Review Comments of Draft Environmental Impact Statement (DEIS) Number 20200165

Stibnite Gold Project

Published Federal Register 8/14/2020
Amended Federal Register 10/02/2020

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Reviewer Affiliation / Qualifications

My name is Ian von Lindern and I have resided in Moscow, Idaho for 40 years. I am a licensed Professional Engineer in Chemical Engineering in Idaho and have practiced in the disciplines of Environmental Engineering and Risk Assessment in Idaho for the last 47 years. I hold a BS degree in Chemical Engineering from Carnegie-Mellon University in Pittsburgh, Pennsylvania, and MS and PhD degrees in Environmental Science and Engineering from Yale University in New Haven, Connecticut, specializing in air pollution and public health. I was the Regional Environmental Engineer for the IDEQ’s predecessor agencies in both the Coeur d’Alene and Twin Falls offices and was responsible for air and water quality and hazardous waste regulatory programs for several years at the major mining and smelting operations in the State, including the last US operational antimony smelter at Big Creek, Idaho. I was President and Principal Scientist for TerraGraphics Environmental Engineering for 30 years and was Project Manager and lead risk assessor for the Bunker Hill Superfund Site as IDEQ’s lead consultant. During that tenure, I directed more than 30 major environmental health investigations at mining and smelting sites, both nationally and internationally. I have served on the US Environmental Protection Agency’s Science Advisory Board several times with regard to toxic metals assessments since 1975, with my last appointment ending in May 2020. Since retiring from the consulting business, I co-founded TerraGraphics International Foundation (TIFO) and continued to work in mining-related health and safety issues in poor countries. Most notably, I am currently working with the international humanitarian organization Medicins sans Frontieres (Doctors Without Borders) assisting the Kyrgyz Republic Ministry of Health in developing health protective strategies to reopen both mercury and antimony smelters in Batken, Kyrgyzstan. These facilities were among the largest Hg and Sb producers in the former Soviet Union and are essential to the regional economy. As such, I have considerable insight and experience with the issues associated with the proposed antimony-gold operation at Stibnite.

Review Comments

I have reviewed the Draft Environmental Impact Statement (DEIS) submitted for Stibnite Gold Project, EIS Number 20200165, Midas Gold, Inc. Stibnite, Idaho and associated documents on behalf of TIFO and in collaboration with the Idaho Conservation League and 7 other conservation groups. TIFO’s mission is to assist mining and mineral processing communities to operate as safely as practicable while maintaining essential economic activities. TIFO supports scientifically-sound and transparent analyses of the environmental and human health issues faced by mining communities; and the development of solutions implemented within local socio-economic and cultural capabilities. The Stibnite Gold proposal is of interest because both the industry and the US regulatory agencies have the capacity to implement best practices that are not available to poor communities throughout the world. In that regard, although the current effort has collected and assembled a large amount of credible scientific data, it has not been analyzed and presented in a manner protective of health or the environment, nor reflective of the capabilities of the applicant or the regulatory agencies.

These comments focus on the analyses regarding Contaminants of Concern (COC)s, specifically toxic metals, and are arranged as follows:

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5.1 Conclusions
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Sections 1.0 through 4.0 discuss major deficiencies in the document and review process, each of which is basis for rejection of the current DEIS and requesting supplemental analyses. Due to the abbreviated review period imposed by the USFS, specific technical comments in Section 4.0 are limited to i) analyses and presentation of Contaminants of Concern (COC) in both the industrial processes and environmental media, and ii) the lack of good engineering practices regarding contaminant production, control, containment, volume and toxicity reduction in the identification and presentation of DEIS Alternatives. Sections 4.1 and 4.2 critique the DEIS presentations regarding industrial process and environmental media, respectively.

The DEIS suffers from a lack of material balances for millions of tons of toxic metals (Hg, As, Sb, Cd, Ni) produced, transported, concentrated, transformed, diluted and disposed to various media. In Section 4.3, example COC Material Balances for Hg, As, and Sb are developed from mineral economic support documents that traced Sb and Au-bearing materials through the processes to the product stage. This allowed development, through reverse engineering, of rudimentary example material balances for toxic metals. Unfortunately, these balances could not be extended to releases to environmental media, as the mineral economic references did not address these. As such, the DEIS lacks coherence. There is no demonstrated internal consistency with regard to the magnitude and chemical composition of toxic metals as these are evaluated through the various impact modeling and analyses performed in evaluating the DEIS Alternatives.

Section 4.4 examines the contaminant-specific material balances employing good engineering practice (i.e., examines opportunities to reduce volume and toxicity of wastes) to identify candidate Alternatives. These analyses are offered as a demonstration of both the deficiencies in the DEIS with regard to COCs, and the opportunity to develop Alternatives in a Supplemental DEIS that are more responsive to good toxic waste management practices. Those include emphasizing minimal disturbance of stabilized *in situ* contaminants and capture, consolidation and concentration of wastes. These example Alternatives potentially present substantially less health and ecologic risk, environmental damage, and loss of critical resources.

It should be noted that these example analyses are not comprehensive and should be significantly expanded in a Supplemental DEIS. It is not the responsibility of a reviewer, nor does the reviewer have the access to the information that should be considered in the development of coherent material balance for a project of this magnitude.

Section 5.0 summarizes the findings and makes specific recommendations for a Supplemental DEIS and specific technical recommendations for the evaluation of Contaminants of Concern.

1.0 Public Review Period / Quality of Document

This document is exceedingly difficult to review. Many of the technical material presentations in the main DEIS are shallow, vague descriptions with non-specific citations to voluminous non-transparent reference materials organized alphabetically in a non-searchable format. It is unfortunate that the applicant has gone to the effort to collect such an impressive database, yet presents simplistic, obfuscated analyses, nearly impossible to unravel without tedious and unnecessary reverse engineering efforts from cumbersome poorly organized reference materials.

The allotted review period, including the two-week extension, is insufficient to evaluate a DEIS for a facility of this magnitude, even were the document organized, complete and transparent. The review period runs concurrent with several other State and federal review processes, making it onerous on the public and nearly impossible for a competent thorough review. There are overlapping comment periods for at least four major regulatory actions regarding this facility including: Idaho Department of Environmental Quality (IDEQ), Idaho Department of Lands (IDL), United States Forest Service (USFS), United States Environmental Protection Agency (USEPA). There are material and contaminant balance deficiencies across all media. This is particularly true, as there are apparent inconsistencies in the applicant’s assertions to different review authorities with respect to important interdisciplinary issues. These inconsistencies are within the DEIS, between the DEIS and the supportive reference materials provided by the USFS, and information being presented to other agencies. Technical reviewers have been hard-pressed to assemble a first draft of comments and concerns within the respective disciplines, due both to the time constraints and to the non-transparency of the presentation. More time should be allocated to refine these comments and allow cross-discipline comparisons of the document’s shortcomings. Reviewers could use an extension to more precisely define the omissions that should be addressed in a supplemental DEIS.

2.0 Lack of Transparency and Coherence

The DEIS lacks transparency and coherence. The USEPA defines transparency to “… ensure that the regulatory science underlying its actions is publicly available in a manner sufficient for independent validation.” https://www.regulations.gov/document?D=EPA-HQ-OA-2018-0259-9322. Coherence is the quality of being logical and consistent, or presented in a manner in which all the parts fit together to form a united whole. The DEIS meets neither of these criteria. It is not possible, in the time allotted with the reference material provided, for an independent reviewer to assess the consistency and accuracy of the assertions made in the DEIS.

This is particularly true as it pertains to toxic metals. No coherent evaluation of contaminants of concern (COCs) - Hg, As, Sb, Cd, Ni - has been presented, nor can one be developed from the references and support materials provided. In order to responsibly evaluate potential adverse effects of COCs with regard to human health, environmental media, and biota, a reviewer must be able to quantitatively identify, understand and assess COC sources, transport and transformation, media sinks and concentrations, and chemical form. Moreover, these data should be developed coherently in a comprehensive, connected format applying basic scientific principles of conservation of mass and energy. This document does not include a material mass balance for COCs. Although it is possible to develop an estimate of quantity of COCs removed from the natural environment, there is no coherent accounting of the where, and in what quantity and chemical form, these materials will reside temporarily, or in perpetuity.

As a result, a public reviewer can neither quantitatively assess, nor rely on the source descriptions for environmental modeling and impact analyses. Without a verifiable material balance, COCs in this DEIS can only be evaluated qualitatively. Even qualitative evaluation for COCs falls short in this DEIS, as there is no discussion of the uncertainty associated with the assertions and conclusions. Moreover, the COC-related analyses provided are largely performed for "average" conditions. Numerous USEPA guidance and sound scientific practice indicate that analyses of potential COC impacts should be conducted at expected typical (central tendency) and reasonable maximum concentrations; with appropriate discussion of the uncertainty and likelihood of worst case conditions. Even if the input values were shown to be coherent, the DEIS fails with regard to worst case analyses.

Material balances developed for average and 95th percentile concentrations in following sections of this report suggest an estimated 737,683 – 2,213,215 tons of As, 564-1685 tons of Hg, and 258,193**-1,130,591 tons of Sb will be mined. Another 4366 – 8286 tons of As, 3-5 tons of Hg, and 4572 – 28,660 tons of Sb in historic tailings will be combined with processed ores for beneficiation. About 1/3rd of the Sb and an unknown percentage of the Hg will leave the site as product or hazardous waste co-product. The remainder will be permanently relocated on-site. All of these metals should be tracked as potential health and environmental toxic COCs in a comprehensive assessment. None are tracked or quantified in the DEIS.

Because of the magnitude of this proposed project

- that millions of tons of toxic metals will be removed from *in situ* containment and relocated in an already compromised local environment,

- that no other combined antimony/gold mineral processing facility of its type operates in the U.S.,

- the uncertainties and lack of understanding of antimony toxicity to both human health and the environment, and

- that the site is located in the headwaters of one of the world's premiere wild rivers and pristine eco-systems;

it is essential that the USFS require comprehensive, transparent and coherent analyses of the assembled database that builds on the existing information for this site. The DEIS should be rejected, additional review time should be granted for reviewers to specify weaknesses and fatal flaws, and a supplemental DEIS should be completed.

3.0 Lack of Meaningful Alternatives

With regard to mining and mineral processing methods, the DEIS does not offer meaningful alternatives, only minor adjustments to a single option suggested in six-year-old feasibility studies. The (2014, 2019) M3 Feasibility Study and the 2017 SRC Geochemical Characterization Report outline a single mining /mineral process approach that appears to mimic the massive strip-mining/autoclave oxidation approach developed for the Carlin deposits in Nevada. Several support documents reference the Nevada operations both with regard to processing technologies and pollution control. Both documents focus on mineral economics and address environmental/health considerations as additional costs and impediments to mine development. Conversely, from a waste management perspective, good toxic waste management practices emphasize minimal disturbance of stabilized *in situ* contaminants, and capture, consolidation, and concentration of process wastes, that reduce the volume and toxicity reduction of hazardous materials.

Generally, there are numerous opportunities in mine, mill and refinery operations to employ alternate processes that result in less production and greater control of contaminants, and subsequently, less environmental damage and risk for catastrophic failure. There is no evidence that the applicant seriously evaluated alternative mining and mineral processing options from a waste management perspective.

This is particularly important for this DEIS, as no other dedicated antimony processing facility of the type proposed for Stibnite is operating in the US. As noted in the DEIS historic reviews, Stibnite was a major producer of antimony to support the World War II effort. Since closure of the Stibnite mine, mill and smelter seventy years ago, antimony production in most western countries has been a by-product of other mineral processing operations. The Coeur d'Alene district in northern Idaho was among the major US producers of antimony in the 20th century, principally through antimonial lead deriving from local and international lead/zinc/silver concentrates processed at the Bunker Hill Mining and Metallurgical facility at Kellogg, and a dedicated antimony smelter associated with silver ores from the Sunshine Mine at Big Creek. Wastes generated from those operations are among those requiring perpetual containment and management costing hundreds of millions dollars at the country's second largest CERCLA mega-mining Superfund Site. Locating the proposed SGP facility at the headwaters of one of the world's most unique river ecosystems, coupled with Idaho's lessons-learned regarding the environmental abuse of the Coeur d'Alene River system (another world class waterway below the Bunker Hill Site), calls for careful consideration of any mining and mineral processing options that could reduce the volume, toxicity and inherent risk of contaminants of concern (COCs).

As noted above, the DEIS provides almost no quantitative material or chemical transformation balance for the COCs. Supporting documents, particularly the (2014, 2019) M3 Feasibility Study and the 2017 SRK Geochemical Characterization Report do carefully track precious metals through the mining and mineral processing steps, antimony as it relates to a salable commodity metal, and arsenic as it relates to processing gold-arsenic ores. These metallurgical and economic reserve calculations can be used to develop a general understanding of the sources, transport, transformation and fate of toxic contaminants through the mining and mineral processing stages. However, these generalizations provide insufficient detail to track the contaminant releases through environmental media or assess potential health and environmental effects. In that sense, the DEIS is wholly insufficient.

In addition to facilitating quantitative analyses of COC health and environmental impacts, careful examination of the material balances could suggest less environmentally damaging mineral processing options. The DEIS should examine alternatives that are potentially more responsible from a waste-management perspective and may present substantially less health and ecologic risk, potential environmental damage, and loss of critical resources. In general, more responsible waste management approaches would reduce COC material volume and toxicity through treatment; and dispose of these segregated wastes in more secure, favorably located, less voluminous, dedicated disposal facilities. Some discussion of these possibilities are found in the original 2014 M3 feasibility study. Unfortunately, it appears these analyses were never considered for the DEIS.

4.0 Lack of COC-specific Analyses

4.1 COCs in the Mining and Metallurgical Beneficiation Processes

The DEIS offers only the briefest qualitative description of the mining and mineral beneficiation processes in Section 2.3.5.1 for Alternative 1 and refers all other Alternatives back to this section. This is wholly inadequate. COCs are mentioned once with regard to captured Hg emissions. Section 2.3.5.1 is reproduced in whole below in small type, followed by added discussion regarding COC considerations. Following these general discussions, Section 4.3 of this report develops, to the extent possible with the materials provided in the DEIS references, a rudimentary COC material balance for Hg, As and Sb. The COC estimates and observations developed in the development of the COC material balances in Section 4.3 are used to develop suggested Alternatives in Section 4.4. These analyses should not be considered sufficient for a comprehensive assessment, but are presented to illustrate the inadequacies of the DEIS, and the potential benefits of developing alternatives oriented toward waste management considerations.

> **2.3.5.1 Ore Processing Facilities**
>
> During operations, approximately 100 million tons of ore would be mined from the three proposed pits. At full operation, targeted ore production would range from 20,000 to 25,000 tons per day, which would be transported to the processing facility to separate the gold, silver, and antimony from the mineral rich rock.

The DEIS does provide an abbreviated material balance for mined development rock and ores, indicating in Section 2.3.5.1 that 436 million tons will be mined from 3 pits and 336 tons of development rock will be disposed in 5 locations. COCs are not mentioned. In contrast the following information has been developed at considerable effort by reverse engineering references provided in the support documentation. This is offered as an example of both the lack of transparency in and the difficulty of reviewing this document.

Total production has been summarized in various documents, but is generally considered to be about 100 million tons of ore stripped by removal of 340 million tons of development rock. The Stibnite area is a highly mineralized, contaminated by historic mining activities, and located in an environmental setting conducive to significant contaminant transport and transformation in several media. As a result, the development rock and overburden represent significant sources of contamination in addition to gangue, tailings and mineral processing releases during and following operations.

Tables 1 and 2 summarize estimate COC production and disposition of waste rock from example material balance calculations developed from mineral economic feasibility analyses referenced in the DEIS. Calculation details are provided in Supplemental Tables S1-S3, attached.

Table 1 Contaminants of Concern (COC) Produced in Mining Activities

DEVLOPMENT ROCK

Production	346747 **Ktons**	**Arsenic Tons**	**Mercury Tons**	**Antimony Tons**
P5		6,001	41	2,249
Average		317,495	324	42,114*
P95		1,216,926	1,045	40,139*

ORES (mined+tails)

Production	98,066 **Ktons**	**Arsenic tons**	**Mercury tons**	**Antimony tons**
P5		61,436	18	3,635
Average		420,188	240	215,989
P95		996,290	640	1,090,452

TOTAL	444813 **Ktons**	**Arsenic tons**	**Mercury tons**	**Antimony tons**
P5		67,437	59	5,885*
Average		737,683	564	258,103*
P95		2,213,215	1,685	1,130,591

* refer to anomalies or errors in underlying data SRK 2017

Table 2 Disposition of Development Rock Contaminants of Concern (COC)

DEVELOPMENT ROCK DISPOSITION		**Arsenic Tons**	**Mercury Tons**	**Antimony Tons**
Total Excavated	**Average**	317,495	324	42,114
	P95	1,216,926	1,045	40,139
Disposition				
Tailings Embankment	**Average**	55,603	57	7,375
	P95	213,121	183	7,030
Main WRSF	**Average**	136,840	140	18,151
	P95	524,495	450	17,300
West End WRSF	**Average**	23,050	24	3,057
	P95	88,349	76	2,914
YP Backfill	**Average**	102,001	104	13,530
	P95	390,960	336	12,895

These example material balances developed in following sections of this report suggest an estimated 737,683 – 2,213,215 tons of As, 564-1685 tons of Hg, and 258,193*-1,130,591 tons of Sb will be mined. Another 4366 – 8286 tons of As, 3-5 tons of Hg, and 4572 – 28,660 tons of Sb in historic tailings will combined with processed ores for beneficiation. All of these metals should be tracked as potential health and environmental toxic COCs in a comprehensive assessment. None are tracked or quantified in the DEIS. The supporting economic feasibility documents do track antimony through the salable concentrate stage and arsenic as a surrogate for gold and sulfur to support autothermic oxidation processes.

4.1.1 Development Rock: According to the feasibility studies, an estimated 309,829–1,204,611 tons of As, 319–1038 tons of Hg , and 41,167-38,483* tons of Sb will be in Development Rock. Development Rock will be disposed of in four locations; 309,829 – 1,204,611 tons of As, 319 – 1038 tons of Hg , and 411,167-38,483 tons of Sb in the Tailings Pond Embankment; 309,829 – 1,204,611 tons of As, 319 – 1038 tons of Hg , and 411,167-38,483 tons of Sb Main WRSF; 309,829 – 1,204,611 tons of As, 319 – 1038 tons of Hg , and 411,167-38,483 tons of Sb West End WRSF; 309,829 – 1,204,611 tons of As, 319 – 1038 tons of Hg , and 411,167-38,483 tons of Sb Yellow Pine Pit Backfill. The DEIS indicates a fifth waste rock repository at “Fiddle” not shown in the other analyses.

Development Rock will have average toxic metals concentrations ranging from 340-1300 mg/kg As, 0.9 – 1.6 mg Hg, and 62 - 260* mg/kg Sb; and 95th percentile values ranging from 1400 - 5200 mg/kg As, 1.2 – 5.3 mg/kg Hg, and 76 - 150 mg/kg Sb. The * value may be an error or anomaly in SRC 2017, otherwise 84 mg/kg Sb maximum average. These metals concentrations substantially exceed health risk screening levels. The several thousands of tons of toxic metals would be disposed in diverse environmental conditions subject to varying oxidation/reduction and chemical transformation phenomena. These include aerobic and anaerobic, wet/dry cycling, and surface erosion mechanisms that could present substantial health and environmental concerns.

Due to the high metals content, the high toxicity of arsenic and mercury and the poorly understood effects of antimony at these concentrations, fugitive dusts are a major concern and should be evaluated human health risk due to potential toxic airborne exposures and transport considerations. These concentrations in dusts, that may accumulate on surfaces and be subject to continual resuspension in dry seasonal periods, are a significant concern. Assessment of these concerns requires reliable quantitative estimates of the mass, concentration, chemical form and environmental conditions followed by comprehensive uncertainty analyses of the key variables and parameters; all of which are absent in the DEIS. This is of particular concern, as the IDEQ has indicated it does not have sufficient authority to regulate these emissions for toxic exposures (see attached comments to IDEQ Permit to Construct application and discussions in Section 4.3.3).

4.1.2 Mined Ores: An estimated 309,829–1,204,611 tons of As, 319–1038 tons of Hg, and 411,167-38,483 tons of Sb of mined ores will be produced from 3 principal mineral reserves – Yellow Pine Pit (YP), Hanger Flats (HF) and the West End (WE). Approximately 33% of the Sb and unknown percentage of the Hg will leave the site as salable product or hazardous waste. The remainder will be disposed of on-site as components of various metallurgical process tailings, or released in fugitive dust or on-site spills and discharges. No accounting of metals disposition is provided in the DEIS. Toxic COC concentrations of ores range from 5400-7000 mg/kg As; 4.4 – 11 mg Hg; and 3900-20,000 mg/kg Sb (maximum average to maximum 95th-%tile).

> Ore would be hauled directly to the primary crusher or the run-of-mine ore stockpile area and would proceed through a series of crushing and grinding steps to reduce the size of the rock to facilitate further processing. The ore processing facility and associated support infrastructure are shown on **Figure 2.3-2**.
>
> The ore processing area would be designed to provide for containment of ore processing materials, chemicals, wastes, and surface runoff. Potentially hazardous chemicals and wastes would be stored within buildings or areas with both primary and secondary containment. Surface runoff within the ore processing area would be directed to a contact water pond for collection.
> Any leaks or spills escaping primary and secondary containment would flow to the contact water pond for collection and would not discharge off site. Containment for each stage of the ore processing is described below. The ore processing workflow is shown on **Figure 2.3-4**.
>
> The processing would result in production of an antimony concentrate, gold- and silver-rich doré, tailings and other waste products. Tailings disposal is discussed in Section 2.3.5.7, Tailings Storage Facility.

These toxic metals will be subject to beneficiation to concentrate both antimony and gold. The DEIS presents only the simplest of process descriptions that are of little value in estimating toxic metal material balances. Moreover, these simplistic descriptions are only provided for the preferred Alternative, and then referenced for all other alternatives. This indicates that the applicant never considered any alternate process methods that might mitigate potential health and environmental risk. A comprehensive environmental impact analysis would consider and compare, contrast and assess the relative risks among alternative mining and mineral processing methods.

> ### CRUSHING AND GRINDING
>
> Mined ore would be hauled to the crusher and typically direct-dumped into the crusher or stockpiled at the uncovered run-of-mine near the crusher. Runoff from the run-of- mine ore stockpile would be captured within the ore processing area and combined with used in the milling process, see Section 2.3.5.9, Surface Water and Groundwater Management.
>
> Following crushing, additional size reduction of the ore would occur through grinding in a semi- autogenous mill followed by a ball mill. Grinding would occur within an enclosed building to reduce noise levels and facilitate maintenance of the milling equipment. Dust emission controls would reduce dust from crushing, conveying, and stockpiling. Grinding would reduce the ore to the size of fine sand for further processing.

All ores will be subject to crushing and grinding, which (at these concentrations) are potentially dangerous sources of fugitive dust if not adequately controlled. Current proposed control protocols sources for fugitive dusts rely on total and respirable particulate, not metals content. Given the large production volumes, high toxic metals content, and poorly understood toxicity of antimony compounds, fugitive dusts present significant risks and control requirements should consider potential toxic metals exposures.

> ### ANTIMONY FLOTATION AND DEWATERING
>
> The antimony flotation process would separate the mineral stibnite from the mineralized material feed where antimony grades are sufficient to warrant this step. An estimated 15 to 20 percent of the mill feed would have enough antimony to justify this step. Following grinding, the ground ore would be mixed with water, lime, and sodium cyanide to inhibit flotation of the gold-bearing minerals(pyrite and arsenopyrite). Lead nitrate or equivalent is added and then a sulfur- and phosphate-bearing organic chemical. These chemicals make the antimony-bearing particles hydrophobic where the particles then attach to air bubbles and float to the surface in the flotation tanks. The gold-bearing mineral particles which do not adhere to the bubbles in the flotation tanks would drop to the bottom of the flotation tanks and be routed to the gold flotation circuit for further processing. The antimony flotation facility would have interior curbing high enough to contain 110 percent of the volume of the largest tank.
>
> The surface air bubbles are allowed to overflow, and the overflow is collected. It is further concentrated, and water content is reduced through thickening and filtering before bagging for shipment. The final antimony concentrate is approximately 8 percent water and ready for shipment off-site for further refining.
>
> ### ANTIMONY CONCENTRATE TRANSPORT

> The antimony concentrate would contain approximately 55 to 60 percent antimony by weight. The remaining balance, 40 to 45 percent by weight, of the concentrate includes common rock forming minerals with trace amounts of gold, silver, and mercury. The concentrate would be in 1 to 2 ton super sacks and transported on flatbed trailers from the mine site for off-site smelting and refining. An estimated one to two truckloads of antimony concentrate, containing up to 20 supersacks per truckload, would be hauled off site each day. The antimony concentrate would be transported via Burntlog Route to State Highway 55, and then to a commercial barge or truck loading facility depending upon the refinery location. It is assumed that the concentrate, when sold, would be shipped to facilities outside of the U.S. for smelting and refining because there are currently no smelters in the U.S. with capacity for refining the antimony concentrate.

4.1.3 Mineral Processing / Beneficiation: All of these ores will be sent to either proposed high-grade antimony (variously estimated at +/- 20% of total) or gold concentration flotation processes. In addition, an unknown quantity of Historic Tailings will be bled into the flotation process streams, and it is unclear if oxide ores will bypass the flotation circuits. It also becomes difficult to reconstruct the toxic metals material balances, as there is a substantial degree of serial and parallel feed strategies depending on Sb and Au content and substantial recycling. Further, the feasibility study focuses on salable metals, or key metallurgical elements (As and S). Sb tails will apparently be sent to gold flotation and some unknowable portion of gold tails will be sent to the leaching circuits.

Floatation beneficiation is a wet process and generally is not a large source of fugitive dust. Concentrates are usually transferred and transported wet (apparently 8% moisture) to avoid dusting but are frequently spilled at transfer points and along transport lines, later becoming a substantial fugitive dust and direct contact risk. These risks are not acknowledged in the DEIS, and are discussed to the extent possible from the limited information in the economic feasibility analyses in the following sections.

High grade Sb ores are sent to primary floatation and cleaning projected to capture approximately 80% of Sb in the feed producing a concentrate greater than 50% Sb. It is unclear the extent to which mercury follows Sb or gold in antimony floatation. The total mass of Hg exiting the site in Sb ore is not provided and cannot be estimated from the reference documents. This is an important factor to determine, as these ores will likely be processed in central Asian or Chinese facilities where it will become a global pollutant of considerable concern under the Minamata Convention (https://www.epa.gov/international-cooperation/minamata-convention-mercury), or used in artisanal gold mining, currently the largest source of anthropogenic mercury pollution globally (https://www.epa.gov/international-cooperation/mercury-emissions-global-context).

The USFS should consider Idaho's potential significant contribution to one of the largest global environmental problems being successfully addressed in a cooperative international effort.

> **GOLD AND SILVER FLOTATION**
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> Housed in a steel frame building set on concrete foundations with curbing to provide secondary containment, flotation and leaching would be used to separate the gold and silver from other minerals. The gold and silver flotation facility would have interior curbing high enough to contain 110 percent of the volume of the largest tank. Gold and silver flotation is a process similar to that described for antimony flotation but using different chemicals to float pyrite and arsenopyrite, the minerals that contain the gold and silver. The flotation bubbles, with particles containing gold and silver, are collected and pumped to the concentrate thickener before processing by pressure oxidation. The particles from flotation that do not float become tailings. The gold and silver concentrations of the tailings would be regularly monitored and, if the concentrations are high enough to warrant further processing, they would be sent to the leaching circuit; otherwise, the tailings would be thickened and neutralized then routed to the TSF as described below.

4.1.4 Gold Concentration: High-grade Sb tailings, low grade Sb ores and an unknown percentage of historic tailings will be sent to gold floatation. Because most of these refractory gold ores are arsenical, the economic analyses do track As. Limited chemical assays suggest that the majority of Sb follows the tails and Hg follows the gold concentrate.

4.1.5 Gold Flotation Tailings: Although the documents do not reveal toxic metals levels in the gold flotation tailings, the feasibility studies indicate tails will be monitored for gold and may be sent to the leaching circuit if sufficient recovery is not accomplished in floatation. This nuance makes it extremely difficult to have confidence in the toxic metal balance downstream from floatation. Generally, it seems the tails would convey most of the remaining Sb and is noted to be a potential buffering source suggesting high pH, but As and Hg would report to the autoclaves for pressure oxidation.

> **OXIDATION AND NEUTRALIZATION**
>
> An autoclave (pressure oxidation) system would be used to free the gold and silver from the gold and silver flotation concentrates. The oxidized gold and silver concentrate from the pressure oxidation system would be cooled in tanks. After pressure oxidation the acidic slurry containing gold and silver would be separated and neutralized using slurried lime and other chemicals. The neutralized solution would be sent to the leach circuit for recovery of gold and silver.
>
> The autoclave system would be housed in a steel frame building set on concrete foundations, with interior curbing to provide secondary containment. Air emissions from the pressure oxidation facility would be captured in a series of air pollution controls, and the material collected would be disposed of as a solid waste or a hazardous waste depending on the waste characterization.

4.1.6 Autoclave Pressure Oxidation (POX): The autoclave thermally treats the ore under pressure with excess oxygen to oxidize the refractory arsenical ores leaving the gold amenable to cyanide leaching. This is the first step to chemically alter the ores and the toxic metals. This process chemically oxidizes the As and S ores producing significantly more toxic gasses and effluents requiring sophisticated controls and stabilization of the toxic compounds, including capture of volatilized mercury.

> **GOLD AND SILVER LEACHING AND CARBON ADSORPTION**
>
> Gold and silver leaching and carbon adsorption would occur in a steel frame building set on concrete foundations, with secondary containment of 110 percent of the volume of the largest tank and could include audible alarms, interlock systems, and/or sumps, as spill control measures (Initiative for Responsible Mining Assurance 2018).
>
> The gold and silver leaching component of the recovery process would be designed and operated consistent with the International Cyanide Management Code For the Manufacture, Transport, and Use of Cyanide in the Production of Gold. The leaching to recover gold and silver would occur in large tanks which would be fully contained to capture, retain, and recycle solutions. Sodium cyanide would be added to the tanks containing the neutralized solution to form a gold-cyanide complex and activated carbon would then be added to the tanks to promote the adsorption of the gold-cyanide complex onto the carbon.
>
> The carbon with gold-cyanide complex attached would then be collected on screens and sent to the carbon stripping circuit. Inside sealed tanks, the carbon with the gold-cyanide complex would be washed with an acid solution to remove impurities, rinsed with fresh water, and stripped of the gold under pressure at approximately 190 degrees Fahrenheit using a hot alkaline solution. The resulting gold-bearing solution would be transferred to the electrowinning and refinery area.
>
> The acid solution used during carbon stripping would be reused until it loses its effectiveness. The solution would be neutralized, sent to the tailings thickener and then sent to the TSF. Air emissions from the leaching facility would be captured in a series of air pollution controls, and the material collected would be disposed of as a solid waste or a hazardous waste depending on characterization of the waste.
>
> **GOLD AND SILVER ELECTROWINNING AND REFINING**
>
> The gold and silver electrowinning and refinery facility is a closed-circuit system with 110 percent containment of the largest vessel. The solution from gold and silver leaching and carbon adsorption would be transferred to electrowinning cells. The gold and silver precipitate would be mixed with flux then placed into an induction furnace and heated. The molten material from the induction furnace, principally gold and silver, would be poured into doré bars. The doré bars would be shipped off site to refineries for further

processing and refining.

Air emissions from the induction furnace would be captured in a series of emission controls. Mercury from the induction furnace would be converted to liquid metallic state, and then securely stored prior to shipment to a certified hazardous waste disposal facility.

TAILINGS NEUTRALIZATION CIRCUIT

Cyanide-bearing solutions used in ore processing would be neutralized within the ore processing plant to less than approximately 10 milligrams per liter weak acid dissociable cyanide before the material is pumped to the TSF. Residual cyanide would be treated using a sulfur dioxide and air system to oxidize cyanide to form cyanate. After neutralization, tailings would be routed to one or more tailings thickeners, to partially dewater the tailings. The overflow water solution as the tailings are thickened would be recycled within the ore processing facility. The neutralized tailings slurry would be pumped from the ore processing plant to the TSF.

4.1.7 Leaching and Tailings Disposal: Cyanide leaching produces highly toxic compounds in the tails and spent leachate. Generally, these compounds require detoxification, as indicated in the accompanying process flow diagram and brief discussion regarding CN oxidation to cyanate. There is no discussion of the quantity or chemical makeup of COC being discharged to the TSF. Ultimately, the State of Idaho will determine the detoxification and storage requirements for these wastes. The current proposal indicates the tailings and spent CN leach solution will be sent to the TSF. Under the current regulations, inclusion of highly toxic cyanide leach materials requires double lining of the entire TSF. Simultaneous to this DEIS review, the applicant is supporting industry-led mining association efforts before the State of Idaho for relief from the cyanide waste repository regulations.

Midas is currently advocating an alternate single liner standard, and cites compliance with International Cyanide Management Code mining practices advocated for operations in poor and middle-income countries. This is both inappropriate and insufficient. With respect to regulation, this Code is a voluntary initiative developed for and by the gold and silver mining industries. The Code's website https://www.cyanidecode.org/about-cyanide-code/cyanide-code states:

> *Compliance with the Cyanide Code is entirely voluntary and is neither intended nor does it create, establish, or recognize any legally enforceable obligations or rights on the part of its signatories, supporters or any other parties. It is intended to complement an operation's existing regulatory requirements. Compliance with the rules, regulations and laws of the applicable political jurisdiction is necessary; the Cyanide Code is not intended to contravene such laws.*

Technically, there will be several hundred feet of hydraulic head in the proposed TSF, a condition not usually anticipated in a cyanide leach operation; and one that amplifies the possibility and severity of leaks. Use of a single liner precludes redundant effectiveness of monitoring, collection, capture and treatment of leaks between the liners.

4.2 COC Material Balances in Environmental Media

Accurate and transparent material balances are key to understanding and estimating contaminant sources, releases, migration, transport and transformation, media-specific concentrations, hazards and risks to the ecologic and human health, and ultimate disposition of potentially harmful constituents. This document fails to provide accurate and transparent material balances for toxic contaminants, making it exceedingly cumbersome and difficult to review, particularly in the abbreviated timeframe provided by the USFS for such a challenging project. Moreover, the applicant has simultaneously applied for relief from regulatory requirements from several State and federal agencies with regard to air, water, and mining waste disposal requirements that would profoundly affect the ultimate disposition of contaminants. It is equally difficult to assess and provide comments in these regulatory reviews without a common basis for contaminant behavior, which is complicated by apparent conflicting information being submitted to different agencies. These conflicts would best be resolved by suspension of the DEIS review and directing the applicant to provide accurate supplemental analyses including accurate and transparent material balances for contaminants of concern. This would also provide time for key decisions by other regulatory agencies that will determine the efficacy of the toxic management assertions in the DEIS.

4.2.1 Ores and Waste Rock: The support documents for the DEIS do contain gross material balance for ores, development rock, cover materials, and tailings redistribution and disposition across the site. The applicant argues that these activities can be staged in a manner that will improve the overall environmental situation through more effective containment of contaminants of concern. However, the document fails to track migration of COCs through these activities. Sample calculations applying available chemical data to elements of these gross material balances show troubling inconsistencies.

4.2.2 Water: The DEIS does contain water balance and rudimentary modeling of the hydrologic system across the site for each Alternative, but also fails to translate these to contaminant migration, transport and transformation, and either short-term or longer-term water quality considerations. Moreover, the characterization of sub-surface conditions, and failure to analyze key hydrologic events, would result in any contaminant balance being suspect, and likely unreliable, were it to be based on the hydrologic models.

4.2.3 Air: With regard to air quality considerations, the applicant alludes to experience with similar facilities regulated by the Nevada Department of Environmental Protection (NDEP). NDEP’s guidance for management of air toxics in the same gold mining and mineral processing facilities proposed for Stibnite, specifically calls for reliance on material balances for toxic constituents. The DEIS fails to provide any such balance. Moreover, the applicant has failed to submit such balances to the IDEQ in their application for a Permit to Construct for this same facility (COMMENTS attached). Sample calculations applying available chemical data to elements of these gross material balances show troubling inconsistencies.

4.2.4 Biota and Human Health: Contaminant intake and uptake through exposures to environmental media are wholly dependent of media-specific contamination levels. Inaccurate contaminant balances make both exposure point concentrations and duration suspect, diminishing any reliance on consequent hazard and risk assessments for human and ecological receptors.

4.3 Example COC Material Balances

4.3.1 Methodology: The Draft EIS provides almost no quantitative material or chemical transformation balance for the COCs (Hg, As, Sb, Cd, Ni). Supporting documents, particularly the (2014, 2019) M3 Feasibility Study and the 2017 SRC Geochemical Characterization Report do carefully track precious metals through the mining and mineral processing steps, antimony as it relates to a salable commodity metal, and arsenic as it relates to processing gold-arsenic ores. These metallurgical and economic reserve calculations can be used to develop a general understanding of the sources, transport, transformation and fate of toxic contaminants through the mining and mineral processing stages.

Rudimentary COC material balances for the overall life of the facility were developed from economic mineral reserve predictions and pilot metallurgical studies in the (2014, 2019) M3 Feasibility Study, and average and 95th-%tile metal content analyses in the 2017 SRC Geochemical Characterization Report. (See attached Supplemental Tables for calculation details). These material balances were assessed to form a general opinion of the likelihood for health and environmental protectiveness, and identify specific needs for supplemental analyses.

Additionally, because there is significant variability in the operations over the projected life with regard to ores mined and processed and seasonal, meteorological and climatic effects, key operational periods should be identified for specific analyses in a DEIS Supplemental, as warranted. Neither the DEIS, nor the support documents, provide sufficient detail to track toxic contaminant releases through environmental media or assess potential health and environmental effects. In that sense, the Draft EIS is wholly insufficient.

4.3.2 Mercury Material Balance: An estimated 564-1645 tons of Hg will be disturbed. About 65% of the disturbed Hg will be in the development rock (324-1045 tons) - the largest contributor being Hangar Flats excavations (about 45% of total mercury in development rock, or 30% of all disturbed Hg on site). Development rock will be disposed in four general locations shown in Table 2. One alternative adds an additional Fiddler WRSF. The Hg-laden Hangar Flats waste rock will largely be deposited in the Main WRSF and the lower portions of the Yellow Pine Pit backfill. These two fills will accommodate approximately 75% of waste rock mercury (or 49% of total site Hg). These locations are open to groundwater flow, subject to alternate wet/dry and oxidation/reduction cycles and are potentially a significant source of subsurface contamination. Other final repositories for waste rock Hg are the tailings embankment (18%) and West End WRSF (7%).

An estimated 240- 640 tons of Hg will be present in production ores, 237- 635 tons in newly produced ores and 3-5 tons from historic tailings. These ores will be crushed and ground to a fine sand grain size and processed by floatation. The largest Hg source being Hangar Flats 157-392 tons (or 65%), with Yellow Pine, West End and Historic Tailings contributing 22%, 12% and 1%, respectively, of total Hg from processed ores. High antimony ores (reportedly 15-20% of mined ores) are sent to antimony floatation. Although no accounting is provided, it appears that Hg selectively follows Sb in floatation, being enriched from approximately l–5 mg/kg in Sb-rich ores to 240-350 mg/kg in Sb concentrate. This unknown but substantial amount of Hg will exit the site in the commercial product.

Low-grade Sb ores and the tails from the high-grade Sb floatation are both sent to gold flotation, indicating that all Hg not sold with antimony concentrates (excepting any in oxide ores) will be charged to the gold floatation circuit. The DEIS provides no meaningful insight to Hg disposition in Au floatation. Pilot metallurgical analyses described in the feasibility studies suggest concentrations are 4 to 10 times greater in Hanger Flats ores, or 4 -11 mg/kg Hg versus 1 mg/kg in other ores. These are also the highest Sb ores. Similarly, Hg levels in the Au concentrates from Hangar Flats are similarly elevated above the other ore concentrates. It is not practicable from the data provided in the DEIS and associated references, to determine the partition of Hg to concentrates and tailings from the floatation circuits.

Gold flotation tailings may be recirculated or sent to leaching, depending on Au content. Gold concentrates are sent to the autoclaves for pressure oxidation. Apparently, significant amounts of Hg will be volatilized in the autoclaves. These processes were of considerable concern in Nevada in the last decade, accounting for the bulk of Hg emissions in the western US, and a subsequent aggressive air pollution control effort. Mercury control from the Nevada autoclave operations have achieved orders of magnitude reduction in Hg emissions and associated increases in mercury co-products and wastes. The DEIS suggests, and Midas application for a Permit to Construct the facility to the IDEQ asserts controls similar to the Nevada operations will be put in place. However, no estimate of Hg input or volatilization is provided, only an optimistic emission rate seemingly independent of Hg content in the system. Nevertheless, it is apparent that a significant Hg waste or product stream will derive from the autoclave system. Quantities, characteristics or disposal details are absent from all documents. The Nevada operations cited as a model for this operation are reportedly storing the wastes on-site in anticipation of a federal repository being developed. Comments submitted to IDEQ regarding the Midas Permit to Construct are attached and should be considered as part of the record for these DEIS comments.

The unknown quantity of Hg remaining in gold concentrates will discharge to the leach tanks, where it will partition to Au product and carbon electro-winning or be discharged with spent CN solutions. The former will likely be volatilized adding to emissions and Hg co-product disposal issues. Spent CN solutions are among the most hazardous and potentially health and environmentally damaging materials on-site. These are projected to be neutralized and discharged to the TSF. Little information is provided regarding the potential for, and mitigation measures in the event of, a catastrophic release, other than assurances the building will be sized for 110% containment.

In summary, the DEIS provides almost no usable information with respect to the production and disposition of Hg from the Midas operations. Somewhat reliable estimates of Hg production can be developed by applying observations from 3 to 6-year old feasibility studies to the generalizations presented in the DEIS. These indicate that about 65% of Hg (324-1045 tons) disturbed is associated with development rock that will be discharged to the local environment in adverse conditions conducive to chemical transformation and long-term bleeding of toxic Hg compounds into groundwater and eventually biotic systems. Several hundred tons of Hg (240-640 tons) will be processed as ores. The DEIS provides no quantitative estimates as to how this Hg will partition or transform through the metallurgical processes. Pilot floatation, oxidation and leachate test conducted for Sb and Au sometimes provide Hg observations that can be used to generalize likely Hg behavior, but quantification is neither provided, nor can be estimated with any degree of confidence. A significant but unquantifiable portion of Hg will exit the site in either Sb or Au concentrate product. The Sb concentrates will likely be processed in poor and middle income countries, where it will eventually contribute to global Hg burdens of considerable concern, exacerbating international treaty efforts to curtail toxic Hg levels threatening eco-systems worldwide.

Floatation, oxidation and leaching pilot studies indicate the Hg will follow gold, with larger portions volatilizing during pressure oxidation and carbon-based refining. The DEIS optimistically asserts this unknown quantity will largely be captured with only 0.2 pounds per year escaping to the atmosphere. The unknown, but apparently substantial quantity of captured Hg, will reportedly exit the site to an unknown, but cited as licensed, destination. Midas has indicated these materials will be handled similar to model sites in Nevada, which have reportedly been unable to export the hazardous materials and to maintain these wastes in on-site temporary storage for several years. The Hg remaining in CN spent solutions for the leachate process will be discharged to the TSF.

4.3.3 Arsenic Material Balance: An estimated 737,683–2,213,215 tons of As will be disturbed. About 57% of the disturbed As will be in the development rock (317,495-1,216,926 tons). The Yellow Pine Pit excavation is the largest contributor (about 51% of total As in development rock, or 29% of all disturbed As on site). Both the Yellow Pine and Hangar Flats Development Rock are extremely high in As concentration, 1300 - 4600 mg/kg and 1200 -5200 mg/kg, respectively)). USEPA Health-based Regional Screening Levels (RSLs) for arsenic tri-oxide for Residential Soils are 0.68 mg/kg (carcinogenic) and 35 mg/kg non-carcinogenic). Composite Workers soil RSLs for worker ingestion are 3.6 mg/kg (carcinogenic) and 580 mg/kg (non-carcinogenic) https://semspub.epa.gov/work/HQ/200043.pdf.

Dusts generated from waste rock excavation will exceed these criteria by 2 to 9 times for workers non-carcinogenic risk and 360 to 1440 times for carcinogenic risk, with an order of magnitude greater risk for residential soil criteria. Depending on chemical species, these levels in the air or in any dusts deposited on local surfaces, could represent substantial risk to workers, local populations and frequent site visitors; and will likely require respiratory protection for workers. No analyses in the DEIS address the chemical speciation and the likelihood for transformation to the more dangerous arsenical compounds.

In the 10/27/2020 Public Information Hearing regarding the Permit to Construct of the Stibnite Gold Project, IDEQ indicated that greater than 93% control of fugitive dusts will be required as a permit condition to meet off-site ambient particulate criteria. It is not unreasonable to assume that particulates containing up to 0.5% As would represent inappropriate carcinogenic and carcinogenic risk at the same off-site locations. Moreover, this is, as IDEQ expressed, an aggressive level of control not typical for other sites. Reportedly, Midas Gold has assured IDEQ that this level of control will be achieved, although no details have been developed to support this claim. Of greatest concern is that IDEQ anticipates not requiring any ambient monitoring to assure the 93% criteria is achieved, and no monitoring to assess risk to human health during operations.

The DEIS should provide a human health risk assessment for worker, trespasser, frequent site visitor, and post-reclamation scenarios for these rock dusts, including evaluation of public typical and reasonable maximum exposures at the most sensitive locations identified in IDEQ’s NAAQS analyses.

Development rock will be disposed in three general locations shown in Table 2. The As-laden Yellow Pine waste rock is projected to go to the tailings pond embankment and the Main WRSF. Hangar Flats high-As waste rock will largely be deposited in the Main WRSF and the lower portions of the Yellow Pine Pit backfill. The fills will accommodate an estimated >80% of waste rock mercury (or nearly 50% of total site As). These locations are open to groundwater flow, subject to subject to alternate wet/dry and oxidation/reduction cycles and are potentially a significant source of subsurface contamination. The As concentrations are too high to leave these materials exposed as surface soils, in either temporary or permanent management or reclamation efforts. Typical cleanup levels for As at CERCLA sites range from <10 mg/kg to 35 mg/kg, with some sites developing site-specific levels as high as 250 mg/kg. Yellow Pine and Hanger Flat Development Rock are 18-1200 times greater than typical CERCLA critical toxicity criteria.

An estimated 420,188 - 996,290 tons of As will be present in production ores, the vast majority in newly produced ores with an estimated 4,366-8,286 tons from historic tailings. These ores will be crushed and ground to a fine sand grain size and processed by floatation. The largest As sources are Hangar Flats and Yellow Pine ores, each contributing about 45% of the total; with West End contributing 9%, and 1% coming from historic tailings. High antimony ores (reportedly 15-20% of mined ores) are sent to antimony floatation. Although no accounting is provided, it appears that about 3%-7% of the As in high antimony ores will be retained with the Sb concentrate. More than 90% of the As will be charged to gold flotation along with all As in the low-antimony ores (excepting oxide ores that are not discussed in DEIS).

The DEIS provides no meaningful insight to As disposition in gold floatation. However, because refractory gold is largely found in arsenical ores (that are also a primary source of sulfur needed for downstream autothermic oxidation), pilot metallurgical analyses described in the feasibility studies do account for As. For Yellow Pine, about 83-93% of As is captured in the gold flotation concentrates (from high and low Sb ores, respectively). About 8-9% of Yellow Pine As is discharged with the Au float tailings. Recoveries were less for the Hangar Flats ores with 64% and 73% of As retained in gold flotation concentrates from the high and low Sb feeds, respectively. For Hangar Flat ores, 24-36% of As escapes with the tailings. West End ore flotation yielded 83% As capture with 17% discharged with tails. The production descriptions indicate that the gold content of flotation tailings may be recirculated or sent to leaching, depending on Au content.

Gold concentrates are sent to the autoclaves for pressure oxidation (POX). Although the DEIS provides no insight with regard to As disposition or toxicity in relation to the metallurgical processes, it appears between 80-90% of total As in ores will reach the POX (350,000 to 900,000 tons As). A primary aim of the POX is to oxidize the arsenical-gold-sulfide compounds concentrated in the flotation circuits.

The DEIS makes no mention of arsenic speciation in relation to the proposed metallurgic processes or waste characteristics. Arsenic geo-chemistry and toxicity considerations are complex, and species (valence) dependent. Arsenic solubility, bio-availability and toxicity are highly variable among mineral processing applications depending on other metal concentrations, pH, and oxidation-reduction status, among other factors. The 2014-2019 M3 feasibility study makes two brief references to arsenic behavior in wastes. The DEIS is silent on these issues.

> The primary product from the gold flotation circuit is an auriferous pyrite concentrate; arsenopyrite and arsenian pyrite are also present in the concentrate. In order to liberate finely encapsulated gold particles in the concentrate, it must be oxidized. The products of oxidation are generally ferric arsenate (scorodite) and sulfuric acid; liberated gold and silver are present within the solids. P17-9
>
> The POX tailings consist mainly of the oxidation product oxyhydroxy scorodite, a crystalline ferric arsenate mineral and also produced near neutral to alkaline leachates. However, the magnitude of antimony and arsenic release was higher in comparison to the flotation tailings, with an average arsenic concentration of 13.3 mg/L and an average antimony concentration of 0.09 mg/L. In addition, sulfate is elevated above the water quality standards for a few of the SPLP results for POX samples, and weak acid dissociable (**WAD**) cyanide was above the water quality standards for all POX samples. P20-26

The reference to POX tailings is confusing. The process flowsheet (DEIS P-29) shows the POX concentrate is washed and neutralized with concentrate sent to leaching and tailings sent to dewatering. The pilot oxidation studies (M3 2014-19) indicate As remains with the cleaned concentrates (Tables 13-9,13,17). However, the above statement refers to residual cyanide, possibly referring to minor amounts introduced as flotation reagents, or to post-leachate tailings that would have considerable CN toxicity. Most of this arsenic will be discharged to the TSF following treatment either following POX or leaching. The speciation, stability, solubility and toxicity of the As compounds will depend on pH, alkalinity and Fe status. The DEIS offers no indication or discussion of the disposition, nor speciation and stability, of potentially 900,000 tons of As that will be stored in perpetuity in behind a 600 foot dam subject to significant hydrologic head pressure and meteoric waters. Moreover, the applicant is simultaneously seeking relief from redundant liner rules for cyanide leach tailings disposal facilities.

4.3.4 Antimony Material Balance: Antimony is both a salable product and a toxic environmental contaminant. The health implications of antimony contamination are among the least understood of the heavy metals, as it is usually encountered with other toxic metals that are drivers in risk assessment, pollution control, and remediation determinations. An estimated 258,103*–1,130,591 tons of Sb will be disturbed. An estimated 4% to 19%* of the disturbed Sb will be in the development rock (42,114*-40,139 tons). The asterisks (*'s) denote apparent anomalies or errors in the SRC 2017 geochemical results regarding the Sb content of development rock that preclude developing accurate estimates. Sb concentration in development rock are relatively low in comparison to arsenic. Average values range from 62 – 260 mg/kg and 95th %-tile concentrations from 76- 150 mg/kg, although the 260 mg/kg observation is suspect. USEPA Health-based (non-carcinogenic) Regional Screening Levels (RSLs) for antimony for Residential and Composite Worker soils are 35 mg/kg and 4700 mg/kg.

An estimated 215,989 – 1,130,591 tons of Sb will be present in production ores, most from newly produced ores with an estimated 4,572 - 28,660 tons from historic tailings. The largest Sb sources are Hangar Flats and Yellow Pine ores, contributing about 2/3rds and 1/3rd of the total, respectively; with West End and Historic Tailings contributing about 3%. These ores will be crushed and ground to a fine sand grain size and processed by floatation. Reportedly, 15-20% of mined ores will go to Sb flotation. Both Sb flotation tails and low-grade Sb will go to gold flotation (possibly excepting oxide ores). High antimony ores are sent to antimony floatation. Although no accounting is provided, it appears that about 82% of the Sb in high antimony ores will float to produce a 58% Sb concentrate, with about 17% of the Sb discharging in tails sent to gold floatation. It is difficult to estimate how much Sb will leave the site as concentrate product, as there are inconsistencies among metallurgical process, reserves estimates and economic analyses among the references and the DEIS.

Information from disparate sources within the feasibility studies suggests about 60% of Yellow Pine and 15% of Hanger Flats ores will go to Sb floatation, and will yield approximately 70,000 tons of antimony in concentrate form including 5000 tons from historic tailings. At average ore concentrations, this would constitute about 1/3rd of total antimony from ore will exit the site as product, with the remainder (147,000 – 745,000 Sb) tons discharged to gold floatation, either as high-grade Sb tails or low-grade Sb ore.

Limited pilot floatation studies indicate that the Sb in gold floatation will partition approximately 78% to gold concentrate, 22% to floatation tails. The gold floatation concentrates are cleaned and sent to POX for thermal treatment. Tails are either sent to the TSF or leach circuit depending on residual Au assays. Antimony discharged to the tailings are likely stibnite (32,000 – 163,000 tons Sb). The limited pilot studies suggest levels in clean gold concentrate will be 0.5 to 1.1% Sb and will be charged to the autoclaves. There is no discussion in any of the documents reviewed regarding chemical transformation of Sb species in and downstream of the POX. It is unknown if any gold autoclave system has operated with these levels of Sb or the oxidized chemical form.

The process flowsheet (DEIS P-29) shows the POX concentrate is washed and neutralized with concentrate sent to leaching and tailings sent to dewatering. There is no information available to determine the chemical form of Sb entering or exiting the cyanide leach cycle. Presumably, 115,000 – 582,000 tons of Sb will be processed concurrent with the precious metal recovery and ultimately discharged to the TSF following CN neutralization. The DEIS makes no mention of antimony speciation in relation to the proposed metallurgic processes or waste characteristics. No information or discussion of the chemical form, stability, solubility, or toxicity of Sb waste is provided. In total, about 147,000 – 745,000 tons Sb in waste from ore processing, and an additional 40,000* tons from development rock will be disposed on site, with little to no information regarding chemical form and critical stability and toxicity characteristics.

4.4 Example COC-based Alternative Selection

From a waste-management perspective, the DEIS does not offer meaningful Alternatives. Although the material balances developed and discussed above are preliminary in nature, and were derived with considerable reverse engineering effort from mineral economic feasibility studies, several potential mining and mineral processing alternatives can be identified from the results. These Alternatives potentially represent substantially less health and ecologic risk, potential environmental damage, and loss of critical resources. In general, good toxic waste management practices emphasize minimal disturbance of stabilized *in situ* contaminants, and capture, consolidation and concentration, that reduce the volume and toxicity reduction of hazardous materials.

More sophisticated material balances drawn from on-site data unavailable to this public review could identify additional potential opportunities to better manage toxic metals, assess the feasibility of the alternatives. Moreover, the feasibility analyses available to the public in the current release of documents are economic analyses and end with the isolation of salable product; the material balances should extend beyond the metallurgical processes and address distribution and transformation of these toxic metals in environmental media. This would aid in developing other alternatives based on the prospective for short and long-term environmental degradation and catastrophic releases.

Summarizing the preliminary findings of this review with respect to the three COCs suggests the following possibilities:

- **Underground mining**
- **Segregation of waste rock for selective disposal (noted in earlier documents)**
- **Cyclone and sand fill of floatation tailings**
- **Segregation of pre- and post-POX and leachate tails with separated dedicated TSFs**
- **Pretreatment and stabilization of arsenic wastes**
- **Flexibility in Hg waste disposal options**
- **Enhanced mechanical collection and disposal controls for high As fugitive dusts.**
- **A No-action Alternative considering CERCLA cleanup of the site**

4.4.1 Mining / Waste Rock: Approximately 65 % of the Hg, 57 % of As and 4 – 19% of Sb disturbed and produced on the site is from development rock and overburden. **Underground mining** could substantially reduce the total toxic metal disturbance, volume of development rock/overburden, and gangue-to-concentrates ratios, requiring substantially less disposal and repository capacity. The result could result in fewer tons of COCs produced with less landscape disturbance and subsequent abuse.

4.4.2 Selective Placement of Waste Rock: The early feasibility studies noted the large volumes of waste rock and the potential need for selective placement of spent ore and waste rock to reduce the potential for further oxidation and mobilization of toxic metals (M3 pp16-18, 20-12). Initial potential acid producing tests indicated fresh-mined waste rock had a low potential to generate acid or leach metals and determined segregation and selective handling of the waste rock was not considered necessary, but noted waste rock from the Hangar Flats and Yellow Pine deposits may require segregation and selective disposal of potentially acid-generating (PAG) material to prevent development of acidic drainage in the long term (M3 pp 20-24, 20-26). The DEIS cites numerous COC contributions to groundwater and surface water associated with historic deposits of waste rock. Some alternatives propose surface liners to prevent meteoric infiltration and leaching of contaminants to ground waters. These analyses are based on geochemical modeling of waste rock and average hydrologic conditions. Confidence in the source terms, predicted water quality and impact conclusions could be enhanced by demonstrating coherence with site-wide metals material balances and assessing reasonable maximum concentrations.

4.4.3 Floatation Tailings: Most of the Sb and a substantial, but undeterminable, percentage of the Hg in high grade ores will be captured in the antimony flotation process and exit the site as product. Hg and Sb total metals concentrations in the antimony flotation tails will likely be in the fines or sand materials associated with captured stibnite or in oxidized chemical forms. These tails are sent to gold floatation for gold (and arsenic) concentration. Sb in low-grade ores would report to the gold floatation circuit and about 20% of the Sb would likely be discharged with the gold floatation tailings. These tailings would contain little As and potentially could be cycloned. Larger particles could then be returned to sand fill abandoned stopes in the underground mines, with relatively less toxic consequence and potential for catastrophic release. Small particles and dissolved metals would be discharged to a segregated low-arsenic, non-CN TSF at lower volume and toxicity levels than in the current alternatives. This could substantially reduce the overall COC production and toxicity; and the volume, surface-area, and dam height requirements of the TSF.

4.4.4 Post-POX Wastes: The metallurgical considerations for the POX autoclaves emphasize concentrating arsenic and sulfur to facilitate gold ore oxidation and leachate recovery. Under thermal processing, As undergoes chemical transformations altering its potential for environmental degradation, making it either more or less dangerous, depending on the downstream disposition of the arsenic bearing waste. It is unclear what, if any, significant chemical transformation of As occurs in the leachate circuit. Regardless, the waste becomes more toxic due to cyanide treatment. From a toxics management perspective, this process concentrates a principal COC and is an opportunity to substantially reduce the risk and potential environmental harm from arsenic. Lesser amounts of arsenic will report to the POX concentrate cleaning tailings and can be disposed of underground or the smaller low toxicity TSF. The majority of As will follow gold to the leach tanks and be concentrated as a highly toxic cyanide leach waste. From a waste management perspective, this in an opportunity to concentrate, and reduce volume and toxicity through treatment and advanced disposal. All alternatives explored in the DEIS advocate dilution of the arsenic laden wastes by mixing with predominately antimony tails and co-disposing in the main TSF. From a waste management perspective this is a lost opportunity and dilution is generally not a preferred solution. A preferred solution could be to detoxify CN, stabilize As and dispose of these materials in a dedicated redundantly-lined TSF, with appropriate monitoring and leak collection safeguards.

4.4.5 Flexibility in Hg Waste Management: Under a waste management approach more attentive to a realistic material balance, Hg would be removed from the site through the antimonial concentrates and toxic waste co-products. Remaining Hg could be returned underground in sand fill, or to a smaller, lower-toxicity antimony tailings pond, captured as an off-gas from the autoclaves, and carbon refinery or securely disposed in the lower volume, high-toxicity, redundantly-lined cyanide leach waste repository.

4.4.6 Arsenic in Fugitive Dusts: The high concentrations of As in fugitive dusts, exceed both carcinogenic and non-carcinogenic critical toxicity criteria by orders of magnitude. Arsenic laden particulate is potentially an unacceptable risk for both inhalation and incidental ingestion through direct contact with recently deposited dusts. Because these dusts will tend to accumulate seasonally, the air quality analyses conducted for the DEIS are insufficient to assess this potential human health risk. Human health risk assessments should be performed to address this critical pathway. It may be necessary to collect fugitive dust emissions and appropriately dispose of the particulates to avoid unacceptable cumulative exposures.

4.4.7 No action alternative should consider CERCLA: This site is also subject to CERCLA, although it has not risen to priority status by the State of Idaho at this time. The USEPA is currently considering CERCLA-related actions based on the outcome of the DEIS, and USFS, State of Idaho and Nez Perce Tribe considerations. Based on preliminary investigations undertaken, and other sites involving PRPS for this site in adjacent States, it is probable this site will achieve active status in the foreseeable future. Imposition of CERCLA, would be among the first steps require a conceptual site model that includes an accurate and transparent material and contaminant balance for the site. Evaluation of such a model would be incumbent on the State, Tribal and federal trustees to resolve remedial requirements and CERCLA liabilities in, either Consent Decrees or implementation of voluntary cleanups, as part of mine development, reclamation, and closure.

5.0 Summary Conclusions and Recommendations

5.1 Conclusions

With respect to the evaluation of potential health and environmental risks associated with Contaminants of Concern:

- lack of confidence in any COC-related quantitative analyses,
- failure to evaluate reasonable maximum concentration scenarios, and
- no quantitative or qualitative discussions of uncertainties

renders the DEIS wholly insufficient and it should be returned for supplemental analyses.

This report outlines four fatal flaws to support this conclusion. The DEIS:

- is not presented in a manner that can be comprehensively evaluated in the allotted Review Period,
- is not Transparent, nor Coherent, with respect to COCs,
- has COC-related analyses that have not included Good Engineering Practices for Hazardous Waste / COC Management, and
- does not Include Meaningful Alternatives with Respect to Hazardous Waste / COC Management

5.2 Recommendations

The USFS should:

- Review all Public Comments itemizing deficiencies in the DEIS.
- Draft request for Supplemental DEIS specifying Deficiencies to be Addressed
- Open Public Comment Period allow public opportunity to comment regarding the request for a Draft Supplemental DEIS.
- Revise the Supplemental DEIS request to include Public Concerns, specifically identifying the deficiencies to be addressed and the process to revise Alternatives accordingly.

With regard to Contaminants of Concern (COCs) the DEIS Supplemental Analyses should:

- Develop Conceptual Site Models (CSM)s and Material Balances for COCs for the current DEIS Alternatives using average and reasonable maximum concentrations.
- Audit the CSMs and Material Balances for Good Engineering Practices to reduce quantities and toxicity of COCs throughout all industrial and environmental processes including mining, mineral processing, disposal and environmental management.
- Quantitatively screen all potential candidate practices that could significantly reduce COC production, disposal quantities, toxicity and potential for catastrophic failure.
- Include in the screening, as a minimum, the alternatives identified in the cursory review conducted above for this DEIS, (i.e., underground mining, segregation of waste rock, pre- and post-POX wastes tailings, pre-treatment of arsenic wastes, containment of fugitive dust emission, Hg co-product disposal options, CERCLA cleanup alternative).
- Collaborate with USFS and interested parties to develop more appropriate Alternatives for a Supplemental DEIS that include practicable COC reduction engineering and design principals identified in the screening.
- Revise DEIS Alternatives accordingly in a Supplemental DEIS. Ensure that the Supplemental DEIS is both transparent and coherent with regard sound scientific and regulatory practices; supported by accessible and searchable references.