B&L Woodwaste Site
Pierce County, Washington

Engineering Design Report (EDR)

Addendum 1
Phase 1 Part 1 Remediation Design Report: Barrier Wall and Groundwater Interceptor Trench

FINAL

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Phase 1 Part 1 Remediation Design Report

Barrier Wall and Interceptor Trench

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1.0 Introduction

This Addendum to the Engineering Design Report (EDR for the B&L Woodwaste Site [Site]) describes the remedial design for a portion of the remedy specified for the 2008 Cleanup Action Plan (CAP) for the Site issued by the Washington Department of Ecology (Ecology 2008). This Addendum is one component of the complete EDR addressing the full Site remedy. Specifically, this Addendum addresses the design and construction of the barrier wall along the perimeter of the B&L Woodwaste Landfill (Landfill), the interceptor trench system to be constructed outside the barrier wall, and a piezometer network to monitor groundwater conditions along the barrier wall and interceptor trench system. These remedy components will be the initial construction element for the Phase 1 CAP implementation to be performed under Consent Decree No. 08-2-10610-7 (Consent Decree). As described in the Scope of Work for implementation of the 2008 CAP (Exhibit B to the Consent Decree), Phase 1 of the cleanup action includes design and construction of the barrier wall, the interceptor trench system, and the End-of-Plume remedy. The Phase 1 implementation has subsequently been divided into two parts: Part 1 addresses the subsurface barrier wall around the perimeter of the Landfill and an interceptor trench system (this Addendum), and Part 2 addresses the End-of-Plume remedy. Addendum 2, to be prepared later this year, will address Part 2 of the Phase 1 implementation program (i.e., the End-of-Plume remedy). Addendum 3 will cover Phase 2 of the 2008 CAP implementation program, which will address the remaining cleanup action components specified in the 2008 CAP.

The Site is located within unincorporated Pierce County (refer to Appendix 1F, Drawing G-1). The Landfill property, property ownership, and general land use for area properties are described in the EDR; the descriptions are not repeated here. The definitions for abbreviations and acronyms used in this Addendum are those described in the EDR.

The work described in this Addendum will be entirely completed within the B&L Property (refer to EDR, Figure 1.1) and includes design and construction of the barrier wall and interceptor trench system specified in the 2008 CAP. The purpose of the subsurface barrier wall is to contain arsenic-impacted groundwater beneath the Landfill and to reduce the groundwater flux to downgradient areas. The barrier wall is expected to raise groundwater elevations hydraulically upgradient of the Landfill and lower the groundwater elevation hydraulically downgradient of the Landfill. Such changes to the ambient groundwater flow field will create an inward gradient along the upgradient portion of the barrier wall and cause some disruption to the groundwater flow pattern downgradient of the Landfill. Therefore, an interceptor trench system has been specified in the 2008 CAP to alleviate these hydraulic effects and restore, to the extent practicable, existing groundwater flow patterns downgradient of the Landfill.

This Addendum is organized as follows. Section 2.0 presents the design criteria and design basis. Section 3.0 presents the design of the subsurface barrier wall and the interceptor trench system. Section 4.0 presents an overview of the construction plan. The operation, monitoring, inspection, and maintenance plans are described in Section 5.0. Section 6.0 presents the construction schedule and anticipated reports. References are listed in Section 7.0.

1.1 REGULATORY REQUIREMENTS

The EDR and this Addendum fully address the requirements specified in the Model Toxics Control Act (MTCA) regulations specified at WAC 173-340-400(4)(a). Table 1.1 provides a summary of the MTCA requirements (column 1) and references the appropriate sections of the EDR and Addendum 1 (columns 2 and 3) which address each of the requirements.

2.0 Design Considerations, Criteria, and Basis of Design

This section presents the criteria and basis for design of the barrier wall and groundwater interceptor trench. The design team prepared a design basis memorandum that was approved by Ecology on March 4, 2009. Key components of the design basis are described below. Appendix 1A includes copy of the approved Design Basis Memorandum.

The primary design objective for this phase of the CAP implementation project is to establish a physical barrier around the perimeter of the Landfill to control groundwater contamination and groundwater flow from beneath the Landfill. The barrier wall is to be keyed into the Lower Silt Aquitard, where present. A future phase of work (not addressed in this Addendum) will design and construct a groundwater extraction and treatment system to extract groundwater from the contained area beneath the Landfill to create an inward hydraulic gradient across the barrier wall, thereby providing hydraulic control of contaminated groundwater beneath the Landfill.

The scope of the design addressed by this Addendum includes a barrier wall surrounding the Landfill, an interceptor trench along the upgradient portion of the barrier wall, and infiltration ponds along the downgradient portion of the barrier wall. The barrier wall will create an obstruction to existing groundwater flow. Therefore, in the absence of the interceptor trench, groundwater would be expected to mound on the upgradient side of the barrier wall (southeast), which might contribute to surface flooding in the surrounding area. Groundwater mound management will include two components: (1) interception and (2) Infiltration of the groundwater on the downgradient side of the Landfill.

Note: the horizontal coordinates used for this project are in the State of Washington Plane coordinate System NAD83 south and the vertical datum is NAVD88. All elevations and coordinates are in feet.

2.1 DESIGN CONSIDERATIONS

As noted in the EDR, the predesign studies confirmed that the Lower Silt Aquitard is not continuous along the barrier wall alignment presented in the 2008 CAP. Two gaps were identified during the Geotechnical Investigation (Appendix B of the EDR). The areal extent of the gap located near the southwest corner of the Landfill was determined; the areal extent of the gap identified along the east side of the Landfill was not fully characterized. The aquitard discontinuities could adversely affect hydraulic containment, as specified in the 2008 CAP, by substantially increasing groundwater extraction rates needed to establish hydraulic control of contaminated groundwater beneath the Landfill.

In order to assess the potential impact of the aquitard gaps, alternative barrier wall alignments and barrier wall depths were considered. The alternative barrier wall alignment evaluated would move the barrier wall along the southwest corner of the Landfill to the northeast, so that the realigned wall could be keyed into the Lower Silt Aquitard, with the wood waste excavated and placed inside the contained area and beneath the Landfill cap (Figure 1.1). Alternate barrier wall depths were evaluated to assess the effect of deepening of the barrier wall in the vicinity of the aquitard gaps on estimated groundwater recovery rates needed to establish hydraulic control. Groundwater modeling was used to assess the effect of the aquitard gaps on potential groundwater recovery rates under the different barrier wall alignment and barrier wall depth configurations. Cost estimates were also prepared to assess potential costs associated with the alternatives. The purpose of the evaluation was to select the alignment and depth configuration for design of the barrier wall.

2.1.1 Groundwater Modeling

Interceptor Trench Considerations

The barrier wall surrounding the Landfill will provide a physical barrier to contain contaminants present in groundwater beneath the Landfill; it will also form an obstruction to existing groundwater flow discharged from the bluff to the east and naturally flowing to Hylebos Creek and Commencement Bay. As naturally flowing groundwater encounters the barrier wall, it will create a “mound” that has the potential to create localized surface ponding or flooding. The calibrated groundwater flow model, as described in Appendix C of the EDR, was used to assess the potential for groundwater mounding caused by the barrier wall, estimate groundwater removal rates needed to control mounding, and to evaluate different mitigation measures for the aquitard gaps that were identified during the predesign investigations summarized in the EDR. The groundwater modeling work for these evaluations is described in Appendix 1B.

Groundwater mounding was assessed under hydrologic conditions characterized by the highest 3-month precipitation event with 10-year recurrence. The model simulation without the barrier wall in place shows that groundwater would reach the ground surface on the upgradient side of the Landfill, with an elevation of 18.8 feet (ft) without the barrier wall. Simulations with the barrier wall in place show that the barrier wall would cause an additional 0.6 ft rise in groundwater level to an elevation 19.4 ft in the same area. A groundwater withdrawal rate of 9 gallons per minute (gpm) from a groundwater interceptor trench along the upgradient of the barrier wall would maintain the average upgradient groundwater elevation at 18.8 ft.

Barrier Wall Design Considerations

Potential benefits associated with mitigation measures to address groundwater leakage caused by the aquitard gaps were assessed under an average hydrologic condition characterized by an annual total precipitation with 10-year recurrence. Based on the barrier wall alignment shown in the 2008 CAP, a relationship between the area of the aquitard gap and the groundwater extraction rate to maintain a 6-inch inward head differential across the barrier wall was developed and is plotted in Figure 1.1. This curve indicates that total aquitard gap areas greater than about 2 acres would have only moderate effects on the groundwater extraction rate needed for hydraulic control. The modeling evaluation shows that if the total aquitard gap area can be reduced below 2 acres, there would be potential benefits in the form of reduced costs for groundwater extraction and treatment.

Another mitigation measure evaluated by modeling was potential deepening of the barrier wall in the vicinity of the east and southwest aquitard gaps to increase the groundwater flow path and potentially decrease the groundwater extraction rate needed for hydraulic control. Three barrier wall depths at the gaps were considered in this evaluation: 20-ft below ground surface (bgs), 35-ft bgs, and 50-ft bgs. For each depth, optimal extraction rates for maintaining a 2-inch, 4-inch, and 6-inch inward head differential across the barrier wall were developed. The results indicate that the effect of deepening the barrier wall on the estimated groundwater extraction rate decreases as the barrier wall depth increases (i.e., a greater reduction in estimated groundwater extraction rate is achieved by extending the wall from 20- to 35-ft bgs than by extending the barrier wall from 35- to 50-ft bgs). This modeling also shows that a substantially lower groundwater extraction rate is necessary to maintain a 2-inch inward head differential across the barrier wall than necessary to maintain a 4-inch or 6-inch inward head differential.

2.1.2 Upgradient Groundwater Mounding

As noted above, groundwater modeling indicates that construction of the barrier wall could cause groundwater to mound and to discharge to the land surface upgradient of the Landfill. This mounding could contribute to localized surface ponding of groundwater (potentially on adjacent properties) or to localized flooding. The model also predicted that removal of 9 gpm of groundwater from the area upgradient of the Landfill would maintain existing hydrogeologic conditions under the conservative hydrologic scenario used for modeling. The groundwater modeling confirmed that groundwater interception is necessary to control potential groundwater mounding after barrier wall construction. In order to negate the effects of the upgradient groundwater mounding and maintain the existing groundwater conditions, the groundwater interceptor system will be designed with capability to remove up to 30 gpm.

Note that the Hylebos Creek Basin in the area of the Site is very prone to surface water flooding during periods of high rainfall (Washington State Department of Transportation [WSDOT] 2006). This effect is not related to the Landfill and will not be affected by the barrier wall. Future changes in the basin related to flood control are being addressed by the WSDOT (2006). The interceptor trench is being designed to address the groundwater mounding caused by the barrier wall only and will only influence the area adjacent to the Landfill.

2.1.3 Mitigation of Aquitard Gaps

In order for the barrier wall to halt future releases of contaminated groundwater to off-site properties, groundwater within the barrier wall must be contained. This will be accomplished through a combination of the barrier wall, the natural groundwater gradients in the area, and removal of groundwater from within the barrier wall to maintain inward gradients.

The presence of the aquitard gaps will increase the groundwater extraction rates needed to maintain hydraulic control of groundwater beneath the Landfill. As noted above, alternatives were evaluated with the objective of reducing the groundwater extraction rate needed for hydraulic control. The alternatives considered for mitigation of the aquitard gaps were based on excluding the gaps from the barrier wall containment or by deepening the barrier wall.

Excluding the eastern aquitard gap from the containment is not feasible since the boundary of the gap could not be identified within a reasonable distance from the Landfill perimeter; based on field investigation data, the gap extends into the Landfill, beneath a substantial thickness of wood waste. Excluding the southwest gap from the barrier wall containment was evaluated. Figure 1.1 shows the edge of the southwest aquitard gap. The option of changing the barrier wall alignment to exclude the southwest aquitard gap was eliminated for several reasons:

- Changing the alignment to exclude the southwest corner of the Landfill would require removal of a substantial amount of wood waste (areal extent of 0.6 acre) and placement of the wood waste beneath the Landfill cap. The net additional cost for relocating the barrier wall alignment was estimated to be approximately $1.3 million.
- Relocating the barrier wall to exclude the southwest corner would create a plume of contamination outside the barrier wall, requiring additional remedy components to address the contamination and adding substantial cost to the remedy. Additional costs associated with remediation of this groundwater were not estimated.
- Groundwater modeling indicates the groundwater extraction rate for hydraulic containment would not be substantially reduced if the area of the aquitard gaps within the contained area is larger than about 2 acres (Appendix 1B). The size of the aquitard gap on the east side of the Landfill is unknown, but is at least 0.2 acres. There is also the potential for additional gaps to exist within the footprint of the Landfill. Due to this uncertainty, the potential benefit that may accrue by relocating the barrier wall to exclude the southwest corner cannot be accurately estimated.

For these reasons, it was concluded that the potential benefits could not be reliably assessed and did not justify the risks for incurring significant additional cost. Based on this analysis, the barrier wall alignment proposed in the 2008 CAP was determined to be appropriate for remedy design.

As noted above, extending the depth of the barrier wall in the vicinity of the aquitard gaps was found to decrease the rate of groundwater recovery needed to establish hydraulic control. Furthermore, it was found that a greater decrease in pumping would be achieved by deepening the barrier wall to 35-ft bgs than by further deepening to 50-ft bgs. The estimated increase in barrier wall construction cost to extend the barrier wall to 35-ft bgs was compared to the estimated savings in future costs to construct and operate a groundwater extraction and treatment system. This cost comparison (Table 1.2) shows that deepening the barrier wall to the depth of 35-ft bgs at the aquitard gaps is more than offset by reduced capital and operating costs for groundwater extraction and treatment. Therefore, it was concluded that deepening the barrier wall at the aquitard gaps would provide the most logical aquitard gap mitigation measure. Based on this evaluation, the barrier wall will be designed to be 35-ft deep in the vicinity of the aquitard gaps.

2.2 DESIGN CRITERIA

Design criteria were developed for design of the barrier wall, interceptor trench, and infiltration ponds. These criteria are summarized below for each component of the design addressed by this Addendum.

The design criteria for barrier wall design are as follows:

- The hydraulic conductivity for the barrier wall should be consistent with standard practice for slurry walls so that it will provide an effective barrier to groundwater flow beneath the Landfill.
- The barrier wall should be constructed of earthen materials that will not degrade so that it will provide a long-term barrier for control of arsenic-contaminated groundwater.
- Due to the interbedded nature of the Lower Silt Aquitard, the barrier wall should be keyed into the central portion of the aquitard, as defined by the soil borings.
- The barrier wall should totally enclose the Landfill and be designed, as much as feasible, to mitigate the impact of the discontinuous Lower Silt Aquitard on future groundwater extraction rates needed to establish hydraulic control.

Design criteria for the interceptor trench include the following:

- Limit mounding of groundwater along the upgradient portion of the barrier wall so that disruption of groundwater flow does not cause an increase over pre-slurry wall conditions of surface ponding or flooding, based on the highest 3-month rainfall event predicted to occur every 10 years.
- Utilize passive, gravity flow to the extent practicable to promote groundwater flow from around the barrier wall.
- Do not adversely impact the barrier wall.

The criteria used for design of the infiltration ponds are as follows:

- Restore, to the extent practicable, existing groundwater flow patterns outside the barrier wall, including flow to the downgradient wetland areas.
- Provide sufficient infiltration capacity to accommodate flow from the interceptor trench and, as appropriate, flow from the future treated groundwater extracted within the contained area beneath the Landfill.

General design criteria that address all remedy components included in this Addendum are as follows:

- Do not conduct remediation work within wetland areas located on or adjacent to the B&L Property.

- Do not adversely impact neighboring properties, including the Interurban Trail, during and after construction of the remedy components.
- Comply with applicable, relevant, or appropriate regulations and standards (federal, state, and local) for the remedy components included in this Addendum.
- Comply with appropriate industry, professional engineering, and technical standards for the remedy components included in this Addendum.

The preliminary design for the barrier wall, interceptor trench, infiltration ponds, and monitoring network presented in this Addendum addresses the above criteria.

2.3 DESIGN BASIS

The design criteria and basis provide a foundation for completing the design and engineering for the remedy components addressed in this Addendum of the EDR. This section addresses the engineering considerations, design constraints, property issues, and basis used in the design and preparation of the plans and specifications. The design and construction approach presented in Sections 3.0 and 4.0 of this Addendum are based on the above criteria and the design basis summarized below.

2.3.1 General Design Basis

The general design basis for the barrier wall, interceptor trench, and infiltration ponds is as follows:

- All work under this Addendum will be completed on the B&L Property.
- Waste generated from the remedy construction, to include only earthen material (including barrier wall materials), waste presently in the Landfill, and materials present in the existing Landfill cap, may be incorporated into the Landfill and need not be transported for disposal in an off-site disposal facility.
- Excavated soil (with no visual evidence of wood waste or slag) located outside the existing Landfill footprint is uncontaminated and may be reused as fill.
- The barrier wall alignment will follow the perimeter of the Landfill cap, as originally anticipated in the CAP. The barrier wall will be located along the existing perimeter stormwater runoff collection ditch at the base of the Landfill cap; this corresponds with the areal extent of wood waste, as described in the 1994 Closure Report, B&L Landfill, prepared by Hydrometrics.
- The existing Landfill cap will be extended over the barrier wall into the existing perimeter access road.
- The extension of the Landfill cap to cover the barrier wall will be consistent with the existing Landfill cap system and will include a polyvinyl chloride (PVC) geomembrane and geosynthetic clay liner (GCL) layer.

- Due to the known discontinuities in the Lower Silt Aquitard, the barrier wall cannot be continuously keyed into an aquitard and will be installed as a "hanging wall" surrounding the Landfill.
- In areas where the Lower Silt Aquitard is present, the wall will be keyed into the aquitard and the depth of the barrier wall will be based on the soil borings drilled in the predesign studies. The average depth of the barrier wall in these areas will be approximately 27-ft bgs.
- The depth of the barrier wall in the two areas where the Lower Silt Aquitard is absent (i.e., the southwest corner and the eastern aquitard gap) will be approximately 35-ft bgs.
- The barrier wall will be a conventional soil-bentonite slurry wall with a design hydraulic conductivity of 1×10^{-6} cm/s. Based on laboratory testing, a mixture of 3–5 percent bentonite by weight with native soil would achieve the design hydraulic conductivity.
- Excess soil and "fluff" from barrier wall and interceptor trench construction, and infiltration pond excavation may be stockpiled on site and placed within the Landfill footprint and covered by construction of an extension of the Landfill cap.
- The Landfill surface may be used as necessary for mixing barrier wall backfill material, so long as the cap is protected against damage or repaired to design conditions.
- A groundwater interceptor system will be designed and constructed to control mounding on the upgradient side of the barrier wall and promote infiltration and restoration of the existing groundwater flow pattern on the downgradient side of the barrier wall.
- Groundwater will be intercepted on the upgradient side of the barrier wall using underground trenches and incorporating the capability to transfer groundwater passively by gravity drainage.
- Groundwater intercepted on the upgradient side of the barrier wall will be infiltrated back into the Upper Sand Aquifer using a detention/infiltration pond located along the downgradient perimeter of the barrier wall. The detention/infiltration pond will be constructed with a permeable base keyed into the Upper Sand Aquifer to ensure the pond is in hydraulic contact with groundwater and to promote infiltration.
- The detention/infiltration pond will receive stormwater runoff from the Landfill cap in addition to groundwater from the upgradient interceptor trench. The detention/infiltration pond design will include overflow lines discharging to the existing area agricultural drainage ditches, as is presently done for the existing detention pond, to handle excess stormwater flows.
- Electrical service and control wiring for the lift stations will be located below grade, beneath the Landfill cap perimeter road.

- The fence along the western side of the Landfill will be relocated as part of the detention/infiltration pond construction so that the pond is within the fenced sections of the landfill.

2.3.2 Environmental Protection Basis

The design basis includes the following measures and precautions for environmental protection:

- Stormwater runoff from undisturbed areas (including undisturbed portions of the existing Landfill cap) may be discharged from the B&L Property without treatment.
- Construction of the remediation components included in this Addendum will occur during the dry season, which is assumed to end on October 1.
- Stormwater impacting disturbed areas will be contained within the work areas. The containment will be designed to contain a 25-year storm event. In the event of an extreme storm event, the runoff will be transferred to the existing stormwater detention pond on the north side of the Landfill for temporary storage.
- There will not be any activity related to construction of the remedy components covered by this Addendum within the existing wetlands or environmentally sensitive areas; all work will be performed in areas previously disturbed by Landfill construction.

3.0 Remedial Measures Design

This section presents the barrier wall and interceptor trench system design, based on the project criteria, and design basis described in the previous section. The design presented here is based on the remediation approach specified in the 2008 CAP; this design addresses the initial remediation components for the Landfill/Ditch CAA, as described in the Consent Decree.

3.1 BARRIER WALL DESIGN

This section describes the key elements of the barrier wall design. Subsurface barrier wall construction will utilize the conventional soil-bentonite slurry wall technique. For this technique, the barrier wall alignment will be excavated to the design depth and the trench will be kept full with a bentonite slurry to prevent it from collapsing. The excavated soil will be mixed with bentonite and water to a homogeneous mix and used to backfill the excavation as the barrier wall. Mixing of backfill will be done in an area adjacent to the trench. Drawings C-1 to C-5 in Appendix 1F show the proposed alignment, stationing, and profile along the planned barrier wall alignment.

3.1.1 Barrier Wall Alignment and Dimensions

The existing stormwater collection ditch at the toe of the Landfill cap has been selected as the barrier wall alignment (refer to Appendix 1F, Drawing C-1). Based on the 1994 Closure Report (Hydrometrics 1994), the stormwater collection ditch defines the extent of wood waste beneath the Landfill cap. This alignment provides several advantages in comparison to other alignments:

- The existing ditch will serve as a guide for trench excavation and wall installation.
- The existing ditch will serve as a reservoir for the slurry.
- The length of the barrier wall will be minimized .
- The extent of the Landfill cap extension will be minimized.

The total length of the barrier wall along the planned alignment is approximately 2,656 ft. The depth of the barrier wall was chosen at each soil boring location, such that the wall will intersect and extend at least 2 ft into the Lower Silt Aquitard, as shown on Drawings C-2 to C-5 in Appendix 1F. The depth of the barrier wall at the aquitard gaps was selected to be 35-ft bgs; this depth was selected to reduce the influx of groundwater through the aquitard gaps and, consequently, to reduce the future groundwater extraction rate needed to establish hydraulic control, as specified in the 2008 CAP. The lateral extent of the 35-ft-deep barrier wall sections will extend approximately 100-ft beyond the horizontal limits of known aquitard gaps, on each side, as shown on Drawings C-3 and C-5. Based on this configuration, the surface area of the barrier wall will be approximately 78,900 square feet (sq ft), with a maximum depth of 35 ft and average depth of 30 ft. The barrier wall will be a minimum of 2-ft thick, with an actual thickness of 3 ft or more based on the size of the excavator bucket and sidewall conditions.

3.1.2 Backfill Mixing Pad

A mixing pad will be required along the barrier wall alignment to mix the excavated soil with bentonite and water. The width of the mixing pad is typically equal to the depth of the barrier wall. The existing Landfill perimeter access road is not sufficiently wide along the entire alignment to serve as the mixing pad. Therefore, the mixing pad will be positioned on the Landfill as an approximately 30- to 35-ft wide strip encircling the perimeter of the Landfill and immediately adjacent to the existing stormwater drainage ditch at the base of the Landfill cap (refer to Appendix 1F, Drawing G-3).

According to the Landfill Closure Report (Hydrometrics 1994), the existing Landfill cap is constructed of the following layers from top to bottom: (1) six inches of topsoil, (2) eighteen inches of sandy pit-run as cover soil, (3) a geonet layer for drainage, (4) a 40-mil PVC geomembrane, (5) a geosynthetic clay liner (GCL), and (6) six inches of sandy pit-run for gas migration placed directly on the landfill waste.

To construct the mixing pad, the topsoil and cover soil layers will be stripped to a width of 30- to 35-ft from the perimeter ditch toward the center of the Landfill and stockpiled separately along the work area. The geosynthetic material will be salvaged to the extent possible for use during construction and/or for Landfill cap restoration. The PVC geomembrane may be used to cover the stockpiled topsoil and cover soil to prevent erosion, if possible. The GCL layer will be salvaged for reuse, where possible. Geosynthetic materials not reused for cap extension will be incorporated into the Landfill when the cap is extended over the barrier wall.

The stockpiled topsoil and cover soil will create an upgradient berm to control the stormwater runoff from the Landfill cap during barrier wall construction. The uphill face of the stockpiles will be built to create a “V” shape every 100 ft to create a low point for stormwater collection. Four-inch diameter, flexible plastic piping will be installed at these low points and extended to the existing perimeter chain-link fence. These pipes will convey the clean stormwater runoff from the undisturbed Landfill cap beyond the work area and discharge to the Landfill perimeter (refer to Appendix 1F, Drawings G-3 and G-4). Alternatively, the contractor may elect to capture the water on the uphill side of the topsoil stockpile and pump the water when needed. This approach is expected to work well due to the relatively low precipitation during summer months, when the construction is expected to be performed.

For preparation of the mixing pad, a layer of 4-ounce per square yard (oz/sy), non-woven geotextile will be placed over the exposed gas migration layer to serve as an indicator or delineator layer for the workers. In order to prevent mixing of Landfill waste with the barrier wall backfill, excavated soil from the barrier wall trench will be spread approximately 6-inches thick and covered with another layer of 4-oz/sy geotextile to prepare a “sacrificial” work pad. This sacrificial layer of geotextile will serve as demarcation for the operator to control the depth of soil mixing. The remainder of the excavated soil will be placed on the work pad, where it will be mixed as barrier wall backfill. The 6-inch thick layer of excavated soil used to prepare the work pad will account for the anticipated excess fluff from the barrier wall construction and will remain in place and be capped when the Landfill cap is extended over the barrier wall.

This design avoids the need to build a construction platform, prevents the top 2 ft of clean cap material from being contaminated by excavated soil, and enables the incorporation of excess soil from barrier wall construction into the Landfill. The design also utilizes existing materials to create stormwater diversion structures and provides for recovery and reuse of existing cap materials to the extent feasible.

3.1.3 Barrier Wall Materials

The barrier wall backfill material will be composed of a mixture of excavated soil, bentonite, and water. The design hydraulic conductivity for the constructed barrier wall, as noted in Section 2.0, is 1 x 10^{-6} cm/s. Based on the slurry mix design (Appendix B of the EDR), a mixture of 3 percent bentonite by weight with native soil should achieve the design hydraulic conductivity. Wyoming bentonite or similar will be used as an additive to achieve the design permeability for the backfill. The main source of water will be the municipal water supply from the City of Milton. The Contractor is responsible for ensuring that the mix used meets the design hydraulic conductivity.

3.1.4 Barrier Wall Cap

The barrier wall trench will be filled with soil-bentonite backfill to the top of the existing stormwater ditch to match the existing grade of the adjacent Landfill perimeter road. After allowing at least 1 week for the backfill to settle, the same soil-bentonite backfill material will be used to bring the top of the barrier wall to the existing grade of the adjacent Landfill perimeter road. A layer of geogrid will be placed on the top of the wall. The geogrid will help spread surface loads across the top of the wall and thus, minimize ruts from forming on the cap.

3.1.5 Environmental Protection During Construction

Stormwater management during construction will implemented in accordance with a Stormwater Pollution Prevention Plan (SWPPP; Appendix 1.E) that will be prepared and submitted as part of detailed design. The stormwater management approach to be incorporated into the SWPP is summarized below. Procedures for stormwater management have been designed to control the spread of contaminants via stormwater based on the concept of “zero discharge.” Refer to Section 4.4 for additional details.

Stormwater management during construction will consist of two components:

1. Managing runoff from the undisturbed Landfill cap above the mixing pad
2. Managing runoff from the mixing pad and runoff from the access road within the work area

Runoff from the undisturbed Landfill cap will be controlled by the stockpiled berm constructed during mixing pad preparation (refer to Section 3.1.2). The stormwater within the work area will be contained by the Landfill and an exterior berm. The crushed rock layer lining the existing stormwater collection toe ditch will be placed on the outside edge of the existing Landfill perimeter access road, and wrapped in plastic sheeting to contain stormwater runoff within the work area and to prevent runoff from the area outside the work area. The berm will be high enough to contain a 24-hour rainfall event with a 10-year recurrence.

Stormwater within the mixing pad and work area is expected to be absorbed by the excavated soil, flow into the barrier wall trench, to be mixed into the backfill, and/or evaporate. Minimal rainfall is expected, as the construction is planned for the driest months of the year. In the event of an extreme rainfall event when the stormwater accumulation within the work area is not manageable, the accumulated stormwater within the work area will be pumped to the existing stormwater infiltration pond north of the Landfill as a contingency measure. After completing barrier wall construction and prior to complete restoration of the Landfill cap, sediment accumulation on the bottom of the existing northern stormwater infiltration pond will be excavated and incorporated into the Landfill.

3.2 INTERCEPTOR TRENCH SYSTEM DESIGN

The interceptor trench system is intended to control groundwater mounding on the upgradient or southeast side of the barrier wall and infiltrate it on the downgradient, or north and west sides, of the Landfill to restore natural groundwater flow patterns. The groundwater along the southern boundary of the Landfill will be managed separately from groundwater along the eastern side of the Landfill. The interceptor trench system will consist of two groundwater interceptor trenches and two infiltration ponds (refer to Appendix 1F, Drawing C-6). The eastern interceptor trench will discharge into the existing infiltration pond on the north of the Landfill, and the southern interceptor trench will discharge into the proposed infiltration pond on the west of the Landfill.

The north infiltration pond will receive water from three sources: stormwater runoff from the Landfill cap, groundwater from the eastern interceptor trench, and treated groundwater from the future groundwater extraction and treatment system (to be constructed during Phase 2 of the 2008 CAP implementation). The west infiltration pond will receive water from two primary sources: groundwater from the southern interceptor trench, and treated groundwater from the future groundwater extraction and treatment system.

3.2.1 Groundwater Interceptor Trenches

The groundwater interceptor trenches will be installed in the access road berm on the east and south sides of the Landfill (refer to Appendix 1F, Drawing C-6). The trenches are designed to collect and transfer groundwater to the infiltration ponds via passive methods (gravity drains), and active methods (lift stations). The interceptor trenches will be at least 7-ft from the outside edge of the barrier wall for slope stability. The interceptor trenches will be designed as shown on Drawing C-10 in Appendix 1F, including partial backfill with the excavated soil.

When the upgradient groundwater elevation exceeds the elevation of the passive drain, groundwater will flow to the infiltration ponds through the perforated pipe. This system will allow groundwater to flow passively around the Landfill and help maintain a uniform groundwater level around the Landfill. When the passive drain is unable to keep the upgradient groundwater elevation below a preset level, the active system, triggered by a high-level sensor, will actively convey groundwater to the infiltration ponds. When there is no capacity in the infiltration ponds, the pumps in the lift stations will shut down by high-level sensors in the infiltration ponds. Check valves will be installed at the discharge ends of the gravity drain pipes to prevent direct backflow from the infiltration ponds to the interceptor trenches.

The passive system will be installed level with an invert elevation of 14 ft. This elevation is approximately 0.5-ft below the bottom of the nearby agricultural ditch. The rationale for choosing Elevation 14 is to drain the groundwater mound without draining the nearby agricultural ditch. The passive drain pipe will be a 6-inch diameter, perforated, high density polyethylene (HDPE), smooth pipe installed within a 2-ft layer of 2-inch diameter crushed rock (ballast) to facilitate groundwater movement. The crushed rock layer will be wrapped in an 8-oz/sy, non-woven geotextile to control siltation.

The active drain system will consist of two lift stations, one in each trench, with discharge pipes at an invert elevation of 16.5 ft. The pumps will be activated by sensors installed in the lift station sumps when the groundwater level reaches elevation 16.5 ft. This elevation was selected to prevent surface ponding, since it is the low point of the nearby ground surface elevation; this elevation can be manually reset to other elevations during future operation of the system. Each lift station discharge pipe will be a 4-inch diameter, solid, smooth HDPE pipe.

Both active and passive piping systems will have cleanouts approximately every 150 ft. Cleanouts will be 45 degree elbows installed with angled risers to the ground surface. The passive and active drain pipes will be installed on opposing sides of the trench to allow the cleanouts to reach the ground surface unobstructed (refer to Appendix 1F, Drawing C-11). Cleanouts for both pipes will be at the same location such that inlets will be side-by-side at the ground surface, where they will be housed inside a small protective vault with surface access. The active pipes cleanouts will have screwed-on caps to prevent pressurized water from flowing out of them. The passive drain pipes will have a check valve and manual shutoff valve at their discharge end in the infiltration ponds.

3.2.2 Groundwater Infiltration Pond Design

The two independent infiltration ponds will be used to infiltrate groundwater and maintain existing groundwater flow patterns to the extent practicable. The infiltration ponds will be located outside the barrier wall and inside the B&L Property boundaries. The bottom of the infiltration ponds will be no higher than elevation 13.5 ft and will be constructed of permeable (granular) material to ensure it is in contact with the Upper Sand Aquifer and to allow rapid infiltration from the pond. The bottom of the existing north infiltration pond will be cleaned of all sediment and lined with gravel, if needed. The design for the infiltration ponds is shown on Drawings C-7, C-8, and C-11 in Appendix 1F.

The west infiltration pond will be constructed outside the barrier wall between the toe of the Landfill and the existing agricultural ditch. The existing vegetation, topsoil, and near-surface soil will be excavated. The existing perimeter road berm beyond the final stormwater collection ditch will also be excavated to maximize the capacity of the pond. The outer containment berm will be constructed using the excavated soil at slopes of 2 horizontal to 1 vertical (2H:1V).

Finer-grained (lower-permeability) portions of the excavated soil will be used to build the core of the berm to control seepage laterally through the berm. The top elevation of the west infiltration pond will match the elevation of existing perimeter road, or the top of the barrier wall.

The north infiltration pond has an existing overflow pipe to discharge excess water into the adjacent agricultural ditch. A new overflow pipe will be installed at the west infiltration pond as emergency overflow, if the water level reaches to 1-ft below the top of the berm. The active discharge (pumping) of water into this pond will be stopped by high-level sensors that will shut down the pumps prior to reaching the overflow elevation.

The passive and active pipe discharges will daylight into an outfall at each infiltration pond. The outfall areas will be lined with riprap and/or crushed rock to dissipate the energy of the water discharging into the pond and control erosion.

Excess soil from construction of the west infiltration pond suitable for use as backfill will be stockpiled on the southwest corner of the property in compacted layers and hydroseeded for surface stabilization. The pad formed by this soil may serve as the pad for the future groundwater treatment building. The top elevation of the pad will be at elevation 23.5 ft, which is the average elevation of Interstate 5. At this height, it is expected that the surface of the pad will not be flooded. The pad will have side slopes of 2H:1V with a top surface area of approximately 3,500 sq ft.

3.2.3 Electrical System

Power for the active pumping system, sensors, and future groundwater treatment system will be brought onto the Site via overhead lines from Fife Way. Switches, breakers, and control panels will be installed inside a weatherproof electrical box on the south side of the Landfill access gate. The electrical lines to the lift stations will be installed below ground surface in a trench separate from the piping system trench.

Wiring to the east and west lift stations and sensors will be installed in separate conduits. Each trench will have four 3/4-inch diameter conduits inside a 4-inch diameter conduit. A second set of conduits will be installed on the south side to accommodate future wiring needs to the future groundwater treatment system to be located on the southwest corner of the property. The electrical conduits will be installed in accordance with local electrical codes and a minimum distance of 2-ft below grade. The excavated soil for utility trenches will be used for backfill.

3.3 LANDFILL CAP RESTORATION DESIGN

The Landfill cap will extend over the barrier wall and will be constructed with the same cross section as the existing cap, as described in Section 3.1.2. A new stormwater collection ditch will be installed on the outside of the new cap limits to convey the stormwater runoff from the Landfill cap to the north infiltration pond. The design for the Landfill cap extension is shown on Drawing C-13 in Appendix 1F.

3.3.1 Landfill Cap Restoration Design

Upon completion of the barrier wall installation, interceptor trench system, and incorporation of any excess material into the Landfill, the cap will be restored and extended to cover the barrier wall. The existing and/or new GCL will be installed in a shingled manner from the top of the mixing pad to the outside edge of the barrier wall. The GCL sections will be overlapped a minimum distance of 1 ft. Likewise the PVC liner will be installed using the salvaged liner and/or new liner, as appropriate, based on the condition of the salvaged liner, in a shingled manner extending beyond the outside edge of the barrier wall. The PVC liner sections will be overlapped a minimum distance of 2 ft and glue-bonded. The geonet drainage layer will be installed similarly to the GCL.

The stockpiled cover soil and topsoil will be placed back over the geonet. Additional cover soil and topsoil to complete the cap extension will be obtained from the excess topsoil and soil excavation from construction of the west infiltration pond and/or clean imported soil, as appropriate.

The GCL and the PVC liner will be anchored in a trench to a minimum depth of 3 ft in an anchor trench approximately 3-ft away from the outside edge of the barrier wall. The geonet will daylight into the new stormwater collection ditch at the toe of the extended Landfill cap. The completed cap, along with other new finish grades will be hydroseeded with native grasses.

3.3.2 Stormwater Collection Design

The new stormwater collection ditch will consist of an 18-inch-diameter, corrugated, HDPE half-pipe with the same slopes and connection as the existing stormwater collection ditch (refer to Appendix 1F, Drawing C-12). The HDPE half pipe will prevent vegetation growth within the conveyance system and will allow for easy cleaning and maintenance. The half-pipe will be connected to the three existing, 12-inch-diameter culverts that discharge into the north infiltration pond.

3.3.3 Access Road

The existing perimeter access road on the south and east of the Landfill will continue to be used as the access road. After the infiltration ponds and runoff collection system are installed, the width of the existing access road on the north and west of the Landfill would be too small for vehicle traffic; therefore, a new access road will be constructed on the restored Landfill cap along the north and west sides of the Landfill (refer to Appendix 1F, Drawing C-12). The new access road will be constructed over the former mixing pad area and will be designed to prevent damage to the underlying low-permeability cap materials and the barrier wall. The new access road will be a minimum of 12-ft wide and will be constructed with 2-inch crushed rock (ballast) (Appendix 1F, Drawing C-13). Along the footprint of the new access road, topsoil will not be placed; instead the cover soil will be 24-inches thick and covered with a layer of 8-oz/sy, non-woven geotextile. Then, an approximately 12-inch to 24-inch thick layer of ballast will be placed to form the road with a 10 percent slope. The ballast layer will be free-draining and will allow the stormwater runoff from the cap to flow through the road to the new stormwater collection ditch.

4.0 Construction Plan

This section provides a description of the construction sequence and procedures in general terms. The actual steps and procedures will be established by the contractor with concurrence with the design team to verify that the steps and procedures meet the project intent and requirements, including plans and specifications.

4.1 PERMITTING AND APPROVAL REQUIREMENTS

This cleanup action is being conducted under an Ecology Consent Decree and, therefore, is exempt from certain procedural and permitting requirements of certain Washington laws and regulations and all local permits (WAC 173-340-710[9][a]); however, implementation of the cleanup action must comply with the substantive requirements of these laws and permits. Table 7.1 of the EDR provides a summary of general permitting and substantive requirements. This cleanup action will meet the substantive requirements for applicable regulations and standards, and will fully comply with all action-, chemical-, and location-specific Applicable or Relevant and Appropriate Requirements (ARARs) as described in the 2008 CAP.

The permitting exemption does not apply to permits required under federal programs or some state-administered federal permitting programs. Because the construction work addressed by this Addendum will not impact jurisdictional wetlands, the U.S. Army Corps of Engineers (USACE) administered wetland permitting program does not apply to the current work. Therefore, no federal permits are required to implement the work addressed in this Addendum.

For Washington administered federal programs, only permits for stormwater or wastewater discharge are required when cleanup work is implemented under a MTCA Consent Decree. The current project has been designed for zero discharge of stormwater; stormwater runoff quality from the B&L Property during the planned construction work will be no different than at present. As noted in this Addendum, the design includes run-on and run-off controls for the entire work area. Rainwater impacting the work area will be contained and will not be discharged to surface waters. Therefore, no construction stormwater permit is needed for this work. A Spill Prevention and Containment Plan (Appendix 1D) and a Stormwater Pollution Prevention Plan (Appendix 1E) will be prepared as part of the Plans and Specifications Package. These plans will be implemented for construction of the remedy components addressed by this Addendum.

A State Environmental Policy Act (SEPA) checklist was done as part of the 2008 CAP public review process. As lead agency, Ecology made a determination of non-significance for the activities identified in the CAP. The work being done under this addendum was specified under the 2008 CAP and therefore covered under that determination. A review of this determination will be conducted to assess the need for an addendum to this determination based on current plans and project understanding.

This cleanup action will meet the substantive requirements for all applicable regulations and standards, and will fully comply with all action-, chemical-, and location-specific Applicable or

Relevant and Appropriate Requirements (ARARs) as described in the final 2008 CAP (Ecology 2008). The cleanup action also addresses the regulatory elements for landfill closure, as specified in Minimum Functional Standards for Solid Waste Landfills (WAC 173-304).

The local permitting requirements for the planned work under this Addendum fall within the jurisdiction of Pierce County, as the B&L Property is within unincorporated Pierce County. A preliminary meeting to discuss applicable requirements for the work was held with Pierce County representatives in April 2009. At this meeting, it was determined that the plans for the 2009 construction are exempt from land use permit requirements and wetland/biological permit requirements. Therefore, Pierce County will not require permitting for the planned work.

Potential impacts of the planned work on local roadways and traffic will be assessed during preparation of the plans and specifications for the work. Pierce County representatives will assess the work for potential traffic and roadway impacts to Fife Way and surrounding roads after estimates are available. Plans for controlling dust and mud transport from the Site and for protecting the roadway at the entrance to the B&L Property will be provided to Pierce County for review and comment. Access will also be provided to Pierce County staff to conduct inspections as needed. Any project related road damage to surrounding roadways or the Interurban Trail will be repaired either by project contractors to the satisfaction of the local agency or by the agency itself with reimbursement by the Trust.

The north and west infiltration ponds will be used to re-infiltrate groundwater recovered from the upgradient side of the Landfill. Recovered groundwater discharged into the ponds will infiltrate to the Upper Sand Aquifer along the two downgradient sides of the Landfill. It has been determined that the design will comply with the substantive requirements of the Ecology-administered underground injection control program, and no permit is needed.

4.2 CONSTRUCTION ACTIVITIES

The construction activities and sequencing are described in this section. The actual equipment used, the sequencing and approach will be discussed with the construction contractor and mutually agreed upon prior to mobilization.

4.2.1 Mobilization

The contractor will use the available space east of the fenced area between the Landfill access road and Wetland B for staging and storage areas (Appendix 1F, Drawing G-3). Some material may be stored on the Landfill cap, so long as the equipment is determined to not damage the cap, as approved by the Field Engineer directing the work. The contractor will decide whether to spread a layer of crushed rock as firm, competent surface prior to mobilizing equipment or to use an alternate method to provide a competent surface. Also, due to the elevation differences between the proposed staging area and the Landfill access road, the contractor may deem it necessary to expand the road to improve access and the turnaround area for the trucks servicing the work. Once the staging area is prepared to the satisfaction of the contractor, equipment and trailers will be mobilized to the B&L Property and the contractor will begin site setup.

4.2.2 Site Setup

The utility services to be provided to the property will include permanent 3-phase power and phone/internet services. The supply lines (e.g., power drop) will be installed prior to contractor mobilization. The supply lines will be brought to the property on poles and via overhead lines. The construction trailers and equipment, including mix plant, if any, will be mobilized to the Site and set up.

Temporary fencing will be installed around the staging area along access points to the Interurban Trail, and along the agricultural ditch on the west side of the Landfill. The existing fencing along the west side will be removed and salvaged to the extent possible for reuse. In order to protect the public and the surrounding area against splashes from the operations, all perimeter fences around the Landfill will be covered with a layer of geotextile for the duration of construction.

A run-on/runoff control berm, wrapped in 10-mil plastic sheeting, will be installed along the temporary fencing at the western project boundary adjacent to where the berm for the new infiltration pond will be installed,. Stormwater containment berms will be installed around the Landfill, on the existing perimeter access road, against the fence, or at the outer edge of the perimeter access road. The existing rock lining in the Landfill cap stormwater collection swale at the toe of the Landfill cap will be excavated and wrapped with 10-mil plastic sheeting to form the perimeter stormwater containment berm. The layout and details for the stormwater management berms are shown on Drawings G-3 and G-4 in Appendix 1F.

The existing Landfill cap, consisting of topsoil, cover soil, drainage grid, PVC geomembrane lines, and GCL liner will be partially removed to prepare a work pad to support barrier wall construction. The topsoil and cover layer over the Landfill cap will be removed to a distance of approximately 35-ft toward the center of the Landfill, as shown on Drawing G-3. The contractor will determine the method to strip the two soil layers in a manner to minimize damage to the geomembrane and GCL liners. The topsoil stockpile will be on the uphill side of the work area (Drawing G-4) and wrapped in 10-mil plastic sheeting to provide a run-on control berm to prevent stormwater from running onto the work area from the clean cap area. The cover-soil stockpile will be kept separate from topsoil, located immediately downhill of the topsoil stockpile, and covered with plastic sheeting. The existing PVC geomembrane and GCL liners will be removed from the work pad and salvaged to the extent possible for reuse in the cap reconstruction; if these liner materials are not reusable for Landfill cap reconstruction, they may be used to cover the soil stockpiles during construction instead of plastic sheeting. The exposed gas migration layer will be covered with a layer of geotextile prior to use of the area as a work pad.

The uphill face of the topsoil stockpile will zigzag approximately 5 ft such that a low point develops approximately every 100-ft along the length of the stockpile (Drawing G-3). A 4-inch diameter, solid HDPE pipe will be installed at those low points to convey clean stormwater runoff from the cap to the downhill side of the work area to discharge to the perimeter agricultural ditches that presently drain the area.

The edges of the existing wetlands will be flagged, and the barrier wall alignment will be surveyed with the station numbers for the contractor.

4.2.3 Preconstruction Test Trench Investigation

A total of 10 test trenches will be excavated along the proposed barrier wall alignment at approximately equal spacing around the entire alignment (Appendix 1F, Drawing C-6). The dimensions of the test trenches will approximately 15-ft minimum in length, a minimum of 5-ft in depth, and the width of the backhoe bucket (2–3 ft). Test trenches will provide an opportunity to identify waste that may be present beyond the planned barrier wall alignment and to conduct archeological observations. Based on the 1993 Closure Report, the planned barrier wall alignment is just outside the landfilled wood waste. The test trenches will be backfilled to grade with excavated soils. If wood waste is present within or beyond the planned barrier wall alignment, appropriate mitigation measures will be implemented, such as altering the barrier wall alignment to contain the waste.

One test trench will be excavated at the location of Boring H-10, where a gravel and cobble layer was encountered during predesign investigation. Upon establishing the depth and extent of the gravel and cobble deposits, a mitigation measure, such as soil exchange, will be implemented to prevent problems with barrier wall construction, such as loss of slurry.

4.2.4 Slurry Wall Construction

After confirming the alignment with the test trenches, preparing the work pad, and completing the archeological survey, the barrier wall will be constructed. Slurry wall construction will start at Station (Sta.) 0+00 and follow the stationing sequence, counterclockwise (refer to Appendix 1F, Drawing C-1). The barrier wall trench will be excavated to the design depth using a standard excavator with a minimum bucket width of 2 ft. The excavation spoils will be placed on the mixing pad, where the cap material was removed, and within the run-on and runoff control berms. A 6-inch thick layer of the excavated soil from the barrier wall alignment will be spread over the work area to serve as a working pad for soil mixing. This soil will remain beneath the Landfill cap, and will comprise a portion of the excess soil or “fluff” generated from barrier wall construction. A layer of geotextile will then be placed over the 6-inch soil layer to serve as demarcation to indicate to the mixing operator to stop mixing the soil for backfill. This approach will help limit the depth of mixing within the mixing pad and reduce the potential for inadvertent mixing of the gas migration layer and Landfill waste into the barrier wall backfill. The remainder of the spoils will be stockpiled on the geotextile along the barrier wall for mixing to prepare slurry wall backfill.

Bentonite slurry will be prepared at the batch plant and will be pumped to the trench. The trench will be kept full with bentonite slurry at all times. Slurry and/or dry bentonite will be added to the excavation spoils and mixed by a dozer to achieve a uniform backfill mix with a 4- to

6-inch slump. This slump level is indicative of a bentonite content of 3 percent, which is sufficient to achieve the target hydraulic conductivity for the barrier wall. Backfill of the trench will lag behind the excavation a distance approximately equal to seven times the depth of the excavation. The depth for the barrier wall is shown for each station location on Drawings C-2 through C-5 in Appendix 1F. As the backfill reaches completion, the excess bentonite slurry in the trench will be incorporated into the Landfill, as appropriate.

The barrier wall will be constructed to the same surface elevation as the existing Landfill perimeter road. The barrier wall backfill will settle with time and addition of backfill material to the surface above the barrier wall material may be necessary. The barrier wall backfill will be inspected daily for at least one week and then weekly for 4 more weeks to assess settlement. The barrier wall cap will be completed after completion of the barrier wall construction and prior to extending the Landfill cap over the barrier wall. The barrier wall cap will consist of soil-bentonite backfill to bring the top of the wall to the existing Landfill perimeter road elevation and a layer of geogrid to help spread the load, which will then be covered with clean soil. After completing construction of the barrier wall, earthmoving equipment used for barrier wall construction will be decontaminated prior to use for any other construction work. Decontamination water will be collected for disposal in accordance with applicable regulations and standards. The settlement of backfill will continue to be monitored until sufficient settlement has occurred. Then the landfill cap will be extended over the barrier wall cap.

4.2.5 Groundwater Interceptor Trenches

Groundwater interceptor trenches will be excavated to the design depth (Appendix 1F, Drawing C-10) using a standard excavator with a minimum bucket width of 2 ft. Soils excavated from the trench will be stockpiled near the trench, within the bermed work area, for backfill. The trench will be sloped at 1H:1V to allow safe entry into the excavation to lay the passive piping. A layer of geotextile will be placed inside the trench, and ballast and piping will be placed to form the passive piping system, as shown on Drawing C-10. The ballast will be wrapped with the geotextile. Then the excavated soil will be used to partially backfill the trench and the active drain pipe will be installed at the design elevation (Drawing C-10). The passive and active drain pipes will be installed on opposing sides of the trench to allow the cleanout risers to reach the ground surface unobstructed; cleanout risers will be placed along the piping alignments as shown on Drawing C-9 in Appendix 1F. The 4-inch diameter active drain pipe will be pressure tested prior to final backfill to verify that it does not leak. Lift stations will be installed at the design locations to the design elevations (Drawing C-10). The trench will then be backfilled to grade with the excavated soil and protective vaults will be installed over the cleanouts.

After completion of the piping trench, the electrical trench will be excavated and the conduits will be installed to the minimum depth of 2 ft (Drawing C-10). Excavated soil from the trench will be stockpiled near the trench (and within the bermed work area) for use as backfill. Once the electrical trench has been completed and backfilled to grade, including connection to the lift stations, wiring will be pulled for the electrical components and tied into the electrical service to the Site

4.2.6 Groundwater Infiltration Ponds

Two infiltration ponds will be incorporated into the interceptor trench system to re-infiltrate groundwater along the downgradient sides of the Landfill. The existing north stormwater detention pond will be cleaned out with an excavator to remove accumulated sediment and vegetation and extend the bottom of the pond until reasonably permeable subsurface soil is reached. The excavated sediment from the pond will be spread over the barrier wall mixing pad to be covered by the restored Landfill cap. Gravel will be placed to backfill the bottom of the infiltration pond as appropriate to elevation 13.5 ft. The overall configuration (i.e., length, width, and side slopes) of the north infiltration pond will not be altered. The invert elevation of the overflow pipe will be verified to be 1-foot below the top of the outside pond berm, which will match the top elevation of the barrier wall, and be adjusted if necessary. The design configuration for the north infiltration pond is shown on Drawing C-6 in Appendix 1F.

The west infiltration pond will be constructed between the Landfill and the west property line (Drawing C-6). The existing fence will be removed and stored for reuse. Topsoil over the footprint of the west infiltration pond will be stripped and stockpiled for reuse. The exposed soil will be excavated to the minimum elevation of 13.5 ft or until reasonably permeable subsurface soil is reached. The granular portion of the excavated soil will be placed on the southwest corner of the B&L Property (refer to Appendix 1F, Drawing C-7) in 1-ft lifts and compacted to at least 98 percent of maximum dry density, as determined by ASTM D1557. The compacted soil pad may be used in the future for construction of the groundwater treatment building.

Construction of the outside containment berm for the west infiltration pond will include a relatively low-permeability core, which will be constructed by using the finer-grained portion of the soil excavated to create the pond. The Engineer will determine whether addition of bentonite to the excavated soil will be necessary at the time of construction. The design for the west infiltration pond is shown in Drawing C-8 in Appendix 1F. The west berm will be constructed at 2H:1V, using soil from the existing perimeter road. The existing perimeter road will become the east pond berm on the Landfill side of the west infiltration pond. The new stormwater collection ditch at the toe of the Landfill cap and the anchor trench for the geosynthetic cap components will be placed in the perimeter road. The top edge of the east pond berm will be a distance of approximately 2-ft from the anchor trench. The outside (west) berm will be constructed in 1-ft lifts and compacted to 95 percent of maximum dry density (ASTM D1557). The final elevation of the outside pond berm will match the top of the barrier wall and will be 3-ft wide. The final 6 inches of the outside face and top of the berm will be salvaged topsoil (from pond excavation) to promote vegetation growth and prevent erosion. One overflow culvert will be installed for the west infiltration pond, similar to the existing overflow culvert in the north pond (Drawing C-8).

West infiltration pond construction is anticipated to start from the south and proceed north. This direction will minimize the volume of earthmoving and allow construction of the outfall for the interceptor trench drain lines.

4.2.7 Cap Restoration

Upon completion of the barrier wall installation and construction in the north infiltration pond, the Landfill cap will be extended over the barrier wall and restored. The design for the cap extension and restoration is shown in Drawings C-12 through C-14 in Appendix 1F. Excess earthen material generated from the project and excess geosynthetic material generated from the Landfill during the mixing pad construction will be incorporated into the Landfill, beneath the restored cap. The cap restoration sequence will ideally start at Sta. 0+00 and proceed counterclockwise, just as the barrier wall was constructed. The contractor may determine that a different sequence is preferred, based on construction needs. It is also possible that the Landfill cap on the west side will be restored first, prior to construction of the west infiltration pond, to facilitate equipment access.

The cap construction will be completed in layers from bottom up, starting with GCL. The mixing pad will be graded to provide a smooth, properly sloped surface. The salvaged GCL and/or new GCL will be installed in a shingled approach starting from the anchor trench and moving upwards toward the existing cap. Ideally, the GCL will be placed parallel to the Landfill to allow rolling out of the GCL along the barrier wall. Subsequent GCL sections will have a minimum overlap of 1-ft. The final layer will be placed under the existing GCL on the uphill side of the mixing pad. The PVC geomembrane installation will follow the same sequence as the GCL, unless the contactor has an operational preference. Sections of geomembrane will overlap by at least 2-ft and will be glued in accordance with manufacturer recommendations.

The geonet will also be installed from the toe toward the top of the cap. The downhill edge of the geonet will be left on the ground to tie into the new stormwater collection ditch at the toe of the Landfill cap; this will facilitate drainage of water infiltrating into the upper layers of the cap into the collection ditch. The salvaged and stockpiled cover soil and topsoil obtained from peeling the cap back and from the west pond excavation will be spread from the uphill side of the restoration area in one lift by an excavator. The equipment and construction sequence will be finalized with the construction contractor. Additional cover soil and topsoil to complete the cap will be obtained from usable portions of the excess material generated from construction of the west infiltration pond. Depending on the strength of the top of the barrier wall, additional measures to increase the surface strength, such as additional layers of geogrid, may be implemented during final engineering and preparation of the plans and specifications.

In the areas where the road alignment extends over the Landfill cap, topsoil will not be placed, instead the cover soil thickness will be increased from 18 to 24 inches and covered with a layer of geotextile to prevent erosion and help spread the vehicular load across the cap. The road will be completed by placing approximately 12 inches to 24 inches of ballast over the geotextile in two lifts. The width of the road on top will be 12-ft. Placing the ballast in two lifts will achieve some compaction by tracking the excavator over each lift.

Upon completion of the major components of earthwork, the new stormwater collection toe ditch will be installed at the location shown on Drawing C-12 using an 18-inch diameter, corrugated, HDPE half pipe, and the cap soil will be finished to its edge. Equipment used for earthwork will be cleaned prior to removal from the work area. Water used for cleaning will be collected and disposed of in accordance with applicable regulations and standards.

The new piezometers (Section 5.0) will be installed during cap construction. The exact construction stage for piezometer installation will be decided by the Engineer and the contractor, to minimize adverse impact to the contractor's operation. The piezometers will be installed by a driller licensed in the State of Washington.

4.2.8 Lift Station Commissioning

During final stages of the cap restoration and before demobilization, all components of the lift station electrical, instrumentation, and mechanical systems will be tested to verify that the systems will operate in accordance with design specifications. If problems are identified, the issue will be corrected prior to system commissioning and acceptance. Commissioning will include testing of pumping rate, leak testing, and operation of control systems.

4.2.9 Site Restoration

After completion of the cap restoration, site restoration activities will be completed prior to final demobilization. A new chain-link fence along the outer berm of the west infiltration pond will be installed to include the pond within the fenced area; fencing salvaged during the project will be used to the extent practicable for the new perimeter fencing. The protective fabric over the fences will be removed and disposed off site. Excess material from the construction and any remaining debris from the construction of the staging and mixing areas will be removed from the B&L Property and managed in accordance with applicable regulations and standards. On completion of construction activities, disturbed areas will be hydroseeded or finished as appropriate (Drawing C-12). The contractor may decide, with approval of the Engineer, to hydroseed portions of the Site as work is completed rather than waiting until all work is completed for operational reasons as well as for stormwater runoff control. Fill used in the contractor staging area may, with the approval of the Engineer, be left in place and hydroseeded.

4.3 CONSTRUCTION QUALITY ASSURANCE AND CONTROL

In order to construct the project components to the specified design requirements, construction quality control will be conducted by the construction contractor and additional construction assurance may be conducted by the Engineer. A detailed Construction Quality Assurance (CQA) Plan will be prepared as part of the plans and specifications. The plan will describe procedures to be followed by the Engineer and the contractor during the construction of the subsurface barrier wall, interceptor trench system, and other ancillary components of the construction work to ensure that they are installed as designed and that they meet design specifications. The CQA Plan and contract documents will require attainment of design specifications and acceptance of the work prior to Engineer approval for final payment to the contractor. The quality assurance requirements to be included in the CQA Plan are summarized below.

4.3.1 Quality Assurance for Barrier Wall

The barrier wall construction elements and procedures will be inspected daily under the supervision of the Engineer for quality assurance. The elements of quality assurance will include, but are not limited to, material used, slurry mix, depth of excavation, backfill mix, and backfill depth.

The bentonite delivery tickets will be checked to document batch and lot numbers. The slurry mix will be routinely tested for density and viscosity. The density of the slurry will be a minimum of 66 pounds per cubic foot (pcf) and the viscosity will be measured using the marsh funnel test to flow at a minimum of 36 seconds.

Depth to bottom of the barrier wall excavation will be measured every 5 ft by measuring tape to verify that design depth has been reached and periodically (as directed by the Engineer) before backfilling to verify that the trench has not collapsed. The backfill mix will be tested for slump to verify that it is between 4 and 6 inches, which will indicate that the design composition of 3 percent bentonite has been achieved. Samples of the backfill will be prepared and tested for hydraulic conductivity to verify the design minimum hydraulic conductivity has been met. On average, one sample will be tested for hydraulic conductivity for every 100 linear ft of barrier wall. The testing frequency will be greater (i.e., testing will be done at intervals less than 100 ft) at the start of the project to verify that work procedures are appropriate and that design criteria have been met.

During backfill operations, the top of the backfill will be profiled at the end of each day and again at the start of the next day. Changes in the profile are typically due to settlement of suspended sand and/or sidewall collapse. Any deposits will be removed prior to the start of backfill operation to prevent formation of a porous zone within the barrier wall.

4.3.2 Quality Assurance Plan for Interceptor Trench System

Material and installations will be checked to verify that the construction meets the minimum design requirements. The elements to be checked include, but are not limited to, material used, depth and elevation of installations, trench backfill compaction, and operational components. The piping, fittings, elbows, vaults, lift station manholes, crushed rock, and geotextile will be inspected to verify compliance with the design specifications. The inspections will include evaluations to document that installations have been competed in accordance with manufacturer recommendations. The installation depths and elevations will be checked and verified as the work proceeds. Results of inspections and testing will be documented.

The earthwork for the construction of the west infiltration pond and the southwest soil pad (potentially to be used for future groundwater treatment building) will be routinely inspected during construction to verify that correct elevations, dimensions, soil type, placement, and compaction requirements are met. Backfill for utility trenches will be checked to ensure the soil is placed in 12-inch lifts and compacted to a firm, non-yielding surface.

Samples of the available soil types will be collected and tested by the Engineer for gradation, moisture content, Atterberg limits, and maximum dry density. The Engineer will determine the appropriate soil types to be used during construction. The backfill compaction standard will be to at least 95 percent of maximum dry density, in accordance with ASTM D1557, for the infiltration pond berm, and 98 percent dry density compaction for the southwest soil pad.

Mechanical and electrical components will be checked to verify correct installation and operation. The active discharge piping will be pressure tested to verify that leaks are not present. The electrical components will be tested during system commissioning to verify that all components are functioning within acceptable operational ranges.

4.3.3 Quality Assurance Plan for Landfill Cap Restoration

All delivered material to be used for cap restoration shall be inspected by the Engineer to ensure it conforms to the specifications. The manufacturer's batch and lot numbers for all geosynthetic material will be recorded. The storage and handling of the geosynthetic material will be checked to verify that material is not damaged prior to installation. All installation overlaps and welds will be checked by the Engineer to verify compliance with the design requirements. Any imported earthen material will be sampled at the source and tested for gradation prior to acceptance for use.

Prior to installation of the GCL, the exposed subgrade will be graded and compacted. The surface will be reasonably smooth, uniform, and free of rocks, sticks, and other debris to prevent damage to the GCL. Field seaming of PVC liner will be visually inspected to confirm that the joints have a minimum of 24 inches of overlap. The seamed PVC liner shall be free of holes or gaps. Samples from seams will be collected for testing of shear and peel in accordance with ASTM D882. The installation will be visually inspected by the Engineer to verify that the geosynthetics layers are shingled per design during installation.

The earthen cover soil type will be checked to verify it meets specifications. Placement of cover soil and topsoil will be in one lift for each soil type. The placement sequence and construction equipment will be inspected to follow the design approach, determined by consultation between the Engineer and contractor, to prevent damage to the geosynthetic layers. The road ballast will be placed in two lifts and compacted by tracking equipment over each lift. Perforations of the geosynthetic layers around wells or piezometers will be inspected to verify that the seals have been properly installed and that the cap system has not been compromised.

The thickness and final elevations of each layer of earthen material will be surveyed to verify that minimum thickness and slopes are met. The final slope of the new stormwater collection ditch will be surveyed to verify that a positive slope toward the north infiltration pond is maintained.

4.3.4 Construction Documentation

The construction work, including quality assurance (QA) and quality control (QC) testing and documentation for resolution of problems, will be formally documented in the Engineer's daily field report and QA/QC testing data sheet. The Engineer's daily field report will document the following:

- Field conditions (weather, surface condition, surface water condition, conditions of site control features)
- Daily safety meetings
- Description of construction activities
- Equipment and personnel involved
- QA/QC observation and testing
- Type and quantity of material used
- Problems encountered and corrective measures
- Record of delivery of materials and quality documentation
- If storm water sampling is conducted, sample location and time

In addition, health and safety sign-in sheets and visitor daily log will be included.

The QA/QC testing data sheet shall document the following information:

- Visual observation of construction quality
- Location and number of QA/QC field measurement or testing
- Field measurement and testing results
- Location and number of samples collected for laboratory analysis

4.3.5 Design or Construction Plan Modification

Any design or construction problems that are encountered, which might require modifications or mitigation measures will be discussed with and approved by the Engineer prior to implementation. Depending on the nature of the issue, the matter may be discussed with the project team and/or the Trust and Ecology. The resolution will be evaluated to confirm that it complies with health and safety procedures and the design intent. Any modifications to the design or installation will be documented in the field notes and reflected on the final record drawings.

4.4 STORMWATER MANAGEMENT

Stormwater management during construction will be based on the concept of "zero discharge." Stormwater management during construction will implemented as described in the SWPPP; (Appendix 1.E) and summarized below. The stormwater management system is designed to contain the runoff from the disturbed or work areas and to prevent releases to the environment. Secondary containment capability has been incorporated into the design to eliminate stormwater discharge during construction. Controls have been established for the work area, contractor staging area, and for vehicles moving from the work area to other areas.

4.4.1 Work Area Controls

Containment within the work area will be achieved by installation of run-on and runoff containment berms on the outside limits of the work areas. The containment berms will be constructed by placing a layer of plastic sheeting on the ground and placing excess soil over the middle and wrapping the plastic sheet over the soil, as shown on Drawing G-4 in Appendix 1F. This will be done on the upslope and downslope sides of the work area for barrier wall construction and surrounding the work area for construction of the west infiltration pond. The existing berms for the north pond will provide effective run-on/runoff control during excavation of the bottom to promote infiltration.

The containment berms for barrier wall construction will be of a height sufficient to contain several inches of rainfall. If the containment capacity of the bermed area is exceeded by a storm, the north pond will serve as emergency containment; stormwater would be pumped to the north pond as necessary to prevent overtopping of the berms around the barrier wall work area. If it is necessary to use the north pond for emergency storage of stormwater, the pond will be drained and transported for treatment and discharge in accordance with applicable regulations and standards.

A gravel pad at least 6-inches thick will be placed over the staging area to minimize the potential for disturbing surface soils and creating turbid runoff. All work and private vehicles will be parked on the gravel, which will extend over the entrance road, to Fife Way. The gravel surface will be inspected weekly during construction and will be repaired as necessary to maintain an effective cover and prevent turbid runoff.

Secondary containment will be established around bentonite mixing operations to contain rainfall and prevent runoff. The containment berms will be capable of containing at least 3 inches of rainfall. Rainfall accumulating within the containment area will either be incorporated into the barrier wall construction to the extent possible or allowed to evaporate/infiltrate within the containment area. In the event of spills of bentonite within the contained area, the spill will be cleaned up to prevent contamination of rainwater accumulating in the secondary containment area. The containment berm will be inspected weekly and maintained as necessary.

Runoff from storage areas located within the staging area will be contained. Fuels, hydraulic oils, and other potentially hazardous materials will be stored with secondary containment capable of containing at least 3-inches of rainfall. To the extent practicable, the secondary containment areas will be covered. Bentonite (for barrier wall construction) will be stored in the staging area and will be covered by plastic sheeting when not in use. Rainfall accumulating within the contained areas will be used in the bentonite mix plant to prepare bentonite slurry or be allowed to evaporate or infiltrate. If spills of stored materials occur, the spill will be cleaned up, with recovered materials disposed off site in accordance with applicable regulations and standards. If a spill occurs while stormwater is present in the secondary containment area, the stormwater and spill will be removed and transported off site for treatment and discharge in accordance with applicable regulations and standards.

4.4.2 Vehicle Egress

Provisions will be made to prevent vehicles leaving work areas from transporting mud or sediment to surfaces outside the work area. Equipment used to construct the barrier wall will be kept within the work area until the work is completed. This equipment will be decontaminated within the bermed area prior to removal from the area after completing barrier wall construction. Earthmoving equipment used for constructing the interceptor trench system (interceptor trench, infiltration ponds, and utility trench) will also remain in the work until the work is completed, and will be decontaminated prior to leaving the work area. If maintenance of equipment is necessary during the work, maintenance will be performed within the work area. If it is necessary to replace equipment due to malfunction, the affected equipment will be decontaminated prior to removal from the work area. Decontamination materials generated during construction will remain within the work area. At the end of the construction project, after the infiltration ponds have been constructed, the Landfill cap restored, and the perimeter roadway and cap drainage ditches are complete, water and wastes from decontamination of vehicles and equipment will be collected for off-site treatment and disposal in accordance with applicable regulations and standards.

4.4.3 Post-Construction Stabilization

At the completion of construction, the Landfill cap will be hydroseeded, the perimeter road will be surfaced per design, and the perimeter ditch system will be in place to collect runoff from the Landfill cap. The drainage design will control discharges to prevent release of turbidity to the agricultural ditches draining the Landfill area. The Landfill cap, including the newly restored areas, will drain to the perimeter ditch system, which will direct runoff to the north infiltration pond. This pond will provide substantial storage and detention capacity, and will provide for infiltration of the runoff to the extent practicable. The pond will also allow any solids present in the runoff to settle within the pond before the water level rises to the overflow pipe and runoff discharges to the agricultural ditches. The Landfill cap will be hydroseeded upon completion; hydroseeding is expected to quickly stabilize the surface of the cap and prevent erosion and sediment runoff. The roadway will be surfaced in accordance with standard practice to prevent sediment runoff.

4.5 HEALTH AND SAFETY

The project work described in this addendum will comply with the health and safety standards prescribed by the Occupational Safety and Health Act (OSHA) and the Washington Department of Occupational Safety and Health (DOSH; formerly WISHA). A project-specific Health and Safety Plan (HASP) covering the work to be done by the Engineer and his representatives is attached as Appendix 1I. The contractor will prepare a HASP for their activities prior to mobilization and provide a copy to the Engineer. The two HASPs will establish protection standards and mandatory safe practices and procedures for all contractor employees, subcontractors, owner's representatives, oversight personnel, and all other persons involved with the field work activities addressed by this Addendum. The HASPs also assign responsibilities, establish standard operating procedures, and provide for contingencies that may occur during field work activities. Emergency contact information is provided in the attached HASP. A copy of the HASP will be on-site at all times, and visitors entering the work area will be required to review and sign the HASP.

Chemical exposure hazards are identified as exposure to arsenic-contaminated groundwater, surface water, and slag. Potential routes of exposure include ingestion, inhalation, dermal contact, and eye contact. The primary route of exposure during field work is ingestion of contaminated water, soil, or dust. The possibility of a flammable or explosive release of methane is considered remote because the Landfill has ceased generation of methane, based on several years of monitoring. Physical hazards and recommended preventative measures are identified in the HASP including falling, lifting, electrical, mechanical, noise, inhalation, heat stress, cold stress, sunburn, biohazards, and traffic hazards.

While work is being conducted within the limits of wood waste and on the Landfill, a hydrogen sulfide lower explosive limit (H_2S/LEL) meter will be used for air monitoring. Unless there is a sulfur odor outside the limits of the Landfill, property perimeter air monitoring will not be required. The Health and Safety Officer/Site Supervisor (HSO/SS) will visually assess dust generation in the work area to ensure that personnel are not exposed to arsenic through inhalation; precautions to control dust generation will be implemented as appropriate.

The contractor will be required to develop a detailed safety plan for conducting work within the interceptor and utility trenches. Applicable DOSH, OSHA, and industry standards for conducting work in trenches will be met.

All work involving heavy equipment, including excavation, berm construction, drilling and well/piezometer installation, will proceed in modified Level D Personal Protective Equipment including hard hat, steel-toed boots, hearing protection, eye protection, gloves, and protective work clothing. The level of protection will be upgraded accordingly by the Site HSO whenever warranted by conditions present in the work area.

Decontamination procedures will be strictly followed to prevent spread of arsenic-contaminated soil or water. Temporary construction fencing, locking gates, signage or other appropriate site control measures will be maintained in all work areas to limit access during and after work hours. Emergency response and administrative requirements are described in the HASP. The operations will be checked closely to prevent tracking of the contamination outside work zones. At the end of the construction, all surface areas that came into contact with the Site contamination will be stripped and incorporated into the Landfill or disposed off site in an appropriate landfill. All construction equipment will be decontaminated prior to leaving the Site.

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5.0 Operation, Monitoring, Inspection, and Maintenance Plan

5.1 OVERVIEW

In this section, maintenance, monitoring, and inspection plans that addressing the barrier wall and interceptor trench system are summarized. To better understand the elements presented in this section, it is helpful to understand how this fits within the larger Operations, Monitoring, Inspection, and Maintenance Plan (OMIMP) for the Site that will be prepared at the end of Phase 2 work.

First, the inspection and maintenance plan for the 1993 remedy components (which include the Landfill cap, cap perimeter stormwater collection system, and the groundwater monitoring well network) are documented in the Interim Compliance Monitoring Plan (ICMP; Appendix A to the Groundwater Remediation Work Plan [GRWP]; Floyd|Snider 2009); the ICMP was approved by Ecology and is being implemented. The additional operations, maintenance, and inspection associated with the construction work covered in this Addendum (i.e., the subsurface barrier wall, interceptor trench system, Landfill cap extension, etc.) will be incorporated into the operations, inspection, and maintenance program established in the ICMP upon completing construction work.

Second, the existing groundwater compliance monitoring program established in the ICMP, which is aimed at monitoring plume stability and contaminant trends, will be supplemented with a Performance Monitoring Plan (PMP) that establishes a monitoring network and program for assessing the hydraulic performance of the barrier wall prior to startup of the groundwater extraction and treatment system that is planned as part of Phase 2 of the 2008 CAP implementation program; the groundwater extraction and treatment system is expected to be completed by early 2012.

Additional operations, monitoring, inspection, and maintenance for other components of the 2008 CAP remedial action will be documented in future Addenda. On completing implementation of all remedy components from the 2008 CAP in Phase 2, a long-term monitoring program will be documented in an OMIMP, which will replace the IMCP.

This Addendum addresses the design for the barrier wall, interceptor trench system, and ancillary work necessary to support the remedy. Operations and maintenance requirements for these components are expected to be minimal; however, operations and maintenance are necessary for the interceptor trench system, which includes mechanical pumps and controls. The barrier wall and cap extension are passive components that will require periodic inspection to ensure the components are in proper condition. These passive components will not require significant maintenance (other than mowing the vegetative cover on the Landfill cap) under normal conditions. However, maintenance may be needed in the event of major catastrophic events such as an earthquake. Plans for operations, monitoring, inspection, and maintenance of the components covered by this Addendum are presented below.

5.2 INTERCEPTOR TRENCH SYSTEM OPERATIONS

As described in Section 3.2, the interceptor trench system relies upon both passive and active drains to intercept groundwater from the upgradient side of the Landfill and redistributes this water around the Landfill perimeter to the downgradient side. The invert of the passive drain system is designed to be at elevation 14 ft. Active draining will be accomplished by the lift station pumps triggered when water levels exceed a set elevation designed to prevent mounding of groundwater above the approximate elevation of 16.5 ft. The lift station pumps will be shut down when an acceptably low level is sensed in the lift station or if a high level occurs in the infiltration pond receiving the lift station discharges. The level switches for activation and shutdown of the lift station pumps can be changed manually to support proper operation of the system. Each of the two lift stations operates independently of the other.

Operation of the interceptor trench system consists of setting or adjusting the water level switch settings to alter pump start and stop levels in each of the two lift stations. It is initially planned to activate the lift station pumps if the water level elevation in the lift station reaches 16.5 ft and to shut the pumps down at an elevation of 16.0 ft in the lift station. Additionally, level sensors will be set to stop pumping in each lift station when the water level in the infiltration pond is within 1 ft of the bottom of the overflow pipe. The high level cutoff in the infiltration ponds will prevent pumped groundwater from overtopping the stormwater infiltration ponds and discharging to the adjacent agricultural ditch system. The high-level shutoff elevation will be determined prior to issuance of the final plans and specifications. It should be noted that when high-water conditions occur that cause shutdown of the lifts' station pumps, then only passive transport of groundwater would occur. High-water conditions are only expected to occur during flood conditions in the vicinity of the Landfill.

5.3 INSPECTION AND MAINTENANCE PLAN

In this section inspection and maintenance elements associated with the barrier wall and interceptor trench system are summarized. Additional details for these components are provided in addition to the existing inspection/maintenance plan presented in the ICMP.

The inspection and maintenance elements established in the ICMP include relevant elements of the inspection/maintenance plan developed as part of the 1993 remedy (Hydrometrics 1992) and Landfill closure (Hydrometrics 1994). The relevant elements include inspection and maintenance of the engineered cap, security fence, stormwater controls, the passive landfill gas system, and the leachate recovery system. These inspection and maintenance procedures, in conjunction with the groundwater and surface water sampling program described in the ICMP, meet the substantive requirements of the closure and monitoring standards applicable to the Landfill, including closure and post-closure requirements (WAC 173-304-407 [6] and [7]). Refer to the ICMP (Appendix A to the GRWP) for additional details. These elements will be sufficient to address the extensions to the Landfill cap so that the cap extends over the barrier wall. Additional inspection and maintenance elements are needed to address the interceptor trench system, which consists of the interceptor trenches, lift stations, infiltration ponds, associated piping and instrumentation, and the performance monitoring network of piezometers. The subsections below describe the inspection and maintenance program that will address the remedy components addressed in this Addendum.

5.3.1 Landfill Cap System

The existing Landfill cap will be extended to cover the new barrier wall, followed by rebuilding the drainage ditch and the roadway along the perimeter of the Landfill. The Landfill cap system, including the reconstructed stormwater V-ditch and culverts, will be inspected and maintained in accordance with the procedures established in the ICMP. Inspection procedures will be modified to include specific inspection for the condition of the cap surface along the barrier wall alignment for signs of settlement of the slurry wall. Reporting requirements will continue as specified in the ICMP.

5.3.2 Interceptor Trench System

Inspection and maintenance of the interceptor trench system will include the following:

- Inspection of lift stations for:
  - pump operation,
  - function and settings for controls and level switches,
  - vault conditions (e.g., accumulation of sediment, physical condition, iron fouling).
- Inspection of the subsurface conveyance lines for iron fouling or other obstructions.
- Inspection of the infiltration ponds for excessive sediment accumulation or vegetation growth.

Maintenance will be implemented as appropriate based on the results of inspections. It is anticipated that maintenance will include mechanical/electrical maintenance for the pumps and controls, cleaning to remove fouling or sediment accumulation in the lift station sumps and underground lines, and periodic sediment and/or vegetation removal from the infiltration ponds. Inspections and maintenance will be documented on appropriate forms and in the operating log for the Site.

5.3.3 Performance Monitoring Piezometers

The piezometers installed for performance monitoring of the Landfill remedy will be incorporated into the program for regular monitoring well maintenance described in the ICMP. As the piezometers are designed similarly to wells, the existing inspection and maintenance program will be applicable to the new piezometers.

5.3.4 Inspection and Maintenance Schedule

The inspection and maintenance schedule and frequency for the elements addressing the barrier wall and interceptor trench system will be the same as for the existing schedule and frequency provided in Table A.5 of the ICMP. The first inspection event addressing the new remedy components is scheduled to follow 2009 construction activities; this inspection will serve as the baseline for subsequent inspections. Thereafter, the new remedy components will be inspected twice a year, in accordance with the current inspection schedule for the Site. As described in the ICMP, Landfill settlement will be surveyed and evaluated following construction of Phase 1 major elements and at 5-year intervals thereafter. Maintenance will be implemented as appropriate, based on the results from inspections and manufacturer recommendations for mechanical equipment and controls.

5.4 PERFORMANCE MONITORING PLAN

Performance monitoring will be performed following construction of the barrier wall and interceptor trench system. The performance monitoring program will assess the overall performance of the remedy components to confirm that they are performing as intended. The goals and scope of the performance monitoring plan for the barrier wall and interceptor trench system are summarized below. The scope and goals will be incorporated into a comprehensive PMP to be prepared as part of the plans and specifications package for the barrier wall and interceptor trench system. The layout planned for the performance monitoring network of piezometers is shown on Drawing N-1 in Appendix 1F.

The barrier wall combined with both natural and controlled groundwater gradients will act as a physical barrier to groundwater flow beneath the Landfill. When combined with the groundwater extraction system to be constructed in Phase 2 of the 2008 CAP implementation program, the remedy will provide for the hydraulic control necessary to meet performance criteria. These Phase 2 components supplement the barrier wall to provide complete hydraulic control by establishing and maintaining inward gradients across the barrier wall. During the period before groundwater extraction for hydraulic gradient control commences beneath the Landfill, the barrier wall will function as a passive barrier relying on the wall and natural gradients in the basin.

During this period, measurements will be taken to establish hydrogeologic system behavior in the absence of active hydraulic controls—that is, how the barrier wall affects groundwater flow outside the barrier wall without active groundwater recovery. Water level measurements in the piezometer network will be made monthly for at least 1 year following barrier wall construction; this period for monitoring will identify the expected seasonal groundwater level variation and identify response, if any, to major storm events. During this same period, pumping tests will be conducted beneath the Landfill during Phase 2 predesign studies as part of the design of the groundwater extraction system within the barrier wall. The perimeter piezometers are expected to provide useful measurements during the pumping tests.

A network of piezometers will be installed for monitoring performance of the barrier wall, as illustrated on Drawing N-1. Piezometer construction details are provided in Drawing N-2 in

Appendix 1F and Table 1.3. Performance monitoring will consist of monthly water level monitoring of these piezometers and temporary groundwater level data logging using transducers in selected piezometers for the period following barrier wall installation and preceding construction of the Phase 2 groundwater extraction and treatment system. It is expected that this performance monitoring program will be incorporated (with appropriate revisions) into the performance monitoring program for the combined barrier wall and groundwater extraction system for the Landfill/Ditch Cleanup Action Acre (CAA).

Performance monitoring of the Landfill piezometer network prior to the Phase 2 construction will be conducted to:

- assess the initial, passive performance of the barrier wall in controlling groundwater discharge,
- collect data to be used for design of the groundwater extraction system,
- collect baseline data for the ongoing hydrogeologic study and for comparison with conditions following startup of the groundwater extraction and treatment systems,
- collect data for design of the performance monitoring program following startup of the groundwater extraction and treatment systems and for comparison with Phase 2 pump test results,
- develop, in consultation with Ecology, appropriate hydraulic performance standards for the Landfill containment remedy.

During the first few months following barrier wall installation, the rise in head associated with the onset of the wet season will provide an initial test of the performance of the barrier wall. It is expected that monthly measurements of the perimeter piezometers will generally be sufficient to demonstrate the potentiometric response of groundwater inside the barrier wall relative to the seasonally changing groundwater levels outside the barrier wall.

To support evaluation of the short-term variability of head inside and outside the barrier wall during storm events, pressure transducers will be temporarily installed in four representative clusters (e.g., Piezometers PZ-1, PZ-4, PZ-6, and PZ-8). Piezometers selected for temporary pressure transducers will include some screened in the Lower Sand Aquifer in the vicinity of the identified aquitard gaps (i.e., Piezometer PZ-4c and PZ-8c). Data loggers associated with the transducers will be programmed to monitor water levels on an hourly basis during several months of data collection. A barometric transducer will also be installed to provide barometric compensation data. Details regarding the automated data collection program will be presented in the barrier wall/interceptor trench system PMP that will be prepared as part of the plans and specifications package.

The final assessment of the barrier wall performance will be based on pumping test results from pumping of wells inside the barrier wall. Data from the pumping tests will be combined with the information from perimeter piezometer monitoring to design an extraction system that will supply the additional hydraulic control needed to prevent the discharge of contaminated groundwater. The pumping tests are projected to occur during the late spring or summer of 2010 after significant information has been collected from the monthly perimeter piezometer monitoring.

As noted above, additional performance monitoring will be conducted under a future Phase 2 performance monitoring plan to assess the effectiveness of the complete Landfill hydraulic control remedy (i.e., the barrier wall and groundwater extraction system) to control groundwater discharge from the contained area. The initial hydraulic performance monitoring program described in this Addendum is intended to address performance monitoring for the remedy components constructed during this portion of the work, and will be performed in conjunction with the ongoing compliance monitoring program, as described in the ICMP. Phase 2 performance monitoring will also be performed in parallel with compliance monitoring. After performance monitoring for the full remedy specified in the 2008 CAP has been completed and performance standards have been established, a comprehensive compliance monitoring plan will be prepared to replace the ICMP that will include hydraulic monitoring of the Landfill perimeter piezometers in addition to groundwater quality monitoring in the monitoring well network selected by Ecology.

6.0 Schedule and Reporting

6.1 PROJECTED CONSTRUCTION SCHEDULE

A summary of the projected construction schedule is presented below. Meeting this approximate projected schedule is dependent on several factors including the nature of any changes that result from the public comment period, timely approval of any required permits, and timely preparation and Ecology approval of the final plans and specifications.

Key milestones from the projected construction schedule include the following:

- Permitting and approval requirements are projected to be completed by June 2, 2009.
- A notice to proceed with construction is expected by June 24, 2009.
- Mobilization and site preparation are scheduled to occur between July 10 and July 30, 2009.
- Barrier wall and interceptor trench system construction, site restoration, and demobilization are scheduled to take place between July 31 and October 9, 2009.
- The final Completion Report for the barrier wall and interceptor trench system is projected to be submitted to Ecology by February 10, 2010.

6.2 REPORTING

6.2.1 Progress Meetings

Progress meetings with the Floyd|Snider/AMEC project team, representatives of the Trust, and Ecology will be held as needed prior to mobilization for construction. After mobilizing to the work site, weekly progress meetings will be held with the Floyd|Snider/AMEC project team, Ecology, the Trust, and the construction contractor. Additional meetings may be held as needed to address specific issues that arise during the work. Minutes of the meetings summarizing the discussions and identifying any action items will be prepared and distributed to attendees.

6.2.2 Design Submittals

Because Ecology input was sought for decision-making during the design process, no design submittals precede Draft Addendum 1. Submittal of the Final Addendum 1, draft plans and specifications, and final plans and specifications will follow submittal of the Draft Addendum 1. The plans and specifications package will include several attachments, including the Stormwater Pollution Prevention Plan, a detailed Performance Monitoring Plan, Health and Safety Plan, and Construction Quality Assurance Plan.

6.2.3 Barrier Wall and Interceptor Trench Construction Report

A Phase 1, Part 1 Construction Completion Report for the barrier wall and interceptor trench system (to include all construction elements included as part of this Addendum) will be prepared in accordance with WAC 173-340-400(6)(b) and Exhibit B to the Consent Decree. The Construction Completion Report will include record drawings for the constructed components, documentation of construction activities, and documentation that the cleanup action was constructed in substantial compliance with the plans and specifications and related documents. Substantial deviations from the plans and specifications will be reviewed with Ecology prior to implementation and will be documented in the Construction Completion Report. The final report will be stamped by a Professional Engineer registered in the State of Washington.

Additional construction completion reports will be prepared for the other 2008 CAP remedial components. The End-of-Plume remedy will be addressed in Addendum 2. The groundwater extraction system, the Wetlands remediation system, and ditch remediation will be addressed in Addendum 3.

6.2.4 Other Reports

In accordance with Exhibit B to the Consent Decree, Construction Oversight Reports for the barrier wall and interceptor trench system will be prepared and submitted to the Trust with copies to Ecology. Other regularly scheduled reports will continue to be submitted, including semiannual compliance monitoring reports submitted to Ecology in accordance with the ICMP and semiannual progress reports submitted to Ecology in accordance with Exhibit B to the Consent Decree.

7.0 References

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