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BUNKER HILL SUPERFUND SITE

PAGE POND CLOSURE
FINAL REMEDIAL DESIGN REPORT

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1.0 INTRODUCTION

This Final Remedial Design Report (RDR) provides information specfic to the design, construction and QA/QC of the Page Pond closure. The remedial design presented herein advances the conceptual plan presented in the Draft RDR (MFG, March 1994) and is consistent with the requirements of the Consent Decree and the Bunker Hill Remedial Design and Remedial Action Area I Statement of Work (SOW) attached thereto.

1.1 BACKGROUND

The Page Pond repository was utilized during the period between 1926 and 1968 and contains flotation tailings produced at the Page Mill in Humboldt Gulch. Approximately 30 acres in the central portion of the inactive 70-acre tailings repository now serves as the site for the Page Pond Wastewater Treatment Plant (PPWTP) which was constructed by the SFCDR Sewer District in 1974. The PPWTP includes four aeration lagoons and a stabilization pond, as well as access roads and a process building located on the north side of the impoundment.

The Page Pond repository is essentially surrounded by water, isolating it from public access except via the road which serves the PPWTP. Two natural wetlands, the East and West Swamps, are located to the east and west, respectively, of the tailings repository. These wetlands areas are connected along the north boundary of the repository by a channel, the North Channel, which conveys flow from the East Swamp to the West Swamp. A lesser channel, along the southwest boundary of the repository, conveys local runoff and drainage from Humboldt Creek westward into the West Swamp and a similar, smaller channel conveys runoff from the southeast corner of the repository eastward into the East Swamp.

The water levels and surface areas of the East and West swamps fluctuate seasonally, being greatest during periods of heavier rainfall and snowmelt in the spring and early summer, and decreasing in the late summer/fall dry season.

In certain areas of the West Swamp, notably in an area at the west end of the swamp known as West Beach and in smaller, localized areas near the discharge locations of the former decants at the northeast corner and along the west side of the former repository as well as in pockets along the North Channel, accumulations of exposed tailings are evident. Investigation of the East Swamp has shown little evidence of any significant quantities of tailings there.

1.2 REMEDIAL OBJECTIVES AND PERFORMANCE STANDARDS

As described in the Draft RDR, the remedial actions associated with Page Pond and the adjacent swamps are intended to mitigate the potential for contamination of surface and ground water; provide a barrier against direct contact with tailings; and reduce the potential for wind-blown dust. They are also intended to decrease leachate generation from Page Pond deposits; provide an ongoing repository for contaminated soils; and maintain and enhance the wetland habitat of the area.

These objectives will be achieved through a coordinated program of removal, consolidation, regrading, capping and revegetation. Exposed tailings will be removed, to the extent technically feasible, from the shallow areas of the West Swamp and the North Channel and a water level control weir will be constructed at the outlet from the West Swamp such that the swamp area will remain flooded throughout the year and any remaining tailings will be continually submerged beneath at least two feet of water. A similar outlet control weir will also be constructed at the point where the East Swamp discharges into the North Channel to sustain water levels in the wetland area east of the repository, although such provisions are not required as a means of isolating

tailings in that area. Tailings removed from the wetland and channel areas will be transported to the West Bench area of the repository and disposed of there. The Page Pond bench areas will also serve as a repository for disposal of potentially contaminated residential soils, removed during the course of the ongoing yard remediation program in the populated areas of the Bunker Hill Superfund Site. Upon completion of all anticipated removal and disposal operations at Page Pond, the bench areas will have been raised to essentially match the crest elevation of the existing PPWTP berms and graded such that there is positive surface drainage away from the PPWTP toward controlled discharge spillways leading to the wetland and channel waterways. The existing West Bench of the repository will be expanded approximately 300 feet to the west to 1) accommodate the anticipated volume of residential soils generated throught the Residential Yards Remediation Program (RYRP) and requiring secure disposal, and 2) to provide residual disposal capacity for potentially contaminated soils subsequently removed and disposed of under the Institutional Controls Program (ICP). The repository expansion will also cover a fan of exposed tailings at the toe of the existing west embankment of the repository. No expansion of the East Bench is contemplated. The existing perimeter embankments of the Page Pond repository, with the exception of the west embankment that will be buried and butressed by the expanded fill area, will be regraded as necessary to ensure their long-term stability, then covered with a minimum six-inch layer of residential soils and revegetated. Channels adjacent to the repository will also be upgraded as necessary to safely convey the design storm flows traversing the area and adjacent embankments will be armored as necessary to protect against erosion from such flows. Channel improvements will be implemented in a manner that preserves and enhances, to the extent practicable, the existing wetland vegetation in the area. Access controls, including fencing and gates as necessary where the remediation area is not isolated by standing water, will be provided to prevent unauthorized public entry to the remediated repository area.

The performance standards stipulated for the remedy require that the vegetated cover layer placed over the regraded embankment slopes and the repository bench areas be a minimum of six inches thick and that the channels and hydraulic control structures be designed to safely convey the tributary flows that would be generated by a 100-year, 24-hour storm event. These requirements are fulfilled by the design presented in this Final RDR.

2.0 REMEDIAL DESIGN

As indicated in Section 1.0, the remedial design for Page Pond involves a coordinated program of removal, consolidation, regrading, capping and revegetation. This remedial program will satisfy the performance requirements of the remedy, as set out in the Consent Decree and the SOW. The remedy, as described in detail in this Final RDR, was presented in conceptual terms in the Draft RDR, which was attached to the Consent Decree.

The Draft RDR also presented a variety of technical analyses in support of the conceptual design. Those technical analyses addressed the hydrologic, hydraulic and geotechnical characteristics of the site as well as an assessment of the nature and extent of tailings accumulations in the West Swamp area. They also presented recommendations regarding application of appropriate technologies and materials for site-specific remediation activities. Details of the technical analyses previously presented are not repeated in this document. However, a summary of pertinent discussions and findings is presented for clarity and continuity.

2.1 TECHNICAL ANALYSES

2.1.1 Stream and Swamp Hydrology and Hydraulics

Major tributary flows to the Page Pond area are from Grouse and Humboldt Creeks, and lesser flows are contributed from incident precipitation and local drainage. The total catchment area drained by the two main creeks is approximately 1360 acres and the local Page Pond area comprises approximately 190 acres. The hydrology of the drainage areas was assessed using the HEC-1 computer model, in conjunction with the Soil Conservation Service (SCS) Unit Hydrograph Method and using published soil, vegetation and topographic data for the area. The HEC-1 model was also used to assess the hydraulics of the respective Page Swamp areas and produce flood stage and discharge data for flows routed through the swamp reservoirs.

Flow from Grouse Creek discharges into and through the East Swamp and then into the North Channel. The estimated discharge from the East Swamp due to the 100-year, 24-hour storm is approximately 127 cubic feet per second (cfs). Flow from Humboldt Creek enters the southwest channel from a 3-foot diameter corrugated metal pipe (CMP) culvert under Highway 10, flows westward to the West Swamp, through the swamp and discharges at the northwest corner of the West Swamp through a 3-foot diameter concrete culvert under Highway 10 and into a channel leading to Pine Creek. The volume of flow entering the West Swamp from Humboldt Creek due to a 100-year, 24-hour storm event is estimated to be approximately 364 cfs. The combined flows from Grouse Creek (via the East Swamp) and from Humboldt Creek merge in the West Swamp and are significantly attenuated due to the large area and storage volume in this reservoir and the resultant reduced hydraulic gradient. The resultant discharge from the West Swamp due to the 100-year, 24-hour storm is estimated to be approximately 230 cfs.

Seasonal variations in the tributary flows to the Page Pond area cause the water levels and surface areas of the swamps to fluctuate significantly. The wetted areas of the East and West Swamps have been seen to vary between approximately 1 and 12 acres and between approximately 0.3 and 27 acres, respectively.

2.1.2 Embankment Stability

The existing Page Pond impoundment area measures approximately 2,800 feet by 1,300 feet, at its maximum extent and has a perimeter embankment length of approximately 1.4 miles. Existing deposits of floatation tailings vary in depth from approximately 20 feet to a maximum of approximately 30 feet. The perimeter embankments, which are comprised primarily of mine waste rock, vary in height from approximately 18 feet to 24 feet and have exterior slopes varying from approximately 1.2(h) : 1(v) to 2:1. With the exception of some minor localized areas of erosion and sloughing, no significant deterioration of the embankments has been noted.

The State of Idaho Rules and Regulations for Mine Tailings Impoundment Structures (1980) require that the slope of downstream (outside) faces of embankments be 2:1 or flatter, in the absence of stability analyses. Closures for other small tailings impoundments in the Silver Valley area have been constructed with 2:1 slopes, and these have provided adequate stability and have supported successful revegetation efforts. The existing Page Pond embankment slopes do not show signs of instability in their current configuration, however, no formal stability analysis of these slopes has been conducted. The default requirements of the State Rules will govern in this case.

2.1.3 Repository Capacity

Based on surveys of the current condition of the bench areas at the Page Pond repository and superposition of proposed final grades and maximum fill elevations, the remaining available capacity of the existing benches (excluding any expansion of the West Bench), for disposal of excavated tailings and residential soils, is estimated to be approximately 245,000 cubic yards (cy). The aniticipated volume of tailings to be excavated from the West Swamp area is estimated to be approximately 30,000 to 40,000 cy and the anticipated volume of residential soils that will be generated by the populated areas remediation program is estimated to be approximately 290,000 cy. Accordingly, the remaining capacity of the existing bench areas of the Page Pond repository is approximately 75,000 to 85,000 cy less than that expected to be necessary. Furthermore, this analysis makes no allowance for soils generated subsequently under the direction of the Institutional Controls Program. Westward expansion of the West Bench area a distance of approximately 300 feet from the toe of the existing west embankment and extrapolation of the design final surface grade will provide additional disposal capacity of approximately 140,000 cy, providing a total available repository capacity of approximately 385,000 cy. This capacity will be sufficient to accommodate the anticipated volumes of Page Pond tailings and residential soils from the populated area remediation program, and

will leave a remaining capacity of approximately 60,000 cy for subsequently generated materials.

2.1.4 Consolidation and Settlement of Repository Soils

Consolidation of the existing tailings in the Page Pond repository and the newly placed tailings and residential soils will occur, to some degree, due to the weight of additional soils placed on top of these materials. However, such consolidation is not expected to be detrimental to the performance of the repository and will be controllable throughout the closure period. Much of the consolidation of the existing tailings deposits has most likely already occurred, under the self-weight of those materials, which have been in place for more than 30 years. The additional tailings and residential soils that will be placed during the course of the closure will be placed over an extended period of time and the normal consolidation that will occur in these materials will not affect the final grading because it will be compensated for by the addition of further layers of soil in subsequent years. Furthermore, the materials will be nominally compacted during placement and grading operations due to the movement of the equipment used to conduct these operations. Upon completion of material placement, final grading of the upper surface will remedy any minor differential settlement that has occurred in the upper lifts of material.

2.1.5 Infiltration Analysis

A hydrologic analysis of the proposed Page Pond cover system was conducted, using the Hydrologic Evaluation of Landfill Performance (HELP) computer model, during preparation of the RI/FS Technical Memorandum: Evaluation of Proposed CIA and Page Pond Closure Methods. Results of the analysis indicate that the proposed cover soil system will reduce infiltration of annual precipitation by approximately 50 percent, under average precipitation conditions, primarily through evapotranspiration and surface runoff.

2.1.6 Erosion Potential

Erosion potential at the Page Pond closure was assessed based on the Universal Soil Loss Equation (USLE), which takes into account all factors affecting rainfall erosion including climate, soil type, vegetation, erosion control devices and topography. Based upon application of appropriate factors for the conditions expected at Page Pond, it is estimated that erosion from the closure surfaces will be approximately 0.4 tons per acre per year following establishment of vegetation. This compares favorably with the USEPA recommended allowable rate of 2.0 tons per acre per year. During closure activities and until surface vegetation is established, the erosion rate will be somewhat higher and temporary sediment control devices will be necessary to control sediment transport into adjacent waterways.

2.2 DESIGN COMPONENTS

The remedial design for Page Pond is consistent with the requirements of the Consent Decree and the SOW. As summarized in previous sections of this Final RDR, exposed tailings in the wetland and channel areas will be excavated and removed, to the extent practicable, and transported to the West Bench repository for disposal. Channels will be upgraded, where necessary, to accommodate the peak design flows and water level control weirs will be constructed at the outlets of the East and West Swamps to maintain a continually submerged condition in as much of these wetlands areas as possible, throughout the year. To supplement the natural inflow to the swamps, consideration will be given to discharging treated effluent from the PPWTP to the West Swamp. Perimeter slopes of the Page Pond embankments will be regraded, as necessary, to improve stability and minimize erosion, and residential soils will be spread over the embankment slopes and bench areas of the impoundment and revegetated.

The design presented in this Final RDR and the attached drawings and specifications represents a cost-effective approach to

efficient and environmentally sound closure of Page Pond. The Page Pond repository evolved over a period of time and is still changing. The facility was originally constructed of mine waste rock, with no specific design or construction quality control. It grew as needs arose, and it is continuing to grow through the deposition of residential soils on the bench areas. The further volume of tailings and residential soils that are to be incorporated into the final configuration of the repository is also only an estimate at this time. As well, the embankment slopes are subject to ongoing erosion, however minor, and the adjacent channels and wetlands areas are subject to aggradation, natural revegetation and animal activity. Consequently, the variability from one location to another, although minor, is frequent and there is no specific remedial design that is universally applicable to all areas of the site. Due to the ever-changing nature of the existing site, the performance-oriented nature of the conceptual closure plan and the potential variability in the quantities of materials that are to be disposed of within the final closure boundaries, implementation of much of the Page Pond remedy will be best achieved through on-site, field application of proto-typical design details and performance criteria. The information provided in this Final RDR and attachments establishes performance-based remedial actions that are to be applied in conjunction with sound engineering judgement at the time of implementation. In addition to the typical design details and performance criteria presented herein, supplementary site-specific design details, as necessary, will be presented in respective annual work plans. Such an approach allows flexibility to respond appropriately to possible changing requirements and conditions as they are found at the time of implementation and to optimize the cost effectiveness of both the design and the construction activities, while satisfying the project objectives and performance standards required of the closure.

2.2.1 Excavation and Capping of Selected Page Swamp Tailings

Selected areas of exposed tailings in the Page Swamp system will be excavated and disposed of on the Page Pond benches. Tailings in the West Swamp and North Channel that would be exposed above the stable free-water surface, after completion of construction of the flow control weir at the West Swamp outlet, will be excavated, to the extent technically feasible, and hauled to the West Bench of Page Pond for final placement. To the extent that tailings in shallow areas cannot be removed or covered with approximately 2 feet of standing water, these materials will be covered with a minimum of 12 inches of clean soil and revegetated. The tailings in the West Beach area comprise the majority of the tailings to be excavated. Other, smaller accumulations of exposed flotation tailings will also be identified, excavated and disposed of, if technically feasible. In the spring and early summer, swamp levels rise and the exposed tailings accumulations at West Beach and in the North Channel are temporarily flooded and saturated. The swamp sediments on which the tailings lie are perennially saturated. Removal of exposed tailings is the objective of the remedial design, however, in a saturated condition the tailings are generally not trafficable by conventional equipment, nor can they be effectively excavated in an environmentally sound manner. Access is typically improved in the late summer and fall, when the water level in the West Swamp falls and the tailings dry out to some extent. To facilitate the excavation and removal process, it may be necessary to construct some temporary channels to further promote drainage from the swamp and expedite further drying of tailings.

The West Beach tailings cover an area of approximately 5 acres, with an average surface elevation of 2,190.5 feet AMSL (Swenseid, 1991). The preliminary remedial design concept provides for the West Swamp area to be permanently flooded to a maintained elevation after tailings removal. The approximate extent of the anticipated permanent pond area is shown on Drawing 2339-1. Metals in the remaining tailings, permanently submerged below the

maintained water level, will not be subject to mobilization by periodic oxidation. Consequently, it should not be necessary to remove tailings beyond a depth of approximately two feet below the new permanent water level. The proposed crest elevation of the West Swamp outlet weir is 2,189 feet AMSL, and it is anticipated that the water level after remediation will be maintained at this level year round. Accordingly, those tailings above elevation 2,187 feet AMSL will be excavated and removed, to the extent technically feasible. It is estimated that this will require excavation of approximately 30,200 cubic yards of material (Swenseid, 1991). Technical feasibility of tailings removal is predominantly a function of the moisture content of the material. Tailings containing sufficient moisture to cause them to slough or flow, when excavated or placed with conventional earth moving equipment, will not be removed. In order to maximize the volume of tailings that can be effectively removed, tailings excavation will be conducted during the low water period

A second significant accumulation of exposed tailings in the West Swamp is an alluvial fan, located immediately west of the existing west embankment of the repository. This accumulation is essentially barren and, for the most part, is not submerged, even during high water. The proposed expansion of the West Bench repository area will effectively cap these tailings with up to 30 feet of residential soils. Therefore, it will not be necessary to remove these tailings. The proposed water level that will be maintained in the West Swamp, as a result of the construction of the outlet control weir, will be 2189 feet AMSL. The toe of the embankment slope of the expanded West Bench will be at an elevation of approximately 2193 feet AMSL and, therefore, will not be inundated by the water in the West Swamp.

Other areas of exposed or insufficiently submerged tailings found in the West Swamp and the North Channel areas will be removed or capped, as necessary, to enhance stream channels and mitigate contaminant sources, in accordance with the criteria set out above.

2.2.2 Flow Controls

2.2.2.1 East Swamp Outlet

As previously noted, there is little evidence to indicate the existence of significant quantities of tailings in the East Swamp. Those metals that are present in the East Swamp soils are likely attributable to smelter emissions. Since the East Swamp does not contain a significant quantity of tailings, cyclic seasonal saturation and drying of portions of this area should not present problems with respect to metals mobilization. Thus, there is no compelling reason to stabilize seasonal water level fluctuations in this area. However, excavation of exposed tailings from the mouth of the North Channel and the resultant enlargement of the channel cross-section in this area could increase the rate of drainage from the East Swamp, adversely affecting the existing habitat there. This potentially undesirable effect will be precluded through the construction of a weir across the eastern end of the North Channel to act as an outlet control. This weir will allow discharge of ponded water down to elevation 2,203.5 feet, but essentially prevent the water level from falling below that elevation. Because the water level in the East Swamp is directly and solely dependent upon inflow from the Grouse Creek drainage, the water level in the swamp may decline below the design level during extended periods of dry weather, due to evapotranspiration, and the area of the East Swamp may shrink in the summer and early fall, as it does now. However, construction of the outlet control weir will raise the discharge elevation from the East Swamp by approximately two feet above the elevation of the existing channel mouth, and wetting of the swamp will be prolonged to a significantly greater extent than if no outlet control weir were to be constructed.

2.2.2.2 West Swamp Outlet

To minimize water level fluctuations in the West Swamp, and to maintain unexcavated tailings in a submerged condition, as discussed in Section 2.2.1, an outlet control weir will be

constructed across the outlet channel from the swamp, approximately 175 feet upstream from the existing culvert under Highway 10, as shown on Drawing 2339-1. As previously noted, the weir will be constructed with a discharge spillway at elevation 2,189 feet AMSL. If water supplies allow, the West Swamp water level will be maintained at this elevation year-round.

The outlet control weirs in each swamp will be constructed of compacted earth fill, founded on firm, undisturbed native soils, and will include a reinforced concrete sill and seepage barrier across the crest and an armored spillway on the balance of the crest and the downstream face. This design will permit free overflow of water to the prescribed elevation, without risk of erosion of the structure. Details of the outlet control weirs are shown on Drawing 2339-4. Downstream of the West Swamp outlet, flow will be directed through the existing culvert under old Highway 10 and westward in the existing channel to Pine Creek.

2.2.2.3 North Channel

Discharge from the East Swamp is conveyed to the West Swamp via the North Channel. This channel is approximately 2,800 feet long and is located between the north embankment of Page Pond and the railroad embankment. The exposed accumulation of tailings present at the mouth of the North Channel, near the existing decant discharge, and others that may be found along the length of the channel, will be removed, except where such removal is technically unfeasible or where tailings will be subsequently capped as a result of slope regrading or construction of the expanded West Bench repository. It is expected that the volume of tailings that may be removed from the North Channel area may be approximately 2,500 cubic yards. This material will be disposed of on the existing West Bench area, along with other tailings excavated from the West Swamp. Such removal will result in an increased channel cross section, but is not expected to significantly affect the overall channel gradient or roughness. The North Channel will

provide sufficient capacity to convey the 100-year, 24-hour design flood flow of 127 cfs.

2.2.2.4 South Channel (East)

This channel lies along the south side of Page Pond, between the impoundment embankment and old US Highway 10, east of the access road into the Page Pond area and to the PPWTP. It carries runoff from the highway embankment and from the southeast embankment of Page Pond, as well as some seepage from Page Pond, eastward to the East Swamp. The catchment area for this channel is small and, consequently, the flow in the channel is also small. During regrading of the Page Pond embankment slopes, exposed tailings encountered in the channel will be removed, subject to technical feasibility, and transported to the West Bench for final disposal. The channel will be graded and improved, as necessary, to ensure positive drainage. An existing high point, part way between the East Swamp and the Page Pond access road, prevents westerly flow from the East Swamp along this route.

2.2.2.5 South Channel (West)

This channel lies along the south side of Page Pond, between the impoundment embankment and old Highway 10, west of the Page Pond access road. In addition to surface runoff from the highway and the south embankment, as well as embankment seepage, the channel also receives the flow from Humboldt Gulch and conveys it to the West Swamp. This channel, which is currently heavily encumbered with beaver dams, will be restored and upgraded, as necessary, to convey the peak design flow from Humboldt Creek and riprap will be placed along a portion of the toe of the south embankment to protect the impingement area against erosive forces resulting from flood events in Humboldt Creek. This riprap blanket will be approximately 18 inches thick with a D_{50} particle size of approximately 12 inches as shown on Drawing 2339-4. The riprap will be placed on a non-woven geotextile filter layer (10 oz./sy minimum), anchored into the north bank of the channel, and will

extend westward approximately 600 feet from the Humboldt Creek confluence. The riprap blanket will extend up the slope from the toe of the embankment, a minimum of 4 feet vertically, and will be set in a key trench at the toe of the slope to ensure stability. Depending upon the final alignment of the restored south channel, a similar riprap blanket may also be placed to protect the toe of the south embankment of the expanded West Bench repository from erosion.

2.2.3 Page Pond Cover Fill And Slope Grading

The present embankments of Page Pond have slopes as steep as 1.2:1, which, in the absence of a stability analysis, do not satisfy the requirements set out in the State of Idaho Rules and Regulations for Mine Tailings Impoundment Structures, and which are also generally considered to be too steep to allow successful establishment of permanent vegetation. Although these embankments have been stable for many years, they will be regraded to achieve slopes of 2:1 or flatter. Where space allows, material may be pushed down from the top of the existing embankment to form a toe fillet and flatten the slope. In most cases, however, it is expected that the required width of such a toe fillet will be too narrow to place and compact efficiently with conventional equipment. Consequently, the slopes will generally be flattened by cutting back the upper portion of the embankment as shown in the typical embankment sections on Drawing 2339-4. It is estimated that approximately 8,000 to 10,000 cy of cut and/or fill will be required to regrade the north, east, and south embankments. The current west embankment of Page Pond will not require regrading, as this portion of the impoundment will be buried by the westward extension of the West Bench and will therefore be buttressed and stabilized by new fill material. As discussed at the beginning of this section, specific determination of the appropriate remedial design for a given location will be determined in the field during the course of implementation, subject to the established performance criteria for the applicable component of the work and procedures that will be set out in the Remedial Action Work Plan.

Residential soils have been placed on the East Bench as part of the ongoing Area I Residential Yards Remediation Program. Based on recently conducted field surveys, the remaining disposal capacity of the East Bench repository is estimated to be approximately 40,000 cy. This remaining capacity is located primarily at the north end of the East Bench area, with some small localized pockets remaining in the southern portion of the area. Materials will continue to be placed on the East Bench until the remaining capacity is exhausted and the surface of the area will be graded such that drainage is away from the PPWTP berms. The configuration of the existing fill on the East Bench indicates a drainage pattern toward a discharge location near the mid-point of the east embankment as shown on Drawing 2339-1. The balance of the residential soils disposed of on the East Bench will be placed and graded to flow to this point, where a reinforced concrete spillway will be constructed to convey the flows safely down the embankment to the East Swamp. Typical cross-sections showing the existing and proposed final grades for the East Bench repository are presented on Drawing 2339-3.

Excavation of tailings from the West Beach, North Channel, and other small areas is expected to produce approximately 30,000 to 40,000 cy of material. This material will be placed on the existing West Bench area and subsequently covered with residential soils. Recent surveys show that the remaining disposal capacity of the existing West Bench facility is approximately 205,000 cy. Expansion of the West Bench repository, as shown on Drawings 2339-1 and 2339-2, will provide a further disposal capacity of approximately 140,000 cy. The West Bench Repository Expansion will be established and raised to match the existing West Bench grade before any further residential soils, other than those required to cover the excavated West Swamp tailings, are placed on the existing West Bench. Early establishment of the expansion area will ensure expeditious capping of the exposed tailings in the West Fan and will facilitate efficient construction of the repository and stabilization of the existing west embankment.

All materials deposited in the Page Pond repositories will be placed in uniform lifts and graded to maintain positive drainage. No specific compaction of the materials will be required. Sufficient compaction will be achieved through the movement of placement and grading equipment over the material. Also, due to the fact that the material will be placed over an extended period of time, the materials in the repository will be effectively preloaded and consolidated by the weight of the subsequently placed material.

The final height and surface grade of the West Bench repository will be a function of the volume of material deposited there. In the interim, temporary drainage controls will be maintained to convey runoff flows safely across the interim surface and down the embankment face. Such measures will include appropriate interim grading and a temporary culvert spillway whose position can be adjusted, as needed, to suit the evolving embankment as filling occurs. Grading of the surface of the West Bench fill materials will be an ongoing process as the material is placed, to avoid creation of pockets that might trap runoff and allow excessive infiltration. When placement of material on the West Bench is complete, a permanent berm will be constructed around the perimeter of the embankment crest to restrict sheet flow down the face of the embankment and to direct runoff to the discharge point at the northwest corner of the repository and down a concrete spillway to the North Channel. Typical details of the drainage spillways for the East and West Benches are shown on Drawing 2339-4.

As shown on Drawing 2339-2, the toe of the new west embankment will be approximately 300 feet to the west of the present embankment toe. The existing ground elevation at the location of the new toe is approximately 2193 feet AMSL, which is approximately four feet above the weir crest elevation at the outlet from the West Swamp. Therefore, the expanded fill area will not be subject to inundation by flood flows. Because the residential soils from which the majority of the expanded West Bench will be constructed

likely possess lower strength properties than the materials traditionally used to construct the embankments (e.g., mine waste rock), the perimeter faces of the expanded West Bench will be constructed at a relatively gentle slope of 3(h):1(v) rather than the steeper slope of 2(h):1(v) allowed by the State of Idaho regulations. The final surface of the West Bench Repository will be graded away from the crest of the existing PPWTP west embankment at a slope of approximately 1.0 percent. If the volume of contaminated soil deposited in the West Bench repository is less than anticipated, the slope of the final closure surface may be generally steeper than 1.0 percent, or a step may be incorporated into the final contours. The general slope over any significant area, however, will be restricted to not more than 1.5 percent to avoid increased erosion potential. Regardless of final configuration, the surface of the fill material on the West Bench will be graded to direct runoff toward the discharge spillway at the northwest corner of the expanded facility.

2.2.4 Long-Term Disposal Of Contaminated Soils

Upon completion of the Area I Residential Yards Remediation Program, the filled portion of the West Bench Repository will be graded to its final configuration, revegetated and closed to further materials disposal. Fill placement operations during the course of the Residential Yards Remediation Program will be coordinated such that the capacity remaining upon completion of the program will be conveniently accessible. As discussed in Section 2.1.3, the remaining capacity of the West Bench Repository expected to be available for long-term disposal of soils under the ICP is estimated to be approximately 60,000 cy. Should the volume of soils generated after the completion of the Residential Yards Remediation Program exceed the anticipated residual disposal capacity, the final grade of the West Bench closure surface could be extended upward to accommodate the additional volume, provided that adequate drainage provisions were made to avoid runoff flowing back into the PPWTP ponds. During the course of placement of soils from the Residential Yards Remediation Program, volumes of disposed

materials will be continually monitored, relative to remaining disposal capacity, and if it appears that the quantity estimates on which the design are based are inaccurate, adjustments will be made to the design to ensure that sufficient residual capacity is provided for future ICP disposal requirements.

2.2.5 Embankment Soil Cover And Revegetation

After the existing Page Pond embankment slopes have been regraded, as necessary to improve stability, a minimum 6-inch thick layer of residential soils will be spread over the slopes to provide a suitable growth medium for revegetation. It is estimated that approximately 5,000 cy of this cover material will be required for this purpose. This cover layer will be continuous with the residential soil fills comprising the majority of the East and West Benches, to produce a consistent final cover surface over all areas of the Page Pond Repositories, except those being used for the PPWTP. A typical cross-section showing the cover layer and its relationship to the bulk of the fill material is shown on Drawing 2339-4. The entire area will then be planted with appropriate native grasses.

2.2.6 Wetlands Enhancement Revegetation

In wetland areas such as West Beach and the North Channel, where tailings removal has occurred, limited plantings of indigenous wetland species will be implemented. Such species may include, but may not be limited to, Scirpus spp. and/or Typha spp. Planting of such species should accelerate overall wetland enhancement. Such plantings will typically consist of a one-time effort, however, if large-scale die-off occurs, additional plantings may be conducted. Locations of plantings will be dependent upon removal activities and the extent of natural vegetation establishment.

2.2.7 Security Fencing

Access to the Page Pond Closure area, and specfically to the repository area, will be restricted to authorized personnel. For the most part, the repository area will be isolated from public areas by water in the swamps and channels. At the point of vehicle access to the site, the existing fencing and gates will be maintained and upgraded, if necessary, to limit unauthorized entry. Along the north and west sides of the repository, foot access to the repository may be possible if the water level in the North Channel falls during dry periods of the year. Therefore, new fencing will be installed along the north toe of the existing repository embankment and extending along the west and southwest toes of the West Bench Expansion Area to a point where access is no longer considered to be probable. The anticipated location of the new fencing is shown on Drawing 2339-1 and typical details of the fencing are shown on Drawing 2339-4. The actual extent of need for such fencing will be determined in the field, based on an examination of the surrounding physical barriers and an assessment of the possibility for unauthorized entry. The locations of any new fencing will be identified in respective annual work plans and documented on as-built drawings. Warning signs will be posted along the fence line to alert possible intruders of the potential risk of exposure to contaminated materials within the restricted area.

3.0 CONSTRUCTION

3.1 SEQUENCE OF REMEDIAL ACTIVITIES

Remediation of the Page Pond site will be conducted over a period of years, due to the extended nature of the Residential Yards Remediation Program. However, certain of the Page Pond remedial actions are not dependent upon the residential soils work and, therefore, can be completed nearer to the outset of the remedial program and in a shorter period of time. Such actions include excavation and disposal of tailings; channel restoration and upgrading; construction of outlet control weirs; and regrading, cover placement and revegetation of the existing embankments. As described in Section 2.2.1, tailings removal will be conducted early in the closure program in order to expedite the mitigation of possible contaminant migration, ensure placement of the tailings on the West Bench such that they can be promptly and securely covered with residential soils, allow subsequent construction of the outlet control weirs in areas where there are currently accumulations of tailings, and permit early establishment of wetlands vegetation in the excavation areas.

Deposition of residential soils will initially continue to be directed to the East Bench Repository, in order to complete the filling operations there and allow final grading, vegetation and closure of that area. Placement of further residential soils will then focus on establishment of the West Bench Expansion Area and raising the fill in that area to the level of the existing West Bench, before further soils are placed on the existing West Bench. This will ensure expedited capping of the exposed tailings in the West Fan and buttressing of the existing west embankment and will also facilitate efficient material placement and grading of the full surface of the West Bench Repository to promote maintenance of suitable drainage slopes and patterns.

Channel upgrading can proceed independently of the other remedial actions, but should be conducted early in the program to

ensure that capacity is available to accommodate possible storm flows and that armoring is in place to protect embankment slopes at the Humboldt Creek discharge, should a flood event occur. Construction of the outlet control weirs should be conducted as soon as possible after excavation of tailings is completed. This will provide for adequate innundation of any remaining tailings and will permit establishment of favorable conditions for the development of wetland vegetation.

Embankment stabilization work can also proceed at any time during the program, as it is only nominally dependent on other remediation activities. It is preferable to expedite this work, however, to ensure the desired stability of the slopes and to permit placement of the final cover layer and establishment of vegetation to reduce the potential for erosion of the slopes. Permanent drainage control works on the Page Pond Benches will be constructed upon completion of soils deposition and final grading. Temporary facilities will be provided in the interim.

3.2 FIELD DESIGN OF REMEDIAL WORKS

As discussed in Section 2.2, implementation of much of the Page Pond remedy will be best achieved through on-site, field application of proto-typical design details and performance criteria. This approach applies particularly to the excavation of tailings from the wetland areas; placement and grading of tailings and residential soils in the repositories; regrading of the embankments; and restoration and upgrading of the channels. Field application of prototype designs will typically involve inspection and possibly further survey of the area being remediated, at the time of implementation, and selection or adaptation, by a qualified, on-site designer/ constructor, of the appropriate design details presented in this Final RDR to suit the as-found conditions. Substantive changes or modifications to the proto-typical design details and/or performance standards presented in this RDR must be approved by the agencies prior to field

application. Details of the remedial actions implemented will then be recorded on as-built drawings.

3.3 TAILINGS EXCAVATION AND PLACEMENT

Tailings excavation and removal will be conducted during the late summer or fall, when the water level in the West Swamp has fallen to its lowest elevation. Where necessary, a temporary drainage ditch may be constructed along the leading edge of the excavation area to encourage further temporary lowering of the water table and a berm may be constructed between the remaining body of water and the excavation area to prevent reflooding of the West Beach area while excavation is underway. Exposed tailings lying above elevation 2,187 feet AMSL will be excavated, to the extent that such excavation is technically feasible, and loaded into trucks for transport to the West Bench Repository. Technical feasibility of removal will be determined at the time of excavation as a function of the moisture content of the tailings and the efficacy of excavating and hauling the material with conventional equipment, without exacerbating the potential risks of contaminant release and migration as a result of the removal operation. Exposed tailings in other areas of the West Swamp and the North Channel will also be excavated during the same time period, subject to technical feasibility. In all cases, the selection of equipment and construction methodology to employ in this aspect of the work will reflect an awareness of the need to preserve the existing wetlands vegetation and habitat, to the maximum extent practicable. It is expected that hydraulic excavators, rubber-tired loaders and trucks will be used for the most part.

A temporary haul road, including two temporary railway crossings, will be constructed north of the railroad embankment, and a temporary channel crossing and access ramp will be constructed at the northwest corner of the existing impoundment to permit transport of the excavated materials from the West Beach area to the repository without necessitating travel on public roads. Upon completion of the tailings excavation and transport

operations, the temporary haul road and channel crossing will be removed. A controlled access road will be constructed along the south perimeter of the PPWTP aeration ponds to the West Bench to allow ongoing transport of residential soils to the repository area. This access route will remain beyond the completion of the closure activities, to permit access under the ICP.

Dust control measures will be implemented during all excavation and regrading operations at the site. These measures may include the application of water and/or polymer sprays, applied by trucks or other appropriate distribution equipment to the surfaces of haul roads and excavation and regrading areas during dry or windy periods, as necessary.

Tailings material will be placed on the West Bench of Page Pond in lifts approximately 18-inches to 2-feet thick and will be compacted by the normal travel of the earthmoving equipment during spreading and grading operations. Tailings and other materials placed on the Page Pond Benches will be regularly graded to promote positive surface drainage toward the discharge spillways. Such grading will continue throughout the course of the closure program. Periodic inspections of the interim surface of the deposited materials will be conducted to identify localized depressions that could allow undesirable ponding and infiltration of precipitation. Any such depressions identified will be promptly filled or graded out to restore appropriate drainage patterns. Upon completion of filling operations, the repository area will be final graded and the surface will be compacted in preparation for vegetation establishment. Allowable tolerances in the slope of the final grading will be plus or minus 0.5 percent from that designed.

3.4 EMBANKMENT SLOPE REGRADING

The existing embankment slopes will be regraded, as necessary, to yield a finished slope of 2:1 or flatter. As discussed earlier, this regrading will be achieved either by constructing a compacted toe fill against the lower portion of the embankment or by pulling

material up the slope and into the repository area. It is anticipated that the latter method will be most commonly employed. Standard earthmoving equipment such as long-reach hydraulic excavators and dozers will be utilized for this work. In most instances, it is expected that excavators will be able to work from the crest of the existing embankments. If a structural fill is placed at the toe of an embankment to achieve the desired 2:1 slope, the material used to construct the fill will be select granular material and this material will be placed in lifts approximately 8 inches thick and compacted using appropriately sized, motorized compactors to a dry density equivalent to 90% of optimum, as determined by the modified Proctor test protocol (ASTM D-1557). All embankment stabilization activities will be performed in a manner that limits the potential for disturbance to existing vegetation along the toe of the embankments. As previously described, the perimeter slopes of fills constructed of the residential soils will be graded to slopes of 3:1 or flatter, reflecting the lower anticipated strength properties of this materials, compared to the mine waste rock used to construct the original Page Pond embankments.

3.5 DRAINAGE AND CONTROLS

Construction of surface runoff spillways, flow control weirs and other drainage works will be done using conventional methods and equipment. Because of the relatively small size of the permanent spillways, dimensional tolerances of plus or minus 0.1 foot will be imposed. Construction tolerances for earthworks component of the flow control weirs are less sensitive, because of their larger scale. Dimensional tolerances for these will be maintained in the range of plus or minus 0.5 foot, with the exception that the elevations of the respective weir crests will be held to a tolerance of 0.05 foot. Spillway, channel and outlet control weir cross-sections will be confirmed by field survey, at appropriate intervals and milestones, to ensure that design tolerances are met.

Construction of modifications to existing channels will be performed so as to limit disturbance to existing wetland vegetation. Riprap installed along the south channel embankment, west of the Humboldt Creek confluence, and as part of the outlet control weirs will be placed or carefully dumped, so as not to damage the geotextile filter layer underlying the rock. The thickness of the riprap blankets will be held to a tolerance of minus 0 inches to plus 3 inches. The geotextile material will be installed in accordance with the manufacturers recommendations and the project specifications.

3.6 FINAL SURVEYING

Upon completion of remedial activities at Page Pond, a Construction Completion Report will be prepared as mandated by the SOW. This report will include as-built drawings showing the location and extent of respective remedial actions at the site and final details, dimensions and elevations of the closure works. These drawings will be signed and stamped by an Idaho-registered Professional Engineer.

4.0 OPERATION & MAINTENANCE

A plan will be prepared in conjunction with preparation of the Page Pond Remedial Action Work Plan that addresses long-term O&M requirements for all aspects of the Page Pond closure. The plan will identify the specific post-remediation activities required to maintain remedy effectiveness at Page Pond and will include, but may not be limited to:

- operational procedures;
- operational emergency response;
- maintenance procedures and schedules;
- monitoring procedures and schedules;
- long-term biomonitoring (after closure);
- parts and equipment inventory; and
- a plan for demonstrating compliance with the applicable objectives and Performance Standards.

Operation and maintenance activities at the tailings and residential soils repository portions of Page Pond will continue for at least five years following completion of the Populated Areas Yard Remediation Program. At that point in time, the remaining active portion of the repository will become the responsibility of the ICP. As such, the ICP developed for the Bunker Hill Superfund Site is expected to accomplish the long-term operations and maintenance requirements for the remediation activities addressed by this Final RDR.

4.1 COVER LAYER

The cover layer of the Page Pond closure will be inspected regularly during the post closure period, primarily to detect localized differential settlement and erosion. Regular inspections will be performed on a semi-annual basis and after major storm

events, during the first three years following closure. The inspections will include assessments of vegetative cover on the final closure cap to evaluate whether the 85 percent cover criterion has been achieved.

Some maintenance may be required if unanticipated conditions develop that may inhibit the performance of the remedy. Areas of the covers or embankments where loss of vegetation from sheet, rill, or gully erosion is detected will be restored with new soil and reseeded. Repair of runoff control berms around the perimeter of the covers will also be performed, if required. Any areas of the closure showing evidence of ponding following precipitation events, or differential settlement which may inhibit free drainage, will be filled with borrow soils, regraded and reseeded.

Five years after closure, if no additional erosion or settlement problems are encountered, inspection frequencies will be reduced to once per year, with additional, unscheduled inspections following major storm events.

4.2 DRAINAGE AND CONTROLS

Drainage and control facilities, including runoff spillways, ditches, and control weirs will be inspected on a semi-annual basis and after significant precipitation events for the first five years following closure. The frequency may then be reduced to once per year. They will be inspected for erosion, displaced riprap, loss of vegetation, slope sloughing, or debris deposition in ditches and channels.

Periodic maintenance procedures may include removal of debris from ditches and channels, repair of eroded or sloughed areas, repair of displaced riprap and reseeding, if required.

5.0 ENVIRONMENTAL MONITORING AND REPORTING

Monitoring of the Page Pond closure area will include assessment of selected water chemistry, sediment chemistry, and biological parameters. The monitoring program is discussed below.

5.1 WATER CHEMISTRY

Surface drainage inflow and outflow locations will be monitored for lead, cadmium, zinc, arsenic, and total suspended solids (TSS). Water samples will be analyzed for total and dissolved metals according to standard methods (EPA, 1986). Sampling locations will be:

Inflow stations:

- Grouse Creek at inflow to East Swamp; and
- Humboldt Creek at inflow to West Swamp.

Outflow stations:

- Outlet of East Swamp to North Channel;
- Outlet of West Swamp at flow control weir upgradient of Pine Creek.

Sampling will occur twice per year in the year prior to remediation and in the first five years following remediation. Sampling will occur in:

- Spring during high flow period; and
- Fall during low flow period.

5.2 SEDIMENT AND SOIL CHEMISTRY

Sediments and soils in East and West Swamps will be sampled and analyzed to assess concentrations of lead, zinc, cadmium and arsenic. The sampling transects presented in the Page Pond Soil Sampling Results report (T-series transects only) will be replicated. A further transect (to be identified as T-0) will be

sampled at the location of transect D-2, in order to ensure that sampling extends over the full length of the West Swamp. The transect locations will be permanently located, with surveyed marker posts, to facilitate sampling replication. Chemical analyses for analytes will be accomplished by standard methods as outlined in the Page Pond Soil Sampling Results report. Sediments will be sampled using a hand auger (3-inch diameter) or, preferably, a hollow core push-tube type sampler, along the specified transects according to the scheme reported in the Page Pond Soil Sampling Results report, with the exception that only the 0- to 3-inch and 3- to 6-inch depths will be sampled. This total sampling depth corresponds to the primary biologically active zone of wetland sediment. Samples of material from the litter layer will be analyzed separately from underlying soils and sediment. Visual observations as to the thickness of the litter layer will also be made. Sediments and soils will be sampled twice: once as soon as practical after site closure and again in five years.

5.3 BIOMONITORING

Biomonitoring will be conducted at the Page Pond closure site to:

- assess changes in wetland habitat conditions resulting from the wet closure action; and
- document that site ponds and wetlands are not attractive nuisances to wildlife due to the presence of lead, zinc, cadmium or arsenic.

The proposed biomonitoring program will document the following site characteristics:

- dominant vegetation and percent cover on the basis of water depth or substrate type (e.g., rock, silt, etc.), including the apparent health of dominant vegetation;
- relative population abundances and metal body-burdens of resident wild rodents;

- the species composition and apparent health of nesting songbirds; and
- the species composition, nesting success and apparent health of resident waterfowl.

The biomonitoring program will be conducted by a qualified biologist and will be qualitative to semi-quantitative. Interpretation of field data will rely to a certain degree on best scientific judgement to assess monitoring results in relation to site closure objectives. This standard practice has been used elsewhere in USEPA-sponsored ecological effects assessment programs (e.g., ETI, 1993). The biomonitoring program will begin in the year prior to remediation and will be conducted in each year during the initial five year post-closure period. Vegetation and wild rodents will be monitored once per year whereas birds and waterfowl will be monitored twice per year. A five-year time frame is sufficient for a mature wetland system to develop and for any unanticipated ecological effects to become manifest.

5.3.1 Reconnaissance Survey of Vegetation

A general vegetation reconnaissance survey at the Page Pond closure area (Page tailings impoundment and East and West Swamps) will begin in the year prior to remediation and will continue once each year for the first five years post-closure. The survey will be conducted according to standard field techniques (e.g., Kuchler and Zonneveld, 1988). Aerial photographs with field truthing will be used to prepare appropriate vegetation maps. The primary requirement for annual overflight photography is that it must be done each year during the peak biomass period of late July to early August before leaf-fall occurs. If annual aerial photography of the site already is included in the hillsides revegetation surveys to be conducted by others, a blowup of the Page Pond area from the master photograph will be produced by the Settling Defendants. If not available, a low-elevation photographic survey of Page Pond will be conducted by the Settling Defendants.

Aerial photography and field data analyses will include an assessment of:

- aerial distribution of dominant habitat types;
- description of dominant vegetation within habitat types; and
- an estimate of relative percent cover (0 - 25 percent, 25 - 50 percent, 50 - 85 percent and 85 - 100 percent) for each habitat type.

Dominant habitat types will be determined, in part, by physical characteristics such as water depth and substrate type. These data will be compared to nearby reference sites having an equivalent stage of vegetation maturity. Qualitative ground truthing will be conducted to verify the maps generated from aerial photographs. The apparent health of dominant vegetation in Page Pond system will be visually determined and documented at that time. Plant health will be evaluated from relative plant height, general vegetation color (e.g., signs of plant stress such as chlorotic conditions), and any other obvious condition including the presence of plant pests (defoliating caterpillars, etc.). These observations will be recorded in field notebooks and summarized in the field reports.

5.3.2 Survey of Resident Wild Rodents

A survey of wild rodents at the Page Pond closure area will begin in the year prior to remediation and will continue once each year for the first five years post-closure. The objectives of monitoring wild rodents at Page Pond will be to monitor their metal-body burdens and to demonstrate that the wet closure habitat contains normal rodent populations. The analytes to be monitored will include lead, cadmium, zinc and arsenic.

Wild rodents will be trapped over a minimum of three trap nights during the peak population period from approximately late July through mid-August. Approximately 25 live traps will be used

per acre of viable habitat according to standard field techniques. Traps will be equally distributed among habitat types to survey a representative selection of habitats and resident rodents. Trapping success will be recorded for each habitat type and trap number to obtain relative population abundance information. Approximately ten small rodents (mice and voles) will be randomly selected from the total catch and sacrificed for analysis of body-burdens.

Individual rodents will be analyzed using standard clean laboratory technique as follows. Of the approximately ten individuals collected, three will be randomly selected and dissected to determine the percent body burdens found in muscle, viscera, and hard body parts (bone, skin, fur). The remaining seven individuals will be processed for whole-body burdens.

Results of the trapping effort and laboratory analyses of metals will be compared to nearby reference sites. Reference sites will be comparable in terms of community structure or type of habitats and will include information from the Milltown Reservoir, MT, site where an extensive study of rodents and associated tissue residues has recently been conducted (ETI, 1993).

5.3.3 Survey of Song Birds

While use of the wet closure area by songbirds is expected to parallel the development of vegetation structural habitat, bird species diversity and presence of breeding pairs are useful indicators of system ecological health as found elsewhere in metal-enriched wetlands (ETI, 1993). Therefore, a site reconnaissance survey will be conducted twice each year during the year prior to remediation and for the first five years post-closure to document use of the Page Pond closure area by songbirds. The timing of the surveys will encompass the peak nesting period and will include early spring and early summer.

Routine bird surveys of the site will be conducted using the stratified random transect method according to standard field techniques. Each survey will determine the bird species composition and will provide information to estimate semi-quantitatively the average densities encountered in dominant habitat types. Special attention will be made to nesting birds, and songbird nests will be counted while running the transect surveys. While the survey is being conducted, the field crew will record the number of sick or dead birds observed according to species. These field observations will be compared to typical ranges of such data for riparian/wetland sites found regionally.

5.3.4 Survey of Waterfowl Nesting Success

A routine reconnaissance survey of waterfowl use of the Page Pond closure area will be conducted using the stratified random transect method according to standard field techniques. As possible, these surveys will be done simultaneous with the songbird surveys, as described above. Two nest counts will be made each year: early in breeding season (typically mid-spring) to catch the early nesting individuals (April-May) and in early summer (June) to catch later nesting birds. While the survey is being conducted, the field crew will record the number of sick or dead waterfowl observed according to species. Field observations on waterfowl nesting success and apparent health of individuals observed will be compared to typical ranges of such data for riparian/wetland sites found regionally.

5.4 LONG-TERM MONITORING

Long-term monitoring may be necessary after completion of the initial five-year monitoring program. The requirement for long-term environmental monitoring of the Page Pond closure area by the Settling Defendants is dependent upon the following considerations:

- The discharge of PPWTP effluent to the swamp closure area;

- The results of the initial five years of monitoring; and
- The requirements for monitoring imposed upon the PPWTP under NPDES.

As noted previously, it is anticipated that the wet closure system will reach maturity within five years of closure completion. Given this assumption, water quality and general wetland conditions would be controlled by the discharge of PPWTP effluent to the system, should this option be implemented. If monitoring results for the initial five years indicate system maturation and stability, and the NPDES monitoring requirements are in place, additional monitoring may not be required. The EPA, IDHW, and Settling Defendants will review the final monitoring report for the initial five-year period, considering the above conditions, to determine what future monitoring, if any, is required. If long-term monitoring is required, portions or all of the program defined above will be implemented once during every five years for an additional 15 years following the first five-year post-closure monitoring period. Under this scenario, the overall program will be carried on for 20 years post-closure.

5.5 REPORTING REQUIREMENTS

A Page Pond Annual Monitoring Report will be prepared for each year that site monitoring is conducted. The report will include all field data collected during the previous calendar year and appropriate analyses. The report will include:

- data collected with tabular and graphical presentations;
- comparisons of site data to similar data from reference systems; and
- comparisons of most recent monitoring data to previous years data for the site.

The annual report will be delivered to appropriate agencies within 90 days of the end of the sampling season. If it is determined that additional monitoring is required, beyond the first five-year

period, monitoring reports will be submitted within 90 days of the end of each sampling season.

6.0 FUTURE DELIVERABLES (PLANS AND REPORTS)

The following described plans and reports will be submitted to IDHW and/or EPA for the Page Pond Element of Work in Area I.

6.1 GENERAL PROJECT MANAGEMENT

6.1.1 Project Management Monthly Reports

Monthly reports submitted pursuant to Section XI of the Consent Decree will include a section on the Page Pond Element of Work when applicable. The Page Pond section will include the following basic information:

- General description of the work.
- Activities/tasks undertaken during the reporting period, and expected to be undertaken during the next reporting period.
- Identification of issues and actions that have been or are being taken to resolve the issues.
- Status of the Page Pond remediation schedule and any proposed schedule changes.

6.1.2 Technical Memoranda

Technical memoranda are the mechanism for requesting modification of plans, designs, and schedules. Technical memoranda will not be prepared or required for non-material field changes that have been approved by the agencies. In the event that the Settling Defendants determine that modification of an approved plan, design, or schedule is necessary, the Settling Defendants will submit a written request for the modification to the Agency Project Coordinators which will include, but will not be limited to, the following information:

- General description of and purpose for the modification.
- Justification, including necessary calculations, if any, for the modification.
- Actions to be taken to implement the modification, including any actions related to subsidiary documents, milestone events, or activities affected by the modification.
- Recommendations.

6.2 REMEDIAL DESIGN

This document reflects the comments and requested modifications received from the EPA and the State of Idaho regarding the Page Pond Closure Draft Final RDR and is submitted as the Final RDR. No further design reports will be required beyond the submittal of the Final RDR.

6.3 REMEDIAL ACTION

6.3.1 Page Pond Remedial Action Work Plan

Following completion of the remedial design phase, the Settling Defendants will submit a conceptual work plan outlining the proposed Page Pond closure remediation activities. A draft of this work plan will be submitted to the agencies by March 1, 1995. Agency comments on the draft work plan will be addressed in the Final Page Pond Remedial Action Work Plan. At a minimum the Final Page Pond Remedial Action Work Plan will include:

- the scope of proposed remediation;
- a map showing areas proposed for remediation during the construction season;
- a remediation schedule for the construction season;
- any deviations or changes from work tasks or procedures outlined in the Final Page Pond RDR;
- a plan for coordinating, integrating, and communicating with various agencies;

- a description of deliverables and milestones during the construction season; and
- a discussion of any health and safety issues particular to Page Pond.

The Residential Areas Annual Remedial Action Work Plan (RAARAWP) submitted to the agencies on an annual basis will provide the specific design criteria and description of the work to be conducted during the subject construction season at Page Pond. The Page Pond section of the RAARAWP will be consistent with the Page Pond Final RDR and Page Pond Final Remedial Action Work Plan.

6.3.2 Health and Safety

As noted in the SOW, a Remedial Action Health and Safety Plan will be prepared that comprehensively addresses construction work in Area I. Health and safety issues specific to the Page Pond Element of Work will be addressed in the Page Pond Remedial Action Work Plan. As noted above, a draft of this work plan will be submitted for agency approval prior to the commencement of remediation activities. The health and safety portion of the Remedial Action Work Plan will include a description of any monitoring activities to be undertaken during remediation of the Page Pond.

6.3.3 Construction Completion Report

The Construction Completion Report will be submitted 60 days following the completion of construction activities at Page Pond. The report will provide evaluations of Completion of Work, relative to the scope outlined in the Final Page Pond Remedial Action Work Plan. The Construction Completion Report will include, but will not necessarily be limited to the following:

- an overall description of the Report, including its purpose, and an overall description of the Work covered by the Report;

- an overall description of the construction components of the Work, and all associated facilities, appurtenances, and piping; and
- as-built plans and specifications, including:
  - construction QA/QC records; and
  - summaries of any modifications implemented by Technical Memoranda.

An Idaho-registered Professional Engineer will sign and stamp as-built plans for the Page Pond Element of Work.

6.3.4 Post-Closure O&M Plan

The Post-Closure O&M Plan for Page Pond will address the specific post-remediation activities required to maintain the effectiveness of the remedy. The Plan will address, but will not necessarily be limited to:

- operational procedures;
- operational emergency response;
- maintenance procedures and schedules;
- monitoring procedures and schedules;
- parts and equipment inventories;
- plan for demonstrating compliance with Performance Standards; and
- long-term biomonitoring issues.

6.3.5 Page Pond Annual Monitoring Reports

Reports presenting the results of ongoing monitoring activities at Page Pond will be prepared annually, within 90 days following the conclusion of the sampling season. The reports will include, but will not necessarily be limited to the following:

- results of sediment and water quality monitoring, conducted as specified in Section 6.0;

- results of biomonitoring, conducted as specified in Section 5.0; and
- a brief evaluation of the data from the current year, relative to historical data and biomonitoring data from similar areas in the region.

7.0 CERTIFICATION OF COMPLETION OF REMEDIAL ACTION

A Pre-Certification Inspection will be conducted within 90 days of concluding that the Performance Standards have been attained for the Page Pond Element of Work. Within 30 days of the Pre-Certification Inspection, a Completion of Remedial Action Certification Report will be submitted to IDHW and EPA. This Report will serve as the Settling Defendants' documentation supporting the completion of remedial actions and achievement of Performance Standards at the Page Pond and their request for certification from the agencies. The Report will include, but will not necessarily be limited to:

- an overall description of the Report, including its purpose, and a general description of the Page Pond area, including the Components of Work addressed by the Report;
- findings of the Pre-Certification Inspection, including documentation supporting the claim that the applicable Performance Standards have been attained;
- cross references to as-built drawings in the Construction Completion Reports, as appropriate;
- demonstration that all obligations for the Page Pond Element of Work, as presented in the SOW and the Consent Decree, have been satisfactorily achieved by the Settling Defendants, in accordance with the Consent Decree;
- a statement by the Settling Defendants' Project Coordinator that remedial action has been completed in full satisfaction of the requirements of the Consent Decree; and
- a statement by an Idaho-registered Professional Engineer that the remedial action at Page Pond is in full satisfaction of the requirements of the Consent Decree.

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APPENDIX A

BUNKER HILL SUPERFUND SITE

PAGE POND CLOSURE

TECHNICAL SPECIFICATIONS WITH
CONSTRUCTION QUALITY CONTROL/QUALITY ASSURANCE

Specification Number	Description
01010	Summary of Work
01060	Regulatory Requirements
01505	Mobilization, Preparatory Work and Demobilization
02100	Site Clearing
02130	Dewatering and Surface Water Control During Construction
02200	Earthwork
02900	Vegetation Establishment
03300	Concrete

SECTION 01010
SUMMARY OF WORK

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section includes a general summary of the work to be performed under this Contract.

1.2 RELATED SECTIONS

A. All Contract Documents.

1.3 SCOPE OF WORK

A. The project consists of the tasks required for closure of the Page Pond repository, including:

1. Removal, to a depth of two feet (2') below the design water level in the West Swamp, exposed tailings from the area known as West Beach and from the area in the North Channel surrounding the former decant line near the northeast corner of Page Pond, and placement of the removed tailings on the Page Pond benches for use as grading fill and a sub-base for a vegetated cover. To the extent that tailings in these and other shallow areas cannot be removed, such remaining accumulations of tailings will be covered with a minimum of twelve inches (12") of clean soil and revegetated;

2. Regrading of the Page Pond impoundment dikes to a finished slope of 2:1 or flatter, to enhance slope stability, placement of a minimum of six inches (6") of residential soils on the regraded embankment slopes and revegetation of the slope areas;

3. Placement of potentially contaminated residential soils on the Page Pond benches for use as grading fill and a sub-base for a vegetated cover and development of an extended repository area to the west of the West Bench to accommodate potentially contaminated soils removed during the course of the ongoing residential yards remediation program and future activities within the populated areas;

4. Construction of runoff control berms and discharge spillways to convey surface drainage from the

graded surfaces of the East Bench and West Bench areas;

5. Modification of the existing channels north and south of the Page Pond Impoundment to adequately convey the flows from Humboldt and Grouse Creeks through the Page Swamps and isolate the flows, to the degree practicable, from contact with tailings accumulations;

6. Construction of outlet control weirs at the discharge points from the East and West Page Swamps to maintain consistent water levels in the swamp areas to the degree practicable, throughout the year; and

7. Provision of adequate controls to prevent public access to the remediated areas at Page Pond.

1.4 ADDITIONAL REQUIREMENTS OF CONTRACTOR

A. In the conduct of the construction work described above, Contractor shall:

1. Comply with terms of all permits required for the Work; and

2. Comply with all applicable local, State and Federal health and safety rules and regulations.

END OF SECTION

SECTION 01060
REGULATORY REQUIREMENTS

PART 1 GENERAL

1.1 CODES AND REGULATIONS

A. Contractor shall comply with all codes and regulations applicable to the Work, including:

1. State of Idaho Rules and Regulations for Mine Tailings Impoundment Structures;

2. Pertinent aspects of RCRA regulations governing disposal of solid wastes and closure of landfills;

3. Sections of the Clean Water Act governing tailings removal and fill placement activities in and adjacent to streams and waterways;

4. Protection of Wetlands Executive Order 11990;

5. Protection of Floodplains Executive Order 11988;

6. Occupational Safety and Health Administration (OSHA) Regulations including 29 CFR 1910.120; and

7. State of Idaho and Federal Department of Transportation Regulations; and

B. In the event of conflicts between the requirements of various codes and regulations, Contractor shall comply with the more stringent code or regulation.

END OF SECTION

SECTION 01505
MOBILIZATION, PREPARATORY WORK AND DEMOBILIZATION

PART 1 GENERAL

1.1 DESCRIPTION

A. This specification covers the requirements for mobilization, preparatory work, temporary facilities, and demobilization.

1.2 RELATED SECTIONS

A. Section 02100 - Site Clearing

B. Section 02130 - Dewatering and Surface-Water Control During Construction

C. Section 02200 - Earthwork

1.3 SUBMITTALS

A. Within 5 days after receipt of Notice to Proceed, Contractor shall submit, to the Company or its Representative, a written plan, with appropriate drawings, identifying all proposed preparatory work including, as applicable, site access and traffic control; construction plan layout; temporary offices and other structures; storage buildings and yards; temporary water supply and distribution; temporary power supply and distribution; and temporary sanitary and personnel decon facilities.

PART 2 PRODUCTS AND EQUIPMENT

A. Contractor shall utilize appropriate and sufficient products and equipment in the conduct of all preparatory work and the establishment of all temporary facilities, consistent with the nature and requirements of the project and the health and safety of workers and the public.

B. Use water trucks and/or approved dust suppressants on haul roads during hauling operations. Use magnesium chloride (Dus-Top), or similar approved product, as necessary.

PART 3 EXECUTION

3.1 MOBILIZATION

A. Following receipt of the Notice to Proceed, Contractor shall mobilize to the Site all labor, materials, equipment, and construction facilities necessary for the proper performance of the Work.

3.2 INSTALLATION OF FACILITIES

A. All preparatory work and installation of temporary facilities shall be done in accordance with applicable codes and regulations.

3.3 SITE SECURITY AND TRAFFIC CONTROL

A. Contractor shall provide temporary fencing, gates, and signs, as necessary, to limit public access to the Site and shall be responsible for the safety of all individuals on the Site.

B. Contractor shall conduct his operations so as not to significantly interfere with the normal flow of traffic on local roads near the Site. Where required by state or local regulations, flagpersons and signage shall be provided to ensure public safety.

3.4 MAINTENANCE AND PROTECTION OF EXISTING DRAINAGE

A. Contractor shall take all necessary precautions to limit disturbance to natural drainageways in the vicinity of the Work, and shall install temporary culverts and other drainage works, as required, to maintain drainageways during construction.

B. Contractor shall control erosion along temporary access roads and provide sedimentation control structures downstream of temporary access roads, and all Work areas.

3.5 ACCESS AND HAUL ROADS

A. Contractor shall properly maintain all access and haul roads necessary for the conduct of the Work. Upon completion of construction, all temporary access and haul roads shall be removed, regraded and revegetated, as required. Remove all spilled materials from public roads, as necessary, and at the completion of hauling. Contractor shall repair any damage to permanent roads and bridges and restore them to a condition equal to or

better than that found at the outset of the project.

B. Contractor shall comply with all posted load limits for local roads and bridges used in transporting materials.

3.6 SITE MAINTENANCE

A. Contractor shall keep the Site free from any unnecessary accumulation of waste materials and rubbish and shall keep the Site in a safe and tidy condition at all times.

3.7 CLEANUP AND DEMOBILIZATION

A. Following completion of the Work, Contractor shall thoroughly clean all equipment that has come into contact with tailings material at an approved decontamination facility, and remove from the site all equipment, materials and temporary facilities not incorporated into the Work.

B. Waste materials, debris and rubbish generated by the Contractor shall be properly collected and disposed of offsite, in accordance with local, state, and federal laws and regulations.

C. Contractor shall leave all areas of the Site in a clean, stable condition.

END OF SECTION

SECTION 02100
SITE CLEARING

PART 1 GENERAL

1.1 DESCRIPTION

A. This section covers the requirements for removal of existing surface debris and clearing of vegetation and organic soils, in preparation for construction of the Works.

1.2 RELATED SECTIONS

A. Section 02200 - Earthwork

1.3 REGULATORY REQUIREMENTS

A. Contractor shall comply with the requirements of all applicable Local, State, or Federal codes regarding clearing and disposal of related debris.

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

3.1 PREPARATION

A. Contractor shall verify the extent of clearing necessary for the conduct of the Work and shall ensure that existing plant life and features designated to remain are clearly tagged or otherwise identified.

3.2 PROTECTION

A. Contractor shall take all necessary precautions to ensure that existing facilities and structures, designated vegetation, and survey control points are protected against damage or displacement.

3.3 PERMITS

A. Contractor shall obtain all necessary permits and pay any applicable fees for removal and/or disposal of cleared materials.

3.4 CLEARING

A. Contractor shall clear only those areas required for access to site and execution of Work, and shall minimize disturbance to adjacent land.

B. Stumps and root systems shall be removed to a depth of 6 inches, within construction areas, unless otherwise directed.

C. Undergrowth and deadwood shall be cleared with minimal disturbance to and no removal of native soils.

END OF SECTION

SECTION 02130
DEWATERING AND SURFACE WATER CONTROL DURING CONSTRUCTION

PART 1 GENERAL

1.1 DESCRIPTION

A. This specification section covers the requirements for dewatering the work areas and controlling surface water and sediment during construction.

1.2 RELATED SECTIONS

A. Section 01505 - Mobilization, Preparatory Work and Demobilization

B. Section 02200 - Earthwork

1.3 QUALITY CONTROL

A. Dewatering, as necessary, shall be conducted in such a way that it does not result in the release of excessive sediments or tailings from the Work areas into adjacent natural watercourses.

B. Contractor shall be fully responsible for complying with all provisions of the applicable stormwater control regulations during all Work at the site.

1.4 SUBMITTALS

A. Contractor shall submit information regarding materials and methods proposed for drainage and sediment control measures at the Site at least five (5) days prior to commencing Work.

PART 2 EQUIPMENT AND PRODUCTS

2.1 EQUIPMENT

A. Contractor shall ensure that sufficient equipment, piping and other appropriate equipment and materials are available on site, prior to commencement of work, such that operation of the surface water control systems can be continuously maintained. All equipment shall be of good quality and in good working order.

2.2 MATERIALS

A. Hay bales, silt fences, or other materials used to

control erosion and sediment transport from work areas shall be new and appropriately sized to serve the intended purpose.

B. Silt fencing material shall be 24 to 30 inches high, and complete with slats to ensure stability during windy periods.

PART 3 EXECUTION

3.1 SITE GRADING

A. Contractor shall grade newly placed materials within the closure area to ensure positive drainage at all times during construction at the site.

B. Contractor shall select storm water management and runoff control methods to minimize direct discharges to adjacent streams and to avoid causing erosion or instability of the work site or adjacent areas.

3.2 SEDIMENT CONTROL AND DIVERSIONS

A. Provide sedimentation control downstream of the Work areas, adjacent to water courses, as required or as directed, to prevent excessive sediment loading to streams.

B. Install silt fences with suitable posts and proper anchorage along the entire length of the silt fence, in accordance with the manufacturer's recommendations.

C. Periodically remove and dewater silt or sediment buildup behind silt fences and sediment control dams and place removed material within the closure area.

END OF SECTION

SECTION 02200
EARTHWORK

PART 1 GENERAL

1.1 DESCRIPTION

A. This section describes the requirements for all earthwork associated with and required by the Project. Earthwork includes excavation, hauling of materials, placement and compaction of fills, placement of rock riprap and geotextile materials, and final grading.

1.2 RELATED SECTIONS

A. Section 01505 - Mobilization, Preparatory Work and Demobilization

B. Section 02100 - Site Clearing

C. Section 02130 - Dewatering and Surface Water Control During Construction

D. Section 02900 - Vegetation Establishment

1.3 MATERIAL CLASSIFICATION

A. The term earthwork applies to all tailings, soil, or rock riprap materials placed, excavated or removed regardless of material characteristics.

1.4 SUBMITTALS

A. Contractor shall submit a description of his proposed methods of excavation, hauling and placement, at least five days prior to commencing work.

B. Contractor shall submit manufacturer's data on geotextiles and other materials, at least five working days prior to beginning work.

1.5 SAFETY

A. Contractor shall conduct all earthwork operations in accordance with OSHA regulations to ensure worker safety, and to protect property from damage during construction.

B. Contractor shall exercise particular cautions during excavation of tailings, which may exhibit elevated concentrations of lead and other metals, which could

present a potential health hazard to Contractor's site personnel, if not properly protected.

C. Contractor shall be fully responsible for the health and safety of all personnel on the Project Site, at all times, and shall take all necessary precautions to protect such health and safety.

D. Contractor shall provide first aid materials and equipment at the Site, as necessary, and shall coordinate with local medical facilities and identify local emergency phone numbers to supplement job site safety and first aid.

E. Work on steep hillsides may present safety hazards to personnel and visitors. These shall be reflected in the Contractor's construction plan. Proper fencing, warning signs, and other precautionary measures, as necessary, shall be implemented.

F. Comply with the requirements of the site Health and Safety Plan.

1.6 DUST AND SEDIMENT CONTROL

A. Contractor shall take adequate precautions to avoid dust emission resulting from earthwork as specified in Sections 01505 and 02130.

B. Contractor shall control release of sediment from excavated areas to limit sediment loading to natural water courses, as specified herein and in Section 02130.

1.7 QUALITY CONTROL

A. Contractor shall use an adequate number of skilled workers experienced in the type of work to be performed.

B. Contractor shall employ the services of an independent laboratory to perform quality control testing for earthwork as specified herein.

C. Where structural fill materials are placed to flatten embankment slopes, Contractor shall perform nuclear instrument testing of compacted soils in accordance with ASTM D2922 or sand-cone testing in accordance with ASTM D1556 to confirm in-place compacted density and moisture of fill materials as compared with ASTM D698 (Standard Proctor Compaction Curve), at a frequency of one test per 1500 cubic yards of compacted fill, maximum. Any area

that fails to meet the compaction acceptance criteria shall be reworked until a subsequent test shows acceptable results.

D. Contractor shall perform construction surveys, as needed, to ensure that the lines and grades of all excavations, embankments, channels, riprap layers, and graded surfaces are in accordance with the design requirements.

E. Owner's Representative will perform periodic quality assurance monitoring. Contractor shall cooperate, as required, in quality assurance monitoring.

PART 2 PRODUCTS

2.1 GRADING AND GENERAL FILL

A. Grading fill shall consist of tailings removed from the West Beach area and the north channel, residential soils and materials recover from the perimeter embankment slopes during flattening operations.

B. Materials used for construction of the vegetative cover layer shall be residential soils, provided that adequate controls are in place to prevent public access to the areas covered with such soils. Where adequate controls are not in place to prevent public access, vegetative cover soils shall consist of "clean soils" containing less than 100 ppm lead, 100 ppm arsenic and 5 ppm cadmium, and no single sample containing more than 150 ppm lead.

2.2 STRUCTURAL FILL MATERIAL

A. Materials used in the construction of the outlet control weirs and for backfill around structures shall consist of locally available, well-graded, silty sand to gravel with no organic material, no rocks larger than 3 inches in maximum dimension, no more than 10 percent by weight passing the No. 200 sieve and no deleterious or otherwise unsuitable material.

2.3 LOW PERMEABILITY MATERIALS

A. Where low permeability materials are required by the design, such materials shall consist of locally available silty materials having at least 30 percent fines (passing the No. 200 sieve) and containing no organic or deleterious or otherwise unsuitable material. Alternately, a synthetic geomembrane (30 mil HDPE or as

otherwise approved) or a geosynthetic clay liner (GCL) may be used.

2.4 GEOTEXTILE MATERIALS

A. Geotextile for use beneath riprap and in sediment control structures shall be a non-woven polyester or polypropylene material having a unit weight of 10 ounces per square yard, and a flow rate of at least 80 gallons/minute/square foot when tested in accordance with ASTM D4491.

B. Geotextile for silt fences shall be woven polypropylene material having a UV resistance of at least 90 percent when tested in accordance with ASTM D4355, and shall have slats for stability during windy periods.

2.5 ROCK FOR RIPRAP

A. Rock for riprap shall be a sound, dense angular rock which is resistant to weathering and is free from large quantities of soil, shale, and organic matter. It shall have a dry specific gravity of at least 2.6. It shall contain no flat or elongated rocks, with the greatest dimension no more than 3 times the least dimension. The rock shall be well graded from 3 to 18 inches, with a D_{50} particle size of 12 inches.

2.6 TEMPORARY EROSION CONTROL MATERIAL

A. Temporary erosion control mats for use in channels and slopes, as shown on the Drawings or as directed by the Engineer shall be Enkamat 7010 as manufactured by Akzo Industrial Systems, Inc., or approved equal.

PART 3 EXECUTION

3.1 EXCAVATION

A. Contractor shall, to the extent practicable, excavate exposed tailings from designated areas in the West Beach and North Channel to an elevation of 2187' Above Mean Sea Level (AMSL), which is two feet (2') below the design sustained water level in the West Swamp, unless otherwise directed by the Engineer.

B. Tailings excavated from the removal areas shall be hauled to the West Bench repository area, spread in lifts of uniform thickness, and graded to promote positive drainage.

C. Contractor shall conduct excavation operations in a manner that will allow continued free drainage of the excavation without passage of drainage flows over or through potentially contaminated materials. Water shall not be permitted to accumulate in excavations. Where necessary, interceptor or diversion channels shall be constructed to convey flows away from excavation areas and to locally lower the water table in the vicinity of the excavation.

D. Channels, spillways and sediment ponds shall be excavated to the lines and grades shown on the Drawings, or as otherwise directed in the field, and temporary culverts and diversion channels shall be used as necessary to convey flows around the work areas during construction.

3.2 UNCOMPACTED FILL

A. Materials placed as the vegetative cover layer shall be placed in a uniform lift of 6 inches minimum thickness.

B. Compaction of this material will not be required other than that achieved by the normal travel of placement and grading equipment.

3.3 COMPACTED FILL

A. Tailings and residential soils deposited in the repository areas shall be placed in uniform lifts of 18 to 24 inches loose thickness and shall be compacted by the normal travel of the earthmoving equipment during spreading and grading operations. Tailings and other materials placed on the Page Pond benches shall be regularly graded to promote positive surface drainage toward the discharge spillways. Such grading shall continue throughout the course of the closure program. Periodic inspections shall be made of the interim surface of the deposited materials to identify localized depressions that could allow undesirable ponding and infiltration of precipitation. Any such depressions so identified shall be promptly filled or graded out to restore appropriate drainage patterns.

B. Structural fill materials for construction of outlet control weirs and runoff control berms and for backfill around culverts and structures shall be placed to the lines and grades shown on the Drawings, or as directed in the field. Prior to placement of the initial lift of structural fill material, all loose and unsuitable soils shall be removed from the footprint area such that the structural fill is placed on a firm, native soil

foundation. No fill shall be placed on frozen soil, unstable soil, or soil that has water ponded on it. Fill material shall not be placed during freezing or extremely wet weather. Structural fill materials shall be placed in horizontal lifts approximately 6 to 8 inches in loose thickness and compacted to 95 percent of the laboratory maximum dry density as determined by the Standard Proctor Density Test (ASTM D698). All lifts of fill material shall be compacted to the full width of the lift, as indicated by slope stakes. Water shall be added, as necessary, to each layer of fill and the material blended with a disc or harrow prior to compaction. Wet materials shall be spread and air dried, as necessary, to achieve proper moisture content for compaction. The surface of each compacted lift shall be lightly scarified prior to placement of material in the subsequent lift, in order to achieve a homogeneous structure.

C. Structural fill dimensions shall be within minus 0.5 foot and plus 1.0 foot from those shown on the Drawings.

3.4 PLACEMENT OF GEOTEXTILE

A. Non-woven geotextile material shall be placed only on prepared, relatively smooth subgrade surfaces. Panels of geotextile shall be overlapped by at least 18 inches with the overlap in the downstream direction with no overlaps parallel to the side slopes. Optionally, sections of geotextile may be sewn together in accordance with the manufacturer's recommendations for a "J" stitch. No horizontal seams or overlaps (parallel to the side slope) shall be used.

B. All geotextile shall be adequately anchored in trenches with compacted backfill.

C. Place geotextile for silt fences with seams sewn at the supports and with adequately anchored bases in accordance with the manufacturer's recommendations.

3.5 RIPRAP

A. Rock for riprap shall be dumped and graded or otherwise moved into position such that the in-place material is stable, without tendency to slide, and such that no large voids exist in the finished layer. The inclusion of earth, sand, or rock dust in excess of 5 percent by volume of the finished riprap layer shall not be permitted. Care shall be taken, during placement, not to damage the earth slopes, or the geotextile on which the

riprap is placed. If riprap is dumped directly onto the geotextile material, the dumping height shall not exceed 1.5 feet.

3.6 FINAL GRADING

A. Contractor shall perform final grading at the repository sites, as shown on the Drawings or as directed in the field. Surfaces shall be graded at a relatively uniform slope toward the drainageways so that no areas of ponded water or localized depressions exist.

B. Erosion control mats or mulch with binder (e.g., tackifier) may be placed on all regraded slopes steeper than 3:1, as specified in Section 02900.

END OF SECTION

SECTION 02900
VEGETATION ESTABLISHMENT

PART 1 GENERAL

1.1 WORK INCLUDED

A. This section describes the requirements for vegetation establishment on the finished surfaces of the Page Pond repositories and perimeter embankments.

1.2 RELATED SECTIONS

A. Section 02200 - Earthwork

1.3 SUBMITTALS

A. Contractor shall submit information regarding proposed seed and fertilizer materials and supplier(s) at least 5 days prior to delivery.

B. Contractor shall submit manufacturer's data on erosion control mats, if used, or fabrics at least 5 days prior to delivery.

PART 2 PRODUCTS

2.1 SEED SUPPLIERS

A. Seed suppliers must provide labeling of variety, purity, and germination. State seed quality laws must be satisfied by the supplier. Seed supplier must be approved by the Company's Representative.

2.2 DELIVERY, STORAGE, AND HANDLING

A. Grass seed mixture shall be delivered in sealed containers. Seed in damaged packaging will not be accepted. Contractor shall provide seed mixture in containers showing the percentage of each species in the seed mix, year of production, net weight, date of packaging, name and address of supplier, percent of weed seed content, and guaranteed percentage of purity and germination.

B. Fertilizer shall be delivered in waterproof bags showing weight, chemical analysis, and name of manufacturer.

2.3 SEED MIXTURE

A. Seed mixture shall include the following, unless otherwise approved by the Engineer:

Upland Seed Mixture

Species	Common Name	(lb. PLS/acre)[1]
Festuca longifolia	Hard fescue	2.0
Festuca rubra	Red fescue	2.0
Schizachyrium scoparium	Little bluestem	4.0
Secale cereale	Cereal rye	40.0
Poa pratensis	Kentucky bluegrass	0.4
Astragalus cicer	Cicer milkvetch	4.1
Lotus corniculatus	Trefoil	1.5
	TOTAL	54.0 lb. PLS/acre

B. Seed for legume species (i.e., Cicer milkvetch - astragalus cicer and Trefoil - lotus corniculatus) shall be inoculated with the appropriate Rhizobium bacteria strain prior to seeding.

2.4 ACCESSORIES

A. Mulching materials shall consist of dry oat or wheat straw, free from weeds and foreign matter detrimental to plant life. Native hay or chopped cornstalks are acceptable. Also acceptable is approved wood cellulose fiber; chip form and free of ingredients that could inhibit growth or germination.

B. Fertilizer shall be inorganic chemical fertilizer as follows:
   -Nitrogen (as N) - 60 pounds/acre;
   -Phosphorous (as P_2O_5) - 60 pounds/acre;
   -Potassium (as K_2O) - 30 pounds/acre;

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[1]Pounds "pure live seed" per acre.

The Engineer may require adjustment of the fertilizer mix, based on confirmatory analysis of the vegetative soil cover.

C. Erosion Fabric, if necessary, shall be biodegradable matting, or tackifier applied to mulched areas.

D. Stakes shall be softwood lumber, chisel pointed.

PART 3 EXECUTION

3.1 INSPECTION AND EXISTING VEGETATION

A. Contractor shall verify that vegetative soil layer is ready to receive the work covered by this section.

B. Commencement of installation shall be construed as acceptance of existing site conditions by the vegetation contractor.

C. Contractor shall minimize disturbance to existing vegetation. Existing shrubs and trees larger than approximately 4 feet high that must be removed to facilitate construction activities shall be transplanted to the extent feasible and as field directed.

3.2 FERTILIZER

A. Fertilizer shall be applied in accordance with manufacturer's instructions.

B. Fertilizer shall be applied at the rate specified in 2.4B (above).

C. Manure, if used, may be applied at a rate of up to 10 tons/acre. Manure application is optional subject to the approval of the Engineer, which must be obtained at least 15 days prior to use.

D. Fertilizer shall be mixed thoroughly into the upper 3 inches of vegetative soil layer for dry application.

E. In the case of dry application, Contractor shall not apply fertilizer at the same time as seed.

3.3 SEEDING

A. Drill seed application is acceptable for slopes equal to or flatter than 3:1 (33%). Slopes steeper than 3:1 must be seeded by dry broadcasting or hydroseeding.

B. Seed shall be applied evenly at a broadcast (or hydroseed) application rate of 54.0 lbs PLS per acre. Adjustment to rate shall be made for variations in seed purity and germination to achieve the PLS equivalent rate. Hydroseeding is acceptable as a broadcast method of seeding and fertilizing. If dry broadcasting is done, rake seeds into the upper soil surface slightly. If drill seeding is done, apply seed at half of the specified broadcast rate. Do not seed area in excess of that which can be mulched on the same day.

C. Seeding season shall be after October 1 until consistent ground freeze (that time at which the surface soil, due to freeze conditions, prevents burying the seed 0.5 inch through normal drill seeding operations) or from spring thaw until June 15.

D. Contractor shall not sow immediately following rain or snowfall, or when ground is too dry, or during windy periods.

E. Immediately following seeding, Contractor shall apply mulch at a rate of at least 2.0 tons per acre or as recommended by the manufacturer. Maintain mulch clear of existing shrubs and trees and out of streams or water courses. Use tackifier or other similar means to ensure that the mulch will not redistribute after application.

F. If seeding is done during the spring season, Contractor shall apply water with a fine spray immediately after each area has been mulched. Saturate to 2-inch soil depth. Water shall not apply water if seeding is conducted during the fall season.

3.4 SEED PROTECTION/EROSION CONTROL

A. Seeded areas shall be identified with stakes around the area perimeter. Stakes shall be spaced at 20 to 30-foot intervals.

B. Where the surface grade is 3:1 or greater, seeded slopes shall be covered with erosion control fabric or mulch with tackifier or similar binder applied at a rate of 4.0 tons per acre. Erosion control fabric shall be rolled onto slopes without stretching or pulling. Where seeded slopes are at a grade of less than 3:1, Contractor shall apply mulch with tackifier or similar binder at a rate of 2.0 tons per acre.

C. Contractor shall follow manufacturer's instructions when

installing erosion control fabric, which should include, at a minimum:

1. Lay fabric smoothly on surface, bury top end of each section in 6-inch-deep excavated trench. Provide 12-inch overlap of adjacent rolls. Overlap upper roll sections onto lower roll sections. Backfill anchor trench and rake smooth, consistent with adjacent soil.

2. Secure outside edges of overlap at 36-inch intervals with stakes.

D. Contractor shall lightly dress fabric-covered slopes with vegetative soil material to ensure close contact between fabric and soil.

END OF SECTION

SECTION 03300
CONCRETE

PART 1 GENERAL

1.1 DESCRIPTION

A. This section covers the requirements for construction of cast-in-place concrete for hydraulic control structures, spillways, headwalls, fence posts, or other minor structures, including furnishing the materials, proportioning, mixing, placing, finishing, curing and protection. This section also covers precast concrete that may be utilized instead of cast-in-place concrete. Concrete reinforcement is also included in this section.

1.2 RELATED SECTIONS

A. Section 02200 - Earthwork

1.3 SUBMITTALS

A. Contractor shall submit information regarding proposed material sources and proposed mix designs for cast-in-place concrete for approval, at least 15 days prior to commencement of work.

B. Results of compressive strength tests to be performed by the Contractor shall be submitted within 7 days of the completion of the tests.

C. For precast concrete, Contractor shall submit shop drawings and certified strength data at least 10 days prior to delivery.

D. Contractor shall submit shop drawings for structural concrete reinforcing steel for each structure for approval.

1.4 QUALITY CONTROL

A. At least two test cylinders shall be collected per cast-in-place concrete structure with one cylinder tested for compressive strength at 7 days and one cylinder tested at 28 days.

B. Perform slump and entrained air tests each day that cast-in-place concrete is placed.

PART 2 PRODUCTS

2.1 PORTLAND CEMENT

A. Portland cement shall conform to ASTM C150, Type II or IIA.

2.2 POZZOLAN

A. Pozzolan, if used, shall conform to ASTM C618, Class F fly ash, including the requirement for reactive expansion. The pozzolan will be considered to comply with the Specification if results of four out of five consecutive tests for each specified property conform to the Specification.

2.3 ADMIXTURES

A. Air entraining agent shall conform to ASTM C260. The admixture shall be added as part of the computed mixing water requirements. Agents prepared in solution shall be maintained at a uniform strength and shall be batched accurately by means of reliable mechanical dispensers.

B. Water-Reducing Admixture

1. The Contractor may use an approved water-reducing or high-range water-reducing admixture at its option. No other admixtures shall be used without prior approval of the Engineer.

2.4 WATER

A. Water shall meet the standard requirements for ready mix concrete as established in ASTM C94.

2.5 AGGREGATES

A. Aggregates for use in concrete shall conform to ASTM C33.

2.6 CONCRETE MIXTURES

A. General

1. Concrete shall be composed of Portland cement, water, fine and coarse aggregates and admixtures. Pozzolan may be used at the option of the Contractor. If used, it shall conform to these Specifications. All concrete constituents shall be well mixed and brought to proper consistency.

B. Strength

1. All structural concrete for hydraulic control structures and spillways, whether cast-in-place or precast, shall develop a 28-day compressive strength of at least 4000 psi.

2. Concrete for fence and gate posts, encasements or settlement monuments, where applicable, shall develop a 28-day compressive strength of at least 2000 psi.

C. Structural Concrete Mix (4000 psi)

1. Minimum cement contents: 6 bags/cy of concrete (including maximum of 25 percent class F fly ash replacement, if used).

2. Concrete shall have water:cement ratios by weight not exceeding 0.50.

3. Maximum slump: 3 inches.

4. Maximum aggregate size: 1-1/2 inches; ¾-inch maximum aggregate size shall be used for pumped concrete.

5. Air entrainment content: 4 to 6 percent.

2.7 PRECAST CONCRETE

A. Concrete shall conform to ACI 318, Chapter 16 and shall meet the same strength requirements specified above for cast-in-place concrete.

B. Conform to ASTM C913.

C. All precast concrete shall have adequate lifting devices and shall be designed for anticipated lifting and placement stresses.

2.8 REINFORCEMENT

A. Reinforcing steel shall be new, deformed steel bars in accordance with ASTM A615, Grade 60.

B. Welded wire fabric shall conform to the requirements of ASTM A185

C. Fibers, if used, shall be monopolymer polypropylene

fibrillated fiber with a length of 1/2 to 3/4-inch and a minimum tensile strength of 70,000 psi.

2.9 FORMWORK

A. Contractor shall use adequate wood or steel forms for cast-in-place concrete that do not distort or displace during concrete pouring and vibrating. Use forms that conform to the requirements of the USBR for finish F1, for buried concrete structures, and F2 for exposed concrete surfaces.

PART 3 EXECUTION

3.1 PREPARATION FOR PLACING

A. General

1. Concrete shall not be placed until all formwork, embedded parts, steel reinforcement, foundation surfaces, and joints involved in the placing have been approved.

B. Surface Preparation

1. Immediately before placing concrete, all surfaces upon or against which concrete is to be placed shall be free from standing water, mud, oil, debris, frost, ice, and snow. Surfaces which are absorptive shall be moistened to a depth of at least 1 inch.

C. Admixtures

1. Admixtures may be included to improve concrete pumpability or placement at the Contractor's option, subject to review and approval of the Engineer.

D. All required reinforcing steel shall be placed prior to concrete placement. Reinforcing steel shall be placed within a tolerance of plus or minus 1/2-inch from the dimensions shown. The following minimum concrete cover (inches) shall be provided for reinforcement:

- Concrete cast against and permanently exposed to earth: 3"

- Concrete exposed to weather or liquid: 2"

- Concrete not exposed to weather or liquid or in contact with ground: 1½"

E. If fibers are used, they shall be in the concrete prior to placement.

3.2 PLACING

A. All formed concrete shall be placed in continuous horizontal lifts, the depth of which shall not exceed 24 inches, with adequate vibration following each layer placement.

B. Cast-in-place concrete shall only be placed when the ambient temperature is between 40 and 90°F. When the ambient temperature is less than 40°F, accelerators may be used, subject to the approval of the Engineer.

C. If freezing temperatures are anticipated within 7 days after placement, Contractor shall adequately protect the concrete with insulating blankets and heaters, if necessary.

D. All concrete except slabs less than four inches thick, shall be consolidated by internal vibration. Standby vibrators in good condition shall be readily available. The concrete shall be thoroughly vibrated around all embedments, anchors and reinforcement to ensure complete consolidation. Additional vibration will be required for fiber reinforced concrete to ensure consolidation.

3.3 FINISHES AND TOLERANCES

A. Formed surfaces shall be finished as specified in ACI 301, and shall be a USBR F1-Rough Form Finish, or USBR U2 or U3 - floated or troweled finish for unformed concrete surfaces, exposed.

B. Thickness of concrete shall be within minus 0 and plus 0.5 inches of that shown on the Drawings. Lines and grades of concrete structures shall be within plus or minus 1/4 inch in 5 feet of that shown on the Drawings. Hydraulic control structures shall be placed level and within 0.05 feet of the specified elevations.

C. Chamfer all exposed edges of concrete 3/4-inch.

3.4 CURING AND PROTECTION

A. Concrete shall be cured and protected as specified in ACI

301 for a minimum of 7 days after placement.

3.5 OPTIONAL PRECAST CONCRETE

A. Where cast-in-place concrete is shown on the Drawings, precast concrete having the same minimum properties may be used as an alternative, subject to the approval of the Engineer.

B. Precast concrete shall conform to the requirements of ACI 318, Chapter 16.

C. All precast concrete hydraulic control structures shall be placed to within 0.05 foot of the design elevations and completely level.

END OF SECTION

APPENDIX B

Appendix B

Supporting Calculations for Estimated Availability and Utilization of Disposal Capacity at Page Pond Benches

General Notes

- Calculations are based on dimensions obtained from aerial photo topographic mapping of the site prepared in 1987.
  - Horizontal scale : 1 inch = 100 feet
  - Contour interval: 2 feet
- Volumes are calculated by method of average end areas.
- For convenience, some dimensions have been averaged and resulting volumes are approximate.
- It is assumed that the fill materials will be placed such that the maximum elevation of the upper surface is a minimum of 0.5 feet below the elevation of the crest of the existing PPWTP dikes and that the fill surface will be graded away from the dike at a slope of approximately 1.0 to 1.5 percent.
- It is assumed that the perimeter slopes of the fills will be graded at 3 horizontal to 1 vertical.

Original East Bench Capacity

• Average N-S dimension	1,300 ft
• Average E-W dimension	375 ft
• Westerly fill depth (at PPWTP dike)	6 ft
• Easterly fill depth	4 ft
• Westerly fill x-section area $\frac{(1,300 + 1,264)}{2} \times 6$	7,700 sf
• Easterly fill x-section area $\frac{(1,300 + 1,276)}{2} \times 4$	5,150 sf
• Available disposal volume $\frac{(7,700 + 5,150)}{2} \times 375$	2,409,375 cf
	89,236 cy
	Allow 90,000 cy

Original West Bench Capacity

• N-S dimension at east side	920 ft
• N-S dimension at west side	590 ft
• Average E-W dimension	630 ft
• Easterly fill depth	14.5 ft
• Westerly fill depth	11.5 ft
• Easterly fill x-section area $\frac{(920 + 830)}{2} \times 14.5$	12,690 sf

- Westerly fill x-section area
  $\frac{(590 + 520)}{2} \times 11.5$ — 6,380 sf
- Available disposal volume
  $\frac{(12,690 + 6,380)}{2} \times 630$ — 6,007,050 cf

222,480 cy

Allow 220,000 cy

West Bench Expansion Area Capacity

- N-S dimension at east side — 620 ft
- N-S dimension at west side — 475 ft
- Average E-W dimension — 300 ft
- Easterly fill depth — 28 ft
- Westerly fill depth — 26 ft
- Easterly fill x-section area
  $\frac{(620 + 450)}{2} \times 28$ — 14,980 sf
- Westerly fill x-section area
  $\frac{(500 + 340)}{2} \times 26$ — 10,920 sf
- Available disposal volume
  $\frac{(14,980 + 10,920)}{2} \times 300$ — 3,885,000 cf

143,888 cy

Allow 140,000 cy

Capacity / Utilization Reconciliation

• Original Bench Capacity		
- East	90,000 cy	
- West	220,000 cy	
	310,000 cy	310,000 cy
• Capacity Used To Date		
- East	50,000 cy	
- West	15,000 cy	
	65,000 cy	65,000 cy
• Available Capacity Balance		245,000 cy
• West Bench Expansion Area Capacity		140,000 cy
Total Available Disposal Capacity		385,000 cy
• Disposal Requirements		
- Excavated tailings	35,000 cy	
- Residential soils	290,000 cy	
	325,000 cy	325,000 cy
Residual Capacity for ICP Use		60,000 cy

DRAWINGS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 SIXTH AVENUE
SEATTLE, WA 98101

TARGET SHEET

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File #: 9.2.5

Site Name: Bunker Hill Site File (BHSF)

Page Pond Closure – Remediation Site Plan

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1200 SIXTH AVENUE
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Page Pond Closure – West Bench Cross-Sections

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Page Pond Closure – East Bench Cross-Sections

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Site Name: Bunker Hill Site File (BHSF)

Page Pond Closure – Typical Sections and Details

BHSF 9.2.5

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McCulley
Frick &
Gilman, inc.

July 28, 1995
MFG Project No. 2339

Mr. Earl Liverman
USEPA, Region X
2110 Ironwood Parkway
Coeur d'Alene, ID 83814

Mr. Mike Thomas
IDHW
1410 North Hilton, 2nd Floor
Boise, ID 83706

RE: BUNKER HILL SUPERFUND SITE
PAGE POND CLOSURE - FINAL REMEDIAL DESIGN REPORT

Gentlemen:

Enclosed herewith for your records are two copies of the Final Remedial Design Report (RDR) for the referenced project. This final version of the RDR, including drawings and technical specifications, incorporates the approved modifications presented in the redline-strikeout version submitted on June 7, 1995 as well as the text revisions suggested by IDHW in the letter of July 14, 1995. It is understood that no further modifications will be made to this document.

If you have any questions regarding the enclosed document, please do not hesitate to contact me.

Yours truly,
McCULLEY, FRICK & GILMAN, INC.

Larry C. Owen, P.E.
Senior Engineer

Enclosures

cc: Scott Peterson - IDHW
Chris Pfahl - ASARCO, Inc.
Matt Fein - Hecla Mining Company
Bob Lunhardt - Sunshine Mining Company
Dan Meyer - Upstream Mining Group
Jerry Cobb - Panhandle Health District
Tony Chavez - MFG