

**Closure Report**  
**on**  
**Monarch Mill Site Prichard Creek Shoshone County Idaho**

Developed by:

Idaho Department of Environmental Quality  
Coeur d'Alene Regional Office  
2110 Ironwood Parkway  
Coeur d'Alene ID 83835

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## **Section 1: Executive Summary**

Water Quality monitoring estimated that the Monarch Mill site was one of two nonpoint sources of metals to Prichard Creek above the Eagle Creek confluence. Subsequent site investigation confirmed the loading and supplied the information necessary to develop an Environmental Evaluation and Cost Analysis (EE/CA) document. The EE/CA indicated that removal of the two jig tailing deposits and the one inch minus fraction from the alluvium- tailing mix located in the floodplain was the preferred removal approach, which was subsequently selected by the Department of Environmental Quality (DEQ). Off site waste removal was the most appropriate alternative. The EE/CA was reviewed by the public and comments were addressed. In addition the removal action used an aggressive public information approach to reach the affected public at their homes and address their concerns.

A repository agreement was developed for the Prichard Creek Repository between DEQ and the Forest Service. The required consultations with the State Historical Preservation Office and the Coeur d'Alene Tribe on historical and cultural resources were completed. The required Endangered Species Act consultation was completed with the U.S. Fish & Wildlife Service. State, Section 319 Clean Water Act and Basin Environmental Improvement Projects Commission (BEIPC) funding was directed to support the removal alternative. The BEIPC funding was used to support a project scale pilot alluvium sorting approach that established the balances of additional cost of sorting against the reduced repository space required and improved waste compaction attained. The results will be documented in a separate report.

The removal action was implemented by DEQ with North Wind Inc. as the construction contractor. Engineering oversight and X-ray Fluorescence Spectroscopy removal confirmation was provided by Terragraphics Environmental Engineering. The Forest Service provided additional repository construction oversight, while the Bureau of Land Management advised DEQ and the landowner on floodplain restoration. Approximately 20,400 cubic yards of material was treated by jig tailing piles removal or alluvium sorting with one-inch minus fraction removed from the site. Approximately 13,000 cubic yard of bulk contaminated material was removed from the site. This material was compacted in the repository to a surveyed volume of 9,301 yards. The majority of the remainder from the sort, 7,464 cubic yards, was placed as a veneer on the mine waste rock pile to remove it from the floodplain.

Increased petroleum cost were the major obstacle to the project. Fuel costs require closure of the project before approximately a half acre of the 5.3 acre site could be treated. This area of contaminated alluvium was graded to prevent additional erosion and should be addressed in a subsequent project. The inability to treat this material created an inefficiency in the alluvium sorting phase, because sorting equipment was a fix cost fixed time item. The other problem recognized was the oversized material from the sort. Although its potential adverse impact on the floodplain was mitigated by its final disposition against the waste rock pile, future project using a sorting strategy should explore the use of the oversize sort material in the aggregate market.

## **Section 2: Introduction**

This completion report documents that construction activities associated with the removal of mine wastes from the Monarch Mill Site tailings piles and floodplain contaminants has been completed. It further documents the complete construction of Prichard Repository Cell 2, which houses the mine wastes removed from the Monarch site. The response documented is a non-time critical CERCLA removal action completed by the Idaho Department of Environmental Quality (Department) in strict conformance with the National Contingency Plan (NCP). The Department completed the removal action as a “good Samaritan” as defined in Section 107 CERCLA adhering to all steps required by the NCP. Repository site design and specifications, construction oversight and QA/QC were completed by the Department’s consultant, Terragraphics Environmental Engineering of Moscow Idaho. Repository construction and closure was implemented by North Wind Inc. of Kellogg Idaho with oversight by the Department, Terragraphics and U.S. Forest Service (site land manager) personnel.

## **Section 3: History of the Site**

The Monarch Mill is located adjacent to Prichard Creek 4.5 miles east of Murray Idaho. The site covers 5.3 acres including the mill area and a downstream area of alluvium contaminated with tailings. The mill concentrated silver-lead ore from adjacent mines during the last decade of the nineteenth and early decades of the twentieth century. The mill ceased operation by 1923, prior to the implementation of flotation refinement of ore. The wastes found on site were comprised of “jig” tailings” relatively high in cadmium, lead and zinc content.

Trace (heavy) metals monitoring of Prichard Creek demonstrated exceedance of cadmium, lead and zinc standards. A trace metals TMDL was drafted for Prichard Creek that recognized the Paragon, and Monarch Mills as well as the Terrible Edith Mine as the primary sources of metals contribution above the Eagle Creek confluence (appended). The Paragon site, located on land managed by the U.S. Forest Service was removed during the 2003 construction season. The Monarch Site located approximately one mile down stream on private land was adopted as a project by the Department. Funds were secured to investigate the site, develop an Environmental Evaluation and Cost Analysis (EE/CA) (appended) and remove the tailings to a repository located on Forest Service managed land. A repository agreement (appended) was entered into by the Department and Forest Service in late 2004 thus insuring tailings removal during the 2005 construction season.

## **Section 4: Project Execution**

### **Public Participation**

An EE/CA was developed for the project. The 30-day EE/CA public comment period was held from 6 August through 10 September 2004. The EECA was distributed to public locations in Shoshone and Kootenai Counties. The comment period was extended an additional thirty days on request of the public. Following the decision to implement the removal action, DEQ personnel implemented “door to door” visits in the Prichard-Murray and Eagle Creek area during late June and early July, 2005. Fact sheets (appended) describing the project, complete with contact information was left at those residences where no residents were home and explanation of the project was supplied verbally to those residents contacted. During construction one complaint concerning noise from “jake braking” trucks was received. The contractor was instructed to remedy the problem and implemented a remedy within the working day. Follow up with the complainant indicated the problem was remedied to their satisfaction.

### **Consultations**

Consultation was completed with the State Historical Preservation Office (SHPO) to establish the presence of any historically significant resources on the treatment area as defined in the EE/CA. SHPO referred DEQ to the Forest Service Archeologist who had made extensive surveys of the area and made a determination of no significant historical resources on the treatment area (e-mail appended). Consultation was complete with the Coeur d’Alene Tribe to assure that no cultural resources significant to the Tribe were located on the treatment area as defined in the EE/CA. The Coeur d’Alene Tribe determined that the area was unlikely to contain cultural resources important to the Tribe (letter appended). The Tribe requested that should such resources be found that work stop in that area and the Tribe be notified. This request was communicated to the contractor. After much of the floodplain was exposed during the project, the Tribal Archeologist made a site visit and found no cultural resources on the site.

DEQ completed an informal Endangered Species consultation with the U.S. Fish & Wildlife Service. A biological assessment (appended) of the project impacts was prepared. After review of the EE/CA and biological assessment, the U.S. Fish & Wildlife Service made a finding of no impact to endangered or threatened species.

### **Project Administration**

The removal action was implemented by the Idaho Department of Environmental Quality with Geoff Harvey as the project manager. Material removal and repository construction was completed by North Wind Incorporated with Kevin Redmond as the project manager and Chris Robertson as the construction site foreman. Plans and specifications (appended) for the removal and repository were developed by Terragraphics of Moscow Idaho with Tom Bourque as project manager. Repository construction engineering oversight and x-ray fluorescence (XRF) monitoring of metals concentration from removal

areas was implemented by Terragraphics with Frank Parker as project manager. Assistance on floodplain and stream stabilization was provided by Mike Stevenson of the Bureau of Land Management.

Volumes removed from the two tailings deposits (Areas 2 and 3) and those sorted from alluvium of areas 4 and 5 and placed in the repository are provided in Table 1. Volumes are based on count of trucks on known volume. Following compaction of materials, post placement survey established a repository volume of 9,301 cubic yards. Metals contaminated waste was removed from areas 2 & 3 to a sub 500 ppm lead average as established by XRF, except from a small area where high value vegetation was present. The top eighteen inches of alluvium from areas 4 & 5 were removed and sorted. Analysis completed for the EE/CA established that metals contamination was found in the strata removed.

Table 1: Volume of metals contaminated material removed from the Monarch Mill Site by Area

Removal Area	Material Type	Alluvium Moved and Sorted (cubic yards)	Contaminant Removed to Repository (cubic yards)
2	Jig tailings	N/A	4,755
3	Jig tailings	N/A	1,537
4 & 5	Contaminated Alluvium	14,119	6,655

Note: Based on count of trucks of known volume.

Repository engineering and QA/QC was designed and implemented by Terragraphics. The repository “as built” documents (appended) were developed by North Wind. The repository design closely followed the Forest Service design of cell 1 of the Prichard Repository that houses materials from the Paragon Site. Repository design was reviewed and approved by the Forest Service. The Forest Service has taken primary O & M responsibilities for the Prichard Repository including groundwater monitoring for which DEQ paid a fee. The repository agreement between Idaho and the Forest Service will govern agency responsibility for response to any future problems with the repository resulting in release of contaminants. The Forest Service accepted the repository as constructed (letter appended).

## Section 5: Summary of Project Milestones

Date	Milestone
7/13/05	Decision Document (appended) Signed by DEQ Director, Toni Hardesty
7/13/05	Mobilization of construction contractor North Wind
7/29/05	Repository base completed
8/1/05	Excavation and haul of jig tailings from areas 2 & 3 begins
8/9/05	Removal of jig tailings piles of areas 2& 3 complete
8/15/05	Excavation and stockpiling for sort of alluvium from area 4 begins
8/31/05	Sorting and transport of all contaminants removed from areas 4&5 ends
9/1/05	Closure of repository begins

9/23/05	Repository complete except for fencing and re-vegetation
10/26/05	Repository construction and re-vegetation complete
11/9/05	Final repository walk through by DEQ, Forest Service and North Wind; Repository closed
11/10/05	Final floodplain and minor stream channel stabilization work completed; Project closed.

### 5.1 Variations from Initial Scope:

The project met all of its goals except, for complete sorting of all materials of area 5. Removal and sorting of material on area 5 was stopped with about a half acre of floodplain on the extreme western (downstream) end remaining, due to lack of funds. The materials in this area were stabilized to protect them from erosion and to facilitate treatment in a later project.

### Section 6: Summary of Costs

Removal Design:	\$ 53,009 <sup>1</sup>
Removal Action:	\$ 459,619
Construction Management:	<u>\$ 31,220 <sup>2</sup></u>
Total Project Cost:	\$ 543,848

1. Includes site investigation, EE/CA, plan and specifications, and bid document development
2. Includes DEQ and Terragraphics oversight including removal XRF measurements.

### Section 7: Difficulties Encountered

The removal action implementation operated smoothly. A few problems were encountered.

The escalation of petroleum costs during the Spring and Summer of 2005 presented the largest unexpected obstacle. These costs required a fuel adjustment allowance for the contractor to complete the work. The alternative would have been holding the contractor to a bid made in January, which was unrealistic given the inflation of petroleum costs between January and July 2005. The result of the allowance was to dramatically increase the cost of the project by 25%. Additional funding was appropriated to the project by the Water Quality Division that helped make up the difference. Even with this funding, a small residual area (0.5 acres) was not treated.

The shortness of funds lead to a second inefficiency in sorting equipment use. Since sorting plant was a fixed cost item, maximum efficiency was directly related to the amount of material that was passed through the plant. The fact that the alluvium volume on the untreated half acre was not sorted due to the funding constraint added inefficiency to the project.

A problem of the oversized material from the sort was not recognized until alluvium sorting had progressed. The final disposition of this material on the site was problematic, because its even redistribution on the floodplain where it was excavated would have produced a layer of material with very low water retention and virtually no cation exchange capacity. Such conditions would be counterproductive to the establishment and growth of vegetation in the floodplain. The problem was solved by placing this material in a location against the mine waste rock pile situated against the hillside. This disposition added a veneer of material to the waste rock pile, but made the floodplain more viable for plant establishment and growth.

## **Section 8: Recommendations (Lessons Learned)**

As mentioned earlier in the report, alluvium sorting to remove the metals contaminated fraction associated with the one-inch minus fraction was applied to areas 4 and 5 of the floodplain where mine tailings had mixed with native alluvium. The approach was tested for the first time on a project level scale, where 14,119 cubic yards of alluvium was sorted with the one-inch minus fraction removed as the contaminated fraction.

The contaminated fraction was 53% smaller than the bulk material. This factor alone saved 7,464 yards of repository space. In addition, the more homogeneous particle size may have permitted a higher level of compaction than experience with bulk materials. The qualitative evidence supporting this conclusion is that nearly 13,000 cubic yards of contaminated material by count of trucks of known volume compacted into a surveyed volume of 9,301 cubic yards. The advantages and liabilities of an alluvium sorting approach both physical and economic at the project scale were studied as a part of the Monarch removal project. Data was collected included volumes, costs and densities of compacted material. The value of the sorting approach will be quantitatively assessed in a separate report to the Basin Environmental Improvement Project Commission that supported some of the removal work. The results should demonstrate the economic balance of the extra cost to sort alluvium contaminated materials compared to the savings in repository costs and potentially the superior compaction possible.

A result was approximately 7,500 yards of material that depending on its final disposal could be harmful to the environment or be beneficially used. As discussed in section 7 the impact of the material was mitigated, however this was likely not the best use of the material. Since metals values were removed this material could have been used in construction requiring aggregate materials. A part of the road over which materials were carried to the repository was “chip sealed” during the summer and the remaining section of the road from Murray to Thompson Pass will likely be chip sealed in the near future. This material once washed could have been crushed for chip seal aggregate. Future projects that use a strategy to sort alluvium should investigate economic uses for the clean aggregate generated by the project as part of the pre-project planning.. The oversize is typically a detriment to the health of the floodplain from which it was removed, but could be used constructively in projects requiring aggregate of this size (1 inch- 5 inches predominantly). Use of this material will lessen environmental impacts of aggregate extraction elsewhere.

## **Section 9: Index of Documents of Site**

“Monarch Mill Site Shoshone County Idaho Final Engineering Evaluation/ Cost Analysis” Prepared for the Idaho Department of Environmental Quality, 1410 N. Hilton Boise ID 83706 by Science Applications International Corporation, Engineering and Environmental Management Sector, 18706 North Creek Parkway, Suite 110, Bothell WA 98011. January 2004. 52p.

“Participating Agreement Among the United States Department of Agriculture, Forest Service and Idaho Department of Environmental Quality Regarding the Prichard Creek Mine Waste Repository” August 2004. 7p.

“Special Project Specifications, Prichard Repository Cell No. 2” Prepared for the Idaho Department of Environmental Quality, Coeur d’Alene Regional Office, 2110 Ironwood Parkway by Terragraphics Environmental Engineering, 121 S. Jackson Street, Moscow ID 83843

“Monarch Mill Site Removal Action Biological Assessment” Prepared by Idaho Department of Environmental Quality, 2110 Ironwood Parkway, Coeur d’Alene ID 83814. June 2005. 15p.

“Site Control Plan for the Construction of a Repository Cell at the Prichard Repository Mine Waste Disposal Area.” Prepared for Idaho Department of Environmental Quality, 2110 Ironwood Parkway, Coeur d’Alene ID 83814 by North Wind Inc., 1176 Big Creek Road, Kellogg ID 83837. May 2005. 33p.

Decision Memorandum: “Request for a State-Lead Removal Action to be Conducted at the Monarch Mill, Shoshone County, Idaho.” Idaho Department of Environmental Quality, 2110 Ironwood Parkway, Coeur d’Alene ID 83814. July 13, 2005. 26p.