

**EXPLANATION OF
SIGNIFICANT DIFFERENCES**

**Non-Time Critical Removal Action
Monte Cristo Mining Area
Mt. Baker-Snoqualmie National Forest
Snohomish County, Washington**

April 2015

1.0 INTRODUCTION

On 28 September, 2012 the Forest Service signed a Removal Action Memorandum (RAM) for a Non-Time Critical Removal Action (RA) to be implemented under the Comprehensive Environmental, Response, Compensation and Liability Act (CERCLA) at the Monte Cristo Mining Area (MCMA or Site). This RAM described actions to be taken to address contamination remaining from former mining activities that posed human health and ecological risks. The MCMA is located on the Darrington Ranger District of the Mt. Baker-Snoqualmie National Forest and includes both federal and private lands. The lead agency for this RA is the US Forest Service (Forest Service) with support from the Washington State Department of Ecology (Ecology).

Subsequent to the RAM, the Forest Service completed a Data Gaps Investigation (DGI), the RA design and a Minimum Requirements Analysis (MRA) for the actions described in the RAM. The MRA was specific for all proposed motorized work within the Henry M. Jackson (HMJ) Wilderness and was undertaken to identify the minimum amount of work in the Wilderness required to achieve the RA objectives. Development of these documents identified information that resulted in changes or proposed changes to actions originally described in the RAM.

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) provides a process for any changes identified after the RAM has been signed (40 C.F.R. 300.820, 300.825, and 300.415(n)¹). These changes can be non-significant/minor, significant or fundamental. For the reasons discussed below in Section 3, the changes contemplated are significant and thus warrant an explanation of significant differences (ESD). The changes described do not singly or cumulatively constitute a fundamental alteration of the RA as described in the RAM.

This ESD provides the rationale for the noted changes and will become part of the Administrative Record for the Site. This ESD summarizes RA changes, references the “*2015 MCMA Removal Action Workplan and Design*”, “*2015 HMJ Wilderness Minimum Requirements Analysis*”, and also relies on information contained in the “*2013 Data Gaps Analysis Report – Monte Cristo Mining Area*”. This ESD and supporting documents are available in hardcopy for review at:

Mt. Baker-Snoqualmie National Forest
Supervisors Office
2930 Wetmore Avenue, Suite 3A
Everett, WA 98201

¹ 42 U.S.C. 9617(c) and 40 C.F.R. 300.435(c)(2), which are applicable to CERCLA remedial actions, and related guidance, provide information useful when considering changes to removal action decisions.

Mt. Baker-Snoqualmie National Forest
Darrington Ranger District
1406 Emens Avenue North
Darrington, WA 98241

These three documents and additional site information including the 2008 Site Inspection, 2010 Risk Assessment, 2010 Engineering Evaluation/Cost Analysis, previous Data Gaps Investigations, and the RAM can also be viewed electronically at:

<http://www.fs.usda.gov/goto/mbs/CERCLA>

2.0 SUMMARY OF SITE HISTORY

The Site consists of various abandoned mines, waste rock piles, haul routes, and associated ore processing facilities. These features are clustered in and around the former townsite of Monte Cristo, which was built in the late 1800's in response to gold mining in the area. The MCMA produced high-arsenic gold and copper ore that was shipped by rail to a smelter in Everett, Washington from the late 1800's to the early 1900's, after which most mining ceased and the facilities were abandoned. The Site is located within the drainage of the South Fork Sauk River (SFSR) and includes the headwater drainages of Glacier Creek and Seventysix Gulch. The Site includes both National Forest System and private lands. Some of the MCMA is located within the boundaries of the Henry M. Jackson (HMJ) Wilderness area.

The Forest Service began environmental investigations of the Site in 2003. In 2008 the ASARCO bankruptcy provided \$11 million, plus interest, shared equally between the Forest Service and Ecology, for additional environmental investigation, analysis of cleanup alternatives, and cleanup at the MCMA. The Forest Service released a Site Inspection Report (SI) in 2008 and an Engineering Evaluation/Cost Analysis (EE/CA) in 2010. Based on the Administrative Record, including the SI and EE/CA, in the RAM the Forest Service decided to remove contaminated material from several mining support facilities and mines and to place that material in an on-Site repository.² Arsenic is the main contaminant in soil and water posing an unacceptable risk to human health and the environment.

² Portions of some of the features included in the RAM are located on private land. Full implementation of the removal and repository placement envisioned in the RAM contemplates a companion early action decision by Ecology for these privately owned portions.

In addition to the work described in the RAM, Ecology plans further investigation of the MCMA. Ecology and/or the Forest Service may conduct additional actions in the future to address releases or threatened releases of hazardous substances.

The RAM includes the following primary elements:

- **Access Route:** Development of an approximately 2.5-mile CERCLA access route to connect the Mt. Loop Highway (MLH) to the former Snohomish County Road to allow equipment and material access to the Site. This route provided for prefabricated steel bridges placed across three drainage channels that would become permanent features.
- **Repository:** Construction of an on-Site repository on an approximately 3-acre site north of the townsite to isolate contaminated mine waste, including material from the Concentrator identified as having leaching characteristics for arsenic and lead indicative of State-listed Dangerous Waste (DW).
- **Glacier Creek Crossing:** Installation of a temporary crossing of Glacier Creek to provide equipment access to the Concentrator, Ore Collector, Comet Terminal and Assay Shack. This planned crossing provided for corrugated metal culverts placed in the stream channel and covered with gravel excavated from Glacier Creek. The temporary crossing would be removed at the end of each work season.
- **Excavate/transport Contaminated Material to Repository:** Contaminated material from the Concentrator, Ore Collector, Comet Terminal, Assay Shack, Rainy Mine, Sidney Mine and Pride of the Woods Mine would be excavated and transported to the on-Site repository. This element would include any material from the Concentrator that exhibits characteristics of State-Listed DW.
- **Adit Drainage Diversion:** Divert adit drainage away from waste rock piles and infiltrate to the ground at the Pride of the Woods, Pride of the Mountains, Sidney, Mystery and Justice Mines.
- **Adit Closure:** Install bat-friendly adit closures at the Boston-American, Liberty, Sidney, Sheridan, Rainy, Justice, Mystery, Pride of the Woods, New Discovery and Pride of the Mountains mines.

3.0 DESCRIPTION AND BASIS OF DIFFERENCES

A discussion of each change follows in Section 3 below. The table at the end of the section provides a side-by-side comparison of the original and revised components of the RA, a brief rationale for each revision and impact on project cost.

3.1 Access Route Drainage Crossings

As described in the RAM, the access route from the MLH to the former Snohomish County road included crossings of three seasonal drainage channels and these crossings were to be achieved by the installation of prefabricated steel bridges that would be left in place at the end of the RA work.

Due to the permanence and industrial appearance of these steel bridges, it was determined that construction of three log stringer bridges across these channels could provide access for equipment and material, while using local forest materials and producing structures that better conform to the forest surroundings. While the life span of the log stringers is shorter than the prefabricated steel structures, it is anticipated that a 30-year lifespan design would be sufficiently cost-effective and the placement of concrete abutments at the edges of each crossing would allow for future replacement of the log stringers. These bridges were constructed at the three crossings during the 2013 and 2014 field seasons as part of the access route component of the RA.

3.2 Glacier Creek Temporary Crossing

The Concentrator, Ore Collector, Comet Terminal and Assay Shack are all located on the opposite side of Glacier Creek from the repository site and no crossing capable of supporting the required excavation and transport equipment exists. The RAM called for a temporary crossing of Glacier Creek to be accomplished by placing large-diameter (12-foot) culverts in the channel and backfilling between and above the culverts with gravel excavated from the adjacent channel.

As described in the RAM, these culverts would be removed at the end of each work season. Placement and removal of the culverts and fill had the potential to disturb the channel and produce sedimentation and turbidity in Glacier Creek and the SFSR.

Due to potential impacts to the Glacier Creek channel and generation of sedimentation and turbidity, the crossing of Glacier Creek will be accomplished with a temporary log bridge using felled trees from the repository site. The temporary log bridges would be constructed by placing large trees parallel to the flow on the each side of the channel and then spanning the channel with logs placed perpendicular to flow (“*2015 Removal Action Workplan and Design Drawings*”

Section 2.8.1 and Sheet D2). This would significantly reduce the need to work in the active channel. The removal of the logs at the end of the work would produce significantly less sedimentation and turbidity downstream. The Glacier Creek crossing would occur only once and will take place in the 2015 work season, per the 16 September 2011 U.S. Fish and Wildlife Service “*Monte Cristo CERCLA Project Biological Opinion*”.

3.3 On-Site Repository and Dangerous Waste-Characteristic Materials

The RAM provided for placement in the on-Site repository of an estimated 100 cubic yards (cy) of material from the concentrator that appeared to designate as state DW due to toxic leaching characteristics for arsenic and lead. There are significant additional construction, operation, and maintenance requirements for landfills that accept dangerous waste.

The amount of DW material was estimated in the RAM at 100 cy but this was based upon the analytical results from a single soil sample. To better quantify the amount of this material, additional sampling and analyses were completed. Eight additional samples were collected and submitted for laboratory analyses of total metals and Toxicity Characteristic Leaching Potential (TCLP). Of the eight samples submitted, one sample exhibited TCLP characteristics for arsenic and lead that meet DW levels. The location and depth of the two samples with DW characteristics indicate that approximately 20 cy of DW-characteristic material is present near the Concentrator. This includes over-excavation of some adjacent non-DW material to ensure removal of the DW characteristic material.

Washington Administrative Code (WAC) Chapter 173-303 *Dangerous Waste* and Ecology Technical Information Memorandum describe various options for managing DW material, including on-site Treatment by Generator with such techniques as stabilization, separation or solidification. Given the relatively small volume of the DW material, the remote nature of the site and the goal of completing the RA within a single work season, on-Site Treatment by Generator was not determined to be the optimal management strategy for this material.

Construction, maintenance and monitoring requirements for an on-site repository that could accept this DW material were also excessive based on the small volume of material and remote nature of the site.

Accordingly, it is proposed³ to excavate, containerize and transport the DW-characteristic material from the Concentrator to an off-site RCRA Subtitle C landfill appropriate for this material. Transport of the DW-characteristic material to an off-site RCRA Subtitle C landfill

³ The DW material at the Site is located on private land. Thus, it is Ecology’s decision as to how to dispose of the DW, as long as the disposal is not on National Forest System land. The transport of the DW is subject to vehicle size and load limitations of the Access Route described in Section 2.0 of this ESD.

designed and operated to handle this material is more protective than keeping this material within the on-Site repository. The containerization and transportation of this material would be completed in accordance with WAC 173-303.

As the DW-material would no longer be placed within the on-Site repository, it would be not be constructed to meet Dangerous Waste landfill requirements. Only mining-related waste rock, soils and debris would be placed in the on-Site repository (“*2015 MCMA Removal Action Work Plan and Design Drawings*”, Section 2.7.1, Section 2.10, Design Sheets C-1 through C-6 and Appendices A and B). No garbage or solid waste generated during the RA would be placed in the on-site repository and it would be constructed, filled and closed in a single work season.

The key changes to the repository design are elimination of the bottom geomembrane liner and a leachate collection system. As the repository will not contain DW material, a bottom geomembrane liner is no longer necessary or appropriate. The repository bottom will consist of a 1-foot layer of compacted native soil and upon closure of the repository the top geomembrane liner will be installed to isolate the waste rock material. Water level data from the repository location indicate that the water level is at least 15 feet below the repository bottom elevation.

Leachate collection systems are used to capture and remove water that is introduced into a landfill during construction and placement of material, which in most landfills occurs over a period of years or decades with the landfill open to the environment. The on-Site repository will be constructed and sealed in a single summer season and introduction of water can be minimized. To achieve this, a rain tarp will be in place and deployed over the repository prior to forecast rain events and in response to sudden rain events. No excavation or transport of material into the repository will occur during or immediately after rain events. Based on the HELP hydrologic model run on the repository design, implementation of these methods to minimize the moisture content of the waste rock will result in minimal generation of leachate repository (“*2015 MCMA Removal Action Work Plan and Design Drawings*, Appendix B). As described in Appendix B of the Workplan, the highest precipitation level used in the model predicts a maximum leachate per year of approximately 2,000 gallons, compared to the nearly 8 million gallons of precipitation that would fall per year on the repository footprint.

3.4 Excavation of Sidney Waste Rock Pile

The Sidney mine is situated adjacent to Seventysix Gulch within the HMJ Wilderness and the RAM called for the excavation and removal of approximately 425 cy of waste rock from this location for placement in the on-Site repository. (For comparison, the RAM calls for a total excavation volume of 17,725 cy of contaminated material from all locations). Currently, access to the Sidney Mine is restricted by lack of a maintained trail in Seventysix Gulch and the waste rock pile is highly vegetated and difficult to find. Implementation of the RA at the Sidney Mine

would require significant tree-felling and either helicopter transport of equipment or construction of a road up the Seventysix drainage.

Due to the remoteness of the Sidney Mine, lack of access by trail and the overgrown nature of the waste rock pile, human exposure is very limited. The 2013 DGI completed as part of the RA Design indicated that arsenic detected in Seventysix Gulch did not originate at the Sidney but rather from patented mining claims higher up the drainage. The average arsenic concentration upstream from the Sydney Mine in Seventysix Gulch was 28.4 ug/L while the average arsenic concentration directly downstream from the Sidney Mine was 8.4 ug/L.

Physical removal of the Sidney Mine waste rock would not increase human protectiveness or improve water quality in Seventysix Gulch, but would entail significant disturbance within the HMJ Wilderness. Accordingly, removal of this material is not warranted based on the level of impact to the Wilderness per the MRA process.

3.5 Adit Diversions at Pride of the Mountains and Sidney Mine

The RAM provided for motorized work at both the Pride of the Mountains and Sidney Mines to divert adit drainage away from the waste rock piles and infiltrate to the ground at each location. Both of these mines are situated within the HMJ Wilderness, with the Pride of the Mountains situated several hundred feet above Glacier Creek and the Sidney situated adjacent to Seventysix Gulch.

The adit drainage from the Pride of the Mountains currently infiltrates to the ground after leaving the adit and none of the adit drainage flows directly into Glacier Creek. The work required within the HMJ Wilderness would result only in the drainage infiltrating closer to the adit than it currently infiltrates and the benefits of this earlier infiltration were not balanced by the impacts required.

The Sidney adit is situated just above the baseflow elevation of Seventysix Gulch and the adit is underwater during the spring melt and summer high flow events. Adit drainage can only be monitored during the late season, low flow time period and the adit drainage volume from the Sidney Mine is very low (ranging from 0.003 to 0.022 cubic foot/second). Given the location of the adit and its relation to Seventysix Gulch, an effective engineering solution to infiltrate this adit drainage does not appear feasible. Given the impacts and disturbance to the HMJ Wilderness from an adit infiltration effort and the high likelihood of failure, this work at the Sidney adit is not appropriate. Additional study will be made of this adit drainage and future work may be proposed.

3.6 Adit Closures

Bat-friendly adit closures were included in the RAM at the Boston-American, Liberty, Sidney, Sheridan, Rainy, Justice, Mystery, Pride of the Woods, New Discovery and Pride of the Mountains mines. These typically consist of horizontal and vertical welded steel bars bolted into the rock at or near the adit opening that allow bats to pass through but prevent human access. These closures were originally included in the RA as safety features but they do not directly address CERCLA hazardous substances.

With the exception of the Boston-American, Mystery, Justice and Rainy mines, these adits are all situated within the HMJ Wilderness and the MRA process indicated a significant amount of effort and disturbance would be required to implement these adit closures. Also, the permanent steel structures would be visible and not compatible with the designation of the surrounding area as wilderness.

The adits at the Mystery and Rainy mines are either collapsed or nearly collapsed and thus the closures are either un-necessary or would be unsafe to install in the unstable rock at the adits. The Boston-American is privately owned and adit closure there is a matter for the owner and/or the State of Washington. An adit closure may be implemented in the future at the Justice Mine, but not as part of the 2015 RA.

Table 1. Summary, Rationale and Cost Impacts of Changes

2012 RAM	2015 Workplan/Design	Rationale	Cost Impact
Three drainage crossings on Access Route to be completed with prefabricated steel bridges.	Three drainage crossings on Access Route to be completed with log stringer bridges.	Log stringers more aesthetically amenable to the forest surroundings than steel structures.	Cost reduced from estimated \$746k to \$310K.
Complete temporary crossing of Glacier Creek with corrugated steel culverts placed in channel and covered with channel material. Remove temporary crossings at the end of each work season.	Complete crossing of Glacier Creek with temporary log crossing that will not require placement of material in the active stream channel. Temporary crossing limited to one season only.	Less impact on Glacier Creek channel and aquatic environment. Less generation of sediment and turbidity. More protective of aquatic environment.	Minimal cost change
Construct on-Site repository for contaminated mine waste and soil also capable of receiving material with DW Characteristics and place estimated 100 cy of material with DW characteristics in on-site repository.	Containerize and transport estimated 20 cubic yards of DW-characteristic material off-site to RCRA Subtitle C landfill. Construct on-site repository for contaminated mine waste and soil only.	More protective of human health and environment as DW-characteristic materials removed from site. Reduces infrastructure and long term monitoring and maintenance requirements of on-Site repository.	Repository cost reduced from \$2.3M to \$1.5M based elimination of DW landfill construction requirements. Cost increase for off-site disposal of DW-characteristic material from \$0 to \$25K
Excavate and transport to repository contaminated mine waste and soil from the Concentrator, Ore	No excavation of waste rock at the Sidney mine in HMJ Wilderness. Otherwise unchanged.	Reduce work level and impacts in HMJ Wilderness per MRA. Human health protectiveness maintained	With respect to the Sidney waste rock cost reduced from estimated \$105K to

Collector, Comet Terminal, Assay Shack and Rainy, Sidney, and Pride of the Woods mines.		due to inaccessibility of Sidney mine, ecological protectiveness maintained as 2013 DGI indicated no water quality impacts to Seventysix Gulch from Sidney mine.	\$0.
2012 RAM	2015 Workplan/Design	Rationale	Cost Impact
Diversion of adit drainage at Pride of the Woods, Pride of the Mountain, Sidney, Mystery and Justice Mines.	Complete diversion of adit drainage at Pride of the Woods, Mystery and Justice Mines only. No diversion work at Pride of the Mountains and Sidney Mines in the HMJ Wilderness	Reduce work level and impacts in HMJ Wilderness per MRA. Drainage at Pride of the Mountains already infiltrates to the subsurface before reaching Glacier Creek. Non-feasibility of successfully implementing adit drainage diversion at Sidney Mine.	Cost reduced from \$134K to \$0 for the mines where diversion work eliminated.
Bat-friendly adit closures at the Boston-American, Liberty, Sidney, Sheridan, Rainy, Justice, Mystery, Pride of the Woods, New Discovery and Pride of the Mountains mines.	No adit closures.	Reduce work level and impacts to HMJ Wilderness features per MRA. Adit closures do not directly address CERCLA hazardous substances.	Cost reduced from \$294K to \$0K
		Cumulative Cost Change	\$1.7M Reduction
		Total RA Cost Estimate (including design, access route construction, ESD changes and post-RA monitoring)	\$6.98M

4.0 SUMMARY

As described in the RAM, the objective of the RA at the Site was to reduce or eliminate human health risks associated with exposure to accessible waste rock, partially processed ore and contaminated surface water as well as reducing ecological impacts that this material was having on aquatic environments. This objective was to be achieved by isolating the contaminated material within an on-Site repository and diverting specific adit drainages that were adversely impacting surface water quality.

The changes described herein do not fundamentally change this RA objective, as isolation of contaminated material within the on-Site Repository and diversion of specific adit drainages remain as the key components.

Removal of the DW-characteristic to an off-site Subtitle C landfill increases the RA's protectiveness and involves only a minor amount of material (an estimated 20 cubic yards compared to more than 17,000 cubic yards of contaminated material to be placed in the on-Site repository. The on-Site repository would continue to handle approximately the same amount of material anticipated in the RAM. The repository design changes described in Section 3.3 above do not fundamentally change the repository concept, location, or function. As the adit drainage from the Pride of the Mountains already infiltrates to the ground before reaching Glacier Creek and as the feasibility of an adit diversion at the Sidney mine is doubtful, implementation of the adit diversions at these two locations is not warranted. The lack of human exposure to the remote, overgrown Sidney mine waste rock pile and the minimal impact that this material has on the water quality in Seventysix Gulch do not justify the disturbance to the HMJ Wilderness required to remove this material. Installation of bat gates at the various mine adits does not directly address CERCLA hazardous substances and the amount of effort and disturbance to the HMJ Wilderness did not meet the minimum requirements threshold to complete the CERCLA action.

The changes reflected in this ESD should yield a cost savings of approximately \$1,700,000 compared to implementing the RAM without changes. However, based on actual costs incurred to date and anticipated costs based on more detailed design documents, the expected cost of the removal action has increased from \$5,100,000 estimated in the RAM to \$6,980,000.

Collectively, the changes discussed above (design changes at four stream crossings, off-site disposal of a small quantity of Dangerous Waste, replacement of repository bottom liner with a compacted soil base, reduction in quantity of waste placed in the repository by less than 1%, the non-diversion of adit discharge at 2 of 5 locations, elimination of adit closures and the 19%

increase in costs) represent a significant, but not a fundamental, change to the actions selected in the RAM. The overall cleanup approach set forth in the RAM remains unchanged.

5.0 SUPPORT AGENCY COMMENTS

The Washington State Department of Ecology (Ecology) was provided a copy of this document for review and did not respond with comments.

6.0 PUBLIC PARTICIPATION

The Forest Service is making this document and supporting materials available via the two locations and website noted above and will accept comments for 30 days following the publication of the notice of availability. Consistent with 40 C.F.R. 300.825(b), the Forest Service requests prospective commenters to limit their comments to the changes outlined above in this ESD.

Written comments on this ESD may be mailed to:

Joseph Gibbens, PE
On-Scene Coordinator
Olympic National Forest Supervisors Office
1835 Black Lake Blvd SW
Olympia, WA 98512

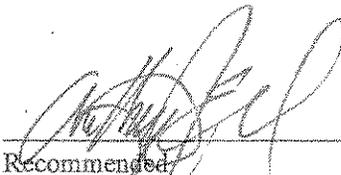
Following the comment period, a responsiveness summary will be prepared in response to significant comments received and added to the project's Administrative Record.

7.0 AFFIRMATION OF REMOVAL ACTION DETERMINATIONS

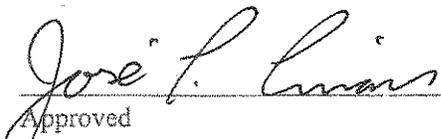
The Forest Service believes that the removal action for MCMA, as revised, has not been fundamentally changed, remains protective of human health and the environment, is cost-effective, and complies with Federal and State requirements that are applicable or relevant and appropriate to this action to the extent practicable.

 3-23-15

Authored by Date
Joseph Gibbens, PE
On-Scene Coordinator
Pacific Northwest Region

for  3/23/15

Recommended Date
Jennifer Eberlein
Forest Supervisor
Mt. Baker-Snoqualmie National Forest

 4/13/15

Approved Date
Jose Linares
Director of Engineering
Pacific Northwest Region

TABLE OF ACRONYMS

- CERCLA: Comprehensive Environmental Response, Compensation and Liability Act
- CFR: Code of Federal Regulations
- CY: cubic yard
- DGI: Data Gaps Investigation
- DW: Dangerous Waste
- EE/CA: Engineering Evaluation/Cost Analysis
- ESD: Explanation of Significant Differences
- HELP: Hydrologic Evaluation of Landfill Performance
- HMJ: Henry M. Jackson
- MCMA: Monte Cristo Mining Area
- MLH: Mountain Loop Highway
- MRA: Minimum Requirements Analysis
- NCP: National Oil and Hazardous Substances Pollution Contingency Plan
- RA: Removal Action
- RAM: Removal Action Memorandum
- RCRA: Resource Conservation and Recovery Act
- SFSR: South Fork Sauk River
- TCLP: Toxicity Characteristic Leaching Potential
- WAC: Washington Administrative Code