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HANFORD

Environmental Restoration Disposal Facility

Waste Disposal Operations

Leachate & Washwater Management Plan

Work Performed for
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Under Subcontract
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Waste Management
Federal Services, Inc.

Waste Management Federal Services
ERDF Waste Disposal Operations

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1.0 Purpose and Scope

1.1 Purpose

The purpose of this Leachate Management Plan is to establish the policy and procedures for properly managing leachate, decontamination washwaters and other contaminated waters generated as a result of operations generated at the Hanford Environmental Restoration Disposal Facility (ERDF). The plan lists the requirements, protocols, procedures, and documentation of the leachate management systems and washwater management systems used at the facility. Waste Management Federal Services, Inc. (WMFS) has responsibility for management of leachate and washwaters produced during waste disposal operations at the ERDF site in accordance with Subcontract 0600X-SC-G0006 and will implement the requirements identified in the plan.

1.2 Scope

The ERDF waste disposal operations will generate leachate that must be collected and appropriately managed. For the purposes of hazardous waste regulations, leachate is defined by the U.S. Environmental Protection Agency (EPA) as "any liquid, including any suspended components in the liquid, that has percolated through or drained from hazardous waste." Additionally, it is expected that ERDF may generate water from disposal cells that have not received hazardous waste. This plan implements the general strategies identified in the BHI Leachate Management Plan (BHI-000734, Draft 0).

The ERDF waste disposal operations will also generate washwaters from decontamination operations that must be collected and appropriately managed. The scope of this plan includes the policy and procedures necessary to collect, sample, analyze, determine a disposal option, and implement that disposal option for leachate, washwaters, and other contaminated waters generated as a result of operations at the ERDF.

2.0 Leachate Collection System Operation

2.1 ERDF Liner System

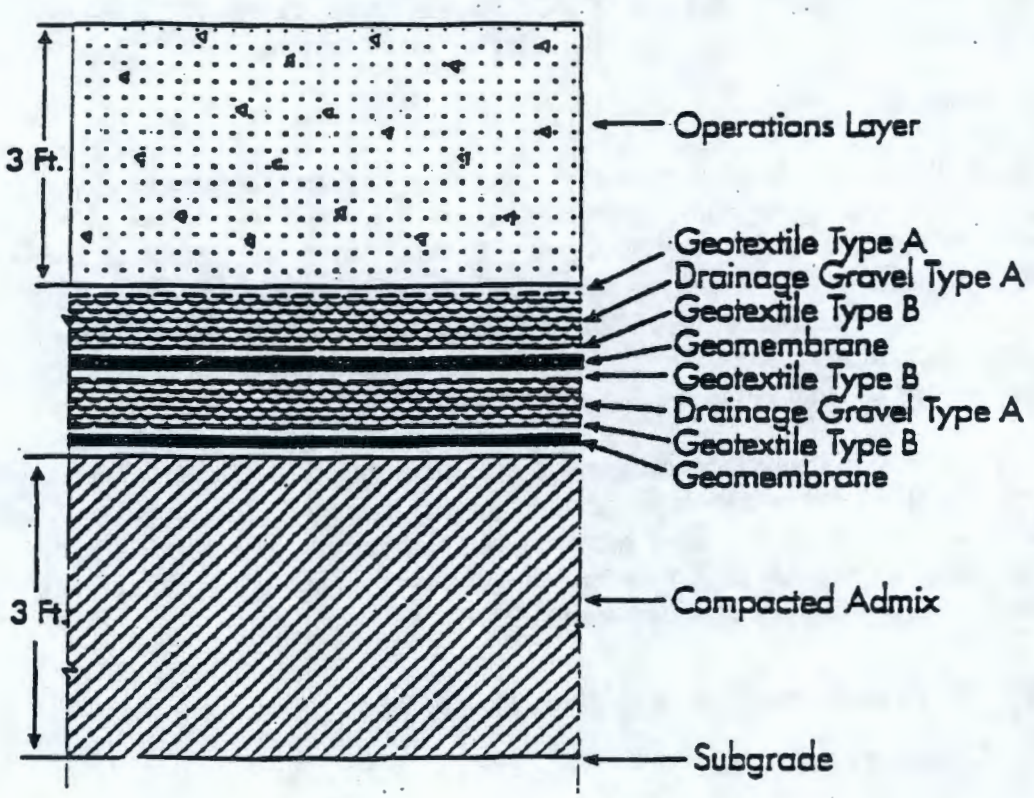
The ERDF landfill liner system is designed to meet EPA minimum technical requirements for landfills. The base and side slopes of the landfill are engineered systems that have primary and secondary liner systems that incorporate methods for leachate to be directed to a central collection sump as described in the following sections.

2.1.1 Landfill Base Liner

Figure 2-1 graphically displays the various components of the landfill liner on the base of the two disposal cells. The engineered liner system starts with a three-foot layer of compacted admix on which the secondary HDPE liner is laid. On top of the secondary liner is the secondary drainage gravel layer encased by an upper and lower layer of geotextile material. This layer provides the collection mechanism for secondary leachate

to collect and drain to the secondary leachate sump. On top of the secondary leachate collection layer is the primary HDPE liner and another geotextile/drainage gravel/geotextile layer. This layer of geotextile, drainage gravel and geotextile provides the collection mechanism for primary leachate to collect and drain to the primary leachate sump. Finally, a three foot compacted operations layer separates the primary liner/geocomposite from the active operational disposal cells.

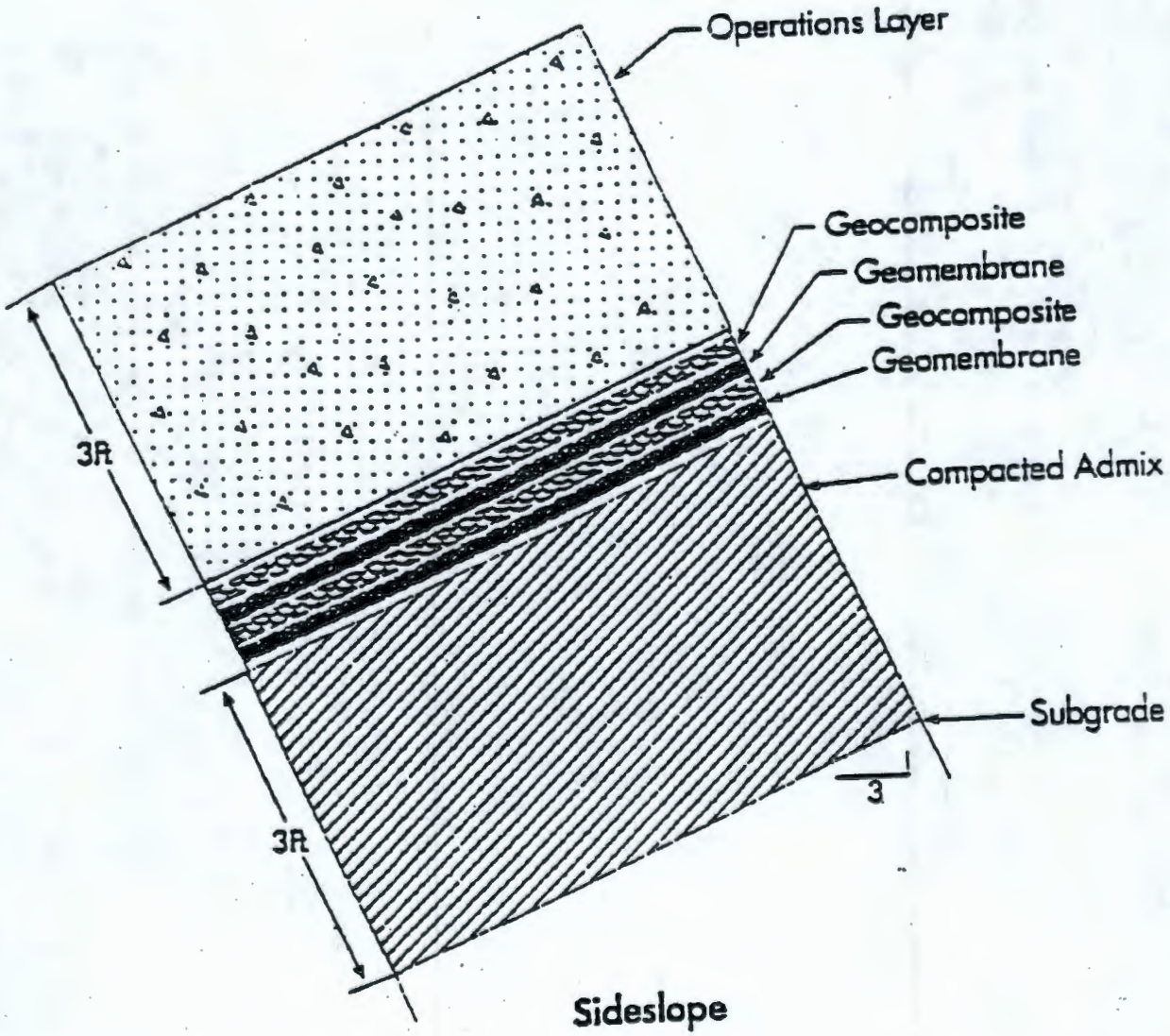
Figure 2-1, ERDF Base Liner Design



2.1.2 Landfill Slope Liner

Figure 2-2 graphically displays the various components of the landfill liner on the sloped sides of the two disposal cells. The engineered liner system starts with a three foot layer of compacted admix on which the secondary HDPE liner is laid. On top of the secondary liner is the secondary geocomposite which provides a collection mechanism for secondary leachate to drain down the slope of the landfill and to the base area/secondary leachate sump. On top of the secondary geomembrane is the primary HDPE liner and another geocomposite, which provides a collection mechanism for primary leachate to drain down the slope of the landfill and to the base area/primary leachate sump. Finally, a three foot compacted operations layer separates the primary liner/geocomposite from the active operational disposal cells.

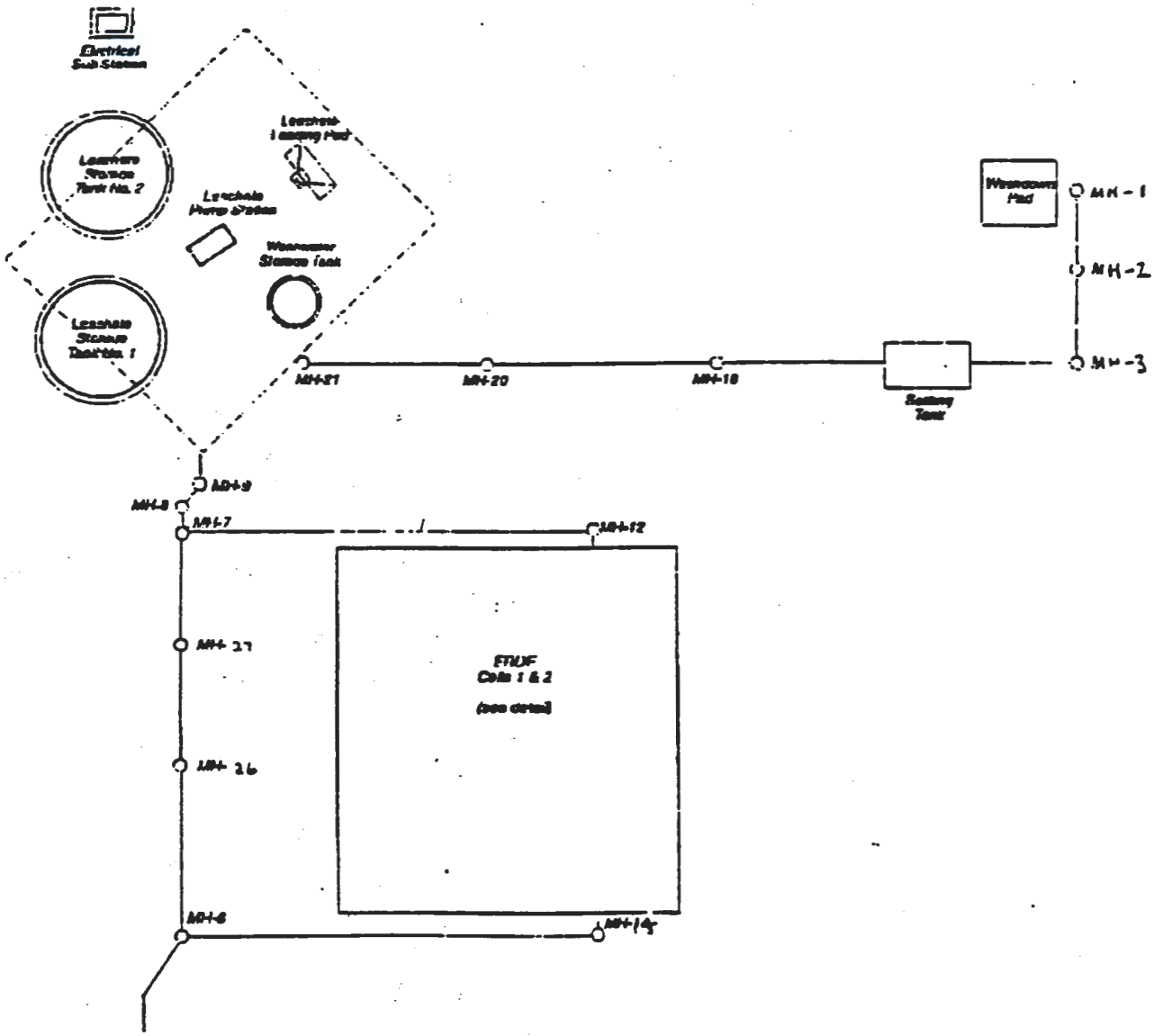
Figure 2-2, ERDF Slope Liner Design



2.2 Leachate Collection System Description

An engineered collection system is provided at the ERDF to collect both the primary and secondary leachate and to allow for disposition of the materials collected. The overall system is shown in Figure 2-3 and consists of the in-cell drainage/sumps, collection piping/storage, and leachate unloading subsystems that are described in the following sections. The leachate piping route on the north and south side of the trench is a 10" diameter pipe with secondary containment and leak detection, while the piping route on the west side of the trench is a 12" diameter pipe (with associated secondary containment and leak detection) to handle the combined flow from the cell. The collection system is designed to accommodate a total of four cells (BHI-00355, Design Analysis).

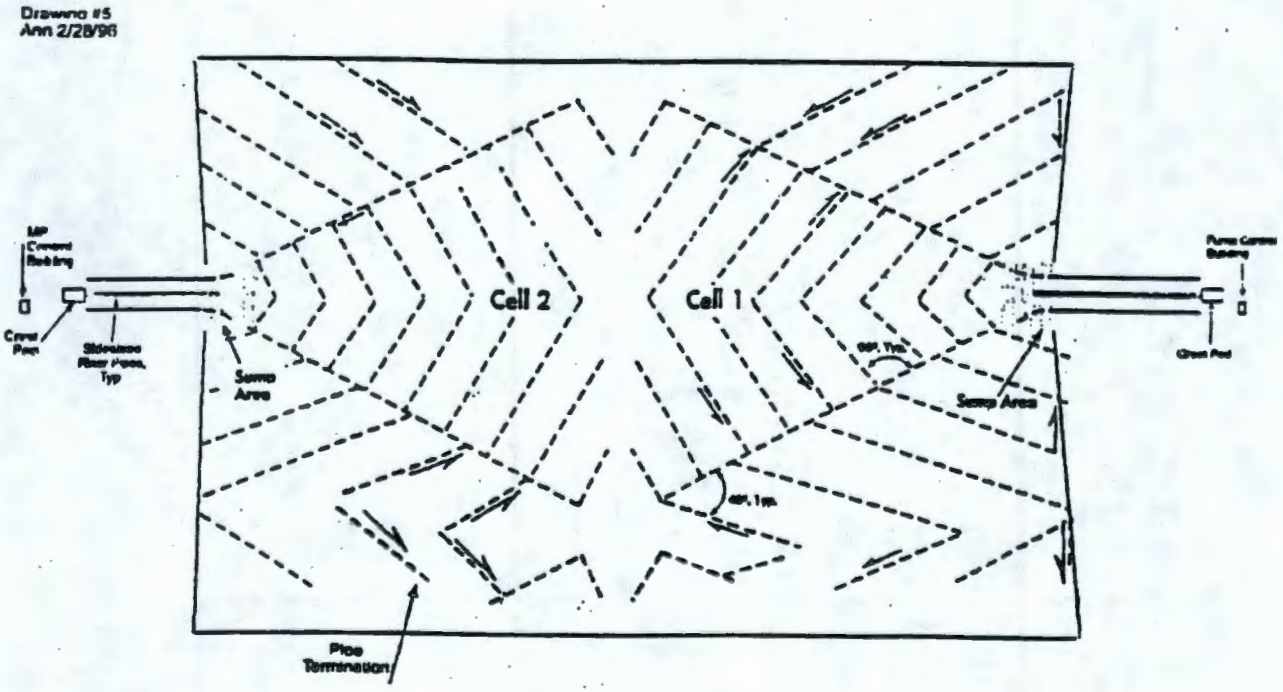
Figure 2-3, Leachate Collection System Overview



2.2.1 In-cell Drainage/Sumps

The leachate that collects in a cell is carried to a cell specific sump through a series of perforated pipes as shown in Figure 2-4. The leachate collects in the sump and is then pumped out using submersible pumps. There are two submersible pumps in the primary sump and a single submersible pump in the secondary sump. The leachate then passes through the crest pad and its associated instrumentation and flows by gravity into the leachate collection system shown previously in Figure 2-3.

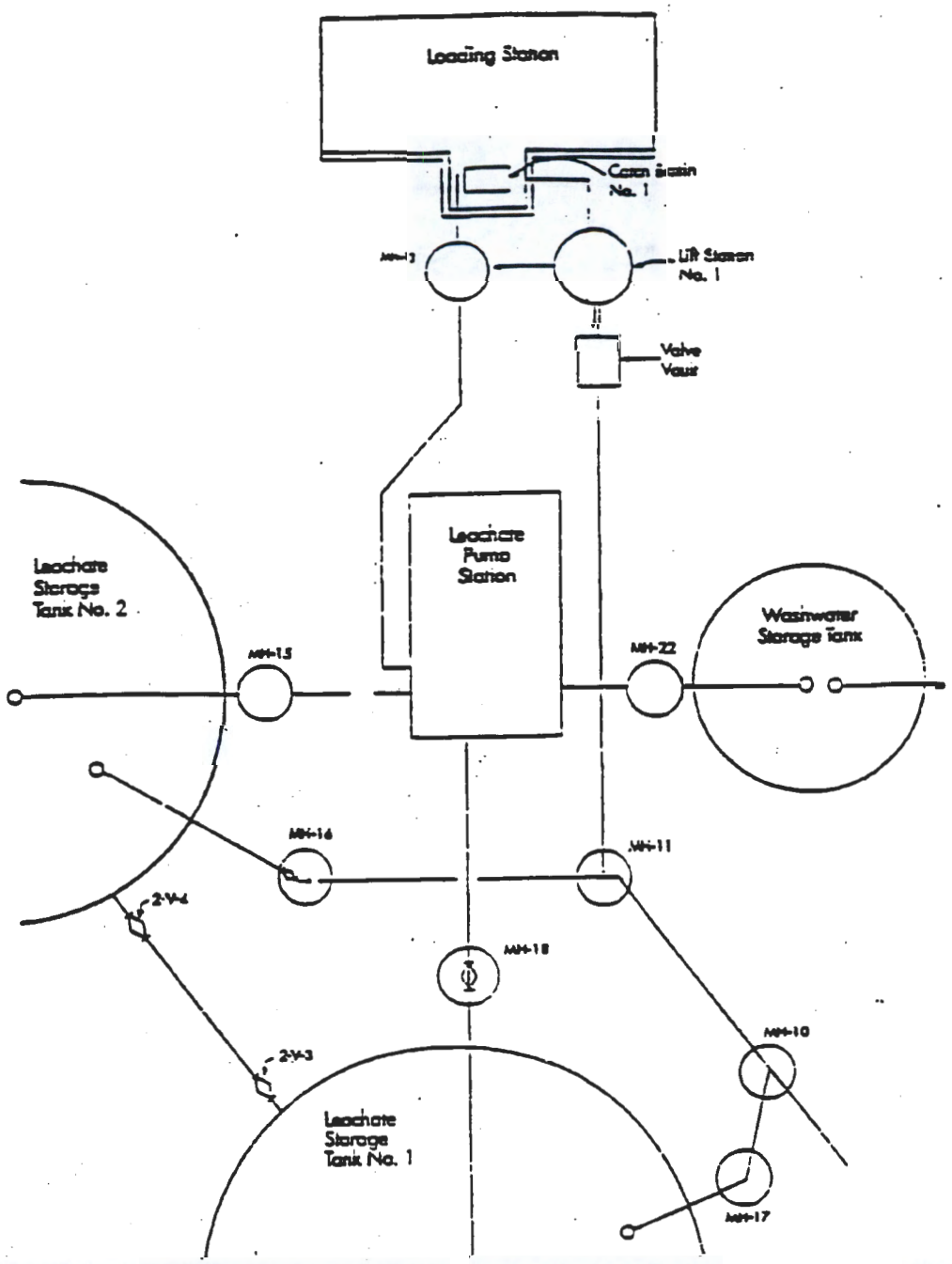
Figure 2-4, Cell Collection Piping



2.2.2 Leachate Storage/Pumping

The leachate is directed from the collection system to a storage/unloading system that is shown in Figure 2-5. The leachate storage system consists of two above ground modular storage tanks complete with secondary containment/leak detection and associated piping. The leachate pumping/unloading system consists of necessary pumps, piping, and loadout area with secondary containment to allow loading of the leachate into truck mounted tanks for disposition.

Figure 2-5, Leachate Storage/Pumping Layout



2.2.3 Sources of Liquids Within the Leachate Collection System

During ERDF operation, leachate will be generated from precipitation, moisture in the incoming soil, and compaction/dust control water. A water balance has been prepared (BHI-000734) which describes the various water sources and quantities of liquids associated with the ERDF leachate management strategy.

2.3 Washwater Collection System

An engineered collection system is provided at the ERDF to collect washwaters from decontamination operations to allow for disposition of the materials collected. The overall system is shown as part of Figure 2-3 and consists of decontamination pad drainage/sumps, collection piping/storage, a settling tank, a washwater storage tank, and unloading subsystems. Washwater is conveyed to the Washwater Storage Tank by gravity through double containment, pipes, manholes, and a settling tank. The settling tank is used to remove solids from the washwater prior to it being conveyed to the storage tank. The design is very similar to a septic tank with two collection chambers. Most of the solids are expected to settle out in the east chamber, although the quantity of solids will depend upon the waste types and operational procedures in the ERDF waste disposal operations. The washwater storage tank consists of an above-ground modular storage tank complete with secondary containment/leak detection and associated piping.

Secondary containment piping is terminated after penetrating each manhole and all secondary containment drains to downstream manholes. Each manhole is equipped with an alarm set to 0.5 inches off the manhole floor to identify the presence of liquids on the floor of a manhole. In addition to an alarm in the manhole, Manhole 21 also contains a motor operated valve that closes if liquid is detected by the flood alarm switch. This prevents water in the storage tank from draining back into Manholes 20 and 21 if a leak occurs upstream of either manhole.

3.0 Action Leakage Rate and Response Plan

3.1 Action Leakage Rate

The Action Leakage Rate (ALR) for a landfill is defined by EPA as Athe maximum design flow rate that the leak detection, collection, and removal system (LDS) can remove without the fluid head on the bottom liner exceeding 1 foot (FR57 No. 129, January 29, 1992, pgs 3462-3485). The ALR for ERDF was calculated in accordance with the referenced EPA guidance as presented in Appendix A. These calculations identified that the ALR for ERDF is 175 gallons per acre per day (gpad). The actual SLCS flowrate will be calculated on a weekly basis as part of the overall leachate inspections identified in Section 4.1 and compared with this level in determining when actions are required.

3.2 Response for Leakage Rates Less Than ALR

Under normal operating conditions, flows into the Secondary Leachate Collection System (SLCS) are expected to be less than the ALR. The SLCS is an automatic pumping system

designed to maintain the cell secondary sump levels within design parameters and no additional action is required. The pump is designed and installed to activate at a depth of 0.9 feet in the secondary containment sump and to automatically stop pumping when suction is lost at a depth of 0.7 feet.

3.3 Response for a Leakage Rate Above the ALR

3.3.1 Notifications

The following notification actions will be taken if flows into the SCLS is greater than the ALR.

1. Verbally Notify BHI, DOE-RL, and EPA within 1 day of the time it is identified that the SLCS flow exceeds the ALR.

2. Provide written notification to EPA within 7 days of identification that the SLCS flow exceeds the ALR.

3. Submit a preliminary written assessment of the situation within 14 days to EPA as to:

    - The amount of liquids seen,
    - Possible size, location, and cause of any leaks, and
    - Short-term actions taken and planned.

4. Prepare a comprehensive written report describing the amounts of liquids, possible location, size, and cause of any leaks. Document in the report the leak determination methods used to identify the cause of exceeding the ALR.

5. Prepare a written report within 30 days of identifying the ALR has been exceeded and submit to the EPA with the following information: results of information gathering, actions taken, results of actions/investigations, planned short-term actions (and the basis for selection/implementation), and planned long-term actions (and the basis of selection/implementation).

3.3.2 Assessments for Size, Location and Cause of Leak

1. Assess the origin and amounts of liquids by source using available information, including the following:

    - Precipitation data from the Hanford meteorological station located less than 1 mile from the ERDF,
    - Water balance baseline information from the ERDF pre-operational water balance,
    - Leachate flowrate trend analysis from recorded flowrate data and weekly ALR calculations, and
    - Operations estimates of water/leachate usage in the landfill to support compaction and dust suppression.

2. Examine the exposed side slope to identify the size, location, cause and severity of any observed leak.

3.3.3 Assessments for Impact of Leak

1. Assess whether the SCLS flow rate is greater than the SLCS pump capacity. Monitor the SLCS pump totalizer on a daily basis. The leak rate is considered to exceed the pump capacity when the total flow averages 21,600 gal/day over 3 or more consecutive days.

2. Perform a fingerprint or tracer type of study to determine the source of the leak and the hazards/mobility of the liquid if the previous assessments have not identified the source/reason for SLCS flow exceeding the ALR.

3. Perform limited waste retrieval to determine cause of leak if unable to determine from the above assessments.

3.3.4 Short Term Corrective Actions

1. Repair any observed damage through procedures, methods , and material equivalent to the original ERDF design, construction and construction quality assurance requirements.

2. If the capacity of the SLCS pump is exceeded, replace the pump with a larger pump capable of meeting the SLCS flow rate.

3.3.5 Long Term Corrective Actions

1. Perform large scale waste retrieval to supplement investigation for leaks and partial or complete unit closure.

2. Waste placement into the cell in question should cease if the short-term corrective actions are unsuccessful.

4.0 Inspection Program

4.1 Periodic Inspections

Periodic inspections and monitoring of the leachate system will be accomplished as part of the overall ERDF maintenance and inspection program, per RFS-ERDF-002.7 and RFS-ERDF-010(H). These inspections will include above ground piping monitoring, liquid level monitoring in the leachate collection and washwater tanks, calculation of weekly SLCS flowrates (on a gallon per acre per day basis), flowrates, and other relevant factors in understanding the operation of the leachate collection system. A log will be maintained of the quantity of leachate removed from the landfill cells and the level of leachate in the storage tanks.

4.2 Integrity Assessments

A periodic integrity assessment program will be used at ERDF to ensure that the tank systems continue to be fit for use. This program will be performed every five years (unless recommended more frequently) and be monitored/approved by an independent, registered professional engineer. The program will be structured around the following methods:

- Tanks - The baseline test method for the leachate and washwater storage tanks will be a 24-hour hydrostatic test. Alternate non-intrusive test methods that develop during the life of the ERDF project (i.e., eddy current testing) will be strongly considered for replacement of the hydrostatic test to minimize the impact on leachate storage capacity and create significant quantities of waste that must be handled as leachate/washwaters. The selected test method must adequately ensure that the tank system is "fit for use" including concurrence of a registered independent professional engineer with the selected test method.

- Hydrostatic testing, if used, will be accomplished by filling the tank to the operational capacity and allowing to stand in a static condition for 24 hours. A maximum leakage rate will be identified in the test plan and will be in accordance with the tank manufacturer's recommendations. Water from the test will be handled as determined by analysis and comparisons with the levels in Section 6.0 in this plan. A water disposition plan will be developed as part of the hydrostatic test plan to consider the sources of water that could be used for the test, the use of flushing to avoid regulation of hydro-waters, and strategies for disposing of the water (including timing of test, disposal options, impact on leachate capacity, etc.).

- Primary Piping - A hydrostatic test at 30 psig will be used to test the primary piping in the leachate and washwater collection systems.

- Secondary Piping - A hydrostatic test at 15 psig will be used to test the secondary piping in the leachate and washwater collection systems.

5.0 Sampling and Analysis

5.1 Sampling Objectives

The objective of sampling and analysis of the ERDF leachate and washwaters encompasses two differing areas:

- To determine the hazardous and radioactive constituents within an individual batch of leachate/washwater to ensure that the materials can be properly managed, and

- To determine the overall ERDF leachate and washwater waste stream compositions in order to support any future stream determinations, including delisting.

The first of these objectives requires an understanding of the proximity of an individual batch of leachate/washwater to the associated management criteria identified in Section 6 of this plan. The data quality objectives for this type of review are less stringent than for the second sampling objective, which will require a more stringent set of data quality requirements. The ongoing data collection system shall consider the requirements of the ERDF QAPjP, QAI 3.3 when compiling data and determining the overall use of leachate and washwater analytical data.

A leachate sample will be obtained for every 200,000 gallons pumped from the lanfill cells.

5.2 Leachate Sampling Method

A representative sample from the leachate storage tank will be taken at the inner liner standpipe (a second standpipe also exists for the secondary liner) using a peristaltic pump at 1 foot increments and composited. The samples, container types, container sizes, preservatives, and holding times are identified in Table 5-1. The required sampling equipment, preservation, chain-of-custody, and packaging are briefly described in the following sections. Actual implementation of sampling activities will be in accordance with the Leachate & Washwater Management Procedures, RFS-ERDF-002.10(B) which will field implement the requirements of this plan.

Table 5-1 – Leachate Sample Size and Container Requirements

Sample Type	Container Type	Volume	Preservatives	Hold Time
Volatile Organic	VOA Vials	2 x 40 ml	HCl pH<2 4°C	14 Days (Ship 24 hrs)
Semi-Volatile Organic	Glass	1000 ml	4°C	7 Days
Radionuclide	Polyethylene or Glass	3 x 250 ml*	None	None
Metals	Polyethylene or Glass	1 x 250 ml*	HNO_3 pH<2 4°C	6 Months

*Laboratory may request larger sample volumes

5.2.1 Sampling Equipment

Equipment used in the collection of leachate samples will be appropriately decontaminated or cleaned prior to use and shall be in compliance with the requirements of the ERDF QAPjP, QAI 11.2. Sample containers shall be purchased commercially and be accompanied by certification which indicates the containers have been properly decontaminated. Sample containers and equipment shall be stored in such a manner as to prevent contamination prior to sampling activities. The major equipment used for leachate sampling includes:

- Peristaltic pump,
- Sample bottles (as identified in Table 5-1),

- Preservatives (as identified in Table 5-1),
- Tubing, and
- Ice chest with ice.

Sampling shall be performed using this major (and other associated minor) equipment in accordance with the leachate sampling procedure found in RFS-ERDF-002.10(B).

5.2.2 Quality Assurance Samples

Quality assurance samples shall be taken in the following types/frequency to understand the quality of the data received in support of leachate management decisions.

5.2.2.1 Splits

Split sampling will normally only be performed if a split sample is requested by BHI, DOE-RL, EPA, the Washington Department of Health (WDOH) or the Washington Department of Ecology (WDOE) for their independent analysis. Split samples will be considered by the Waste Acceptance Manager as part of the overall leachate program if the contracted laboratory is brought into question by a regulatory agency or DOE through their ongoing laboratory surveillance programs.

5.2.2.2 Field Blanks

One full set of field blanks will be taken on every leachate sampling event and submitted for laboratory analysis. All paperwork submitted to the contracted analytical service will indicate that the field blank is a leachate sample from the other leachate tank. The field blank will be prepared with exactly the same bottles, volumes, preservatives, and hold times as the actual leachate sample. The field blank liquids will be de-ionized water carried to the field and transferred to the sample bottles at the leachate sampling location.

5.2.2.3 Duplicates

Duplicates will be taken on every 10th leachate sample (10%) by performing two identical sampling events and submitting both sets of samples to the contracted laboratory to compare analytical results. The second set of sample bottles will be labeled as being a sample from the other leachate tank.

5.2.2.4 Spikes

Spike samples will not be used as a normal procedures for leachate samples, but shall be considered when the Waste Acceptance Manager has deemed that an overall concern exists with respect to the integrity of the leachate sampling/analytical process.

5.2.3 Labeling/Chain-of-Custody

Sample numbers for both leachate samples and quality assurance samples shall be obtained from the Waste Acceptance Manager. Labeling and chain-of-custody shall be maintained at all times for leachate samples by implementing the requirements of QAI 13.1, Sample Handling and QAI 13.2, Chain-of-Custody from the ERDF Quality Assurance Project Plan, RFS-ERDF-003. Labeling of quality assurance samples (duplicates and field blanks) shall be performed such that the quality assurance nature of the sample is not known by the contracted analytical services.

5.3 Leachate Analytical Requirements

Table 5-2 identifies the baseline analytical procedures to be performed on the ERDF leachate to understand the composition and allow proper management of the materials. Additional analytical procedures above these requirements shall be performed as necessary to quantify the presence of other hazardous constituents identified as present in the landfill.

Table 5-2 - Leachate Analytical Requirements

Constituent	Analytical Method
Gamma Radionuclides	Gamma Energy Analysis
Beta Radionuclides	Total Beta Analysis
Alpha Radionuclides	Total Alpha Analysis
Volatile Organics	SW-846 Method 8260
Semi-Volatile Organics	SW-846 Method 8270
Metals	SW-846 Method 6010

5.4 Washwater Sampling Method

A representative sample from the washwater storage tank will be taken at the inner liner standpipe (a second standpipe also exists for the secondary liner) using a peristaltic pump at 1 foot increments and composited. The samples, container types, container sizes, preservatives, and holding times are identified in Table 5-3. The required sampling equipment, preservation, chain-of-custody, and packaging are briefly described in the following sections. Actual implementation of sampling activities will be in accordance with the Leachate & Washwater Management Procedures, RFS-ERDF-002.6(a) which will field implement the requirements of this plan.

Table 5-3 - Washwater Sample Size and Container Requirements

Sample Type	Container Type	Volume	Preservatives	Hold Time
Volatile Organic	VOA Vials	2 x 40 ml	HCl pH<2 4°C	14 Days (Ship within 24 hrs)
Semi-Volatile Organic	Glass	1000 ml	4°C	7 Days
Radionuclide	Polyethylene or Glass	3 x 250 ml*	None	None
Metals	Polyethylene or Glass	1 x 250 ml*	HNO_3 pH<2 4°C	6 Months

*Laboratory may request larger sample volumes

5.4.1 Sampling Equipment

Equipment used in the collection of washwater samples will be appropriately decontaminated or cleaned prior to use and shall be in compliance with the requirements of the ERDF QAPjP, QAI 11.2. Sample containers shall be purchased commercially and shall be accompanied by certification which indicates the containers have been properly decontaminated. Sample containers and equipment shall be stored in such a manner as to prevent contamination prior to sampling activities. The major equipment used for washwater sampling includes:

- Peristaltic pump,
- Sample bottles (as identified in Table 5-1),
- Preservatives (as identified in Table 5-1),
- Tubing, and
- Ice chest with ice.

Sampling shall be performed using this major (and other associated minor) equipment in accordance with the washwater sampling procedure found in RFS-ERDF-002.6(a).

5.4.2 Quality Assurance Samples

Quality assurance samples shall be taken in the following types/frequency to understand the quality of the data received in support of washwater management decisions:

5.4.2.1 Splits

Split sampling will be performed only if a split sample is requested by BHI, DOE-RL, EPA, the Washington Department of Health (WDOH) or the Washington

Department of Ecology (WDOE) for their independent analysis. Split samples will be considered by the Waste Acceptance Manager as part of the overall leachate program if the contracted laboratory is brought into question by a regulatory agency or DOE through their ongoing laboratory surveillance programs.

5.4.2.2 Field Blanks

One full set of field blanks will be taken on every washwater sampling event and submitted for laboratory analysis. All paperwork submitted to the contracted analytical service will indicate that the field blank is a leachate sample from either of the leachate storage tanks. The field blank will be prepared with exactly the same bottles, volumes, preservatives, and hold times as the actual washwater sample. The field blank liquids will be de-ionized water carried to the field and transferred to the sample bottles at the washwater sampling location.

5.4.2.3 Duplicates

Duplicates will be taken on every 10th washwater sample (10%) by performing two identical sampling events and submitting both sets of samples to the contracted laboratory to compare analytical results. The second set of sample bottles will be labeled as being a sample from either of the leachate storage tanks.

5.4.2.4 Spikes

Spike samples will not be used as a normal procedures for washwater samples, but shall be considered when the Waste Acceptance Manager has deemed that an overall concern exists with respect to the integrity of the washwater sampling/analytical process.

5.4.3 Labeling/Chain-of-Custody

Sample numbers for both leachate samples and quality assurance samples shall be obtained from the Waste Acceptance Manager. Labeling and chain-of-custody shall be maintained at all times for leachate samples by implementing the requirements of QAI 13.1, Sample Handling and QAI 13.2, Chain-of-Custody from the ERDF Quality Assurance Project Plan, RFS-ERDF-003. Labeling of quality assurance samples (duplicates and field blanks) shall be performed such that the quality assurance nature of the sample is not known by the contracted analytical services.

5.5 Washwater Analytical Requirements

Table 5-4 identifies the baseline analytical procedures to be performed on the ERDF washwater to understand the composition and allow proper management of the materials. Additional analytical procedures above these requirements shall be performed as necessary to quantify the presence of other hazardous constituents identified as present in the landfill.

Table 5-4 - Washwater Analytical Requirements

Constituent	Analytical Method
Gamma Radionuclides	Gamma Energy Analysis
Beta Radionuclides	Total Beta Analysis
Alpha Radionuclides	Total Alpha Analysis
Volatile Organics	SW-846 Method 8260
Semi-Volatile Organics	SW-846 Method 8270
Metals	SW-846 Method 6010

6.0 Disposition Determination

The required controls for leachate , decontamination washwaters and other contaminated waters generated as a result of operations generated at the ERDF will be dependent upon the source and/or results of the sampling and analysis described in Section 5.0, but will reside in one of three categories:

- Clean waters from inactive cells will be released and disposed of as part of the ERDF storm water/runoff system,
- Leachate, decontamination washwaters and other contaminated waters generated as a result of operations that are acceptable for reuse will be cycled within the ERDF cell as compaction and dust suppressant waters, and
- Leachate, decontamination washwaters and other contaminated waters generated as a result of operations generated that do not qualify for reuse will be transported to the Effluent Treatment Facility (ETF), if acceptable, or to another approved facility for treatment and disposal.

6.1 Basis of Leachate/Washwater Management Strategy

The ERDF is expected to generate leachate that requires management within a regulatory framework. The ERDF ROD currently requires sufficient leachate storage capacity to ensure uninterrupted operations, complying with 40 CFR Part 264, Subpart N.

The Tri-Parties have determined that the ERDF leachate may be collected and stored at the ERDF for use at ERDF, as appropriate. Appropriate uses are limited to dust suppression and waste compaction. Compaction of the waste is necessary to minimize the potential for subsidence and to support a final surface cover. The following discussions concerning the use of these water is the basis for the overall leachate management strategies discussed in this section.

6.1.1 Dust Suppression

If a landfill contains material that is subject to wind dispersal, the 40CFR264.301(j) requires the material to be managed to prevent wind dispersal. The ERDF operations involve bulk placement of soils and other materials that in an uncontrolled dry form could have a strong potential for dispersion in localized areas within the landfill and the surrounding areas. The potential for dispersion has been studied as part of the ERDF environmental monitoring program and the ERDF Safety Analysis (BHI-00370). The ERDF Safety Analysis requires soil fixative agents to be applied during non-operational times (at the end of shift operations) to fix the working place and minimize dispersion. Dust suppression programs have been incorporated into the operations procedures (within the ERDF Waste Materials Placement Procedure) including the use of water to suppress dust dispersion during the dumping operation and the waste placement into "lifts" within the landfill.

6.1.2 Waste Compaction

Compaction of waste within the landfill is also required to ensure that the wastes are placed in an engineered fill, to minimize the potential for subsidence, and to support the final surface barrier. The integrity of the final surface barrier is the ultimate objective of these compaction requirements in order to meet the requirements of 40 CFR 264.310. Wastes and daily operating cover are required to be placed and compacted to 90% of modified proctor (ASTM D1557) maximum dry density. These compaction requirements lead to the use of water during compaction to achieve wastes at or near optimal moisture content to allow necessary compaction results to be achieved.

6.1.3 Water Balance

A water balance around the ERDF landfill was performed as part of the overall ERDF leachate management strategy (BHI-00734) to understand the amount of water necessary for dust suppression and compaction in comparison to the amount of leachate and washwaters that would be generated at the site. This study considered several water sources, including moisture contained in soil shipped for disposal, leachate used to dust control, etc. and precipitation. Pathways for water loss were evaporation and leachate collection. This study concluded that the required water needed for compaction and dust suppression was greater than the volume of leachate and decontamination washwater that would be generated at the site. These conclusions support the use of leachate and decontamination washwaters for use in the landfill as dust suppression and compaction purposes and is not considered placement of liquid wastes within a landfill.

Moisture addition in the ERDF landfill is required for both dust control and to facilitate compaction of waste material. The water balance study suggests an application rate for dust control of 0.50 gal/sqyd, with a service life of one hour. The daily work area in the landfill can be 100,000 sqft (11,100 sqyds). Applying this volume eight times per day equates to 44,000 gallons required for dust control. The water balance also assumes that an average of 2% moisture by weight will be added to facilitate compaction of incoming

waste material. Daily receipts at the ERDF can average 3,000 tons of waste material. Assuming a 2% moisture addition is necessary, another 14,000 gallons is required which brings the total to 58,000 gallons per day. The total volume of moisture added to the landfill is subject to a great deal of variability due to weather effects such as temperature, relative humidity, and precipitation. Rather than create a complex set of moisture addition limits that are subject to many assumptions and changing conditions, the moisture addition will be based on the moisture measurement obtained daily with the nuclear moisture gage. The optimum moisture content for the incoming waste material is about 8%. After the daily moisture measurement, the value of the moisture content is communicated to dumping station personnel who control the quantity of moisture added to the waste during the unloading process. If the moisture content is greater than 8%, they will be instructed to reduce the amount of moisture added. This method of moisture control is based on the actual moisture content required to achieve optimum compaction of the waste material and also accounts for varying weather conditions.

6.2 Leachate and Washwater Management

6.2.1 Inactive Cells Containing No Waste

The leachate collection system for inactive cells in which no waste has been placed will be disconnected and will be routed to the ERDF storm water/runoff management system for disposal.

6.2.2 Leachate Storage Tank Level Management

The leachate storage tanks have a capacity of 580,000 gallons. This capacity allows for 420,000 gallons of capacity to receive a 25 year, 24 hour rainfall event with an additional surge capacity of 160,000 gallons to be used for storage of leachate.

- During normal operations, leachate will be managed by filling a leachate storage tank to the three foot level at which point it will be isolated and leachate flow redirected to the other leachate storage tank. The isolated tank will then be sampled in accordance with the requirements of section 5 and the results of that sampling/analysis will determine the disposal option for the leachate as described below.
- During off-normal operations (periods of high precipitation),leachate will be managed by filling a leachate storage tank to its maximum level (approximately 7') at which point it will be isolated and leachate flow redirected to the other leachate storage tank. The isolated tank will then be sampled in accordance with the requirements of section 5. The leachate will be transported to the ETF to maintain the 24-hour, 25-year storm design capacity.

6.2.3 Washwater Storage Tank Level Management

The washwater storage tank has a capacity of 23,750 gallons (assuming 1 foot of freeboard). This capacity allows for 8 weeks of decontamination operations (14,000 gallons), precipitation from a 25 year, 24 hour rain event (2,438 gallons), and a surge capacity of 7,312 gallons (which equates to an additional four weeks of decontamination

operations). A sample will be taken at the direction of the Waste Acceptance Manager, but prior to the tank reaching 70% of the design capacity (16,625 gallons). This will ensure that operations are not impacted by the washwater analysis/disposition process due to a spare capacity of four weeks of continued decontamination operations.

6.3 Leachate Disposition Determination

Waters collected in the leachate sump from cells where no waste placement has occurred will be directed to the storm water/runoff management systems using methods described in Section 6.2.1. Periodic radiological surveys as part of the overall ERDF radiological controls program (as identified in the ERDF Health & Safety Plan) will ensure that contamination is not spreading into any unused cell(s) within the landfill. These surveys will be documented and retained for review within the BHI Document Control Records. Waters collected in the leachate sump of unused cells will be routed to the leachate collection system should contamination be identified by these surveys that is not readily contained and/or removed and disposed of in active portions of the landfill.

Leachate collected in the leachate storage tanks will be sampled/analyzed in accordance with Section 5.0 for known hazardous and radioactive constituents placed to date in ERDF. Based upon the results of these analyses, leachate will be considered acceptable for reuse as compaction and dust suppression water if:

- Known hazardous constituents are present at less than the land disposal restriction limits, and
- Known hazardous constituents are present at less than the ERDF Waste Acceptance Criteria (BHI-00139).
- Known radiological constituents are present at less than the ERDF Waste Acceptance Criteria (BHI-00139).
- Known hazardous substances will not present a potential for an unacceptable work exposure (>50% of the OSHA PEL), based on an exposure assessment conducted in the ERDF Health and Safety Plan.

Leachate that is not acceptable for reuse will be transported to the ETF, if acceptable, or to another approved facility for treatment and disposal.

Use of leachate for dust suppression and compaction purposes shall be maintained to the minimum necessary to support landfill operations. The overall waste addition process shall be controlled by the ERDF Waste Materials Management Procedures. The use of water will be minimized, and the water addition person will be informed of the results of the daily moisture content testing. The water addition person will use the results to adjust the quantities of water being sprayed.

6.4 Washwater Disposition Determination

Washwater collected in the washwater storage tank will be sampled/analyzed in accordance with Section 5.0 for known hazardous and radioactive constituents placed to date in ERDF. Based upon the results of these analyses, washwater will be considered acceptable for reuse as compaction and dust suppression water if:

- Known hazardous constituents are present at less than the land disposal restriction limits, and
- Known hazardous constituents are present at less than the ERDF Waste Acceptance Criteria (BHI-00139).
- Known radiological constituents are present at less than the ERDF Waste Acceptance Criteria (BHI-00139).
- Known hazardous substances will not present a potential for an unacceptable work exposure (>50% of the OSHA PEL), based on an exposure assessment conducted in the ERDF Health and Safety Plan.

Washwater that is not acceptable for reuse will be transported to the ETF, if acceptable, or to another approved facility for treatment and disposal.

Use of washwater for dust suppression and compaction purposes shall be maintained to the minimum necessary to support landfill operations. The overall waste addition process shall be controlled by the ERDF Waste Materials Management Procedures. The use of water will be minimized, and the water addition person will be informed of the results of the daily moisture content testing. The water addition person will use the results to adjust the quantities of water being sprayed. The use of water will be minimized, and the water addition person will be informed of the results of the daily moisture content testing. The water addition person will use the results to adjust the quantities of water being sprayed.

7.0 Response to Leaks from Leachate Storage Tanks

In accordance with the substantive standards of 40 Code of Federal Regulations, section 264.196 and Washington Administrative Code 173-303-640(7), as applied to the ERDF via the ARARs process, the following steps will be implemented immediately upon discovery of an apparent leak in either the primary or secondary containment systems of the leachate or washwater storage tanks. If any circumstance prevents immediate action in response, immediate written notification will be made to BHI.

a. Immediately stop the flow of leachate into the tank.

b. Notify BHI of all evidence of the leak. BHI will ensure appropriate notifications are made.

c. Remove waste from the tank. As early as practicable, draw down the contents of the tank in question to the other tank, until the leak is repaired or the tank is emptied. If such transfer is not possible (due to the other tank being full, leaking, or otherwise impaired), begin transfer as quickly as possible to an appropriate treatment, storage or disposal facility.

d. The following shall be completed in an expeditious manner by the appropriate parties: Inspection and repair of the tank; appropriate tests of the repairs; certification of the repairs prior to returning the tank to service, with appropriate documentation.

e. If there has been a release into the secondary containment system, all released materials must be removed, to the other tank or other appropriate location, within 24 hours or as timely as possible to prevent harm to the environment.

Appendix A
Action Leakage Rate Calculation

1. Problem - Calculate the capacity of the Secondary Leachate Collection System (SLCS) for ERDF to determine the Action Leakage Rate (ALR) in accordance with the latest EPA guidance and RCRA regulations.

2. Sources - EPA published specific guidance for calculating site-specific ALR=s when the final "Leak Detection Rule" was published in the Federal Register on 1/29/92 (54 F.R. 3462, 1992). These guidelines will be followed to calculate the ERDF site-specific ALR as specified in 40 CFR 264.304.

3. Approach - The ALR is defined by EPA as "the maximum capacity of the SLCS so as not to exceed one foot head on the bottom liner" (formerly known as the rapid and extremely large rate in the proposed rues). The approach used to calculate the ALR for ERDF will be to:

   - Calculate capacity of the SLCS drainage layer as-built using EPA guidelines,
   - Apply the appropriate safety factors to the calculated ALR to account for uncertainties as specified by EPA, and
   - Check capacities of key SLCS components (i.e., SLCS pump) to ensure these do not limit the calculated ALR for the drainage layer.

4. As-Built Secondary Collection System Design - The basic design of the base liner system is shown in Figure 2-1. The important features for drainage/SLCS design are the drainage material type and the slope:

   - Drainage Material - Drainage gravel with encasing geotextile materials,
   - Slope of Secondary Drainage in sump - 2% minimum (S=0.002) per Drawing 0600X-DD-C0043 (Cell 1) & 0600X-DD-C0044 (Cell 2).

5. Calculation of SLCS Capacity - As an example, EPA proposed the following model to calculate flow originating from a hole in a geomembrane liner:

$$Q = k * h * \tan a * B$$

Where:	$Q =$	Flow rate in the leak detection layer
	$k =$	Hydraulic conductivity of the drainage medium
	$h =$	Head on the bottom of the liner
	$\tan \alpha_ =$	Slope of the leak detection system
	$B =$	Width of the flow in the leak detection system, perpendicular to the flow

The example given by EPA assumes the following values for the minimum acceptable system for a landfill under minimum technology requirements (MTR):

$k = 1 \times 10^{-2}$ cm/sec
h = 1 foot maximum
tan a = 1% minimum
B = 100 foot width of flow

Combined with a safety factor of 2, this calculates to an EPA recommended minimum ALR of 100 gallons/acre/day (gpad) for landfills meeting the MTR.

For ERDF the following apply:

$k = 1 \times 10^{-1}$ cm/sec	Testing information ranges from 0.25 cm/sec up to 0.9 cm/sec, but this number was chosen to add some conservatism to the calculation.
h = 1 foot maximum	As required by EPA guidance
tan a = 0.02	Per drawing 0600X-DD-C0043 (Cell 1) and Drawing 0600X--DD-C0044 (Cell 2) which has the slope as 2% minimum
B = 100 feet	Per Drawing 0600X-DD-C0045

Based on these factors, the flowrate (Q) for ERDF is calculated as:

$Q = (1 \times 10^{-1}$ cm/sec) * (1 foot) * (0.02) * (100 feet) = 0.2 cm*ft^2/sec

= 0.2 cm*ft^2/sec * (foot/30.48 cm) * (7.48 gallons/ft^3) * (86,400 sec/day)

= 4240 gallons/day

6) ALR Calculation Taking Into Account Safety Factors - The ERDF design has the two cells at a surface area of 12 acres leading to an overall ALR of:

ALR = Q / Surface Area / Safety Factor

= (4240 gallons/day) / (12 Acres) / (2)

= 177 gallons/acre/day

7) SLCS Pumping Capacity - The leachate collection sump pump must be verified to be supportive of the selected ALR:

Secondary leachate sump pump - The leachate extraction pump capacity is 15 gpm which equates to a pump-out rate of:

Q = 15 gal/min * 60 min/hr * 24 hr/day / 12 acres

= 1,800 gpad

Conclusion: The SLCS pump is supportive of the selected ALR.