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BEFORE THE BOARD OF ENVIRONMENTAL QUALITY
STATE OF IDAHO

IN THE MATTER OF AIR QUALITY PERMIT TO CONSTRUCT P-2019.0047

NEZ PERCE TRIBE, IDAHO CONSERVATION LEAGUE, and SAVE THE SOUTH FORK SALMON,

Petitioners,

v.

IDAHO DEPARTMENT OF ENVIRONMENTAL QUALITY,

Respondent,

and

PERPETUA RESOURCES IDAHO, INC.,

Intervenor-Respondent.

Case Docket No. 0101-22-01
OAH Case No. 23-245-01

EXPERT DECLARATION OF NORKA E. PADEN, Ph.D.

I, NORKA E. PADEN, Ph.D., hereby declare under penalty of perjury and pursuant to the law of the State of Idaho that the foregoing is true and correct:

Qualifications

1. My name is Norka E. Paden. I am an Environmental Toxicologist with 16 years of experience and have been with the Idaho Department of Environmental Quality's (DEQ's) Toxicologist/Risk Assessor since 2016. I am responsible for toxicological and risk assessment analyses for contaminated sites and toxic exposures statewide. I provide toxicological expertise for contamination issues related to air, water, and soil. I deliver written comments to policy makers and stakeholders during negotiated rulemaking that involves selenium, copper, and arsenic human health water quality criteria. I mentored a professor from Lewis-Clark State College on the risk assessment of air pollutants in the Lewiston Valley and was acknowledged in the paper, "Observations of volatile organic and sulfur compounds in ambient air and health risk assessment near a paper mill in rural Idaho, U.S.A," published in the 2020 *Atmospheric Pollution Journal*. In 2023, I delivered technical comments for the Idaho Department of Health and Welfare's "Letter Health Consultation for the Lewiston Clark Air Quality Study," and DEQ received commendation from the Nez Perce Tribe for the technical support.

2. I received my Master of Science in Human Ecology at the Free University of Brussels, Belgium, and Ph.D. in Environmental Toxicology from Texas Tech University. Prior to joining DEQ, I worked for the Idaho Department of Health and Welfare from 2011 through 2016 and authored six public health consultations and 12 letter health consultations, which are written responses to a specific request for information about health risks related to a hazardous material, chemical release, or specific site, under the Agency for Toxic Substances and Disease Registry (ATSDR) cooperative agreement. While working at GEI Inc., a Colorado environmental consulting firm from 2008 to 2011, I provided technical expertise in preparing risk investigations for Superfund sites, drafted technical reports on toxicity evaluations, and supported clients by writing technical reports and rebuttals during rulemaking meetings. I served as an adjunct faculty member for the Department of Community and Environmental Health at Boise State University from 2012 to 2015. I currently serve on various advisory committees in Idaho including the Cancer/Cluster Analysis Work Group, Fish Consumption Advisory Project, One Health Consortium, Groundwater Monitoring Technical Group, and Federal-State Toxicology Risk Analysis Committee. I am also a member of the Society of Environmental Toxicology and Chemistry (SETAC) and Editorial Board of the Journal of Integrated Environmental Assessment and Management.

Assignment

3. I have been asked by DEQ's Air Quality Division to review and evaluate the issue: "DEQ did not act reasonably and in accordance with law when it applied the 16/70 calculation to the ambient arsenic air concentration analysis" and provide this declaration to assist the Hearing Officer as the trier of fact. This declaration provides evidence in the form of an expert opinion

as a toxicologist, as the Board of Environmental Quality (DEQ Board) suggested in its *Final Order in the Matter of Air Quality Permit to Construct P-2019.0047* (Final Order).[1]

Summary of Opinions

4. Based on the information provided, cancer risk estimates using 16-years, and 70-years of exposure duration are both within the range of public health guidelines of 1 in 1,000,000 to 1 in 10,000 (i.e., one in a million to one in ten thousand) for protection of human health as suggested by the United States Environmental Protection Agency's (EPA's) target cancer risk range. Based on this assessment, the estimated lifetime cancer risk from exposure to arsenic through inhalation using the exposure duration of 16 years (lifetime of the mine) followed EPA's guidelines that are the framework for DEQ's Rules for the Control of Air Pollution in Idaho and falls within EPA's target cancer risk range of 1 in 1,000,000 to 1 in 10,000 (i.e., one in a million to one in ten thousand) and is not expected to increase cancer risk under current permit operating conditions.

Documents reviewed

5. I reviewed the May 1, 2024, DEQ Board meeting minutes transcript and background of the Perpetua-Stibnite Gold Mine Permit to Construct issued in June 2022 and subsequent documents on the case docket No. 0101-55-01 OAH No 23-245-01: May 23 Memorandum in Support of Joint Motion for Reconsideration and/or Clarification of Final Order, June 12 Order on Petitions for Reconsideration and/or Clarification of Final order, and July 8 Scheduling Order.

Background and Discussion

6. Based on my interpretation, the DEQ Board supported DEQ on four of the five matters. The fifth matter related to Section 586 of the "Rules for Control of Air Pollution in Idaho" (IDAPA 58.01.01) and DEQ's approach to arsenic and cancer risk. The DEQ Board found insufficient evidence to support DEQ's ambient arsenic air concentration analysis and determined that further factual development was needed on this issue. The DEQ Board remanded this issue to the Hearing Officer.

7. Dr. McMillan indicates that DEQ misinterpreted the acceptable ambient concentration (AACC) for carcinogens to comply with the air quality rules. He disagrees with the project-specific adjustment factor (16 years of mining operation), contends that DEQ failed to recognize the AACC functions to limit cancer initiation not only after 70 years but every day

[1] *See* REC 3716, *Final Order in the Matter of Air Quality Permit to Construct P-2019.0047*, *Nez Perce Tribe, Idaho Conservation League, and Save the South Fork Salmon v. Idaho Department of Environmental Quality*, Case Docket No. 0101-22-01, OAH Case No. 23-245-01 (Final Order at 22).

of a person's life starting at birth, and posits that DEQ's analysis underestimates the actual cancer risk (MacMillan 2024).[2]

8. Based on the analyses presented below, the cancer risk estimates were accurately calculated; the methodology for the calculations adheres to toxicological guidance and analytical practices to modify exposure duration and did not underestimate risk.

9. After reviewing the permit's cancer risk calculations and the toxic air pollutant rules, I researched cancer risk from arsenic exposures through inhalation. I calculated exposure concentrations and excess cancer risks for a residential inhalation exposure scenario (for a person living at a residence) using the maximum modeled annual concentration (potential worse-case scenario) of 0.00416 µg/m^3, calculated by analyses of the permit application, for the following exposure duration scenarios of 16 years (lifetime of the mine), and 70 years (EPA's lifetime exposure). The following paragraphs summarize my findings.

10. The permit application and DEQ review documentation states that cancer risk calculations used modeling scenarios, applied to develop AACCs outlined in the rules, and evaluated via the 70-year lifetime exposure. The maximum modeled concentrations for carcinogenic toxic air pollutants were modified to account for the life-of-mine production limits that affect the lifetime exposure using the following formula (DEQ 2022)[3]:

$$Lifetime\ exposure\ \left(\frac{\mu g}{m^3}\right) = \frac{Highest\ annual\ concentration\ \left(\frac{\mu g}{m^3}\right) \times 16\ (mine\ operation\ years)}{70\ (years, lifetime\ exposure)}$$

Cancer Risk Calculation in the Idaho Air Rules mirrors EPA's Guidelines

11. Section 586 in IDAPA 58.01.01, "Rules for the Control of Air Pollution in Idaho" (Idaho Air Rules), provides the following values for carcinogen toxic air pollutants: unit risk factors (URF) from EPA, screening emission levels (EL), and acceptable ambient levels for carcinogens (AACCs) (i.e., determined to cause cancer over lifetime exposure). The acceptable ambient levels for carcinogens are based on the cancer unit risk values from EPA and correspond to a one in one million cancer risk (DEQ 2019)[4]. In other words, the AACC for arsenic compounds presented in Idaho Air Rule Section 586 is calculated using EPA's Excess Cancer Risk Probability formula shown below:

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[2] *See* Board of Environmental Quality Special Meeting (May 1, 2024) Transcript ("SM Tr.") 10:19-21 ("I believe DEQ has misinterpreted how the acceptable ambient concentration for carcinogens, the AACC, must be applied if it is to comply with our air quality rules"); *see also* SM Tr. 11:2-11.

[3] REC 710, Idaho Department of Environmental Quality. *TAPs Addendum Modeling Review Attachment* to the *PRI SGP Modeling Review Memorandum* (January 6, 2022) ("DEQ's TAPS Modeling Attachment") at 14. For convenience, a true and correct copy of DEQ's TAPS Modeling Attachment is attached hereto as Exhibit A.

[4] Idaho Department of Environmental Quality. *Idaho Administrative Bulletin*. Boise, ID, September 4, 2019–Vol 19-9, page 388 ("The acceptable ambient levels for carcinogens are based on the cancer unit risk values from the Environmental Protection Agency and correspond to a one in a million cancer risk") (citing EPA 2019). A true and correct copy of page 388 is attached hereto as Exhibit B.

Excess Cancer Risk Probability = IUR x EC

Where Excess Cancer risk = 10^{-6} (1 in 1,000,000 one in a million)

IUR for arsenic is = 4 x 10^{-3} (0.0043)

EC = exposure concentration or acceptable ambient concentration (AACC)

AACC= (10^{-6})/ 4.3 x 10^{-3}

AACC= 2.3 x 10^{-4} = 0.00023 µg/m^3

The arsenic lifetime concentration associated with an excess cancer risk of one in one million is 0.00023 µg/m^3.

12. Under EPA's methodology for human health risk assessments, cancer risk calculations are done using a lifetime exposure set at 70 years. The exposure duration is the amount of time an individual is exposed to the contaminant being evaluated and is typically given in years. The exposure duration can be modified based on the site-specific information using the following formula to calculate screening values (EPA 2009)[5].

EC = (CA x ET x EF x ED)/AT

Where: EC (µg/m^3) = exposure concentration;
CA (µg/m^3) = contaminant concentration in air;
ET (hours/day) = exposure time;
EF (days/year) = exposure frequency;
ED (years) = exposure duration; and
AT (lifetime in years 70 x 365 days/year x 24 hours/day) = averaging time

13. **Step 1: Exposure Concentration Calculations**: I calculated exposure concentrations using the maximum modeled arsenic concentration in air (0.00416 µg/m^3), exposure time (24 hours per day), exposure frequency (365 days per year), and averaging time for 70 years of lifetime (EPA's default value) exposed for 365 days and 24 hours per day for a resident scenario with exposure durations of 16-years (life time of the mine), 70- years (EPA's default lifetime exposure) using EPA's approach and the formulas presented above. Table 1 shows the results for the calculations:

Table 1. Values used for the exposure concentration calculation.

Contaminant Concentration in Air (µg/m^3)	Exposure Time (hours/day)	Exposure Frequency (days/year)	Exposure Duration (years)	Averaging Time	Exposure Concentration µg/m^3
0.00416	24	365	16 (lifetime of the mine)	70x365x24	0.00095
0.00416	24	365	70 (EPA's default lifetime exposure)	70x365x24	0.00416

[5] Environmental Protection Agency (EPA). 2009. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment). EPA-540-R-070-002. OSWER 9285.7-82. Available at: https://semspub.epa.gov/work/HQ/140530.pdf. Accessed on July 18, 2024.

14. **Step 2: Cancer Risk Calculations:** To calculate cancer risk, I used the Inhalation Unit Risk (IUR) for arsenic from EPA's Integrated Risk Information System (IRIS) and the exposure concentrations calculated in Table 1 using the following formula (EPA 2009).[6] As previously mentioned, this is the same formula used for the AACC calculation in the Idaho Air Rules. Results of these calculations are presented in Table 2. *See* IDAPA 58.01.01.586.

Excess Cancer Risk Probability = IUR x EC

Where: IUR $(\mu g/m^3)^{-1}$ = Inhalation Unit Risk (for arsenic is 0.0043); and
EC $(\mu g/m^3)$ = exposure concentration

EPA defines excess cancer risk as an additional risk of cancer from exposure to a contaminant beyond an individual's risk of cancer from everyday life. Excess cancer risk is the probability that an exposed individual will develop cancer from exposure over a lifetime (70 years)[7]. The methodology EPA uses for the calculation of the excess cancer risk includes the inhalation unit risk (IUR) value, based on toxicological studies, the value selected for the inhalation unit risk represents a continuous exposure (24 hours/day and 7 days/week) and is supported by years of research from scientists at EPA's Integrated Risk Information System (IRIS) and the Superfund Health Risk Technical Support Center[8].

Table 2. Excess cancer risk calculations and interpretation.

Exposure duration (in years)	Inhalation Unit Risk $(\mu g/m^3)^{-1}$	Exposure Concentration $(\mu g/m^3)$	Excess Cancer Risk Probability	Interpretation	Within EPA's Recommended range > 1 in 1 million to < 1 in 10,000
16 (lifetime of the mine)	0.0043	0.00095	4.09E-06	4 in 1 million	Yes
70 (EPA's default lifetime exposure)	0.0043	0.00416	1.79E-05	2 in 100,000	Yes

15. DEQ used EPA's methodology for adjusting exposure duration given the known exposure duration (lifetime of the mine). The modification of the exposure duration is also consistent with DEQ's screening level risk assessment methodology for any contaminated site in Idaho (i.e., EPA's Regional Screening Levels)[9]. Inputs and outputs of the EPA's Regional Screening Levels online calculator using the parameters outlined in Table 1 (i.e., exposure duration, exposure time, lifetime in years) yield the same cancer risk estimates shown in Table 2 and are

[6] *Id.*

[7] Environmental Protection Agency. 2024. Supplementary Materials: Risk Communication. Attachment 6: Useful Terms and Definitions for Explaining Risk. Available at: https://semspub.epa.gov/work/11/176250.pdf. Accessed on July 19, 2024.

[8] *See* fn. 5.

[9] United States Environmental Protection Agency. Regional Screening Levels for Chemical Contaminants at Superfund Sites. Available at: https://www.epa.gov/risk/regional-screening-levels-rsls. Accessed on June 4, 2024.

presented in Exhibit C.[10] Two parameters that were modified in the EPA's Regional Screening Level Calculator were: exposure frequency from 350 days (EPA assumption is that the receptor takes 2 weeks of vacation every year away from the contamination) to 365 days/year, which is more conservative. The other parameter that was modified was the target hazard quotient (THQ) from 0.1 usually used when screening multiple contaminants to THQ=1.0, commonly used when screening only one contaminant, in this case arsenic.

Cancer Risk Estimates and T-RACT within EPA's acceptable range

16. Toxic Air Pollutant Reasonably Available Control Technology (T-RACT) for carcinogens outlined in the Idaho Air Rules: cancer risk probability of less than one in one hundred thousand (1 in 100,000) (IDAPA 58.01.01.210.12.b) falls within the EPA's recommended range of > 1 in 1 million to < 1 in 10,000 presented in Table 2.

17. The cancer risk estimates from exposure to 0.00416 µg/m^3 arsenic (maximum arsenic concentration calculated from modeling using potential worse-case scenario) through inhalation 24 hours a day, 365 days, and for 16 years (lifetime of the mine) is four additional cancers in a population of one million people exposed. The probability for a resident to develop cancer after exposure to 0.00416 µg/m^3 arsenic through inhalation 24 hours a day, 365 days, and for 70 years (EPA's default lifetime exposure) is two additional cancers in 100,000. These excess cancer risk estimates are within the range EPA considers acceptable (<1 in 10,000 to > 1 in 1,000,000) [7]. EPA considers excess cancer risk < 10^{-6} (1 in 1,000,000) to be negligible, 10^{-4} (>1 in 10,000) and 10^{-6} to 10^{-4} (1 in 1,000,000 to 1 in 10,000) to be acceptable (EPA 1989)[11]. This analysis shows at the maximum arsenic levels modeled (0.00416 µg/m^3) for exposures of 16, or 70 years are within the public health guidelines, and DEQ followed EPA's guidelines when using the 16-year exposure scenario (lifetime of the mine).

Cancer Risk Considerations

18. Other factors may play a role in analyzing cancer risk, such as existing cancers in the population, arsenic background concentrations at the site, sensitive populations living near the site, and uncertainty of maximum arsenic concentration derivation. According to the American Cancer Society, cancer affects 1 in 3 people in the United States, meaning that over a lifetime, an American's probability of getting any cancer is 0.333333 (ACS 2024)[12]. Adding the probability of 2 in 100,000 (excess cancer risk calculated for someone exposed for a lifetime of 70) to 0.333333, the probability of an individual getting cancer increases to 0.333353; this difference is very small.

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[10] A true and correct copy of EPA's *Regional Screening Levels Calculator Inputs and Outputs for Exposure Durations 16, and 70 years* is attached hereto as Exhibit C.

[11] Environmental Protection Agency (EPA). 1989. Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part A). Available at: https://www.epa.gov/sites/default/files/2015-09/documents/rags_a.pdf. Accessed on June 5, 2024.

[12] American Cancer Society. 2024. Understanding Cancer. Available at: https://www.cancer.org/cancer/understanding-cancer/what-is-cancer.html. Accessed on July 22, 2024.

19. From the toxicological point of view, enough evidence exists on the carcinogenic effects (urinary bladder, lung, and skin) of inorganic arsenic (IARC 2012)[13]. People who accidentally eat arsenic for a long time can develop some diseases. Sources of arsenic for ingestion include food (seafood, fish, algae, cereals), air (coal-fired power and smelting), and water (EFSA 2009)[14]. Evidence indicates that long-term exposure to arsenic mainly through drinking water is of great concern to human health due to daily consumption and occurrence in several regions of the world over the past decades (Martinez et al. 2011)[15]. Some occupational studies have documented lung cancer due to inhalation exposures to arsenic, and EPA has used these studies to derive the Inhalation Unit Risk (IUR) (EPA 2024)[16].

20. Cancer risk depends on a wide variety of factors such as alcohol and tobacco use, sun light and radiation exposures, age, diet, hormones, obesity, infectious agents, cancer-causing agents, family history, immunosuppression, and chronic inflammation (NIH 2015)[17]. The literature indicates that inorganic arsenic causes harmful effects mainly through the initiation of oxidative stress (when there are many molecules called free radicals in the body and not enough antioxidants to eliminate them), alterations to DNA (DNA and RNA are both macromolecules essential for life), protein modification, and RNA expression as Dr. McMillan alluded; however, these effects are mainly documented from exposures to elevated levels of arsenic in drinking water (EPA 2024)[18]. The literature also reveals that further cancer studies are needed to understand the mechanisms of arsenic carcinogenesis (Zhou & Xi 2018; Speer et al. 2022)[19,20].

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[13] International Agency for Research on Cancer (IARC). 2012. Arsenic, Metals and Dusts. Volume 100C. A Review of Human Carcinogens. Lyon, France. Available at: https://publications.iarc.fr/Book-And-Report-Series/Iarc-Monographs-On-The-Identification-Of-Carcinogenic-Hazards-To-Humans/Arsenic-Metals-Fibres-And-Dusts-2012. Accessed on July 22, 2024.

[14] European Food Safety Authority (EFSA). 2009. Scientific opinion on arsenic in food. *EFSA Journal*. 7(10):1351. Available at: https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2009.1351. Accessed on July 21, 2024.

[15] Martinez V.D., Vucic E.A., Becker-Santos D. D., Gil L., Lam W.L. 2011. Arsenic Exposure and the Induction of Human Cancers. *Journal of Toxicology.* Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3235889/. Accessed on July 19, 2024.

[16] Environmental Protection Agency (EPA) & National Center for Environmental Assessment. 2024. Integrated Risk Information System (IRIS). Chemical Summary for Arsenic, inorganic; CASRN 7440-38-2. Available at: https://iris.epa.gov/static/pdfs/0278_summary.pdf. Accessed on July 19, 2024.

[17] National Institutes of Health (NIH). National Cancer Institute. 2015. Risk Factors for Cancer. Available at: https://www.cancer.gov/about-cancer/causes-prevention/risk. Accessed on July 19, 2024.

[18] *See* fn. 14.

[19] Zhou Q., Xi S. 2018. *A review on arsenic carcinogenesis: Epidemiology, metabolism, genotoxicity and epigenetic changes.* Journal of Regulatory Toxicology and Pharmacology 99: 78-88. https://www.sciencedirect.com/science/article/abs/pii/S0273230018302320?via%3Dihub

[20] Speer R. M., Zhou X., Volk L.B., Liu K.J., Hudson L.G. 2022. Arsenic and cancer: evidence and mechanisms. Journal Adv Pharmacol. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10860672/. Accessed on July 18, 2024.

Cancer Risk Calculations were not underestimated

21. Additional information to support DEQ's calculation did not underestimate cancer risk, including the no significant concentration level of 0.067 μg/m^3 (i.e., air concentration at 1 in 100,000 excess lung cancer mortality) from the Texas Commission on Environmental Quality (Erraguntla et al.2012)[21]. The value is used to evaluate ambient air monitoring data to protect the public against adverse health effects from chronic exposure to arsenic. The maximum modeled air concentration 0.00416 μg/m^3 is below this threshold. The maximum modeled air concentration of 0.00416 μg/m^3 is within World Health Organization's recommendations for concentrations of arsenic range from 1–10 ng/m^3 (0.001–0.01 μg/m^3) in rural areas, 3–30 ng/m^3 (0.003–0.03 μg/m^3) in noncontaminated urban areas (WHO 2000)[22].

Conclusion

22. I conclude that DEQ's analysis followed EPA's guidelines and that results from a shorter duration exposure (i.e., 16 years) is within EPA's target risk range of 1 in 1,000,000 to 1 in 10,000 (i.e., one in one million to one in ten thousand) and is not likely to increase cancer risk by the arsenic air emissions calculated by the analyses of the air permit application (maximum arsenic-modeled concentrations).

DATED: August 13, 2024

/s/ Norka E. Paden, Ph.D.
NORKA E. PADEN, Ph.D.

[21] Erraguntla N.K., Sielken R.L. Valdez-Flores C., Grant R.L. 2012. An updated inhalation unit risk factor for arsenic and inorganic arsenic compounds based on a combined analysis of epidemiology studies. *Journal Regulatory Toxicology and Pharmacology* 64(2):329-41. Available at: https://www.sciencedirect.com/science/article/abs/pii/S0273230012001304. Accessed on July 23, 2024.

[22] World Health Organization (WHO), 2000, Air Quality Guidelines for Europe: Second Edition (WHO Regional Publications, European Series, No 91) Copenhagen, Denmark, World Health Organization, Regional Office for Europe, Available at https://www.who.int/publications/i/item/9789289013581. Accessed on July 22, 2024

CERTIFICATE OF SERVICE

I hereby certify that on August 13, 2024, a true and correct copy of the foregoing ***EXPERT DECLARATION OF NORKA E. PADEN, Ph.D.*** was served on the following:

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EXHIBIT A

TAPs Addendum Modeling Review Attachment

1.0 Introduction and Summary

Perpetua Resources Idaho, Inc. (PRI) submitted the *Stibnite Gold Project (SGP) Permit to Construct Application TAP Addendum* (*TAP Addendum*), prepared by Air Sciences Inc. (Air Sciences) and submitted to DEQ on October 5, 2021. The TAP Addendum reassessed source applicability to Toxic Air Pollutant (TAP) permitting requirements, refined TAPs regulatory methods to demonstrate compliance with applicable TAP increments, revised and/or refined operations and operational parameters affecting TAP emissions, and refined TAP air impact analyses. The revisions and refinements made for the TAP Addendum also reduced PM_{10} and $PM_{2.5}$ emissions, and this effect is presented in this *TAPs Addendum Modeling Review Attachment* (*Modeling Review Attachment*).

2.0 Scope of TAPs Addendum

DEQ reevaluated TAPs compliance regulatory interpretations and impact assessment methods following the second public comment period of February 18, 2021, through March 19, 2021. Areas of revision in response to issues identified after the public comment period included:

- Revising source-specific TAP impact assessment applicability, primarily identifying what sources can be excluded because they are "covered" or "addressed" by a National Emissions Standard for Hazardous Air Pollutants (NESHAP) or New Source Performance Standard (NSPS).
- Refining regulatory methods used to demonstrate compliance with TAP increments.
- Refining TAP emission calculation methods and dispersion-affecting parameters.
- Reassessing TAP impacts resulting from revised and/or refined methods and data.
- Providing a best-estimate of actual TAP emissions that will occur from operation of the mine, and then comparing this to maximum permit-allowable emissions.

PRI and Air Sciences, PRI's permitting consultant, submitted the *TAP Addendum* on October 5, 2021.

3.0 Revised NESHAP/NSPS TAP Exclusion

DEQ and PRI reevaluated TAP source applicability after the second public comment period in response to expressed concerns regarding sources excluded as per *Idaho Air Rules* Section 210.20 (excluding sources that are "covered" or "addressed" by a NESHAP). TAP applicability is explained in greater detail in the main body of the DEQ Statement of Basis. As a result of the reevaluation, some additional sources were included in the TAP impact modeling analyses that were not previously. TAP sources from gold mining that were modeled in the final TAP analyses included: drilling, blasting, excavating, hauling, prill silos, rock dumps and storage piles, and tailings.

Air Sciences consulted with DEQ to refine TAP compliance demonstration methods from what was originally submitted in the application. The refinement was primarily needed to show compliance with the

arsenic Acceptable Ambient Concentration of a Carcinogen (AACC). The revised methods are described in the submitted *TAP Addendum* and this DEQ *Modeling Review Attachment*.

4.0 TAPs Refined Compliance Demonstration Approach

PRI, in consultation with DEQ, used a highly refined TAPs analysis approach to demonstrate compliance with applicable TAP increments. This approach involved the following:

- AACC Adjustment for Toxic Air Pollutant Reasonably Available Control Technology (T-RACT) Utilization.
- TAP Emission Averaging Period.
- AACC Adjustment for the Operational Life of the Mine.

4.1 AACC Adjustment for T-RACT Utilization

Idaho Air Rules Section 210.12 allows TAP impacts of 10 times the AACC if the application demonstrates that T-RACT is used for the TAP emission sources. This represents a life-time cancer risk of 1-in-100,000. An adjustment cannot be made for non-carcinogenic TAPs listed in *Idaho Air Rules* Section 585.

Review of the T-RACT demonstration is performed by the DEQ permit writer and is described in the main body of the DEQ Statement of Basis.

4.2 TAP Emission Averaging Period

Annual average emissions of carcinogenic TAPs are typically used in the dispersion model to estimate maximum annual impacts. PRI refined the analyses by using source-specific emission rates that are representative of a 5-year averaging period. This approach is appropriate because carcinogenic impacts are of concern from a long-term exposure basis.

4.3 AACC Adjustment for the Operational Life of the Mine

AACCs were established based on a 1-in-1,000,000 cancer risk over a 70-year lifetime, as stated in *Idaho Air Rules* Section 006.125:

> ***Toxic Air Pollutant Carcinogenic Increments****. Those ambient air quality increments based on the probability of developing excess cancers over a seventy (70) year lifetime exposure to one (1) microgram per cubic meter (1 ug/m3) of a given carcinogen and expressed in terms of a screening emission level or an acceptable ambient concentration for a carcinogenic toxic air pollutant. They are listed in Section 586.*

PRI indicated the maximum life-of-mine will be 16 years. Life-time exposures to carcinogenic TAPs were refined by multiplying the maximum modeled annual impact by a ratio of 16/70. Section 5.7 of this *Modeling Review Attachment* provides more details on this adjustment for the project.

5.0 Refined TAP Emission Estimates and Modeling Methods/Parameters

This section describes changes made to TAP emission estimates and to methods/parameters used in the impact modeling analyses.

5.1 Operational Adjustments

PRI and Air Sciences proposed and committed to several operational adjustments to reduce actual and estimated TAP emissions:

- Installing and operating dust collection systems on drilling rigs (determined to be T-RACT).
- Capping the haul roads that are outside of the pits and development rock storage facilities (DRSFs) with clean (lower levels of arsenic) development rock (determined to be T-RACT).
- Eliminating the West End Development Rock Storage Facility, which eliminated the highest-emitting operational scenario W5.
- Limiting long-term mining production to an average of 135,000 tons/day for a 5-year rolling average.
- Constructing the Burntlog access road with offsite materials containing "background" levels of arsenic.
- Updating the bulldozing emission factor using the SGP site-specific silt content.

5.2 General Modeling Methods and Parameters

Modeling methods and parameters used in TAP impact analyses presented in the *TAP Addendum* are largely identical to those used in the previously submitted application. These include the air dispersion model used, meteorological data, terrain, building downwash, ambient air boundary, and receptors. TAP modeling was conducted for the 14 operational modeling scenarios, consistent with the NAAQS analyses. Modeling Scenario W5 was eliminated from the arsenic modeling, as discussed in Section 5.8 of this *Modeling Review Attachment*.

The meteorological dataset processed using McCall, Idaho, cloud cover data was used for analyses in the *TAP Addendum*. Impacts were not assessed using the dataset processed using the Bulk Richardson (BULKRN) method for boundary layer parameter calculations. EPA considers both methods to be acceptable. Although modeled impacts tend to be somewhat larger when using meteorological data processed by the BULKRN method, DEQ contends that the impact analyses are still largely conservative compared to actual impacts anticipated. Conservative aspects include: continual operation of the worst-case operational scenario; operation at maximum allowable rates for the averaging period; no reduction in winter-time emissions from fugitive sources, accounting for emission suppression effects of increased moisture.

5.3 TAP Modeling Applicability

Table 1 provides a comparison between applicable facility-wide maximum potential TAP emissions for the highest-emitting scenario (W3) and TAP screening emission levels (ELs) from *Idaho Air Rules* Sections 585 (for non-carcinogens) and 586 (for carcinogens). Note that TAPs also classified as HAPs

emitted from sources "addressed" or "covered" by NSPS or NESHAP were not required to be evaluated for compliance with TAP increments in accordance with *Idaho Air Rules* Section 210.20. Furthermore, PRI has determined that the West End Development Rock Storage Facility will not be constructed. This change eliminated Modeling Scenario W5 (the highest-emitting scenario described in the main body of the DEQ *Modeling Review Memorandum*) as a potential operating scenario. After eliminating Modeling Scenario W5, it was determined that Modeling Scenario W3 is the highest-emitting scenario for all TAPs.

Table 1. TAP MODELING APPLICABILITY DETERMINATION (HIGHEST-EMITTING MODELING SCENARIO: W3).

HAP/TAP	Emissions (lb/hr)			EL (lb/hr)		Determination
	(a)	(b)	Total	(c)	(d)	
1,3-Butadiene	--	--	--	--	2.4E-5	EL not exceeded
3-Methylchloranthrene	--	4.5E-8	4.5E-8	--	2.5E-6	EL not exceeded
Acetaldehyde	--	--	--	--	3.0E-3	EL not exceeded
Acrolein	--	--	--	1.7E-2	--	EL not exceeded
Antimony	1.9E-2	1.6E-6	1.9E-2	3.3E-2	--	EL not exceeded
Arsenic	5.4E-1	8.2E-6	5.4E-1	--	1.5E-6	Carcinogenic EL exceeded
Benzene	--	5.3E-5	5.3E-5	--	8.0E-4	EL not exceeded
Benzo(a)pyrene[e]	--	3.0E-8				
Benz(a)anthracene[e]	--	4.5E-8				
Benzo(b)fluoranthene[e]	--	4.5E-8				
Benzo(k)fluoranthene[e]	--	4.5E-8	2.9E-7	--	2.0E-6	EL not exceeded
Chrysene[e]	--	4.5E-8				
Dibenzo(a,h)anthracene[e]	--	3.0E-8				
Indenol(1,2,3-cd)pyrene[e]	--	4.5E-8				
Beryllium	2.6E-3	3.5E-7	2.6E-3	--	2.8E-5	Carcinogenic EL exceeded
Biphenyl	--	--	--	1.0E-1	--	EL not exceeded
Cadmium	4.1E-4	2.8E-5	4.4E-4	--	3.7E-6	Carcinogenic EL exceeded
Carbon disulfide	1.4E-2	--	1.4E-2	2.0E+0	--	EL not exceeded
Chromium	7.3E-3	4.8E-5	7.4E-3	3.3E-2	--	EL not exceeded
Chromium (VI)	--	3.4E-7	3.4E-7	--	5.6E-7	EL not exceeded
Cobalt	3.3E-3	4.8E-6	3.26E-3	3.3E-3	--	EL not exceeded
Cyanide	4.5E-1	--	4.5E-1	3.3E-1	--	Non-carcinogenic EL exceeded
Dichlorobenzene	--	3.1E-5	3.1E-5	3.0E+1	--	EL not exceeded
Formaldehyde	--	1.9E-3	1.9E-3	--	5.1E-4	Carcinogenic EL exceeded
Hexane	--	4.6E-2	4.6E-2	1.2E+1	--	EL not exceeded
Hydrogen Chloride	--	--	--	5.0E-2	--	EL not exceeded
Manganese	2.4E-1	1.9E-4	2.4E-1	6.7E-2	--	Non-carcinogenic EL exceeded
Naphthalene	--	1.6E-5	1.6E-5	3.3E+0	--	EL not exceeded
Nickel	1.6E-3	5.6E-5	1.7E-3	--	2.7E-5	Carcinogenic EL exceeded
Phenol	--	--	--	1.3E+0	--	EL not exceeded
Phosphorus	5.3E-1	9.3E-5	5.3E-1	7.0E-3	--	Non-carcinogenic EL exceeded
Selenium	3.3E-4	6.2E-7	3.3E-4	1.3E-2	--	EL not exceeded
Toluene	--	8.8E-5	8.8E-5	2.5E+1	--	EL not exceeded
Xylene	--	--	--	2.9E+1	--	EL not exceeded
Aluminum	5.8E+1	6.5E-1	5.9E+1	6.7E-1	--	Non-carcinogenic EL exceeded
Barium	6.5E-1	6.8E-3	6.6E-1	3.3E-2	--	Non-carcinogenic EL exceeded
Calcium Carbonate	1.1E+1	2.2E+0	1.4E+1	6.7E-1	--	Non-carcinogenic EL exceeded
Calcium Oxide	--	7.0E-1	7.0E-1	1.3E-1	--	Non-carcinogenic EL exceeded
Copper	4.1E-3	5.3E-4	4.6E-3	6.7E-2	--	EL not exceeded
Cyclohexane	--	1.0E-3	1.0E-3	7.0E+1	--	EL not exceeded
Hydrogen Sulfide	--	9.0E-1	9.0E-1	9.3E-1	--	EL not exceeded
Iron	1.5E+1	2.1E-1	1.5E+1	6.7E-2	--	Non-carcinogenic EL exceeded
Molybdenum	8.1E-4	4.7E-4	1.3E-3	3.3E-1	--	EL not exceeded
Pentane	--	1.2E-1	1.2E-1	1.2E+2	--	EL not exceeded
Silver	4.1E-4	4.1E-4	8.2E-4	7.0E-3	--	EL not exceeded
Sulfuric Acid	--	2.0E+0	2.0E+0	6.7E-2	--	Non-carcinogenic EL exceeded

Table 1. TAP MODELING APPLICABILITY DETERMINATION (HIGHEST-EMITTING MODELING SCENARIO: W3).						
HAP/TAP	Emissions (lb/hr)			EL (lb/hr)		Determination
	(a)	(b)	Total	(c)	(d)	
Thallium	8.1E-3	5.2E-4	8.7E-3	7.0E-3	--	Non-carcinogenic EL exceeded
Uranium	8.1E-3	5.2E-4	8.7E-3	1.3E-2	--	EL not exceeded
Vanadium	2.3E-2	8.4E-4	2.4E-2	3.0E-3	--	Non-carcinogenic EL exceeded
Trimethyl Benzene	--	1.1E-2	1.1E-2	8.2E+0	--	EL not exceeded
Tungsten	8.1E-3	5.2E-4	8.7E-3	3.3E-1	--	EL not exceeded
Zinc	2.9E-2	2.2E-3	3.1E-2	6.7E-1	--	EL not exceeded

a. Total HAP/TAP emissions for EL evaluation from mining (i.e., pits, blasting, haul roads, stockpiles and DRSF, tailings storage facility, access road, and underground exploration) and leaching. Emissions from sources covered/addressed by NSPS/NESHAP are not included in the evaluation for modeling applicability.

b. Total HAP/TAP emissions for EL evaluation from processing and production (i.e., ore processing [crushers and transfer, prill silos], ore concentration and refining [autoclave, electrowinning cells and pregnant solution tank, retort, furnace, carbon kiln], process heating [POX boiler, carbon regeneration kiln, propane vaporizer, solution heater], lime production [limestone crushers, screens, mill, transfers, lime kiln, kiln feed, lime mill, pebble lime silo, lime silos, lime mill crushing], aggregate production [portable crushers, screens, transfers], concrete production [central mixer, cement silos, aggregate bin], HVAC [heaters], emergency power [emergency generators, fire pump], fuel storage [gasoline fuel and tanks]). Emissions from sources covered/addressed by NSPS/NESHAP are not included in the evaluation for modeling applicability.

c. Non-carcinogenic EL from *Idaho Air Rules* Section 585.

d. Carcinogenic EL from *Idaho Air Rules* Section 586.

Table 1 shows that the SGP facility-wide potential TAP emissions exceed the respective EL for arsenic, beryllium, cadmium, cyanide, formaldehyde, manganese, nickel, phosphorus, aluminum, barium, calcium carbonate, calcium oxide, iron, sulfuric acid, thallium, and vanadium. Therefore, modeling was required for these 16 TAPs (11 non-carcinogenic and five carcinogenic TAPs) to demonstrate compliance with Acceptable Ambient Concentrations of Non-Carcinogens (AACs) and AACCs.

5.4 TAP Modeled Emission Rates

Table 2 lists the source-specific modeled emission rates for all 11 non-carcinogenic TAPs that required modeling (worst-case modeling scenario for all non-carcinogenic TAPs: W5). Table 3 lists the source-specific modeled emission rates for all five carcinogenic TAPs that required modeling (worst-case impacts for arsenic are associated with modeling scenario W2; worst-case impacts for all other carcinogenic TAPs are associated with modeling scenario W1). Note that all source-specific emission rates listed in Tables 2 and 3 were extracted by DEQ's modeling staff from the submitted modeling input files.

The total modeled emission rates for all non-carcinogenic TAPs are equal to the total facility-wide HAP/TAP emissions as stated in the permitting emissions inventory (excluding sources addressed by NSPS/NESHAP), evaluated at 180,000 T/day (see last two rows of Table 2). However, for carcinogenic TAPs, modeling was performed using an emission inventory that included T-RACT controls, long-term mining production limits, and other emission inventory refinements, as described in Section 4.0 of this *Modeling Review Attachment* (see last three rows of Table 3).

Table 2. MODELED EMISSION RATES FOR NON-CARCINOGENIC TAPS (WORST-CASE MODELING SCENARIOS).												
Type of Source	**Source ID**	**ALUM[a] (lb/hr)[b]**	**BARI[c] (lb/hr)**	**CACA[d] (lb/hr)**	**CAOX[e] (lb/hr)**	**CYAN[f] (lb/hr)**	**IRON[g] (lb/hr)**	**MANG[h] (lb/hr)**	**PHOS[i] (lb/hr)**	**SULF[j] (lb/hr)**	**THAL[k] (lb/hr)**	**VANA[l] (lb/hr)**
Point Sources	LS1L	2.33E-04	1.50E-06	0	7.63E-03	0	1.07E-04	2.44E-06	1.34E-06	0	5.16E-08	1.60E-07
	MILLS2L	2.33E-04	1.50E-06	0	7.63E-03	0	1.07E-04	2.44E-06	1.34E-06	0	5.16E-08	1.60E-07
	AC	2.31E-05	2.31E-05	2.31E-05	0	0	2.31E-05	0	0	2.03E+00	2.31E-05	2.31E-05
	ACB	0	3.06E-06	0	0	0	0	2.64E-07	0	0	0	1.60E-06
	ACS1L	9.32E-04	5.98E-06	0	3.05E-02	0	4.27E-04	9.76E-06	5.36E-06	0	2.06E-07	6.39E-07
	ACS2L	9.32E-04	5.98E-06	0	3.05E-02	0	4.27E-04	9.76E-06	5.36E-06	0	2.06E-07	6.39E-07
	ACS3L	9.32E-04	5.98E-06	0	3.05E-02	0	4.27E-04	9.76E-06	5.36E-06	0	2.06E-07	6.39E-07
	ACS4L	4.66E-04	2.99E-06	0	1.53E-02	0	2.13E-04	4.88E-06	2.68E-06	0	1.03E-07	3.20E-07
	CKD	9.59E-05	9.59E-05	9.59E-05	0	0	9.59E-05	0	0	0	9.59E-05	9.59E-05
	CKB	0	9.73E-06	0	0	0	0	8.40E-07	0	0	0	5.08E-06
	EW	9.59E-05	9.59E-05	9.59E-05	0	0	9.59E-05	0	0	0	9.59E-05	9.59E-05
	MR	9.59E-05	9.59E-05	9.59E-05	0	0	9.59E-05	0	0	0	9.59E-05	9.59E-05
	MF	9.59E-05	9.59E-05	9.59E-05	0	0	9.59E-05	0	0	0	9.59E-05	9.59E-05
	EDG1	0	0	0	0	0	0	0	0	0	0	0
	EDG2	0	0	0	0	0	0	0	0	0	0	0
	EDG3	0	0	0	0	0	0	0	0	0	0	0
	EDFP	0	0	0	0	0	0	0	0	0	0	0
	PV	0	4.31E-07	0	0	0	0	3.73E-08	0	0	0	2.25E-07
	HS	0	2.16E-05	0	0	0	0	1.86E-06	0	0	0	1.13E-05
	H1M	0	1.73E-05	0	0	0	0	1.49E-06	0	0	0	9.02E-06
	H2M	0	1.73E-05	0	0	0	0	1.49E-06	0	0	0	9.02E-06
	HM	0	1.73E-05	0	0	0	0	1.49E-06	0	0	0	9.02E-06
	HAC	0	1.08E-06	0	0	0	0	9.31E-08	0	0	0	5.64E-07
	HR	0	1.08E-06	0	0	0	0	9.31E-08	0	0	0	5.64E-07
	HA	0	1.08E-06	0	0	0	0	9.31E-08	0	0	0	5.64E-07
	HMO	0	2.16E-06	0	0	0	0	1.86E-07	0	0	0	1.13E-06
	HTS	0	8.63E-06	0	0	0	0	7.45E-07	0	0	0	4.51E-06
	HW	0	1.29E-05	0	0	0	0	1.12E-06	0	0	0	6.76E-06
	PSL	0	0	0	0	0	0	0	0	0	0	0
	CS1L	0	0	0	0	0	0	8.01E-07	0	0	0	0
	CS2L	0	0	0	0	0	0	8.01E-07	0	0	0	0
	LS6	3.19E-03	2.05E-05	3.88E-02	0	0	1.46E-03	0	0	0	7.06E-07	2.19E-06
	LSBM	4.30E-02	2.76E-04	5.22E-01	0	0	1.97E-02	0	0	0	9.51E-06	2.95E-05
	LS9	7.54E-04	4.84E-06	9.16E-03	0	0	3.45E-04	0	0	0	1.67E-07	5.17E-07
	LK	2.07E-02	1.33E-04	2.51E-01	0	0	9.47E-03	0	0	0	4.58E-06	1.42E-05
	LKC	0	9.51E-05	0	0	0	0	0	0	0	0	4.97E-05
	LCR	6.43E-03	4.12E-05	0	2.11E-01	0	2.94E-03	0	0	0	1.42E-06	4.41E-06
	LSL	1.40E-04	8.99E-07	0	4.59E-03	0	6.41E-05	0	0	0	3.10E-08	9.60E-08

Table 2. MODELED EMISSION RATES FOR NON-CARCINOGENIC TAPS (WORST-CASE MODELING SCENARIOS).												
Type of Source	**Source ID**	**ALUM[a] (lb/hr)[b]**	**BARI[c] (lb/hr)**	**CACA[d] (lb/hr)**	**CAOX[e] (lb/hr)**	**CYAN[f] (lb/hr)**	**IRON[g] (lb/hr)**	**MANG[h] (lb/hr)**	**PHOS[i] (lb/hr)**	**SULF[j] (lb/hr)**	**THAL[k] (lb/hr)**	**VANA[l] (lb/hr)**
Area Sources	WEP	5.59E+00	6.29E-02	1.10E+00	0	0	1.43E+00	2.35E-02	5.11E-02	0	7.87E-04	2.20E-03
	UGEXP	2.49E-05	2.80E-07	4.91E-06	0	0	6.38E-06	1.05E-07	2.28E-07	0	3.50E-09	9.81E-09
	TSF	0	0	0	0	2.32E-01	0	0	0	0	0	0
Line Sources	AR01	2.02E-02	2.28E-04	3.99E-03	0	0	5.18E-03	8.52E-05	1.85E-04	0	2.85E-06	7.98E-06
	AR02	1.56E-02	1.75E-04	3.07E-03	0	0	3.99E-03	6.55E-05	1.42E-04	0	2.19E-06	6.13E-06
	AR03	3.93E-02	4.43E-04	7.75E-03	0	0	1.01E-02	1.66E-04	3.60E-04	0	5.54E-06	1.55E-05
	AR04	3.77E-02	4.25E-04	7.43E-03	0	0	9.66E-03	1.59E-04	3.45E-04	0	5.31E-06	1.49E-05
Volume Sources	WEPBL	1.90E+00	2.14E-02	3.75E-01	0	0	4.88E-01	8.01E-03	1.74E-02	0	2.68E-04	7.50E-04
	WEDRSF	8.58E-01	9.66E-03	1.69E-01	0	0	2.20E-01	3.61E-03	7.85E-03	0	1.21E-04	3.38E-04
	OC1	1.04E-02	1.17E-04	2.04E-03	0	0	2.65E-03	0	0	0	1.46E-06	4.08E-06
	OC2	1.04E-02	1.17E-04	2.04E-03	0	0	2.65E-03	0	0	0	1.46E-06	4.08E-06
	OC3	1.04E-02	1.17E-04	2.04E-03	0	0	2.65E-03	0	0	0	1.46E-06	4.08E-06
	OC4	1.04E-02	1.17E-04	2.04E-03	0	0	2.65E-03	0	0	0	1.46E-06	4.08E-06
	OC5	1.04E-02	1.17E-04	2.04E-03	0	0	2.65E-03	0	0	0	1.46E-06	4.08E-06
	OC6	1.04E-02	1.17E-04	2.04E-03	0	0	2.65E-03	0	0	0	1.46E-06	4.08E-06
	OC7	8.87E-02	1.00E-03	1.75E-02	0	0	2.28E-02	0	0	0	1.25E-05	3.50E-05
	OC8	1.04E-02	1.17E-04	2.04E-03	0	0	2.65E-03	0	0	0	1.46E-06	4.08E-06
	OC9	4.90E-02	5.52E-04	9.66E-03	0	0	1.26E-02	0	0	0	6.90E-06	1.93E-05
	OC10	4.90E-02	5.52E-04	9.66E-03	0	0	1.26E-02	0	0	0	6.90E-06	1.93E-05
	OC11	4.90E-02	5.52E-04	9.66E-03	0	0	1.26E-02	0	0	0	6.90E-06	1.93E-05
	OC12	9.80E-02	1.10E-03	1.93E-02	0	0	2.51E-02	0	0	0	1.38E-05	3.86E-05
	OC13	1.14E-02	1.29E-04	2.25E-03	0	0	2.93E-03	0	0	0	1.61E-06	4.51E-06
	LS1U	1.13E-03	7.25E-06	0	3.70E-02	0	5.18E-04	1.18E-05	6.50E-06	0	2.50E-07	7.75E-07
	MILLS2U	1.13E-03	7.25E-06	0	3.70E-02	0	5.18E-04	1.18E-05	6.50E-06	0	2.50E-07	7.75E-07
	ACS1U	2.17E-03	1.39E-05	0	7.10E-02	0	9.94E-04	2.27E-05	1.25E-05	0	4.80E-07	1.49E-06
	ACS2U	2.17E-03	1.39E-05	0	7.10E-02	0	9.94E-04	2.27E-05	1.25E-05	0	4.80E-07	1.49E-06
	ACS3U	2.17E-03	1.39E-05	0	7.10E-02	0	9.94E-04	2.27E-05	1.25E-05	0	4.80E-07	1.49E-06
	ACS42U	2.17E-03	1.39E-05	0	7.10E-02	0	9.94E-04	2.27E-05	1.25E-05	0	4.80E-07	1.49E-06
	PSU	0	0	0	0	0	0	0	0	0	0	0
	CS1U	0	0	0	0	0	0	8.01E-07	0	0	0	0
	CS2U	0	0	0	0	0	0	8.01E-07	0	0	0	0
	CAL	1.56E-02	1.00E-04	0	0	0	7.14E-03	0	0	0	3.45E-06	1.07E-05
	CAU	1.56E-02	1.00E-04	0	0	0	7.14E-03	0	0	0	3.45E-06	1.07E-05
	CM	0	0	0	0	0	0	2.59E-05	8.22E-06	0	0	0
	PCSP1	1.41E-02	9.06E-05	1.72E-01	0	0	6.47E-03	0	0	0	3.12E-06	9.69E-06
	PCSP2	1.41E-02	9.06E-05	1.72E-01	0	0	6.47E-03	0	0	0	3.12E-06	9.69E-06
	LS1	3.19E-03	2.05E-05	3.88E-02	0	0	1.46E-03	0	0	0	7.06E-07	2.19E-06
	LS2	5.75E-03	3.69E-05	6.98E-02	0	0	2.63E-03	0	0	0	1.27E-06	3.94E-06
	LS3	2.66E-02	1.71E-04	3.23E-01	0	0	1.22E-02	0	0	0	5.88E-06	1.82E-05

Table 2. MODELED EMISSION RATES FOR NON-CARCINOGENIC TAPS (WORST-CASE MODELING SCENARIOS).												
Type of Source	**Source ID**	**ALUM[a] (lb/hr)[b]**	**BARI[c] (lb/hr)**	**CACA[d] (lb/hr)**	**CAOX[e] (lb/hr)**	**CYAN[f] (lb/hr)**	**IRON[g] (lb/hr)**	**MANG[h] (lb/hr)**	**PHOS[i] (lb/hr)**	**SULF[j] (lb/hr)**	**THAL[k] (lb/hr)**	**VANA[l] (lb/hr)**
	LS4	5.75E-03	3.69E-05	6.98E-02	0	0	2.63E-03	0	0	0	1.27E-06	3.94E-06
	LS5	2.66E-02	1.71E-04	3.23E-01	0	0	1.22E-02	0	0	0	5.88E-06	1.82E-05
	LS7	3.19E-03	2.05E-05	3.88E-02	0	0	1.46E-03	0	0	0	7.06E-07	2.19E-06
	LS8	3.19E-03	2.05E-05	3.88E-02	0	0	1.46E-03	0	0	0	7.06E-07	2.19E-06
	LS10	7.54E-04	4.84E-06	9.16E-03	0	0	3.45E-04	0	0	0	1.67E-07	5.17E-07
	LS11	6.29E-03	4.03E-05	7.63E-02	0	0	2.88E-03	0	0	0	1.39E-06	4.31E-06
	LS12	7.54E-04	4.84E-06	9.16E-03	0	0	3.45E-04	0	0	0	1.67E-07	5.17E-07
	LSU	1.40E-05	8.99E-08	0	4.59E-04	0	6.41E-06	0	0	0	3.10E-09	9.60E-09
	MILLTANKS	0	0	0	0	2.21E-01	0	0	0	0	0	0
	HRT001-HRT072[m]	2.62E-01	2.95E-03	5.16E-02	0	0	6.71E-02	1.10E-03	2.40E-03	0	3.69E-05	1.03E-04
	HRN001-HRN022[m]	2.62E-01	2.95E-03	5.16E-02	0	0	6.71E-02	1.10E-03	2.40E-03	0	3.69E-05	1.03E-04
Total Modeled Rates		***3.37E+01***	***3.79E-01***	***8.76E+00***	***6.96E-01***	***4.53E-01***	***8.69E+00***	***1.39E-01***	***3.03E-01***	***2.03E+00***	***5.17E-03***	***1.39E-02***
Total Emission Rates at 180,000 T/day[n]		***3.37E+01***	***3.79E-01***	***8.76E+00***	***6.96E-01***	***4.53E-01***	***8.69E+00***	***1.39E-01***	***3.03E-01***	***2.03E+00***	***5.17E-03***	***1.39E-02***

a. Aluminum (worst-case modeling scenario: W5).
b. Pounds per hour.
c. Barium (worst-case modeling scenario: W5).
d. Calcium carbonate (worst-case modeling scenario: W5).
e. Calcium oxide (worst-case modeling scenario: W5).
f. Cyanide (worst-case modeling scenario: W5).
g. Iron (worst-case modeling scenario: W5).
h. Manganese (worst-case modeling scenario: W5).
i. Phosphorus (worst-case modeling scenario: W5).
j. Sulfuric acid (worst-case modeling scenario: W5).
k. Thallium (worst-case modeling scenario: W5).
l. Vanadium (worst-case modeling scenario: W5).
m. The Haul Road was represented in the model as a series of volume sources. The emission rates listed in this table represent each individual volume source.
n. Total emission rates at 180,000 tons per day were derived from Worksheet "TblA" in the emission inventory dated October 5, 2021. The total emission rates in this row represent all facility-wide HAP/TAP emission sources from mining, leaching, and processing and production (excluding emissions from sources "addressed" or "covered" by NSPS/NESHAP).

Table 3. MODELED EMISSION RATES FOR CARCINOGENIC TAPS (WORST-CASE MODELING SCENARIOS).						
Type of Source	**Source ID**	**ARSE[a] (lb/hr)[b]**	**BERY[c] (lb/hr)**	**CADM[d] (lb/hr)**	**FORM[e] (lb/hr)**	**NICK[f] (lb/hr)**
Point Sources	LS1L	1.14E-08	3.96E-10	1.24E-10	0	2.47E-09
	MILLS2L	1.14E-08	3.96E-10	1.24E-10	0	2.47E-09
	AC	0	0	0	0	0
	ACB	1.28E-07	7.66E-09	7.02E-07	4.79E-05	1.34E-06
	ACS1L	4.55E-08	1.58E-09	4.94E-10	0	9.89E-09
	ACS2L	4.55E-08	1.58E-09	4.94E-10	0	9.89E-09
	ACS3L	4.55E-08	1.58E-09	4.94E-10	0	9.89E-09
	ACS4L	2.27E-08	7.91E-10	2.47E-10	0	4.94E-09
	CKD	0	0	0	0	0
	CKB	4.07E-07	2.44E-08	2.24E-06	1.52E-04	4.27E-06
	EW	0	0	0	0	0
	MR	0	0	0	0	0
	MF	0	0	0	0	0
	EDG1	0	0	0	0	0
	EDG2	0	0	0	0	0
	EDG3	0	0	0	0	0
	EDFP	0	0	0	0	0
	PV	1.80E-08	1.08E-09	9.91E-08	6.76E-06	1.89E-07
	HS	9.01E-07	5.41E-08	4.96E-06	3.38E-04	9.46E-06
	H1M	7.84E-07	4.71E-08	4.31E-06	2.94E-04	8.24E-06
	H2M	7.84E-07	4.71E-08	4.31E-06	2.94E-04	8.24E-06
	HM	7.84E-07	4.71E-08	4.31E-06	2.94E-04	8.24E-06
	HAC	4.90E-08	2.94E-09	2.70E-07	1.84E-05	5.15E-07
	HR	4.90E-08	2.94E-09	2.70E-07	1.84E-05	5.15E-07
	HA	4.90E-08	2.94E-09	2.70E-07	1.84E-05	5.15E-07
	HMO	9.80E-08	5.88E-09	5.39E-07	3.68E-05	1.03E-06
	HTS	3.92E-07	2.35E-08	2.16E-06	1.47E-04	4.12E-06
	HW	5.88E-07	3.53E-08	3.24E-06	2.21E-04	6.18E-06
	PSL	0	0	0	0	0
	CS1L	2.90E-08	3.33E-09	0	0	2.86E-07
	CS2L	2.90E-08	3.33E-09	0	0	2.86E-07
	LS6	0	0	0	0	0
	LSBM	0	0	0	0	0
	LS9	0	0	0	0	0
	LK	0	0	0	0	0
	LKC	0	0	0	0	0
	LCR	0	0	0	0	0
	LSL	0	0	0	0	0
Area Sources	WEP	9.40E-03	4.51E-05	7.04E-06	0	2.82E-05
	UGEXP	2.34E-07	1.12E-09	1.75E-10	0	7.01E-10
	TSF	0	0	0	0	0
Line Sources	AR01	7.12E-07	9.12E-07	1.42E-07	0	5.70E-07
	AR02	5.48E-07	7.01E-07	1.10E-07	0	4.38E-07
	AR03	1.38E-06	1.77E-06	2.77E-07	0	1.11E-06
	AR04	1.33E-06	1.70E-06	2.65E-07	0	1.06E-06

Table 3. MODELED EMISSION RATES FOR CARCINOGENIC TAPS (WORST-CASE MODELING SCENARIOS).						
Type of Source	**Source ID**	**ARSE[a] (lb/hr)[b]**	**BERY[c] (lb/hr)**	**CADM[d] (lb/hr)**	**FORM[e] (lb/hr)**	**NICK[f] (lb/hr)**
Volume Sources	WEPBL	1.79E-02	8.57E-05	1.34E-05	0	5.36E-05
	FDRSF	4.23E-03				
	STKP		2.72E-05	4.25E-06	0	1.70E-05
	OC1	0	0	0	0	0
	OC2	0	0	0	0	0
	OC3	0	0	0	0	0
	OC4	0	0	0	0	0
	OC5	0	0	0	0	0
	OC6	0	0	0	0	0
	OC7	0	0	0	0	0
	OC8	0	0	0	0	0
	OC9	0	0	0	0	0
	OC10	0	0	0	0	0
	OC11	0	0	0	0	0
	OC12	0	0	0	0	0
	OC13	0	0	0	0	0
	LS1U	5.51E-08	1.92E-09	5.99E-10	0	1.20E-08
	MILLS2U	5.51E-08	1.92E-09	5.99E-10	0	1.20E-08
	ACS1U	2.21E-07	7.67E-09	2.40E-09	0	4.79E-08
	ACS2U	2.21E-07	7.67E-09	2.40E-09	0	4.79E-08
	ACS3U	2.21E-07	7.67E-09	2.40E-09	0	4.79E-08
	ACS42U	1.10E-07	3.84E-09	1.20E-09	0	2.40E-08
	PSU	0	0	0	0	0
	CS1U	2.90E-08	3.33E-09	0	0	2.86E-07
	CS2U	2.90E-08	3.33E-09	0	0	2.86E-07
	CAL	0	0	0	0	0
	CAU	0	0	0	0	0
	CM	2.03E-06	0	4.86E-09	0	1.70E-06
	PCSP1	0	0	0	0	0
	PCSP2	0	0	0	0	0
	LS1	0	0	0	0	0
	LS2	0	0	0	0	0
	LS3	0	0	0	0	0
	LS4	0	0	0	0	0
	LS5	0	0	0	0	0
	LS7	0	0	0	0	0
	LS8	0	0	0	0	0
	LS10	0	0	0	0	0
	LS11	0	0	0	0	0
	LS12	0	0	0	0	0
	LSU	0	0	0	0	0
	MILLTANKS	0	0	0	0	0

Table 3. MODELED EMISSION RATES FOR CARCINOGENIC TAPS (WORST-CASE MODELING SCENARIOS).						
Type of Source	**Source ID**	**ARSE[a] (lb/hr)[b]**	**BERY[c] (lb/hr)**	**CADM[d] (lb/hr)**	**FORM[e] (lb/hr)**	**NICK[f] (lb/hr)**
Volume Sources	HRF001-HRF055[g]	1.03E-03				
	HRQ001-HRQ049[g]	1.03E-03				
	HRR001-HRR006[g]	1.03E-03				
	HRN001-HRN022[g]	1.03E-03	9.27E-06	1.45E-06	0	5.80E-06
	HRB001-HRB003[g]	1.03E-03				
	HRP001-HRP057[g]		9.27E-06	1.45E-06	0	5.80E-06
	HRO001-HRO002[g]	1.03E-03	9.27E-06	1.45E-06	0	5.80E-06
Total Modeled Rates		***1.73E-01***	***9.15E-04***	***1.71E-04***	***1.89E-03***	***6.27E-04***
Total T-RACT Emission Rates[h]		***1.73E-01***	***9.1E-04***	***1.7E-04***	***1.9E-03***	***6.3E-04***
Total Emission Rates at 180,000 T/day[i]		***4.03E-01***	***1.36E-03***	***2.40E-04***	***1.89E-03***	***9.04E-04***

a. Arsenic (worst-case modeling scenario: W2).
b. Pounds per hour.
c. Beryllium (worst-case modeling scenario: W1).
d. Cadmium (worst-case modeling scenario: W1).
e. Formaldehyde (worst-case modeling scenario: W1).
f. Nickel (worst-case modeling scenario: W1).
g. The Haul Road was represented in the model as a series of volume sources. The emission rates listed in this table represent each individual volume source.
h. Total T-RACT emission rates – calculated based on T-RACT controls, long-term mining production limits, and other emission inventory refinements, as described in Section 4.0 of this *Modeling Review Attachment* – are derived from Tables B-W2 (for Arsenic) and B-W1 (for Beryllium, Cadmium, Formaldehyde, and Nickel) in Appendix B of the *TAP Addendum*.
i. Total emission rates at 180,000 tons per day were derived from Worksheet "TblA" in the emission inventory dated October 5, 2021. The total emission rates in this row represent all facility-wide HAP/TAP emission sources from mining, leaching, and processing and production (excluding emissions from sources "addressed" or "covered" by NSPS/NESHAP).

5.5 Cyanide Modeling Emission Source Parameters

Modeling analyses for cyanide introduced two new emission sources that were not previously evaluated by DEQ: tailings storage facility (model ID: TSF) and mill tanks (model ID: MILLTANKS).

1. The tailings storage facility was modeled by Air Sciences as a surface-based (zero release height above ground-level and zero initial vertical dimension) AREA source. The easterly and northerly lengths were calculated as square-root of the TSF area (easterly length = northerly length = $\sqrt{1{,}338{,}158\ square\ meters}$ = 1,157 meters).

2. The mill tanks were grouped and modeled by Air Sciences as a single VOLUME source. The tanks sit on the ground, so the release height was set to the average tank height of 12.2 meters (40 feet). The initial lateral dispersion (σ_y) was calculated as the equivalent diameter of the combined (18) tank area divided by the single VOLUME source coefficient of 4.3:

$$\sigma_{y(MILLTANKS)} = \frac{Equivalent\ diameter}{4.3} = \frac{\sqrt{\Sigma(d)^2}}{4.3} = 42.8\ feet$$

The individual tank diameters (d) are: two tanks at 40 feet, four tanks at 52 feet, six tanks at 54 feet, and six tanks at 20 feet.

DEQ typically requires that tailings storage facilities be modeled as an AREAPOLY source with an outline that follows the contour of the emission source, and that mill tanks be represented in the model as individual volume sources; but, given that the maximum modeled concentration for cyanide is safely below the AAC (0.08%), DEQ's modeling team accepted the modeling analysis submitted by Air Sciences and concluded that it confidently demonstrates that the cyanide AAC will not be exceeded.

5.6 Deposition Modeling

Air Sciences applied particle deposition algorithms in the impact modeling for particulate TAPs. The particulate deposition parameters used in the NAAQS compliance analysis were derived for PM_{10} and $PM_{2.5}$ (see Tables 22 and 23 in the main body of the DEQ *Modeling Review Memorandum*). Dust-related metal TAP emissions include total particulates (all size fractions of particulate matter [PM] up to PM_{30}). Therefore, the deposition parameters for PM were calculated using the same methodology and EPA references used for PM_{10} and $PM_{2.5}$ in the NAAQS compliance demonstration analyses. The PM deposition parameters are provided below in Table 4. The same density values were used as in the previous TAPs modeling analysis. However, an additional deposition characterization bin was added to better handle deposition of 10 µm to 30 µm particulates; mass fractions were adjusted accordingly.

Table 4. PARTICULATE MATTER DEPOSITION PARAMETERS BY SOURCE CATEGORY.

Source Category	Parameter	PM				
		Bin 1	**Bin 2**	**Bin 3**	**Bin 4**	**Bin 5**
Haul Roads	Bin Upper Diameter (µm)	2.50	10.00	30.00	--	--
	Mass Fraction	0.02	0.23	0.75	--	--
	Mass Mean Diameter (µm)	2.50	10.00	30.00	--	--
	Density (g/cm^3) (YPP, HFP, WEP DR average)	2.46	2.46	2.46	--	--
Material Handling (Ore, DR, Limestone)	Bin Upper Diameter (µm)	2.50	5.00	10.00	30.00	--
	Mass Fraction	0.07	0.20	0.20	0.53	--
	Mass Mean Diameter (µm)	2.50	5.00	10.00	30.00	--
	Density (g/cm^3) (Ore)	Pit-specific, see Table 23[a].				
	Density (g/cm^3) (Ore and Waste)	Pit-specific, see Table 23.				
	Density (g/cm^3) (Limestone)	1.09	1.09	1.09	1.09	--
Baghouses	Bin Upper Diameter (µm)	2.50	6.00	10.00	30.00	--
	Mass Fraction	0.25	0.45	0.20	0.10	--
	Mass Mean Diameter (µm)	2.50	6.00	10.00	30.00	--
	Density (g/cm^3) (Ore)	Pit-specific, see Table 23.				
Diesel Engines	Bin Upper Diameter (µm)	1.00	2.50	6.00	10.00	30.00
	Mass Fraction	0.82	0.08	0.03	0.03	0.04
	Mass Mean Diameter (µm)	1.00	2.50	6.00	10.00	30.00
	Density (g/cm^3) (Diesel Combustion)	1.00	1.00	1.00	1.00	1.00
Heaters and Boilers	Bin Upper Diameter (µm)	1.00	2.50	6.00	10.00	30.00
	Mass Fraction	0.23	0.22	0.25	0.09	0.21
	Mass Mean Diameter (µm)	1.00	2.50	6.00	10.00	30.00
	Density (g/cm^3) (Propane Combustion)	1.24	1.24	1.24	1.24	1.24

Table 4. PARTICULATE MATTER DEPOSITION PARAMETERS BY SOURCE CATEGORY.						
Source Category	**Parameter**	**PM**				
		Bin 1	**Bin 2**	**Bin 3**	**Bin 4**	**Bin 5**
Lime Loading and Unloading (Quick, Pebble)	Bin Upper Diameter (µm)	2.50	10.00	30.00	--	--
	Mass Fraction	0.05	0.29	0.66	--	--
	Mass Mean Diameter	2.50	10.00	30.00	--	--
	Density (g/cm^3) (Quick)	0.44	0.44	0.44	--	--
	Density (g/cm^3) (Pebble)	0.96	0.96	0.96	--	--
Lime Unloading (Quick, Pebble)	Bin Upper Diameter (µm)	2.50	10.00	30.00	--	--
	Mass Fraction	0.09	0.49	0.42	--	--
	Mass Mean Diameter (µm)	2.50	10.00	30.00	--	--
	Density (g/cm^3) (Quick)	0.44	0.44	0.44	--	--
	Density (g/cm^3) (Pebble)	0.96	0.96	0.96	--	--
Cement and Aggregate Loading and Unloading	Bin Upper Diameter (µm)	2.50	10.00	30.00	--	--
	Mass Fraction	0.05	0.29	0.66	--	--
	Mass Mean Diameter (µm)	2.50	10.00	30.00	--	--
	Density (g/cm^3) (Cement)	1.44	1.44	1.44	--	--
	Density (g/cm^3) (Aggregate)	1.28	1.28	1.28	--	--
Prill Loading and Unloading	Bin Upper Diameter (µm)	2.50	10.00	30.00	--	--
	Mass Fraction	0.05	0.30	0.65	--	--
	Mass Mean Diameter (µm)	2.50	10.00	30.00	--	--
	Density (g/cm^3) (Prill)	0.84	0.84	0.84	--	--
Refining Processes	Bin Upper Diameter (µm)	1.00	2.50	6.00	10.00	30.00
	Mass Fraction	0.72	0.10	0.07	0.03	0.08
	Mass Mean Diameter (µm)	1.00	2.50	6.00	10.00	30.00
	Density (g/cm^3) (Diesel Combustion)	1.00	1.00	1.00	1.00	1.00
Portable Crushing and Screening Plant	Bin Upper Diameter (µm)	2.50	10.00	30.00	--	--
	Mass Fraction	0.05	0.32	0.63	--	--
	Mass Mean Diameter (µm)	2.50	10.00	30.00	--	--
	Density (g/cm^3) (YPP, HFP, WEP DR average)	2.46	2.46	2.46	--	--
Lime Kiln and Ball Mill	Bin Upper Diameter (µm)	2.50	10.00	30.00	--	--
	Mass Fraction (Kiln)	0.27	0.28	0.45	--	--
	Mass Fraction (Ball Mill)	0.30	0.54	0.16	--	--
	Mass Mean Diameter (µm)	2.50	10.00	30.00	--	--
	Density (g/cm^3)	1.09	1.09	1.09	--	--
Blasting and Drilling	Bin Upper Diameter (µm)	2.50	10.00	30.00	--	--
	Mass Fraction	0.03	0.49	0.48	--	--
	Mass Mean Diameter (µm)	2.50	10.00	30.00	--	--
	Density (g/cm^3) (Ore or DR)	Pit-specific, see Table 23.				
Dozing	Bin Upper Diameter (µm)	2.50	10.00	15.00	30.00	--
	Mass Fraction	0.11	0.08	0.06	0.75	--
	Mass Mean Diameter (µm)	2.50	10.00	15.00	30.00	--
	Density (g/cm^3) (DR)	Pit-specific, see Table 23.				

[a.] See Table 23 in the main body of the DEQ *Modeling Review Memorandum*.

5.7 Carcinogenic TAP Modeling Lifetime Exposure Adjustment

Maximum modeled concentrations for carcinogenic TAPs were adjusted to account for the life-of-mine production limits, which affects the lifetime exposure.

PRI evaluated the highest modeled annual carcinogenic TAP concentration from each of the 14 modeling scenarios for lifetime exposure as follows:

$$Lifetime\ exposure\ \left(\frac{\mu g}{m^3}\right) = \frac{Highest\ annual\ concentration\ \left(\frac{\mu g}{m^3}\right) \times 16\ (mine\ operation\ years)}{70\ (years, lifetime\ exposure)}$$

This equation assumes that the highest annual concentration from the 14 modeling scenarios is repeated for 16 years of mining operation. This was then averaged over 70 years to calculate the 70-year lifetime exposure.

PRI and Air Sciences contend that calculating lifetime exposure based on 16 years of mining operation is conservative. The annual emissions for carcinogenic TAP modeling are based on 135,000 tons/day (see Section 5.1 of this *Modeling Review Attachment*) and 365 days per year. Over 16 years, this equates to a potential mining production of 788.4 million tons:

$$\frac{135{,}000\ \left(\frac{tons}{day}\right) \times 365\ \left(\frac{days}{year}\right) \times 16\ years}{1{,}000{,}000\ \left(\frac{tons}{million\ ton}\right)} = 788.4\ million\ tons$$

The actual life-of-mine total production as described in the SGP *Refined Proposed Action* (*ModPRO2*) mine plan is only 402.86 million tons (Perpetua 2021), which is 51.1% of the potential life-of-mine production represented in the above equation and related emission evaluations.

5.8 Arsenic Compliance Demonstration for Modeling Scenarios W1-W4

To demonstrate compliance with the AACC for arsenic, PRI applied two additional operating limitations:

- The removal of Modeling Scenario W5 as a potential operating scenario
- Limiting the West End Pit's life-of-mine potential mining production to 50% of the total life-of-mine potential mining production of 788.4 million tons: 50% * 788.4 million tons = 394.2 million tons

PRI has determined that the West End Development Rock Storage Facility (DRSF) will not be constructed. This change eliminated Modeling Scenario W5 from the arsenic modeling evaluation. The remaining four West End Pit modeling scenarios (W1–W4) are evaluated using the 70-year lifetime exposure equation from Section 5.7 and adjusting for the proposed West End Pit life-of-mine production limit of 50% of the total production as follows:

$$LifeExpose_{Wi,j,n} = \left[\left(WEPExpose_{Wi,n}\right)(50\%) + \left(nonWEPExpose_{Sj,n}\right)(50\%)\right]\left[\frac{16\ year\ LOM}{70\ year\ exposure}\right]$$

where:

W*i*	=	West End Pit scenario, where *i* = 1 to 4.
S*j*	=	non West End Pit scenario, where *j* = B1, B2, H1, H2, H3, H4, Y1, Y2, and Y3.
n	=	specific receptor.
$LifeExpose_{Wi,j,n}$	=	lifetime exposure in µg/m^3 for West End Pit scenario *i*, non West End Pit scenario *j*, at receptor *n*.
$WEPExpose_{Wi,n}$	=	annual maximum impact in µg/m^3 for West End Pit scenario *i* at receptor *n*.
$nonWEPExpose_{Sj,n}$	=	annual maximum impact in µg/m^3 for non West End Pit scenario *j* at receptor *n*.
16 year LOM	=	maximum life-of-mine.
70 year exposure	=	Lifetime exposure used for development of AACCs in *Idaho Air Rules*.

The above equation was used to calculate the lifetime arsenic exposure from the West End Pit scenarios (W1–W4) on a receptor-by-receptor basis. Combining the concentrations from Modeling Scenarios W1–W4 with the highest concentration from the remaining non-West End Pit scenarios (B1, B2, H1, H2, H3, H4, Y1, Y2, or Y3) conservatively ensures that the maximum potential impacts from applicable sources are evaluated and remain below AACCs.

PRI contends that calculating lifetime arsenic exposure based on the proposed West End Pit life-of-mine production limit of 50% of the total production is conservative. The actual life-of-mine total production from the West End Pit as described in the ModPRO2 mine plan is only 198.26 million tons (Perpetua 2021), which is 50.3% of the proposed West End Pit life-of-mine production limit of 394.2 million tons.

6.0 Impact Results

TAP impact analysis results, as submitted in the *TAP Addendum* and as further assessed by DEQ, are discussed in this section. The effect of various operational refinements also reduced PM_{10} and $PM_{2.5}$ impacts, and this is discussed in Section 6.2.

6.1 TAP Impact Analyses Results

This section describes the revised TAP impact analyses and demonstrates that applicable TAP emissions resulting from operation of the SGP will not result in increased impacts that exceed AACs or AACCs.

6.1.1 Modeling Non-Carcinogenic TAPs

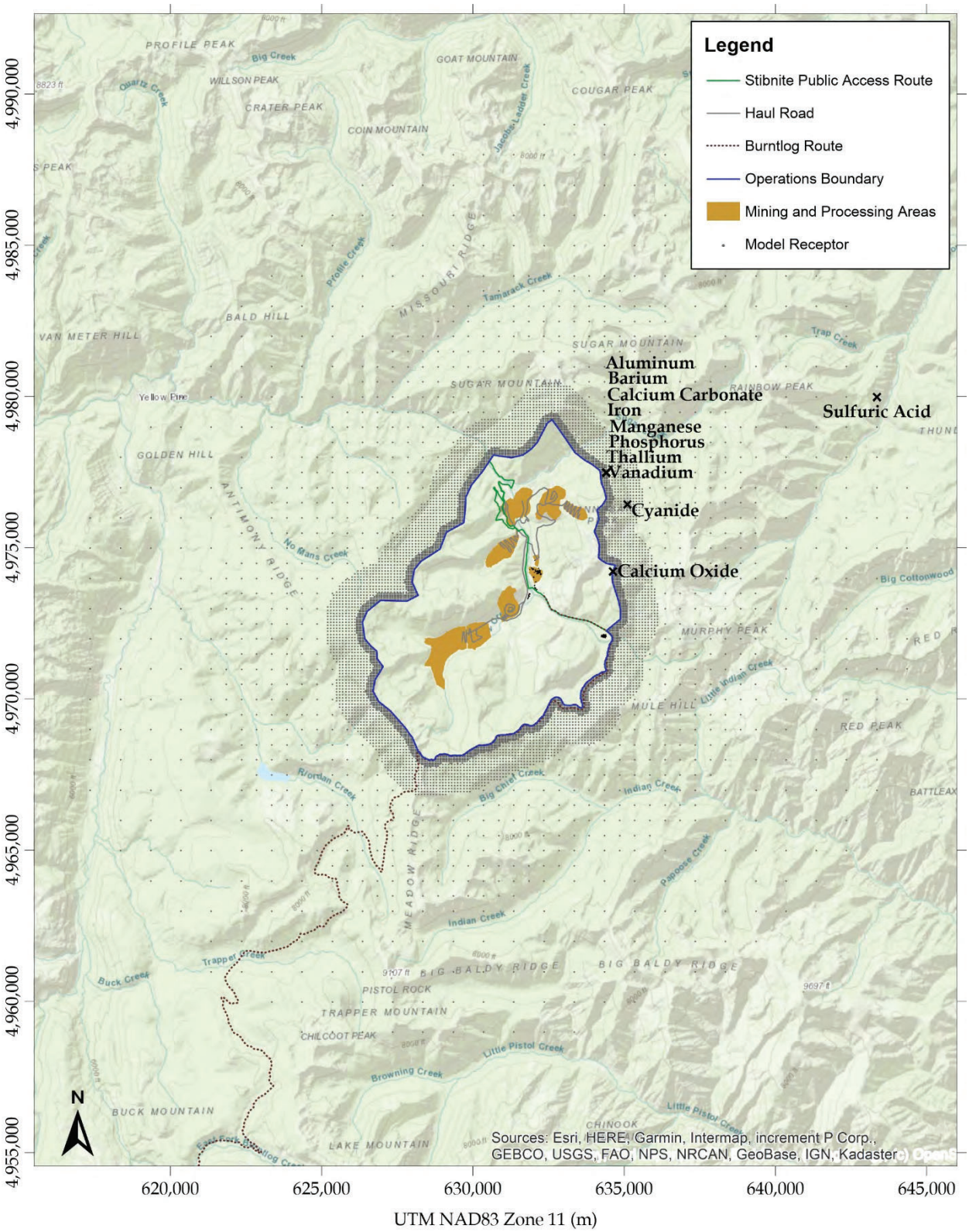
The non-carcinogenic TAPs subject to impact modeling requirements to demonstrate compliance with AACs of *Idaho Air Rules* Section 585 were modeled at the emission levels shown in Table 1 above. The maximum 24-hour modeled concentration for each of the 14 modeling scenarios demonstrates compliance with the applicable AAC, as summarized below in Table 5. PRI elected to include Scenario W5 in the modeling analysis for non-carcinogenic TAPs. Figure 1 illustrates the locations of the maximum impacts for each non-carcinogenic TAP.

Table 5. RESULTS FOR TAPS IMPACT ANALYSES FOR NON-CARCINOGENIC TAPS.					
Toxic Air Pollutant	**Averaging Time**	**Maximum Modeled Concentration ($\mu g/m^3$)[a]**	**Model Scenario**	**AAC[b] ($\mu g/m^3$)**	**Percent of AAC**
Aluminum	24-hour	6.17	W5	500	1.23%
Barium	24-hour	0.07	W5	25	0.28%
Calcium carbonate	24-hour	1.22	W5	500	0.24%
Calcium oxide	24-hour	0.15	All	100	0.15%
Cyanide	24-hour	0.20	All	250	0.08%
Iron	24-hour	1.58	W5	50	3.16%
Manganese	24-hour	0.03	W5	250	0.01%
Phosphorus	24-hour	0.06	W5	5	1.20%
Sulfuric acid	24-hour	0.41	All	50	0.82%
Thallium	24-hour	0.001	W5	5	0.02%
Vanadium	24-hour	0.002	W5	2.5	0.08%

a. Micrograms per cubic meter.

b. Acceptable Ambient Concentration of a Non-carcinogenic TAP.

Figure 1. SGP NON-CARCINOGENIC MAXIMUM TAP IMPACT LOCATIONS.



6.1.2 Modeling Carcinogenic TAPs

The carcinogenic TAPs subject to impact modeling requirements to demonstrate compliance with AACCs of *Idaho Air Rules* Section 586 were modeled using an emission inventory that includes the T-RACT controls, long-term mining production limits, and other emission inventory refinements, as described in Section 4.0 and 5.0 of this *Modeling Review Attachment*.

The maximum modeled impact for each of the 14 modeling scenarios demonstrated compliance with the T-RACT AACC, as summarized below in Table 6. The SGP maximum concentrations were adjusted to account for the life-of-mine production limits, which affect the lifetime exposure, and to account for the elimination of Modeling Scenario W5. See Sections 5.7 and 5.8 of this *Modeling Review Attachment* for more detail. The locations of the maximum impacts for each carcinogenic TAP are presented in Figure 2. Arsenic concentrations are considerably lower in areas away from the location of maximum impact as shown in Figure 3.

Table 6. RESULTS FOR TAPS IMPACT ANALYSES FOR CARCINOGENIC TAPS.

Toxic Air Pollutant	Averaging Time	Maximum Modeled Lifetime Exposure Concentration ($\mu g/m^3$)[a,b]	Model Scenario	AACC[c] ($\mu g/m^3$)	T-RACT[d] AACC	Percent of T-RACT AACC
Arsenic	Annual	0.00095	W2	0.00023	0.0023	41.30%
Beryllium	Annual	0.00001	W1	0.0042	0.042	0.02%
Cadmium	Annual	0.000002	W1	0.00056	0.0056	0.04%
Formaldehyde	Annual	0.00007	W1	0.077	0.77	0.01%
Nickel	Annual	0.00001	W1	0.042	0.42	<0.01%

a. Micrograms per cubic meter.
b. The lifetime exposure concentrations are based on the proposed restrictions discussed in Sections 5.7 and 5.8 of this *Modeling Review Attachment*.
c. Acceptable Ambient Concentration of a Carcinogenic TAP.
d. Toxic Air Pollutant Reasonably Available Control Technology allows the AACCs to be increased by a factor of ten per *Idaho Air Rules* Section 210.12(b).

Figure 2. SGP CARCINOGENIC MAXIMUM TAP IMPACT LOCATIONS.

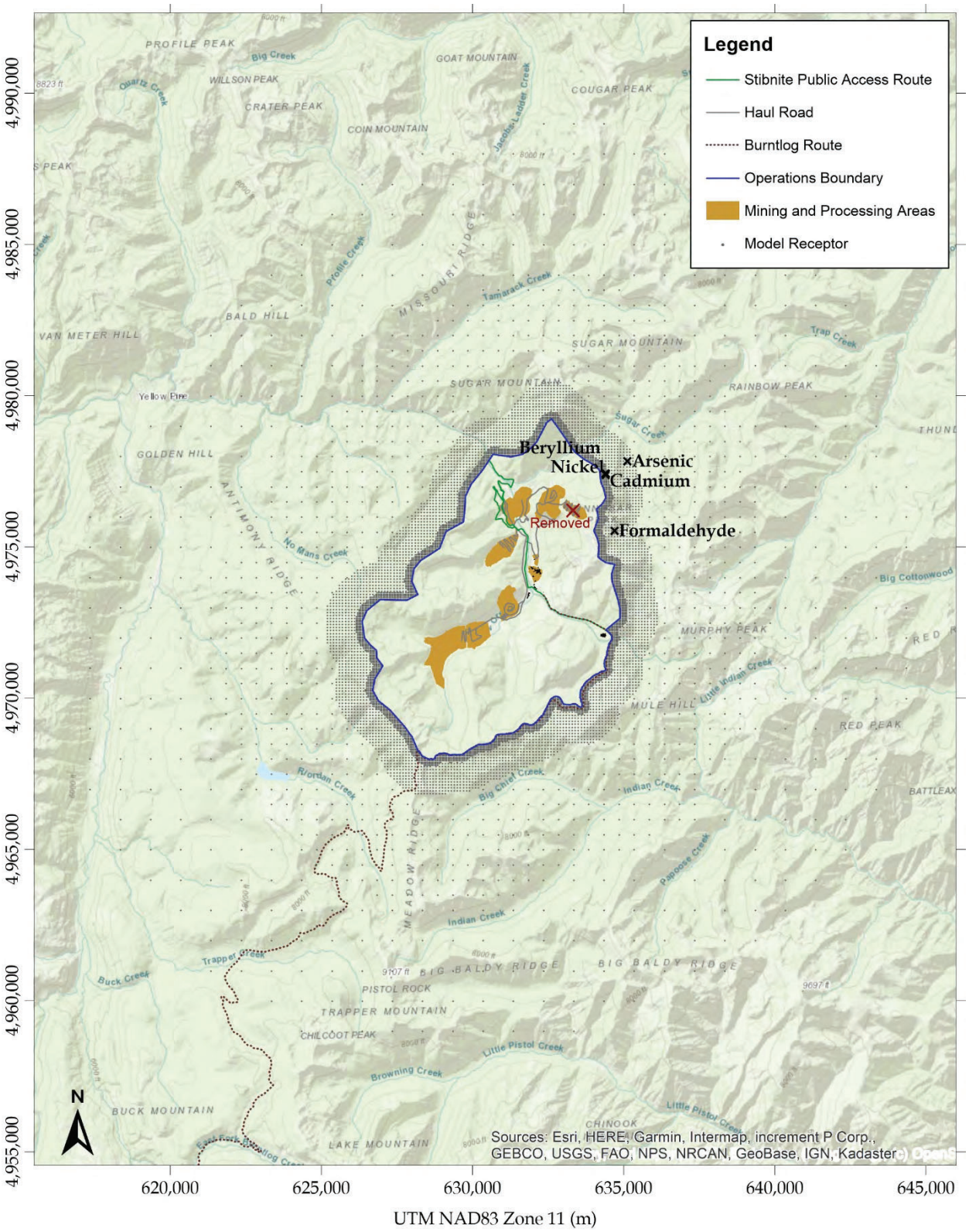
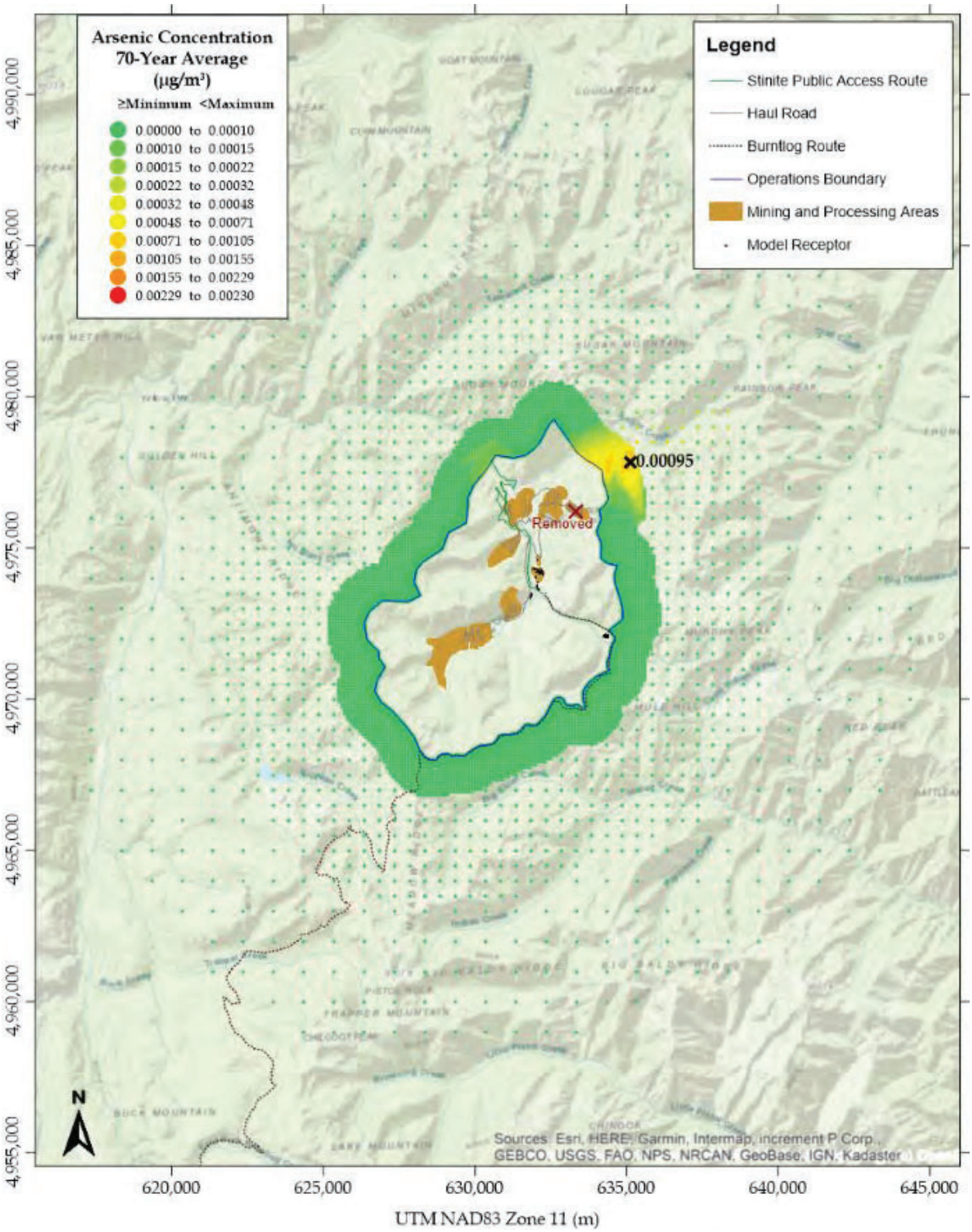


Figure 3. SGP CONTOURS OF LIFETIME ARSENIC IMPACTS.



6.2 Effect of Changes to Modeled PM_{10} Results

PRI has determined that the West End Development Rock Storage Facility will not be constructed. This change eliminated Modeling Scenario W5 as a potential operating scenario. In Section 4.1.4 in the main body of the DEQ *Modeling Review Memorandum*, DEQ identified PM_{10} NAAQS exceedances at four hotspot receptors when using the BULKRN meteorological dataset for Modeling Scenario W5 (the highest PM_{10} impact modeling scenario). When Modeling Scenario W5 is removed, the highest modeled impacts are predicted to occur for Modeling Scenario W3, which represents the transport of development rock from the West End Pit to the Hangar Flats Development Rock Storage Facility.

Table 7 presents results for the cumulative NAAQS impact analyses for Scenario W3. Results still exceed the 24-hour PM_{10} NAAQS even when Modeling Scenario W5 is eliminated. However, there is only one hotspot receptor exceeding NAAQS. The modeled violation is also predicted to occur during winter. This is a critical consideration because during winter, not only are fugitive emissions minimized because of the higher moisture content of material handled or driven over, but background concentrations in such remote areas are also generally much lower because of the absence of wildfires and dust-generating sources.

Table 7 also lists the results when using temporally varying backgrounds, instead of a single-value background, in the cumulative NAAQS impact analysis (using the "SEASON" and "MONTH" options in AERMOD). The highest daily average PM_{10} concentrations measured at Stibnite for every season and month in 2014 were used as inputs in the model. Table 7 shows that the SGP facility ***safely*** demonstrates compliance with the 24-hour PM_{10} NAAQS when temporally varying backgrounds (both seasonal and monthly) are used instead of the single-value background. Summing modeled design values with a single-value background that is on the upper end of the distribution results in a very conservative estimate of total impacts. DEQ strongly believes that using temporally varying backgrounds that respect seasonality is appropriate for the SGP facility, and that using the highest value in the period interval is very conservative.

TABLE 7. RESULTS FOR 24-HOUR PM_{10} CUMULATIVE NAAQS IMPACT ANALYSES FOR MODELING SCENARIO W3.

Backgrounds Scenario	Max. Conc.[a] (µg/m³)[b]	Model Scenario	Back. Conc.[c] (µg/m³)	Total Conc.[d] (µg/m³)	NAAQS (µg/m³)	Percent of NAAQS
Single-Value Background	116.9	W3	34.0	150.9[e]	150	100.6%
Seasonally Varying Backgrounds	123.5[f]	W3	*Seasonal*	123.5[f]		82.3%
Monthly Varying Backgrounds	123.5[f]	W3	*Monthly*	123.5[f]		82.3%

a. Max. Conc. = maximum modeled design concentration.
b. Micrograms per cubic meter.
c. Back. Conc. = background concentration.
d. Total Conc. = total (modeled + background) concentration.
e. One hotspot receptor exceeds NAAQS.
f. The maximum modeled design concentration already incorporates the seasonal and monthly background values.

The time series plot in Figure 4 and the box-and-whiskers plot in Figure 5 illustrate the variability in daily average PM_{10} concentrations collected at the Stibnite Site in 2014. Figures 4 and 5 confirm that the highest concentrations from the modeled and monitored datasets do ***not*** occur simultaneously. Highest modeled impacts are predicted to occur during winter while the highest background concentrations were measured at Stibnite during summer. Therefore, the summation method, where total impacts are

calculated by summing modeled design values with a background concentration that is also consistent in form with the regulatory design value, results in a very conservative estimate of the total impact for comparison to NAAQS. DEQ concludes that use of temporally varying (i.e., seasonal and monthly) backgrounds for SGP is justified. DEQ is highly confident that operation of the SGP will not cause or contribute to a violation of NAAQS.

PM_{10} and $PM_{2.5}$ NAAQS compliance was previously demonstrated prior to refinements and adjustments proposed in the submitted *TAP Addendum*. The main body of the DEQ *Modeling Review Memorandum* discussed and considered results from both modeling with meteorological data processed using the BULKRN method and modeling with data processed using cloud cover data, and DEQ concluded that NAAQS compliance was demonstrated with a high degree of confidence. The adjustments and refinements described in the *TAP Addendum* further increase DEQ's confidence in NAAQS compliance.

Figure 4. TIME SERIES OF DAILY AVERAGE PM_{10} CONCENTRATIONS MEASURED AT STIBNITE IN 2014.

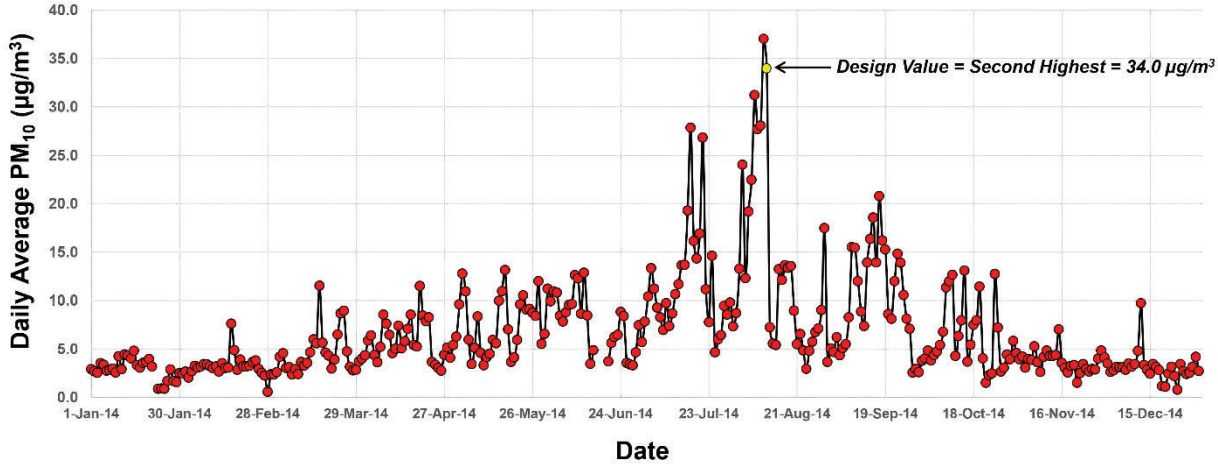
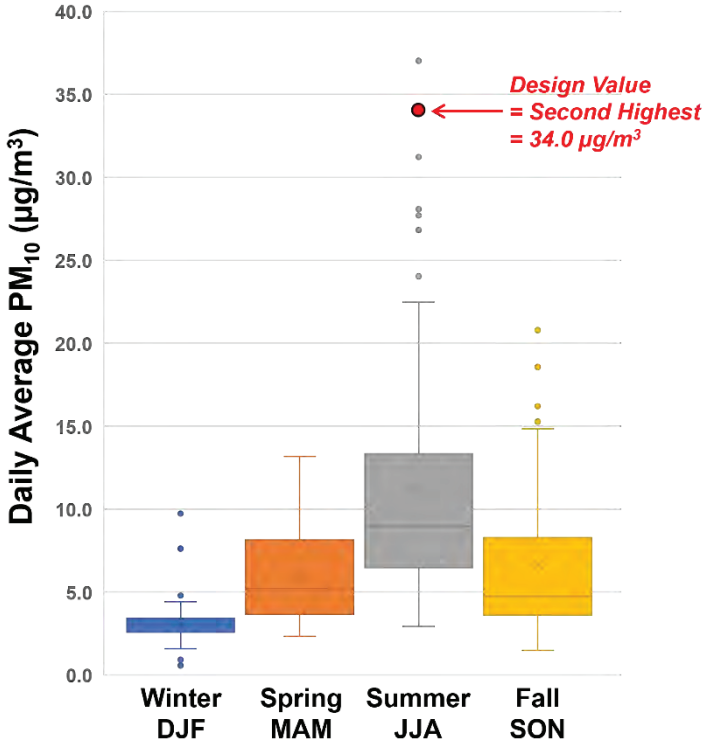


Figure 5. BOX-AND-WHISKERS PLOT FOR SEASONAL PM_{10} BACKGROUND CONCENTRATIONS MEASURED AT STIBNITE IN 2014.



In Figure 5 the middle line of each box represents the median. The "x" in the box represents the mean. The bottom and the top lines of the box represent the 1st quartile (25th percentile) and the 3rd quartile (75th percentile), respectively. The whiskers extend to the minimum and maximum values not considered outliers. Outliers are plotted individually.

7.0 Conclusions

This section provides conclusions of the *TAP Addendum* and DEQ's review of the *TAP Addendum*.

7.1 Conclusions of Revised TAP Analyses

The revised and refined TAP analyses:

- Revised TAP-applicable sources at the SGP facility.
- Proposed additional emission control measure and adjusted operations to reduce TAP emissions.
- Refined the approach used to demonstrate compliance with TAP regulations.

The submitted application, with the adjustments and refinements to analyses as described in the *TAP Addendum*, demonstrated to DEQ's satisfaction that the emissions of applicable TAPs will not result in impacts to ambient air that exceed TAP increments of *Idaho Air Rules* Section 585 and 586.

7.2 Effects of Adjustments/Revisions on NAAQS Compliance Demonstrations

The submitted application, prior to the *TAP Addendum*, demonstrated compliance with NAAQS to DEQ's satisfaction; and the operational measures proposed in the *TAP Addendum* will only further reduce estimated emissions. Eliminating Modeling Scenario W5 impacts, with the elimination of the West End Development Rock Storage Facility, affects the 24-hour PM_{10} impact modeling analysis for SGP. Modeling Scenario W3 is now the scenario producing the highest modeled impacts, and NAAQS compliance is easily demonstrated when using temporally varying background PM_{10} values, which were obtained from onsite monitoring data.

7.3 Conservatism of Permitting Analyses

Emissions and locations from which emissions occur are highly dynamic at mining facilities. This presents unique challenges for permit development because permits must include limits and operational requirements that ensure air quality standards are not violated. Permitting rules require that air impacts be assessed using maximum potential emissions as limited by either the capacity of the unit/operation or as limited by enforceable permit provisions. A permit where actual emissions are nearly representative of maximum allowable emissions, through imposing permit limits, would be exceedingly complex and require overly burdensome monitoring and record-keeping requirements. To avoid this, applicants typically calculate allowable emissions and perform impact analyses based on simplistic operational scenarios that largely overstate emissions estimated to occur from the facility.

PRI and Air Sciences have asserted that the submitted emission estimates, operational scenarios, and air impact analyses associated with the permit application greatly overstate best-estimated values. This point is evident when comparing the permit application materials and analyses with those presented in ModPRO2, PRI's revised mine plan and associated impacts. ModPRO2 is used in support of the Environmental Impact Statement (EIS).

Reference

Perpetua. 2021. "ModPRO2 Mine Plan." *File: Midas Stibnite Mine Plan and Equipment Schedule (10Feb21).xlsx.* Email from R. McCluskey, Perpetua Resources Inc., to E. Memon, Air Sciences Inc., February 11.

EXHIBIT B

order to effectively implement 161, the department developed a policy that set emission limits for certain toxic air pollutants. Idaho industry requested that the policy be implemented in rule (instead of a policy) to provide greater certainty and transparency for industry. Through many discussions with industry and the public, a rule was developed that was responsibly protective of environmental quality while being reasonably permissive of industrial activity. As noted in Section 203.03, by complying with the TAPs rules developed in sections 210, 585 and 586, a facility adequately demonstrated compliance with 161.

Because TAPs are generally known to be hazardous to human health (EPA 1991), the federal government also implemented rules to control emissions of TAPs through National Emission Standards for Hazardous Air Pollutants (NESHAPs). EPA first tried to implement risk based standards according to the Clean Air Act (CAA) amendments of 1970. Between 1970 and 1990, EPA was only able to implement standards for 8 pollutants (asbestos, benzene, beryllium, coke oven emissions, inorganic arsenic, mercury, radionuclides, and vinyl chloride). Because of EPA's inability to address air toxics in a timely and efficient manner, Congress revised the CAA in 1990 to develop a program to control a list of hazardous air pollutants (HAPs) through technology standards for specific industries. Congress itself developed the list of 188 HAPs. They also prescribed maximum achievable control (MACT) standards for large (major) sources of HAPs and generally achievable control technology (GACT) standards for smaller (area) sources. The area source NESHAPs also only focused on a subset of 30 HAPs that were identified as being the most problematic in urban areas. Congress's intent was to address the major risks associated with TAPs by focusing on the most toxic pollutants and most significant source categories. The original list of 188 HAPs was based on the list of pollutants subject to the Emergency Planning and Community Right-to-Know Act (EPCRA). After the HAPs list was created in the early 1990's, the list of pollutants subject to EPCRA has doubled, while the list of HAPs has remained essentially unchanged.

The Idaho TAPs rules were developed to complement the federal NESHAPs, thus the rules are not more stringent than federal law. IDAPA 58.01.01.210.20 specifically states that if a facility is subject to a federal NESHAP, they have met the requirements of our state air toxics rules. These rules do regulate an activity not regulated by the federal government. They are a uniquely Idaho solution of addressing air toxics emissions. An argument could be made that the rules are broader in scope than federal law, as they do regulate an activity not regulated by federal law.

(2) To the degree that a department action is based on science, in proposing any rule or portions of any rule subject to this section, the department shall utilize:

(a) The best available peer reviewed science and supporting studies conducted in accordance with sound and objective scientific practices; and

The Idaho TAPs rules were developed to protect public health by developing risk based standards that would apply to new or modified industrial sources only. There are two lists of pollutants that facilities need to consider, but only if the facility is not subject to a federal air toxics standard.

The first list of pollutants are non-carcinogens (do not cause cancer) in IDAPA 58.01.01.585. They may cause adverse health effects based on short term (24-hour) exposures. Examples include methyl isocyanate, chlorine, cyanide and xylene. The acceptable ambient levels for non-carcinogens are based on occupational exposure levels from the American Conference of Government Industrial Hygienists (ACGIH) threshold limit values (TLV). (ACGIH 2019). The TLV is typically an 8 hour time weighted average concentration and it is the concentration to which workers may be repeatedly exposed during a 40 hour work week without adverse effect. Two safety factors were applied to the TLV value: 1) to extrapolate the 8 hour exposure level to a 24 hour public exposure, and 2) to extrapolate from the relatively healthy mostly male working population to a general population that included women, children and the elderly. Thus the TAP increment values are 1/20th the TLV values.

Because ambient monitoring values can sometimes be difficult to determine, the department also developed stack emission screening levels (ELs) for easier analysis (in pounds/hour). These were based on a conservative stack modeling analysis.

The second list of pollutants are carcinogens (i.e., have been determined to cause cancer over a lifetime of exposure) in IDAPA 58.01.01.586. Examples include formaldehyde, benzene, and polycyclic aromatic hydrocarbons. The acceptable ambient levels for carcinogens are based on the cancer unit risk values from the Environmental Protection Agency and correspond to a one in a million cancer risk. (EPA 2019). An EL was also determined for

Exhibit C:

EPA's Regional Screening Levels Calculator Inputs and Outputs for Exposure Durations: 16, and 70 years

Site-specific
Resident Air Inputs

Variable	Resident Air Default Value	Site-Specific Value
ED_{res} (exposure duration) years	26	16
ED_{0-2} (mutagenic exposure duration first phase) years	2	2
ED_{2-6} (mutagenic exposure duration second phase) years	4	4
ED_{6-16} (mutagenic exposure duration third phase) years	10	10
ED_{16-26} (mutagenic exposure duration fourth phase) years	10	10
EF_{res} (exposure frequency) days/year	350	365
EF_{0-2} (mutagenic exposure frequency first phase) days/year	350	350
EF_{2-6} (mutagenic exposure frequency second phase) days/year	350	350
EF_{6-16} (mutagenic exposure frequency third phase) days/year	350	350
EF_{16-26} (mutagenic exposure frequency fourth phase) days/year	350	350
ET_{res} (exposure time) hours/day	24	24
ET_{0-2} (mutagenic exposure time first phase) hours/day	24	24
ET_{2-6} (mutagenic exposure time second phase) hours/day	24	24
ET_{6-16} (mutagenic exposure time third phase) hours/day	24	24
ET_{16-26} (mutagenic exposure time fourth phase) hours/day	24	24
THQ (target hazard quotient) unitless	0.1	1
LT (lifetime) years	70	70
TR (target risk) unitless	1.0E-06	1.0E-06

Site-specific

Resident Risk-Based Regional Screening Levels (RSL) for Air

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; T = ATSDR DRAFT; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = OW; R = ORD; N = WI; W = TEF applied; E = RPF applied; G = see user guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	IUR ($ug/m^3)^{-1}$	IUR Ref	RfC (mg/m^3)	RfC Ref	Carcinogenic SL TR=1E-06 (ug/m^3)	Noncarcinogenic SL THI=1 (ug or $fibers/m^3$)	Screening Level (ug or $fibers/m^3$)
Arsenic, Inorganic	7440-38-2	No	No	Inorganics	4.30E-03	I	1.50E-05	C	1.02E-03	1.50E-02	1.02E-03 ca*

Site-specific
Resident Risk for Air

Chemical	IUR (ug/m^3)$^{-1}$	IUR Ref	RfC (mg/m^3)	RfC Ref	Concentration (ug or fibers/m^3)	Carcinogenic Risk	Noncarcinogenic HI
Arsenic, Inorganic	4.30E-03	I	1.50E-05	C	4.16E-03	4.09E-06	2.77E-01
**Total Risk/HI*	-		-		-	*4.09E-06*	*2.77E-01*

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Site-specific
Resident Air Inputs

Variable	Resident Air Default Value	Site-Specific Value
ED_{res} (exposure duration) years	26	70
ED_{0-2} (mutagenic exposure duration first phase) years	2	2
ED_{2-6} (mutagenic exposure duration second phase) years	4	4
ED_{6-16} (mutagenic exposure duration third phase) years	10	10
ED_{16-26} (mutagenic exposure duration fourth phase) years	10	10
EF_{res} (exposure frequency) days/year	350	365
EF_{0-2} (mutagenic exposure frequency first phase) days/year	350	350
EF_{2-6} (mutagenic exposure frequency second phase) days/year	350	350
EF_{6-16} (mutagenic exposure frequency third phase) days/year	350	350
EF_{16-26} (mutagenic exposure frequency fourth phase) days/year	350	350
ET_{res} (exposure time) hours/day	24	24
ET_{0-2} (mutagenic exposure time first phase) hours/day	24	24
ET_{2-6} (mutagenic exposure time second phase) hours/day	24	24
ET_{6-16} (mutagenic exposure time third phase) hours/day	24	24
ET_{16-26} (mutagenic exposure time fourth phase) hours/day	24	24
THQ (target hazard quotient) unitless	0.1	1
LT (lifetime) years	70	70
TR (target risk) unitless	1.0E-06	1.0E-06

Site-specific

Resident Risk-Based Regional Screening Levels (RSL) for Air

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; T = ATSDR DRAFT; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D = OW; R = ORD; N = WI; W = TEF applied; E = RPF applied; G = see user guide; U = user provided; ca = cancer; nc = noncancer; * = where: nc SL < 100X ca SL; ** = where nc SL < 10X ca SL; SSL values are based on DAF=1; max = ceiling limit exceeded; sat = Csat exceeded.

Chemical	CAS Number	Mutagen?	Volatile?	Chemical Type	IUR ($ug/m^3)^{-1}$	IUR Ref	RfC (mg/m^3)	RfC Ref	Carcinogenic SL TR=1E-06 (ug/m^3)	Noncarcinogenic SL THI=1 (ug or $fibers/m^3$)	Screening Level (ug or $fibers/m^3$)
Arsenic, Inorganic	7440-38-2	No	No	Inorganics	4.30E-03	I	1.50E-05	C	2.33E-04	1.50E-02	2.33E-04 ca*

Site-specific
Resident Risk for Air

Chemical	IUR $(ug/m^3)^{-1}$	IUR Ref	RfC (mg/m^3)	RfC Ref	Concentration (ug or fibers/m^3)	Carcinogenic Risk	Noncarcinogenic HI
Arsenic, Inorganic	4.30E-03	I	1.50E-05	C	4.16E-03	1.79E-05	2.77E-01
**Total Risk/HI*	-		-		-	*1.79E-05*	*2.77E-01*

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