



August 16, 2006

003-09403-00

Ms. Cheryl Woodall
Gifford Pinchot National Forest
10600 N.E. 51st Circle
Vancouver, WA 98682

SUBJECT: Responses to USFS Comments for the Azurite Mine Site Revised Risk Assessment and the Engineering Evaluation / Cost Analysis

Dear Cheryl:

Please find attached the response to USFS comments for the report entitled Streamlined Human Health And Ecological Risk Assessment at the Azurite Mine Site, Okanogan National Forest prepared by MFG, Inc. and dated July 17, 2006 (Revision) and the report entitled Azurite Mine and Millsite, Whatcom County, Washington, Draft Engineering Evaluation/Cost Analysis (EE/CA) prepared by MFG, Inc. and dated December 30, 2005.

If you have any questions, or wish to discuss any items further, please do not hesitate to contact me at (509) 535-7225.

Sincerely,
MFG, INC.

A handwritten signature in black ink that reads "Thomas F. Mullen". The signature is fluid and cursive, with the first name being the most prominent.

Thomas F. Mullen, P.G.
Senior Hydrogeologist

TFM:bms

cc: J.C. Pfahl – Asarco
Jim Kienholz – MFG
Tom Hakonson – MFG
John Rahe - TTRMC

Response to comments cover letter.doc

Azurite Mine EE/CA Responses to Comments

Revised Risk Assessment Comments:

*1. **Human Health Risk Assessment:** The conceptual exposure model shows surface water ingestion as a complete pathway for humans under the recreational user scenario, but the report does not assess the risk. Please assess risk of surface water ingestion.*

Surface water ingestion was indeed evaluated. During the initial screen against detection limits and background concentrations, several COPCs were identified for further evaluation (see Table 3.1) during the PRG screen. During the PRG screen, all COPCs in surface water were eliminated except lead (see Table 4.1). Lead was carried forward for further evaluation only because a PRG for lead does not exist. Narrative was provided that showed that maximum measured lead concentrations in Mill Creek water were 0.006 mg/l which compared to the EPA Action Level for drinking water of 0.015 mg/l. The conclusion was that lead was not a water ingestion hazard to a recreational user of the Azurite Site.

*2. **Ecological Risk Assessment:** The report mentions that significant ecological impacts are expected for individuals. What can be said about the effects at the population level?*

A paragraph will be added that qualitatively evaluates population level effects by assuming that the scalar between NOAEL TRVs and LOAEL TRVs is 10. For example a NOAEL TRV (protective of individuals) would be multiplied by 10 to estimate a LOAEL TRV (protective of populations). In practice, this will mean that any HQ>10, based on NOAEL TRVs, could be interpreted to mean that there is a possibility of population level effects. Narrative will be provided describing the results of this approach on population level effects.

General EE/CA Comments:

*1. **ARARs:** The table does not contain all of the ARARs provided to ASARCO by the Forest Service (e.g. Wilderness Act, National Forest Management Act, Executive Order 11593, Clean Air Act, Water Quality Standards for Surface Waters of the State of Washington, etc.). Please include them in the development of ARARs or provide justification for their exclusion.*

Response: The ARARs table will be revised to include the aforementioned ARARs.

*2. **Stability Analyses:** The stability analysis performed is insufficient. Some of the deficiencies include: no analysis of the existing condition of the tailings and waste rock piles, many of the parameters for the analysis are assumed or are based on work at other sites, water surface for the analysis is assumed and only one elevation was considered, analysis assumed that the underlying materials of the piles are alluvial (i.e. not based on observation from cut bank, etc.), analysis didn't address potential effect on pile from stream erosion, and the talus source material for cap may have more fine material than is assumed. Please note that waste rock and tailings should have been collected during the September 2005 sampling event and used during the stability analysis.*

Response: Additional stability analyses have been performed based on shear strength tests of tailings materials from the site. This recent work indicates that the proposed 2:1 side slopes will be adequate and that the existing stability of the tailings and mine waste rock piles are marginal to

potentially unstable. This information will be presented in the Draft Final EE/CA. It is typical to assume one conservative water surface through a non-impounding structure which does not have variable impounded water depths such as mine waste piles on hillsides. This analysis procedure has been followed on many such closed mine waste piles. The observed cut bank would likely have material properties assumed for the subsurface. We agree that stream erosion of existing toe areas would affect existing stability. The closure proposes stabilizing such toe areas with riprap, which would provide long-term stability. The talus source material would be sampled and analyzed as part of final design to determine if screening of the material is necessary. Based on visual assessments, this is not anticipated to be required.

3. Scope of Removal Action: *Section 5.2 states that the scope of the removal action is to control releases and will not address mine discharges. Please note that the scope of the removal action is to mitigate any unacceptable risk. One way to do this may be to manage releases. It can also include total site cleanup, site stabilization or adit discharge control. The mitigation of unacceptable risk in all media (soil, waste rock, tailings, adit discharge, and surface water) should be driving the evaluation and selection of removal alternatives.*

Risks to a recreational user were very small compared to those calculated for ecological receptors at the Site. In both cases, estimated risks were dominated by tailings, soil, and waste rock sources of COPCs while surface water sources of COPCs to both humans and ecological receptors was relatively small. Narrative will be provided detailing possible transport pathways of Site COPCs to help identify possible mechanisms for controlling transport pathways to humans and ecological receptors. Most certainly, remediation strategies involving soils, waste rock, and tailings will be the focus for possible removal actions.

4. Removal Alternatives: *Approval from the Forest Service of preliminary screening results was supposed to occur prior to the more thorough analysis of the top 3-5 alternatives. The screening fails to provide adequate justification for the exclusion of alternatives. For example, physical and chemical stabilization is excluded due to high cost and significant energy input without quantifying either. The removal alternatives also failed to consider combinations of alternatives (e.g. stabilization and capping, reprocessing and partial removal, etc.). Provide more details about the identification and screening of removal alternatives. Provide quantitative reasons for excluding alternatives. In addition, the removal alternatives must address all of the removal action objections (i.e. mitigation of unacceptable risk in soil/waste rock/tailings/adit discharge/surface water).*

Response: The Screening Analysis in Section 6.1 will be expanded in the Draft Final EE/CA to quantify the requirements and costs in an order-of-magnitude assessment for the technology options not carried forward to the detailed analysis of alternatives.

5. Offsite Repository: *The report assumes the use of an offsite repository located 20 miles away without identifying an available site. Any offsite disposal alternative must identify available sites. Also, would an onsite repository be possible?*

Response: A map investigation will be performed to determine potential off-site repository locations on FS land within approximately 20 miles of the site and this information will be added to the text for this alternative. We do not believe that an onsite repository would be feasible due to the relatively steep slopes and therefore lack of a suitable site.

6. Time-Critical Removal: *This section states that the waste rock and tailings piles have remained stable over the past several decades. Is this supported by aerial photographs or other evidence? Please note that past stability does not guarantee future stability and the erosion of the pile by Mill Creek could significantly affect the stability of the pile. What does the stability analysis predict about the piles?*

Response: As discussed above the existing stability of the mine waste piles is marginal and erosion could significantly decrease their stability. However, site evidence indicates that significant slope failures have not occurred in recent decades due to the lack of very large slope movements or significant offset tension cracks at the tops of existing slopes. Overall stability will be improved through the onsite closure alternative with a flattened slope, rock cover, runoff/runoff controls and toe erosion protection.

7. Cost Analysis: *The cost estimates do not appear to capture road improvement costs. The cost to build a road to the site in this kind of terrain may be \$300,000-\$700,000 per mile, while the report uses \$10,000 per mile. Do the costs from Jack Waite mine (and other similar sites) that were used as reference, represent similar access conditions (i.e. 11 miles of ATV trail that would need to be upgraded to handle construction equipment)?*

Response: The cost estimates for the access roadways of approximately \$10,000 to \$20,000 per mile will be increased to approximately \$50,000 to \$60,000 per mile in the Draft Final EE/CA, based on assumed the amount of rock cut and the likely need to upgrade two bridges.

Specific EE/CA Section Comments:

1. Executive Summary, Page ES-3: *The middle paragraph mentions institutional controls but fails to specify the type of controls. The paragraph also states that “restrictions on residential use would also be formalized using administrative controls”. Is this referring to a deed restriction? If so, please note that the Forest Service cannot add deed restrictions to land that it manages.*

Response: The Executive Summary will be revised to clarify the specific types of controls proposed. Reference to “restrictions on residential use would also be formalized using administrative controls” will be deleted.

2. Executive Summary, Page ES-4: *The last sentence in the last paragraph states “...although an undisturbed area would be permanently modified due to the importation of nearly 88,000 cubic yards of tailings and mine waste material.” What idea are you trying to convey with this sentence? In addition, the next sentence states that the offsite repository alternative provides low to moderate degree of toxicity and mobility reduction. The reason for this is unclear and the “closure cover system” explanation is unclear.*

Response: The statement that a large volume of mine wastes would be imported to a previously undisturbed piece of land implies significant disturbance to that land. The “low to moderate” reduction in toxicity, mobility and volume is assigned because the toxicity and volume of the source materials are not changed, while the mobility is reduced (improved) through the placement of a cover.

3. Section 2.1.7, Hydrology, page 9: *The third paragraph states that the waste rock pile has remained stable over the past several decades. Please note that past stability does not guarantee future stability and the erosion of the pile by Mill Creek could significantly affect the stability of the pile.*

Response: Please see response to General Comment 6 above.

4. Section 2.1.11, Site Access, page 13: *Please note that there may also be weight limitations across the bridges. This should be considered when performing the cost analysis for removal alternatives.*

Response: The text will be revised to recognize that two bridges will likely require reinforcement or replacement as part of access road upgrades required for the project.

5. Section 4.3, Risk Based PRGs, page 33: *There was no mention of Washington State's standards for risk based PRGs (i.e. 10-6).*

This omission will be corrected

6. Section 5.3, Timeframes for the Removal Action Alternatives, page 38: *The information in this section is too vague to be useful.*

Response: The intent is to describe the possible removal action schedule shown on Figure 5-1. This schedule only presents a likely timeframe for the closure-in-place, Alternative 2. If Alternative 3, complete removal to offsite, is selected, the timeframe would be well in excess of this. Because the finalization of the EE/CA, project funding and other factors potentially impacting the schedule are unknown at this time, the schedule cannot be more precisely defined. Usually, when a project proceeds to final design for removal action a more detailed schedule is provided at that time.

7. Section 6.1, Screening of Removal Action Alternatives, page 38: *A list of alternatives and preliminary information used for screening was supposed to be provided to the Forest Service for concurrence on the final list of alternatives to be considered in detail. Please provide that information.*

Response: The five optional technologies for the solid mine wastes and four optional technologies for the adits/mine openings and associated drainages are screened in Section 6.1. These are described and screened for effectiveness, implementability and general cost to associated benefits obtained from the technology option. Three options for the mine wastes are carried forward for detailed analysis and two options for the mine adits/openings are carried forward for detailed analysis. These then form the three overall alternatives presented and analyzed in Section 6.2. As discussed in the response to General Comment No. 4 above, these screening discussions will be expanded to quantify the requirements and costs in an order-of-magnitude assessment for the technology options not carried forward to detailed analysis of alternatives.

8. Section 6.1.1.1, Removal Action Technologies for Solid Wastes, page 39: *The reprocessing alternative is excluded due to the need for additional studies and the need for infrastructure. The infrastructure requirements and associated costs must be quantified. Any pilot studies needed to evaluate alternatives should have been included in this EE/CA and site information needed for such studies (i.e. tailings samples, etc) should have been collected during the September 2005 sampling event.*

Response: As discussed in Section 6.1.1.1, the 2005 report by CES regarding potential reprocessing of the mine wastes would likely have marginal feasibility at the site. This report will be appended to the EE/CA if needed and order-of-magnitude costs for infrastructure required for reprocessing and subsequent closure to necessary environmental standards will be provided in the Draft Final EE/CA. This technology option should be excluded from further consideration based on the study by CES without any further site studies.

9. Section 6.2.1, Overall Protection, page 44: *An available offsite repository must be identified if it is to be considered as an alternative. Would an onsite repository be possible?*

Response: As discussed above in the response to General Comment No. 5, a map investigation will be performed to better identify potential offsite repository locations on FS land within 20 miles of the site.

10. Section 6.2.2, Short- and Long-Term Effectiveness and Permanence, page 45-46: *For the closure-in-place alternative, how is the 20% decrease in percolation by adding a 12 inch rock cover representative of “good long-term effectiveness”? In addition, how are the safety concerns (open mine adits and shafts) addressed by the closure in place alternative? For the complete removal alternative, the second paragraph is confusing. It is not clear whether it is referring to conditions at the mine site or the repository site. Also, as stated above, an offsite repository site must be identified to consider it an alternative.*

Response: The overall good long-term effectiveness of the closure-in-place alternative is due partially to the 20% decrease in infiltration and more importantly to the significant reduction in erosion potential due to the rock cover, runoff controls and toe riprap protection. This will be clarified in the Draft Final EE/CA. The safety concerns of the open mine adits and shafts are addressed in overall Alternative 2 by sealing the openings with installation of mine safety gratings as discussed in Section 6.2.1 of the Draft EE/CA. The second paragraph of the complete removal alternative in this section will be clarified in the Draft Final EE/CA to refer to conditions at the offsite repository location.

11. Section 6.2.5, Implementability, page 49: *For the closure-in-place alternative, please provide examples of small to medium size earthmoving equipment that would be used. What are the overall dimensions and weight of this equipment? Will extra road/bridge reinforcement be required to get the equipment to the site? How will this affect the cost estimates?*

Response: The small to medium size earthmoving equipment would likely require Caterpillar D-5 to D-6 bulldozers (80 to 105 Hp), or equivalent, and ½ to 1 cy excavators with 12 cy dump trucks, or equivalent. This size of equipment generally increases project construction costs over

projects using larger equipment, which has generally been reflected in the EE/CA cost estimates. As discussed above in the response to General Comment No. 7, the access road costs will be increased to account for upgrading existing bridges.

12. Section 6.2.6, State and Federal Agency Acceptance, page 49: *Be specific when making claims about agency acceptance. For example, what does it mean that something may have low, medium or high agency acceptance? Can you relate it to ARARs or some other standard as a basis for acceptance? Is acceptance expected to differ between state and federal agencies (again, can you relate this to regulatory standards)?*

Response: State and Federal Agency acceptance of a project varies from project to project and location to location depending upon environmental threats posed by the project, visibility and priority of the project and public involvement. This includes all State and Federal agencies which may become involved such as the U.S. EPA., the State of Washington Department of Ecology and the Forest Service. The agency acceptance criteria presented in this EE/CA is presented relative to the other alternatives. For example, the No Action Alternative likely has the lowest agency acceptance because the ARARs are not addressed and no improvement in protection of public health and the environment results. The In-Place Closure Alternative and the Offsite Repository/Disposal Alternative would likely have higher agency acceptance than the No Action Alternative because the ARARs would essentially be addressed and a higher level of protection of human health and the environment would result. In this EE/CA, the Offsite Repository location would appear to have a somewhat lower overall agency acceptance than the Closure-In-Place Alternative because of the additional risks involved in moving a large quantity of contaminated material offsite from a remote disturbed area to an undisturbed area. One agency may actually prefer one of these alternatives over another, while another agency may have a different opinion. Because subjective opinions are often involved, it is not possible to be more specific when assigning these criteria.

13. Section 6.2.7, Community Acceptance, page 49: *Please identify the community (e.g. property owners, city, county, environmental groups, etc.).*

Response: The community will be defined in the Draft Final EE/CA as the local landowners (other than the Forest Service), residents and environmental groups.

EE/CA Editorial Comments

1. PRG Acronym: *The report uses PRGs as an acronym for preliminary removal goals. I recommend that this acronym not be used to avoid confusion with EPA Region 9 PRGs.*

The PRG acronym will not be used for *preliminary removal goals*

2. Presentation of Removal Alternatives: *In addition to the text, please provide two tables of the removal alternatives. The first table will contain all of the alternatives considered and the screening results. The second table will contain the top alternatives evaluated more thoroughly, and the evaluation results.*

Response: One additional table (6-1) will be provided showing all technology options considered in the initial screening with the screening results. Existing EE/CA Table 7-1 presents

the Comparative Analysis of Alternatives for the three overall alternatives evaluated in detail. The cost portion of this table will be revised as necessary.