Attachment 17
Surface Impoundments
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D.4 Surface Impoundments

This Section provides information for the following RCRA surface impoundment units located at the facility:

- The Evaporation Pond;
- Collection Pond #1; and
- Collection Pond #3.

These surface impoundments are located as shown on the Facility Site Plan, Figure D-1. The Evaporation Pond is the primary surface impoundment at the facility and is used to evaporate treated leachate and on-site and off-site generated liquids. The primary purpose of Collection Ponds #1 and #3 is the collection and containment of surface run-off from within the facility, however, the Ponds can also store leachate and other liquids in accordance with the general requirements and limitations found in the WAP for liquid wastes placed into Surface Impoundments. In addition, the facility does not manage any wastes subject to the requirements of 40 CFR Part 264, Subpart CC in surface impoundments, therefore these regulations do not apply.

Run-off, leachate, and aqueous wastes either flow to the surface impoundments by gravity or are transferred by pumps, tank trucks, vacuum trucks, or by other appropriate means. The stored aqueous wastes are treated by solar evaporation. If residues in the surface impoundments reach a level of 1 foot or greater, they will be carefully removed to avoid damage to the liner system. The residual sediments are analyzed for proper disposal as necessary. Site run-off collected in the Collection Ponds may also be utilized for process water.

The Collection Ponds collect surface run-off from active areas and were designed to retain the run-off from a 25-year, 24-hour storm (1¾ in.) while maintaining 2.8 ft. of freeboard. General specifications for the surface impoundments, including excavation, liner placement, flow zone materials, berm construction, roadway construction, drainage control construction, etc., are provided in Appendix D.4.1. Any needed repairs are observed and certified by a licensed Professional Engineer (PE) prior to returning the surface impoundment to service, in accordance with 40 CFR §264.227(d). An example certification is included as Figure D-8.

A liquid waste recirculation system may be constructed in the Evaporation Pond to enhance evaporation of liquids and prevent stagnation of the water. This system would consist of a recirculation pump or pumps, piping, and a perforated distribution pipe that would be installed along the Evaporation Pond's side slopes below the top of the slope. The liquids would be discharged through the distribution pipe and flow over the HDPE liner down to the liquid surface in the Evaporation Pond. The system would be designed such that "misting" of liquids and the airborne migration of mist beyond the boundaries of the surface impoundment will not occur. The details of the systems design will be submitted to IDEQ for approval.

The design storage volume capacity of all surface impoundments (i.e. Collection Ponds No. 1 and 3) and Evaporation Pond No. 1, were re-evaluated in the previous revision to the SWMP based on a total storage volume of a 100-year, 24-hour storm, plus 2.8 feet of freeboard. The design freeboard depth was based on maximum wave height calculations for on-site surface impoundments using a maximum wind velocity of 70 miles per hour (i.e. worst case scenario). Based on existing site conditions, the computed runoff from the 100-year, 24-hour storm event and the actual capacity provided by each Collection Pond and Evaporation Pond No. 1, allowing for a minimum 2.8 feet of freeboard, is as follows:

Summary of Collection & Evaporation Pond Storage Volume Capacities During Existing Condition of Site Development

Pond	Storage Volume Capacity (See Note 1) (ft^3)	100-yr, 24-hr Storm Runoff Volume (ft^3)	Limit Of Lined Contain-ment Elev. (ft)	Water Surface Elev. Of Design Storm (ft)	Storage Volume of 2.8 ft of Freeboard (ft^3)	Excess Storage Volume Capacity (ft^3)
Collection Pond 1	104,504	67,140	2533.0	2530.2	37,819	0
Collection Pond 3	136,446	65,333	2560.0	2555.9	52,919	18,195
Evap. Pond 1	841,383	27,152	2569.6	2556.7	243,300	570,931

Table Notes

1. Storage Volume Capacities for Collection Ponds No. 1 and 3 and Evaporation Pond No. 1 were obtained by computer modeling the primary geomembrane liner surface from as-built (constructed) survey information. The storage volume capacity was estimated up to the elevation corresponding to the limit of lined containment (i.e. pond rim elevation). For Collection Ponds No. 1 and 3, there is adequate capacity to contain the entire 100-year, 24-hour storm event within the lined containment area, as presented in the above table.

The actual storage capacity total volumes for the ponds were obtained by computer modeling the geomembrane liner surface (or top of protective cover over the lining system) of each pond as taken from as-built (constructed) survey information. Water surface areas for the ponds were calculated by computer methods and a cumulative storage volume determined based on existing contours and pond geometry. The storage volumes (summarized in the previous table for each existing collection pond and the Evaporation Pond) were computed by each foot of elevation in the drainage design surface water calculations on stage storage curves.

The design of all existing channels was re-evaluated in the latest revision of the SWMP, based on the Manning's Equation for open channel flow. A triangular channel cross-section was selected as a typical shape, with side slopes (3H:1V) and a minimum channel design depth of two (2)feet was used; this provides a minimum design channel freeboard of one (1) foot. Design channel hydraulics for the various channel reaches is summarized in the Channel Schedule (See Drawing PRMI-D01 and Table 2, except for Cell 15, which is shown on Drawing 52-01-09). Flow velocities in the channels were determined using Manning’s Equation and if the velocity exceeded five (5) feet per second, the channel was designed with a riprap lining. Refer to Drawing PRMI-D05 for typical channel sections and details.

The design of all existing culverts was re-evaluated, based on inlet control and checked for outlet control and minimum slope. A roadway surface “overtopping analysis” was performed using Federal Highway Administration (FHWA) computational methods (HY-8 program) to verify the performance of each culvert, to pass the 25-year, 24-hour design storm event. Culvert outlet protection of the immediate tailwater (downstream) channel was evaluated based on comparison of the culvert outlet velocity with the surface water velocity in the tailwater channel. Design hydraulics for the culverts are summarized in the Culvert Schedule (See Drawing PRMI-D01 and Table 1, except for Cell 15, which is shown on Drawing 52-01-09).

D.4.a List of Acceptable Wastes

All surface impoundments are currently permitted to manage the RCRA wastes listed in Section A, provided the wastes do not exhibit concentrations of hazardous constituents above the land disposal restrictions (LDRs) described in 40 CFR Part 268 and are not ignitable, reactive, corrosive (e.g. D001, D002 or D003) or subject to the requirements of 40 CFR 264 Subpart CC for volatile organics.

Liquid waste for treatment in the Evaporation Pond initially comes from the facilities Wastewater Treatment tanks, the Collection Ponds, the leachate treatment system, or off-site generators. Waste from the Evaporation Pond may be transferred to Ponds 1, and 3, if necessary for water balance requirements. Prior to discharge of liquid wastes into any of the ponds, the waste and pond compatibility are determined in accordance with the WAP.

D.4.b. Exemption Requests

No exemption is requested.

D.4.b.(1) Liner System Description

All three (3) surface impoundments were constructed in the summer of 1984. As such, the minimum technology design requirements described under 40 CFR §264.221(c) do not apply to these impoundments. However, the impoundments were designed and constructed to exceed the requirements of 40 CFR §264.221(a).

D.4.b.(1)(a) Collection Ponds #'s 1 and 3

The Collection Ponds each have an engineered lining and leachate collection system (leak detection, collection, and removal system (LDCRS)) along their base (floor), as shown on Drawing # PRMI-D06 and -D07. The LDCRS is the flow zone between the primary and secondary liners which collects liquids that may potentially leak through the primary liner and conveys them to the sump (leachate collection vault). The LDCRS consist of the following components (from bottom to top):

- Liner sub-grade - Native subsoil
- Bedding material - Geotextile fabric
- Secondary synthetic liner – 40 mil HDPE material
- Leachate, collection and removal zone - 12 in. of free-draining granular material, with a perforated collection pipe system
- Primary synthetic liner - 60 mil HDPE
- Protective cover layer (bottom of Collection Pond 1 only) - Cobbles over sand (varying thickness), separated by a geotextile filter fabric

The Collection Ponds have interior side slopes varying from two (2) horizontal to one (1) vertical (2H:1V) to approximately 6H:1V. The engineered lining and leachate collection system along the side slopes of the Collection Ponds consist of the following (from bottom to top):

- Liner sub-grade - Native subsoil
- Bedding material - Geotextile filter fabric
- Secondary synthetic liner - 40 mil HDPE
- Leachate, collection and removal zone - Drainage net/Primary synthetic liner – 60 to 80 (pond #3) mil HDPE.

In 1993, a new 80 mil HDPE primary liner was installed in Collection Pond # 3 directly over the original primary liner. The original primary liner was cut and left in place. Synthetic drainage net material was used as the leak detection, collection, and removal system rather than natural granular material because of its ease of placement on the side slopes and its high hydraulic conductivity.

D.4.b.(1)(b) The Evaporation Pond

The Evaporation Pond has an engineered LDCRS along its base (floor) as shown on Drawing #PRMI-L41. The LDCRS consists of the following (from bottom to top):

- Liner sub-grade - Native subsoil;
- Secondary synthetic liner – 40 mil HDPE;
- Leachate, collection and removal zone -12 in. to 18 in. of free draining granular material with a perforated collection pipe system;
- “Old” primary synthetic liner – 60 mil HDPE, cut/left in place where “New” was placed;
- Protective cover layer - 12 in. soil liner over four (4) in. to six (6) in. of granular material;
- “New” primary synthetic liner – 80 mil HDPE over a portion of the Pond; and During installation of the new primary liner, the old primary liner was cut and left in place.

The engineered lining and leak detection, collection, and removal system along the side slopes of the Evaporation Pond consists of the following (from bottom to top):

- Liner sub-grade - Native subsoil;
- Secondary synthetic liner – 40 mil HDPE;
- Leachate, collection, and removal zone Drainage net;
- “Old” primary synthetic liner – 60 mil HDPE, cut and left in place when “New” was placed;
- Protective cover layer – 12 in. primary soil liner (to elevation 2560 ± only); and
- “New” primary synthetic liner - 80 mil HDPE material over a portion of the Pond.

During installation of the new primary liner in sections, the old primary liner was cut and left in place. Synthetic drainage net material was used as the leak detection, collection, and removal system rather than natural granular material because of its ease of placement on the side slopes and its high hydraulic conductivity. The Evaporation Pond has interior side slopes varying from 3H:1V to approximately 6H:1V. The exterior side slopes of the Evaporation Pond dikes are 2.5H:1V. The relatively flat side slopes (6H:1V) are used as access ramps for sediment removal and repair operations. If necessary, repair operations will be conducted according to Section D.4.f.(5).

D.4.b.(2) Liner System Location Relative to High Water Table

For all surface impoundments, separation distances exceed 100 ft. between the lowest point of the synthetic liner and the uppermost aquifer beneath it. As shown in Section E, the depth to the uppermost aquifer in the vicinity of the surface impoundments ranges from approximately 135 ft. to 190 ft. below the present ground surface.

D.4.b.(3) Loads on Liner System

D.4.b.(3)(a) Pressure Gradients

Based on laboratory tests and manufacturer’s data (contained in Appendix D.4.3), the primary HDPE liner can support static, uniform loads of 4,000 psi without tearing. This allowable static loading greatly exceeds the anticipated maximum vertical static stress at the surface impoundment base which is estimated to be less than 10 psi. The estimated static pressure is based on the 10 vertical feet of liquid/sludge material with an average in-place density of 80 pounds per cubic foot (pcf). Based on the soil characteristics of the site, bottom heave and slope stability are not expected to produce undue stress on the liner.

HDPE has superior tear resistance compared to other common flexible membrane liners. Additional data on tear resistance from a manufacturer appear in Appendix D.4.3.

D.4.b.(3)(b) Installation Stresses

Inspections of the surface impoundment liners indicated that the liner materials do not exhibit “snare drum” effects that are caused by the contracting of the liners in the colder temperatures during the winter months. In addition, the tensile physical properties of HDPE, as presented in Appendix D.4.3 indicate a minimum elongation of 500% before break. Because the HDPE liners are able to withstand temperature extremes and retain their elastic qualities, installation stresses were minimal.

D.4.b.(3)(c) Operational Stresses

The 6H:1V interior side slopes of the impoundments are used as access ramps. Operational stresses will be minimized by allowing only foot traffic on the liners.

D.4.b.(4) Liner System Coverage

The HDPE liners cover the entire bottom surfaces and side slopes of each surface impoundment. Drawing #’s PRMI-D06, -D07, and -L41 show plans and typical sections of the engineered liner systems.

D.4.b.(5) Liner System Exposure Prevention

The primary liners are exposed to the general climatic conditions of the area for a period of time during installation and treatment operations; this exposure should have no detrimental effects. The polymeric HDPE material has good weathering-resistant characteristics as described below:

- Water - Very low water absorption capacity (< 0.1%);
- Cold - Strength increases with temperature decrease;
- Heat - Full strength is maintained up to 90^{O}C; and
- Ultraviolet sunlight - HDPE containing carbon black has shown no change in mechanical properties when exposed to UV test conditions.

Examples of manufacturer’s test results are documented in Appendix D.4.3. As described in Section F, the exposed liners are regularly inspected for signs of deterioration and to assess the integrity of the liners.

D.4.c Liner System - Foundation

D.4.c.(1) Foundation Description

In 1984, the sub-grades for the surface impoundments were excavated/constructed into the native soils (a gravelly, silty sand). Sub-grade (top of secondary HDPE liner) elevations for the four impoundments are shown on Drawing #’s PRMI-D06, -D07 and -L41.

D.4.c.(2) Subsurface Exploration Data

Appendix D.6.1 includes the Construction Certification Report. This report summarizes the results of observations and testing of earthwork conducted during construction of PCB Trench 5, Phase 2, including field and laboratory testing. As the soils present do not vary significantly across the facility, the native sub-soils that are present beneath the surface impoundments are of similar characteristics to those observed during the construction of PCB Trench 5, Phase 2. These soils consist of gravelly, silty sand that gradually grades to clean, poorly graded sand. Additional information describing the geology and hydrogeologic conditions present at the facility is included in Section D.6.d.(2) and in Section E.

D.4.c.(3) Laboratory Subsurface Testing Data

Geotechnical laboratory testing data for facility soils are described in Section D.6.d.(2).

D.4.c.(4) Engineering Analyses

Geotechnical calculations and engineering analyses for the surface impoundment foundations are included in Appendix D.4.8. As shown in this appendix, engineering analyses were performed for bearing capacity of the bases of landfill Cells 5 and 14 and the capacity of soil liners to support loads for Cells 5 and 14. These analyses are applicable to the surface impoundment foundations as the soils across the facility are generally consistent. Additional discussions regarding testing of site soils are provided in Appendix D.6.5.

D.4.d Liner Systems – Liners

D.4.d.(1) Synthetic Liners

General information (thickness, type and material) describing the synthetic liners present in the surface impoundments is provided in Section D.4.d. The original liners were manufactured by National Seal Company. The new primary liner for the Evaporation Pond was also manufactured by National Seal Company, while the new primary liner for Collection Pond # 3 was manufactured by Gundle Lining Systems (now GSE). Data describing the material specifications for these liners are contained in Appendix D.4.3.

D.4.d.(1)(a) Synthetic Liner Compatibility Data

The primary synthetic liner is in direct contact with hazardous wastes. Leachate and chemical compatibility data for HDPE liners are presented in Appendices D.4.4 and D.4.5, respectively. These data indicate that the liners are compatible with the wastes placed in the impoundments.

Prior to submittal of the facility's original Part B Permit Document in 1987, a liner chemical compatibility test program to test the effects of five (5) synthetic waste streams on two (2) different brands of 60 mil HDPE liner material was completed. The synthetic waste streams were representative of the general types of wastes that were managed at the facility. A copy of the test program report is included in Appendix D.4.4. In general, the test results indicated that the HDPE liner is compatible with the potential waste streams.

Since completion of these tests, the LDRs were promulgated under 40 CFR Part 268. As a result of the promulgation of the LDRs, the concentrations of hazardous constituents managed in the surface impoundments and landfills have decreased significantly. Therefore, the five waste streams used in the 1987 liner chemical compatibility test program represent higher strength wastes than those currently managed at the facility. As such, the results of these tests are still applicable to current operations.

Relative to radioactive liquids that would be placed in the Surface Impoundments, the following provides an analysis on the impacts to the liner:

The contact dose rate for a slab of depleted uranium is known to be 200 mrad/hr. This dose is due to the beta emissions of its two immediate progeny, thorium-234 and proctatinium-234m. There are nine beta emitters in the decay chain of uranium-238. Over 99% of the dose the uranium and its progeny could deliver to the liner would be from beta emissions. The beta emissions from each of the progeny would deliver a dose of approximately 0.02 mrad/hr. if it were in equilibrium with the parent nuclide, uranium-238, and at the concentration allowed by the WAC. The instantaneous dose rate to the liner would be 0.18 mrad/hr. The annual dose to the liner would be 1.67 rad. HDPE used as insulation for electrical wires is advertised to have a radiation resistance of 7E+6 rads. This indicates a potential lifetime for the liner, based solely on dose, of 4.2 million years.

It is also worthy of note that 40 CFR 192, Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings, requires the same containment system for uranium mill tailings as are required for RCRA wastes. Uranium mill tailings contain from 25 to 100 times higher concentrations of the entire beta emitting progeny of uranium-238 than the USEI WAC allows for receipt at the facility.

D.4.d.(1)(b) Synthetic Liner Strength

The basic mechanical and physical properties of HDPE can be summarized as follows:

- High tensile strength;
- Good elastic deformation;
- Good plastic deformation;
- Good relaxation properties;
- Good stress crack resistance; and
- Good resistance to aging.

To assure consistent mechanical properties, the manufacturer closely monitors the density of HDPE. Typical data on the physical properties of an HDPE liner from a major manufacturer are presented in Appendix D.4.3.

D.4.d.(1)(c) Synthetic Liner Bedding

As shown on Drawing #'s PRMI-D06, -D07 and -L41, the synthetic liners installed have soil and/or geotextile bedding materials above and below the liners to provide additional protection of the liners during installation and operation of the surface impoundments. The soil bedding materials consisted of the native gravelly, silty sands present across the site. These soils were excavated, fine graded, and compacted as described in the technical specifications contained in Appendix D.4.1. Liners were installed using procedures similar to those described in Appendix D.4.1 to protect the liners from potential damage during installation. Descriptions of the liner systems for the Collection Ponds and the Evaporation Pond were provided previously in Section D.4.d.(1).

D.4.d.(2) Soil Liners

Because the impoundments were constructed in the summer of 1984, the requirements of 40 CFR §264.221(c)(1)(i)(B) do not apply.

D.4.e Liner System-Leachate Detection System

Because the impoundments were constructed in the summer of 1984, they are not required to have leak detection systems described under 40 CFR §264.221(c)(2). However, as described previously in Section D.4.e, all impoundments do have leak detection, collection and removal systems meeting those requirements.

The layout for the LDCRS for each of the surface impoundments is shown on Drawing # PRMI-D06, -D07 and -L41. The drainage layer detects and collects leakage escaping through the primary liner and conveys it to collection sumps located under the impoundments.

The base of each surface impoundment is graded to drain toward the collection sumps at a 2% slope (minimum). The collection pipes in the Evaporation Pond and Collection Pond #1 and #3 are also constructed at a minimum slope of 2%. These collection pipes are four (4) in. diameter (minimum) perforated HDPE pipes that are placed within the 12 in. to 18 in. leakage collection drain layer. The four (4) in. diameter HDPE pipes are adequate for gravity drainage of leakage to the sumps. Design calculations for the collection pipes systems are included in Appendix D.4.8.

The collection sumps include HDPE riser pipes in each surface impoundment. Sumps are located in the low points as indicated on Drawing #'s PRMI-D06 and -L41. Drawing # PRMI-D06, -D07, and -L41 depict cross-sections of the liner system and sumps. As shown in these drawings, the riser pipes extend up the side slopes from below the base to the top of the surface impoundment crest. The riser pipes penetrate the primary liners at the tops of the side slopes at the edges of the impoundments, which is well above the maximum allowable liquid level.

As stated, the four (4) in. (minimum) diameter perforated collection pipes and fittings are constructed of HDPE similar to those described in Appendix D.4.1 and the pipes have sufficient strength to support the loads applied to them over the operating life of the surface impoundments. The collection sumps are approximately five (5) ft. long by five (5) ft. wide by three (3) ft. deep, are filled with granular material surrounding a three (3) ft. high, perforated, 24 in. diameter HDPE vault. The 24 in. diameter HDPE vaults are set in concrete bases placed over a protective HDPE slip sheet to prevent puncture of the secondary liner. Access to the vaults for monitoring leakage levels and for removing leakage is provided by a 12 in. diameter HDPE side slope riser pipe. The four (4) in. (minimum) diameter collection pipes are connected to the 24 in. diameter HDPE vaults.

The LDCRS at the base and side slopes is described in Section D.4.c.(1). The side slope net is a permeable synthetic mesh that allows migration of leachate along the slope to the base LDCRS. The drainage nets installed in the surface impoundments have transmissivity values that typically exceed 3×10^{-4} m^2/sec. Section 6 of Appendix D.4.1 provides additional information on flow zone and collection pipe placement. Typical design calculations are included in Appendix D.4.8.

The LDCRSs for the Evaporation Pond and Collection Ponds #1 and #3 each consist of a drainage net on the side slopes and a free-draining granular material and collection pipes with a stone annulus wrapped in polypropylene geotextile filter on the bases. The geotextile filter minimizes the clogging of the stone annulus. The granular material minimizes the infiltration of fine grained particles if a leak occurs in the liner. The collection pipes are covered with approximately six (6) in. of ¾ in. to two (2) in. coarse aggregate. This size aggregate does not enter and/or block the ⅜ in. diameter pipe perforations. Where possible, four (4) in. (minimum) diameter clean-out lines are provided for the leachate pipes. Drawing #'s PRMI-D06 and -L41 show the location of these clean-out lines for the various impoundments.

The collection sumps of the Collection Ponds and the Evaporation Pond are inspected in accordance with Section F and the liquid levels in the collection sumps are measured as part of the surface impoundment inspections. A gauge is lowered down the HDPE riser pipe to the leachate collection sump in each surface impoundment to measure the level of liquids (if any). If liquid is found in a zone at a depth of 12 in. or more, it is pumped dry to the extent practical. A backup pump is maintained at the facility.

The liquid removed from the collection sumps is pumped to containers or tank trucks that are weighed before and after pumping, through calibrated containers or tanks, or through a flow meter to determine the volume of leachate removed. The collected liquid may be returned to a surface impoundment, transferred to a tank, or other authorized unit. A chronological record of pumping events and volume of liquid removed is maintained in the operating record. The pumping data are analyzed to determine the leakage rate and the calculated leakage rate is compared to the ranges of leakage established in the *Response Action Plan* (RAP) included in Appendix D.4.6. As described in the RAP, various leakage rates for each unit trigger various levels of response actions (such as repairing the primary liner system, modifying daily operating procedures and notifying the IDEQ).

D.4.f Liner System - Construction and Maintenance

D.4.f.(1) Material Specifications

D.4.f.(1)(a) Synthetic Liners

See Section D.4.d.(1).

D.4.f.(1)(b) Soil Liners

See Section D.4.d.(2).

D.4.f.(1)(c) Leachate Detection System

See Section D.4.e.

D.4.f.(2) Construction Specifications

The construction specifications, similar to those followed during construction of the surface impoundments are included in Appendix D.4.1.

D.4.f.(3) Construction Quality Control Program

The Construction Quality Assurance (CQA) Plan is included in Appendix D.4.2. This CQA Plan provides for any subsequent repairs to or replacements of the liner systems for the landfill cells and surface impoundments to meet or exceed the design criteria, plans, and specifications. Additionally, this CQA plan demonstrates that the USEPA's *Technical Guidance Document: Quality Assurance and Quality Control for Waste Containment Facilities* (September 1993) has been followed. As the surface impoundment liner systems were installed prior to the issuance of the USEPA CQA guidance, the liners were installed in accordance with a previous CQA plan prepared by the designer of the impoundments, Conversion Systems, Inc.

D.4.f.(4) Maintenance Procedures for the Leachate Detection System

The LDCRSs for the surface impoundments are inspected as described in Section D.4.l and in Section F. Based on the results of these inspections, repairs to the affected component(s) will be made. Because of the nature of the LDCRSs (i.e., in-place underground field systems), routine maintenance procedures are not necessary except for the pumps. These are maintained and repaired as necessary.

D.4.f.(5) Liner Repairs During Operation

Upon observation of damage to the liner system, the placement of liquids in the surface impoundment is immediately restricted. The liquid level is lowered, as necessary to maintain a level below the damaged area to allow for repairs. An inspection to assess the damage is performed. The inspection procedures are as follows:

- If the damage is located on the base, the materials overlying the primary liner will be carefully removed a minimum of 24 in. beyond the damage in all directions to provide a working area. If the cover material is saturated, barriers, absorbents and/or the vacuum truck are used to maintain the work area in a dry condition and to minimize leakage to the LDCRS or underlying base material.
- Rope or other appropriate ladders are used to provide access for the inspector, repair crew, and qualified, certifying engineer.
- The primary liner is cleaned and dried. If the primary liner is deformed but not penetrated, the damage is repaired as described below. However, if the primary liner is penetrated, the liner is carefully cut and removed a minimum of 12 in. beyond the damage in all directions to expose the LDCRS.
- If the LDCRS materials (drainage net on the side slopes and granular material and geotextile fabric on the base) are penetrated or disturbed, the LDCRS materials are cut and removed a minimum of 12 in. beyond the damage in all directions to expose the secondary liner.
- The secondary liner is then cleaned and dried. If the secondary liner is deformed but not penetrated, the damage is repaired as described below. However, if the secondary liner is penetrated, obvious visible contamination is removed, and the underlying base materials sampled. Samples are analyzed for indicator parameters, and the results are compared with risk-based concentrations for these same parameters. Risk-based soil concentrations are described in Section I. Soils are considered clean as described in Section I.

Temporary repairs are made to provide containment until the permanent repairs can be completed. Temporary HDPE patches are heat-seamed over the damage and in addition, duct tape can be used to further secure and seal the temporary patch. The liquid in the surface impoundment is not allowed to rise above the level of the temporary repair. However, liquid may be discharged into the temporarily repaired impoundment to a level not to exceed 24 in. below the lowest point of the temporarily repaired area.

Permanent repairs may be delayed because of the following conditions:

- Liner temperature is below 35^{O}F;
- Precipitation or high humidity;
- High winds and/or dusty conditions;
- Qualified HDPE welder not available;
- Qualified certifying engineer not available; and
- Results of soil sampling analyses not received (if secondary liner was penetrated).

All permanent repair work is performed only in the presence of the qualified certifying engineer, as described below:

- If sub-base soil was removed, it is replaced and compacted with similar materials.
- Prior to any welding repair activities, the person who is to perform the repair must make a satisfactory test weld. This test requires preparing and welding together two pieces of HDPE material that are at least three (3) ft. long. Three one (1) in. wide samples are removed and tested in peel until failure. As an alternative, test welds may be performed in accordance with the requirements described in the CQA Plan (see Appendix D.4.2). A passing test requires the sheet material to fail before the weld. Deformations in the HDPE liner are repaired by roughening the damaged and surrounding area with sand paper. A bead of extruded HDPE is then placed over

penetrations in the HDPE Liners are patched with material of the same thickness and type as the damaged liner. The patch is cut to extend beyond the damaged area by at least four (4) in., and all corners are rounded. The liner surface and patch material are then cleaned and dried. With the hot air gun and roller, the patch is heat seamed to the liner so that the patch lies flat and without wrinkles. The surface to which the patch will be extrusion welded is roughened with sand paper and the patch immediately welded. When the weld has cooled, a soap solution is applied to the seams, and the repair is vacuum tested, if possible. Should a leak be detected, the defective weld is roughened, re-welded, and re-tested. The procedure continues until a leak free repair has been made.

- Drainage net, if clean, may be reused. If required, additional net will be placed over the repair to overlap underlying pieces a minimum of two (2) in., and secured with nylon cable ties.
- Geotextile fabric, if clean, may be reused. If required, additional fabric is placed over the repair to overlap underlying pieces a minimum of four (4) in., and heat seamed together.
- Granular materials and cover soils will be replaced with similar materials and to the original thickness.

Upon completion and testing of the repair, the qualified certifying engineer completes the certification form shown on Figure D-8.

The inspection, assessment, repair, and testing of the damaged liner system will be documented on the liner system repair report form shown on Figure D-9. The repaired unit may then be returned to normal service.

D.4.g Prevention of Overtopping

Overtopping of the surface impoundments is prevented by maintaining sufficient freeboard in each of the impoundments. Evaluations of all surface impoundments were performed and the maximum wave height from wind was determined to be 2.8 feet for the Evaporation Pond. Similar calculations for the Collection Ponds indicate the maximum wave height for these impoundments is less than 2.8 ft. Therefore, freeboard for the impoundments is generally maintained at least 2.8 ft. below the top of liner sidewall when used to manage wastes.

The Evaporation Pond has a small drainage area that generates a run-off volume from the 25-year, 24-hour storm of less than 5% of the designed Evaporation Pond capacity. Although the Evaporation Pond is primarily used for the solar evaporation of aqueous wastes, it has sufficient capacity to handle this excess run-off. If necessary, the level in the Evaporation Pond can be controlled manually by pumping to the Collection Ponds.

All of the surface impoundments are inspected to avoid overtopping. These inspections are performed as described in Section F. Before a Collection Pond encroaches on its’ freeboard, the water in the Collection Pond is transferred to the Evaporation Pond. If necessary, the surface impoundment levels can be lowered by transporting excess water from the surface impoundments by the pump and pipe system, tank trucks, or vacuum trucks.

D.4.h Dike Stability

The Evaporation Pond is the only surface impoundment which incorporates dikes into its sidewall construction. The other surface impoundments were excavated below original grade and, therefore, do not have dikes. In May 1998, Geosystems Consultants, Inc. of Fort Washington, Pennsylvania, prepared a *Geotechnical Investigation* report for the surface impoundments and landfill units. A copy of this report is included in Appendix D.4.8. As described in this report, the following information/analyses were presented/performed:

- Geotechnical (i.e., general geology, subsurface conditions and groundwater) conditions of the facility;
- A discussion of site seismicity; and
- Discussions of laboratory test results for:
    - Consolidation tests of in-situ soils;
    - Triaxial shear strength tests of in-situ soils;
    - Shear strength tests of compacted site soils;
    - Shear strength tests of un-stabilized and stabilized waste;
    - Slope stability analyses under both static and pseudo-static seismic conditions;
    - Veneer system (i.e., final cover system) static and seismic stability analyses; and
    - A discussion of factors of safety for slopes under static and seismic conditions.

D.4.h.(1) Engineer's Certification

Included in Appendix D.4.10 is a certification by a qualified engineer attesting to the structural integrity of the surface impoundment dikes in accordance with 40 CFR §264.226(c). The impoundment names on the certifications are the names originally used when the impoundments were built. Landfill Pond #1 corresponds to Pond #1; Process Area Pond corresponds to Pond #3; and Evaporation Pond #1 corresponds to the Evaporation Pond.

D.4.h.(2) Dike Design Description

A description of the Evaporation Pond dike design layout and materials of construction is provided in Appendix D.4.8. The capability of these dikes to withstand failure from expected static and dynamic loading is also described in this appendix.

D.4.h.(3) Erosion and Piping Protection

The Evaporation Pond dikes were designed and constructed to minimize erosion and prevent failure from excessive erosion from:

- Rainfall;
- Surface water run-off;
- Contact between impounded wastes and the dikes;
- Potential leakage through the dikes; and
- Potential leakage along conduits or structures through the dikes.

Because of the relatively short length of the dike slopes and the lack of run-off from adjacent areas over the dikes, the dike erosion potential from rainfall and surface water run-off is minimal. In addition, the coarse, granular nature of the materials used to construct the outer slopes of the dike provides a surface that is not easily eroded.

Because of the double HDPE liner system design of the Evaporation Pond, impounded wastes should not contact the dike materials. The dikes and liner system are inspected as described in Section F. Any leaks detected in the liner system will be repaired as described in Section D.4.f.(5). Therefore, potential leakage through the dikes should be negligible and should not cause any significant erosion of the dikes.

There are no conduits or structures through the dikes. As such, there is no potential leakage along conduits or structures through the dikes.

D.4.h.(4) Subsurface Soil Conditions

The engineering characteristics of the dike foundation materials were verified through testing and subsurface investigations as described in Section D.4.h and Appendix D.4.11.

D.4.h.(5) Stability Analysis

A description of, and the results from, applicable stability analyses are described in Appendix D.4.8.

D.4.h.(6) Strength and Compressibility Results

The results of strength and consolidation tests on the dike materials, together with a description of the sampling procedures and test methods, are described in Appendix D.4.8.

D.4.h.(7) Dike Construction Procedures

No new RCRA surface impoundment units are planned at the facility.

D.4.h.(8) Dike Construction Inspection Program

No new RCRA surface impoundment units are planned at the facility.

D.4.i Action Leakage Rate

As the surface impoundments are not subject to the requirements of 40 CFR §264.221(c) or (d), approved action leakage rates (ALRs) for the impoundment leak detection systems are not required. However, as the impoundments do have LDCRSs in place, the RAP establishes ALRs and response actions for each impoundment.

D.4.j Response Actions

The surface impoundment collection systems are routinely checked as described in Section F. In the event liquid is found, the following actions are taken: The liquid will be removed using the following procedures:

- Pump the zone dry to the extent practical;
- Determine the volume of leachate removed;
- Compare volume of liquid removed to ranges of leakage defined in the RAP; and
- Initiate response actions as established in the RAP, if required.

The liquid is handled by one of the following methods, following analysis in accordance with the WAP (depending on amount and analysis):

- Return it to a surface impoundment for solar evaporation;
- Stabilize the leachate and dispose within the landfill area;
- Ship it to an authorized TSD facility;
- Utilize liquid in the stabilization process;
- Store liquid in a tank for future treatment; and

- Log the activity in the facility operating record.

D.4.k Monitoring and Inspection

Surface impoundments are inspected for:

- Run-on diversion and run-off control systems;
- Leak detection, collection and removal system;
- Freeboard level; and
- Potential leaks or deterioration in the earthen dikes.

Periodic inspections of surface impoundment operations also include the following:

- Haul and access roads for accessibility and damage due to excessive run-off;
- Run-off/run-on control;
- Spillage on haul roads;
- Dikes;
- Safety and emergency response equipment; and
- Odors.

Section F contains the details of the surface impoundment inspection program.

D.4.l Emergency Repairs; Contingency Plans

The procedures followed if emergency repairs to a surface impoundment are required are described in the Contingency Plan which is located in Section G.

D.4.m Closure and Post-Closure Care

The surface impoundments will be removed from service in a sequential manner that is coordinated with the total facility closure. Section I provides details on the closure procedures for each of the surface impoundments.

D.4.n Special Requirements for Ignitable or Reactive Waste

Bulk ignitable or reactive waste liquids and sludge’s meeting the definition of ignitable or reactive waste under 40 CFR §§261.21 or 261.23 are not disposed or treated in the surface impoundments. The fingerprint analysis procedures noted in the WAP are used to assure that ignitable or reactive wastes are not accepted for disposal or treatment in surface impoundments.

D.4.o Special Requirements for Incompatible Wastes

Incompatible wastes are not placed in the same surface impoundment.

D.4.p Air Emission Standards

Wastes regulated by Subpart CC of 40 CFR Part 264 are not managed in impoundments at the facility.

Figure D-8 - Typical Certification of Liner System Repair Form

CERTIFICATION OF LINER SYSTEM REPAIR
FOR
US ECOLOGY IDAHO, INC.
GRAND VIEW, IDAHO

WASTE MANAGEMENT UNIT:
LOCATION OF REPAIR:

(TYPED OR PRINTED NAME OF QUALIFIED ENGINEER)

____ HEREBY CERTIFY THAT BASED ON MY OBSERVATIONS AND TESTING, THE REPAIR OF THE LINER SYSTEM MEETS THE DESIGN SPECIFICATIONS APPROVED IN THE PART B PERMIT.

____

(SIGNATURE OF QUALIFIED ENGINEER AND DATE)

(SEAL)

Figure D-9 - Typical Liner System Repair Report Form

LINER SYSTEM REPAIR REPORT

I. INCIDENT

DATE: ____

WEATHER: ____

UNIT: ____

LOCATION: ____

EXTENT OF DAMAGE:____

____

DID WASTE PENETRATE PRIMARY LINER? YES___ NO___

DID WASTE PENETRATE SECONDARY LINER? YES___ NO___

DESCRIBE TEMPORARY REPAIR: ______________________________

____

REPORTED BY: ____

II. REPAIR

DATE: ____

WEATHER: ____

NAME OF WELDER: ______________________________________

TEST WELD: PASS______ FAIL______

DESCRIBE REPAIR: ______________________________________

____

____

TESTING OF REPAIR: ______________________________________

____

ATTACH COPY OF AS BUILT DRAWING INDICATING LOCATION OF REPAIR

REPAIR DOCUMENTED BY: ________________________________