12 Selected Remedy

The *Original Proposed Plan* (EPA 2003) described and summarized the characteristics of the areas that may be contaminated, the wastes that each media may contain, and how the proposed remedy approach addresses each of these. The *Original Proposed Plan* was presented to the public and comments were received from many individuals, organizations, State and Federal Trustees, and other groups. In response to those comments and a revised proposal from Atlantic Richfield Company regarding the removal of contaminated sediments, the *Original Proposed Plan* was revised. The *Revised Proposed Plan* was presented to the public in May 2004 and comments were once again requested from the public and the Trustees. EPA has responded to all significant comments. These comments and responses are found in Part 3, *Responsiveness Summary*, of this *Record of Decision*. Responses to specific comments on the *Revised Proposed Plan* received from Atlantic Richfield Company and NorthWestern Corporation are also provided in Part 3, *Responsiveness Summary*.

The Selected Remedy is defined and described in this section, as are the general priorities for action.

12.1 Rationale for the Selected Remedy

As summarized in Section 10, *Comparative Analysis of Alternatives*, detailed criteria were developed and applied by EPA Region 8 to compare among the alternatives. The performance of each alternative was evaluated against threshold criteria, balancing criteria, and modifying criteria. The selected remedy for the MRSOU is a modified version of *Combined Feasibility Study* Alternative 7A2, Partial Dam Removal with Partial Sediment Removal of the Lower Reservoir plus Groundwater ICs and Natural Attenuation within the Aquifer Plume.

As described in Section 10, *Comparative Analysis of Alternatives*, the two alternatives that scored the most favorably when looking at the first seven criteria were Alternative 2A, Modification of Dam and Operational Practices, and Alternative 7A2 modified, which involves dam and sediment removal. Other alternatives did not meet threshold criteria and did not provide sufficient reliability or permanence. Alternative 2A would have modified the dam with a pneumatic crest, imposed groundwater ICs and other operational BMPs, and incorporated substantial FERC improvements to accommodate stability issues associated with the north abutment and fish passage. The projected cost was approximately $21 million, and it required operation and maintenance in perpetuity. Actual costs may have been higher. A dam safety consultant hired by Missoula County estimated an additional $30 to $50 million may be necessary to upgrade the spillway section of the dam (FERC required additional geotechnical studies to be conducted—in October 2002—to determine the degree of upgrades necessary for the spillway section of the dam). The threat of contaminated sediment release from the stored sediments as a function of climatic conditions, although reduced, would not have been eliminated.

Alternative 7A2, modified, which called for dam decommissioning and removal with lower reservoir sediment removal and channel reconstruction, was proposed by Region 8 in the *Original* and *Revised Proposed Plans* for a variety of reasons. This alternative meets groundwater ARARs (Alternative 2A would not), it offers the best opportunity for long-term protection of human and environmental health, and it is supported by the community, the State, and the CSKT. Importantly, Alternative 7A2 complies with groundwater ARAR standards relevant to Missoula's sole source aquifer, which is used for domestic consumption. Alternative 7A2, modified, scored high in long-term effectiveness and permanence because it does not require significant ongoing maintenance, since the dam and sediment are removed. It does not rely on groundwater ICs in perpetuity for protection of human health. This is fortunate because groundwater ICs are opposed by the local county government and local controls may not be implemented. This alternative is strongly favored by the larger Missoula area community (98 percent), including local elected officials, the State, the CSKT, the USFWS, and other stakeholders.

The score for short-term effectiveness for this alternative was low-moderate because of potential negative impacts on downstream aquatic life during reservoir drawdown and remedy construction. Implementation of this remedy is complex. High costs are associated with this remedy. However, EPA believes that these criteria considerations are balanced by the significant ARAR compliance, long-term effectiveness and permanence, and reduction in mobility and volume achieved by the Selected Remedy. The EPA cost of this remedy is approximately $106 million. The USACE developed a detailed cost estimate for the selected alternative. This cost estimate and its associated work breakdown structure is discussed in more detail in Section 12.9, *Cost Estimate for the Selected Remedy*. The RPs have estimated much lower costs. As noted earlier, EPA finds the benefits gained are proportional to the costs, in accordance with CERCLA and the NCP.

Implementation of the Selected Remedy will allow recovery of the aquifer within a much shorter time period (4 to 10 years) versus Alternative 2A (200 to 2,000 years). Recovery of the aquifer is much quicker under the Selected Remedy because the major source of groundwater contamination, the reservoir source sediment and the hydraulic head driving the arsenic into the alluvial aquifer, are significantly changed and for the most part eliminated. This ability to achieve groundwater RAOs in a relatively short period of time is a favorable factor.

During the comment periods for the *Original Proposed Plan* (2003) and *Revised Proposed Plan* (2004), EPA Region 8 also received some comments advocating sediment removal and leaving the dam in place. This option did not warrant as much consideration as the Selected Remedy because it is costly to maintain, it does not provide a permanent remedy since numerous dam upgrades and periodic dredging would be required, and offers no increase in environmental protection over other alternatives.

12.2 Description of the Selected Remedy

The primary objectives of this remedy are to reduce or eliminate the groundwater arsenic plume, and reduce a threat to aquatic life below the dam from the release of contaminated sediments. This will be accomplished by removing the dam, removing the primary source of contaminated sediment in the reservoir, and allowing natural attenuation processes to restore the aquifer over time.

Only those sediments shown to be contributing directly to existing groundwater degradation (sediments with the highest pore water contaminant concentrations), and with the potential to contribute to future surface water degradation, will be removed to meet remedial objectives. The reservoir sediments are divided into two sections: the upper and lower reservoir sediment areas (the Duck Bridge dike and abutments form the dividing line). These two reservoir sections are further delineated into sub-areas based on sediment accumulation features (see Exhibit 2-2, *Key Sediment Accumulation Areas*). The lower reservoir is comprised of Areas 1, 2, and 3. The upper reservoir encompasses Areas 4 and 5. The sediments in Area 1 (lower reservoir adjacent to Milltown) will be removed and isolated from the Clark Fork River channel, while most of those in Areas 2, 3, 4, and 5 will initially be left in place (some Area 3 sediments will be removed). Further removal of sediments may be necessary if groundwater RAOs are not achieved and removal is feasible. A new river channel with flood plains for lateral stability will be designed through Area 1, constructed, and vegetated to provide adequate stability against erosion.

Alternative 7A2 modified, as defined in this *Record of Decision*, includes removal of the spillway of the Milltown Dam. Additional restoration actions will remove the powerhouse and right abutment and divider block. This will leave the river to flow freely through the constricted confluence point of the rivers. Four to five construction seasons are estimated to implement the Selected Remedy. Other elements of the Selected Remedy are described below.

12.2.1 Remediation—Restoration Coordination

Since the release of the *Original Proposed Plan*, the Natural Resource Trustees (USFWS, CSKT, and State of Montana), via the lead trustee (State of Montana), have released and taken public comment on their restoration plan (DCRP) and have issued a first amendment. As amended, the DCRP encompasses the area where the Milltown Reservoir has slowed the flow of the river and created areas of sediment deposition. Restoration activities will be closely coordinated with the Selected Remedy, specifically for the Blackfoot River from the Milltown Dam to just downstream of the Stimson Dam and the Clark Fork River from the I-90 bridge below the Milltown Dam up to the high reservoir level above Duck Bridge.

EPA has worked closely with the Trustees to integrate the remediation and restoration plans within the remediation project area (the area from the dam to Duck Bridge on the Clark Fork River arm of the reservoir and to the I-90 bridge on the Blackfoot River arm). EPA's *Original Proposed Plan* and Alternative 7A2 proposed the construction of an engineered and partially armored channel, which would have met remediation requirements. The DCRP adopted by the natural resource Trustees contains a different channel alignment and flood plain, which will produce a more natural and habitat friendly stream channel after the dam and sediments are removed. These elements of the DCRP in the project area will be done in lieu of EPA's proposed remediation channel. Because of this coordination, restoration aspects of the project are also presented in the figures shown in this document. The coordinated restoration elements include the following:

- Removal of the divider block / power house / north (right) abutment

- Changes in the flood plain topography and channel alignment throughout the entire MRSOU and below Milltown Dam.
- Implementation of soft stabilization / revegetation techniques to stabilize the channel

Another element of this project is the removal of the Stimson Dam, which is being planned as a cooperative effort through the USFWS National Fish Passage Program with matching funds.

12.3 Dam and Sediment Removal

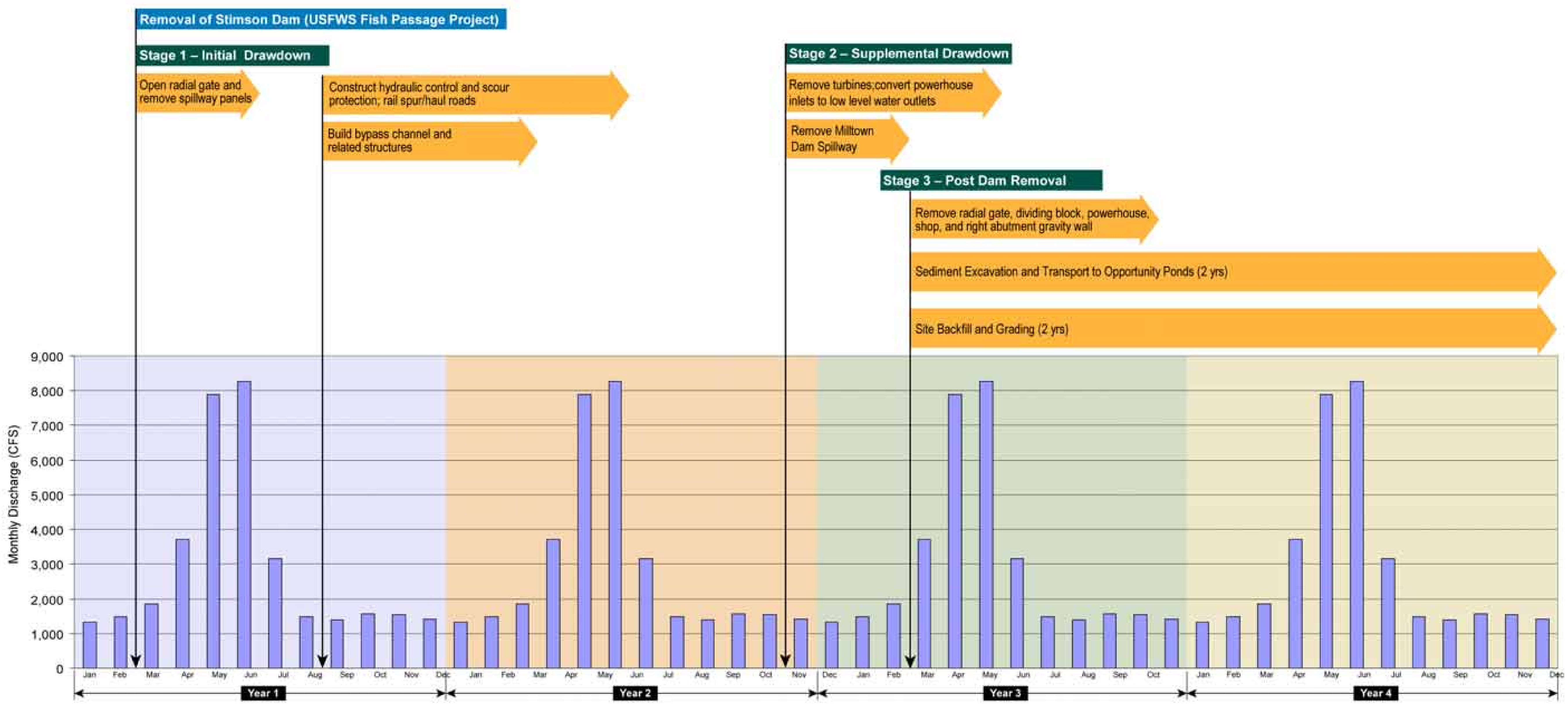
The removal of the source sediment is the foundation of the Selected Remedy. The sediment residing in Area 1 (2.6 mcy) comprises the primary and initial target of the remedial action. The actual volume to be removed could be somewhat smaller after accounting for clean surficial sediment that may be salvaged for re-use onsite as topsoil, in addition to uncertainties in defining the bottom of the sediment at the alluvial contact. Area 1 is approximately 4,300 feet long by an average of 800 feet wide and forms an elongated wedge of partially submerged land bounded by the Clark Fork River to the southwest, Duck Bridge to the south, I-90 to the east, and the Blackfoot River channel to the north. This area is oriented southeast to northwest (closest to the dam) within the reservoir. Sediment thickness increases in the same orientation from approximately 14 feet in the south, to 20 or 25 feet in the north.

The timing or sequencing of construction activities for this remedy are critical to avoiding uncontrolled impacts to the local water resources. The following sections describe significant activities that comprise this aspect of the Selected Remedy. The discussion is presented in the general order in which the construction activities are expected to occur, thus giving the reader an appreciation of the timing that is so critical to successful implementation of the remedy. The information and sequence of events described in this section are conceptual in nature and may change in the final remedial design following issuance of this *Record of Decision*. The anticipated sequence is illustrated in Exhibit 2-26, *Remedial Construction Activities and Clark Fork River Hydrograph*.

12.3.1 Bypass Construction

To reduce erosion within the existing Clark Fork River channel during reservoir drawdown and the removal of sediments from Area 1, a bypass channel will be constructed within Area 1 and the river will be to routed to a new confluence point with the Blackfoot River. The conceptual bypass channel, which is expected to be approximately 100 feet wide at the bottom with 3H:1V side slopes on the right embankment (looking downstream) and 2H:1V on the left bank, will be excavated into the underlying alluvium (up to 5 feet) to sustain the desired grade through the reach to its confluence with the Blackfoot River. The bypass channel will be required by EPA to contain a 100-year, 24-hour flood event; the actual dimensions of the channel will be determined during remedial design. The bypass channel will originate at the Duck Bridge abutments and be constructed to run adjacent and parallel to I-90 where it will intercept the Blackfoot River. In addition, modifications to the former Duck Bridge foundation remnants and dikes will be necessary. Prior to sediment removal activities, sediment in Area 1 will be isolated from the Clark Fork River at the head of the bypass channel (southeast end of Area 1 at Duck Bridge), as well as at the mouth of the channel where it connects with the Blackfoot River, by a wall of interlocking sheet piling driven into the underlying alluvium (see Exhibit 2-27, *Construction of Bypass Channel and*

EXHIBIT 2-26
Conceptual Illustration of Clark Fork River Hydrograph and Major Remedial Construction Activities



Note:
Hydrograph prepared from USGS Station No. 12340500, Period of Record 1929-2003.

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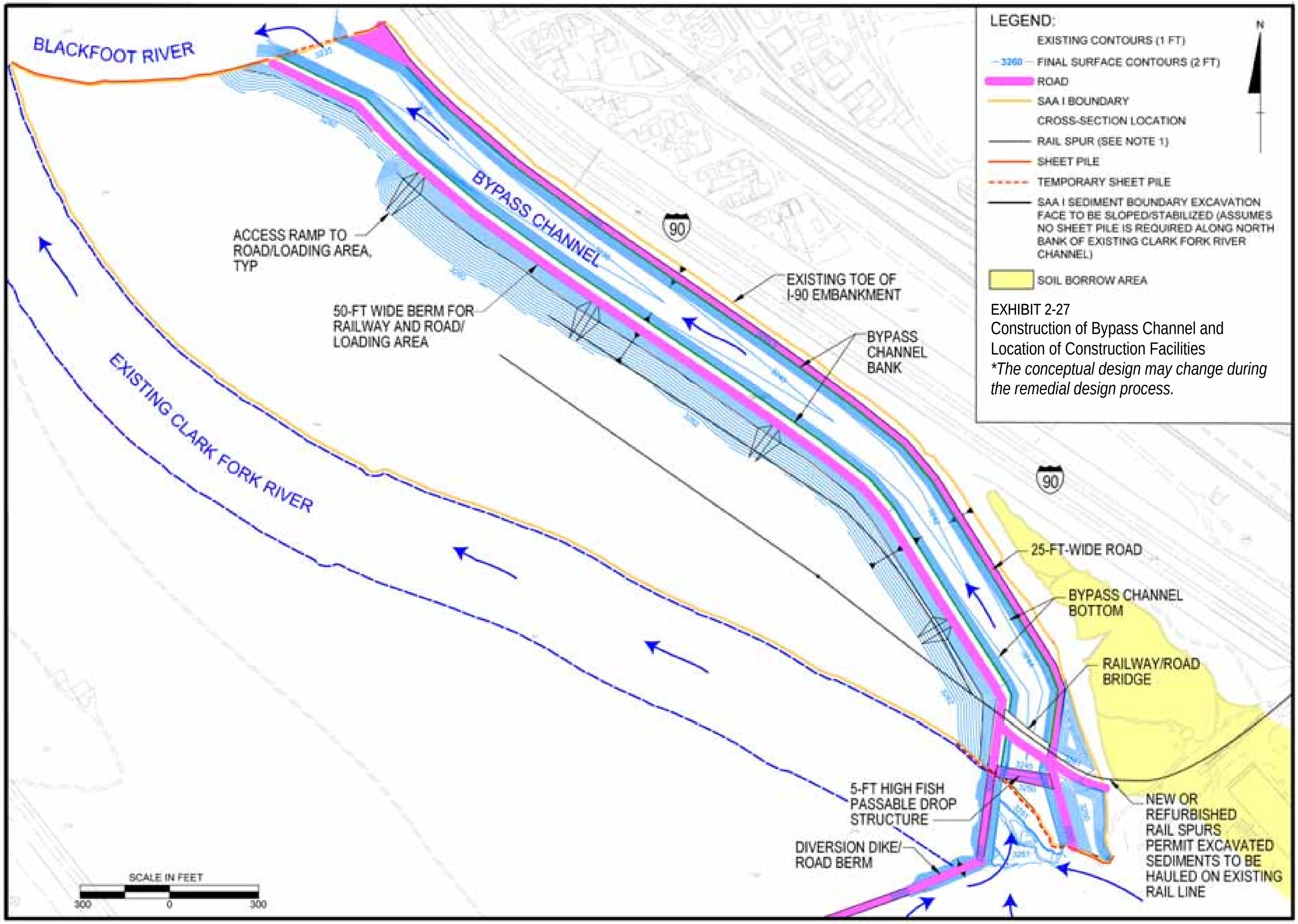


EXHIBIT 2-27
Construction of Bypass Channel and Location of Construction Facilities
The conceptual design may change during the remedial design process.

Location of Construction Facilities). The conceptual design also assumes an offset of a minimum of 20 feet from the existing toe of the I-90 embankment to provide added slope stability protection for the embankment. To facilitate the drainage of free water from within the sediments before construction of the bypass begins, the reservoir water level will be lowered approximately 8 to 10 feet below normal pool level using the existing radial gate. This action, in addition to possible pre-loading with clean soil, will initiate the potential "drying" and consolidation of the sediments.

Sediment removal from the bypass channel (approximately 600,000 cy) will be initiated with conventional excavation equipment such as tracked excavators or a dragline. The bypass will be excavated to an elevation that coincides with the underlying alluvium that acted as armoring for other historic channels. Grade control will be necessary to prevent unacceptable upstream headcutting (see Exhibit 2-28, *Conceptual Longitudinal Profile through Area 1*). A temporary, fish passable grade control structure for dissipating energy will be constructed. The bypass channel dimensions will be designed to accommodate a 24-hour 100-year storm event on the Clark Fork River. Channel side walls will be armored with appropriately sized rip rap or other erosion-resistant materials to prevent erosion during its use.

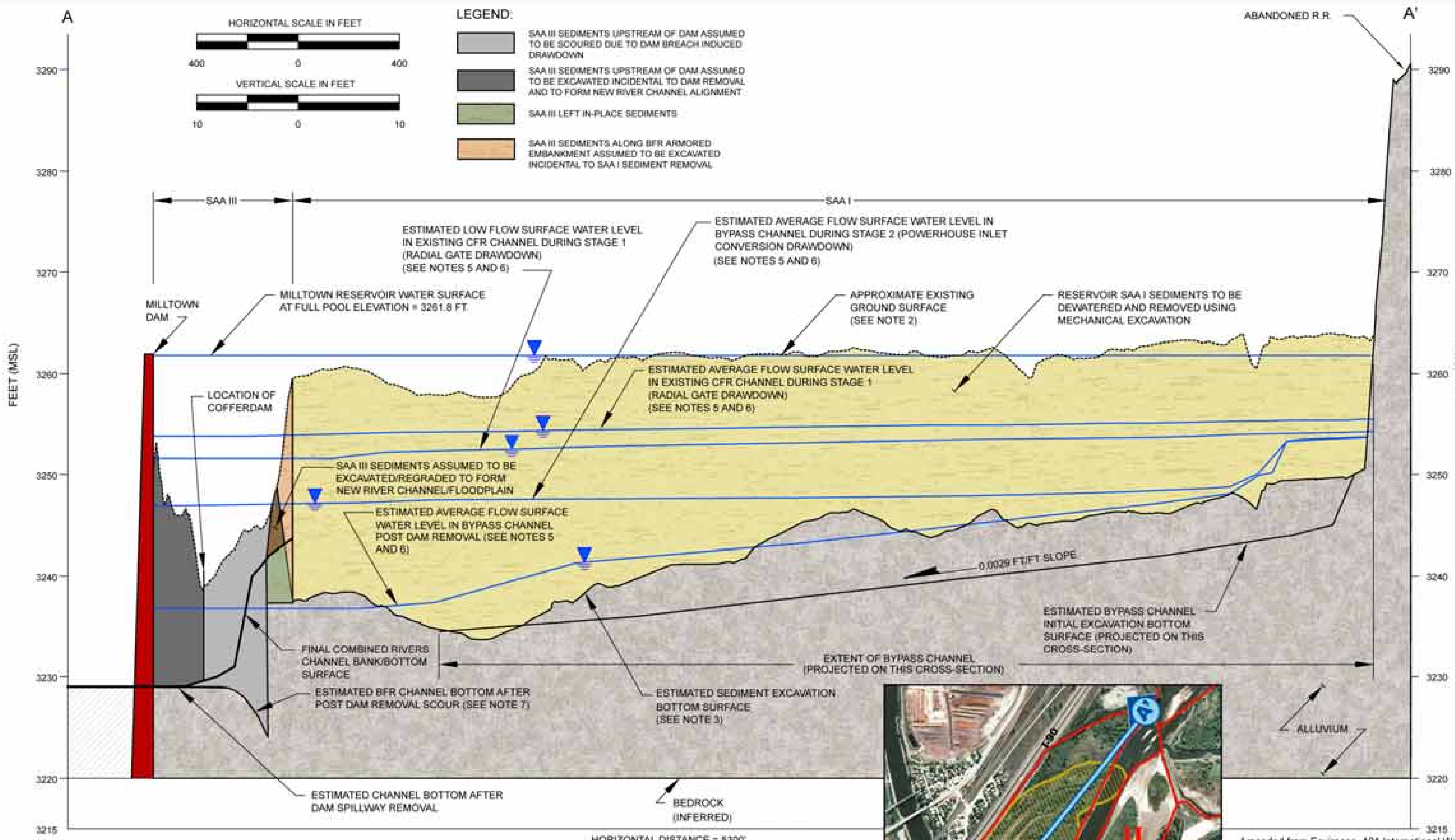
During bypass construction, the excavated materials will be stacked on the south side of the bypass channel and allowed to drain. Water management associated with saturated sediments is an important construction issue. The solution to this issue lies in the dewatering of the sediments and appropriate treatment of the effluent. Settling ponds with infiltration beds or galleries are being considered as a method for dealing with the water produced from dewatering efforts. Water quality sampling of the effluent during remedial design will dictate whether formal treatment and discharge into the river is an option.

At some point, a bridge crossing the bypass channel will be constructed to carry the rail spur to the south side of the channel. Sediment stockpiled from the bypass construction would be loaded into rail cars and hauled to an existing waste repository at the Anaconda Smelter Superfund Site. This repository for "dry" materials, called Opportunity Ponds, is located approximately 100 miles upstream. The bypass will be designed with the objective of achieving fish passage during low flow through bank full discharge periods (3,500 cfs).

During construction of the bypass channel, a cofferdam will be constructed across the front of the spillway of the Milltown Dam. The purpose of this structure is to isolate the spillway from the active channel to facilitate its removal at the appropriate time.

12.3.2 Dam Removals

Prior to routing the Clark Fork River through the bypass, the Stimson Dam will be demolished and removed as part of the associated cooperative project under the National Fish Passage program. Removing Stimson Dam will enable passage of bull trout and other fish up the Blackfoot River after the Milltown Dam is removed. This activity is scheduled for late fall or early winter to take advantage of low seasonal discharge on the rivers. The Stimson Dam, a pre-1900 wood crib structure, is located approximately 1.5 miles upstream of the Milltown Dam on the Blackfoot River. The Stimson Dam was built to create a backwater into which logs coming down the Blackfoot River could be staged and recovered from the river for processing in the adjacent timber mill (located on the south bank of the river). The mill is presently owned and operated by Stimson Lumber Company. The backwater created by the dam is no longer used by the mill and Stimson Lumber Company is assisting with the removal process. It is anticipated that the removal of the Stimson Dam



NOTES:

1. ALL ELEVATIONS ARE IN FEET ABOVE MEAN SEA LEVEL (MSL) NAVD88.
2. EXISTING GROUND SURFACE PROVIDED BY LAND & WATER CONSULTING, INC.'S 2003 TOPOGRAPHIC AND BATHYMETRIC SURVEY.
3. ESTIMATED SEDIMENT EXCAVATION BOTTOM SURFACE IS PRELIMINARY BASED ON RESERVOIR SEDIMENT ISOPAC MAP FIGURE B-16 FROM THE REMEDIAL INVESTIGATION REPORT (ATLANTIC RICHFIELD, 1995) COMPARED TO THE 2003 TOPOGRAPHY; AND LIMITED SEDIMENT THICKNESS SOIL BORING DATA FROM 2003 REMEDIAL DESIGN FIELD INVESTIGATIONS. THIS SURFACE WILL BE UPDATED FOR THE DRAFT FINAL DESIGN BASED ON SUPPLEMENTAL SAA I DEPTH OF CONTAMINATION GRID SAMPLING TO BE PERFORMED SUMMER 2004.
4. FOR CROSS-SECTION A-A' PLAN VIEW LOCATION, SEE FIGURE 6.

NOTES (CONT.):

5. THE PREDICTED SURFACE WATER LEVELS IN SAA I SEDIMENTS WILL LIKELY BE HIGHER THAN THE DRAWN DOWN SURFACE WATER LEVELS IN THE EXISTING CFR AND/OR BYPASS CHANNEL, RESULTING IN A PERCENTAGE OF THE SEDIMENTS REMAINING SATURATED.
6. ESTIMATED AVERAGE FLOW SURFACE WATER LEVELS ARE BASED ON HEC-6 HYDRAULIC CALCULATIONS. THE ESTIMATED AVERAGE FLOW SURFACE WATER LEVELS IN THE EXISTING CFR AND/OR BYPASS CHANNEL ARE PROJECTED ONTO THIS CROSS-SECTION LOCATION.
7. ESTIMATED CHANNEL BOTTOM SCOUR SURFACE IS CONSERVATIVE BASED ON HEC-6 HYDRAULIC MODEL RESULTS PRESENTED IN THE MAY 17, 2004 'FINAL TECHNICAL MEMORANDUM, MILLTOWN RESERVOIR DRY REMOVAL SCOUR EVALUATION'.

Amended from Envirocon, 101 International Way, Missoula, Montana 59808

EXHIBIT 2-28
Conceptual Longitudinal Profile through Area 1

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will trigger the transport downstream of a small volume of sediment previously impounded by that dam. The backwater effect created by the Milltown Dam is expected to mitigate, through deposition, the transport of all but the finest sediment released.

Prior to the removal of the Milltown Dam's spillway, the coffer dam structures at the head and mouth of the bypass channel will be removed and the Clark Fork River will be directed down the restored channel. A substantial earth berm will be constructed across the existing Clark Fork River channel at Duck Bridge to prevent water from entering that channel.

Once the Stimson Dam is successfully removed, the bypass channel is functional, and the water is diverted into the channel, the spillway for the Milltown Dam will be dismantled and removed. As indicated previously, this will occur behind a coffer dam that will isolate the work from the flows in the river. The combined Clark Fork and Blackfoot river flows are being directed through the radial gate and turbine tubes of the powerhouse during this period. This activity is scheduled to be completed in late winter, if possible, to again take advantage of low seasonal flows. Once the spillway is dismantled, a new restored channel will be constructed. The coffer dam will slowly be eroded away as the combined river flows are directed to the new breach in the structure and the river is returned to a lower, more natural elevation. Once achieved, this minimal river elevation will be maintained throughout the construction period and will allow remaining sediments in Area 1 to drain more freely down to the new elevation of the river. A new coffer dam will be constructed to permit the subsequent dismantling of the powerhouse and right abutment.

The work described in this section will be completed before the beginning of spring runoff, which typically carries the high annual flows and sediment loads. Some scour of sediment is anticipated with the construction activities described above. Timing the completion of those activities with the start of spring runoff will allow the scouring of in-place sediments in the bypass and around the dams to occur during the period of highest seasonal flow, a natural period in which sediment transport is also at its seasonal high. Sequencing this work in this manner should mitigate impacts to downstream aquatic life that might otherwise have occurred as a result of residual sediment scouring.

12.3.3 Removal of Remaining Sediments Within Area 1

Sediment removal for the balance of sediment in Area 1 (remaining 2 mcy) may utilize, if necessary, an approach called pre-loading. Pre-loading means placing a layer of clean fill material (up to 9 feet thick) on top of the sediments in Area 1. The purpose of the pre-load is to force the underlying sediment to consolidate and release excess water to the previously lowered reservoir channel areas. This makes the soft, wet sediment material more stable for the operation of large equipment that will be needed for the excavation. EPA expects the clean fill will come from a local source.

The sediment removal process will use large excavators working a linear face to optimize production and minimize the area of exposed groundwater. The area will be quickly backfilled following excavation. The specific sequence and methodology for conducting the actual removal may change as a result of final design, but at this time, the anticipated construction process is as follows:

- The first excavator will remove the pre-load materials and create blending areas ahead of the sediment excavation operation. Pre-load material will also be loaded into trucks and used as backfill in areas where the sediment has been excavated. Concurrently, other excavators will remove the sediment, place it on an adjacent area where the pre-load material has been removed, and let it drain, if necessary. EPA anticipates that, even after spillway and radial gate removal, a small portion of the sediment will remain below the water table. This sediment will be stacked and allowed to drain naturally, mechanically dewatered, or mixed with drier sediment to improve its consistency, and the blended materials will be loaded into trucks and transported to the staging area by the rail spur.

12.3.4 Sediment Transportation and Disposal

At the rail staging and loadout area located between I-90 and the river, the sediment will be placed into rail cars. Rail transport will be provided by two unit trains of gondola rail cars. Rail transport will require approximately 26,500 to 29,000 rail car loads with 83-cy capacity cars to relocate the dewatered sediments to the Opportunity Ponds. Some sediment from Area 1 may remain for reclamation of borrow areas if approved by EPA, in consultation with the State, during the design process. The rail cars will be transported each night to Opportunity Ponds, so a train full of empty cars will be onsite for loading each morning. Exhibit 2-27, *Construction of Bypass Channel and Location of Construction Facilities*, shows the location of the new rail spur near Milltown. Exhibit 2-29, *Rail Spur at Opportunity Ponds*, shows the location and configuration of rail facilities at Opportunity Ponds. The dewatered sediments transported to Opportunity Ponds are considered potentially suitable for use as a reclamation growth media and may be used to cap Cell D at the Opportunity Ponds. Large or woody debris encountered during excavation may require additional handling and processing to reduce its size so it can be transported by rail to Opportunity Ponds or it may be disposed in local landfills. Rail transport of the sediment will require the construction of additional loading and unloading spurs and facilities to access the excavation and disposal sites. Long-term operation and maintenance of the transported materials at Opportunity will be the responsibility of Atlantic Richfield Company as part of its obligations within the Anaconda Smelter Superfund Site.

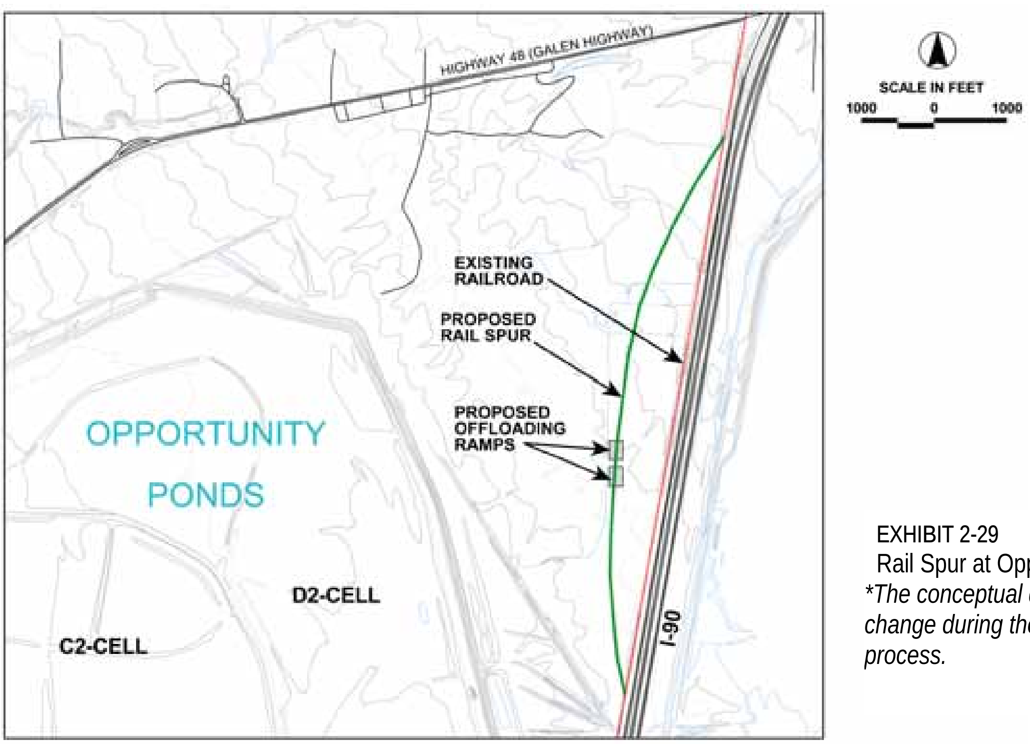


EXHIBIT 2-29
Rail Spur at Opportunity Ponds
**The conceptual design may change during the remedial design process.*

12.3.5 Dewatering

Dewatering of the lower sediments within Area 1 may be necessary if the sediments do not free-drain completely. For the proposed cleanup, EPA anticipates that some sediment dewatering will occur. An estimate of sediment pore water quality using sediment drainage test data collected by EPA during the 2002 drawdown study indicates that discharge of pore water into the Clark Fork River would not raise the river's dissolved arsenic and copper concentrations above EPA's temporary construction standards. Extraction wells and/or trenching may be used to aid dewatering. However, monitoring will be conducted and, if the impacts of returning excavation water to the river are found to be harmful or temporary standards are expected to be exceeded, the water will be treated or additional BMPs will be implemented before being discharged to the river.

12.3.6 Other Highly Contaminated Sediments

Certain higher metals-contaminated sediments in Area 3 (about 416,000 cy) located in the area shown on Exhibit 2-30, *Area 3 Sediment to be Left in Place and Isolated from the Floodplain*, may be left in place but will be isolated from the flood plain and will be armored through use of engineering controls to ensure that they are not eroded into the river. This area is to remain above the constructed river's 100-year flood plain and will be outside the extent of the regraded flood plain areas. The higher metals concentration sediments in Area 3 will need to be protected against potential erosional forces occurring from channel migration and high flows, including a 100-year flow event. Additional sediments containing higher metals adjacent to and underneath the eastbound lane of I-90 may be left in place. These sediments will be protected against erosion from up to a 100-year flood event. The remedy will also need to ensure long-term protection of these areas through appropriate ICs and operation and maintenance activities. A small portion of Area 3 will be removed.

Also, an identified 30,000 cubic yards of sediments directly in front of the dam within Area 3 will be removed. These sediments are located within the area that will be isolated by a cofferdam upstream of the spillway (see Exhibit 2-31, *Conceptual Model of Remedial Cleanup Plan*). This excavated material may, if practicable, be placed with the Area 3 materials that are to be left in place, isolated from the flood plain and armored from erosion as discussed above. If these sediments need to be dewatered, the water will be managed and treated the same way as pore water from Area 1.

Other highly contaminated materials that are excavated from other areas as part of the remedy will also be transported to the Opportunity Ponds, unless another appropriate disposal method is approved by EPA, in consultation with DEQ.

12.3.7 Infrastructure Protection

The remedy will be protective of infrastructure, including bridges located on the Blackfoot River between the Stimson Dam and the Milltown Dam and the Interstate 90 lower embankment. Sediment scour modeling indicates these bridge piers on the Blackfoot River will most likely require scour protection to maintain their integrity. Analyses of bridge scour and bridge pier protection for these bridges will be conducted as part of the remedy. The Interstate 90 embankment located on the north side of the site will be extended lower by the removal of sediment from Area 1. This embankment will need to be stabilized as part of the remedy. Both bridge protection and Interstate 90 embankment protection will meet Montana Department of Transportation specifications.

12.3.8 Clark Fork and Blackfoot River Channel Reconstruction/Restoration and Installation of Drop Structures

Concurrent with sediment removal, a new flood plain and channel will be constructed. The original channel and flood plain design, which reflected a highly engineered channel with a narrow 100-year flood plain within the project area, will be replaced with a design consistent with the DCRP. The plan proposes a more natural flood plain and channel design than presented in the *Original* and *Revised Proposed Plans* that will benefit fish and wildlife as well as local recreational use. The removal of the entire dam—including the powerhouse, divider block, and right abutment—allows for a wider, more natural channel and flood plain.

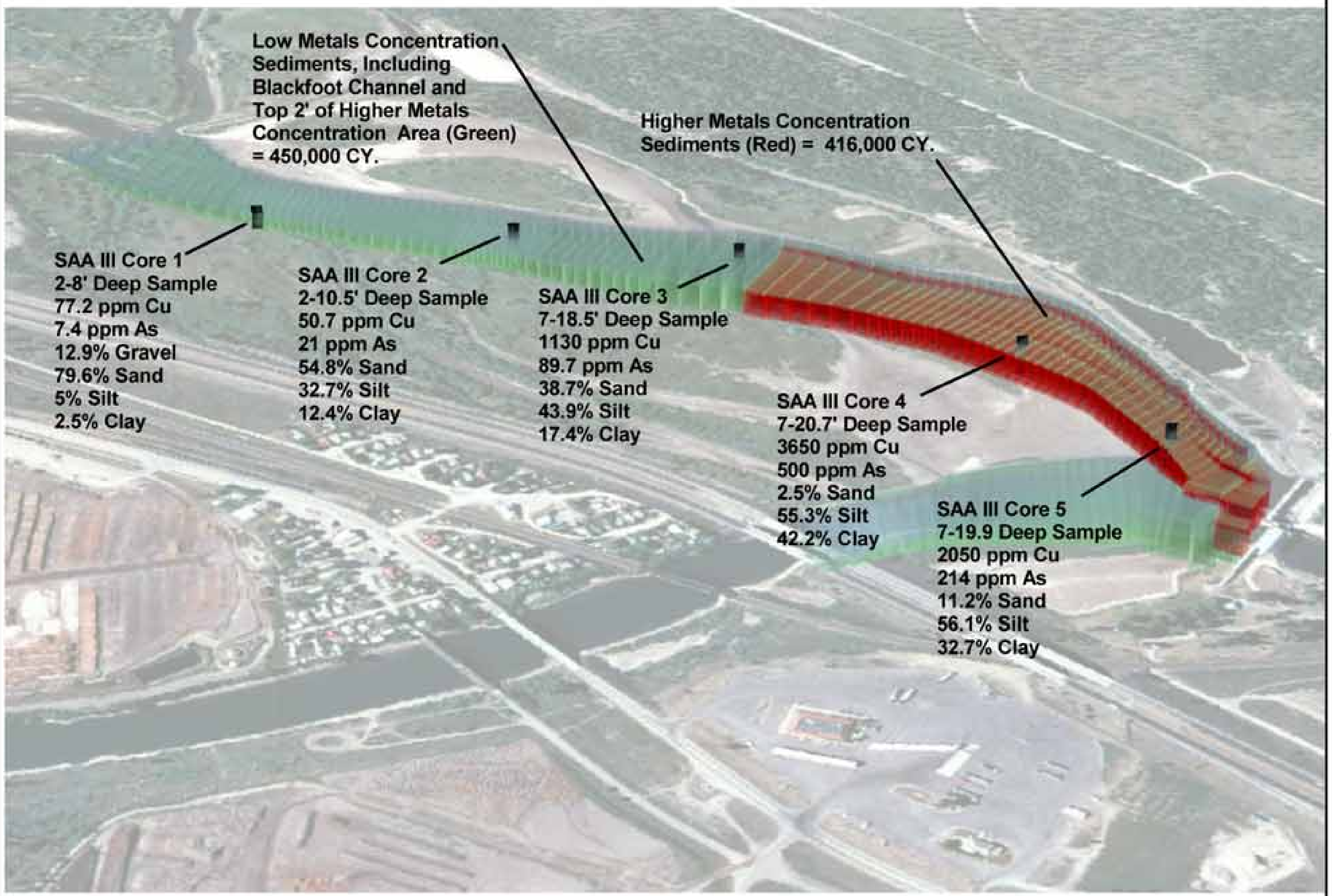
12.3.8.1 Reconstruction/Restoration Objectives

The following objectives will be addressed in the DCRP:

- Restore the confluence of the Blackfoot and Clark Fork Rivers to a naturally functioning, stable system appropriate for the geomorphic setting.
- Use native materials, to the extent practicable, for stabilizing channels, banks, and the flood plain to improve water quality by reducing bank erosion of contaminated sediments.
- Provide adequate channel and flood plain capacity to accommodate sediment transport and channel dynamics appropriate for the geomorphic setting.
- Provide high-quality habitat for fish and wildlife, including continuous upstream and downstream migration for all native and cold water fishes.
- Provide high-quality wetlands and riparian communities, where feasible and appropriate for the proposed stream type.
- Improve visual and aesthetic values through natural channel design, revegetation, and the use of native plants and materials.
- Minimize habitats that will promote non-native, undesirable fish species.
- Supplement revegetation activities proposed by remedy to increase flood plain vegetation diversity.
- Provide increased recreational opportunities compatible with other restoration goals, such as river boating and fishing.

12.3.8.2 Channel Design Elements

A new channel and flood plain for the Clark Fork River will be constructed extending from I-90 downstream of the dam to approximately 1.5 miles upstream of Duck Bridge. The new channel will reflect a “restoration” design that matches a natural meander pattern and gradient.



Notes:

1) Core sample information provided for deepest reservoir sediment sample collected during EPA's 2002 field investigation.

EXHIBIT 2-30
Area 3 Sediment to be Left in Place and Isolated from the Floodplain

SCALE IN FEET
1000 0 1000

Amended from ENVIROCON
101 INTERNATIONAL WAY
MISSOULA, MONTANA 59808

Revision 1

ISSUED FOR: Final Draft Technical Memorandum: Milltown Reservoir Dry Removal Scour Evaluation

Drawn: JJ
Checked: TW
Approved: DGB
Date: 5-17-04
Dwg. No:

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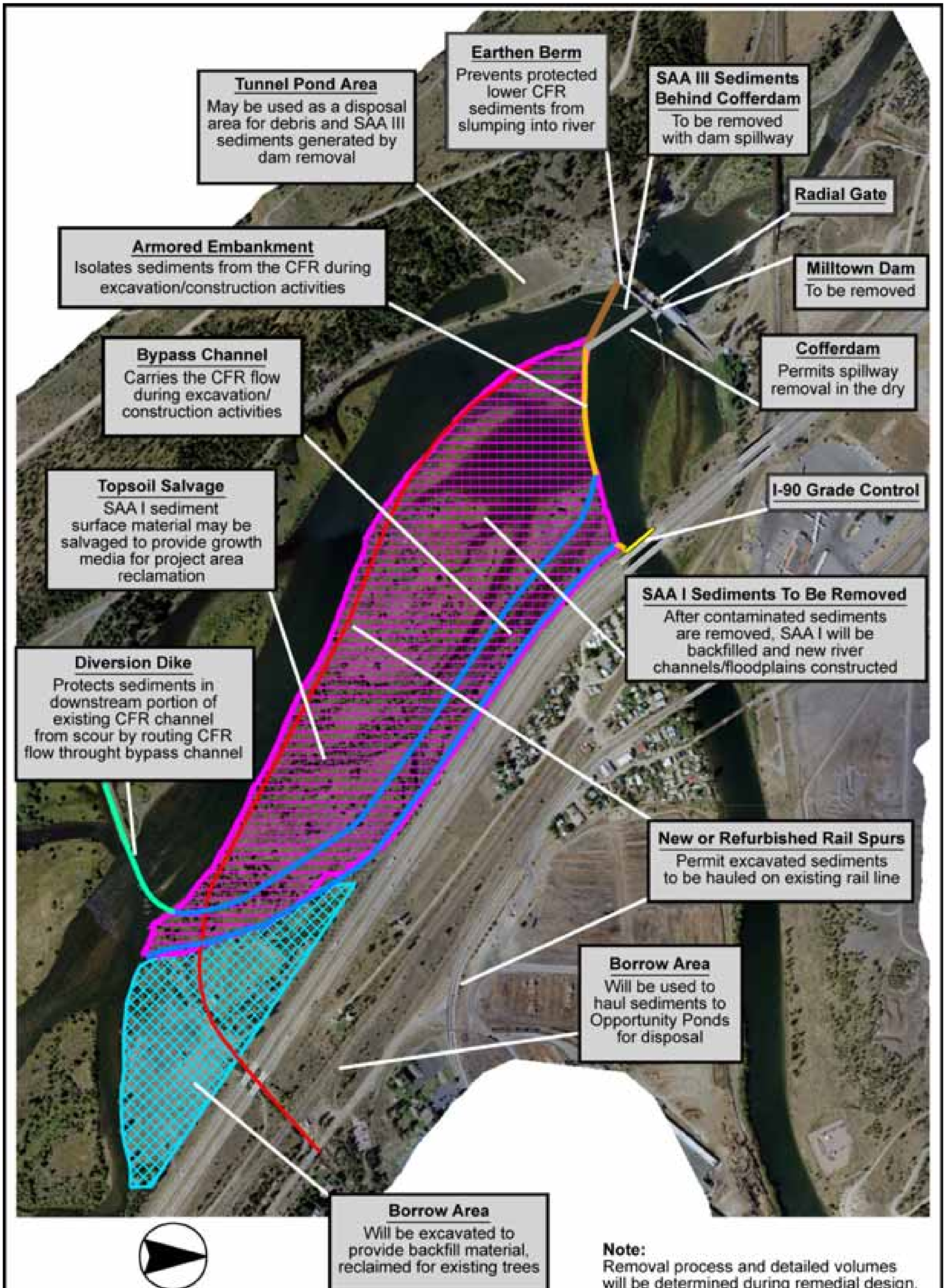

Drawn: TMG Checked: TW Approved: DGB Date: 11-23-04	ISSUED FOR: DRAFT FINAL RD/RA STATEMENT OF WORK	Revision 1	EXHIBIT 2-31 Conceptual Model of Remedial Cleanup Plan

Amended from ENVIROCON
101 INTERNATIONAL WAY
MISSOULA, MONTANA 59808

In concept, it is anticipated that the reconstructed Clark Fork and Blackfoot river channels will range from approximately 115 feet to 175 feet wide with a typical water depth initially ranging from approximately 4 feet to 9 feet under average flow conditions. The new channel will extend to the alluvium and will be designed to carry the annual flood (1.5-year) rather than the 100-year flood as previously proposed under remediation. The actual channel design has not been finalized, nor will it, until the necessary remedial design / remedial action phase of the project has been approved. Native alluvium exposed after the removal of the overlying sediments is assumed to be acceptable as bed material for the reconstructed channels. Riverbanks will be reconstructed at a bankfull height that allows for out-of-bank flow when flows exceed a 1.5- to 2-year return interval. Bank stabilization of the reconstructed channels will be necessary to maintain geomorphic stability. Stabilization could include bioengineering approaches using vegetation, as well as in-stream and bank structures.

Channel grade control will be constructed along the project reach of the Clark Fork and Blackfoot Rivers to mitigate headcutting associated with the removal of the dam structures and the resultant drop in river base level. The channel restoration will incorporate gradual grade control along the reach with the use of many different kinds of structures designed to benefit riparian vegetation and habitats, natural channel processes, fish habitat, fish passage, flood plain function, recreation use consistent with restoration goals, and other resource goals. A preference exists for structures that use more natural gradients and vegetative armoring that would provide a more natural appearing and naturally functioning channel.

The flood plain will be designed adjacent to the active channel to accommodate a variety of flow regimes, including a 100-year event. Stream banks would be stabilized through a more natural approach using vegetation, rocks, and log structures designed to meet remedial objectives. No rip-rap or armored banks are proposed. When the new channel is completed, the present, pre-remedial Clark Fork River channel will be abandoned, backfilled, and regraded into flood plain.

12.4 Control of Sediment Releases During Construction

An important factor in EPA’s and DEQ’s choice of this remedy was an evaluation of the downstream impact of reservoir sediments potentially scoured as the reservoir pool and river levels are lowered to accommodate removal of sediments. Of particular concern was the following:

- Volume of scoured sediments and associated concentration of metals, arsenic, and TSS released
- Potential downstream impact of these sediments
- Methods for controlling and mitigating these potential impacts
- Monitoring during and after cleanup activities

To assess and evaluate these concerns, EPA required Atlantic Richfield Company to run a sediment scour model under a variety of flow conditions. The USACE model HEC 6 was used to make the calculations needed. EPA employed a panel of sediment experts from the

USACE, U.S. Bureau of Reclamation, EPA's Research and Development Lab (Athens, Georgia), and industry to provide technical support in evaluating the results.

Conservative input data and assumptions were used in sediment scour modeling calculations so the values reported represent the upper range of sediment transport that is expected to occur during construction. The following section briefly describes these issues. For additional details concerning these issues please see *Final Technical Memorandum—Milltown Reservoir Dry Removal Scour Evaluation* (Envirocon 2004) and *Addendum 1 Updated Scour Evaluation* (Envirocon 2004) on the EPA Milltown website or in EPA's Administrative Record. In summary:

- Modeling results estimate that approximately 478,000 tons (406,000 cy) of additional sediment (sediment above and beyond that moving through the reservoir in an average year) will be scoured from the Milltown Reservoir during a 4-year construction period.
- The concentrations of dissolved metals moving downstream during construction are estimated to be similar to those seen during normal high flow events.
- EPA expects little or no effect on downstream aquatic life resulting from metals released during construction. The release of high levels of TSS will likely have a temporary negative impact on aquatic life during the remedial action.
- Sediment releases should not pollute downstream drinking water supplies because of the expected low concentrations of dissolved arsenic being released.
- Deposition of sediment should not cause problems for downstream public infrastructure. There is a potential for some temporary problems at irrigation intakes where coarse particles may settle and constrict intakes. These areas will be monitored and problems will be corrected as part of the remedy. Equipment will be available to clean out downstream irrigation intakes to ensure they are not constricted.
- The majority of the sediment will be transported downstream, mixed with other channel sediment, and ultimately come to rest in depositional areas downstream such as Thompson Falls and Noxon Reservoirs. The amount released from Milltown as a result of construction activities is relatively small when compared to the amounts entering downstream reservoirs on a routine basis (see Exhibit 2-32, *Annual Sediment Loads—Estimated Yield for Bypass versus Historic Long-Term Averages and Sediment Loads from High Flow Years*.
- Several key engineering controls and BMPs will be used to protect downstream water quality. They consist of isolating the most highly contaminated sediments with sheet piling and a bypass channel, and carefully planning the timing and sequence of reservoir drawdown and dam removal.
- The Clark Fork River downstream of the Milltown Dam will be monitored during and after remediation. Monitoring will include daily water quality sampling and caged fish exposure studies, as well as seasonal or annual measurements of fish and benthic (bottom-dwelling) macroinvertebrates communities. Proposed monitoring programs are discussed in more detail in Section 12.5, *Monitoring*.

12.4.1 Volume of Sediments Released/Downstream Concentration of Copper, Arsenic, and TSS

Sediment scour modeling using conservative input assumptions was conducted to estimate the volume of scoured materials and the potential TSS, copper, and arsenic concentrations produced and transported as a result of the proposed Milltown cleanup. The modeling estimates that approximately 478,000 tons of additional sediment will be scoured from the reservoir during a 4-year construction period. In a comparison, approximately 148,000 tons of sediment presently move through the Milltown reservoir to be transported downstream in a typical year. During high flow years, the sediment load is significantly larger. For instance, in 1996, about 317,000 tons of sediment moved through the reservoir and in 1997, the volume increased to 445,000 tons (see Exhibit 2-32, *Annual Sediment Loads—Estimated Yield for Bypass versus Historic Long-Term Averages and Sediment Loads from High Flow Years*).

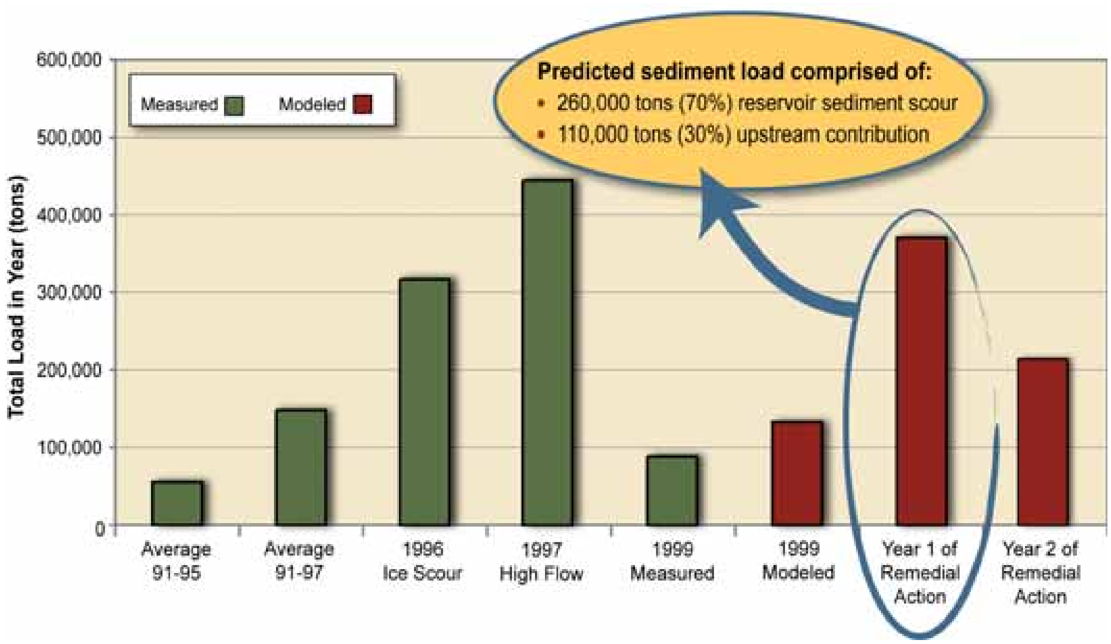

EXHIBIT 2-32
Annual Sediment Loads—Estimated Yield for Bypass versus Historic Long-Term Averages and Sediment Loads from High Flow Years

EPA believes that a temporary bypass channel for the Clark Fork River will prevent the scouring and subsequent transport downstream of the most highly contaminated sediments. Of the material that is scoured from the reservoir, slightly more than half will be uncontaminated sediments from the Blackfoot River and the rest from the Clark Fork River. The concentrations of metals from the Clark Fork arm of the reservoir are expected to be similar to what already comes down the Clark Fork each year. Nearly all (about 97 percent) of the sediment scouring would happen during the high flow seasons during the first 2 years of the remedial action.

According to modeling results, the concentration of dissolved metals in the Clark Fork River during construction should not be any higher than concentrations observed during normal high flow events. Dissolved metals concentrations in the river are not expected to exceed any of the temporary standards established for this project (see Exhibit 2-33, *MRSOU*

Proposed Temporary Construction Related Water Quality Standards). Peak dissolved copper and arsenic levels are expected to be about 23 µg/l and 14 µg/l, respectively. Of these concentrations, about 15 to 25 percent is expected to be from upstream loading. TSS concentrations may exceed the temporary standards for short periods of time, but are not expected to approach the construction standards after the high flow season following dam removal. Peak TSS concentrations are estimated to be about 1,850 mg/l. It is estimated that the daily maximum TSS standard (550 mg/l) will be exceeded for approximately 3 to 4 days during a 4-year construction period. The estimated ranges of total arsenic and copper concentrations are 3 to 35 µg/l and 5 to 205 µg/l, respectively.

A key technical issue during implementation of the selected remedy will be to control, contain, and prevent the release of sediment during removal activities in protection of downstream water quality and aquatic resources. The sediment management program that will be implemented considers OSWER Directive 9285.6-08, *Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites.*

EXHIBIT 2-33
MRSOU Temporary Construction Related Water Quality Standards*

Cadmium—Acute FAWQC	2 µg/l	short-term (1 hour)
Copper—80% of the TRV (dissolved) (at hardness of 100 mg/l)	25 µg/l	short-term (1 hour)
Zinc—Acute FAWQC (dissolved)	117 µg/l	short-term (1 hour)
Lead—Acute FAWQC (dissolved) DWS (dissolved)	65 µg/l 15 µg/l	short-term (1 hour) long-term (30-day average)
Arsenic— Acute FAWQC (dissolved) DWS (dissolved)	340 µg/l 10 µg/l	short-term (1 hour) long-term (30-day average)
Iron—FAWQC (dissolved)	1,000 µg/l	short-term (1 hour)
Total Suspended Solids (TSS)	550 mg/l 170 mg/l 86 mg/l	short-term (day) mid-term (week) long-term (season)

*All hardness related FAWQC values assume a hardness of 100 mg/l
TRV = Toxicity Reference Value, used in *Proposed Plan* for the Clark Fork River Operable Unit
FAWQC = Federal Ambient Water Quality Criteria (Gold Book update 2002)
DWS = Federal Drinking Water Standard

An important part of the sediment management program will be to monitor the site during and after sediment remediation to assess and document the effectiveness of the cleanup. Water quality and biological studies will be conducted during and after site remediation activities to monitor for potential adverse effects on aquatic habitat and organisms. A water quality monitoring station will continuously monitor turbidity on the Clark Fork River downstream of the Milltown Dam Site at the Deer Creek Bridge. Total suspended solids and dissolved and total recoverable metals sampling will be conducted daily. EPA and DEQ have established temporary construction-related water quality standards (Exhibit 2-33, *MRSOU Proposed Temporary Construction Related Water Quality Standards*) that will be applied to the river during the construction process. The point of compliance for these standards is proposed at the Deer Creek Bridge, located about 2.8 miles downstream of Milltown Dam and the site of a current USGS sampling station (Station No. 12340500). Additional BMPs and control actions will be considered if these standards were exceeded or if in-situ bioassays (caged fish) indicated the need.

Biological monitoring will be conducted downstream of Milltown Dam and at control stations to assess whether or not cleanup activities may be affecting aquatic life. Caged-fish bioassays will be used to assess the protectiveness of the temporary construction standards, while seasonal or annual measurements of fish and benthic macroinvertebrate communities will be used to assess longer-term impacts. Results from these monitoring activities will be used to adjust construction activities, BMPs, or treatment if necessary, to avoid acute impacts on fish.

Construction BMPs will be employed to help prevent uncontrolled release of sediment into the river during construction activities. Examples may include building temporary berms along the banks of the active channel to prevent material spillage into the river by trucking activities, careful planning of spoils pile locations and dewatering activities, careful planning of egress and access to the site, employment of silt curtains downstream of the construction activities if needed, liberal use of hay bales in likely areas of potential runoff from rain events, and watering of roads and stockpile areas to reduce dust emissions.

12.4.2 Effects of Sediment Release

There is expected to be little or no effect on downstream aquatic life resulting from metals released during the cleanup. The release of high levels of TSS and sediments is likely to have a temporary negative impact on aquatic life downstream during implementation of the remedy. Adult trout have been shown to have high tolerances to high levels of TSS, but concentrations of TSS greater than 1,200 mg/l have been shown to cause some mortality in trout less than a year old. Longer term exposure to TSS concentrations between 100 and 1,000 mg/l have been shown to have chronic impacts on trout such as impaired feeding and reduced growth. Deposited sediment can also reduce fish spawning habitat and macroinvertebrate populations (fish food supplies), and thereby impacting fish reproduction, growth and population. The sediment scour modeling effort indicated that the fine materials (silts, clays, and organic matter; about 50 percent of the total release) will move through the system very quickly. Maximum impacts will be observed from immediately below the Milltown Dam to the junction of the Clark Fork and Bitterroot Rivers. Impacts of sand and fine material moving downstream become less and less as more water enters the river. The flow of the Clark Fork River below the Bitterroot River is twice as great as the flow of the Clark Fork River leaving the Milltown Reservoir and seven times greater by the time the Clark Fork River reaches Thompson Falls Reservoir.

Drinking water supplies should not be polluted in any way by the cleanup. To the contrary, the cleanup will result in a restored drinking water aquifer for Milltown. EPA and DEQ are confident that drinking water supplies will not be impacted by the cleanup because the levels of metals and arsenic in any released sediments are expected to be low. In addition, there are no drinking water system intakes drawing water directly from the river.

Downstream irrigation systems may be impacted, namely those withdrawing water between the Milltown Dam and the Bitterroot River. The main impact is expected to be from sand accumulating at the intakes and constricting intake flows.

There should be very little impact on infrastructure from sediment accumulation downstream of the I-90 bridge immediately below Milltown other than at the irrigation intakes. This is because of the higher river velocity between Milltown Dam and Thompson Falls Reservoir. Most of the fine sediments and sand will accumulate in the Thompson Falls Reservoir (some fines may go through Thompson Falls Reservoir into Noxon Reservoir). The amounts of sediment that will be transported to the downstream reservoirs as a result of construction activities at Milltown will be relatively small as compared to the amount routinely transported. An estimated 478,000 tons of additional sediment will be transported from the Milltown Reservoir during a 4-year construction period as compared to an estimated 2,200,000 tons of sediment transported from upstream to Thompson Falls Reservoir during a typical 4-year period. Given the large amounts of sediment routinely deposited in these reservoirs and the low levels of metals in the released Milltown sediments, there should be little to no impact on overall sediment metals levels, groundwater quality adjacent to these reservoirs, or reservoir storage capacity.

12.4.3 Controls and Mitigation Measures

Several key engineering controls and construction BMPs will be used to minimize the scour and release of reservoir channel sediment and associated metals during construction activities to protect downstream water quality.

The major planned engineering controls include the isolation of the Area 1 sediments using a sheet pile and bypass channel system (see Exhibit 2-27, *Construction of Bypass Channel and Location of Construction Facilities*). This system should be highly effective in reducing the potential sediment scouring. This system reduces total scouring from about 1.2 million tons of sediment to about 478,000 tons and reduces the amount of highly contaminated sediment (greater than 1000 mg/kg copper or greater than 100 mg/kg arsenic) scoured from the reservoir from an estimated 400,000 tons to 0 tons. Additional BMPs (such as silt curtains, coffer dams, and grading and armoring of bypass stream banks) will be developed in detail during remedial cleanup design and construction.

Another important aspect of mitigating and reducing potential downstream impacts is the timing and sequencing of reservoir drawdown and dam removal. To minimize downstream impacts and allow the earliest possible fish passage and recovery, EPA and DEQ propose dam removal during the winter and spring months immediately after the Area–1 sediments are isolated and the Clark Fork River is routed into the bypass channel. By timing the reservoir drawdown and dam removal in late winter/early spring, most sediment would be scoured during spring run-off and before the major irrigation withdrawals and the summer/early fall recreational season. There is also a potential for intake gate elevation control to try to bypass the sand fraction past irrigation intakes. Excavation equipment will also be dedicated to ensure that gates are not constricted by sand deposition. EPA and DEQ will require the party implementing the remedial action to work closely with irrigators to insure that negative impacts are minimized.

12.5 Monitoring

An important part of the cleanup remedy is the monitoring program during and after remediation. Monitoring will assess and document the effectiveness of the cleanup. The monitoring program will include a variety of media, aquatic life, and flora, including surface and groundwater water quality and biological studies conducted during and after site remediation activities to assess any adverse effects on aquatic habitat and organisms. Monitoring of repositories, engineered control structures, such as the Area 3 sediments left in place, and the lower I-90 embankment is also required.

Another facet to the proposed monitoring programs involves the restoration activities of the State and other Natural Resource Trustees. EPA has worked with the State and other Trustees to provide close coordination between the remediation and restoration plans within the remediation project area (the area from the dam to Duck Bridge on the Clark Fork River arm of the reservoir and to the Interstate Bridge on the Blackfoot River arm). This cooperation and integration will also extend to the monitoring programs.

12.5.1 Surface Water Monitoring

The primary surface water quality monitoring station and point of compliance downstream of Milltown Reservoir is a long term USGS monitoring station with 75 years of record ("Clark Fork River above Missoula," at the Deer Creek Bridge, USGS Station No. 12340500). The Deer Creek Bridge is located approximately 2.8 miles downstream of Milltown Dam. No other tributaries enter the Clark Fork River between the dam and this gaging station. This monitoring point will allow direct comparison to historic levels. Recharge from groundwater back into the river will be monitored through an existing network of wells (see Section 12.7, *Performance Standards and Remedial Goals*).

Monitoring during implementation of the remedy will include the following:

1. Continuous monitoring of turbidity on the Clark Fork River downstream of the Milltown Dam Site at the Deer Creek Bridge.
2. Daily sampling of TSS and dissolved and total recoverable arsenic, cadmium, copper, lead, and zinc.
3. Periodic sampling of TSS, metals, and arsenic will occur downstream at a predetermined location immediately upstream of Thompson Falls Reservoir. The exact location and frequency will be determined during remedial design.

In addition, EPA and DEQ have also established temporary construction standards (see Exhibit 2-33, *MRSOU Temporary Construction Related Water Quality Standards*) for the river to protect human health and prevent acute impacts to the downstream fishery, including bull trout. Additional BMPs and control actions will be considered if these standards are exceeded.

Seasonal or annual measurements of fish and benthic macroinvertebrate communities and caged fish studies will be used to assess longer-term impacts. Results from these monitoring activities will be used to adjust construction activities or BMPs to avoid acute impacts on fish.

12.5.2 Groundwater Monitoring

In addition to the surface water quality monitoring, groundwater quality in the Milltown area and at key downstream locations will be monitored. Although negative impacts to groundwater used for drinking water are not expected, EPA is committed to remedy any problems related to drinking water that might occur.

Atlantic Richfield Company, through their contractor Land & Water, presently monitors water quality in an extensive network of potable water wells and monitoring wells strategically located throughout the valley (see Exhibit 2-16, *Land Use and Future Water Needs Analysis Area*). Water levels and water quality (arsenic, cadmium, copper, lead, and zinc) are monitored on a quarterly basis. Monitoring of this network will extend through construction and into the post construction period to document impacts and the rate of change to both water table elevations and water quality.

During the construction period when the reservoir is being drawn down and the dams are removed, water levels in the monitoring network will be monitored more frequently to capture and record any changes in groundwater elevation and flow direction.

The specific frequency of monitoring will be determined during remedial design when the construction schedule for remedial activities is confirmed and set. Additional monitoring wells may be added to the network to fill unanticipated data gaps and make the groundwater monitoring as comprehensive as possible. The specific locations of any new wells will be determined during remedial design.

12.5.3 Operational and Functional Monitoring

The results of remedial/restoration actions are to be evaluated during the post-construction period, and during the first, second, and third growing season, to rapidly determine if the re-vegetation component of the remedy is operational and functional and to trigger corrective actions immediately as problems are encountered. Because of the extensive restoration activities applied to the project area, the State of Montana has agreed to lead certain aspects of the operational and functional monitoring. During remedial design, as a precursor to construction implementation, re-vegetation targets will be established for the new flood plain areas, river banks, and other areas impacted by construction activities (e.g., soil borrow area, temporary access roads, etc.), specifically for the following:

- Streambank and flood plain stability against accelerated erosion.
- Established and fully functional riparian and flood plain areas, including species diversity.

It is reasonable to expect attainment of these targets during the third growing season, although recurrent drought cycles may extend this period. To ascertain flood plain stability and determine whether vegetation is on a trajectory to attain the performance targets, the following assessments are to be made following implementation of remedial action:

- General flood plain stability—Evidence of rills and gullies; soil movement or mass instability will trigger corrective actions.
- Streambank stability—Assessments of the banks are to be conducted. Evidence of erosion along the toe or erosion at either the upper or lower ends of the treated banks will trigger corrective actions.
- Assessment of woody vegetation survival will be conducted of the original planted materials by species. Corrective actions may include replanting to the original number of plants for a particular species.

- The goal for herbaceous vegetation in the flood plain and riparian zone is 98 percent canopy cover of the seeded area. Corrective actions may include determining cause(s) for failure, correcting them, and reseeding.

Noxious weeds and undesirable weedy species are to be controlled in accordance with County regulations.

12.5.4 Short-Term Monitoring

Following demonstration that the remedy is operational and functional, the site will be monitored for a period of at least 5 years. The short-term performance phase will demonstrate the immediate success of the remedy in terms of streambank stabilization and preferred vegetation establishment in the flood plain. In addition to the vegetation cover, species richness, weed control, and flood plain stability conditions required under operational and functional, the short-term performance monitoring phase will include broader evaluations of ecological trend.

This level of monitoring will be conducted after remedial action(s) are implemented, and results will be used to determine whether the action remains operational and functional. This level includes baseline measurements of groundwater and surface water, qualitative assessments of the remedial action, and failure assessments. Specific short-term monitoring plans will be prepared during the remedial design phase of the project.

12.5.5 Long-Term Monitoring

Specific areas will be subjected to long-term monitoring after short-term monitoring, which may include the assessment of temporal changes using qualitative and quantitative assessments. These data and information are used to assess whether the Selected Remedy has been implemented and whether vegetation targets are met. This period of monitoring is generally 6 to 20 years depending on the time required to achieve operational and functional status, changes in land use, and any on-going maintenance activities.

All of the abiotic and biotic monitoring—including plant communities, growth media, erosional stability, aquatic communities, evidence of sustainability, and wildlife—will play significant roles in the assessments of achievement of ecological and health risk reduction and assessment of meeting ARARs. Specific long-term monitoring plans will be prepared during the remedial design / remedial action phase of the project.

12.6 Additional Selected Remedy Considerations

12.6.1 Replacement Water Supply Program/Temporary Groundwater ICs

EPA is aware that some temporary groundwater ICs may be necessary during and immediately after construction to address potential human health risks by limiting the use of the groundwater until the aquifer recovers through natural attenuation. Groundwater ICs to be implemented throughout the 4- to 10-year attenuation period include the following:

- Provide continued funding for maintaining the existing replacement water supply for Milltown residents.

- Make contingency funds available to reconfigure, expand, or update replacement water supplies.
- Establish a controlled groundwater area to ban future wells within or immediately adjacent to the arsenic plume.

Several ICs are already in effect, routinely enforced, and currently contribute to the protection of public health and the environment. These controls include the following:

- Missoula County land use plans
- Flood plain and subdivision regulations
- Zoning
- County development regulations for utility service extensions
- Missoula Valley Aquifer Protection Ordinance—Controls well use in the county as well as private land use controls

Some of these, or similar controls, may need to be developed or refined to promote proper land use where wastes are left in place.

12.6.2 Compliance with the ESA

Bull trout and bald eagle are both listed as threatened species and occur in or near the site. Construction activities should have minimal impact on bald eagles in the area, but bull trout may be impacted by site activities. To minimize the impact on bull trout, construction methods proposed during implementation of this remedy include use of a sheet pile system and construction of a bypass channel to minimize TSS and metals release. Activities will also be timed and sequenced to minimize impacts. EPA will coordinate and conduct cleanup activities in a manner that will facilitate fish passage as soon as possible. In the long term, it is considered beneficial to fishes to implement cleanup and dam removal quickly and in an environmentally safe manner.

Although extensive mitigation methods are proposed, there is a potential that short-term adverse impacts to bull trout could occur as a result of construction activities. Adverse impacts could reach the level at which incidental take of bull trout could result. The USFWS has worked with the EPA on the development of measures to reduce impacts of this project on fish and wildlife. The EPA prepared a revised biological assessment, describing potential impacts of this cleanup with mitigation measures to minimize impacts to fish and wildlife. This document was submitted to the USFWS for incorporation into their Biological Opinion. The USFWS Biological Opinion has been completed in support of the Milltown Project, is available for review as a separate document (USFWS 2004) and is part of the administrative record.

12.6.3 Stimson Dam Removal

As previously described in discussion of the remedy, another necessary action, coordinated with the State's restoration plan and the remedial action, is the removal of the Stimson Dam located on the Blackfoot River, a mile upstream of the Milltown Dam. Although not specifically a remediation element of the project, EPA, DEQ, and the Trustees have determined that the removal of this dam is necessary to provide fish passage and eliminate physical hazards that would occur from the lower water level once the Milltown Dam is removed. Currently, plans call for removal of the Stimson Dam. This would occur with funding from the USFWS National Fish Passage Program, matching funds, and other contributions. The removal of the Stimson Dam would occur immediately prior to the removal of the Milltown Dam.

12.6.4 Other Selected Remedy provisions

Significant wetlands exist at the MRSOU. EPA has previously worked with the USFWS on a methodology for assessing wetlands in the Clark Fork River Basin prior to construction activities, and ensuring that a no net loss of wetland standard is achieved. This important ARAR requirement will be complied with for the MRSOU. Existing wetlands will be carefully mapped and scored, and the wetlands destroyed during the remedy implementation will be replaced within the Clark Fork River Basin. The implementation of the DCRP within the Project Area may offer significant opportunity for the development of riparian wetlands as replacement wetlands.

The Milltown Dam facility is potentially eligible for protection under the National Historic Preservation Act. There are other potentially eligible historical or cultural resources within the MRSOU. EPA will work with FERC, the State Historic Preservation Office, and the CSKT to ensure that the destruction of protected historical and cultural resources is avoided if possible, appropriate mitigation is conducted for resources lost as a result of the Milltown cleanup, and careful protection of any newly discovered protected resources as the project is implemented.

As noted in various sections above, this *Record of Decision* requires the protection of groundwater users. EPA does not expect contamination to expand or spread during remedy implementation. However, if it does, contingency plans will be in place to address wells that may be temporarily affected by the implementation of the Selected Remedy. The Selected Remedy also requires a response to current domestic wells that have been adversely affected by the expected drop in ground water levels as a result of dam removal. EPA will also ensure that downstream users of irrigation ditches and similar structures are protected from adverse effects of sediment release during remedial construction.

12.6.5 FERC License Surrender

The dam owner, NorthWestern Corporation, plans to submit the plans and agreements to implement the combined remediation and restoration plan for the Milltown site to FERC. FERC has issued NorthWestern Corporation, via its subsidiary, a license for operation of the dam. The combined plan should comply with FERC dam license surrender and de-commissioning requirements, if applicable. Section 121(e)(6) of CERCLA exempts CERCLA remediation projects from permits or licenses. EPA, NorthWestern Corporation, and FERC have worked cooperatively on this project.

12.7 Performance Standards and Remedial Goals

This section of the *Record of Decision* describes and discusses key performance standards for groundwater, surface water, and vegetation. Performance standards are also contained in Appendix A of the *Record of Decision*—the description of ARARs.

12.7.1 Performance Standards for Groundwater

The groundwater RAOs are as follows:

- Return contaminated groundwater in the Milltown alluvial aquifer to its beneficial use within a reasonable time frame.
- Comply with State and Federal groundwater standards, including nondegradation standards.
- Prevent groundwater discharge containing arsenic and metals that would degrade surface waters.

Implementation of the Selected Remedy will accomplish these objectives. The Selected Remedy must be compliant with groundwater ARARs as established for the MRSOU. Standards for groundwater are as follows (dissolved concentrations):

- Arsenic 10 µg/l
- Cadmium 5 µg/l
- Copper 1,300 µg/l
- Lead 15 µg/l
- Zinc 2,000 µg/l

Methods to evaluate groundwater performance standards, points of compliance, monitoring well locations and numbers, frequency of sampling and analysis, and reporting requirements are to be specified in remedial action monitoring and maintenance plans. EPA expects the Selected Remedy to obtain these standards within 4 to 10 years after construction is completed in areas where production rates are suitable for water supply purposes. However, EPA recognizes that there is uncertainty about how quickly the Selected Remedy will achieve full compliance with these Performance Standards in the Milltown alluvial aquifer. If full compliance is not achieved, EPA will consider other options to meet this standard, or, if warranted, invoke appropriate waivers of these standards. Timing of evaluations relates to the determination of when the remedy becomes operational and functional, and other monitoring and maintenance requirements. EPA also recognizes that there may be limited areas where sediments are left in place and pore water within these sediments exceeds groundwater standards. These areas would not contribute significant amounts of contamination to the underlying aquifer.

12.7.2 Performance Standards for Surface Water

Final standards for surface waters provided in Exhibit 2-34 are based on a hardness of 100 mg/l using a total recoverable method, except for the copper standards and the arsenic and cadmium human health standard. The copper and the Federal human health arsenic and cadmium standards are based on the dissolved component.

Methods to evaluate surface water performance standards, points of compliance, sample locations, frequency of sampling and analysis, and reporting requirements are to be specified in the Remedial Design documents. Timing of evaluations relates to the determination of when the remedy becomes operational and functional, and other monitoring and maintenance requirements as described below.

EXHIBIT 2-34
Surface Water Standards[a]

	Acute	Chronic	Human Health
Arsenic	340 µg/l	150 µg/l	10/18 µg/l[b]
Cadmium	2.10 µg/l	0.27 µg/l	5 µg/l[c]
Copper[d]	13 µg/l	9 µg/l	1,300 µg/l
Lead	81 µg/l	3.2 µg/l	15 µg/l
Zinc	119 µg/l	119 µg/l	2,000 µg/l

[a] Based on 100 mg/l hardness, total recoverable, acute, and chronic (WQB-7, January 2004, unless otherwise noted)

[b] The performance standard includes both the federal MCL, 10 µg/l, dissolved and the State WQB-7 standard, 18 µg/l, based on total recoverable analysis. Final determination of whether these standards will be consistently attained will depend upon upstream source control as well as implementation of this remedy.

[c] Performance standard based on the Federal and State MCL, measured as a dissolved standard.

[d] Federal Ambient Water Quality Criteria (dissolved; Gold Book, update 2002)

12.7.2.1 Temporary Surface Water Quality Standards

EPA has invoked a waiver of the ambient surface water standards during construction activities pursuant to section 121(d)(4)(A) of CERCLA, 42 USC § 9621 (d)(4)(A), which allows waivers for interim measures. The waiver applies to the ambient surface water standards for cadmium, copper, zinc, lead, arsenic, iron, and total suspended solids. As discussed in Section 12.4, *Control of Sediment Releases During Construction*, EPA has determined that exceeding these ambient surface water standards during construction activities is unavoidable. However, the construction activities are temporary, interim measures implemented as part of the total remedial action for the purpose of attaining the ARARs when completed. As set forth in Appendix A, the final remedial action will attain the ambient surface water standards with the exception of copper. Copper exceedances resulting from upstream sources are discussed in Appendix A.

Exhibit 2-33, *MRSOU Proposed Temporary Construction Related Water Quality Standards*, lists the temporary surface water quality standards to be used during the construction (both remedial action and restoration) and implementation portion of the project. These temporary standards were established by EPA and DEQ, in consultation with FWP, to protect human health and prevent acute impacts to the downstream fishery, including bull trout. Reference to these standards during remedy implementation needs to consider whether an exceedance of temporary standards is related to construction activities at the MRSOU or to loading from upstream or other sources. Neither remedial action nor restoration may contribute to an exceedance of the temporary surface water quality standards. The construction standards apply to both ambient surface water and point source discharges created during the remedial action or restoration construction.

12.7.3 Specifications for Backfill and Growth Media

Specifications for backfill and growth media will be developed and approved during the remedial design process. The growth media may be obtained onsite or from adjacent borrow areas when appropriate specifications are met. The backfill will be obtained from the BDG and Sheriff's Posse borrow areas. The objectives for the backfill specifications are to allow the establishment of a stable naturally migrating channel, in compliance with Performance Standards including ARARs, and to prevent excessive erosion and downstream transport of flood plain materials. The objective for the growth media is to provide adequate plant cover, in compliance with Performance Standards including ARARs, to prevent excessive erosion and subsequent potential negative impacts on water quality and aquatic life.

12.7.4 Performance Standards for the Protection of Waste Left In Place and Local Repositories

Sediments left in place and existing and newly created repositories will be protected through planning and construction design to ensure the following:

- Existing local waste repositories and newly created debris repositories will remain out of the 100-year flood plain. Remedial design of the new channel and the adjacent flood plain will accommodate this requirement.
- Milltown Reservoir sediments containing elevated levels of metals in Area 3 not removed by the remedial activities or left in place adjacent to I-90 will be isolated from the flood plain and protected from erosion by adequate slope and toe protection. Remedial design considerations for such areas will be able to withstand a 100-year flood event without significant soil losses resulting from erosion.

12.7.5 Performance Standards for the New Channel

Specific performance standards for the new channel will be developed in detail during the final design. Draft conceptual standards are presented in the State's DCRP. General requirements include the following:

- The active channel will be designed to accommodate the bankfull discharge with an adequately vegetated flood plain to convey flood flows of higher magnitude (such as a 100-year, 24-hour event). Channel plan view geometry and characteristics (sinuosity, meander length range, curvature radii, and step frequency) will reflect bank full discharge needs and mimic characteristics of similar reference reaches.
- Channel dimensions (including depth, slope, roughness, cross-sectional area, and width/depth ratio) will be designed to meet the specific features of the reach in which they reside. The State's restoration plan has designated these areas as Clark Fork River sections 1, 2, and 3, and Blackfoot River section 1.
- Riffle, pool, run, and glide features will be incorporated into the design to efficiently dissipate water energy, sustain a gradient that maintains sediment entrainment through the project area, and provide for adequate deep pool habitat for aquatic life (fish).
- The final design shall promote the passage of adult and juvenile salmonids and other fish without restriction during periods of low flow through all discharge periods.

These standards apply to the Restoration action within the Project Area, which is being done in lieu of certain remedial actions.

12.7.6 Performance Standards for Re-Vegetation of River Banks and the Flood Plain

Performance standards for vegetation are to be integrated into remedial and restoration design, as appropriate, based primarily on end land use. The use of native species for revegetation will be emphasized within the flood plain. Vegetation performance measurements endpoints include, but are not limited to, the following:

- Woody browse levels
- Completeness of the canopy along the streambank and riparian area
- Vegetation cover
- Species richness
- Vegetation structural complexity
- Maturation periods
- Plant reproduction
- Species diversity

The re-vegetation performance standards measurement endpoints will be further developed as land management objectives for the project area are developed. For instance, wildlife would favor good habitat value associated with structurally complex vegetation and species diversity. The degree to which the remedy is able to satisfy the objectives of the land managers is dependent on the management objectives for the project area. Native vegetation—such as grasses, shrubs, and trees—will be specified for many areas that will receive remedial actions. For other areas, the vegetation community to be established will depend on current land use and condition. For example, in many riparian plant communities, greater diversity means earlier seral, disturbed conditions. Some healthy, natural communities are monocultures (such as common cattail or sedge stands).

Methods to evaluate soil and vegetation performance standards are to be provided in remedial action and restoration construction quality assurance plans and in remedial action and restoration monitoring and maintenance plans. Assessment areas or points of compliance are to be determined on a polygon-by-polygon basis. Timing of evaluations relates to the determination of when the remedy or restoration becomes operational and functional, and other monitoring and maintenance requirements.

The performance of remedial efforts to reach minimum standards in terms of survival of plantings, vegetation composition, and canopy cover on areas within the 100-year flood plain will be assessed on a polygon-by-polygon basis. Performance standards and guidelines will be written to assure the achievement of ultimate targets at 10 years from initial remedial or restoration treatment. Interim targets at intervals of 1, 2, 4, and 7 years from initial remedial or restoration treatment are typically designated as checkpoints to assess that progress is being made along a trajectory that will reach the ultimate performance standard after 10 years.

12.7.7 Compliance with ESA During Construction

The minimization methods for sediment control proposed during construction of this remedy include the following:

- Construction of a bypass channel to isolate Area 1 sediment from entrainment in river flow.
- Use of a cofferdam, sheet pile, or silt curtain system to isolate and control sediment and metals release.
- Other BMPs such as controlling reservoir pool level (until the dam is removed) to minimize scouring, and timing and sequencing activities to minimize impacts.

EPA will coordinate and conduct cleanup activities in consultation with USFWS to facilitate fish passage while the dam is in place. In the long term, it is considered beneficial to fishes to implement cleanup and dam removal quickly and in an environmentally safe manner. Therefore, time sensitive actions related to cleanup and dam removal may hold priority over fish passage needs. Even though extensive minimization methods are proposed, there is still a chance that bull trout will be negatively impacted by the construction. The USFWS Biological Opinion contains requirements for ESA compliance, which are applicable to the remediation project, the restoration implementation, the interim dam operation, and the Stimson Dam removal, respectively (USFWS 2004).

12.7.8 Performance Evaluations for the Selected Remedy

Following completion of the Selected Remedy, a need will exist to maintain the remedy, including restoration actions done in lieu of remedial action, and demonstrate that the remedy is operational and functional, and ultimately that the remedy is successful. A Monitoring and Maintenance Plan is to be developed and is to include assessments of the success of the Selected Remedy by evaluating the following:

- Improvements in groundwater quality compared to Performance Standards for multiple points of compliance over a reasonable time period.
- Reduction of acute and chronic risks to aquatics as measured by biological surveys of fish densities, and benthic macroinvertebrate taxa richness and species diversity counts.
- A measure of vegetation attributes of cover, production, species richness, and successional trend across the reconstructed flood plain.
- Assessments of meeting Performance Standards established in this *Record of Decision*, including ARARs.

12.7.9 Safety Concerns

Conducting a cleanup in a safe manner is a primary concern. Safety will be stressed throughout all aspects of the project. Other sections of the *Record of Decision* elaborate on why it is necessary to remove some of the most toxic sediments. EPA's experience with other sites where large scale removal has been done indicates this project can be conducted safely with careful planning.

Comments on both *Proposed Plans* specifically discussed the potential for inhalation of contaminated dust from construction activities. A concern regarding inhalation is contrary to the findings of the *Human Health Risk Assessment*, which did not find the inhalation pathway for contaminants associated with disturbance to be a problem. It is also contrary to experience at other sites (Warm Springs Ponds, LAO, Butte Hill, and Silver Bow Creek) where dust control during removal of wastes has been appropriately implemented and no adverse health effects have been suggested or demonstrated.

The safety risks posed by removing and hauling sediment to a secure rail car loading dock can be controlled and managed. Past cleanup actions in the Clark Fork Basin have generally demonstrated this. However, it does require a high level of safety consciousness, good planning, and a commitment to coordination and cooperation with local county and city officials and residents. In 17 years of cleanup construction valued at hundreds of millions of dollars and involving the removal of millions of cubic yards of wastes in the Clark Fork Basin, there has been one construction worker fatality and very few other injuries, but no injuries to the public.

A primary consideration at the MRSOU project is to manage haul trucks safely. This includes planning to safely optimize truck traffic flows on major highways, primary local county roads, and secondary access roads onto private property. EPA has consulted with construction specialists at the U.S. Bureau of Reclamation and with EPA's contractor, and believes that the project can be designed and implemented in a safe manner. Other large scale construction projects, such as road construction and logging operations, commonly pose traffic safety risks and yet are effectively planned and implemented.

EPA will emphasize project safety in implementation. This particular project will require possible road paving and widening, the coordination of rail car hauling of wastes to the Opportunity Ponds repository, and other techniques to minimize public contact with the trucks, trains, and heavy equipment, and to ensure wide and stable enough roads where that contact may occur. The remedy will retain responsibility for road upgrades and EPA will work closely with local representatives. EPA believes the remedy can be safely implemented through good planning and engineering practices.

12.8 Scheduling

The potential schedule for implementation of the proposed remedy is summarized below. This schedule is likely to change based on public participation activities, final design components and sequencing, and yearly variations in hydrologic conditions.

2004	*Record of Decision*
2004 – 2005	Planning / Remedial Design
2004 - 2005	FERC License Surrender Regulatory Activities
2005	Infrastructure Construction (sheet pile, bypass channel, rail spurs, etc.)
2006	Dam Removal (Remediation and Restoration elements)
2006 – 2007	Sediment Removal, Backfilling, Regrading
2007 – 2008	Channel Stabilization and Revegetation Activities (Restoration)
2009 – Future	Redevelopment Activities
2009 – Future	Operation and Maintenance and 5-year reviews

12.9 Cost Estimate for the Selected Remedy

A cost estimate was prepared by the USACE based on EPA's selection of a final remedy for the MRSOU. Previous cost estimates were developed by Atlantic Richfield Company and their contractors to evaluate potential alternatives for the cleanup of this site (*Draft Combined Feasibility Study*, 2001; and *Draft Sediment/Dam Removal Cost Estimate Report Milltown Reservoir Site*, Atlantic Richfield Company/EMC^2, June 2002 and its addendum in July 2002). The cost estimate presented here uses the cost information from those previous efforts and modifies it for the current remedy, which consists of 100 percent mechanical excavation of sediments with 40 percent requiring dewatering and 100 percent of the material going to Opportunity Ponds with no costs associated with the unloading and redistribution of the wastes at the repository. Further modifications include a rail/haul road bridge, changing sheet pile design and quantities, inclusion of a drop structure, construction of a dike across the existing channel of the Clark Fork River, and installation of a bypass channel.

Total Estimated Construction Costs for the project were prepared after sufficient detail was developed for the key components of the cost breakdown structure. Total Construction Costs are defined as Capital Costs of various defined categories, plus Miscellaneous Costs, which includes such items as design engineering cost, contractor mobilization/demobilization costs, contractor profit, construction management costs, etc.

In terms of schedule, this is an EPA directed superfund cleanup incorporating the surrender of a FERC license. The construction periods are assumed to be based on four typical construction work seasons for western Montana (March through December). The Milltown Dam presently acts as a barrier to the migration of fish up and down the river, and it was assumed that the annual construction period would not be altered (for the duration of the project) to accommodate the passage of migrating fish.

Capital costs for the project are estimated at $139,500,000. The net present value (NPV) for these estimated project costs (discounted by 3 percent per year for the estimated life of the project) is $106,000,000. It should be noted these costs assume that the project is implemented by EPA and the USACE and include a contingency of 15 to 20 percent. The actual cost of implementation by RPs with no contingency may be significantly lower.

The information in this cost estimate section is based on the best available information regarding the anticipated scope of the Selected Remedy. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the Selected Remedy. Major changes may be documented in the form of a memorandum to the Administrative Record file, an Explanation of Significant Differences, or *Record of Decision* amendment.

12.10 Expected Outcomes of the Selected Remedy

Exhibit 2-35 presents a summary of the anticipated outcomes of the Selected Remedy by river reach with regards to land use, groundwater use, and human and ecological risk reduction as a result of the response action.

EXHIBIT 2-35
Expected Outcomes for the Selected Remedy

Site Scenario	Exposure Controlled Through Treatment, Off-site Disposal of Source Material, and ICs
Land use and time frame	The land use is expected to focus on open space preservation, recreational activities, and wildlife habitat. No permanent structures may be placed in the 100-year floodway. The entire reservoir basin and flat lands south of 1-90 are located in the floodway, as are other areas adjacent to the Blackfoot and Clark Fork rivers. If the land use immediately surrounding the reservoir changed to residential, human health risks would be unacceptable, but this use is not considered likely because of the floodway regulations. Additional ICs will be put in place, if necessary, to ensure that there is no residential use of areas that exceed risk-based levels. The MRSOU is expected to be re-opened for recreational uses, such as hiking, birdwatching, and fishing, following construction.
Groundwater use and time frame	The Milltown aquifer is expected to recover through natural attenuation. The use is expected to be restored approximately 4 to 10 years after dam removal and construction completion. The replacement water supply program and implementation of temporary groundwater ICs will be continued to protect human health until the recovery of the aquifer is complete. Groundwater performance standards are described in detail in Section 12.7.1 of this *Record of Decision*.
Anticipated socio-economic and community revitalization impacts	The design and construction of the Selected Remedy is expected to boost the local economy. Although some members of the public expressed concern that the loss of Milltown Dam would have negative tax impacts for Bonner School, the restoration of the confluence is expected to greatly improve the fishery and attract more tourism dollars to the area. The degraded groundwater quality has limited economic development in Bonner and adjacent areas. Restoration of the aquifer would eliminate this development limitation. Under the Selected Remedy, a waste repository will not be constructed at Bandman Flats, which allows use of that site for residential, recreational, or commercial development.
Anticipated environmental and ecological benefits:	
Ecosystem restoration	The Blackfoot and Clark Fork Rivers will be restored to a free-flowing confluence. The Clark Fork River channel will be designed to provide a natural appearance with meander bends across the flood plain. Removal of the entire dam—including the powerhouse, divider block, and right abutment—allows for a wider, more natural channel and flood plain. Final surface water performance standards are described in Section 12.7.2 of this *Record of Decision*.
Endangered species	Removal of both the Milltown and Stimson dams will provide passage for bull trout, a Federally listed threatened species. Temporary construction standards are designed to protect human health and prevent acute impacts to the downstream fishery and bull trout. The anticipated outcome is that the natural flood plain and channel design will benefit fish in the long term.
Wetland and wildlife habitat preservation	Any wetlands lost by removing Milltown Reservoir will be replaced according to valuation methods developed by the USFWS. EPA expects that wetlands will be created through the construction of riparian areas adjacent to the new channel and off channel wetlands within the 100-year flood plain. The created wetlands will have to match the functional value of the destroyed wetlands, or, if that does not occur, additional wetlands will be developed. This will preserve and enhance wildlife habitat in the MRSOU.

Cleanup levels or media-specific Performance Standards are described in detail throughout this *Record of Decision*.

13 Statutory Determinations

The Selected Remedy described in this *Record of Decision* meets the statutory requirements of section 121 of CERCLA, 42 U.S.C. § 9621, and NCP section 300.430(f)(5)(ii). These provisions require that CERCLA remedies be protective of human health and the environment, comply with ARARs or replacement standards for waived requirements, be cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes. The following sections discuss how the Selected Remedy meets these statutory requirements.

13.1 Protection of Human Health and the Environment

The Selected Remedy protects risks to human health identified in EPA's *Human Health Risk Assessment* (EPA 1993b) by selecting a remedial action that is highly likely to achieve groundwater RAOs and performance standards within a reasonable period of time. Implementation of the Selected Remedy will return contaminated groundwater to its beneficial use as drinking water within a reasonable timeframe. The Selected Remedy will also comply with State standards (WQB-7) for groundwater, as well as prevent discharge of metals-contaminated groundwater to surface waters.

The Selected Remedy will address environmental risks to surface water described in this *Record of Decision*. First, it will control, contain, and prevent the release of sediment during removal activities to protect downstream water quality and aquatic resources. An important part of the sediment management program will be to monitor the site during and after remediation to document the effectiveness of the cleanup. EPA and DEQ have established temporary construction standards to protect human health and prevent acute impacts to the downstream fishery and bull trout. Additional BMPs and control actions would be considered if these standards were to be exceeded. Second and importantly, it will eliminate the long-term risks to aquatic receptors from high flow, ice scour, and catastrophic release events by removing the aging Milltown Dam and the worst of the contaminated sediments, and controlling the remaining of the sediments.

The Selected Remedy does not produce unacceptable short term risks. Such risks as worker safety, community safety from truck traffic and contaminant release, land use interference, and flood plain stability and run-off during construction can be readily controlled through careful planning. In addition, no adverse cross-media impacts are expected from the Selected Remedy.

13.2 Compliance with ARARs

The ARARs and replacement standards for this site that the Selected Remedy must comply with are identified in detail in Appendix A to the *Record of Decision*. Key ARAR requirements and other Performance Standards for the site are described in Section 12.7, *Performance Standards and Remedial Goals*, of this *Record of Decision*.

Other criteria, advisories, or guidance to be considered during remedial design for this action are also identified in Appendix A, ARARs.

EPA has invoked the ARAR waiver of section 121(d)(4)(A) of CERCLA for this site, for surface water quality ARARs during construction. Replacement standards, and the basis for those standards are contained in Appendix A, and described in Section 12.7 of this *Record of Decision*. Appendix A also describes EPA's recognition that upstream surface water quality impacts the surface water at the MRSOU, and, accordingly, the final surface water quality standards for copper will reflect the standards established for the upstream operable unit—the Clark Fork River operable unit. Appendix A also acknowledges that the arsenic standard for the Clark Fork River OU may not be met at that site, and may be waived in the future under the Clark Fork River OU *Record of Decision*. That waiver, if granted, would also carry over into the MRSOU.

13.3 Cost Effectiveness

In EPA's judgment, the Selected Remedy is cost-effective. In making this determination, the following definition was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness" [NCP § 300.430(f)(1)(ii)(D)]. This was accomplished by evaluating the overall effectiveness of the Selected Remedy and comparing that effectiveness to the overall costs. Overall effectiveness was evaluated by examining how the Selected Remedy meets three of the balancing criteria in combination—long term effectiveness and permanence, reduction in toxicity, mobility, and volume; and short-term effectiveness. The relationship of the overall effectiveness of the Selected Remedy was determined to be proportional to its costs.

The Selected Remedy provides significant long term effectiveness and permanence by removing the need for long term dam maintenance and ICs at the site, and removing the primary waste and principal threat from the flood plain. It also provides reductions in mobility and volume by removing the primary waste and principal threat from the flood plain where it could be moved during flood events to a secure location. The Selected Remedy provides for compliance with ground water RAOs within a reasonable period of time, which meets one of the sub-criteria under short-term effectiveness. It also provides for assurances that surface water RAOs will be consistently met after remedial construction because it removes the primary waste and principal threat from the flood plain. The Selected Remedy does contain some short term risks, which lowers its overall protectiveness. However, EPA has worked closely with all stakeholders to ensure that these risks are addressed and minimized to the extent practicable. The added costs associated with efforts to minimize the short term risks are worth the benefits to downstream users, and increase the overall cost-effectiveness of the Selected Remedy. EPA has also worked with the potentially responsible parties to lower costs when possible, such as allowing use of excavated material at the Opportunity Ponds, where approved, for cover material at Opportunity Ponds; and using other programs to remove the related Stimson Dam in association with the Selected Remedy.

13.4 Utilization of Permanent Solutions and Alternative Treatment Technologies (or Resource Recovery Technologies) to the Maximum Extent Practicable

This finding looks at whether the *Selected Remedy* provides the best balance of trade-offs among the alternative with respect to the balancing criteria set forth in NCP § 300.430(f)(1)(ii)(B), with an emphasis on long-term effectiveness and permanence and reduction in toxicity, mobility, and volume [see NCP § 300.430(f)(1)(ii)(E)]. Modifying criteria were also examined in making this finding. In other words, the finding of practicability for use of permanent solutions and alternative treatment technologies to the maximum extent practicable is determined by looking at the remedy selection criteria and weighing trade-offs among those criteria.

EPA has determined that the *Selected Remedy* represents the maximum extent to which permanent solutions and alternative treatment technologies can be utilized in a practicable manner at the MRSOU. Of those alternatives that are protective of human health and the environment and comply with ARARs or justify a waiver, EPA has determined that the *Selected Remedy* provides the best balance of trade-offs in terms of the balancing criteria, while also considering the statutory preference for treatment as a principal element and bias against off-site treatment and disposal and considering State and community acceptance. EPA's balancing of the criteria and consideration of the criteria is explained in Sections 10.2.8, *State Acceptance*, 10.2.9, *Community Acceptance*, and 12.1, *Rationale for the Selected Remedy*, of this *Record of Decision*.

A permanent solution is employed in the Selected Remedy through dam and sediment removal and channel reconstruction. The *Original Proposed Plan* called for removal of sediments using a slurry pipeline to a nearby, newly created repository. The *Revised Proposed Plan*, which has been carried forward as the Selected Remedy, proposed a new, alternative treatment approach that may allow for beneficial reuse of the material. Atlantic Richfield Company proposed dewatering the sediments, which allows mechanical removal and transport by rail car to an existing waste repository. Because the sediments are projected to be low in metals content, much of this material could be used as a vegetative growth medium at the repository, which is managed by Atlantic Richfield Company. This may help to reduce the amount of barrow material Atlantic Richfield Company needs at the existing site. This approach also consolidates the waste to one repository site instead of creating a new site, so long-term management will only be required at one site instead of two.

13.5 Preference for Treatment as a Principal Element

The principal threat waste at the MRSOU—the sediments within Area 1—are not chemically treated onsite as part of the MRSOU *Selected Remedy*. They are removed from the flood plain and disposed of at an existing mine waste repository upstream of the site and out of the flood plain. This is appropriate because in-place treatment methods were not found during the *Feasibility Study* to be feasible or effective, and because the sediments can be effectively disposed of at the existing waste repository site.

There may be limited treatment of the removed wastes required at the Opportunity Ponds as part of the Remedial Action for that site, but that issue will be addressed under the Anaconda site remedial activities.

13.6 Five Year Reviews

Because this remedy will result in some contaminants remaining onsite above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within 5 years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

14 Documentation of Significant Differences

The *Revised Proposed Plan* for the MRSOU was released for public comment in May 2004. The *Revised Proposed Plan* identified a modified version of Alternative 7A2 as the Preferred Alternative for cleanup. As defined in this *Record of Decision*, this Selected Remedy includes mechanical excavation of the most contaminated reservoir sediments, removal of the spillway, and coordination with restoration of the Clark Fork and Blackfoot rivers to a free-flowing state. EPA reviewed all written and verbal comments submitted during the public comment period. It was determined that no significant changes to the remedy, as identified in the *Revised Proposed Plan*, were necessary or appropriate.

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15 Coordination with Natural Resource Restoration Actions

Since the release of the *Original Proposed Plan*, the Natural Resource Trustees (USFWS, CSKT, and State of Montana) via the lead trustee, the State of Montana, have released and taken public comment on their restoration plan (*Draft Conceptual Restoration Plan*, May 2003; and First Amendment modifying and adopting the Draft Plan, June 2004). A significant portion of the restoration project encompasses the area where the Milltown Reservoir has slowed the flow of the river and created areas of sediment deposition. Restoration activities will be closely coordinated with the proposed remediation plan, specifically the Blackfoot River from the Milltown Dam up to the Stimson Dam and the Clark Fork River from the I-90 bridge below the Milltown Dam up to the high reservoir level above Duck Bridge.

EPA has worked with the Trustees to provide close coordination between the remediation and restoration plans within the remediation project area (the area from the dam to Duck Bridge on the Clark Fork River arm of the reservoir and to the Interstate Bridge on the Blackfoot River arm). Because the remediation and restoration plans must be closely integrated within the remediation project area, the restoration aspects of the project are reflected in the figures previously presented in this document. The coordinated restoration elements include the following:

- Removal of the divider block / power house / right abutment
- Changes in the flood plain and channel alignment
- Implementation of soft stabilization / revegetation techniques to stabilize the channel

Another element of this entire project is the removal of the Stimson Dam, which is being planned as a cooperative effort through the USFWS National Fish Passage Program with matching funds.

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