in the wastes designated as F020, F021, F022, F023, F026, F027, intended to be managed for disposal at the Arlington Facility, are below the regulated levels identified in 40 CFR § 268.40 for wastewaters or non-wastewaters except for debris and wastes intended to be managed for disposal as corrective action management unit (CAMU)-eligible wastes.

Debris contaminated waste can be treated in accordance with the alternative treatment standard in 40 CFR § 268.45 as discussed in Standalone Document No. 11, *Debris Treatment Plan*.

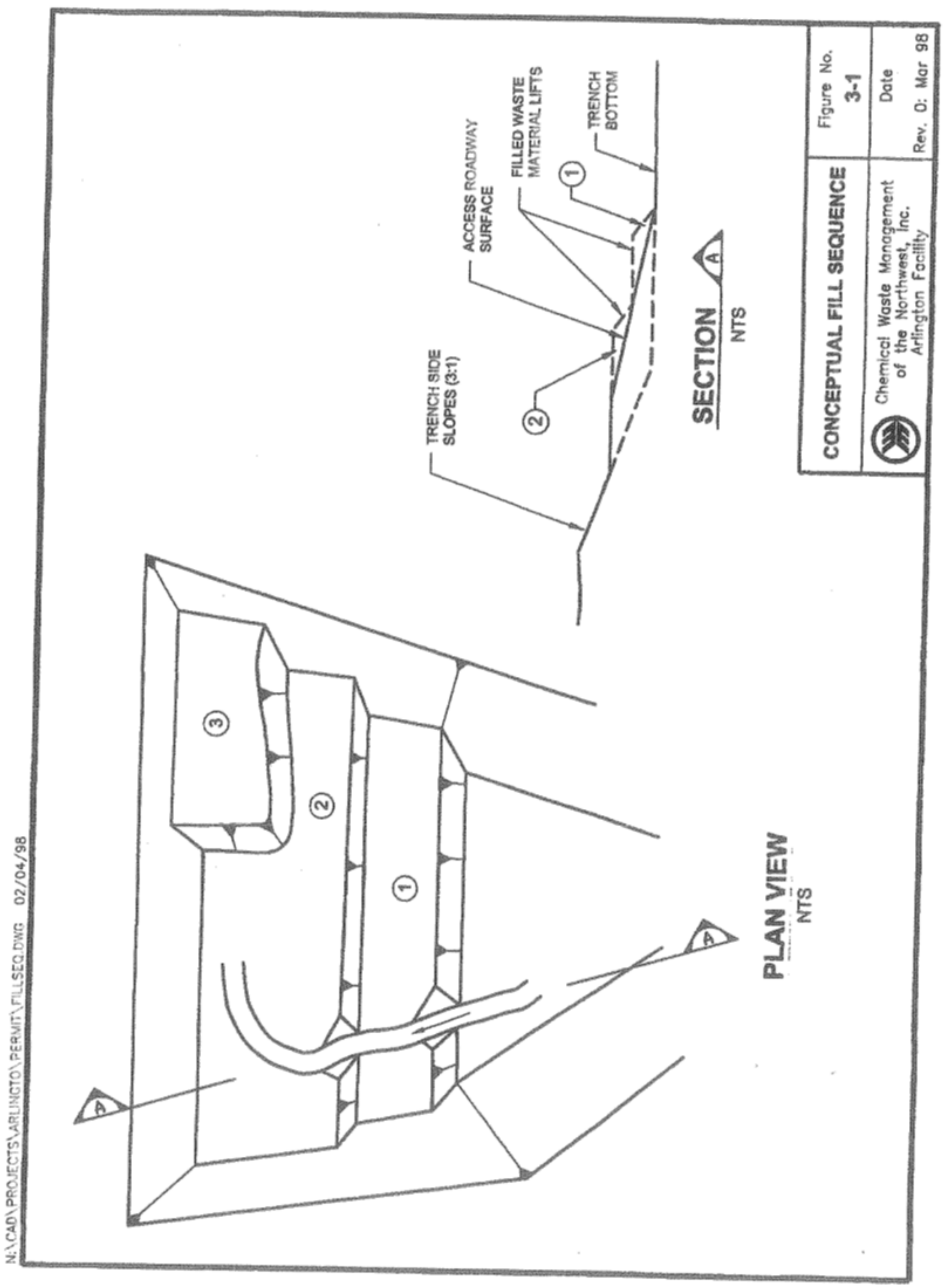
All of these wastes accepted at the Arlington Facility for landfilling are disposed of in impermeable enclosures that are capped and sealed to reduce the possibility of migration of these wastes to groundwater, surface water, or air so as to protect human health and the environment.

3.9.3 Disposal Procedures

As identified above, all dioxin-containing wastes that are disposed of in a landfill will be confined within an impermeable enclosure that is later capped and sealed. These enclosures may be drums, prefabricated HDPE macroencapsulation boxes, super sacks (non-rigid containers consisting of an inner layer of impermeable material (such as polyethelene) and an outer layer of woven fabric capable of withstanding waste loading, transport, and disposal without tearing), or may be constructed of flexible membrane liner (FML) within the landfill. FMLs may be polyethylene (HDPE, LLDPE) or other materials as appropriate. Macroencapsulation enclosures constructed within the landfill will have FML above and below the waste to be encapsulated with the overlying FML seamed to the underlying FML at the edges. All macroencapsulation FML panels will be seamed using either fusion or extrusion methods.

CQA of macroencapsulation enclosures within the landfill will consist of non-destructive testing of the seams in accordance with the Construction Quality Assurance Plan. Other requirements of the Construction Quality Assurance Plan may be implemented at the CQA Engineer's discretion. ‡ Rev. 5

Liquids accepted for disposal in a landfill are solidified prior to being landfilled. All containers, in which these wastes have been removed and where the waste has contacted the container, are triple rinsed to remove any hazardous residue. This rinsate is also stabilized and landfilled in similar enclosures discussed above.Figure 3-1 Example Fill Sequence


N:\CAD\PROJECTS\ARLINGTO\PERMIT\FILLSEQ.DWG 02/04/98
PLAN VIEW
NTS
TRENCH SIDE SLOPES (3:1)
ACCESS ROADWAY SURFACE
FILLED WASTE MATERIAL LIFTS
TRENCH BOTTOM
SECTION A
NTS
CONCEPTUAL FILL SEQUENCE
Chemical Waste Management of the Northwest, Inc. Arlington Facility
Figure No. 3-1
Date
Rev. 0: Mar 98