



Appendix F - Part 1

Human health risk assessment



HUMAN HEALTH RISK ASSESSMENT FOR NEW COBAR COMPLEX

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BASIS OF REPORT

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DOCUMENT CONTROL

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EXECUTIVE SUMMARY

Background

Peak Gold Mines Pty Ltd (PGM), a wholly owned and operated subsidiary of Aurelia Metals Limited (Aurelia), owns and operates the Peak Gold Mines operation south-east of Cobar, western New South Wales (NSW). The PGM operation comprises the New Cobar Complex located 3 kilometres (km) to the south-east of Cobar town centre and the Peak Complex located 10 km south-east of the town centre.

In order to extend the life of the New Cobar Complex, PGM is seeking approval to mine additional deposits, i.e. the Gladstone and Great Cobar deposits (the Proposal). Mining of previously approved deposits would wind down as mining of new deposits ramps up, meaning no change to the annual ore production rate. The Proposal would include minimal changes to existing operations.

SLR Consulting Australia Pty Ltd (SLR) was engaged to provide a Human Health Risk Assessment (HHRA) for the Proposal. The HHRA has used air quality modelling information provided to SLR by EMM. SLR has not evaluated the air dispersion modelling, the information has been used as provided on face value.

HHRA Methodology

The HHRA is consistent with established national and international risk assessment frameworks. The chemicals of potential concern are metals within the dust potentially emitted by the Proposal.

Locations considered

The EMM air quality modelling predicted metal concentrations in airborne dust and deposition to soil at 40 locations throughout Cobar. They include residences, public facilities, parks, schools, child-care centres, Cobar Base Hospital and an aged care facility.

Scenarios evaluated

To be able to discern and assess the change in public exposure that might occur from the Proposal, the HHRA has evaluated metal in dust emissions from three exposure scenarios.

- Scenario 1 (S1): Current operations. Includes background.
- Scenario 2 (S2): Proposal increment. That is emissions only from the Proposal. No background.
- Scenario 3 (S3): Cumulative. S1 plus S2.

Each scenario assumes the same emissions will occur for the remainder of the practical mine life (i.e. 2023-2035 or approximately 15 years). Soil metal concentrations from deposition onto existing soil were estimated using standard equations from the United States Environmental Protection Agency (US EPA) which incorporate physical loss of metal from soil due to surface water runoff. Other loss processes (soil erosion, leaching) are not included.

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Existing soil/dust metal concentrations in Cobar were informed by a comprehensive sampling program. Some of the samples were tested for bioaccessibility of lead (Pb) and arsenic (As). Bioaccessibility is the amount of metal released from soil in the gastrointestinal tract, and which is available to be absorbed into the systemic circulation. Not all that is released from soil is absorbed.

Risk characterisation methodology

The methodology for assessing risk of harm due to Pb exposure differs from the methodology used for other metals.

- For Pb, potential health impacts were assessed by using a validated model (IEUBK) from US EPA to predict blood lead (BPb) in 1-2 year old children. The modelled BPb was compared with the National Health and Medical Research Council (NHMRC 2015) action level of 5 µg/dL. A different model (ALM), also from the US EPA, was used to estimate BPb in pregnant females and their unborn children.

Input parameters into the modelling were chosen based on relevant data for Cobar. The input assumptions into the modelling are conservative and consequently more likely to overpredict than underpredict modelled BPb.

- Other metals assessed within emitted dust were arsenic, cadmium, chromium, manganese, antimony, barium, beryllium, copper, mercury, nickel, silver, and zinc. As with Pb, these metals within the dust are part of the geology of the region. With the exception of As for which bioaccessibility data were available, it has been conservatively assumed these metals may be fully (i.e. 100%) soluble.

For these metals, risk of exceedance of a chronic toxicity reference value (TRV; adjusted for possible 'background' exposures) or chronic air guideline value is used to judge potential risk of harm. It is assumed the metals may have additive effects even though this is very unlikely. For those metals which may cause cancer by directly altering genetic material (e.g. nickel), cancer risk from inhalation exposure was calculated. The resulting estimated 'cancer risk' was compared with a target acceptable risk of 1×10^{-5} , as recommended by Australian health authorities.

An 'unacceptable' risk, as defined by regulatory standards and requirements, is often determined as an exposure being larger than the TRV. This definition of unacceptable risk does not equate with imminent adverse health effects or even high risk of adverse health effects. It simply means that the regulatory guideline value has been exceeded.

Results and Conclusions

Lead (Pb)

The ALM and IEUBK modelling undertaken predicted negligible change to blood lead levels of pregnant females, their unborn offspring, or 1-2 year old children as a result of the Proposal, and predictions were well below the target action level of the NHMRC. All estimates were consistent with the range of blood lead levels reported for Australian children in communities not affected by point sources of Pb. Both models incorporated incidental oral exposure to Pb in soil and dust, inhalation exposure to Pb in air, as well as 'background' exposures such as from diet and water. In addition, the IEUBK model also incorporated ingestion of tank water which may contain Pb deposited in dust onto roofs.

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Other metals

Estimated exposure to metals other than Pb are all well below their respective health guidelines. There is also very low probability of additive effects between the metals.

It is concluded the risk of exceeding health-based toxicity reference values as a result of the Proposal is very low. The assessment is conservative.

The highest estimated cancer risk (for nickel) was 7.6×10^{-10} , which is almost 10,000 to 100,000 times less than the risk that NSW and other jurisdictions consider as negligible or acceptable.

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1 Introduction

Peak Gold Mines Pty Ltd (PGM), a wholly owned and operated subsidiary of Aurelia Metals Limited (Aurelia), owns and operates the Peak Gold Mines operation south-east of Cobar, western New South Wales (NSW). The PGM operation comprises the New Cobar Complex located 3 kilometres (km) to the south-east of Cobar town centre and the Peak Complex located 10 km south-east of the town centre (Figure 1-1)¹.

PGM has been operational since mining commenced at the Peak deposit in 1991 and operates under a number of development approvals issued by Cobar Shire Council. Mineral production commenced in 1992, producing gold, copper, lead, zinc and silver. Mining at the New Cobar Complex commenced with the open cut pit in 2000, then transitioned to underground mining in 2004. The current approvals at Peak and New Cobar allow for operations to continue indefinitely and process up to 800,000 tonnes per annum of ore at the Peak processing facility, with tailings placed into the Peak Tailings Storage Facility (TSF) (EMM 2019). Both the processing facility and the TSF are located at the Peak Complex. Ore² from the New Cobar Complex is currently being transported to the processing³ and storage facilities at the Peak Complex along 5 km of public road (Kidman Way)⁴ in road registered trucks.

In order to extend the life of the New Cobar Complex, PGM is seeking approval under the *Environmental Planning and Assessment Act 1979* and the *State Environmental Planning Policy (State Regional Development) 2011* to mine the Gladstone and Great Cobar deposits. In addition, PGM is seeking to consolidate all existing development consents applicable to the New Cobar Complex into a single modern consent issued by the Department of Planning, Industry and Environment (DPIE) (EMM 2019).

All existing and proposed surface works associated with mining the Great Cobar and Gladstone deposits will be located in an existing operational mining complex⁵, i.e. the New Cobar Complex. Access to all underground workings in the complex occurs via a portal and decline in the base of the New Cobar Pit (EMM 2019). Mining of the New Cobar and Chesney deposits (currently mined under an existing approval) would ramp down as mining of the proposed additional deposits (Great Cobar and Gladstone) ramp up, therefore no change is proposed to the total annual ore production rate. The project proposal (the Proposal) involves (EMM 2019):

¹ Ore deposits with approval for mining at the New Cobar Complex include New Cobar, Chesney and Jubilee; deposits approved for mining at the Peak Complex include Peak, Perseverance, Chronos, New Occidental, Kairos and S400. The area of land to which PGM's current approvals extend includes consolidated mining lease (CML) 8 for the Peak Complex, and CML 6, ML 1483, ML1805 and MPL 0854 for the New Cobar Complex. PGM also holds authorities over CML 7 and CML 9 which contain historic working of the Coronation/Beechworth and Queen Bee deposits (mining ceased at these locations last century) (EMM 2019).

² Ore from the New Cobar Complex is transported to the surface Run of Mine (ROM) pad, where, if necessary, oversizes material is broken up by a rockbreaker, or it may be crushed, graded and loaded onto road registered haul trucks prior to transportation along Kidman Way to the Peak Complex.

³ Ore is processed and treated to produce copper, lead and zinc concentrates.

⁴ Kidman Way runs north to south away from Cobar town to the Peak complex. The only residence in close proximity to the ore transport path is R2 (see Section 2.4), a residence on the mine lease which is owned by Aurelia.

⁵ Existing surface facilities include administration and car parking, workshop and laydown yard, magazine, ROM pad, waste rock emplacements, sulphide pit, soil stockpiles, sediment basins (stormwater), settling ponds (mine dewatering), water storage and mine dewatering lines.

- Development of underground mining operations to access and mine the Great Cobar and Gladstone deposits using underground stope mining methods.
- Extension of the functional life of mine by 12 years from 2023 to approximately 2035 (it is noted PGM already hold approval for an indefinite mine life).
- Continuing use of the underground mining fleet and associated workforce.
- Increasing ore truck movements on Kidman Way from an average of 25 loaded trips per day (50 movements in and out) to 50 loaded trips (100 movements in and out) per day averaged over a calendar year.
- Continued use of the existing power and water supply.
- Two ventilation shafts (one inlet and one outlet) that have already been approved for the Great Cobar Exploration Decline within the New Cobar Complex. No new ventilation stacks will be required (fans will be required to maintain airflow).
- Negligible additional surface disturbance outside of surface disturbance areas permitted under the current approval.

A detailed description of the Proposal is provided in the Environmental Impact Statement (EIS) prepared by EMM (2021).

SLR Consulting Australia Pty Ltd (SLR) was engaged to provide a Human Health Risk Assessment (HHRA) for the Proposal. The Department of Planning, Industry and Environment (DPIE)'s secretary environmental assessment requirements (SEARs) for the project were issued on 13 February 2020. The SEARs that are relevant to human health, and where they have been addressed, are provided in Table 1-1.

Table 1-1 Health related SEARs and agency requirements

Agency	Requirement	Location in Report/ How Requirement has been Addressed
DPIE	Human Health – including: - A Human Health Risk Assessment addressing how the development's environmental impacts in relation to air quality (including heavy metals) and noise may impact on the health of the local community; - Monitoring and management measures to reduce risk to human health;	- Air quality (including heavy metals) & human health: Addressed throughout whole report. - Noise: Addressed by EMM (2020e). - Monitoring and management of dust emissions: Addressed in Section 9 of EMM (2020a).
NSW Health	"A suitable experienced toxicologist should be engaged to conduct a risk assessment." "The frame work that we would suggest you follow for your assessment can be found at...." enHealth (2012a, b).	- The author and reviewer of this HHRA are both certified toxicologists and experienced health risk assessors. - Section 2 of this HHRA (this HHRA follows guidance in enHealth 2012a and utilises exposure factors from enHealth 2012b).

The HHRA has used air quality modelling information provided to SLR by EMM in their report (EMM 2020a) and via e-mail in a number of spreadsheets⁶. The information from EMM has been used on face value.

Figure 1-1 shows a map of the New Cobar and Peak Complexes, highlighting the location of the two new deposits proposed to be mined (Gladstone and Great Cobar).

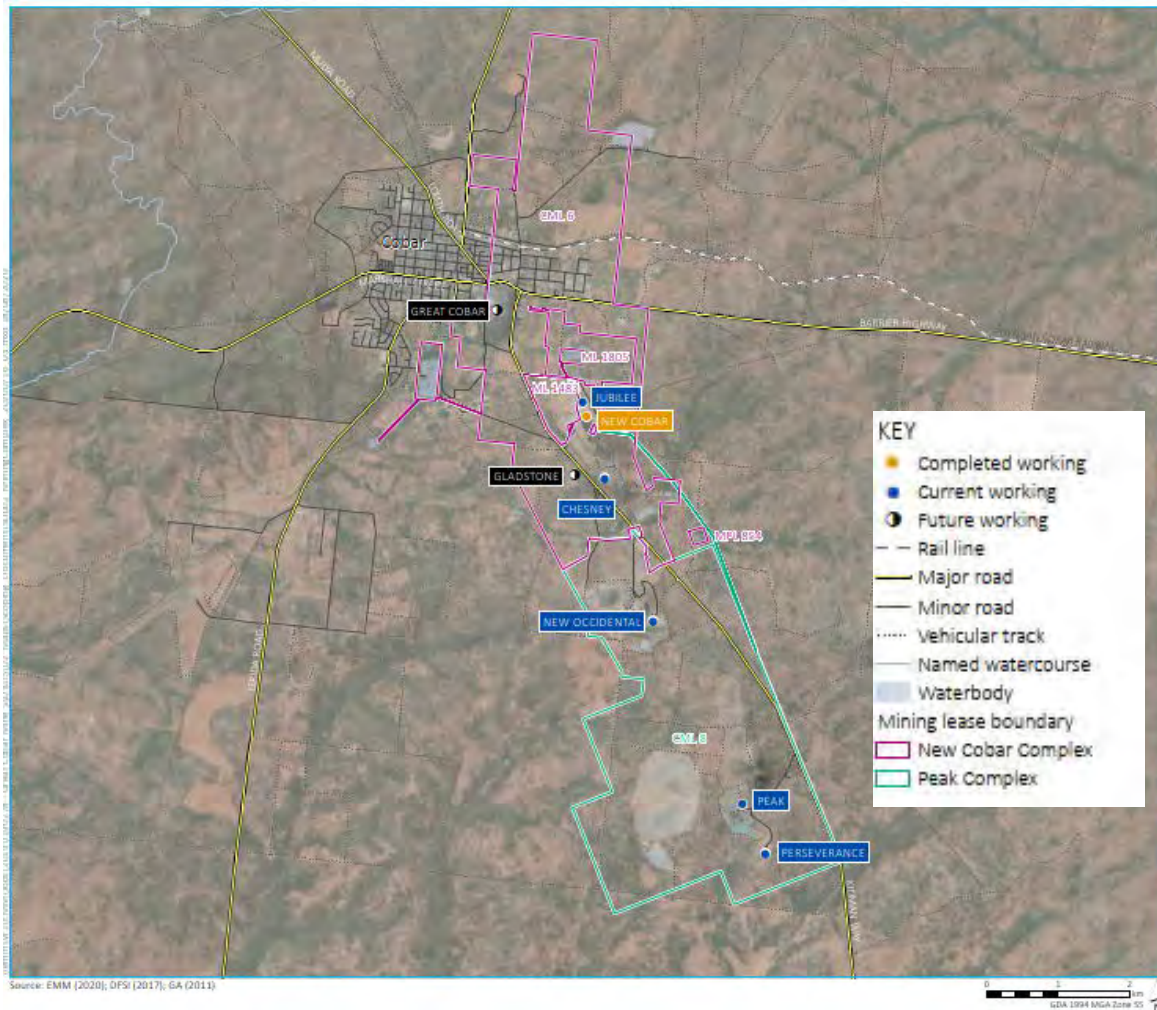


Figure 1-1 Map of New Cobar and Peak Complexes (adapted from Figure 2.1 in EMM 2020a)

⁶ EMM (2020b). Excel spreadsheet 'GCU_metals_results_1hr_24hr_PM10_v2'. Received by SLR from EMM on 23/06/2020. EMM (2020c). Excel spreadsheet 'GCU_metals_TSP_conc_dep_summary_V2'. Received by SLR from EMM on 23/06/2020.

2 HHRA Methodological Considerations

2.1 General

The HHRA broadly follows the guidance provided by the Environmental Health Standing Committee (enHealth 2012a), World Health Organisation (WHO 1999, 2010) and the US Environmental Protection Agency (US EPA 1989a, 1999a) and uses exposure factors as per enHealth (2012b).

The general HHRA methodology follows the steps detailed in enHealth (2012a). These include:

1. *Issue identification:* PGM proposes to modify existing mining operations at the New Cobar Complex. The change in operations may result in a change in exposure of persons in the surrounding area due to altered dust emissions from the Mine site, and/or from associated roadways.
2. *Hazard assessment:*
 - Chemicals of potential concern are metals in the emitted dust (Section 2.2).
 - Dose response has been determined by authoritative bodies (e.g. NHMRC, WHO) where targets for blood concentrations for lead (Pb) (Section 3.2) and toxicity reference values for other metals have been established (Section 4.3).
3. *Exposure assessment:*
 - Adaptation of modelled metal in dust information to calculate potential metal concentrations in soil which were used to inform exposures by the general public⁷ (Section 2.6.2).
 - Use of data from soil/dust sampling undertaken for this HHRA to inform background metal exposures by the general public (Section 2.6.1).
 - Review and application of bioaccessibility information obtained as part of the sampling program undertaken for this HHRA (Section 2.5).
 - Scenario and receptor identification for the general public (Section 2.3 and 2.4). This HHRA does not consider occupational exposures at the mine, only residents, non-mine workers and visitors within Cobar town which may be affected by mine-related dust.
4. *Risk characterisation:*
 - For Pb, potential health impacts are assessed by modelling blood lead (BPb) in children that might result from exposure to Pb in dust associated with the Proposal and comparing the modelled BPb with the NHMRC (2015) blood lead action level of 5 µg/dL (Section 3).

⁷ The general public includes all residents and visitors of Cobar town and nearby surrounds. This HHRA does not consider occupational exposure at the Mine.

- For other metals (Section 4), risk of exceedance of a chronic toxicity reference value (TRV; which has been adjusted for possible 'background' exposures) or chronic air guideline value is judged by examining the hazard quotients (HQ) for individual metals and combined hazard index (HI), excluding Pb⁸. For those metals for which the health effect of concern is cancer, and whose mode of carcinogenic action is by directly altering genetic material (i.e. they are genotoxic)⁹ cancer risk of estimated intakes is judged for relevant metals by comparison with 'acceptable'¹⁰ risk levels.

2.2 Chemicals of Potential Concern

The substances of potential concern associated with the Proposal are dust *per se* (i.e. effects due to the particulate nature and size of dust) and various metals in/on the dust. The risk of exceedance of air quality standards for dust *per se* (as PM₁₀, PM_{2.5}, and TSP – total suspended particles) is considered in the air quality assessment by EMM (2020a)¹¹ and is not addressed in this HHRA.

The chemicals of potential concern for the Proposal that are the subject of this HHRA are metals embedded within the dust generated from mine-related activities (which includes the increased truck movements along Kidman Way).

Due to different risk assessment methodologies and also different public awareness/perception of the hazards the metals have been divided into two groups.

1. Lead (Pb), assessed in Section 3:

Pb is the principal chemical of potential concern (CoPC). This is because Cobar has a long mining history and there is considerable community cognisance of exposure to Pb, particularly by children. However, Cobar has never housed a Pb smelter (a copper smelter operated up until 1920). Prior to the studies undertaken for this HHRA, comprehensive data for existing soil and dust Pb levels in Cobar were lacking. The data collected for this HHRA has confirmed existing Pb levels in soil and dust around Cobar are on average low, relative to the NEPM (2013) residential health investigation level in soil (EMM 2020d). This indicates Pb exposure by the general population in Cobar is also likely to be low. No current or historical data could be found in the publicly available literature for BPb levels in Cobar children.

2. Other metals, assessed in Section 4:

⁸ Pb is excluded from the HI calculations, as it has been assessed separately using estimated blood Pb concentration.

⁹ This approach is in line with guidelines for undertaking health risk assessments in Australia (enHealth 2012a). For most chemicals, a threshold occurs when the dose or exposure has not reached a critical level sufficient to trigger a response. Thus, there is a dose below which there is no risk of adverse health effects. For genotoxic carcinogens, a non-threshold dose-response is generally assumed. This assumes linearity between the lowest experimentally derived dose and the zero dose. This implies there is a calculable probability of an adverse effect (i.e. cancer) no matter how small the dose.

¹⁰ 'Acceptable' total excess cancer risks were taken to be 1×10^{-5} (i.e. 1 in 100,000) as per NEPM (2013) and enHealth (2012a).

¹¹ From the dispersion modelling, the EMM (2020a) report found there will be no predicted exceedances of the NSW EPA air quality impact assessment criteria at any privately owned location of PM_{2.5}, PM₁₀, TSP or dust deposition assessment criteria, either from the Proposal alone or cumulatively. One exceedance additional to the three predicted from background dust alone of the cumulative 24-hour average PM₁₀, 24-hour average PM_{2.5} and annual average PM_{2.5} criteria was predicted to occur at a PGM-owned residence (receptor location R2) (EMM 2020a). Ambient background PM_{2.5} was the major contributor to predicted cumulative concentrations.

Other metals of potential concern (based on mineralogy analysis undertaken for ore) within emitted dust that require assessment are silver (Ag), antimony (Sb), arsenic (As), barium (Ba), beryllium (Be), cadmium (Cd), chromium (Cr), copper (Cu), mercury (Hg), manganese (Mn), nickel (Ni) and zinc (Zn). It should be noted, that as with Pb, these metals within the dust are part of the geology of the mined Cobar ore and are in a mineralised form that requires solubilisation and absorption into the body for potential health effects to occur.

2.3 Exposure scenarios

The existing approval for the New Cobar and Peak Complexes allows an indefinite mine life. Although the Proposal does not propose to alter the approved mine life, it would extend the practical remaining mine life by 12 years from 2023 (approximately 3 remaining years) to 2035 (approximately 15 remaining years).

To be able to discern and assess the incremental metal exposure (i.e. the change in public exposure that might occur from the Proposal), metal emissions associated with existing conditions, with the Proposal, and background emissions have been estimated in the following combinations:

- Scenario 1 (S1): Current operations (including background). This scenario evaluates the health risks from metals in dust for the existing situation. This scenario also includes estimated background metal concentrations in air (for Pb only) and measured background metal concentrations in soil (see Section 2.6.1) from other sources (e.g. previous and currently active mining in Cobar, metals in wind-blown dust from non-mining areas). It assumes the same 'background' exposures will occur for the remainder of the practical mine life (i.e. 2023-2035 or approximately 15 years).
- Scenario 2 (S2): Incremental exposure from the proposal. This scenario assesses the health risk of metals from the Proposal only (i.e. no existing operations and no background included). Thus this scenario excludes any existing metals in soil/dust as well as any metals in air or soil from sources other than the Proposal. It also assumes the same emissions will occur for the duration of the remainder of the practical mine life (i.e. 15 years).
- Scenario 3 (S3): Cumulative proposed situation (including background). This scenario assesses the health risks of metals from the Proposal (S2) plus those from current operations including background (S1). As for the other scenarios, this scenario also assumes emissions will occur for the duration of the remainder of the practical mine life (i.e. 15 years). It is noted background concentrations of metals in air were only available for Pb, thus they have not been included for other metals.

2.4 Receptor locations

Cobar is located 690 km north-west of Sydney and has been a mining town since the late 1880's (Cobar Shire Council 2020). At the 2016 census, the Cobar Local Government Area had a population of approximately 4,700, of which 13.7% were Aboriginal and/or Torres Strait Islander people. The median age of the local population was slightly younger than that of Australia, at 36 years compared to 38. Children aged 0-14 years made up 22.2% of the population (compared to 18.7% across Australia) and people aged 65 years or older made up 13.7% (compared to 15.8% across Australia) (ABS 2020). As a reflection of the level of highest educational attainment, 9% of people in Cobar had bachelor's degree level or above qualifications compared to 22% Australia wide, however median household incomes were slightly higher in Cobar. Almost 28% of those surveyed about their employment stated they worked in the Copper or Gold Ore Mining Sector, compared to 0.1% across Australia¹².

No specific information on the health status of Cobar residents was found. Cobar is classified as Remote under the Accessibility/Remoteness Index for Australia (ARIA). On average, Australians living in rural and remote areas have shorter lives, higher levels of disease and injury and poorer access to and use of health services, compared with people living in metropolitan areas (AIWH 2020). In the 2015 Australian Burden of Disease Study, remote and very remote areas experienced disease burden 1.4 times higher than that of major cities (AIWH 2020). Life expectancy (measured at birth) in remote areas of NSW is approximately 3 years less than that of major cities for women, and 5 years less for men (HealthStats NSW 2019). In 2017-2018, hospitalisations attributable to smoking were approximately double in remote NSW (1127 per 100,000) when compared to major cities (636 per 100,000). Hospitalisations over the same period attributable to high body mass (i.e. overweight or obese) were highest in remote NSW (983 per 100,000) when compared to all other NSW regions (average of 736 per 100,000). Levels of children who have ever had asthma are also higher in remote areas of NSW (24.9%) when compared to the state average (20.6%) (HealthStats NSW 2019).

Prevailing winds in Cobar in the morning are from the East and North-East directions, and the greatest frequency of winds at 3pm are from the South-West direction (BOM 2019) (see Figure 2-1).

¹² Worker health is protected under NSW Work Health and Safety legislation and controls are already implemented through existing Occupational Health and Safety Management Systems at the mine site. For this reason, this HHRA does not consider occupational exposures at the mine, only visitors, non-mine workers and residents within Cobar town which may be affected by mine-related dust.

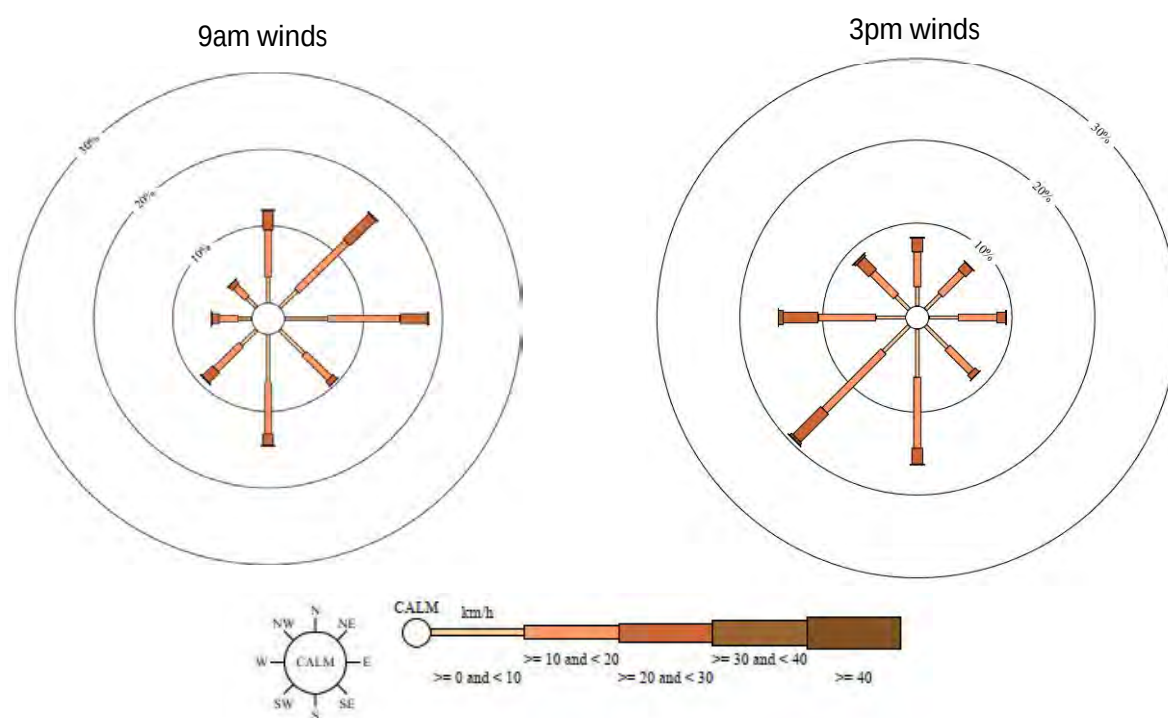


Figure 2-1 Wind roses for Cobar (from BOM 2019)

For the proposal EMM (2020a, b, c) has predicted concentrations for metals in airborne dust, and deposition¹³ of metals to soil, at 40 locations throughout Cobar. The locations include residences, parks, schools, childcare and commercial properties. A description of each location is given in Table 2-1 and Figure 2-2 shows their locations relative to the proposed New Cobar Complex. No relevant receptor locations were identified south of the northern boundary of the Peak Complex, as this area is remote and no residences are located there.

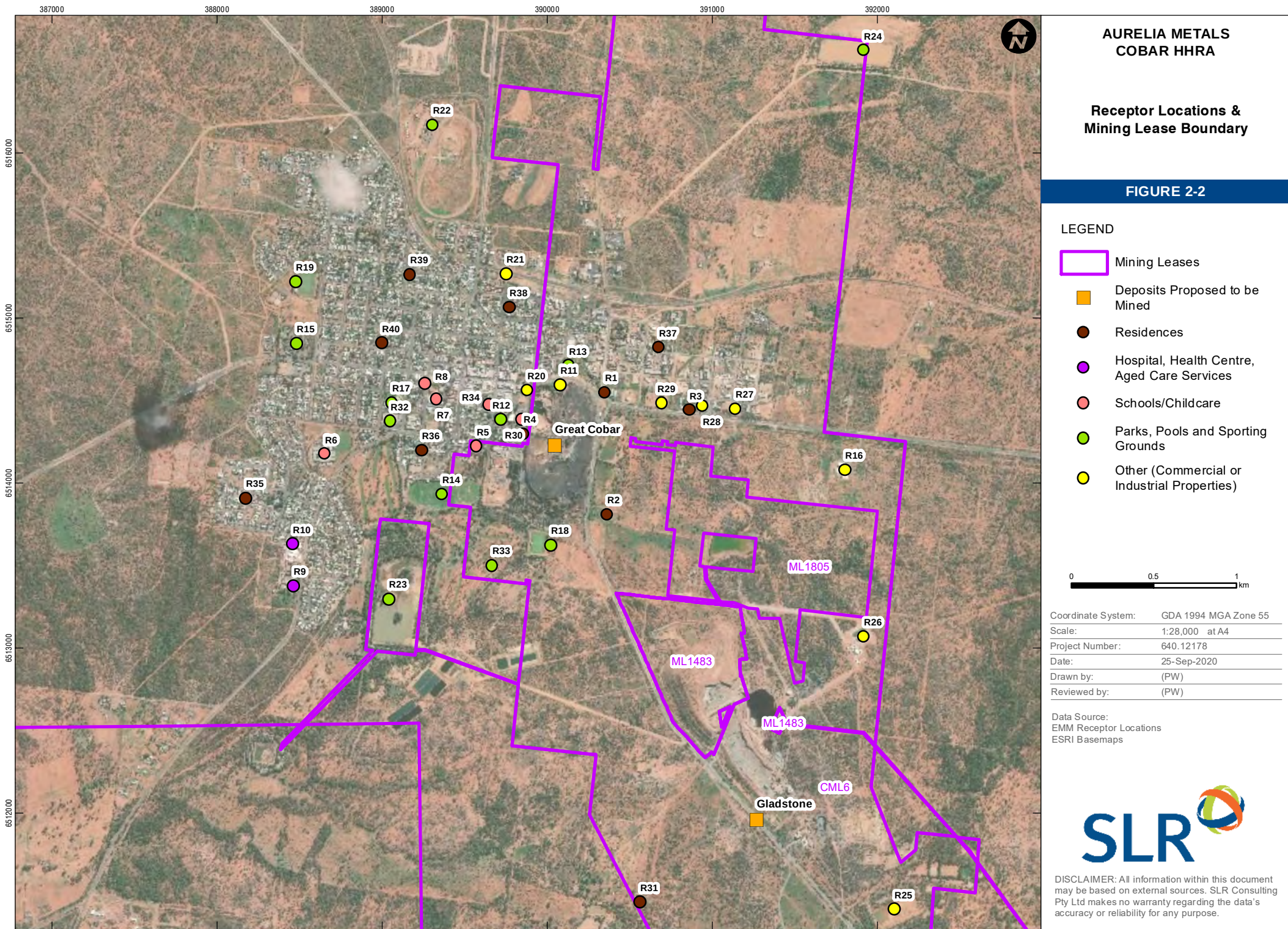
Table 2-1 Descriptions of receptor locations

Receptor ID	Type	Description
R1	Residence	82 Old Bourke Road
R2	Residence	Cornish Town House (owned by PGM)
R3	Residence	13 Nyngan Road
R4	Residence	2-4 Harcourt Street
R5	School/Childcare	Cobar Public School
R6	School/Childcare	Cobar High School
R7	School/Childcare	St Johns Primary School
R8	School/Childcare	Kubby Child Care
R9	Hospital/Health Centre/Aged Care Service	Cobar Hospital
R10	Hospital/Health Centre/Aged Care Service	Lillian Brady Nursing Home
R11	Other (Commercial or Industrial Property)	Great Cobar Heritage Museum

¹³ Modelled by EMM (2020a) as deposition from total suspended particulates (TSP).

Receptor ID	Type	Description
R12	Parks, Pools and Sporting Grounds	Drummond Park
R13	Parks, Pools and Sporting Grounds	Cobar Miners Heritage Park
R14	Parks, Pools and Sporting Grounds	Ward Oval
R15	Parks, Pools and Sporting Grounds	Cobar Caravan Park
R16	Other (Commercial or Industrial Property)	TJ Hospitality Group Accommodation
R17	Parks, Pools and Sporting Grounds	Cobar Swimming Pool
R18	Parks, Pools and Sporting Grounds	Cobar Rugby Club
R19	Parks, Pools and Sporting Grounds	Cobar Rugby Leagues Club
R20	Other (Commercial or Industrial Property)	Cobar Memorial Services Club
R21	Other (Commercial or Industrial Property)	Cobar Railway Station
R22	Parks, Pools and Sporting Grounds	Cobar Race Track
R23	Parks, Pools and Sporting Grounds	Newey Reserve
R24	Parks, Pools and Sporting Grounds	Old Reservoir
R25 ⁽¹⁾	Other (Commercial or Industrial Property)	Young Australia Reservoir ⁽¹⁾
R26	Other (Commercial or Industrial Property)	Water Treatment Plant
R27	Other (Commercial or Industrial Property)	10 Dapville Street
R28	Other (Commercial or Industrial Property)	12 Dunstan Street
R29	Other (Commercial or Industrial Property)	27 Nyngan Street
R30	School/Childcare	Ngali Child Care Centre, Harcourt Street
R31	Residence	Dellavale Residence
R32	Parks, Pools and Sporting Grounds	Cobar Bowling and Gold Club
R33	Parks, Pools and Sporting Grounds	Cobar Golf Course
R34	School/Childcare	Far West Family Day Care
R35	Residence	15 James Plane
R36	Residence	3 Maidens Avenue
R37	Residence	39 Cornish Street
R38	Residence	10 Linsley Street
R39	Residence	24 Leah Street
R40	Residence	49 Becker Street

1. R25 (Young Australia Reservoir) was included in the air modelling due to its past inclusion for the noise modelling assessment. It is, however, a water storage reservoir on the mine lease and not accessible to the public. It has therefore not been included in the HHRA.



2.5 Bioaccessibility

2.5.1 General concepts

Inorganic substances (e.g. metals) occur in soil as a complex mixture of solid phase compounds of varying particle size and morphology. These compounds may include discrete mineral phases, co-precipitated and sorbed species associated with soil minerals or organic matter, and dissolved species that may be complexed by a variety of organic and inorganic ligands (Noller et al. 2017, Ruby et al. 1999). A substance's dissolution properties (and, hence, its propensity to be taken up into the body, i.e. its bioavailability) is therefore largely dependent on the nature of associations within/between these phases. The bioavailability of a given compound can vary considerably between different soils and chemicals.

Oral bioavailability (absolute bioavailability) is defined as the fraction of an orally administered dose of chemical that reaches the systemic circulation (enHealth 2012b, RIVM 2009). The bioavailability of the substance from environmental media is a product of two major processes:

- *Bioaccessibility*: This is the amount of contaminant released from the media (e.g. during digestion in the gastrointestinal tract) that is available to be absorbed through the gastrointestinal tract into the systemic circulation. The solubility of the substance in gastrointestinal media is a major determinant of bioaccessibility.
- *Absorption*: Usually only part of the bioaccessible fraction is transported across the intestinal epithelium to reach the systemic circulation. This is the absorbed fraction.

Thus for a chemical to be absorbed into the systemic circulation it must be in a form available for uptake. For absorption to take place a degree of desorption or dissociation from the medium in which it is present is required, the degree that this can occur is termed the substance's bioaccessibility from the medium (UK EA 2002). For soil, therefore, the bioaccessible fraction that is available for absorption represents the amount of contaminant partitioned from the soil into gastrointestinal fluid.

Estimates of bioaccessibility and overall bioavailability (i.e. bioaccessibility plus absorption) can be determined from experimental studies: *in vitro* systems mimicking biological conditions for bioaccessibility and/or *in vivo* (whole animal) models for bioavailability (enHealth 2012b). There are a number of test protocols for estimating bioaccessibility using *in vitro* digestion models that simulate conditions in various compartments of the gastrointestinal tract (saliva, stomach, small intestine). enHealth (2012b), Noller et al. (2017), RIVM (2009), UK Environment Agency (2002, 2005) and Van de Wiele et al. (2007) describe the protocols for many of these test systems.

One such protocol, which was employed in the metal bioaccessibility testing undertaken for this HHRA (see Section 2.5.2) is the Solubility Bioaccessibility Research Consortium (SBRC) method, which is very similar to the Physiologically Based Extraction Test (PBET). The PBET and SBRC tests are two-stage digestion systems using various enzymes and solutes to simulate leaching of a substances from solid matrix in the human stomach and small intestine under fed and fasting conditions. The PBET was designed around paediatric gastrointestinal tract parameters for a 2-3 year old child. The analytical sequence includes a 1-hour gastric phase extraction and a 2-hour intestinal phase. In a recent application of the technique (Noller et al. 2017), an average pH representing the fasted, semi-fed, and full-fed states of the stomach and the near neutral pH of the intestine was selected to provide an intermediate between fasting and fed states (i.e. a total of four different pH were tested: 1.3, 2.5, 4.0 and 7.0). This represents a more realistic exposure scenario of daily life rather than the more conservative assumption that exposure only occurs during the fasted state (Noller et al. 2017). The SBRC method undertaken for the samples collected for this investigation uses two different pHs, i.e. the more conservative fasted stomach pH of 1.5, and an intestinal pH of 6.5-7, and bioaccessibilities are reported at both pHs.

PBET validation has been undertaken for Pb (1,388 – 10,230 mg/kg) and As (170 – 3,900 mg/kg) using *in vivo* oral bioavailability studies in rats, rabbits or monkeys (Ruby et al. 1996). On entering the small intestinal phase, solubilised Pb decreased by $74 \pm 18\%$, consistent with extensive adsorption and precipitation reactions removing Pb from solution as the pH increases. Relative Pb bioaccessibility from the PBET test and Pb bioavailability in rats were compared using linear regression. At a simulated stomach pH of 2.5, this model yielded an r^2 of 0.93 ($n=7$) based on bioaccessibility calculated from the stomach phase data and an r^2 of 0.76, based on the small intestinal phase data (Ruby et al. 1996). Bruce et al. (2007) have used the PBET model in a risk assessment for assessing the bioavailability of Pb and As in mine waste from a Queensland mining operation and it has been applied in assessment of heavy metals (including Pb) at the Leichhardt River in Queensland (Noller et al. 2009) and in a recently published health risk assessment of Pb in Mount Isa (Noller et al. 2017). Noller et al. (2017) measured the rat *in vivo* bioavailability of Pb in 10 samples of soil/dust collected in Mount Isa, and found all of these to be <5% bioavailable. When the *in vitro* PBET data were fitted to the *in vivo* data, the results showed that the *in vivo* rat bioavailability of a sample was less than 20% its PBET bioaccessibility (determined using the average of four pHs as noted above). Noller et al. (2017) advocate that their study indirectly confirms that use of gastric-only bioaccessibility data over-predicts Pb bioavailability in children.

Following solubilisation in the stomach, metals are transferred with nutrients from food to the intestine where absorption of metals occurs. Metal absorption occurs via the intestinal phase and not from the gastric/stomach phase where solubilisation occurs (Noller et al. 2017). Therefore, in a simple SBRC test as has been used for this HHRA, the intestinal phase bioaccessibility determination (at a pH of 6.5-7.0) is likely more reflective of true bioaccessibility than gastric phase bioaccessibility (at a pH of 1.5). For this reason, the intestinal phase bioaccessibility data have been used in this HHRA where it was available (for As, only results for the gastric phase were provided).

For Pb, typically bioaccessibility is translated into an absolute bioavailability after taking into account 50% absorption of soluble Pb by children (US EPA 1999b, ATSDR 2007a). However due to the uncertainty in the correlation between the SBRC intestinal bioaccessibility obtained for the samples collected in Cobar for this investigation in 2020 and the corresponding *in vivo* bioavailability, this additional adjustment (i.e. *in vivo* bioavailability = 0.5 x intestinal bioaccessibility) has not been made in this HHRA. The intestinal bioaccessibility was assumed to be equal to the *in vivo* bioavailability.

2.5.2 Data used in the HHRA

For this HHRA, a sampling program was undertaken by EMM to acquire information with respect to metal bioaccessibility of soils/dusts around Cobar. The program involved collection of 30 samples in residential and recreational areas around Cobar (COB_001-COB_030), 13 samples from various locations on the mine site (PGM_001 to PGM_005, PGM_007, PGM_009 to PGM_015), one sample near the water treatment plant located on the mine lease (PGM_008), and three samples collected upwind of the mine site designated 'background' but not within the Cobar township (PGM_006, PGM_016 and PGM_017) (see Figure 2-3 and Figure 2-4). Of these, seven samples (six from Cobar township and one from the ROM pad on the mine site) were subjected to Pb and As bioaccessibility testing by the SBRC method at the Future Industries Institute of the University of South Australia (see circled locations in Figure 2-3 and Figure 2-4). Table 2-2 provides the bioaccessibility results for each sample as well as the values used in the HHRA. The soil/dust sampling campaign methodology and analytical certificates of analysis are provided in EMM (2020d) which has been appended as Appendix L.

The Pb intestinal and As gastric bioaccessible fraction of most samples was less than the laboratory limit of reporting, which did not enable calculation of bioaccessibility for these samples. The maximum bioaccessibility (intestinal for Pb, gastric for As) measured in any of the seven samples was chosen for use in the HHRA (Table 2-2).

As discussed in Section 2.5.1, due to the uncertainty in the correlation between the SBRC intestinal Pb bioaccessibility obtained for the samples collected by EMM and the corresponding *in vivo* bioavailability, additional adjustment to account for less than 100% absorption of Pb from the gastrointestinal tract has not been made in this HHRA. The intestinal bioaccessibility for Pb was assumed to be equal to the *in vivo* bioavailability. The impact on the HHRA conclusions of incorporating 50% absorption into the intestinal bioaccessibility results for Pb and/or using the gastric bioaccessibility instead of intestinal bioaccessibility data for Pb has been explored in the sensitivity analysis (Section 3.6).

Table 2-2 Bioaccessibility (%) of metals in Cobar soils/dusts collected in 2020

Soil/dust sample location ⁽⁴⁾	Location description	Metal concentration (mg/kg)		Bioaccessibility (%)					
		Lead ⁽²⁾	Arsenic ⁽³⁾	Lead		Arsenic		Used in HHRA	
				Gastric	Intestinal	Gastric	Intestinal	Lead	Arsenic
PGM_005	New Cobar – ROM Pad	3,600	180	19.0	6.0	3.8	-	Maximum intestinal: 6.0%	Maximum: 3.8%
COB_001	Residence, 82 Old Bourke Rd – beside fence in driveway	190	50	42.9	2.9	3.3	-		
COB_005	Cobar Public School – mud kitchen	8.0	4.5	36.7	<LOR ⁽¹⁾	<LOR ⁽¹⁾	-		
COB_006	Cobar Public School – next to picnic table in top quad	29	13	36.7	<LOR ⁽¹⁾	<LOR ⁽¹⁾	-		

Soil/dust sample location (4)	Location description	Metal concentration (mg/kg)		Bioaccessibility (%)					
		Lead (2)	Arsenic (3)	Lead		Arsenic		Used in HHRA	
				Gastric	Intestinal	Gastric	Intestinal	Lead	Arsenic
COB_010	Golf course – next to fairway near creek	70	6.6	65.7	5.9	<LOR (1)	-		
COB_018	Rugby Club, Lewis Street – beside spectator seats near clubhouse	31	4.7	51.7	<LOR (1)	<LOR (1)	-		
COB_030	Ngali Preschool	12	4.1	62.5	<LOR (1)	<LOR (1)	-		

Data from soil sampling program described in EMM (2020d), attached in Appendix L. COB samples are from the general Cobar township area, the PGM sample in the table was collected from the ROM pad on the mine site. See also Figure 2-3 and Figure 2-4 for soil sampling locations.

¹ Bioaccessible fraction was found to be below the laboratory limit of reporting (LOR) of 1 mg/kg, as reported in the bioaccessibility testing report (see Appendix L). The method actually analyses the concentration in mimicked gastrointestinal fluid by ICP:MS and the analysts use the result in solution and convert this back to a solid concentration by multiplying by the soil:solution ratio of 100, and the dilution of 10 (therefore a total multiplication factor of 1000 is applied to what is in solution).

² Lead concentrations in the 30 soil samples taken around Cobar township ranged from 7.3 to 370 mg/kg (average 55 ± 77 mg/kg). In the samples taken around the mine lease (13 samples, 21 data points including field duplicates), lead concentrations ranged from 8 to 3,600 mg/kg (average 736 ± 1153 mg/kg). Detailed results for each sampling location are provided in EMM (2020d), attached as Appendix L.

³ Arsenic concentrations in the 30 soil samples taken around Cobar township ranged from 2.4 to 50 mg/kg (average 8.1 ± 9.8 mg/kg). In the samples taken around the mine lease (13 samples, 21 data points including field duplicates), arsenic concentrations ranged from 3 to 230 mg/kg (average 65 ± 77 mg/kg). Detailed results for each sampling location are provided in EMM (2020d), attached as Appendix L.

⁴ Soil sampling locations COB_001, COB_005, COB_006, COB_018, and COB_030 correspond to modelled receptor locations R1, R5, R6, R18, and R30 respectively (see also Section 2.6.1). All samples were surface sweepings with metal analysis undertaken for the <250 µm fraction, i.e. the fraction most likely to be incidentally ingested by children (see EMM 2020d in Appendix L for detailed description of sampling methodology).

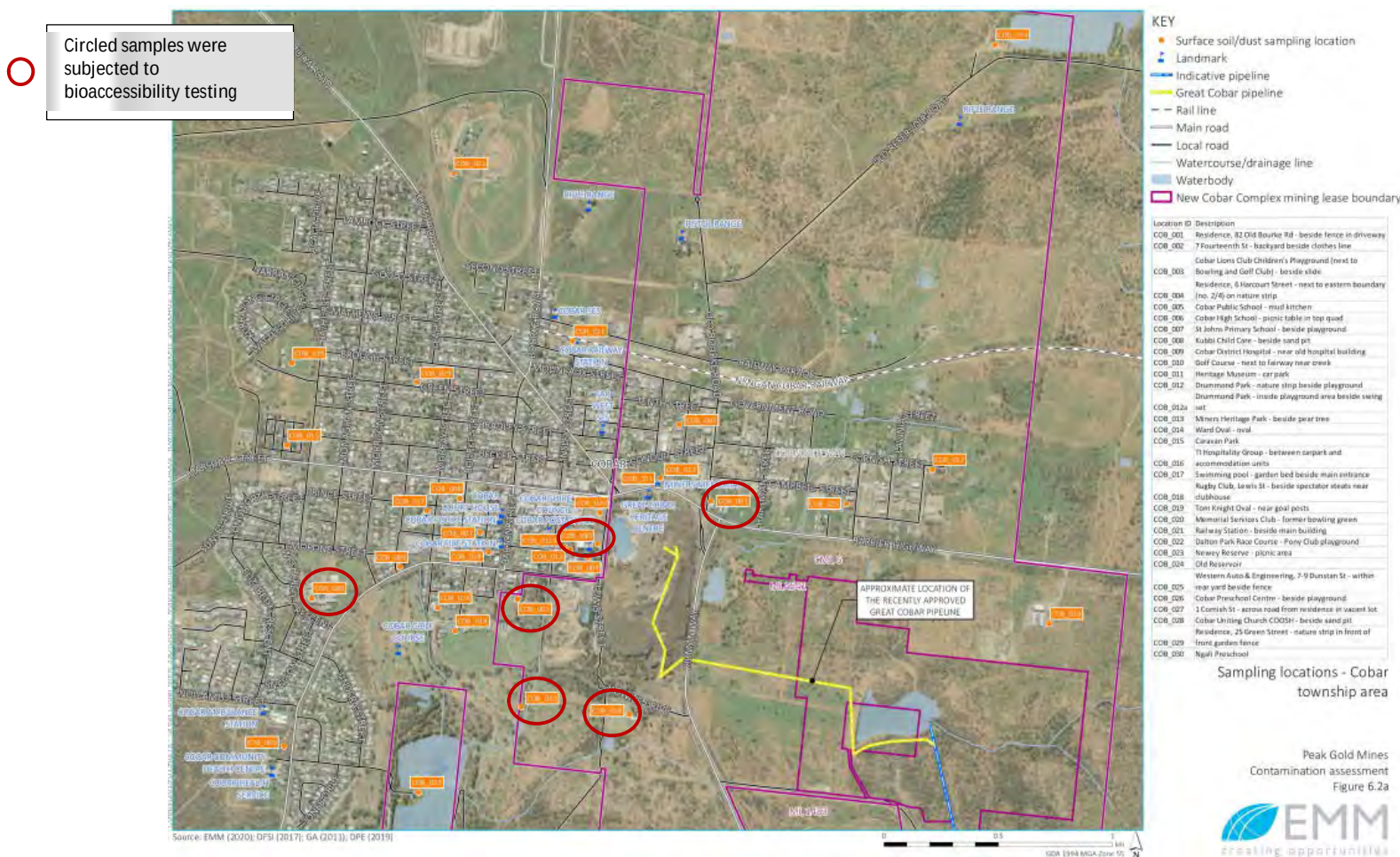


Figure 2-3 Soil sampling locations in Cobar township (adapted from EMM 2020d, Figure 6.2a)

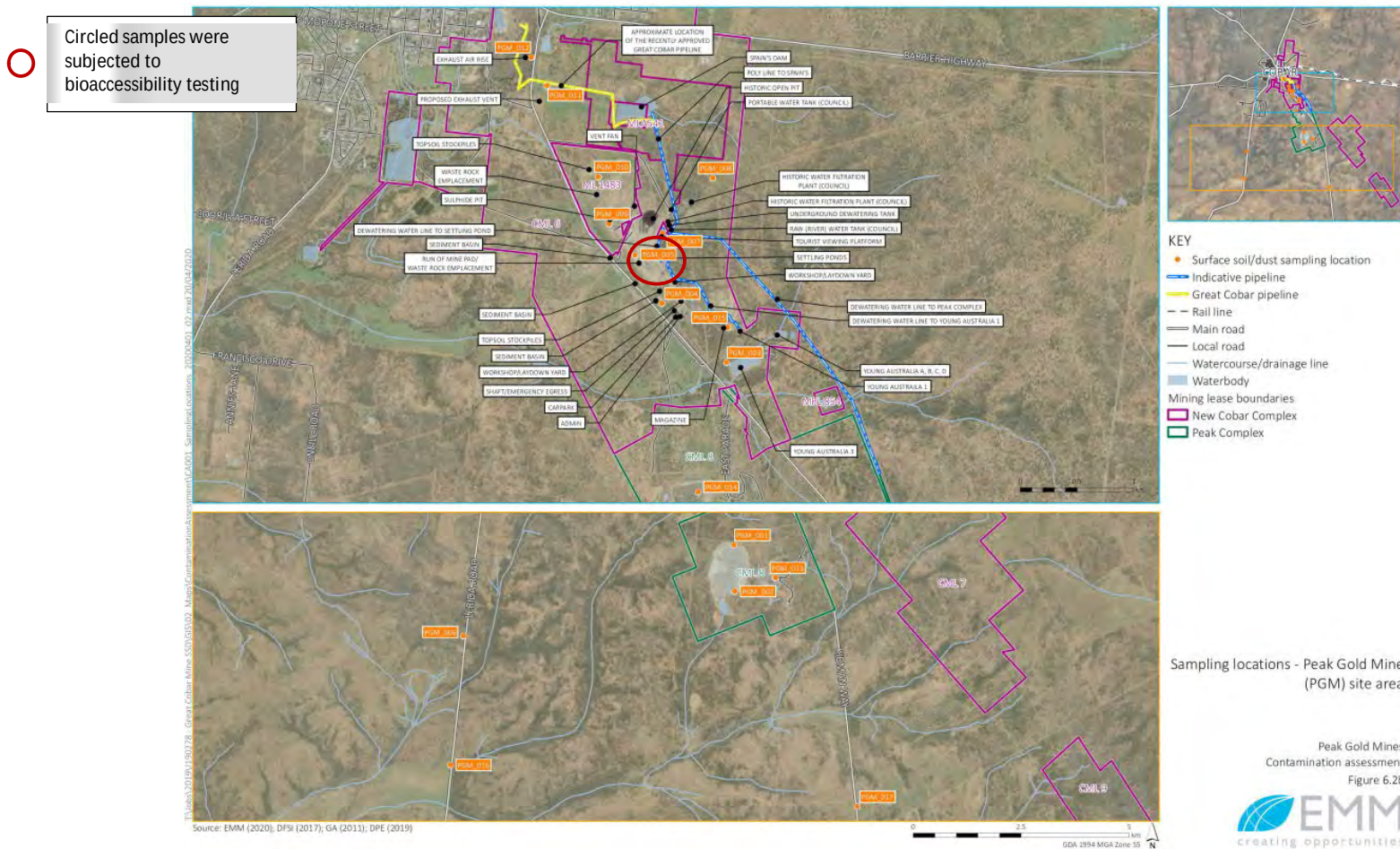


Figure 2-4 Soil sampling locations at Peak Gold Mine site (adapted from EMM 2020d, Figure 6.2b)

2.6 Soil metal concentrations

2.6.1 Existing soil concentrations

No existing data were found in the publicly available literature for soil/dust metal concentrations in residential areas of Cobar. For this reason, a sampling program was undertaken by EMM to acquire information. As outlined in Section 2.5.2, the program involved collection of 30 samples in residential and recreational areas around Cobar (COB_001 to COB_030), 13 samples from various locations on the mine site (PGM_001 to PGM_005, PGM_007, PGM_009 to PGM_015), one sample near the water treatment plant located on the mine lease (PGM_008), and three samples collected upwind of the mine site designated 'background' but not within the Cobar township (PGM_006, PGM_016-PGM_017) (see Figure 2-3 and Figure 2-4 for sampling locations). The sampling locations were matched as closely as possible with some of the receptor locations selected for the HHRA (Section 2.4). The sampling methodology, quality control aspects and certificates of analysis are provided in EMM (2020d).

The results of this sampling program helped inform the existing soil/dust metal concentrations at the selected receptor locations used in the HHRA (see Table 2-3).

It is apparent from Table 2-3 that existing concentrations of metals/metalloids in Cobar (all samples with 'COB' designator) are relatively low, with most (or all) samples returning concentrations less than the respective limits of reporting for some elements (i.e. Ag, Sb, Be, Cd, and Hg). Existing soil/dust concentrations of Pb are also relatively low in most locations when compared to the residential soil health investigation level of 300 mg/kg from NEPM (2013). This suggests that past and present mining activities near Cobar have not caused widespread contamination of town soil/dust.

The air quality modelling conducted by EMM (2020a) has incorporated background dust (i.e. TSP) deposition levels at all receptor locations based on measured data obtained south of Cobar and west of the proposed New Cobar Complex.

Table 2-3 Existing soil metal concentrations (µg/g) at receptor locations used in HHRA

Receptor Location	Closest Sampling Location ⁽¹⁾	Metal/Metalloid												
		Pb	Ag	Sb	As	Ba	Be	Cd	Cr ^{III} ⁽³⁾	Cu	Hg	Mn	Ni	Zn
R1	COB_001	190	0.4	<10	50	130	<2	<0.4	26	370	0.1	300	17	300
R2	PGM_011	60	<0.2	<10	7.9	47	<2	<0.4	36	280	<0.1	230	13	100
R3	COB_025	200	0.6	<10	7.6	410	<2	0.7	48	1,000	<0.1	400	39	780
R4	COB_004	370	1.0	<10	27	150	<2	0.8	33	1,100	0.3	290	14	580
R5	COB_005	8.0	<0.2	<10	4.5	52	<2	<0.4	14	15	<0.1	190	8.2	26
R6	COB_006	29	<0.2	<10	13	54	<2	<0.4	16	62	<0.1	110	5.6	76
R7	COB_007	25	<0.2	<10	4.2	540	<2	<0.4	30	54	<0.1	190	40	110
R8	COB_008	8.7	<0.2	<10	2.8	31	<2	<0.4	11	20	<0.1	140	5.8	32
R9	COB_009	26	<0.2	<10	4.4	43	<2	<0.4	23	150	<0.1	120	5.3	120
R10	COB_009	26	<0.2	<10	4.4	43	<2	<0.4	23	150	<0.1	120	5.3	120
R11	COB_011	25	<0.2	<10	5.0	84	<2	<0.4	30	77	<0.1	240	12	62
R12	COB_012A	57	<0.2	<10	8.3	44	<2	<0.4	23	120	<0.1	130	8.9	120
R13	COB_013	25	<0.2	<10	2.9	55	<2	<0.4	17	42	<0.1	130	6.4	33
R14	COB_014	73	<0.2	<10	22	50	<2	<0.4	33	92	<0.1	210	8.8	98
R15	COB_015	22	<0.2	<10	2.8	54	<2	<0.4	23	55	<0.1	63	5.4	78
R16	COB_016	12	<0.2	<10	2.7	60	<2	<0.4	27	32	<0.1	150	13	38
R17	COB_017	31	<0.2	<10	5.5	76	<2	<0.4	24	120	<0.1	150	11	120
R18	COB_018	31	<0.2	<10	4.7	57	<2	<0.4	27	71	<0.1	220	11	120
R19	COB_019	14	0.2	<10	5.1	50	<2	<0.4	24	46	<0.1	160	8.7	63
R20	COB_020	31	<0.2	<10	5.0	50	<2	<0.4	28	92	<0.1	300	11	140
R21	COB_021	33	<0.2	<10	2.8	16	<2	<0.4	17	25	<0.1	33	<5	79
R22	COB_022	15	<0.2	<10	3.2	51	<2	<0.4	23	26	<0.1	87	9.1	41

Receptor Location	Closest Sampling Location ⁽¹⁾	Metal/Metalloid												
		Pb	Ag	Sb	As	Ba	Be	Cd	Cr ^{III} ⁽³⁾	Cu	Hg	Mn	Ni	Zn
R23	COB_023	26	<0.2	<10	4.9	110	<2	<0.4	20	73	<0.1	290	13	72
R24	COB_024	13	<0.2	<10	2.4	42	<2	<0.4	20	19	<0.1	84	11	35
R25 ⁽⁴⁾	PGM_003	120	<0.2	<10	10	78	<2	<0.4	37	200	0.2	300	11	44
R26	PGM_008	11	<0.2	<10	3.9	28	<2	<0.4	27	69	<0.1	56	7.7	39
R27	COB_027	32	<0.2	<10	4.4	39	<2	<0.4	26	67	<0.1	100	11	65
R28	COB_025	200	0.6	<10	7.6	410	<2	0.7	48	1,000	<0.1	400	39	780
R29	COB_025	200	0.6	<10	7.6	410	<2	0.7	48	1,000	<0.1	400	39	780
R30	COB_030	12	<0.2	<10	4.1	61	<2	<0.4	14	17	<0.1	280	9.5	34
R31	PGM_008 ⁽²⁾	11	<0.2	<10	3.9	28	<2	<0.4	27	69	<0.1	56	7.7	39
R32	COB_017	31	<0.2	<10	5.5	76	<2	<0.4	24	120	<0.1	150	11	120
R33	COB_014	73	<0.2	<10	22	50	<2	<0.4	33	92	<0.1	210	8.8	98
R34	COB_012A	57	<0.2	<10	8.3	44	<2	<0.4	23	120	<0.1	130	8.9	120
R35	COB_009	26	<0.2	<10	4.4	43	<2	<0.4	23	150	<0.1	120	5.3	120
R36	COB_026	38	<0.2	<10	5.1	100	<2	<0.4	23	35	<0.1	200	10	75
R37	COB_002	130	0.3	<10	7.5	86	<2	0.4	30	250	<0.1	190	11	360
R38	COB_021	33	<0.2	<10	2.8	16	<2	<0.4	17	25	<0.1	33	<5	79
R39	COB_029	80	<0.2	<10	5.2	69	<2	<0.4	18	140	<0.1	130	10	190
R40	COB_029	80	<0.2	<10	5.2	69	<2	<0.4	18	140	<0.1	130	10	190

Highlighted cells indicate those which present data on the mine lease.

1. It has been assumed soil concentrations are similar to the concentration measured at the closest sampling location. If concentrations were less than the limit of reporting, they were assumed to be at half the limit of reporting for the HHRA calculations.
2. No soil/dust sample was collected in the vicinity of the residence at R31. The closest samples to R31 is PGM_003, but this sample is from the embankments of a mine water storage pond. Such a disturbed area is unlikely to be representative of the soil/dust metal concentrations at the R31 residence. The closest sampling location, which is less likely to be directly disturbed by mine activities, is PGM_008 (the water treatment plant).
3. Soil/dust sampling showed there was no measurable hexavalent chromium in any of the soil/dust samples (EMM 2020d). All measurable chromium was present as trivalent chromium (i.e. Cr^{III}).
4. R25 (Young Australia Reservoir) was included in the air modelling due to its past inclusion for the noise modelling assessment. It is, however, a water storage reservoir on the mine lease and not accessible to the public. It has therefore not been included in exposure estimates undertaken in this HHRA.

2.6.2 Calculation of metal concentrations in soil from deposition data

For each scenario evaluated in this HHRA (Section 2.3), SLR was provided with estimates of annual deposition of Pb and 12 other metals/metalloids at each of the 40 receptor locations (Section 2.4).

For practical purposes metals in soil are chemically stable (i.e. they intrinsically have an infinite environmental life); the physical processes likely to remove deposited metals from soil, i.e. decrease exposure, at a given location are:

- wind erosion,
- transportation by rain, i.e. washing surface soil metal laden particles away from receptor soil,
- rain causing infiltration of metals to deeper soil so exposure is reduced (essentially cleansing the top soil layer), and
- removal or capping of the topsoil layer as part of remediation works.

The concentration of metals in soil was calculated using the Equations in Table 2-4 below (in US EPA 2005). The deposition rate ($M_{ann\ dep}$) for each metal was sourced from data spreadsheets provided by EMM (2020c), values for other parameters are those recommended by US EPA (2005) for untilled (non-agricultural) soil, or data specific for Cobar (where available). The equation incorporates physical loss from the soil due to surface water runoff. Other loss processes typically included by US EPA (2005), i.e. biotic and abiotic degradation, soil erosion, leaching, and volatilisation, were either considered not applicable to metals in soil or were assumed to be zero due to lack of specific information to enable their inclusion.

Based on a study that profiled dioxin measurements in soil, the US EPA (2005) recommend a soil mixing depth of 2 cm for untilled soils. This mixing depth has been adopted in estimating soil metal concentrations at receptor locations after the approximate 15 years of remaining practical operation at Peak Gold Mine (see Section 2.3).

Table 2-4 Equations and Parameter Values for Estimating Soil Metal Concentration from Deposition Data

Parameter	Acronym	Units	Value	Basis/Description
Equation 1 ⁽¹⁾ : $C_s = \frac{100 \times M_{ann\ dep} \times [1 - \exp(-ks \times tD)]}{D \times B \times D \times ks}$			Equation 2 ⁽²⁾ : $ks = ksg + kse + ksr + ksl + ksv$	
Equation 3 ⁽³⁾ : $ksr = \frac{RO}{\theta_{SW} \times D} \times \left[\frac{1}{1 + \left(\frac{Kd_s \times BD}{\theta_{SW}} \right)} \right]$			Equation 4 ⁽⁴⁾ : $RO = \frac{(P - 0.2S)^2}{(P + 0.8S)} \times 2.54$	
Equation 5 ⁽⁵⁾ : $S = \frac{1000}{CN} - 10$				
Soil metal concentration after 15 years of remaining mine life	C_s	µg metal/ g soil	Calculated using Equation 1.	
Conversion factor	100	(µg/g) (cm ² /m ²) ⁻¹	100	Conversion factor [(10 ⁶ µg/g)/(10 ⁴ cm ² /m ²)]
Annual metal deposition	$M_{ann\ dep}$	g/m ² /year	Receptor & scenario specific (see Appendix D).	Annual metal deposition from dust (i.e. TSP) onto receptor location soil. Provided by EMM (2020c).

Parameter	Acronym	Units	Value	Basis/Description
Metal soil loss constant due to all processes	ks	year ⁻¹	Calculated using Equation 2.	
Time period over which deposition occurs	tD	years	15	Assumed to occur for approximate period of practical remaining mine life (i.e. 2020-2035).
Soil mixing zone depth	D	cm	2	Default soil mixing depth recommended by US EPA (2005) for untilled soils.
Bulk density of soil	BD	g/cm ³	1.5	Recommended default from US EPA (2005). US EPA guidance states literature values for soil bulk density range from 0.93-1.84 g/cm ³ , depending on soil type. It is not stated what soil type coincides with a value of 1.5 g/cm ³ , and the original references were not available to SLR to verify the value selected. Therefore, the default value used by the US EPA (2005) has been adopted on face value in this risk assessment.
Metal loss constant due to biotic and abiotic degradation	ksg	year ⁻¹	0	Negligible degradation of metals/metalloids is considered to occur.
Metal loss constant due to soil erosion	kse	year ⁻¹	0	Data for Cobar were not available to calculate loss from soil erosion, therefore this was assumed to be zero.
Metal loss constant due to surface runoff	ksr	year ⁻¹	Metal/metalloid specific. Calculated using Equation 3.	
Metal loss constant due to leaching	ksl	year ⁻¹	0	Losses of metals from soil due to leaching depends on the amount of water available to generate leachate as well as the properties of the soil. Data for irrigation rates in Cobar were not available. If no irrigation is assumed to occur, then leaching is dependent on annual rainfall. Back-of-the envelope calculations using the annual average rainfall in Cobar revealed metal loss due to leaching makes negligible contribution to the overall loss constant, therefore for simplicity this was assumed to be zero.
Metal loss constant due to volatilisation	ksv	year ⁻¹	0	Volatilisation of metals/metalloids is not expected to occur.
Average annual surface runoff from pervious areas	RO	cm/yr	Estimated for Cobar using the Curve Number Equation developed by USDA (1986, Eq. 2-3), reproduced as Equation 4. Curve numbers are assigned to an area based on soil type, land use cover and hydrologic conditions of the soil.	
Soil volumetric water content	θ_{sw}	mL water/cm ³ soil	0.2	Default value in US EPA (2005).
Soil/water partition coefficient	Kd _s	mL water/g soil	Metal/metalloid-specific.	Soil/water partition coefficients as provided by US EPA (2019), used by US EPA to calculate soil screening guidelines ⁽⁶⁾ .

Parameter	Acronym	Units	Value	Basis/Description
Conversion factor from inches to centimetres	2.54	cm/inch	2.54	Conversion factor from inch to cm.
Annual rainfall	P	inches/yr	15.4	Mean annual rainfall in Cobar is 390mm/year, i.e. 15.4 inches/yr (BoM 2020).
Potential maximum retention after runoff begins	S	inches	This variable is related to the soil and cover conditions of the watershed through curve numbers. Calculated using Equation 5.	
Curve Number relating direct runoff to rainfall.	CN	inches	61	The major factors that determine CN are hydrologic soil group, cover type, treatment, hydrologic condition and antecedent runoff condition. USDA (1986) provides values for CN which represent average runoff conditions for urban, cultivated agricultural, other agricultural and arid or semi-arid rangeland uses. The CN selected for this HHRA was provided in Table 2-2a of USDA (1986) for: - Hydrologic soil group A (i.e. sand, loamy sand, or sandy loam), since Cobar soils are primarily gravelly silt or sandy fill material (EMM 2020d). - Residential districts of 1/4 acre (i.e. ~1,000 m²). Most residential properties in Cobar are of this size as determined by satellite observation (via Google® Maps).
1. Based on US EPA (2005, Equation 5-1). 2. Based on US EPA (2005, Equation 5-2A). 3. Based on US EPA (2005, Equation 5-4). 4. Based on USDA (1986, Equation 2-3). 5. Based on USDA (1986, Equation 2-4). 6. They are (mL/g): 83 for Ag, 29 for As, 41 for Ba, 790 for Be, 75 for Cd; 1,800,000 for Cr (+3), 35 for Cu, 65 for Mn, 52 for Hg; 1,900 for Ni (from US EPA 1996a at soil pH of 8.0), 900 for Pb, 45 for Sb, and 62 for Zn.				

As outlined in Section 2.6.1, the modelling undertaken for metal deposition (for Scenarios 1 and 3) incorporates contribution of 'background' sources to metal deposition.

Equation 1 in Table 2-4 was adapted as per the Equation in Table 2-5 below to enable calculation of the existing soil metal concentrations at the end of the remaining 15-year practical mine life after incorporating soil metal loss due to surface runoff.

Table 2-5 Equations and Parameter Values for Estimating Existing Soil Metal Concentration after Accounting for Loss at End of Remaining Practical Mine Life

Parameter	Acronym	Units	Value	Basis/Description
Equation 1 ⁽¹⁾ : $C_{s_existing(end)} = C_{s_existing} - C_{s_existing} \times [1 - \exp(-ks \times tD)]$				
Existing (i.e. 'background') soil metal concentration after 15 years of remaining practical mine life	$C_{s_existing(end)}$	mg metal/ kg soil	Calculated using Equation 1.	
Existing (i.e. 'background') soil metal concentration	$C_{s_existing}$	mg metal/ kg soil	Varies for each metal and location. See Table 2-3.	
Time period over which deposition occurs	tD	years	15	Assumed to occur for approximate period of remaining practical mine life (i.e. 2020-2035).
Metal soil loss constant due to all processes	ks	year ⁻¹	Calculated using Equation 2 in Table 2-4.	
1. Adapted from US EPA (2005, Equation 5-1).				

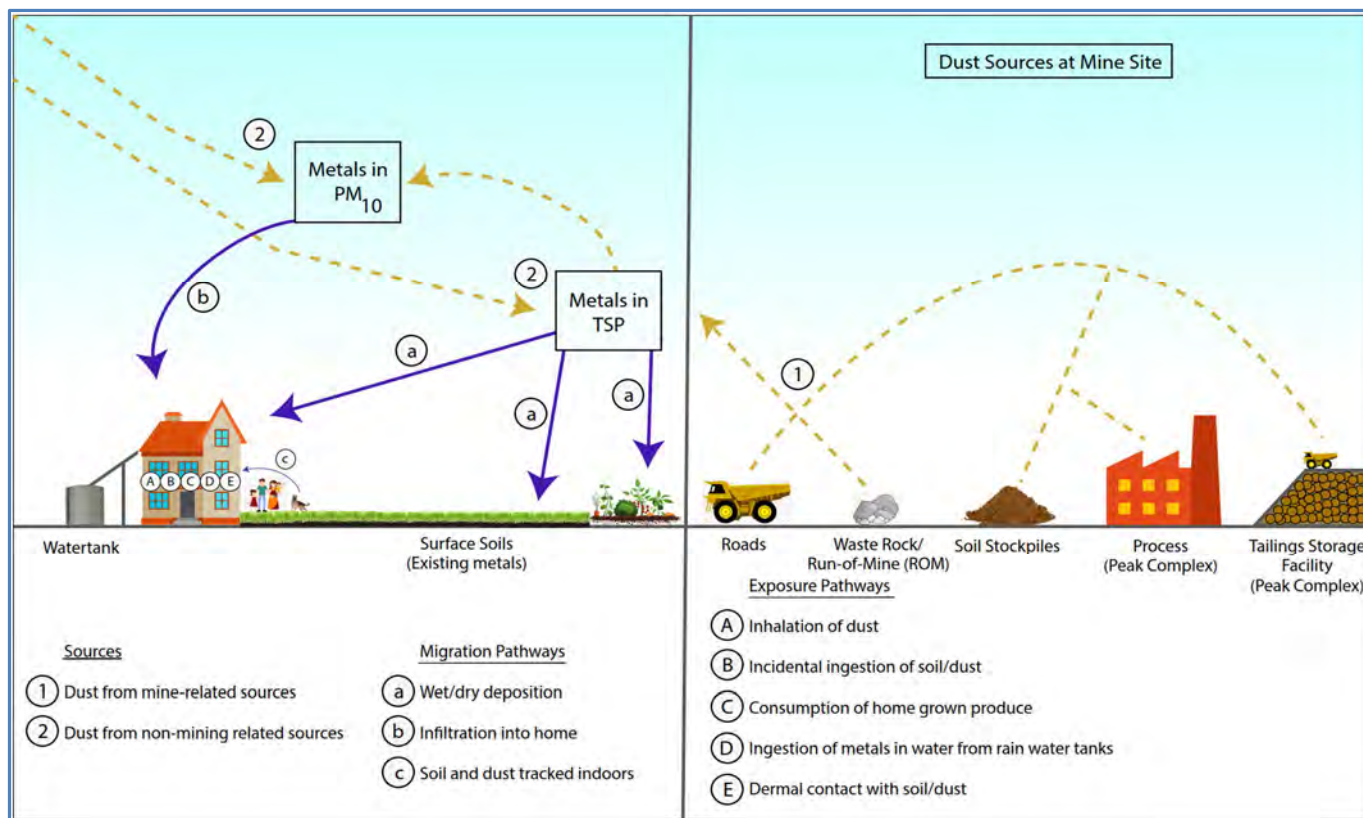
2.7 Conceptual model for exposure to metals in dust

Conceptual exposure pathways considered for mine-derived¹⁴ Pb and other metals are summarised in Figure 2-5. At the receptor locations, exposure to mine derived metal may occur via incidental ingestion of soil, incidental ingestion of indoor dust which has either been tracked in or which has infiltrated from outdoor air, inhalation of indoor and/or outdoor airborne dust, ingestion of tank water containing metal deposited as dust on roofs, or consumption of vegetables or fruits grown in home garden soil. Although dermal contact with metal-containing soil and dust could theoretically occur, dermal absorption of inorganic metals is considered to be a minor route of entry into the body¹⁵ (ATSDR 2007a, b; US EPA 2006, RIVM 2007, UK EA 2009) and was therefore not considered in this report. The remaining exposure pathways have been included quantitatively in exposure estimates where relevant.

¹⁴ Non mine sources of Pb or other metal exposure, such as Pb paint in soil or indoors from renovating houses, or from hobbies involving Pb, are not included in the assessment. It is however recognised that these may contribute to existing soil Pb concentrations and biomonitoring data for Pb.

¹⁵ For example, for soluble inorganic Pb (e.g. Pb acetate) dermal absorption was 0.06% when tested *in vitro* in human skin (ATSDR 2007a). Approximately 0.93% of a soluble inorganic As acid dose was absorbed when applied to human cadaver skin; absorption was lower (0.43%) when the As acid was mixed with soil (ATSDR 2007b). Skin absorption of less soluble inorganic metals (such as those found in ore or rock) would be expected to be much lower than soluble forms.

As Pb is not readily translocated to edible plant parts from soil and home grown produce ingestion is only a small percentage of total vegetable intake (see Appendix A), ingestion of home-grown vegetables and fruits is not considered a major exposure pathway for Pb. It is expected home-grown produce would be washed before consumption to remove deposited dust. Ingestion of Pb by Cobar residents from vegetables is expected/assumed to be similar to that of people residing in unimpacted communities¹⁶ around Australia. Therefore, for Pb, as per NEPM (2013), this pathway is accounted for in the BPb modelling by including dietary background intakes of Pb. For other metals, this exposure pathway has been considered by adjusting the relevant TRV for background intakes and potential contribution from home grown produce.



TSP = Total Suspended Particulates.

Figure 2-5 Illustrative representation of potential dust sources, migration pathways, and residential exposure pathways to metals in dust/soil.

¹⁶ An unimpacted (non-impacted) community is considered in this risk assessment to be one whose environment is not, and has not been, affected by an industrial or geological source of metals.

3 Lead risk assessment

3.1 Overview

Figure 3-1 is a summary of the risk assessment approach for Pb. For each of the exposure scenarios described in Section 2.3, BPb concentrations have been modelled for 1-2 year old children using the US EPA (2010) *Integrated Exposure Update Biokinetic* (IEUBK) software (Section 3.4). At commercial/industrial receptor locations, BPb concentrations have been modelled for adults (and the unborn foetus) by adapting the US EPA *Adult Lead Methodology* (ALM) excel spreadsheet (Section 3.4). Important aspects of the modelling are:

- Calculating accumulation of Pb in surface soil at residential and other locations around Cobar from the 15 year remaining practical mine life (this calculation incorporates metal loss from soil via surface water runoff, but all other loss processes are conservatively assumed to be zero, see Section 2.6.2).
- Incorporating into the modelling existing surface soil Pb concentrations by adding these to calculated incremental soil Pb (done for Scenarios 1 and 3 only).
- Determination of bioaccessibility and bioavailability of Pb in mine derived dust¹⁷ and Pb already existing in surface soils at Cobar (Section 2.5.2). The maximum intestinal bioaccessibility obtained for any of the samples tested (i.e. 6%) was used for all sources (Section 2.5.2).
- Incorporating inhalation exposure (indoors and outdoors) to Pb in inhalable airborne dust.
- Background Pb intake from diet.
- Background BPb concentrations in children and adults.

Potential health risks to children exposed to mine dust containing Pb (in combination with existing background Pb exposures and sources other than the Proposal) has been assessed by modelling BPb concentrations and comparing the results with the NHMRC (2015) BPb target level of 5 µg/dL; noting that this does not represent a bright-line 'safe' level of exposure but rather a BPb level above which the individual's Pb exposures should be investigated and reduced (Section 3.2). Similarly, modelled BPb concentrations in the foetus of female workers at commercial/industrial receptor locations were compared with the Safe Work (2020) management goal for Pb of 5 µg/dL.

Background BPb concentrations are detailed in Sections 3.3, modelling of BPb concentrations in Section 3.4, and the risk characterisation in Sections 3.5 – 3.6.

The HHRA methodology for Pb is outlined in Figure 3-1.

¹⁷ As outlined in Section 2.5.2, a soil/dust sample of ore from the ROM pad was subjected to bioaccessibility testing.

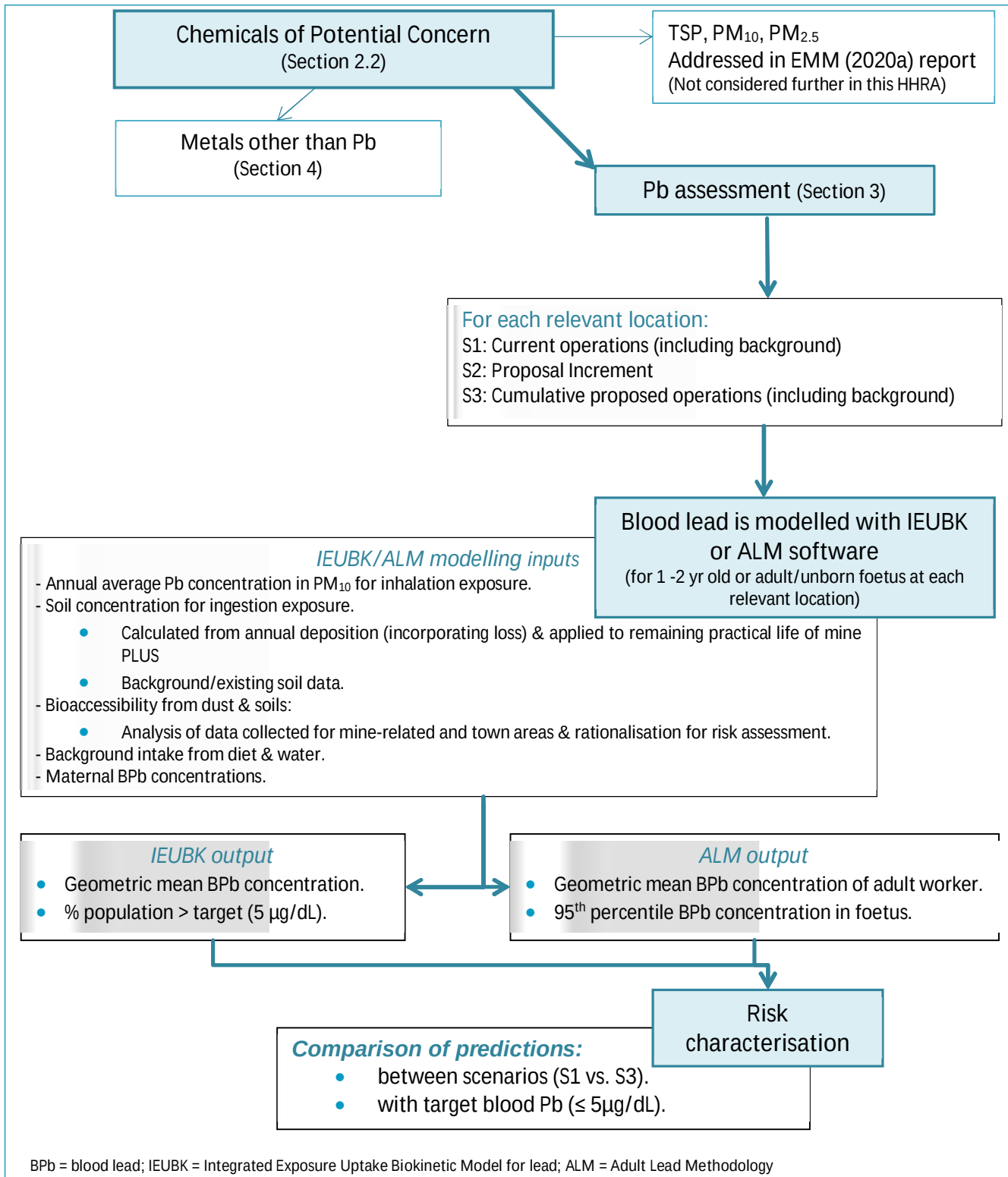


Figure 3-1 Summary of lead (Pb) HHRA methodology

3.2 Hazard assessment for Pb

Only those aspects of the toxicity of Pb that are relevant to this HHRA are presented in this section.

The World Health Organisation Joint Expert Committee on Food Additives (JECFA) originally set a provisional tolerable weekly intake (PTWI) for Pb at 25 µg/kg of body weight in 1986 (JECFA 1986). This was reconfirmed in 1999 (JECFA 1999) but later withdrawn in June 2010 (FAO/WHO 2010).

The JECFA (1986) PTWI was based on metabolic studies in infants showing mean daily intakes of 3-4 µg/kg were not associated with an increase in the body burden of Pb (3.5 µg/kg/d x 7 days = PTWI of 25 µg/kg/week). Since that time, a large number of studies investigating the impact of Pb on intellectual development in children have become available. Collectively these show measurable decrements on intellectual function at much lower BPb concentrations than previously considered. In 2010, the FAO/WHO Committee estimated that intake of Pb by children at the JECFA established PTWI is associated with a decrease of at least 3 IQ points. They considered this change important when viewed as a shift in the distribution of IQ within a population (not necessarily important for an individual). The Committee concluded the PTWI could no longer be considered public health protective, and it was therefore withdrawn. They also concluded, based on the absence of a population threshold for health effects, that it was not possible to establish a new PTWI that would be public health protective. A number of other health authorities around the World have also not derived threshold toxicity reference values for Pb (e.g. UK COT 2013, ATSDR 2007a, US EPA 2004).

The dose - response of Pb is described in terms of the effects that occur at given BPb concentrations. Indeed, throughout the world the health effects of Pb, both for the public and workers in Pb related industries, are managed by maintaining BPb concentrations below nominated target levels. In Australia the NHMRC (2009) originally recommended all Australians should have a BPb concentration below 10 µg/dL. After considering additional studies and reviews up to 2015, NHMRC (2015) concluded a BPb level greater than 5 µg/dL suggests a person has been, or continues to be, exposed to Pb at a level that is above what is considered the average 'background' exposure in Australia, and that if a person has a BPb greater than 5 µg/dL, their exposure to Pb should be investigated and reduced. The NHMRC noted that research on the effects of low-level exposure to Pb indicates there is not enough high-quality evidence to conclude that a BPb level <10 µg/dL was the causing factor for any health effects observed. Thus it was not possible to make a definitive statement on what constitutes a 'safe level' or what should be considered as a 'level of concern' for BPb concentrations in children. This arises because the tools of psychologists and psychiatrists used to investigate subtle impacts on intellectual performance and development are not precise, and the outcomes are influenced by such things as genetics, socio-economic status and early life experience/environment. NHMRC (2015) also concluded that BPb levels between 5 and 10 µg/dL are associated with increased blood pressure in adults.

Given the established dose-response for Pb (based on blood concentrations), and the management goal of the NHMRC for public health in relation to Pb (≤ 5 µg/dL), prediction of BPb concentrations associated with a given level of environmental Pb exposure is an important method in being able to interpret potential community impacts in Cobar. Furthermore, it is important that such predictions are made for the most susceptible sub-population, i.e. children. It is also noted that dietary iron deficiency may result in higher absorption of Pb (ATSDR 2007a, IARC 2006).

3.3 Background blood lead concentrations

Background BPb concentrations (i.e. those measured in non-impacted communities¹⁸) in Australia and overseas have decreased with time (Figure 3-2 and Appendix B). This is primarily due to phasing out of leaded petrol in the mid-1990s overseas, and in Australia during the late 1990s to early 2000 (DEWHA 2001). Consequently, it is important to ensure contemporary information for background BPb (i.e. dietary exposure) is used for BPb modelling.

Geometric mean (GM) BPb concentrations for children (<6 years) in non-impacted communities in Australia measured in the year 2000 or later¹⁹ were 0.97 µg/dL in Barwon, Victoria (Symeonides et al. 2020), 1.8 µg/dL in Fremantle (Guttinger et al. 2008), 2.3 µg/dL in Port Esperance (Gulson et al. 2009) and 2.6 µg/dL in Sydney (Gulson et al. 2006), with an average GM of 1.9 µg/dL from these four studies. Background BPb levels are primarily the result of dietary intakes. In this risk assessment the children in Cobar are assumed to have a similar contribution to BPb from their diets. These concentrations (i.e. 0.97 – 2.6 µg/dL) are comparable with the overseas range for non-impacted children (<14 years) for the same time period (0.76 - 3.1 µg/dL, with rounded average GM of 1.5 µg/dL from 11 studies) (Appendix B).

Inspection of Figure 3-2 shows the decline in background levels of BPb in Australian children originally lagged behind those of overseas children, but both appear to be plateauing below 2 µg/dL. Plateauing is also observed for the percentage of children with BPb levels above the previous NHMRC BPb recommendation of 10 µg/dL (NHMRC 2009). This ranges from 0 to 5% in non-impacted communities (average of 1.7%, including data from 2000 or later) in Australia, which is also consistent with overseas communities (0 - 4.1%, average of 1.0%) (Figure 3-3).

Note, as indicated in Section 3.2, in 2015, the NHMRC revised the target investigation BPb level to 5µg/dL. Because the target level was revised, previous BPb investigations have not reported the percentage of children with BPb >5 µg/dL.

Recent background BPb data for adult workers in Australia were not available. The latest information for the Australian general population stems from the 2009-2010 Victorian Health Monitor. Sample selection in this study was based on a stratified cluster sample of Census Collection Districts within Victoria and involved individuals aged 18-75 years. BPb was obtained by venipuncture for 3,622 participants. The median BPb in women of child-bearing age (18-44) was 0.055 µmol/L (i.e. 1.1 µg/dL) (VIC DoH 2011, 2012). As a comparison, the median BPb for adults (males and females) aged 20+ for the year 2009-2010 in the US was similar at 1.2 µg/dL (CDC 2019). However, the US NHANES has kept monitoring BPb in the general population after this date. The most recent data for adults age 20+ in the US (year 2015-2016) indicates BPb has decreased to a median of 0.88 µg/dL (CDC 2019). Current BPb is likely even lower, and Australian BPb levels have likely mirrored those in the US. It is also noted adult females generally have lower BPb than adult males, so the median for female adults of child-bearing age in the US is likely to be lower than the median value for all adults. Overall this supports using a background BPb level of <0.88 µg/dL as an assumption for Australian adult workers in the ALM model.

¹⁸ An impacted community is defined as one residing near a known anthropogenic point source of atmospheric Pb. BPb concentrations in a non-impacted community represent background, or reference, concentrations.

¹⁹ To correspond with the phasing out of leaded petrol in Australia (DEWHA 2001).

Conclusion:

From the above information 'background' BPb concentrations in Australia used for the ALM modelling and for determining the accuracy of IEUBK modelling assumptions for 'background' intakes from diet are (Section 3.4.3.7):

- BPb GMs Australian children = 0.97 - 2.6 $\mu\text{g}/\text{dL}$; average GM of 1.9 $\mu\text{g}/\text{dL}$.
- BPb median adult females = 0.88 $\mu\text{g}/\text{dL}$.
- Percentage of children with BPb >10 $\mu\text{g}/\text{dL}$ = 0 - 5%; average 1.7%.
- Percentage of children with BPb > 5 $\mu\text{g}/\text{dL}$ = no data available.

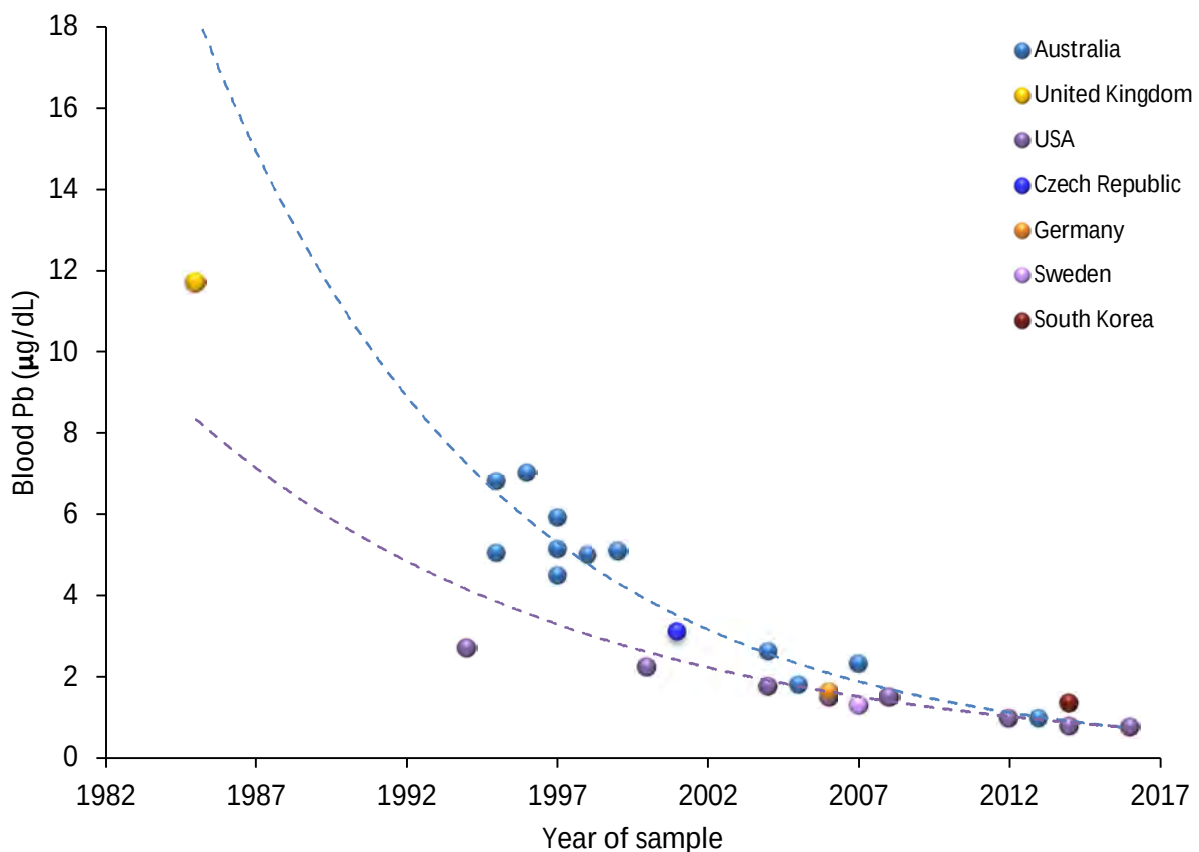


Figure 3-2 Blood lead concentrations (geometric means) in Australian (<6 yrs) and overseas (<14 yrs) children between 1984 – 2016. Dashed lines show trends (blue = Australia; purple = overseas). Graph drawn from information in Appendix B.

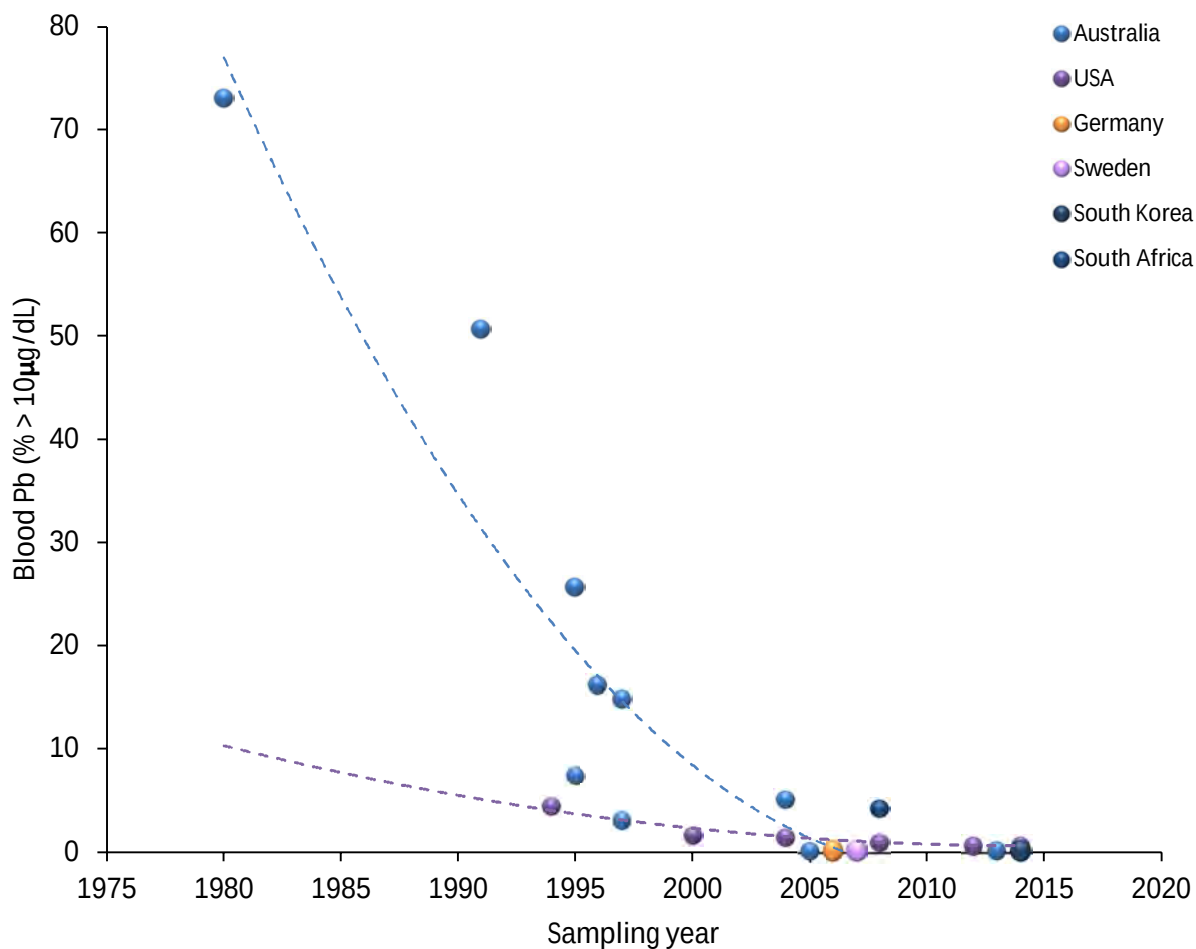


Figure 3-3 Percentage of children with blood lead concentrations > 10µg/dL in Australian (<6 yrs) and overseas (<14 yrs) children between 1980 – 2014. Dashed lines show trends (blue = Australia; purple = overseas). Graph drawn from information in Appendix B.

3.4 Modelling blood lead concentrations

3.4.1 Overview

A number of physiologically based pharmacokinetic (PBPK) models have been developed that are able to predict BPb concentrations, e.g. O'Flaherty 1993, 1995 and Leggett 1993, IEUBK, ALM, AALM²⁰. However only the IEUBK model and the ALM excel spreadsheet developed by the US EPA are publicly available in a form amenable for use. Consequently these are the predictive models used in this HHRA; apart from being readily available and validated, the IEUBK model has the advantage of being maintained and updated, having an extensive user manual, being used in regulatory decision making in the US and in health risk assessments undertaken by the Centre for Disease Control (CDC). The model has also been used in Australia in previous risk assessments for other mining towns (Toxikos 2010, ToxConsult 2017) and to inform deliberations in establishing a health investigation level (HIL) for Pb in soil (NEPM 2013).

Briefly, the IEUBK model was applied to estimate BPb levels for the most vulnerable and sensitive life stage (1-2 year old children) residing at selected locations in Cobar.

Modelling in previous risk assessments for other mining towns and conventional risk assessment wisdom (enHealth 2012a, b; Toxikos 2010, ToxConsult 2017) have shown that the 1-2 year old age group has the highest potential BPb increase if exposure to all age groups occurs to the same Pb concentrations in environmental media. Hence in the remainder of this report the BPb modelling results are for the 1-2 year old age group²¹, except at commercial/industrial receptor locations where the ALM model was applied to estimate BPb of female pregnant workers and their unborn foetus.

It is noted that the IEUBK and ALM models predict BPb concentrations for a *population* of children or adult workers. In this risk assessment the models were used for predicting BPb concentrations for a hypothetical population of children or adult workers exposed to the conditions at individual locations. Caution needs to be exercised when interpreting model results for individuals rather than a population as a whole. The individual location modelling is best interpreted as envisaging a large population of 1-2 year old's living at the modelled receptor location, or a large population of female pregnant workers working at the modelled receptor location. The predicted BPb concentration is the geometric mean, or central estimate, of that hypothetical population. The modelling also provides an estimate of the proportion or probability (as a percentage) of the hypothetical population having BPb concentrations above a specific target level (in this case 5 µg/dL). Thus the model outputs relate to an individual only in a statistical sense.

A brief description of the IEUBK PBPK and ALM models for Pb is given in Section 3.4.2.

Of interest for this risk assessment is the change in population BPb concentration profile that may arise as a result of the Proposal (i.e. Scenario 2).

Pb in blood due to the diet and/or in consumed water has been addressed in the ALM model by including background BPb measured in Australian female adults (see Section 3.3), and in the IEUBK model by including 'background' dietary intakes for Scenarios 1 and 3 (Scenario 2 did not include background). The IEUBK model

²⁰ Although the All Ages Lead Model (AALM) is an outgrowth of the IEUBK model, at the time of writing this report the latest available version of the AALM was still an external review draft (US EPA 2020). As the model is not yet available as a finalised version, it was not used in this HHRA.

²¹ The 1-2 year old modelling also takes into account Pb exposure prior to one year of age.

does not allow input of a BPb level which corresponds to measured 'background' (i.e. dietary) concentrations in children such as those described in Section 3.3. Instead 'background' BPb needs to be estimated by the model software from Pb dietary intakes which are provided to the model. The assumed Pb intakes for a 1-2 year old child have been based on literature information for Pb in diet and water of the general Australian population (the 'background' intake of Pb from air is negligible) (see Section 3.4.3.7). The modelled 'background' BPb estimates from assumed 'background' Pb intakes via diet and water are compared in Section 3.4.3.7 to measured 'background' BPb concentrations from overseas and Australian data to determine how well the assumed intakes predict 'background' BPb. Comparison of IEUBK modelled 'background' dietary Pb intake with measured background levels in children (Section 3.3) shows the IEUBK modelling agrees well with the published data (Section 3.4.3.7).

There are a number of important considerations in the modelling of BPb concentrations and for interpreting the results. They are discussed in the following sections.

- Measured BPb levels arising from Pb in the diet and consumed water from the reticulated supply (Section 3.3). These are dubbed 'background' BPb concentrations and are expected to occur in the absence of any anthropogenic mining activity that has, or may, result in Pb in the soil or air at Cobar. These are the concentrations expected in the majority of Australian children or adults that arise from background intakes of Pb from diet and water. Background 'dietary' Pb intakes are included in the modelling for Scenarios 1 and 3 (Scenario 2 does not include background).
- Existing soil Pb concentrations (Section 2.6.1). These were based on recently measured data and added to modelled estimates for soil Pb in Scenarios 1 and 3. The soil concentrations at each receptor evaluated in this HHRA and used as inputs into the modelling are summarised in Appendix E.
- The bioaccessibility of Pb in soil and deposited mine-related and non-mine related dust (Section 2.5.2).
- The amount of soil/dust that may be ingested by a child or adult worker (Section 3.4.3.1).
- The extent of absorption of Pb in soil/dust into the blood (Section 3.4.3.2).
- The contribution of Pb from a mother to her children (Section 3.4.3.3).
- The extent to which Pb in outside soil is part of indoor dust (Section 3.4.3.4).
- The time a child spends outdoors/indoors (Section 3.4.3.5).
- The inhalation (i.e. ventilation rate) of air by children or adult workers (Section 3.4.3.6).
- Air Pb concentrations, modelled by EMM (2020a, b) as an annual average in PM₁₀, at each location evaluated in this HHRA are summarised in Appendix F. Existing concentrations of Pb in PM₁₀ within Cobar were based on 2017 to 2020 annual average measured data at a monitoring station at the Hera Mine (~80 km southeast of the New Cobar Complex near Nymagee)²².

²² Since the PGM beta attenuation monitor (BAM) for recording continuous PM₁₀ and the high-volume air samplers (HVAS) recording TSP and PM₁₀ on a one-in-six day routine were only installed in late 2019, there are limited monitoring data that could be used to characterise existing ambient (i.e. existing) particulate matter concentrations. For the limited period of data available, the average Pb concentrations in TSP and PM₁₀ HVAS samples was very low, in the order of 0.02-0.04%. Therefore, to supplement the PGM data, monitoring data recorded by HVAS from the Aurelia Metals Hera Mine were used. While based on a limited set of data points, EMM (2020a) found the distribution of concentrations recorded at the Cobar BAM and Hera Mine HVAS to be closely aligned. The Hera Mine TSP and PM₁₀ HVAS monitoring also undertakes Pb analysis of collected samples. For the period between 2017 to 2020, the average Pb content was in the order of 0.03-0.04%. This percentage was used by EMM (2020a) to calculate an ambient background concentration of Pb in PM₁₀.

3.4.2 BPb model descriptions

3.4.2.1 IEUBK model

A brief description of the IEUBK model for Pb is provided in this section. The latest Windows version of the model is the IEUBKwin v 1.1 build 11, 32-bit version, which became available in February 2010 and was used in this HHRA. The reader is referred to the detailed guidance documents of previous and current versions of the model for a description of inputs and underlying equations (US EPA 1994a, b; 2002, 2007a, 2009a).

The model is designed to mimic exposure to Pb in air, water, soil, dust, diet, and paint, as well as other sources to predict BPb levels in children from 6 months to 7 years old. It consists of four major components:

1. an exposure module that relates environmental Pb concentrations to age-dependent intake via inhalation and ingestion,
2. an absorption (or uptake) module that relates Pb intake to Pb uptake,
3. a biokinetic module that relates the uptake to tissue concentrations, including blood, and
4. a module for uncertainty in exposure and for population variability in absorption and biokinetics.

The IEUBK model uses the above interrelated modules to estimate BPb levels in *populations* of children exposed to Pb-contaminated media and constructs a plausible distribution of BPb concentrations centered on a geometric mean. If one of the media components in the exposure module is not relevant for a particular risk assessment it can be 'switched off'. In this assessment for Scenario 2 (Proposal increment, no background) only the 'air', 'water', 'dust' and 'soil' compartments in the exposure module in Figure 3-4 have been operated. BPb from background intake via diet and reticulated water was included for Scenarios 1 and 3 by sourcing background Pb intakes for 1-2 year old children from the literature and comparing the modelled estimates with measured background BPb in Australia and overseas (Section 3.4.3.7).

The model contains more than 100 input parameters that are initially set to default values (US EPA 2007a). Almost half of these may be changed by the user. These parameters were reviewed and changed in this HHRA if site-specific or Australian-specific information existed (Section 3.4.3). The biological structure of the IEUBK model is shown pictorially in Figure 3-4.

Of relevance to this risk assessment the IEUBK model provides the following outputs:

- Geometric mean BPb levels, by age (text file) for the population.
- A distribution curve of BPb concentrations for a population with the specified exposure inputs.
- The percentage of children of a particular age group with predicted BPb concentrations in excess of a user-specified level (set at 5 µg/dL for this risk assessment).

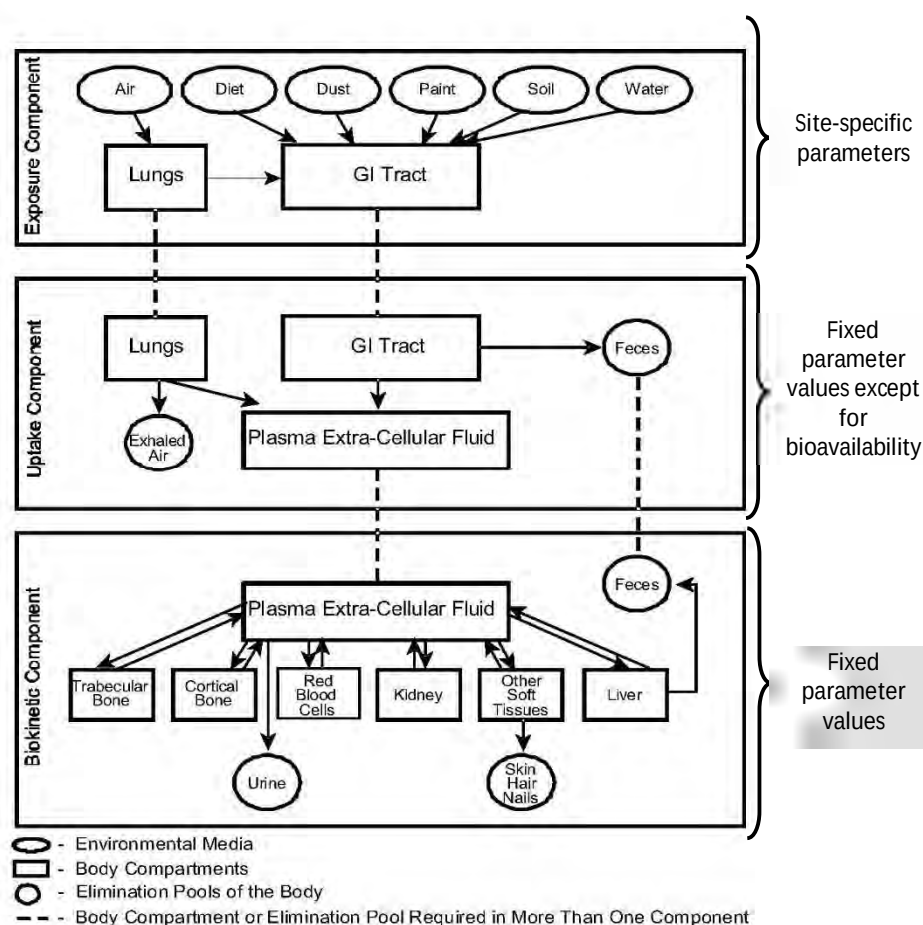


Figure 3-4 Biological structure of IEUBK model (US EPA 2007a, pg. 4)

3.4.2.2 ALM model

The Adult Lead Methodology (ALM) is a model developed by the US EPA in 1996, originally published as a report and now available as an excel spreadsheet. It is used to assess adult Pb exposures from soil in non-residential settings. The methodology focuses on estimating BPb concentrations in women of child-bearing age exposed to Pb contaminated soils, as well as estimating the corresponding 95th percentile foetal BPb. The methodology employs a simplified representation of Pb biokinetics to predict quasi-steady state BPb concentrations among women with relatively steady exposure patterns (US EPA 1996b). The algorithm embedded into the ALM model is depicted with Equation 1 in Table 3-1. The equation was adapted in this HHRA (as per guidance in enHealth 2012a and NEPM 2013) to allow incorporation of inhalation exposure to dust as well as incidental ingestion of soil/dust²³ (see Equation 2 in Table 3-1).

²³ As discussed in Section 2.7, dermal absorption of inorganic metals is considered to be a negligible route of entry into the body (ATSDR 2007a, b; US EPA 2006, RIVM 2007, UK EA 2009) and was therefore not considered in this report.

Table 3-1 ALM Model Equation

Parameter	Acronym	Units	Value used in HHRA	Basis
Equation 1: $BPb_{adult,central} = BPb_{adult,0} + \frac{PbS \times BKSf \times IR_s \times AF_s \times EF_s}{AT}$				
Equation 2 ⁽¹⁾ : $BPb_{adult,central} = BPb_{adult,0} + \frac{[(PbS \times IR_s \times F_s \times AF_s) + (PbD \times IR_s \times F_D \times AF_s) + (PbA \times InhR_{AxLR} \times AF_A)] \times BKSf \times EF_s}{AT}$				
Central estimate of BPb concentration in women of child-bearing age that have site exposure to Pb in soil/dust	$BPb_{adult,central}$	µg/dL	Calculated using Equation 2.	
Typical BPb concentration in women of child-bearing age in the absence of exposure to the site being assessed, i.e. 'background' BPb	$BPb_{adult,0}$	µg/dL	0.88	Likely median BPb in adult Australian females in the general population (Section 3.3).
Soil Pb concentration	PbS	µg/g	Varies by receptor location and Scenario. Calculated from modelled annual Pb deposition for 15-year remaining practical mine life (Section 2.6.2). For Scenarios 1 and 3, this was added to existing soil Pb concentrations. See Appendix E for individual values.	
Biokinetic slope factor relating (quasi-steady state) increase in typical BPb concentration to average daily Pb uptake	BKSF	µg/dL blood Pb increase per µg/d Pb uptake	0.4	ALM default. The recommended value is based on data reported by Pocock et al. (1983) on the relationship between tap water Pb concentrations and BPb concentrations for adult males, and on estimates of the bioavailability of Pb in tap water. There is some uncertainty associated with applying this value to populations of pregnant women. In the absence of other information, the default value was applied.
Intake rate of soil, including both outdoor soil and indoor soil-derived dust	IR_s	g/d	0.05	This is the central estimate for daily ingestion of outdoor soil and indoor dust by an adult, as recommended in enHealth (2012b). This is also the ALM default. Although the exposures under consideration in the ALM model are occupational, which would suggest a lower soil/dust ingestion rate may be justified, the value was not decreased as it was assumed the (non-mine) worker also lives somewhere in Cobar. The commercial/industrial areas are located closer to the Proposal location (and may have higher associated deposition rates or existing soil Pb concentrations than residential areas), thus assuming a worker's soil exposure occurs entirely to the soil Pb concentration at the workplace rather than accounting for potential dilution of this exposure whilst at home is considered conservative.
Fraction of total soil & dust ingestion that is soil.	F_s	unitless	0.45	Same as IEUBK default.

Parameter	Acronym	Units	Value used in HHRA	Basis
Absolute gastrointestinal absorption fraction for ingested Pb in soil and Pb in dust derived from soil	AF _s	unitless	0.06	This is the maximum intestinal Pb bioaccessibility measured in the seven samples of soil/dust collected from the mine site or Cobar area which were subjected to bioaccessibility testing (Section 2.5.2). As discussed previously, due to the uncertainty in the correlation between the SBRC intestinal Pb bioaccessibility obtained for the samples collected by EMM and the corresponding <i>in vivo</i> bioavailability, additional adjustment to account for less than 100% absorption of Pb from the adult gastrointestinal tract has not been made in this HHRA.
Indoor dust Pb concentration	PbD	µg/g	Varies by receptor location and Scenario. Calculated by applying a ratio of indoor dust to outdoor soil factor of 1.5 to the soil Pb concentration (Section 3.4.3.4). See Appendix E for individual values.	
Fraction of total soil & dust ingestion that is dust.	F _D	unitless	0.55	IEUBK default for F _s subtracted from unity, leaving 55% of total soil & dust ingestion that is dust.
Air Pb concentration (i.e. in PM ₁₀)	PbA	µg/m ³	Modelled annual average air Pb in PM ₁₀ . Varies by location and Scenario (includes background for Scenarios 1 and 3). See Appendix F for individual values.	
Inhalation rate	InhR _A	m ³ /day	15	This is the central estimate for daily inhalation rate by an adult, as recommended in enHealth (2012b). No adjustment was made to account for occupational exposures which, due to shorter timeframe spent at work, typically have average inhalation rates of 10 m ³ /day (at work). Since it was assumed the worker also lives somewhere in Cobar, the higher inhalation rate was used (recognising this is likely conservative for estimation of exposure solely at the workplace due to closer proximity of commercial/industrial locations to the Proposal).
Dust lung retention factor	LR	unitless	1	NEPM (2013) incorporates a dust lung retention factor of 0.375 into equations used to calculate soil health investigation levels. This factor is used to account for the respirable fraction of inspirable indoor and outdoor dust exposures. However, since the proportion of respirable dust within PM ₁₀ is not constant for all sources of PM ₁₀ , for conservatism this factor was set at 100%, i.e. 1.

Parameter	Acronym	Units	Value used in HHRA	Basis
Absolute lung absorption fraction for inhaled Pb in air	AF _A	unitless	0.32	This is the default lung absorption factor utilised in the IEUBK model (also used in NEPM 2013 for the IEUBK modelling). It is based on an estimation of deposition efficiency of airborne Pb particles (presumed to be in PM ₁₀) in young children by the US EPA (1989b), which resulted in a calculated respiratory deposition/absorption of 25-45% for young children living near non-point source areas while 42% was calculated for those living near point sources. US EPA chose an intermediate value of 32% as the default. In the latest draft documentation for the upcoming All Ages Lead Model (AALM), US EPA (2019) provide a similar value of 40% to represent deposition/absorption of Pb from the respiratory tract, of which 4% is transferred to the stomach by mucociliary clearance (leaving 36% absorbed via the lungs). As these values are very similar and the AALM is still in draft and has not yet been validated, the default value from IEUBK was used in this HHRA.
Exposure frequency for contact with assessed soils and/or dust derived in part from these soils	EF _s	days/year	365	For occupational exposure, typically an exposure frequency of 240 days/year would be assumed. However, since it was assumed the worker also lives somewhere in Cobar, this was modified to a continuous exposure throughout the year. It is recognised this is likely conservative since the commercial/industrial areas are located closer to the Proposal (and may have higher associated deposition rates or existing soil Pb concentrations than residential areas).
Averaging time; the total period during which soil contact may occur	AT	days/year	365	ALM default. This is consistent with the averaging time for continuing long term exposures.
1. Equation 1 was adapted to allow incorporation of inhalation exposure to dust as well as incidental ingestion of soil/dust, as per the Equations provided in enHealth (2012a, Section 4.6) and NEPM (2013, Schedule B4, Section 4.7.4).				

3.4.3 IEUBK input parameters

This section briefly describes the IEUBK input parameters that were modified by SLR to undertake the BPb modelling.

It should be noted that many of the input parameters are common to the BPb modelling for the different scenarios described in Section 2.3. There are varying degrees of uncertainty associated with each parameter value used in the modelling.

3.4.3.1 Soil and dust ingestion

The IEUBK default values for combined ingestion of soil and dust are 0.085, 0.135, 0.1, 0.09, and 0.085 g/day for 0-1, 1-4, 4-5, 5-6 and 6-7 year olds, respectively. The values correspond to those reported by Binder et al. (1986) and Clausen et al. (1987).

These values have been changed to correspond to those recommended for use in risk assessments by enHealth (2012b) and by the US EPA child exposure factors handbook (US EPA 2008, Table 5-1). These are 0.06 g/day for 0-1 year olds and 0.1 g/day (i.e. 100 mg/day) for 1-7 year old children.

3.4.3.2 Total gastrointestinal absorption of lead from dust and soil

The IEUBK default value for total gut absorption of Pb from soil and dust is 0.3 (i.e. 30%). This value is based on an assumed bioaccessibility of Pb in soil of 60% and a bioavailability (i.e. absorption) of soluble Pb in water and food of 50% (i.e. $60\% \times 50\% = 30\%$) (US EPA 1999b, 1994a, 2007b).

As discussed in Section 2.5.2, this default parameter has been modified in this HHRA to correspond to the maximum experimental intestinal bioaccessibility (6%) measured for Pb in seven dust/soil samples collected by EMM in 2020 from mine-related and non-mine related areas in Cobar.

Due to the uncertainty in the correlation between the SBRC intestinal bioaccessibility obtained for the samples collected by EMM in 2020 and the corresponding *in vivo* bioavailability (see Section 2.5), additional adjustment to account for less than 100% absorption of Pb from the gastrointestinal tract in children (and adults for the ALM model) has not been made in this HHRA. The intestinal bioaccessibility was assumed to be equal to the *in vivo* bioavailability. The impact on the HHRA conclusions of incorporating 50% absorption by children into the intestinal bioaccessibility results for Pb and/or using the gastric bioaccessibility instead of intestinal bioaccessibility data for Pb has been explored in the sensitivity analysis (Section 3.6).

3.4.3.3 Maternal blood Pb

The default value for maternal BPb concentration in the IEUBK model is 1 µg/dL (US EPA 1994b).

This value was changed to 0.88 µg/dL to coincide with the likely median BPb in adult Australian females in the general population (Section 3.3).

3.4.3.4 Ratio of indoor dust lead to soil lead concentration

The IEUBK default value for the ratio of indoor dust Pb to soil Pb concentration is 0.7 g Pb soil/g Pb dust. No information was found specifically for Cobar. An analysis undertaken by Toxikos (2010) of available paired indoor dust and soil data for another mining town in NSW (Broken Hill) indicated a ratio of 1.5 (for indoor dust to soil Pb) is appropriate for Broken Hill. This was based on data from Gulson et al. (1995). Data from an investigation recently undertaken by Noller et al. (2017) in a different mining town (Mount Isa, Queensland) suggest ratios of 2-4.4 (for the approximate median Pb concentration in carpet dust to soil PM₁₀ Pb or garden soil Pb) may be appropriate for Mount Isa. However, it is noted Mount Isa currently houses a copper smelter whereas the smelter in Broken Hill has been closed for over a century. Similarly, Cobar's copper smelter also closed in 1920. Presence of a smelter may increase the amount of fine dust that can infiltrate or be tracked into the home.

Therefore, in the absence of information for Cobar, a ratio of 1.5 (indoor dust to soil Pb) was adopted in the IEUBK analysis instead of the default factor of 0.7, consistent with the most recent information available for Broken Hill (Toxikos 2010, ToxConsult 2017).²⁴

²⁴ To do this in the model, the outdoor soil Pb concentration was set to the constant value for each relevant receptor, and the indoor dust Pb concentration was set to a constant value corresponding to 1.5 x outdoor soil Pb concentration.

3.4.3.5 Time spent outdoors

The IEUBK default values for time spent outdoors are 1, 2, 3, and 4 hours/day for 0-1, 1-2, 2-3, and 3-7 year old children, respectively. The values were derived from a literature review of the US population (Pope 1985, cited in US EPA 1994b).

In Australia, the average time spent outdoors by 0-1, 1-2, and 2-7 year old children is 0.5, 1.4, and 2 hours per day, respectively (enHealth 2012b), therefore these values were used in the IEUBK modelling.

3.4.3.6 Ventilation rate

The IEUBK default values for pulmonary ventilation rate (i.e. inhalation rate) for 0-1, 1-2, 2-5 and 5-7 year olds are 2, 3, 5, and 7 m³/day, respectively. The estimates are based on body size in combination with data from Phalen et al. (1985).

The values were changed to correspond to those recommended for use in risk assessments by enHealth (2012b) and US EPA (2008). These are 5.4, 8, 9.5, 10.9, and 12.4 m³/d for 0-1, 1-2, 2-3, 3-6, and 6-7 year old children, respectively.

3.4.3.7 Background intakes of Pb

Section 3.3 examines published background BPb concentrations in non-impacted communities in Australia and overseas and concluded a population geometric mean of 1.9 µg Pb/dL was a reasonable estimate for background (i.e. dietary derived) BPb for children. For Scenarios 1 (existing situation, including 'background') and 3 (proposed cumulative situation, including 'background'), an estimate of 'background' intakes of Pb from diet and water by 1-2 year old children was included in the IEUBK modelling.

The IEUBK model does not allow a user to simply input a BPb level which corresponds to 'background' (i.e. dietary) intake. Instead 'background' BPb needs to be estimated within the model from provided Pb dietary intakes. The assumed Pb intakes have been based on literature information for Pb for the general Australian population, as outlined below.

Intake from food

FSANZ (2003) reported a range of mean dietary intake of Pb of 0.03 - 0.93 µg/kg bw/day for 2 year olds. For this HHRA, background intake of Pb from the diet was assumed to be at or about the top end of the range (i.e. 0.9 µg/kg bw/day). Using the recommended median body weight of 11 kg for a 1-2 year old child (enHealth 2012b), the daily intake per child is 9.9 µg Pb/day from the diet. This intake was used in the IEUBK modelling for background BPb.

Intake from water

The NHMRC and NRMCC (2018) state that total Pb concentrations in Australian reticulated water supplies may be up to 10 µg/L, with typical concentrations of less than 5 µg/L. Cobar Shire Council, the supplier of the reticulated water in Cobar, analyses and monitors the quality of the water they supply. All 44 samples collected from the Cobar water filtration plant during 2018 and 2019 and tested for Pb returned a result less than the limit of reporting (i.e. <1 µg/L) (CSC 2018, 2019). The concentration was conservatively assumed to be at the limit of reporting of 1 µg/L for this HHRA. This Pb concentration, along with a mean daily water intake of 0.3 L/day for a 1 – 2 yr old (enHealth 2012b)²⁵, were used as input parameters for the calculation of background Pb intake from water.

Intake from air

Monitoring of Pb in air is no longer conducted routinely in non-impacted major Australian cities or in most other jurisdictions, as its removal from petrol has made airborne levels extremely low (Tas EPA 2020, SA EPA 2003). Thus, the contribution of Pb intake from air to 'background' BPb (i.e. other than from existing sources and the Proposal) is expected to be negligible. Thus for the IEUBK modelling of each of the scenarios evaluated, no additional Pb in air (due to 'background') was added to the modelled and measured estimates of Pb in PM₁₀.

Modelled intake from diet and water

Table 3-2 shows the predicted BPb modelling results from the above high-end background exposure dietary intake assumptions for a 1-2 year old child.

The modelled geometric mean 'dietary' background BPb for 1-2 year old children is approximately 1.7 µg/dL, which is the midpoint of the measured range of geometric mean background BPb for Australian children from non-impacted communities (0.97 – 2.6 µg/dL) (Section 3.3).

Thus, the IEUBK modelling of 'background' BPb concentrations at the chosen parameter values agrees well with the published data summarised in Section 3.3. Therefore the 'background' dietary intake assumptions above (i.e. 9.9 µg Pb/day from the diet, 1 µg/L Pb in water) were used to account for 'background' BPb levels in modelling of Scenarios 1 and 3 in this HHRA (no background intakes were included for Scenario 2).

Table 3-2 Predicted background BPb results for 1-2 year old child

	Predicted blood lead (µg/dL)	% of population >5 µg/dL	% of population >10 µg/dL
Total Background	1.7 ⁽¹⁾	1.2	0 ⁽²⁾
- This predicted 'background' BPb is within the range of measured 'background' BPb for Australian (and overseas) children from non-impacted communities (range Australian children: 0.97 – 2.6 µg/dL; range overall: 0.76 – 3.1 µg/dL) (Section 3.3). - This is within the range of 0 – 5% >10 µg/dL measured in Australian and overseas children from non-impacted communities (Section 3.3).			

²⁵ The water consumption represents mean ingestion of tap water and includes water used in food preparation. It excludes commercially produced bottled water and water intrinsic to food and beverages (e.g. milk) (enHealth 2012b, US EPA 2008).

3.4.3.8 Intake of Pb from rainwater tanks

Cobar Shire Council receives a bulk water supply from WaterNSW. Cobar's raw water comes from Burrendong Dam via the Macquarie River and Albert Priest Channel, plus the ground catchment areas around the Cobar surface water storages. Water from Macquarie River is diverted at Warren via a 73 km open channel to the Nyngan Weir Pools. From there it is delivered by the Cobar Water Board, pumped via a pipeline 130 km to the Fort Bourke Hill filtration plant where it is either pumped out to storages as raw water or filtered for potable uses around town (CSC 2020). Although residents in Cobar are supplied with enough water via the filtration plant for their domestic uses, it is conceivable that some residents may have rainwater tanks connected to their household supply. Residents could be using some of this rainwater to supplement their domestic uses. It is unknown whether water in rainwater tanks is used for consumption by residents in Cobar, but this HHRA has assumed this is a possibility.

Thus, one of the potential exposure pathways to Pb (and other metals) in Cobar is consumption of Pb which has deposited on residential roofs and been washed into rainwater tanks (see Section 2.7). The Equations in Table 3-3 below were used to calculate the possible concentration of Pb (and other metals) in rainwater tanks in Cobar. The equations conservatively assume 100% of the deposited dust on roofs is mobilised by rainwater and 85% of rainwater (containing deposited dust) is collected by a tank. The former is a conservative assumption since some of the dust may resuspend and deposit elsewhere, and/or may be present on surfaces of the roof which do not readily come into contact with rainwater. The latter assumption of 85% collection efficiency stems from enHealth (2010).

It is well-known that some of the roof dust washed into a rainwater tank settles at the bottom of the tank as sediment. Australian literature was consulted to inform what likely fraction of Pb (and other metals) may be dissolved in tank water and/or resuspended from sediment in the form of very fine particles which could then conceptually be ingested together with the water. Multiple factors influence these aspects (dissolution and resuspension), predominantly the time since disturbance of the water (e.g. rainfall event or top-up of tank) and the pH of the water (Maygar et al 2011a, Maygar et al 2014). The amount of Pb that enters the tank varies with the type of roofing material, including flashing and nails, in addition to any local sources in dust or rain (Maygar et al 2014). Two studies on rainwater tanks in Melbourne demonstrated that at higher water pH levels (pH > 6), the fraction of dissolved Pb decreased and particle bound Pb was predominant, with the settlement of Pb particles enhanced (Maygar et al 2011a, Maygar et al 2014). As the pH decreased below 5.5, the dissolved Pb phase was predominant (Maygar et al 2011a).

In relation to the proportion of Pb found in suspension in particulate form (following fractionation of the water samples: >63 µm, 0.45-63 µm and <0.45 µm) these studies reported that metals were still found in particulate form in suspension (Maygar et al 2011a, Maygar et al 2014). One study with sampling during steady conditions (at least one day after a rain event) showed that 0-80% of Pb was found in a dissolved form and the remainder (20-100%) was attached to particles in suspension (Maygar et al 2011a). The second study (with samples taken 2-6 days after a rain event) showed that 50-90% of the total concentration of Pb was in a dissolved form, and the remaining Pb (10-50%) was attached to particles in suspension (Maygar et al 2014). Re-suspension of sediment was shown to occur regardless of inflow rate, position of inlet and outlet, shape of tank, depth of sediment, or particle size, thus it was recommended by the study authors that tanks should be regularly cleaned and that tank water should not be used during or immediately following rain events (Maygar et al 2011b). This is consistent with advice from enHealth (2010) on general rainwater tank maintenance²⁶.

²⁶ enHealth (2010) recommends that gutters be inspected every six months and cleaned (and if large amounts of leaves are detected on regular inspections to clean gutters more frequently). The presence of leaf material causes lower pH which can increase the solubility of metals. It is also recommended by enHealth (2010) to regularly clean tanks to remove accumulated sediment.

The research conducted by Maygar et al. (2011a, b; 2014) indicates a large proportion of metal in dust that washes into a rainwater tank from roofs may be present in a form that is available for consumption (i.e. dissolved in water or attached to particles in suspension). It was therefore assumed 100% of Pb that potentially washes into rainwater tanks could be available for consumption.

Table 3-3 Equation for Calculating Concentration of Pb in Rainwater Tanks

Parameter	Acronym	Units	Value used in HHRA	Basis
Equation 1: $MConc_{tank} = \frac{(M_{ann\ dep} \times RoofArea \times CF)}{Runoff}$				
Equation 2 ⁽¹⁾ : $Runoff = Collection\ efficiency \times (rainfall - loss) \times RoofArea$				
Estimated concentration of metal in rainwater tanks.	MConc _{tank}	µg/L	Calculated using Equation 1. Calculated concentration at each receptor location and scenario can be found in Appendix G.	
Annual metal deposition	M _{ann dep}	g/m ² /year	Receptor & scenario specific (see Appendix E).	Annual metal deposition from dust (i.e. TSP) onto receptor location soil. Provided by EMM (2020c).
Roof area	RoofArea	m ²	206	The average floor areas of new houses in Australia according to enHealth (2012b) is 206 m ² . It was assumed floor area equals roof area. It is recognised this assumption may overestimate roof area if a house has multiple stories, but may underestimate roof area if the roof is pitched.
Unit conversion factor to convert from µg to g	CF	µg/g	10 ⁶	Unit conversion factor.
Maximum rainwater runoff into rainwater tank	Runoff	L/year	Calculated using Equation 2.	
Efficiency of collection by rainwater tank	Collection efficiency	unitless	0.85	As per enHealth (2010).
Annual rainfall in Cobar	rainfall	L/m ² /year	390	The median annual rainfall for Cobar is 390 mm/year (BoM 2020). This is equivalent to 390 L/m ² /year.
Loss of rainfall associated with absorption and wetting of surfaces.	loss	L/m ² /year	24	As per enHealth (2010).
1. Equation for calculating runoff stems from enHealth (2010, Appendix B).				

The IEUBK model allows for multiple sources of water intake. The calculated concentration of Pb in rainwater tanks at each location and for each Scenario was used as an input parameter in the IEUBK model for the 'Concentration of Lead in Fountain Water'. In addition to a concentration, the other input required by the IEUBK model is the percentage of total water consumption due to fountains (i.e. in this case it is the proportion of total tap water intake that stems from rainwater tanks by residents of Cobar).

To provide an estimate of approximate proportion of water consumed that stems from rainwater tanks, it is informative to understand the total amount of potential runoff which can be captured by rainwater tanks in Cobar relative to the average water consumption per household. Water tank sizes have been summarised by SA Water Corporation in enHealth (2010, Table B.2). Water tank sizes range from 3,000 – 50,000 L depending on the volume of water required per day, average rainfall and roof area. For a roof area of 200 m² (the approximate roof area assumed in this HHRA), a rainfall of 400 mm/year (the approximate median annual rainfall in Cobar), water tank sizes range from 7,000 – 15,000 L. enHealth (2010) indicates tanks of this volume provide between 60 – 100 L of water per day. The average water consumption per household in NSW (which presumably includes garden irrigation) is approximately 900 L/day (Riverina Water 2019). Thus, rainwater in Cobar would only be able to provide approximately a 10th of an average household's water requirements. It has therefore been assumed in this HHRA that the proportion of water consumed that stems from rainwater tanks may be 10% (i.e. 0.1). This is likely conservative since households are provided with reticulated water. It is considered more likely that residents will use rainwater for domestic purposes other than drinking (e.g. irrigation of gardens, toilet flushing, etc). Nevertheless, the eventuality that a person may source 100% of their drinking water from rainwater tanks has been considered in the sensitivity analysis, and was found to have only minimal impact on the overall conclusions of the HHRA (Section 3.6).

3.4.3.9 Summary of BPb modelling parameters

Table 3-4 summarises the input parameter assumptions for the IEUBK modelling undertaken in this HHRA. Only the 1-2 year old age group results are presented in this report²⁷.

Table 3-4 Summary of IEUBK input parameters for this HHRA

Parameter	Units	Assumed value for this HHRA	Comment
AIR			
Outdoor air Pb concentration	µg/m ³	Modelled annual average air Pb in PM ₁₀ . Varies by location and Scenario.	see Appendix F for individual values
Time spent outdoors	hrs/day	0.5, 1.4, or 2 (for 0-1, 1-2, 2-7 yr old)	Section 3.4.3.5
Ventilation rate	m ³ /day	5.4, 8, 9.5, 10.9, or 12.4 (for 0-1, 1-2, 2-3, 3-6, 6-7 yr old)	Section 3.4.3.6
DIET			
Dietary lead intake	µg/day	9.9 (for 1-2 year old, others set to zero)	Section 3.4.3.7

²⁷ The BPb modelling for various age groups showed the 1-2 year old child as potentially having the highest BPb increase (Section 3.4.1). This is consistent with conventional risk assessment wisdom in which the behaviour of this age group confers high exposure to environmental chemicals (Toxikos 2010, ToxConsult 2017, enHealth 2012a, b).

Parameter	Units	Assumed value for this HHRA	Comment
WATER			
Water consumption	L/day	0.3 (for 1-2 year old, others set to zero)	Section 3.4.3.7
'Concentration of Lead in Flushed' (i.e. in reticulated water)	µg/L	1	
'Percent of Total Consumed as First Draw'	%	0	Only reticulated water concentrations and estimated rainwater tank concentrations were used in the HHRA. First draw was set to zero. ⁽¹⁾
'Concentration of Lead in First Draw'	µg/L	0	
'Concentration of Lead in Fountain Water'	µg/L	Estimated concentration of lead in rainwater tanks. Varies by receptor location and Scenario.	Calculated using Equations in Section 3.4.3.8. See Appendix G for individual values.
'Percentage of Total Consumed from Fountains'	%	10 (percentage of total water intake that stems from rainwater tanks)	Section 3.4.3.8
SOIL/DUST			
Outdoor soil Pb concentration	µg/g	Calculated from modelled annual Pb deposition for 15-year remaining practical mine life (Section 2.6.2). This was added to existing soil Pb concentrations for Scenarios 1 and 3.	see Appendix E for individual values
Indoor dust Pb concentration	µg/g	Set to a 'constant value' in the model, calculated by applying a ratio of indoor dust to outdoor soil factor of 1.5 to the soil Pb concentration.	Section 3.4.3.4 See Appendix E for individual values
Total dust + soil ingestion	g/day	0.06 or 0.1 (0-1, 1-7 yr old)	Section 3.4.3.1
MATERNAL			
Mother's blood Pb concentration	µg/dL	0.88	Section 3.4.3.3
GI/BIO			
Absorbed fraction from soil	%	6 (maximum intestinal bioaccessibility from soil/dust samples)	Section 2.5.2
Absorbed fraction from dust	%	6 (maximum intestinal bioaccessibility from soil/dust samples)	Section 2.5.2
Absorbed fraction from diet/water	%	50	IEUBK default

1. First draw Pb concentration was set to zero, since percentage consumption of first draw water was also set to zero. This ensures 100% of a person's water intake is catered for by either reticulated water or rain water containing a specified concentration of Pb.

3.5 Results and Conclusions

Adult females

As discussed in Section 3.4.2.2, the ALM model was used to estimate the median BPb of adult females who are pregnant (as well as corresponding 95th percentile foetal BPb) at each commercial/industrial receptor location. The model, which typically only incorporates incidental ingestion of soil Pb was adapted to also include inhalation exposure to Pb in dust as well as incidental ingestion of soil/dust. The results are provided in Table 3-5.

- The ALM model predicts no change to BPb for either adult females or their unborn offspring as a result of the Proposal.
- It is also noted the 95th percentile modelled foetal BPb (2.1-2.6 µg/dL) for the existing situation (and cumulative proposed situation) in Cobar at the commercial/industrial locations assessed is consistent with that expected for other communities in Australia which are not impacted by point sources of Pb (i.e. as per Section 3.3, the *geometric mean* BPb in Australian children from non-impacted communities ranges from 0.97-2.6 µg/dL; the 95th percentile BPb would be expected to be higher than this range). The ALM modelling outputs are presented in Appendix H.

Table 3-5 ALM modelled BPb in adult female pregnant workers and their foetus at relevant receptor locations

Location ID	ALM Modelled median BPb adult female workers (µg/dL)			ALM Modelled 95th %ile BPb foetus (µg/dL)		
	S1: Existing Situation	S2: Proposed Increment	S3: Cumulative Proposed Situation	S1: Existing Situation	S2: Proposed Increment	S3: Cumulative Proposed Situation
R11	0.93	0	0.93	2.1	0	2.1
R16	0.91	0	0.91	2.1	0	2.1
R20	0.94	0	0.94	2.2	0	2.2
R21	0.94	0	0.94	2.2	0	2.2
R26	0.91	0	0.91	2.1	0	2.1
R27	0.94	0	0.94	2.2	0	2.2
R28	1.2	0	1.2	2.6	0	2.6
R29	1.2	0	1.2	2.6	0	2.6

ALM = Adult Lead Methodology spreadsheet. S = Scenario. R = Receptor location. %ile = percentile.

Children

The IEUBK model was used to estimate geometric mean BPb in hypothetical populations of 1-2 year old children living in Cobar. It is noted these did not only include residential properties, but also schools, childcare facilities, hospitals, parks, pools and sporting grounds. Since a child may spend a portion of their day in different locations (e.g. partially at residence, partially at childcare, and partially at a park), the assessment was simplified by assuming children may spend all of their time at the designated receptor location. The modelling incorporated incidental ingestion of Pb in soil/dust, inhalation of Pb in air (PM₁₀), ingestion of Pb in rainwater tanks which has resulted from dust (TSP containing Pb) deposition onto roofs, as well as (for Scenarios 1 and 3) inclusion of modelled 'background' intakes of Pb from the diet, reticulated drinking water, soil (from measured 'existing' soil concentrations), and contribution from maternal BPb.

The estimated geometric mean BPb in 1-2 year old children at each receptor location is presented in Figure 3-5. The IEUBK modelling outputs are presented in Appendix I. As shown in Figure 3-5, modelled geometric mean BPb in populations of 1-2 year old children assumed to live at the various receptor locations ranged from 1.75 – 2.64 µg/dL for S1 (the existing situation) and 1.75 – 2.66 µg/dL for S2 (the proposed cumulative situation). All estimates are consistent with the range of geometric mean BPb reported for Australian children in communities not impacted by point sources of Pb (0.97 – 2.6 µg/dL).

Discussion and conclusions

From Proposal:

- The Proposal (S2) is predicted to have negligible impact on existing BPb concentrations.
The location with the highest estimated increase in geometric mean BPb was R2 (0.13 µg/dL in children), a residence within the mine lease currently inhabited by an elderly gentleman with no children. No children are expected to reside at this property in the future²⁸.
- Regardless, all estimated geometric mean BPb are well below the NHMRC (2015) BPb management goal of 5 µg/dL, above which exposure to Pb should be investigated and reduced.
- The assessment indicates negligible risk of harm to children or adults from Pb exposure as a result of the Proposal.

From background and Proposal:

- For the cumulative proposed situation (S3), the percentage of 1-2 year old children estimated by the IEUBK modelling to have BPb >5 µg/dL ranged from 1.29% (at R8) to 8.95% (at R4) (Appendix I).
- Since the target BPb level in children was only lowered relatively recently from <10 µg/dL to <5 µg/dL (see Sections 3.2 and 3.3), there are no 'background' data for Australian children with respect to percentage >5 µg/dL. At the same receptor locations, the percentage of 1-2 year old children predicted to have BPb >10 µg/dL was 0.01% (at R8) and 0.24% (at R4). This is within the range of 0-5% (average 1.7%) reported for Australian children in communities not impacted by point sources of Pb (i.e. from 'background' exposures to Pb).

²⁸ Verbal correspondence (Tarah Hagen from SLR) with EMM and Aurelia Metals on 10/07/2020.

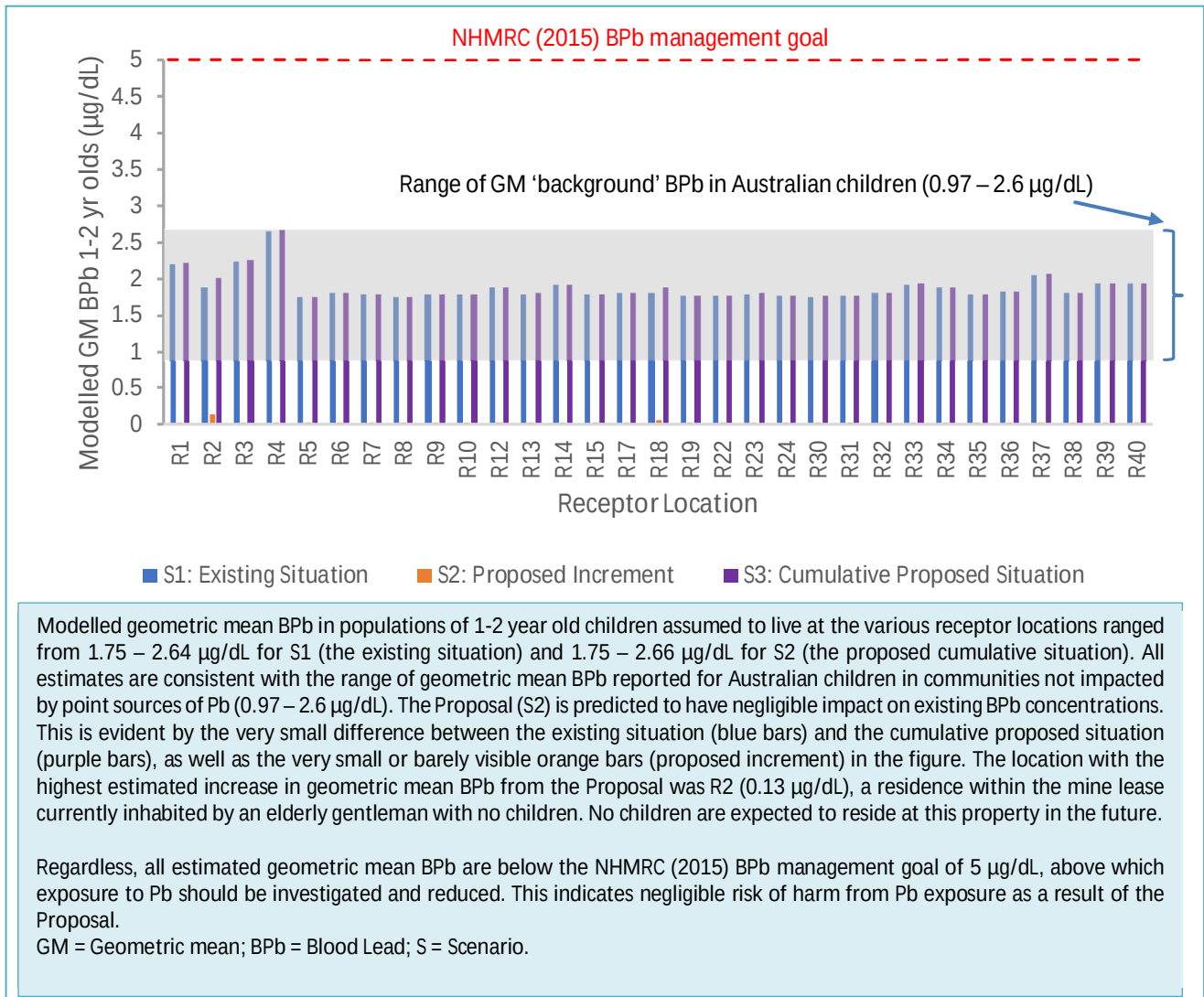


Figure 3-5 IEUBK modelled geometric mean BPb in populations of 1-2 year old children at relevant receptor locations

The proportion of estimated geometric mean BPb contributed by each exposure medium has been summarised for each scenario at four residential or child-care receptor locations (R1, R2, R4, and R8)²⁹ in Figure 3-6. The locations were chosen to span the range of BPb estimated for each particular scenario (see also Figure 3-5). From Figure 3-6, it is evident the contribution of each medium to BPb remains very similar for Scenario 1 (the existing situation) and Scenario 3 (the cumulative proposed situation) at each receptor location; this is not surprising since the Proposal increment is predicted to have negligible impact on existing BPb concentrations (see also Figure 3-5). For Scenarios 1 and 3, the dominant contributing exposure medium to estimated BPb is background exposure via the diet. The contribution of existing soil and dust Pb to BPb levels in Scenarios 1 and 3 varies between approximately 0.2-33% depending on the measured existing concentration of Pb in soil at the specific receptor location.

Keeping in mind that the absolute predicted increases in BPb due to the Proposal are very low (i.e. negligible), the exposure medium which is the largest contributor to these incremental modelled BPb (Scenario 2 – Proposed

²⁹ R1, R2 and R4 are all residences; R8 is a childcare centre.

increment) is rainwater in rainwater tanks. The latter have been assumed in this HHRA to contain Pb from dust depositing onto roofs and washing into the tank. The HHRA assumes 10% of a 1-2-year old's total daily water intake comes from rainwater tanks containing Pb. This is likely conservative since there is a reticulated water supply in Cobar and limited rainfall in the area.

Overall, BPb concentrations in 1-2 year old children living in Cobar are not anticipated to be affected by activities associated with the Proposal.

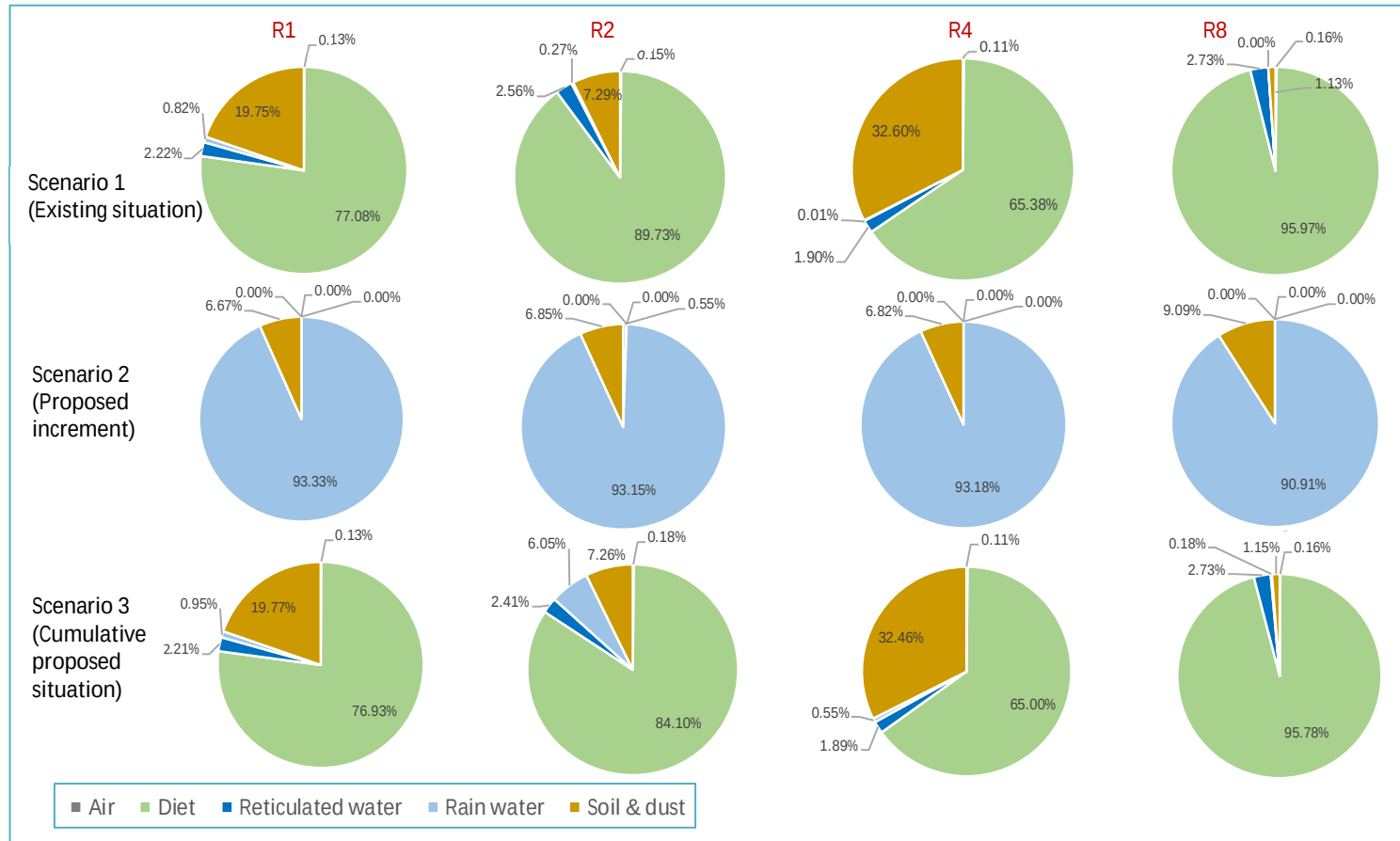


Figure 3-6 Exposure media contribution (%) to IEUBK modelled geometric mean BPb at four residential receptor locations

3.6 Uncertainty/Sensitivity Analysis for lead

The risk assessment process involves a number of steps (e.g. exposure assessment, toxicity assessment and risk characterisation), each of which incorporates the use of assumptions and simplifications to manage uncertainty or lack of knowledge about the correct value. Without such assumptions and simplifications it would not be possible to quantitatively evaluate the potential for health effects. Although uncertainties in the risk assessment may influence its accuracy, reliability and interpretation, the assumptions used to cope with unknown data for specific parameters tend to err on the side of safety and therefore bias the evaluation to over estimation of health risk. This is appropriate for an assessment for possible impacts on public health. It must be realised however the conservatism regarding one value is at least additive, most times multiplicative with conservatisms in other values such that the cumulative or compound conservatism incorporated into the assessment can be very large. This is especially so when gross, unrealistic default parameters are used in lieu of measured data.

Table 3-6 contains a general qualitative discussion of the major uncertainties and their potential influence on the health risk assessment. The 'big picture' uncertainties fall into the following major categories.

- Those associated with external exposure estimation (air dispersion modelling, calculated soil concentrations).
- Internal exposure estimation (BPb modelling).
- Receptor specific uncertainties.

Elsewhere in this report, when particular assumptions are discussed/assessed, information on the uncertainty is provided to enable the reader to integrate the uncertainties with the assessment that has been performed at that point in the report.

Table 3-6 Uncertainties in the HHRA for Pb and potential effect on health risk assessment outcome

Uncertainty/ Assumption	Comment	Effect on Risk Assessment
Exposure estimation <i>Modelled Pb concentrations in air and deposited dust. Provided to SLR by EMM (2020a, b, c).</i>	SLR has not assessed the information provided by EMM for its representativeness for predicted air metal concentrations or metal deposition to soil at receptors. However we note EMM (2020a) considers the predictions to be conservative. The EMM information has been taken on face value.	The modelled Pb deposition rates and air Pb concentrations underpin the estimation of Pb exposure and BPb levels. This is based on maximum incremental emission concentrations and an assumption that constant emissions at full ventilation outlet fan capacity will occur (EMM 2020a). In reality, this will not ever occur since power requirements would be restrictive and PGM do not use all areas of the mine simultaneously (EMM 2020a). Therefore these assumptions result in potential overestimation of incremental soil metal concentrations at each receptor.

Uncertainty/ Assumption	Comment	Effect on Risk Assessment
<i>Receptor location soil concentrations</i>	The soil Pb concentrations were calculated assuming the maximum yearly ore extraction will occur for each of the 15 years of practical mining operation and deposition will be into the top 2cm of soil. Physical loss of Pb from soil due to surface water runoff was included and based on a standard equation from US EPA (2005) used for these purposes. Other loss processes typically included in the Equation, i.e. biotic and abiotic degradation, soil erosion, leaching, and volatilisation were either considered not applicable to metals in soil or were assumed to be zero due to lack of specific information to enable their inclusion.	Smaller mixing depth would increase soil concentrations and larger mixing depth would decrease them. The assumption of zero loss of mine related deposited dust from processes other than surface water runoff will over-estimate exposure and consequently modelled BPb levels. Nevertheless, as the incremental deposition rates and subsequent estimated soil Pb concentrations from the Proposal are very low (ranging from 0.02 – 3.5 µg/g), modifying the mixing depth or soil loss calculations would not alter the conclusions of the HHRA. For example, if no soil loss was included the incremental soil Pb concentrations would only minimally increase by to 0.024 – 3.8 µg/g. The Health Investigation Level (HIL) for residential land use (including accessible soil) in Australia is 300 µg/g (i.e. mg/kg) (NEPM 2013).
<i>Existing soil Pb concentrations</i>	Data for existing soil Pb concentrations at various locations around Cobar (both on the mine site and within the township) were obtained in a comprehensive sampling program by EMM (2020d). For locations without sampled data, information for Pb in soil was gleaned from measured data near the receptor location.	As judged by the sampling campaign, existing soil Pb concentrations in Cobar have a relatively wide range of 8-370 µg/g. Thus there is uncertainty in the absolute value of the background soil Pb concentration used in the HHRA for locations at which no soil data were collected. However, this has no impact on the assessment for incremental change due to the Proposal (S2). It is considered to have a minor impact on the relative assessment conclusions for S1 & S3 because the same assumptions were made for each.

Uncertainty/ Assumption	Comment	Effect on Risk Assessment
<i>Existing air Pb concentration</i>	Existing concentrations of Pb in PM ₁₀ are based on 2017 annual average measured data at a monitoring station at the Hera Mine (~80 km southeast of Cobar).	As the air Pb data are from another mining location, this may overestimate true 'background' air Pb concentrations in Cobar. Nevertheless, when compared to existing (albeit limited) data available for PGM the distribution of concentrations recorded at the locations were closely aligned (EMM 2020a). This lends support that the concentrations are unlikely to be an underestimate for Cobar. Regardless, because the concentration is low (annual average of 0.009 µg/m³ in PM₁₀), it has minimal impact on modelled BPb. By comparison, the ambient air standard for Pb (in TSP) is 0.5 µg/m³, whereas the standards (also annual averages) for particles as PM_{2.5} and PM₁₀ are 8 and 25 µg/m³, respectively (NEPM 2016).
<i>Exclusion of home-grown foodstuff pathway for Pb</i>	Literature information showed the extent of Pb exposure from eating home-grown produce is probably low due to insufficient/inefficient uptake to edible parts of most plants. This is consistent with the conclusions in NEPM (2013).	Exclusion of the home-grown vegetable and fruit consumption pathway for Pb is considered an appropriate simplification of the BPb modelling and is unlikely to affect the outcome of the HHRA. It is excluded from all scenarios.

Calculation of metal intakes from rainwater tanks	The tank water metal concentrations were calculated assuming the annual average metal deposition will occur for each of the 15 years remaining operational mine life under the Proposal. It was assumed deposition will be onto roofs of an average size measured in Australia (206 m²) and that tanks would have an 85% collection efficiency of rainwater. These assumptions are consistent with enHealth (2010).	The calculation of metal concentrations in tank water is consistent with recommendations from enHealth (2010), however it is recognised there are many factors (unrelated to deposition rate) that also affect metal concentrations in tank water (e.g. state of roof, type of roof, age and size of tank, etc). There is therefore uncertainty with the calculated concentrations in tank water. The assumption that 100% of Pb potentially deposited in dust on roofs is mobilised by rainwater is conservative and will more likely over- rather than under-estimate the concentration of Pb in rainwater tanks.																										
	It was also assumed 10% of a person's daily water consumption comes from their rainwater tanks. This was based on the fact there is a reticulated water supply available in Cobar, and the average rainfall in Cobar could only supply approximately 1/10th of an average household's water requirements.	The assumption that 10% of a person's daily water consumption comes from rainwater tanks is likely conservative and is also more likely to over- rather than under-estimate the metal intakes from this exposure pathway. This is because it is considered unlikely that a person would need to drink from the rainwater tank at Cobar on a regular basis. It is more likely that rainwater is used to irrigate gardens or for recreational purposes (e.g. to top up a swimming pool). In such instances, intake of tankwater would not necessarily occur every single day, and incidental ingestion rates would likely be much lower than what has been assumed. Nevertheless, the potential impact on the HHRA conclusions if 100% of a child's drinking water intake were assumed to be sourced from rainwater tanks has been explored for the two residential receptors closest to the Proposal (R2 and R4), with results provided below.																										
	Metal intakes from rainwater tanks is the major exposure pathway contributing to estimated total intakes for Scenario 2, but only a minor contributor in Scenarios 1 and 3.	<table><tr><th rowspan="2"></th><th rowspan="2">Assumed proportion of daily drinking water intake that is tank water</th><th colspan="2">Predicted GM BPb (µg/dL)</th></tr><tr><th>R2</th><th>R4</th></tr><tr><td rowspan="2">S1</td><td>10%</td><td>1.885</td><td>2.645</td></tr><tr><td>100%</td><td>1.904</td><td>2.629</td></tr><tr><td rowspan="2">S2</td><td>10%</td><td>0.132</td><td>0.016</td></tr><tr><td>100%</td><td>1.185</td><td>0.146</td></tr><tr><td rowspan="2">S3</td><td>10%</td><td>2.005</td><td>2.659</td></tr><tr><td>100%</td><td>2.975</td><td>2.756</td></tr></table> If 100% of a child's drinking water intake is assumed to come from rainwater tanks instead of 10%, the predicted GM BPb levels would increase for S2 and S3. For R2 and R4, the increase ranges from approx. 0.1-1 µg/dL. As a result, the predicted GM BPb in S1 (for R4) and S3 (for both R2 and R4) would no longer be within the range of 'background' BPb in Australian children. Nevertheless, the predicted GM BPb would still be below the NHMRC BPb management goal. Therefore, the impact on the HHRA conclusions would be minimal.		Assumed proportion of daily drinking water intake that is tank water	Predicted GM BPb (µg/dL)		R2	R4	S1	10%	1.885	2.645	100%	1.904	2.629	S2	10%	0.132	0.016	100%	1.185	0.146	S3	10%	2.005	2.659	100%	2.975
	Assumed proportion of daily drinking water intake that is tank water	Predicted GM BPb (µg/dL)																										
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	100%	1.185	0.146																									
S3	10%	2.005	2.659																									
	100%	2.975	2.756																									

<i>Bioaccessibility of Pb from soil and dust</i>	Bioaccessibility testing was undertaken for seven samples of soil/dust collected from around Cobar or within the mine lease. The maximum Pb intestinal bioaccessibility (i.e. 6%) in any of the samples tested was used in the HHRA. As discussed in Section 2.5.1, there is uncertainty in the correlation between the SBRC intestinal Pb bioaccessibility obtained for the samples collected by EMM and the corresponding <i>in vivo</i> bioavailability. Therefore, additional adjustment to account for less than 100% absorption of Pb from the gastrointestinal tract has not been made in this HHRA. The intestinal bioaccessibility for Pb was assumed to be equal to the <i>in vivo</i> bioavailability.	The potential impact on the HHRA conclusions of incorporating 50% absorption into the intestinal bioaccessibility results for Pb and/or using the average gastric bioaccessibility (45%) instead of intestinal bioaccessibility data for Pb has been explored for the two residential receptors closest to the Proposal (R2 and R4), with results provided below. <table><tr><th rowspan="2"></th><th rowspan="2">Assumed soil/dust bioavailability</th><th colspan="2">Predicted GM BPb (µg/dL)</th></tr><tr><th>R2</th><th>R4</th></tr><tr><td rowspan="3">S1</td><td>6%</td><td>1.885</td><td>2.645</td></tr><tr><td>3%</td><td>1.81</td><td>2.192</td></tr><tr><td>45%</td><td>2.845</td><td>7.791</td></tr><tr><td rowspan="3">S2</td><td>6%</td><td>0.132</td><td>0.016</td></tr><tr><td>3%</td><td>0.127</td><td>0.015</td></tr><tr><td>45%</td><td>0.199</td><td>0.024</td></tr><tr><td rowspan="3">S3</td><td>6%</td><td>2.005</td><td>2.659</td></tr><tr><td>3%</td><td>1.925</td><td>2.206</td></tr><tr><td>45%</td><td>3.018</td><td>7.807</td></tr></table> If 50% absorption is incorporated into the intestinal bioaccessibility results (i.e. 3% bioavailability), instead of the assumed 6%, the predicted absolute BPb levels would be slightly lower for each scenario; this would not impact on the conclusions. Assuming 45% bioavailability of Pb in soil/dust increases the predicted absolute BPb levels for Scenarios 1 and 3, since this assumes 7.5x higher bioavailability of existing soil Pb measured around Cobar than indicated by the intestinal bioaccessibility data³⁰. As a result, the predicted GM BPb in Scenarios 1 and 3 would no longer be within the range of ‘background’ BPb in Australian children. The sensitivity analysis shows that the impact of this assumption on estimated BPb for Scenario 2 (the incremental BPb from the Proposal) is in the order of a 50% increase. Nevertheless, the absolute BPb is still very small, therefore the conclusions with respect to the estimated incremental change in BPb attributable to the Proposal would be unchanged.		Assumed soil/dust bioavailability	Predicted GM BPb (µg/dL)		R2	R4	S1	6%	1.885	2.645	3%	1.81	2.192	45%	2.845	7.791	S2	6%	0.132	0.016	3%	0.127	0.015	45%	0.199	0.024	S3	6%	2.005	2.659	3%	1.925	2.206	45%	3.018	7.807
	Assumed soil/dust bioavailability	Predicted GM BPb (µg/dL)																																				
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	3%	1.925	2.206																																			
	45%	3.018	7.807																																			

Uncertainty/ Assumption	Comment	Effect on Risk Assessment
Internal exposure estimation (i.e. Modelling Uncertainty) <i>Background exposures</i>	For BPb modelling of Scenarios 1 and 3, background Pb intake assumptions have been included.	The modelled background BPb (1.7 µg/dL) from dietary assumptions was at the mid-point of the range of measured background BPb for Australian and overseas children from non-impacted communities (0.76 – 3.1 µg/dL). Thus the IEUBK modelling of 'background' BPb concentrations agrees well with published measurement data. Thus, the model performs well. Nevertheless, background assumptions have minor impact on the assessment because the same assumptions are made for S1 & S3.

³⁰ BPb is not linearly related to soil bioavailability because a number of other exposure pathways, particularly Pb intake from diet, make a contribution to total BPb.

Uncertainty/ Assumption	Comment	Effect on Risk Assessment
Receptor Uncertainty <i>There may be people within the dispersion area of mine emissions that are more susceptible or vulnerable than others to developing health effects if they are exposed to Pb and other metals from the mine site.</i>	It is widely accepted by health authorities that the effects of Pb are well correlated with BPb levels. Intrinsic variability (i.e. toxicodynamic variability) has not been identified as a major contributor to the effects of Pb (e.g. ATSDR 2007a). Nevertheless, it is assumed that any condition or disease which compromises physiological functions could cause increased susceptibility to Pb. It is currently not possible to quantitatively account for potential increased susceptibility to Pb due to a pre-existing condition. For most individuals, when a given population is exposed to the same environmental concentrations of Pb, the variability in effects occurs due to variability in BPb levels, which may be affected by a person's nutritional status (e.g. dietary iron intake). This is the result of behavioural differences between persons resulting in different personal exposures (e.g. extent of time outdoors, extent of hand to mouth activity, personal and house hygiene etc) and differences that affect the absorption of Pb.	Impact on the conclusions of the HHRA is minimal. Because: 1. Maximum incremental Pb air concentrations and conservative deposition rates have been used, which together with background exposure, ensure the most exposed persons are included in the HHRA. 2. Exposure assumptions corresponding to values at the high end of the expected range were used for most parameters as input to the IEUBK model (e.g. Pb deposition onto soils and roofs, ratio of indoor dust Pb to soil Pb, calculated soil Pb concentrations from the Proposal). In predicting BPb levels, the IEUBK model calculates the most likely BPb level that would occur if a large population of children were exposed to the same exposures. The IEUBK model also predicts the percentage of such a theoretical population that could have BPb levels higher than the determined trigger level (5µg/dL). This is based on the observed BPb variability in US children that are in the same Pb contaminated environment. There is uncertainty regarding the applicability of the US children BPb variability to the population of Cobar. However appropriate data were not available to make this input parameter site specific. These considerations are likely to have minor impact on the assessment.

Uncertainty/ Assumption	Comment	Effect on Risk Assessment
<i>There is a market garden located on the mine lease southeast of the proposed vent rise and approximately 0.6 km southeast of R2.</i>	The uncertainty analysis herein considers the potential risk of harm from exposure to produce which has assimilated metals from soil which have been deposited via dust from the Proposal. EMM have indicated metal deposition in dust from the Proposal at the market gardens is expected to be 20% lower than that at R2³¹.	The risk of harm from exposure to Pb in produce sourced from the market gardens is considered to be low, since Pb is assimilated very poorly by plants (Section 2.7). Given this fact, the market garden has not been assessed quantitatively in the HHRA. Consideration on the potential conclusions for other metals is discussed in Section 4.6.

4 Risk Assessment for Other Metals

4.1 Overview

The HHRA for metals other than Pb has been undertaken as follows:

- Calculation of lifetime time-weighted average daily intakes from ingestion of soil/dust and tank water and comparison of these with tolerable daily intakes (TDIs) (Section 4.3.1), as well as calculation of an inhalation exposure concentration and comparison with chronic air guideline values (Section 4.3.2). TDIs were adjusted for 'background' exposures. The resulting ratio of the intake or inhalation exposure concentration to the background-adjusted TDI or air guideline value is called a hazard quotient (HQ). The exposure pathways considered are the same as those described in Section 2.7. Plant uptake of metals from soil may or may not be significant for the metals/metalloids considered in this HHRA. This has been incorporated by adjusting the TDI to account for this pathway (and background intakes). The adjustment is metal-specific (Section 4.3.1). HQs for the inhalation and oral exposure pathways were summed to give an overall HQ for that metal.
- In addition, for those metals for which the health effect of concern is cancer via inhalation or ingestion, and whose mode of action is by directly altering genetic material (i.e. they are genotoxic), excess lifetime cancer risks were calculated by multiplying the relevant exposure estimate (annual average concentration in PM₁₀ or lifetime time-weighted average daily intake from incidental ingestion) by an estimate of the carcinogenic potency of the metal (Section 4.3.3). The latter is commonly termed a unit risk factor if exposure is via inhalation and a slope factor if it is via ingestion. The resulting estimated excess 'cancer risk' was compared with a target acceptable risk of 1×10^{-5} as recommended by enHealth (2012a) and NEPM (2013). Nickel was the only metal which was assessed using this non-threshold approach. Justification for this is provided in Appendix C.

³¹ E-mail correspondence between Scott Fishwick (EMM) and Tarah Hagen (SLR) entitled 'RE: Request for contour plots', dated 10 July 2020.

Hazard indices (HI) were calculated by summing the HQ's of individual metals. Calculation of an overall HI assumes the toxicological effects of the assessed individual metals are additive, and that possibly multiple sub-threshold exposures may result in an effect. In toxicological terms this assumption of additivity is only valid if the compounds assessed have a similar mode of toxicological action and affect the same target tissues. In the present HHRA, all metals included in the hazard quotient assessment were conservatively assumed to act in an additive manner, and the hazard quotients were summed to calculate an overall HI.

The above are standard risk assessment procedures used internationally and in Australia (enHealth 2012a, NEPM 2013, US EPA 1989a, 2009b). The HHRA methodology for metals other than Pb is outlined in Figure 4-1.

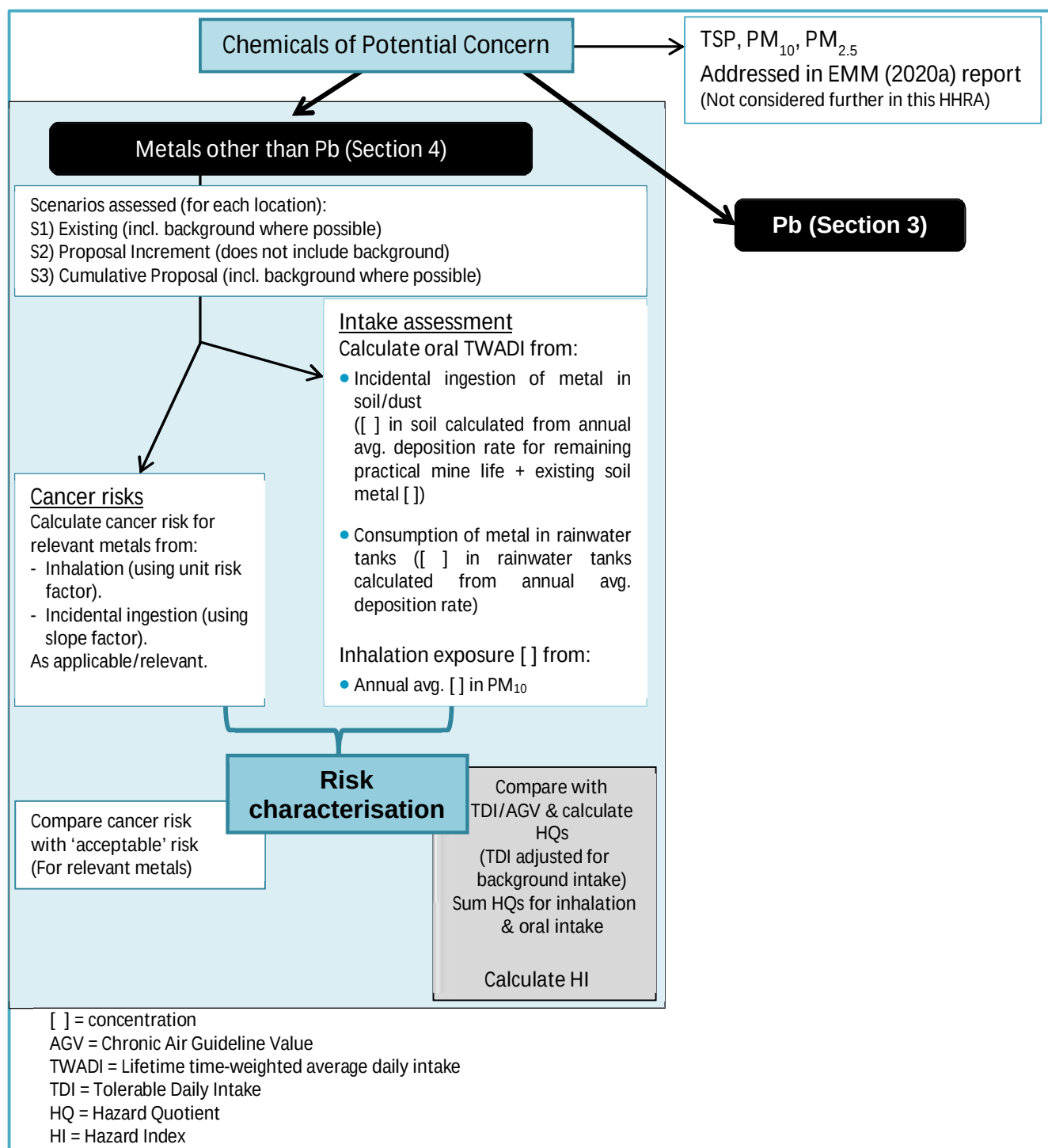


Figure 4-1 Summary of HHRA methodology for metals other than Pb

Interpretation of Hazard Quotients and Hazard Indices

If the HQ for the cumulative exposure pathways in the assessment is greater than one ($HQ > 1$) then there is a possibility that the TDI or chronic air guideline value for that substance might be exceeded. This does not directly equate with possibility of harm as the TDIs and chronic air guidelines have inherent safety margins incorporated within them. The TDIs are also adjusted for potential background exposure which is mostly from diet.

An 'unacceptable' risk, as defined by regulatory standards and requirements, is often determined as an exposure being larger than the toxicity reference value (TRV) used to calculate the hazard quotient, i.e. the HQ or HI > 1. This definition of unacceptable risk does not equate with imminent adverse health effects or even high risk of adverse health effects. It simply means that the regulatory guideline value has been exceeded.

Notwithstanding their use in this risk assessment, HQs and HIs are relatively blunt tools used to assist in characterising and prioritising risks. Great care must be taken to the level of importance that is placed on high numerical values of the HI. Hazard indices should not be used in isolation of other pertinent data such as the reality of exposures actually happening and with the intensity and frequency assumed in the HHRA. These aspects relate to the conservatism (i.e. over exposure) incorporated into the exposure assessment and TRVs.

4.2 Interactions between metals

The HI, i.e. the sum of HQs, is a screening risk assessment technique commonly used to judge whether there is concern for additive effects between chemicals. Similar to the interpretation of HQs, if the HI is less than unity (i.e. <1) there is low likelihood of additive health effects between the substances. This process does not take into account toxicological mechanisms or kinetics. However, in strict biological terms an interaction, additivity or synergy, would only be expected if chemicals were affecting the same tissue types in an equivalent manner. Nevertheless, for the purposes of the present HHRA all the metals included in the hazard index are, by default, conservatively assumed to act in an additive manner.

4.3 Hazard assessment for other metals

4.3.1 Tolerable daily intakes

A toxicity category summary for the metals assessed in this HHRA is provided in Appendix C. Table 4-1 summarises oral tolerable daily intake (TDIs) for all metals/metalloids assessed in this HHRA, except for Pb which was evaluated using predicted BPb levels (see Section 3). The TDIs were adjusted for assumed high end background intakes. The adjusted TDIs are also presented in the table. The adjusted TDIs represent the dose of metal (adjusted for background intakes) which can be ingested every day over a lifetime without adverse health effects.

Table 4-1 Tolerable daily intakes (TDIs) for metals assessed in this HHRA

Metal/Metalloid	TDI (µg/kg/d)	Basis (Reference)	Assumed background intake, as % of TDI (reference)	Adjusted TDI used in HHRA (µg/kg/d) ⁽¹⁾
Silver (Ag)	400	Based on oral NOAEL for argyria in humans for a total lifetime intake of 10 g of silver based on human case reports and long-term experiments. Use of UF not described (NHMRC and NRMCC 2018).	0% (NHMRC and NRMCC 2018) ⁽²⁾	400
Antimony (Sb)	6	Based on a NOAEL of 6 mg/kg/d for decreased body weight gain and reduced food and water intake in a 90-day study where rats were administered potassium antimony tartrate in DW and application of an UF of 1000 (100 for intra- and inter-species variation, 10 for short duration of study) (WHO 2017).	0% (Iyengar et al. 1987) ⁽³⁾	6
Arsenic (As)	2	Based on studies of human populations exposed to inorganic As in drinking water, and an assessment by NEPM (2013) on the comparability of the TDI value to international agency deliberations.	54.5% (NEPM 2013) ⁽⁴⁾	0.91
Barium (Ba)	67	Based on a NOAEL of 0.2 mg/kg bw/d from an epidemiological study on two populations in the United States ingesting drinking water of 0.1 or 7.3 mg/L, and application of an UF of 3 (for potential human variability). No differences were observed in blood pressure or incidence of kidney disease between the two communities (NHMRC and NRMCC 2018). Since no adverse effect was observed the true NOAEL is likely higher.	25% (NHMRC and NRMCC 2018) ⁽⁵⁾	50
Beryllium (Be)	2	TDI of 0.002 mg/kg/d (i.e. 2 µg/kg/d) based on a BMDL ₁₀ (equivalent to a NOAEL) of 0.46 mg/kg bw/day for small intestinal lesions in dogs chronically exposed to dietary beryllium sulphate tetrahydrate, and application of an UF of 300 (100x for intra- and inter-species variation, 3x for database deficiencies) (NHMRC and NRMCC 2018).	38.4% (NEPM 2013) ⁽⁶⁾	1.2

Metal/Metalloid	TDI (µg/kg/d)	Basis (Reference)	Assumed background intake, as % of TDI (reference)	Adjusted TDI used in HHRA (µg/kg/d) ⁽¹⁾
Cadmium (Cd)	0.8	Derived from PTMI of 25 µg/kg bw/month ÷ 30d. PTMI based on relationship of dietary Cd intake to NOEL for β2MG urinary excretion in susceptible population (≥50yrs) (JECFA 2011b).	93.4% (NEPM 2013) ⁽⁷⁾	0.053
Chromium (as Cr ^{III})	300	TDI derived by EFSA (2014) from lowest NOAEL (286 mg/kg bw/d) identified in a chronic dietary rat study with chromium picolinate monohydrate and application of an uncertainty factor of 1,000 (10x for intra-, 10x for inter-species variability, 10x to account for absence of adequate data on reproductive and developmental toxicity).	0% (FSANZ 2011) ⁽⁸⁾	300
Copper (Cu)	130	WHO (2017) note that intakes derived from consuming 2-3 L of water/day are not expected to exceed a tolerable upper intake level of 10 mg Cu/day. This upper intake level is equal to a TDI of 130 µg/kg/day for a 78kg adult. This is consistent with an oral TDI of 140 µg/kg/day derived by RIVM (2001) based on a chronic oral mouse study.	70% (NEPM 2013)	39
Mercury (Hg)	0.6	Based on PTWI of 4 µg/kg bw/week. PTWI based on BMDL ₁₀ (0.06 mg/kg/d) for relative kidney weight increases in male rats in 6-month DW study with mercuric chloride, after adjustment for 5 day/week dosing schedule & molar percent of Hg in Hg (II) chloride. UF of 100 (10x for inter- and 10x for intra-species variability) was applied (JECFA 2011a).	60.5% (NEPM 2013) ⁽⁹⁾	0.24

Metal/Metalloid	TDI (µg/kg/d)	Basis (Reference)	Assumed background intake, as % of TDI (reference)	Adjusted TDI used in HHRA (µg/kg/d) ⁽¹⁾
Manganese (Mn)	Adult: 6.4 Child & adolescent: 270	Guidance value from UK Expert Group on Vitamins and Minerals (2003). After reviewing available epidemiological studies for Mn, the Expert Group concluded it is reasonable to assume that in the general population a supplemental intake of up to 4 mg Mn/day in addition to the diet would be unlikely to produce adverse effects; this level is lower (0.5 mg Mn/day) in older people (>50 yrs). Assuming an average BW of 78 kg, this equates to 0.0064 mg/kg bw/day in persons >50 yrs old. This value was selected for use as the TDI for adults in this HHRA. For children (and adolescents) the TDI was taken to be 4 mg ÷ 15 kg bw = 0.27 mg/kg bw/d.	0% (background intake already included in derivation)	Adult: 6.4 Child & adolescent: 270 (the lower of the two, the adult TDI, was used in the HHRA for lifetime exposure)
Nickel (Ni)	12	Derived from an acute LOAEL of 0.012 mg/kg/day established after oral provocation (via drinking water) of allergic contact dermatitis in fasted patients with an empty stomach. Because absorption from DW on an empty stomach is 10-40 fold higher than absorption from food, this was considered a worst-case scenario, and an UF of 1 was applied (WHO 2017).	85.2% (NEPM 2013) ⁽¹⁰⁾	1.8
Zinc (Zn)	320	Guidance value from UK Expert Group on Vitamins and Minerals (2003). After reviewing available epidemiological information, the Expert Group concluded an upper level of 25 mg/day for supplemental zinc (i.e. in addition to the normal diet) would not be associated with adverse effects. Assuming an adult average BW of 78 kg, this equates to 0.32 mg/kg bw/day.	0% (background intake already included in derivation)	320

TDI = Tolerable Daily Intake; NOAEL = No Observed Adverse Effect Level; LOAEL = Low Observed Adverse Effect Level; UF = Uncertainty Factor; DW = Drinking Water; PTMI = Provisional Tolerable Monthly Intake; β2MG = beta-2-microglobulin; RfD = Reference Dose (US EPA terminology); BMDL₁₀ = Benchmark Dose Lower 10% response level.

¹ All assumed background intakes include consideration of intakes from home-grown produce.

² NHMRC and NRMCC (2018) indicate daily dietary intake of Ag has been estimated at between 0.03 – 0.09 mg. For an adult weighing 78kg (enHealth 2012b), this equates to an intake of 0.0004 – 0.001 mg/kg/d, i.e. 0.4 – 1 µg/kg/d. This is only 0.1 – 0.25% of the TDI. In line with recommendations in enHealth (2012a), where background exposure is essentially negligible (i.e. <5% of the TDI) the TDI does not require adjustment for background intake.

- ³ The average intake of antimony by adults in the US from food and water has been estimated to be approximately 5 µg/day, i.e. 0.064 µg/kg bw/day for a 78 kg adult. Since this is only approximately 1% of the TDI, this indicates background intakes of Sb are likely very low. In line with recommendations in enHealth (2012a), where background exposure is essentially negligible (i.e. <5% of the TDI) the TDI does not require adjustment for background intake.
- ⁴ In deriving a health investigation level (HIL) for arsenic in soil, NEPM (2013) assumed 50% of the TDI is attributable to background intake, and 9% of the left-over TDI (i.e. 4.5% of the total TDI) was attributed to ingestion of home-grown produce. Therefore a total potential background intake of 54.5% of the TDI was assumed in this HHRA.
- ⁵ NHMRC and NRMCC (2018) indicate daily dietary intake of barium has been estimated at 1 mg. For an adult weighing 78kg (enHealth 2012b), this equates to an intake of 0.013 mg/kg/d, i.e. 13 µg/kg/d. This is 19% of the TDI. An additional 6% of the TDI was attributed to ingestion of home-grown produce. Therefore, a total potential background intake of 25% of the TDI was assumed in this HHRA.
- ⁶ In deriving a health investigation level (HIL) for beryllium in soil, NEPM (2013) assumed 30% of the TDI is attributable to background intake, and 12% of the left-over TDI (i.e. 8.4% of the total TDI) was attributed to ingestion of home-grown produce. Therefore a total potential background intake of 38.4% of the TDI was assumed in this HHRA.
- ⁷ In deriving a health investigation level (HIL) for cadmium in soil, NEPM (2013) assumed 80% of the TDI is attributable to background intakes, and 67% of the left-over TDI (i.e. 13.4% of the total TDI) was attributed to ingestion of home-grown produce. Therefore a total potential background intake of 93.4% of the TDI was assumed in this HHRA.
- ⁸ Background intakes of Cr^{III} are likely very low. According to FSANZ (2011, Table A19.2), the 95th percentile daily intake of Cr^{III} from the diet by Australian adults ranges from 119-204 µg/day. At a 78kg average body weight (enHealth 2012b), this equates to approximately 1.5-2.5 µg/kg/day. This is <1% of the TDI. Uptake of Cr^{III} into home-grown produce from soil is also likely to be minimal, due to its limited mobility and transferability into edible parts of plants (Oliveira 2012). In line with recommendations in enHealth (2012a), where background exposure is essentially negligible (i.e. <5% of the TDI) the TDI does not require adjustment for background intake.
- ⁹ In deriving a health investigation level (HIL) for inorganic mercury in soil, NEPM (2013) assumed 50% of the TDI is attributable to background intake, and 21% of the left-over TDI (i.e. 10.5% of the total TDI) was attributed to ingestion of home-grown produce. Therefore a total potential background intake of 60.5% of the TDI was assumed in this HHRA.
- ¹⁰ In deriving a health investigation level (HIL) for nickel in soil, NEPM (2013) assumed 80% of the TDI is attributable to background intake, and 26% of the left-over TDI (i.e. 5.2% of the total TDI) was attributed to ingestion of home-grown produce. Therefore, a total potential background intake of 85.2% of the TDI was assumed in this HHRA.

4.3.2 Chronic air guideline values

Chronic air guideline values (AGVs) were sourced for all metals/metalloids assessed in this HHRA in order to calculate a HQ for the inhalational exposure pathway. Table 4-2 summarises the AGVs; they represent a concentration of metal which can be inhaled every day over a lifetime without adverse health effects.

Table 4-2 Chronic air guideline values for metals assessed in this HHRA

Metal/Metalloid	Health endpoint for guideline value	Critical effect level (mg/m ³)	UF	AGV (µg/m ³) ⁽²⁾	Reference
Silver (Ag)	Argyria in humans after oral exposure	No chronic AGV located. Use TDI extrapolated to inhalational exposure: [400 µg/kg/d x 78 kg] ÷ 20 m ³ /day		1,560	Oral TDI source: NHMRC and NRMCC 2018 (see Table 4-1)
Antimony (Sb)	Pulmonary toxicity in rats	0.87 (BMC ₁₀) 0.074 (BMC _{HEC})	300	0.2	US EPA 1995
Arsenic (As)	Lung cancer from As trioxide exposure in smelter workers (threshold approach)	0.01 (LOAEC)	10	1.0	RIVM 2001 (also used in NEPM 2013)

Metal/Metalloid	Health endpoint for guideline value	Critical effect level (mg/m ³)	UF	AGV (µg/m ³) ⁽²⁾	Reference
Barium (Ba)	Cardiovascular effects in rats	0.11 (NOAEC)	100	1.0	RIVM 2001
Beryllium (Be)	Chronic beryllium disease in workers	0.00055 (LOAEC) 0.0002 (LOAEC _{ADJ})	30	0.007	OEHHA 2008
Cadmium (Cd)	Kidney/renal effects (i.e. β2-microglobulin proteinuria) in humans	0.0001 (air concentration corresponding to urinary UC _{DL10})	9	0.011	TCEQ 2016 (same value as ATSDR 2012)
Chromium (as Cr ^{III})	Increased total relative lung & trachea weights in male rats (13 weeks) exposed to 25% chromic oxide	3.451 (BMCL ₁₀) (as chromic oxide) 0.8086 (POD _{HEC}) (as chromic oxide)	1000	0.14 (converted to trivalent Cr)	TCEQ 2009
Copper (Cu)	Respiratory & immunological effects in rabbits	0.6 (NOAEC) 0.11 (NOAEC _{ADJ})	100	1	RIVM 2001
Mercury (Hg)	CNS effects in workers	0.025 (LOAEC) 0.009 (LOAEC _{ADJ})	300	0.03	OEHHA 2008
Manganese (Mn)	Neurotoxic effects in workers	0.03 (BMDC ₅)	200	0.15	WHO 2000
Nickel (Ni)	Combined approach protective of non-cancer (i.e. pulmonary fibrosis) and cancer (lung) effects. ⁽¹⁾			0.02	EC 2001
Zinc (Zn)	No adverse effects in humans from oral intakes	No chronic AGV located. Use TDI extrapolated to inhalational exposure: [320 µg/kg/d x 78 kg] ÷ 20 m ³ /day		1,248	Oral TDI source: UK Expert Group on Vitamins and Minerals (2003) (see Table 4-1)

AGV = Air Guideline Value, UF = Uncertainty Factor, NOAEC = No Observed Adverse Effect Concentration, LOAEC = Lowest Observed Adverse Effect Concentration, BMC₁₀ = Benchmark Concentration for 10% effect, BMCL₁₀ = Lower Benchmark Concentration for 10% effect, POD_{HEC} = Human equivalent point of departure, BMC_{HEC} = Human equivalent benchmark concentration, BMDC₅ = Lower 95% confidence limit of the benchmark concentration for a 5% response, LOAEC_{ADJ} = Time-adjusted LOAEC, NOAEC_{ADJ} = Time-adjusted NOAEC, TDI = Tolerable Daily Intake, UC_{DL10} = urinary cadmium dose 95% confidence limit at the 10% response level.

- EC (2001) derived an annual AGV of 0.01 µg/m³ for non-cancer effects using a chronic LOAEC of 0.06 mg/m³ for lung fibrosis in mice exposed to nickel sulphate hexahydrate, and applied an adjustment factor of 6 to adjust from discontinuous to continuous exposure, then applied an UF of 1000 (10x for use of a LOAEC, 10x for inter- and 10x for intraspecies variability). EC (2001) also used unit risk estimates from WHO and US EPA for nickel refinery dust to calculate concentrations of nickel compounds associated with 1 x 10⁻⁶ cancer risk (2.6 – 4 ng/m³). Because the form of nickel in the occupational studies on which risk estimates were based were different from that encountered in ambient air, EC (2001) accepted that these concentrations may overestimate the true risk by about one order of magnitude. In addition, the linear extrapolation over many orders of magnitude from the observed excess risk in exposed human workers to one in a million also confers conservatism. EC (2001) concluded that “a limit value in the range 10-50 ng/m³ as derived from non-cancer effects can be judged compatible with the aim of limiting the excess lifetime cancer risk to not more than one in a million. The majority of the Working Group proposes a limit value at the lower end of this range.”
- All AGVs are for chronic (i.e. long-term) exposure. Averaging time is generally not stated but presumed to be annual.

4.3.3 Inhalation unit risks and oral slope factors (cancer)

From Appendix C, one of the metals assessed in this HHRA (nickel) is considered to induce lung cancer in humans via a genotoxic mode of action at high concentrations when inhaled (occupational exposures). The other metals that may induce cancer (via oral or inhalation exposure) are thought to exert these effects via a threshold mode of action (see Appendix C). For nickel, a lifetime cancer risk has been calculated using a unit risk factor from a reputable international agency.

For airborne carcinogens, the “unit” is generally $1 \mu\text{g}/\text{m}^3$ and depending on the nature of the data used to determine the carcinogenic potency, the numerical value refers to the probability of developing, or dying of cancer. If a lifetime exposure to $1 \mu\text{g}/\text{m}^3$ of a substance may carry a risk of 1 chance in 200 of developing cancer, this is often interpreted as meaning if 200 people were exposed to $1 \mu\text{g}/\text{m}^3$ for their lifetime then one individual may develop cancer. This probability is expressed as 0.5 in 100 or 0.5×10^{-2} per $\mu\text{g}/\text{m}^3$, written as $0.5 \times 10^{-2} (\mu\text{g}/\text{m}^3)^{-1}$. For the purposes of carcinogenicity, a *de minimus* risk, i.e. trivial or negligible risk, is usually taken to be a risk level of less than or equal to one in a million (1×10^{-6}) or one in one hundred thousand (1×10^{-5}).

The Texas Commission on Environmental Quality (TCEQ 2011) provides one of the most recent evaluations of the carcinogenicity data for nickel. The agency recognised that nickel species differ in their carcinogenic potency, and that it is important a unit risk factor be developed based on studies with nickel species exposure profiles similar to nickel emissions in Texas. Estimates of nickel emissions in Texas indicated they were predominantly metallic along with soluble nickel (i.e. nickel sulphate) and nickel oxides, rather than refinery dust containing high proportions of nickel subsulphide. Therefore, TCEQ (2011) developed a unit risk factor based on epidemiological studies where workers were exposed to relatively low concentrations of refinery dust containing low levels of nickel subsulphide (~2 -15%). These plants were in Huntington, West Virginia (Enterline and Marsh 1982) and Kristiansand, Norway (Magnus et al. 1982 updated by Grimsrud et al. 2002, 2003). TCEQ excluded studies where exposure was to high amounts of dust in which nickel subsulphide exposure was predominant (i.e. ~50%) (Chovil et al. 1981, Peto et al. 1984).

The unit risk estimate for all the workers combined from the Huntington and Kristiansand cohorts, which includes groups exposed to low levels of nickel subsulphide as well as groups mainly unexposed to nickel subsulphide, was $4.34 \times 10^{-5} (\mu\text{g}/\text{m}^3)^{-1}$, calculated with Texas specific background rates of lung cancer. For workers who were mainly non-exposed³² to nickel subsulphide the unit risk factor was an approximate order of magnitude less at $5.65 \times 10^{-6} (\mu\text{g}/\text{m}^3)^{-1}$. The nickel in dust at Cobar is likely to be principally in sulphide form, rather than subsulphides as would be present around smelters. Although the nickel at Cobar is unlikely to contain nickel subsulphide, the former cancer potency factor was preferred for airborne exposure to nickel dust from the New Cobar Complex, since cancer potency of nickel sulphide is unknown.

‘Cancer risk’ for nickel was calculated for each receptor location by multiplying the annual average modelled nickel in PM_{10} concentration by the unit risk factor [$4.34 \times 10^{-5} (\mu\text{g}/\text{m}^3)^{-1}$]. The calculated cancer risk was compared with a target acceptable risk of 1×10^{-5} as recommended by enHealth (2012a) and NEPM (2013).

³² Persons mainly non-exposed to nickel subsulphide were refinery workers hired after 1946 and non-refinery workers.

4.4 Exposure equations and parameterisation

Human intake of environmental chemicals is not only reliant upon the concentration of the chemical in environmental media but also on age dependent behaviour factors of population subsections that are exposed. For example, children are more likely to gather soil on their hands and have more frequent hand-mouth transfer rates.

Hazard quotients were estimated for each receptor location and Scenario. The HQs were calculated by adding up the HQ from:

- intake via air calculated by dividing the modelled metal concentration³³ in PM₁₀ by the respective chronic air guideline value (Section 4.3.2), and
- intake via soil/dust and rainwater (collected on roofs) calculated by dividing the estimated overall lifetime weighted daily intake for all life stages (also called the time weighted average daily intake or TWADI)³⁴ by the TDI adjusted for potential background exposures (Section 4.3.1) from diet, water and air; the latter includes consideration of metal intake from home-grown produce³⁵.

The total HQs for each metal were summed to calculate an overall hazard index. If HQs and HIs are less than unity it indicates that under the exposure scenarios being considered there is little likelihood of health effects occurring.

Effects from acute exposures are not anticipated based on a conservative screening comparison undertaken in Appendix K of the maximum modelled cumulative air concentration (i.e. existing situation plus increment from Proposal) with published acute air guideline values. This comparison showed acute HQs for individual metals ranged from 0.000002 to 0.19, with a HI of 0.25 (i.e. the sum of all acute HQs for all metals).

4.4.1 Exposure equations

Exposure pathways which were quantitatively evaluated are:

- Ingestion of metal in soil/dust,
- Ingestion of metal in rainwater collected in rainwater tanks from deposited metal on roofs, and
- Inhalation of metal in air.

Age-specific physiological parameters (e.g. body weight, soil/dust ingestion rate, etc.) for each age group were assumed to correspond to the mean age in the age group. For example, for the 0.5-3 year life stage, physiological parameters were assumed to be equivalent to those of a 2 year old child ($[0.5 + 3]/2 = 1.75$ yrs, rounded to 2 yrs).

³³ As no data were available for 'background' concentrations of metals in PM₁₀ (other than for Pb) the inhalational intakes only incorporate modelled metal concentrations in PM₁₀ from the existing or proposed mining complex.

³⁴ The comparison was done using daily intake of metals for infants/toddlers (0.5 up to 3 years), children (3 up to 13 years), adolescents (13 up to 18 years) and adults (18 up to 82 years).

³⁵ Where possible, TDIs have been adjusted for both background intake from normal dietary exposure, but also for home-grown produce, as per the approach taken in NEPM (2013), where a certain percentage of the TDI was allocated to home-grown produce. The latter varies for each metal depending on the importance of this exposure pathway (see Section 4.3.1).

4.4.1.1 Ingestion of metals deposited from New Cobar Complex

Estimated daily intake via ingestion of soil/dust and ingestion of rainwater was calculated using the Equations in Table 4-3 below (from enHealth 2012a).

The lifetime time-weighted average daily intake (TWADI, i.e. $\text{Intake}_{\text{ing_lifetime}}$) calculated for each metal or metalloid from combined soil/dust and rainwater ingestion was compared with the background-adjusted TDI to generate an oral HQ for these pathways (plus background intakes).

Table 4-3 Equation and parameters for estimating ingestion of metals in soil/dust and rainwater tanks deposited from New Cobar Complex

Parameter	Acronym	Units	Value	Basis/Description
<u>Soil and Dust</u>				
Equation 1a ⁽¹⁾ : Intake _{oralS+D(x)}	$= \frac{(C_s + C_{s_existing(end)}) \times BAc \times IR_{soil_as} \times EF \times ED_x \times BA_{oral}}{365 \times BW_{as} \times AT_x}$			(for Scenarios 1 and 3)
Equation 1b ⁽¹⁾ : Intake _{oralS+D(x)}	$= \frac{(C_s) \times BAc \times IR_{soil_as} \times EF \times ED_x \times BA_{oral}}{365 \times BW_{as} \times AT_x}$			(for Scenario 2)
<u>Tank Water</u>				
Equation 2 ⁽¹⁾ : Intake _{oralW(x)}	$= \frac{[MConc_{tank} \times IR_{water_as} \times F] \times EF \times ED_x \times BA_{oral}}{365 \times BW_{as} \times AT_x}$			
<u>Total Oral Intake Soil/Dust plus Tank Water</u>				
Equation 3: Intake _{oral(x)}	Intake _{oralS+D(x)} + Intake _{oralW(x)}			
<u>TWADI Total Intake</u>				
Equation 4:	$Intake_{oral_lifetime} = \frac{(Intake_{oral(0.5-3)} \times 365 \times AT_x) + (Intake_{oral(3-13)} \times 365 \times AT_x) + (Intake_{oral(13-18)} \times 365 \times AT_x) + (Intake_{oral(18-82)} \times 365 \times AT_x)}{AT_{lifetime}}$			
<u>Oral Hazard Quotient</u>				
Equation 5: HQ _{oral}	$= \frac{Intake_{oral_lifetime}(TWADI)}{TDI_{adj}}$			
Life stage oral intake of metal/metalloid from soil/dust	Intake _{oralS+D(x)} Intake _{oralS+D(0-3)} Intake _{oralS+D(3-13)} Intake _{oralS+D(13-18)} Intake _{oralS+D(18-82)}	µg/kg bw/day	Calculated using Equation 1 in this table. The (x) in the subscript refers to the specific lifestage (i.e. 0-3, 3-13, 13-18, or 18-82 years) being calculated.	
Life stage oral intake of metal/metalloid from rainwater	Intake _{oralW(x)} Intake _{oralW(0-3)} Intake _{oralW(3-13)} Intake _{oralW(13-18)} Intake _{oralW(18-82)}	µg/kg bw/day	Calculated using Equation 2 in this table. The (x) in the subscript refers to the specific lifestage (i.e. 0-3, 3-13, 13-18, or 18-82 years) being calculated.	

Parameter	Acronym	Units	Value	Basis/Description
Life stage oral intake of metal/metalloid from soil/dust and rainwater	Intake _{oral(x)} Intake _{oral(0-3)} Intake _{oral(3-13)} Intake _{oral(13-18)} Intake _{oral(18-82)}	µg/kg bw/day	Calculated using Equation 3 in this table. The (x) in the subscript refers to the specific lifestage (i.e. 0-3, 3-13, 13-18, or 18-82 years) being calculated.	
Soil metal concentration after 15 years of remaining practical mine life	C _s	µg metal/ g soil	Calculated using Equation in Table 2-4.	
Existing (i.e. 'background') soil metal concentration after 15 years of remaining practical mine life	C _{s_existing(end)}	µg metal/ g soil	Metal-specific. Calculated using Equation in Table 2-5.	
Bioaccessibility of metal in soil/dust	BAC	unitless	Metal-specific. As determined by bioaccessibility testing for As (0.038, see Table 2-2). In the absence of data, this was assumed to be 100% (i.e. 1) for other metals.	
Age-specific rate of soil/dust ingestion per day	IR _{soil_as}	g/day	0.5-3yrs: 0.1 3-13 yrs: 0.1 13-18 yrs: 0.05 18-82 yrs: 0.05	Central tendency values (outside soil + indoor dust) (enHealth 2012b).
Estimated concentration of metal in rainwater tank	MConc _{tank}	µg/L	Calculated using Equations in Table 3-3.	
Age-specific rate of tap water consumption per day	IR _{water_as}	L/day	0.5-3yrs: 0.3 3-13 yrs: 0.5 13-18 yrs: 0.8 18-82 yrs: 1.2	Mean tap water (i.e. community supply) intake. Includes water used in food preparation, excludes commercially purchased bottled water and water intrinsic to purchased food and beverages (enHealth 2012b).
Fraction of total water intake that stems from rainwater tanks	F	unitless	0.1	As per rationale in Section 3.4.3.8.
Exposure frequency	EF	days/yr	365	Residential exposure assumes exposure throughout the whole year (365 days/year).
Age-interval exposure duration	ED _x	yr	0.5-3yrs: 2.5 3-13 yrs: 10 13-18 yrs: 5 18-82 yrs: 64	Number of years in relevant age dependent exposure span. Neonate exposure is considered to be very low for the first 0.5 years of life. Hence for the ages 0-3 years the exposure interval is 2.5 years (US EPA 1994a, pg. 1-19).
Absolute bioavailability of ingested metal (i.e. absorption from the gastrointestinal tract)	BA _{oral}	unitless	1	Since the TDIs for all metals are based on applied doses in dietary or drinking water studies (Section 4.3.1), the bioavailabilities of all metals assessed in this section were assumed to be 100%.
Part of averaging time	365	days/yr	365	Number of days per year to calculate averaging time in days.

Parameter	Acronym	Units	Value	Basis/Description
Age-interval body weight	BW _{as}	kg	0.5-3yrs: 11 3-13 yrs: 24 13-18 yrs: 56 18-82 yrs: 78	Average body weight by age range (enHealth 2012b).
Averaging time	AT _x	yrs	0.5-3yrs: 2.5 3-13 yrs: 10 13-18 yrs: 5 18-82 yrs: 64	This is the age-specific exposure period and is equal to the exposure duration.
Time-weighted average daily intake (TWADI) of metal/metalloid from ingestion over a lifetime	Intake _{oral_lifetime}	µg/kg bw/day	Calculated using Equation 4 in this table.	
Averaging time for lifetime exposure	AT _{lifetime}	days	29,930	Averaging time for lifetime exposure (82 years x 365 days/year = 29,930)
Hazard quotient from TWADI total oral intake	HQ _{oral}	unitless	Calculated using Equation 5 in this table.	
Tolerable daily intake adjusted for background intakes from diet, water and air	TDI _{adj}	µg/kg bw/day	Varies by metal/metalloid	See Table 4-1.
1. Adapted from enHealth 2012a.				

4.4.1.2 Inhalation of metals in airborne dust from mine site

Both NEPM (2013) and the US EPA (2009b) revised guidance for inhalation risk assessment for superfund sites recommend that when estimating risk via inhalation, risk assessors should use the concentration of the chemical in air as the exposure metric rather than inhalation intake of a chemical in air. The former is then compared directly with an appropriate air guideline value. This approach has been taken in this risk assessment (see Equation in Table 4-4). The approach assumes the modelled air metal concentration in PM₁₀ is the same indoors and outdoors, and exposure may occur 24 hours per day over the entire lifetime of an individual.

Table 4-4 Equation and parameters for estimating inhalation hazard quotient

Parameter	Acronym	Units	Value	Basis/Description
Equation 1: $HQ_{inhal} = \frac{C_A}{AGV}$				
Hazard quotient from inhalation intake	HQ _{inhal}	unitless	Calculated using Equation 1 in this table.	
Modelled annual average concentration of metal in PM ₁₀ fraction in air	C _A	µg/m ³	Varies with metal/metalloid, receptor location, and scenario. As data for background metal concentrations in air were not available, this concentration is the modelled metal concentration for the existing or proposed mining complex. For individual values see Appendix F.	
Chronic air guideline value	AGV	µg/m ³	Varies with metal/metalloid. See Table 4-2.	

4.4.1.3 Hazard index

The hazard quotients for oral (HQ_{oral}) and inhalation (HQ_{inhal}) exposure were added together for each individual metal/metalloid to calculate an overall HQ. HQs for individual metals/metalloids (except Pb, which has been assessed separately) were then added together to calculate a HI.

4.5 Results and Conclusions

4.5.1 Hazard indices

The hazard indices represent the sum of all hazard quotients (for both the oral and inhalation exposure pathways) for metals other than Pb for incidental ingestion of metal in soil/dust, plus ingestion of metal deposited onto roofs which has washed into rainwater tanks, inhalation of metal in air (dust), as well as background intakes of metal from the diet including home-grown produce³⁶. They are presented in Figure 4-2 for each receptor location. The scenarios evaluated assume 15 years' practical operational life of the New Cobar Complex, and for Scenarios 1 and 3 include intakes from 'background' (i.e. existing) soil metal concentrations. For each metal, the oral intakes for each life stage, oral and inhalation hazard quotients, as well as the overall hazard quotients are presented in Appendix J. As expected, the estimated intakes were highest for the 0-3 year old age group; this is because children have higher exposures relative to their body weights.

As shown in Figure 4-2, hazard indices (which represent the sum of HQs for all 12 metals/metalloids assessed):

- For Scenario 1 (Existing Situation) range from 0.008 (for R21, Cobar Railway station – a commercial/industrial property which is no longer in use)³⁷ to 0.06 (for R3, a residence).
- For Scenario 2 (Proposed Increment) range from 0.001 (for R19, Cobar Rugby Leagues Club) to 0.08 (for R2, a residence).
- For Scenario 3 (Cumulative Proposed Situation) range from 0.01 (for R21, Cobar Railway station) to 0.11 (for R2, a residence).

Since all HIs are markedly less than unity, it is concluded the risk of exceeding health-based TDIs and AGVs as a result of the Proposal is very low, as a consequence the risk of harm is also very low. The assessment is conservative in that it assumes additivity between metals (see Section 4.2).

³⁶ The latter has been accounted for by adjusting the TDI for background intake from the diet but also assuming an additional contribution to the TDI from home-grown produce; this contribution is metal/metalloid-specific and is described in Section 4.3.1).

³⁷ It is recognised the HI calculations are in reality not applicable at commercial/industrial receptor locations. This is because the exposure circumstances at those locations may be very different from residential locations (e.g. exposure does not occur during childhood or adolescence, rainwater tanks are unlikely to be used for drinking at commercial premises, and exposure times and frequencies are different than those in a residential setting). Nevertheless, for conservatism the HI calculations have been presented in this HHRA to cater for the possibility that commercial/industrial properties could be redeveloped to residential locations in the future.

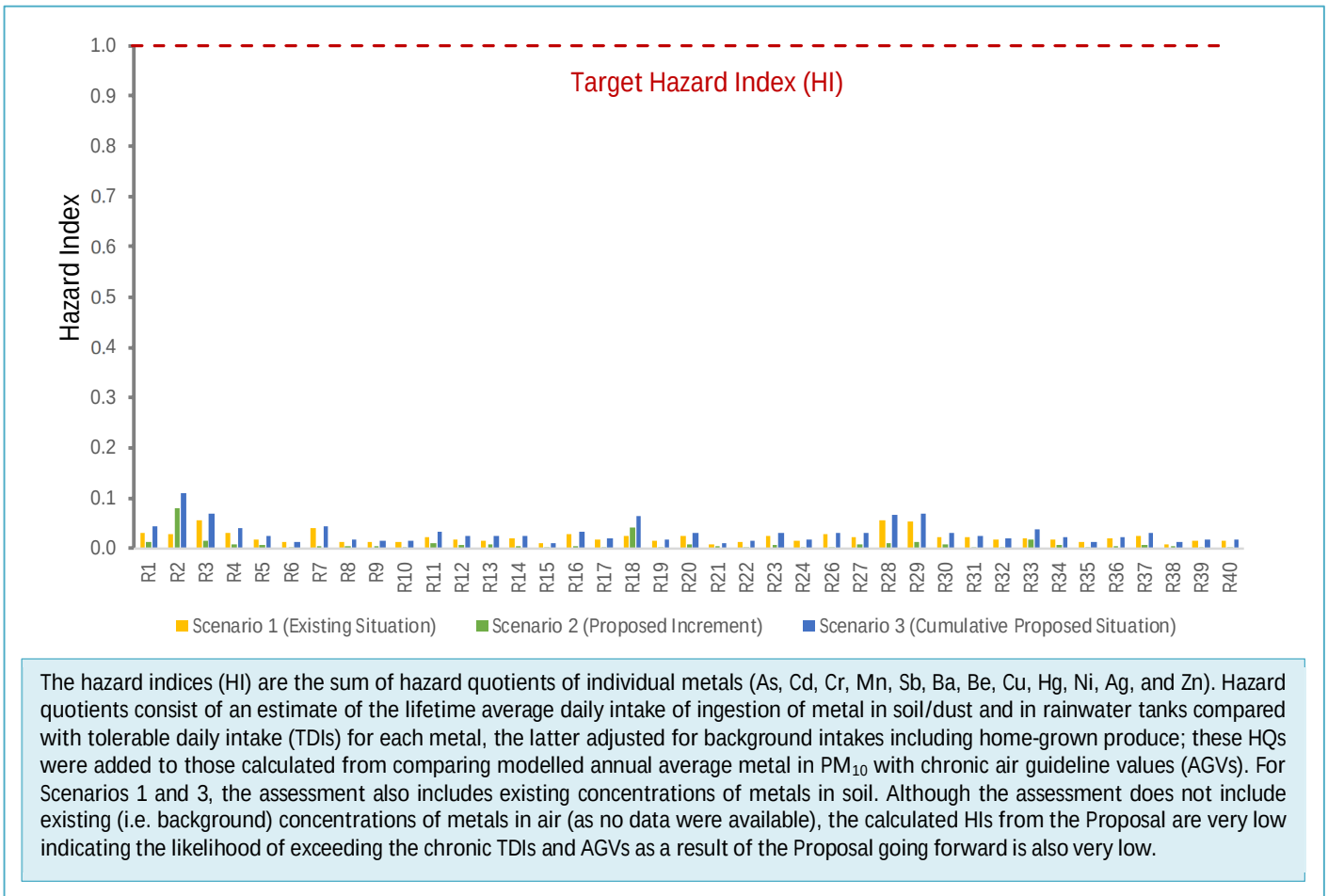


Figure 4-2 Chronic hazard indices for all evaluated receptors

4.5.2 Cancer risk

For the chemicals of potential concern evaluated in this HHRA, one metal (Ni) is considered a genotoxic carcinogen via the inhalational route of exposure (Appendix C). Nickel has been assessed for cancer risk via inhalation exposure as per Section 4.3.3. The estimated 'cancer risk' was compared with a target acceptable risk of 1×10^{-5} as recommended by enHealth (2012a) and NEPM (2013).

The highest estimated cancer risk is 7.6×10^{-10} (Figure 4-3, R26, Scenario 3). This is almost five orders of magnitude below the commonly accepted risk of one in one hundred thousand³⁸, therefore it is concluded the emissions from the Proposed Cumulative situation do not pose an unacceptable inhalation carcinogenic risk. The cancer risk calculations are presented in Appendix J.

³⁸ This is four orders of magnitude below the 1 in a million cancer risk considered to be acceptable by NSW EPA (2016).

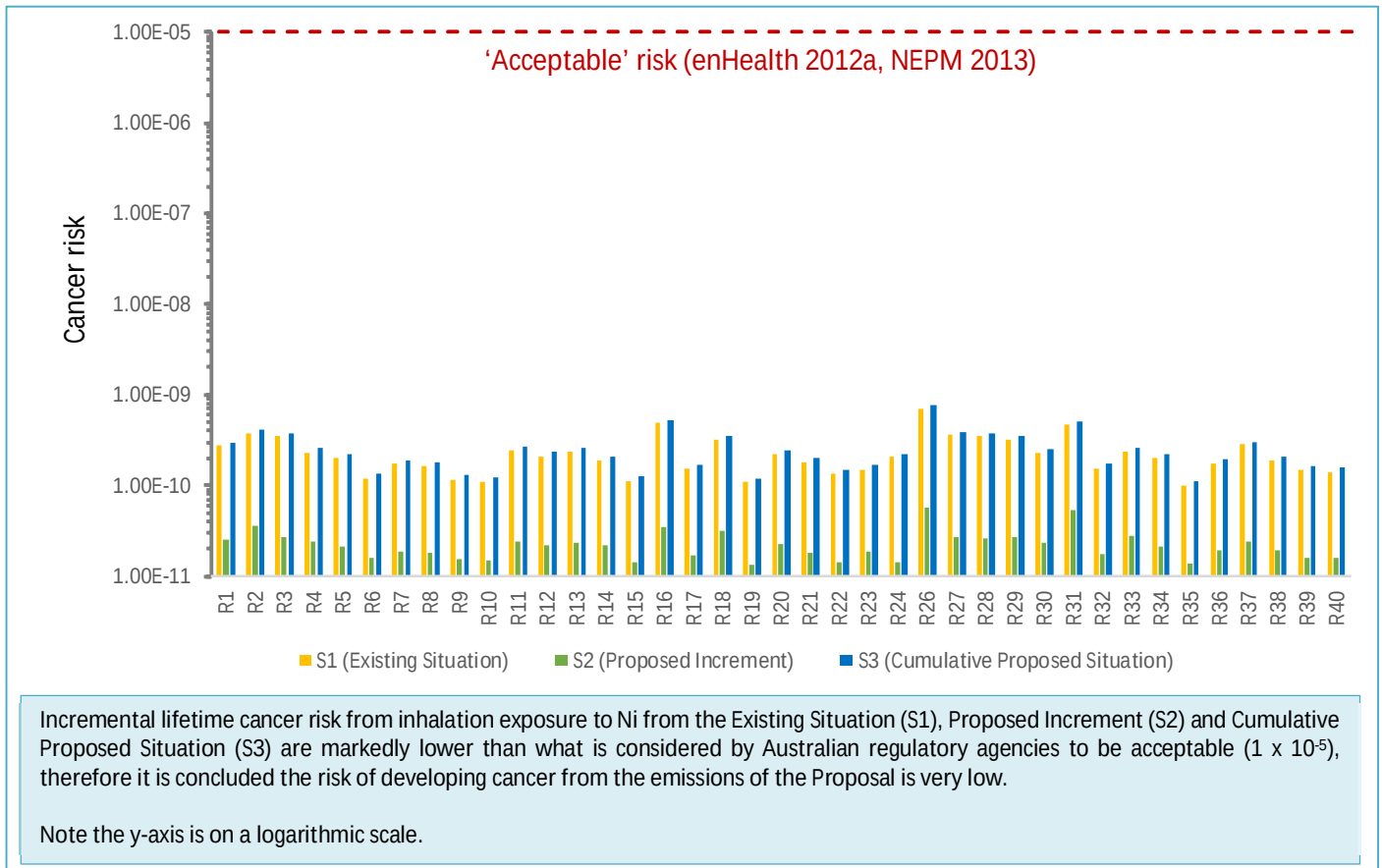


Figure 4-3 Incremental cancer risk at all receptor locations

4.6 Uncertainty Analysis for other metals

Many of the uncertainties discussed for Pb in Section 3.6 are also applicable to the other metals assessed. Additional uncertainties/assumptions and the effect they have on the risk assessment for other metals are summarised in Table 4-5. The assumptions made in this report are considered conservative so that they are more likely to over- rather than under-estimate the risk of harm.

Table 4-5 Uncertainties in the HHRA for metals other than Pb and potential effect on health risk assessment outcome

Uncertainty/ Assumption	Comment	Effect on Risk Assessment
Exposure estimation <i>'Background' air metal concentrations</i>	'Background' concentrations of metals other than Pb in air were not available, so these have not been included in the HHRA.	Information for 'background' concentrations of metals in air was not available. However, compared to background-adjusted TRVs for these metals, the calculated oral intakes (which does include intakes from existing metal in soil) were very small; and compared to chronic air guideline values, the mine-related air metal concentrations (excluding 'background') were also very small as demonstrated by the small calculated HIs (0.001 – 0.11). Therefore, the conclusions are unlikely to change if these data were available. It is also noted that for Pb, for example, where 'background' Pb concentrations in air were available, the inhalation pathway makes negligible contribution to total intake (see Figure 3-6). A similar observation would also be applicable to metals other than Pb.
<i>Background exposures</i>	The TRVs were adjusted for the potential contribution from background exposures (including home-grown produce). The contribution was based on literature information, including for high end background dietary intakes.	The intake assumptions are for high end intakes, and are therefore likely to overestimate exposure.
<i>Bioaccessibility of metal from soil</i>	For As, a 3.8% bioaccessibility has been used, based on the maximum gastric bioaccessibility measured in three out of seven samples (4 were less than the limit of reporting) of soil/dust collected from locations around Cobar or the mine lease. For other metals, in the absence of any data, 100% bioaccessibility was assumed.	The As bioaccessibility is likely representative of the average bioaccessibility of As in soil/dust from the mine lease and around Cobar, and is therefore unlikely to over- or under- estimate risk calculations. The assumption of 100% bioaccessibility for other metals is conservative and will likely over-estimate hazard indices and conclusions regarding risk of harm from exposure to these metals.

Uncertainty/ Assumption	Comment	Effect on Risk Assessment
<i>TRVs are protective</i>	The HHRA relies on regulatory guidelines (TRVs) established to protect public health. These have been sourced from reputable authorities who establish the guideline to ensure the most susceptible portion of the population are protected.	It is unlikely the guidelines used will fail to be protective of all or nearly all individuals. This is the very essence of the philosophy of creating public health guidelines.
<i>There may be interactive health effects between metals emitted</i>	Regardless of effect or mode of toxicological action, additivity of either dose or effect has been assumed to occur between metals emitted from the Proposal (Section 4.2).	This practice causes the HHRA to grossly overestimate the health risks to combined exposure to metals. This is because each TRV typically contains large safety factors applied to doses which are without adverse health effect; in addition, for chemicals to interact toxicologically they need to affect the same target organ via the same mechanism of action. The resulting hazard index, after accounting for potential background intakes and existing soil metal concentrations, at the most affected receptor location is 0.11. Therefore, even when assuming a toxicological interaction between each of the metals, the HI is very low indicating the risk of harm is also very low. This does not alter, in fact it strengthens, the conclusions of the HHRA.
<i>Toxicological potency of metals emitted from the Proposal</i>	The metals present in the orebody at the New Cobar Complex are likely present as relatively insoluble metals complexed in mineral form (e.g. as metal sulphides). It is assumed the metals in emissions are in a form which can cause a health effect (e.g. cancer) while in fact they may not be.	The form of metals typically used in toxicity experiments and for hazard assessment (e.g. for deriving the unit risk factor for nickel carcinogenicity) are soluble forms such as oxides or metal salts. The assessment assumes the metals in the orebody will be similarly available and have similar toxicity to the soluble metals on which the toxicological information has been based. This is conservative and is likely to over-estimate the risk of harm.

Uncertainty/ Assumption	Comment	Effect on Risk Assessment
Receptor Uncertainty <i>There is a market garden located on the mine lease southeast of the proposed vent rise and approximately 0.6 km southeast of R2.</i>	The uncertainty analysis herein considers the potential risk of harm from exposure to produce which has assimilated metals from soil which have been deposited via dust from the Proposal. EMM have indicated metal deposition in dust from the Proposal at the market gardens is expected to be 20% lower than that at R2.³⁹	To undertake a back-of-the envelope calculation to determine the risk of harm due to ingestion of produce from the market gardens, it was assumed the existing soil metal concentrations and deposition rates from the Proposal are similar to those at R2 for each metal (this is conservative based on information provided by EMM that deposition at the market gardens is expected to be ~20% lower than at R2). The total soil concentrations for S3 (Cumulative Proposed Situation), which includes existing soil concentrations at R2 plus the additional metal in soil resulting from deposition over a practical mine life of 15 years, was compared with low-density residential soil health investigation levels (HILs) from NEPM (2013). These investigation levels include an allowance for growing and consuming produce at home. The total soil metal concentrations at R2 only amount to between 0.01 and 3% of the respective low-density residential HILs (with the Proposal increment only amounting to 0.000015 to 0.07% of the respective HILs), therefore it is concluded the risk of harm from consuming produce from the market gardens affected by deposition of metals in dust is very low. Thus, exclusion of this receptor for the HHRA does not affect the overall conclusions of the assessment.

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³⁹ E-mail correspondence between Scott Fishwick (EMM) and Tarah Hagen (SLR) entitled 'RE: Request for contour plots', dated 10 July 2020.

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APPENDIX A

Significance of home-grown produce exposure pathway for Pb

Plant uptake of Pb from home-grown produce was not considered a complete exposure pathway because:

- According to IARC (2006), of all the heavy metals, Pb is the least available to plants. Water soluble and exchangeable Pb that is readily available for uptake by plants constitutes only about 0.1% of total Pb in most soils. In addition, Pb is very poorly transported from roots to shoots.
- The Handbook on the Toxicology of Metals (Nordberg et al. 2007) indicates the uptake pathway of Pb by roots of vegetables to be a relatively unimportant human exposure pathway. Pb is present in vegetables mainly as the result of deposition from air, rather than uptake from soil, and careful washing of dust from plants will minimise exposure.
- A literature search also indicated Pb is not readily translocated from soil to the edible part of most vegetables (Davies 1978, Hong et al. 2008, Kumar et al. 2009, Peralta-Videa et al. 2009, Ciesliński and Mercik 1993, Mbila and Thompson 2004)⁴⁰. Pb uptake from soil by plants varies with plant type, different soil conditions and the species of Pb in soil. Data indicate accumulation becomes important when levels of water-soluble Pb are around 500 mg/kg ⁴¹ (Judel and Stelte 1977). Experiments by Sterrett et al. (1996) showed that, when maintaining soil pH > 6.5, application of adequate NPK fertilisers and organic composite minimised plant (lettuce) uptake of Pb from contaminated urban soils; the form of Pb was not provided by the authors.
- Regarding plant uptake of Pb in air, Lagerwerff (1971) published a study of metal uptake by radish from soil and air (grown in a heavily trafficked area) and concluded there was no significant translocation of Pb from leaves contaminated by aerial deposition to the roots, and large changes in soil Pb caused only small changes in washed radish root Pb. Nevertheless, it is apparent that plants can absorb and accumulate some forms of Pb through their leaves from atmospheric fallout. For example, tetraethyl Pb near road sides (Nasralla and Ali 1985) or Pb from smelters (Kachenko and Singh 2004) can be taken up by leaves of herbs and leafy vegetables. In these studies, care was taken to wash and remove deposited Pb on the surface of leaves. Thus in field studies conducted near atmospheric emitters of Pb, and where deposition is occurring, it is difficult to separate the relative contribution of soil and air Pb to concentrations of Pb in leaves.
- Pb associated with the New Cobar Complex is mineralised and unlikely to be water soluble.
- For the derivation of soil health investigation levels (HILs), the Australian soil National Environment Protection Measure (NEPM 2013) assumed the small amount of Pb that may be taken up into home-grown produce from contaminated residential soil is essentially accounted for in the consideration of background dietary intake, which is included in this HHRA.
- Home grown produce only makes up a small percentage of total vegetable intake by the general population. In the ABS survey of 1994 (ABS 1994), 4.3% of total fruit and 5.6% of total vegetables produced in Australia were home-grown.

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⁴⁰ Plants investigated in these studies include strawberries, pakchoi, celery, hot pepper, anthem, beat, gourd, cauliflower, chilli, coriander, garlic, lufa, lady's finger, mint, tomato, aniseroot, and black snakeroot.

⁴¹ Judel and Stelte (1977) showed at 20 mg Pb acetate/kg soil, there was a slight increase (0.1-1.6 mg Pb/kg plant) in Pb content of radish root, carrots and spinach relative to the control. This increased further at 100 mg/kg soil (0.8 – 3.7 mg Pb/kg plant) and at 500 mg/kg (9.5 – 16.3 mg Pb/kg plant).

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APPENDIX B

Background BPb concentrations in Australia

The table below contains background BPb concentrations in Australian and international children. The information was collated in a previous risk assessment (ToxConsult 2017). An updated literature search to find additional contemporary information was conducted for this HHRA.

Background BPb concentrations in Australian and international children

Date of Study	Location	Age [n=]	Blood Pb (µg/dL)			Method of blood collection	Method of blood Pb analysis	Reference
			AM [SD]	GM	% ≥ 10µg/dL			
Australia								
2010-2013	Barwon, Victoria	0-4 yrs [523]	-	0.97	0	-	ICP-MS	Symeonides et al. (2020)
2007	Port Esperance	<6 yrs, [45] ⁽¹⁾	-	2.3	-	Not applicable		Gulson et al. 2009
2005	Fremantle, WA	0-5 yrs, [100]	-	1.8	0	Venous	Furnace atomic absorption spec	Guttinger et al. 2008
2004(?)	Sydney	0.29-2.4 yr, [113]	3.1 [2.45]	2.6	5	Venous	High resolution ICP-MS	Gulson et al. 2006
1997-1999	Derby, WA	<6 yrs, [95] (1997), [100] (1998), [79] (1999)	-	4.5 (1997), 5.0 (1998), 5.1 (1999)	-	Finger prick	Furnace AAS	Mak et al. 2003
1997	Queenstown	1-4 yr, [127]	7.04	5.9	14.8	Venous	Electro-thermal AAS	Menzies 1999
1997	Strahan	1-4 yr, [28]	5.59	5.15	3	Venous	Electro-thermal AAS	Menzies 1999
1996	Sydney	0.75-5 yrs [718]	-	7	16.1	Venous	AAS	Mira et al. 1996
1995	Fremantle, WA	0-5 years [164]	6.9 [4.1]	6.8	25.6	Venous	Furnace atomic absorption spec	Willis et al. 1995
1995	Australia	1-4 yr, [1575]	5.72 [3.13]	5.05	7.3	Venous	Graphite furnace AAS	Donovan et al. 1995
1991	Balmain, Sydney	9-48mths, [153]	11	-	50.6	Venous	Electro-thermal AAS	Menzies 1993

Date of Study	Location	Age [n=]	Blood Pb ($\mu\text{g}/\text{dL}$)			Method of blood collection	Method of blood Pb analysis	Reference
			AM [SD]	GM	% $\geq 10\mu\text{g}/\text{dL}$			
1984	NW Adelaide	0-4 yr, [513]	-	16.3	-	Venous	Electro-thermal AAS	Menzies 1993
1980	Sydney	4-5 yr [400]	14	-	73	Venous	Electro-thermal AAS	Menzies 1993
1979	Melbourne	<6 yrs [62]	13.3	-	-	Venous	Electro-thermal AAS	Menzies 1993
Overseas								
2015-2016	USA	1-5 yrs [713]	-	0.758		Venous	ICP-MS or Graphite furnace AAS	CDC 2019
2013-2014	USA	1-5 yrs [818]	-	0.782	0.51 ²	Venous	ICP-MS or Graphite furnace AAS	CDC 2019
2011-2012	USA	1-5 yrs [790]	-	0.97	0.55 ²	Venous	ICP-MS or Graphite furnace AAS	CDC 2019
2012-2014	South Korea	3-5 yrs [571]	-	1.34	0	Venous	Graphite furnace AAS	Burm et al. 2016
2008	South Africa	8-10 yrs	5.6	-	4.1	Venous	ICP-MS	Bazzi et al. 2008
2007-2008	USA	1-5 yrs, [817]	-	1.5	0.9	Venous	-	CDC 2009
2007	Trelleborg, Sweden	7-11 yrs [1407]	-	1.3	0	Venous	ICP-MS	Strömberg et al. 2008
2005-2006	USA	1-5 yrs, [968]	-	1.5	-	Venous	-	CDC 2009
2003-2006	Germany	3-14 yrs [1560]	1.82	1.63	0	Venous	Electro-thermal AAS	Becker et al. 2008
2003-2004	USA	1-5 yrs, [911]	-	1.77	1.4	Venous	-	CDC 2009
2001	Czech Republic	8-10 yrs [333]	-	3.1	-	-	Electro-thermal AAS	Batářiiová et al. 2006

Date of Study	Location	Age [n=]	Blood Pb ($\mu\text{g}/\text{dL}$)			Method of blood collection	Method of blood Pb analysis	Reference
			AM [SD]	GM	% $\geq 10\mu\text{g}/\text{dL}$			
1999-2000	USA	1-5 yrs, [723]	-	2.23	1.6	Venous	-	CDC 2009
1991-1994	USA	1-5 yrs [2,392]	-	2.7	4.4	Venous	-	CDC 2009
1984-1985	Birmingham, UK	2 yrs, [97]	-	11.7	-	Venous	AAS	Davies et al 1990

- not reported; AM = arithmetic mean; SD = standard deviation; GM = geometric mean

¹ Expected background blood Pb levels for young children living in Port Esperance were estimated from Pb isotope ratio data by subtracting the mean contribution from Magellan ore from the total. Four children, whose Pb isotope ratios indicate the majority of Pb stemming from a non-Magellan metal source, were excluded from this analysis.

² NHANES data analysed in McClure et al (2016),

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APPENDIX C

Toxicity Category Summary

The toxicity category table below summarises whether a metal/metalloid has been evaluated by a competent authority for genotoxic, carcinogenic or reproductive toxicity potential. It also identifies the major target organs for which critical effects have been observed.

The metals were placed into 'toxicity categories' by consulting the following sources:

1. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans and Supplements.
<http://monographs.iarc.fr/>
2. Environmental Health Criteria Monograph Series from the International Programme on Chemical Safety (IPCS) - a cooperative programme of the World Health Organization (WHO), the International Labour Organisation (ILO), and the United Nations Environment Programme (UNEP).
<http://www.inchem.org/>
3. Screening Information Data Set Series from the Organisation for Economic Co-operation and Development (OECD) and produced by United Nations Environment Programme (UNEP).
<http://www.oecd.org/chemicalsafety/risk-assessment/publishedassessments.htm>
4. Concise International Chemical Assessment Documents from the International Programme on Chemical Safety (IPCS) - a cooperative programme of the World Health Organization (WHO), the International Labour Organisation (ILO), and the United Nations Environment Programme (UNEP).
<http://www.inchem.org/>
5. Toxicological Profiles for Chemical Substances, Agency for Toxic substances and Disease Registry (ATSDR), US Department of Health and Human Services. <https://www.atsdr.cdc.gov/>
6. Re-evaluation of Human Toxicological Maximum Permissible Risk Levels, Dutch National Institute of Public Health and the Environment (RIVM 2001).
<https://www.rivm.nl/bibliotheek/rapporten/711701025.html>
7. WHO Guidelines for Air Quality (2000a); Air Quality Guidelines for Europe, 2nd Edition (2000b), World Health Organization.
8. Priority Existing Chemical (PEC) Reports. National Industrial Chemicals Notification and Assessment Scheme (NICNAS), Commonwealth of Australia. <https://www.nicnas.gov.au/chemical-information/pec-assessments>
9. European Union Existing Chemical Risk Assessment Reports, European Commission, Joint Research Centre European Chemical Bureau, European Union. <https://echa.europa.eu/information-on-chemicals/transitional-measures/voluntary-risk-assessment-reports>
10. Office of Environmental Human Hazard Assessment (OEHHA), Californian Environmental Protection Agency. <https://oehha.ca.gov/>
11. EU Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures. <https://osha.europa.eu/en/legislation/directives/regulation-ec-no-1272-2008-classification-labelling-and-packaging-of-substances-and-mixtures>
12. WHO. Safety Evaluation of Certain Food Additives and Contaminants. WHO Food Additives Series. Prepared by the Joint FAO/WHO Expert Committee on Food Additives (JECFA) World Health Organization, Geneva. <http://www.inchem.org/>

Table C.1: Toxicity category summary table

Metal/Metalloid	Target Organ of Concern	Toxicity Category		
		Genotoxic	Carcinogenic (route of exposure)	Reproductive Toxicant
Silver (Ag)	Skin (argyria).		N (US EPA D)	
Antimony (Sb)	Lung and lung tumours (from inhalation of antimony trioxide).	U ⁽¹⁾	Y (Antimony trioxide - IARC 2B) (Inhalation) N (Antimony trisulfide – IARC 3)	N
Arsenic (As)	Respiratory; skin; cardiovascular; nervous system; lung cancer.	Y/N ⁽²⁾	Y (IARC 1, US EPA A) (oral & inhalation)	N
Barium (Ba)	Nephropathy (kidney).	N	N (US EPA D)	N
Beryllium (Be)	Lung, e.g. acute & chronic beryllium disease, and lung tumours (from inhalation exposure). Gastrointestinal (oral).	?	Y (IARC 1, US EPA B1) (inhalation) ⁽³⁾	N
Cadmium (Cd)	Respiratory system; kidney; lung cancer.	Y/N ⁽⁴⁾	Y (IARC 1, US EPA B1) (inhalation) ⁽⁴⁾	Y
Chromium (Cr as Cr ^{III})	Essential element.	N	N (US EPA D, IARC 3)	N
Copper (Cu)	Essential element. Nausea, vomiting, stomach cramps, diarrhoea.	N	N (US EPA D)	N
Lead (Pb)	Impaired neurobehavioural functioning and IQ in children.	N	Y (IARC 2A, US EPA B2)	Y
Mercury (Hg)	Central nervous system; kidney.	N	N	Y
Manganese (Mn)	Nervous system; lungs; reproductive system; immune system.	N	N (US EPA D)	Y
Nickel (Ni)	Allergic reaction (e.g. eczema) as a result of exposure in sensitised individuals (inhalation & oral). Lung and nasal tumours (inhalation).	Y	Y (IARC 1) (inhalation) N (oral)	N
Zinc (Zn)	Secondary copper deficiency, i.e. haematopoietic; kidney; pancreas.	N	N (US EPA D)	N

Y = Yes, N = No, ? = Uncertainty whether this metal/metalloid can cause this due to mixed or inadequate experimental results. U = Unlikely relevant to humans.

- ¹ There is some evidence of mutagenic potential of antimony trioxide, however a number of technical experts have independently concluded that antimony trioxide is unlikely to be mutagenic *in vivo* (US EPA 2014). US EPA (2014) indicated a possible local genotoxic effect of antimony trioxide would only be relevant under exposure conditions that also produce lung overload, and therefore this indicates minimal concerns for genotoxicity in humans. Safe Work Australia (2019) have recently concluded insufficient data are available to determine if antimony is a non-threshold based genotoxic carcinogen. For these reasons, antimony has not been evaluated as a genotoxic carcinogen in this HHRA.
- ² There is some evidence for mutagenic and clastogenic effects associated with inorganic As exposure. However, the evidence is weak, generally only seen *in vitro* at cytotoxic concentrations, and the precise mechanism for any observed genotoxic effects has not been established, nor is it entirely clear whether genotoxicity *in vivo* is due to metabolic conversion to methyl arsenic. Mechanisms may include oxygen radical damage, the ability of arsenic to act as a phosphate analogue, and impaired DNA repair process (IPCS 2001). However, for long-term, low-dose exposure (more relevant to human exposures) observed genotoxic effects may be secondary to genomic instability, perhaps mediated by increased levels of reactive oxygen species, or induction of oxidative DNA damage and DNA-repair inhibition, changes in DNA-methylation patterns, aneuploidy, and gene amplification. Inhibition of DNA repair is also co-mutagenic (IARC 2012). There are additional recent published studies that also cast doubt on the validity of assuming linearity of the dose-response relationship for arsenic carcinogenicity at low exposures, and emerging evidence that a threshold approach may be applied to the assessment of both cancer (and possible pre-cancer) and non-cancer endpoints (Gentry et al. 2014a, b; Tsuji et al. 2014, 2015; Lamm et al. 2014, Sidhu et al. 2015, Lewis et al. 2015). WHO (2017) indicated the available mode of action data on arsenic do not provide a biological basis for using either a linear or non-linear extrapolation. Consistent with deliberations in the NEPM (2013), a threshold dose-response approach for the assessment of carcinogenic effects associated with arsenic exposure was used in this HHRA.
- ³ Beryllium compounds have produced mixed results in mutation and chromosomal aberration assays (NRC 2007). Although the bacterial assays have been largely negative, the mammalian test systems exposed to beryllium compounds have shown evidence of mutations, chromosomal aberrations, and cell transformations (NRC 2007). ATSDR (2002) consider beryllium compounds to be weakly genotoxic. Reviews summarised in NEPM (2013) concluded whilst lung cancer is an important end point, it is unlikely to be a concern for beryllium in soil/dust. Beryllium lung disease appears to occur prior to the development of lung cancer and may play a role in its induction. Consistent with NEPM (2013), a threshold approach was considered appropriate to assess the risk of adverse health effects from beryllium exposure in this HHRA.
- ⁴ The evidence for the genotoxicity of cadmium is mixed (ATSDR 2012). *In vitro* studies, as well as studies of chromosomal aberration in humans and animals, have provided both positive and negative results; DNA damage has been consistently observed in *in vitro* studies (ATSDR 2012). TCEQ (2016) indicates the various molecular mechanisms involved in cadmium-induced lung carcinogenesis are poorly understood; nevertheless there is evidence that many of the plausible mechanisms for cadmium-induced genotoxicity may operate via thresholds, rather than a linear dose response. In line with the approach taken in NEPM (2013), a threshold approach was considered appropriate to assess the risk of adverse health effects from cadmium exposure in this HHRA.

Carcinogen classifications of IARC and US EPA

IARC Carcinogen Classifications	
Group	Category
1	Is a human carcinogen.
2A	Is probably carcinogenic to humans.
2B	Is possibly carcinogenic to humans.
3	Is not classifiable as to its carcinogenicity to humans.

US EPA Carcinogen classifications	
Group	Category
A	Human carcinogen.
B	Probable human carcinogen.
B1	Indicates limited human evidence.
B2	Indicates sufficient evidence in animals and inadequate or no evidence in humans.
C	Possible human carcinogen.
D	Not classifiable as to human carcinogenicity.
E	Evidence of non-carcinogenicity for humans.

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APPENDIX D

Spreadsheets provided by EMM (2020b, c)

EMM (2020b). Excel spreadsheet entitled 'GCU_metals_results_1hr_24hr_PM10_v2'. Received by SLR from EMM on 23/06/2020.

EMM (2020c). Excel spreadsheet entitled 'GCU_metals_TSP_conc_dep_summary_V2'. Received by SLR from EMM on 23/06/2020.

Nickel

µg/m³	EXISTING	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary	Max
1-hour	Max	0.000401619	0.000451	0.000482	0.000284	0.000315	0.000204	0.000236	0.000214	0.000202	0.000175	0.000461	0.000292	0.000469	0.000269	0.000169	0.000351	0.000238	0.000451	0.000193	0.000285	0.000386	0.00033	0.00021	0.000391	0.000439	0.000425	0.00027	0.000386	0.000392	0.000245	0.000499	0.000222	0.000345	0.000279	0.000178	0.000246	0.000399	0.000355	0.000174	0.000197	0.000829	
1-hour	99.9th	0.000222654	0.000302	0.000239	0.000201	0.000154	0.000103	0.000135	0.000127	0.000106	9.93E-05	0.000203	0.000178	0.000194	0.000178	0.000114	0.000185	0.000146	0.000297	9.99E-05	0.000189	0.00016	0.00012	0.000118	8.41E-05	0.000222	0.000269	0.000176	0.000205	0.000249	0.000205	0.000271	0.000154	0.000169	0.00017	9.04E-05	0.00017	0.000217	0.000164	0.000132	0.00011	0.000551	
1-hour	99th	9.7951E-05	0.000124	9.66E-05	7.19E-05	6.33E-05	3.75E-05	5.4E-05	5.21E-05	3.51E-05	3.52E-05	8.77E-05	6.58E-05	8.55E-05	5.58E-05	3.79E-05	0.000108	4.49E-05	9.34E-05	3.46E-05	7.5E-05	6.5E-05	4.72E-05	4.56E-05	3.93E-05	9.69E-05	0.000139	9.09E-05	9.65E-05	9.8E-05	7.35E-05	0.000119	4.57E-05	6.72E-05	6.16E-05	3.22E-05	5.06E-05	8E-05	6.51E-05	4.87E-05	4.39E-05	0.000269	
1-hour	97.5th	4.27264E-05	6.65E-05	5.69E-05	4.03E-05	3.28E-05	2.1E-05	2.82E-05	2.73E-05	2.06E-05	1.97E-05	3.79E-05	3.75E-05	3.67E-05	2.97E-05	1.87E-05	6.8E-05	2.56E-05	4.96E-05	1.83E-05	3.46E-05	2.61E-05	1.78E-05	2.66E-05	2.2E-05	5.56E-05	9.38E-05	5.21E-05	5.38E-05	5.53E-05	3.81E-05	7.66E-05	2.47E-05	3.81E-05	3.48E-05	1.73E-05	2.7E-05	4.41E-05	2.78E-05	2.22E-05	2.39E-05	0.000181	
1-hour	95th	1.96453E-05	3.37E-05	2.84E-05	1.98E-05	1.85E-05	1.21E-05	1.51E-05	1.43E-05	1.23E-05	1.16E-05	1.71E-05	1.84E-05	1.67E-05	1.77E-05	1.01E-05	3.87E-05	1.37E-05	3.06E-05	9.48E-06	1.69E-05	1.15E-05	7.92E-06	1.58E-05	1.08E-05	3.54E-05	5.78E-05	2.84E-05	2.85E-05	2.48E-05	1.88E-05	4.73E-05	1.39E-05	2.45E-05	1.72E-05	1E-05	1.58E-05	2.04E-05	1.3E-05	1.11E-05	1.22E-05	0.000128	
1-hour	Average	4.46589E-06	6.56E-06	5.59E-06	3.86E-06	3.46E-06	2.26E-06	2.89E-06	2.75E-06	2.28E-06	2.17E-06	3.9E-06	3.53E-06	3.84E-06	3.32E-06	2.04E-06	7.11E-06	2.64E-06	5.59E-06	1.9E-06	3.59E-06	2.81E-06	2.03E-06	2.93E-06	2.23E-06	6.31E-06	1.06E-05	5.45E-06	5.52E-06	5.23E-06	3.74E-06	8.45E-06	2.68E-06	4.2E-06	3.32E-06	1.91E-06	3.01E-06	4.34E-06	2.96E-06	2.33E-06	2.37E-06	2.55E-05	
µg/m³	ADDITION	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary	Max
1-hour	Max	0.000050538	8.63E-05	5.11E-05	5.35E-05	4.6E-05	3.31E-05	4.08E-05	3.94E-05	2.9E-05	3.29E-05	6.97E-05	4.74E-05	6.35E-05	4.12E-05	2.79E-05	5.7E-05	3.29E-05	6.3E-05	3.11E-05	5.05E-05	5.84E-05	5.3E-05	3.78E-05	5.25E-05	6.23E-05	0.000103	3.87E-05	3.52E-05	6.55E-05	5.35E-05	8.27E-05	3.43E-05	4.38E-05	4.5E-05	3.09E-05	3.81E-05	5.96E-05	5.7E-05	4.04E-05	3.63E-05	0.000189	
1-hour	99.9th	2.6161E-05	4.28E-05	2.2E-05	3.43E-05	3.16E-05	1.95E-05	2.91E-05	2.85E-05	1.47E-05	1.57E-05	3.08E-05	3.43E-05	2.94E-05	2.61E-05	1.83E-05	3.03E-05	2.32E-05	4.38E-05	2.04E-05	3.21E-05	2.6E-05	2.23E-05	1.82E-05	1.97E-05	3.47E-05	6.68E-05	2.38E-05	2.03E-05	2.51E-05	3.46E-05	4.76E-05	2.14E-05	3.08E-05	3.31E-05	1.41E-05	2.36E-05	2.16E-05	2.61E-05	2.76E-05	2.45E-05	8.84E-05	
1-hour	99th	1.06426E-05	1.67E-05	1E-05	1.08E-05	8.85E-06	6.31E-06	7.91E-06	7.66E-06	5.94E-06	5.95E-06	1.14E-05	1.04E-05	1.05E-05	8.05E-06	5.81E-06	1.21E-05	7.21E-06	1.36E-05	5.64E-06	1.07E-05	8.51E-06	6.64E-06	6.96E-06	5.19E-06	1.57E-05	1.89E-05	9.41E-06	9.87E-06	1.02E-05	1.07E-05	1.67E-05	7.18E-06	1.02E-05	9.89E-06	5.34E-06	7.79E-06	8.64E-06	9.38E-06	7.55E-06	6.54E-06	4.47E-05	
1-hour	97.5th	5.65695E-06	7.43E-06	6.05E-06	4.48E-06	4.5E-06	3.41E-06	3.79E-06	3.61E-06	3.26E-06	3.18E-06	5.23E-06	4.24E-06	5.24E-06	4.54E-06	2.88E-06	7.08E-06	3.65E-06	7.3E-06	2.56E-06	4.18E-06	3.68E-06	2.64E-06	3.99E-06	2.68E-06	9.65E-06	1.12E-05	5.88E-06	5.82E-06	5.99E-06	4.27E-06	1.03E-05	3.62E-06	5.63E-06	3.95E-06	2.86E-06	4.05E-06	5.21E-06	3.83E-06	2.94E-06	3.18E-06	2.85E-05	
1-hour	95th	2.89532E-06	3.8E-06	3.57E-06	2.26E-06	2.35E-06	1.89E-06	2.01E-06	1.91E-06	1.92E-06	1.84E-06	2.43E-06	2.11E-06	2.43E-06	2.53E-06	1.52E-06	4.5E-06	1.91E-06	3.65E-06	1.42E-06	2.14E-06	1.73E-06	1.28E-06	2.4E-06	1.51E-06	6.1E-06	7.07E-06	3.69E-06	3.54E-06	3.39E-06	2.23E-06	7.05E-06	1.96E-06	3.32E-06	2.01E-06	1.63E-06	2.18E-06	2.97E-06	1.81E-06	1.43E-06	1.69E-06	1.73E-05	
1-hour	Average	5.59329E-07	7.96E-07	6.11E-07	5.27E-07	4.81E-07	3.65E-07	4.22E-07	4.07E-07	3.58E-07	3.46E-07	5.38E-07	4.88E-07	5.22E-07	4.79E-07	3.2E-07	7.77E-07	3.83E-07	7.16E-07	3E-07	4.94E-07	4.08E-07	3.17E-07	4.3E-07	3.16E-07	9.95E-07	1.29E-06	6.12E-07	5.97E-07	6.01E-07	5.13E-07	1.2E-06	3.92E-07	6.03E-07	4.64E-07	3.12E-07	4.31E-07	4.24E-07	3.57E-07	3.58E-07	3.08E-06		
µg/m³	ALL	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary	Max
1-hour	Max	0.000452157	0.000537	0.000533	0.0003	0.000323	0.000222	0.000242	0.000219	0.000231	0.000208	0.000531	0.000314	0.000533	0.000297	0.000183	0.0004	0.000264	0.000477	0.000205	0.000335	0.000444	0.000383	0.000216	0.000444	0.000489	0.000528	0.000309	0.000414	0.000458	0.000293	0.000582	0.000236	0.000373	0.000301	0.000209	0.000262	0.000459	0.000412	0.000213	0.000203	0.00083	
1-hour	99.9th	0.000243755	0.000344	0.000254	0.000235	0.000179	0.000113	0.00016	0.000157	0.000114	0.000106	0.000234	0.00021	0.000219	0.000194	0.000128	0.000207	0.000162	0.000319	0.000113	0.000222	0.00019	0.000144	0.000137	9.73E-05	0.000247	0.000324	0.000178	0.000212	0.000267	0.000243	0.000313	0.000163	0.000204	0.0002	9.82E-05	0.000185	0.000239	0.00019	0.00016	0.000135	0.000551	
1-hour	99th	0.000109795	0.000139	0.000105	8.23E-05	6.92E-05	4.38E-05	6.05E-05	5.79E-05	4.06E-05	3.93E-05	9.72E-05	7.38E-05	9.63E-05	6.21E-05	4.18E-05	0.000118	5.14E-05	0.000106	4.03E-05	8.46E-05	7.32E-05	5.4E-05	5.27E-05	4.41E-05	0.000107	0.000157	9.76E-05	0.000105	0.000105	8.38E-05	0.000137	5.32E-05	7.43E-05	7.01E-05	3.64E-05	5.81E-05	8.51E-05	7.37E-05	5.59E-05	5.03E-05	0.000282	
1-hour	97.5th	4.94904E-05	7.52E-05	6.19E-05	4.71E-05	3.89E-05	2.4E-05	3.34E-05	3.24E-05	2.41E-05	2.33E-05	4.36E-05	4.27E-05	4.24E-05	3.48E-05	2.22E-05	7.33E-05	2.93E-05	5.77E-05	2.16E-05	3.92E-05	3.04E-05	2.09E-05	3.07E-05	2.43E-05	6.56E-05	0.000104	5.83E-05	6.04E-05	6.14E-05	4.31E-05	8.54E-05	2.95E-05	4.42E-05	3.99E-05	2.03E-05	3.27E-05	4.96E-05	3.24E-05	2.56E-05	2.77E-05	0.000198	
1-hour	95th	2.24999E-05	3.76E-05	3.3E-05	2.27E-05	2.14E-05	1.43E-05	1.74E-05	1.65E-05	1.48E-05	1.39E-05	1.97E-05	2.1E-05	1.89E-05	2.08E-05	1.21E-05	4.23E-05	1.63E-05	3.59E-05	1.1E-05	1.9E-05	1.3E-05	9.14E-06	1.89E-05	1.26E-05	4.29E-05	6.5E-05	3.26E-05	3.28E-05	2.81E-05	2.14E-05	5.49E-05	1.63E-05	2.86E-05	1.96E-05	1.21E-05	1.84E-05	2.4E-05	1.47E-05	1.25E-05	1.41E-05	0.00014	
1-hour	Average	5.02522E-06	7.36E-06	6.2E-06	4.39E-06	3.94E-06	2.62E-06	3.31E-06	3.15E-06	2.63E-06	2.51E-06	4.44E-06	4.01E-06	4.36E-06	3.8E-06	2.36E-06	7.89E-06	3.02E-06	6.31E-06	2.2E-06	4.08E-06	3.22E-06	2.35E-06	3.36E-06	2.55E-06	7.3E-06	1.19E-05	6.06E-06	6.12E-06	5.83E-06	4.26E-06	9.65E-06	3.08E-06	4.81E-06	3.78E-06	2.22E-06	3.45E-06	4.86E-06	3.39E-06	2.68E-06	2.73E-06	2.7E-05	
µg/m³	EXISTING	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary	Max
24-hour	Max	4.69188E-05	6.01E-05	3.67E-05	3.13E-05	2.9E-05	1.85E-05	2.35E-05	2.2E-05	2.15E-05	1.27E-05	4.11E-05	2.91E-05	3.91E-05	2.36E-05	1.59E-05	6.22E-05	1.92E-05	4.06E-05	1.63E-05	3.58E-05	3.04E-05	2.24E-05	2.59E-05	2.11E-05	3.54E-05	6.6E-05	3.56E-05	3.62E-05	3.77E-05	3.21E-05	4.44E-05	2.01E-05	3.1E-05	2.74E-05	1.23E-05	2.22E-05	3.13E-05	3.24E-05	2.1E-05	1.95E-05	0.000163	
24-hour	99.9th	4.37327E-05	5.72E-05	3.63E-05	3.11E-05	2.65E-05	1.78E-05	2.16E-05	2.03E-05	1.86E-05	1.25E-05	3.9E-05	2.81E-05	3.89E-05	2.34E-05	1.46E-05	5.6E-05	1.91E-05	3.94E-05	1.5E-05	3.44E-05	2.92E-05	2.17E-05	2.24E-05	1.88E-05	3.48E-05	6.57E-05	3.45E-05	3.57E-05	3.76E-05	3.17E-05	4.41E-05	1.85E-05	3.06E-05	2.65E-05	1.18E-05	2.03E-05	3.05E-05	3.01E-05	2.08E-05	1.78E-05	0.000158</	

Chromium

µg/m³	EXISTING	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max
1-hour	Max	0.003825743	0.003377	0.004557	0.00277	0.002641	0.002047	0.002043	0.001879	0.001454	0.001558	0.002893	0.002627	0.002329	0.00304	0.001396	0.004077	0.001932	0.003831	0.001389	0.002166	0.002014	0.001407	0.001965	0.002106	0.006222	0.0058	0.004062	0.004083	0.007536	0.002552	0.005699	0.001738	0.00363	0.002508	0.001145	0.002113	0.005679	0.002325	0.001584	0.001598	0.015556
1-hour	99.9th	0.00181507	0.001865	0.001696	0.001007	0.000876	0.000677	0.000787	0.000794	0.000782	0.000772	0.001395	0.000918	0.001479	0.000997	0.000567	0.001571	0.000712	0.001522	0.000566	0.001095	0.001067	0.000865	0.000907	0.000599	0.001673	0.002107	0.001397	0.001505	0.001885	0.000981	0.001908	0.000709	0.00127	0.00089	0.000652	0.000838	0.001329	0.001065	0.000702	0.000703	0.006408
1-hour	99th	0.000616142	0.000715	0.000601	0.000464	0.000388	0.000292	0.000349	0.000334	0.000277	0.000267	0.000551	0.000422	0.000566	0.000344	0.000261	0.000469	0.000304	0.000541	0.000264	0.000473	0.000448	0.000365	0.000322	0.000238	0.000548	0.000621	0.000518	0.000569	0.000622	0.000466	0.000609	0.000301	0.000428	0.000403	0.000254	0.000335	0.000531	0.00045	0.000359	0.000306	0.001252
1-hour	97.5th	0.00024276	0.000384	0.000358	0.000274	0.000226	0.000159	0.000205	0.0002	0.000157	0.000146	0.000234	0.000248	0.000225	0.000214	0.000154	0.000316	0.000185	0.000304	0.000152	0.000233	0.000169	0.000131	0.000182	0.000136	0.000325	0.000374	0.000325	0.000338	0.000309	0.000263	0.000393	0.000188	0.000246	0.000237	0.000131	0.000201	0.000287	0.000188	0.000178	0.000181	0.000605
1-hour	95th	8.71797E-05	0.000145	0.000148	9.56E-05	0.000106	7.64E-05	8.82E-05	8.36E-05	7.73E-05	7.32E-05	7.84E-05	9.09E-05	7.66E-05	0.000103	6.51E-05	0.000193	7.96E-05	0.00017	5.95E-05	8.01E-05	5.85E-05	4.61E-05	9.19E-05	7.58E-05	0.000164	0.000227	0.000181	0.000165	0.000117	8.78E-05	0.000244	8.1E-05	0.000124	8.57E-05	6.5E-05	9.27E-05	0.000103	6.24E-05	5.86E-05	7.28E-05	0.000403
1-hour	Average	2.63541E-05	3.56E-05	3.26E-05	2.28E-05	2.05E-05	1.52E-05	1.79E-05	1.73E-05	1.57E-05	1.49E-05	2.37E-05	2.11E-05	2.34E-05	2.01E-05	1.35E-05	3.79E-05	1.64E-05	3.09E-05	1.28E-05	2.17E-05	1.81E-05	1.42E-05	1.92E-05	1.45E-05	3.65E-05	5.22E-05	3.25E-05	3.22E-05	3.1E-05	2.23E-05	4.86E-05	1.66E-05	2.54E-05	2.01E-05	1.33E-05	1.83E-05	2.64E-05	1.88E-05	1.55E-05	1.53E-05	0.000109
µg/m³	ADDITION	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max
1-hour	Max	0.060783747	0.159117	0.034906	0.029353	0.035598	0.010358	0.017256	0.01031	0.01736	0.012379	0.023402	0.013874	0.027969	0.018856	0.010877	0.0108	0.019206	0.083682	0.004075	0.020905	0.008992	0.004579	0.011807	0.004421	0.006623	0.009514	0.018397	0.040214	0.022258	0.02061	0.011564	0.015385	0.036651	0.024366	0.006765	0.012532	0.048377	0.009333	0.007641	0.007925	0.506841
1-hour	99.9th	0.014016252	0.084208	0.011971	0.007437	0.006306	0.003339	0.004935	0.005183	0.002886	0.002497	0.009096	0.005149	0.00885	0.006001	0.002075	0.001368	0.003304	0.025644	0.002366	0.006982	0.004247	0.002684	0.004876	0.001364	0.000816	0.001478	0.004564	0.006764	0.008787	0.007731	0.000934	0.003575	0.010055	0.005033	0.001856	0.006145	0.006477	0.004178	0.00298	0.00348	0.110859
1-hour	99th	0.001388392	0.011843	0.000988	0.000841	0.000774	0.000328	0.000575	0.000444	0.000732	0.000555	0.001124	0.000777	0.000935	0.000657	0.00024	0.000173	0.000396	0.006446	0.000226	0.000908	0.000454	0.000249	0.001096	0.000196	0.000104	0.00013	0.00046	0.000784	0.001236	0.000802	0.000161	0.000424	0.002799	0.000641	0.0003	0.000528	0.000672	0.000521	0.00029	0.000344	0.031639
1-hour	97.5th	0.000337171	0.002398	0.000345	0.000249	0.000205	9.52E-05	0.000148	0.00014	0.000246	0.000191	0.00022	0.000215	0.000224	0.000177	7.43E-05	6.18E-05	0.000112	0.002008	7.83E-05	0.000212	0.000138	7.87E-05	0.000449	8.24E-05	4.12E-05	5.38E-05	0.000148	0.000297	0.000334	0.000231	5.61E-05	0.000104	0.00102	0.000192	0.000109	0.000134	0.000203	0.00015	8.62E-05	0.000104	0.009715
1-hour	95th	0.000010505	0.000499	0.000109	7.92E-05	6.14E-05	3.58E-05	4.79E-05	4.29E-05	8.39E-05	5.82E-05	7.62E-05	6.49E-05	7.13E-05	6.53E-05	2.8E-05	2.65E-05	3.93E-05	0.000506	2.68E-05	6.93E-05	4.42E-05	2.48E-05	0.000138	2.31E-05	2.24E-05	2.57E-05	5.39E-05	9.15E-05	0.000103	7.38E-05	2.75E-05	3.91E-05	0.000298	5.84E-05	3.56E-05	4.48E-05	6.93E-05	5.38E-05	3.22E-05	3.58E-05	0.001915
1-hour	Average	8.18269E-05	0.00055	7.02E-05	5.46E-05	4.8E-05	2.13E-05	3.21E-05	2.84E-05	3.38E-05	2.66E-05	6.04E-05	4.19E-05	5.68E-05	4.31E-05	1.61E-05	1.27E-05	2.62E-05	0.00025	1.39E-05	4.65E-05	2.75E-05	1.51E-05	5.04E-05	1.08E-05	8.65E-06	1.21E-05	3E-05	5.38E-05	6.14E-05	5E-05	1.13E-05	2.67E-05	0.000117	3.63E-05	1.59E-05	3.13E-05	4.27E-05	3.09E-05	1.81E-05	2.07E-05	0.0012
µg/m³	ALL	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max
1-hour	Max	0.060856767	0.161375	0.034964	0.03045	0.036477	0.010614	0.017731	0.010703	0.017378	0.012457	0.024927	0.03315	0.028794	0.018871	0.011531	0.010816	0.019393	0.083785	0.004344	0.022659	0.010281	0.005568	0.011839	0.004423	0.009963	0.009636	0.01841	0.040234	0.022325	0.022005	0.012188	0.015827	0.036678	0.0255	0.00677	0.01268	0.048435	0.011658	0.008578	0.009524	0.506859
1-hour	99.9th	0.01411136	0.085424	0.012008	0.007911	0.006375	0.003351	0.005835	0.005379	0.002891	0.002501	0.010131	0.005514	0.009718	0.006008	0.002255	0.002611	0.003494	0.025664	0.002637	0.007936	0.005285	0.003481	0.004921	0.001499	0.002475	0.003003	0.004567	0.006765	0.00879	0.008337	0.002438	0.003706	0.010093	0.005554	0.001859	0.006618	0.006495	0.005039	0.003433	0.003785	0.111078
1-hour	99th	0.001799709	0.012221	0.001518	0.001209	0.001042	0.00053	0.000776	0.000715	0.000805	0.000697	0.001526	0.001047	0.000906	0.000458	0.000603	0.000652	0.000645	0.000428	0.001259	0.000901	0.000639	0.001219	0.000358	0.000665	0.000783	0.000822	0.001133	0.001634	0.001154	0.000726	0.000652	0.002979	0.000885	0.000478	0.000769	0.001031	0.000889	0.000589	0.000579	0.03179	
1-hour	97.5th	0.00070105	0.00259	0.000648	0.000509	0.000457	0.000298	0.000387	0.00037	0.000393	0.000342	0.000547	0.00047	0.000579	0.000413	0.000253	0.000377	0.00033	0.002174	0.000262	0.000476	0.000342	0.000212	0.000596	0.000213	0.00038	0.000428	0.00047	0.000572	0.000674	0.00049	0.000451	0.000328	0.001172	0.000439	0.000262	0.000379	0.000517	0.000387	0.0003	0.000311	0.009901
1-hour	95th	0.000293895	0.000649	0.000366	0.000241	0.000227	0.000146	0.000183	0.000168	0.000211	0.000183	0.000187	0.000204	0.000183	0.000228	0.000119	0.000235	0.000161	0.000728	0.000105	0.000174	0.000011	7.08E-05	0.000287	0.000133	0.000199	0.000259	0.000277	0.000336	0.00033	0.000208	0.000286	0.000163	0.000486	0.000184	0.000139	0.00019	0.000259	0.000121	9.5E-05	0.000132	0.002143
1-hour	Average	0.000108181	0.000586	0.000103	7.74E-05	6.85E-05	3.66E-05	5E-05	4.57E-05	4.95E-05	4.15E-05	8.41E-05	6.3E-05	8.02E-05	6.32E-05	2.95E-05	5.06E-05	4.26E-05	0.000281	2.67E-05	6.82E-05	4.57E-05	2.93E-05	6.96E-05	2.53E-05	4.51E-05	6.44E-05	6.24E-05	8.6E-05	9.24E-05	7.23E-05	5.99E-05	4.33E-05	0.000143	5.64E-05	2.92E-05	4.96E-05	6.92E-05	4.97E-05	3.36E-05	3.61E-05	0.001239
µg/m³	EXISTING	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max
24-hour	Max	0.000240974	0.00046	0.000344	0.00028	0.000209	0.000169	0.000188	0.000182	0.000137	0.000121	0.000207	0.000261	0.000211	0.000193	8.86E-05	0.00031	0.00012	0.000238	0.000103	0.000233	0.000158	0.00013	0.000163	0.000123	0.000277	0.000308	0.000314	0.000313	0.000354	0.000269	0.000372	0.000107	0.000283	0.000249	0.000111	0.000114	0.000287	0.00016	0.000187	0.000154	0.000926
24-hour	99.9th	0.000237207	0.000382	0.000335	0.000239	0.000187	0.000156	0.000163	0.000158	0.000131	0.000117	0.000206	0.000224	0.00021	0.000181	8.65E-05	0.000294	0.000118	0.000231	9.68E-05	0.000203	0.000155	0.000124	0.000155	0.000117	0.000273	0.000304	0.000296	0.000309	0.000345	0.000228	0.000359	0.000106	0.000264	0.000214	0.000107	0.000114	0.000274	0.000159	0.000155	0.000134	0.000852
24-hour	99th	0.000201674	0.000226	0.000227	0.00013	0.000124	8.																																			

Cadmium

µg/m³	EXISTING	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max
1-hour	Max	7.4071E-05	8.82E-05	9.24E-05	7.28E-05	6.77E-05	1.67E-05	6.14E-05	5.95E-05	1.5E-05	1.54E-05	8.07E-05	7.25E-05	7.95E-05	5.22E-05	1.74E-05	9.23E-05	4.31E-05	8.06E-05	2E-05	6.84E-05	7.12E-05	5.39E-05	1.74E-05	6.59E-05	0.000135	0.000105	9.03E-05	9.69E-05	7.02E-05	7.12E-05	9.37E-05	3.8E-05	6.47E-05	7.08E-05	1.46E-05	4.96E-05	7.5E-05	6.97E-05	5.97E-05	4.89E-05	0.000213
1-hour	99.9th	1.91346E-05	2.91E-05	3.32E-05	2.08E-05	1.49E-05	8.04E-06	1.27E-05	1.2E-05	8.25E-06	7.49E-06	1.74E-05	1.7E-05	1.66E-05	1.73E-05	9.59E-06	5.42E-05	1.4E-05	2.81E-05	8.47E-06	1.79E-05	1.5E-05	1.24E-05	9.94E-06	3.42E-05	9.73E-05	6.98E-05	4.13E-05	3.24E-05	3.23E-05	1.95E-05	2.64E-05	1.46E-05	2.07E-05	1.54E-05	7.09E-06	1.66E-05	2.65E-05	1.66E-05	1.05E-05	1E-05	0.00015
1-hour	99th	7.76388E-06	9.67E-06	8.6E-06	5.48E-06	5.22E-06	2.83E-06	4.44E-06	4.18E-06	2.62E-06	2.57E-06	6.44E-06	5.32E-06	6.49E-06	4.62E-06	3.14E-06	9.07E-06	3.79E-06	7.63E-06	3.01E-06	5.84E-06	4.95E-06	3.71E-06	3.34E-06	4.36E-06	1.1E-05	1.29E-05	7.57E-06	8.39E-06	8.67E-06	5.57E-06	8.68E-06	3.97E-06	5.3E-06	4.99E-06	2.27E-06	4.42E-06	7.4E-06	5.08E-06	3.68E-06	3.76E-06	2.22E-05
1-hour	97.5th	4.33308E-06	5.65E-06	4.96E-06	3.19E-06	2.61E-06	1.47E-06	2.17E-06	2.05E-06	1.26E-06	1.28E-06	3.49E-06	2.96E-06	3.6E-06	2.28E-06	1.25E-06	5.85E-06	1.88E-06	4.03E-06	1.25E-06	3.17E-06	2.45E-06	1.65E-06	1.78E-06	2.24E-06	5.9E-06	8.13E-06	4.86E-06	4.92E-06	4.83E-06	3E-06	5.66E-06	1.78E-06	2.95E-06	2.74E-06	1.09E-06	2.05E-06	3.9E-06	2.6E-06	1.78E-06	1.68E-06	1.37E-05
1-hour	95th	1.63837E-06	2.85E-06	2.26E-06	1.59E-06	1.37E-06	8.27E-07	1.09E-06	1.03E-06	8.07E-07	7.69E-07	1.43E-06	1.41E-06	1.39E-06	1.25E-06	6.97E-07	3.45E-06	9.44E-07	2.28E-06	6.52E-07	1.35E-06	9.34E-07	6.25E-07	1.09E-06	8.96E-07	2.85E-06	4.72E-06	2.4E-06	2.29E-06	1.91E-06	1.5E-06	3.34E-06	9.68E-07	1.74E-06	1.3E-06	6.53E-07	1.11E-06	1.54E-06	1.04E-06	8.28E-07	8.71E-07	9.4E-06
1-hour	Average	3.94403E-07	5.64E-07	5.04E-07	3.34E-07	2.92E-07	1.62E-07	2.42E-07	2.29E-07	1.59E-07	1.5E-07	3.42E-07	3.03E-07	3.38E-07	2.68E-07	1.51E-07	7E-07	2.12E-07	4.75E-07	1.44E-07	3.13E-07	2.49E-07	1.8E-07	2.12E-07	2.71E-07	8.39E-07	1.02E-06	5.21E-07	5.04E-07	4.68E-07	3.25E-07	6.46E-07	2.13E-07	3.43E-07	2.85E-07	1.31E-07	2.44E-07	3.96E-07	2.62E-07	1.98E-07	1.93E-07	2E-06
µg/m³	ADDITION	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max
1-hour	Max	4.2115E-06	7.19E-06	4.26E-06	4.46E-06	3.83E-06	2.76E-06	3.4E-06	3.29E-06	2.42E-06	2.74E-06	5.81E-06	3.95E-06	5.29E-06	3.43E-06	2.33E-06	4.75E-06	2.74E-06	5.25E-06	2.59E-06	4.21E-06	4.87E-06	4.42E-06	3.15E-06	4.38E-06	5.19E-06	8.6E-06	3.23E-06	2.93E-06	5.46E-06	4.46E-06	6.89E-06	2.86E-06	3.65E-06	3.75E-06	2.58E-06	3.17E-06	4.97E-06	4.75E-06	3.37E-06	3.03E-06	1.58E-05
1-hour	99.9th	2.18009E-06	3.57E-06	1.83E-06	2.86E-06	2.64E-06	1.62E-06	2.43E-06	2.37E-06	1.23E-06	1.31E-06	2.56E-06	2.86E-06	2.45E-06	2.18E-06	1.52E-06	2.53E-06	1.94E-06	3.65E-06	1.7E-06	2.68E-06	2.16E-06	1.86E-06	1.51E-06	1.64E-06	2.89E-06	5.57E-06	1.98E-06	1.69E-06	2.1E-06	2.88E-06	3.97E-06	1.78E-06	2.57E-06	2.76E-06	1.18E-06	1.97E-06	1.8E-06	2.17E-06	2.3E-06	2.04E-06	7.37E-06
1-hour	99th	8.86879E-07	1.39E-06	8.34E-07	9.04E-07	7.37E-07	5.26E-07	6.59E-07	6.38E-07	4.95E-07	4.96E-07	9.47E-07	8.64E-07	8.77E-07	6.71E-07	4.84E-07	1.01E-06	6.01E-07	1.13E-06	4.7E-07	8.93E-07	7.09E-07	5.53E-07	5.8E-07	4.32E-07	1.31E-06	1.58E-06	7.84E-07	8.22E-07	8.46E-07	8.95E-07	1.39E-06	5.98E-07	8.49E-07	8.24E-07	4.45E-07	6.49E-07	7.2E-07	7.82E-07	6.29E-07	5.45E-07	3.73E-06
1-hour	97.5th	4.71412E-07	6.19E-07	5.04E-07	3.74E-07	3.75E-07	2.84E-07	3.16E-07	3.01E-07	2.72E-07	2.65E-07	4.36E-07	3.53E-07	4.37E-07	3.78E-07	2.4E-07	5.9E-07	3.04E-07	6.08E-07	2.14E-07	3.48E-07	3.07E-07	2.2E-07	3.32E-07	2.23E-07	8.04E-07	9.35E-07	4.9E-07	4.85E-07	4.99E-07	3.56E-07	8.6E-07	3.02E-07	4.69E-07	3.29E-07	2.38E-07	3.38E-07	4.34E-07	3.19E-07	2.45E-07	2.65E-07	2.38E-06
1-hour	95th	2.41277E-07	3.17E-07	2.98E-07	1.88E-07	1.96E-07	1.57E-07	1.67E-07	1.59E-07	1.6E-07	1.54E-07	2.02E-07	1.76E-07	2.02E-07	2.11E-07	1.27E-07	3.75E-07	1.6E-07	3.04E-07	1.18E-07	1.79E-07	1.44E-07	1.06E-07	2E-07	1.26E-07	5.08E-07	5.89E-07	3.08E-07	2.95E-07	2.83E-07	1.86E-07	5.87E-07	1.63E-07	2.76E-07	1.68E-07	1.36E-07	1.82E-07	2.47E-07	1.51E-07	1.2E-07	1.41E-07	1.44E-06
1-hour	Average	4.66108E-08	6.63E-08	5.09E-08	4.39E-08	4.01E-08	3.04E-08	3.52E-08	3.39E-08	2.98E-08	2.89E-08	4.48E-08	4.06E-08	4.35E-08	3.99E-08	2.67E-08	6.48E-08	3.19E-08	5.97E-08	2.5E-08	4.12E-08	3.4E-08	2.64E-08	3.58E-08	2.63E-08	8.29E-08	1.07E-07	5.1E-08	4.98E-08	5.01E-08	4.27E-08	1E-07	3.27E-08	5.03E-08	3.87E-08	2.6E-08	3.59E-08	4.36E-08	3.53E-08	2.97E-08	2.98E-08	2.56E-07
µg/m³	ALL	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max
1-hour	Max	7.43194E-05	8.83E-05	9.25E-05	7.28E-05	6.77E-05	1.82E-05	6.14E-05	5.96E-05	1.51E-05	1.54E-05	8.07E-05	7.25E-05	7.96E-05	5.22E-05	1.74E-05	9.23E-05	4.31E-05	8.06E-05	2E-05	6.85E-05	7.13E-05	5.39E-05	1.79E-05	6.59E-05	0.000135	0.000105	9.03E-05	9.69E-05	7.04E-05	7.12E-05	9.37E-05	3.8E-05	6.47E-05	7.09E-05	1.46E-05	4.96E-05	7.52E-05	6.97E-05	5.97E-05	4.89E-05	0.000213
1-hour	99.9th	2.18641E-05	3.32E-05	3.33E-05	2.27E-05	1.68E-05	8.9E-06	1.42E-05	1.35E-05	8.47E-06	7.87E-06	2.09E-05	1.85E-05	1.9E-05	1.96E-05	1.04E-05	5.43E-05	1.5E-05	2.94E-05	9.11E-06	2.1E-05	1.64E-05	1.26E-05	1.05E-05	3.42E-05	9.73E-05	6.98E-05	4.13E-05	3.42E-05	3.41E-05	2.09E-05	3.1E-05	1.6E-05	2.37E-05	1.75E-05	7.83E-06	1.84E-05	2.71E-05	1.91E-05	1.32E-05	1.17E-05	0.00015
1-hour	99th	8.55278E-06	1.07E-05	9.22E-06	6.34E-06	5.84E-06	3.3E-06	4.93E-06	4.6E-06	3E-06	2.93E-06	7.34E-06	5.71E-06	7.41E-06	5.18E-06	3.39E-06	9.72E-06	4.34E-06	8.47E-06	3.31E-06	6.66E-06	5.52E-06	4.12E-06	4E-06	4.52E-06	1.11E-05	1.4E-05	8.01E-06	9.06E-06	9.05E-06	6.47E-06	9.62E-06	4.54E-06	5.43E-06	2.79E-06	4.98E-06	7.94E-06	5.63E-06	4.26E-06	4.22E-06	2.31E-05	
1-hour	97.5th	4.80788E-06	6.28E-06	5.37E-06	3.68E-06	3.06E-06	1.67E-06	2.56E-06	2.4E-06	1.65E-06	1.57E-06	3.98E-06	3.42E-06	4.09E-06	2.72E-06	1.61E-06	6.43E-06	2.16E-06	4.76E-06	1.56E-06	3.53E-06	2.89E-06	2.01E-06	2.19E-06	2.49E-06	6.36E-06	8.78E-06	5.16E-06	5.23E-06	5.32E-06	3.46E-06	6.43E-06	2.2E-06	3.41E-06	3.2E-06	1.4E-06	2.43E-06	4.17E-06	2.94E-06	2.09E-06	2.05E-06	1.54E-05
1-hour	95th	1.91499E-06	3.21E-06	2.63E-06	1.87E-06	1.65E-06	1.05E-06	1.33E-06	1.27E-06	1.06E-06	9.85E-07	1.67E-06	1.7E-06	1.65E-06	1.54E-06	8.78E-07	3.79E-06	1.18E-06	2.73E-06	7.89E-07	1.57E-06	1.11E-06	7.7E-07	1.35E-06	1.07E-06	3.55E-06	5.41E-06	2.8E-06	2.67E-06	2.23E-06	1.74E-06	4.01E-06	1.18E-06	2.11E-06	1.56E-06	8.44E-07	1.34E-06	1.86E-06	1.23E-06	9.96E-07	1.05E-06	1.06E-05
1-hour	Average	4.41014E-07	6.3E-07	5.55E-07	3.78E-07	3.32E-07	1.92E-07	2.77E-07	2.63E-07	1.89E-07	1.79E-07	3.87E-07	3.44E-07	3.82E-07	3.08E-07	1.77E-07	7.64E-07	2.44E-07	5.35E-07	1.69E-07	3.55E-07	2.83E-07	2.07E-07	2.48E-07	2.97E-07	9.22E-07	1.12E-06	5.72E-07	5.53E-07	5.18E-07	3.67E-07	7.47E-07	2.46E-07	3.94E-07	3.24E-07	1.57E-07	2.8E-07	4.4E-07	2.97E-07	2.28E-07	2.23E-07	2.13E-06
µg/m³	EXISTING	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max
24-hour	Max	5.44034E-06	5.87E-06	4.92E-06	4.23E-06	4.83E-06	1.33E-06	4.43E-06	4.27E-06	1.72E-06	1.12E-06	5.17E-06	4.44E-06	5.26E-06	3.96E-06	1.22E-06	7.63E-06	3.28E-06	5.21E-06	1.77E-06	4.2E-06	4.38E-06	3.34E-06	2.1E-06	4.23E-06	1.31E-05	8.8E-06	6.42E-06	5.69E-06	4.54E-06	4.07E-06	7.88E-06	3.01E-06	4.91E-06	4.45E-06	9.51E-07	3.74E-06	4.2E-06	4.29E-06	4.09E-06	3.54E-06	2.24E-05
24-hour	99.9th	4.99829E-06	5.42E-06	4.84E-06	4.01E-06	4.31E-06	1.26E-06	3.93E-06	3.79E-06	1.5E-06	1.07E-06	4.68E-06	4.1E-06	4.8E-06	3.46E-06	1.16E-06	7.36E-06	2.87E-06	4.86E-06	1.59E-06	3.99E-06	3.96E-06	3.04E-06	1.83E-06	4.14E-06	1.28E-05	8.32E-06	6.02E-06	5.36E-06	4.31E-06	3.92E-06	6.91E-06	2.62E-06	4.31E-06	4.07E-06	9.08E-07	3.27E-06	3.92E-06	3.91E-06	3.65E-06	3.13E-06	2.07E-05
24-hour	99th	3.37884E-06	4.04E-06	3.89E-06	2.77E-06	1.98E-06	9.7E-07	1.74E-06																																		

Beryllium

µg/m³	EXISTING	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary	Max			
1-hour	Max	7.94976E-06	1.39E-05	1.32E-05	1.09E-05	6.99E-06	7.56E-06	7.23E-06	7.3E-06	1.21E-05	9.82E-06	1.29E-05	9.26E-06	1.13E-05	7.45E-06	6.39E-06	1.19E-05	6.95E-06	9.13E-06	6.23E-06	1.19E-05	1.18E-05	1.15E-05	7.59E-06	2.37E-05	2.69E-05	1.42E-05	1.61E-05	1.47E-05	9.8E-06	1.12E-05	1.33E-05	6.83E-06	8.2E-06	8.66E-06	1.02E-05	7.26E-06	1.16E-05	1.16E-05	7.47E-06	7.09E-06	4.64E-05				
1-hour	99.9th	5.11272E-06	5.15E-06	6.22E-06	4.52E-06	4.16E-06	4.42E-06	3.98E-06	3.91E-06	4.01E-06	4.58E-06	4.94E-06	4.55E-06	4.82E-06	4.47E-06	3.86E-06	6.95E-06	4.03E-06	5.1E-06	3.75E-06	3.81E-06	4.27E-06	3.5E-06	4.72E-06	3.54E-06	1.18E-05	8.43E-06	6.36E-06	6.15E-06	5.8E-06	4.53E-06	9.43E-06	4.16E-06	5.28E-06	4.37E-06	3.99E-06	4.23E-06	5.52E-06	3.97E-06	3.95E-06	3.84E-06	2.42E-05				
1-hour	99th	1.93677E-06	2.07E-06	1.86E-06	1.54E-06	1.34E-06	1.13E-06	1.23E-06	1.16E-06	9.71E-07	9.73E-07	1.78E-06	1.5E-06	1.84E-06	1.27E-06	8.66E-07	2.54E-06	1.11E-06	1.67E-06	8.78E-07	1.5E-06	1.49E-06	1.19E-06	1.31E-06	1.15E-06	3.61E-06	3.3E-06	2.13E-06	1.9E-06	1.89E-06	1.53E-06	3.51E-06	1.05E-06	1.48E-06	1.45E-06	8.46E-07	1.19E-06	1.71E-06	1.45E-06	1.14E-06	9.75E-07	9.01E-06				
1-hour	97.5th	5.86109E-07	8.16E-07	8.96E-07	6.44E-07	5.64E-07	3.69E-07	5.01E-07	4.77E-07	3.99E-07	3.86E-07	5.78E-07	5.94E-07	5.52E-07	4.68E-07	3.3E-07	1.26E-06	3.95E-07	7.2E-07	3.2E-07	5.67E-07	4.54E-07	3.5E-07	4.23E-07	4.83E-07	1.8E-06	1.6E-06	8.83E-07	8.84E-07	7.74E-07	6.35E-07	1.63E-06	3.9E-07	5.58E-07	5.7E-07	3.52E-07	4.18E-07	7.24E-07	4.74E-07	4.53E-07	3.97E-07	5.46E-06				
1-hour	95th	2.8592E-07	3.57E-07	4.05E-07	2.8E-07	2.81E-07	2.12E-07	2.53E-07	2.44E-07	2.31E-07	2.19E-07	2.68E-07	2.68E-07	2.57E-07	2.67E-07	1.92E-07	6.1E-07	2.27E-07	3.6E-07	1.83E-07	2.55E-07	2.18E-07	1.77E-07	2.57E-07	2.31E-07	8.42E-07	9.19E-07	4.25E-07	4.27E-07	3.56E-07	2.71E-07	8.61E-07	2.31E-07	3.27E-07	2.59E-07	1.99E-07	2.48E-07	3.32E-07	2.26E-07	2.06E-07	2.21E-07	3.56E-06				
1-hour	Average	7.82198E-08	9.21E-08	9.88E-08	7.19E-08	6.64E-08	5.59E-08	6.11E-08	5.97E-08	5.83E-08	5.69E-08	7.4E-08	6.84E-08	7.35E-08	6.52E-08	4.93E-08	1.42E-07	5.67E-08	8.41E-08	4.76E-08	6.9E-08	6.13E-08	5.05E-08	6.59E-08	6.26E-08	1.99E-07	1.87E-07	1.06E-07	1.02E-07	8.82E-08	7.07E-08	1.87E-07	5.72E-08	7.64E-08	6.62E-08	5.21E-08	6.1E-08	8.18E-08	6.27E-08	5.51E-08	5.45E-08	5.33E-07				
µg/m³	ADDITION	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary	Max			
1-hour	Max		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
1-hour	99.9th		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
1-hour	99th		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
1-hour	97.5th		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
1-hour	95th		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
1-hour	Average		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
µg/m³	ALL	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary	Max			
1-hour	Max	7.94976E-06	1.39E-05	1.32E-05	1.09E-05	6.99E-06	7.56E-06	7.23E-06	7.3E-06	1.21E-05	9.82E-06	1.29E-05	9.26E-06	1.13E-05	7.45E-06	6.39E-06	1.19E-05	6.95E-06	9.13E-06	6.23E-06	1.19E-05	1.18E-05	1.15E-05	7.59E-06	2.37E-05	2.69E-05	1.42E-05	1.61E-05	1.47E-05	9.8E-06	1.12E-05	1.33E-05	6.83E-06	8.2E-06	8.66E-06	1.02E-05	7.26E-06	1.16E-05	1.16E-05	7.47E-06	7.09E-06	4.64E-05				
1-hour	99.9th	5.11272E-06	5.15E-06	6.22E-06	4.52E-06	4.16E-06	4.42E-06	3.98E-06	3.91E-06	4.01E-06	4.58E-06	4.94E-06	4.55E-06	4.82E-06	4.47E-06	3.86E-06	6.95E-06	4.03E-06	5.1E-06	3.75E-06	3.81E-06	4.27E-06	3.5E-06	4.72E-06	3.54E-06	1.18E-05	8.43E-06	6.36E-06	6.15E-06	5.8E-06	4.53E-06	9.43E-06	4.16E-06	5.28E-06	4.37E-06	3.99E-06	4.23E-06	5.52E-06	3.97E-06	3.95E-06	3.84E-06	2.42E-05				
1-hour	99th	1.93677E-06	2.07E-06	1.86E-06	1.54E-06	1.34E-06	1.13E-06	1.23E-06	1.16E-06	9.71E-07	9.73E-07	1.78E-06	1.5E-06	1.84E-06	1.27E-06	8.66E-07	2.54E-06	1.11E-06	1.67E-06	8.78E-07	1.5E-06	1.49E-06	1.19E-06	1.31E-06	1.15E-06	3.61E-06	3.3E-06	2.13E-06	1.9E-06	1.89E-06	1.53E-06	3.51E-06	1.05E-06	1.48E-06	1.45E-06	8.46E-07	1.19E-06	1.71E-06	1.45E-06	1.14E-06	9.75E-07	9.01E-06				
1-hour	97.5th	5.86109E-07	8.16E-07	8.96E-07	6.44E-07	5.64E-07	3.69E-07	5.01E-07	4.77E-07	3.99E-07	3.86E-07	5.78E-07	5.94E-07	5.52E-07	4.68E-07	3.3E-07	1.26E-06	3.95E-07	7.2E-07	3.2E-07	5.67E-07	4.54E-07	3.5E-07	4.23E-07	4.83E-07	1.8E-06	1.6E-06	8.83E-07	8.84E-07	7.74E-07	6.35E-07	1.63E-06	3.9E-07	5.58E-07	5.7E-07	3.52E-07	4.18E-07	7.24E-07	4.74E-07	4.53E-07	3.97E-07	5.46E-06				
1-hour	95th	2.8592E-07	3.57E-07	4.05E-07	2.8E-07	2.81E-07	2.12E-07	2.53E-07	2.44E-07	2.31E-07	2.19E-07	2.68E-07	2.68E-07	2.57E-07	2.67E-07	1.92E-07	6.1E-07	2.27E-07	3.6E-07	1.83E-07	2.55E-07	2.18E-07	1.77E-07	2.57E-07	2.31E-07	8.42E-07	9.19E-07	4.25E-07	4.27E-07	3.56E-07	2.71E-07	8.61E-07	2.31E-07	3.27E-07	2.59E-07	1.99E-07	2.48E-07	3.32E-07	2.26E-07	2.06E-07	2.21E-07	3.56E-06				
1-hour	Average	7.82198E-08	9.21E-08	9.88E-08	7.19E-08	6.64E-08	5.59E-08	6.11E-08	5.97E-08	5.83E-08	5.69E-08	7.4E-08	6.84E-08	7.35E-08	6.52E-08	4.93E-08	1.42E-07	5.67E-08	8.41E-08	4.76E-08	6.9E-08	6.13E-08	5.05E-08	6.59E-08	6.26E-08	1.99E-07	1.87E-07	1.06E-07	1.02E-07	8.82E-08	7.07E-08	1.87E-07	5.72E-08	7.64E-08	6.62E-08	5.21E-08	6.1E-08	8.18E-08	6.27E-08	5.51E-08	5.45E-08	5.33E-07				
µg/m³	EXISTING	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary	Max			
24-hour	Max	7.92246E-07	8.74E-07	8.34E-07	7.05E-07	7.02E-07	6.39E-07	6.81E-07	6.75E-07	7.66E-07	6.93E-07	7.56E-07	6.83E-07	7.65E-07	7.2E-07	6.24E-07	1.8E-06	6.54E-07	8.02E-07	5.86E-07	6.82E-07	6.42E-07	5.54E-07	6.06E-07	1.11E-06	1.6E-06	1.49E-06	9.87E-07	9.4E-07	8.1E-07	6.97E-07	1.33E-06	6.59E-07	7.97E-07	6.69E-07	6.79E-07	6.9E-07	7.67E-07	6.4E-07	6.01E-07	6.39E-07	6.24E-06				
24-hour	99.9th	7.55939E-07	8.64E-07	8.33E-07	6.86E-07	6.51E-07	6E-07	6.38E-07	6.35E-07	7.06E-07	6.45E-07	7.45E-07	6.57E-07	7.4E-07	7.06E-07	6.04E-07	1.63E-06	6.38E-07	7.84E-07	5.86E-07	6.77E-07	6.3E-07	5.49E-07	5.85E-07	9E-07	1.6E-06	1.36E-06	9.51E-07	8.98E-07	7.64E-07	6.81E-07	1.27E-06	6.52E-07	7.75E-07	6.4E-07	6.27E-07	6.72E-07	7.14E-07	6.36E-07	5.68E-07	6.1E-07	5.27E-06				
24-hour	99th	6.28387E-07	6.09E-07	6.39E-07	5.17E-07	4.55E-07	4.1E-07	4.25E-07	4.16E-07	4.54E-07	4.82E-07	5.26E-07	5.01E-07	5.66E-07	3.86E-07	3.42E-07	8.6E-07	3.67E-07	5.69E-07	3.21E-07	4.63E-07	4.37E-07	3.54E-07	4.82E-07	3.78E-07	1.28E-06	9.56E-07	7.57E-07	6.54E-07	5.96E-07	4.99E-07	9.83E-07	3.51E-07	4.49E-07	4.8E-07	4.48E-07	3.89E-07	5.8E-07	4.3E-07	4.18E-07	3.57E-07	4.4E-06				
24-hour	97.5th	4.7587E-07	5.24E-07	5.54E-07	3.79E-07	3.3E-07	2.97E-07	3.14E-07	3.08E-07	2.78E-07	2.97E-07	4.22E-07	3.49E-07	4.18E-07	3.38E-07	2.64E-07	6.78E-07	3E-07	3.76E-07	2.6E-07	3.73E-07	3.42E-07	2.76E-07	3.73E-07	3.32E-07	1.04E-06	7.75E-07	6.03E-07	5.85E-07	4.81E-07	3.64E-07	7.63E-07	3.11E-07	3.75E-07	3.34E-07	2.77E-07	3.19E-07	4.6E-07	3.5E-07	2.76E-07	2.94E-07	3.06E-06				
24-hour	95th	3.35673E-07	3.89E-07	4.26E-07	2.89E-07	2.68E-07	2.21E-07	2.54E-07	2.5E-07	2.14E-07	1.93E-07	3.27E-07	2.66E-07	3.35E-07	2.63E-07	2.04E-07	5.32E-07	2.4E-07	3.38E-07	1.95E-07	2.83E-07	2.74E-07	2.21E-07	2.52E-07	2.55E-07	7.51E-07	6.28E-07	4.33E-07	4.62E-07	3.66E-07	2.87E-07	5.85E-07	2.35E-07	3.26E-07	2.62E-07	1.89E-07	2.54E-07	3.46E-07	2.81E-07	2.22E-07	2.27E-07					

Barium

µg/m³	EXISTING	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max	
1-hour	Max	0.001565109	0.002743	0.0026	0.002137	0.001376	0.001488	0.001423	0.001437	0.002377	0.001934	0.002546	0.001823	0.00223	0.001466	0.001258	0.002346	0.001368	0.001798	0.001226	0.002338	0.002317	0.002265	0.001494	0.004663	0.005292	0.002792	0.003162	0.002889	0.00193	0.002196	0.002609	0.001345	0.001615	0.001704	0.002016	0.00143	0.002277	0.002281	0.001471	0.001395	0.009126	
1-hour	99.9th	0.001006566	0.001015	0.001212	0.000889	0.000818	0.000869	0.000783	0.00077	0.00079	0.0009	0.000972	0.000896	0.000949	0.000881	0.00076	0.001368	0.000794	0.001004	0.000738	0.00075	0.000841	0.00069	0.00093	0.000696	0.00232	0.00166	0.001252	0.001207	0.0011	0.000892	0.001857	0.000819	0.00104	0.000861	0.000783	0.000833	0.001076	0.000782	0.000778	0.000757	0.004772	
1-hour	99th	0.000377988	0.000398	0.000364	0.000299	0.000263	0.000223	0.000239	0.000225	0.000191	0.000192	0.000345	0.000286	0.000357	0.000245	0.00017	0.000501	0.000219	0.000325	0.000173	0.000295	0.000287	0.000233	0.000257	0.000221	0.00071	0.00065	0.000408	0.000371	0.000371	0.000293	0.00069	0.000207	0.00029	0.000283	0.000167	0.00023	0.000326	0.000282	0.000225	0.000191	0.001773	
1-hour	97.5th	0.000115212	0.000158	0.000176	0.000125	0.000111	7.25E-05	9.86E-05	9.39E-05	7.85E-05	7.6E-05	0.000113	0.000117	0.000109	9.19E-05	6.46E-05	0.000245	7.68E-05	0.000142	6.14E-05	0.000111	8.83E-05	6.82E-05	8.29E-05	9.44E-05	0.00034	0.00031	0.000171	0.000172	0.000151	0.000123	0.000321	7.69E-05	0.000109	0.000112	6.87E-05	8.23E-05	0.000143	9.33E-05	8.92E-05	7.82E-05	0.001076	
1-hour	95th	5.5303E-05	7E-05	7.95E-05	5.48E-05	5.48E-05	4.16E-05	4.94E-05	4.75E-05	4.56E-05	4.32E-05	5.26E-05	5.24E-05	5.02E-05	5.23E-05	3.74E-05	0.000119	4.44E-05	7.07E-05	3.6E-05	5.01E-05	4.23E-05	3.45E-05	5.06E-05	4.51E-05	0.000165	0.000178	8.24E-05	8.22E-05	7E-05	5.32E-05	0.00017	4.53E-05	6.36E-05	4.98E-05	3.92E-05	4.88E-05	6.53E-05	4.43E-05	4E-05	4.27E-05	0.000702	
1-hour	Average	1.53133E-05	1.8E-05	1.93E-05	1.41E-05	1.3E-05	1.1E-05	1.2E-05	1.17E-05	1.14E-05	1.12E-05	1.45E-05	1.34E-05	1.44E-05	1.28E-05	9.68E-06	2.77E-05	1.11E-05	1.65E-05	9.34E-06	1.35E-05	1.2E-05	9.9E-06	1.29E-05	1.22E-05	3.86E-05	3.65E-05	2.06E-05	2E-05	1.73E-05	1.38E-05	3.68E-05	1.12E-05	1.5E-05	1.3E-05	1.02E-05	1.2E-05	1.6E-05	1.23E-05	1.08E-05	1.07E-05	0.000105	
µg/m³	ADDITION	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max	
1-hour	Max	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1-hour	99.9th	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1-hour	99th	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1-hour	97.5th	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-hour	95th	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1-hour	Average	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
µg/m³	ALL	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max	
1-hour	Max	0.001565109	0.002743	0.0026	0.002137	0.001376	0.001488	0.001423	0.001437	0.002377	0.001934	0.002546	0.001823	0.00223	0.001466	0.001258	0.002346	0.001368	0.001798	0.001226	0.002338	0.002317	0.002265	0.001494	0.004663	0.005292	0.002792	0.003162	0.002889	0.00193	0.002196	0.002609	0.001345	0.001615	0.001704	0.002016	0.00143	0.002277	0.002281	0.001471	0.001395	0.009126	
1-hour	99.9th	0.001006566	0.001015	0.001212	0.000889	0.000818	0.000869	0.000783	0.00077	0.00079	0.0009	0.000972	0.000896	0.000949	0.000881	0.00076	0.001368	0.000794	0.001004	0.000738	0.00075	0.000841	0.00069	0.00093	0.000696	0.00232	0.00166	0.001252	0.001207	0.0011	0.000892	0.001857	0.000819	0.00104	0.000861	0.000783	0.000833	0.001076	0.000782	0.000778	0.000757	0.004772	
1-hour	99th	0.000377988	0.000398	0.000364	0.000299	0.000263	0.000223	0.000239	0.000225	0.000191	0.000192	0.000345	0.000286	0.000357	0.000245	0.00017	0.000501	0.000219	0.000325	0.000173	0.000295	0.000287	0.000233	0.000257	0.000221	0.00071	0.00065	0.000408	0.000371	0.000371	0.000293	0.00069	0.000207	0.00029	0.000283	0.000167	0.00023	0.000326	0.000282	0.000225	0.000191	0.001773	
1-hour	97.5th	0.000115212	0.000158	0.000176	0.000125	0.000111	7.25E-05	9.86E-05	9.39E-05	7.85E-05	7.6E-05	0.000113	0.000117	0.000109	9.19E-05	6.46E-05	0.000245	7.68E-05	0.000142	6.14E-05	0.000111	8.83E-05	6.82E-05	8.29E-05	9.44E-05	0.00034	0.00031	0.000171	0.000172	0.000151	0.000123	0.000321	7.69E-05	0.000109	0.000112	6.87E-05	8.23E-05	0.000143	9.33E-05	8.92E-05	7.82E-05	0.001076	
1-hour	95th	5.5303E-05	7E-05	7.95E-05	5.48E-05	5.48E-05	4.16E-05	4.94E-05	4.75E-05	4.56E-05	4.32E-05	5.26E-05	5.24E-05	5.02E-05	5.23E-05	3.74E-05	0.000119	4.44E-05	7.07E-05	3.6E-05	5.01E-05	4.23E-05	3.45E-05	5.06E-05	4.51E-05	0.000165	0.000178	8.24E-05	8.22E-05	7E-05	5.32E-05	0.00017	4.53E-05	6.36E-05	4.98E-05	3.92E-05	4.88E-05	6.53E-05	4.43E-05	4E-05	4.27E-05	0.000702	
1-hour	Average	1.53133E-05	1.8E-05	1.93E-05	1.41E-05	1.3E-05	1.1E-05	1.2E-05	1.17E-05	1.14E-05	1.12E-05	1.45E-05	1.34E-05	1.44E-05	1.28E-05	9.68E-06	2.77E-05	1.11E-05	1.65E-05	9.34E-06	1.35E-05	1.2E-05	9.9E-06	1.29E-05	1.22E-05	3.86E-05	3.65E-05	2.06E-05	2E-05	1.73E-05	1.38E-05	3.68E-05	1.12E-05	1.5E-05	1.3E-05	1.02E-05	1.2E-05	1.6E-05	1.23E-05	1.08E-05	1.07E-05	0.000105	
µg/m³	EXISTING	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max	
24-hour	Max	0.000155968	0.000172	0.000164	0.000138	0.000137	0.000126	0.000133	0.000132	0.000151	0.000136	0.000149	0.000134	0.000151	0.000141	0.000123	0.000355	0.000128	0.000157	0.000115	0.000134	0.000126	0.000109	0.000119	0.000219	0.000316	0.000294	0.000192	0.000184	0.000159	0.000137	0.000262	0.000129	0.000156	0.000131	0.000133	0.000135	0.000151	0.000126	0.000118	0.000125	0.001228	
24-hour	99.9th	0.000148822	0.00017	0.000163	0.000135	0.000128	0.000118	0.000125	0.000124	0.000139	0.000127	0.000147	0.000129	0.000146	0.000138	0.000119	0.000321	0.000125	0.000154	0.000115	0.000133	0.000124	0.000108	0.000115	0.000177	0.000316	0.000267	0.000186	0.000176	0.00015	0.000134	0.00025	0.000128	0.000152	0.000126	0.000123	0.000132	0.000141	0.000125	0.000111	0.00012	0.001037	
24-hour	99th	0.00012134	0.00012	0.000126	0.000102	8.95E-05	8.06E-05	8.37E-05	8.18E-05	8.89E-05	9.49E-05	0.000104	9.86E-05	0.00011	7.59E-05	6.73E-05	0.000167	7.22E-05	0.000112	6.31E-05	9.12E-05	8.61E-05	6.97E-05	9.48E-05	7.43E-05	0.000251	0.000188	0.000149	0.000127	0.000116	9.81E-05	0.000193	6.92E-05	8.83E-05	9.44E-05	8.82E-05	7.66E-05	0.000114	8.45E-05	8.22E-05	7.03E-05	0.000866	
24-hour	97.5th	9.25339E-05	0.000103	0.000108	7.45E-05	6.44E-05	5.86E-05	6.18E-05	6.07E-05	5.48E-05	5.85E-05	8.21E-05	6.87E-05	8.03E-05	6.65E-05	5.2E-05	0.000134	5.89E-05	7.4E-05	5.12E-05	7.35E-05	6.58E-05	5.44E-05	7.3E-05	6.5E-05	0.000204	0.000153	0.000117	0.000115	9.37E-05	7.17E-05	0.00015	6.12E-05	7.38E-05	6.57E-05	5.44E-05	6.28E-05	8.91E-05	6.87E-05	5.41E-05	5.79E-05	0.000603	
24-hour	95th	6.60855E-05	7.37E-05	8.29E-05	5.68E-05	5.26E-05	4.35E-05	4.99E-05	4.91E-05	4.17E-05	3.8E-05	6.43E-05	5.2E-05	6.59E-05	5.17E-05	4.01E-05	0.000105	4.71E-05	6.65E-05	3.85E-05	5.56E-05	5.36E-05	4.3E-05	4.93E-05	4.99E-05	0.000146	0.000124	8.48E-05	9.06E-05	7.11E-05	5.58E-05	0.000115	4.63E-05	6.41E-05	5.09E-05	3.71E-05	4.99E-05	6.8E-05	5.49E-05	4.35E-05	4.46E-05	0.00047	
24-hour	Average	1.53071E-05	1.8E-05	1.93E-05	1.41E-05	1.3E-05	1.1E-05	1.2E-05	1.17E-05	1.14E-05	1.12E-05	1.45E-05	1.34E-0																														

Manganese

µg/m³	EXISTING	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max	
1-hour	Max	0.019915479	0.019459	0.022535	0.015152	0.014156	0.011554	0.010581	0.009693	0.008331	0.00868	0.016181	0.015011	0.016636	0.016216	0.008226	0.021047	0.011769	0.021646	0.007892	0.012886	0.013509	0.011545	0.012202	0.012542	0.032098	0.025563	0.020577	0.020135	0.035898	0.013448	0.032313	0.010682	0.021327	0.014291	0.006637	0.011475	0.027042	0.012803	0.008255	0.008317	0.055253	
1-hour	99.9th	0.010897576	0.013047	0.010111	0.008367	0.007033	0.0047	0.005817	0.005551	0.005511	0.004253	0.009334	0.007456	0.009405	0.007625	0.005143	0.009398	0.006005	0.012081	0.004106	0.008088	0.007449	0.006168	0.005452	0.003755	0.009907	0.014264	0.008775	0.008585	0.010771	0.008405	0.012662	0.006434	0.007593	0.007129	0.004362	0.007233	0.008902	0.007566	0.005648	0.004828	0.030544	
1-hour	99th	0.00499703	0.00652	0.004833	0.003758	0.003282	0.002096	0.002879	0.002764	0.001918	0.001898	0.004623	0.003411	0.004653	0.002861	0.002035	0.004796	0.002509	0.004699	0.001937	0.003928	0.00354	0.002618	0.002458	0.001964	0.004311	0.006058	0.004161	0.004599	0.00497	0.003886	0.005277	0.002577	0.003417	0.003228	0.001645	0.002771	0.004166	0.00377	0.002713	0.002475	0.015177	
1-hour	97.5th	0.002096835	0.003496	0.003024	0.002114	0.001738	0.001117	0.001444	0.001089	0.001028	0.001847	0.001953	0.001745	0.001526	0.000981	0.003137	0.001321	0.002635	0.000994	0.001743	0.001253	0.000877	0.001415	0.001016	0.002555	0.004005	0.002593	0.002959	0.002867	0.001982	0.003531	0.001315	0.001923	0.001833	0.000927	0.001454	0.002369	0.001286	0.001133	0.001211	0.007348		
1-hour	95th	0.000848983	0.001447	0.001368	0.000872	0.000855	0.000597	0.000698	0.000661	0.000614	0.00059	0.000756	0.000805	0.000722	0.000844	0.0005	0.001829	0.000647	0.00141	0.000455	0.000739	0.000531	0.000381	0.000785	0.000543	0.001509	0.002404	0.001462	0.001412	0.001051	0.000821	0.002033	0.000668	0.001135	0.000757	0.000512	0.000749	0.000915	0.000564	0.0005	0.000566	0.005206	
1-hour	Average	0.000219421	0.000316	0.000273	0.000189	0.00017	0.000117	0.000144	0.000138	0.000119	0.000113	0.000193	0.000174	0.00019	0.000165	0.000104	0.00033	0.000132	0.00027	9.78E-05	0.000177	0.000141	0.000105	0.00015	0.000108	0.000284	0.000483	0.000266	0.000268	0.000257	0.000184	0.00041	0.000134	0.000209	0.000164	9.97E-05	0.00015	0.000215	0.000148	0.000119	0.00012	0.001126	
µg/m³	ADDITION	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max	
1-hour	Max	0.20278982	0.530442	0.116371	0.097858	0.118679	0.034544	0.057533	0.034382	0.057874	0.041283	0.078873	0.106265	0.093891	0.062859	0.036263	0.036004	0.064025	0.278971	0.013589	0.069925	0.030627	0.015646	0.039368	0.014737	0.022122	0.031747	0.061327	0.134054	0.074215	0.068783	0.038774	0.05129	0.122179	0.081237	0.022553	0.041792	0.161277	0.031875	0.025494	0.026523	1.689477	
1-hour	99.9th	0.046821886	0.280716	0.039915	0.024809	0.021023	0.011132	0.016452	0.017278	0.00962	0.008326	0.030735	0.017172	0.02999	0.020004	0.006928	0.004578	0.011019	0.085486	0.007928	0.023415	0.014561	0.009335	0.016264	0.00457	0.002777	0.004932	0.015213	0.022546	0.029292	0.025805	0.003445	0.011933	0.033529	0.016802	0.006187	0.020502	0.021597	0.014232	0.010009	0.011627	0.369591	
1-hour	99th	0.004789245	0.039538	0.003299	0.002885	0.002619	0.001135	0.001926	0.001519	0.00246	0.001855	0.003945	0.002603	0.003198	0.002201	0.000853	0.000844	0.001357	0.021487	0.000835	0.003093	0.001729	0.001078	0.003697	0.000738	0.000788	0.001039	0.001555	0.002665	0.00442	0.00273	0.00094	0.001449	0.009359	0.002149	0.001032	0.001786	0.00224	0.001868	0.001141	0.001227	0.105526	
1-hour	97.5th	0.001180082	0.008095	0.001211	0.001025	0.000865	0.000422	0.000636	0.000603	0.000856	0.000693	0.000934	0.000866	0.000978	0.000758	0.000372	0.000423	0.000494	0.006712	0.000384	0.00088	0.000656	0.000354	0.001529	0.000342	0.000476	0.000579	0.000603	0.001026	0.001182	0.000991	0.000551	0.00048	0.003438	0.000761	0.000439	0.000586	0.00077	0.000716	0.000502	0.000499	0.032384	
1-hour	95th	0.000515331	0.001775	0.000481	0.000428	0.000345	0.000205	0.000289	0.00026	0.000347	0.000269	0.00036	0.000363	0.000359	0.000322	0.000174	0.000257	0.00024	0.001792	0.000162	0.000336	0.000202	0.000125	0.000527	0.000163	0.000299	0.000354	0.000308	0.000431	0.000478	0.000381	0.000344	0.000235	0.001088	0.000337	0.000194	0.00027	0.000353	0.000238	0.000165	0.000209	0.006383	
1-hour	Average	0.000290702	0.001859	0.000254	0.000199	0.000175	8.27E-05	0.00012	0.000108	0.000124	9.98E-05	0.000218	0.000155	0.000206	0.000159	6.38E-05	6.74E-05	9.98E-05	0.000858	5.6E-05	0.000171	0.000105	6.05E-05	0.000182	4.6E-05	6.08E-05	8.18E-05	0.000119	0.000199	0.000224	0.000183	7.63E-05	0.000102	0.00041	0.000136	6.29E-05	0.000118	0.000159	0.000117	7.18E-05	8.06E-05	0.00403	
µg/m³	ALL	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max	
1-hour	Max	0.203627595	0.540552	0.116674	0.102265	0.122219	0.035586	0.059399	0.035923	0.057968	0.04165	0.088641	0.111601	0.09993	0.062939	0.039918	0.036088	0.064728	0.279516	0.017894	0.079816	0.038518	0.021205	0.039538	0.014748	0.038547	0.032343	0.061399	0.134157	0.074566	0.075783	0.04229	0.052979	0.122327	0.085964	0.022579	0.042403	0.161574	0.044678	0.030376	0.034841	1.689577	
1-hour	99.9th	0.047532153	0.286393	0.040112	0.02745	0.0213	0.011853	0.021373	0.018022	0.009649	0.008716	0.036985	0.019395	0.035258	0.020046	0.0078	0.011772	0.012003	0.085597	0.008999	0.029306	0.020048	0.013711	0.016485	0.006808	0.011751	0.016148	0.016809	0.022567	0.030107	0.029179	0.015567	0.012602	0.033743	0.020307	0.006953	0.020845	0.024425	0.019361	0.013328	0.012721	0.370737	
1-hour	99th	0.008618939	0.042389	0.007199	0.006381	0.005384	0.00318	0.004457	0.004118	0.003377	0.003213	0.008189	0.005649	0.008239	0.005039	0.002896	0.00555	0.003699	0.0219	0.002944	0.006678	0.005805	0.004139	0.00496	0.002401	0.005115	0.006957	0.005116	0.006565	0.007512	0.006365	0.003768	0.010395	0.005047	0.002636	0.004332	0.005672	0.003927	0.003528	0.105985			
1-hour	97.5th	0.004688798	0.010675	0.004171	0.003512	0.003107	0.00176	0.002574	0.002399	0.002062	0.001778	0.003259	0.003131	0.003499	0.002564	0.001624	0.003522	0.002121	0.008841	0.001536	0.002984	0.002021	0.001217	0.002743	0.001377	0.003007	0.004543	0.003307	0.003895	0.00456	0.003336	0.003984	0.002165	0.005159	0.002818	0.00141	0.002338	0.003466	0.002124	0.00185	0.001991	0.033058	
1-hour	95th	0.001783289	0.00448	0.002463	0.00148	0.001536	0.00098	0.001234	0.001113	0.00117	0.001092	0.001121	0.001359	0.00118	0.001454	0.000801	0.002137	0.001085	0.004136	0.000681	0.001079	0.000731	0.000509	0.001638	0.000749	0.00182	0.002799	0.001961	0.002298	0.002113	0.00132	0.002435	0.001125	0.002652	0.001211	0.000837	0.001271	0.001699	0.000774	0.000693	0.000884	0.009067	
1-hour	Average	0.000510123	0.002175	0.000527	0.000388	0.000345	0.000199	0.000264	0.000245	0.000243	0.000213	0.000412	0.000329	0.000397	0.000324	0.000168	0.000398	0.000232	0.001128	0.000154	0.000348	0.000246	0.000166	0.000332	0.000154	0.000344	0.000565	0.000385	0.000467	0.000482	0.000367	0.000486	0.000236	0.00062	0.0003	0.000163	0.000268	0.000374	0.000265	0.00019	0.0002	0.004387	
µg/m³	EXISTING	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max	
24-hour	Max	0.001935629	0.002567	0.002144	0.001639	0.001226	0.001021	0.001088	0.00105	0.000935	0.00067	0.001607	0.001538	0.001593	0.001148	0.000707	0.002488	0.000817	0.00155	0.000674	0.001386	0.001218	0.000935	0.001099	0.000757	0.001538	0.002671	0.001833	0.00203	0.002065	0.001565	0.002394	0.000855	0.001889	0.001466	0.000609	0.000932	0.001673	0.001281	0.001073	0.000889	0.006704	
24-hour	99.9th	0.001856979	0.002463	0.002023	0.001551	0.001192	0.000934	0.001032	0.000988	0.00084	0.000661	0.001542	0.001449	0.001567	0.001087	0.000676	0.002224	0.0008	0.001533	0.000647	0.00136	0.001178	0.000911	0.001028	0.000719	0.001532	0.002603	0.00179	0.001919	0.001917	0.001482	0.00238	0.000822	0.001724	0.001379	0.000592	0.000892	0.001537	0.001199	0.000996	0.000853	0.005955	
24-hour	99th																																										

Silver

µg/m³	EXISTING	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max		
1-hour	Max	8.69505E-06	1.52E-05	1.44E-05	1.19E-05	7.64E-06	8.27E-06	7.91E-06	7.98E-06	1.32E-05	1.07E-05	1.41E-05	1.01E-05	1.24E-05	8.15E-06	6.99E-06	1.3E-05	7.6E-06	9.99E-06	6.81E-06	1.3E-05	1.29E-05	1.26E-05	8.3E-06	2.59E-05	2.94E-05	1.55E-05	1.76E-05	1.61E-05	1.07E-05	1.22E-05	1.45E-05	7.47E-06	8.97E-06	9.47E-06	1.12E-05	7.94E-06	1.26E-05	1.27E-05	8.17E-06	7.75E-06	5.07E-05		
1-hour	99.9th	6.01715E-06	5.75E-06	7.67E-06	5.04E-06	4.9E-06	4.83E-06	4.42E-06	4.34E-06	4.39E-06	5.07E-06	5.51E-06	5E-06	5.62E-06	4.89E-06	4.22E-06	7.6E-06	4.41E-06	5.77E-06	4.1E-06	4.66E-06	4.71E-06	3.92E-06	5.17E-06	4.21E-06	1.29E-05	9.22E-06	6.95E-06	7.73E-06	7.84E-06	5.06E-06	1.03E-05	4.55E-06	5.78E-06	4.98E-06	4.46E-06	4.63E-06	6.93E-06	4.45E-06	4.44E-06	4.2E-06	2.65E-05		
1-hour	99th	2.1608E-06	2.34E-06	2.11E-06	1.72E-06	1.49E-06	1.24E-06	1.37E-06	1.31E-06	1.12E-06	1.11E-06	2.07E-06	1.66E-06	2.1E-06	1.47E-06	9.81E-07	3.11E-06	1.29E-06	1.87E-06	1.02E-06	1.73E-06	1.72E-06	1.35E-06	1.47E-06	1.58E-06	5.14E-06	4.03E-06	2.44E-06	2.11E-06	2.18E-06	1.71E-06	3.99E-06	1.24E-06	1.67E-06	1.6E-06	1.02E-06	1.35E-06	1.95E-06	1.63E-06	1.28E-06	1.16E-06	9.85E-06		
1-hour	97.5th	7.29345E-07	9.21E-07	1.03E-06	7.6E-07	6.21E-07	4.11E-07	5.58E-07	5.37E-07	4.47E-07	4.26E-07	6.63E-07	6.71E-07	6.44E-07	5.41E-07	3.76E-07	1.49E-06	4.62E-07	8.13E-07	3.84E-07	6.67E-07	5.33E-07	4.13E-07	4.83E-07	5.94E-07	2.11E-06	1.96E-06	1.02E-06	1.04E-06	9.28E-07	7.3E-07	1.84E-06	4.6E-07	6.28E-07	6.42E-07	3.93E-07	4.87E-07	8.66E-07	5.72E-07	5.35E-07	4.72E-07	6.06E-06		
1-hour	95th	3.33207E-07	4.25E-07	4.65E-07	3.28E-07	3.26E-07	2.47E-07	2.95E-07	2.89E-07	2.55E-07	2.43E-07	3.24E-07	3.15E-07	3.11E-07	3.16E-07	2.2E-07	7.24E-07	2.63E-07	4.12E-07	2.15E-07	3.1E-07	2.64E-07	2.12E-07	2.9E-07	2.93E-07	9.68E-07	1.04E-06	5.1E-07	5.12E-07	3.95E-07	3.21E-07	9.59E-07	2.66E-07	3.78E-07	3.06E-07	2.23E-07	2.9E-07	3.67E-07	2.77E-07	2.43E-07	2.58E-07	4E-06		
1-hour	Average	9.00591E-08	1.06E-07	1.14E-07	8.24E-08	7.57E-08	6.23E-08	6.96E-08	6.79E-08	6.48E-08	6.33E-08	8.49E-08	7.82E-08	8.45E-08	7.38E-08	5.51E-08	1.67E-07	6.41E-08	9.61E-08	5.34E-08	7.92E-08	7.05E-08	5.8E-08	7.34E-08	7.53E-08	2.41E-07	2.19E-07	1.23E-07	1.19E-07	1.02E-07	8.1E-08	2.1E-07	6.45E-08	8.65E-08	7.57E-08	5.79E-08	6.91E-08	9.48E-08	7.2E-08	6.29E-08	6.18E-08	5.96E-07		
µg/m³	ADDITION	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max		
1-hour	Max	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
1-hour	99.9th	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
1-hour	99th	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1-hour	97.5th	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1-hour	95th	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1-hour	Average	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
µg/m³	ALL	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max		
1-hour	Max	8.69505E-06	1.52E-05	1.44E-05	1.19E-05	7.64E-06	8.27E-06	7.91E-06	7.98E-06	1.32E-05	1.07E-05	1.41E-05	1.01E-05	1.24E-05	8.15E-06	6.99E-06	1.3E-05	7.6E-06	9.99E-06	6.81E-06	1.3E-05	1.29E-05	1.26E-05	8.3E-06	2.59E-05	2.94E-05	1.55E-05	1.76E-05	1.61E-05	1.07E-05	1.22E-05	1.45E-05	7.47E-06	8.97E-06	9.47E-06	1.12E-05	7.94E-06	1.26E-05	1.27E-05	8.17E-06	7.75E-06	5.07E-05		
1-hour	99.9th	6.01715E-06	5.75E-06	7.67E-06	5.04E-06	4.9E-06	4.83E-06	4.42E-06	4.34E-06	4.39E-06	5.07E-06	5.51E-06	5E-06	5.62E-06	4.89E-06	4.22E-06	7.6E-06	4.41E-06	5.77E-06	4.1E-06	4.66E-06	4.71E-06	3.92E-06	5.17E-06	4.21E-06	1.29E-05	9.22E-06	6.95E-06	7.73E-06	7.84E-06	5.06E-06	1.03E-05	4.55E-06	5.78E-06	4.98E-06	4.46E-06	4.63E-06	6.93E-06	4.45E-06	4.44E-06	4.2E-06	2.65E-05		
1-hour	99th	2.1608E-06	2.34E-06	2.11E-06	1.72E-06	1.49E-06	1.24E-06	1.37E-06	1.31E-06	1.12E-06	1.11E-06	2.07E-06	1.66E-06	2.1E-06	1.47E-06	9.81E-07	3.11E-06	1.29E-06	1.87E-06	1.02E-06	1.73E-06	1.72E-06	1.35E-06	1.47E-06	1.58E-06	5.14E-06	4.03E-06	2.44E-06	2.11E-06	2.18E-06	1.71E-06	3.99E-06	1.24E-06	1.67E-06	1.6E-06	1.02E-06	1.35E-06	1.95E-06	1.63E-06	1.28E-06	1.16E-06	9.85E-06		
1-hour	97.5th	7.29345E-07	9.21E-07	1.03E-06	7.6E-07	6.21E-07	4.11E-07	5.58E-07	5.37E-07	4.47E-07	4.26E-07	6.63E-07	6.71E-07	6.44E-07	5.41E-07	3.76E-07	1.49E-06	4.62E-07	8.13E-07	3.84E-07	6.67E-07	5.33E-07	4.13E-07	4.83E-07	5.94E-07	2.11E-06	1.96E-06	1.02E-06	1.04E-06	9.28E-07	7.3E-07	1.84E-06	4.6E-07	6.28E-07	6.42E-07	3.93E-07	4.87E-07	8.66E-07	5.72E-07	5.35E-07	4.72E-07	6.06E-06		
1-hour	95th	3.33207E-07	4.25E-07	4.65E-07	3.28E-07	3.26E-07	2.47E-07	2.95E-07	2.89E-07	2.55E-07	2.43E-07	3.24E-07	3.15E-07	3.11E-07	3.16E-07	2.2E-07	7.24E-07	2.63E-07	4.12E-07	2.15E-07	3.1E-07	2.64E-07	2.12E-07	2.9E-07	2.93E-07	9.68E-07	1.04E-06	5.1E-07	5.12E-07	3.95E-07	3.21E-07	9.59E-07	2.66E-07	3.78E-07	3.06E-07	2.23E-07	2.9E-07	3.67E-07	2.77E-07	2.43E-07	2.58E-07	4E-06		
1-hour	Average	9.00591E-08	1.06E-07	1.14E-07	8.24E-08	7.57E-08	6.23E-08	6.96E-08	6.79E-08	6.48E-08	6.33E-08	8.49E-08	7.82E-08	8.45E-08	7.38E-08	5.51E-08	1.67E-07	6.41E-08	9.61E-08	5.34E-08	7.92E-08	7.05E-08	5.8E-08	7.34E-08	7.53E-08	2.41E-07	2.19E-07	1.23E-07	1.19E-07	1.02E-07	8.1E-08	2.1E-07	6.45E-08	8.65E-08	7.57E-08	5.79E-08	6.91E-08	9.48E-08	7.2E-08	6.29E-08	6.18E-08	5.96E-07		
µg/m³	EXISTING	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max		
24-hour	Max	8.69576E-07	9.76E-07	9.49E-07	8.04E-07	8.1E-07	6.99E-07	7.87E-07	7.79E-07	8.49E-07	7.65E-07	8.28E-07	7.83E-07	8.37E-07	8.28E-07	6.83E-07	1.97E-06	7.52E-07	9.17E-07	6.68E-07	7.73E-07	7.03E-07	6.07E-07	6.63E-07	1.23E-06	1.75E-06	1.63E-06	1.19E-06	1.08E-06	8.86E-07	7.93E-07	1.46E-06	7.56E-07	9.17E-07	7.68E-07	7.51E-07	7.94E-07	8.39E-07	7.08E-07	6.95E-07	7.36E-07	6.82E-06		
24-hour	99.9th	8.68566E-07	9.58E-07	9.34E-07	7.73E-07	7.4E-07	6.63E-07	7.26E-07	7.21E-07	7.82E-07	7.13E-07	8.22E-07	7.42E-07	8.14E-07	7.98E-07	6.68E-07	1.79E-06	7.21E-07	8.84E-07	6.58E-07	7.58E-07	6.97E-07	6.02E-07	6.4E-07	9.92E-07	1.75E-06	1.49E-06	1.12E-06	1.01E-06	8.38E-07	7.66E-07	1.42E-06	7.35E-07	8.78E-07	7.25E-07	6.93E-07	7.6E-07	7.81E-07	7.06E-07	6.46E-07	6.92E-07	5.76E-06		
24-hour	99th	7.41747E-07	7.48E-07	7.56E-07	5.69E-07	4.98E-07	4.48E-07	4.66E-07	4.55E-07	5.17E-07	5.28E-07	6.37E-07	5.54E-07	6.56E-07	4.33E-07	3.74E-07	1.05E-06	4.04E-07	6.29E-07	3.51E-07	5.39E-07	5.33E-07	4.29E-07	5.38E-07	4.6E-07	1.62E-06	1.06E-06	8.56E-07	7.98E-07	6.8E-07	5.49E-07	1.08E-06	3.85E-07	4.94E-07	5.31E-07	4.96E-07	4.29E-07	6.53E-07	5.32E-07	4.62E-07	3.95E-07	4.81E-06		
24-hour	97.5th	5.3076E-07	5.84E-07	6.83E-07	4.41E-07	3.67E-07	3.25E-07	3.44E-07	3.38E-07	3.05E-07	3.25E-07	4.8E-07	3.84E-07	5.24E-07	3.75E-07	2.9E-07	8.11E-07	3.32E-07	4.28E-07	2.88E-07	4.34E-07	4.03E-07	3.33E-07	4.29E-07	4.12E-07	1.16E-06	8.54E-07	6.67E-07	6.96E-07	5.83E-07	4.36E-07	8.35E-07	3.41E-07	4.11E-07	3.72E-07	3.02E-07	3.51E-07	5.69E-07	4.11E-07	3.2E-07	3.22E-07	3.35E-06		
24-hour	95th	3.91147E-07	4.89E-07	5.22E-07	3.28E-07	3.1E-07	2.44E-07	3E-07	2.97E-07	2.43E-07	2.16E-07	3.75E-07	3.27E-07	3.86E-07	2.98E-07	2.25E-07	6.07E-07	2.63E-07	3.83E-07	2.14E-07	3.32E-07	3.11E-07	2.59E-07	2.81E-07	3.31E-07	9.02E-07	7.2E-07	5.14E-07	5.44E-07	4.77E-07	3.33E-07	6.41E-07	2.57E-07	3.72E-07	3.19E-07	2.09E-07	2.83E-07	4.25E-07	3.27E-07	2.6E-07	2.63E-07	2.61E-06		
24-hour	Average	9.00249E-08	1.06E-07	1.14E-07	8.23E-08	7.57E-08	6.23E-08	6.96E-08																																				

Lead

µg/m³	EXISTING	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary	Max
1-hour	Max	0.017161719	0.017598	0.020446	0.014571	0.013512	0.009897	0.012274	0.011892	0.006884	0.007673	0.016114	0.014497	0.015999	0.014653	0.007065	0.019164	0.009975	0.018101	0.006916	0.013647	0.01422	0.010761	0.010254	0.013141	0.026908	0.02548	0.018534	0.021005	0.032442	0.014266	0.028389	0.009001	0.018432	0.014157	0.005236	0.009896	0.023621	0.013905	0.011911	0.009766	0.062092	
1-hour	99.9th	0.009982791	0.010839	0.010749	0.006284	0.005874	0.003616	0.005018	0.004767	0.003762	0.003153	0.00816	0.00577	0.008197	0.005671	0.003335	0.012908	0.004485	0.009344	0.003063	0.006368	0.006394	0.004797	0.004411	0.007566	0.019856	0.01508	0.009468	0.010372	0.011463	0.006564	0.012492	0.004363	0.006813	0.005606	0.003203	0.005118	0.009787	0.006502	0.004467	0.0043	0.029915	
1-hour	99th	0.00356135	0.004642	0.003794	0.002785	0.002293	0.001423	0.002007	0.001925	0.001442	0.001385	0.003204	0.002482	0.003468	0.002027	0.001425	0.00336	0.001772	0.003339	0.001459	0.002844	0.002635	0.002093	0.001734	0.001582	0.003549	0.004579	0.003106	0.003457	0.003824	0.002856	0.003421	0.00182	0.002323	0.002382	0.001247	0.001986	0.003351	0.002653	0.00197	0.001731	0.008754	
1-hour	97.5th	0.001823753	0.002505	0.002197	0.001535	0.001307	0.000842	0.001144	0.001098	0.000785	0.000735	0.001516	0.00147	0.001436	0.001164	0.000797	0.002084	0.001047	0.001836	0.000832	0.001483	0.001085	0.000775	0.000977	0.00091	0.002043	0.002605	0.002016	0.002155	0.002162	0.001504	0.002305	0.001026	0.001318	0.001386	0.000672	0.001104	0.001773	0.001122	0.000974	0.00098	0.004584	
1-hour	95th	0.000676123	0.001074	0.001035	0.00066	0.000663	0.000443	0.00055	0.000516	0.00043	0.000406	0.000606	0.000619	0.000587	0.000633	0.000381	0.001345	0.000498	0.001026	0.000356	0.000582	0.000421	0.000299	0.00054	0.000519	0.001258	0.001705	0.001187	0.001097	0.000818	0.000645	0.001411	0.000506	0.000817	0.000588	0.000362	0.000569	0.0007	0.000442	0.000383	0.000437	0.003034	
1-hour	Average	0.000168207	0.000234	0.000211	0.000144	0.000128	8.42E-05	0.000109	0.000104	8.54E-05	8.07E-05	0.000149	0.000132	0.000147	0.000122	7.58E-05	0.000264	9.78E-05	0.0002	7.24E-05	0.000136	0.000111	8.43E-05	0.000108	0.000102	0.000281	0.000374	0.000213	0.000209	0.000199	0.00014	0.000292	9.89E-05	0.000155	0.000125	7.16E-05	0.000111	0.000169	0.000116	9.22E-05	9.05E-05	0.000753	
µg/m³	ADDITION	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary	Max
1-hour	Max	0.236464605	0.618813	0.135753	0.114158	0.138446	0.040289	0.067112	0.040103	0.067515	0.04815	0.091415	0.123962	0.109079	0.073332	0.042303	0.042001	0.074692	0.325444	0.015849	0.08141	0.035276	0.017988	0.045921	0.017193	0.025778	0.037014	0.071545	0.156392	0.08657	0.080188	0.045077	0.059834	0.142536	0.094764	0.02631	0.048745	0.188143	0.036654	0.029726	0.03087	1.971052	
1-hour	99.9th	0.054555151	0.327485	0.046559	0.028932	0.024524	0.012987	0.019192	0.020157	0.011222	0.009712	0.035569	0.020028	0.034646	0.023337	0.008075	0.005321	0.01285	0.099729	0.00922	0.02722	0.016705	0.010622	0.018967	0.005316	0.003201	0.00575	0.017748	0.026303	0.034173	0.030082	0.003639	0.013909	0.039108	0.019585	0.007217	0.023907	0.025191	0.016392	0.011624	0.013547	0.431148	
1-hour	99th	0.005472337	0.046085	0.003844	0.003289	0.003027	0.001275	0.002246	0.001738	0.002863	0.002158	0.00442	0.003025	0.003679	0.002568	0.000952	0.00073	0.001555	0.025068	0.000893	0.003563	0.00185	0.001033	0.004292	0.000787	0.000575	0.000775	0.001792	0.003074	0.004806	0.003127	0.000746	0.001667	0.01091	0.002502	0.001182	0.002065	0.002613	0.002057	0.001165	0.001347	0.123071	
1-hour	97.5th	0.001337864	0.009374	0.001381	0.001034	0.000853	0.000408	0.000643	0.000592	0.000959	0.000758	0.000933	0.000897	0.000947	0.000736	0.000336	0.000339	0.000487	0.007816	0.000374	0.000892	0.00064	0.00036	0.001751	0.000344	0.000326	0.000389	0.000599	0.001164	0.001319	0.000969	0.000382	0.000454	0.003977	0.000784	0.000554	0.000815	0.000686	0.000451	0.000473	0.03778		
1-hour	95th	0.000463824	0.001976	0.000453	0.000385	0.000298	0.000173	0.000237	0.000219	0.000356	0.000255	0.000359	0.000328	0.000352	0.000295	0.000151	0.000186	0.000204	0.001975	0.000144	0.000331	0.000205	0.000115	0.000553	0.000129	0.000193	0.000229	0.000269	0.000387	0.000442	0.000357	0.000223	0.000197	0.001173	0.000303	0.000172	0.00023	0.000309	0.000236	0.000155	0.000188	0.007446	
1-hour	Average	0.000326652	0.002151	0.000282	0.00022	0.000194	8.84E-05	0.000131	0.000116	0.000137	0.000109	0.000243	0.00017	0.000229	0.000175	6.72E-05	6.13E-05	0.000108	0.000985	5.86E-05	0.000188	6.22E-05	0.000203	4.66E-05	4.87E-05	6.66E-05	0.000126	0.000218	0.000209	0.000248	0.000202	6.22E-05	0.00011	0.000465	0.000148	6.64E-05	0.000128	0.000127	7.58E-05	8.61E-05	0.004681		
µg/m³	ALL	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary	Max
1-hour	Max	0.237022793	0.628796	0.136018	0.11877	0.142127	0.04136	0.069082	0.04173	0.067592	0.048488	0.098526	0.129429	0.113407	0.0734	0.045528	0.042074	0.075453	0.325921	0.018462	0.090045	0.041113	0.022511	0.046067	0.017201	0.041244	0.037564	0.071606	0.156482	0.086876	0.086704	0.048074	0.06165	0.14266	0.099613	0.026331	0.049364	0.188401	0.0477	0.034182	0.038478	1.971136	
1-hour	99.9th	0.055100593	0.332968	0.046731	0.031137	0.024813	0.013035	0.023309	0.020962	0.011246	0.00973	0.040369	0.021734	0.038839	0.023372	0.00889	0.013319	0.013695	0.099822	0.010355	0.032112	0.02122	0.014075	0.019168	0.008581	0.020654	0.01603	0.018726	0.026311	0.034184	0.032959	0.017008	0.014423	0.039287	0.022437	0.007232	0.024222	0.025281	0.02047	0.014152	0.014767	0.432165	
1-hour	99th	0.008149149	0.048034	0.006741	0.005652	0.004707	0.002525	0.003716	0.003463	0.00324	0.002942	0.007601	0.004962	0.007279	0.004609	0.002218	0.004113	0.003293	0.025176	0.002226	0.00575	0.004542	0.003384	0.004827	0.001996	0.004245	0.005382	0.00432	0.005962	0.007318	0.005456	0.003966	0.003201	0.011746	0.004266	0.002129	0.003731	0.005047	0.004585	0.003092	0.002875	0.123634	
1-hour	97.5th	0.003684592	0.010682	0.003603	0.002822	0.002536	0.001402	0.00207	0.001905	0.001768	0.001558	0.002858	0.002453	0.002771	0.002106	0.00131	0.002426	0.001732	0.008905	0.001307	0.002522	0.00179	0.001213	0.002569	0.001189	0.002332	0.003001	0.002627	0.00315	0.003753	0.002784	0.002558	0.0017	0.005085	0.00232	0.001204	0.001917	0.002804	0.001969	0.001586	0.001651	0.038558	
1-hour	95th	0.001635282	0.003687	0.002016	0.001263	0.001254	0.000773	0.000971	0.000918	0.000983	0.000878	0.001008	0.001135	0.001032	0.001174	0.000661	0.001564	0.000872	0.003637	0.000581	0.000935	0.000668	0.000448	0.001361	0.000754	0.001478	0.001946	0.001639	0.001871	0.001871	0.00107	0.001671	0.000904	0.002251	0.001017	0.000702	0.001031	0.001508	0.000712	0.000574	0.000738	0.009194	
1-hour	Average	0.00049486	0.002385	0.000493	0.000364	0.000322	0.000173	0.00024	0.000221	0.000222	0.000189	0.000392	0.000302	0.000376	0.000297	0.000143	0.000326	0.000206	0.001185	0.000131	0.000324	0.000224	0.000148	0.00031	0.000148	0.00033	0.000441	0.000339	0.000427	0.000447	0.000342	0.000354	0.000209	0.00062	0.000273	0.000138	0.000239	0.000343	0.000242	0.000168	0.000177	0.004942	
µg/m³	EXISTING	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary	Max
24-hour	Max	0.001749709	0.002228	0.001798	0.001371	0.000997	0.000859	0.000897	0.000865	0.000655	0.000558	0.001401	0.001267	0.001502	0.000978	0.000478	0.001685	0.000665	0.001185	0.000501	0.001123	0.001157	0.000881	0.000738	0.000957	0.003269	0.001901	0.001742	0.001685	0.001782	0.001322	0.001943	0.00061	0.001525	0.001204	0.000509	0.000756	0.001442	0.001118	0.00089	0.000718	0.004688	
24-hour	99.9th	0.001631439	0.001973	0.001728	0.001194	0.00099	0.000777	0.000892	0.00086	0.000635	0.000554	0.001268	0.001136	0.001375	0.000913	0.000464	0.001608	0.000646	0.001185	0.000479	0.001099	0.001045	0.000802	0.00073	0.000952	0.003054	0.00188	0.001672	0.001635	0.001678	0.001163	0.00187	0.000595	0.0014	0.001096	0.000501	0.000705	0.001342	0.001008	0.000868	0.000718	0.004204	

Antimony

µg/m³	EXISTING	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary	Max	
1-hour	Max	0.000259783	0.000336	0.000328	0.000278	0.000259	5.42E-05	0.000235	0.000227	5.74E-05	5.86E-05	0.000307	0.000277	0.000298	0.000199	6.66E-05	0.000353	0.000164	0.000308	7.65E-05	0.000261	0.000272	0.000206	5.68E-05	0.000252	0.000515	0.000402	0.000343	0.000349	0.000234	0.000272	0.000358	0.000145	0.000247	0.000271	5.57E-05	0.000189	0.000258	0.000266	0.000228	0.000187	0.000814		
1-hour	99.9th	4.61852E-05	5.31E-05	9.5E-05	4.47E-05	3.13E-05	2.45E-05	3.08E-05	3.17E-05	2.29E-05	2.4E-05	4.67E-05	3.93E-05	4.28E-05	3.07E-05	2.19E-05	0.000207	2.95E-05	4.69E-05	2.44E-05	5.71E-05	4.74E-05	4.32E-05	2.6E-05	0.000131	0.000372	0.000266	0.000147	9.7E-05	9.74E-05	4.72E-05	5.43E-05	2.85E-05	3.45E-05	3.81E-05	2.18E-05	3.02E-05	7.45E-05	4.88E-05	2.81E-05	2.84E-05	0.000573		
1-hour	99th	1.1937E-05	1.17E-05	1.6E-05	8.61E-06	8.01E-06	4.9E-06	7.51E-06	7.52E-06	4.38E-06	4.28E-06	9.63E-06	8.14E-06	1.06E-05	7.02E-06	4.43E-06	2.12E-05	6.09E-06	9.73E-06	4.54E-06	8.65E-06	8.38E-06	6.56E-06	5.73E-06	1.37E-05	3.81E-05	2.68E-05	1.75E-05	1.61E-05	1.28E-05	8.35E-06	1.67E-05	5.69E-06	8.62E-06	7.79E-06	3.73E-06	6.68E-06	1.29E-05	8.3E-06	6.84E-06	6.06E-06	7.05E-05		
1-hour	97.5th	3.7641E-06	4.7E-06	4.62E-06	3.12E-06	2.31E-06	1.43E-06	1.94E-06	1.89E-06	1.51E-06	1.35E-06	3.56E-06	2.89E-06	3.57E-06	1.9E-06	1.37E-06	9.07E-06	1.62E-06	3.31E-06	1.34E-06	3.11E-06	2.61E-06	1.88E-06	1.65E-06	4.23E-06	1.85E-05	1.16E-05	6.21E-06	5.25E-06	4.5E-06	3.02E-06	6.75E-06	1.6E-06	2.36E-06	2.67E-06	1.25E-06	1.79E-06	3.99E-06	2.77E-06	2.11E-06	1.56E-06	3.87E-05		
1-hour	95th	9.61204E-07	1.29E-06	1.58E-06	9.58E-07	9.08E-07	6.91E-07	8.24E-07	7.9E-07	6.93E-07	6.88E-07	9.39E-07	9.18E-07	9.03E-07	8.71E-07	6.15E-07	3.13E-06	7.51E-07	1.2E-06	6.03E-07	8.84E-07	7.8E-07	6.18E-07	8.21E-07	1.07E-06	5.76E-06	4.07E-06	1.95E-06	1.73E-06	1.24E-06	9.4E-07	2.86E-06	7.45E-07	1.03E-06	8.77E-07	6.13E-07	8.05E-07	1.19E-06	8.01E-07	7.17E-07	7.23E-07	1.2E-05		
1-hour	Average	5.64001E-07	6.26E-07	7.5E-07	4.84E-07	4.21E-07	2.35E-07	3.75E-07	3.62E-07	2.32E-07	2.24E-07	5.16E-07	4.53E-07	5.19E-07	3.64E-07	2.22E-07	1.29E-06	3.12E-07	5.48E-07	2.32E-07	4.78E-07	4.33E-07	3.52E-07	2.72E-07	7.2E-07	2.46E-06	1.66E-06	9.09E-07	7.96E-07	6.67E-07	4.79E-07	9.09E-07	3.05E-07	4.37E-07	4.36E-07	2.06E-07	3.42E-07	6.37E-07	4.41E-07	3.53E-07	3.15E-07	4.1E-06		
µg/m³	ADDITION	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary	Max	
1-hour	Max		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
1-hour	99.9th		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
1-hour	99th		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
1-hour	97.5th		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
1-hour	95th		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
1-hour	Average		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
µg/m³	ALL	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary	Max	
1-hour	Max	0.000259783	0.000336	0.000328	0.000278	0.000259	5.42E-05	0.000235	0.000227	5.74E-05	5.86E-05	0.000307	0.000277	0.000298	0.000199	6.66E-05	0.000353	0.000164	0.000308	7.65E-05	0.000261	0.000272	0.000206	5.68E-05	0.000252	0.000515	0.000402	0.000343	0.000349	0.000234	0.000272	0.000358	0.000145	0.000247	0.000271	5.57E-05	0.000189	0.000258	0.000266	0.000228	0.000187	0.000814		
1-hour	99.9th	4.61852E-05	5.31E-05	9.5E-05	4.47E-05	3.13E-05	2.45E-05	3.08E-05	3.17E-05	2.29E-05	2.4E-05	4.67E-05	3.93E-05	4.28E-05	3.07E-05	2.19E-05	0.000207	2.95E-05	4.69E-05	2.44E-05	5.71E-05	4.74E-05	4.32E-05	2.6E-05	0.000131	0.000372	0.000266	0.000147	9.7E-05	9.74E-05	4.72E-05	5.43E-05	2.85E-05	3.45E-05	3.81E-05	2.18E-05	3.02E-05	7.45E-05	4.88E-05	2.81E-05	2.84E-05	0.000573		
1-hour	99th	1.1937E-05	1.17E-05	1.6E-05	8.61E-06	8.01E-06	4.9E-06	7.51E-06	7.52E-06	4.38E-06	4.28E-06	9.63E-06	8.14E-06	1.06E-05	7.02E-06	4.43E-06	2.12E-05	6.09E-06	9.73E-06	4.54E-06	8.65E-06	8.38E-06	6.56E-06	5.73E-06	1.37E-05	3.81E-05	2.68E-05	1.75E-05	1.61E-05	1.28E-05	8.35E-06	1.67E-05	5.69E-06	8.62E-06	7.79E-06	3.73E-06	6.68E-06	1.29E-05	8.3E-06	6.84E-06	6.06E-06	7.05E-05		
1-hour	97.5th	3.7641E-06	4.7E-06	4.62E-06	3.12E-06	2.31E-06	1.43E-06	1.94E-06	1.89E-06	1.51E-06	1.35E-06	3.56E-06	2.89E-06	3.57E-06	1.9E-06	1.37E-06	9.07E-06	1.62E-06	3.31E-06	1.34E-06	3.11E-06	2.61E-06	1.88E-06	1.65E-06	4.23E-06	1.85E-05	1.16E-05	6.21E-06	5.25E-06	4.5E-06	3.02E-06	6.75E-06	1.6E-06	2.36E-06	2.67E-06	1.25E-06	1.79E-06	3.99E-06	2.77E-06	2.11E-06	1.56E-06	3.87E-05		
1-hour	95th	9.61204E-07	1.29E-06	1.58E-06	9.58E-07	9.08E-07	6.91E-07	8.24E-07	7.9E-07	6.93E-07	6.88E-07	9.39E-07	9.18E-07	9.03E-07	8.71E-07	6.15E-07	3.13E-06	7.51E-07	1.2E-06	6.03E-07	8.84E-07	7.8E-07	6.18E-07	8.21E-07	1.07E-06	5.76E-06	4.07E-06	1.95E-06	1.73E-06	1.24E-06	9.4E-07	2.86E-06	7.45E-07	1.03E-06	8.77E-07	6.13E-07	8.05E-07	1.19E-06	8.01E-07	7.17E-07	7.23E-07	1.2E-05		
1-hour	Average	5.64001E-07	6.26E-07	7.5E-07	4.84E-07	4.21E-07	2.35E-07	3.75E-07	3.62E-07	2.32E-07	2.24E-07	5.16E-07	4.53E-07	5.19E-07	3.64E-07	2.22E-07	1.29E-06	3.12E-07	5.48E-07	2.32E-07	4.78E-07	4.33E-07	3.52E-07	2.72E-07	7.2E-07	2.46E-06	1.66E-06	9.09E-07	7.96E-07	6.67E-07	4.79E-07	9.09E-07	3.05E-07	4.37E-07	4.36E-07	2.06E-07	3.42E-07	6.37E-07	4.41E-07	3.53E-07	3.15E-07	4.1E-06		
µg/m³	EXISTING	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary	Max	
24-hour	Max	1.68791E-05	2E-05	1.63E-05	1.61E-05	1.84E-05	3.44E-06	1.69E-05	1.63E-05	2.96E-06	2.96E-06	1.78E-05	1.69E-05	1.77E-05	1.51E-05	4.63E-06	2.63E-05	1.25E-05	1.98E-05	6.75E-06	1.51E-05	1.55E-05	1.2E-05	3.62E-06	1.61E-05	4.99E-05	3.18E-05	2.24E-05	1.78E-05	1.49E-05	1.54E-05	2.99E-05	1.15E-05	1.87E-05	1.7E-05	2.8E-06	1.42E-05	1.42E-05	1.52E-05	1.56E-05	1.35E-05	8.52E-05		
24-hour	99.9th	1.50995E-05	1.81E-05	1.59E-05	1.53E-05	1.64E-05	3.38E-06	1.5E-05	1.44E-05	2.96E-06	2.94E-06	1.61E-05	1.56E-05	1.59E-05	1.32E-05	4.28E-06	2.47E-05	1.09E-05	1.85E-05	5.72E-06	1.45E-05	1.4E-05	1.1E-05	3.47E-06	1.55E-05	4.89E-05	3.06E-05	2.08E-05	1.73E-05	1.33E-05	1.48E-05	2.62E-05	9.96E-06	1.64E-05	1.55E-05	2.79E-06	1.25E-05	1.3E-05	1.39E-05	1.39E-05	1.19E-05	7.88E-05		
24-hour	99th	1.10184E-05	1.04E-05	1.21E-05	8.17E-06	5.44E-06	2.56E-06	4.97E-06	4.86E-06	2.69E-06	2.36E-06	8.63E-06	7.4E-06	9.48E-06	4.77E-06	2.37E-06	1.91E-05	3.65E-06	8.91E-06	2.85E-06	7.66E-06	6.88E-06	6.08E-06	2.89E-06	1.15E-05	3.28E-05	2.31E-05	1.49E-05	1.36E-05	9.73E-06	8.05E-06	1.06E-05	3.43E-06	5.71E-06	6.83E-06	2.27E-06	4.41E-06	9.13E-06	6.98E-06	4.52E-06	4.26E-06	5.71E-05		
24-hour	97.5th	3.76267E-06	3.81E-06	5.66E-06	3.68E-06	2.24E-06	1.59E-06	2.26E-06	2.27E-06	1.57E-06	1.54E-06	3.19E-06	3.1E-06	3.35E-06	2.62E-06	1.61E-06	1.25E-05	2.3E-06	3.75E-06	1.62E-06	3.64E-06	2.99E-06	2.83E-06	1.77E-06	7.64E-06	2.68E-05	1.54E-05	7.65E-06	6.02E-06	5.8E-06	3.73E-06	4.31E-06	2.21E-06	2.67E-06	2.86E-06	1.3E-06	2.5E-06	5.03E-06	3.21E-06	1.96E-06	2.34E-06	4.21E-05		
24-hour	95th	2.30954E-06	2.43E-06	3.71E-06	1.72E-06	1.56E-06	1.07E-06	1.51E-06	1.49E-06	1.2E-06	1.08E-06	2.05E-06	1.7E-06	2.03E-06	1.35E-06	9.79E-07	6.49E-06	1.25E-06	1.99E-06	9.51E-07	1.82E-06	1.8E-06	1.44E-06	1.24E-06	4E-06	1.51E-05	8.95E-06	4.44E-06	4.01E-06	3.02E-06	1.71E-06	2.85E-06	1.21E-06	1.63E-06	1.64E-06	1.12E-06	1.33E-06	3.3E-06	1.79E-06	1.34E-06	1.32E-06	2.48E-05		
24-hour	Average	5.639																																										

Arsenic

µg/m³	EXISTING	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max	
1-hour	Max	0.000660117	0.000703	0.000868	0.000517	0.000576	0.000371	0.000432	0.000391	0.000279	0.000227	0.000722	0.000531	0.000752	0.000488	0.000307	0.000632	0.000431	0.00082	0.000351	0.000447	0.000594	0.000494	0.000385	0.00049	0.000571	0.000769	0.000455	0.000696	0.000712	0.000447	0.000899	0.000403	0.000627	0.000508	0.000229	0.000447	0.000723	0.00054	0.00029	0.000359	0.00152	
1-hour	99.9th	0.000384297	0.000519	0.000386	0.000345	0.000285	0.000167	0.000239	0.000216	0.000165	0.000162	0.00035	0.00031	0.000322	0.000323	0.000204	0.000332	0.000265	0.00054	0.000147	0.000315	0.000274	0.00021	0.000182	0.000182	0.000439	0.000491	0.000333	0.000372	0.000465	0.000344	0.00049	0.000279	0.000306	0.000295	0.000152	0.000309	0.000388	0.000282	0.000238	0.000185	0.00101	
1-hour	99th	0.000165238	0.00022	0.00017	0.000121	0.000107	6.03E-05	9.13E-05	8.8E-05	5.62E-05	5.46E-05	0.00015	0.000109	0.000145	9.36E-05	5.91E-05	0.000188	7.55E-05	0.000162	5.55E-05	0.000131	0.000108	7.66E-05	7.34E-05	6.85E-05	0.000166	0.000251	0.000158	0.000168	0.000164	0.000125	0.000199	7.87E-05	0.000114	0.000103	4.79E-05	8.79E-05	0.000139	0.000112	7.86E-05	7.46E-05	0.000457	
1-hour	97.5th	7.54117E-05	0.000117	9.68E-05	6.54E-05	5.22E-05	3.37E-05	4.51E-05	4.36E-05	3.23E-05	3.14E-05	6.32E-05	6.19E-05	6.3E-05	4.65E-05	3.04E-05	0.000122	4.05E-05	8.24E-05	2.94E-05	5.98E-05	4.48E-05	3.16E-05	4.33E-05	3.44E-05	8.69E-05	0.000169	8.58E-05	9.32E-05	9.69E-05	6.34E-05	0.000123	3.9E-05	6.1E-05	5.8E-05	2.75E-05	4.34E-05	7.64E-05	4.74E-05	3.58E-05	3.8E-05	0.00031	
1-hour	95th	3.51624E-05	5.88E-05	4.95E-05	3.44E-05	3.1E-05	2.01E-05	2.53E-05	2.4E-05	2E-05	1.9E-05	2.98E-05	3.12E-05	2.93E-05	2.95E-05	1.69E-05	6.39E-05	2.3E-05	5.04E-05	1.6E-05	2.92E-05	2E-05	1.39E-05	2.61E-05	1.83E-05	5.64E-05	9.95E-05	4.86E-05	4.91E-05	4.34E-05	3.22E-05	7.79E-05	2.34E-05	4.05E-05	2.92E-05	1.65E-05	2.65E-05	3.54E-05	2.26E-05	1.9E-05	2.05E-05	0.000218	
1-hour	Average	7.70279E-06	1.14E-05	9.67E-06	6.61E-06	5.88E-06	3.67E-06	4.87E-06	4.62E-06	3.68E-06	3.49E-06	6.68E-06	6.01E-06	6.58E-06	5.6E-06	3.34E-06	1.23E-05	4.41E-06	9.69E-06	3.11E-06	6.13E-06	4.76E-06	3.4E-06	4.81E-06	3.9E-06	1.11E-05	1.85E-05	9.44E-06	9.53E-06	9.06E-06	6.41E-06	1.4E-05	4.49E-06	7.15E-06	5.64E-06	3.06E-06	5.08E-06	7.48E-06	5.04E-06	3.89E-06	3.95E-06	4.33E-05	
µg/m³	ADDITION	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max	
1-hour	Max	0.000092653	0.000158	9.37E-05	9.81E-05	8.43E-05	6.07E-05	7.48E-05	7.23E-05	5.32E-05	6.03E-05	0.000128	8.68E-05	0.000116	7.56E-05	5.12E-05	0.000104	6.03E-05	0.000115	5.69E-05	9.25E-05	0.000107	9.72E-05	6.93E-05	9.63E-05	0.000114	0.000189	7.1E-05	6.45E-05	0.00012	9.8E-05	0.000152	6.29E-05	8.03E-05	8.26E-05	5.67E-05	6.98E-05	0.000109	0.000104	7.41E-05	6.66E-05	0.000347	
1-hour	99.9th	4.79619E-05	7.85E-05	4.03E-05	6.29E-05	5.8E-05	3.57E-05	5.34E-05	5.22E-05	2.7E-05	2.88E-05	5.64E-05	6.3E-05	5.39E-05	4.79E-05	3.35E-05	5.56E-05	4.26E-05	8.03E-05	3.73E-05	5.89E-05	4.76E-05	4.09E-05	3.33E-05	3.62E-05	6.37E-05	0.000123	4.36E-05	3.71E-05	4.61E-05	6.34E-05	8.73E-05	3.92E-05	5.65E-05	6.07E-05	2.59E-05	4.32E-05	3.96E-05	4.78E-05	5.07E-05	4.48E-05	0.000162	
1-hour	99th	1.95113E-05	3.06E-05	1.83E-05	1.99E-05	1.62E-05	1.16E-05	1.45E-05	1.4E-05	1.09E-05	1.09E-05	2.08E-05	1.9E-05	1.93E-05	1.48E-05	1.07E-05	2.21E-05	1.32E-05	2.49E-05	1.03E-05	1.96E-05	1.56E-05	1.22E-05	1.28E-05	9.51E-06	2.87E-05	3.47E-05	1.73E-05	1.81E-05	1.86E-05	1.97E-05	3.06E-05	1.32E-05	1.87E-05	1.81E-05	9.8E-06	1.43E-05	1.58E-05	1.72E-05	1.38E-05	1.2E-05	8.2E-05	
1-hour	97.5th	1.03711E-05	1.36E-05	1.11E-05	8.22E-06	8.25E-06	6.26E-06	6.94E-06	6.62E-06	5.98E-06	5.82E-06	9.6E-06	7.77E-06	9.61E-06	8.32E-06	5.28E-06	1.3E-05	6.69E-06	1.34E-05	4.7E-06	7.66E-06	6.75E-06	4.84E-06	7.31E-06	4.91E-06	1.77E-05	2.06E-05	1.08E-05	1.07E-05	1.1E-05	7.83E-06	1.89E-05	6.64E-06	1.03E-05	7.24E-06	5.24E-06	7.43E-06	9.56E-06	7.03E-06	5.38E-06	5.83E-06	5.23E-05	
1-hour	95th	5.30809E-06	6.97E-06	6.55E-06	4.14E-06	4.31E-06	3.46E-06	3.68E-06	3.49E-06	3.52E-06	3.38E-06	4.45E-06	3.87E-06	4.45E-06	4.64E-06	2.79E-06	8.24E-06	3.51E-06	6.68E-06	2.6E-06	3.93E-06	3.17E-06	2.34E-06	4.4E-06	2.77E-06	1.12E-05	1.3E-05	6.77E-06	6.49E-06	6.22E-06	4.1E-06	1.29E-05	3.58E-06	6.08E-06	3.69E-06	4E-06	5.44E-06	3.32E-06	2.63E-06	3.1E-06	3.17E-05		
1-hour	Average	1.02544E-06	1.46E-06	1.12E-06	9.65E-07	8.82E-07	6.69E-07	7.73E-07	7.46E-07	6.56E-07	6.35E-07	9.86E-07	8.14E-07	9.57E-07	8.78E-07	5.86E-07	1.43E-06	7.03E-07	1.31E-06	5.5E-07	9.05E-07	7.49E-07	5.8E-07	7.88E-07	5.79E-07	1.82E-06	2.36E-06	1.12E-06	1.1E-06	1.1E-06	9.4E-07	2.2E-06	7.19E-07	1.11E-06	8.51E-07	5.72E-07	7.9E-07	9.6E-07	7.77E-07	6.54E-07	6.56E-07	5.64E-06	
µg/m³	ALL	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max	
1-hour	Max	0.00075277	0.000851	0.000962	0.000547	0.00059	0.000403	0.000442	0.0004	0.000308	0.000287	0.000849	0.000572	0.000868	0.000538	0.000333	0.000722	0.00048	0.000867	0.000374	0.000539	0.000701	0.000592	0.000396	0.000586	0.000639	0.000952	0.000522	0.000748	0.000832	0.00051	0.00105	0.000431	0.000678	0.000548	0.000286	0.000477	0.000832	0.000645	0.00035	0.00037	0.001521	
1-hour	99.9th	0.000429759	0.000593	0.000423	0.000406	0.000298	0.000186	0.000262	0.000255	0.00019	0.000183	0.000391	0.000376	0.000368	0.000353	0.000223	0.000376	0.000294	0.000581	0.000177	0.000365	0.000311	0.000243	0.000219	0.000208	0.000454	0.000591	0.000344	0.00038	0.000491	0.00042	0.000569	0.000298	0.00037	0.000175	0.000337	0.00044	0.000326	0.000282	0.000217	0.001011		
1-hour	99th	0.000183088	0.000241	0.000187	0.000143	0.000122	7.28E-05	0.000105	9.9E-05	6.51E-05	6.35E-05	0.000171	0.000125	0.000163	0.000108	7.21E-05	0.000207	8.58E-05	0.000184	6.58E-05	0.000147	0.000125	9.03E-05	8.59E-05	7.62E-05	0.00018	0.000284	0.000172	0.000182	0.000183	0.000145	0.000231	9E-05	0.000132	0.000117	5.77E-05	0.000102	0.000149	0.000128	9.3E-05	8.63E-05	0.000472	
1-hour	97.5th	8.7499E-05	0.000132	0.000106	7.63E-05	6.36E-05	3.84E-05	5.55E-05	5.31E-05	3.96E-05	3.8E-05	7.38E-05	6.98E-05	7.33E-05	5.58E-05	3.73E-05	0.00013	4.8E-05	9.9E-05	3.5E-05	6.71E-05	5.17E-05	3.72E-05	5.06E-05	4.04E-05	0.000104	0.000184	9.59E-05	0.000103	0.000106	7.24E-05	0.00014	4.72E-05	7.05E-05	6.51E-05	3.34E-05	5.17E-05	8.6E-05	5.42E-05	4.08E-05	4.64E-05	0.000347	
1-hour	95th	4.04997E-05	6.53E-05	5.63E-05	3.9E-05	3.59E-05	2.42E-05	2.94E-05	2.84E-05	2.52E-05	2.3E-05	3.48E-05	3.57E-05	3.41E-05	3.51E-05	2.04E-05	7.25E-05	2.74E-05	5.99E-05	1.85E-05	3.35E-05	2.31E-05	1.64E-05	3.21E-05	2.18E-05	6.98E-05	0.000113	5.55E-05	5.63E-05	5E-05	3.65E-05	9.06E-05	2.79E-05	4.75E-05	3.35E-05	2.01E-05	3.11E-05	4.16E-05	2.57E-05	2.2E-05	2.4E-05	0.000241	
1-hour	Average	8.72823E-06	1.29E-05	1.08E-05	7.58E-06	6.77E-06	4.34E-06	5.64E-06	5.36E-06	4.33E-06	4.12E-06	7.67E-06	6.91E-06	7.54E-06	6.48E-06	3.93E-06	1.38E-05	5.11E-06	1.1E-05	3.66E-06	7.04E-06	5.51E-06	3.98E-06	5.6E-06	4.48E-06	1.29E-05	2.09E-05	1.06E-05	1.06E-05	1.02E-05	1.06E-05	1.02E-05	7.35E-06	1.62E-05	5.21E-06	8.26E-06	6.5E-06	3.63E-06	5.87E-06	8.44E-06	4.54E-06	4.61E-06	4.61E-05
µg/m³	EXISTING	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max	
24-hour	Max	7.84422E-05	0.000103	6.3E-05	5.37E-05	5.18E-05	2.97E-05	4.19E-05	3.92E-05	3.86E-05	2.2E-05	6.93E-05	5E-05	6.46E-05	4.04E-05	2.63E-05	9.68E-05	3.39E-05	7.21E-05	2.9E-05	6.07E-05	5.1E-05	3.75E-05	4.68E-05	2.88E-05	6.9E-05	0.000119	6.22E-05	6.22E-05	6.33E-05	5.41E-05	7.87E-05	3.38E-05	5.49E-05	4.72E-05	1.69E-05	3.77E-05	5.14E-05	5.47E-05	3.5E-05	3.48E-05	0.000268	
24-hour	99.9th	7.32826E-05	9.87E-05	6.3E-05	5.3E-05	4.68E-05	2.97E-05	3.79E-05	3.55E-05	3.12E-05	2.06E-05	6.52E-05	4.77E-05	6.45E-05	4.03E-05	2.4E-05	8.82E-05	3.33E-05	6.98E-05	2.61E-05	5.85E-05	4.82E-05	3.57E-05	3.87E-05	2.77E-05	6.52E-05	0.000117	6.04E-05	6.15E-05	6.26E-05	5.34E-05	7.8E-05	3.11E-05	5.45E-05	4.51E-05	1.68E-05	3.46E-05	5E-05	4.99E-05	3.42E-05	3.12E-05	0.000267	
24-hour	99th	5.23162E-05	6.72E-05	5.58E-05	4.33E-05	3E-05	2.06E-05	2.62E-05	2.53E-05	1.66E																																	

Zinc

µg/m³	EXISTING	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max
1-hour	Max	0.043897154	0.039169	0.052998	0.031423	0.030082	0.023313	0.023423	0.021588	0.016985	0.017617	0.033017	0.029539	0.026116	0.034656	0.015604	0.046777	0.021427	0.045104	0.015642	0.024188	0.022942	0.016029	0.021704	0.024349	0.071764	0.068328	0.046988	0.047238	0.087819	0.029167	0.064194	0.019894	0.040579	0.028223	0.012935	0.024629	0.06625	0.026372	0.018138	0.018308	0.188739
1-hour	99.9th	0.020732437	0.022003	0.022008	0.013135	0.01082	0.007319	0.009791	0.009515	0.008678	0.00899	0.016129	0.012169	0.017365	0.012061	0.006233	0.020774	0.008173	0.018617	0.006231	0.013037	0.013156	0.010795	0.010263	0.010935	0.029239	0.02796	0.019548	0.018371	0.021831	0.013339	0.024331	0.008567	0.015812	0.011182	0.007476	0.010415	0.018371	0.01272	0.009532	0.008527	0.077508
1-hour	99th	0.006742657	0.007958	0.007071	0.005303	0.004345	0.003242	0.003818	0.003752	0.003119	0.002972	0.006149	0.004624	0.00623	0.003768	0.002938	0.006062	0.003337	0.006072	0.002938	0.005162	0.00486	0.004196	0.003672	0.003183	0.00827	0.008995	0.006548	0.006924	0.007258	0.005393	0.006991	0.003358	0.004686	0.004425	0.002852	0.003646	0.006471	0.004975	0.003967	0.003378	0.015589
1-hour	97.5th	0.002658547	0.003778	0.003787	0.002712	0.002313	0.001712	0.002156	0.002155	0.001725	0.001643	0.002647	0.002542	0.002395	0.002221	0.001692	0.00346	0.001992	0.003077	0.001675	0.002519	0.00199	0.001591	0.002001	0.001677	0.004113	0.004291	0.003758	0.0037	0.003142	0.002693	0.004258	0.002001	0.002647	0.00242	0.001502	0.002093	0.003068	0.002187	0.001916	0.001946	0.006504
1-hour	95th	0.001060811	0.001557	0.001574	0.001204	0.001203	0.000861	0.001041	0.000993	0.000852	0.000795	0.000989	0.001173	0.000992	0.001178	0.000746	0.0021	0.000959	0.001714	0.000696	0.001016	0.000784	0.000602	0.001021	0.001018	0.002201	0.002426	0.001951	0.001754	0.001313	0.001115	0.002614	0.000967	0.001356	0.0011	0.000722	0.001088	0.001218	0.000815	0.00077	0.000844	0.003923
1-hour	Average	0.000291621	0.00038	0.000363	0.000251	0.000226	0.000166	0.000199	0.000192	0.000171	0.000162	0.000264	0.000233	0.000261	0.000218	0.000147	0.000438	0.00018	0.000331	0.000142	0.000241	0.000206	0.000165	0.000206	0.000188	0.000501	0.000587	0.000373	0.000361	0.000344	0.000247	0.000522	0.000182	0.000276	0.000223	0.000146	0.0002	0.000299	0.000212	0.000176	0.000171	0.001096
µg/m³	ADDITION	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max
1-hour	Max	0.742839684	1.944745	0.426616	0.358757	0.435084	0.126589	0.210895	0.12601	0.212178	0.15129	0.285667	0.389561	0.341568	0.230463	0.132942	0.131994	0.234737	1.022765	0.0498	0.2554	0.109631	0.055811	0.1444301	0.054034	0.080931	0.116264	0.224848	0.491504	0.272036	0.251861	0.14124	0.188038	0.447952	0.297795	0.082685	0.153165	0.591271	0.113754	0.093377	0.096821	6.194724
1-hour	99.9th	0.171268277	1.029193	0.146306	0.090895	0.077068	0.040814	0.060309	0.063347	0.035267	0.030522	0.111005	0.062927	0.107961	0.073339	0.02536	0.016713	0.040383	0.313423	0.028895	0.085283	0.051735	0.032652	0.059587	0.016664	0.009955	0.018063	0.055777	0.082666	0.107399	0.094478	0.011419	0.043682	0.122886	0.061508	0.02268	0.075102	0.079158	0.05094	0.036389	0.042528	1.354923
1-hour	99th	0.016840606	0.144725	0.012079	0.010253	0.009441	0.004003	0.007018	0.00541	0.00894	0.006782	0.013699	0.00946	0.011394	0.008016	0.002907	0.002112	0.004831	0.078782	0.002762	0.011028	0.005466	0.002982	0.013396	0.002385	0.001193	0.001473	0.00562	0.00957	0.015104	0.009794	0.001901	0.005173	0.034194	0.007745	0.003656	0.006434	0.008186	0.006336	0.003516	0.004191	0.386677
1-hour	97.5th	0.004096872	0.02927	0.00419	0.003036	0.002493	0.001149	0.001772	0.0017	0.003012	0.002318	0.002676	0.00259	0.002712	0.002154	0.0009	0.000706	0.001361	0.024528	0.000937	0.002552	0.00166	0.000926	0.005482	0.001005	0.000428	0.000489	0.0018	0.003612	0.004068	0.00279	0.000622	0.001266	0.01247	0.002307	0.001319	0.001592	0.002472	0.001731	0.001032	0.001253	0.118736
1-hour	95th	0.001222731	0.006095	0.001297	0.0009	0.000732	0.00043	0.000556	0.000501	0.001016	0.000706	0.000901	0.000747	0.000838	0.000786	0.000319	0.000274	0.00046	0.006178	0.000294	0.000804	0.000502	0.000289	0.001673	0.000262	0.000181	0.000217	0.000639	0.001111	0.001256	0.000851	0.000243	0.000452	0.003645	0.000689	0.00041	0.000539	0.000838	0.000605	0.000361	0.000389	0.023402
1-hour	Average	0.000992743	0.006713	0.000851	0.000661	0.00058	0.000256	0.000386	0.000341	0.000409	0.000321	0.000731	0.000506	0.000687	0.000521	0.000192	0.000146	0.000316	0.003052	0.000166	0.000562	0.000331	0.00018	0.000611	0.000127	9.27E-05	0.000131	0.000358	0.00065	0.000743	0.000605	0.000123	0.000321	0.001426	0.000438	0.00019	0.000372	0.000515	0.000217	0.000249	0.014658	
µg/m³	ALL	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max
1-hour	Max	0.743488604	1.971283	0.427286	0.371854	0.445588	0.129644	0.216585	0.13072	0.212375	0.152203	0.302453	0.404721	0.350342	0.230634	0.140328	0.132181	0.236993	1.023943	0.052991	0.275192	0.123981	0.067001	0.144664	0.054056	0.119579	0.117687	0.225002	0.491735	0.272807	0.267948	0.148285	0.193352	0.448259	0.311265	0.08274	0.154929	0.591927	0.140127	0.104107	0.115129	6.194927
1-hour	99.9th	0.172269999	1.043399	0.146734	0.096353	0.077896	0.040956	0.070859	0.065712	0.035326	0.030566	0.122545	0.067131	0.117503	0.073426	0.027452	0.030607	0.042615	0.31365	0.032133	0.095746	0.063636	0.041728	0.060118	0.018122	0.032843	0.036328	0.055816	0.082685	0.107426	0.101599	0.029495	0.045277	0.123325	0.067119	0.02272	0.075945	0.079367	0.060498	0.041493	0.046224	1.357426
1-hour	99th	0.02164459	0.149166	0.018818	0.015076	0.013405	0.006136	0.009169	0.008601	0.009676	0.008308	0.018718	0.012716	0.017919	0.010987	0.005374	0.008319	0.007979	0.078826	0.004935	0.0156	0.010809	0.007486	0.014745	0.004555	0.009762	0.010982	0.010498	0.01469	0.019913	0.014251	0.008166	0.007708	0.035698	0.010723	0.005525	0.009176	0.012813	0.010672	0.006964	0.006808	0.388536
1-hour	97.5th	0.008104735	0.031397	0.007992	0.005964	0.005422	0.003341	0.004427	0.004269	0.004514	0.00404	0.005853	0.005313	0.006236	0.004655	0.002854	0.004204	0.003761	0.026178	0.002883	0.005192	0.003946	0.002476	0.007051	0.002585	0.004699	0.004745	0.005552	0.007003	0.008138	0.005489	0.004831	0.003703	0.014322	0.004946	0.002981	0.004184	0.006055	0.004306	0.003381	0.003552	0.120754
1-hour	95th	0.003247683	0.007472	0.004048	0.002631	0.002338	0.001592	0.0019	0.001799	0.002431	0.002143	0.002146	0.002344	0.002063	0.002415	0.001332	0.002502	0.001729	0.008746	0.001202	0.002115	0.001313	0.000909	0.003267	0.00158	0.002473	0.002773	0.003169	0.003698	0.00371	0.002406	0.002988	0.001768	0.005794	0.00208	0.00158	0.002036	0.002909	0.001422	0.001273	0.001534	0.025719
1-hour	Average	0.001284364	0.007093	0.001213	0.000912	0.000806	0.000422	0.000586	0.000534	0.00058	0.000483	0.000995	0.000739	0.000949	0.000739	0.000339	0.000584	0.000496	0.003383	0.000308	0.000803	0.000537	0.000345	0.000817	0.000316	0.000594	0.000718	0.000731	0.001011	0.001087	0.000851	0.000645	0.000503	0.001701	0.00066	0.000336	0.000577	0.000814	0.000584	0.000393	0.000419	0.01507
µg/m³	EXISTING	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max
24-hour	Max	0.003155332	0.005216	0.003986	0.003137	0.002343	0.001877	0.002108	0.002042	0.001625	0.001451	0.002388	0.002923	0.002601	0.002154	0.001009	0.00351	0.001345	0.00264	0.00118	0.002634	0.00195	0.001498	0.001909	0.001484	0.005869	0.003466	0.00364	0.003654	0.004101	0.00303	0.004083	0.001211	0.003068	0.002789	0.001335	0.001305	0.003344	0.001861	0.002107	0.001728	0.011081
24-hour	99.9th	0.003012084	0.004331	0.003882	0.002686	0.002095	0.001732	0.001844	0.00179	0.001559	0.001369	0.002377	0.00251	0.002524	0.002041	0.000988	0.003323	0.001307	0.002597	0.001106	0.002342	0.00189	0.001491	0.001778	0.001466	0.005104	0.003452	0.003549	0.003609	0.003998	0.002567	0.003903	0.001187	0.002898	0.002393	0.001256	0.001303	0.003184	0.001842	0.001767	0.001547	0.010573
24-hour	99th	0.002411734	0.002612	0.002741	0.001498	0.00146	0.001																																			

Copper

µg/m³	EXISTING	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max
1-hour	Max	0.046141069	0.066908	0.069009	0.043773	0.029241	0.031374	0.03009	0.030287	0.047655	0.03934	0.064489	0.036722	0.060092	0.02982	0.027215	0.046794	0.027965	0.035688	0.025074	0.051638	0.056879	0.053142	0.03046	0.093123	0.124973	0.056448	0.076299	0.068846	0.074728	0.045548	0.053612	0.027383	0.032818	0.034251	0.040799	0.029173	0.069532	0.05465	0.02949	0.029019	0.179195
1-hour	99.9th	0.030332445	0.030707	0.028592	0.02213	0.018189	0.018088	0.016658	0.016567	0.016861	0.019538	0.025084	0.020316	0.025713	0.020743	0.017516	0.030394	0.018089	0.025375	0.016027	0.023452	0.020678	0.016679	0.020455	0.015191	0.04874	0.036452	0.027434	0.027969	0.026828	0.021329	0.03998	0.018535	0.023446	0.019485	0.016958	0.018976	0.02587	0.020574	0.017406	0.016985	0.096913
1-hour	99th	0.012658452	0.015239	0.012129	0.009675	0.008016	0.005984	0.007127	0.007002	0.00551	0.005551	0.010978	0.008695	0.011941	0.008076	0.005595	0.01319	0.0067	0.010955	0.005291	0.009947	0.008597	0.006778	0.006997	0.005742	0.017437	0.016506	0.011021	0.01174	0.01274	0.00957	0.017488	0.006854	0.008892	0.008836	0.005157	0.007516	0.010674	0.008925	0.006835	0.006255	0.036584
1-hour	97.5th	0.004629008	0.007522	0.007274	0.004949	0.004545	0.002678	0.003985	0.003741	0.002893	0.002797	0.004382	0.004878	0.004199	0.003901	0.002734	0.008139	0.003327	0.006543	0.002623	0.004392	0.003256	0.002457	0.003467	0.002867	0.00886	0.010327	0.006389	0.007064	0.006403	0.004785	0.010321	0.003325	0.004804	0.004603	0.002436	0.003663	0.0056	0.003335	0.00312	0.003236	0.023093
1-hour	95th	0.002052314	0.003234	0.003122	0.002205	0.002143	0.001633	0.001854	0.001785	0.001682	0.001587	0.00192	0.002106	0.001798	0.002098	0.001408	0.004683	0.00172	0.003305	0.001293	0.001909	0.001436	0.001058	0.002028	0.001445	0.004683	0.006255	0.003391	0.003322	0.002595	0.002117	0.005386	0.001776	0.002747	0.001995	0.001402	0.001937	0.002236	0.001551	0.001388	0.00157	0.016063
1-hour	Average	0.000536979	0.000714	0.000672	0.000478	0.000435	0.000331	0.000383	0.00037	0.000341	0.000329	0.000488	0.000445	0.000483	0.000425	0.000294	0.000088	0.000353	0.000627	0.000279	0.000451	0.000378	0.000295	0.000407	0.000331	0.000971	0.001231	0.00068	0.000676	0.000618	0.000467	0.001139	0.000358	0.000519	0.000425	0.000296	0.000391	0.00054	0.000392	0.000329	0.000329	0.002944
µg/m³	ADDITION	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max
1-hour	Max	0.219767695	0.574668	0.126077	0.106019	0.128577	0.037431	0.062334	0.037253	0.0627	0.044732	0.085831	0.115128	0.102009	0.068099	0.039287	0.039007	0.069363	0.302233	0.014724	0.075861	0.03347	0.01712	0.042654	0.015966	0.023985	0.034409	0.06644	0.145228	0.08041	0.074552	0.042107	0.055567	0.132364	0.088014	0.024433	0.045282	0.174725	0.034871	0.027629	0.028781	1.83027
1-hour	99.9th	0.050768568	0.30412	0.043246	0.026884	0.022777	0.01206	0.017825	0.018718	0.010423	0.00902	0.033481	0.018607	0.032674	0.021673	0.00751	0.005051	0.011941	0.092612	0.008608	0.025444	0.015955	0.010263	0.017625	0.004961	0.00348	0.005855	0.016481	0.024425	0.031733	0.02797	0.004135	0.012935	0.036329	0.018213	0.006703	0.022218	0.0234	0.015554	0.010877	0.012608	0.400418
1-hour	99th	0.005210343	0.04286	0.003579	0.003148	0.00285	0.001291	0.002168	0.001763	0.002669	0.00201	0.004422	0.002862	0.003542	0.002385	0.001011	0.001058	0.001533	0.023279	0.00101	0.003414	0.001964	0.001337	0.004006	0.000846	0.001088	0.001364	0.001752	0.00291	0.004499	0.003036	0.001261	0.001608	0.01014	0.002441	0.001134	0.001967	0.002502	0.002135	0.001417	0.001438	0.114347
1-hour	97.5th	0.001389068	0.008814	0.00136	0.001196	0.001007	0.000521	0.000752	0.000729	0.000975	0.000793	0.001173	0.001025	0.0012	0.000917	0.00047	0.000577	0.000615	0.00728	0.000472	0.001034	0.000788	0.000441	0.001673	0.000406	0.000646	0.000769	0.000744	0.001177	0.001337	0.001137	0.000736	0.000582	0.003731	0.000929	0.000501	0.000713	0.000889	0.000833	0.000627	0.00062	0.035083
1-hour	95th	0.000644561	0.002016	0.000597	0.000506	0.000426	0.000259	0.000352	0.000325	0.000413	0.000336	0.000428	0.00044	0.000428	0.0004	0.000225	0.000343	0.0003	0.002038	0.000205	0.000389	0.000245	0.000144	0.000601	0.000216	0.000429	0.000501	0.000403	0.000539	0.000576	0.000456	0.00049	0.000298	0.001254	0.000389	0.000244	0.000348	0.000431	0.000282	0.000198	0.000262	0.006915
1-hour	Average	0.000322893	0.002026	0.000284	0.000223	0.000197	9.48E-05	0.000137	0.000122	0.00014	0.000113	0.000244	0.000175	0.000231	0.000179	7.36E-05	8.41E-05	0.000114	0.00094	6.49E-05	0.000192	0.000119	7E-05	0.000203	5.43E-05	8E-05	0.000107	0.000138	0.000224	0.000251	0.000206	9.98E-05	0.000116	0.000453	0.000154	7.26E-05	0.000134	0.00018	0.000132	8.28E-05	9.25E-05	0.004379
µg/m³	ALL	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max
1-hour	Max	0.221022993	0.586982	0.126667	0.11123	0.132801	0.03886	0.064642	0.039186	0.062937	0.045441	0.114912	0.121493	0.116889	0.068279	0.044083	0.048013	0.070231	0.303211	0.025912	0.089794	0.06014	0.056225	0.042999	0.095983	0.127727	0.058422	0.078439	0.145432	0.081082	0.083412	0.055347	0.057565	0.132684	0.093659	0.042482	0.046195	0.175324	0.057798	0.033923	0.03933	1.830463
1-hour	99.9th	0.051775963	0.311162	0.047471	0.035219	0.027641	0.021842	0.027318	0.026522	0.021479	0.023557	0.053931	0.027952	0.045521	0.028906	0.020325	0.031361	0.022065	0.092843	0.018714	0.03794	0.032793	0.023871	0.025339	0.015697	0.049895	0.037617	0.032259	0.036208	0.039959	0.034533	0.041795	0.023838	0.036779	0.027042	0.018398	0.026122	0.030096	0.032607	0.024315	0.020044	0.402317
1-hour	99th	0.017751803	0.050108	0.015098	0.012845	0.010597	0.007151	0.00907	0.008691	0.007231	0.006787	0.017564	0.011359	0.016883	0.010362	0.006544	0.013984	0.00822	0.025712	0.006192	0.014344	0.012981	0.009163	0.009281	0.006134	0.01855	0.017724	0.012448	0.013525	0.014893	0.013675	0.018514	0.008165	0.014906	0.010746	0.006113	0.009114	0.0126	0.012621	0.008765	0.007696	0.114858
1-hour	97.5th	0.008148814	0.018652	0.008845	0.007273	0.006236	0.003738	0.005404	0.005075	0.004015	0.003688	0.005841	0.006669	0.006138	0.005612	0.003421	0.008729	0.004518	0.01331	0.003451	0.006016	0.003954	0.002825	0.005277	0.003354	0.009571	0.011217	0.007128	0.008246	0.00881	0.007015	0.011091	0.004414	0.008639	0.006162	0.003149	0.004876	0.007096	0.004114	0.004142	0.004279	0.037503
1-hour	95th	0.00302455	0.007466	0.004834	0.003023	0.003168	0.002048	0.002497	0.002319	0.002341	0.002105	0.002359	0.002822	0.00235	0.002792	0.001774	0.005111	0.002239	0.007405	0.001633	0.002391	0.001713	0.001234	0.002957	0.001669	0.005157	0.006805	0.004031	0.004647	0.004167	0.002664	0.005826	0.00226	0.004817	0.002537	0.001807	0.002576	0.003189	0.001891	0.001682	0.001975	0.016297
1-hour	Average	0.000859872	0.00274	0.000955	0.000701	0.000632	0.000425	0.000519	0.000492	0.000481	0.000442	0.000733	0.00062	0.000713	0.000604	0.000367	0.000964	0.000467	0.001567	0.000344	0.000643	0.000498	0.000365	0.00061	0.000385	0.001051	0.001338	0.000818	0.0009	0.00087	0.000672	0.001239	0.000474	0.000972	0.000579	0.000369	0.000525	0.00072	0.000524	0.000412	0.000422	0.00517
µg/m³	EXISTING	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max
24-hour	Max	0.005239076	0.006018	0.005354	0.003861	0.003144	0.002757	0.002997	0.002959	0.003197	0.002943	0.004559	0.003525	0.00467	0.002998	0.002653	0.00921	0.002717	0.003829	0.002549	0.004093	0.003623	0.002921	0.002805	0.00457	0.006864	0.005985	0.00537	0.005553	0.004766	0.00391	0.005792	0.00278	0.003515	0.003405	0.002866	0.002854	0.004123	0.003769	0.002996	0.002741	0.024412
24-hour	99.9th	0.00487193	0.005719	0.00497	0.003664	0.003038	0.002615	0.002883	0.002855	0.00297	0.002768	0.004506	0.003354	0.004551	0.002985	0.002536	0.008304	0.002705	0.003781	0.002509	0.003876	0.00361	0.002909	0.002687	0.003801	0.006854	0.005858	0.005141	0.005061	0.004663	0.003695	0.005694	0.002756	0.003434	0.003236	0.002668	0.00284	0.00406	0.003674	0.002858	0.002679	0.022178
24-hour	99th	0.003809663	0.00448	0.003692	0.003031	0.002432	0.002029																																			

Mercury

µg/m³	EXISTING	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max
1-hour	Max	6.22364E-06	7.07E-06	9.13E-06	5.54E-06	6.2E-06	4.02E-06	4.65E-06	4.21E-06	2.99E-06	2.86E-06	5.64E-06	5.68E-06	6.25E-06	5.18E-06	3.37E-06	6.63E-06	4.57E-06	8.74E-06	3.76E-06	4.4E-06	4.47E-06	3.45E-06	4.34E-06	2.74E-06	5.22E-06	8.29E-06	4.89E-06	7.33E-06	8.26E-06	4.81E-06	1.13E-05	4.39E-06	7.37E-06	5.42E-06	2.09E-06	4.86E-06	7.67E-06	3.91E-06	3.12E-06	3.86E-06	1.65E-05
1-hour	99.9th	3.43054E-06	5.5E-06	3.73E-06	3.47E-06	3.11E-06	1.76E-06	2.51E-06	2.32E-06	1.76E-06	1.44E-06	3.19E-06	2.95E-06	3.22E-06	3.46E-06	2.24E-06	3.56E-06	2.99E-06	5.98E-06	1.61E-06	3.36E-06	2.5E-06	1.84E-06	2.09E-06	1.24E-06	3.03E-06	5.71E-06	3E-06	3.18E-06	4.49E-06	3.49E-06	5.12E-06	3.1E-06	3.58E-06	2.78E-06	1.56E-06	3.51E-06	3.52E-06	2.54E-06	2.16E-06	2.08E-06	1.1E-05
1-hour	99th	1.70409E-06	2.3E-06	1.73E-06	1.28E-06	1.14E-06	5.59E-07	9.68E-07	9.13E-07	5.19E-07	5.17E-07	1.5E-06	1.16E-06	1.5E-06	9.03E-07	5.6E-07	1.77E-06	7.76E-07	1.8E-06	5.77E-07	1.35E-06	1.07E-06	7.62E-07	7.12E-07	6.01E-07	1.03E-06	2.45E-06	1.53E-06	1.73E-06	1.69E-06	1.26E-06	1.91E-06	7.29E-07	1.16E-06	1.1E-06	4.31E-07	8.24E-07	1.38E-06	1.14E-06	7.82E-07	7.81E-07	4.76E-06
1-hour	97.5th	7.749E-07	1.19E-06	9.57E-07	6.2E-07	5E-07	3.02E-07	4.2E-07	4.03E-07	2.87E-07	2.81E-07	6.15E-07	5.76E-07	6.17E-07	4.44E-07	2.74E-07	1.08E-06	3.66E-07	8.49E-07	2.58E-07	5.44E-07	4.09E-07	2.71E-07	3.79E-07	2.68E-07	6.17E-07	1.47E-06	8.7E-07	9.37E-07	9.63E-07	5.87E-07	1.17E-06	3.67E-07	5.91E-07	5.4E-07	2.47E-07	4.16E-07	7.27E-07	4.25E-07	3.26E-07	3.42E-07	3.02E-06
1-hour	95th	3.3388E-07	5.97E-07	4.67E-07	3.21E-07	2.93E-07	1.91E-07	2.33E-07	2.19E-07	1.91E-07	1.77E-07	2.9E-07	2.88E-07	2.78E-07	2.84E-07	1.59E-07	5.51E-07	2.14E-07	5.02E-07	1.44E-07	2.73E-07	1.88E-07	1.24E-07	2.4E-07	1.52E-07	4.29E-07	9.24E-07	4.58E-07	4.43E-07	4.17E-07	3.02E-07	6.88E-07	2.15E-07	3.61E-07	2.65E-07	1.53E-07	2.45E-07	3.33E-07	2.07E-07	1.68E-07	1.84E-07	2.17E-06
1-hour	Average	7.64207E-08	1.17E-07	9.51E-08	6.5E-08	5.77E-08	3.54E-08	4.7E-08	4.44E-08	3.54E-08	3.33E-08	6.56E-08	5.87E-08	6.44E-08	5.52E-08	3.22E-08	1.14E-07	4.28E-08	9.87E-08	2.96E-08	5.99E-08	4.54E-08	3.17E-08	4.74E-08	3.14E-08	7.94E-08	1.75E-07	9.01E-08	9.25E-08	9.04E-08	6.28E-08	1.34E-07	4.37E-08	7.17E-08	5.48E-08	2.89E-08	4.97E-08	7.28E-08	4.83E-08	3.67E-08	3.77E-08	4.18E-07
µg/m³	ADDITION	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max
1-hour	Max	3.21856E-05	8.4E-05	1.84E-05	1.55E-05	1.88E-05	5.48E-06	9.12E-06	5.45E-06	9.17E-06	6.55E-06	1.29E-05	1.68E-05	1.52E-05	9.95E-06	5.74E-06	5.7E-06	1.01E-05	4.42E-05	2.15E-06	1.12E-05	5.13E-06	2.64E-06	6.24E-06	2.33E-06	3.52E-06	5.04E-06	9.71E-06	2.12E-05	1.18E-05	1.09E-05	6.24E-06	8.12E-06	1.93E-05	3.57E-06	6.62E-06	2.55E-05	5.38E-06	4.05E-06	4.25E-06	0.000268	
1-hour	99.9th	7.45744E-06	4.45E-05	6.33E-06	3.94E-06	3.33E-06	1.76E-06	2.61E-06	2.74E-06	1.52E-06	1.32E-06	5.05E-06	2.72E-06	4.92E-06	3.17E-06	1.1E-06	1.01E-06	1.75E-06	1.35E-05	1.27E-06	3.87E-06	2.48E-06	1.62E-06	2.58E-06	7.67E-07	8.07E-07	1.53E-06	2.41E-06	3.57E-06	4.64E-06	4.1E-06	1.26E-06	1.9E-06	5.31E-06	2.67E-06	9.8E-07	3.25E-06	3.42E-06	2.39E-06	1.62E-06	1.85E-06	5.85E-05
1-hour	99th	8.28535E-07	6.28E-06	5.88E-07	5.98E-07	5.49E-07	2.73E-07	4.1E-07	3.59E-07	4.01E-07	3.29E-07	7.74E-07	5.12E-07	6.52E-07	4.59E-07	2.27E-07	2.82E-07	3.09E-07	3.4E-06	2.14E-07	6.15E-07	4.31E-07	3.02E-07	6.04E-07	1.62E-07	3.36E-07	4.16E-07	3.31E-07	4.58E-07	7.38E-07	5.78E-07	3.8E-07	3.3E-07	1.52E-06	4.56E-07	2.14E-07	3.79E-07	4.42E-07	4.47E-07	2.86E-07	2.74E-07	1.67E-05
1-hour	97.5th	3.00766E-07	1.33E-06	2.66E-07	2.76E-07	2.17E-07	1.25E-07	1.83E-07	1.74E-07	1.82E-07	1.56E-07	2.6E-07	2.4E-07	2.72E-07	2.01E-07	1.11E-07	1.76E-07	1.5E-07	1.1E-06	1.14E-07	2.32E-07	1.53E-07	9.35E-08	2.83E-07	9.06E-08	2.17E-07	2.42E-07	1.86E-07	2.43E-07	2.66E-07	2.75E-07	2.27E-07	1.47E-07	6.09E-07	2.22E-07	1.12E-07	1.67E-07	2.07E-07	1.71E-07	1.26E-07	1.42E-07	5.13E-06
1-hour	95th	1.37295E-07	3.7E-07	1.4E-07	1.11E-07	1.05E-07	6.55E-08	8.53E-08	7.81E-08	9.66E-08	8.25E-08	9.02E-08	9.6E-08	9.35E-08	9.78E-08	5.32E-08	1.07E-07	7.41E-08	3.53E-07	5.03E-08	8.44E-08	5.66E-08	4.03E-08	1.29E-07	5.36E-08	1.39E-07	1.62E-07	1.07E-07	1.29E-07	1.35E-07	9.94E-08	1.57E-07	7.18E-08	2.36E-07	8.73E-08	6.12E-08	8.38E-08	1.09E-07	6.02E-08	5.08E-08	6.38E-08	1.08E-06
1-hour	Average	5.3837E-08	3.05E-07	4.87E-08	3.88E-08	3.45E-08	1.82E-08	2.5E-08	2.27E-08	2.47E-08	2.06E-08	4.21E-08	3.14E-08	3.99E-08	3.19E-08	1.46E-08	2.15E-08	2.11E-08	1.46E-07	1.3E-08	3.4E-08	2.23E-08	1.4E-08	3.48E-08	1.17E-08	2.35E-08	3.1E-08	2.75E-08	3.98E-08	4.39E-08	3.62E-08	2.89E-08	2.16E-08	7.34E-08	2.8E-08	1.43E-08	2.47E-08	3.25E-08	2.44E-08	1.63E-08	1.78E-08	6.51E-07
µg/m³	ALL	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max
1-hour	Max	3.25712E-05	8.67E-05	1.85E-05	1.65E-05	1.96E-05	5.71E-06	9.52E-06	6.61E-06	9.19E-06	6.63E-06	1.53E-05	1.81E-05	1.71E-05	9.98E-06	6.95E-06	7.6E-06	1.03E-05	4.43E-05	4.31E-06	1.44E-05	7E-06	4.53E-06	6.28E-06	3.01E-06	8.42E-06	1.04E-05	9.73E-06	2.13E-05	1.19E-05	1.3E-05	1.31E-05	8.48E-06	1.94E-05	1.4E-05	3.58E-06	6.76E-06	2.56E-05	9.2E-06	5.57E-06	6.85E-06	0.000268
1-hour	99.9th	7.66768E-06	4.61E-05	7.18E-06	5.65E-06	4.43E-06	2.91E-06	3.95E-06	3.7E-06	2.41E-06	1.96E-06	7.13E-06	4.77E-06	6.32E-06	4.99E-06	2.78E-06	4.06E-06	3.44E-06	1.36E-05	1.98E-06	5.57E-06	4.31E-06	2.77E-06	3.36E-06	1.58E-06	3.43E-06	6.83E-06	4.16E-06	5.53E-06	5.97E-06	5.59E-06	6.16E-06	4.04E-06	6.67E-06	4.45E-06	1.75E-06	4.29E-06	4.68E-06	4.18E-06	3.16E-06	2.75E-06	5.89E-05
1-hour	99th	2.5218E-06	7.62E-06	2.21E-06	1.91E-06	1.62E-06	8.31E-07	1.4E-06	1.34E-06	8.65E-07	7.87E-07	2.39E-06	1.6E-06	2.28E-06	1.37E-06	8.41E-07	1.95E-06	1.14E-06	4.32E-06	8.71E-07	2.04E-06	1.63E-06	1.14E-06	1.18E-06	7.42E-07	1.39E-06	2.75E-06	1.73E-06	2.09E-06	2.11E-06	1.96E-06	2.17E-06	1.12E-06	2.19E-06	1.52E-06	6.1E-07	1.29E-06	1.69E-06	1.64E-06	1.16E-06	1.14E-06	1.68E-05
1-hour	97.5th	1.33984E-06	2.79E-06	1.29E-06	9.9E-07	8.38E-07	4.56E-07	6.56E-07	6.24E-07	4.92E-07	4.54E-07	9.69E-07	8.66E-07	1.07E-06	7.31E-07	4.11E-07	1.24E-06	5.69E-07	2.13E-06	3.93E-07	8.11E-07	5.56E-07	3.74E-07	6.77E-07	3.68E-07	8.33E-07	1.7E-06	1.04E-06	1.21E-06	1.32E-06	8.69E-07	1.34E-06	5.61E-07	1.21E-06	7.81E-07	3.77E-07	6.4E-07	1.02E-06	5.92E-07	4.52E-07	5.19E-07	6.18E-06
1-hour	95th	5.34153E-07	1.14E-06	7.1E-07	4.51E-07	4.35E-07	2.77E-07	3.42E-07	3.18E-07	3.09E-07	2.83E-07	3.99E-07	4.08E-07	3.89E-07	4.21E-07	2.3E-07	6.75E-07	3.1E-07	1.08E-06	2.01E-07	3.62E-07	2.58E-07	1.68E-07	4.09E-07	2.05E-07	5.71E-07	1.11E-06	5.87E-07	6.5E-07	6.78E-07	4.16E-07	8.6E-07	3.18E-07	7.07E-07	3.76E-07	2.35E-07	3.61E-07	5.18E-07	2.75E-07	2.22E-07	2.65E-07	2.45E-06
1-hour	Average	1.30258E-07	4.23E-07	1.44E-07	1.04E-07	9.22E-08	5.35E-08	7.2E-08	6.72E-08	6E-08	5.39E-08	1.08E-07	9.01E-08	1.04E-07	8.71E-08	4.67E-08	1.35E-07	6.39E-08	2.45E-07	4.26E-08	9.39E-08	6.77E-08	4.56E-08	8.22E-08	4.31E-08	1.03E-07	2.06E-07	1.18E-07	1.32E-07	1.34E-07	9.9E-08	1.63E-07	6.53E-08	1.45E-07	8.28E-08	4.32E-08	7.45E-08	1.05E-07	7.27E-08	5.31E-08	5.55E-08	7.86E-07
µg/m³	EXISTING	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	Boundary Max
24-hour	Max	7.55924E-07	9.71E-07	6.59E-07	5.59E-07	5.48E-07	3.47E-07	4.45E-07	4.17E-07	4.26E-07	2.5E-07	6.38E-07	5.2E-07	6E-07	4.09E-07	2.56E-07	7.95E-07	3.57E-07	7.5E-07	3.09E-07	5.4E-07	4.57E-07	3.27E-07	5.19E-07	1.87E-07	5.08E-07	1.26E-06	5.39E-07	6.12E-07	6E-07	5.23E-07	8.29E-07	3.35E-07	6.89E-07	4.92E-07	1.8E-07	3.75E-07	4.98E-07	4.91E-07	3.23E-07	3.71E-07	3.01E-06
24-hour	99.9th	6.99527E-07	9.48E-07	6.39E-07	5.4E-07	4.89E-07	3.34E-07	3.96E-07	3.71E-07	3.55E-07	2.39E-07	5.97E-07	4.99E-07	5.99E-07	4.04E-07	2.41E-07	7.43E-07	3.43E-07	7.23E-07	2.71E-07	5.35E-07	4.31E-07	3.11E-07	4.45E-07	1.8E-07	4.88E-07	1.24E-06	5.33E-07	6E-07	5.96E-07	5.11E-07	8.23E-07	3.17E-07	6.43E-07	4.72E-07	1.8E-07	3.54E-07	4.86E-07	4.52E-07	3.19E-07	3.25E-07	2.91E-06
24-hour	99th	4.48652E-07	7.23E-07	5.39E-07	4.45E-07	3.36E-07	2.24E-07	2																																		

Annual Conc

Annual average (µg/m³)														Annual average (µg/m³)														Annual average (µg/m³)															
Receptor	copper	lead	silver	arsenic	manganese	antimony	barium	beryllium	cadmium	chromium	nickel	mercury	zinc	Additional	Receptor	copper	lead	silver	arsenic	manganese	antimony	barium	beryllium	cadmium	chromium	nickel	mercury	zinc	All	Receptor	copper	lead	silver	arsenic	manganese	antimony	barium	beryllium	cadmium	chromium	nickel	mercury	zinc
R01	0.000433	0.000218	5.68E-08	5.59E-06	0.000231	1.43E-07	9.22E-06	4.73E-08	3.22E-07	4.19E-05	3.13E-06	2.07E-08	0.0005		R01	0.000747	0.000792	0	6.04E-07	0.000685	0	0	0	2.75E-08	0.000202	3.3E-07	2.75E-09	0.002468		R01	0.00118	0.00101	5.68E-08	6.19E-06	0.000916	1.43E-07	9.22E-06	4.73E-08	3.49E-07	0.000244	3.46E-06	2.35E-08	0.002968
R02	0.000645	0.000351	6.7E-08	8.69E-06	0.000378	1.67E-07	1.1E-05	5.64E-08	4.64E-07	6.96E-05	4.86E-06	3.41E-08	0.000819		R02	0.004599	0.004933	0	9.43E-07	0.004238	0	0	0	4.29E-08	0.001267	5.14E-07	4.29E-09	0.015473		R02	0.005243	0.005284	6.7E-08	9.63E-06	0.004616	1.67E-07	1.1E-05	5.64E-08	5.07E-07	0.001336	5.38E-06	3.84E-08	0.016291
R03	0.000601	0.000294	7.91E-08	7.93E-06	0.000317	1.98E-07	1.29E-05	6.63E-08	4.47E-07	5.58E-05	4.46E-06	2.96E-08	0.000662		R03	0.000792	0.000838	0	7.14E-07	0.000726	0	0	0	3.25E-08	0.000214	3.89E-07	3.25E-09	0.00261		R03	0.001393	0.001132	7.91E-08	8.64E-06	0.001042	1.98E-07	1.29E-05	6.63E-08	4.8E-07	0.00027	4.85E-06	3.29E-08	0.003272
R04	0.000353	0.000177	4.75E-08	4.38E-06	0.000186	1.19E-07	7.75E-06	3.97E-08	2.53E-07	3.44E-05	2.46E-06	1.6E-08	0.000412		R04	0.000557	0.000588	0	5.44E-07	0.00051	0	0	0	2.47E-08	0.00015	2.97E-07	2.47E-09	0.001831		R04	0.00091	0.000766	4.75E-08	4.92E-06	0.000696	1.19E-07	7.75E-06	3.97E-08	2.78E-07	0.000185	2.76E-06	1.85E-08	0.002244
R05	0.000303	0.000148	4.24E-08	3.68E-06	0.000156	1.06E-07	6.93E-06	3.55E-08	2.13E-07	2.87E-05	2.08E-06	1.33E-08	0.000343		R05	0.000337	0.000353	0	4.8E-07	0.000308	0	0	0	2.18E-08	8.98E-05	2.62E-07	2.18E-09	0.001094		R05	0.00064	0.000501	4.24E-08	4.16E-06	0.000463	1.06E-07	6.93E-06	3.55E-08	2.35E-07	0.000118	2.34E-06	1.55E-08	0.001437
R06	0.000201	8.63E-05	3.08E-08	2.08E-06	9.45E-05	7.42E-08	5.26E-06	2.69E-08	1.08E-07	1.77E-05	1.23E-06	7.2E-09	0.000209		R06	0.000122	0.000125	0	3.22E-07	0.00011	0	0	0	1.46E-08	3.14E-05	1.75E-07	1.46E-09	0.000381		R06	0.000323	0.000211	3.08E-08	2.41E-06	0.000205	7.42E-08	5.26E-06	2.69E-08	1.22E-07	4.9E-05	1.41E-06	8.66E-09	0.00059
R07	0.00025	0.00012	3.71E-08	2.92E-06	0.000125	9.28E-08	6.07E-06	3.11E-08	1.73E-07	2.32E-05	1.66E-06	1.03E-08	0.00028		R07	0.000222	0.000231	0	3.98E-07	0.000202	0	0	0	1.81E-08	5.85E-05	2.17E-07	1.81E-09	0.000712		R07	0.000472	0.00035	3.71E-08	3.32E-06	0.000327	9.28E-08	6.07E-06	3.11E-08	1.91E-07	8.17E-05	1.87E-06	1.21E-08	0.000992
R08	0.000237	0.000113	3.56E-08	2.73E-06	0.000117	8.92E-08	5.83E-06	2.99E-08	1.63E-07	2.19E-05	1.55E-06	9.55E-09	0.000265		R08	0.000197	0.000205	0	3.77E-07	0.000179	0	0	0	1.71E-08	5.18E-05	2.06E-07	1.71E-09	0.000631		R08	0.000434	0.000317	3.56E-08	3.11E-06	0.000297	8.92E-08	5.83E-06	2.99E-08	1.8E-07	7.37E-05	1.76E-06	1.13E-08	0.000895
R09	0.000214	8.9E-05	3.2E-08	2.24E-06	0.0001	7.6E-08	5.53E-06	2.82E-08	1.09E-07	1.84E-05	1.33E-06	7.9E-09	0.000215		R09	0.000188	0.000196	0	3.31E-07	0.000171	0	0	0	1.51E-08	4.96E-05	1.81E-07	1.51E-09	0.000604		R09	0.000401	0.000285	3.2E-08	2.57E-06	0.000271	7.6E-08	5.53E-06	2.82E-08	1.24E-07	6.8E-05	1.51E-06	9.4E-09	0.000818
R10	0.000204	8.4E-05	3.12E-08	2.08E-06	9.42E-05	7.43E-08	5.4E-06	2.75E-08	1.02E-07	1.74E-05	1.24E-06	7.21E-09	0.000204		R10	0.000152	0.000158	0	3.18E-07	0.000138	0	0	0	1.45E-08	3.98E-05	1.74E-07	1.45E-09	0.000485		R10	0.000356	0.000242	3.12E-08	2.4E-06	0.000233	7.43E-08	5.4E-06	2.75E-08	1.16E-07	5.72E-05	1.42E-06	8.66E-09	0.000688
R11	0.000364	0.000184	4.92E-08	4.54E-06	0.000192	1.24E-07	7.98E-06	4.09E-08	2.66E-07	3.55E-05	2.55E-06	1.66E-08	0.000426		R11	0.000578	0.000611	0	5.44E-07	0.000529	0	0	0	2.47E-08	0.000156	2.97E-07	2.47E-09	0.001903		R11	0.000942	0.000795	4.92E-08	5.09E-06	0.000722	1.24E-07	7.98E-06	4.09E-08	2.91E-07	0.000191	2.85E-06	1.91E-08	0.002329
R12	0.000319	0.000157	4.46E-08	3.87E-06	0.000164	1.12E-07	7.28E-06	3.73E-08	2.27E-07	3.04E-05	2.19E-06	1.4E-08	0.000365		R12	0.000401	0.000421	0	4.94E-07	0.000366	0	0	0	2.24E-08	0.000107	2.69E-07	2.24E-09	0.001308		R12	0.000719	0.000578	4.46E-08	4.37E-06	0.000531	1.12E-07	7.28E-06	3.73E-08	2.49E-07	0.000138	2.46E-06	1.62E-08	0.001673
R13	0.000361	0.00018	4.97E-08	4.51E-06	0.000189	1.26E-07	8.05E-06	4.13E-08	2.66E-07	3.46E-05	2.53E-06	1.64E-08	0.000416		R13	0.000504	0.000532	0	5.25E-07	0.000461	0	0	0	2.39E-08	0.000136	2.86E-07	2.39E-09	0.001655		R13	0.000865	0.000712	4.97E-08	5.04E-06	0.00065	1.26E-07	8.05E-06	4.13E-08	2.9E-07	0.00017	2.82E-06	1.88E-08	0.002071
R14	0.000289	0.000135	4.07E-08	3.49E-06	0.000146	1.01E-07	6.76E-06	3.46E-08	1.93E-07	2.64E-05	1.99E-06	1.26E-08	0.000313		R14	0.000287	0.000299	0	4.67E-07	0.000261	0	0	0	2.12E-08	7.6E-05	2.55E-07	2.12E-09	0.000926		R14	0.000576	0.000435	4.07E-08	3.95E-06	0.000407	1.01E-07	6.76E-06	3.46E-08	2.14E-07	0.000102	2.25E-06	1.48E-08	0.001239
R15	0.000171	7.55E-05	2.63E-08	1.79E-06	8.1E-05	6.4E-08	4.44E-06	2.27E-08	9.71E-08	1.53E-05	1.04E-06	6.12E-09	0.000182		R15	9.12E-05	9.27E-05	0	2.7E-07	8.23E-05	0	0	0	1.23E-08	2.33E-05	1.47E-07	1.23E-09	0.000282		R15	0.000262	0.000168	2.63E-08	2.06E-06	0.000163	6.4E-08	4.44E-06	2.27E-08	1.09E-07	3.86E-05	1.19E-06	7.35E-09	0.000465
R16	0.000841	0.000394	1.24E-07	1.09E-05	0.000419	3.13E-07	2E-05	1.03E-07	6.53E-07	7.27E-05	6.14E-06	3.95E-08	0.000874		R16	0.000167	0.000162	0	8.59E-07	0.000148	0	0	0	3.91E-08	3.99E-05	4.69E-07	3.91E-09	0.000482		R16	0.001008	0.000557	1.24E-07	1.18E-05	0.000567	3.13E-07	2E-05	1.03E-07	6.92E-07	0.000113	6.61E-06	4.34E-08	0.001356
R17	0.000224	0.000104	3.36E-08	2.55E-06	0.00011	8.33E-08	5.57E-06	2.85E-08	1.46E-07	2.04E-05	1.46E-06	8.92E-09	0.000244		R17	0.000156	0.00016	0	3.56E-07	0.000141	0	0	0	1.62E-08	4.04E-05	1.94E-07	1.62E-09	0.000492		R17	0.00038	0.000264	3.36E-08	2.9E-06	0.000251	8.33E-08	5.57E-06	2.85E-08	1.62E-07	6.08E-05	1.65E-06	1.05E-08	0.000736
R18	0.000502	0.00026	5.74E-08	6.78E-06	0.000282	1.43E-07	9.42E-06	4.83E-08	3.67E-07	5.07E-05	3.81E-06	2.62E-08	0.000596		R18	0.002204	0.002358	0	7.97E-07	0.002029	0	0	0	3.62E-08	0.000605	4.35E-07	3.62E-09	0.007384		R18	0.002707	0.002618	5.74E-08	7.58E-06	0.002312	1.43E-07	9.42E-06	4.83E-08	4.03E-07	0.000655	4.24E-06	2.99E-08	0.00798
R19	0.00016	7.16E-05	2.54E-08	1.65E-06	7.51E-05	6.26E-08	4.25E-06	2.17E-08	9.47E-08	1.44E-05	9.59E-07	5.51E-09	0.000173		R19	9.08E-05	9.26E-05	0	2.52E-07	8.2E-05	0	0	0	1.14E-08	2.33E-05	1.37E-07	1.14E-09	0.000283		R19	0.00025	0.000164	2.54E-08	1.9E-06	0.000157	6.26E-08	4.25E-06	2.17E-08	1.06E-07	3.77E-05	1.1E-06	6.66E-09	0.000456
R20	0.000329	0.000164	4.56E-08	4.03E-06	0.000171	1.15E-07	7.4E-06	3.8E-08	2.38E-07	3.18E-05	2.27E-06	1.46E-08	0.000383		R20	0.000455	0.000479	0	5.06E-07	0.000416	0	0	0	2.3E-08	0.000122	2.76E-07	2.3E-09	0.001489		R20	0.000783	0.000643	4.56E-08	4.54E-06	0.000587	1.15E-07	7.4E-06	3.8E-08	2.61E-07	0.000154	2.54E-06	1.69E-08	0.001872
R21	0.000253																																										

Annual Dep

Annual average deposition (g/m ² /year)														Annual average deposition (g/m ² /year)														Annual average deposition (g/m ² /year)															
Receptor	copper	lead	silver	arsenic	manganese	antimony	barium	beryllium	cadmium	chromium	nickel	mercury	zinc	Additional	Receptor	copper	lead	silver	arsenic	manganese	antimony	barium	beryllium	cadmium	chromium	nickel	mercury	zinc	All	Receptor	copper	lead	silver	arsenic	manganese	antimony	barium	beryllium	cadmium	chromium	nickel	mercury	zinc
R01	0.000397	0.000257	5.56E-08	5.37E-06	0.000232	1.56E-07	7.81E-06	4.08E-08	4.21E-07	4.68E-05	2.79E-06	1.87E-08	0.000596		R01	0.001093	0.001169	0	4.19E-07	0.001006	0	0	0	1.9E-08	0.0003	2.28E-07	1.9E-09	0.00366		R01	0.001491	0.001426	5.56E-08	5.79E-06	0.001238	1.56E-07	7.81E-06	4.08E-08	4.41E-07	0.000346	3.02E-06	2.06E-08	0.004256
R02	0.000608	0.000443	5.68E-08	7.51E-06	0.000411	1.61E-07	7.91E-06	4.13E-08	5.29E-07	8.97E-05	3.94E-06	2.82E-08	0.001108		R02	0.006583	0.007076	0	6.48E-07	0.006072	0	0	0	2.95E-08	0.001818	3.54E-07	2.95E-09	0.022218		R02	0.007192	0.007519	5.68E-08	8.16E-06	0.006483	1.61E-07	7.91E-06	4.13E-08	5.59E-07	0.001908	4.29E-06	3.12E-08	0.023327
R03	0.000674	0.00039	8.9E-08	9.38E-06	0.000381	2.4E-07	1.33E-05	6.88E-08	6.38E-07	7.15E-05	5.04E-06	3.42E-08	0.000884		R03	0.001302	0.00139	0	6E-07	0.001197	0	0	0	2.73E-08	0.000356	3.27E-07	2.73E-09	0.004347		R03	0.001975	0.00178	8.9E-08	9.98E-06	0.001579	2.4E-07	1.33E-05	6.88E-08	6.66E-07	0.000428	5.36E-06	3.69E-08	0.005231
R04	0.000267	0.000192	3.71E-08	3.6E-06	0.000164	1.09E-07	4.88E-06	2.57E-08	3.12E-07	3.49E-05	1.81E-06	1.22E-08	0.000453		R04	0.000795	0.000849	0	3.38E-07	0.000731	0	0	0	1.54E-08	0.000218	1.84E-07	1.54E-09	0.002657		R04	0.001061	0.001041	3.71E-08	3.93E-06	0.000896	1.09E-07	4.88E-06	2.57E-08	3.27E-07	0.000253	1.99E-06	1.37E-08	0.00311
R05	0.000213	0.000151	3.18E-08	2.98E-06	0.000128	9.33E-08	4.15E-06	2.19E-08	2.65E-07	2.66E-05	1.49E-06	9.99E-09	0.000348		R05	0.000418	0.000444	0	2.93E-07	0.000384	0	0	0	1.33E-08	0.000114	1.6E-07	1.33E-09	0.001386		R05	0.000631	0.000595	3.18E-08	3.28E-06	0.000511	9.33E-08	4.15E-06	2.19E-08	2.79E-07	0.00014	1.65E-06	1.13E-08	0.001734
R06	0.000131	7.18E-05	2.08E-08	1.76E-06	6.8E-05	5.61E-08	3.11E-06	1.61E-08	1.3E-07	1.26E-05	9.44E-07	6.05E-09	0.00016		R06	0.000118	0.000123	0	1.98E-07	0.000107	0	0	0	8.99E-09	3.11E-05	1.08E-07	8.99E-10	0.000379		R06	0.000249	0.000194	2.08E-08	1.96E-06	0.000175	5.61E-08	3.11E-06	1.61E-08	1.39E-07	4.37E-05	1.05E-06	6.95E-09	0.000538
R07	0.000163	0.000114	2.75E-08	2.36E-06	9.29E-05	8.12E-08	3.57E-06	1.88E-08	2.22E-07	1.9E-05	1.16E-06	7.59E-09	0.000255		R07	0.000241	0.000254	0	2.35E-07	0.00022	0	0	0	1.07E-08	6.49E-05	1.28E-07	1.07E-09	0.000791		R07	0.000403	0.000368	2.75E-08	2.59E-06	0.000313	8.12E-08	3.57E-06	1.88E-08	2.33E-07	8.39E-05	1.29E-06	8.66E-09	0.001046
R08	0.000151	0.000105	2.64E-08	2.2E-06	8.49E-05	7.79E-08	3.42E-06	1.8E-08	2.11E-07	1.73E-05	1.08E-06	7.02E-09	0.000233		R08	0.000205	0.000217	0	2.21E-07	0.000188	0	0	0	1.01E-08	5.53E-05	1.21E-07	1.01E-09	0.000674		R08	0.000356	0.000322	2.64E-08	2.43E-06	0.000273	7.79E-08	3.42E-06	1.8E-08	2.21E-07	7.25E-05	1.2E-06	8.03E-09	0.000907
R09	0.000149	7.51E-05	2.02E-08	2E-06	7.86E-05	5.16E-08	3.21E-06	1.65E-08	1.21E-07	1.39E-05	1.11E-06	7.37E-09	0.000168		R09	0.000186	0.000196	0	2.22E-07	0.00017	0	0	0	1.01E-08	4.99E-05	1.21E-07	1.01E-09	0.000609		R09	0.000335	0.000271	2.02E-08	2.22E-06	0.000249	5.16E-08	3.21E-06	1.65E-08	1.31E-07	6.39E-05	1.23E-06	8.38E-09	0.000777
R10	0.000137	6.97E-05	1.94E-08	1.8E-06	7.14E-05	5.02E-08	3.06E-06	1.58E-08	1.14E-07	1.29E-05	9.95E-07	6.51E-09	0.000157		R10	0.000153	0.000161	0	2.09E-07	0.00014	0	0	0	9.51E-09	4.09E-05	1.14E-07	9.51E-10	0.000498		R10	0.00029	0.00023	1.94E-08	2.01E-06	0.000211	5.02E-08	3.06E-06	1.58E-08	1.23E-07	5.37E-05	1.11E-06	7.46E-09	0.000655
R11	0.000293	0.000202	4.29E-08	3.96E-06	0.000174	1.24E-07	5.79E-06	3.04E-08	3.39E-07	3.63E-05	2.01E-06	1.33E-08	0.00047		R11	0.000788	0.000842	0	3.44E-07	0.000725	0	0	0	1.56E-08	0.000216	1.88E-07	1.56E-09	0.002634		R11	0.001081	0.001043	4.29E-08	4.3E-06	0.000899	1.24E-07	5.79E-06	3.04E-08	3.54E-07	0.000252	2.19E-06	1.49E-08	0.003104
R12	0.000231	0.000164	3.45E-08	3.17E-06	0.000138	1.01E-07	4.53E-06	2.38E-08	2.84E-07	2.91E-05	1.58E-06	1.06E-08	0.000381		R12	0.000546	0.000582	0	3.03E-07	0.000502	0	0	0	1.38E-08	0.000149	1.65E-07	1.38E-09	0.001818		R12	0.000777	0.000746	3.45E-08	3.48E-06	0.00064	1.01E-07	4.53E-06	2.38E-08	2.98E-07	0.000178	1.75E-06	1.19E-08	0.002199
R13	0.0003	0.000199	4.56E-08	4.08E-06	0.000173	1.3E-07	6.25E-06	3.27E-08	3.47E-07	3.53E-05	2.08E-06	1.37E-08	0.000458		R13	0.000659	0.000703	0	3.38E-07	0.000606	0	0	0	1.54E-08	0.00018	1.84E-07	1.54E-09	0.002197		R13	0.000959	0.000902	4.56E-08	4.42E-06	0.000779	1.3E-07	6.25E-06	3.27E-08	3.62E-07	0.000215	2.27E-06	1.52E-08	0.002656
R14	0.000207	0.000135	2.97E-08	3.04E-06	0.000121	8.51E-08	4.07E-06	2.13E-08	2.44E-07	2.36E-05	1.56E-06	1.06E-08	0.000303		R14	0.000352	0.000373	0	2.9E-07	0.000323	0	0	0	1.32E-08	9.54E-05	1.58E-07	1.32E-09	0.001164		R14	0.00056	0.000509	2.97E-08	3.33E-06	0.000444	8.51E-08	4.07E-06	2.13E-08	2.57E-07	0.000119	1.72E-06	1.2E-08	0.001467
R15	9.93E-05	5.9E-05	1.73E-08	1.41E-06	5.15E-05	4.86E-08	2.43E-06	1.27E-08	1.19E-07	9.73E-06	7.26E-07	4.63E-09	0.000128		R15	7.66E-05	7.93E-05	0	1.56E-07	6.96E-05	0	0	0	7.11E-09	2.01E-05	8.53E-08	7.11E-10	0.000244		R15	0.000176	0.000138	1.73E-08	1.57E-06	0.000121	4.86E-08	2.43E-06	1.27E-08	2.98E-05	8.12E-07	5.34E-09	0.000372	
R16	0.001131	0.000595	1.69E-07	1.48E-05	0.000588	4.45E-07	2.61E-05	1.35E-07	1E-06	0.000108	8.08E-06	5.21E-08	0.00134		R16	0.000236	0.000239	0	7.37E-07	0.000213	0	0	0	3.35E-08	5.99E-05	4.02E-07	3.35E-09	0.000727		R16	0.001368	0.000834	1.69E-07	1.56E-05	0.000801	4.45E-07	2.61E-05	1.35E-07	1.03E-06	0.000168	8.49E-06	5.55E-08	0.002067
R17	0.000141	9.39E-05	2.36E-08	2.06E-06	7.88E-05	6.88E-08	3.14E-06	1.65E-08	1.86E-07	1.56E-05	1.03E-06	6.75E-09	0.000208		R17	0.000159	0.000167	0	2.11E-07	0.000145	0	0	0	9.61E-09	4.24E-05	1.15E-07	9.61E-10	0.000517		R17	0.0003	0.000261	2.36E-08	2.27E-06	0.000224	6.88E-08	3.14E-06	1.65E-08	1.95E-07	5.8E-05	1.15E-06	7.71E-09	0.000725
R18	0.000423	0.000304	4.39E-08	5.78E-06	0.00028	1.27E-07	5.92E-06	3.1E-08	4.27E-07	5.86E-05	2.99E-06	2.15E-08	0.000731		R18	0.003452	0.003707	0	5.16E-07	0.003183	0	0	0	2.34E-08	0.000952	2.81E-07	2.34E-09	0.011633		R18	0.003875	0.004011	4.39E-08	6.3E-06	0.003462	1.27E-07	5.92E-06	3.1E-08	4.5E-07	0.001011	3.28E-06	2.38E-08	0.012365
R19	8.78E-05	5.5E-05	1.73E-08	1.28E-06	4.43E-05	4.99E-08	2.33E-06	1.22E-08	1.22E-07	8.54E-06	6.36E-07	3.94E-09	0.000118		R19	6.99E-05	7.23E-05	0	1.45E-07	6.35E-05	0	0	0	6.58E-09	1.83E-05	7.9E-08	6.58E-10	0.000222		R19	0.000158	0.000127	1.73E-08	1.42E-06	0.000108	4.99E-08	2.33E-06	1.22E-08	1.29E-07	2.68E-05	7.15E-07	4.59E-09	0.00034
R20	0.000245	0.000175	3.65E-08	3.35E-06	0.000147	1.07E-07	4.79E-06	2.52E-08	3E-07	3.11E-05	1.67E-06	1.11E-08	0.000408		R20	0.000616	0.000657	0	3.16E-07	0.000566	0	0	0	1.44E-08	0.000168	1.73E-07	1.44E-09	0.002053		R20	0.000861	0.000831	3.65E-08	3.67E-06	0.000713	1.07E-07	4.79E-06	2.52E-08	3.15E-07	0.000199	1.85E-06	1.26E-08	0.002461
R21																																											

Monthly Dep

Existing	Monthly average deposition (g/m ² /month)														Additional	Receptor	Monthly average deposition (g/m ² /month)														All	Receptor	Monthly average deposition (g/m ² /month)												
	copper	lead	silver	arsenic	manganese	antimony	barium	beryllium	cadmium	chromium	nickel	mercury	zinc				copper	lead	silver	arsenic	manganese	antimony	barium	beryllium	cadmium	chromium	nickel	mercury	zinc				copper	lead	silver	arsenic	manganese	antimony	barium	beryllium	cadmium	chromium	nickel	mercury	zinc
R01	3.31023E-05	2.14E-05	4.63E-09	4.47E-07	1.93E-05	1.3E-08	6.51E-07	3.4E-09	3.51E-08	3.9E-06	2.32E-07	1.56E-09	4.97E-05			R01	9.11E-05	9.74E-05	0	3.49E-08	8.39E-05	0	0	0	1.59E-09	2.5E-05	1.9E-08	1.59E-10	0.000305			R01	0.000124	0.000119	4.63E-09	4.82E-07	0.000103	1.3E-08	6.51E-07	3.4E-09	3.67E-08	2.89E-05	2.51E-07	1.71E-09	0.000355
R02	5.07031E-05	3.69E-05	4.73E-09	6.26E-07	3.43E-05	1.34E-08	6.26E-07	3.44E-09	4.41E-08	7.47E-06	3.28E-07	2.35E-09	9.24E-05			R02	0.000549	0.00059	0	5.4E-08	0.000506	0	0	0	2.46E-09	0.000152	2.95E-08	2.46E-10	0.001852			R02	0.000599	0.000627	4.73E-09	6.8E-07	0.00054	1.34E-08	6.59E-07	3.44E-09	4.66E-08	0.000159	3.58E-07	2.6E-09	0.001944
R03	5.61398E-05	3.25E-05	7.41E-09	7.82E-07	3.18E-05	2E-08	1.11E-06	5.74E-09	5.32E-08	5.96E-06	4.2E-07	2.85E-09	7.37E-05			R03	0.000108	0.000116	0	5E-08	9.98E-05	0	0	0	2.27E-09	2.97E-05	2.73E-08	2.27E-10	0.000362			R03	0.000165	0.000148	7.41E-09	8.32E-07	0.000132	2E-08	1.11E-06	5.74E-09	5.55E-08	3.56E-05	4.47E-07	3.08E-09	0.000436
R04	2.22184E-05	1.6E-05	3.09E-09	3E-07	1.37E-05	9.04E-09	4.07E-07	2.14E-09	2.6E-08	2.91E-06	1.51E-07	1.02E-09	3.77E-05			R04	6.62E-05	7.07E-05	0	2.81E-08	6.09E-05	0	0	0	1.28E-09	1.81E-05	1.54E-08	1.28E-10	0.000221			R04	8.85E-05	8.67E-05	3.09E-09	3.28E-07	7.46E-05	9.04E-09	4.07E-07	2.14E-09	2.73E-08	2.1E-05	1.66E-07	1.15E-09	0.000259
R05	1.7733E-05	1.26E-05	2.65E-09	2.49E-07	1.06E-05	7.78E-09	3.46E-07	1.82E-09	2.21E-08	2.22E-06	1.24E-07	8.33E-10	2.9E-05			R05	3.48E-05	3.7E-05	0	2.44E-08	3.2E-05	0	0	0	1.11E-09	9.46E-06	1.33E-08	1.11E-10	0.000115			R05	5.26E-05	4.97E-05	2.65E-09	2.73E-07	4.26E-05	7.78E-09	3.46E-07	1.82E-09	2.32E-08	1.17E-05	1.38E-07	9.44E-10	0.000145
R06	1.09459E-05	5.98E-06	1.74E-09	1.47E-07	5.67E-06	4.67E-09	2.59E-07	1.34E-09	1.08E-08	1.05E-06	7.87E-08	5.04E-10	1.33E-05			R06	9.8E-06	1.02E-05	0	1.65E-08	8.93E-06	0	0	0	7.49E-10	2.59E-06	8.99E-09	7.49E-11	3.16E-05			R06	2.07E-05	1.62E-05	1.74E-09	1.63E-07	1.46E-05	4.67E-09	2.59E-07	1.34E-09	1.16E-08	3.64E-06	8.76E-08	5.79E-10	4.49E-05
R07	1.35486E-05	9.48E-06	2.29E-09	1.96E-07	7.74E-06	6.77E-09	2.97E-07	1.57E-09	1.85E-08	1.59E-06	9.67E-08	6.32E-10	2.13E-05			R07	2E-05	2.12E-05	0	1.96E-08	1.84E-05	0	0	0	8.91E-10	5.41E-06	1.07E-08	8.91E-11	6.59E-05			R07	3.36E-05	3.07E-05	2.29E-09	2.16E-07	2.61E-05	6.77E-09	2.97E-07	1.57E-09	1.94E-08	6.99E-06	1.07E-07	7.21E-10	8.72E-05
R08	1.25722E-05	8.75E-06	2.2E-09	1.84E-07	7.07E-06	6.49E-09	2.85E-07	1.5E-09	1.76E-08	1.44E-06	9.02E-08	5.85E-10	1.94E-05			R08	1.71E-05	1.81E-05	0	1.84E-08	1.57E-05	0	0	0	8.38E-10	4.61E-06	1.01E-08	8.38E-11	5.62E-05			R08	2.97E-05	2.68E-05	2.2E-09	2.02E-07	2.27E-05	6.49E-09	2.85E-07	1.5E-09	1.84E-08	6.05E-06	1E-07	6.69E-10	7.56E-05
R09	1.2376E-05	6.25E-06	1.68E-09	1.67E-07	6.55E-06	4.3E-09	2.68E-07	1.38E-09	1.01E-08	1.16E-06	9.24E-08	6.14E-10	1.4E-05			R09	1.55E-05	1.63E-05	0	1.85E-08	1.42E-05	0	0	0	8.42E-10	4.16E-06	1.01E-08	8.42E-11	5.07E-05			R09	2.79E-05	2.26E-05	1.68E-09	1.85E-07	2.07E-05	4.3E-09	2.68E-07	1.38E-09	1.09E-08	5.32E-06	1.03E-07	6.98E-10	6.47E-05
R10	1.13768E-05	5.81E-06	1.62E-09	1.5E-07	5.95E-06	4.19E-09	2.55E-07	1.31E-09	9.49E-09	1.07E-06	8.3E-08	5.43E-10	1.31E-05			R10	1.28E-05	1.34E-05	0	1.74E-08	1.17E-05	0	0	0	7.93E-10	3.41E-06	9.51E-09	7.93E-11	4.15E-05			R10	2.41E-05	1.92E-05	1.62E-09	1.68E-07	1.76E-05	4.19E-09	2.55E-07	1.31E-09	1.03E-08	4.48E-06	9.25E-08	6.22E-10	5.45E-05
R11	2.44361E-05	1.68E-05	3.58E-09	3.3E-07	1.45E-05	1.03E-08	4.82E-07	2.53E-09	2.82E-08	3.02E-06	1.67E-07	1.11E-09	3.92E-05			R11	6.57E-05	7.01E-05	0	2.87E-08	6.04E-05	0	0	0	1.3E-09	1.8E-05	1.56E-08	1.3E-10	0.000219			R11	9.01E-05	8.69E-05	3.58E-09	3.58E-07	7.49E-05	1.03E-08	4.82E-07	2.53E-09	2.95E-08	2.1E-05	1.83E-07	1.24E-09	0.000259
R12	1.92242E-05	1.37E-05	2.88E-09	2.65E-07	1.15E-05	8.44E-09	3.78E-07	1.99E-09	2.37E-08	2.43E-06	1.32E-07	8.8E-10	3.18E-05			R12	4.55E-05	4.85E-05	0	2.52E-08	4.18E-05	0	0	0	1.15E-09	1.24E-05	1.38E-08	1.15E-10	0.000152			R12	6.47E-05	6.21E-05	2.88E-09	2.9E-07	5.33E-05	8.44E-09	3.78E-07	1.99E-09	2.48E-08	1.48E-05	1.46E-07	9.95E-10	0.000183
R13	2.4996E-05	1.66E-05	3.8E-09	3.4E-07	1.44E-05	1.09E-08	5.2E-07	2.72E-09	2.89E-08	2.94E-06	1.73E-07	1.14E-09	3.82E-05			R13	5.49E-05	5.86E-05	0	2.82E-08	5.05E-05	0	0	0	1.28E-09	1.5E-05	1.54E-08	1.28E-10	0.000183			R13	7.99E-05	7.51E-05	3.8E-09	3.69E-07	6.49E-05	1.09E-08	5.2E-07	2.72E-09	3.02E-08	1.79E-05	1.89E-07	1.27E-09	0.000221
R14	1.72842E-05	1.13E-05	2.48E-09	2.53E-07	1.01E-05	7.09E-09	3.39E-07	1.77E-09	2.03E-08	1.96E-06	1.3E-07	8.86E-10	2.53E-05			R14	2.94E-05	3.11E-05	0	2.42E-08	2.69E-05	0	0	0	1.1E-09	7.95E-06	1.32E-08	1.1E-10	9.7E-05			R14	4.66E-05	4.24E-05	2.48E-09	2.77E-07	3.7E-05	7.09E-09	3.39E-07	1.77E-09	2.14E-08	9.92E-06	1.43E-07	9.96E-10	0.000122
R15	8.27123E-06	4.91E-06	1.44E-09	1.18E-07	4.3E-06	4.05E-09	2.03E-07	1.06E-09	9.95E-09	8.11E-07	6.05E-08	3.86E-10	1.07E-05			R15	6.38E-06	6.61E-06	0	1.3E-08	5.8E-06	0	0	0	5.93E-10	1.67E-06	7.11E-09	5.93E-11	2.03E-05			R15	1.47E-05	1.15E-05	1.44E-09	1.31E-07	1.01E-05	4.05E-09	2.03E-07	1.06E-09	1.05E-08	2.48E-06	6.76E-08	4.45E-10	3.1E-05
R16	9.42879E-05	4.95E-05	1.41E-08	1.23E-06	4.9E-05	3.71E-08	2.18E-06	1.12E-08	8.34E-08	9.01E-06	6.74E-07	4.34E-09	0.000112			R16	1.97E-05	1.99E-05	0	6.14E-08	1.77E-05	0	0	0	2.79E-09	4.99E-06	3.35E-08	2.79E-10	6.06E-05			R16	0.000114	6.95E-05	1.41E-08	1.3E-06	6.67E-05	3.71E-08	2.18E-06	1.12E-08	8.62E-08	1.4E-05	7.07E-07	4.62E-09	0.000172
R17	1.1735E-05	7.83E-06	1.97E-09	1.72E-07	6.56E-06	5.73E-09	2.62E-07	1.38E-09	1.55E-08	1.3E-06	8.59E-08	5.63E-10	1.73E-05			R17	1.32E-05	1.39E-05	0	1.76E-08	1.21E-05	0	0	0	8.01E-10	3.53E-06	9.61E-09	8.01E-11	4.3E-05			R17	2.5E-05	2.17E-05	1.97E-09	1.89E-07	1.86E-05	5.73E-09	2.62E-07	1.38E-09	1.63E-08	4.83E-06	9.55E-08	6.43E-10	6.04E-05
R18	3.52775E-05	2.53E-05	3.66E-09	4.82E-07	2.33E-05	1.06E-08	4.93E-07	2.59E-09	3.56E-08	4.88E-06	2.5E-07	1.79E-09	6.09E-05			R18	0.000288	0.000309	0	4.3E-08	0.000265	0	0	0	1.95E-09	7.93E-05	2.34E-08	1.95E-10	0.000969			R18	0.000323	0.000334	3.66E-09	5.25E-07	0.000289	1.06E-08	4.93E-07	2.59E-09	3.75E-08	8.42E-05	2.73E-07	1.99E-09	0.00103
R19	7.31759E-06	4.58E-06	1.44E-09	1.07E-07	3.69E-06	4.16E-09	1.95E-07	1.02E-09	1.02E-08	7.12E-07	5.3E-08	3.28E-10	9.79E-06			R19	5.82E-06	6.02E-06	0	1.21E-08	5.29E-06	0	0	0	5.48E-10	1.52E-06	6.58E-09	5.48E-11	1.85E-05			R19	1.31E-05	1.06E-05	1.44E-09	1.19E-07	8.98E-06	4.16E-09	1.95E-07	1.02E-09	1.07E-08	2.24E-06	5.96E-08	3.83E-10	2.83E-05
R20	2.0424E-05	1.46E-05	3.05E-09	2.79E-07	1.23E-05	8.94E-09	4E-07	2.1E-09	2.5E-08	2.6E-06	1.39E-07	9.28E-10	3.4E-05			R20	5.13E-05	5.47E-05	0	2.64E-08	4.72E-05E																								

APPENDIX E

Metal soil concentrations used in HHRA

Pb operations

Lead (Pb)												Annual metal deposition			Additional soil metal concentration after 15 yrs remaining practical mine life					Total soil metal concentration after 15 years remaining practical mine life			Total indoor dust Pb concentration after 15 years remaining mine life		
	Curve Number	Potential max retention after runoff begins	Annual rainfall	Avg annual surface runoff from pervious areas	Soil volumetric water content	Soil/water partition coefficient	Bulk density of soil	Soil mixing zone depth	Metal loss constant due to surface runoff	Metal soil loss constant due to all processes	Time period over which deposition occurs	S1: Existing situation	S2: Proposal increment	S3: Cumulative proposed situation	S1: Existing situation	S2: Proposal increment	S3: Cumulative proposed situation	Existing soil metal concentration	Existing soil metal concentration incorporating loss over 15 yrs	S1: Existing situation	S2: Proposal increment	S3: Cumulative proposed situation	S1: Existing situation	S2: Proposal increment	S3: Cumulative proposed situation
ID	CN (inches)	S (inches)	P (inch/yr)	RO (cm/yr)	θ_{SW} (mL water/cm ³ soil)	Kd _s (mL water/g soil)	BD (g/cm ³)	D (cm)	ksr (year ⁻¹)	ks (year ⁻¹)	tD (years)	M _{ann dep} (g/m ² /yr)			C _s (µg/g)			C _{s existing} (µg/g)	C _{s existing(end)} (µg/g)	C _s (µg/g)			Dust Pb (µg/g)		
R1	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00026	0.00117	0.00143	0.12	0.55	0.67	190	166	165.8	0.55	166.3	248.7	0.82	249.5
R2	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00044	0.00708	0.00752	0.21	3.31	3.51	60	52	52.5	3.31	55.8	78.8	4.96	83.7
R3	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00039	0.00139	0.00178	0.18	0.65	0.83	200	174	174.6	0.65	175.2	261.8	0.97	262.8
R4	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00019	0.00085	0.00104	0.09	0.40	0.49	370	323	322.7	0.40	323.1	484.0	0.60	484.6
R5	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00015	0.00044	0.00060	0.07	0.21	0.28	8	7	7.0	0.21	7.3	10.6	0.31	10.9
R6	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00007	0.00012	0.00019	0.03	0.06	0.09	29	25	25.3	0.06	25.4	38.0	0.09	38.1
R7	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00011	0.00025	0.00037	0.05	0.12	0.17	25	22	21.8	0.12	22.0	32.8	0.18	33.0
R8	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00010	0.00022	0.00032	0.05	0.10	0.15	8.7	8	7.6	0.10	7.7	11.5	0.15	11.6
R9	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00008	0.00020	0.00027	0.04	0.09	0.13	26	23	22.7	0.09	22.8	34.1	0.14	34.2
R10	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00007	0.00016	0.00023	0.03	0.08	0.11	26	23	22.7	0.08	22.8	34.1	0.11	34.2
R11	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00020	0.00084	0.00104	0.09	0.39	0.49	25	22	21.9	0.39	22.3	32.8	0.59	33.4
R12	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00016	0.00058	0.00075	0.08	0.27	0.35	57	50	49.8	0.27	50.0	74.7	0.41	75.1
R13	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00020	0.00070	0.00090	0.09	0.33	0.42	25	22	21.9	0.33	22.2	32.8	0.49	33.3
R14	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00014	0.00037	0.00051	0.06	0.17	0.24	73	64	63.7	0.17	63.9	95.6	0.26	95.8
R15	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00006	0.00008	0.00014	0.03	0.04	0.06	22	19	19.2	0.04	19.2	28.8	0.06	28.9
R16	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00059	0.00024	0.00083	0.28	0.11	0.39	12	10	10.7	0.11	10.9	16.1	0.17	16.3
R17	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00009	0.00017	0.00026	0.04	0.08	0.12	31	27	27.1	0.08	27.1	40.6	0.12	40.7
R18	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00030	0.00371	0.00401	0.14	1.73	1.87	31	27	27.2	1.73	28.9	40.8	2.60	43.4
R19	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00005	0.00007	0.00013	0.03	0.03	0.06	14	12	12.2	0.03	12.3	18.3	0.05	18.4
R20	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00017	0.00066	0.00083	0.08	0.31	0.39	31	27	27.1	0.31	27.4	40.7	0.46	41.1
R21	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00012	0.00023	0.00035	0.06	0.11	0.16	33	29	28.8	0.11	28.9	43.2	0.16	43.4
R22	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00007	0.00009	0.00016	0.03	0.04	0.08	15	13	13.1	0.04	13.2	19.7	0.06	19.7
R23	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00012	0.00045	0.00057	0.06	0.21	0.27	26	23	22.7	0.21	22.9	34.1	0.32	34.4
R24	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00013	0.00008	0.00020	0.06	0.04	0.10	13	11	11.4	0.04	11.4	17.1	0.05	17.1
R25	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00048	0.00005	0.00053	0.22	0.02	0.25	120	105	104.8	0.02	104.9	157.3	0.03	157.3
R26	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00091	0.00014	0.00105	0.43	0.06	0.49	11	10	10.02	0.06	10.08	15.0	0.10	15.1
R27	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00041	0.00075	0.00117	0.19	0.35	0.54	32	28	28.1	0.35	28.4	42.1	0.53	42.7
R28	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00040	0.00110	0.00150	0.19	0.51	0.70	200	174	174.6	0.51	175.1	261.8	0.77	262.6
R29	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00034	0.00131	0.00165	0.16	0.61	0.77	200	174	174.5	0.61	175.1	261.8	0.92	262.7
R30	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00018	0.00076	0.00095	0.09	0.36	0.44	12	10	10.5	0.36	10.9	15.8	0.53	16.4
R31	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00052	0.00009	0.00061	0.24	0.04	0.28	11	10	9.8	0.04	9.9	14.8	0.06	14.8
R32	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00010	0.00017	0.00027	0.04	0.08	0.12	31	27	27.1	0.08	27.2	40.6	0.12	40.7
R33	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00020	0.00150	0.00170	0.09	0.70	0.79	73	64	63.7	0.70	64.4	95.6	1.05	96.7
R34	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00015	0.00046	0.00061	0.07	0.22	0.29	57	50	49.8	0.22	50.0	74.6	0.32	75.0
R35	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00006	0.00010	0.00015	0.03	0.04	0.07	26	23	22.7	0.04	22.7	34.0	0.07	34.1
R36	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00012	0.00024	0.00036	0.05	0.11	0.17	38	33	33.2	0.11	33.3	49.8	0.17	49.9
R37	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00026	0.00062	0.00087	0.12	0.29	0.41	130	113	113.5	0.29	113.7	170.2	0.43	170.6
R38	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00013	0.00029	0.00042	0.06	0.13	0.19	33	29	28.8	0.13	29.0	43.2	0.20	43.4
R39	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00009	0.00014	0.00022	0.04	0.06	0.10	80	70	69.8	0.06	69.9	104.7	0.10	104.8
R40	61	6.39	15.4	24.7	0.2	900	1.5	2	0.0091	0.0091	15	0.00008	0.00014	0.00022	0.04	0.06	0.10	80	70	69.8	0.06	69.8	104.7	0.09	104.8

As operations

Arsenic (As)												Annual metal deposition			Additional soil metal concentration after 15 yrs remaining mine life				
	Curve Number	Potential max retention after runoff begins	Annual rainfall	Avg annual surface runoff from pervious areas	Soil volumetric water content	Soil/water partition coefficient	Bulk density of soil	Soil mixing zone depth	Metal loss constant due to surface runoff	Metal soil loss constant due to all processes	Time period over which deposition occurs	S1: Current situation	S2: Proposal increment	S3: Cumulative proposed situation	S1: Current situation	S2: Proposal increment	S3: Cumulative proposed situation	Existing soil metal concentration	Existing soil metal concentration incorporating loss over 15 yrs
ID	CN (inches)	S (inches)	P (inch/yr)	RO (cm/yr)	θ_{SW} (mL water/cm ³ soil)	Kd _s (mL water/g soil)	BD (g/cm ³)	D (cm)	ksr (year ⁻¹)	ks (year ⁻¹)	tD (years)	M _{ann dep} (g/m ² /yr)			C _s (µg/g)			C _{s_existing} (µg/g)	C _{s_existing(end)} (µg/g)
R1	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000005	0.00000042	0.000006	0.0006	0.00005	0.0007	50	0.72
R2	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000008	0.00000065	0.000008	0.0009	0.00008	0.0009	7.9	0.11
R3	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000009	0.00000060	0.000010	0.0011	0.00007	0.0012	7.6	0.11
R4	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000004	0.00000034	0.000004	0.0004	0.00004	0.0005	27	0.39
R5	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000003	0.00000029	0.000003	0.0003	0.00003	0.0004	4.5	0.07
R6	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000002	0.00000020	0.000002	0.0002	0.00002	0.0002	13	0.19
R7	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000002	0.00000024	0.000003	0.0003	0.00003	0.0003	4.2	0.06
R8	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000002	0.00000022	0.000002	0.0003	0.00003	0.0003	2.8	0.04
R9	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000002	0.00000022	0.000002	0.0002	0.00003	0.0003	4.4	0.06
R10	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000002	0.00000021	0.000002	0.0002	0.00002	0.0002	4.4	0.06
R11	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000004	0.00000034	0.000004	0.0005	0.00004	0.0005	5	0.07
R12	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000003	0.00000030	0.000003	0.0004	0.00004	0.0004	8.3	0.12
R13	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000004	0.00000034	0.000004	0.0005	0.00004	0.0005	2.9	0.04
R14	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000003	0.00000029	0.000003	0.0004	0.00003	0.0004	22	0.32
R15	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000001	0.00000016	0.000002	0.0002	0.00002	0.0002	2.8	0.04
R16	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000015	0.00000074	0.000016	0.0017	0.00009	0.0018	2.7	0.04
R17	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000002	0.00000021	0.000002	0.0002	0.00002	0.0003	5.5	0.08
R18	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000006	0.00000052	0.000006	0.0007	0.00006	0.0007	4.7	0.07
R19	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000001	0.00000014	0.000001	0.0001	0.00002	0.0002	5.1	0.07
R20	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000003	0.00000032	0.000004	0.0004	0.00004	0.0004	5	0.07
R21	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000003	0.00000024	0.000003	0.0003	0.00003	0.0003	2.8	0.04
R22	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000002	0.00000017	0.000002	0.0002	0.00002	0.0002	3.2	0.05
R23	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000003	0.00000031	0.000003	0.0003	0.00004	0.0004	4.9	0.07
R24	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000003	0.00000024	0.000004	0.0004	0.00003	0.0004	2.4	0.03
R25	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000011	0.00000083	0.000012	0.0013	0.00010	0.0014	10	0.14
R26	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000023	0.00000115	0.000024	0.0026	0.00013	0.0028	3.9	0.06
R27	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000010	0.00000056	0.000011	0.0012	0.00007	0.0012	4.4	0.06
R28	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000010	0.00000059	0.000010	0.0011	0.00007	0.0012	7.6	0.11
R29	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000008	0.00000054	0.000008	0.0009	0.00006	0.0010	7.6	0.11
R30	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000003	0.00000033	0.000004	0.0004	0.00004	0.0004	4.1	0.06
R31	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000015	0.00000154	0.000016	0.0017	0.00018	0.0019	3.9	0.06
R32	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000002	0.00000022	0.000002	0.0002	0.00003	0.0003	5.5	0.08
R33	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000005	0.00000042	0.000005	0.0005	0.00005	0.0006	22	0.32
R34	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000003	0.00000028	0.000003	0.0003	0.00003	0.0004	8.3	0.12
R35	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000001	0.00000018	0.000002	0.0002	0.00002	0.0002	4.4	0.06
R36	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000003	0.00000025	0.000003	0.0003	0.00003	0.0003	5.1	0.07
R37	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000006	0.00000044	0.000007	0.0007	0.00005	0.0008	7.5	0.11
R38	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000003	0.00000026	0.000003	0.0003	0.00003	0.0004	2.8	0.04
R39	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000002	0.00000018	0.000002	0.0002	0.00002	0.0002	5.2	0.08
R40	61	6.39	15.4	24.7	0.2	29	1.5	2	0.2825	0.2825	15	0.000002	0.00000019	0.000002	0.0002	0.00002	0.0002	5.2	0.08

Cd operations

Cadmium (Cd)												Annual metal deposition			Additional soil metal concentration after 15 yrs remaining mine life				
	Curve Number	Potential max retention after runoff begins	Annual rainfall	Avg annual surface runoff from pervious areas	Soil volumetric water content	Soil/water partition coefficient	Bulk density of soil	Soil mixing zone depth	Metal loss constant due to surface runoff	Metal soil loss constant due to all processes	Time period over which deposition occurs	S1: Current situation	S2: Proposal increment	S3: Cumulative proposed situation	S1: Current situation	S2: Proposal increment	S3: Cumulative proposed situation	Existing soil metal concentration	Existing soil metal concentration incorporating loss over 15 yrs
ID	CN (inches)	S (inches)	P (inch/yr)	RO (cm/yr)	θ_{SW} (mL water/cm ³ soil)	Kd _s (mL water/g soil)	BD (g/cm ³)	D (cm)	ksr (year ⁻¹)	ks (year ⁻¹)	tD (years)	M _{ann dep} (g/m ² /yr)			C _s (µg/g)			C _{s_existing} (µg/g)	C _{s_existing(end)} (µg/g)
R1	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000004	0.000000019	0.0000004	0.0001	0.000005	0.00011	0.2	0.04
R2	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000005	0.000000029	0.0000006	0.0001	0.000007	0.00014	0.2	0.04
R3	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000006	0.000000027	0.0000007	0.0002	0.000007	0.00016	0.7	0.14
R4	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000003	0.000000015	0.0000003	0.0001	0.000004	0.00008	0.8	0.15
R5	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000003	0.000000013	0.0000003	0.0001	0.000003	0.00007	0.2	0.04
R6	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000001	0.000000009	0.0000001	0.0000	0.000002	0.00003	0.2	0.04
R7	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000002	0.000000011	0.0000002	0.0001	0.000003	0.00006	0.2	0.04
R8	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000002	0.000000010	0.0000002	0.0001	0.000002	0.00005	0.2	0.04
R9	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000001	0.000000010	0.0000001	0.0000	0.000002	0.00003	0.2	0.04
R10	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000001	0.000000010	0.0000001	0.0000	0.000002	0.00003	0.2	0.04
R11	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000003	0.000000016	0.0000004	0.0001	0.000004	0.00009	0.2	0.04
R12	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000003	0.000000014	0.0000003	0.0001	0.000003	0.00007	0.2	0.04
R13	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000003	0.000000015	0.0000004	0.0001	0.000004	0.00009	0.2	0.04
R14	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000002	0.000000013	0.0000003	0.0001	0.000003	0.00006	0.2	0.04
R15	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000001	0.000000007	0.0000001	0.0000	0.000002	0.00003	0.2	0.04
R16	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000010	0.000000034	0.0000010	0.00025	0.000008	0.00025	0.2	0.04
R17	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000002	0.000000010	0.0000002	0.00005	0.000002	0.00005	0.2	0.04
R18	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000004	0.000000023	0.0000005	0.00010	0.000006	0.00011	0.2	0.04
R19	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000001	0.000000007	0.0000001	0.00003	0.000002	0.00003	0.2	0.04
R20	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000003	0.000000014	0.0000003	0.00007	0.000004	0.00008	0.2	0.04
R21	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000003	0.000000011	0.0000003	0.00006	0.000003	0.00007	0.2	0.04
R22	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000002	0.000000008	0.0000002	0.00005	0.000002	0.00005	0.2	0.04
R23	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000002	0.000000014	0.0000002	0.00005	0.000003	0.00005	0.2	0.04
R24	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000004	0.000000011	0.0000004	0.00010	0.000003	0.00010	0.2	0.04
R25	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000013	0.000000038	0.0000013	0.00031	0.000009	0.00032	0.2	0.04
R26	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000014	0.000000052	0.0000015	0.00035	0.000013	0.00037	0.2	0.04
R27	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000007	0.000000025	0.0000007	0.00017	0.000006	0.00018	0.2	0.04
R28	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000007	0.000000027	0.0000007	0.00016	0.000007	0.00017	0.7	0.14
R29	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000006	0.000000024	0.0000006	0.00014	0.000006	0.00014	0.7	0.14
R30	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000003	0.000000015	0.0000003	0.00007	0.000004	0.00008	0.2	0.04
R31	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000008	0.000000070	0.0000009	0.00020	0.000017	0.00022	0.2	0.04
R32	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000002	0.000000010	0.0000002	0.00005	0.000002	0.00005	0.2	0.04
R33	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000003	0.000000019	0.0000004	0.00008	0.000005	0.00009	0.2	0.04
R34	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000003	0.000000013	0.0000003	0.00007	0.000003	0.00007	0.2	0.04
R35	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000001	0.000000008	0.0000001	0.00002	0.000002	0.00003	0.2	0.04
R36	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000002	0.000000011	0.0000002	0.00005	0.000003	0.00006	0.2	0.04
R37	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000005	0.000000020	0.0000005	0.00012	0.000005	0.00012	0.4	0.08
R38	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000003	0.000000012	0.0000003	0.00006	0.000003	0.00007	0.2	0.04
R39	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000002	0.000000008	0.0000002	0.00005	0.000002	0.00005	0.2	0.04
R40	61	6.39	15.4	24.7	0.2	75	1.5	2	0.1095	0.1095	15	0.0000002	0.000000009	0.0000002	0.00004	0.000002	0.00005	0.2	0.04

Cr operations

Trivalent Chromium (Cr ^{III})												Annual metal deposition			Additional soil metal concentration after 15 yrs remaining mine life				
	Curve Number	Potential max retention after runoff begins	Annual rainfall	Avg annual surface runoff from pervious areas	Soil volumetric water content	Soil/water partition coefficient	Bulk density of soil	Soil mixing zone depth	Metal loss constant due to surface runoff	Metal soil loss constant due to all processes	Time period over which deposition occurs	S1: Current situation	S2: Proposal increment	S3: Cumulative proposed situation	S1: Current situation	S2: Proposal increment	S3: Cumulative proposed situation	Existing soil metal concentration	Existing soil metal concentration incorporating loss over 15 yrs
ID	CN (inches)	S (inches)	P (inch/yr)	RO (cm/yr)	θ_{SW} (mL water/cm ³ soil)	Kd _s (mL water/g soil)	BD (g/cm ³)	D (cm)	ksr (year ⁻¹)	ks (year ⁻¹)	tD (years)	M _{ann dep} (g/m ² /yr)			C _s (µg/g)			C _{s_existing} (µg/g)	C _{s_existing(end)} (µg/g)
R1	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00005	0.00030	0.00035	0.023	0.15	0.17	26	26
R2	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00009	0.00182	0.00191	0.045	0.91	0.95	36	36
R3	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00007	0.00036	0.00043	0.036	0.18	0.21	48	48
R4	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00003	0.00022	0.00025	0.017	0.11	0.13	33	33
R5	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00003	0.00011	0.00014	0.013	0.06	0.07	14	14
R6	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00001	0.00003	0.00004	0.006	0.02	0.02	16	16
R7	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00002	0.00006	0.00008	0.010	0.03	0.04	30	30
R8	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00002	0.00006	0.00007	0.009	0.03	0.04	11	11
R9	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00001	0.00005	0.00006	0.007	0.02	0.03	23	23
R10	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00001	0.00004	0.00005	0.006	0.02	0.03	23	23
R11	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00004	0.00022	0.00025	0.018	0.11	0.13	30	30
R12	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00003	0.00015	0.00018	0.015	0.07	0.09	23	23
R13	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00004	0.00018	0.00022	0.018	0.09	0.11	17	17
R14	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00002	0.00010	0.00012	0.012	0.05	0.06	33	33
R15	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00001	0.00002	0.00003	0.005	0.01	0.01	23	23
R16	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00011	0.00006	0.00017	0.054	0.03	0.08	27	27
R17	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00002	0.00004	0.00006	0.008	0.02	0.03	24	24
R18	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00006	0.00095	0.00101	0.029	0.48	0.51	27	27
R19	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00001	0.00002	0.00003	0.004	0.01	0.01	24	24
R20	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00003	0.00017	0.00020	0.016	0.08	0.10	28	28
R21	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00002	0.00006	0.00008	0.010	0.03	0.04	17	17
R22	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00001	0.00002	0.00003	0.005	0.01	0.02	23	23
R23	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00002	0.00012	0.00014	0.011	0.06	0.07	20	20
R24	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00001	0.00002	0.00003	0.007	0.01	0.02	20	20
R25	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00007	0.00001	0.00008	0.033	0.01	0.04	37	37
R26	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00017	0.00003	0.00020	0.085	0.02	0.10	27	27
R27	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00007	0.00019	0.00027	0.037	0.10	0.13	26	26
R28	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00007	0.00028	0.00035	0.036	0.14	0.18	48	48
R29	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00006	0.00034	0.00040	0.031	0.17	0.20	48	48
R30	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00003	0.00020	0.00023	0.017	0.10	0.11	14	14
R31	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00010	0.00002	0.00012	0.049	0.01	0.06	27	27
R32	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00002	0.00004	0.00006	0.008	0.02	0.03	24	24
R33	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00004	0.00038	0.00042	0.018	0.19	0.21	33	33
R34	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00003	0.00012	0.00014	0.013	0.06	0.07	23	23
R35	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00001	0.00002	0.00003	0.005	0.01	0.02	23	23
R36	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00002	0.00006	0.00008	0.010	0.03	0.04	23	23
R37	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00004	0.00016	0.00020	0.022	0.08	0.10	30	30
R38	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00002	0.00007	0.00009	0.011	0.04	0.05	17	17
R39	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00001	0.00003	0.00005	0.007	0.02	0.02	18	18
R40	61	6.39	15.4	24.7	0.2	1800000	1.5	2	0.000005	0.000005	15	0.00001	0.00003	0.00005	0.007	0.02	0.02	18	18

Mn operations

Manganese (Mn)												Annual metal deposition			Additional soil metal concentration after 15 yrs remaining mine life				
	Curve Number	Potential max retention after runoff begins	Annual rainfall	Avg annual surface runoff from pervious areas	Soil volumetric water content	Soil/water partition coefficient	Bulk density of soil	Soil mixing zone depth	Metal loss constant due to surface runoff	Metal soil loss constant due to all processes	Time period over which deposition occurs	S1: Current situation	S2: Proposal increment	S3: Cumulative proposed situation	S1: Current situation	S2: Proposal increment	S3: Cumulative proposed situation	Existing soil metal concentration	Existing soil metal concentration incorporating loss over 15 yrs
ID	CN (inches)	S (inches)	P (inch/yr)	RO (cm/yr)	θ_{SW} (mL water/cm ³ soil)	Kd _s (mL water/g soil)	BD (g/cm ³)	D (cm)	ksr (year ⁻¹)	ks (year ⁻¹)	tD (years)	M _{ann dep} (g/m ² /yr)			C _s (µg/g)			C _{s_existing} (µg/g)	C _{s_existing(end)} (µg/g)
R1	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00023	0.00101	0.0012	0.05	0.23	0.28	300	45
R2	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00041	0.00607	0.0065	0.09	1.36	1.45	230	35
R3	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00038	0.00120	0.0016	0.09	0.27	0.35	400	60
R4	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00016	0.00073	0.0009	0.04	0.16	0.20	290	44
R5	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00013	0.00038	0.0005	0.03	0.09	0.11	190	29
R6	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00007	0.00011	0.0002	0.02	0.02	0.04	110	17
R7	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00009	0.00022	0.0003	0.02	0.05	0.07	190	29
R8	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00008	0.00019	0.0003	0.02	0.04	0.06	140	21
R9	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00008	0.00017	0.0002	0.02	0.04	0.06	120	18
R10	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00007	0.00014	0.0002	0.02	0.03	0.05	120	18
R11	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00017	0.00072	0.0009	0.04	0.16	0.20	240	36
R12	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00014	0.00050	0.0006	0.03	0.11	0.14	130	20
R13	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00017	0.00061	0.0008	0.04	0.14	0.17	130	20
R14	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00012	0.00032	0.0004	0.03	0.07	0.10	210	32
R15	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00005	0.00007	0.0001	0.01	0.02	0.03	63	9
R16	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00059	0.00021	0.0008	0.13	0.05	0.18	150	23
R17	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00008	0.00014	0.0002	0.02	0.03	0.05	150	23
R18	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00028	0.00318	0.0035	0.06	0.71	0.78	220	33
R19	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00004	0.00006	0.0001	0.01	0.01	0.02	160	24
R20	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00015	0.00057	0.0007	0.03	0.13	0.16	300	45
R21	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00010	0.00020	0.0003	0.02	0.04	0.07	33	5
R22	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00005	0.00008	0.0001	0.01	0.02	0.03	87	13
R23	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00012	0.00039	0.0005	0.03	0.09	0.11	290	44
R24	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00009	0.00007	0.0002	0.02	0.02	0.03	84	13
R25	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00034	0.00005	0.0004	0.08	0.01	0.09	300	45
R26	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00093	0.00013	0.0011	0.21	0.03	0.24	56	8
R27	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00040	0.00065	0.0011	0.09	0.15	0.24	100	15
R28	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00039	0.00095	0.0013	0.09	0.21	0.30	400	60
R29	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00032	0.00113	0.0015	0.07	0.25	0.33	400	60
R30	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00016	0.00066	0.0008	0.03	0.15	0.18	280	42
R31	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00057	0.00009	0.0007	0.13	0.02	0.15	56	8
R32	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00008	0.00015	0.0002	0.02	0.03	0.05	150	23
R33	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00019	0.00129	0.0015	0.04	0.29	0.33	210	32
R34	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00012	0.00040	0.0005	0.03	0.09	0.12	130	20
R35	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00006	0.00008	0.0001	0.01	0.02	0.03	120	18
R36	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00010	0.00021	0.0003	0.02	0.05	0.07	200	30
R37	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00024	0.00053	0.0008	0.05	0.12	0.17	190	29
R38	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00011	0.00025	0.0004	0.02	0.06	0.08	33	5
R39	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00006	0.00012	0.0002	0.01	0.03	0.04	130	20
R40	61	6.39	15.4	24.7	0.2	65	1.5	2	0.13	0.13	15	0.00007	0.00012	0.0002	0.01	0.03	0.04	130	20

Sb operations

Antimony (Sb)												Annual metal deposition			Additional soil metal concentration after 15 yrs remaining mine life				
	Curve Number	Potential max retention after runoff begins	Annual rainfall	Avg annual surface runoff from pervious areas	Soil volumetric water content	Soil/water partition coefficient	Bulk density of soil	Soil mixing zone depth	Metal loss constant due to surface runoff	Metal soil loss constant due to all processes	Time period over which deposition occurs	S1: Current situation	S2: Proposal increment	S3: Cumulative proposed situation	S1: Current situation	S2: Proposal increment	S3: Cumulative proposed situation	Existing soil metal concentration	Existing soil metal concentration incorporating loss over 15 yrs
ID	CN (inches)	S (inches)	P (inch/yr)	RO (cm/yr)	θ_{SW} (mL water/cm ³ soil)	Kd _s (mL water/g soil)	BD (g/cm ³)	D (cm)	ksr (year ⁻¹)	ks (year ⁻¹)	tD (years)	M _{ann dep} (g/m ² /yr)			C _s (µg/g)			C _{s_existing} (µg/g)	C _{s_existing(end)} (µg/g)
R1	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000016	Not Av	0.00000016	0.00003	Not Av	0.00003	5	0.32
R2	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000016	Not Av	0.00000016	0.00003	Not Av	0.00003	5	0.32
R3	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000024	Not Av	0.00000024	0.00004	Not Av	0.00004	5	0.32
R4	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000011	Not Av	0.00000011	0.00002	Not Av	0.00002	5	0.32
R5	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000009	Not Av	0.00000009	0.00002	Not Av	0.00002	5	0.32
R6	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000006	Not Av	0.00000006	0.00001	Not Av	0.00001	5	0.32
R7	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000008	Not Av	0.00000008	0.00001	Not Av	0.00001	5	0.32
R8	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000008	Not Av	0.00000008	0.00001	Not Av	0.00001	5	0.32
R9	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000005	Not Av	0.00000005	0.00001	Not Av	0.00001	5	0.32
R10	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000005	Not Av	0.00000005	0.00001	Not Av	0.00001	5	0.32
R11	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000012	Not Av	0.00000012	0.00002	Not Av	0.00002	5	0.32
R12	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000010	Not Av	0.00000010	0.00002	Not Av	0.00002	5	0.32
R13	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000013	Not Av	0.00000013	0.00002	Not Av	0.00002	5	0.32
R14	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000009	Not Av	0.00000009	0.00001	Not Av	0.00001	5	0.32
R15	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000005	Not Av	0.00000005	0.00001	Not Av	0.00001	5	0.32
R16	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000045	Not Av	0.00000045	0.00008	Not Av	0.00008	5	0.32
R17	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000007	Not Av	0.00000007	0.00001	Not Av	0.00001	5	0.32
R18	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000013	Not Av	0.00000013	0.00002	Not Av	0.00002	5	0.32
R19	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000005	Not Av	0.00000005	0.00001	Not Av	0.00001	5	0.32
R20	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000011	Not Av	0.00000011	0.00002	Not Av	0.00002	5	0.32
R21	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000010	Not Av	0.00000010	0.00002	Not Av	0.00002	5	0.32
R22	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000008	Not Av	0.00000008	0.00001	Not Av	0.00001	5	0.32
R23	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000007	Not Av	0.00000007	0.00001	Not Av	0.00001	5	0.32
R24	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000016	Not Av	0.00000016	0.00003	Not Av	0.00003	5	0.32
R25	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000057	Not Av	0.00000057	0.00010	Not Av	0.00010	5	0.32
R26	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000061	Not Av	0.00000061	0.00010	Not Av	0.00010	5	0.32
R27	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000027	Not Av	0.00000027	0.00005	Not Av	0.00005	5	0.32
R28	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000026	Not Av	0.00000026	0.00004	Not Av	0.00004	5	0.32
R29	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000020	Not Av	0.00000020	0.00003	Not Av	0.00003	5	0.32
R30	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000011	Not Av	0.00000011	0.00002	Not Av	0.00002	5	0.32
R31	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000044	Not Av	0.00000044	0.00008	Not Av	0.00008	5	0.32
R32	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000007	Not Av	0.00000007	0.00001	Not Av	0.00001	5	0.32
R33	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000011	Not Av	0.00000011	0.00002	Not Av	0.00002	5	0.32
R34	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000010	Not Av	0.00000010	0.00002	Not Av	0.00002	5	0.32
R35	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000004	Not Av	0.00000004	0.00001	Not Av	0.00001	5	0.32
R36	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000008	Not Av	0.00000008	0.00001	Not Av	0.00001	5	0.32
R37	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000018	Not Av	0.00000018	0.00003	Not Av	0.00003	5	0.32
R38	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000010	Not Av	0.00000010	0.00002	Not Av	0.00002	5	0.32
R39	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000007	Not Av	0.00000007	0.00001	Not Av	0.00001	5	0.32
R40	61	6.39	15.4	24.7	0.2	45	1.5	2	0.1823	0.1823	15	0.00000007	Not Av	0.00000007	0.00001	Not Av	0.00001	5	0.32

Ba operations

Barium (Ba)												Annual metal deposition			Additional soil metal concentration after 15 yrs remaining mine life				
	Curve Number	Potential max retention after runoff begins	Annual rainfall	Avg annual surface runoff from pervious areas	Soil volumetric water content	Soil/water partition coefficient	Bulk density of soil	Soil mixing zone depth	Metal loss constant due to surface runoff	Metal soil loss constant due to all processes	Time period over which deposition occurs	S1: Current situation	S2: Proposal increment	S3: Cumulative proposed situation	S1: Current situation	S2: Proposal increment	S3: Cumulative proposed situation	Existing soil metal concentration	Existing soil metal concentration incorporating loss over 15 yrs
ID	CN (inches)	S (inches)	P (inch/yr)	RO (cm/yr)	θ_{SW} (mL water/cm ³ soil)	Kd _s (mL water/g soil)	BD (g/cm ³)	D (cm)	ksr (year ⁻¹)	ks (year ⁻¹)	tD (years)	M _{ann dep} (g/m ² /yr)			C _s (µg/g)			C _{s_existing} (µg/g)	C _{s_existing(end)} (µg/g)
R1	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000008	Not Av	0.000008	0.0012	Not Av	0.0012	130	6.5
R2	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000008	Not Av	0.000008	0.0013	Not Av	0.0013	47	2.3
R3	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000013	Not Av	0.000013	0.0021	Not Av	0.0021	410	20.4
R4	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000005	Not Av	0.000005	0.0008	Not Av	0.0008	150	7.5
R5	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000004	Not Av	0.000004	0.0007	Not Av	0.0007	52	2.6
R6	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000003	Not Av	0.000003	0.0005	Not Av	0.0005	54	2.7
R7	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000004	Not Av	0.000004	0.0006	Not Av	0.0006	540	26.9
R8	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000003	Not Av	0.000003	0.0005	Not Av	0.0005	31	1.5
R9	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000003	Not Av	0.000003	0.0005	Not Av	0.0005	43	2.1
R10	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000003	Not Av	0.000003	0.0005	Not Av	0.0005	43	2.1
R11	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000006	Not Av	0.000006	0.0009	Not Av	0.0009	84	4.2
R12	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000005	Not Av	0.000005	0.0007	Not Av	0.0007	44	2.2
R13	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000006	Not Av	0.000006	0.0010	Not Av	0.0010	55	2.7
R14	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000004	Not Av	0.000004	0.0006	Not Av	0.0006	50	2.5
R15	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000002	Not Av	0.000002	0.0004	Not Av	0.0004	54	2.7
R16	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000026	Not Av	0.000026	0.0041	Not Av	0.0041	60	3.0
R17	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000003	Not Av	0.000003	0.0005	Not Av	0.0005	76	3.8
R18	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000006	Not Av	0.000006	0.0009	Not Av	0.0009	57	2.8
R19	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000002	Not Av	0.000002	0.0004	Not Av	0.0004	50	2.5
R20	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000005	Not Av	0.000005	0.0008	Not Av	0.0008	50	2.5
R21	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000004	Not Av	0.000004	0.0007	Not Av	0.0007	16	0.8
R22	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000003	Not Av	0.000003	0.0005	Not Av	0.0005	51	2.5
R23	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000004	Not Av	0.000004	0.0007	Not Av	0.0007	110	5.5
R24	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000007	Not Av	0.000007	0.0011	Not Av	0.0011	42	2.1
R25	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000026	Not Av	0.000026	0.0042	Not Av	0.0042	79	3.9
R26	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000037	Not Av	0.000037	0.0059	Not Av	0.0059	28	1.4
R27	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000015	Not Av	0.000015	0.0024	Not Av	0.0024	39	1.9
R28	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000014	Not Av	0.000014	0.0023	Not Av	0.0023	410	20.4
R29	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000011	Not Av	0.000011	0.0017	Not Av	0.0017	410	20.4
R30	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000005	Not Av	0.000005	0.0008	Not Av	0.0008	61	3.0
R31	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000030	Not Av	0.000030	0.0047	Not Av	0.0047	28	1.4
R32	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000003	Not Av	0.000003	0.0005	Not Av	0.0005	76	3.8
R33	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000006	Not Av	0.000006	0.0009	Not Av	0.0009	50	2.5
R34	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000004	Not Av	0.000004	0.0007	Not Av	0.0007	44	2.2
R35	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000003	Not Av	0.000003	0.0004	Not Av	0.0004	43	2.1
R36	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000004	Not Av	0.000004	0.0006	Not Av	0.0006	100	5.0
R37	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000009	Not Av	0.000009	0.0015	Not Av	0.0015	86	4.3
R38	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000004	Not Av	0.000004	0.0007	Not Av	0.0007	16	0.8
R39	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000003	Not Av	0.000003	0.0005	Not Av	0.0005	69	3.4
R40	61	6.39	15.4	24.7	0.2	41	1.5	2	0.2001	0.2001	15	0.000003	Not Av	0.000003	0.0005	Not Av	0.0005	69	3.4

Be operations

Beryllium (Be)												Annual metal deposition			Additional soil metal concentration after 15 yrs remaining mine life				
	Curve Number	Potential max retention after runoff begins	Annual rainfall	Avg annual surface runoff from pervious areas	Soil volumetric water content	Soil/water partition coefficient	Bulk density of soil	Soil mixing zone depth	Metal loss constant due to surface runoff	Metal soil loss constant due to all processes	Time period over which deposition occurs	S1: Current situation	S2: Proposal increment	S3: Cumulative proposed situation	S1: Current situation	S2: Proposal increment	S3: Cumulative proposed situation	Existing soil metal concentration	Existing soil metal concentration incorporating loss over 15 yrs
ID	CN (inches)	S (inches)	P (inch/yr)	RO (cm/yr)	θ_{SW} (mL water/cm ³ soil)	Kd _s (mL water/g soil)	BD (g/cm ³)	D (cm)	ksr (year ⁻¹)	ks (year ⁻¹)	tD (years)	M _{ann dep} (g/m ² /yr)			C _s (µg/g)			C _{s_existing} (µg/g)	C _{s_existing(end)} (µg/g)
R1	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000004	Not Av	0.00000004	0.000019	Not Av	0.000019	1	0.86
R2	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000004	Not Av	0.00000004	0.000019	Not Av	0.000019	1	0.86
R3	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000007	Not Av	0.00000007	0.000032	Not Av	0.000032	1	0.86
R4	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000003	Not Av	0.00000003	0.000012	Not Av	0.000012	1	0.86
R5	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000002	Not Av	0.00000002	0.000010	Not Av	0.000010	1	0.86
R6	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000002	Not Av	0.00000002	0.000007	Not Av	0.000007	1	0.86
R7	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000002	Not Av	0.00000002	0.000009	Not Av	0.000009	1	0.86
R8	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000002	Not Av	0.00000002	0.000008	Not Av	0.000008	1	0.86
R9	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000002	Not Av	0.00000002	0.000008	Not Av	0.000008	1	0.86
R10	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000002	Not Av	0.00000002	0.000007	Not Av	0.000007	1	0.86
R11	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000003	Not Av	0.00000003	0.000014	Not Av	0.000014	1	0.86
R12	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000002	Not Av	0.00000002	0.000011	Not Av	0.000011	1	0.86
R13	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000003	Not Av	0.00000003	0.000015	Not Av	0.000015	1	0.86
R14	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000002	Not Av	0.00000002	0.000010	Not Av	0.000010	1	0.86
R15	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000001	Not Av	0.00000001	0.000006	Not Av	0.000006	1	0.86
R16	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000013	Not Av	0.00000013	0.000062	Not Av	0.000062	1	0.86
R17	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000002	Not Av	0.00000002	0.000008	Not Av	0.000008	1	0.86
R18	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000003	Not Av	0.00000003	0.000014	Not Av	0.000014	1	0.86
R19	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000001	Not Av	0.00000001	0.000006	Not Av	0.000006	1	0.86
R20	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000003	Not Av	0.00000003	0.000012	Not Av	0.000012	1	0.86
R21	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000002	Not Av	0.00000002	0.000011	Not Av	0.000011	1	0.86
R22	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000002	Not Av	0.00000002	0.000008	Not Av	0.000008	1	0.86
R23	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000002	Not Av	0.00000002	0.000010	Not Av	0.000010	1	0.86
R24	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000004	Not Av	0.00000004	0.000017	Not Av	0.000017	1	0.86
R25	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000014	Not Av	0.00000014	0.000064	Not Av	0.000064	1	0.86
R26	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000019	Not Av	0.00000019	0.000088	Not Av	0.000088	1	0.86
R27	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000008	Not Av	0.00000008	0.000036	Not Av	0.000036	1	0.86
R28	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000007	Not Av	0.00000007	0.000035	Not Av	0.000035	1	0.86
R29	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000006	Not Av	0.00000006	0.000026	Not Av	0.000026	1	0.86
R30	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000003	Not Av	0.00000003	0.000012	Not Av	0.000012	1	0.86
R31	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000015	Not Av	0.00000015	0.000071	Not Av	0.000071	1	0.86
R32	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000002	Not Av	0.00000002	0.000008	Not Av	0.000008	1	0.86
R33	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000003	Not Av	0.00000003	0.000014	Not Av	0.000014	1	0.86
R34	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000002	Not Av	0.00000002	0.000011	Not Av	0.000011	1	0.86
R35	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000001	Not Av	0.00000001	0.000006	Not Av	0.000006	1	0.86
R36	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000002	Not Av	0.00000002	0.000009	Not Av	0.000009	1	0.86
R37	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000005	Not Av	0.00000005	0.000022	Not Av	0.000022	1	0.86
R38	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000002	Not Av	0.00000002	0.000011	Not Av	0.000011	1	0.86
R39	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000002	Not Av	0.00000002	0.000008	Not Av	0.000008	1	0.86
R40	61	6.39	15.4	24.7	0.2	790	1.5	2	0.0104	0.0104	15	0.00000002	Not Av	0.00000002	0.000007	Not Av	0.000007	1	0.86

Cu operations

Copper (Cu)												Annual metal deposition			Additional soil metal concentration after 15 yrs remaining mine life				
	Curve Number	Potential max retention after runoff begins	Annual rainfall	Avg annual surface runoff from pervious areas	Soil volumetric water content	Soil/water partition coefficient	Bulk density of soil	Soil mixing zone depth	Metal loss constant due to surface runoff	Metal soil loss constant due to all processes	Time period over which deposition occurs	S1: Current situation	S2: Proposal increment	S3: Cumulative proposed situation	S1: Current situation	S2: Proposal increment	S3: Cumulative proposed situation	Existing soil metal concentration	Existing soil metal concentration incorporating loss over 15 yrs
ID	CN (inches)	S (inches)	P (inch/yr)	RO (cm/yr)	θ_{SW} (mL water/cm ³ soil)	Kd _s (mL water/g soil)	BD (g/cm ³)	D (cm)	ksr (year ⁻¹)	ks (year ⁻¹)	tD (years)	M _{ann dep} (g/m ² /yr)			C _s (µg/g)			C _{s_existing} (µg/g)	C _{s_existing(end)} (µg/g)
R1	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00040	0.00109	0.0015	0.05	0.15	0.21	370	11
R2	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00061	0.00658	0.0072	0.08	0.91	0.99	280	8.3
R3	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00067	0.00130	0.0020	0.09	0.18	0.27	1,000	30
R4	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00027	0.00079	0.0011	0.04	0.11	0.15	1,100	33
R5	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00021	0.00042	0.0006	0.03	0.06	0.09	15	0.4
R6	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00013	0.00012	0.0002	0.02	0.02	0.03	62	1.8
R7	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00016	0.00024	0.0004	0.02	0.03	0.06	54	1.6
R8	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00015	0.00021	0.0004	0.02	0.03	0.05	20	0.6
R9	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00015	0.00019	0.0003	0.02	0.03	0.05	150	4.5
R10	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00014	0.00015	0.0003	0.02	0.02	0.04	150	4.5
R11	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00029	0.00079	0.0011	0.04	0.11	0.15	77	2.3
R12	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00023	0.00055	0.0008	0.03	0.08	0.11	120	3.6
R13	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00030	0.00066	0.0010	0.04	0.09	0.13	42	1.3
R14	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00021	0.00035	0.0006	0.03	0.05	0.08	92	2.7
R15	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00010	0.00008	0.0002	0.01	0.01	0.02	55	1.6
R16	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00113	0.00024	0.0014	0.16	0.03	0.19	32	1.0
R17	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00014	0.00016	0.0003	0.02	0.02	0.04	120	3.6
R18	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00042	0.00345	0.0039	0.06	0.48	0.54	71	2.1
R19	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00009	0.00007	0.0002	0.01	0.01	0.02	46	1.4
R20	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00025	0.00062	0.0009	0.03	0.09	0.12	92	2.7
R21	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00018	0.00022	0.0004	0.02	0.03	0.05	25	0.7
R22	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00011	0.00009	0.0002	0.02	0.01	0.03	26	0.8
R23	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00022	0.00043	0.0006	0.03	0.06	0.09	73	2.2
R24	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00020	0.00008	0.0003	0.03	0.01	0.04	19	0.6
R25	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00078	0.00006	0.0008	0.11	0.01	0.12	200	6.0
R26	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00172	0.00015	0.0019	0.24	0.02	0.26	69	2.1
R27	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00073	0.00071	0.0014	0.10	0.10	0.20	67	2.0
R28	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00070	0.00103	0.0017	0.10	0.14	0.24	1,000	29.8
R29	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00055	0.00123	0.0018	0.08	0.17	0.25	1,000	29.8
R30	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00026	0.00071	0.0010	0.04	0.10	0.13	17	0.5
R31	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00119	0.00011	0.0013	0.16	0.02	0.18	69	2.1
R32	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00015	0.00016	0.0003	0.02	0.02	0.04	120	3.6
R33	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00032	0.00140	0.0017	0.04	0.19	0.24	92	2.7
R34	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00021	0.00044	0.0006	0.03	0.06	0.09	120	3.6
R35	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00011	0.00009	0.0002	0.02	0.01	0.03	150	4.5
R36	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00017	0.00023	0.0004	0.02	0.03	0.06	35	1.0
R37	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00043	0.00058	0.0010	0.06	0.08	0.14	250	7.4
R38	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00019	0.00027	0.0005	0.03	0.04	0.06	25	0.7
R39	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00012	0.00013	0.0003	0.02	0.02	0.03	140	4.2
R40	61	6.39	15.4	24.7	0.2	35	1.5	2	0.2342	0.2342	15	0.00012	0.00013	0.0003	0.02	0.02	0.03	140	4.2

Hg operations

Mercury (Hg)												Annual metal deposition			Additional soil metal concentration after 15 yrs remaining mine life				
	Curve Number	Potential max retention after runoff begins	Annual rainfall	Avg annual surface runoff from pervious areas	Soil volumetric water content	Soil/water partition coefficient	Bulk density of soil	Soil mixing zone depth	Metal loss constant due to surface runoff	Metal soil loss constant due to all processes	Time period over which deposition occurs	S1: Current situation	S2: Proposal increment	S3: Cumulative proposed situation	S1: Current situation	S2: Proposal increment	S3: Cumulative proposed situation	Existing soil metal concentration	Existing soil metal concentration incorporating loss over 15 yrs
ID	CN (inches)	S (inches)	P (inch/yr)	RO (cm/yr)	θ_{SW} (mL water/cm ³ soil)	Kd _s (mL water/g soil)	BD (g/cm ³)	D (cm)	ksr (year ⁻¹)	ks (year ⁻¹)	tD (years)	M _{ann dep} (g/m ² /yr)			C _s (µg/g)			C _{s_existing} (µg/g)	C _{s_existing(end)} (µg/g)
R1	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000019	0.000000019	0.000000021	0.0000036	0.0000036	0.000004	0.1	0.009
R2	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000028	0.000000029	0.000000031	0.0000054	0.0000056	0.000006	0.05	0.005
R3	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000034	0.000000027	0.000000037	0.0000065	0.0000052	0.000007	0.05	0.005
R4	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000012	0.000000015	0.000000014	0.0000023	0.0000029	0.000003	0.3	0.028
R5	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000010	0.000000013	0.000000011	0.0000019	0.0000025	0.000002	0.05	0.005
R6	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000006	0.000000009	0.000000007	0.0000012	0.0000017	0.000001	0.05	0.005
R7	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000008	0.000000011	0.000000009	0.0000015	0.0000020	0.000002	0.05	0.005
R8	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000007	0.000000010	0.000000008	0.0000013	0.0000019	0.000002	0.05	0.005
R9	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000007	0.000000010	0.000000008	0.0000014	0.0000019	0.000002	0.05	0.005
R10	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000007	0.000000010	0.000000007	0.0000012	0.0000018	0.000001	0.05	0.005
R11	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000013	0.000000016	0.000000015	0.0000026	0.0000030	0.000003	0.05	0.005
R12	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000011	0.000000014	0.000000012	0.0000020	0.0000026	0.000002	0.05	0.005
R13	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000014	0.000000015	0.000000015	0.0000026	0.0000029	0.000003	0.05	0.005
R14	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000011	0.000000013	0.000000012	0.0000020	0.0000025	0.000002	0.05	0.005
R15	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000005	0.000000007	0.000000005	0.0000009	0.0000014	0.000001	0.05	0.005
R16	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000052	0.000000034	0.000000055	0.0000100	0.0000064	0.000011	0.05	0.005
R17	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000007	0.000000010	0.000000008	0.0000013	0.0000018	0.000001	0.05	0.005
R18	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000021	0.000000023	0.000000024	0.0000041	0.0000045	0.000005	0.05	0.005
R19	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000004	0.000000007	0.000000005	0.0000008	0.0000013	0.000001	0.05	0.005
R20	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000011	0.000000014	0.000000013	0.0000021	0.0000028	0.000002	0.05	0.005
R21	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000008	0.000000011	0.000000009	0.0000016	0.0000021	0.000002	0.05	0.005
R22	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000005	0.000000008	0.000000006	0.0000010	0.0000015	0.000001	0.05	0.005
R23	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000011	0.000000014	0.000000013	0.0000021	0.0000027	0.000002	0.05	0.005
R24	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000010	0.000000011	0.000000011	0.0000018	0.0000021	0.000002	0.05	0.005
R25	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000029	0.000000038	0.000000033	0.0000055	0.0000072	0.000006	0.2	0.019
R26	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000083	0.000000052	0.000000088	0.0000159	0.00000100	0.000017	0.05	0.005
R27	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000037	0.000000025	0.000000039	0.0000070	0.0000049	0.000007	0.05	0.005
R28	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000035	0.000000027	0.000000038	0.0000067	0.0000052	0.000007	0.05	0.005
R29	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000028	0.000000024	0.000000030	0.0000054	0.0000047	0.000006	0.05	0.005
R30	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000012	0.000000015	0.000000013	0.0000022	0.0000028	0.000003	0.05	0.005
R31	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000053	0.000000070	0.000000060	0.0000101	0.00000134	0.000011	0.05	0.005
R32	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000007	0.000000010	0.000000008	0.0000014	0.0000019	0.000002	0.05	0.005
R33	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000017	0.000000019	0.000000019	0.0000032	0.0000037	0.000004	0.05	0.005
R34	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000010	0.000000013	0.000000011	0.0000018	0.0000025	0.000002	0.05	0.005
R35	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000005	0.000000008	0.000000006	0.0000010	0.0000015	0.000001	0.05	0.005
R36	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000009	0.000000011	0.000000010	0.0000017	0.0000022	0.000002	0.05	0.005
R37	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000022	0.000000020	0.000000024	0.0000042	0.0000038	0.000005	0.05	0.005
R38	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000009	0.000000012	0.000000010	0.0000017	0.0000022	0.000002	0.05	0.005
R39	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000006	0.000000008	0.000000006	0.0000011	0.0000016	0.000001	0.05	0.005
R40	61	6.39	15.4	24.7	0.2	52	1.5	2	0.1579	0.1579	15	0.000000006	0.000000009	0.000000006	0.0000011	0.0000016	0.000001	0.05	0.005

Ni operations

Nickel (Ni)												Annual metal deposition			Additional soil metal concentration after 15 yrs remaining mine life				
	Curve Number	Potential max retention after runoff begins	Annual rainfall	Avg annual surface runoff from pervious areas	Soil volumetric water content	Soil/water partition coefficient	Bulk density of soil	Soil mixing zone depth	Metal loss constant due to surface runoff	Metal soil loss constant due to all processes	Time period over which deposition occurs	S1: Current situation	S2: Proposal increment	S3: Cumulative proposed situation	S1: Current situation	S2: Proposal increment	S3: Cumulative proposed situation	Existing soil metal concentration	Existing soil metal concentration incorporating loss over 15 yrs
ID	CN (inches)	S (inches)	P (inch/yr)	RO (cm/yr)	θ_{SW} (mL water/cm ³ soil)	Kd _s (mL water/g soil)	BD (g/cm ³)	D (cm)	ksr (year ⁻¹)	ks (year ⁻¹)	tD (years)	M _{ann dep} (g/m ² /yr)			C _s (µg/g)			C _{s_existing} (µg/g)	C _{s_existing(end)} (µg/g)
R1	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000028	0.00000023	0.000003	0.0013	0.00011	0.0015	17	16
R2	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000039	0.00000035	0.000004	0.0019	0.00017	0.0021	13	12
R3	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000050	0.00000033	0.000005	0.0024	0.00016	0.0026	39	37
R4	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000018	0.00000018	0.000002	0.0009	0.00009	0.0010	14	13
R5	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000015	0.00000016	0.000002	0.0007	0.00008	0.0008	8.2	8
R6	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000009	0.00000011	0.000001	0.0005	0.00005	0.0005	5.6	5
R7	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000012	0.00000013	0.000001	0.0006	0.00006	0.0006	40	37
R8	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000011	0.00000012	0.000001	0.0005	0.00006	0.0006	5.8	5
R9	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000011	0.00000012	0.000001	0.0005	0.00006	0.0006	5.3	5
R10	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000010	0.00000011	0.000001	0.0005	0.00006	0.0005	5.3	5
R11	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000020	0.00000019	0.000002	0.0010	0.00009	0.0011	12	11
R12	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000016	0.00000017	0.000002	0.0008	0.00008	0.0008	8.9	8
R13	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000021	0.00000018	0.000002	0.0010	0.00009	0.0011	6.4	6
R14	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000016	0.00000016	0.000002	0.0008	0.00008	0.0008	8.8	8
R15	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000007	0.00000009	0.000001	0.0004	0.00004	0.0004	5.4	5
R16	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000081	0.00000040	0.000008	0.0039	0.00019	0.0041	14	13
R17	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000010	0.00000012	0.000001	0.0005	0.00006	0.0006	11	10
R18	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000030	0.00000028	0.000003	0.0014	0.00014	0.0016	11	10
R19	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000006	0.00000008	0.000001	0.0003	0.00004	0.0003	8.7	8
R20	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000017	0.00000017	0.000002	0.0008	0.00008	0.0009	11	10
R21	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000013	0.00000013	0.000001	0.0006	0.00006	0.0007	2.5	2
R22	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000009	0.00000009	0.000001	0.0004	0.00004	0.0005	9.1	9
R23	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000016	0.00000017	0.000002	0.0008	0.00008	0.0009	13	12
R24	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000016	0.00000013	0.000002	0.0008	0.00006	0.0009	11	10
R25	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000053	0.00000045	0.000006	0.0026	0.00022	0.0028	11	10
R26	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000125	0.00000063	0.000013	0.0061	0.00030	0.0064	7.7	7
R27	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000055	0.00000031	0.000006	0.0026	0.00015	0.0028	11	10
R28	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000052	0.00000032	0.000006	0.0025	0.00016	0.0027	39	37
R29	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000041	0.00000029	0.000004	0.0020	0.00014	0.0021	39	37
R30	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000017	0.00000018	0.000002	0.0008	0.00009	0.0009	9.5	9
R31	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000084	0.00000084	0.000009	0.0041	0.00041	0.0045	7.7	7
R32	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000011	0.00000012	0.000001	0.0005	0.00006	0.0006	11	10
R33	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000024	0.00000023	0.000003	0.0012	0.00011	0.0013	8.8	8
R34	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000015	0.00000015	0.000002	0.0007	0.00007	0.0008	8.9	8
R35	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000008	0.00000010	0.000001	0.0004	0.00005	0.0004	5.3	5
R36	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000013	0.00000014	0.000001	0.0006	0.00007	0.0007	10	9
R37	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000033	0.00000024	0.000003	0.0016	0.00012	0.0017	11	10
R38	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000014	0.00000014	0.000001	0.0007	0.00007	0.0007	2.5	2
R39	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000009	0.00000010	0.000001	0.0004	0.00005	0.0005	10	9
R40	61	6.39	15.4	24.7	0.2	1900	1.5	2	0.0043	0.0043	15	0.0000009	0.00000010	0.000001	0.0004	0.00005	0.0005	10	9

Ag operations

Silver (Ag)												Annual metal deposition			Additional soil metal concentration after 15 yrs remaining mine life				
	Curve Number	Potential max retention after runoff begins	Annual rainfall	Avg annual surface runoff from pervious areas	Soil volumetric water content	Soil/water partition coefficient	Bulk density of soil	Soil mixing zone depth	Metal loss constant due to surface runoff	Metal soil loss constant due to all processes	Time period over which deposition occurs	S1: Current situation	S2: Proposal increment	S3: Cumulative proposed situation	S1: Current situation	S2: Proposal increment	S3: Cumulative proposed situation	Existing soil metal concentration	Existing soil metal concentration incorporating loss over 15 yrs
ID	CN (inches)	S (inches)	P (inch/yr)	RO (cm/yr)	θ_{SW} (mL water/cm ³ soil)	Kd _s (mL water/g soil)	BD (g/cm ³)	D (cm)	ksr (year ⁻¹)	ks (year ⁻¹)	tD (years)	M _{ann dep} (g/m ² /yr)			C _s (µg/g)			C _{s_existing} (µg/g)	C _{s_existing(end)} (µg/g)
R1	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000006	Not Av	0.00000006	0.000014	Not Av	0.000014	0.4	0.09
R2	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000006	Not Av	0.00000006	0.000015	Not Av	0.000015	0.1	0.02
R3	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000009	Not Av	0.00000009	0.000023	Not Av	0.000023	0.6	0.14
R4	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000004	Not Av	0.00000004	0.000010	Not Av	0.000010	1	0.23
R5	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000003	Not Av	0.00000003	0.000008	Not Av	0.000008	0.1	0.02
R6	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000002	Not Av	0.00000002	0.000005	Not Av	0.000005	0.1	0.02
R7	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000003	Not Av	0.00000003	0.000007	Not Av	0.000007	0.1	0.02
R8	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000003	Not Av	0.00000003	0.000007	Not Av	0.000007	0.1	0.02
R9	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000002	Not Av	0.00000002	0.000005	Not Av	0.000005	0.1	0.02
R10	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000002	Not Av	0.00000002	0.000005	Not Av	0.000005	0.1	0.02
R11	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000004	Not Av	0.00000004	0.000011	Not Av	0.000011	0.1	0.02
R12	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000003	Not Av	0.00000003	0.000009	Not Av	0.000009	0.1	0.02
R13	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000005	Not Av	0.00000005	0.000012	Not Av	0.000012	0.1	0.02
R14	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000003	Not Av	0.00000003	0.000008	Not Av	0.000008	0.1	0.02
R15	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000002	Not Av	0.00000002	0.000005	Not Av	0.000005	0.1	0.02
R16	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000017	Not Av	0.00000017	0.000044	Not Av	0.000044	0.1	0.02
R17	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000002	Not Av	0.00000002	0.000006	Not Av	0.000006	0.1	0.02
R18	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000004	Not Av	0.00000004	0.000011	Not Av	0.000011	0.1	0.02
R19	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000002	Not Av	0.00000002	0.000005	Not Av	0.000005	0.2	0.05
R20	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000004	Not Av	0.00000004	0.000010	Not Av	0.000010	0.1	0.02
R21	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000003	Not Av	0.00000003	0.000009	Not Av	0.000009	0.1	0.02
R22	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000003	Not Av	0.00000003	0.000007	Not Av	0.000007	0.1	0.02
R23	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000003	Not Av	0.00000003	0.000007	Not Av	0.000007	0.1	0.02
R24	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000005	Not Av	0.00000005	0.000014	Not Av	0.000014	0.1	0.02
R25	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000020	Not Av	0.00000020	0.000051	Not Av	0.000051	0.1	0.02
R26	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000024	Not Av	0.00000024	0.000062	Not Av	0.000062	0.1	0.02
R27	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000010	Not Av	0.00000010	0.000026	Not Av	0.000026	0.1	0.02
R28	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000010	Not Av	0.00000010	0.000025	Not Av	0.000025	0.6	0.14
R29	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000007	Not Av	0.00000007	0.000019	Not Av	0.000019	0.6	0.14
R30	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000004	Not Av	0.00000004	0.000009	Not Av	0.000009	0.1	0.02
R31	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000018	Not Av	0.00000018	0.000047	Not Av	0.000047	0.1	0.02
R32	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000002	Not Av	0.00000002	0.000006	Not Av	0.000006	0.1	0.02
R33	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000004	Not Av	0.00000004	0.000011	Not Av	0.000011	0.1	0.02
R34	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000003	Not Av	0.00000003	0.000009	Not Av	0.000009	0.1	0.02
R35	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000002	Not Av	0.00000002	0.000004	Not Av	0.000004	0.1	0.02
R36	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000003	Not Av	0.00000003	0.000007	Not Av	0.000007	0.1	0.02
R37	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000007	Not Av	0.00000007	0.000017	Not Av	0.000017	0.3	0.07
R38	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000003	Not Av	0.00000003	0.000009	Not Av	0.000009	0.1	0.02
R39	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000002	Not Av	0.00000002	0.000006	Not Av	0.000006	0.1	0.02
R40	61	6.39	15.4	24.7	0.2	83	1.5	2	0.0990	0.0990	15	0.00000002	Not Av	0.00000002	0.000006	Not Av	0.000006	0.1	0.02

Zn operations

Zinc (Zn)												Annual metal deposition			Additional soil metal concentration after 15 yrs remaining mine life				
	Curve Number	Potential max retention after runoff begins	Annual rainfall	Avg annual surface runoff from pervious areas	Soil volumetric water content	Soil/water partition coefficient	Bulk density of soil	Soil mixing zone depth	Metal loss constant due to surface runoff	Metal soil loss constant due to all processes	Time period over which deposition occurs	S1: Current situation	S2: Proposal increment	S3: Cumulative proposed situation	S1: Current situation	S2: Proposal increment	S3: Cumulative proposed situation	Existing soil metal concentration	Existing soil metal concentration incorporating loss over 15 yrs
ID	CN (inches)	S (inches)	P (inch/yr)	RO (cm/yr)	θ_{SW} (mL water/cm ³ soil)	Kd _s (mL water/g soil)	BD (g/cm ³)	D (cm)	ksr (year ⁻¹)	ks (year ⁻¹)	tD (years)	M _{ann dep} (g/m ² /yr)			C _s (µg/g)			C _{s_existing} (µg/g)	C _{s_existing(end)} (µg/g)
R1	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0006	0.0037	0.0043	0.13	0.79	0.92	300	41
R2	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0011	0.0222	0.0233	0.24	4.82	5.07	100	14
R3	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0009	0.0043	0.0052	0.19	0.94	1.14	780	107
R4	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0005	0.0027	0.0031	0.10	0.58	0.68	580	80
R5	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0003	0.0014	0.0017	0.08	0.30	0.38	26	4
R6	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0002	0.0004	0.0005	0.03	0.08	0.12	76	10
R7	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0003	0.0008	0.0010	0.06	0.17	0.23	110	15
R8	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0002	0.0007	0.0009	0.05	0.15	0.20	32	4
R9	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0002	0.0006	0.0008	0.04	0.13	0.17	120	16
R10	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0002	0.0005	0.0007	0.03	0.11	0.14	120	16
R11	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0005	0.0026	0.0031	0.10	0.57	0.67	62	9
R12	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0004	0.0018	0.0022	0.08	0.39	0.48	120	16
R13	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0005	0.0022	0.0027	0.10	0.48	0.58	33	5
R14	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0003	0.0012	0.0015	0.07	0.25	0.32	98	13
R15	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0001	0.0002	0.0004	0.03	0.05	0.08	78	11
R16	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0013	0.0007	0.0021	0.29	0.16	0.45	38	5
R17	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0002	0.0005	0.0007	0.05	0.11	0.16	120	16
R18	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0007	0.0116	0.0124	0.16	2.53	2.68	120	16
R19	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0001	0.0002	0.0003	0.03	0.05	0.07	63	9
R20	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0004	0.0021	0.0025	0.09	0.45	0.53	140	19
R21	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0003	0.0007	0.0010	0.06	0.15	0.21	79	11
R22	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0001	0.0003	0.0004	0.03	0.06	0.09	41	6
R23	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0003	0.0014	0.0017	0.06	0.31	0.36	72	10
R24	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0002	0.0002	0.0005	0.05	0.05	0.10	35	5
R25	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0010	0.0001	0.0011	0.21	0.03	0.24	44	6
R26	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0021	0.0004	0.0025	0.45	0.08	0.53	39	5
R27	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0009	0.0023	0.0033	0.20	0.51	0.71	65	9
R28	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0009	0.0034	0.0043	0.19	0.75	0.94	780	107
R29	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0008	0.0041	0.0049	0.17	0.89	1.06	780	107
R30	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0004	0.0024	0.0028	0.09	0.52	0.61	34	5
R31	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0012	0.0002	0.0014	0.25	0.05	0.30	39	5
R32	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0002	0.0005	0.0007	0.05	0.11	0.16	120	16
R33	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0005	0.0047	0.0052	0.10	1.02	1.12	98	13
R34	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0003	0.0014	0.0018	0.07	0.31	0.39	120	16
R35	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0001	0.0003	0.0004	0.03	0.06	0.09	120	16
R36	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0003	0.0007	0.0010	0.06	0.16	0.22	75	10
R37	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0006	0.0019	0.0025	0.12	0.42	0.54	360	49
R38	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0003	0.0009	0.0012	0.06	0.19	0.26	79	11
R39	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0002	0.0004	0.0006	0.04	0.09	0.13	190	26
R40	61	6.39	15.4	24.7	0.2	62	1.5	2	0.1325	0.1325	15	0.0002	0.0004	0.0006	0.04	0.09	0.13	190	26

APPENDIX F

Air Metal (in PM₁₀) concentrations used in HHRA

Lead (Pb)	Annual avg metal in PM ₁₀ (mine-only)				Annual avg metal in PM ₁₀ (mine+background, except S2)		
	S1: Existing situation	S2: Proposal Increment	S3: Cumulative Proposed Situation	Background	S1: Existing situation	S2: Proposal Increment	S3: Cumulative Proposed Situation
ID	µg/m ³			µg/m ³	PbA (µg/m ³)		
R1	0.00017	0.00033	0.0005	0.009	0.0092	0.00033	0.0095
R2	0.00023	0.00215	0.0024	0.009	0.0092	0.00215	0.0114
R3	0.00021	0.00028	0.0005	0.009	0.0092	0.00028	0.0095
R4	0.00014	0.00022	0.0004	0.009	0.0091	0.00022	0.0094
R5	0.00013	0.00019	0.0003	0.009	0.0091	0.00019	0.0093
R6	0.00008	0.00009	0.0002	0.009	0.0091	0.00009	0.0092
R7	0.00011	0.00013	0.0002	0.009	0.0091	0.00013	0.0092
R8	0.00010	0.00012	0.0002	0.009	0.0091	0.00012	0.0092
R9	0.00009	0.00014	0.0002	0.009	0.0091	0.00014	0.0092
R10	0.00008	0.00011	0.0002	0.009	0.0091	0.00011	0.0092
R11	0.00015	0.00024	0.0004	0.009	0.0091	0.00024	0.0094
R12	0.00013	0.00017	0.0003	0.009	0.0091	0.00017	0.0093
R13	0.00015	0.00023	0.0004	0.009	0.0091	0.00023	0.0094
R14	0.00012	0.00017	0.0003	0.009	0.0091	0.00017	0.0093
R15	0.00008	0.00007	0.0001	0.009	0.0091	0.00007	0.0091
R16	0.00026	0.00006	0.0003	0.009	0.0093	0.00006	0.0093
R17	0.00010	0.00011	0.0002	0.009	0.0091	0.00011	0.0092
R18	0.00020	0.00098	0.0012	0.009	0.0092	0.00098	0.0102
R19	0.00007	0.00006	0.0001	0.009	0.0091	0.00006	0.0091
R20	0.00014	0.00019	0.0003	0.009	0.0091	0.00019	0.0093
R21	0.00011	0.00011	0.0002	0.009	0.0091	0.00011	0.0092
R22	0.00008	0.00006	0.0001	0.009	0.0091	0.00006	0.0091
R23	0.00011	0.00020	0.0003	0.009	0.0091	0.00020	0.0093
R24	0.00010	0.00005	0.0001	0.009	0.0091	0.00005	0.0091
R25	0.00028	0.00005	0.0003	0.009	0.0093	0.00005	0.0093
R26	0.00037	0.00007	0.0004	0.009	0.0094	0.00007	0.0094
R27	0.00021	0.00013	0.0003	0.009	0.0092	0.00013	0.0093
R28	0.00021	0.00022	0.0004	0.009	0.0092	0.00022	0.0094
R29	0.00020	0.00025	0.0004	0.009	0.0092	0.00025	0.0094
R30	0.00014	0.00020	0.0003	0.009	0.0091	0.00020	0.0093
R31	0.00029	0.00006	0.0004	0.009	0.0093	0.00006	0.0094
R32	0.00010	0.00011	0.0002	0.009	0.0091	0.00011	0.0092
R33	0.00016	0.00046	0.0006	0.009	0.0092	0.00046	0.0096
R34	0.00012	0.00015	0.0003	0.009	0.0091	0.00015	0.0093
R35	0.00007	0.00007	0.0001	0.009	0.0091	0.00007	0.0091
R36	0.00011	0.00013	0.0002	0.009	0.0091	0.00013	0.0092
R37	0.00017	0.00017	0.0003	0.009	0.0092	0.00017	0.0093
R38	0.00012	0.00013	0.0002	0.009	0.0091	0.00013	0.0092
R39	0.00009	0.00008	0.0002	0.009	0.0091	0.00008	0.0092
R40	0.00009	0.00009	0.0002	0.009	0.0091	0.00009	0.0092

Antimony (Sb)	Annual avg metal in PM ₁₀ (mine-only)		
	S1: Existing situation	S2: Proposal Increment	S3: Cumulative Proposed Situation
ID	C _A (µg/m ³)		
R1	0.0000006	Not Av	0.0000006
R2	0.0000006	Not Av	0.0000006
R3	0.0000008	Not Av	0.0000008
R4	0.0000005	Not Av	0.0000005
R5	0.0000004	Not Av	0.0000004
R6	0.0000002	Not Av	0.0000002
R7	0.0000004	Not Av	0.0000004
R8	0.0000004	Not Av	0.0000004
R9	0.0000002	Not Av	0.0000002
R10	0.0000002	Not Av	0.0000002
R11	0.0000005	Not Av	0.0000005
R12	0.0000005	Not Av	0.0000005
R13	0.0000005	Not Av	0.0000005
R14	0.0000004	Not Av	0.0000004
R15	0.0000002	Not Av	0.0000002
R16	0.0000013	Not Av	0.0000013
R17	0.0000003	Not Av	0.0000003
R18	0.0000005	Not Av	0.0000005
R19	0.0000002	Not Av	0.0000002
R20	0.0000005	Not Av	0.0000005
R21	0.0000004	Not Av	0.0000004
R22	0.0000004	Not Av	0.0000004
R23	0.0000003	Not Av	0.0000003
R24	0.0000007	Not Av	0.0000007
R25	0.0000025	Not Av	0.0000025
R26	0.0000017	Not Av	0.0000017
R27	0.0000009	Not Av	0.0000009
R28	0.0000008	Not Av	0.0000008
R29	0.0000007	Not Av	0.0000007
R30	0.0000005	Not Av	0.0000005
R31	0.0000009	Not Av	0.0000009
R32	0.0000003	Not Av	0.0000003
R33	0.0000004	Not Av	0.0000004
R34	0.0000004	Not Av	0.0000004
R35	0.0000002	Not Av	0.0000002
R36	0.0000003	Not Av	0.0000003
R37	0.0000006	Not Av	0.0000006
R38	0.0000004	Not Av	0.0000004
R39	0.0000004	Not Av	0.0000004
R40	0.0000003	Not Av	0.0000003
Not Av = Not available; geochemistry profiles from site samples were not available for this metal, therefore no associated emissions could be modelled.			

Arsenic (As)		Annual avg metal in PM ₁₀ (mine-only)	
	S1: Existing situation	S2: Proposal Increment	S3: Cumulative Proposed Situation
ID	C _A (µg/m ³)		
R1	0.000008	0.0000010	0.000009
R2	0.000011	0.0000015	0.000013
R3	0.000010	0.0000011	0.000011
R4	0.000007	0.0000010	0.000008
R5	0.000006	0.0000009	0.000007
R6	0.000004	0.0000007	0.000004
R7	0.000005	0.0000008	0.000006
R8	0.000005	0.0000007	0.000005
R9	0.000004	0.0000007	0.000004
R10	0.000003	0.0000006	0.000004
R11	0.000007	0.0000010	0.000008
R12	0.000006	0.0000009	0.000007
R13	0.000007	0.0000010	0.000008
R14	0.000006	0.0000009	0.000006
R15	0.000003	0.0000006	0.000004
R16	0.000012	0.0000014	0.000014
R17	0.000004	0.0000007	0.000005
R18	0.000010	0.0000013	0.000011
R19	0.000003	0.0000005	0.000004
R20	0.000006	0.0000009	0.000007
R21	0.000005	0.0000007	0.000006
R22	0.000003	0.0000006	0.000004
R23	0.000005	0.0000008	0.000006
R24	0.000004	0.0000006	0.000004
R25	0.000011	0.0000018	0.000013
R26	0.000019	0.0000024	0.000021
R27	0.000009	0.0000011	0.000011
R28	0.000010	0.0000011	0.000011
R29	0.000009	0.0000011	0.000010
R30	0.000006	0.0000009	0.000007
R31	0.000014	0.0000022	0.000016
R32	0.000004	0.0000007	0.000005
R33	0.000007	0.0000011	0.000008
R34	0.000006	0.0000009	0.000006
R35	0.000003	0.0000006	0.000004
R36	0.000005	0.0000008	0.000006
R37	0.000007	0.0000010	0.000008
R38	0.000005	0.0000008	0.000006
R39	0.000004	0.0000007	0.000005
R40	0.000004	0.0000007	0.000005

Barium (Ba)	Annual avg metal in PM ₁₀ (mine-only)		
	S1: Existing situation	S2: Proposal Increment	S3: Cumulative Proposed Situation
ID	C _A (µg/m ³)		
R1	0.000015	Not Av	0.000015
R2	0.000018	Not Av	0.000018
R3	0.000019	Not Av	0.000019
R4	0.000014	Not Av	0.000014
R5	0.000013	Not Av	0.000013
R6	0.000011	Not Av	0.000011
R7	0.000012	Not Av	0.000012
R8	0.000012	Not Av	0.000012
R9	0.000011	Not Av	0.000011
R10	0.000011	Not Av	0.000011
R11	0.000014	Not Av	0.000014
R12	0.000013	Not Av	0.000013
R13	0.000014	Not Av	0.000014
R14	0.000013	Not Av	0.000013
R15	0.000010	Not Av	0.000010
R16	0.000028	Not Av	0.000028
R17	0.000011	Not Av	0.000011
R18	0.000016	Not Av	0.000016
R19	0.000009	Not Av	0.000009
R20	0.000014	Not Av	0.000014
R21	0.000012	Not Av	0.000012
R22	0.000010	Not Av	0.000010
R23	0.000013	Not Av	0.000013
R24	0.000012	Not Av	0.000012
R25	0.000039	Not Av	0.000039
R26	0.000037	Not Av	0.000037
R27	0.000021	Not Av	0.000021
R28	0.000020	Not Av	0.000020
R29	0.000017	Not Av	0.000017
R30	0.000014	Not Av	0.000014
R31	0.000037	Not Av	0.000037
R32	0.000011	Not Av	0.000011
R33	0.000015	Not Av	0.000015
R34	0.000013	Not Av	0.000013
R35	0.000010	Not Av	0.000010
R36	0.000012	Not Av	0.000012
R37	0.000016	Not Av	0.000016
R38	0.000012	Not Av	0.000012
R39	0.000011	Not Av	0.000011
R40	0.000011	Not Av	0.000011
Not Av = Not available; geochemistry profiles from site samples were not available for this metal, therefore no associated emissions could be modelled.			

Beryllium (Be)		Annual avg metal in PM ₁₀ (mine-only)	
	S1: Existing situation	S2: Proposal Increment	S3: Cumulative Proposed Situation
ID	C _A (µg/m ³)		
R1	0.00000008	Not Av	0.00000008
R2	0.00000009	Not Av	0.00000009
R3	0.00000010	Not Av	0.00000010
R4	0.00000007	Not Av	0.00000007
R5	0.00000007	Not Av	0.00000007
R6	0.00000006	Not Av	0.00000006
R7	0.00000006	Not Av	0.00000006
R8	0.00000006	Not Av	0.00000006
R9	0.00000006	Not Av	0.00000006
R10	0.00000006	Not Av	0.00000006
R11	0.00000007	Not Av	0.00000007
R12	0.00000007	Not Av	0.00000007
R13	0.00000007	Not Av	0.00000007
R14	0.00000007	Not Av	0.00000007
R15	0.00000005	Not Av	0.00000005
R16	0.00000014	Not Av	0.00000014
R17	0.00000006	Not Av	0.00000006
R18	0.00000008	Not Av	0.00000008
R19	0.00000005	Not Av	0.00000005
R20	0.00000007	Not Av	0.00000007
R21	0.00000006	Not Av	0.00000006
R22	0.00000005	Not Av	0.00000005
R23	0.00000007	Not Av	0.00000007
R24	0.00000006	Not Av	0.00000006
R25	0.00000020	Not Av	0.00000020
R26	0.00000019	Not Av	0.00000019
R27	0.00000011	Not Av	0.00000011
R28	0.00000010	Not Av	0.00000010
R29	0.00000009	Not Av	0.00000009
R30	0.00000007	Not Av	0.00000007
R31	0.00000019	Not Av	0.00000019
R32	0.00000006	Not Av	0.00000006
R33	0.00000008	Not Av	0.00000008
R34	0.00000007	Not Av	0.00000007
R35	0.00000005	Not Av	0.00000005
R36	0.00000006	Not Av	0.00000006
R37	0.00000008	Not Av	0.00000008
R38	0.00000006	Not Av	0.00000006
R39	0.00000006	Not Av	0.00000006
R40	0.00000005	Not Av	0.00000005
Not Av = Not available; geochemistry profiles from site samples were not available for this metal, therefore no associated emissions could be modelled.			

Cadmium (Cd)	Annual avg metal in PM ₁₀ (mine-only)		
	S1: Existing situation	S2: Proposal Increment	S3: Cumulative Proposed Situation
ID	C _A (µg/m ³)		
R1	0.0000004	0.00000005	0.0000004
R2	0.0000006	0.00000007	0.0000006
R3	0.0000005	0.00000005	0.0000006
R4	0.0000003	0.00000004	0.0000004
R5	0.0000003	0.00000004	0.0000003
R6	0.0000002	0.00000003	0.0000002
R7	0.0000002	0.00000004	0.0000003
R8	0.0000002	0.00000003	0.0000003
R9	0.0000002	0.00000003	0.0000002
R10	0.0000002	0.00000003	0.0000002
R11	0.0000003	0.00000004	0.0000004
R12	0.0000003	0.00000004	0.0000003
R13	0.0000003	0.00000004	0.0000004
R14	0.0000003	0.00000004	0.0000003
R15	0.0000002	0.00000003	0.0000002
R16	0.0000007	0.00000006	0.0000008
R17	0.0000002	0.00000003	0.0000002
R18	0.0000005	0.00000006	0.0000005
R19	0.0000001	0.00000002	0.0000002
R20	0.0000003	0.00000004	0.0000004
R21	0.0000002	0.00000003	0.0000003
R22	0.0000002	0.00000003	0.0000002
R23	0.0000002	0.00000004	0.0000002
R24	0.0000003	0.00000003	0.0000003
R25	0.0000008	0.00000008	0.0000009
R26	0.0000010	0.00000011	0.0000011
R27	0.0000005	0.00000005	0.0000006
R28	0.0000005	0.00000005	0.0000006
R29	0.0000005	0.00000005	0.0000005
R30	0.0000003	0.00000004	0.0000004
R31	0.0000006	0.00000010	0.0000007
R32	0.0000002	0.00000003	0.0000002
R33	0.0000003	0.00000005	0.0000004
R34	0.0000003	0.00000004	0.0000003
R35	0.0000001	0.00000003	0.0000002
R36	0.0000002	0.00000004	0.0000003
R37	0.0000004	0.00000004	0.0000004
R38	0.0000003	0.00000004	0.0000003
R39	0.0000002	0.00000003	0.0000002
R40	0.0000002	0.00000003	0.0000002

Chromium (Cr)	Annual avg metal in PM ₁₀ (mine-only)		
	S1: Existing situation	S2: Proposal Increment	S3: Cumulative Proposed Situation
ID	C _A (µg/m ³)		
R1	0.000026	0.00008	0.00011
R2	0.000036	0.00055	0.00058
R3	0.000033	0.00007	0.00010
R4	0.000023	0.00005	0.00008
R5	0.000021	0.00005	0.00007
R6	0.000015	0.00002	0.00004
R7	0.000018	0.00003	0.00005
R8	0.000017	0.00003	0.00005
R9	0.000016	0.00003	0.00005
R10	0.000015	0.00003	0.00004
R11	0.000024	0.00006	0.00008
R12	0.000021	0.00004	0.00006
R13	0.000023	0.00006	0.00008
R14	0.000020	0.00004	0.00006
R15	0.000013	0.00002	0.00003
R16	0.000038	0.00001	0.00005
R17	0.000016	0.00003	0.00004
R18	0.000031	0.00025	0.00028
R19	0.000013	0.00001	0.00003
R20	0.000022	0.00005	0.00007
R21	0.000018	0.00003	0.00005
R22	0.000014	0.00002	0.00003
R23	0.000019	0.00005	0.00007
R24	0.000015	0.00001	0.00003
R25	0.000036	0.00001	0.00005
R26	0.000052	0.00001	0.00006
R27	0.000032	0.00003	0.00006
R28	0.000032	0.00005	0.00009
R29	0.000031	0.00006	0.00009
R30	0.000022	0.00005	0.00007
R31	0.000049	0.00001	0.00006
R32	0.000017	0.00003	0.00004
R33	0.000025	0.00012	0.00014
R34	0.000020	0.00004	0.00006
R35	0.000013	0.00002	0.00003
R36	0.000018	0.00003	0.00005
R37	0.000026	0.00004	0.00007
R38	0.000019	0.00003	0.00005
R39	0.000016	0.00002	0.00003
R40	0.000015	0.00002	0.00004

Copper (Cu)	Annual avg metal in PM ₁₀ (mine-only)		
	S1: Existing situation	S2: Proposal Increment	S3: Cumulative Proposed Situation
ID	C _A (µg/m ³)		
R1	0.00054	0.00032	0.00086
R2	0.00071	0.00202	0.00274
R3	0.00067	0.00028	0.00095
R4	0.00048	0.00022	0.00070
R5	0.00043	0.00020	0.00063
R6	0.00033	0.00009	0.00043
R7	0.00038	0.00014	0.00052
R8	0.00037	0.00012	0.00049
R9	0.00034	0.00014	0.00048
R10	0.00033	0.00011	0.00044
R11	0.00049	0.00024	0.00073
R12	0.00044	0.00018	0.00062
R13	0.00048	0.00023	0.00071
R14	0.00042	0.00018	0.00060
R15	0.00029	0.00007	0.00037
R16	0.00088	0.00008	0.00096
R17	0.00035	0.00011	0.00047
R18	0.00063	0.00094	0.00157
R19	0.00028	0.00006	0.00034
R20	0.00045	0.00019	0.00064
R21	0.00038	0.00012	0.00050
R22	0.00030	0.00007	0.00037
R23	0.00041	0.00020	0.00061
R24	0.00033	0.00005	0.00039
R25	0.00097	0.00008	0.00105
R26	0.00123	0.00011	0.00134
R27	0.00068	0.00014	0.00082
R28	0.00068	0.00022	0.00090
R29	0.00062	0.00025	0.00087
R30	0.00047	0.00021	0.00067
R31	0.00114	0.00010	0.00124
R32	0.00036	0.00012	0.00047
R33	0.00052	0.00045	0.00097
R34	0.00042	0.00015	0.00058
R35	0.00030	0.00007	0.00037
R36	0.00039	0.00013	0.00053
R37	0.00054	0.00018	0.00072
R38	0.00039	0.00013	0.00052
R39	0.00033	0.00008	0.00041
R40	0.00033	0.00009	0.00042

Manganese (Mn)		Annual avg metal in PM ₁₀ (mine-only)	
	S1: Existing situation	S2: Proposal Increment	S3: Cumulative Proposed Situation
ID	C _A (µg/m ³)		
R1	0.00022	0.00029	0.00051
R2	0.00032	0.00186	0.00217
R3	0.00027	0.00025	0.00053
R4	0.00019	0.00020	0.00039
R5	0.00017	0.00018	0.00035
R6	0.00012	0.00008	0.00020
R7	0.00014	0.00012	0.00026
R8	0.00014	0.00011	0.00025
R9	0.00012	0.00012	0.00024
R10	0.00011	0.00010	0.00021
R11	0.00019	0.00022	0.00041
R12	0.00017	0.00016	0.00033
R13	0.00019	0.00021	0.00040
R14	0.00016	0.00016	0.00032
R15	0.00010	0.00006	0.00017
R16	0.00033	0.00007	0.00040
R17	0.00013	0.00010	0.00023
R18	0.00027	0.00086	0.00113
R19	0.00010	0.00006	0.00015
R20	0.00018	0.00017	0.00035
R21	0.00014	0.00010	0.00025
R22	0.00011	0.00006	0.00017
R23	0.00015	0.00018	0.00033
R24	0.00011	0.00005	0.00015
R25	0.00028	0.00006	0.00034
R26	0.00048	0.00008	0.00057
R27	0.00027	0.00012	0.00038
R28	0.00027	0.00020	0.00047
R29	0.00026	0.00022	0.00048
R30	0.00018	0.00018	0.00037
R31	0.00041	0.00008	0.00049
R32	0.00013	0.00010	0.00024
R33	0.00021	0.00041	0.00062
R34	0.00016	0.00014	0.00030
R35	0.00010	0.00006	0.00016
R36	0.00015	0.00012	0.00027
R37	0.00021	0.00016	0.00037
R38	0.00015	0.00012	0.00026
R39	0.00012	0.00007	0.00019
R40	0.00012	0.00008	0.00020

Mercury (Hg)	Annual avg metal in PM ₁₀ (mine-only)		
	S1: Existing situation	S2: Proposal Increment	S3: Cumulative Proposed Situation
ID	C _A (µg/m ³)		
R1	0.00000008	0.00000005	0.00000013
R2	0.00000012	0.00000030	0.00000042
R3	0.00000010	0.00000005	0.00000014
R4	0.00000006	0.00000004	0.00000010
R5	0.00000006	0.00000003	0.00000009
R6	0.00000004	0.00000002	0.00000005
R7	0.00000005	0.00000002	0.00000007
R8	0.00000004	0.00000002	0.00000007
R9	0.00000004	0.00000002	0.00000006
R10	0.00000003	0.00000002	0.00000005
R11	0.00000007	0.00000004	0.00000011
R12	0.00000006	0.00000003	0.00000009
R13	0.00000006	0.00000004	0.00000010
R14	0.00000006	0.00000003	0.00000009
R15	0.00000003	0.00000001	0.00000005
R16	0.00000011	0.00000002	0.00000014
R17	0.00000004	0.00000002	0.00000006
R18	0.00000010	0.00000015	0.00000024
R19	0.00000003	0.00000001	0.00000004
R20	0.00000006	0.00000003	0.00000009
R21	0.00000005	0.00000002	0.00000007
R22	0.00000003	0.00000001	0.00000005
R23	0.00000005	0.00000003	0.00000008
R24	0.00000003	0.00000001	0.00000004
R25	0.00000008	0.00000002	0.00000010
R26	0.00000017	0.00000003	0.00000021
R27	0.00000009	0.00000003	0.00000012
R28	0.00000009	0.00000004	0.00000013
R29	0.00000009	0.00000004	0.00000013
R30	0.00000006	0.00000004	0.00000010
R31	0.00000013	0.00000003	0.00000016
R32	0.00000004	0.00000002	0.00000007
R33	0.00000007	0.00000007	0.00000015
R34	0.00000005	0.00000003	0.00000008
R35	0.00000003	0.00000001	0.00000004
R36	0.00000005	0.00000002	0.00000007
R37	0.00000007	0.00000003	0.00000011
R38	0.00000005	0.00000002	0.00000007
R39	0.00000004	0.00000002	0.00000005
R40	0.00000004	0.00000002	0.00000006

Nickel (Ni)			
Annual avg metal in PM ₁₀ (mine-only)			
	S1: Existing situation	S2: Proposal Increment	S3: Cumulative Proposed Situation
ID	C _A (µg/m ³)		
R1	0.0000045	0.0000006	0.0000050
R2	0.0000066	0.0000008	0.0000074
R3	0.0000056	0.0000006	0.0000062
R4	0.0000039	0.0000005	0.0000044
R5	0.0000035	0.0000005	0.0000039
R6	0.0000023	0.0000004	0.0000026
R7	0.0000029	0.0000004	0.0000033
R8	0.0000027	0.0000004	0.0000032
R9	0.0000023	0.0000004	0.0000026
R10	0.0000022	0.0000003	0.0000025
R11	0.0000039	0.0000005	0.0000044
R12	0.0000035	0.0000005	0.0000040
R13	0.0000038	0.0000005	0.0000044
R14	0.0000033	0.0000005	0.0000038
R15	0.0000020	0.0000003	0.0000024
R16	0.0000071	0.0000008	0.0000079
R17	0.0000026	0.0000004	0.0000030
R18	0.0000056	0.0000007	0.0000063
R19	0.0000019	0.0000003	0.0000022
R20	0.0000036	0.0000005	0.0000041
R21	0.0000028	0.0000004	0.0000032
R22	0.0000020	0.0000003	0.0000023
R23	0.0000029	0.0000004	0.0000034
R24	0.0000022	0.0000003	0.0000025
R25	0.0000063	0.0000010	0.0000073
R26	0.0000106	0.0000013	0.0000119
R27	0.0000054	0.0000006	0.0000061
R28	0.0000055	0.0000006	0.0000061
R29	0.0000052	0.0000006	0.0000058
R30	0.0000037	0.0000005	0.0000043
R31	0.0000084	0.0000012	0.0000096
R32	0.0000027	0.0000004	0.0000031
R33	0.0000042	0.0000006	0.0000048
R34	0.0000033	0.0000005	0.0000038
R35	0.0000019	0.0000003	0.0000022
R36	0.0000030	0.0000004	0.0000034
R37	0.0000043	0.0000005	0.0000049
R38	0.0000030	0.0000004	0.0000034
R39	0.0000023	0.0000004	0.0000027
R40	0.0000024	0.0000004	0.0000027

Silver (Ag)			
Annual avg metal in PM ₁₀ (mine-only)			
	S1: Existing situation	S2: Proposal Increment	S3: Cumulative Proposed Situation
ID	C _A (µg/m ³)		
R1	0.00000009	Not Av	0.00000009
R2	0.00000011	Not Av	0.00000011
R3	0.00000011	Not Av	0.00000011
R4	0.00000008	Not Av	0.00000008
R5	0.00000008	Not Av	0.00000008
R6	0.00000006	Not Av	0.00000006
R7	0.00000007	Not Av	0.00000007
R8	0.00000007	Not Av	0.00000007
R9	0.00000006	Not Av	0.00000006
R10	0.00000006	Not Av	0.00000006
R11	0.00000008	Not Av	0.00000008
R12	0.00000008	Not Av	0.00000008
R13	0.00000008	Not Av	0.00000008
R14	0.00000007	Not Av	0.00000007
R15	0.00000006	Not Av	0.00000006
R16	0.00000017	Not Av	0.00000017
R17	0.00000006	Not Av	0.00000006
R18	0.00000010	Not Av	0.00000010
R19	0.00000005	Not Av	0.00000005
R20	0.00000008	Not Av	0.00000008
R21	0.00000007	Not Av	0.00000007
R22	0.00000006	Not Av	0.00000006
R23	0.00000007	Not Av	0.00000007
R24	0.00000008	Not Av	0.00000008
R25	0.00000024	Not Av	0.00000024
R26	0.00000022	Not Av	0.00000022
R27	0.00000012	Not Av	0.00000012
R28	0.00000012	Not Av	0.00000012
R29	0.00000010	Not Av	0.00000010
R30	0.00000008	Not Av	0.00000008
R31	0.00000021	Not Av	0.00000021
R32	0.00000006	Not Av	0.00000006
R33	0.00000009	Not Av	0.00000009
R34	0.00000008	Not Av	0.00000008
R35	0.00000006	Not Av	0.00000006
R36	0.00000007	Not Av	0.00000007
R37	0.00000009	Not Av	0.00000009
R38	0.00000007	Not Av	0.00000007
R39	0.00000006	Not Av	0.00000006
R40	0.00000006	Not Av	0.00000006
Not Av = Not available; geochemistry profiles from site samples were not available for this metal, therefore no associated emissions could be modelled.			

Zinc (Zn)	Annual avg metal in PM ₁₀ (mine-only)		
	S1: Existing situation	S2: Proposal Increment	S3: Cumulative Proposed Situation
ID	C _A (µg/m ³)		
R1	0.0003	0.0010	0.0013
R2	0.0004	0.0067	0.0071
R3	0.0004	0.0008	0.0012
R4	0.0003	0.0007	0.0009
R5	0.0002	0.0006	0.0008
R6	0.0002	0.0003	0.0004
R7	0.0002	0.0004	0.0006
R8	0.0002	0.0003	0.0005
R9	0.0002	0.0004	0.0006
R10	0.0002	0.0003	0.0005
R11	0.0003	0.0007	0.0010
R12	0.0002	0.0005	0.0007
R13	0.0003	0.0007	0.0009
R14	0.0002	0.0005	0.0007
R15	0.0001	0.0002	0.0003
R16	0.0004	0.0001	0.0006
R17	0.0002	0.0003	0.0005
R18	0.0003	0.0030	0.0034
R19	0.0001	0.0002	0.0003
R20	0.0002	0.0006	0.0008
R21	0.0002	0.0003	0.0005
R22	0.0002	0.0002	0.0003
R23	0.0002	0.0006	0.0008
R24	0.0002	0.0001	0.0003
R25	0.0005	0.0001	0.0006
R26	0.0006	0.0001	0.0007
R27	0.0004	0.0004	0.0007
R28	0.0004	0.0006	0.0010
R29	0.0003	0.0007	0.0011
R30	0.0002	0.0006	0.0009
R31	0.0005	0.0001	0.0006
R32	0.0002	0.0003	0.0005
R33	0.0003	0.0014	0.0017
R34	0.0002	0.0004	0.0007
R35	0.0001	0.0002	0.0003
R36	0.0002	0.0004	0.0006
R37	0.0003	0.0005	0.0008
R38	0.0002	0.0004	0.0006
R39	0.0002	0.0002	0.0004
R40	0.0002	0.0002	0.0004

APPENDIX G

Calculated rain water tank Pb concentrations used in HHRA

Pb S1

Lead (Scenario 1)			R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20
Parameter	Abbreviation	Unit	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20
Annual metal deposition (from EMM 2020c)	M _{ann dep}	g/m ² /year	0.00026	0.00044	0.00039	0.00019	0.00015	0.00007	0.00011	0.00010	0.00008	0.00007	0.00020	0.00016	0.00020	0.00014	0.00006	0.00059	0.00009	0.00030	0.00005	0.00017
Roof area (Section 3.4.3.8)	RoofArea	m ²	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206
Unit conversion factor to convert from µg to g	CF	µg/g	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000
Maximum rainwater runoff into rainwater tank (calculated from Equation 2 in Table 3-3)	Runoff	L/yr	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087
Efficiency of collection by rainwater tank (Section 3.4.3.8)	Collection efficiency	unitless	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Annual rainfall in Cobar	Rainfall	L/m ² /year	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390
Loss of rainfall associated with absorption and wetting of surfaces (Section 3.4.3.8)	loss	L/m ² /year	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Estimated concentration of metal in rainwater tank (calculated from Equation 1 in Table 3-3)	MConC _{tank}	µg/L	0.83	1.42	1.25	0.62	0.49	0.23	0.37	0.34	0.24	0.22	0.65	0.53	0.64	0.43	0.19	1.91	0.30	0.98	0.18	0.56
Lead (Scenario 1)			R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40
Parameter	Abbreviation	Unit	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40
Annual metal deposition (from EMM 2020c)	M _{ann dep}	g/m ² /year	0.00012	0.00007	0.00012	0.00013	0.00048	0.00091	0.00041	0.00040	0.00034	0.00018	0.00052	0.00010	0.00020	0.00015	0.00006	0.00012	0.00026	0.00013	0.00009	0.00008
Roof area (Section 3.4.3.8)	RoofArea	m ²	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206
Unit conversion factor to convert from µg to g	CF	µg/g	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000
Maximum rainwater runoff into rainwater tank (calculated from Equation 2 in Table 3-3)	Runoff	L/yr	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087
Efficiency of collection by rainwater tank (Section 3.4.3.8)	Collection efficiency	unitless	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Annual rainfall in Cobar	Rainfall	L/m ² /year	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390
Loss of rainfall associated with absorption and wetting of surfaces (Section 3.4.3.8)	loss	L/m ² /year	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Estimated concentration of metal in rainwater tank (calculated from Equation 1 in Table 3-3)	MConC _{tank}	µg/L	0.38	0.24	0.38	0.41	1.54	2.92	1.32	1.28	1.08	0.59	1.68	0.31	0.64	0.48	0.18	0.37	0.83	0.42	0.28	0.27

Pb S2

Lead (Scenario 2)			R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20
Parameter	Abbreviation	Unit	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20
Annual metal deposition (from EMM 2020c)	M _{ann dep}	g/m ² /year	0.00117	0.00708	0.00139	0.00085	0.00044	0.00012	0.00025	0.00022	0.00020	0.00016	0.00084	0.00058	0.00070	0.00037	0.00008	0.00024	0.00017	0.00371	0.00007	0.00066
Roof area (Section 3.4.3.8)	RoofArea	m ²	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206
Unit conversion factor to convert from µg to g	CF	µg/g	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000
Maximum rainwater runoff into rainwater tank (calculated from Equation 2 in Table 3-3)	Runoff	L/yr	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087
Efficiency of collection by rainwater tank (Section 3.4.3.8)	Collection efficiency	unitless	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Annual rainfall in Cobar	Rainfall	L/m ² /year	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390
Loss of rainfall associated with absorption and wetting of surfaces (Section 3.4.3.8)	loss	L/m ² /year	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Estimated concentration of metal in rainwater tank (calculated from Equation 1 in Table 3-3)	MConC _{tank}	µg/L	3.76	22.75	4.47	2.73	1.43	0.39	0.82	0.70	0.63	0.52	2.71	1.87	2.26	1.20	0.25	0.77	0.54	11.92	0.23	2.11
Lead (Scenario 2)			R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40
Annual metal deposition (from EMM 2020c)	M _{ann dep}	g/m ² /year	0.00023	0.00009	0.00045	0.00008	0.00005	0.00014	0.00075	0.00110	0.00131	0.00076	0.00009	0.00017	0.00150	0.00046	0.00010	0.00024	0.00062	0.00029	0.00014	0.00014
Roof area (Section 3.4.3.8)	RoofArea	m ²	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206
Unit conversion factor to convert from µg to g	CF	µg/g	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000
Maximum rainwater runoff into rainwater tank (calculated from Equation 2 in Table 3-3)	Runoff	L/yr	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087
Efficiency of collection by rainwater tank (Section 3.4.3.8)	Collection efficiency	unitless	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Annual rainfall in Cobar	Rainfall	L/m ² /year	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390
Loss of rainfall associated with absorption and wetting of surfaces (Section 3.4.3.8)	loss	L/m ² /year	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Estimated concentration of metal in rainwater tank (calculated from Equation 1 in Table 3-3)	MConC _{tank}	µg/L	0.74	0.29	1.46	0.25	0.16	0.44	2.42	3.54	4.22	2.45	0.28	0.55	4.82	1.49	0.31	0.77	1.98	0.92	0.44	0.43

Pb S3

Lead (Scenario 3)			R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20
Parameter	Abbreviation	Unit																				
Annual metal deposition (from EMM 2020c)	M _{ann dep}	g/m ² /year	0.00143	0.00752	0.00178	0.00104	0.00060	0.00019	0.00037	0.00032	0.00027	0.00023	0.00104	0.00075	0.00090	0.00051	0.00014	0.00083	0.00026	0.00401	0.00013	0.00083
Roof area (Section 3.4.3.8)	RoofArea	m ²	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206
Unit conversion factor to convert from µg to g	CF	µg/g	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000
Maximum rainwater runoff into rainwater tank (calculated from Equation 2 in Table 3-3)	Runoff	L/yr	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087
Efficiency of collection by rainwater tank (Section 3.4.3.8)	Collection efficiency	unitless	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Annual rainfall in Cobar	Rainfall	L/m ² /year	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390
Loss of rainfall associated with absorption and wetting of surfaces (Section 3.4.3.8)	loss	L/m ² /year	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Estimated concentration of metal in rainwater tank (calculated from Equation 1 in Table 3-3)	MConC _{tank}	µg/L	4.58	24.17	5.72	3.35	1.91	0.62	1.18	1.03	0.87	0.74	3.35	2.40	2.90	1.63	0.44	2.68	0.84	12.89	0.41	2.67
Lead (Scenario 3)			R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40
Annual metal deposition (from EMM 2020c)	M _{ann dep}	g/m ² /year	0.00035	0.00016	0.00057	0.00020	0.00053	0.00105	0.00117	0.00150	0.00165	0.00095	0.00061	0.00027	0.00170	0.00061	0.00015	0.00036	0.00087	0.00042	0.00022	0.00022
Roof area (Section 3.4.3.8)	RoofArea	m ²	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206	206
Unit conversion factor to convert from µg to g	CF	µg/g	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000
Maximum rainwater runoff into rainwater tank (calculated from Equation 2 in Table 3-3)	Runoff	L/yr	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087	64087
Efficiency of collection by rainwater tank (Section 3.4.3.8)	Collection efficiency	unitless	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Annual rainfall in Cobar	Rainfall	L/m ² /year	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390	390
Loss of rainfall associated with absorption and wetting of surfaces (Section 3.4.3.8)	loss	L/m ² /year	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Estimated concentration of metal in rainwater tank (calculated from Equation 1 in Table 3-3)	MConC _{tank}	µg/L	1.12	0.52	1.84	0.66	1.70	3.36	3.75	4.82	5.30	3.04	1.96	0.85	5.46	1.97	0.49	1.14	2.81	1.34	0.71	0.70

APPENDIX H

ALM Modelling outputs

R11 Output

Calculations of Blood Lead Concentrations (PbBs) and Risk in Nonresidential Areas

U.S. EPA Technical Review Workgroup for Lead

Version date 06/14/2017

New cells added by SLR = Red text

Receptor 11

Variable	Description of Variable	Units	Scenario 1 (Existing Situation)	Scenario 2 (Proposed Increment)	Scenario 3 (Cumulative Proposed Situation)
PbS	Soil lead concentration	µg/g or ppm	21.9	0.39	22.3
PbD	Indoor dust Pb concentration	µg/g or ppm	32.8	0.59	33.4
F _S	Fraction of total soil & dust ingestion that is soil	unitless	0.45	0.45	0.45
F _D	Fraction of total soil & dust ingestion that is indoor dust	unitless	0.55	0.55	0.55
R _{fetal/maternal}	Fetal/maternal PbB ratio	--	0.9	0.9	0.9
BKSF	Biokinetic Slope Factor	µg/dL per µg/day	0.4	0.4	0.4
GSD _i	Geometric standard deviation PbB	--	1.8	1.8	1.8
PbB ₀	Baseline PbB	µg/dL	0.88	0.88	0.88
IR _S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.05	0.05	0.05
AF _S	Absorption fraction (same for soil and dust)	unitless	0.06	0.06	0.06
PbA	Air Pb concentration (i.e. in PM ₁₀)	µg/m ³	0.0091	0.00024	0.0094
InhR _A	Inhalation rate	m ³ /day	15	15	15
LR	Lung dust retention factor	unitless	1	1	1
AF _A	Absolute lung absorption fraction for inhaled Pb in air	unitless	0.32	0.32	0.32
EF _{S, D}	Exposure frequency (same for soil and dust, and air)	days/yr	365	365	365
AT _{S, D}	Averaging time (same for soil and dust and air)	days/yr	365	365	365
PbB _{adult}	PbB of adult worker, geometric mean	µg/dL	0.93	0.00	0.93
PbB _{fetal, 0.95}	95th percentile PbB among fetuses of adult workers	µg/dL	2.1	0.00	2.1
PbB _t	Target PbB level of concern (e.g., 2-8 ug/dL)	µg/dL	5.0	5.0	5.0
P(PbB _{fetal} > PbB _t)	Probability that fetal PbB exceeds target PbB, assuming lognormal distribution	%	0.1%	0.0%	0.1%

R16 Output

Calculations of Blood Lead Concentrations (PbBs) and Risk in Nonresidential Areas

U.S. EPA Technical Review Workgroup for Lead

Version date 06/14/2017

New cells added by SLR = Red text

Receptor 16

Variable	Description of Variable	Units	Scenario 1 (Existing Situation)	Scenario 2 (Proposed Increment)	Scenario 3 (Cumulative Proposed Situation)
PbS	Soil lead concentration	µg/g or ppm	10.7	0.11	10.9
PbD	Indoor dust Pb concentration	µg/g or ppm	16.1	0.17	16.3
F _S	Fraction of total soil & dust ingestion that is soil	unitless	0.45	0.45	0.45
F _D	Fraction of total soil & dust ingestion that is indoor dust	unitless	0.55	0.55	0.55
R _{fetal/maternal}	Fetal/maternal PbB ratio	--	0.9	0.9	0.9
BKSF	Biokinetic Slope Factor	µg/dL per µg/day	0.4	0.4	0.4
GSD _i	Geometric standard deviation PbB	--	1.8	1.8	1.8
PbB ₀	Baseline PbB	µg/dL	0.88	0.88	0.88
IR _S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.05	0.05	0.05
AF _S	Absorption fraction (same for soil and dust)	unitless	0.06	0.06	0.06
PbA	Air Pb concentration (i.e. in PM ₁₀)	µg/m ³	0.0093	0.00006	0.0093
InhR _A	Inhalation rate	m ³ /day	15	15	15
LR	Lung dust retention factor	unitless	1	1	1
AF _A	Absolute lung absorption fraction for inhaled Pb in air	unitless	0.32	0.32	0.32
EF _{S, D}	Exposure frequency (same for soil and dust, and air)	days/yr	365	365	365
AT _{S, D}	Averaging time (same for soil and dust and air)	days/yr	365	365	365
PbB _{adult}	PbB of adult worker, geometric mean	µg/dL	0.91	0.00	0.91
PbB _{fetal, 0.95}	95th percentile PbB among fetuses of adult workers	µg/dL	2.1	0.00	2.1
PbB _t	Target PbB level of concern (e.g., 2-8 ug/dL)	µg/dL	5.0	5.0	5.0
P(PbB _{fetal} > PbB _t)	Probability that fetal PbB exceeds target PbB, assuming lognormal distribution	%	0.1%	0.0%	0.1%

R20 Output

Calculations of Blood Lead Concentrations (PbBs) and Risk in Nonresidential Areas U.S. EPA Technical Review Workgroup for Lead

Version date 06/14/2017

New cells added by SLR = Red text

			Receptor 20		
Variable	Description of Variable	Units	Scenario 1 (Existing Situation)	Scenario 2 (Proposed Increment)	Scenario 3 (Cumulative Proposed Situation)
PbS	Soil lead concentration	µg/g or ppm	27.1	0.31	27.4
PbD	Indoor dust Pb concentration	µg/g or ppm	40.7	0.46	41.1
F _S	Fraction of total soil & dust ingestion that is soil	unitless	0.45	0.45	0.45
F _D	Fraction of total soil & dust ingestion that is indoor dust	unitless	0.55	0.55	0.55
R _{fetal/maternal}	Fetal/maternal PbB ratio	--	0.9	0.9	0.9
BKSF	Biokinetic Slope Factor	µg/dL per µg/day	0.4	0.4	0.4
GSD _i	Geometric standard deviation PbB	--	1.8	1.8	1.8
PbB ₀	Baseline PbB	µg/dL	0.88	0.88	0.88
IR _S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.05	0.05	0.05
AF _S	Absorption fraction (same for soil and dust)	unitless	0.06	0.06	0.06
PbA	Air Pb concentration (i.e. in PM ₁₀)	µg/m ³	0.0091	0.00019	0.0093
InhR _A	Inhalation rate	m ³ /day	15	15	15
LR	Lung dust retention factor	unitless	1	1	1
AF _A	Absolute lung absorption fraction for inhaled Pb in air	unitless	0.32	0.32	0.32
EF _{S, D}	Exposure frequency (same for soil and dust, and air)	days/yr	365	365	365
AT _{S, D}	Averaging time (same for soil and dust and air)	days/yr	365	365	365
PbB _{adult}	PbB of adult worker, geometric mean	µg/dL	0.94	0.00	0.94
PbB _{fetal, 0.95}	95th percentile PbB among fetuses of adult workers	µg/dL	2.2	0.00	2.2
PbB _t	Target PbB level of concern (e.g., 2-8 ug/dL)	µg/dL	5.0	5.0	5.0
P(PbB _{fetal} > PbB _t)	Probability that fetal PbB exceeds target PbB, assuming lognormal distribution	%	0.1%	0.0%	0.1%

R21 Output

Calculations of Blood Lead Concentrations (PbBs) and Risk in Nonresidential Areas

U.S. EPA Technical Review Workgroup for Lead

Version date 06/14/2017

New cells added by SLR = Red text

Receptor 21

Variable	Description of Variable	Units	Scenario 1 (Existing Situation)	Scenario 2 (Proposed Increment)	Scenario 3 (Cumulative Proposed Situation)
PbS	Soil lead concentration	µg/g or ppm	28.8	0.11	28.9
PbD	Indoor dust Pb concentration	µg/g or ppm	43.2	0.16	43.4
F _S	Fraction of total soil & dust ingestion that is soil	unitless	0.45	0.45	0.45
F _D	Fraction of total soil & dust ingestion that is indoor dust	unitless	0.55	0.55	0.55
R _{fetal/maternal}	Fetal/maternal PbB ratio	--	0.9	0.9	0.9
BKSF	Biokinetic Slope Factor	µg/dL per µg/day	0.4	0.4	0.4
GSD _i	Geometric standard deviation PbB	--	1.8	1.8	1.8
PbB ₀	Baseline PbB	µg/dL	0.88	0.88	0.88
IR _S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.05	0.05	0.05
AF _S	Absorption fraction (same for soil and dust)	unitless	0.06	0.06	0.06
PbA	Air Pb concentration (i.e. in PM ₁₀)	µg/m ³	0.0091	0.00011	0.0092
InhR _A	Inhalation rate	m ³ /day	15	15	15
LR	Lung dust retention factor	unitless	1	1	1
AF _A	Absolute lung absorption fraction for inhaled Pb in air	unitless	0.32	0.32	0.32
EF _{S, D}	Exposure frequency (same for soil and dust, and air)	days/yr	365	365	365
AT _{S, D}	Averaging time (same for soil and dust and air)	days/yr	365	365	365
PbB _{adult}	PbB of adult worker, geometric mean	µg/dL	0.94	0.00	0.94
PbB _{fetal, 0.95}	95th percentile PbB among fetuses of adult workers	µg/dL	2.2	0.00	2.2
PbB _t	Target PbB level of concern (e.g., 2-8 ug/dL)	µg/dL	5.0	5.0	5.0
P(PbB _{fetal} > PbB _t)	Probability that fetal PbB exceeds target PbB, assuming lognormal distribution	%	0.1%	0.0%	0.1%

R26 Output

Calculations of Blood Lead Concentrations (PbBs) and Risk in Nonresidential Areas

U.S. EPA Technical Review Workgroup for Lead

Version date 06/14/2017

New cells added by SLR = Red text

Receptor 26

Variable	Description of Variable	Units	Scenario 1 (Existing Situation)	Scenario 2 (Proposed Increment)	Scenario 3 (Cumulative Proposed Situation)
PbS	Soil lead concentration	µg/g or ppm	10.02	0.06	10.08
PbD	Indoor dust Pb concentration	µg/g or ppm	15	0.1	15.1
F _S	Fraction of total soil & dust ingestion that is soil	unitless	0.45	0.45	0.45
F _D	Fraction of total soil & dust ingestion that is indoor dust	unitless	0.55	0.55	0.55
R _{fetal/maternal}	Fetal/maternal PbB ratio	--	0.9	0.9	0.9
BKSF	Biokinetic Slope Factor	µg/dL per µg/day	0.4	0.4	0.4
GSD _i	Geometric standard deviation PbB	--	1.8	1.8	1.8
PbB ₀	Baseline PbB	µg/dL	0.88	0.88	0.88
IR _S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.05	0.05	0.05
AF _S	Absorption fraction (same for soil and dust)	unitless	0.06	0.06	0.06
PbA	Air Pb concentration (i.e. in PM ₁₀)	µg/m ³	0.0094	0.00007	0.0094
InhR _A	Inhalation rate	m ³ /day	15	15	15
LR	Lung dust retention factor	unitless	1	1	1
AF _A	Absolute lung absorption fraction for inhaled Pb in air	unitless	0.32	0.32	0.32
EF _{S, D}	Exposure frequency (same for soil and dust, and air)	days/yr	365	365	365
AT _{S, D}	Averaging time (same for soil and dust and air)	days/yr	365	365	365
PbB _{adult}	PbB of adult worker, geometric mean	µg/dL	0.91	0.00	0.91
PbB _{fetal, 0.95}	95th percentile PbB among fetuses of adult workers	µg/dL	2.1	0.00	2.1
PbB _t	Target PbB level of concern (e.g., 2-8 ug/dL)	µg/dL	5.0	5.0	5.0
P(PbB _{fetal} > PbB _t)	Probability that fetal PbB exceeds target PbB, assuming lognormal distribution	%	0.1%	0.0%	0.1%

R27 Output

Calculations of Blood Lead Concentrations (PbBs) and Risk in Nonresidential Areas

U.S. EPA Technical Review Workgroup for Lead

Version date 06/14/2017

New cells added by SLR = Red text

Receptor 27

Variable	Description of Variable	Units	Scenario 1 (Existing Situation)	Scenario 2 (Proposed Increment)	Scenario 3 (Cumulative Proposed Situation)
PbS	Soil lead concentration	µg/g or ppm	28.1	0.35	28.4
PbD	Indoor dust Pb concentration	µg/g or ppm	42.1	0.53	42.7
F _S	Fraction of total soil & dust ingestion that is soil	unitless	0.45	0.45	0.45
F _D	Fraction of total soil & dust ingestion that is indoor dust	unitless	0.55	0.55	0.55
R _{fetal/maternal}	Fetal/maternal PbB ratio	--	0.9	0.9	0.9
BKSF	Biokinetic Slope Factor	µg/dL per µg/day	0.4	0.4	0.4
GSD _i	Geometric standard deviation PbB	--	1.8	1.8	1.8
PbB ₀	Baseline PbB	µg/dL	0.88	0.88	0.88
IR _S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.05	0.05	0.05
AF _S	Absorption fraction (same for soil and dust)	unitless	0.06	0.06	0.06
PbA	Air Pb concentration (i.e. in PM ₁₀)	µg/m ³	0.0092	0.00013	0.0093
InhR _A	Inhalation rate	m ³ /day	15	15	15
LR	Lung dust retention factor	unitless	1	1	1
AF _A	Absolute lung absorption fraction for inhaled Pb in air	unitless	0.32	0.32	0.32
EF _{S, D}	Exposure frequency (same for soil and dust, and air)	days/yr	365	365	365
AT _{S, D}	Averaging time (same for soil and dust and air)	days/yr	365	365	365
PbB _{adult}	PbB of adult worker, geometric mean	µg/dL	0.94	0.00	0.94
PbB _{fetal, 0.95}	95th percentile PbB among fetuses of adult workers	µg/dL	2.2	0.00	2.2
PbB _t	Target PbB level of concern (e.g., 2-8 ug/dL)	µg/dL	5.0	5.0	5.0
P(PbB _{fetal} > PbB _t)	Probability that fetal PbB exceeds target PbB, assuming lognormal distribution	%	0.1%	0.0%	0.1%

R28 Output

Calculations of Blood Lead Concentrations (PbBs) and Risk in Nonresidential Areas

U.S. EPA Technical Review Workgroup for Lead

Version date 06/14/2017

New cells added by SLR = Red text

Receptor 28

Variable	Description of Variable	Units	Scenario 1 (Existing Situation)	Scenario 2 (Proposed Increment)	Scenario 3 (Cumulative Proposed Situation)
PbS	Soil lead concentration	µg/g or ppm	174.6	0.51	175.1
PbD	Indoor dust Pb concentration	µg/g or ppm	261.8	0.77	262.6
F _S	Fraction of total soil & dust ingestion that is soil	unitless	0.45	0.45	0.45
F _D	Fraction of total soil & dust ingestion that is indoor dust	unitless	0.55	0.55	0.55
R _{fetal/maternal}	Fetal/maternal PbB ratio	--	0.9	0.9	0.9
BKSF	Biokinetic Slope Factor	µg/dL per µg/day	0.4	0.4	0.4
GSD _i	Geometric standard deviation PbB	--	1.8	1.8	1.8
PbB ₀	Baseline PbB	µg/dL	0.88	0.88	0.88
IR _S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.05	0.05	0.05
AF _S	Absorption fraction (same for soil and dust)	unitless	0.06	0.06	0.06
PbA	Air Pb concentration (i.e. in PM ₁₀)	µg/m ³	0.0092	0.00022	0.0094
InhR _A	Inhalation rate	m ³ /day	15	15	15
LR	Lung dust retention factor	unitless	1	1	1
AF _A	Absolute lung absorption fraction for inhaled Pb in air	unitless	0.32	0.32	0.32
EF _{S, D}	Exposure frequency (same for soil and dust, and air)	days/yr	365	365	365
AT _{S, D}	Averaging time (same for soil and dust and air)	days/yr	365	365	365
PbB _{adult}	PbB of adult worker, geometric mean	µg/dL	1.2	0.00	1.2
PbB _{fetal, 0.95}	95th percentile PbB among fetuses of adult workers	µg/dL	2.6	0.00	2.6
PbB _t	Target PbB level of concern (e.g., 2-8 ug/dL)	µg/dL	5.0	5.0	5.0
P(PbB _{fetal} > PbB _t)	Probability that fetal PbB exceeds target PbB, assuming lognormal distribution	%	0.4%	0.0%	0.4%

R29 Output

Calculations of Blood Lead Concentrations (PbBs) and Risk in Nonresidential Areas U.S. EPA Technical Review Workgroup for Lead

Version date 06/14/2017

New cells added by SLR = Red text

Receptor 29

Variable	Description of Variable	Units	Scenario 1 (Existing Situation)	Scenario 2 (Proposed Increment)	Scenario 3 (Cumulative Proposed Situation)
PbS	Soil lead concentration	µg/g or ppm	174.5	0.61	175.1
PbD	Indoor dust Pb concentration	µg/g or ppm	261.8	0.92	262.7
F _S	Fraction of total soil & dust ingestion that is soil	unitless	0.45	0.45	0.45
F _D	Fraction of total soil & dust ingestion that is indoor dust	unitless	0.55	0.55	0.55
R _{fetal/maternal}	Fetal/maternal PbB ratio	--	0.9	0.9	0.9
BKSF	Biokinetic Slope Factor	µg/dL per µg/day	0.4	0.4	0.4
GSD _i	Geometric standard deviation PbB	--	1.8	1.8	1.8
PbB ₀	Baseline PbB	µg/dL	0.88	0.88	0.88
IR _S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.05	0.05	0.05
AF _S	Absorption fraction (same for soil and dust)	unitless	0.06	0.06	0.06
PbA	Air Pb concentration (i.e. in PM ₁₀)	µg/m ³	0.0092	0.00025	0.0094
InhR _A	Inhalation rate	m ³ /day	15	15	15
LR	Lung dust retention factor	unitless	1	1	1
AF _A	Absolute lung absorption fraction for inhaled Pb in air	unitless	0.32	0.32	0.32
EF _{S, D}	Exposure frequency (same for soil and dust, and air)	days/yr	365	365	365
AT _{S, D}	Averaging time (same for soil and dust and air)	days/yr	365	365	365
PbB _{adult}	PbB of adult worker, geometric mean	µg/dL	1.2	0.00	1.2
PbB _{fetal, 0.95}	95th percentile PbB among fetuses of adult workers	µg/dL	2.6	0.00	2.6
PbB _t	Target PbB level of concern (e.g., 2-8 ug/dL)	µg/dL	5.0	5.0	5.0
P(PbB _{fetal} > PbB _t)	Probability that fetal PbB exceeds target PbB, assuming lognormal distribution	%	0.4%	0.0%	0.4%