REPORT

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Human Health Risk Assessment

Bolts Lake Area and Areas within OU-1 of the Eagle Mine Site

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This Baseline Human Health Risk Assessment was prepared for Environmental Resources Management ("ERM") by Terra Technologies on behalf of Ginn Battle North, LLC ("Ginn Battle North") to assess the current baseline human health risks at its parcel known as the "North Property". The North Property contains certain features of the Eagle Mine Superfund Site ("Eagle Mine Site"), such as the Consolidated Tailings Pile ("CTP"), Old (former) Tailings Pile ("OTP"), Rex Flats, and surrounding areas adjacent to features of the Eagle Mine Site, including Bolts Lake and the Highlands Area. The Eagle Mine Site was once the primary mine in the Gilman mining district, which now includes abandoned mining and ore processing facilities located along the banks of the Eagle River.

A human health risk assessment ("HHRA") was performed with the current Remedial Investigation ("RI") data collected by ERM. A human health risk assessment describes the potential for site-related risks to human receptors. It contains quantitative estimates of exposure compared to estimates of cancer and noncancer health effects (i.e., hazard) in order to develop risk estimates.

The HHRA was performed in two tiers. The initial tier ("Tier I") was a screening step in which the data were evaluated and summary statistics compiled, and then maximum sitewide concentrations of each contaminant were compared to conservative, readily available screening levels. Any contaminants exceeding their initial screening levels were further evaluated to determine if they should be evaluated in Tier II as chemicals of potential concern ("COPCs"). The additional evaluation included consideration of detection frequency, comparison to background levels, evaluation as nutrients, and consideration of historic use. Analytes that were not detected in more than 5 percent (%) of the samples, were below background, or were below nutritional levels, were not carried forward as Tier II COPCs.

In Tier II, COPCs were further evaluated by developing a site conceptual model, a list of potential site receptors, and estimating receptor-specific exposure. Toxicity values were obtained, and predictions of cancer and noncancer risk were made for these receptors.

Samples for organic chemical analyses were collected and tested infrequently at the site based on the lack of field indications of organic constituents. The results of the Tier I data evaluation indicated that organic chemicals were not frequently occurring across the site. Only one volatile organic compound ("VOC") and one semivolatile organic compound ("SVOC") were detected in surface soil as follows:

VOCs	*SVOCs*
1,1,1,2-Tetrachloroethane	Pentachlorophenol

No organics were detected in subsurface soil or ground water samples. Therefore, based on historic knowledge of the Eagle Mine Site, organic chemicals were dropped from the risk analysis.

Metals were detected at high frequencies in every media during the Tier I screening. Metals in every media were carried forward as Tier II COPCs. Many of the same metals exceeded screening values for subsurface soils and for surface soils.

The Tier II analysis focused on analytes carried forward from Tier I. Several receptors were selected that best represented the range of potential users of the site. These were long-time residents, recreationalists (hiker, angler, rafter, golfer), and construction/golf course workers. Intakes were estimated, and risks were calculated, for each Tier II COPC and potentially complete exposure pathway.

The results of the Tier II analysis indicate that all exposure areas demonstrate excess noncancer and cancer risks for at least one receptor. The major contributors to noncancer risk are antimony, arsenic, iron, lead, manganese, and thallium. Antimony produced excess noncancer risks at Bolts Lake Area only. The major contributor to cancer risk at all locations is arsenic. Lead causes excess risk levels at all locations except Bolts Lake and the Old Tailings Pile. The cumulative cancer and noncancer risks are shown for each exposure area and media-specific exposure pathway in Table ES-1 and Table ES-2, below. Site-specific remediation goals, which incorporate this HHRA, are evaluated within Appendix C.

Table ES-1 Cumulative Noncancer Risks by Exposure Area and Media-Specific Exposure Pathway

NONCANCER RISKS

Exposure Area	Exposure Pathway	On-Site Resident			Hiker			Rafter	Angler	Golfer	Construction Worker
		Child	Adult	Age Averaged	Child	Adult	Age Averaged	Adult	Adult	Adult	Adult
Bolts Lake	Surface Soil - Incidental Ingestion	**5.16E+01**	**5.53E+00**	**1.47E+01**	**7.37E+00**	7.89E-01	**2.11E+00**	NA	NA	7.89E-01	**1.30E+01**
	Surface Soil - Dermal Contact	3.60E-02	5.49E-03	1.16E-02	1.03E-02	1.57E-03	3.31E-03	NA	NA	1.46E-03	9.73E-03
	Surface Soil -Particulate Inhalation	1.07E-02	1.07E-02	2.14E-03	3.06E-03	3.06E-03	6.13E-04	3.06E-03	3.06E-03	3.06E-03	7.66E-03
	Subsurface Soil - Incidental Ingestion	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.36E-01
	Subsurface Soil - Dermal Contact	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.21E-02
	Subsurface Soil - Particulate Inhalation	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.13E-03
	Surface Water-Incidental Ingestion	8.77E-03	1.09E-03	2.63E-03	2.92E-03	2.51E-04	1.34E-04	1.25E-03	1.25E-03	NA	2.51E-04
	Surface Water - Dermal Contact	1.04E-03	3.53E-04	4.91E-04	3.47E-04	8.12E-05	1.34E-04	4.06E-04	4.06E-04	NA	8.12E-05
	Fish Ingestion	**2.77E+00**	**1.58E+00**	**1.82E+00**	NA	NA	NA	NA	**1.58E+00**	NA	NA
	Sediment - Incidental Ingestion	4.98E-01	5.34E-02	1.42E-01	3.32E-01	3.56E-02	9.49E-02	7.12E-02	7.12E-02	NA	7.12E-02
	Sediment - Dermal Contact	2.99E-01	5.35E-02	1.03E-01	1.99E-01	3.57E-02	6.84E-02	3.57E-02	3.57E-02	NA	3.76E-02
	Diversion Trench Surface Water - Incidental Ingestion	4.46E-02	5.55E-03	1.34E-02	1.49E-02	1.27E-03	3.99E-03	NA	6.37E-03	NA	1.27E-03
	Diversion Trench Surface Water - Dermal Contact	5.89E-03	2.00E-03	2.78E-03	1.96E-03	4.59E-04	7.60E-04	NA	2.29E-03	NA	4.59E-04
	Seep Water - Incidental Ingestion	3.49E-01	4.33E-02	1.04E-01	1.16E-01	9.96E-03	3.12E-02	NA	4.98E-02	NA	9.96E-03
	Seep Water- Dermal Contact	4.48E-02	1.52E-02	2.11E-02	1.49E-02	3.49E-03	5.78E-03	NA	1.75E-02	NA	3.49E-03
	Groundwater Potable Use	**9.00E+02**	**3.86E+02**	**4.89E+02**	NA	NA	NA	NA	NA	NA	NA
	Groundwater - Dermal Contact	**5.63E+00**	**1.91E+00**	**2.65E+00**	NA	NA	NA	NA	NA	NA	NA
	Boulder - Incidental Ingestion	**3.83E+00**	3.28E-01	**1.03E+00**	**1.09E+00**	9.38E-02	2.94E-01	NA	NA	NA	NA
Total Noncancer HI		**9.65E+02**	**3.95E+02**	**5.09E+02**	**9.16E+00**	9.75E-01	**2.61E+00**	1.12E-01	**1.77E+00**	7.94E-01	**1.34E+01**
Maloit Park	Surface Soil - Incidental Ingestion	**3.02E+01**	**3.23E+00**	**8.62E+00**	**4.31E+00**	4.62E-01	**1.23E+00**	NA	NA	4.62E-01	**7.62E+00**
	Surface Soil - Dermal Contact	**1.34E+00**	2.05E-01	4.33E-01	3.84E-01	5.86E-02	1.24E-01	NA	NA	5.45E-02	3.63E-01
	Surface Soil -Particulate Inhalation	1.38E-01	1.38E-01	2.77E-02	3.95E-02	3.95E-02	7.91E-03	3.95E-02	3.95E-02	3.95E-02	9.89E-02
	Subsurface Soil - Incidental Ingestion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Subsurface Soil - Dermal Contact	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Subsurface Soil - Particulate Inhalation	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Surface Water-Incidental Ingestion	8.77E-03	1.09E-03	2.63E-03	2.92E-03	2.51E-04	1.34E-04	1.25E-03	1.25E-03	NA	2.51E-04
	Surface Water - Dermal Contact	1.04E-03	3.53E-04	4.91E-04	3.47E-04	8.12E-05	1.34E-04	4.06E-04	4.06E-04	NA	8.12E-05
	Fish Ingestion	**2.77E+00**	**1.58E+00**	**1.82E+00**	NA	NA	NA	NA	**1.58E+00**	NA	NA
	Sediment - Incidental Ingestion	4.98E-01	5.34E-02	1.42E-01	3.32E-01	3.56E-02	9.49E-02	7.12E-02	7.12E-02	NA	7.12E-02
	Sediment - Dermal Contact	2.99E-01	5.35E-02	1.03E-01	1.99E-01	3.57E-02	6.84E-02	3.57E-02	3.57E-02	NA	3.76E-02
	Diversion Trench Surface Water - Incidental Ingestion	4.46E-02	5.55E-03	1.34E-02	1.49E-02	1.27E-03	3.99E-03	NA	6.37E-03	NA	1.27E-03
	Diversion Trench Surface Water - Dermal Contact	5.89E-03	2.00E-03	2.78E-03	1.96E-03	4.59E-04	7.60E-04	NA	2.29E-03	NA	4.59E-04
	Seep Water - Incidental Ingestion	3.49E-01	4.33E-02	1.04E-01	1.16E-01	9.96E-03	3.12E-02	NA	4.98E-02	NA	9.96E-03
	Seep Water- Dermal Contact	4.48E-02	1.52E-02	2.11E-02	1.49E-02	3.49E-03	5.78E-03	NA	1.75E-02	NA	3.49E-03
	Groundwater Potable Use	**9.00E+02**	**3.86E+02**	**4.89E+02**	NA	NA	NA	NA	NA	NA	NA
	Groundwater - Dermal Contact	**5.63E+00**	**1.91E+00**	**2.65E+00**	NA	NA	NA	NA	NA	NA	NA
	Boulder - Incidental Ingestion	**3.83E+00**	3.28E-01	**1.03E+00**	**1.09E+00**	9.38E-02	2.94E-01	NA	NA	NA	NA
Total Noncancer HI		**9.45E+02**	**3.93E+02**	**5.04E+02**	**6.51E+00**	7.40E-01	**1.86E+00**	1.48E-01	**1.81E+00**	5.56E-01	**8.20E+00**

Table ES-1 Cumulative Noncancer Risks by Exposure Area and Media-Specific Exposure Pathway

NONCANCER RISKS

Exposure Area	Exposure Pathway	On-Site Resident			Hiker			Rafter	Angler	Golfer	Construction Worker
		Child	Adult	Age Averaged	Child	Adult	Age Averaged	Adult	Adult	Adult	Adult
Old Tailings Pile (&Sump 3, Old Slurry Line)	Surface Soil - Incidental Ingestion	**8.22E+00**	8.81E-01	**2.35E+00**	**1.17E+00**	1.26E-01	3.36E-01	NA	NA	1.26E-01	**2.08E+00**
	Surface Soil - Dermal Contact	1.98E-01	3.02E-02	6.37E-02	5.65E-02	8.62E-03	1.82E-02	NA	NA	8.02E-03	5.35E-02
	Surface Soil -Particulate Inhalation	8.75E-03	8.75E-03	1.75E-03	2.50E-03	2.50E-03	5.00E-04	2.50E-03	2.50E-03	2.50E-03	6.25E-03
	Subsurface Soil - Incidental Ingestion	NA	NA	NA	NA	NA	NA	NA	NA	NA	**1.51E+00**
	Subsurface Soil - Dermal Contact	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.07E-01
	Subsurface Soil - Particulate Inhalation	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.45E-03
	Surface Water-Incidental Ingestion	8.77E-03	1.09E-03	2.63E-03	2.92E-03	2.51E-04	1.34E-04	1.25E-03	1.25E-03	NA	2.51E-04
	Surface Water - Dermal Contact	1.04E-03	3.53E-04	4.91E-04	3.47E-04	8.12E-05	1.34E-04	4.06E-04	4.06E-04	NA	8.12E-05
	Fish Ingestion	**2.77E+00**	**1.58E+00**	**1.82E+00**	NA	NA	NA	NA	**1.58E+00**	NA	NA
	Sediment - Incidental Ingestion	4.98E-01	5.34E-02	1.42E-01	3.32E-01	3.56E-02	9.49E-02	7.12E-02	7.12E-02	NA	7.12E-02
	Sediment - Dermal Contact	2.99E-01	5.35E-02	1.03E-01	1.99E-01	3.57E-02	6.84E-02	3.57E-02	3.57E-02	NA	3.76E-02
	Diversion Trench Surface Water - Incidental Ingestion	4.46E-02	5.55E-03	1.34E-02	1.49E-02	1.27E-03	3.99E-03	NA	6.37E-03	NA	1.27E-03
	Diversion Trench Surface Water - Dermal Contact	5.89E-03	2.00E-03	2.78E-03	1.96E-03	4.59E-04	7.60E-04	NA	2.29E-03	NA	4.59E-04
	Seep Water - Incidental Ingestion	3.49E-01	4.33E-02	1.04E-01	1.16E-01	9.96E-03	3.12E-02	NA	4.98E-02	NA	9.96E-03
	Seep Water- Dermal Contact	4.48E-02	1.52E-02	2.11E-02	1.49E-02	3.49E-03	5.78E-03	NA	1.75E-02	NA	3.49E-03
	Groundwater Potable Use	**9.00E+02**	**3.86E+02**	**4.89E+02**	NA	NA	NA	NA	NA	NA	NA
	Groundwater - Dermal Contact	**5.63E+00**	**1.91E+00**	**2.65E+00**	NA	NA	NA	NA	NA	NA	NA
	Boulder - Incidental Ingestion	**3.83E+00**	3.28E-01	**1.03E+00**	**1.09E+00**	9.38E-02	2.94E-01	NA	NA	NA	NA
Total Noncancer HI		**9.22E+02**	**3.91E+02**	**4.97E+02**	**3.01E+00**	3.18E-01	8.53E-01	1.11E-01	**1.77E+00**	1.36E-01	**3.88E+00**
Rex Flats	Surface Soil - Incidental Ingestion	**2.75E+01**	**2.95E+00**	**7.86E+00**	**3.93E+00**	4.21E-01	**1.12E+00**	NA	NA	4.21E-01	**6.95E+00**
	Surface Soil - Dermal Contact	**1.58E+00**	2.41E-01	5.08E-01	4.50E-01	6.87E-02	1.45E-01	NA	NA	6.39E-02	4.26E-01
	Surface Soil -Particulate Inhalation	1.43E-02	1.43E-02	2.86E-03	4.09E-03	4.09E-03	8.18E-04	4.09E-03	4.09E-03	4.09E-03	1.02E-02
	Subsurface Soil - Incidental Ingestion	NA	NA	NA	NA	NA	NA	NA	NA	NA	**6.29E+00**
	Subsurface Soil - Dermal Contact	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.84E-01
	Subsurface Soil - Particulate Inhalation	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.84E-03
	Surface Water-Incidental Ingestion	8.77E-03	1.09E-03	2.63E-03	2.92E-03	2.51E-04	1.34E-04	1.25E-03	1.25E-03	NA	2.51E-04
	Surface Water - Dermal Contact	1.04E-03	3.53E-04	4.91E-04	3.47E-04	8.12E-05	1.34E-04	4.06E-04	4.06E-04	NA	8.12E-05
	Fish Ingestion	**2.77E+00**	**1.58E+00**	**1.82E+00**	NA	NA	NA	NA	**1.58E+00**	NA	NA
	Sediment - Incidental Ingestion	4.98E-01	5.34E-02	1.42E-01	3.32E-01	3.56E-02	9.49E-02	7.12E-02	7.12E-02	NA	7.12E-02
	Sediment - Dermal Contact	2.99E-01	5.35E-02	1.03E-01	1.99E-01	3.57E-02	6.84E-02	3.57E-02	3.57E-02	NA	3.76E-02
	Diversion Trench Surface Water - Incidental Ingestion	4.46E-02	5.55E-03	1.34E-02	1.49E-02	1.27E-03	3.99E-03	NA	6.37E-03	NA	1.27E-03
	Diversion Trench Surface Water - Dermal Contact	5.89E-03	2.00E-03	2.78E-03	1.96E-03	4.59E-04	7.60E-04	NA	2.29E-03	NA	4.59E-04
	Seep Water - Incidental Ingestion	3.49E-01	4.33E-02	1.04E-01	1.16E-01	9.96E-03	3.12E-02	NA	4.98E-02	NA	9.96E-03
	Seep Water- Dermal Contact	4.48E-02	1.52E-02	2.11E-02	1.49E-02	3.49E-03	5.78E-03	NA	1.75E-02	NA	3.49E-03
	Groundwater Potable Use	**9.00E+02**	**3.86E+02**	**4.89E+02**	NA	NA	NA	NA	NA	NA	NA
	Groundwater - Dermal Contact	**5.63E+00**	**1.91E+00**	**2.65E+00**	NA	NA	NA	NA	NA	NA	NA
	Boulder - Incidental Ingestion	**3.83E+00**	3.28E-01	**1.03E+00**	**1.09E+00**	9.38E-02	2.94E-01	NA	NA	NA	NA
Total Noncancer HI		**9.43E+02**	**3.93E+02**	**5.03E+02**	**6.16E+00**	6.75E-01	**1.77E+00**	1.13E-01	**1.77E+00**	4.89E-01	**1.43E+01**

Table ES-1 Cumulative Noncancer Risks by Exposure Area and Media-Specific Exposure Pathway

NONCANCER RISKS

Exposure Area	Exposure Pathway	On-Site Resident			Hiker			Rafter	Angler	Golfer	Construction Worker
		Child	Adult	Age Averaged	Child	Adult	Age Averaged	Adult	Adult	Adult	Adult
Roaster Pile 5	Surface Soil - Incidental Ingestion	**9.22E+00**	9.88E-01	**2.63E+00**	**1.32E+00**	1.41E-01	3.76E-01	NA	NA	1.41E-01	**2.33E+00**
	Surface Soil - Dermal Contact	4.12E-01	6.30E-02	1.33E-01	1.18E-01	1.80E-02	3.80E-02	NA	NA	1.67E-02	1.12E-01
	Surface Soil -Particulate Inhalation	3.71E-02	3.71E-02	7.42E-03	1.06E-02	1.06E-02	2.12E-03	1.06E-02	1.06E-02	1.06E-02	2.65E-02
	Subsurface Soil - Incidental Ingestion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Subsurface Soil - Dermal Contact	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Subsurface Soil - Particulate Inhalation	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Surface Water-Incidental Ingestion	8.77E-03	1.09E-03	2.63E-03	2.92E-03	2.51E-04	1.34E-04	1.25E-03	1.25E-03	NA	2.51E-04
	Surface Water - Dermal Contact	1.04E-03	3.53E-04	4.91E-04	3.47E-04	8.12E-05	1.34E-04	4.06E-04	4.06E-04	NA	8.12E-05
	Fish Ingestion	**2.77E+00**	**1.58E+00**	**1.82E+00**	NA	NA	NA	NA	**1.58E+00**	NA	NA
	Sediment - Incidental Ingestion	4.98E-01	5.34E-02	1.42E-01	3.32E-01	3.56E-02	9.49E-02	7.12E-02	7.12E-02	NA	7.12E-02
	Sediment - Dermal Contact	2.99E-01	5.35E-02	1.03E-01	1.99E-01	3.57E-02	6.84E-02	3.57E-02	3.57E-02	NA	3.76E-02
	Diversion Trench Surface Water - Incidental Ingestion	4.46E-02	5.55E-03	1.34E-02	1.49E-02	1.27E-03	3.99E-03	NA	6.37E-03	NA	1.27E-03
	Diversion Trench Surface Water - Dermal Contact	5.89E-03	2.00E-03	2.78E-03	1.96E-03	4.59E-04	7.60E-04	NA	2.29E-03	NA	4.59E-04
	Seep Water - Incidental Ingestion	3.49E-01	4.33E-02	1.04E-01	1.16E-01	9.96E-03	3.12E-02	NA	4.98E-02	NA	9.96E-03
	Seep Water- Dermal Contact	4.48E-02	1.52E-02	2.11E-02	1.49E-02	3.49E-03	5.78E-03	NA	1.75E-02	NA	3.49E-03
	Groundwater Potable Use	**9.00E+02**	**3.86E+02**	**4.89E+02**	NA	NA	NA	NA	NA	NA	NA
	Groundwater - Dermal Contact	**5.63E+00**	**1.91E+00**	**2.65E+00**	NA	NA	NA	NA	NA	NA	NA
	Boulder - Incidental Ingestion	**3.83E+00**	3.28E-01	**1.03E+00**	**1.09E+00**	9.38E-02	2.94E-01	NA	NA	NA	NA
Total Noncancer HI		**9.23E+02**	**3.91E+02**	**4.97E+02**	**3.22E+00**	3.50E-01	9.15E-01	1.19E-01	**1.78E+00**	1.68E-01	**2.59E+00**

Table ES-2 Cumulative Cancer Risks by Exposure Area and Media-Specific Exposure Pathway

CANCER RISKS

Exposure Area	Exposure Pathway	On-Site Resident	Hiker	Rafter	Angler	Golfer	Worker
		Age Averaged	Age Averaged	Adult	Adult	Adult	Adult
Bolts Lake	Surface Soil - Incidental Ingestion	**2.35E-05**	**3.35E-06**	NA	NA	**1.26E-06**	**1.38E-06**
	Surface Soil - Dermal Contact	**2.22E-06**	6.35E-07	NA	NA	2.80E-07	1.25E-07
	Surface Soil -Particulate Inhalation	2.35E-07	9.18E-10	4.59E-09	4.59E-09	4.59E-09	1.53E-09
	Subsurface Soil - Incidental Ingestion	NA	NA	NA	NA	NA	**1.73E-06**
	Subsurface Soil - Dermal Contact	NA	NA	NA	NA	NA	1.56E-07
	Subsurface Soil - Particulate Inhalation	NA	NA	NA	NA	NA	1.74E-09
	Surface Water-Incidental Ingestion	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
	Surface Water - Dermal Contact	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
	Fish Ingestion	0.00E+00	NA	NA	0.00E+00	NA	NA
	Sediment - Incidental Ingestion	**2.44E-05**	**1.63E-05**	**1.22E-05**	**1.22E-05**	NA	8.14E-07
	Sediment - Dermal Contact	**1.97E-05**	**1.32E-05**	**6.87E-06**	**6.87E-06**	NA	4.83E-07
	Diversion Trench Surface Water - Incidental Ingestion	**1.50E-06**	4.49E-07	NA	7.17E-07	NA	9.56E-09
	Diversion Trench Surface Water - Dermal Contact	3.12E-07	8.55E-08	NA	2.58E-07	NA	3.44E-09
	Seep Water - Incidental Ingestion	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00
	Seep Water- Dermal Contact	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00
	Groundwater Potable Use	**2.45E-03**	NA	NA	NA	NA	NA

Table ES-2 Cumulative Cancer Risks by Exposure Area and Media-Specific Exposure Pathway

CANCER RISKS

Exposure Area	Exposure Pathway	On-Site Resident Age Averaged	Hiker Age Averaged	Rafter Adult	Angler Adult	Golfer Adult	Worker Adult
	Groundwater - Dermal Contact	1.41E-05	NA	NA	NA	NA	NA
	Boulder - Incidental Ingestion	1.93E-04	5.53E-05	NA	NA	NA	NA
Total Cancer Risk		2.73E-03	8.92E-05	1.91E-05	2.01E-05	1.54E-06	4.71E-06
Maloit Park	Surface Soil - Incidental Ingestion	8.81E-04	1.26E-04	NA	NA	4.72E-05	5.19E-05
	Surface Soil - Dermal Contact	8.34E-05	2.38E-05	NA	NA	1.05E-05	4.67E-06
	Surface Soil -Particulate Inhalation	1.75E-06	6.85E-09	3.43E-08	3.43E-08	3.43E-08	1.14E-08
	Subsurface Soil - Incidental Ingestion	NA	NA	NA	NA	NA	NA
	Subsurface Soil - Dermal Contact	NA	NA	NA	NA	NA	NA
	Subsurface Soil - Particulate Inhalation	NA	NA	NA	NA	NA	NA
	Surface Water-Incidental Ingestion	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
	Surface Water - Dermal Contact	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
	Fish Ingestion	0.00E+00	NA	NA	0.00E+00	NA	NA
	Sediment - Incidental Ingestion	2.44E-05	1.63E-05	1.22E-05	1.22E-05	NA	8.14E-07
	Sediment - Dermal Contact	1.97E-05	1.32E-05	6.87E-06	6.87E-06	NA	4.83E-07
	Diversion Trench Surface Water - Incidental Ingestion	1.50E-06	4.49E-07	NA	7.17E-07	NA	9.56E-09
	Diversion Trench Surface Water - Dermal Contact	3.12E-07	8.55E-08	NA	2.58E-07	NA	3.44E-09
	Seep Water - Incidental Ingestion	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00
	Seep Water- Dermal Contact	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00
	Groundwater Potable Use	2.45E-03	NA	NA	NA	NA	NA
	Groundwater - Dermal Contact	1.41E-05	NA	NA	NA	NA	NA
	Boulder - Incidental Ingestion	1.93E-04	5.53E-05	NA	NA	NA	NA
Total Cancer Risk		3.67E-03	2.35E-04	1.91E-05	2.01E-05	5.77E-05	5.79E-05
Old Tailings Pile (&Sump 3, Old Slurry Line)	Surface Soil - Incidental Ingestion	1.29E-04	1.85E-05	NA	NA	6.92E-06	7.61E-06
	Surface Soil - Dermal Contact	1.22E-05	3.50E-06	NA	NA	1.54E-06	6.85E-07
	Surface Soil -Particulate Inhalation	4.08E-07	1.60E-09	7.99E-09	7.99E-09	7.99E-09	2.66E-09
	Subsurface Soil - Incidental Ingestion	NA	NA	NA	NA	NA	1.52E-05
	Subsurface Soil - Dermal Contact	NA	NA	NA	NA	NA	1.37E-06
	Subsurface Soil - Particulate Inhalation	NA	NA	NA	NA	NA	4.56E-09
	Surface Water-Incidental Ingestion	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
	Surface Water - Dermal Contact	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
	Fish Ingestion	0.00E+00	NA	NA	0.00E+00	NA	NA
	Sediment - Incidental Ingestion	2.44E-05	1.63E-05	1.22E-05	1.22E-05	NA	8.14E-07
	Sediment - Dermal Contact	1.97E-05	1.32E-05	6.87E-06	6.87E-06	NA	4.83E-07
	Diversion Trench Surface Water - Incidental Ingestion	1.50E-06	4.49E-07	NA	7.17E-07	NA	9.56E-09
	Diversion Trench Surface Water - Dermal Contact	3.12E-07	8.55E-08	NA	2.58E-07	NA	3.44E-09
	Seep Water - Incidental Ingestion	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00
	Seep Water- Dermal Contact	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00
	Groundwater Potable Use	2.45E-03	NA	NA	NA	NA	NA
	Groundwater - Dermal Contact	1.41E-05	NA	NA	NA	NA	NA
	Boulder - Incidental Ingestion	1.93E-04	5.53E-05	NA	NA	NA	NA
Total Cancer Risk		2.85E-03	1.07E-04	1.91E-05	2.01E-05	8.47E-06	2.62E-05

Table ES-2 Cumulative Cancer Risks by Exposure Area and Media-Specific Exposure Pathway

CANCER RISKS

Exposure Area	Exposure Pathway	On-Site Resident Age Averaged	Hiker Age Averaged	Rafter Adult	Angler Adult	Golfer Adult	Worker Adult
Rex Flats	Surface Soil - Incidental Ingestion	**1.03E-03**	**1.48E-04**	NA	NA	**5.54E-05**	**6.09E-05**
	Surface Soil - Dermal Contact	**9.79E-05**	**2.80E-05**	NA	NA	**1.23E-05**	**5.48E-06**
	Surface Soil -Particulate Inhalation	**1.89E-06**	7.41E-09	3.70E-08	3.70E-08	3.70E-08	1.23E-08
	Subsurface Soil - Incidental Ingestion	NA	NA	NA	NA	NA	**6.92E-05**
	Subsurface Soil - Dermal Contact	NA	NA	NA	NA	NA	**6.23E-06**
	Subsurface Soil - Particulate Inhalation	NA	NA	NA	NA	NA	1.41E-08
	Surface Water-Incidental Ingestion	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
	Surface Water - Dermal Contact	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
	Fish Ingestion	0.00E+00	NA	NA	0.00E+00	NA	NA
	Sediment - Incidental Ingestion	**2.44E-05**	**1.63E-05**	**1.22E-05**	**1.22E-05**	NA	8.14E-07
	Sediment - Dermal Contact	**1.97E-05**	**1.32E-05**	**6.87E-06**	**6.87E-06**	NA	4.83E-07
	Diversion Trench Surface Water - Incidental Ingestion	**1.50E-06**	4.49E-07	NA	7.17E-07	NA	9.56E-09
	Diversion Trench Surface Water - Dermal Contact	3.12E-07	8.55E-08	NA	2.58E-07	NA	3.44E-09
	Seep Water - Incidental Ingestion	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00
	Seep Water- Dermal Contact	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00
	Groundwater Potable Use	**2.45E-03**	NA	NA	NA	NA	NA
	Groundwater - Dermal Contact	**1.41E-05**	NA	NA	NA	NA	NA
	Boulder - Incidental Ingestion	**1.93E-04**	**5.53E-05**	NA	NA	NA	NA
Total Cancer Risk		**3.84E-03**	**2.61E-04**	**1.91E-05**	**2.01E-05**	**6.77E-05**	**1.43E-04**
Roaster Pile 5	Surface Soil - Incidental Ingestion	**2.70E-04**	**3.86E-05**	NA	NA	**1.45E-05**	**1.59E-05**
	Surface Soil - Dermal Contact	**2.56E-05**	**7.31E-06**	NA	NA	**3.22E-06**	**1.43E-06**
	Surface Soil -Particulate Inhalation	6.08E-07	2.38E-09	1.19E-08	1.19E-08	1.19E-08	3.97E-09
	Subsurface Soil - Incidental Ingestion	NA	NA	NA	NA	NA	NA
	Subsurface Soil - Dermal Contact	NA	NA	NA	NA	NA	NA
	Subsurface Soil - Particulate Inhalation	NA	NA	NA	NA	NA	NA
	Surface Water-Incidental Ingestion	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
	Surface Water - Dermal Contact	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
	Fish Ingestion	0.00E+00	NA	NA	0.00E+00	NA	NA
	Sediment - Incidental Ingestion	**2.44E-05**	**1.63E-05**	**1.22E-05**	**1.22E-05**	NA	8.14E-07
	Sediment - Dermal Contact	**1.97E-05**	**1.32E-05**	**6.87E-06**	**6.87E-06**	NA	4.83E-07
	Diversion Trench Surface Water - Incidental Ingestion	**1.50E-06**	4.49E-07	NA	7.17E-07	NA	9.56E-09
	Diversion Trench Surface Water - Dermal Contact	3.12E-07	8.55E-08	NA	2.58E-07	NA	3.44E-09
	Seep Water - Incidental Ingestion	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00
	Seep Water- Dermal Contact	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00
	Groundwater Potable Use	**2.45E-03**	NA	NA	NA	NA	NA
	Groundwater - Dermal Contact	**1.41E-05**	NA	NA	NA	NA	NA
	Boulder - Incidental Ingestion	**1.93E-04**	**5.53E-05**	NA	NA	NA	NA
Total Cancer Risk		**3.00E-03**	**1.31E-04**	**1.91E-05**	**2.01E-05**	**1.77E-05**	**1.87E-05**

Notes:
NA - Not applicable
Bold underlines - indicates value exceeds target noncancer or cancer risk values
Zeros - indicate there were no cancer risks because there were no identified carcinogens as COPCs

1.0 INTRODUCTION

Ginn Battle North proposes to redevelop the North Property into a residential and recreational community, including an 18-hole golf course facility, through remedy retrofits and enhancements to the existing remedy at the Eagle Mine Site. Prior to any remedial activities on the North Property, Ginn Battle North must first obtain a baseline human health risk assessment for the North Property in its current state. A Human Health Risk Assessment ("HHRA") describes the potential for site-related risks to human receptors. It contains quantitative estimates of exposure compared to estimates of cancer and noncancer health effects (i.e., hazard) in order to develop risk estimates. Risk estimates are typically presented in the form of hazard quotients and cancer risks.

ERM conducted the Remedial Investigation ("RI")of the North Property under the EPA approved, "Final Work Plan for Site Investigation of Bolts Lake and Eagle Mine Site OU-1 Development Areas, Battle Mountain North Development" ("Work Plan"), and Work Plan Addenda 1, 2, and 3 for additional investigation. The Work Plan and its Addenda are herein collectively referred to as the Work Plan. This HHRA will further identify the potential for site-related risks to human health prior to the proposed remedial actions and redevelopment.

The HHRA was performed in two tiers. The initial tier ("Tier I") was a screening step in which the data were evaluated and summary statistics compiled, and then maximum sitewide concentrations of each contaminant were compared to conservative, readily available screening levels. Any contaminants exceeding their initial screening levels were further evaluated to determine if they should be evaluated in Tier II as chemicals of potential concern ("COPCs"). This further evaluation included consideration of detection frequency, comparison to background levels, evaluation as nutrients, and consideration of historic use. Analytes that were not detected in more than 5 percent (%) of the samples, were below background, were below nutritional levels, or not part of the historic mining operations were not carried forward as COPCs.

In Tier II, COPCs were further evaluated by developing a site conceptual model, a list of potential site receptors, and estimating receptor-specific exposure. Toxicity values were obtained, and predictions of cancer and noncancer risk were made for these receptors.

1.1 ORGANIZATION

This HHRA contains the following sections:

- Introduction
- Tier I Screening-Level Human Health Evaluation
- Tier II Risk Evaluation
- Conclusions

The objectives, North Property history, and organization of the HHRA are presented in the following sections. The overall risk assessment process is presented in Figure 1.

1.2 NORTH PROPERTY SITE HISTORY

The subject property ("North Property") includes a portion of the Eagle Mine Site, which was designated as a Superfund Site and placed on the National Priorities List ("NPL") in 1986 by the Environmental Protection Agency ("EPA") (Figure 2), and surrounding areas adjacent to the Eagle Mine Site known as Bolts Lake and the Highlands Area. The Eagle Mine Site was listed on the NPL by the EPA due to the impacts of mining activities on the metals concentrations in the Eagle River. The Eagle Mine was the primary mine in the Battle Mountain mining district.

The Eagle Mine Site encompasses approximately 235 acres, and includes abandoned mining and ore processing facilities located along the banks of the Eagle River. The North Property, addressed herein, encompasses the northern portion of Eagle Mine Site Operable Unit 1 ("OU-1") which historically received waste (tailings) from the ore beneficiation (crushing, grinding, washing, extraction) operations that occurred at Belden. Belden is a railroad siding located in the Eagle River valley below the town of Gilman and is an area where most of the ore benefication processes were operated. Belden is not part of the North Property.

Figure 1 Human Health Risk Assessment Process

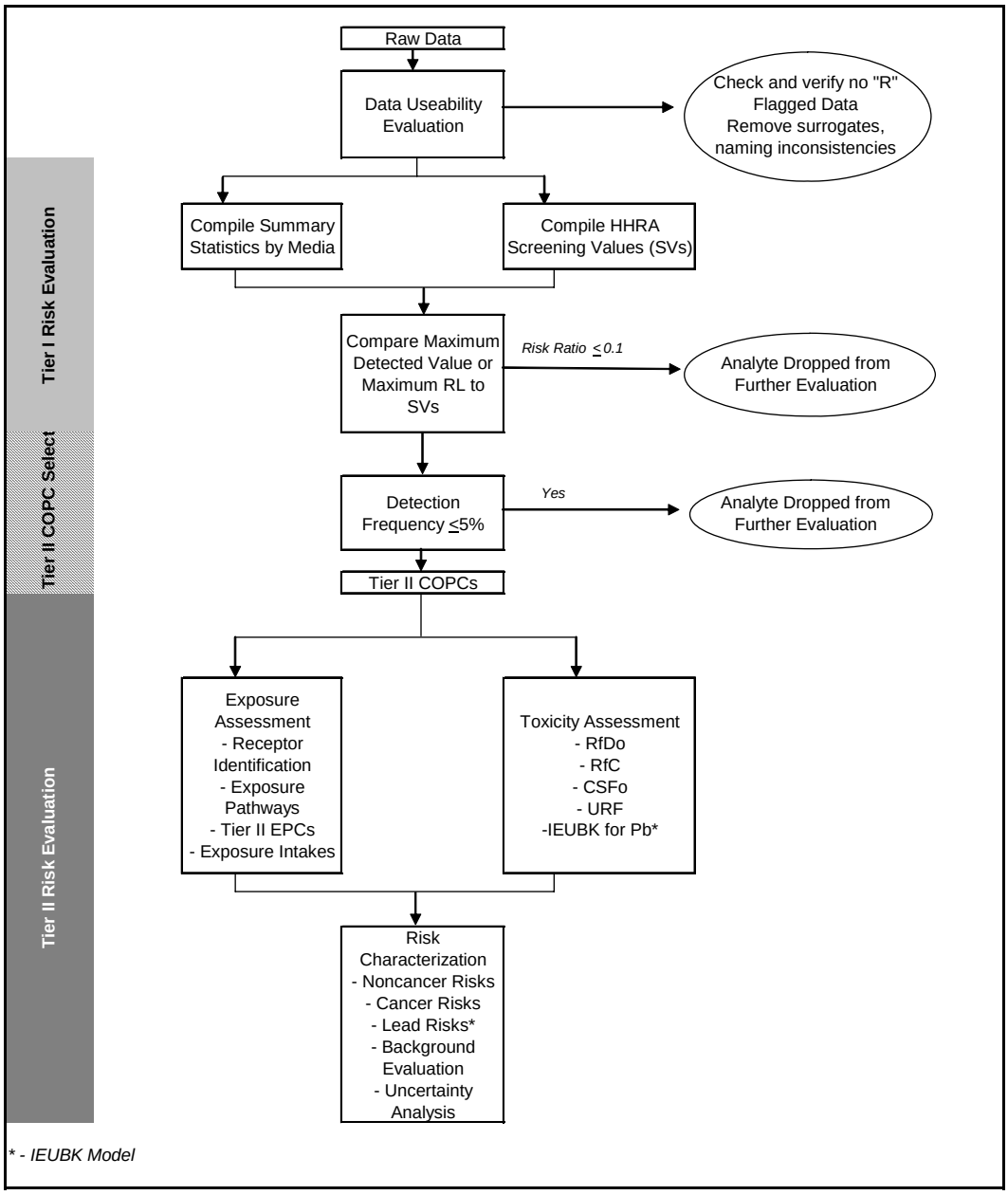
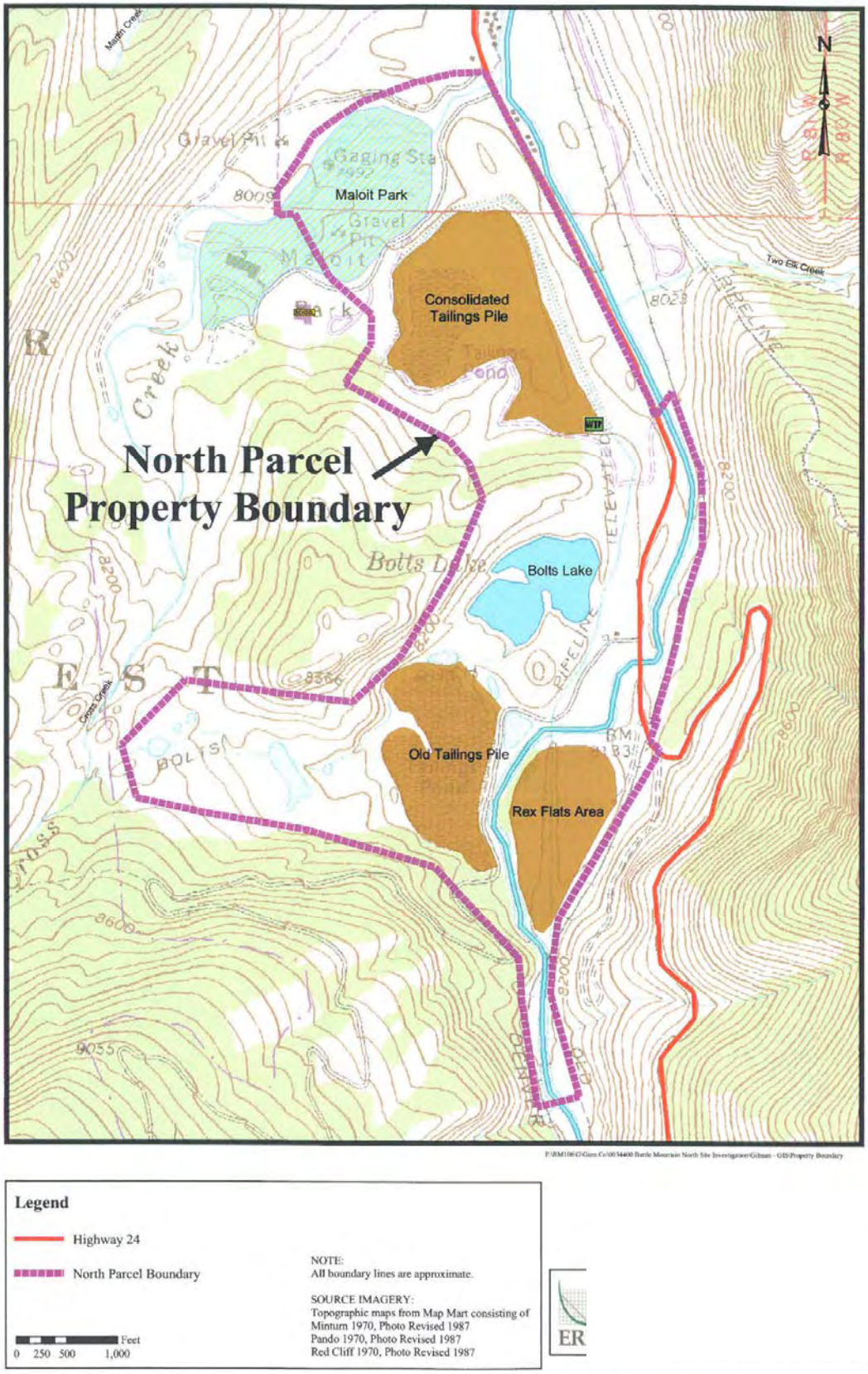


Figure 2 *Map of the North Battle Mountain Property*



In 1988, the State of Colorado ("State"), through the Colorado Department of Public Health and Environment ("CDPHE") and the previous mine owner/operator ("Gulf +Western Industries"), entered into a Consent Decree ("1988 Consent Decree") to conduct remedial actions. In 1993, EPA identified additional site investigation and remedial actions to be implemented at the Eagle Mine Site, and in 1995 EPA, CDPHE, and Viacom International, Inc. ("Viacom"), successor to liability at the Eagle Mine Site, entered into a subsequent Consent Decree ("3-Party Consent Decree").

Remediation activities at the OU-1 area have included:

- removal of tailing materials from the Old Tailings Pile ("OTP"), Rex Flats and Maloit Park areas to the Consolidated Tailings Pile ("CTP");
- construction of the Water Treatment Plant ("WTP") and a lined sludge pond;
- capping the CTP;
- ground and surface water monitoring; and
- revegetation of disturbed areas.

The Eagle Mine Site OU-1 includes the OTP, Rex Flats, Maloit Park, and the CTP areas, (which were part of the Eagle Mine operations), and Bolts Lake and its immediate surroundings, which are addressed in this risk assessment.

Remediation of the Eagle Mine Site soil for non-residential uses was completed by 1996. Operation and maintenance of remediation systems at the OU-1 area continues today as the responsibility of Viacom. Soil and ground water beneath the OU-1 area were not remediated and are potentially impacted by the former tailings placement.

1.3 OBJECTIVES OF THE HUMAN HEALTH RISK ASSESSMENT

The objectives of the HHRA were to use standard CDPHE and EPA methods in order to estimate human health risks. This HHRA will serve as a technical support document for the risk managers.

2.0 TIER I SCREENING LEVEL HUMAN HEALTH EVALUATION

The Tier I analysis is described below. The data used in the Tier I evaluation are presented, as well as the "screening values" used for analysis.

2.1 RISK ASSESSMENT DATA

Five abiotic media (surface soil, subsurface soil, sediment, ground water, and surface water) were sampled during the 2005 and 2006 RI. In addition, boulders (via rock chips collected from the boulders), ditch water, and seep water samples were also collected. These media were analyzed for the chemicals on the target analyte list (Table 1), although the specific suite/subset of analyses was media specific.

Analytical methods were selected to generate data appropriate for use in a human health risk assessment. Analytical method detection limits were compared to relevant screening levels to ensure that the screening levels would be met to the extent technically feasible.

Table 1 Target Analyte List

Table 1 - Target Analyte List		
SVOCs		
1,2-Benzphenanthracene (Chrysene)	4-Nitrophenol	Di-n-butyl phthalate
2,4,5-Trichlorophenol	Acenaphthylene	Di-n-octyl phthalate
2,4,6-Trichlorophenol	Acetophenone	Fluoranthene
2,4-Dichlorophenol	Anthracene	Fluorene
2,4-Dimethylphenol	Atrazine	Hexachloro-1,3-butadiene
2,4-Dinitrophenol	Benzo(a)anthracene	Hexachlorobenzene
2,4-Dinitrotoluene	Benzo(a)pyrene	Hexachlorocyclopentadiene
2,6-Dinitrotoluene	Benzo(b)fluoranthene	Hexachloroethane
2-Chloronaphthalene	Benzo(ghi)perylene	Indeno(1,2,3-cd)pyrene
2-Chlorophenol	Benzo(k)fluoranthene	Naphthalene
2-Methylnaphthalene	Benzyl butyl phthalate	Nitrobenzene
2-Methylphenol	Bis(2-Chloroethoxy)methane	N-Nitrosodi-n-propylamine
2-Nitroaniline	Bis(2-Chloroethyl) ether	N-nitrosodiphenylamine
2-Nitrophenol	Bis(2-Chloroisopropyl) ether	P-Chloroaniline (4-Chloroaniline)
3,3-Dichlorobenzidine	Bis(2-Ethylhexyl) phthalate	Pentachlorophenol

Table 1 - Target Analyte List		
3-Nitroaniline	Caprolactam	Phenanthrene
4,6-Dinitro-2-methylphenol	Carbazole	Phenol
4-Bromophenyl phenyl ether	Dibenz(a,h)anthracene"	P-Nitroaniline (4-Nitroaniline)
4-Chloro-3-methylphenol	Dibenzofuran	Pyrene
4-Chlorophenyl phenyl ether	Diethyl phthalate	
4-Methylphenol	Dimethyl phthalate	
VOCs		
1,1,1,2-Tetrachlorroethane	2-Chlorotoluene	Ethylbenzene
1,1,1-Trichloroethane	2-Phenylbutane (sec-Butylbenzene)	Hexachloro-1,3-butadiene
1,1,2,2-Tetrachloroethane	4-Chlorotoluene	Isopropylbenzene
1,1,2-Trichloroethane	4-Methyl-2-pentanone	M-dichlorobenzene (1,3-Dichlorobenzene)
1,1-Dichloroethane	Acetone	Methyl n-butyl ketone (2-Hexanone)
1,1-Dichloroethylene	Benzene	Methyl tert-butyl ether
1,1-Dichloropropene	Bromobenzene	Methylbenzene (Toluene)
1,2,3-Trichlorobenzene	Bromodichloromethane	M-Xylene & p-Xylene
1,2,3-Trichloropropane	Bromomethane	Naphthalene
1,2,4-Trichlorobenzene	Carbon tetrachloride	N-Butylbenzene
1,2,4-Trimethylbenzene	CFC-11 (Trichlorofluoromethane)	N-Propylbenzene
1,2-Dibromo-3-chloropropane	CFC-12 (Dichlorodifluoromethane)	P-Cymene (4-Isopropyltoluene)
1,2-Dibromoethane (edb)	Chlorobenzene	Styrene
1,2-Dichlorobenzene	Chlorobromomethane (Bromochloromethane)	Tert-Butylbenzene
1,2-Dichloroethane	Chlorodibromomethane (Dibromochloromethane)	Tetrachloroethene
1,2-Dichloroethene (total)	Chloroethane	Trans-1,2-Dichloroethene
1,2-Dichloropropane	Chloroform	Trans-1,3-Dichloropropene
1,3,5-Trimethylbenzene	Chloromethane	Tribomomethane (Bromoform)
1,3-Dichloropropane	Cis-1,2-Dichloroethene	Trichloroethylene
1,4-Dichlorobenzene	Cis-1,3-Dichloropropene	Vinyl chloride
2,2-Dichloropropane	Dibromomethane	Xylenes (total, and o-xylene)
2-Butanone (mek)	Dichloromethane (Methylene chloride)	
Metals		
Aluminum	Cobalt	Nickel
Antimony	Copper	Selenium

Table 1 - Target Analyte List		
Arsenic	Iron	Silver
Barium	Lead	Thallium
Beryllium	Manganese	Vanadium
Cadmium	Mercury	Zinc
Chromium		
Other Inorganics		
Calcium	pH	Sulfate
Cyanide	Potassium	
Magnesium	Sodium	

2.2 *DATA VALIDATION*

Laboratory data from the sampling investigations were validated prior to inclusion in the risk assessment data set. A validation rate of 10% was stipulated in the Work Plan, and greater than 10% of the data were validated. Some of the data were qualified with "J," indicating that the reported data is estimated. The data is useable as qualified with the exception of five samples that were rejected for thallium and 5 samples that were rejected for a partial list of the volatile organic compounds ("VOCs"). The thallium ground water data that were rejected were inadvertently analyzed by method 6010. The thallium results used to assess North Property conditions were analyzed by EPA Method 6020 in order to achieve lower detection limits; therefore, the rejection of the thallium 6010 samples did not affect the North Property data set. The VOC results rejected included 11 of the 65 volatile constituents from 5 monitoring well locations. These locations were evaluated based on the data that were not rejected and the results of another sampling event. Therefore, the rejection of these data does not affect the overall characterization of the North Property.

2.3 *DATA EVALUATION*

Validated and suitable data collected in 2005 to 2006 were compiled into the risk assessment database for inclusion into the risk analyses. These current data are hereafter referred to as the RI data. The data were segregated by media. For the Tier I screening-level HHRA, abiotic data were grouped into the following sets for analysis:

- Surface soil (0-6 inch below ground surface ("in-bgs"),

- Subsurface soil (6 inch to 25 feet below ground surface ("ft-bgs"),
- Surface water from the Eagle River and Cross Creek (Total and Dissolved),
- Saturated sediment from the Eagle River,
- Ground water,
- Rock Chips from boulders (literally hammering at the boulders to collect a sample of the discolored material coating the boulders),
- Ditch Water, and
- Seeps.

It is noted that sediment samples were not collected from other surface water bodies, such as the seeps or the diversion trenches. These other surface water bodies are small in area, have intermittent flow, do not support fish, and therefore are not included in potential exposure areas as related to surface water. In general, the area of the seeps and OTP diversion trenches are included in the overall evaluation of surface soil and related potential exposure.

2.4 DERIVATION OF SCREENING LEVELS

Table 2 presents the conservative screening levels used as the basis for comparison. These values were obtained from various regulatory sources. Soils and sediments were compared to the EPA Region 9 Residential or migration to ground water ("MTG") preliminary remedial goals ("PRGs") (EPA, 2004a); surface water and ground water were compared to the CDPHE water quality standards (CDPHE 2005; CDPHE, 2003) and EPA Region 9 tap water PRGs (EPA, 2004a).

Table 2 *Tier I Human Health Screening Values*

Table 2 - Tier I Human Health Screening Value									
	CDPHE Surface Water Values (mg/L)				EPA Region IX	CDPHE Ground water Values (mg/L)		Soil (mg/kg)	
Analyte	Water Supply	Water & Fish	Fish Only	Agriculture	Tap Water PRG (mg/L)	Drinking Water	Agricultural	Region IX Residential PRG	Region IX Migration to Ground water
VOCs									
1,1,1,2-Tetrachloroethane	NA	NA	NA	NA	4.32E-04	NA	NA	3.19E+00	NA
1,1,1-Trichloroethane	2.00E-01	NA	NA	NA	3.17E+00	2.00E-01	NA	1.20E+03	1.00E-01
1,1,2,2-Tetrachloroethane	1.80E-04	1.70E-04	4.00E-03	NA	5.53E-05	1.80E-04	NA	4.08E-01	2.00E-04
1,1,2-Trichloroethane	2.80E-03	2.70E-03	7.10E-02	NA	2.00E-04	2.80E-03	NA	7.29E-01	9.00E-04
1,1-Dichloroethane	NA	NA	NA	NA	8.11E-01	NA	NA	5.06E+02	1.00E+00
1,1-Dichloroethylene	7.00E-03	7.00E-03	3.60E+00	NA	3.39E-01	NA	NA	1.24E+02	3.00E-03
1,1-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	NA	NA	NA	NA	5.60E-06	NA	NA	3.40E-02	NA
1,2,4-Trichlorobenzene	7.00E-02	3.50E-02	NA	NA	7.16E-03	7.00E-02	NA	6.22E+01	3.00E-01
1,2,4-Trimethylbenzene	NA	NA	NA	NA	1.23E-02	NA	NA	5.16E+01	NA
1,2-Dibromo-3-Chloropropane (DBCP)	2.00E-04	NA	NA	NA	4.76E-05	2.00E-04	NA	4.60E-01	NA
1,2-Dibromoethane (EDB)	4.10E-07	NA	NA	NA	5.60E-06	4.10E-07	NA	3.20E-02	NA
1,2-Dichlorobenzene	6.00E-01	4.20E-01	1.30E+00	NA	3.70E-01	6.00E-01	NA	6.00E+02	9.00E-01
1,2-Dichloroethane	3.80E-04	3.80E-04	3.70E-02	NA	1.23E-04	3.80E-04	NA	2.78E-01	1.00E-03
1,2-Dichloroethene (Total)	7.00E-02	NA	NA	NA	6.08E-02	7.00E-02	NA	4.29E+01	2.00E-02
1,2-Dichloropropane	5.20E-04	5.00E-04	1.40E-02	NA	1.65E-04	5.20E-04	NA	3.42E-01	1.00E-03
1,3,5-Trimethylbenzene	NA	NA	NA	NA	1.23E-02	NA	NA	2.13E+01	NA
1,3-Dichloropropane	NA	NA	NA	NA	1.22E-01	NA	NA	1.05E+02	NA
1,4-Dichlorobenzene	7.50E-02	6.30E-02	1.90E-01	NA	5.02E-04	7.50E-02	NA	3.45E+00	1.00E-01
2,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	7.00E-01	7.00E-01	3.60E+00	NA	3.65E+00	7.00E-01	NA	6.11E+03	1.40E+01
2,4,6-Trichlorophenol	3.20E-03	1.40E-03	2.40E-03	NA	3.65E-03	3.20E-03	NA	6.11E+00	8.00E-03
2,4-Dichlorophenol	2.10E-02	2.10E-02	2.90E-01	NA	1.09E-01	2.10E-02	NA	1.83E+02	5.00E-02
2,4-Dimethylphenol	1.40E-01	1.40E-01	8.50E-01	NA	7.30E-01	1.40E-01	NA	1.22E+03	4.00E-01
2,4-Dinitrophenol	1.40E-02	1.40E-02	5.30E+00	NA	7.30E-02	1.40E-02	NA	1.22E+02	1.00E-02
2,4-Dinitrotoluene	1.10E-04	1.10E-04	3.40E-03	NA	7.30E-02	1.10E-04	NA	1.22E+02	4.00E-05
2,6-Dinitrotoluene	NA	NA	NA	NA	3.65E-02	NA	NA	6.11E+01	3.00E-05
2-Butanone (MEK)	NA	NA	NA	NA	6.97E+00	NA	NA	2.23E+04	NA
2-Chloronaphthalene	5.60E-01	5.60E-01	NA	NA	4.87E-01	5.60E-01	NA	4.94E+03	NA
2-Chlorophenol	3.50E-02	3.50E-02	1.50E-01	NA	3.04E-02	3.50E-02	NA	6.34E+01	2.00E-01
2-Chlorotoluene	NA	NA	NA	NA	1.22E-01	NA	NA	1.58E+02	NA
2-Nitroaniline	NA	NA	NA	NA	1.09E-01	NA	NA	1.83E+02	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Phenylbutane	NA	NA	NA	NA	2.43E-01	NA	NA	2.20E+02	NA
3,3-Dichlorobenzidine	7.80E-05	2.10E-05	2.80E-05	NA	1.49E-04	7.80E-05	NA	1.08E+00	3.00E-04
3-Nitroaniline	NA	NA	NA	NA	3.20E-03	NA	NA	1.83E+01	NA
4,6-Dinitro-2-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl Phenyl Ether	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 2 - Tier I Human Health Screening Value

Analyte	CDPHE Surface Water Values (mg/L)				EPA Region IX	CDPHE Ground water Values (mg/L)		Soil (mg/kg)	
	Water Supply	Water & Fish	Fish Only	Agriculture	Tap Water PRG (mg/L)	Drinking Water	Agricultural	Region IX Residential PRG	Region IX Migration to Ground water
4-Chloro-3-Methylphenol	2.10E-01	NA	NA	NA	NA	2.10E-01	NA	NA	NA
4-Chlorophenyl Phenyl Ether	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Isobutyltoluene									
4-Methyl-2-Pentanone	NA	NA	NA	NA	1.99E+00	NA	NA	5.28E+03	NA
4-Nitrophenol	5.60E-02	5.60E-02	9.70E+00	NA	NA	5.60E-02	NA	NA	NA
Acetone	NA	NA	NA	NA	5.48E+00	NA	NA	1.41E+04	8.00E-01
Acetophenone	NA	NA	NA	NA	6.08E-01	NA	NA	7.82E+03	1.59E-01
Benzene	2.30E-03	2.20E-03	5.10E-02	NA	3.54E-04	5.00E-03	NA	6.43E-01	2.00E-03
Bis(2-Chloroethoxy)Methane	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-Chloroethyl) Ether	3.20E-05	3.00E-05	5.30E-04	NA	1.02E-05	3.20E-05	NA	2.18E-01	2.00E-05
Bis(2-Chloroisopropyl) Ether	2.80E-01	2.80E-01	6.50E+01	NA	2.74E-04	NA	NA	2.88E+00	NA
Bis(2-Ethylhexyl) Phthalate	2.50E-03	1.20E-03	2.20E-03	NA	4.80E-03	2.50E-03	NA	3.47E+01	NA
Bromobenzene	NA	NA	NA	NA	2.03E-02	NA	NA	2.78E+01	NA
Bromodichloromethane	NA	5.50E-04	1.70E-02	NA	1.81E-04	5.60E-04	NA	8.24E-01	3.00E-02
Bromomethane	NA	9.80E-03	1.50E+00	NA	8.66E-03	NA	NA	3.90E+00	1.00E-02
Caprolactam	NA	NA	NA	NA	1.82E+01	NA	NA	3.06E+04	NA
Carbazole	NA	NA	NA	NA	3.36E-03	NA	NA	2.43E+01	3.00E-02
Carbon Tetrachloride	2.70E-04	2.30E-04	1.60E-03	NA	1.71E-04	2.70E-04	NA	2.51E-01	3.00E-03
CFC-11	NA	NA	NA	NA	1.29E+00	NA	NA	3.86E+02	NA
CFC-12	NA	NA	NA	NA	3.95E-01	NA	NA	9.39E+01	NA
Chlorobenzene	1.00E-01	1.00E-01	1.60E+00	NA	1.06E-01	1.00E-01	NA	1.51E+02	7.00E-02
Chlorobromomethane	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorodibromomethane	NA	5.40E-02	1.70E+00	NA	1.33E-04	1.40E-02	NA	1.11E+00	2.00E-02
Chloroethane	NA	NA	NA	NA	4.64E-03	NA	NA	3.03E+00	NA
Chloroform	NA	3.40E-03	1.10E-01	NA	1.66E-04	3.50E-03	NA	2.21E-01	3.00E-02
Chloromethane	NA	NA	NA	NA	1.58E-01	NA	NA	4.69E+01	NA
Cis-1,2-Dichloroethene	7.00E-02	NA	NA	NA	6.08E-02	7.00E-02	NA	4.29E+01	2.00E-02
Cis-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromomethane	NA	NA	NA	NA	6.08E-02	NA	NA	6.69E+01	NA
Dichloromethane	4.70E-03	4.60E-03	5.90E-01	NA	4.28E-03	4.70E-03	NA	9.11E+00	1.00E-03
Hexachloro-1,3-Butadiene	4.50E-04	4.40E-04	NA	NA	8.62E-04	4.50E-04	NA	6.24E+00	1.00E-01
Hexachlorobenzene	2.20E-05	2.80E-07	2.90E-07	NA	4.20E-05	2.20E-05	NA	3.04E-01	1.00E-01
Hexachlorocyclopentadiene	4.20E-02	4.00E-02	NA	NA	2.19E-01	4.20E-02	NA	3.65E+02	2.00E+01
Hexachloroethane	7.00E-04	4.00E-04	9.20E-04	NA	4.80E-03	7.00E-04	NA	3.47E+01	2.00E-02
Ethylbenzene	7.00E-01	5.30E-01	2.10E+00	NA	1.34E+00	7.00E-01	NA	3.95E+02	7.00E-01
Isopropylbenzene	NA	NA	NA	NA	6.58E-01	NA	NA	5.72E+02	NA
Methylene Chloride	4.70E-03	4.60E-03	5.90E-01	NA	4.34E-03	4.70E-03	NA	9.11E+00	1.00E-03
Nitrobenzene	3.50E-03	3.50E-03	6.90E-01	NA	3.40E-03	3.50E-03	NA	1.96E+01	7.00E-03
m-Dichlorobenzene	9.40E-02	9.40E-02	9.60E-01	NA	1.83E-01	9.40E-02	NA	5.31E+02	NA
Methyl n-Butyl Ketone	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Tert-Butyl Ether	NA	NA	NA	NA	1.10E-02	NA	NA	3.20E+01	NA
Methylbenzene	1.00E+00	1.00E+00	1.50E+01	NA	7.23E-01	1.00E+00	NA	5.20E+02	6.00E-01

Table 2 - Tier I Human Health Screening Value

Analyte	CDPHE Surface Water Values (mg/L)				EPA Region IX	CDPHE Ground water Values (mg/L)		Soil (mg/kg)	
	Water Supply	Water & Fish	Fish Only	Agriculture	Tap Water PRG (mg/L)	Drinking Water	Agricultural	Region IX Residential PRG	Region IX Migration to Ground water
m-Xylene &p-Xylene	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Butylbenzene	NA	NA	NA	NA	2.43E-01	NA	NA	2.40E+02	NA
n-Nitrosodi-n-Propylamine	5.00E-06	5.00E-06	5.00E-04	NA	9.60E-06	5.00E-06	NA	6.95E-02	2.00E-06
n-Nitrosodiphenylamine	7.10E-03	3.30E-03	6.00E-03	NA	1.37E-02	7.10E-03	NA	9.93E+01	6.00E-02
n-Propylbenzene	NA	NA	NA	NA	2.43E-01	NA	NA	2.40E+02	NA
o-Xylene	NA	NA	NA	NA	NA	NA	NA	NA	NA
p-Chloroaniline	NA	NA	NA	NA	1.46E-01	NA	NA	2.44E+02	3.00E-02
p-Cymene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	2.90E-04	2.70E-04	3.00E-03	NA	5.60E-04	2.90E-04	NA	2.98E+00	1.00E-03
Phenol	2.10E+00	2.10E+00	NA	NA	1.09E+01	2.10E+00	NA	1.83E+04	5.00E+00
p-Nitroaniline	NA	NA	NA	NA	3.20E-03	NA	NA	2.32E+01	NA
Styrene (Monomer)	1.00E-01	NA	NA	NA	1.64E+00	1.00E-01	NA	1.70E+03	2.00E-01
Tert-Butylbenzene	NA	NA	NA	NA	2.43E-01	NA	NA	3.90E+02	NA
Tetrachloroethene	5.00E-03	6.90E-04	3.30E-03	NA	1.04E-04	5.00E-03	NA	4.84E-01	3.00E-03
Toluene	1.00E+00	1.00E+00	1.50E+01	NA	7.23E-01	1.00E+00	NA	5.20E+02	6.00E-01
Trans-1,2-Dichloroethene	1.00E-01	1.00E-01	1.00E+01	NA	1.22E-01	1.00E-01	NA	6.95E+01	3.00E-02
Trans-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tribomomethane	NA	4.30E-03	1.40E-01	NA	8.51E-03	4.00E-03	NA	6.16E+01	4.00E-02
Trichloroethylene	5.00E-03	2.50E-03	3.00E-02	NA	2.80E-05	5.00E-03	NA	5.30E-02	3.00E-03
Vinyl Chloride	2.30E-05	2.30E-05	2.30E-03	NA	1.98E-05	2.30E-05	NA	7.91E-02	7.00E-04
Xylenes (Total)	1.40E+00	NA	NA	NA	2.06E-01	1.40E+00	NA	2.71E+02	1.00E+01
SVOCs									
1,2-Benzphenanthracene	4.80E-06	3.80E-06	1.80E-05	NA	9.21E-03	4.80E-06	NA	6.21E+01	8.00E+00
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA	1.82E+00	NA	NA	3.06E+03	8.00E-01
4-Methylphenol	NA	NA	NA	NA	1.82E-01	NA	NA	3.06E+02	NA
Acenaphthene	4.20E-01	4.20E-01	NA	NA	3.65E-01	4.20E-01	NA	3.68E+03	2.90E+01
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	2.10E+00	2.10E+00	4.00E+01	NA	1.83E+00	2.10E+00	NA	2.19E+04	5.90E+02
Benzo(a)anthracene	4.80E-06	3.80E-06	1.80E-05	NA	9.21E-05	4.80E-06	NA	6.21E-01	8.00E-02
Benzo(a)pyrene	4.80E-06	3.80E-06	1.80E-05	NA	9.21E-06	4.80E-06	NA	6.21E-02	4.00E-01
Benzo(b)fluoranthene	4.80E-06	3.80E-06	1.80E-05	NA	9.21E-05	4.80E-06	NA	6.21E-01	2.00E-01
Benzo(ghi)Perylene	NA	3.80E-06	1.80E-05	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	4.80E-06	3.80E-06	1.80E-05	NA	9.21E-04	4.80E-06	NA	6.21E+00	2.00E+00
Benzyl Butyl Phthalate	1.40E+00	1.40E+00	1.90E+00	NA	7.30E+00	1.40E+00	NA	1.22E+04	8.10E+02
Bis(2-Ethylhexyl) Phthalate	2.50E-03	1.20E-03	2.20E-03	NA	4.80E-03	2.50E-03	NA	3.47E+01	NA
Carbazole	NA	NA	NA	NA	3.36E-03	NA	NA	2.43E+01	3.00E-02
Chrysene	4.80E-06	3.80E-06	1.80E-05	NA	9.21E-03	4.80E-06	NA	6.21E+01	8.00E+00
Dibenz(a,h)Anthracene	4.80E-06	3.80E-06	1.80E-05	NA	9.21E-06	4.80E-06	NA	6.21E-02	8.00E-02
Diethyl Phthalate	5.60E+00	5.60E+00	4.40E+01	NA	2.92E+01	5.60E+00	NA	4.89E+04	NA
Dimethyl Phthalate	7.00E+01	7.00E+01	1.10E+03	NA	3.65E+02	NA	NA	1.00E+05	NA
Di-n-Butyl Phthalate	7.00E-01	7.00E-01	4.50E+00	NA	3.65E+00	7.00E-01	NA	6.11E+03	2.70E+02
Di-n-Octyl Phthalate	NA	NA	NA	NA	1.46E+00	NA	NA	2.44E+03	1.00E+04

Table 2 - Tier I Human Health Screening Value

Analyte	CDPHE Surface Water Values (mg/L)				EPA Region IX	CDPHE Ground water Values (mg/L)		Soil (mg/kg)	
	Water Supply	Water & Fish	Fish Only	Agriculture	Tap Water PRG (mg/L)	Drinking Water	Agricultural	Region IX Residential PRG	Region IX Migration to Ground water
Dibenzofuran	NA	NA	NA	NA	1.22E-02	NA	NA	1.45E+02	NA
Fluoranthene	2.80E-01	1.30E-01	1.40E-01	NA	1.46E+00	2.80E-01	NA	2.29E+03	2.10E+02
Fluorene	2.80E-01	1.10E+00	5.30E+00	NA	2.43E-01	2.80E-01	NA	2.75E+03	2.80E+01
Indeno(1,2,3-cd)Pyrene	4.80E-06	3.80E-06	1.80E-05	NA	9.21E-05	4.80E-06	NA	6.21E-01	7.00E-01
Naphthalene	1.40E-01	1.40E-01	NA	NA	6.20E-03	1.40E-01	NA	5.59E+01	4.00E+00
Phenanthrene	2.10E+00	2.10E+00	4.00E+01	NA	1.83E+00	2.10E+00	NA	2.19E+04	5.90E+02
Pyrene	2.10E-01	2.10E-01	NA	NA	1.83E-01	2.10E-01	NA	NA	2.10E+02
Pesticides and PCBs									
Atrazine	3.00E-03	NA	NA	NA	3.03E-04	3.00E-03	NA	2.19E+00	NA
Total PCBs	1.75E-05	6.40E-08	6.40E-08	NA	3.36E-05	1.75E-05	NA	2.22E-01	NA
Alpha-Chlordane	1.00E-04	8.00E-06	8.10E-06	NA	7.30E-01	1.00E-04	NA	1.62E+00	5.00E-01
Heptachlor Epoxide	4.00E-06	3.90E-08	3.90E-08	NA	7.39E-03	4.00E-06	NA	5.34E-02	3.00E-02
Inorganics & Metals									
Aluminum	NA	NA	NA	NA	3.65E+01	NA	5.00E+00 d	7.61E+04	NA
Antimony	6.00E-03	6.00E-03	4.30E+00	NA	1.46E-02	NA	NA	3.13E+01	3.00E-01
Arsenic	5.00E-02	1.80E-05	1.40E-04	1.00E-01	4.48E-05	5.00E-02 d	1.00E-01 d	3.90E-01	1.00E+00
Barium	4.90E-01	NA	NA	NA	2.55E+00	2.00E+00 d	NA	5.37E+03	8.20E+01
Beryllium	1.00E-01	4.00E-03	NA	1.00E-01	7.30E-02	4.00E-03 d	1.00E-01 d	1.54E+02	3.00E+00
Boron	NA	NA	NA	7.50E-01	7.30E+00	NA	7.50E-01 d	1.60E+04	NA
Cadmium	5.00E-03	NA	NA	1.00E-02	1.82E-02	5.00E-03 d	1.00E-02 d	3.70E+01	4.00E-01
Calcium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	5.00E-02	NA	NA	1.00E-01	1.09E-01	1.00E-01 d	1.00E-01 d	2.11E+02	2.00E+00
Cobalt	NA	NA	NA	NA	7.30E-01	NA	5.00E-02 d	9.03E+02	NA
Copper	1.00E+00	NA	NA	2.00E-01	1.46E+00	1.00E+00 d,s	2.00E-01 d	3.13E+03	NA
Cyanide	2.00E-01 F	NA	NA	2.00E-01	6.20E-03	2.00E-01 d	0.20	1.08E+01	NA
Iron	3.00E-01 d	NA	NA	NA	1.09E+01	3.00E-01 d	5.00E+00 d	2.35E+04	NA
Lead	5.00E-02	NA	NA	1.00E-01	NA	5.00E-02 d	1.00E-01 d	4.00E+02	NA
Magnesium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	5.00E-02 d	NA	NA	2.00E-01	8.76E-01	5.00E-02 d,s	2.00E-01 d	1.76E+03	NA
Mercury	2.00E-03	NA	NA	NA	3.65E-03	2.00E-03 d	1.00E-02 d	6.11E+00	NA
Molybdenum	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	1.00E-01	NA	4.60E+00	2.00E-01	7.30E-01	1.00E-01 d	2.00E-01 d	1.56E+03	7.00E+00
Nitrogen, Nitrate (As N)	1.00E+01	NA	NA	NA	1.00E+01	1.00E+01 d	100.00	NA	NA
Nitrogen, Nitrite (As N)	1.00E+00	NA	NA	NA	1.00E+00	1.00E+00 d	1.00E+01	NA	NA
Potassium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	5.00E-02	NA	NA	2.00E-02	1.82E-01	5.00E-02 d	2.00E-02 d	3.91E+02	3.00E-01
Silver	1.00E-01	NA	NA	NA	1.82E-01	5.00E-02 d	NA	3.91E+02	2.00E+00
Sodium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Strontium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	2.50E+02	NA	NA	NA	NA	2.50E+02 d,s	NA	NA	NA
Sulfide	5.00E-02	NA	NA	NA	NA	NA	NA	NA	NA

Table 2 - Tier I Human Health Screening Value

Analyte	CDPHE Surface Water Values (mg/L)				EPA Region IX	CDPHE Ground water Values (mg/L)		Soil (mg/kg)	
	Water Supply	Water & Fish	Fish Only	Agriculture	Tap Water PRG (mg/L)	Drinking Water	Agricultural	Region IX Residential PRG	Region IX Migration to Ground water
Thallium	5.00E-04	5.00E-04	6.30E-03	NA	2.41E-03	2.00E-03 d	NA	5.16E+00	NA
Tin	NA	NA	NA	NA	NA	NA	NA	NA	NA
Titanium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	3.65E-02	NA	1.00E-01 d	7.82E+01	3.00E+02
Zinc	5.00E+00	NA	NA	2.00E+00	1.09E+01	5.00E+00 d,s	2.00E+00 d	2.35E+04	6.20E+02

Notes: All data are from CDPHE unless indicated otherwise

SW Source: CDPHE WQCC. Regulation No. 31. The Basic Standards and Methodologies for Surface Water (5 CCR 1002-31). August 2005.

GW Source: CDPHE WQCC. Regulation No. 41. The Basic Standards and Methodologies for Ground Water. March 2005.

EPA Source: EPA, 2004a. Region 9 PRG Tables, Version 9. October 2004

Acetophenone - all values from Region III rbc0405 Screening Tables

Phenanthrene - values for anthracene used as a surrogate for phenanthrene in shaded cells

Cis-1,2-dichloroethene used for total as the cis more conservative than trans; no total available

Drinking water - domestic water supply

All metals in water SVs are total recoverable unless indicated otherwise

The residential soil PRG was used as a screening level for sediments

The migration to ground water PRG is based on a dilution attenuation factor (DAF) of 1

Abbreviations

PRG - Preliminary Remedial Goal

NA - Not available

d - dissolved

C = Carcinogenic effects
N = Noncarcinogenic effects
F – free

s - Secondary water standard
F - free

b - MCL is for hydrogen cyanide

c - MCL for inorganic mercury
e - taste threshold

TT- TT Action Level, Copper and lead are regulated by Treatment Technique that requires systems to control the corrosivity of their water. If more than 10% of tap water samples exceed the action level, water systems must take additional steps. Action level is shown in MCL column.

Analytes that exceeded the conservative screening levels were evaluated further as shown in Figure 1.

The following conservative assumptions were used in selecting screening levels:

- Application of chromium (Cr) VI values to represent total chromium for the EPA tap water PRGs was a conservative assumption applied in the Tier I risk calculations. The laboratory analysis did not provide information regarding the speciation of chromium (+3 versus +6 valence states), and the +6 valence state (Cr VI) is more toxic than the +3 valence state (Cr III).
- Total chromium (1:6 ratio Cr VI:Cr III) was used to represent total chromium for the Region 9 MTG PRGs. This value is approximately three orders of magnitude lower than the value for Cr III only, and is thus conservative.
- Cyanide values for the residential PRGs are for hydrogen cyanide ("HCN"), which is lower (more conservative) than using values for free cyanide. Hydrogen cyanide is a liquid or gas at observed worldwide temperatures and is readily volatized from solution (Bodek et al., 1988). Other cyanide forms are less toxic (EPA, 2004a); thus, HCN PRGs conservatively represent cyanide present in the environment.
- 1,2-Dichloroethene (Total) lacked toxicity values. The numbers for cis 1,2-dichloroethene were used to represent exposure to this chemical as they are more stringent than the values for trans 1,2-dichloroethene.
- Organic mercury residential PRGs were used to represent total mercury. These PRGs are lower (more conservative) than toxicity values for inorganic mercury compounds. The exact form of mercury in soils is unknown, but it could alter with soil properties such as pH. Mercury is unlikely to be in a methylated form unless in sediment or fish. Thus, assuming that the mercury is in a highly toxic form is conservative.
- Nickel values for the residential nickel PRG are for the nickel soluble salt, which is the lowest (more conservative) of the available values for various forms of nickel. The exact form of nickel in soils is unknown, but it could alter with soil properties such as pH. Thus, assuming that the nickel is in a highly toxic form is conservative.

PRGs or similar screening values were not available for all of the chemicals. To avoid gaps in the screening levels, where appropriate,

surrogates were selected. Surrogates were used for chemicals that lacked a screening value and where there were similar chemicals that had screening values. For example, phenanthrene is a semi-volatile organic compound ("SVOC") on the target analyte list for the site that lacks screening values. Phenanthrene is similar to anthracene in that both have a molecular weight ("MW") of 178. The Louisiana Risk Evaluation and Cleanup Program ("RECAP") uses regulatory values for anthracene to represent phenanthrene (LDEQ, 2003), suggesting anthracene is an appropriate surrogate for phenanthrene. Screening values for anthracene were thus used to evaluate phenanthrene.

The EPA default values for lead were used in the Tier I screening level analysis. Because even low concentrations of lead have been linked to subtle neurological effects in children; lead in the environment is regulated on blood lead concentration. Residential screening values for lead are derived with the Integrated Exposure Uptake Biokinetic ("IEUBK") Model. This is a pharmacokinetic model that is designed to predict the probable blood lead concentrations for children six months to seven years of age exposed to lead through various sources (air, water, soil, dust, diet and in-utero contributions from the mother). Childhood blood lead concentrations at or above 10 micrograms of lead per deciliter of blood (µg/dL) present risks to children's health. The EPA risk reduction goal for contaminated sites is to limit the probability of a child's blood lead concentration exceeding 10 µg/dL (the P10) to 5% or less after site cleanup. The default residential screening value for lead in soil that correlates to this blood lead level is 400 milligrams per kilogram ("mg/kg").

2.5 TIER I EVALUATION PROCESS

To perform the Tier I risk evaluation, the maximum concentration of each analyte in each media was used as the Tier I exposure point concentration ("Tier I EPC"). For Tier I, this was the maximum of the highest detected concentration of each target analyte, or the maximum reporting limit used as the representative value for nondetects. The risk evaluation was performed by dividing the Tier I EPC by the appropriate screening value. The evaluation was as follows:

Risk Ratio (unitless) = Tier I EPC / Screening Value

For solid media (i.e., soils and sediments), the units for both site media and screening values were mg/kg. For liquid media, the units were milligrams per Liter ("mg/L"). For some media, there was more than one appropriate screening value. In this case, the following tables show the results of comparison of the EPC to each screening value. For example,

the Tier I EPC for surface soil was compared to the residential soil PRG and MTG values. Surface soil data from both the "total" and "fines fraction" of the soil sample were included in the Tier 1 evaluation. The fines fraction analytes were conducted on a subset of the surface soil only and represent soil that will pass through the minus 60 mesh sieve (250 micrometers and smaller). The fines fraction samples were analyzed for arsenic, cadmium, chromium, copper, lead, manganese, and zinc. It was considered conservative to include both the total and fines in the Tier I since this would preclude dropping an analyte as a COPC if the total data were lower in concentration than the fines data. The risk evaluation results are discussed by media below.

The EPC was divided by each screening level representative of that media. If the quotient exceeded 0.1, the analyte was carried forward for further evaluation as a COPC. If the quotient was less than 0.1, the analyte was dropped from further evaluation. If there was no screening value, the analyte was carried forward to Tier II.

2.6 TIER I RISK ESTIMATES

2.6.1 Surface Soil

Table 3 presents summary statistics (sample size, minima, and maxima), reporting limit ranges (minima and maxima), and detection frequency for the RI surface soil data. The Tier I EPC is the maximum detected value or ½ the maximum reporting limit in the event there were no detections of that analyte. Table 4 presents the results of comparing the Tier I in surface soil to the conservative screening levels.

2.6.2 Subsurface Soil

Table 5 presents the summary statistics and reporting limit ranges for the RI subsurface soil data. Table 6 presents the results of comparing the Tier I EPC in subsurface soil to the conservative screening levels.

2.6.3 Surface Water

Table 7 presents the summary statistics for surface water. The Tier I risk evaluation for surface water is shown in Table 8.

2.6.4 Sediment

Table 9 presents the summary statistics for sediment. The Tier I risk evaluation for sediment is shown in Table 10.

2.6.5 *Ground Water*

Table 11 presents the summary statistics for ground water. The Tier I risk evaluation for ground water is shown in Table 12.

2.6.6 *Rock Chips from Boulders*

Rock chips from boulders are an unlikely exposure medium. They are evaluated since boulders were stained, children may climb on them, and to help identify appropriate disposal possibilities. Table 13 presents the summary statistics for boulders. The Tier I risk evaluation for boulders is shown in Table 14.

There is the possibility that metals may leach off of the boulders, or that excessive flaking of the rock surface could occur. This potentially elevates the surrounding soils. The data for soil samples associated with the sampled boulders falls within the observed range for surface soils from other areas of the site, as shown below. Therefore, estimates of risk for onsite surface soils are representative of soils under and immediately around the stained boulders. The data for soils associated with boulders are as follows:

Analyte	*N[1]*	*Minimum[1] (mg/kg)*	*Maximum[1] (mg/kg)*	*Site Soils (mg/kg)*
Arsenic	3	130	700	0.85 - 2900
Cadmium	3	0.11	0.81	0.1 - 98
Chromium	3	6.1	11	2.3 - 77
Copper	3	91	170	4.3 - 1400
Lead	3	100	960	2.4 - 14000
Manganese	3	92	480	22 - 120000
Zinc	3	95	540	29 - 42000

1 – data from soils associated with stained boulders

2.6.7 *Diversion Trench Surface Water*

Table 15 presents the summary statistics for diversion trench surface water. The Tier I risk evaluation for diversion trench surface water is shown in Table 16.

Table 3 Summary Statistics for Surface Soil (0 to 6 in-bgs)

Table 3 - Summary Statistics for Surface Soil (0 to 6 in-bgs)

Analyte	n	Minimum Detected Value (mg/kg)	Maximum Detected Value (mg/kg)	Minimum Reporting Limit (mg/kg)	Maximum Reporting Limit (mg/kg)	Number of Detects	Detection Frequency	Tier I EPC (mg/kg)
1,1,1,2-Tetrachloroethane	1			5.1	5.1	0	0%	5.10E+00
1,1,1-Trichloroethane	1			5.1	5.1	0	0%	5.10E+00
1,1,2,2-Tetrachloroethane	1			5.1	5.1	0	0%	5.10E+00
1,1,2-Trichloroethane	1			5.1	5.1	0	0%	5.10E+00
1,1-Dichloroethane	1			5.1	5.1	0	0%	5.10E+00
1,1-Dichloroethylene	1			5.1	5.1	0	0%	5.10E+00
1,1-Dichloropropene	1			5.1	5.1	0	0%	5.10E+00
1,2,3-Trichlorobenzene	1			5.1	5.1	0	0%	5.10E+00
1,2,3-Trichloropropane	1			5.1	5.1	0	0%	5.10E+00
1,2,4-Trichlorobenzene	1			5.1	5.1	0	0%	5.10E+00
1,2,4-Trimethylbenzene	1			5.1	5.1	0	0%	5.10E+00
1,2-Benzphenanthracene	1			5.1	5.1	0	0%	5.10E+00
1,2-Dibromo-3-Chloropropane (DBCP)	1			340	340	0	0%	3.40E+02
1,2-Dibromoethane (EDB)	1			10	10	0	0%	1.00E+01
1,2-Dichlorobenzene	1			5.1	5.1	0	0%	5.10E+00
1,2-Dichloroethane	1			5.1	5.1	0	0%	5.10E+00
1,2-Dichloroethene (Total)	1			5.1	5.1	0	0%	5.10E+00
1,2-Dichloropropane	1			5.1	5.1	0	0%	5.10E+00
1,3,5-Trimethylbenzene	1			5.1	5.1	0	0%	5.10E+00
1,3-Dichloropropane	1			5.1	5.1	0	0%	5.10E+00
1,4-Dichlorobenzene	1			5.1	5.1	0	0%	5.10E+00
2,2-Dichloropropane	1			5.1	5.1	0	0%	5.10E+00
2,4,5-Trichlorophenol	1			5.1	5.1	0	0%	5.10E+00
2,4,6-Trichlorophenol	1			340	340	0	0%	3.40E+02
2,4-Dichlorophenol	1			340	340	0	0%	3.40E+02
2,4-Dimethylphenol	1			340	340	0	0%	3.40E+02
2,4-Dinitrophenol	1			340	340	0	0%	3.40E+02

Table 3 - Summary Statistics for Surface Soil (0 to 6 in-bgs)

Analyte	n	Minimum Detected Value (mg/kg)	Maximum Detected Value (mg/kg)	Minimum Reporting Limit (mg/kg)	Maximum Reporting Limit (mg/kg)	Number of Detects	Detection Frequency	Tier I EPC (mg/kg)
2,4-Dinitrotoluene	1			1600	1600	0	0%	1.60E+03
2,6-Dinitrotoluene	1			340	340	0	0%	3.40E+02
2-Butanone (MEK)	1			340	340	0	0%	3.40E+02
2-Chloronaphthalene	1			21	21	0	0%	2.10E+01
2-Chlorophenol	1			340	340	0	0%	3.40E+02
2-Chlorotoluene	1			340	340	0	0%	3.40E+02
2-Methylnaphthalene	1			5.1	5.1	0	0%	5.10E+00
2-Methylphenol	1			340	340	0	0%	3.40E+02
2-Nitroaniline	1			340	340	0	0%	3.40E+02
2-Nitrophenol	1			1600	1600	0	0%	1.60E+03
2-Phenylbutane	1			340	340	0	0%	3.40E+02
3,3-Dichlorobenzidine	1			5.1	5.1	0	0%	5.10E+00
3-Nitroaniline	1			680	680	0	0%	6.80E+02
4,6-Dinitro-2-Methylphenol	1			1600	1600	0	0%	1.60E+03
4-Bromophenyl Phenyl Ether	1			1600	1600	0	0%	1.60E+03
4-Chloro-3-Methylphenol	1			340	340	0	0%	3.40E+02
4-Chlorophenyl Phenyl Ether	1			340	340	0	0%	3.40E+02
4-Chlorotoluene	1			340	340	0	0%	3.40E+02
4-Methyl-2-Pentanone	1			5.1	5.1	0	0%	5.10E+00
4-Methylphenol	1			21	21	0	0%	2.10E+01
4-Nitrophenol	1			340	340	0	0%	3.40E+02
Acenaphthene	1			1600	1600	0	0%	1.60E+03
Acenaphthylene	1			340	340	0	0%	3.40E+02
Acetone	1			340	340	0	0%	3.40E+02
Acetophenone	1			21	21	0	0%	2.10E+01
Aluminum (Fume Or Dust)	44	1800	30000	10	53	44	100%	3.00E+04
Anthracene	1			340	340	0	0%	3.40E+02
Antimony	44	1.1	51	1	5.3	13	30%	5.10E+01
Arsenic	376	0.85	2900	0.6	75	372	99%	2.90E+03

Table 3 - Summary Statistics for Surface Soil (0 to 6 in-bgs)

Analyte	n	Minimum Detected Value (mg/kg)	Maximum Detected Value (mg/kg)	Minimum Reporting Limit (mg/kg)	Maximum Reporting Limit (mg/kg)	Number of Detects	Detection Frequency	Tier I EPC (mg/kg)
Atrazine	1			340	340	0	0%	3.40E+02
Barium	44	45	540	1	5.3	44	100%	5.40E+02
Benzene	1			340	340	0	0%	3.40E+02
Benzo(a)Anthracene	1			5.1	5.1	0	0%	5.10E+00
Benzo(a)Pyrene	1			340	340	0	0%	3.40E+02
Benzo(b)Fluoranthene	1			340	340	0	0%	3.40E+02
Benzo(ghi)Perylene	1			340	340	0	0%	3.40E+02
Benzo(K)Fluoranthene	1			340	340	0	0%	3.40E+02
Benzyl Butyl Phthalate	1			340	340	0	0%	3.40E+02
Beryllium	44	0.54	7.9	0.52	2.7	14	32%	7.90E+00
Bis(2-Chloroethoxy)Methane	1			340	340	0	0%	3.40E+02
Bis(2-Chloroethyl) Ether	1			340	340	0	0%	3.40E+02
Bis(2-Chloroisopropyl) Ether	1			340	340	0	0%	3.40E+02
Bis(2-Ethylhexyl) Phthalate	1			340	340	0	0%	3.40E+02
Bromobenzene	1			340	340	0	0%	3.40E+02
Bromodichloromethane	1			5.1	5.1	0	0%	5.10E+00
Bromomethane	1			5.1	5.1	0	0%	5.10E+00
Cadmium	376	0.1	98	0.1	2.8	328	87%	9.80E+01
Calcium Metal	44	320	83000	21	110	44	100%	8.30E+04
Caprolactam	1			10	10	0	0%	1.00E+01
Carbazole	1			1600	1600	0	0%	1.60E+03
Carbon Tetrachloride	1			340	340	0	0%	3.40E+02
CFC-11	1			5.1	5.1	0	0%	5.10E+00
CFC-12	1			10	10	0	0%	1.00E+01
Chlorobenzene	1			10	10	0	0%	1.00E+01
Chlorobromomethane	1			5.1	5.1	0	0%	5.10E+00
Chlorodibromomethane	1			5.1	5.1	0	0%	5.10E+00
Chloroethane	1			5.1	5.1	0	0%	5.10E+00
Chloroform	1			10	10	0	0%	1.00E+01

Table 3 - Summary Statistics for Surface Soil (0 to 6 in-bgs)

Analyte	n	Minimum Detected Value (mg/kg)	Maximum Detected Value (mg/kg)	Minimum Reporting Limit (mg/kg)	Maximum Reporting Limit (mg/kg)	Number of Detects	Detection Frequency	Tier I EPC (mg/kg)
Chloromethane	1			10	10	0	0%	1.00E+01
Chromium	376	2.3	77	0.2	4.9	375	100%	7.70E+01
Cis-1,2-Dichloroethene	1			10	10	0	0%	1.00E+01
Cis-1,3-Dichloropropene	1			2.6	2.6	0	0%	2.60E+00
Cobalt	44	1.8	68	1	5.3	44	100%	6.80E+01
Copper	376	4.3	1400	0.2	13	376	100%	1.40E+03
Cyanide	44	0.54	36	0.52	2.7	4	9%	3.60E+01
Dibenz(a,h)Anthracene	1			5.1	5.1	0	0%	5.10E+00
Dibenzofuran	1			340	340	0	0%	3.40E+02
Dibromomethane	1			340	340	0	0%	3.40E+02
Dichloromethane	1			5.1	5.1	0	0%	5.10E+00
Diethyl Phthalate	1			5.1	5.1	0	0%	5.10E+00
Dimethyl Phthalate	1			680	680	0	0%	6.80E+02
Di-N-Butyl Phthalate	1			340	340	0	0%	3.40E+02
Di-N-Octyl Phthalate	1			340	340	0	0%	3.40E+02
Ethylbenzene	1			340	340	0	0%	3.40E+02
Fluoranthene	1			5.1	5.1	0	0%	5.10E+00
Fluorene	1			340	340	0	0%	3.40E+02
Hexachloro-1,3-Butadiene	2			340	340	0	0%	3.40E+02
Hexachlorobenzene	1			5.1	5.1	0	0%	5.10E+00
Hexachlorocyclopentadiene	1			340	340	0	0%	3.40E+02
Hexachloroethane	1			1600	1600	0	0%	1.60E+03
Indeno(1,2,3-cd)Pyrene	1			340	340	0	0%	3.40E+02
Iron	44	11000	260000	10	130	44	100%	2.60E+05
Isopropylbenzene	1			340	340	0	0%	3.40E+02
Lead	376	2.4	14000	0.15	19	376	100%	1.40E+04
Magnesium	44	330	17000	21	110	44	100%	1.70E+04
Manganese	376	22	120000	0.15	130	376	100%	1.20E+05
M-Dichlorobenzene	1			5.1	5.1	0	0%	5.10E+00

Table 3 - Summary Statistics for Surface Soil (0 to 6 in-bgs)

Analyte	n	Minimum Detected Value (mg/kg)	Maximum Detected Value (mg/kg)	Minimum Reporting Limit (mg/kg)	Maximum Reporting Limit (mg/kg)	Number of Detects	Detection Frequency	Tier I EPC (mg/kg)
Mercury	44	0.036	2.7	0.034	0.2	27	61%	2.70E+00
Methyl N-Butyl Ketone	1			5.1	5.1	0	0%	5.10E+00
Methyl Tert-Butyl Ether	1			21	21	0	0%	2.10E+01
Methylbenzene	1			21	21	0	0%	2.10E+01
M-Xylene &p-Xylene	1			5.1	5.1	0	0%	5.10E+00
Naphthalene	2			2.6	5.1	0	0%	5.10E+00
N-Butylbenzene	1			340	340	0	0%	3.40E+02
Nickel	44	5	71	4.2	21	40	91%	7.10E+01
Nitrobenzene	1			5.1	5.1	0	0%	5.10E+00
N-Nitrosodi-N-Propylamine	1			340	340	0	0%	3.40E+02
N-Nitrosodiphenylamine	1			340	340	0	0%	3.40E+02
N-Propylbenzene	1			340	340	0	0%	3.40E+02
o-Xylene	1			5.1	5.1	0	0%	5.10E+00
p-Chloroaniline	1			2.6	2.6	0	0%	2.60E+00
p-Cymene	1			340	340	0	0%	3.40E+02
Pentachlorophenol	1	59	59	5.1	5.1	1	100%	5.90E+01
Phenanthrene	1			1600	1600	0	0%	1.60E+03
Phenol	1			340	340	0	0%	3.40E+02
p-Nitroaniline	1			340	340	0	0%	3.40E+02
Potassium	44	1400	13000	310	1600	44	100%	1.30E+04
Pyrene	1			1600	1600	0	0%	1.60E+03
Selenium	44	1.4	100	1.4	8	3	7%	1.00E+02
Silver	44	1.1	52	1	5.3	23	52%	5.20E+01
Sodium	44	540	8600	520	2700	3	7%	8.60E+03
Styrene (Monomer)	1			340	340	0	0%	3.40E+02
Sulfate	44	54	42000	52	29000	33	75%	4.20E+04
Tert-Butylbenzene	1			5.1	5.1	0	0%	5.10E+00
Tetrachloroethene	1			5.1	5.1	0	0%	5.10E+00
Thallium	44	1.3	260	1.2	6.4	18	41%	2.60E+02

Table 3 - Summary Statistics for Surface Soil (0 to 6 in-bgs)

Analyte	n	Minimum Detected Value (mg/kg)	Maximum Detected Value (mg/kg)	Minimum Reporting Limit (mg/kg)	Maximum Reporting Limit (mg/kg)	Number of Detects	Detection Frequency	Tier I EPC (mg/kg)
Trans-1,2-Dichloroethene	1			5.1	5.1	0	0%	5.10E+00
Trans-1,3-Dichloropropene	1			2.6	2.6	0	0%	2.60E+00
Tribomomethane	1			5.1	5.1	0	0%	5.10E+00
Trichloroethylene	1			5.1	5.1	0	0%	5.10E+00
Vanadium (Fume Or Dust)	44	5.3	110	2.1	11	44	100%	1.10E+02
Vinyl Chloride	1			5.1	5.1	0	0%	5.10E+00
Xylenes (Total)	1			5.1	5.1	0	0%	5.10E+00
Zinc	376	29	42000	1	890	376	100%	4.20E+04

Notes:
Blank cells indicate no detects
The Tier I EPC is the lower of the maximum detected value or the maximum reporting limit for nondetected analytes in the absence of any detections
Multiple samples had U, J, J, or UJ qualifiers; there were no R qualified data*
Background samples are not included in the site summary statistics
Data include fine and total fraction

Table 4 Tier I Risk Analysis for Surface Soil (0 to 6 in-bgs)

Table 4 - Tier I Risk Analysis for Surface Soil (0 to 6 in-bgs)			
Analyte	**Risk Ratio Region IX Residential PRG**	**Risk Ratio Region IX MTG PRG**	**Exceeds SVs?**
1,1,1,2-Tetrachloroethane	***1.60E+00***	No SV	Yes
1,1,1-Trichloroethane	4.25E-03	***5.10E+01***	Yes
1,1,2,2-Tetrachloroethane	***1.25E+01***	***2.55E+04***	Yes
1,1,2-Trichloroethane	***7.00E+00***	***5.67E+03***	Yes
1,1-Dichloroethane	1.01E-02	***5.10E+00***	Yes
1,1-Dichloroethylene	4.13E-02	***1.70E+03***	Yes
1,1-Dichloropropene	No SV	No SV	No SV
1,2,3-Trichlorobenzene	No SV	No SV	No SV
1,2,3-Trichloropropane	***1.50E+02***	No SV	Yes
1,2,4-Trichlorobenzene	8.20E-02	***1.70E+01***	Yes
1,2,4-Trimethylbenzene	9.88E-02	No SV	No
1,2-Benzphenanthracene	8.21E-02	***6.38E-01***	Yes
1,2-Dibromo-3-Chloropropane (DBCP)	***7.39E+02***	No SV	Yes
1,2-Dibromoethane (EDB)	***3.13E+02***	No SV	Yes
1,2-Dichlorobenzene	8.50E-03	***5.67E+00***	Yes
1,2-Dichloroethane	***1.84E+01***	***5.10E+03***	Yes
1,2-Dichloroethene (Total)	***1.19E-01***	***2.55E+02***	Yes
1,2-Dichloropropane	***1.49E+01***	***5.10E+03***	Yes
1,3,5-Trimethylbenzene	***2.40E-01***	No SV	Yes
1,3-Dichloropropane	4.87E-02	No SV	No
1,4-Dichlorobenzene	***1.48E+00***	***5.10E+01***	Yes
2,2-Dichloropropane	No SV	No SV	No SV
2,4,5-Trichlorophenol	8.35E-04	***3.64E-01***	Yes
2,4,6-Trichlorophenol	***5.56E+01***	***4.25E+04***	Yes
2,4-Dichlorophenol	***1.85E+00***	***6.80E+03***	Yes
2,4-Dimethylphenol	***2.78E-01***	***8.50E+02***	Yes
2,4-Dinitrophenol	***2.78E+00***	***3.40E+04***	Yes
2,4-Dinitrotoluene	***1.31E+01***	***4.00E+07***	Yes
2,6-Dinitrotoluene	***5.56E+00***	***1.13E+07***	Yes
2-Butanone (MEK)	1.52E-02	No SV	No
2-Chloronaphthalene	4.25E-03	No SV	No
2-Chlorophenol	***5.36E+00***	***1.70E+03***	Yes

Table 4 - Tier I Risk Analysis for Surface Soil (0 to 6 in-bgs)			
Analyte	**Risk Ratio Region IX Residential PRG**	**Risk Ratio Region IX MTG PRG**	**Exceeds SVs?**
2-Chlorotoluene	***2.15E+00***	No SV	Yes
2-Methylnaphthalene	No SV	No SV	No SV
2-Methylphenol	***1.11E-01***	***4.25E+02***	Yes
2-Nitroaniline	***1.86E+00***	No SV	Yes
2-Nitrophenol	No SV	No SV	No SV
2-Phenylbutane	***1.55E+00***	No SV	Yes
3,3-Dichlorobenzidine	***4.72E+00***	***1.70E+04***	Yes
3-Nitroaniline	***3.71E+01***	No SV	Yes
4,6-Dinitro-2-Methylphenol	No SV	No SV	No SV
4-Bromophenyl Phenyl Ether	No SV	No SV	No SV
4-Chloro-3-Methylphenol	No SV	No SV	No SV
4-Chlorophenyl Phenyl Ether	No SV	No SV	No SV
4-Chlorotoluene	No SV	No SV	No SV
4-Methyl-2-Pentanone	9.66E-04	No SV	No
4-Methylphenol	6.87E-02	No SV	No
4-Nitrophenol	No SV	No SV	No SV
Acenaphthene	***4.35E-01***	***5.52E+01***	Yes
Acenaphthylene	No SV	No SV	No SV
Acetone	2.41E-02	***4.25E+02***	Yes
Acetophenone	2.69E-03	***1.32E+02***	Yes
Aluminum (Fume Or Dust)	***3.94E-01***	No SV	Yes
Anthracene	1.55E-02	***5.76E-01***	Yes
Antimony	***1.63E+00***	***1.70E+02***	Yes
Arsenic	***7.44E+03***	***2.90E+03***	Yes
Atrazine	***1.55E+02***	No SV	Yes
Barium	***1.01E-01***	***6.59E+00***	Yes
Benzene	***5.29E+02***	***1.70E+05***	Yes
Benzo(a)Anthracene	***8.21E+00***	***6.38E+01***	Yes
Benzo(a)Pyrene	***5.48E+03***	***8.50E+02***	Yes
Benzo(b)Fluoranthene	***5.48E+02***	***1.70E+03***	Yes
Benzo(ghi)Perylene	No SV	No SV	No SV
Benzo(K)Fluoranthene	***5.48E+01***	***1.70E+02***	Yes
Benzyl Butyl Phthalate	2.78E-02	***4.20E-01***	Yes
Beryllium	5.13E-02	***2.63E+00***	Yes

Table 4 - Tier I Risk Analysis for Surface Soil (0 to 6 in-bgs)			
Analyte	**Risk Ratio Region IX Residential PRG**	**Risk Ratio Region IX MTG PRG**	**Exceeds SVs?**
Bis(2-Chloroethoxy)Methane	No SV	No SV	No SV
Bis(2-Chloroethyl) Ether	***1.56E+03***	***1.70E+07***	Yes
Bis(2-Chloroisopropyl) Ether	***1.18E+02***	No SV	Yes
Bis(2-Ethylhexyl) Phthalate	***9.79E+00***	No SV	Yes
Bromobenzene	***1.22E+01***	No SV	Yes
Bromodichloromethane	***6.19E+00***	***1.70E+02***	Yes
Bromomethane	***1.31E+00***	***5.10E+02***	Yes
Cadmium	***2.65E+00***	***2.45E+02***	Yes
Calcium Metal	No SV	No SV	No SV
Caprolactam	3.27E-04	No SV	No
Carbazole	***6.58E+01***	***5.33E+04***	Yes
Carbon Tetrachloride	***1.35E+03***	***1.13E+05***	Yes
CFC-11	1.32E-02	No SV	No
CFC-12	***1.07E-01***	No SV	Yes
Chlorobenzene	6.64E-02	***1.43E+02***	Yes
Chlorobromomethane	No SV	No SV	No SV
Chlorodibromomethane	***4.60E+00***	***2.55E+02***	Yes
Chloroethane	***1.69E+00***	No SV	Yes
Chloroform	***4.53E+01***	***3.33E+02***	Yes
Chloromethane	***2.13E-01***	No SV	Yes
Chromium	***3.65E-01***	***3.85E+01***	Yes
Cis-1,2-Dichloroethene	***2.33E-01***	***5.00E+02***	Yes
Cis-1,3-Dichloropropene	No SV	No SV	No SV
Cobalt	7.53E-02	No SV	No
Copper	***4.47E-01***	No SV	Yes
Cyanide	***3.33E+00***	No SV	Yes
Dibenz(a,h)Anthracene	***8.21E+01***	***6.38E+01***	Yes
Dibenzofuran	***2.34E+00***	No SV	Yes
Dibromomethane	***5.08E+00***	No SV	Yes
Dichloromethane	***5.60E-01***	***5.10E+03***	Yes
Diethyl Phthalate	1.04E-04	No SV	No
Dimethyl Phthalate	6.80E-03	No SV	No
Di-N-Butyl Phthalate	5.56E-02	***1.26E+00***	Yes
Di-N-Octyl Phthalate	***1.39E-01***	3.40E-02	Yes

Table 4 - Tier I Risk Analysis for Surface Soil (0 to 6 in-bgs)			
Analyte	**Risk Ratio Region IX Residential PRG**	**Risk Ratio Region IX MTG PRG**	**Exceeds SVs?**
Ethylbenzene	***8.61E-01***	***4.86E+02***	Yes
Fluoranthene	2.23E-03	2.43E-02	No
Fluorene	***1.24E-01***	***1.21E+01***	Yes
Hexachloro-1,3-Butadiene	***5.45E+01***	***3.40E+03***	Yes
Hexachlorobenzene	***1.68E+01***	***5.10E+01***	Yes
Hexachlorocyclopentadiene	***9.30E-01***	***1.70E+01***	Yes
Hexachloroethane	***4.61E+01***	***8.00E+04***	Yes
Indeno(1,2,3-cd)Pyrene	***5.47E+02***	***4.86E+02***	Yes
Iron	***1.11E+01***	No SV	Yes
Isopropylbenzene	***5.94E-01***	No SV	Yes
Lead	***3.50E+01***	No SV	Yes
Magnesium	No SV	No SV	No SV
Manganese	***6.82E+01***	No SV	Yes
M-Dichlorobenzene	9.60E-03	No SV	No
Mercury	***4.42E-01***	No SV	Yes
Methyl N-Butyl Ketone	No SV	No SV	No SV
Methyl Tert-Butyl Ether	***6.56E-01***	No SV	Yes
Methylbenzene	4.04E-02	***3.50E+01***	Yes
M-Xylene &p-Xylene	No SV	No SV	No SV
Naphthalene	9.12E-02	***1.28E+00***	Yes
N-Butylbenzene	***1.42E+00***	No SV	Yes
Nickel	4.55E-02	***1.01E+01***	Yes
Nitrobenzene	***2.60E-01***	***7.29E+02***	Yes
N-Nitrosodi-N-Propylamine	***4.89E+03***	***1.70E+08***	Yes
N-Nitrosodiphenylamine	***3.43E+00***	***5.67E+03***	Yes
N-Propylbenzene	***1.42E+00***	No SV	Yes
o-Xylene	No SV	No SV	No SV
p-Chloroaniline	1.06E-02	***8.67E+01***	Yes
p-Cymene	No SV	No SV	No SV
Pentachlorophenol	***1.98E+01***	***5.90E+04***	Yes
Phenanthrene	7.31E-02	***2.71E+00***	Yes
Phenol	1.85E-02	***6.80E+01***	Yes
p-Nitroaniline	***1.47E+01***	No SV	Yes
Potassium	No SV	No SV	No SV

Table 4 - Tier I Risk Analysis for Surface Soil (0 to 6 in-bgs)			
Analyte	**Risk Ratio Region IX Residential PRG**	**Risk Ratio Region IX MTG PRG**	**Exceeds SVs?**
Pyrene	No SV	***7.62E+00***	Yes
Selenium	***2.56E-01***	***3.33E+02***	Yes
Silver	***1.33E-01***	***2.60E+01***	Yes
Sodium	No SV	No SV	No SV
Styrene (Monomer)	***2.00E-01***	***1.70E+03***	Yes
Sulfate	No SV	No SV	No SV
Tert-Butylbenzene	1.31E-02	No SV	No
Tetrachloroethene	***1.05E+01***	***1.70E+03***	Yes
Thallium	***5.04E+01***	No SV	Yes
Trans-1,2-Dichloroethene	7.34E-02	***1.70E+02***	Yes
Trans-1,3-Dichloropropene	No SV	No SV	No SV
Tribomomethane	8.28E-02	***1.28E+02***	Yes
Trichloroethylene	***9.63E+01***	***1.70E+03***	Yes
Vanadium (Fume Or Dust)	***1.41E+00***	***3.67E-01***	Yes
Vinyl Chloride	***6.45E+01***	***7.29E+03***	Yes
Xylenes (Total)	1.88E-02	***5.10E-01***	Yes
Zinc	***1.79E+00***	***6.77E+01***	Yes

Notes:

The risk ratio is the EPC divided by the media-specific screening value (Table 2)

Ratios in excess of 0.1 are shown in bold italics

Ratios in excess of 0.1 are used to account for potential cumulative effects; the analyte is carried forward

SVs - Screening values

NA - Not applicable

PRG - Preliminary Remedial Goal

MTG - Migration to Ground water

Table 5 Summary Statistics for Subsurface Soil (6 in-bgs to approximately 25 ft-bgs)

Table 5 - Summary Statistics for Subsurface Soil (6 in-bgs to approximately 25 ft-bgs)								
Analyte	**n**	**Minimum Detected Value (mg/kg)**	**Maximum Detected Value (mg/kg)**	**Minimum Reporting Limit (mg/kg)**	**Maximum Reporting Limit (mg/kg)**	**Number of Detects**	**Detection Frequency**	**Tier I EPC (mg/kg)**
1,1,1,2-Tetrachloroethane	1			5.20E-03	5.20E-03	0	0%	5.20E-03
1,1,1-Trichloroethane	1			5.20E-03	5.20E-03	0	0%	5.20E-03
1,1,2,2-Tetrachloroethane	1			5.20E-03	5.20E-03	0	0%	5.20E-03
1,1,2-Trichloroethane	1			5.20E-03	5.20E-03	0	0%	5.20E-03
1,1-Dichloroethane	1			5.20E-03	5.20E-03	0	0%	5.20E-03
1,1-Dichloroethylene	1			5.20E-03	5.20E-03	0	0%	5.20E-03
1,1-Dichloropropene	1			5.20E-03	5.20E-03	0	0%	5.20E-03
1,2,3-Trichlorobenzene	1			5.20E-03	5.20E-03	0	0%	5.20E-03
1,2,3-Trichloropropane	1			5.20E-03	5.20E-03	0	0%	5.20E-03
1,2,4-Trichlorobenzene	1			5.20E-03	5.20E-03	0	0%	5.20E-03
1,2,4-Trimethylbenzene	1			5.20E-03	5.20E-03	0	0%	5.20E-03
1,2-Benzphenanthracene	1			3.40E-01	3.40E-01	0	0%	3.40E-01
1,2-Dibromo-3-Chloropropane (DBCP)	1			1.00E-02	1.00E-02	0	0%	1.00E-02
1,2-Dibromoethane (EDB)	1			5.20E-03	5.20E-03	0	0%	5.20E-03
1,2-Dichlorobenzene	1			5.20E-03	5.20E-03	0	0%	5.20E-03
1,2-Dichloroethane	1			5.20E-03	5.20E-03	0	0%	5.20E-03
1,2-Dichloroethene (Total)	1			5.20E-03	5.20E-03	0	0%	5.20E-03
1,2-Dichloropropane	1			5.20E-03	5.20E-03	0	0%	5.20E-03
1,3,5-Trimethylbenzene	1			5.20E-03	5.20E-03	0	0%	5.20E-03
1,3-Dichloropropane	1			5.20E-03	5.20E-03	0	0%	5.20E-03
1,4-Dichlorobenzene	1			5.20E-03	5.20E-03	0	0%	5.20E-03
2,2-Dichloropropane	1			5.20E-03	5.20E-03	0	0%	5.20E-03
2,4,5-Trichlorophenol	1			3.40E-01	3.40E-01	0	0%	3.40E-01
2,4,6-Trichlorophenol	1			3.40E-01	3.40E-01	0	0%	3.40E-01
2,4-Dichlorophenol	1			3.40E-01	3.40E-01	0	0%	3.40E-01
2,4-Dimethylphenol	1			3.40E-01	3.40E-01	0	0%	3.40E-01

Table 5 - Summary Statistics for Subsurface Soil (6 in-bgs to approximately 25 ft-bgs)

Analyte	n	Minimum Detected Value (mg/kg)	Maximum Detected Value (mg/kg)	Minimum Reporting Limit (mg/kg)	Maximum Reporting Limit (mg/kg)	Number of Detects	Detection Frequency	Tier I EPC (mg/kg)
2,4-Dinitrophenol	1			1.70E+00	1.70E+00	0	0%	1.70E+00
2,4-Dinitrotoluene	1			3.40E-01	3.40E-01	0	0%	3.40E-01
2,6-Dinitrotoluene	1			3.40E-01	3.40E-01	0	0%	3.40E-01
2-Butanone (MEK)	1			2.10E-02	2.10E-02	0	0%	2.10E-02
2-Chloronaphthalene	1			3.40E-01	3.40E-01	0	0%	3.40E-01
2-Chlorophenol	1			3.40E-01	3.40E-01	0	0%	3.40E-01
2-Chlorotoluene	1			5.20E-03	5.20E-03	0	0%	5.20E-03
2-Methylnaphthalene	1			3.40E-01	3.40E-01	0	0%	3.40E-01
2-Methylphenol	1			3.40E-01	3.40E-01	0	0%	3.40E-01
2-Nitroaniline	1			1.70E+00	1.70E+00	0	0%	1.70E+00
2-Nitrophenol	1			3.40E-01	3.40E-01	0	0%	3.40E-01
2-Phenylbutane	1			5.20E-03	5.20E-03	0	0%	5.20E-03
3,3-Dichlorobenzidine	1			6.80E-01	6.80E-01	0	0%	6.80E-01
3-Nitroaniline	1			1.70E+00	1.70E+00	0	0%	1.70E+00
4,6-Dinitro-2-Methylphenol	1			1.70E+00	1.70E+00	0	0%	1.70E+00
4-Bromophenyl Phenyl Ether	1			3.40E-01	3.40E-01	0	0%	3.40E-01
4-Chloro-3-Methylphenol	1			3.40E-01	3.40E-01	0	0%	3.40E-01
4-Chlorophenyl Phenyl Ether	1			3.40E-01	3.40E-01	0	0%	3.40E-01
4-Chlorotoluene	1			5.20E-03	5.20E-03	0	0%	5.20E-03
4-Methyl-2-Pentanone	1			2.10E-02	2.10E-02	0	0%	2.10E-02
4-Methylphenol	1			3.40E-01	3.40E-01	0	0%	3.40E-01
4-Nitrophenol	1			1.70E+00	1.70E+00	0	0%	1.70E+00
Acenaphthene	1			3.40E-01	3.40E-01	0	0%	3.40E-01
Acenaphthylene	1			3.40E-01	3.40E-01	0	0%	3.40E-01
Acetone	1			2.10E-02	2.10E-02	0	0%	2.10E-02
Acetophenone	1			3.40E-01	3.40E-01	0	0%	3.40E-01
Aluminum	29	8.70E+01	1.40E+04	1.00E+01	1.40E+01	29	100%	1.40E+04
Anthracene	1			3.40E-01	3.40E-01	0	0%	3.40E-01
Antimony	29	2.80E+00	2.80E+00	1.00E+00	1.40E+00	1	3%	2.80E+00

Table 5 - Summary Statistics for Subsurface Soil (6 in-bgs to approximately 25 ft-bgs)

Analyte	n	Minimum Detected Value (mg/kg)	Maximum Detected Value (mg/kg)	Minimum Reporting Limit (mg/kg)	Maximum Reporting Limit (mg/kg)	Number of Detects	Detection Frequency	Tier I EPC (mg/kg)
Arsenic	113	6.50E-01	1.00E+03	6.10E-01	6.90E+00	85	75%	1.00E+03
Atrazine	1			3.40E-01	3.40E-01	0	0%	3.40E-01
Barium	29	3.10E+01	3.90E+02	1.00E+00	1.40E+00	28	97%	3.90E+02
Benzene	1			5.20E-03	5.20E-03	0	0%	5.20E-03
Benzo(a)Anthracene	1			3.40E-01	3.40E-01	0	0%	3.40E-01
Benzo(a)Pyrene	1			3.40E-01	3.40E-01	0	0%	3.40E-01
Benzo(b)Fluoranthene	1			3.40E-01	3.40E-01	0	0%	3.40E-01
Benzo(ghi)Perylene	1			3.40E-01	3.40E-01	0	0%	3.40E-01
Benzo(k)Fluoranthene	1			3.40E-01	3.40E-01	0	0%	3.40E-01
Benzyl Butyl Phthalate	1			3.40E-01	3.40E-01	0	0%	3.40E-01
Beryllium	29	6.10E-01	3.40E+00	5.10E-01	7.20E-01	8	28%	3.40E+00
Bis(2-Chloroethoxy)Methane	1			3.40E-01	3.40E-01	0	0%	3.40E-01
Bis(2-Chloroethyl) Ether	1			3.40E-01	3.40E-01	0	0%	3.40E-01
Bis(2-Chloroisopropyl) Ether	1			3.40E-01	3.40E-01	0	0%	3.40E-01
Bis(2-Ethylhexyl) Phthalate	1			3.40E-01	3.40E-01	0	0%	3.40E-01
Bromobenzene	1			5.20E-03	5.20E-03	0	0%	5.20E-03
Bromodichloromethane	1			5.20E-03	5.20E-03	0	0%	5.20E-03
Bromomethane	1			1.00E-02	1.00E-02	0	0%	1.00E-02
Cadmium	113	1.10E-01	2.30E+00	1.00E-01	5.70E-01	33	29%	2.30E+00
Calcium Metal	29	2.40E+01	1.20E+04	2.00E+01	2.90E+01	29	100%	1.20E+04
Caprolactam	1			1.70E+00	1.70E+00	0	0%	1.70E+00
Carbazole	1			3.40E-01	3.40E-01	0	0%	3.40E-01
Carbon Tetrachloride	1			5.20E-03	5.20E-03	0	0%	5.20E-03
CFC-11	1			1.00E-02	1.00E-02	0	0%	1.00E-02
CFC-12	1			1.00E-02	1.00E-02	0	0%	1.00E-02
Chlorobenzene	1			5.20E-03	5.20E-03	0	0%	5.20E-03
Chlorobromomethane	1			5.20E-03	5.20E-03	0	0%	5.20E-03
Chlorodibromomethane	1			5.20E-03	5.20E-03	0	0%	5.20E-03

Table 5 - Summary Statistics for Subsurface Soil (6 in-bgs to approximately 25 ft-bgs)

Analyte	n	Minimum Detected Value (mg/kg)	Maximum Detected Value (mg/kg)	Minimum Reporting Limit (mg/kg)	Maximum Reporting Limit (mg/kg)	Number of Detects	Detection Frequency	Tier I EPC (mg/kg)
Chloroethane	1			1.00E-02	1.00E-02	0	0%	1.00E-02
Chloroform	1			1.00E-02	1.00E-02	0	0%	1.00E-02
Chloromethane	1			1.00E-02	1.00E-02	0	0%	1.00E-02
Chromium	113	5.80E+00	9.20E+01	2.00E-01	2.30E+00	113	100%	9.20E+01
Cis-1,2-Dichloroethene	1			2.60E-03	2.60E-03	0	0%	2.60E-03
Cis-1,3-Dichloropropene	1			5.20E-03	5.20E-03	0	0%	5.20E-03
Cobalt	29	2.60E+00	1.40E+01	1.00E+00	1.40E+00	28	97%	1.40E+01
Copper	113	5.50E+00	2.50E+02	2.00E-01	2.30E+00	113	100%	2.50E+02
Cyanide	31	7.20E-01	1.00E+00	5.10E-01	7.20E-01	2	6%	1.00E+00
Dibenz(a,h)Anthracene	1			3.40E-01	3.40E-01	0	0%	3.40E-01
Dibenzofuran	1			3.40E-01	3.40E-01	0	0%	3.40E-01
Dibromomethane	1			5.20E-03	5.20E-03	0	0%	5.20E-03
Dichloromethane	1			5.20E-03	5.20E-03	0	0%	5.20E-03
Diethyl Phthalate	1			6.80E-01	6.80E-01	0	0%	6.80E-01
Dimethyl Phthalate	1			3.40E-01	3.40E-01	0	0%	3.40E-01
Di-N-Butyl Phthalate	1			3.40E-01	3.40E-01	0	0%	3.40E-01
Di-N-Octyl Phthalate	1			3.40E-01	3.40E-01	0	0%	3.40E-01
Ethylbenzene	1			5.20E-03	5.20E-03	0	0%	5.20E-03
Fluoranthene	1			3.40E-01	3.40E-01	0	0%	3.40E-01
Fluorene	1			3.40E-01	3.40E-01	0	0%	3.40E-01
Hexachloro-1,3-Butadiene	2			5.20E-03	3.40E-01	0	0%	3.40E-01
Hexachlorobenzene	1			3.40E-01	3.40E-01	0	0%	3.40E-01
Hexachlorocyclopentadiene	1			1.70E+00	1.70E+00	0	0%	1.70E+00
Hexachloroethane	1			3.40E-01	3.40E-01	0	0%	3.40E-01
Indeno(1,2,3-cd)Pyrene	1			3.40E-01	3.40E-01	0	0%	3.40E-01
Iron	29	4.30E+02	1.40E+05	1.00E+01	1.40E+01	29	100%	1.40E+05
Isopropylbenzene	1			5.20E-03	5.20E-03	0	0%	5.20E-03
Lead	11	1.70E+00	2.40E+03	1.50E-01	1.70E+00	113	100%	2.40E+03

Table 5 - Summary Statistics for Subsurface Soil (6 in-bgs to approximately 25 ft-bgs)								
Analyte	**n**	**Minimum Detected Value (mg/kg)**	**Maximum Detected Value (mg/kg)**	**Minimum Reporting Limit (mg/kg)**	**Maximum Reporting Limit (mg/kg)**	**Number of Detects**	**Detection Frequency**	**Tier I EPC (mg/kg)**
	3							
Magnesium	29	3.40E+01	9.30E+03	2.00E+01	2.90E+01	29	100%	9.30E+03
Manganese	113	2.50E+01	2.20E+03	1.50E-01	1.90E+01	113	100%	2.20E+03
M-Dichlorobenzene	1			5.20E-03	5.20E-03	0	0%	5.20E-03
Mercury	29	7.90E-02	3.80E-01	3.40E-02	4.80E-02	3	10%	3.80E-01
Methyl N-Butyl Ketone	1			2.10E-02	2.10E-02	0	0%	2.10E-02
Methyl Tert-Butyl Ether	1			2.10E-02	2.10E-02	0	0%	2.10E-02
Methylbenzene	1			5.20E-03	5.20E-03	0	0%	5.20E-03
m-Xylene &p-Xylene	1			2.60E-03	2.60E-03	0	0%	2.60E-03
Naphthalene	2			5.20E-03	3.40E-01	0	0%	3.40E-01
N-Butylbenzene	1			5.20E-03	5.20E-03	0	0%	5.20E-03
Nickel	29	5.70E+00	2.40E+01	4.10E+00	5.80E+00	28	97%	2.40E+01
Nitrobenzene	1			3.40E-01	3.40E-01	0	0%	3.40E-01
n-Nitrosodi-N-Propylamine	1			3.40E-01	3.40E-01	0	0%	3.40E-01
n-Nitrosodiphenylamine	1			3.40E-01	3.40E-01	0	0%	3.40E-01
n-Propylbenzene	1			5.20E-03	5.20E-03	0	0%	5.20E-03
o-Xylene	1			2.60E-03	2.60E-03	0	0%	2.60E-03
p-Chloroaniline	1			3.40E-01	3.40E-01	0	0%	3.40E-01
p-Cymene	1			5.20E-03	5.20E-03	0	0%	5.20E-03
Pentachlorophenol	1			1.70E+00	1.70E+00	0	0%	1.70E+00
pH	102	2.20E+00	9.20E+00	1.00E-01	1.00E-01	102	100%	9.20E+00
Phenanthrene	1			3.40E-01	3.40E-01	0	0%	3.40E-01
Phenol	1			3.40E-01	3.40E-01	0	0%	3.40E-01
p-Nitroaniline	1			1.70E+00	1.70E+00	0	0%	1.70E+00
Potassium	29	1.10E+03	6.70E+03	3.10E+02	4.30E+02	28	97%	6.70E+03
Pyrene	1			3.40E-01	3.40E-01	0	0%	3.40E-01
Selenium	29			1.30E+00	1.90E+00	0	0%	1.90E+00
Silver	29	1.10E+00	2.80E+01	1.00E+00	1.40E+00	4	14%	2.80E+01

Table 5 - Summary Statistics for Subsurface Soil (6 in-bgs to approximately 25 ft-bgs)

Analyte	n	Minimum Detected Value (mg/kg)	Maximum Detected Value (mg/kg)	Minimum Reporting Limit (mg/kg)	Maximum Reporting Limit (mg/kg)	Number of Detects	Detection Frequency	Tier I EPC (mg/kg)
Sodium	29			5.10E+02	7.20E+02	0	0%	7.20E+02
Styrene (Monomer)	1			5.20E-03	5.20E-03	0	0%	5.20E-03
Sulfate	31	7.10E+01	2.00E+04	5.10E+01	3.60E+03	17	55%	2.00E+04
Tert-Butylbenzene	1			5.20E-03	5.20E-03	0	0%	5.20E-03
Tetrachloroethene	1			5.20E-03	5.20E-03	0	0%	5.20E-03
Thallium	29	1.70E+00	6.90E+00	1.20E+00	1.70E+00	2	7%	6.90E+00
Trans-1,2-Dichloroethene	1			2.60E-03	2.60E-03	0	0%	2.60E-03
Trans-1,3-Dichloropropene	1			5.20E-03	5.20E-03	0	0%	5.20E-03
Tribomomethane	1			5.20E-03	5.20E-03	0	0%	5.20E-03
Trichloroethylene	1			5.20E-03	5.20E-03	0	0%	5.20E-03
Vanadium	29	1.20E+01	5.80E+01	2.00E+00	2.90E+00	28	97%	5.80E+01
Vinyl Chloride	1			5.20E-03	5.20E-03	0	0%	5.20E-03
Xylenes (Total)	1			5.20E-03	5.20E-03	0	0%	5.20E-03
Zinc	113	1.20E+01	1.00E+03	1.00E+00	1.30E+02	113	100%	1.00E+03

Note:

Blank cells indicate no detects

The Tier I EPC is the lower of the maximum detected value or the maximum reporting limit for nondetected analytes in the absence of any detections

Multiple samples had U, J, J, or UJ qualifiers; there were no R qualified data*

Background samples are not included in the site summary statistics

Table 6 Tier I Risk Analysis for Subsurface Soil (6 in-bgs to approximately 25 ft-bgs)

Table 6 - Tier I Risk Analysis for Subsurface Soil (6 in-bgs to approximately 25 ft-bgs)			
Analyte	**Risk Ratio Region IX Residential Surface Soil PRG**	**Risk Ratio Region IX MTG PRG**	**Exceeds SVs?**
1,1,1,2-Tetrachloroethane	1.63E-03	No SV	No
1,1,1-Trichloroethane	4.33E-06	5.20E-02	No
1,1,2,2-Tetrachloroethane	1.28E-02	***2.60E+01***	Yes
1,1,2-Trichloroethane	7.14E-03	***5.78E+00***	Yes
1,1-Dichloroethane	1.03E-05	5.20E-03	No
1,1-Dichloroethylene	4.21E-05	***1.73E+00***	Yes
1,1-Dichloropropene	No SV	No SV	No SV
1,2,3-Trichlorobenzene	No SV	No SV	No SV
1,2,3-Trichloropropane	***1.53E-01***	No SV	Yes
1,2,4-Trichlorobenzene	8.37E-05	1.73E-02	No
1,2,4-Trimethylbenzene	1.01E-04	No SV	No
1,2-Benzphenanthracene	5.48E-03	4.25E-02	No
1,2-Dibromo-3-Chloropropane (DBCP)	2.17E-02	No SV	No
1,2-Dibromoethane (EDB)	***1.63E-01***	No SV	Yes
1,2-Dichlorobenzene	8.67E-06	5.78E-03	No
1,2-Dichloroethane	1.87E-02	***5.20E+00***	Yes
1,2-Dichloroethene (Total)	1.21E-04	***2.60E-01***	No
1,2-Dichloropropane	1.52E-02	***5.20E+00***	Yes
1,3,5-Trimethylbenzene	2.45E-04	No SV	No
1,3-Dichloropropane	4.96E-05	No SV	No
1,4-Dichlorobenzene	1.51E-03	5.20E-02	No
2,2-Dichloropropane	No SV	No SV	No SV
2,4,5-Trichlorophenol	5.56E-05	2.43E-02	No
2,4,6-Trichlorophenol	5.56E-02	***4.25E+01***	Yes
2,4-Dichlorophenol	1.85E-03	***6.80E+00***	Yes
2,4-Dimethylphenol	2.78E-04	***8.50E-01***	No
2,4-Dinitrophenol	1.39E-02	***1.70E+02***	Yes
2,4-Dinitrotoluene	2.78E-03	***8.50E+03***	Yes
2,6-Dinitrotoluene	5.56E-03	***1.13E+04***	Yes
2-Butanone (MEK)	9.41E-07	No SV	No
2-Chloronaphthalene	6.89E-05	No SV	No
2-Chlorophenol	5.36E-03	***1.70E+00***	Yes
2-Chlorotoluene	3.28E-05	No SV	No
2-Methylnaphthalene	No SV	No SV	No SV
2-Methylphenol	1.11E-04	***4.25E-01***	No
2-Nitroaniline	9.30E-03	No SV	No
2-Nitrophenol	No SV	No SV	No SV
2-Phenylbutane	2.36E-05	No SV	No
3,3-Dichlorobenzidine	***6.29E-01***	***2.27E+03***	Yes
3-Nitroaniline	9.27E-02	No SV	No
4,6-Dinitro-2-Methylphenol	No SV	No SV	No SV
4-Bromophenyl Phenyl Ether	No SV	No SV	No SV

Table 6 - Tier I Risk Analysis for Subsurface Soil (6 in-bgs to approximately 25 ft-bgs)			
Analyte	**Risk Ratio Region IX Residential Surface Soil PRG**	**Risk Ratio Region IX MTG PRG**	**Exceeds SVs?**
4-Chloro-3-Methylphenol	No SV	No SV	No SV
4-Chlorophenyl Phenyl Ether	No SV	No SV	No SV
4-Chlorotoluene	No SV	No SV	No SV
4-Methyl-2-Pentanone	3.98E-06	No SV	No
4-Methylphenol	1.11E-03	No SV	No
4-Nitrophenol	No SV	No SV	No SV
Acenaphthene	9.24E-05	1.17E-02	No
Acenaphthylene	No SV	No SV	No SV
Acetone	1.49E-06	2.63E-02	No
Acetophenone	4.35E-05	***2.14E+00***	Yes
Aluminum (Fume Or Dust)	***1.84E-01***	No SV	Yes
Anthracene	1.55E-05	5.76E-04	No
Antimony	8.95E-02	***9.33E+00***	Yes
Arsenic	***2.56E+03***	***1.00E+03***	Yes
Atrazine	***1.55E-01***	No SV	Yes
Barium	7.26E-02	***4.76E+00***	Yes
Benzene	8.09E-03	***2.60E+00***	Yes
Benzo(a)Anthracene	***5.48E-01***	***4.25E+00***	Yes
Benzo(a)Pyrene	***5.48E+00***	***8.50E-01***	Yes
Benzo(b)Fluoranthene	***5.48E-01***	***1.70E+00***	Yes
Benzo(ghi)Perylene	No SV	No SV	No SV
Benzo(k)Fluoranthene	5.48E-02	***1.70E-01***	No
Benzyl Butyl Phthalate	2.78E-05	4.20E-04	No
Beryllium	2.21E-02	***1.13E+00***	Yes
Bis(2-Chloroethoxy)Methane	No SV	No SV	No SV
Bis(2-Chloroethyl) Ether	***1.56E+00***	***1.70E+04***	Yes
Bis(2-Chloroisopropyl) Ether	***1.18E-01***	No SV	Yes
Bis(2-Ethylhexyl) Phthalate	9.79E-03	No SV	No
Bromobenzene	1.87E-04	No SV	No
Bromodichloromethane	6.31E-03	***1.73E-01***	No
Bromomethane	2.57E-03	***1.00E+00***	Yes
Cadmium	6.22E-02	***5.75E+00***	Yes
Calcium Metal	No SV	No SV	No SV
Caprolactam	5.56E-05	No SV	No
Carbazole	1.40E-02	***1.13E+01***	Yes
Carbon Tetrachloride	2.07E-02	***1.73E+00***	Yes
CFC-11	2.59E-05	No SV	No
CFC-12	1.07E-04	No SV	No
Chlorobenzene	3.45E-05	7.43E-02	No
Chlorobromomethane	No SV	No SV	No SV
Chlorodibromomethane	4.69E-03	***2.60E-01***	No
Chloroethane	3.30E-03	No SV	No
Chloroform	4.53E-02	***3.33E-01***	No
Chloromethane	2.13E-04	No SV	No
Chromium	***4.36E-01***	***4.60E+01***	Yes

Table 6 - Tier I Risk Analysis for Subsurface Soil (6 in-bgs to approximately 25 ft-bgs)			
Analyte	**Risk Ratio Region IX Residential Surface Soil PRG**	**Risk Ratio Region IX MTG PRG**	**Exceeds SVs?**
Cis-1,2-Dichloroethene	6.05E-05	***1.30E-01***	No
Cis-1,3-Dichloropropene	No SV	No SV	No SV
Cobalt	1.55E-02	No SV	No
Copper	7.99E-02	No SV	No
Cyanide	9.26E-02	No SV	No
Dibenz(a,h)Anthracene	***5.47E+00***	***4.25E+00***	Yes
Dibenzofuran	2.34E-03	No SV	No
Dibromomethane	7.77E-05	No SV	No
Dichloromethane	5.71E-04	***5.20E+00***	Yes
Diethyl Phthalate	1.39E-05	No SV	No
Dimethyl Phthalate	3.40E-06	No SV	No
Di-N-Butyl Phthalate	5.56E-05	1.26E-03	No
Di-N-Octyl Phthalate	1.39E-04	3.40E-05	No
Ethylbenzene	1.32E-05	7.43E-03	No
Fluoranthene	1.48E-04	1.62E-03	No
Fluorene	1.24E-04	1.21E-02	No
Hexachloro-1,3-Butadiene	5.45E-02	***3.40E+00***	Yes
Hexachlorobenzene	***1.12E+00***	***3.40E+00***	Yes
Hexachlorocyclopentadiene	4.65E-03	8.50E-02	No
Hexachloroethane	9.79E-03	***1.70E+01***	Yes
Indeno(1,2,3-cd)Pyrene	***5.47E-01***	***4.86E-01***	Yes
Iron	***5.96E+00***	No SV	Yes
Isopropylbenzene	9.09E-06	No SV	No
Lead	***6.00E+00***	No SV	Yes
Magnesium	No SV	No SV	No SV
Manganese	***1.25E+00***	No SV	Yes
M-Dichlorobenzene	9.79E-06	No SV	No
Mercury	6.22E-02	No SV	No
Methyl N-Butyl Ketone	No SV	No SV	No SV
Methyl Tert-Butyl Ether	6.56E-04	No SV	No
Methylbenzene	1.00E-05	8.67E-03	No
m-Xylene &p-Xylene	No SV	No SV	No SV
Naphthalene	6.08E-03	8.50E-02	No
N-Butylbenzene	2.17E-05	No SV	No
Nickel	1.54E-02	***3.43E+00***	Yes
Nitrobenzene	1.73E-02	***4.86E+01***	Yes
n-Nitrosodi-N-Propylamine	***4.89E+00***	***1.70E+05***	Yes
n-Nitrosodiphenylamine	3.43E-03	***5.67E+00***	Yes
n-Propylbenzene	2.17E-05	No SV	No
o-Xylene	No SV	No SV	No SV
p-Chloroaniline	1.39E-03	***1.13E+01***	Yes
p-Cymene	No SV	No SV	No SV
Pentachlorophenol	***5.71E-01***	***1.70E+03***	Yes
pH	NA	NA	No
Phenanthrene	1.55E-05	5.76E-04	No

Table 6 - Tier I Risk Analysis for Subsurface Soil (6 in-bgs to approximately 25 ft-bgs)

Analyte	Risk Ratio Region IX Residential Surface Soil PRG	Risk Ratio Region IX MTG PRG	Exceeds SVs?
Phenol	1.85E-05	6.80E-02	No
p-Nitroaniline	7.34E-02	No SV	No
Potassium	No SV	No SV	No SV
Pyrene	No SV	1.62E-03	No
Selenium	4.86E-03	***6.33E+00***	Yes
Silver	7.16E-02	***1.40E+01***	Yes
Sodium	No SV	No SV	No SV
Styrene (Monomer)	3.06E-06	2.60E-02	No
Sulfate	No SV	No SV	No SV
Tert-Butylbenzene	1.33E-05	No SV	No
Tetrachloroethene	1.08E-02	***1.73E+00***	Yes
Thallium	***1.34E+00***	No SV	Yes
Trans-1,2-Dichloroethene	3.74E-05	8.67E-02	No
Trans-1,3-Dichloropropene	No SV	No SV	No SV
Tribomomethane	8.45E-05	***1.30E-01***	No
Trichloroethylene	9.82E-02	***1.73E+00***	Yes
Vanadium (Fume Or Dust)	***7.42E-01***	***1.93E-01***	Yes
Vinyl Chloride	6.58E-02	***7.43E+00***	Yes
Xylenes (Total)	1.92E-05	5.20E-04	No
Zinc	4.26E-02	***1.61E+00***	Yes

Notes:

The risk ratio is the EPC divided by the media-specific screening value (Table 2)

Ratios in excess of 0.1 are shown in bold italics

Ratios in excess of 0.1 are used to account for potential cumulative effects; the analyte is carried forward

SVs - Screening values

NA - Not applicable

PRG - Preliminary Remedial Goal

MTG - Migration to Ground water

The Tier I EPC is the lower of the maximum detected value or the maximum reporting limit for nondetected analytes in the absence of any detections

Table 7 Summary Statistics for Surface Water

Table 7 - Summary Statistics for Surface Water								
Analyte	**n**	**Minimum Detected Value (mg/L)**	**Maximum Detected Value (mg/L)**	**Minimum Reporting Limit (mg/L)**	**Maximum Reporting Limit (mg/L)**	**Number of Detects**	**Detection Frequency**	**Tier I EPC (mg/L)**
Arsenic	99	0.000	0.0000	0.005	0.005	0	0%	0.005
Cadmium	117	0.001	0.0027	0.001	0.001	39	33%	0.0027
Calcium Metal	81	4.000	29	0.0002	0.2	81	100%	29
Chromium	100	0.0000	0.0022	0.002	0.002	1	1%	0.0022
Copper	117	0.0000	0.019	0.002	0.002	96	82%	0.019
Lead	99	0.0000	0.011	0.001	0.001	34	34%	0.011
Magnesium	81	0.920	13	0.0002	0.2	81	100%	13
Manganese	99	0.0210	0.52	0.001	0.001	99	100%	0.52
Zinc	153	0.0000	0.9	0.01	0.01	149	97%	0.9
Hardness In Water By ICP And Calculation	81	19.000	130	0.0013	0.0013	81	100%	130

Note:

Blank cells indicate no detects

The Tier I EPC is the lower of the maximum detected value or the maximum reporting limit for nondetected analytes in the absence of any detections

Four copper (Cu) samples were biased high (J+) qualified; this does not affect the Tier I EPC

Background samples are not included in the site summary statistics

Table 8 Tier I Screening Level Risk Analysis for Surface Water

Table 8 - Tier I Screening Level Risk Analysis for Surface Water						
	Risk Ratios					
Analyte	**CDPHE Water Supply**	**Water & Fish**	**Fish Only**	**Agriculture**	**EPA Region 9 Tap Water PRG**	**Exceeds SVs?**
Arsenic	0.10	***278***	***36***	0.05	***111.61***	Yes
Cadmium	***0.54***	No SV	No SV	***0.27***	***0.15***	Yes
Calcium Metal	No SV	No SV	No SV	No SV	No SV	No
Chromium	0.04	No SV	No SV	0.02	0.02	No
Copper	0.019	No SV	No SV	0.10	0.01	No
Lead	***0.22***	No SV	No SV	***0.11***	No SV	Yes
Magnesium	No SV	No SV	No SV	No SV	No SV	No
Manganese	***10***	No SV	No SV	***2.60***	***0.59***	Yes
Zinc	***0.18***	No SV	No SV	***0.45***	0.08	Yes

Notes:
The risk ratio is the EPC divided by the media-specific screening value (Table 2)
Ratios in excess of 0.1 are shown in bold italics
Ratios in excess of 0.1 are used to account for potential cumulative effects; the analyte is carried forward
SVs - Screening values
NA - Not applicable
PRG - Preliminary Remedial Goal
The Tier I EPC is the lower of the maximum detected value or the maximum reporting limit for nondetected analytes in the absence of any detections

Table 9 *Summary Statistics for Eagle River Sediment*

Table 9 - Summary Statistics for Eagle River Sediment								
Analyte	**n**	**Minimum Detected Value (mg/kg)**	**Maximum Detected Value (mg/kg)**	**Minimum Reporting Limit (mg/kg)**	**Maximum Reporting Limit (mg/kg)**	**Number of Detects**	**Detection Frequency**	**Tier I EPC (mg/kg)**
Arsenic	6	14.00	97.00	1.5	1.5	6	100%	97.00
Cadmium	6	3.50	8.10	0.24	0.25	6	100%	8.10
Chromium	6	5.90	8.50	0.48	0.51	6	100%	8.50
Copper	6	41.00	160.00	0.48	0.51	6	100%	160.00
Lead	6	350.00	810.00	0.37	1.9	6	100%	810.00
Manganese	6	880.00	2200.00	0.37	1.9	6	100%	2200.00
Zinc	6	940.00	2500.00	2.5	13	6	100%	2500.00

Note:
The Tier I EPC is the lower of the maximum detected value or the maximum reporting limit for nondetected analytes in the absence of any detections
There were no laboratory or validator qualified surface sediments
Background samples are not included in the site summary statistics

Table 10 Tier I Screening Level Risk Analysis for Eagle River Sediment

Table 10 - Tier I Screening Level Risk Analysis for Eagle River Sediment		
Analyte	**Risk Ratio Region IX Residential Soil PRG**	**Exceeds SVs?**
Arsenic	***249***	Yes
Cadmium	***0.2***	Yes
Chromium	0.04	No
Copper	0.05	No
Lead	***2***	Yes
Manganese	***1***	Yes
Zinc	***0.11***	Yes

Notes:
The risk ratio is the EPC divided by the media-specific screening value (Table 2)
Ratios in excess of 0.1 are shown in bold italics
Ratios in excess of 0.1 are used to account for potential cumulative effects; the analyte is carried forward
SVs - Screening values
NA - Not applicable
PRG - Preliminary Remedial Goal
The Tier I EPC is the lower of the maximum detected value or the maximum reporting limit for nondetected analytes in the absence of any detections

Table 11 Summary Statistics for Ground Water

Table 11 - Summary Statistics for Ground Water								
Analyte	**n**	**Minimum Detected Value (mg/L)**	**Maximum Detected Value (mg/L)**	**Minimum Reporting Limit (mg/L)**	**Maximum Reporting Limit (mg/L)**	**Number of Detects**	**Detection Frequency**	**Tier I EPC (mg/L)**
1,1,1,2-Tetrachloroethane	15			0.001	0.001	0	0%	0.001
1,1,1-Trichloroethane	15			0.001	0.001	0	0%	0.001
1,1,2,2-Tetrachloroethane	15			0.001	0.001	0	0%	0.001
1,1,2-Trichloroethane	15			0.001	0.001	0	0%	0.001
1,1-Dichloroethane	15			0.001	0.001	0	0%	0.001
1,1-Dichloroethylene	15			0.001	0.001	0	0%	0.001
1,1-Dichloropropene	15			0.001	0.001	0	0%	0.001
1,2,3-Trichlorobenzene	15			0.001	0.001	0	0%	0.001
1,2,3-Trichloropropane	15			0.001	0.001	0	0%	0.001
1,2,4-Trichlorobenzene	15			0.001	0.001	0	0%	0.001
1,2,4-Trimethylbenzene	15			0.001	0.001	0	0%	0.001
1,2-Benzphenanthracene	15			0.01	0.01	0	0%	0.01
1,2-Dibromo-3-Chloropropane (DBCP)	15			0.002	0.005	0	0%	0.005
1,2-Dibromoethane (EDB)	15			0.001	0.001	0	0%	0.001
1,2-Dichlorobenzene	15			0.001	0.001	0	0%	0.001
1,2-Dichloroethane	15			0.001	0.001	0	0%	0.001
1,2-Dichloroethene (Total)	15			0.001	0.001	0	0%	0.001
1,2-Dichloropropane	15			0.001	0.001	0	0%	0.001
1,3,5-Trimethylbenzene	15			0.001	0.001	0	0%	0.001
1,3-Dichloropropane	15			0.001	0.001	0	0%	0.001
1,4-Dichlorobenzene	15			0.001	0.001	0	0%	0.001
2,2-Dichloropropane	15			0.005	0.005	0	0%	0.005
2,4,5-Trichlorophenol	15			0.01	0.01	0	0%	0.01
2,4,6-Trichlorophenol	15			0.01	0.01	0	0%	0.01
2,4-Dichlorophenol	15			0.01	0.01	0	0%	0.01
2,4-Dimethylphenol	15			0.01	0.01	0	0%	0.01

Table 11 - Summary Statistics for Ground Water

Analyte	n	Minimum Detected Value (mg/L)	Maximum Detected Value (mg/L)	Minimum Reporting Limit (mg/L)	Maximum Reporting Limit (mg/L)	Number of Detects	Detection Frequency	Tier I EPC (mg/L)
2,4-Dinitrophenol	15			0.05	0.05	0	0%	0.05
2,4-Dinitrotoluene	15			0.01	0.01	0	0%	0.01
2,6-Dinitrotoluene	15			0.01	0.01	0	0%	0.01
2-Butanone (MEK)	11			0.005	0.005	0	0%	0.005
2-Chloronaphthalene	15			0.01	0.01	0	0%	0.01
2-Chlorophenol	15			0.01	0.01	0	0%	0.01
2-Chlorotoluene	15			0.001	0.001	0	0%	0.001
2-Methylnaphthalene	15			0.01	0.01	0	0%	0.01
2-Methylphenol	15			0.01	0.01	0	0%	0.01
2-Nitroaniline	15			0.05	0.05	0	0%	0.05
2-Nitrophenol	15			0.01	0.01	0	0%	0.01
2-Phenylbutane	15			0.001	0.001	0	0%	0.001
3,3-Dichlorobenzidine	15			0.05	0.05	0	0%	0.05
3-Nitroaniline	15			0.05	0.05	0	0%	0.05
4,6-Dinitro-2-Methylphenol	15			0.05	0.05	0	0%	0.05
4-Bromophenyl Phenyl Ether	15			0.01	0.01	0	0%	0.01
4-Chloro-3-Methylphenol	15			0.01	0.01	0	0%	0.01
4-Chlorophenyl Phenyl Ether	15			0.01	0.01	0	0%	0.01
4-Chlorotoluene	15			0.001	0.001	0	0%	0.001
4-Methyl-2-Pentanone	15			0.005	0.005	0	0%	0.005
4-Methylphenol	15			0.01	0.01	0	0%	0.01
4-Nitrophenol	15			0.05	0.05	0	0%	0.05
Acenaphthene	15			0.01	0.01	0	0%	0.01
Acenaphthylene	15			0.01	0.01	0	0%	0.01
Acetone	15			0.01	0.01	0	0%	0.01
Acetophenone	15			0.01	0.01	0	0%	0.01
Aluminum	16	2	4.1	0.0001	0.5	6	38%	4.1
Anthracene	15			0.01	0.01	0	0%	0.01

Table 11 - Summary Statistics for Ground Water

Analyte	n	Minimum Detected Value (mg/L)	Maximum Detected Value (mg/L)	Minimum Reporting Limit (mg/L)	Maximum Reporting Limit (mg/L)	Number of Detects	Detection Frequency	Tier I EPC (mg/L)
Antimony	22			0.000002	0.01	0	0%	0.01
Arsenic	275	0.0051	0.11	0.005	0.025	46	17%	0.11
Atrazine	15			0.05	0.05	0	0%	0.05
Barium	16	0.012	0.08	0.00001	0.01	11	69%	0.08
Benzene	15			0.001	0.001	0	0%	0.001
Benzo(a)Anthracene	15			0.01	0.01	0	0%	0.01
Benzo(a)Pyrene	15			0.01	0.01	0	0%	0.01
Benzo(b)Fluoranthene	15			0.01	0.01	0	0%	0.01
Benzo(ghi)Perylene	15			0.01	0.01	0	0%	0.01
Benzo(k)Fluoranthene	15			0.01	0.01	0	0%	0.01
Benzyl Butyl Phthalate	15			0.01	0.01	0	0%	0.01
Beryllium	31	0.0011	0.013	0.000001	0.05	7	23%	0.05
Bis(2-Chloroethoxy)Methane	15			0.01	0.01	0	0%	0.01
Bis(2-Chloroethyl) Ether	15			0.01	0.01	0	0%	0.01
Bis(2-Chloroisopropyl) Ether	15			0.01	0.01	0	0%	0.01
Bis(2-Ethylhexyl) Phthalate	15			0.01	0.01	0	0%	0.01
Bromobenzene	15			0.001	0.001	0	0%	0.001
Bromodichloromethane	15			0.001	0.001	0	0%	0.001
Bromomethane	15			0.002	0.002	0	0%	0.002
Cadmium	275	0.0015	0.39	0.001	0.002	107	39%	0.39
Calcium Metal	16	14	550	0.0002	2	16	100%	550
Caprolactam	15			0.02	0.02	0	0%	0.02
Carbazole	15			0.01	0.01	0	0%	0.01
Carbon Tetrachloride	15			0.001	0.001	0	0%	0.001
CFC-11	15			0.002	0.002	0	0%	0.002
CFC-12	15			0.002	0.002	0	0%	0.002
Chlorobenzene	15			0.001	0.001	0	0%	0.001
Chlorobromomethane	15			0.001	0.001	0	0%	0.001

Table 11 - Summary Statistics for Ground Water

Analyte	n	Minimum Detected Value (mg/L)	Maximum Detected Value (mg/L)	Minimum Reporting Limit (mg/L)	Maximum Reporting Limit (mg/L)	Number of Detects	Detection Frequency	Tier I EPC (mg/L)
Chlorodibromomethane	15			0.001	0.001	0	0%	0.001
Chloroethane	15			0.002	0.002	0	0%	0.002
Chloroform	15			0.001	0.001	0	0%	0.001
Chloromethane	15			0.002	0.002	0	0%	0.002
Chromium	275	0.002	0.012	0.002	0.01	27	10%	0.012
Cis-1,2-Dichloroethene	15			0.001	0.001	0	0%	0.001
Cis-1,3-Dichloropropene	15			0.001	0.001	0	0%	0.001
Cobalt	16	0.014	2.8	0.00001	0.1	9	56%	2.8
Copper	275	0.002	0.62	0.002	0.01	238	87%	0.62
Dibenz(a,h)Anthracene	15			0.01	0.01	0	0%	0.01
Dibenzofuran	15			0.01	0.01	0	0%	0.01
Dibromomethane	15			0.001	0.001	0	0%	0.001
Dichloromethane	15			0.005	0.005	0	0%	0.005
Diethyl Phthalate	15			0.01	0.01	0	0%	0.01
Dimethyl Phthalate	15			0.01	0.01	0	0%	0.01
Di-n-Butyl Phthalate	15			0.01	0.01	0	0%	0.01
Di-n-Octyl Phthalate	15			0.01	0.01	0	0%	0.01
Ethylbenzene	15			0.001	0.001	0	0%	0.001
Fluoranthene	15			0.01	0.01	0	0%	0.01
Fluorene	15			0.01	0.01	0	0%	0.01
Free Cyanide (4500-Cn-I)	15	0.012	0.012	0.00001	0.00001	1	7%	0.012
Hexachloro-1,3-Butadiene	30			0.001	0.01	0	0%	0.01
Hexachlorobenzene	15			0.01	0.01	0	0%	0.01
Hexachlorocyclopentadiene	15			0.05	0.05	0	0%	0.05
Hexachloroethane	15			0.01	0.01	0	0%	0.01
Indeno(1,2,3-cd)Pyrene	15			0.01	0.01	0	0%	0.01
Iron	16	0.12	2200	0.0001	0.1	10	63%	2200
Isopropylbenzene	15			0.001	0.001	0	0%	0.001

Table 11 - Summary Statistics for Ground Water

Analyte	n	Minimum Detected Value (mg/L)	Maximum Detected Value (mg/L)	Minimum Reporting Limit (mg/L)	Maximum Reporting Limit (mg/L)	Number of Detects	Detection Frequency	Tier I EPC (mg/L)
Lead	275	0.001	0.018	0.001	0.002	25	9%	0.018
Magnesium	16	4.9	1300	0.0002	2	16	100%	1300
Manganese	275	0.001	1400	0.001	2	264	96%	1400
M-Dichlorobenzene	15			0.001	0.001	0	0%	0.001
Mercury	17			0.0002	0.0002	0	0%	0.0002
Methyl n-Butyl Ketone	15			0.005	0.005	0	0%	0.005
Methyl Tert-Butyl Ether	15			0.005	0.005	0	0%	0.005
Methylbenzene	15			0.001	0.001	0	0%	0.001
m-Xylene & p-Xylene	15			0.002	0.002	0	0%	0.002
Naphthalene	30			0.001	0.01	0	0%	0.01
n-Butylbenzene	15			0.001	0.001	0	0%	0.001
Nickel	16	0.061	0.63	0.00004	0.4	8	50%	0.63
Nitrobenzene	15			0.01	0.01	0	0%	0.01
n-Nitrosodi-n-Propylamine	15			0.01	0.01	0	0%	0.01
n-Nitrosodiphenylamine	15			0.01	0.01	0	0%	0.01
n-Propylbenzene	15			0.001	0.001	0	0%	0.001
o-Xylene	15			0.001	0.001	0	0%	0.001
p-Chloroaniline	15			0.01	0.01	0	0%	0.01
p-Cymene	15			0.001	0.001	0	0%	0.001
Pentachlorophenol	15			0.05	0.05	0	0%	0.05
Phenanthrene	15			0.01	0.01	0	0%	0.01
Phenol	15			0.01	0.01	0	0%	0.01
p-Nitroaniline	15			0.05	0.05	0	0%	0.05
Potassium	16	4.7	13	0.003	3	12	75%	13
Pyrene	15			0.01	0.01	0	0%	0.01
Selenium	16			0.000015	0.15	0	0%	0.15
Silver	16	0.013	0.02	0.00001	0.01	3	19%	0.02
Sodium	16	6.4	44	0.005	5	12	75%	44
Styrene (Monomer)	15			0.001	0.001	0	0%	0.001

Table 11 - Summary Statistics for Ground Water

Analyte	n	Minimum Detected Value (mg/L)	Maximum Detected Value (mg/L)	Minimum Reporting Limit (mg/L)	Maximum Reporting Limit (mg/L)	Number of Detects	Detection Frequency	Tier I EPC (mg/L)
Sulfate	15	26	7100	0.005	1	15	100%	7100
Tert-Butylbenzene	15			0.001	0.001	0	0%	0.001
Tetrachloroethene	15			0.001	0.001	0	0%	0.001
Thallium	26	0.0014	0.16	0.000001	0.15	3	12%	0.16
Trans-1,2-Dichloroethene	15			0.001	0.001	0	0%	0.001
Trans-1,3-Dichloropropene	15			0.001	0.001	0	0%	0.001
Tribomomethane	15			0.001	0.001	0	0%	0.001
Trichloroethylene	15			0.001	0.001	0	0%	0.001
Vanadium	16	0.019	0.019	0.00001	0.01	1	6%	0.019
Vinyl Chloride	15			0.001	0.001	0	0%	0.001
Xylenes (Total)	15			0.002	0.002	0	0%	0.002
Zinc	275	0.01	540	0.01	10	233	85%	540

Notes:

Blank cells indicate no detects

The Tier I EPC is the lower of the maximum detected value or the maximum reporting limit for nondetected analytes in the absence of any detections

Multiple samples had U, J, J, or UJ qualifiers; R qualified data were removed prior to analysis*

Table 12 Tier I Risk Analysis for Ground Water

Table 12 - Tier I Risk Analysis for Ground Water				
Analyte	**CDPHE Drinking Water Screening Value**	**CDPHE Agricultural Screening Value**	**EPA Region IX Tap water PRG**	**Exceeds SVs?**
1,1,1,2-Tetrachloroethane	No SV	No SV	***2.31E+00***	Yes
1,1,1-Trichloroethane	5.00E-03	No SV	3.15E-04	No
1,1,2,2-Tetrachloroethane	***5.56E+00***	No SV	***1.81E+01***	Yes
1,1,2-Trichloroethane	***3.57E-01***	No SV	***5.01E+00***	Yes
1,1-Dichloroethane	No SV	No SV	1.23E-03	No
1,1-Dichloroethylene	No SV	No SV	2.95E-03	No
1,1-Dichloropropene	No SV	No SV	No SV	No SV
1,2,3-Trichlorobenzene	No SV	No SV	No SV	No SV
1,2,3-Trichloropropane	No SV	No SV	***1.78E+02***	Yes
1,2,4-Trichlorobenzene	1.43E-02	No SV	***1.40E-01***	Yes
1,2,4-Trimethylbenzene	No SV	No SV	8.11E-02	No
1,2-Benzphenanthracene	***2.08E+03***	No SV	***1.09E+00***	Yes
1,2-Dibromo-3-Chloropropane (DBCP)	***2.50E+01***	No SV	***1.05E+02***	Yes
1,2-Dibromoethane (EDB)	***2.44E+03***	No SV	***1.79E+02***	Yes
1,2-Dichlorobenzene	1.67E-03	No SV	2.70E-03	No
1,2-Dichloroethane	***2.63E+00***	No SV	***8.12E+00***	Yes
1,2-Dichloroethene (Total)	1.43E-02	No SV	1.64E-02	No
1,2-Dichloropropane	***1.92E+00***	No SV	***6.07E+00***	Yes
1,3,5-Trimethylbenzene	No SV	No SV	8.11E-02	No
1,3-Dichloropropane	No SV	No SV	8.22E-03	No
1,4-Dichlorobenzene	1.33E-02	No SV	***1.99E+00***	Yes
2,2-Dichloropropane	No SV	No SV	No SV	No SV
2,4,5-Trichlorophenol	1.43E-02	No SV	2.74E-03	No
2,4,6-Trichlorophenol	***3.13E+00***	No SV	***2.74E+00***	Yes
2,4-Dichlorophenol	***4.76E-01***	No SV	9.13E-02	Yes
2,4-Dimethylphenol	7.14E-02	No SV	1.37E-02	No
2,4-Dinitrophenol	***3.57E+00***	No SV	***6.85E-01***	Yes
2,4-Dinitrotoluene	***9.09E+01***	No SV	***1.37E-01***	Yes
2,6-Dinitrotoluene	No SV	No SV	***2.74E-01***	Yes
2-Butanone (MEK)	No SV	No SV	7.18E-04	No
2-Chloronaphthalene	1.79E-02	No SV	2.05E-02	No
2-Chlorophenol	***2.86E-01***	No SV	***3.29E-01***	Yes
2-Chlorotoluene	No SV	No SV	8.22E-03	No
2-Methylnaphthalene	No SV	No SV	No SV	No SV
2-Methylphenol	No SV	No SV	5.48E-03	No
2-Nitroaniline	No SV	No SV	***4.57E-01***	Yes
2-Nitrophenol	No SV	No SV	No SV	No SV
2-Phenylbutane	No SV	No SV	4.11E-03	No
3,3-Dichlorobenzidine	***6.41E+02***	No SV	***3.35E+02***	Yes
3-Nitroaniline	No SV	No SV	***1.56E+01***	Yes
4,6-Dinitro-2-Methylphenol	No SV	No SV	No SV	No SV
4-Bromophenyl Phenyl	No SV	No SV	No SV	No SV

Table 12 - Tier I Risk Analysis for Ground Water

Analyte	CDPHE Drinking Water Screening Value	CDPHE Agricultural Screening Value	EPA Region IX Tap water PRG	Exceeds SVs?
Ether				
4-Chloro-3-Methylphenol	4.76E-02	No SV	No SV	No
4-Chlorophenyl Phenyl Ether	No SV	No SV	No SV	No SV
4-Chlorotoluene	No SV	No SV	No SV	No SV
4-Methyl-2-Pentanone	No SV	No SV	2.51E-03	No
4-Methylphenol	No SV	No SV	5.48E-02	No
4-Nitrophenol	***8.93E-01***	No SV	No SV	Yes
Acenaphthene	2.38E-02	No SV	2.74E-02	No
Acenaphthylene	No SV	No SV	No SV	No SV
Acetone	No SV	No SV	1.83E-03	No
Acetophenone	No SV	No SV	1.64E-02	No
Aluminum	No SV	***8.20E-01***	***1.12E-01***	Yes
Anthracene	4.76E-03	No SV	5.46E-03	No
Antimony	No SV	No SV	6.85E-01	No
Arsenic	***2.20E+00***	***1.10E+00***	***2.46E+03***	Yes
Atrazine	***1.67E+01***	No SV	***1.65E+02***	Yes
Barium	4.00E-02	No SV	3.14E-02	No
Benzene	***2.00E-01***	No SV	***2.83E+00***	Yes
Benzo(a)Anthracene	***2.08E+03***	No SV	***1.09E+02***	Yes
Benzo(a)Pyrene	***2.08E+03***	No SV	***1.09E+03***	Yes
Benzo(b)Fluoranthene	***2.08E+03***	No SV	***1.09E+02***	Yes
Benzo(ghi)Perylene	No SV	No SV	No SV	No SV
Benzo(k)Fluoranthene	***2.08E+03***	No SV	***1.09E+01***	Yes
Benzyl Butyl Phthalate	7.14E-03	No SV	1.37E-03	No
Beryllium	***1.25E+01***	***5.00E-01***	***6.85E-01***	Yes
Bis(2-Chloroethoxy)Methane	No SV	No SV	No SV	No SV
Bis(2-Chloroethyl) Ether	***3.13E+02***	No SV	***9.82E+02***	Yes
Bis(2-Chloroisopropyl) Ether	No SV	No SV	***3.64E+01***	Yes
Bis(2-Ethylhexyl) Phthalate	***4.00E+00***	No SV	***2.08E+00***	Yes
Bromobenzene	No SV	No SV	4.93E-02	No
Bromodichloromethane	***1.79E+00***	No SV	***5.53E+00***	Yes
Bromomethane	No SV	No SV	***2.31E-01***	Yes
Cadmium	***7.80E+01***	***3.90E+01***	***2.14E+01***	Yes
Calcium Metal	No SV	No SV	No SV	No SV
Caprolactam	No SV	No SV	1.10E-03	No
Carbazole	No SV	No SV	***2.97E+00***	Yes
Carbon Tetrachloride	***3.70E+00***	No SV	***5.84E+00***	Yes
CFC-11	No SV	No SV	1.55E-03	No
CFC-12	No SV	No SV	5.07E-03	No
Chlorobenzene	1.00E-02	No SV	9.43E-03	No
Chlorobromomethane	No SV	No SV	No SV	No SV
Chlorodibromomethane	7.14E-02	No SV	***7.50E+00***	Yes
Chloroethane	No SV	No SV	***4.31E-01***	Yes

Table 12 - Tier I Risk Analysis for Ground Water

Analyte	CDPHE Drinking Water Screening Value	CDPHE Agricultural Screening Value	EPA Region IX Tap water PRG	Exceeds SVs?
Chloroform	***2.86E-01***	No SV	***6.02E+00***	Yes
Chloromethane	No SV	No SV	1.26E-02	No
Chromium	1.20E-01	1.20E-01	1.10E-01	No
Cis-1,2-Dichloroethene	1.43E-02	No SV	1.64E-02	No
Cis-1,3-Dichloropropene	No SV	No SV	No SV	No SV
Cobalt	No SV	***5.60E+01***	***3.84E+00***	Yes
Copper	***6.20E-01***	***3.10E+00***	***4.25E-01***	Yes
Dibenz(a,h)Anthracene	***2.08E+03***	No SV	***1.09E+03***	Yes
Dibenzofuran	No SV	No SV	***8.20E-01***	Yes
Dibromomethane	No SV	No SV	1.64E-02	No
Dichloromethane	***1.06E+00***	No SV	***1.17E+00***	Yes
Diethyl Phthalate	1.79E-03	No SV	3.42E-04	No
Dimethyl Phthalate	No SV	No SV	2.74E-05	No
Di-n-Butyl Phthalate	1.43E-02	No SV	2.74E-03	No
Di-n-Octyl Phthalate	No SV	No SV	6.85E-03	No
Ethylbenzene	1.43E-03	No SV	7.46E-04	No
Fluoranthene	3.57E-02	No SV	6.85E-03	No
Fluorene	3.57E-02	No SV	4.11E-02	No
Free Cyanide (4500-Cn-I)	6.00E-02	6.00E-02	***1.94E+00***	Yes
Hexachloro-1,3-Butadiene	***2.22E+01***	No SV	***1.16E+01***	Yes
Hexachlorobenzene	***4.55E+02***	No SV	***2.38E+02***	Yes
Hexachlorocyclopentadiene	***1.19E+00***	No SV	***2.28E-01***	Yes
Hexachloroethane	***1.43E+01***	No SV	***2.08E+00***	Yes
Indeno(1,2,3-cd)Pyrene	***2.08E+03***	No SV	***1.09E+02***	Yes
Iron	***7.33E+03***	***4.40E+02***	***2.02E+02***	Yes
Isopropylbenzene	No SV	No SV	1.52E-03	No
Lead	***3.60E-01***	***1.80E-01***	No SV	Yes
Magnesium	No SV	No SV	No SV	No SV
Manganese	***2.80E+04***	***7.00E+03***	***1.60E+03***	Yes
M-Dichlorobenzene	1.06E-02	No SV	5.48E-03	No
Mercury	1.00E-01	2.00E-02	5.48E-02	
Methyl n-Butyl Ketone	No SV	No SV	No SV	No SV
Methyl Tert-Butyl Ether	No SV	No SV	***4.55E-01***	Yes
Methylbenzene	1.00E-03	No SV	1.38E-03	No
m-Xylene & p-Xylene	No SV	No SV	No SV	No SV
Naphthalene	7.14E-02	No SV	***1.61E+00***	Yes
n-Butylbenzene	No SV	No SV	4.11E-03	No
Nickel	***6.30E+00***	***3.15E+00***	***8.63E-01***	Yes
Nitrobenzene	***2.86E+00***	No SV	***2.95E+00***	Yes
n-Nitrosodi-n-Propylamine	***2.00E+03***	No SV	***1.04E+03***	Yes
n-Nitrosodiphenylamine	***1.41E+00***	No SV	***7.29E-01***	Yes
n-Propylbenzene	No SV	No SV	4.11E-03	No
o-Xylene	No SV	No SV	No SV	No SV
p-Chloroaniline	No SV	No SV	6.85E-02	No
p-Cymene	No SV	No SV	No SV	No SV

Table 12 - Tier I Risk Analysis for Ground Water

Analyte	CDPHE Drinking Water Screening Value	CDPHE Agricultural Screening Value	EPA Region IX Tap water PRG	Exceeds SVs?
Pentachlorophenol	***1.72E+02***	No SV	***8.92E+01***	Yes
Phenanthrene	4.76E-03	No SV	5.46E-03	No
Phenol	4.76E-03	No SV	9.13E-04	No
p-Nitroaniline	No SV	No SV	***1.56E+01***	Yes
Potassium	No SV	No SV	No SV	No SV
Pyrene	4.76E-02	No SV	5.46E-02	No
Selenium	***3.00E+00***	***7.50E+00***	8.24E-01	Yes
Silver	***4.00E-01***	No SV	***1.10E-01***	Yes
Sodium	No SV	No SV	No SV	No SV
Styrene (Monomer)	1.00E-02	No SV	6.09E-04	No
Sulfate	***2.84E+01***	No SV	No SV	Yes
Tert-Butylbenzene	No SV	No SV	4.11E-03	No
Tetrachloroethene	***2.00E-01***	No SV	***9.59E+00***	Yes
Thallium	***8.00E+01***	No SV	***6.64E+01***	Yes
Trans-1,2-Dichloroethene	1.00E-02	No SV	8.22E-03	No
Trans-1,3-Dichloropropene	No SV	No SV	No SV	No SV
Tribomomethane	***2.50E-01***	No SV	***1.18E-01***	Yes
Trichloroethylene	***2.00E-01***	No SV	***3.57E+01***	Yes
Vanadium	No SV	***1.90E-01***	***5.21E-01***	Yes
Vinyl Chloride	***4.35E+01***	No SV	***5.05E+01***	Yes
Xylenes (Total)	1.43E-03	No SV	9.71E-03	No
Zinc	***1.08E+02***	***2.70E+02***	***4.95E+01***	Yes

Notes:
The risk ratio is the EPC divided by the media-specific screening value (Table 2)
Ratios in excess of 0.1 are shown in bold italics
Ratios in excess of 0.1 are used to account for potential cumulative effects; the analyte is carried forward
SVs - Screening values
NA - Not applicable
PRG - Preliminary Remedial Goal
MTG - Migration to Ground water

Table 13 Summary Statistics for Boulders

Table 13 - Summary Statistics for Boulders

Analyte	n	Minimum Detected Value (mg/kg)	Maximum Detected Value (mg/kg)	Minimum Reporting Limit (mg/kg)	Maximum Reporting Limit (mg/kg)	Number of Detects	Detection Frequency	Tier I EPC (mg/kg)
Arsenic	16	0.60	1500	0.6	6.6	15	94%	1500
Cadmium	16	0.10	15	0.1	0.55	5	31%	15
Chromium	16	1.90	34	0.2	2.2	16	100%	34
Copper	16	0.30	720	0.2	2.2	16	100%	720
Lead	16	2.30	1400	0.15	1.6	16	100%	1400
Manganese	16	15.00	2900	0.15	15	16	100%	2900
Zinc	16	7.30	2400	1	100	16	100%	2400
pH	16	1.90	7	0.1	0.1	16	100%	7

Note:
The Tier I EPC is the lower of the maximum detected value or the maximum reporting limit for nondetected analytes in the absence of any detections
Three copper samples J flagged (no +/-), including the sample that provided the maximum value
Background samples are not included in the site summary statistics

Table 14 Tier I Screening Level Risk Analysis for Boulders

Table 14 - Tier I Screening Level Risk Analysis for Boulders			
	Risk Ratio		
Analyte	**Region IX Residential Soil PRG**	**MTG PRG**	**Exceeds SVs?**
Arsenic	***3.85E+03***	***1.50E+03***	Yes
Cadmium	***4.05E-01***	***3.75E+01***	Yes
Chromium	***1.61E-01***	***1.70E+01***	Yes
Copper	***2.30E-01***	No SV	Yes
Lead	***3.50E+00***	No SV	Yes
Manganese	***1.65E+00***	No SV	Yes
Zinc	***1.02E-01***	***3.87E+00***	Yes

Notes:
The risk ratio is the EPC divided by the media-specific screening value (Table 2)
Ratios in excess of 0.1 are shown in bold italics
Ratios in excess of 0.1 are used to account for potential cumulative effects; the analyte is carried forward
SVs - Screening values
NA - Not applicable
PRG - Preliminary Remedial Goal
MTG - Migration to Ground water
The Tier I EPC is the lower of the maximum detected value or the maximum reporting limit for nondetected analytes in the absence of any detections

Table 15 Summary Statistics for Diversion Trench Surface Water

Table 15 - Summary Statistics for Diversion Trench Surface Water								
Analyte	**n**	**Minimum Detected Value (mg/L)**	**Maximum Detected Value (mg/L)**	**Minimum Reporting Limit (mg/L)**	**Maximum Reporting Limit (mg/L)**	**Number of Detects**	**Detection Frequency**	**Tier I EPC (mg/L)**
Arsenic	4	0.006	0.0057	0.005	0.005	1	25%	0.0057
Cadmium	4			0.001	0.001	0	0%	0.001
Chromium	4			0.002	0.002	0	0%	0.002
Copper	4			0.002	0.002	0	0%	0.002
Lead	4			0.001	0.001	0	0%	0.001
Manganese	4	0.03	1.9	0.001	0.001	4	100%	1.9
Zinc	4	0.010	0.016	0.01	0.01	2	50%	0.016

Note:
Blank cells indicate no detects
The Tier I EPC is the lower of the maximum detected value or the maximum reporting limit for nondetected analytes in the absence of any detections
There were no laboratory or validator qualified samples
Background samples are not included in the site summary statistics

Table 16 Tier I Screening Level Risk Analysis for Diversion Trench Surface Water

Table 16 - Tier I Screening Level Risk Analysis for Diversion Trench Surface Water						
	Risk Ratios					
Analyte	**CDPHE Water Supply**	**Water & Fish**	**Fish Only**	**Agriculture**	**EPA Region 9 Tap Water PRG (mg/L)**	**Exceeds SVs?**
Arsenic	***0.11***	***317***	***41***	0.057	***127***	Yes
Cadmium	***0.20***	No SL	No SL	0.100	0.055	Yes
Chromium	0.040	No SL	No SL	0.02	0.02	No
Copper	0.002	No SL	No SL	0.01	0.001	No
Lead	0.020	No SL	No SL	0.01	No SL	No
Manganese	***38.00***	No SL	No SL	***9.50***	***2.2***	Yes
Zinc	0.003	No SL	No SL	0.01	0.00	No

Notes:
The risk ratio is the EPC divided by the media-specific screening value (Table 2)
Ratios in excess of 0.1 are shown in bold italics
Ratios in excess of 0.1 are used to account for potential cumulative effects; the analyte is carried forward
The Tier I EPC is the lower of the maximum detected value or the maximum reporting limit for nondetected analytes in the absence of any detections

SVs - Screening values
NA - Not applicable
PRG - Preliminary Remedial Goal

2.6.8 Seeps

Table 17 presents the summary statistics for seeps. The Tier I risk evaluation for seeps is shown in Table 18.

2.6.9 Background

The summary statistics for background soils are based on data collected by Ginn in 2005 and 2006 at various unimpacted areas in the vicinity of the site. The soil background statistics are shown in Table 19. ProUCL Guidance and Software ("ProUCL") (EPA, 2004c) was used to estimate the upper 95th percent confidence limit ("UCL95") on the mean. The background data are evaluated statistically relevant to the various exposure areas in Appendix A

The background data for the rock chips flaked off of the boulders were limited to one sample as follows:

Analyte	*Concentration (mg/kg)*
Arsenic	<1.2
Cadmium	<0.2
Chromium	29
Copper	6.4
Lead	7.6
Manganese	360
pH	9.0
Zinc	99

This sample was collected from a rock outcrop near the town of Red Cliff.

Table 17 Summary Statistics for Seeps

Table 17 - Summary Statistics for Seeps								
Analyte	**n**	**Minimum Detected Value (mg/L)**	**Maximum Detected Value (mg/L)**	**Minimum Reporting Limit (mg/L)**	**Maximum Reporting Limit (mg/L)**	**Number of Detects**	**Detection Frequency**	**Tier I EPC (mg/L)**
Arsenic	5			0.005	0.005	0	0%	0.005
Cadmium	5	0.001	0.0012	0.001	0.001	1	20%	0.0012
Chromium	5			0.002	0.002	0	0%	0.002
Copper	5	0.0026	0.01	0.002	0.002	5	100%	0.01
Lead	5	0.0028	0.0028	0.001	0.001	1	20%	0.0028
Manganese	5	1.20	33	0.001	0.02	5	100%	33
Zinc	5	0.082	4.9	0.01	0.2	5	100%	4.9

Note:
Blank cells indicate no detects
The Tier I EPC is the lower of the maximum detected value or the maximum reporting limit for nondetected analytes in the absence of any detections
Two copper samples were biased high (J+ flag); this did not affect the Tier I EPC
Background samples are not included in the site summary statistics
All metals are dissolved fraction

Table 18 Tier I Screening Level Risk Analysis for Seeps

Table 18 - Tier I Screening Level Risk Analysis for Seeps						
	Risk Ratios					
Analyte	**CDPHE Water Supply**	**Water & Fish**	**Fish Only**	**Agriculture**	**EPA Region 9 Tap Water PRG**	**Exceeds SVs?**
Arsenic	0.100	***278***	***36***	0.050	***112***	Yes
Cadmium	***0.24***	No SV	No SV	***0.120***	0.066	Yes
Chromium	0.04	No SV	No SV	0.02	0.02	No
Copper	0.010	No SV	No SV	0.05	0.007	No
Lead	0.06	No SV	No SV	0.03	No SL	No
Manganese	***660***	No SV	No SV	***165***	***37.7***	Yes
Zinc	***0.98***	No SV	No SV	***2.45***	***0.45***	Yes

Notes:
The risk ratio is the EPC divided by the media-specific screening value (Table 2)
Ratios in excess of 0.1 are shown in bold italics
Ratios in excess of 0.1 are used to account for potential cumulative effects; the analyte is carried forward
SVs - Screening values
NA - Not applicable
PRG - Preliminary Remedial Goal
The Tier I EPC is the lower of the maximum detected value or the maximum reporting limit for nondetected analytes in the absence of any detections

Table 19 - Summary Statistics for Site Background Soils

Metal(mg/kg)	***2005 Background Data***	***2006 Background Data***	***95% UCL on the Mean***	***Distribution***	***ProUCL recommended statistical method***
Arsenic	0.67-43	2.9-48	18.4	Gamma	Approximate Gamma
Cadmium	<0.1-5.5	0.31-3.9	2.12	Gamma	Approximate Gamma
Chromium	13-22	10-18	17.4	Normal	Student's-t UCL
Copper	3.2-25	6.8-23	17.2	Normal	Student's-t UCL
Lead	4.3-170	18-100	61.1	Gamma	Approximate Gamma
Manganese	83-1300	160-900	605	Normal	Student's-t UCL
Zinc	24-810	87-920	359	Gamma	Approximate Gamma
		Sample Size	19		

Notes:

1 – Ginn 2005 and 2006 samples only; n=19

2 – ProUCL Guidance and Software (EPA, 2004c)

UCL05 – 95th percent confidence limit on the mean

3.0 TIER II RISK EVALUATION

The Tier II risk evaluation consists of calculations that estimate risk for different receptors based on measured concentrations in site media. This is known as a "forward" risk assessment. It includes evaluation and quantification of exposure, presentation of pertinent toxicity information, characterization of risk, and an uncertainty analysis.

3.1 SELECTION OF CHEMICALS OF POTENTIAL CONCERN FOR TIER II

All analytes that exceeded screening values by a factor of 0.1 or more were carried forward to this point. In the determination of appropriate COPCs for inclusion in further quantitative risk analysis, the following criteria were considered (EPA, 1994):

- Essential nutrients
- Detection frequency
- Persistence, mobility, and bioaccumulation
- Historic use at the site

A comparison to background is made in the risk characterization. Therefore, some of the Tier II COPCs may actually not be significantly different from background. These criteria are discussed in detail in the following paragraphs, and the process for selecting Tier II (COPCs is documented in Tables 20 through 26).

It is noted that the analytical results from the fines fraction of the surface soil samples were not included in the evaluation of the Tier II risk. Including the fines during the Tier II evaluation would over-compensate for the concentrations available at the North Property. The fines fraction is further discussed within the uncertainty analysis of this risk assessment.

3.1.1 Essential Nutrients

The essential nutrients are considered widespread and a major component of the normal diet. Many of the heavy metals are also essential nutrients (i.e., zinc); however, toxicity and risk are addressed within the standard risk assessment framework using toxicity values published on the Integrated Risk Information System ("IRIS") database. For essential nutrients that lack toxicity values in IRIS, allowable concentrations must be determined.

Media concentrations that would not produce adverse health effects were estimated for each of the essential nutrients not listed in IRIS with the standard residential noncancer PRG equation (EPA, 2004a). This equation estimates soil concentrations at or below which no human health risks are expected to occur for dermal contact and ingestion of soils, and inhalation of soil particulates. The recommended daily allowance ("RDA") (EPA, 1994) or other "safe" intake was used as the reference dose ("RfDo"). Inhalation of particulates could not be evaluated due to lack of inhalation toxicity information.

RDAs were available from EPA (1994) for calcium, magnesium, and potassium. Values for sodium and sulfate were derived from literature sources. A high sodium intake and a genetic predisposition correlate with a high incidence of hypertension and stroke (Healthy Eating Club, 2006). A safe intake is in the range of 0.9 and 2.3 grams ("g") of sodium per day (Healthy Eating Club, 2006) (12.9 to 32.9 milligrams per kilogram per day ("mg/kg-d"), assuming a 70 kilogram ("kg") body weight).

There is no recommended daily allowance for sulfate. Data for sulfur were used to estimate a safe intake rate for sulfate. Low protein foods like breads and cereals contain 20 to 170 mg of sulfur/100 g, whereas higher protein foods like eggs or meats contain 150 to 300 mg/100 g (Healthy Eating Club, 2006). The 95th percentile ingestion rate for meat (5.1 g/kg-d), grains (10.8 g/kg-d), and dairy products (29.7 g/kg-d) sums to 45.6 g/kg-d. For these food types, a sulfur content of 150 mg/100 g is not unreasonable. This indicates that there could easily be 68.4 mg/kg-d sulfur in diet.

The RDA or safe intake rates are shown below:

Analyte	*RfDo (mg/kg-d)*	*RfDi (mg/kg-d)*
Calcium	**14**	**NA**
Magnesium	**5.7**	**NA**
Potassium	**0.57**	**NA**
Sodium	**32.9**	**NA**
Sulfate	**68.4**	**NA**

Reference Dose oral = ("RfDo")
Reference Dose ingestion = ("RfDi")

The PRG equation (EPA, 2004a) was used to estimate a safe concentration in soils given the above information regarding safe chronic daily doses of the nutrients. The PRG equation is as follows:

$$C(mg/kg) = \frac{THQ \times BW_c \times AT_n}{EF_r \times ED_c \left[\left(\frac{1}{RfD_o} \times \frac{IRS_c}{10^6 mg/kg}\right) + \left(\frac{1}{RfD_o} \times \frac{SA_c \times AF \times ABS}{10^6 mg/kg}\right) + \left(\frac{1}{RfD_i} \times \frac{IRA_c}{VF_s^a}\right)\right]}$$

The remaining parameters in the above equation are defined as follows:

	Parameter (units)	*Value*	*Source*
THQ	Target hazard quotient (unitless)	1	EPA, 2004a
IRSc	Soil ingestion rate for a child (mg/d)	200	EPA, 2004a
BWc	Body weight for a child (kg)	15	EPA, 2004a
ATn	Noncancer averaging time (day) (d)	2190	EPA, 2004a
EFr	Exposure Frequency (days/year) (d/yr)	350	EPA, 2004a
EDc	Exposure duration (year) (yr)	6	EPA, 2004a
SAc	Surface area exposed to soil for child (centimeters squared) (cm^2)	2800	EPA, 2004a
AF	Adherence factor (mg/cm^2)	0.2	EPA, 2004a
ABS	Absorption coefficient (**u**nitless)	0.01	Assumed
IRAc	Inhalation rate for child (cubic meters/day) (m^3/d)	12	EPA, 2006
PEFs	Particulate emission factor for soil	1.32E+09	EPA, 2004a

The PRGs are shown below compared to the maximum concentration in soils. As shown below, the soil concentrations for the nutrients are well below PRGs, indicating there is no human health risk due to exposure to these common elements.

Analyte	*PRG (mg/kg)*	*Tier I EPC Surface Soil (mg/kg)*	*Tier I EPC Subsurface Soil (mg/kg)*
Calcium	**1.07E+06**	**1.4E+01**	**1.20E+04**
Magnesium	**4.34E+05**	**8.7E+04**	**9.30E+03**
Potassium	**4.34E+04**	**1.5E+01**	**6.70E+03**
Sodium	**9.81.E+05**	**5.20E+01**	**7.20E+02**
Sulfate	**5.20.E+06**	**8.60E+03**	**2.00E+04**

For ground water, inorganics are not expected to be absorbed dermally or inhaled in droplets. The Region 9 PRG equations (EPA, 2004) for tap water do not have a dermal component. The inorganics under consideration will not volatilize, and therefore, ingestion is the only

exposure pathway. The nutrients were evaluated with the following equation:

$$C\,(mg\ /\ L) = \frac{THQ \times BWa \times ATnc}{EF \times ED \times \frac{1}{RfDo} \times IRWa}$$

where:

	Parameter (units)	*Value*	*Source*
THQ	Target hazard quotient (unitless)	1	EPA, 2004a
IRW	Water ingestion rate (liters/day) (L/day	2	EPA, 2004a
BWa	Body weight for adult (kg)	70	EPA, 2004a
ATn	Noncancer averaging time (d)	10950	EPA, 2004a
EFr	Exposure Frequency (d/yr)	350	EPA, 2004a
ED	Exposure duration (yr)	30	EPA, 2004a

Analyte	*PRG (mg/L)*	*Tier I EPC Ground water (mg/L)*
Calcium	**511**	**500**
Magnesium	**208**	1300
Potassium	**20.8**	**13**
Sodium	**471**	**44**
Sulfate	**2497**	5700

The magnesium concentration exceeds estimated risk based levels in ground water. The sulfate concentration in ground water exceeds the risk-based PRG for sulfate; it also exceeds the secondary drinking water standard of 250 milligrams per liter ("mg/L") sulfate (EPA, 2004b). The remaining nutrients were not evaluated further.

3.1.2 Detection Frequency

The site-wide data were reviewed for the frequency of detection. Only constituents with a detection frequency greater than 5% were carried forward through the remainder of the risk assessment. This step eliminated nearly all of the organic chemicals in all media.

3.1.3 Exceeding Natural Background Concentrations

All background sampling locations visually appeared unimpacted and were collected off site of site-related activities. However, metals may be elevated throughout the Eagle River watershed due to natural mineralization in this region.

The data were evaluated statistically to determine which analytes exceeded naturally occurring background conditions (Appendix A). The data were divided by exposure area, since some exposure areas may have had more mine-site impacts than others, and Bolts Lake was expected to be unimpacted. The data were analyzed with Statgraphics. Summary statistics were estimated, including indications of kurtosis and skewness. A one-way Analysis of Variance ("ANOVA") and a nonparametric Kruskal-Wallis test were run on the data. Box and whisker plots with a median notch to indicate 95th percent confidence limits were constructed to compare the data by exposure area to the background data (Appendix A). If the data were indicated as nonnormal, the appropriate statistical test is the Kruskal-Wallis test. If the data were normal, the ANOVA is the preferred statistical test. All Tier II COPCs were carried forward to estimate risks, and the results of this background analysis are presented in the Risk Characterization section and Appendix A.

3.1.4 Historic Use

Contamination by inorganics at the North Property is well recognized. VOCs and SVOCs were also target analytes in the Tier I risk analysis. However, most of the organic analytes were never detected in any media sampled. Those that were detected were typically below screening levels. Therefore, all organic chemicals were dropped from further evaluation at this point.

3.1.5 Summary of Tier II COPCs

The analytes that exceeded screening values in the Tier I were compared to the above criteria to determine if they warranted further evaluation as COPCs. The COPC selection process and the COPCs are summarized by medium in Tables 20 through 27. The analytes that are evaluated as Tier II COPCs in one or more media are:

- Aluminum
- Antimony
- Arsenic
- Barium
- Beryllium
- Cadmium

- Chromium
- Cobalt (Ground water only)
- Copper
- Cyanide
- Iron
- Lead
- Magnesium (Ground water only)
- Manganese
- Mercury
- Nickel
- Selenium
- Silver
- Sulfate (Ground water only)
- Thallium
- Vanadium
- Zinc

Table 20 Tier II COPC Selection Process for Surface Soils

Table 20 - Tier II COPC Selection Process for Surface Soils							
Analyte	**Exceeds SV?**	**Essential Nutrient?**	**Detection Frequency >5%?**	**BCC?**	**Class A Carcinogen?**	**Historic Use?**	**Tier II COPC?**
1,1,1,2-Tetrachloroethane	Yes	No	Yes	No	No	No	No, HU
1,1,1-Trichloroethane	Yes	No	No	No	No	No	No, HU
1,1,2,2-Tetrachloroethane	Yes	No	No	No	No	No	No, HU
1,1,2-Trichloroethane	Yes	No	No	No	No	No	No, HU
1,1-Dichloroethane	Yes	No	No	No	No	No	No, HU
1,1-Dichloroethylene	Yes	No	No	No	No	No	No, HU
1,1-Dichloropropene	No SV	No	No	No	No	No	No, HU
1,2,3-Trichlorobenzene	No SV	No	No	No	No	No	No, HU
1,2,3-Trichloropropane	Yes	No	No	No	No	No	No, HU
1,2,4-Trichlorobenzene	Yes	No	No	No	No	No	No, HU
1,2,4-Trimethylbenzene	No	No	No	No	No	No	No, HU
1,2-Benzphenanthracene	No	No	No	No	No	No	No, HU
1,2-Dibromo-3-Chloropropane (DBCP)	Yes	No	No	No	No	No	No, HU
1,2-Dibromoethane (EDB)	Yes	No	No	No	No	No	No, HU
1,2-Dichlorobenzene	Yes	No	No	No	No	No	No, HU
1,2-Dichloroethane	Yes	No	No	No	No	No	No, HU
1,2-Dichloroethene (Total)	Yes	No	No	No	No	No	No, HU
1,2-Dichloropropane	Yes	No	No	No	No	No	No, HU
1,3,5-Trimethylbenzene	Yes	No	No	No	No	No	No, HU
1,3-Dichloropropane	No	No	No	No	No	No	No, HU
1,4-Dichlorobenzene	Yes	No	No	No	No	No	No, HU
2,2-Dichloropropane	No SV	No	No	No	No	No	No, HU
2,4,5-Trichlorophenol	No	No	No	No	No	No	No, HU
2,4,6-Trichlorophenol	Yes	No	No	No	No	No	No, HU
2,4-Dichlorophenol	Yes	No	No	No	No	No	No, HU
2,4-Dimethylphenol	Yes	No	No	No	No	No	No, HU
2,4-Dinitrophenol	Yes	No	No	No	No	No	No, HU
2,4-Dinitrotoluene	Yes	No	No	No	No	No	No, HU

Table 20 - Tier II COPC Selection Process for Surface Soils

Analyte	Exceeds SV?	Essential Nutrient?	Detection Frequency >5%?	BCC?	Class A Carcinogen?	Historic Use?	Tier II COPC?
2,6-Dinitrotoluene	Yes	No	No	No	No	No	No, HU
2-Butanone (MEK)	No	No	No	No	No	No	No, HU
2-Chloronaphthalene	No	No	No	No	No	No	No, HU
2-Chlorophenol	Yes	No	No	No	No	No	No, HU
2-Chlorotoluene	Yes	No	No	No	No	No	No, HU
2-Methylnaphthalene	No SV	No	No	No	No	No	No, HU
2-Methylphenol	Yes	No	No	No	No	No	No, HU
2-Nitroaniline	Yes	No	No	No	No	No	No, HU
2-Nitrophenol	No SV	No	No	No	No	No	No, HU
2-Phenylbutane	Yes	No	No	No	No	No	No, HU
3,3-Dichlorobenzidine	Yes	No	No	No	No	No	No, HU
3-Nitroaniline	Yes	No	No	No	No	No	No, HU
4,6-Dinitro-2-Methylphenol	No SV	No	No	No	No	No	No, HU
4-Bromophenyl Phenyl Ether	No SV	No	No	No	No	No	No, HU
4-Chloro-3-Methylphenol	No SV	No	No	No	No	No	No, HU
4-Chlorophenyl Phenyl Ether	No SV	No	No	No	No	No	No, HU
4-Chlorotoluene	No SV	No	No	No	No	No	No, HU
4-Methyl-2-Pentanone	No	No	No	No	No	No	No, HU
4-Methylphenol	No	No	No	No	No	No	No, HU
4-Nitrophenol	No SV	No	No	No	No	No	No, HU
Acenaphthene	Yes	No	No	No	No	No	No, HU
Acenaphthylene	No SV	No	No	No	No	No	No, HU
Acetone	Yes	No	No	No	No	No	No, HU
Acetophenone	Yes	No	No	No	No	No	No, HU
Aluminum (Fume Or Dust)	Yes	No	Yes	No	No	Inorganic	Yes
Anthracene	No	No	No	No	No	No	No, HU
Antimony	Yes	No	Yes	No	No	Inorganic	Yes
Arsenic	Yes	No	Yes	No	Yes	Inorganic	Yes
Atrazine	Yes	No	No	No	No	No	No, HU
Barium	Yes	No	Yes	No	No	Inorganic	Yes
Benzene	Yes	No	No	No	No	No	No, HU

Table 20 - Tier II COPC Selection Process for Surface Soils

Analyte	Exceeds SV?	Essential Nutrient?	Detection Frequency >5%?	BCC?	Class A Carcinogen?	Historic Use?	Tier II COPC?
Benzo(a)Anthracene	Yes	No	No	No	No	No	No, HU
Benzo(a)Pyrene	Yes	No	No	No	No	No	No, HU
Benzo(b)Fluoranthene	Yes	No	No	No	No	No	No, HU
Benzo(ghi)Perylene	No SV	No	No	No	No	No	No, HU
Benzo(K)Fluoranthene	Yes	No	No	No	No	No	No, HU
Benzyl Butyl Phthalate	No	No	No	No	No	No	No, HU
Beryllium	Yes	No	Yes	No	No	Inorganic	Yes
Bis(2-Chloroethoxy)Methane	No SV	No	No	No	No	No	No, HU
Bis(2-Chloroethyl) Ether	Yes	No	No	No	No	No	No, HU
Bis(2-Chloroisopropyl) Ether	Yes	No	No	No	No	No	No, HU
Bis(2-Ethylhexyl) Phthalate	Yes	No	No	No	No	No	No, HU
Bromobenzene	Yes	No	No	No	No	No	No, HU
Bromodichloromethane	Yes	No	No	No	No	No	No, HU
Bromomethane	Yes	No	No	No	No	No	No, HU
Cadmium	Yes	No	Yes	No	No	Inorganic	Yes
Calcium Metal	No SV	Yes	Yes	No	No	Inorganic	No, <RDA
Caprolactam	No	No	No	No	No	No	No, HU
Carbazole	Yes	No	No	No	No	No	No, HU
Carbon Tetrachloride	Yes	No	No	No	No	No	No, HU
CFC-11	No	No	No	No	No	No	No, HU
CFC-12	Yes	No	No	No	No	No	No, HU
Chlorobenzene	Yes	No	No	No	No	No	No, HU
Chlorobromomethane	No SV	No	No	No	No	No	No, HU
Chlorodibromomethane	Yes	No	No	No	No	No	No, HU
Chloroethane	Yes	No	No	No	No	No	No, HU
Chloroform	Yes	No	No	No	No	No	No, HU
Chloromethane	Yes	No	No	No	No	No	No, HU
Chromium	Yes	No	Yes	No	Cr VI only	Inorganic	Yes
Cis-1,2-Dichloroethene	Yes	No	No	No	No	No	No, HU
Cis-1,3-Dichloropropene	No SV	No	No	No	No	No	No, HU
Cobalt	No	No	Yes	No	No	Inorganic	No

Table 20 - Tier II COPC Selection Process for Surface Soils

Analyte	Exceeds SV?	Essential Nutrient?	Detection Frequency >5%?	BCC?	Class A Carcinogen?	Historic Use?	Tier II COPC?
Copper	Yes	No	Yes	No	No	Inorganic	yes
Cyanide	Yes	No	Yes	No	No	Inorganic	Yes
Dibenz(a,h)Anthracene	Yes	No	No	No	No	No	No, HU
Dibenzofuran	Yes	No	No	No	No	No	No, HU
Dibromomethane	Yes	No	No	No	No	No	No, HU
Dichloromethane	Yes	No	No	No	No	No	No, HU
Diethyl Phthalate	No	No	No	No	No	No	No, HU
Dimethyl Phthalate	No	No	No	No	No	No	No, HU
Di-N-Butyl Phthalate	Yes	No	No	No	No	No	No, HU
Di-N-Octyl Phthalate	Yes	No	No	No	No	No	No, HU
Ethylbenzene	Yes	No	No	No	No	No	No, HU
Fluoranthene	No	No	No	No	No	No	No, HU
Fluorene	Yes	No	No	No	No	No	No, HU
Hexachloro-1,3-Butadiene	Yes	No	No	No	No	No	No, HU
Hexachlorobenzene	Yes	No	No	No	No	No	No, HU
Hexachlorocyclopentadiene	Yes	No	No	No	No	No	No, HU
Hexachloroethane	Yes	No	No	No	No	No	No, HU
Indeno(1,2,3-cd)Pyrene	Yes	No	No	No	No	No	No, HU
Iron	Yes	No	Yes	No	No	Inorganic	Yes
Isopropylbenzene	Yes	No	No	No	No	No	No, HU
Lead	Yes	No	Yes	No	No	Inorganic	Yes
Magnesium	No SV	Yes	Yes	No	No	Inorganic	No, <RDA
Manganese	Yes	No	Yes	No	No	Inorganic	Yes
M-Dichlorobenzene	No	No	No	No	No	No	No, HU
Mercury	Yes	No	Yes	Yes	No	Inorganic	Yes
Methyl N-Butyl Ketone	No SV	No	No	No	No	No	No, HU
Methyl Tert-Butyl Ether	Yes	No	No	No	No	No	No, HU
Methylbenzene	Yes	No	No	No	No	No	No, HU
M-Xylene &p-Xylene	No SV	No	No	No	No	No	No, HU
Naphthalene	Yes	No	No	No	No	No	No, HU
N-Butylbenzene	Yes	No	No	No	No	No	No, HU

Table 20 - Tier II COPC Selection Process for Surface Soils

Analyte	Exceeds SV?	Essential Nutrient?	Detection Frequency >5%?	BCC?	Class A Carcinogen?	Historic Use?	Tier II COPC?
Nickel	Yes	No	Yes	No	No	Inorganic	Yes
Nitrobenzene	Yes	No	No	No	No	No	No, HU
N-Nitrosodi-N-Propylamine	Yes	No	No	No	No	No	No, HU
N-Nitrosodiphenylamine	Yes	No	No	No	No	No	No, HU
N-Propylbenzene	Yes	No	No	No	No	No	No, HU
o-Xylene	No SV	No	No	No	No	No	No, HU
p-Chloroaniline	Yes	No	No	No	No	No	No, HU
p-Cymene	No SV	No	No	No	No	No	No, HU
Pentachlorophenol	Yes	No	Yes	No	No	No	No, HU
Phenanthrene	Yes	No	No	No	No	No	No, HU
Phenol	Yes	No	No	No	No	No	No, HU
p-Nitroaniline	Yes	No	No	No	No	No	No, HU
Potassium	No SV	Yes	Yes	No	No	Inorganic	No, <RDA
Pyrene	Yes	No	No	No	No	No	No, HU
Selenium	Yes	No	Yes	No	No	Inorganic	Yes
Silver	Yes	No	Yes	No	No	Inorganic	Yes
Sodium	No SV	Yes	Yes	No	No	Inorganic	No, <RDA
Styrene (Monomer)	Yes	No	No	No	No	No	No, HU
Sulfate	No SV	Yes	Yes	No	No	Inorganic	No, <RDA
Tert-Butylbenzene	No	No	No	No	No	No	No, HU
Tetrachloroethene	Yes	No	No	No	No	No	No, HU
Thallium	Yes	No	Yes	No	No	Inorganic	Yes
Trans-1,2-Dichloroethene	Yes	No	No	No	No	No	No, HU
Trans-1,3-Dichloropropene	No SV	No	No	No	No	No	No, HU
Tribomomethane	Yes	No	No	No	No	No	No, HU
Trichloroethylene	Yes	No	No	No	No	No	No, HU
Vanadium (Fume Or Dust)	Yes	No	Yes	No	No	Inorganic	Yes
Vinyl Chloride	Yes	No	No	No	No	No	No, HU
Xylenes (Total)	No	No	No	No	No	No	No, HU
Zinc	Yes	No	Yes	No	No	Inorganic	Yes

Table 20 - Tier II COPC Selection Process for Surface Soils							
Analyte	**Exceeds SV?**	**Essential Nutrient?**	**Detection Frequency >5%?**	**BCC?**	**Class A Carcinogen?**	**Historic Use?**	**Tier II COPC?**

Notes:
SV - Screening value
BKG - Background
BCC - bioaccumulative chemical of concern
HU - Historic use
RDA - recommended daily allowance or other allowable dose
COPC - Chemical of potential concern
NA - Not available
DF - detection frequency

Table 21 Tier II COPC Selection Process for Subsurface Soils

Table 21 - Tier II COPC Selection Process for Subsurface Soils								
Analyte	**Exceeds SV?**	**Essential Nutrient?**	**Detection Frequency >5%?**	**Exceeds BKG?**	**BCC?**	**Class A Carcinogen?**	**Historic Use?**	**Tier II COPC?**
1,1,1,2-Tetrachloroethane	No	No	No	No	No	No	No, HU	1,1,1,2-Tetrachloroethane
1,1,1-Trichloroethane	No	No	No	No	No	No	No, HU	1,1,1-Trichloroethane
1,1,2,2-Tetrachloroethane	Yes	No	No	No	No	No	No, HU	1,1,2,2-Tetrachloroethane
1,1,2-Trichloroethane	Yes	No	No	No	No	No	No, HU	1,1,2-Trichloroethane
1,1-Dichloroethane	No	No	No	No	No	No	No, HU	1,1-Dichloroethane
1,1-Dichloroethylene	Yes	No	No	No	No	No	No, HU	1,1-Dichloroethylene
1,1-Dichloropropene	No SV	No	No	No	No	No	No, HU	1,1-Dichloropropene
1,2,3-Trichlorobenzene	No SV	No	No	No	No	No	No, HU	1,2,3-Trichlorobenzene
1,2,3-Trichloropropane	Yes	No	No	No	No	No	No, HU	1,2,3-Trichloropropane
1,2,4-Trichlorobenzene	No	No	No	No	No	No	No, HU	1,2,4-Trichlorobenzene
1,2,4-Trimethylbenzene	No	No	No	No	No	No	No, HU	1,2,4-Trimethylbenzene
1,2-Benzphenanthracene	No	No	No	No	No	No	No, HU	1,2-Benzphenanthracene
1,2-Dibromo-3-Chloropropane (DBCP)	No	No	No	No	No	No	No, HU	1,2-Dibromo-3-Chloropropane (DBCP)
1,2-Dibromoethane (EDB)	Yes	No	No	No	No	No	No, HU	1,2-Dibromoethane (EDB)
1,2-Dichlorobenzene	No	No	No	No	No	No	No, HU	1,2-Dichlorobenzene
1,2-Dichloroethane	Yes	No	No	No	No	No	No, HU	1,2-Dichloroethane
1,2-Dichloroethene (Total)	No	No	No	No	No	No	No, HU	1,2-Dichloroethene (Total)
1,2-Dichloropropane	Yes	No	No	No	No	No	No, HU	1,2-Dichloropropane
1,3,5-Trimethylbenzene	No	No	No	No	No	No	No, HU	1,3,5-Trimethylbenzene
1,3-Dichloropropane	No	No	No	No	No	No	No, HU	1,3-Dichloropropane
1,4-Dichlorobenzene	No	No	No	No	No	No	No, HU	1,4-Dichlorobenzene
2,2-Dichloropropane	No SV	No	No	No	No	No	No, HU	2,2-Dichloropropane
2,4,5-Trichlorophenol	No	No	No	No	No	No	No, HU	2,4,5-Trichlorophenol
2,4,6-Trichlorophenol	Yes	No	No	No	No	No	No, HU	2,4,6-Trichlorophenol
2,4-Dichlorophenol	Yes	No	No	No	No	No	No, HU	2,4-Dichlorophenol
2,4-Dimethylphenol	No	No	No	No	No	No	No, HU	2,4-Dimethylphenol
2,4-Dinitrophenol	Yes	No	No	No	No	No	No, HU	2,4-Dinitrophenol
2,4-Dinitrotoluene	Yes	No	No	No	No	No	No, HU	2,4-Dinitrotoluene

Table 21 - Tier II COPC Selection Process for Subsurface Soils

Analyte	Exceeds SV?	Essential Nutrient?	Detection Frequency >5%?	Exceeds BKG?	BCC?	Class A Carcinogen?	Historic Use?	Tier II COPC?
2,6-Dinitrotoluene	Yes	No	No	No	No	No	No, HU	2,6-Dinitrotoluene
2-Butanone (MEK)	No	No	No	No	No	No	No, HU	2-Butanone (MEK)
2-Chloronaphthalene	No	No	No	No	No	No	No, HU	2-Chloronaphthalene
2-Chlorophenol	Yes	No	No	No	No	No	No, HU	2-Chlorophenol
2-Chlorotoluene	No	No	No	No	No	No	No, HU	2-Chlorotoluene
2-Methylnaphthalene	No SV	No	No	No	No	No	No, HU	2-Methylnaphthalene
2-Methylphenol	No	No	No	No	No	No	No, HU	2-Methylphenol
2-Nitroaniline	No	No	No	No	No	No	No, HU	2-Nitroaniline
2-Nitrophenol	No SV	No	No	No	No	No	No, HU	2-Nitrophenol
2-Phenylbutane	No	No	No	No	No	No	No, HU	2-Phenylbutane
3,3-Dichlorobenzidine	Yes	No	No	No	No	No	No, HU	3,3-Dichlorobenzidine
3-Nitroaniline	No	No	No	No	No	No	No, HU	3-Nitroaniline
4,6-Dinitro-2-Methylphenol	No SV	No	No	No	No	No	No, HU	4,6-Dinitro-2-Methylphenol
4-Bromophenyl Phenyl Ether	No SV	No	No	No	No	No	No, HU	4-Bromophenyl Phenyl Ether
4-Chloro-3-Methylphenol	No SV	No	No	No	No	No	No, HU	4-Chloro-3-Methylphenol
4-Chlorophenyl Phenyl Ether	No SV	No	No	No	No	No	No, HU	4-Chlorophenyl Phenyl Ether
4-Chlorotoluene	No SV	No	No	No	No	No	No, HU	4-Chlorotoluene
4-Methyl-2-Pentanone	No	No	No	No	No	No	No, HU	4-Methyl-2-Pentanone
4-Methylphenol	No	No	No	No	No	No	No, HU	4-Methylphenol
4-Nitrophenol	No SV	No	No	No	No	No	No, HU	4-Nitrophenol
Acenaphthene	No	No	No	No	No	No	No, HU	Acenaphthene
Acenaphthylene	No SV	No	No	No	No	No	No, HU	Acenaphthylene
Acetone	No	No	No	No	No	No	No, HU	Acetone
Acetophenone	Yes	No	No	No	No	No	No, HU	Acetophenone
Aluminum (Fume Or Dust)	Yes	No	Yes	No	No	Inorganic	Yes	Aluminum (Fume Or Dust)
Anthracene	No	No	No	No	No	No	No, HU	Anthracene
Antimony	Yes	No	No	No	No	Inorganic	No, DF<5%	Antimony
Arsenic	Yes	No	Yes	No	Yes	Inorganic	Yes	Arsenic
Atrazine	Yes	No	No	No	No	No	No, HU	Atrazine

Table 21 - Tier II COPC Selection Process for Subsurface Soils

Analyte	Exceeds SV?	Essential Nutrient?	Detection Frequency >5%?	Exceeds BKG?	BCC?	Class A Carcinogen?	Historic Use?	Tier II COPC?
Barium	Yes	No	Yes	No	No	Inorganic	Yes	Barium
Benzene	Yes	No	No	No	No	No	No, HU	Benzene
Benzo(a)Anthracene	Yes	No	No	No	No	No	No, HU	Benzo(a)Anthracene
Benzo(a)Pyrene	Yes	No	No	No	No	No	No, HU	Benzo(a)Pyrene
Benzo(b)Fluoranthene	Yes	No	No	No	No	No	No, HU	Benzo(b)Fluoranthene
Benzo(ghi)Perylene	No SV	No	No	No	No	No	No, HU	Benzo(ghi)Perylene
Benzo(k)Fluoranthene	No	No	No	No	No	No	No, HU	Benzo(k)Fluoranthene
Benzyl Butyl Phthalate	No	No	No	No	No	No	No, HU	Benzyl Butyl Phthalate
Beryllium	Yes	No	Yes	No	No	Inorganic	Yes	Beryllium
Bis(2-Chloroethoxy)Methane	No SV	No	No	No	No	No	No, HU	Bis(2-Chloroethoxy)Methane
Bis(2-Chloroethyl) Ether	Yes	No	No	No	No	No	No, HU	Bis(2-Chloroethyl) Ether
Bis(2-Chloroisopropyl) Ether	Yes	No	No	No	No	No	No, HU	Bis(2-Chloroisopropyl) Ether
Bis(2-Ethylhexyl) Phthalate	No	No	No	No	No	No	No, HU	Bis(2-Ethylhexyl) Phthalate
Bromobenzene	No	No	No	No	No	No	No, HU	Bromobenzene
Bromodichloromethane	No	No	No	No	No	No	No, HU	Bromodichloromethane
Bromomethane	Yes	No	No	No	No	No	No, HU	Bromomethane
Cadmium	Yes	No	Yes	No	No	Inorganic	No, <BKG	Cadmium
Calcium Metal	No SV	Yes	Yes	No	No	Inorganic	No, <RDA	Calcium Metal
Caprolactam	No	No	No	No	No	No	No, HU	Caprolactam
Carbazole	Yes	No	No	No	No	No	No, HU	Carbazole
Carbon Tetrachloride	Yes	No	No	No	No	No	No, HU	Carbon Tetrachloride
CFC-11	No	No	No	No	No	No	No, HU	CFC-11
CFC-12	No	No	No	No	No	No	No, HU	CFC-12
Chlorobenzene	No	No	No	No	No	No	No, HU	Chlorobenzene
Chlorobromomethane	No SV	No	No	No	No	No	No, HU	Chlorobromomethane
Chlorodibromomethane	No	No	No	No	No	No	No, HU	Chlorodibromomethane
Chloroethane	No	No	No	No	No	No	No, HU	Chloroethane
Chloroform	No	No	No	No	No	No	No, HU	Chloroform
Chloromethane	No	No	No	No	No	No	No, HU	Chloromethane
Chromium	Yes	No	Yes	No	CrVI	Inorganic	Yes	Chromium

Table 21 - Tier II COPC Selection Process for Subsurface Soils

Analyte	Exceeds SV?	Essential Nutrient?	Detection Frequency >5%?	Exceeds BKG?	BCC?	Class A Carcinogen?	Historic Use?	Tier II COPC?
Cis-1,2-Dichloroethene	No	No	No	No	No	No	No, HU	Cis-1,2-Dichloroethene
Cis-1,3-Dichloropropene	No SV	No	No	No	No	No	No, HU	Cis-1,3-Dichloropropene
Cobalt	No	No	Yes	No	No	Inorganic	No, <SV	Cobalt
Copper	No	No	Yes	No	No	Inorganic	No, <SV	Copper
Cyanide	No	No	Yes	No	No	Inorganic	No, <SV	Cyanide
Dibenz(a,h)Anthracene	Yes	No	No	No	No	No	No, HU	Dibenz(a,h)Anthracene
Dibenzofuran	No	No	No	No	No	No	No, HU	Dibenzofuran
Dibromomethane	No	No	No	No	No	No	No, HU	Dibromomethane
Dichloromethane	Yes	No	No	No	No	No	No, HU	Dichloromethane
Diethyl Phthalate	No	No	No	No	No	No	No, HU	Diethyl Phthalate
Dimethyl Phthalate	No	No	No	No	No	No	No, HU	Dimethyl Phthalate
Di-N-Butyl Phthalate	No	No	No	No	No	No	No, HU	Di-N-Butyl Phthalate
Di-N-Octyl Phthalate	No	No	No	No	No	No	No, HU	Di-N-Octyl Phthalate
Ethylbenzene	No	No	No	No	No	No	No, HU	Ethylbenzene
Fluoranthene	No	No	No	No	No	No	No, HU	Fluoranthene
Fluorene	No	No	No	No	No	No	No, HU	Fluorene
Hexachloro-1,3-Butadiene	Yes	No	No	No	No	No	No, HU	Hexachloro-1,3-Butadiene
Hexachlorobenzene	Yes	No	No	No	No	No	No, HU	Hexachlorobenzene
Hexachlorocyclopentadiene	No	No	No	No	No	No	No, HU	Hexachlorocyclopentadiene
Hexachloroethane	Yes	No	No	No	No	No	No, HU	Hexachloroethane
Indeno(1,2,3-cd)Pyrene	Yes	No	No	No	No	No	No, HU	Indeno(1,2,3-cd)Pyrene
Iron	Yes	No	Yes	No	No	Inorganic	Yes	Iron
Isopropylbenzene	No	No	No	No	No	No	No, HU	Isopropylbenzene
Lead	Yes	No	Yes	No	No	Inorganic	Yes	Lead
Magnesium	No SV	Yes	Yes	No	No	Inorganic	No, <RDA	Magnesium
Manganese	Yes	No	Yes	No	No	Inorganic	Yes	Manganese
M-Dichlorobenzene	No	No	No	No	No	No	No, HU	M-Dichlorobenzene
Mercury	No	No	Yes	Yes	No	Inorganic	No, <SV	Mercury
Methyl N-Butyl Ketone	No SV	No	No	No	No	No	No, HU	Methyl N-Butyl Ketone
Methyl Tert-Butyl Ether	No	No	No	No	No	No	No, HU	Methyl Tert-Butyl Ether
Methylbenzene	No	No	No	No	No	No	No, HU	Methylbenzene

Table 21 - Tier II COPC Selection Process for Subsurface Soils

Analyte	Exceeds SV?	Essential Nutrient?	Detection Frequency >5%?	Exceeds BKG?	BCC?	Class A Carcinogen?	Historic Use?	Tier II COPC?
m-Xylene &p-Xylene	No SV	No	No	No	No	No	No, HU	m-Xylene &p-Xylene
Naphthalene	No	No	No	No	No	No	No, HU	Naphthalene
N-Butylbenzene	No	No	No	No	No	No	No, HU	N-Butylbenzene
Nickel	Yes	No	Yes	No	No	Inorganic	Yes	Nickel
Nitrobenzene	Yes	No	No	No	No	No	No, HU	Nitrobenzene
n-Nitrosodi-N-Propylamine	Yes	No	No	No	No	No	No, HU	n-Nitrosodi-N-Propylamine
n-Nitrosodiphenylamine	Yes	No	No	No	No	No	No, HU	n-Nitrosodiphenylamine
n-Propylbenzene	No	No	No	No	No	No	No, HU	n-Propylbenzene
o-Xylene	No SV	No	No	No	No	No	No, HU	o-Xylene
p-Chloroaniline	Yes	No	No	No	No	No	No, HU	p-Chloroaniline
p-Cymene	No SV	No	No	No	No	No	No, HU	p-Cymene
Pentachlorophenol	Yes	No	No	No	No	No	No, HU	Pentachlorophenol
pH	No	No	Yes	No	No	NA	No, HU	pH
Phenanthrene	No	No	No	No	No	No	No, HU	Phenanthrene
Phenol	No	No	No	No	No	No	No, HU	Phenol
p-Nitroaniline	No	No	No	No	No	No	No, HU	p-Nitroaniline
Potassium	No SV	Yes	Yes	No	No	Inorganic	No, <RDA	Potassium
Pyrene	No	No	No	No	No	No	No, HU	Pyrene
Selenium	Yes	No	No	No	No	Inorganic	No, DF<5%	Selenium
Silver	Yes	No	Yes	No	No	Inorganic	Yes	Silver
Sodium	No SV	Yes	No	No	No	Inorganic	No, <RDA	Sodium
Styrene (Monomer)	No	No	No	No	No	No	No, HU	Styrene (Monomer)
Sulfate	No SV	Yes	Yes	No	No	Inorganic	No, <RDA	Sulfate
Tert-Butylbenzene	No	No	No	No	No	No	No, HU	Tert-Butylbenzene
Tetrachloroethene	Yes	No	No	No	No	No	No, HU	Tetrachloroethene
Thallium	Yes	No	Yes	No	No	Inorganic	Yes	Thallium
Trans-1,2-Dichloroethene	No	No	No	No	No	No	No, HU	Trans-1,2-Dichloroethene
Trans-1,3-Dichloropropene	No SV	No	No	No	No	No	No, HU	Trans-1,3-Dichloropropene
Tribomomethane	No	No	No	No	No	No	No, HU	Tribomomethane
Trichloroethylene	Yes	No	No	No	No	No	No, HU	Trichloroethylene
Vanadium (Fume Or Dust)	Yes	No	Yes	No	No	Inorganic	Yes	Vanadium (Fume Or Dust)

Table 21 - Tier II COPC Selection Process for Subsurface Soils

Analyte	Exceeds SV?	Essential Nutrient?	Detection Frequency >5%?	Exceeds BKG?	BCC?	Class A Carcinogen?	Historic Use?	Tier II COPC?
Vinyl Chloride	Yes	No	No	No	No	No	No, HU	Vinyl Chloride
Xylenes (Total)	No	No	No	No	No	No	No, HU	Xylenes (Total)
Zinc	Yes	No	Yes	No	No	Inorganic	Yes	Zinc

Notes:
SV - Screening value
BKG - Background
BCC - bioaccumulative chemical of concern
HU - Historic use
RDA - recommended daily allowance or other allowable dose
COPC - Chemical of potential concern
NA - Not available
DF - detection frequency

Table 22 Tier II COPC Selection Process for Surface Water

Table 22 - Tier II COPC Selection Process for Surface Water							
Analyte	**Exceeds SV?**	**Essential Nutrient?**	**Detection Frequency >5%?**	**BCC?**	**Class A Carcinogen?**	**Historic Use?**	**Tier II COPC?**
Arsenic	Yes	No	No	No	Yes	Inorganic	No, DF<5%
Cadmium	Yes	No	Yes	No	No	Inorganic	Yes
Calcium Metal	No*	Yes	Yes	No	Cr VI only	Inorganic	No
Chromium	No	Yes	No	No	No	Inorganic	No, DF<5%
Copper	No	Yes	Yes	No	No	Inorganic	No
Lead	Yes	No	Yes	No	No	Inorganic	Yes
Magnesium	No*	Yes	Yes	No	No	Inorganic	No
Manganese	Yes	Yes	Yes	No	No	Inorganic	Yes
Zinc	Yes	Yes	Yes	No	No	Inorganic	Yes

Notes:
SV - Screening value
BCC - bioaccumulative chemical of concern
COPC - Chemical of potential concern
**Ca estimated SV=511 mg/L; see text*
**Mg estimated SV = 208 mg/L; see text*
DF - Detection frequency

Table 23 Tier II COPC Selection Process for Eagle River Sediment

Table 23 - Tier II COPC Selection Process for Eagle River Sediment							
Analyte	**Exceeds SV?**	**Essential Nutrient?**	**Detection Frequency >5%?**	**BCC?**	**Class A Carcinogen?**	**Historic Use?**	**Tier II COPC?**
Arsenic	Yes	No	Yes	No	Yes	Inorganic	Yes
Cadmium	Yes	No	Yes	No	No	Inorganic	Yes
Chromium	No	No	Yes	No	No	Inorganic	No
Copper	No	No	Yes	No	No	Inorganic	No
Lead	Yes	No	Yes	No	No	Inorganic	Yes
Manganese	Yes	No	Yes	No	No	Inorganic	Yes
Zinc	Yes	No	Yes	No	No	Inorganic	Yes

Notes:
SV - Screening value
BCC - bioaccumulative chemical of concern
COPC - Chemical of potential concern
NA - Not available

Table 24 Tier II COPC Selection Process for Ground Water

Table 24 - Tier II COPC Selection Process for Ground Water							
Analyte	**Exceeds SV?**	**Essential Nutrient ?**	**Detection Frequency >5%?**	**BCC?**	**Class A Carcinogen?**	**Historic Use?**	**Tier II COPC?**
1,1,1,2-Tetrachloroethane	Yes	No	No	No	No	No	No, HU
1,1,1-Trichloroethane	No	No	No	No	No	No	No, <SV
1,1,2,2-Tetrachloroethane	Yes	No	No	No	No	No	No, HU
1,1,2-Trichloroethane	Yes	No	No	No	No	No	No, HU
1,1-Dichloroethane	No	No	No	No	No	No	No, <SV
1,1-Dichloroethylene	No	No	No	No	No	No	No, <SV
1,1-Dichloropropene	No SV	No	No	No	No	No	No, HU
1,2,3-Trichlorobenzene	No SV	No	No	No	No	No	No, HU
1,2,3-Trichloropropane	Yes	No	No	No	No	No	No, HU
1,2,4-Trichlorobenzene	Yes	No	No	No	No	No	No, HU
1,2,4-Trimethylbenzene	No	No	No	No	No	No	No, <SV
1,2-Benzphenanthracene	Yes	No	No	No	No	No	No, HU
1,2-Dibromo-3-Chloropropane (DBCP)	Yes	No	No	No	No	No	No, HU
1,2-Dibromoethane (EDB)	Yes	No	No	No	No	No	No, HU
1,2-Dichlorobenzene	No	No	No	No	No	No	No, <SV
1,2-Dichloroethane	Yes	No	No	No	No	No	No, HU
1,2-Dichloroethene (Total)	No	No	No	No	No	No	No, <SV
1,2-Dichloropropane	Yes	No	No	No	No	No	No, HU
1,3,5-Trimethylbenzene	No	No	No	No	No	No	No, <SV
1,3-Dichloropropane	No	No	No	No	No	No	No, <SV
1,4-Dichlorobenzene	Yes	No	No	No	No	No	No, HU
2,2-Dichloropropane	No SV	No	No	No	No	No	No, HU
2,4,5-Trichlorophenol	No	No	No	No	No	No	No, <SV
2,4,6-Trichlorophenol	Yes	No	No	No	No	No	No, HU
2,4-Dichlorophenol	Yes	No	No	No	No	No	No, HU
2,4-Dimethylphenol	No	No	No	No	No	No	No, <SV
2,4-Dinitrophenol	Yes	No	No	No	No	No	No, HU

Table 24 - Tier II COPC Selection Process for Ground Water

Analyte	Exceeds SV?	Essential Nutrient ?	Detection Frequency >5%?	BCC?	Class A Carcinogen?	Historic Use?	Tier II COPC?
2,4-Dinitrotoluene	Yes	No	No	No	No	No	No, HU
2,6-Dinitrotoluene	Yes	No	No	No	No	No	No, HU
2-Butanone (MEK)	No	No	No	No	No	No	No, <SV
2-Chloronaphthalene	No	No	No	No	No	No	No, <SV
2-Chlorophenol	Yes	No	No	No	No	No	No, HU
2-Chlorotoluene	No	No	No	No	No	No	No, <SV
2-Methylnaphthalene	No SV	No	No	No	No	No	No, HU
2-Methylphenol	No	No	No	No	No	No	No, <SV
2-Nitroaniline	Yes	No	No	No	No	No	No, HU
2-Nitrophenol	No SV	No	No	No	No	No	No, HU
2-Phenylbutane	No	No	No	No	No	No	No, <SV
3,3-Dichlorobenzidine	Yes	No	No	No	No	No	No, HU
3-Nitroaniline	Yes	No	No	No	No	No	No, HU
4,6-Dinitro-2-Methylphenol	No SV	No	No	No	No	No	No, HU
4-Bromophenyl Phenyl Ether	No SV	No	No	No	No	No	No, HU
4-Chloro-3-Methylphenol	No	No	No	No	No	No	No, <SV
4-Chlorophenyl Phenyl Ether	No SV	No	No	No	No	No	No, HU
4-Chlorotoluene	No SV	No	No	No	No	No	No, HU
4-Methyl-2-Pentanone	No	No	No	No	No	No	No, <SV
4-Methylphenol	No	No	No	No	No	No	No, <SV
4-Nitrophenol	Yes	No	No	No	No	No	No, HU
Acenaphthene	No	No	No	No	No	No	No, <SV
Acenaphthylene	No SV	No	No	No	No	No	No, HU
Acetone	No	No	No	No	No	No	No, <SV
Acetophenone	No	No	No	No	No	No	No, <SV
Aluminum	Yes	No	Yes	No	No	Inorganic	Yes
Anthracene	No	No	No	No	No	No	No, <SV
Antimony	No	No	No	No	No	Inorganic	No, <SV
Arsenic	Yes	No	Yes	No	Yes	Inorganic	Yes

Table 24 - Tier II COPC Selection Process for Ground Water

Analyte	Exceeds SV?	Essential Nutrient ?	Detection Frequency >5%?	BCC?	Class A Carcinogen?	Historic Use?	Tier II COPC?
Atrazine	Yes	No	No	No	No	No	No, HU
Barium	No	No	Yes	No	No	Inorganic	No, <SV
Benzene	Yes	No	No	No	No	No	No, HU
Benzo(a)Anthracene	Yes	No	No	No	No	No	No, HU
Benzo(a)Pyrene	Yes	No	No	No	No	No	No, HU
Benzo(b)Fluoranthene	Yes	No	No	No	No	No	No, HU
Benzo(ghi)Perylene	No SV	No	No	No	No	No	No, HU
Benzo(k)Fluoranthene	Yes	No	No	No	No	No	No, HU
Benzyl Butyl Phthalate	No	No	No	No	No	No	No, <SV
Beryllium	Yes	No	Yes	No	No	Inorganic	Yes
Bis(2-Chloroethoxy)Methane	No SV	No	No	No	No	No	No, HU
Bis(2-Chloroethyl) Ether	Yes	No	No	No	No	No	No, HU
Bis(2-Chloroisopropyl) Ether	Yes	No	No	No	No	No	No, HU
Bis(2-Ethylhexyl) Phthalate	Yes	No	No	No	No	No	No, HU
Bromobenzene	No	No	No	No	No	No	No, <SV
Bromodichloromethane	Yes	No	No	No	No	No	No, HU
Bromomethane	Yes	No	No	No	No	No	No, HU
Cadmium	Yes	No	Yes	No	No	Inorganic	Yes
Calcium Metal	No SV	Yes	Yes	No	No	Inorganic	Yes
Caprolactam	No	No	No	No	No	No	No, <SV
Carbazole	Yes	No	No	No	No	No	No, HU
Carbon Tetrachloride	Yes	No	No	No	No	No	No, HU
CFC-11	No	No	No	No	No	No	No, <SV
CFC-12	No	No	No	No	No	No	No, <SV
Chlorobenzene	No	No	No	No	No	No	No, <SV
Chlorobromomethane	No SV	No	No	No	No	No	No, HU
Chlorodibromomethane	Yes	No	No	No	No	No	No, HU
Chloroethane	Yes	No	No	No	No	No	No, HU
Chloroform	Yes	No	No	No	No	No	No, HU

Table 24 - Tier II COPC Selection Process for Ground Water

Analyte	Exceeds SV?	Essential Nutrient ?	Detection Frequency >5%?	BCC?	Class A Carcinogen?	Historic Use?	Tier II COPC?
Chloromethane	No	No	No	No	No	No	No, <SV
Chromium	No	No	Yes	No	No	Inorganic	No, <SV
Cis-1,2-Dichloroethene	No	No	No	No	No	No	No, <SV
Cis-1,3-Dichloropropene	No SV	No	No	No	No	No	No, HU
Cobalt	Yes	No	Yes	No	No	Inorganic	Yes
Copper	Yes	No	Yes	No	No	Inorganic	Yes
Dibenz(a,h)Anthracene	Yes	No	No	No	No	No	No, HU
Dibenzofuran	Yes	No	No	No	No	No	No, HU
Dibromomethane	No	No	No	No	No	No	No, <SV
Dichloromethane	Yes	No	No	No	No	No	No, HU
Diethyl Phthalate	No	No	No	No	No	No	No, <SV
Dimethyl Phthalate	No	No	No	No	No	No	No, <SV
Di-n-Butyl Phthalate	No	No	No	No	No	No	No, <SV
Di-n-Octyl Phthalate	No	No	No	No	No	No	No, <SV
Ethylbenzene	No	No	No	No	No	No	No, <SV
Fluoranthene	No	No	No	No	No	No	No, <SV
Fluorene	No	No	No	No	No	No	No, <SV
Free Cyanide (4500-Cn-I)	Yes	No	Yes	No	No	Inorganic	Yes
Hexachloro-1,3-Butadiene	Yes	No	No	No	No	No	No, HU
Hexachlorobenzene	Yes	No	No	No	No	No	No, HU
Hexachlorocyclopentadiene	Yes	No	No	No	No	No	No, HU
Hexachloroethane	Yes	No	No	No	No	No	No, HU
Indeno(1,2,3-cd)Pyrene	Yes	No	No	No	No	No	No, HU
Iron	Yes	No	Yes	No	No	Inorganic	Yes
Isopropylbenzene	No	No	No	No	No	No	No, <SV
Lead	Yes	No	Yes	No	No	Inorganic	Yes
Magnesium	No SV	Yes	Yes	No	No	Inorganic	Yes
Manganese	Yes	No	Yes	No	No	Inorganic	Yes
m-Dichlorobenzene	No	No	No	No	No	No	No, <SV
Mercury		No	No				

Table 24 - Tier II COPC Selection Process for Ground Water

Analyte	Exceeds SV?	Essential Nutrient ?	Detection Frequency >5%?	BCC?	Class A Carcinogen?	Historic Use?	Tier II COPC?
Methyl n-Butyl Ketone	No SV	No	No	No	No	No	No, HU
Methyl Tert-Butyl Ether	Yes	No	No	No	No	No	No, HU
Methylbenzene	No	No	No	No	No	No	No, <SV
m-Xylene &p-Xylene	No SV	No	No	No	No	No	No, HU
Naphthalene	Yes	No	No	No	No	No	No, HU
n-Butylbenzene	No	No	No	No	No	No	No, <SV
Nickel	Yes	No	Yes	No	No	Inorganic	Yes
Nitrobenzene	Yes	No	No	No	No	No	No, HU
n-Nitrosodi-n-Propylamine	Yes	No	No	No	No	No	No, HU
n-Nitrosodiphenylamine	Yes	No	No	No	No	No	No, HU
n-Propylbenzene	No	No	No	No	No	No	No, <SV
o-Xylene	No SV	No	No	No	No	No	No, HU
p-Chloroaniline	No	No	No	No	No	No	No, <SV
p-Cymene	No SV	No	No	No	No	No	No, HU
Pentachlorophenol	Yes	No	No	No	No	No	No, HU
Phenanthrene	No	No	No	No	No	No	No, <SV
Phenol	No	No	No	No	No	No	No, <SV
p-Nitroaniline	Yes	No	No	No	No	No	No, HU
Potassium	No SV	Yes	Yes	No	No	Inorganic	No, <RDA
Pyrene	No	No	No	No	No	No	No, <SV
Selenium	Yes	No	No	No	No	Inorganic	No, DF<5%
Silver	Yes	No	Yes	No	No	Inorganic	Yes
Sodium	No SV	Yes	Yes	No	No	Inorganic	No, <RDA
Styrene (Monomer)	No	No	No	No	No	No	No, <SV
Sulfate	Yes	Yes	Yes	No	No	Inorganic	Yes
Tert-Butylbenzene	No	No	No	No	No	No	No, <SV
Tetrachloroethene	Yes	No	No	No	No	No	No, HU
Thallium	Yes	No	Yes	No	No	Inorganic	Yes
Trans-1,2-Dichloroethene	No	No	No	No	No	No	No, <SV
Trans-1,3-Dichloropropene	No SV	No	No	No	No	No	No, HU

Table 24 - Tier II COPC Selection Process for Ground Water							
Analyte	**Exceeds SV?**	**Essential Nutrient ?**	**Detection Frequency >5%?**	**BCC?**	**Class A Carcinogen?**	**Historic Use?**	**Tier II COPC?**
Tribomomethane	Yes	No	No	No	No	No	No, HU
Trichloroethylene	Yes	No	No	No	No	No	No, HU
Vanadium	Yes	No	Yes	No	No	Inorganic	Yes
Vinyl Chloride	Yes	No	No	No	No	No	No, HU
Xylenes (Total)	No	No	No	No	No	No	No, <SV
Zinc	Yes	No	Yes	No	No	Inorganic	Yes

Notes:
SV - Screening value
BCC - bioaccumulative chemical of concern
HU - Historic use
RDA - recommended daily allowance or other allowable dose
COPC - Chemical of potential concern
NA - Not available
DF - detection frequency

Table 25 Tier II COPC Selection Process for Boulders

Table 25 - Tier II COPC Selection Process for Boulders								
Analyte	**Exceeds SV?**	**Essential Nutrient?**	**Detection Frequency >5%?**	**Exceeds BKG?**	**BCC?**	**Class A Carcinogen?**	**Historic Use?**	**Tier II COPC?**
Arsenic	Yes	No	Yes	Yes	No	Yes	Inorganic	Yes
Cadmium	Yes	No	Yes	Yes	No	No	Inorganic	Yes
Chromium	Yes	No	Yes	Yes	No	No	Inorganic	Yes
Copper	Yes	No	Yes	Yes	No	No	Inorganic	Yes
Lead	Yes	No	Yes	Yes	No	No	Inorganic	Yes
Manganese	Yes	No	Yes	Yes	No	No	Inorganic	Yes
Zinc	Yes	No	Yes	Yes	No	No	Inorganic	Yes

Notes:
SV - Screening value
BKG - Background
BCC - bioaccumulative chemical of concern
COPC - Chemical of potential concern

Table 26 Tier II COPC Selection Process for Diversion Trench Surface Water

Table 26 - Tier II COPC Selection Process for Diversion Trench Surface Water							
Analyte	**Exceeds SV?**	**Essential Nutrient?**	**Detection Frequency >5%?**	**BCC?**	**Class A Carcinogen ?**	**Historic Use?**	**Tier II COPC?**
Arsenic	Yes	No	Yes	No	Yes	Inorganic	Yes
Cadmium	Yes	No	No	No	No	Inorganic	No, DF<5%
Chromium	No	No	No	No	No	Inorganic	No,<SV
Copper	No	No	No	No	No	Inorganic	No,<SV
Lead	No	No	No	No	No	Inorganic	No,<SV
Manganese	Yes	No	Yes	No	No	Inorganic	Yes
Zinc	No	No	Yes	No	No	Inorganic	No, <SV

Notes:
SV - Screening value
BCC - bioaccumulative chemical of concern
COPC - Chemical of potential concern
DF - detection frequency
NA - Not available

Table 27 Tier II COPC Selection Process for Seeps

Table 27 - Tier II COPC Selection Process for Seeps						
Analyte	**Exceeds SV?**	**Essential Nutrient?**	**Detection Frequency >5%?**	**BCC?**	**Historic Use?**	**Tier II COPC?**
Arsenic	Yes	No	No	No	Inorganic	No, DF<5%
Cadmium	Yes	No	Yes	No	Inorganic	Yes
Chromium	No	No	No	No	Inorganic	No,<SV
Copper	No	No	Yes	No	Inorganic	No,<SV
Lead	No	No	Yes	No	Inorganic	No,<SV
Manganese	Yes	No	Yes	No	Inorganic	Yes
Zinc	Yes	No	Yes	No	Inorganic	Yes

Notes:
SV - Screening value
BKG - Background
BCC - bioaccumulative chemical of concern
COPC - Chemical of potential concern
DF - detection frequency
NA - Not available

3.2 EXPOSURE ASSESSMENT

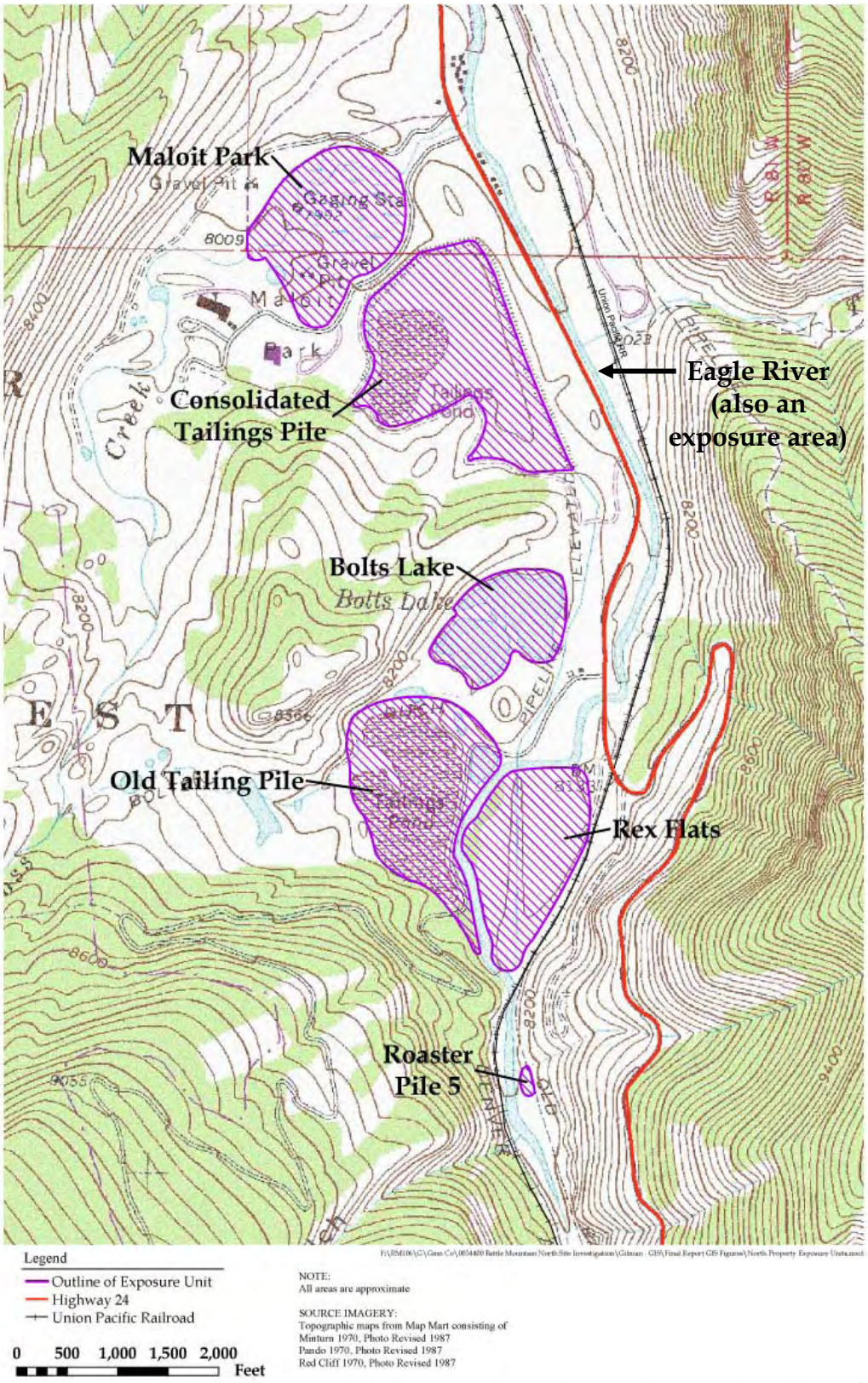
The objective of the exposure assessment process is to estimate the type and magnitude of possible exposures to COPCs that have been detected at, or migrating from, a given site. Consideration of the appropriate site-specific exposure scenarios provides the basis for analyzing risks at a given site. The methodology is consistent with EPA (EPA, 1989) and more recent guidance. The steps in the exposure assessment process are:

- Characterization of exposure setting;
- Identification of current and future receptors;
- Identification of potential exposure media;
- Identification of potential exposure pathways; and
- Quantification of exposure.

3.2.1 Characterization of Exposure Setting

The North Property lies in the valley and along either side of the Eagle River, south of the town of Minturn. The North Property was divided into multiple exposure units for evaluation in the risk assessment (Figure 3).

Figure 3 *Battle Mountain North Exposure Units*



An exposure unit or area is the area throughout which a receptor moves and encounters an environmental medium for the duration of the exposure (EPA, 2002b). Unless there is site-specific evidence that indicates otherwise, EPA (2002b) indicates that an individual receptor is assumed to be equally exposed to all media within all portions of the exposure area throughout the time frame the risk assessment represents. The North Property was divided into the following general exposure areas based on topography, contamination sources, and historic use.

- Bolts Lake,
- CTP (for surface soil, only background samples collected from outside of , but near this location),
- Eagle River,
- Maloit Park,
- OTP (& Sump 3, Old Slurry Line),
- Rex Flats, and
- Roaster Pile 5.

3.2.2 Characterization of Exposure Setting

The area surrounding the North Property is currently used for recreational purposes, including hiking, fishing, and whitewater rafting. In the future, residents and workers could also be present. Golfing would become a major recreational use under current redevelopment plans. In addition, there could be intermittent current and future workers not familiar with the site hazards that are engaged in activities in and around the site such as wood cutting, fire-fighting, or other forest management practice. Remediation workers and construction workers engaged in building residences will occur at some point in the future. Groundskeepers and golf course maintenance workers will also occur in the future.

The following potential receptors were identified from the available information:

- Future Residents,
- Current Recreationalists (hiker, rafter, angler),
- Future Recreationalists (hiker, rafter, angler, golfer), and
- Current and Future Workers.

3.2.3 Identification of Potential Exposure Media

The potential exposure media are identified in the Conceptual Site Model ("CSM") (Figure 4). These exposure media are:

- Surface soil,
- Subsurface soil,
- Surface water,
- Seeps/springs,
- Sediment within the Eagle River,
- Ground water,
- Boulders,
- Diversion trench water, and
- Fish.

3.2.4 Identification of Potentially Complete Exposure Pathways

For this baseline risk assessment, residents, recreationalists, and workers are considered to be exposed to surface soil via ingestion or dermal contact (Figure 4). Workers are also considered to be exposed to subsurface soil by ingestion and inhalation during digging or excavation. Because there will be no gardens, and excavation activity by residents will not be permitted, residents will not be exposed to subsurface soils. Contact with subsurface soil is considered an incomplete pathway for all recreational receptors (Figure 4).

Boulders are evaluated as a potential exposure medium. However, it is unlikely that they actually serve as a source of exposure. Dermal contact with solid rock is unlikely to result in uptake of metals because metals adsorb to rock and do not desorb readily. Most human exposure is due to ingestion or other contact with fine particles. It is possible that by climbing or playing on rocks, small pieces of grit could adhere to hands and then be ingested.

Particulates can be generated by any dust-creating disturbance of surface soil. Residents could be exposed to particulates generated from surface soils in indoor/outdoor air (Figure 4). Particulates could be generated by workers digging in subsurface soil.

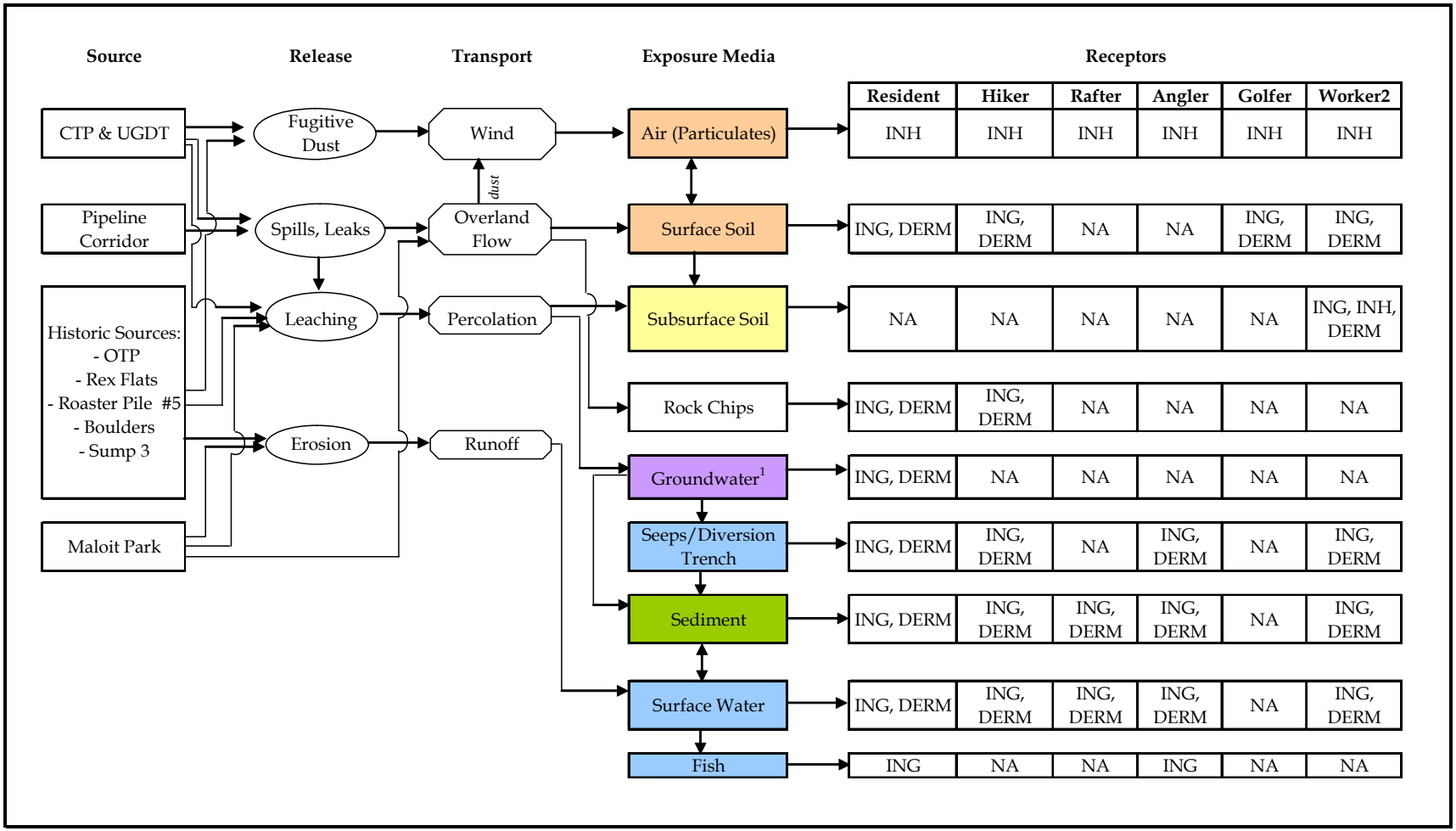
Exposure to ground water is technically incomplete for residents since ground water wells are off site; these off site wells are the primary source of potable water in the near future. However, it was assumed that ground

water wells could become contaminated at the current concentrations of metals in ground water. The ground water ingestion pathways are thus potentially complete and significant for residents. Recreationalists and workers may also contact ground water, but only after it surfaces as seeps/springs (Figure 4). This is likely to be infrequent, for example, a hiker could occasionally fill a water bottle at a seep, or children could play around a seep. There are no hot springs in the area that would offer bathing opportunities.

Residents, recreationalists, and workers may contact surface water or sediments in the Eagle River. The ingestion pathways are complete and potentially significant.

Residents or recreationalists may consume game animals that may have contacted site-related contaminated media. This is potentially complete but likely insignificant (EPA, 2004c). This is because most game animals will move in and out of the North Property area and not remain in contact with site-contaminated media long enough to bioaccumulate significant amounts of site-related contaminants. Furthermore, most of the inorganics are not highly bioaccumulative in terrestrial systems. Therefore, ingestion of game does not appear on the Tier II CSM (Figure 4).

Figure 4 Human Health Risk Assessment Conceptual Site Model



1 Ground water is not currently used for potable purposes, and future development plans are based on use of municipal water supplies.
2 Workers modeled as construction workers. This is protective of other workers including groundskeepers or golf course workers
ING – ingestion
INH – inhalation
DERM – dermal
NA - not applicable
Grayed text indicates exposure pathway is unlikely to be significant and will be addressed qualitatively.

Recreationalists may collect edible wild vegetation, but this is expected to be infrequent and insignificant and does not appear on the CSM. Residents or recreationalists may consume fish; thus, consumption of locally caught fish was evaluated in the risk assessment. Brown trout and brook trout are the only potentially resident species that could be caught and consumed. Rainbow trout may be routinely stocked, but it is unlikely that they maintain a sustaining, reproducing population.

All of the Tier II COPCs are metals. At mining and smelting sites in EPA Region 8, which includes Colorado, the dermal exposure pathway for inorganics in soil, sediment and water is considered to be complete, but insignificant. The rationale for this is that:

- most metals tend to bind to soil particles, reducing the likelihood of dissociation from soil and absorption across the dermal membranes,
- ionic species such as metals have a relatively low tendency to cross intact skin even when contact does occur,
- current methods and data are very limited for attempting to quantify dermal absorption of inorganics from soil, water or sediment.

As a result, the dermal pathway should be evaluated qualitatively. However, to be conservative, this pathway was carried forward at the request of CDPHE. The exposure pathways identified as potentially complete and significant (Figure 4) are summarized as follows:

Future Residents

- incidental surface soil ingestion,
- dermal contact with surface soils,
- inhalation of particulates generated from surface soils to outdoor and indoor air,
- ingestion of ground water as a potable water supply,
- dermal contact with ground water during potable use,
- incidental ingestion with surface or seep water,
- dermal contact with surface or seep water,
- incidental ingestion of sediments,
- dermal contact with sediments, and
- ingestion of fish.

Current and Future Recreationalists

- incidental surface soil ingestion,
- dermal contact with surface soils,
- inhalation of particulates generated by surficial soils in outdoor air,
- incidental ingestion of surface or seep water,
- dermal contact with surface or seep water,
- incidental ingestion of sediments,
- dermal contact with sediments, and
- ingestion of fish.

Current and Future Workers

- incidental surface and subsurface soil ingestion,
- dermal contact with surface and subsurface soil,
- inhalation of particulates generated by surficial or subsurface soils to outdoor air,
- incidental ingestion of surface or seep water,
- dermal contact with surface or seep water,
- incidental ingestion of sediment, and
- dermal contact with sediment.

It is expected that risk estimates obtained for the receptors evaluated in the risk assessment will offer the highest exposure rates, thus being protective of other potentially exposed receptor groups.

3.2.5 Quantification of Exposure

Exposure is quantified by determining exposure point concentrations, conservative receptor-specific exposure parameters, and calculating intakes. These steps are described in more detail below.

3.2.5.1 Exposure Point Concentrations ("EPCs")

The exposure point concentration ("EPC") is a conservative estimate of the average chemical concentration in each environmental medium (EPA, 2002b). The EPCs are used in the calculation of estimated intakes. An EPC was determined for each Tier II COPC in each individual exposure area within the site (EPA, 2002b). A simple substitution method was used

in the risk assessment whereby one-half the reporting limit was substituted for all non-detects.

The methods for determining the EPCs are described below. The ProUCL software from EPA was used to estimate the UCL95 values (EPA, 2002b). The recommended value from ProUCL was used as the UCL95. A UCL95 was only estimated if there were at least 10 samples and the detection frequency was 85% or greater (EPA, 2002b). When the sample size was 10 or higher and the detection frequency was greater than 85%, the EPC applied in the risk assessment is the lower of the maximum detected value or the UCL95 value for all data. According to current EPA Region 8 policy, a UCL should not be calculated when the sample size is less than 10, and/or the detection frequency is less than 85%. Therefore, where these conditions occurred, the Tier II EPC was the maximum detected value. The summary statistics for the data organized by exposure medium and by exposure area are presented in Tables 28 through 35.

All maximum detected values for the COPCs in every media were above the maximum analytical reporting limit; therefore, a surrogate of ½ the maximum reporting limit was not necessary and never applied as an EPC in the Tier II analysis.

There were insufficient samples for sediment, seep, and diversion trench water by which to estimate a robust UCL95 by exposure area. Thus, the EPC for these media defaults to the maximum detected value, which in all cases was higher than ½ the maximum reporting limit.

EPCs for fish tissue were estimated with uptake factors that relate tissue concentrations to environmental concentrations by multiplying the surface water Tier II EPC by the uptake factor (Table 36). Manganese is an essential element for living things and it is therefore physiologically assimilated and utilized by both plants and animals. Uptake by aquatic life is influenced by temperature and pH. However, lower trophic organisms can significantly bioconcentrate manganese, although fish reportedly do not accumulate manganese to as high an extent (IPCS, 2004). Bioconcentration factors ("BCFs") of 2,000–20,000 for marine and freshwater plants, 2,500–6,300 for phytoplankton, and 35–930 for fish have been reported (IPCS, 2004). Typical BCFs for fish are about 100. There was no biomagnification in a simple freshwater food-chain (IPCS, 2004). Maximum BCFs of 911, 65, and 23 were reported for algae, *Daphnia magna*, and fathead minnows (*Pimephales promelas*), respectively. However, other studies suggest weak biomagnification. Manganese was readily accumulated in all tissues of brown trout (*Salmo trutta*) (IPCS, 2004). The upper range for fish (930) was used as a BCF for fish (Table 36). It was assumed these values were given on a wet weight basis as the sources consulted did not specifically address this issue.

Table 28 Summary Statistics and EPCs by Exposure Area for Surface Soil Tier II COPCs

Table 28 - Summary Statistics and EPCs by Exposure Area for Surface Soil Tier II COPCs										
Exposure Area	**Analyte**	**n**	**Minimum Detected Value (mg/kg)**	**Maximum Detected Value (mg/kg)**	**Number of Detects**	**Detection Frequency**	**UCL95**	**Distribution**	**ProUCL Recommended Statistic**	**Tier II EPC**
Bolts Lake	Aluminum	3	6200	10000	3	100%	NA	NA	NA	10000.00
	Antimony	3	51	51	1	33%	NA	NA	NA	51.00
	Arsenic	29	2.7	57	29	100%	20.00	Gamma	Approximate Gamma UCL	10.00
	Barium	3	120	540	3	100%	NA	NA	NA	540.00
	Beryllium	3	7.9	7.9	1	33%	NA	NA	NA	7.90
	Cadmium	29	0.12	6.3	29	100%	2.30	Gamma	Approximate Gamma UCL	2.30
	Chromium	29	8.7	21	29	100%	16.00	Normal	Student's-t UCL	16.00
	Copper	29	4.3	73	29	100%	21.38	Gamma	Approximate Gamma UCL	21.38
	Cyanide	3			0	0%	NA	NA	NA	0.00
	Iron	3	31000	170000	3	100%	NA	NA	NA	170000.00
	Lead	29	7.4	150	29	100%	68.00	Gamma	Approximate Gamma UCL	68.00
	Manganese	29	75	980	29	100%	540.00	Gamma	Approximate Gamma UCL	540.00
	Mercury	3	0.05	0.05	1	33%	NA	NA	NA	0.05
	Nickel	3	5.5	71	3	100%	NA	NA	NA	71.00
	Selenium	3	100	100	1	33%	NA	NA	NA	100.00
	Silver	3	1.3	21	2	67%	NA	NA	NA	21.00
	Thallium	3	260	260	1	33%	NA	NA	NA	260.00
	Vanadium	3	31	110	3	100%	NA	NA	NA	110.00
	Zinc	29	44	890	29	100%	380.00	Gamma	Approximate Gamma UCL	380.00

Table 28 - Summary Statistics and EPCs by Exposure Area for Surface Soil Tier II COPCs

Exposure Area	Analyte	n	Minimum Detected Value (mg/kg)	Maximum Detected Value (mg/kg)	Number of Detects	Detection Frequency	UCL95	Distribution	ProUCL Recommended Statistic	Tier II EPC
Maloit Park										
	Aluminum	5	5200	30000	5	100%	NA	NA	NA	30000.00
	Antimony	5	12	12	1	20%	NA	NA	NA	12.00
	Arsenic	21	2.3	1400	19	90%	750.00	Non-parametric	99% Chebbyshev (Mean, Sd) UCL	375.00
	Barium	5	45	350	5	100%	NA	NA	NA	350.00
	Beryllium	5	0.93	1.4	2	40%	NA	NA	NA	1.40
	Cadmium	21	0.12	26	21	100%	5.60	Gamma	Approximate Gamma UCL	5.60
	Chromium	21	7.9	36	21	100%	25.00	Normal	Student's-t UCL	25.00
	Copper	21	13	1300	21	100%	838.83	Non-parametric	99% Chebyshev (Mean, Sd) UCL	838.83
	Cyanide	5			0	0%	NA	NA	NA	0.00
	Iron	5	11000	250000	5	100%	NA	NA	NA	250000.00
	Lead	21	8.5	7100	21	100%	3700.00	Non-parametric	99% Chebyshev (Mean, Sd) UCL	3700.00
	Manganese	21	170	9800	21	100%	7900.00	Non-parametric	99% Chebyshev (Mean, Sd) UCL	7900.00
	Mercury	5	0.19	1.2	2	0.4	NA	NA	NA	1.20
	Nickel	5	7.5	30	5	100%	NA	NA	NA	30.00
	Selenium	5	2.2	2.2	1	20%	NA	NA	NA	2.20
	Silver	5	40	40	1	20%	NA	NA	NA	40.00
	Thallium	5	6.4	12	2	40%	NA	NA	NA	12.00
	Vanadium	5	5.3	49	5	100%	NA	NA	NA	49.00
	Zinc	21	53	7700	21	100%	2900.00	Lognormal	95% Chebyshev (Mean, Sd) UCL	2900.00

Table 28 - Summary Statistics and EPCs by Exposure Area for Surface Soil Tier II COPCs

Exposure Area	Analyte	n	Minimum Detected Value (mg/kg)	Maximum Detected Value (mg/kg)	Number of Detects	Detection Frequency	UCL95	Distribution	ProUCL Recommended Statistic	Tier II EPC
Old Tailings Pile (inc. Old Slurry Line & Sump 3)	Aluminum	19	2500	19000	19	100%	9933.37	Gamma	Approximate Gamma UCL	9933.37
	Antimony	19	1.1	8.1	4	21%	NA	NA	NA	8.10
	Arsenic	145	0.85	1000	145	100%	110.00	Lognormal	95% H-UCL	55.00
	Barium	19	66	340	19	100%	180.00	Normal	Student's-t UCL	180.00
	Beryllium	19	0.54	1.2	6	32%	NA	NA	NA	1.20
	Cadmium	145	0.1	9.9	118	81%	NA	NA	NA	9.90
	Chromium	145	5.1	62	145	100%	16.00	Normal	Student's-t UCL	16.00
	Copper	145	6.9	320	145	1	48.99	Non-parametric	95% Chebyshev (Mean, Sd) UCL	48.99
	Cyanide	19	0.54	36	3	16%	NA	NA	NA	36.00
	Iron	19	14000	170000	19	100%	67000.00	Gamma	Approximate Gamma UCL	67000.00
	Lead	145	2.4	4500	145	100%	190.00	Lognormal	95% H-UCL	190.00
	Manganese	145	40	5000	145	100%	480.00	Lognormal	95% H-UCL	480.00
	Mercury	19	0.036	1	11	58%	NA	NA	NA	1.00
	Nickel	19	5.2	22	16	84%	11.00	Normal	Student's-t UCL	11.00
	Selenium	19	1.4	1.6	0	0%	NA	NA	NA	1.60
	Silver	19	1.1	44	10	53%	NA	NA	NA	44.00
	Thallium	19	1.3	14	7	37%	NA	NA	NA	14.00
	Vanadium	19	20	59	19	100%	32.00	Gamma	Approximate Gamma UCL	32.00
	Zinc	145	29	4600	145	100%	470.00	Non-parametric	95% Chebyshev (Mean, Sd) UCL	470.00

Table 28 - Summary Statistics and EPCs by Exposure Area for Surface Soil Tier II COPCs										
Exposure Area	**Analyte**	**n**	**Minimum Detected Value (mg/kg)**	**Maximum Detected Value (mg/kg)**	**Number of Detects**	**Detection Frequency**	**UCL95**	**Distribution**	**ProUCL Recommended Statistic**	**Tier II EPC**
Rex Flats	Aluminum	14	1800	22000	14	100%	11555.10	Normal	Student's-t UCL	11555.10
	Antimony	14	1.1	11	7	50%	NA	NA	NA	11.00
	Arsenic	106	1.9	2700	104	98%	880.00	Lognormal	95% H-UCL	440.00
	Barium	14	100	410	14	100%	270.00	Normal	Student's-t UCL	270.00
	Beryllium	14	0.56	1.4	4	29%	NA	NA	NA	1.40
	Cadmium	106	0.1	16	93	88%	3.64	Lognormal	95% H-UCL	3.64
	Chromium	106	2.3	36	105	99%	15.00	Normal	Student's-t UCL	15.00
	Copper	106	8.2	850	106	100.00%	124.17	Lognormal	H-UCL	124.17
	Cyanide	14	0.56	0.85	1	7%	NA	NA	NA	0.85
	Iron	14	14000	260000	14	100%	120000.00	Gamma	Approximate Gamma UCL	120000.00
	Lead	106	9.6	14000	106	100%	2200.00	Lognormal	95% H-UCL	2200.00
	Manganese	106	22	6200	106	100%	790.00	Lognormal	95% H-UCL	790.00
	Mercury	14	0.037	2.7	12	85.71%	1.32	Gamma	Approximate Gamma UCL	1.32
	Nickel	14	5	31	13	93%	15.00	Gamma	Approximate Gamma UCL	15.00
	Selenium	14	1.4	1.8	1	7%	NA	NA	NA	1.80
	Silver	14	1.1	52	9	64%	NA	NA	NA	52.00
	Thallium	14	1.3	18	8	57%	NA	NA	NA	18.00
	Vanadium	14	14	41	14	100%	31.00	Normal	Student's-t UCL	31.00
	Zinc	106	46	3300	106	100%	850.00	Lognormal	95% H-UCL	850.00

Table 28 - Summary Statistics and EPCs by Exposure Area for Surface Soil Tier II COPCs

Exposure Area	Analyte	n	Minimum Detected Value (mg/kg)	Maximum Detected Value (mg/kg)	Number of Detects	Detection Frequency	UCL95	Distribution	ProUCL Recommended Statistic	Tier II EPC
Roaster Pile 5	Aluminum	3	5900	9800	3	100.00%	NA	NA	NA	9800.00
	Antimony	3			0	0%	NA	NA	NA	0.00
	Arsenic	5	14	230	5	100%	NA	NA	NA	115.00
	Barium	3	120	270	3	100%	NA	NA	NA	270.00
	Beryllium	3	0.65	0.65	1	33%	NA	NA	NA	0.65
	Cadmium	5	0.27	9.5	5	100%	NA	NA	NA	9.50
	Chromium	5	7.4	13	5	100%	NA	NA	NA	13.00
	Copper	5	13	92	5	100.00%	NA	NA	NA	92.00
	Cyanide	3			0	0%	NA	NA	NA	0.00
	Iron	3	25000	87000	3	100%	NA	NA	NA	87000.00
	Lead	5	98	1800	5	100%	NA	NA	NA	1800.00
	Manganese	5	240	2100	5	100%	NA	NA	NA	2100.00
	Mercury	3	0.072	0.072	1	33.33%	NA	NA	NA	0.07
	Nickel	3	12	15	3	100%	NA	NA	NA	15.00
	Selenium	3			0	0%	NA	NA	NA	0.00
	Silver	3	2.8	2.8	1	33%	NA	NA	NA	2.80
	Thallium	3			0	0%	NA	NA	NA	0.00
	Vanadium	3	12	30	3	100%	NA	NA	NA	30.00
	Zinc	5	110	2200	5	100%	NA	NA	NA	2200.00

Notes:

A UCL95 was estimated only if n>10 and the detection frequency >85%

NA - Not applicable

The arsenic Tier II EPC was reduced by a factor of 50% to account for the lower bioavailability of arsenic in soil media

BKG - Background

The UCL estimate uses all data, with 1/2 the RL as a surrogate for nondetects

The fines fraction is not included in these statistics

Table 29 Summary Statistics and EPCs by Exposure Area for Subsurface Soil Tier II COPCs

Table 29 - Summary Statistics and EPCs by Exposure Area for Subsurface Soil Tier II COPCs										
Exposure Area	**Analyte**	**n**	**Minimum Detected Value (mg/kg)**	**Maximum Detected Value (mg/kg)**	**Number of Detects**	**Detection Frequency**	**UCL95**	**Distribution**	**ProUCL Recommended Statistic**	**Tier II EPC**
Bolts Lake	Aluminum	1	4500	4500	1	100%	NA	NA	NA	4500.00
	Arsenic	19	1.3	25	13	68%	NA	NA	NA	12.50
	Barium	1	32	32	1	100%	NA	NA	NA	32.00
	Beryllium	1			0	0%	NA	NA	NA	0.00
	Chromium	19	8.1	36	19	100%	20.00	Gamma	Approximate Gamma UCL	20.00
	Iron	1	8600	8600	1	100%	NA	NA	NA	8600.00
	Lead	19	2.8	70	19	100%	28.00	Non-parametric	95% Chebyshev (Mean, Sd) UCL	28.00
	Manganese	19	57	940	19	100%	270.00	Gamma	Approximate Gamma UCL	270.00
	Nickel	1	6.1	6.1	1	100%	NA	NA	NA	6.10
	Silver	1			0	0%	NA	NA	NA	0.00
	Thallium	1			0	0%	NA	NA	NA	0.00
	Vanadium	1	12	12	1	100.00%	NA	NA	NA	12.00
	Zinc	19	14	460	19	100%	150.00	Non-parametric	95% Chebyshev (Mean, Sd) UCL	150.00

Table 29 - Summary Statistics and EPCs by Exposure Area for Subsurface Soil Tier II COPCs

Exposure Area	Analyte	n	Minimum Detected Value (mg/kg)	Maximum Detected Value (mg/kg)	Number of Detects	Detection Frequency	UCL95	Distribution	ProUCL Recommended Statistic	Tier II EPC
Old Tailings Pile (&Sump 3)	Aluminum	17	3600	14000	17	100%	8978.35	Gamma	Approximate Gamma UCL	8978.35
	Arsenic	63	0.65	220	46	73%	NA	NA	NA	110.00
	Barium	17	31	170	17	100%	110.00	Gamma	Approximate Gamma UCL	110.00
	Beryllium	17	0.63	3.4	4	24%	NA	NA	NA	3.40
	Chromium	63	5.8	92	63	100%	24.00	Non-parametric	95% Chebyshev (Mean, Sd) UCL	24.00
	Iron	17	10000	40000	17	100%	22000.00	Gamma	Approximate Gamma UCL	22000.00
	Lead	63	1.7	230	63	100%	29.00	Non-parametric	95% Chebyshev (Mean, Sd) UCL	29.00
	Manganese	63	25	2200	63	100%	330.00	Lognormal	95% H-UCL	330.00
	Nickel	17	6.5	24	17	100%	15.00	Gamma	Approximate Gamma UCL	15.00
	Silver	17	1.1	1.1	1	6%	NA	NA	NA	1.10
	Thallium	17	1.7	1.7	1	6%	NA	NA	NA	1.70
	Vanadium	17	14	58	17	100%	33.42	Gamma	Approximate Gamma UCL	33.42
	Zinc	63	12	1000	63	100%	190.00	Non-parametric	95% Chebyshev (Mean, Sd) UCL	190.00

Table 29 - Summary Statistics and EPCs by Exposure Area for Subsurface Soil Tier II COPCs

Exposure Area	Analyte	n	Minimum Detected Value (mg/kg)	Maximum Detected Value (mg/kg)	Number of Detects	Detection Frequency	UCL95	Distribution	ProUCL Recommended Statistic	Tier II EPC
Rex Flats	Aluminum	11	87	13000	11	100%	9145.35	Normal	Student's-t UCL	9145.35
	Arsenic	31	0.81	1000	26	84%	NA	NA	NA	500.00
	Barium	11	34	390	10	91%	210.00	Normal	Student's-t UCL	210.00
	Beryllium	11	0.61	1	4	36%	NA	NA	NA	1.00
	Chromium	31	6.7	31	31	100%	19.00	Normal	Student's-t UCL	19.00
	Iron	11	430	140000	11	100%	55000.00	Gamma	Approximate Gamma UCL	55000.00
	Lead	31	2.4	2400	31	100%	1000.00	Non-parametric	99% Chebyshev (Mean, Sd) UCL	1000.00
	Manganese	31	73	1200	31	100%	420.00	Gamma	Approximate Gamma UCL	420.00
	Nickel	11	5.7	19	10	91%	14.00	Normal	Student's-t UCL	14.00
	Silver	11	1.8	28	3	27%	NA	NA	NA	28.00
	Thallium	11	6.9	6.9	1	9%	NA	NA	NA	6.90
	Vanadium	11	12	40	10	91%	28.19	Normal	Student's-t UCL	28.19
	Zinc	31	20	940	31	100%	300.00	Lognormal	95% H-UCL	300.00

Notes:

A UCL95 was estimated only if n>10 and the detection frequency >85%

NA - Not applicable

The arsenic Tier II EPC was reduced by a factor of 50% to account for the lower bioavailability of arsenic in soil media

BKG - Background

Blank cells - analyte was not detected

The UCL estimate uses all data, with 1/2 the RL as a surrogate for nondetects

Table 30 Summary Statistics and EPCs by Exposure Area for Surface Water Tier II COPCs (Total Fraction)

Table 30 - Summary Statistics and EPCs by Exposure Area for Surface Water Tier II COPCs (Total Fraction)									
Analyte	**n**	**Minimum Detected Value (mg/L)**	**Maximum Detected Value (mg/L)**	**Number of Detects**	**Detection Frequency**	**UCL95 (mg/L)**	**Distribution**	**ProUCL Recommended Statistic**	**Tier II EPC**
Cadmium	27	0.001	0.0017	14	52%	0.001	Nonparametric	95% Chebyshev	0.0014
Lead	27	0.0018	0.011	24	89%	0.007	Nonparametric	95% Chebyshev	0.0075
Manganese	27	0.0500	0.52	27	100%	0.286	Lognormal	H-UCL	0.2859
Zinc	27	0.0190	0.52	26	96%	0.481	Nonparametric	97.5% Chebyshev	0.4808

Notes:

A UCL95 was estimated only if n>10 and the detection frequency >85%

The UCL estimate uses all data, with 1/2 the RL as a surrogate for nondetects

Table 31 Summary Statistics and EPCs by Exposure Area for Sediment Tier II COPCs

Table 31 - Summary Statistics and EPCs by Exposure Area for Sediment Tier II COPCs									
Analyte	**n**	**Minimum Detected Value (mg/kg)**	**Maximum Detected Value (mg/kg)**	**Number of Detects**	**Detection Frequency**	**UCL95 (mg/L)**	**Distribution**	**ProUCL Recommended Statistic**	**Tier II EPC (mg/kg)**
Arsenic	6	14.00	97.00	6	100%	NA	NA	NA	97.00
Cadmium	6	3.50	8.10	6	100%	NA	NA	NA	8.10
Lead	6	350.00	810.00	6	100%	NA	NA	NA	810.00
Manganese	6	880.00	2200.00	6	100%	NA	NA	NA	2200.00
Zinc	6	940.00	2500.00	6	100%	NA	NA	NA	2500.00

Notes:

A UCL95 was estimated only if n>10 and the detection frequency >85%

NA - Not applicable

The UCL estimate uses all data, with 1/2 the RL as a surrogate for nondetects

Table 32 Summary Statistics and EPCs by Exposure Area for Ground Water Tier II COPCs

Table 32 - Summary Statistics and EPCs by Exposure Area for Ground Water Tier II COPCs									
Analyte	**n**	**Minimum Detected Value (mg/L)**	**Maximum Detected Value (mg/L)**	**Number of Detects**	**Detection Frequency**	**UCL95 (mg/L)**	**Distribution**	**ProUCL Recommended Statistic**	**Tier II EPC**
Aluminum	16	2	4.1	6	38%	NA	NA	NA	4.1
Arsenic	275	0.0051	0.11	46	17%	NA	NA	NA	0.11
Beryllium	31	0.0011	0.013	7	23%	NA	NA	NA	0.013
Cadmium	275	0.0015	0.39	107	39%	NA	NA	NA	0.39
Calcium	16	14	550	16	100%	410.81	Normal	Student's-t UCL	410.81
Cobalt	16	0.014	2.8	9	56%	NA	NA	NA	2.8
Copper	275	0.002	0.62	238	87%	0.08	Nonparametric	97.5% Chebyshev	0.08
Cyanide	15	0.012	0.012	1	7%	NA	NA	NA	0.012
Iron	16	0.12	2200	10	63%	NA	NA	NA	2200
Lead	275	0.001	0.018	25	9%	NA	NA	NA	0.018
Magnesium	16	4.9	1300	16	100%	411.16	Gamma	Approximate gamma UCL	411.16
Manganese	275	0.001	1400	264	96%	198.38	Nonparametric	99% Chebyshev	198.38
Nickel	16	0.061	0.63	8	50%	NA	NA	NA	0.63
Silver	16	0.013	0.02	3	19%	NA	NA	NA	0.02
Sulfate	15	26	7100	15	100%	6,388.00	Nonparametric	97.5% Chebyshev	6,388.00
Thallium	26	0.0014	0.16	3	12%	NA	NA	NA	0.16
Vanadium	16	0.019	0.019	1	6%	NA	NA	NA	0.019
Zinc	275	0.01	540	233	85%	NA	NA	NA	540

Notes:

A UCL95 was estimated only if n>10 and the detection frequency >85%

Includes 2005 and 2006 ground water data in the UCL calculation

NA - Not applicable

All fractions used since otherwise sulfate and magnesium could not be evaluated

Table 33 Summary Statistics and EPCs by Exposure Area for Boulder Tier II COPCs

Table 33 - Summary Statistics and EPCs by Exposure Area for Boulder Tier II COPCs s									
Analyte	**n**	**Minimum Detected Value (mg/kg)**	**Maximum Detected Value (mg/kg)**	**Number of Detects**	**Detection Frequency**	**UCL95 (mg/kg)**	**Distribution**	**ProUCL Recommended Statistic**	**Tier II EPC**
Arsenic	16	0.6	1500	15	94%	701	Lognormal	99% Chebyshev (MVUE) UCL	701
Cadmium	16	0.1	15	5	31%	NA	NA	NA	15
Chromium	16	1.9	34	16	100%	22.3	Normal	Student's-t UCL	22.3
Copper	16	0.3	720	16	100%	346	Non-parametric	99% Chebyshev (Mean, Sd) UCL	346
Lead	16	2.3	1400	16	100%	967	Non-parametric	99% Chebyshev (Mean, Sd) UCL	967
Manganese	16	15	2900	16	100%	2657	Lognormal	99% Chebyshev (MVUE) UCL	2657
Zinc	16	7.3	2400	16	100%	566	Lognormal	95% Chebyshev (MVUE) UCL	566

Notes:

A UCL95 was estimated only if n>10 and the detection frequency >85%

NA - Not applicable

Table 34 Summary Statistics and EPCs by Exposure Area for Diversion Trench Surface Water Tier II COPCs

Table 34 - Summary Statistics and EPCs by Exposure Area for Diversion Trench Surface Water Tier II COPCs									
Analyte	**n**	**Minimum Detected Value (mg/L)**	**Maximum Detected Value (mg/L)**	**Number of Detects**	**Detection Frequency**	**UCL95 (mg/L)**	**Distribution**	**ProUCL Recommended Statistic**	**Tier II EPC**
Arsenic	4	0.01	0.01	1	25%	NA	NA	NA	0.01
Manganese	4	0.03	1.90	4	100%	NA	NA	NA	1.90

Notes:

A UCL95 was estimated only if n>10 and the detection frequency >85%

NA - Not applicable

Table 35 Summary Statistics and EPCs by Exposure Area for Seep Tier II COPCs

Table 35 - Summary Statistics and EPCs by Exposure Area for Seep Tier II COPCs									
Analyte	**n**	**Minimum Detected Value (mg/L)**	**Maximum Detected Value (mg/L)**	**Number of Detects**	**Detection Frequency**	**UCL95 (mg/L)**	**Distribution**	**ProUCL Recommended Statistic**	**Tier I EPC (mg/L)**
Cadmium	5	0.00	0.00	1	20%	NA	NA	NA	0.001
Manganese	5	1.20	33.00	5	100%	NA	NA	NA	33.00
Zinc	5	0.08	4.90	5	100%	NA	NA	NA	4.90

Notes:
A UCL95 was estimated only if n>10 and the detection frequency >85%
Blank cells indicate analyte not detected
NA - Not applicable

Table 36 Bioaccumulation Factors and Tier II EPCs for Fish Tissue

Table 36 - Bioaccumulation Factors and Tier II EPCs for Fish Tissue			
Analyte	**Tier II Surface Water EPC (mg/L)**	**Bioaccumulation Factor (BAF)[1]**	**Estimated Fish Tissue EPC (mg/kg wwb)**
Cadmium	0.0014	200	0.28
Lead	0.0075	300	2.24
Manganese	0.2859	400	114.38
Zinc	0.4808	1000	480.85

Notes:
wwb - wet weight basis
1 - RAIS Chemical Specific Factors. August 24, 2006. http://risk.lsd.ornl.gov/cgi-bin/tox/TOX_select?select=csf

3.2.5.2 Exposure Parameters

Exposure parameters are the variables that make up the exposure equation(s). They can be receptor or chemical-specific, or general and not vary by receptor or chemical. There are high end or upper-bound exposure parameters referred to as reasonable maximum exposure (RME) parameters (EPA, 1989), and there are average or central tendency exposure ("CTE") parameters. The RME parameters represent the highest level, but not worst case, for which receptors would reasonably be expected to be exposed. The CTE parameters represent exposure for the average receptor. Table 37 presents the RME receptor-specific exposure parameters. Chemical-specific parameters are shown in Table 38.

3.2.5.3 Daily Intakes

The daily intakes for each pathway and scenario combination were calculated using the equations (EPA, 1989; EPA, 2004a) shown in Figures 5 and 6. Different equations are used to estimate carcinogenic and noncarcinogenic intakes.

The Particulate Emission Factor ("PEF") in m^3/kg, used to estimate air concentrations based on surface soil particulate emissions, was estimated as follows (EPA, 2004a):

PEF = Q/C * (3600 sec/hr) * [0.036 *(1-V)*(Um/Ut)3 * F(x)]-1 = 1.10E+09

Where:

Q/C = Inverse Mean Concentration at Square Source Center (gram per meter squared per second per kilogram per meter cubed) (g/m^2-sec per kg/m^3)), Denver Area (75.59)

Table 37 Reasonable Maximum Exposure (RME) Parameters

Table 37 - Reasonable Maximum Exposure (RME) Parameters

Exposure Pathway	Exposure Parameter		Units	Receptors													
				On-Site Resident			Hiker			Rafter		Angler		Golfer		Construction Worker	
				Child	Adult	Source	Child	Adult	Source	Adult	Source	Adult	Source	Adult	Source	Adult	Source
General	Exposure Frequency	(EF)	day/yr	350	350	*1*	100	100	*2*	100	*2*	100	*2*	100	*2*	250	*1*
	Exposure Duration	(ED_i)	yr	6	24	*1*	6	24	*1*	30	*2*	30	*2*	30	*2*	2	*1*
	Body Weight	(BW_i)	kg	15	70	*1*	15	70	*1*	70	*1*	70	*1*	70	*1*	70	*1*
	Averaging Time - Cancer	(ATc)	days	25550	25550	*1*	25550	25550	*1*	25550	*1*	25550	*1*	25550	*1*	25550	*1*
	Averaging Time - Noncancer	(AT)	days	2190	8760	*1*	2190	8760	*1*	10950	*1*	10950	*1*	10950	*1*	730	*1*
	Mass Conversion Factor	(CF)	kg/mg	1.0E-06	1.0E-06	*1*	1.0E-06	1.0E-06	*1*	1.0E-06	*1*	1.0E-06	*1*	1.0E-06	*1*	1.0E-06	*1*
Surface Soil Ingestion	Soil Ingestion Rate	(IRS_i)	mg/day	200	100	*1*	100	50	*2*	NA		NA		50	*2*	330	*3*
Surface Soil Dermal Contact	Surface Area - Soil Contact	(SAS_i)	cm^2	2800	5700	*1*	2800	5700	*1*	NA		NA		5300	*2*	3300	*1*
	Event Frequency	(EV)	ev/day	1	1		1	1		NA		NA		1		1	
	Adherence Factor	(AF_i)	mg/cm^2 or mg/cm^2-ev	0.2	0.07	*1*	0.2	0.07	*1*	NA		0.07	*1*	0.07	*1*	0.3	*4*
Particulate Inhalation	Particulate Emission Factor	(PEF)	m^3/kg	1.1.E+09	1.1.E+09		1.1.E+09	1.1.E+09		1.1.E+09		1.1.E+09		1.1.E+09		1.1.E+09	
	Exposure Time	(ET)	unitless	1.0.E+00	1.0.E+00	*4*	1.7.E-01	1.7.E-01	*4*	1.7.E-01	*4*	1.7.E-01	*4*	1.7.E-01	*4*	3.3.E-01	*4*
Subsurface Soil Ingestion	Soil Ingestion Rate	(IRS_i)	mg/day	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	330	*3*
Subsurface Soil Dermal Contact	Surface Area - Soil Contact	(SAS_i)	cm^2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3300	*1*
	Adherence Factor	(AF_i)	mg/cm^2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.3	*4*
Boulders	Ingestion Rate	IRRC	mg/day	25	10	*2*	25	10	*2*	NA		NA		NA		NA	
Sediment	Exposure Frequency - Swimming, wading	(EFsw)	day/yr	150	150	*2*	100	100	*2*	100	*2*	100	*2*	NA		100	*2*
	Sediment Ingestion Rate	(IRSed)	mg/day	50	25	*2*	50	25	*2*	50	*2*	50	*2*	NA		50	*2*
Sediment Dermal Contact	Surface Area - Sediment Contact	(SASD)	cm^2	1122	1490	*2*	1122	1490	*2*	1490	*2*	1490	*2*	NA		3300	*1*
	Adherence Factor Sediment	(AFsed)	mg/cm^2	1	0.63	*2*	1	0.63	*2*	0.63	*2*	0.63	*2*			0.3	*4*
Ingestion of Surface Water, Seeps, Diversion Trench Water During Recreational Use	Incidental Water Ingestion Rate	($IRSW_i$)	L/day	0.05	0.029	*6*	0.025	0.01	*6*	0.05	*6*	0.05	*6*	NA		0.01	*6*
	Exposure Frequency - Swimming, wading	(EFsw)	day/yr	150	150	*2*	100	100	*2*	100	*2*	100	*2*	NA		100	*2*

Table 37 - Reasonable Maximum Exposure (RME) Parameters

Exposure Pathway	Exposure Parameter		Units	Receptors													
				On-Site Resident			Hiker			Rafter		Angler		Golfer		Construction Worker	
				Child	Adult	Source	Child	Adult	Source	Adult	Source	Adult	Source	Adult	Source	Adult	Source
Dermal Contact with Surface Water, Seeps, Diversion Trench Water During Recreational Use	Surface Area - Potable Use	(SAW_i)	cm^2	6600	18000	*8*	6600	18000	*8*	18000	*8*	18000	*8*	NA		18000	*8*
	Surface Area - Swimming, wading	($SAWS_i$)	cm^2	6600	18000	*8*	6600	18000	*8*	18000	*8*	18000	*8*	NA		18000	*8*
	Event Frequency	(EVsw)	ev/day	1	1		1	1		1		1		1		1	
	Volumetric Conversion Factor	(CFv)	L/cm^3	0.001	0.001		0.001	0.001		0.001		0.001		0.001		0.001	
	Exposure Time - Swimming, wading	(Tev)	hr/event	1	0.58	*8*	**0.5**	**0.2**	*2*	**1**	*2*	**1**	*2*	NA		**0.2**	*2*
Fish Ingestion	Fish Ingestion Rate (dwb)	(IRF_i)	mg/day	22700	60500	*7*	NA	NA		NA		60500	*7*	NA		NA	
	Exposure Frequency - Fish	(EFfish)	day/yr	225	225	*2*	NA	NA		NA		225	*2*	NA		NA	
Ingestion of Groundwater	Drinking Water Ingestion Rate	(IRW_i)	L/day	1.0	2.0	*1*	NA	NA		NA		NA		NA		NA	
Groundwater Dermal Contact	Surface Area - Potable Use	(SAW_i)	cm^2	6600	18000	*8*	6600	18000	*8*	18000	*8*	18000	*8*	NA		18000	*8*
	Event Frequency	(EVgw)	ev/day	1	1		1	1		1		1		1		1	
	Volumetric Conversion Factor	(CFv)	L/cm^3	0.001	0.001		0.001	0.001		0.001		0.001		0.001		0.001	
	Exposure Time - Bathing	(TBev)	hr/event	1	0.580	*8; 35 min*	NA	NA		NA		NA		NA		NA	

Notes:

i = child (c); adult (a); resident (r)[sum of adult and child]

Construction worker is protective of other workers; see text

Sources: "c" indicates source applies to child value only, "a" indicates source applies to adult only

1. EPA (2004a). 2004 Region 9 PRG Table.

2. Assumed based on professional judgment

3. Construction worker IRS: Default recommended value (EPA, 2002c)

4. ET assumes 24 h/ 24 h for residents; 4 hr/24 hr for recreationalists; 8 hr/24 hr workers

5. Child Inhalation Rate: EPA, 2006

*6. Incidental water ingestion during swimming/wading based on 0.05 L/hr (EPA, 1989) * exposure time*

7. Fish Ingestion Rate: Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000), EPA-822-B-00-004, October 2000. Converted to dry weight basis using a value of 70% moisture (EPA, 1997b).

8. RAGS E. 2004.

V = Fraction of vegetative cover (unitless) (0.5)

Um = Mean Annual Windspeed (meter per second (m/sec)) (4.69)

Ut = Equivalent Threshold Windspeed at 7 m Above Ground (m/sec) (11.32)

F(x) = Cowherd Function (unitless) (0.194)

Exposure parameters and assumptions for the pathways quantitatively evaluated under each scenario are described below.

Future Residents

Exposure for future residents is quantified with the chronic daily intake ("CDI") equations shown for each medium and route of exposure in Figures 5 and 6. Each of the pathways identified as potentially complete and significant in Figure 4 was quantified. Age-adjusted equations were used to assess potential cancer risk (Figure 6). The age adjusted equations were obtained or inferred from EPA Region 9 PRG Guidance (EPA, 2004a).

The age adjusted equations, for which the parameters are defined in Table 37 above, for future residents are as follows:

Description Value			*Equation*	*Value*
Age-adjusted Ingestion Rate for Soils (mg-yr/kg-d)	(IRSadj)	=	[(EDc*IRSc)/BWc + (EDr-EDc*IRSa)/BWa]	114
Age-adjusted Ingestion rate for Potable Use Ground water (L-yr/kg-d)	(IRWadj)	=	[(EDc*IRWc)/BWc + (EDr-EDc*IRWa)/BWa]	1.1
Age-adjusted Ingestion Rate for Fish (mg-yr/kg-d)	(IRFadj)	=	[(EDc*IRFc)/BWc + (EDr-EDc*IRFa)/BWa]	29822.9
Age-adjusted Ingestion rate for Incidental Use Surface Water (L-yr/kg-d)	(IRSWadj)	=	[(EDc*IRSWc)/BWc + (EDr-EDc*IRSWa)/BWa]	0.037
Age-adjusted Ingestion Rate for Sediments (mg-yr/kg-d)	($IRSed_{adj}$)	=	[(EDc*IRSedc)/BWc + (EDr-EDc*IRSeda)/BWa]	28.6
Boulder Ingestion Rate (mg-yr/kg-d)	(IRRCadj)	=	(EDc*IRRCc)/BWc +[(EDr-EDc)*IRRCa]/BWa	13.4
Dermal Contact with Soil (mg-yr/kg-d)	(SFSadj)	=	EDc*AF*SAc/BWc+(EDr-EDc)*AF*SAa/BWa	360.8
Dermal Contact with Surface Water (yr-cm2-hr/kg-ev)	(SFWadj)	=	ED*SAc*tevc/BWc+(EDr-EDc)*SAa*teva/BWa	6219.4

Description Value			*Equation*	*Value*
Dermal Contact with Sediment (mg-yr/kg-d)	SFSDadj)	=	EDc*AFsed*SAc/BWc+(EDr-EDc)*AFsed*SAa/BWa	770.6
Dermal Contact with Ground Water(yr-cm2-hr/kg-ev)	(SFGWadj)	=	EDc*SAW*TBevc/BWc+(EDr -EDc)*SAWa*TBeva/BWa	6219.4

c - child; a - adult; r - resident

There will be residents living close to or within the mine site under future redevelopment plans. Adult and child residents are assumed to be potentially exposed to surface soil at a frequency of 350 days/year for a duration of six years for a child and 24 years for an adult (Table 37). This is conservative as snow cover would reduce actual exposure in most years.

The soil ingestion rate used in the evaluation of incidental ingestion is 200 mg/day for the child and 100 mg/day for the adult as recommended in EPA (EPA, 2004a). The body weight is 15 kg for the child and 70 kg for the adult (EPA, 2004a). A value of 25,550 days was used as the lifetime averaging time for carcinogenic risk. The noncarcinogenic averaging time is 2,190 days for the child and 8,760 days for the adult based on the proposed exposure durations.

Particulates in ambient air can enter the home and settle on surfaces as house dust or be inhaled. Inhalation of particulates in indoor air is addressed herein as part of the ambient air pathway. The chemical specific particulate emission factor was calculated in accordance with the 2002 EPA Supplemental Soil Screening Guidance (EPA, 2002c).

Ground water, surface water, and water from seeps may be contacted by residents. The potable use ingestion rate for ground water was 2 L/day for adults and 1 L/day for children (EPA, 2004a).

Where data were lacking, professional judgment was used to address potential exposure. For example, it is unlikely that boulders (in the form of rock chips beaten off of the rocks) will be ingested at a high rate on a daily basis year in and year out. Therefore, professional judgment was used to arrive at a reasonable maximum estimate for boulder ingestion (Table 37).

Figure 5 Noncancer Intake Equations for Residential Receptors

Receptor Type	*Noncancer Intakes by Exposure Pathway*
	Surface Soil Ingestion
Adult, Child	CDIsi = Cs * IRS * CF * EF * ED/ (BW *ATn)
Age Averaged	CDIsi = Cs * IRSadj * CF * EF / (ATr)
	Surface Soil Dermal Contact
Adult, Child	CDIsd = Cs * AF * ABS * CF * EV * SAS * EF * ED/ (BW *ATn)
Age Averaged	CDIsd = Cs * ABS * SFSadj * CF * EV * EF / (ATr)
	Particulate Inhalation
Adult, Child	CDIap = Cs * ET * EF * ED/ (ATn * PEF)
Age Averaged	CDIap = Cs * ET * EF * ED / (ATr * PEF)
	Ground Water Potable Use Ingestion
Adult, Child	CDIgwi = Cgw * IRW * EF * ED/ (BW *ATn)
Age Averaged	CDIgwi = Cgw * IRWadj * EF / (ATr)
	Ground Water Potable Use Dermal Contact
Adult, Child	CDIgwd = Cgw * CFv * Kp * TB_{ev} * EV_{GW} * SAW * EF * ED/ (BW *ATn)
Age Averaged	CDIgwd = Cgw * CFv * Kp *EV_{GW} * SFGWadj * EF / (ATr)
	Surface Water, Diversion Trench, or Seep Incidental Ingestion
Adult, Child	CDIswi = Csw * IRSW * EFsw * ED/ (BW *ATn)
Age Averaged	CDIswi = Csw * IRSWadj * EFsw / (ATr)
	Surface Water, Diversion Trench, or Seep Dermal Contact
Adult, Child	CDIswd = Csw * CFv * Kp * T_{ev} * EV_{SW} * SAW * EF_{SW} * ED/ (BW *ATn)
Age Averaged	CDIswd = Csw * CFv * Kp *EV_{SW} * SFWadj * EF_{SW} / (ATr)
	Sediment Incidental Ingestion
Adult, Child	CDIsedi = Csed * IRSed * CF* EFsw * ED/ (BW *ATn)
Age Averaged	CDIsedi = Csed * $IRSed_{adj}$ * CF * EFsw / (ATr)
	Sediment Dermal Contact
Adult, Child	CDIsed = Csed * AF_{sed} * ABS * CF * EV_{SW} * SASD * EF_{SW} * ED/ (BW *ATn)
Age Averaged	CDIsed = Csed * ABS * SFSDadj * CF * EV_{SW} * EF_{SW} / (ATr)
	Fish Ingestion
Adult, Child	CDIfish = Csw * BAF * IRF * CF* EFfish * ED/ (BW *ATn)

Receptor Type	*Noncancer Intakes by Exposure Pathway*
Age Averaged	CDIfish = Csw * BAF * IRFadj * CF * EFfish / (ATr)
	Boulder Ingestion
Adult, Child	CDIrc = Crc * IRRC * CF* EF * ED/ (BW *ATn)
Age Averaged	CDIrc = Crc * IRRCadj * CF * EF / (ATr)

*ATn-noncancer = ED*365 day/yr*
*ATr-resident = 30 yr * 365 day/yr*
Parameters defined in Table 37

Figure 6 Cancer Intake Equations for Residential Receptors

Receptor Type	Cancer Intakes by Exposure Pathway
	Surface Soil Ingestion
Age Averaged	CDIsi = Cs * IRSadj * CF * EF / (ATc)
	Surface Soil Dermal Contact
Age Averaged	CDIsd = Cs * SFSadj * ABS * CF * EV * EF / (ATc)
	Particulate Inhalation
Age Averaged	CDIap = Cs * ET * EF * ED / (ATc * PEF)
	Ground water Potable Use Ingestion
Age Averaged	CDIgwi = Cgw * IRWadj * EF / (ATc)
	Ground Water Potable Use Dermal Contact
Age Averaged	CDIgwd = Cgw * CFv * Kp *EV_{GW} * SFGWadj * EF / (ATc)
	Surface Water, Diversion Trench, or Seep Incidental Ingestion
Age Averaged	CDIswi = Csw * IRSWadj * EFsw / (ATc)
	Surface Water, Diversion Trench, or Seep Dermal Contact
Age Averaged	CDIswd = Csw * CFv * Kp * EV_{SW} * SFWadj * EF_{SW} / (ATr)
	Sediment Incidental Ingestion
Age Averaged	CDIsedi = Csed * IRSedadj * CF * EFsw / (ATc)
	Sediment Dermal Contact
Age Averaged	CDIsedd = Csed * SFSDadj * ABS * CF * EV_{sw} * EF_{sw} / (ATc)
	Fish Ingestion
Age Averaged	CDIfish = Csw * BAF * IRFadj * CF * EFfish / (ATc)
	Boulder Ingestion
Age Averaged	CDIrc = Crc * IRRCadj * CF * EF / (ATc)

*ATc – cancer averaging time = 70 yr*365 day/yr*
Parameters defined in Table 37

Incidental ingestion of surface water or seep water during swimming or wading may occur, although less water is ingested during swimming than during potable use. Ingestion of sediments can also occur during wading or swimming. Winter weather would preclude wading, swimming, and even gathering water for potable use if the stream is frozen. Thus, the wading and swimming scenarios were assumed limited to the months of May through September (150 days/yr) since snow and freezing conditions are common at this elevation during the other months of the year.

The RME default fish ingestion rate is 17.5 g/day (EPA, 2000a) for evaluating lifetime exposures of 365 days/year for 70 years. Information for the western U.S. indicates most respondents consume 1 to 5 servings of fish per month (Exposure Factors Handbook Table 10-48; EPA, 1997b). Because the area is on a popular stretch of river for fishing, a fish ingestion rate based on the catch limits (2 fish per day) and the number of meals/month (calculated using number of meals/week) was developed by CDPHE. The catch limit is two fish per day. The Colorado Division of Wildlife ("CDOW") evaluated historical data for fish from the Eagle River through the annual fish shocking program, and found that the average weight of fish in the 10 to 13 inch range is 206 g. If at least two fish are caught each week, the total fish weight is at least 400 g. The edible fraction is 0.25 to 0.5, depending on the species (EPA, 1997b), as the remainder is lost during preparation (i.e., deboning, skinning, filleting). Two fish could be considered a meal, and it was assumed that fishing success was 16 fish per month. This is eight meals/month where the meal size for an adult weighing 70 kg is a default value of 227 g (8 oz portion of uncooked fish (EPA, 2000b), or about ½ the weight of two whole fish). For children younger than four years old, the assumed meal size was a default value of 85 g (3 oz portion of uncooked fish) (EPA, 2000b). The fish intake rate is thus:

Adult fish intake rate = 8 meals/month x 227 g/meal x 1 month/30 days = 60.5 g/day

Child fish intake rate = 8 meals/month x 85 g/meal x 1 month/30 days = 22.7g/day

The proposed RME exposure frequency of 180 days accounts for 6-8 months of successful fishing in a year. To be conservative, data from CDOW were used that indicated fishing could occur 225 days per year. It is assumed that this fishing effort results in a successful catch.

The chemical- specific parameters for absorption from soils (ABS) and uptake from water (the permeability coefficient Kp) used to assess dermal uptake are as follows:

COPC	*Absorption Coefficient [ABS] (unitless)*	*Permeability Coefficient [Kp] (cm/hr)*
Aluminum		1.00E-03
Antimony		1.00E-03
Arsenic	0.03	1.00E-03
Barium		1.00E-03
Beryllium		1.00E-03
Cadmium	0.001	1.00E-03
Calcium		1.00E-03
Chromium		1.00E-03
Cobalt		1.00E-03
Copper		1.00E-03
Cyanide		1.00E-03
Iron		1.00E-03
Lead		1.00E-04
Magnesium		1.00E-03
Manganese		1.00E-03
Mercury		1.00E-03
Nickel		2.00E-04
Selenium		1.00E-03
Silver		6.00E-04
Sulfate		1.00E-03
Thallium		1.00E-03
Vanadium		1.00E-03
Zinc		6.00E-04

Notes:
Shaded cells - default value applied; result may be more uncertain
Source: Exhibit 3-1. RAGS E, 2004.

These chemical-specific parameters apply to evaluation of dermal uptake for recreational and worker receptors as well as for residents.

Recreationalists

Recreationalists are people who use the area for hiking, fishing, picnicking, or other recreational purposes. Exposure for current and future recreationalists is quantified with the equations shown in Figure 7. There are four recreational receptors for which risk estimates are quantified:

- Hikers,
- Rafters,
- Anglers, and
- Golfers.

It was assumed that the hikers would include adults and children, whereas rafters, anglers, and golfers would be primarily adults or people over the age of six. Adult and child recreationalists are assumed to be potentially exposed to surface soil for 100 days/year, for a period of six years for a child and 24 years for an adult (EPA, 2004a). Recreationalists are not expected to contact subsurface soil; thus, exposure to this medium was not evaluated.

Age adjustment is required for the hiker since there is an adult and child component to this exposure. The other recreational receptors are modeled as adults only (Figure 7). The parameters for the age adjusted equations are found in Table 37. The age adjusted equations for hikers are as follows:

Description		*Equation*	*Value*
Age-adjusted Ingestion Rate for Soils (mg-yr/kg-d)	(IRSadj)	= [(EDc*IRSc)/BWc + (Edr-Edc*IRSa)/Bwa]	57.1
Age-adjusted Ingestion rate for Incidental Use Surface Water (L-yr/kg-d)	(IRSWadj)	= [(Edc*IRSWc)/BWc + (Edr-Edc*IRSWa)/Bwa]	0.013
Age-adjusted Ingestion Rate for Sediments (mg-yr/kg-d)	($IRSed_{adj}$)	= [(Edc*IRSedc)/BWc + (Edr-Edc*IRSeda)/Bwa]	28.6
Age-adjusted Ingestion Rate for Boulders (mg-yr/kg-d)	(IRRCadj)	= [(Edc*IRRCc)/BWc + (Edr-Edc*IRRCa)/Bwa]	13.4
Dermal Contact with Soil (mg-yr/kg-d)	(SFSadj)	= EDc*AF*SASc/BWc+(EDr-EDc)*AF*SASa/BWa	360.8
Dermal Contact with Surface Water (yr-cm2-hr/kg-ev)	(SFWadj)	= ED*SAWc*tevc/BWc+(EDr-EDc)*SAWa*teva/BWa	2554.3
Dermal Contact with Sediment (mg-yr/kg-d)	SFSDadj)	= EDc*AFsed*SAc/BWc+(EDr-EDc)*AFsed*SAa/BWa	770.6

Notes: a – adult, c - child

Figure 7 Noncancer and Cancer Intake Equations for Recreational Receptors

Receptor Type	*Noncancer Intakes by Exposure Pathway*	*Cancer Intakes by Exposure Pathway*
	Surface Soil Ingestion	
Adult	CDIsi = Cs * IRS * CF * EF * ED/ (BW *ATn)	CDIsi = Cs * IRS * CF * EF * ED/ (BW *ATc)
Age Averaged	CDIsi = Cs * IRSadj * CF * EF / (ATr)	CDIsi = Cs * IRSadj * CF * EF / (ATc)
	Surface Soil Dermal Contact	
Adult	CDIsd = Cs * AF * ABS * CF * EV * SAS * EF * ED/ (BW *ATn)	CDIsd = Cs * AF * ABS * CF * EV * SAS * EF * ED/ (BW *ATc)
Age Averaged	CDIsd = Cs * ABS * SFSadj * CF * EV * EF/ (ATr)	CDIsd = Cs * SFSadj * ABS * CF * EV * EF / (ATc)
	Particulate Inhalation	
Adult	CDIap = Cs * ET * EF * ED/ (ATn * PEF)	CDIap = Cs * ET * EF * ED/ (ATc * PEF)
Age Averaged	CDIap = Cs * ET * EF * ED / (ATr * PEF)	CDIap = Cs * ET * EF * ED / (ATc * PEF)
	Surface Water, Diversion Trench, or Seep Incidental Ingestion	
Adult	CDIswi = Csw * IRSW * EFsw * ED/ (BW *ATn)	CDIswi = Csw * IRSW * EFsw * ED/ (BW *ATc)
Age Averaged	CDIswi = Csw * IRSWadj * EFsw / (ATr)	CDIswi = Csw * IRSWadj * EFsw / (ATc)
	Surface Water, Diversion Trench, or Seep Dermal Contact	
Adult	CDIswd = Csw * CFv * Kp * T_{ev} * EV_{SW} * SAW * EF_{SW} * ED/ (BW *ATn)	CDIswd = Csw * CFv * Kp * T_{ev} * EV_{SW} * SAW * EF_{SW} * ED/ (BW *ATc)
Age Averaged	CDIswd = Csw * CFv * Kp *EV_{SW} * SFWadj * EF_{SW} / (ATr)	CDIswd = Csw * CFv * Kp * EV_{SW} * SFWadj * EF_{SW} / (ATc)
	Sediment Incidental Ingestion	
Adult	CDIsedi = Csed * IRSed * CF * EFsw * ED/ (BW *ATn)	CDIsedi = Csed * IRSed * CF * EFsw * ED/ (BW *ATc)
Age Averaged	CDIsedi = Csed * IRSedadj * CF * EFsw / (ATr)	CDIsedi = Csed * IRSedadj * CF * EFsw / (ATc)
	Sediment Dermal Contact	
Adult	CDIsedd = Csed * AF_{sed} * ABS * CF * EV_{SW} * SASD * EF_{SW} * ED/ (BW *ATn)	CDIsedd = Csed * AF_{sed} * ABS * CF * EV_{SW} * SASD * EF_{SW} * ED/ (BW *ATc)
Age Averaged	CDIsedd = Csed * ABS * SFSDadj * CF * EV_{SW} * EF_{SW} / (ATr)	CDIsedd = Csed * SFSDadj * ABS * CF * EV_{sw} * EF_{sw} / (ATc)
	Fish Ingestion	
Adult	CDIfish = Csw * BAF * IRF * CF* EFfish * ED/ (BW *ATn)	CDIfish = Csw * BAF * IRF * CF* EFfish * ED/ (BW *ATc)
	Boulder Ingestion	
Age Averaged	CDIrc = Crc * IRRCadj * CF * EF / (ATr)	CDIrc = Crc * IRRCadj * CF * EF / (ATc)

*ATn-noncancer = ED*365 day/yr*
*ATr-resident = 30 yr * 365 day/yr*
*ATc – cancer averaging time = 70 yr*365 day/yr*
Parameters defined in Table 37

The proposed soil ingestion rate used in the evaluation of incidental ingestion was 200 mg/day for the child and 100 mg/day for the adult as recommended in EPA (2004a). The body weight is 15 kg for the child and 70 kg for the adult (EPA, 2004a). A value of 25,550 days was used as the lifetime averaging time for carcinogenic risk (EPA, 2004a). The noncarcinogenic averaging time is 2190 days for the child and 8760 days for the adult based on the proposed exposure durations averaged over the course of 365 days (EPA, 2004a).

Some recreationalists might use surface water for potable uses during camping or fishing. However, it is more likely that surface water or water from seeps would be ingested incidentally during play by children or recreational activities.

Recreational anglers could ingest fish caught locally. Estimated concentrations of the surface water COPCs in fish were used to estimate EPCs for fish tissue. The fish ingestion rate of 60.5 g/day described above was applied to anglers. The proposed RME exposure frequency of 180 days accounts for 6-8 months of successful fishing in a year.

Construction Worker

The worker receptor includes future construction workers, grounds maintenance workers, golf course workers, and current and future forest management workers. The equations and parameters used to quantify exposure for potential future workers are shown in Figure 8. Construction worker parameters were used to model potential intakes.

Construction workers are assumed to be potentially exposed to surface soil (including waste rock or tailings) and subsurface soil for 8 hours per day, 250 days/year, for a period of 2 years. However, other workers could be employed for a long period of time, including golf course maintenance workers, groundskeepers, or forest management workers; these workers are unlikely to remain in any one exposure area 250 days per year, whereas a construction worker could potentially remain in one exposure area for a year or two. The soil ingestion rate used in the evaluation of incidental ingestion is for the construction worker is 330 mg/day for the adult construction worker as recommended by EPA (EPA, 1997b; EPA, 2004a). This could over-estimate exposure to other types of workers, for which soil ingestion rates are 100 mg/d. The body weight is assumed to be 70 kg. Additionally, 25,550 days was used as the averaging time for carcinogenic risk. The noncarcinogenic averaging time is 730 days based on the proposed exposure duration.

Figure 8 Noncancer and Cancer Intake Equations for Workers

Receptor Type	*Noncancer Intakes by Exposure Pathway*	*Cancer Intakes by Exposure Pathway*
	Surface or Subsurface Soil Ingestion	**Surface or Subsurface Soil Ingestion**
Adult	CDIsi = Cs * IRS * CF * EF * ED/ (BW *ATn)	CDIsi = Cs * IRS * CF * EF * ED/ (BW *ATc)
	Surface or Subsurface Soil Dermal Contact	**Surface or Subsurface Soil Contact**
Adult	CDIsd = Cs * AF * ABS * CF * EV * SAS * EF * ED/ (BW *ATn)	CDIsd = Cs * AF * ABS * CF * EV * SAS * EF * ED/ (BW *ATc)
	Particulate Inhalation	**Particulate Inhalation**
Adult	CDIap = Cs * ET * EF * ED/ (ATn * PEF)	CDIap = Cs * ET * EF * ED/ (ATc * PEF)
	Surface Water, Diversion Trench, or Seep Incidental Ingestion	**Surface Water, Diversion Trench, or Seep Incidental Ingestion**
Adult	CDIswi = Csw * IRSW * EFsw * ED/ (BW *ATn)	CDIswi = Csw * IRSW * EFsw * ED/ (BW *ATc)
	Surface Water, Diversion Trench, or Seep Dermal Contact	**Surface Water, Diversion Trench, or Seep Dermal Contact**
Adult	CDIswd = Csw * CFv * Kp * T_{ev} * EV_{SW} * SAW * EF_{SW} * ED/ (BW *ATn)	CDIswd = Csw * CFv * Kp * T_{ev} * EV_{SW} * SAW * EF_{SW} * ED/ (BW *ATc)
	Sediment Incidental Ingestion	**Sediment Incidental Ingestion**
Adult	CDIsedi = Csed * IRSed * CF * EFsw * ED/ (BW *ATn)	CDIsedi = Csed * IRSed * CF * EFsw * ED/ (BW *ATc)
	Sediment Dermal Contact	**Sediment Dermal Contact**
Adult	CDIsedd = Csed * AF_{sed} * ABS * CF * EV_{SW} * SASD * EF_{SW} * ED/ (BW *ATn)	CDIsedd = Csed * AF_{sed} * ABS * CF * EV_{SW} * SASD * EF_{SW} * ED/ (BW *ATc)
	Boulder Ingestion	**Boulder Ingestion**
Adult	CDIrc = Crc * IRRC * CF* EF * ED/ (BW *ATn)	CDIrc = Crc * IRRC * CF* EF * ED/ (BW *ATc)

*ATn-noncancer = ED*365 day/yr*
*ATc – cancer averaging time = 70 yr*365 day/yr*
Parameters defined in Table 37

The ingestion noncancer intake for construction workers is protective of other workers as shown for the intakes per unit of soil below:

Receptor	*Cs* *	*IRS* *	*CF* *	*EF* *	*ED/*	*(BW* *	*ATn)*	=	*x*
Construction Worker	1	330	10^{-6}	250	2	70	730	=	3.22E-6
Other Worker	1	100	10^{-6}	250	25	70	9125	=	9.78E-7

Parameters defined in Table 37

The higher averaging time and the lower soil ingestion rate of 100 mg/d (Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (EPA, 2001a)) make the total noncancer intake due to soil ingestion for other workers lower than the construction worker. Therefore, any noncancer risks due to soil ingestion predicted for construction workers would be slightly higher than those for other workers. There is only one carcinogen (arsenic) for which soil intakes is modeled; arsenic cancer intakes are 7.5 times higher for other workers than construction workers. For particulate inhalation, the risk estimates will be 25 times higher for any given analyte for other workers than the construction worker. However, intakes due to particulate inhalation are typically orders of magnitude lower than ingestion intakes. The worker risks will be addressed in the uncertainty analysis.

The estimated intakes for all receptors are shown by exposure media in Tables 38 through 46. Noncancer and cancer intakes are estimated separately.

Table 38 Noncancer Intakes – Surface Soil Pathways

Exposure Area	Analyte	On-Site Resident									Hiker									Rafter		Angler		Golfer			Worker		
		Incidental Ingestion (mg/kg-d)			Dermal Contact (mg/kg-d)			Particulate Inhalation (mg/m³)			Incidental Ingestion (mg/kg-d)			Dermal Contact (mg/kg-d)			Particulate Inhalation (mg/m³)			Incidental Ingestion (mg/kg-d)	Particulate Inhalation (mg/m³)	Incidental Ingestion (mg/kg-d)	Particulate Inhalation (mg/m³)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Particulate Inhalation (mg/m³)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Particulate Inhalation (mg/m³)
		Child	Adult	Age Averaged	Child	Adult	Age Averaged	Child	Adult	Age Averaged	Child	Adult	Age Averaged	Child	Adult	Age Averaged	Child	Adult	Age Averaged	Adult	Adult	Adult	Adult	Adult	Adult	Adult	Adult	Adult	Adult
Bolts Lake																													
	Aluminum	1.28E-01	1.37E-02	3.65E-02	0.00E+00	0.00E+00	0.00E+00	8.72E-06	8.72E-06	1.74E-06	1.83E-02	1.96E-03	5.22E-03	0.00E+00	0.00E+00	0.00E+00	2.49E-06	2.49E-06	4.98E-07	NA	2.49E-06	NA	2.49E-06	1.96E-03	0.00E+00	2.49E-06	3.23E-02	0.00E+00	6.23E-06
	Antimony	6.52E-04	6.99E-05	1.86E-04	0.00E+00	0.00E+00	0.00E+00	4.45E-08	4.45E-08	8.89E-09	9.32E-05	9.98E-06	2.66E-05	0.00E+00	0.00E+00	0.00E+00	1.27E-08	1.27E-08	2.54E-09	NA	1.27E-08	NA	1.27E-08	9.98E-06	0.00E+00	1.27E-08	1.65E-04	0.00E+00	3.18E-08
	Arsenic	1.28E-04	1.37E-05	3.65E-05	1.07E-05	1.64E-06	3.46E-06	8.72E-09	8.72E-09	1.74E-09	1.83E-05	1.96E-06	5.22E-06	3.07E-06	4.68E-07	9.88E-07	2.49E-09	2.49E-09	4.98E-10	NA	2.49E-09	NA	2.49E-09	1.96E-06	4.36E-07	2.49E-09	3.23E-05	2.91E-06	6.23E-09
	Barium	6.90E-03	7.40E-04	1.97E-03	0.00E+00	0.00E+00	0.00E+00	4.71E-07	4.71E-07	9.41E-08	9.86E-04	1.06E-04	2.82E-04	0.00E+00	0.00E+00	0.00E+00	1.34E-07	1.34E-07	2.69E-08	NA	1.34E-07	NA	1.34E-07	1.06E-04	0.00E+00	1.34E-07	1.74E-03	0.00E+00	3.36E-07
	Beryllium	1.01E-04	1.08E-05	2.89E-05	0.00E+00	0.00E+00	0.00E+00	6.89E-09	6.89E-09	1.38E-09	1.44E-05	1.55E-06	4.12E-06	0.00E+00	0.00E+00	0.00E+00	1.97E-09	1.97E-09	3.94E-10	NA	1.97E-09	NA	1.97E-09	1.55E-06	0.00E+00	1.97E-09	2.55E-05	0.00E+00	4.92E-09
	Cadmium	2.94E-05	3.15E-06	8.40E-06	8.23E-08	1.26E-08	2.65E-08	2.00E-09	2.00E-09	4.01E-10	4.20E-06	4.50E-07	1.20E-06	2.35E-08	3.59E-09	7.58E-09	5.73E-10	5.73E-10	1.15E-10	NA	5.73E-10	NA	5.73E-10	4.50E-07	3.34E-09	5.73E-10	7.43E-06	2.23E-08	1.43E-09
	Chromium	2.05E-04	2.19E-05	5.84E-05	0.00E+00	0.00E+00	0.00E+00	1.39E-08	1.39E-08	2.79E-09	2.92E-05	3.13E-06	8.35E-06	0.00E+00	0.00E+00	0.00E+00	3.99E-09	3.99E-09	7.97E-10	NA	3.99E-09	NA	3.99E-09	3.13E-06	0.00E+00	3.99E-09	5.17E-05	0.00E+00	9.96E-09
	Copper	2.73E-04	2.93E-05	7.81E-05	0.00E+00	0.00E+00	0.00E+00	1.86E-08	1.86E-08	3.73E-09	3.91E-05	4.18E-06	1.12E-05	0.00E+00	0.00E+00	0.00E+00	5.33E-09	5.33E-09	1.07E-09	NA	5.33E-09	NA	5.33E-09	4.18E-06	0.00E+00	5.33E-09	6.90E-05	0.00E+00	1.33E-08
	Cyanide	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Iron	2.17E+00	2.33E-01	6.21E-01	0.00E+00	0.00E+00	0.00E+00	1.48E-04	1.48E-04	2.96E-05	3.11E-01	3.33E-02	8.87E-02	0.00E+00	0.00E+00	0.00E+00	4.23E-05	4.23E-05	8.47E-06	NA	4.23E-05	NA	4.23E-05	3.33E-02	0.00E+00	4.23E-05	5.49E-01	0.00E+00	1.06E-04
	Lead	8.69E-04	9.32E-05	2.48E-04	0.00E+00	0.00E+00	0.00E+00	5.93E-08	5.93E-08	1.19E-08	1.24E-04	1.33E-05	3.55E-05	0.00E+00	0.00E+00	0.00E+00	1.69E-08	1.69E-08	3.39E-09	NA	1.69E-08	NA	1.69E-08	1.33E-05	0.00E+00	1.69E-08	2.20E-04	0.00E+00	4.23E-08
	Manganese	6.90E-03	7.40E-04	1.97E-03	0.00E+00	0.00E+00	0.00E+00	4.71E-07	4.71E-07	9.41E-08	9.86E-04	1.06E-04	2.82E-04	0.00E+00	0.00E+00	0.00E+00	1.34E-07	1.34E-07	2.69E-08	NA	1.34E-07	NA	1.34E-07	1.06E-04	0.00E+00	1.34E-07	1.74E-03	0.00E+00	3.36E-07
	Mercury	6.39E-07	6.85E-08	1.83E-07	0.00E+00	0.00E+00	0.00E+00	4.36E-11	4.36E-11	8.72E-12	9.13E-08	9.78E-09	2.61E-08	0.00E+00	0.00E+00	0.00E+00	1.25E-11	1.25E-11	2.49E-12	NA	1.25E-11	NA	1.25E-11	9.78E-09	0.00E+00	1.25E-11	1.61E-07	0.00E+00	3.11E-11
	Nickel	9.08E-04	9.73E-05	2.59E-04	0.00E+00	0.00E+00	0.00E+00	6.19E-08	6.19E-08	1.24E-08	1.30E-04	1.39E-05	3.71E-05	0.00E+00	0.00E+00	0.00E+00	1.77E-08	1.77E-08	3.54E-09	NA	1.77E-08	NA	1.77E-08	1.39E-05	0.00E+00	1.77E-08	2.29E-04	0.00E+00	4.42E-08
	Selenium	1.28E-03	1.37E-04	3.65E-04	0.00E+00	0.00E+00	0.00E+00	8.72E-08	8.72E-08	1.74E-08	1.83E-04	1.96E-05	5.22E-05	0.00E+00	0.00E+00	0.00E+00	2.49E-08	2.49E-08	4.98E-09	NA	2.49E-08	NA	2.49E-08	1.96E-05	0.00E+00	2.49E-08	3.23E-04	0.00E+00	6.23E-08
	Silver	2.68E-04	2.88E-05	7.67E-05	0.00E+00	0.00E+00	0.00E+00	1.83E-08	1.83E-08	3.66E-09	3.84E-05	4.11E-06	1.10E-05	0.00E+00	0.00E+00	0.00E+00	5.23E-09	5.23E-09	1.05E-09	NA	5.23E-09	NA	5.23E-09	4.11E-06	0.00E+00	5.23E-09	6.78E-05	0.00E+00	1.31E-08
	Thallium	3.32E-03	3.56E-04	9.50E-04	0.00E+00	0.00E+00	0.00E+00	2.27E-07	2.27E-07	4.53E-08	4.75E-04	5.09E-05	1.36E-04	0.00E+00	0.00E+00	0.00E+00	6.48E-08	6.48E-08	1.30E-08	NA	6.48E-08	NA	6.48E-08	5.09E-05	0.00E+00	6.48E-08	8.40E-04	0.00E+00	1.62E-07
	Vanadium	1.41E-03	1.51E-04	4.02E-04	0.00E+00	0.00E+00	0.00E+00	9.59E-08	9.59E-08	1.92E-08	2.01E-04	2.15E-05	5.74E-05	0.00E+00	0.00E+00	0.00E+00	2.74E-08	2.74E-08	5.48E-09	NA	2.74E-08	NA	2.74E-08	2.15E-05	0.00E+00	2.74E-08	3.55E-04	0.00E+00	6.85E-08
	Zinc	4.86E-03	5.21E-04	1.39E-03	0.00E+00	0.00E+00	0.00E+00	3.31E-07	3.31E-07	6.63E-08	6.94E-04	7.44E-05	1.98E-04	0.00E+00	0.00E+00	0.00E+00	9.46E-08	9.46E-08	1.89E-08	NA	9.46E-08	NA	9.46E-08	7.44E-05	0.00E+00	9.46E-08	1.23E-03	0.00E+00	2.37E-07
Maloit Park																													
	Aluminum	3.84E-01	4.11E-02	1.10E-01	0.00E+00	0.00E+00	0.00E+00	2.62E-05	2.62E-05	5.23E-06	5.48E-02	5.87E-03	1.57E-02	0.00E+00	0.00E+00	0.00E+00	7.47E-06	7.47E-06	1.49E-06	NA	7.47E-06	NA	7.47E-06	5.87E-03	0.00E+00	7.47E-06	9.69E-02	0.00E+00	1.87E-05
	Antimony	1.53E-04	1.64E-05	4.38E-05	0.00E+00	0.00E+00	0.00E+00	1.05E-08	1.05E-08	2.09E-09	2.19E-05	2.35E-06	6.26E-06	0.00E+00	0.00E+00	0.00E+00	2.99E-09	2.99E-09	5.98E-10	NA	2.99E-09	NA	2.99E-09	2.35E-06	0.00E+00	2.99E-09	3.87E-05	0.00E+00	7.47E-09
	Arsenic	4.79E-03	5.14E-04	1.37E-03	4.03E-04	6.15E-05	1.30E-04	3.27E-07	3.27E-07	6.54E-08	6.85E-04	7.34E-05	1.96E-04	1.15E-04	1.76E-05	3.71E-05	9.34E-08	9.34E-08	1.87E-08	NA	9.34E-08	NA	9.34E-08	7.34E-05	1.63E-05	9.34E-08	1.21E-03	1.09E-04	2.33E-07
	Barium	4.47E-03	4.79E-04	1.28E-03	0.00E+00	0.00E+00	0.00E+00	3.05E-07	3.05E-07	6.10E-08	6.39E-04	6.85E-05	1.83E-04	0.00E+00	0.00E+00	0.00E+00	8.72E-08	8.72E-08	1.74E-08	NA	8.72E-08	NA	8.72E-08	6.85E-05	0.00E+00	8.72E-08	1.13E-03	0.00E+00	2.18E-07
	Beryllium	1.79E-05	1.92E-06	5.11E-06	0.00E+00	0.00E+00	0.00E+00	1.22E-09	1.22E-09	2.44E-10	2.56E-06	2.74E-07	7.31E-07	0.00E+00	0.00E+00	0.00E+00	3.49E-10	3.49E-10	6.97E-11	NA	3.49E-10	NA	3.49E-10	2.74E-07	0.00E+00	3.49E-10	4.52E-06	0.00E+00	8.72E-10
	Cadmium	7.16E-05	7.67E-06	2.05E-05	2.00E-07	3.06E-08	6.46E-08	4.88E-09	4.88E-09	9.76E-10	1.02E-05	1.10E-06	2.92E-06	5.73E-08	8.75E-09	1.85E-08	1.39E-09	1.39E-09	2.79E-10	NA	1.39E-09	NA	1.39E-09	1.10E-06	8.13E-09	1.39E-09	1.81E-05	5.42E-08	3.49E-09
	Chromium	3.20E-04	3.42E-05	9.13E-05	0.00E+00	0.00E+00	0.00E+00	2.18E-08	2.18E-08	4.36E-09	4.57E-05	4.89E-06	1.30E-05	0.00E+00	0.00E+00	0.00E+00	6.23E-09	6.23E-09	1.25E-09	NA	6.23E-09	NA	6.23E-09	4.89E-06	0.00E+00	6.23E-09	8.07E-05	0.00E+00	1.56E-08
	Copper	1.07E-02	1.15E-03	3.06E-03	0.00E+00	0.00E+00	0.00E+00	7.31E-07	7.31E-07	1.46E-07	1.53E-03	1.64E-04	4.38E-04	0.00E+00	0.00E+00	0.00E+00	2.09E-07	2.09E-07	4.18E-08	NA	2.09E-07	NA	2.09E-07	1.64E-04	0.00E+00	2.09E-07	2.71E-03	0.00E+00	5.22E-07
	Cyanide	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Iron	3.20E+00	3.42E-01	9.13E-01	0.00E+00	0.00E+00	0.00E+00	2.18E-04	2.18E-04	4.36E-05	4.57E-01	4.89E-02	1.30E-01	0.00E+00	0.00E+00	0.00E+00	6.23E-05	6.23E-05	1.25E-05	NA	6.23E-05	NA	6.23E-05	4.89E-02	0.00E+00	6.23E-05	8.07E-01	0.00E+00	1.56E-04
	Lead	4.73E-02	5.07E-03	1.35E-02	0.00E+00	0.00E+00	0.00E+00	3.23E-06	3.23E-06	6.45E-07	6.76E-03	7.24E-04	1.93E-03	0.00E+00	0.00E+00	0.00E+00	9.22E-07	9.22E-07	1.84E-07	NA	9.22E-07	NA	9.22E-07	7.24E-04	0.00E+00	9.22E-07	1.19E-02	0.00E+00	2.30E-06
	Manganese	1.01E-01	1.08E-02	2.89E-02	0.00E+00	0.00E+00	0.00E+00	6.89E-06	6.89E-06	1.38E-06	1.44E-02	1.55E-03	4.12E-03	0.00E+00	0.00E+00	0.00E+00	1.97E-06	1.97E-06	3.94E-07	NA	1.97E-06	NA	1.97E-06	1.55E-03	0.00E+00	1.97E-06	2.55E-02	0.00E+00	4.92E-06
	Mercury	1.53E-05	1.64E-06	4.38E-06	0.00E+00	0.00E+00	0.00E+00	1.05E-09	1.05E-09	2.09E-10	2.19E-06	2.35E-07	6.26E-07	0.00E+00	0.00E+00	0.00E+00	2.99E-10	2.99E-10	5.98E-11	NA	2.99E-10	NA	2.99E-10	2.35E-07	0.00E+00	2.99E-10	3.87E-06	0.00E+00	7.47E-10
	Nickel	3.84E-04	4.11E-05	1.10E-04	0.00E+00	0.00E+00	0.00E+00	2.62E-08	2.62E-08	5.23E-09	5.48E-05	5.87E-06	1.57E-05	0.00E+00	0.00E+00	0.00E+00	7.47E-09	7.47E-09	1.49E-09	NA	7.47E-09	NA	7.47E-09	5.87E-06	0.00E+00	7.47E-09	9.69E-05	0.00E+00	1.87E-08
	Selenium	2.81E-05	3.01E-06	8.04E-06	0.00E+00	0.00E+00	0.00E+00	1.92E-09	1.92E-09	3.84E-10	4.02E-06	4.31E-07	1.15E-06	0.00E+00	0.00E+00	0.00E+00	5.48E-10	5.48E-10	1.10E-10	NA	5.48E-10	NA	5.48E-10	4.31E-07	0.00E+00	5.48E-10	7.10E-06	0.00E+00	1.37E-09
	Silver	5.11E-04	5.48E-05	1.46E-04	0.00E+00	0.00E+00	0.00E+00	3.49E-08	3.49E-08	6.97E-09	7.31E-05	7.83E-06	2.09E-05	0.00E+00	0.00E+00	0.00E+00	9.96E-09	9.96E-09	1.99E-09	NA	9.96E-09	NA	9.96E-09	7.83E-06	0.00E+00	9.96E-09	1.29E-04	0.00E+00	2.49E-08
	Thallium	1.53E-04	1.64E-05	4.38E-05	0.00E+00	0.00E+00	0.00E+00	1.05E-08	1.05E-08	2.09E-09	2.19E-05	2.35E-06	6.26E-06	0.00E+00	0.00E+00	0.00E+00	2.99E-09	2.99E-09	5.98E-10	NA	2.99E-09	NA	2.99E-09	2.35E-06	0.00E+00	2.99E-09	3.87E-05	0.00E+00	7.47E-09
	Vanadium	6.26E-04	6.71E-05	1.79E-04	0.00E+00	0.00E+00	0.00E+00	4.27E-08	4.27E-08	8.54E-09	8.95E-05	9.59E-06	2.56E-05	0.00E+00	0.00E+00	0.00E+00	1.22E-08	1.22E-08	2.44E-09	NA	1.22E-08	NA	1.22E-08	9.59E-06	0.00E+00	1.22E-08	1.58E-04	0.00E+00	3.05E-08
	Zinc	3.71E-02	3.97E-03	1.06E-02	0.00E+00	0.00E+00	0.00E+00	2.53E-06	2.53E-06	5.06E-07	5.30E-03	5.68E-04	1.51E-03	0.00E+00	0.00E+00	0.00E+00	7.22E-07	7.22E-07	1.44E-07	NA	7.22E-07	NA	7.22E-07	5.68E-04	0.00E+00	7.22E-07	9.36E-03	0.00E+00	1.81E-06
Old Tailings Pile (&Sump 3, Old Slurry Line)																													
	Aluminum	1.27E-01	1.36E-02	3.63E-02	0.00E+00	0.00E+00	0.00E+00	8.66E-06	8.66E-06	1.73E-06	1.81E-02	1.94E-03	5.18E-03	0.00E+00	0.00E+00	0.00E+00	2.47E-06	2.47E-06	4.95E-07	NA	2.47E-06	NA	2.47E-06	1.94E-03	0.00E+00	2.47E-06	3.21E-02	0.00E+00	6.19E-06
	Antimony	1.04E-04	1.11E-05	2.96E-05	0.00E+00	0.00E+00	0.00E+00	7.06E-09	7.06E-09	1.41E-09	1.48E-05	1.59E-06	4.23E-06	0.00E+00	0.00E+00	0.00E+00	2.02E-09	2.02E-09	4.03E-10	NA	2.02E-09	NA	2.02E-09	1.59E-06	0.00E+00	2.02E-09	2.62E-05	0.00E+00	5.04E-09
	Arsenic	7.03E-04	7.53E-05	2.01E-04	5.91E-05	9.02E-06	1.90E-05	4.79E-08	4.79E-08	9.59E-09	1.00E-04	1.08E-05	2.87E-05	1.69E-05	2.58E-06	5.44E-06	1.37E-08	1.37E-08	2.74E-09	NA	1.37E-08	NA	1.37E-08	1.08E-05	2.40E-06	1.37E-08	1.78E-04	1.60E-05	3.42E-08
	Barium	2.30E-03	2.47E-04	6.58E-04	0.00E+00	0.00E+00	0.00E+00	1.57E-07	1.57E-07	3.14E-08	3.29E-04	3.52E-05	9.39E-05	0.00E+00	0.00E+00	0.00E+00	4.48E-08	4.48E-08	8.97E-09	NA	4.48E-08	NA	4.48E-08	3.52E-05	0.00E+00	4.48E-08	5.81E-04	0.00E+00	1.12E-07
	Beryllium	1.53E-05	1.64E-06	4.38E-06	0.00E+00	0.00E+00	0.00E+00	1.05E-09	1.05E-09	2.09E-10	2.19E-06	2.35E-07	6.26E-07	0.00E+00	0.00E+00	0.00E+00	2.99E-10	2.99E-10	5.98E-11	NA	2.99E-10	NA	2.99E-10	2.35E-07	0.00E+00	2.99E-10	3.87E-06	0.00E+00	7.47E-10
	Cadmium	1.27E-04	1.36E-05	3.62E-05	3.54E-07	5.41E-08	1.14E-07	8.63E-09	8.63E-09	1.73E-09	1.81E-05	1.94E-06	5.17E-06	1.01E-07	1.55E-08	3.26E-08	2.47E-09	2.47E-09	4.93E-10	NA	2.47E-09	NA	2.47E-09	1.94E-06	1.44E-08	2.47E-09	3.20E-05	9.59E-08	6.16E-09
	Chromium	2.05E-04	2.19E-05	5.84E-05	0.00E+00	0.00E+00	0.00E+00	1.39E-08	1.39E-08	2.79E-09	2.92E-05	3.13E-06	8.35E-06	0.00E+00	0.00E+00	0.00E+00	3.99E-09	3.99E-09	7.97E-10	NA	3.99E-09	NA	3.99E-09	3.13E-06	0.00E+00	3.99E-09	5.17E-05	0.00E+00	9.96E-09
	Copper	6.26E-04	6.71E-05	1.79E-04	0.00E+00	0.00E+00	0.00E+00	4.27E-08	4.27E-08	8.54E-09	8.95E-05	9.59E-06	2.56E-05	0.00E+00	0.00E+00	0.00E+00	1.22E-08	1.22E-08	2.44E-09	NA	1.22E-08	NA	1.22E-08	9.59E-06	0.00E+00	1.22E-08	1.58E-04	0.00E+00	3.05E-08
	Cyanide	4.60E-04	4.93E-05	1.32E-04	0.00E+00	0.00E+00	0.00E+00	3.14E-08	3.14E-08	6.28E-09	6.58E-05	7.05E-06	1.88E-05	0.00E+00	0.00E+00	0.00E+00	8.97E-09	8.97E-09	1.79E-09	NA	8.97E-09	NA	8.97E-09	7.05E-06	0.00E+00	8.97E-09	1.16E-04	0.00E+00	2.24E-08
	Iron	8.57E-01	9.18E-02	2.45E-01	0.00E+00	0.00E+00	0.00E+00	5.84E-05	5.84E-05	1.17E-05	1.22E-01	1.31E-02	3.50E-02	0.00E+00	0.00E+00	0.00E+00	1.67E-05	1.67E-05	3.34E-06	NA	1.67E-05	NA	1.67E-05	1.31E-02	0.00E+00	1.67E-05	2.16E-01	0.00E+00	4.17E-05
	Lead	2.43E-03	2.60E-04	6.94E-04	0.00E+00	0.00E+00	0.00E+00	1.66E-07	1.66E-07	3.31E-08	3.47E-04	3.72E-05	9.92E-05	0.00E+00	0.00E+00	0.00E+00	4.73E-08	4.73E-08	9.46E-09	NA	4.73E-08	NA	4.73E-08	3.72E-05	0.00E+00	4.73E-08	6.14E-04	0.00E+00	1.18E-07
	Manganese	6.14E-03	6.58E-04	1.75E-03	0.00E+00	0.00E+00	0.00E+00	4.18E-07	4.18E-07	8.37E-08	8.77E-04	9.39E-05	2.50E-04	0.00E+00	0.00E+00	0.00E+00	1.20E-07	1.20E-07	2.39E-08	NA	1.20E-07	NA	1.20E-07	9.39E-05	0.00E+00	1.20E-07	1.55E-03	0.00E+00	2.99E-07
	Mercury	1.28E-05	1.37E-06	3.65E-06	0.00E+00	0.00E+00	0.00E+00	8.72E-10	8.72E-10	1.74E-10	1.83E-06	1.96E-07	5.22E-07	0.00E+00	0.00E+00	0.00E+00	2.49E-10	2.49E-10	4.98E-11	NA	2.49E-10	NA	2.49E-10	1.96E-07	0.00E+00	2.49E-10	3.23E-06	0.00E+00	6.23E-10
	Nickel	1.41E-04	1.51E-05	4.02E-05	0.00E+00	0.00E+00	0.00E+00	9.59E-09	9.59E-09	1.92E-09	2.01E-05	2.15E-06	5.74E-06	0.00E+00	0.00E+00	0.00E+00	2.74E-09	2.74E-09	5.48E-10	NA	2.74E-09	NA	2.74E-09	2.15E-06	0.00E+00	2.74E-09	3.55E-05	0.00E+00	6.85E-09
	Selenium	2.05E-05	2.19E-06	5.84E-06	0.00E+00	0.00E+00	0.00E+00	1.39E-09	1.39E-09	2.79E-10	2.92E-06	3.13E-07	8.35E-07	0.00E+00	0.00E+00	0.00E+00	3.99E-10	3.99E-10	7.97E-11	NA	3.99E-10	NA	3.99E-10	3.13E-07	0.00E+00	3.99E-10	5.17E-06	0.00E+00	9.96E-10
	Silver	5.63E-04	6.03E-05	1.61E-04	0.00E+00	0.00E+00	0.00E+00	3.84E-08	3.84E-08	7.67E-09	8.04E-05	8.61E-06	2.30E-05	0.00E+00	0.00E+00	0.00E+00	1.10E-08	1.10E-08	2.19E-09	NA	1.10E-08	NA	1.10E-08	8.61E-06	0.00E+00	1.10E-08	1.42E-04	0.00E+00	2.74E-08
	Thallium	1.79E-04	1.92E-05	5.11E-05	0.00E+00	0.00E+00	0.00E+00	1.22E-08	1.22E-08	2.44E-09	2.56E-05	2.74E-06	7.31E-06	0.00E+00	0.00E+00	0.00E+00	3.49E-09	3.49E-09	6.97E-10	NA	3.49E-09	NA	3.49E-09	2.74E-06	0.00E+00	3.49E-09	4.52E-05	0.00E+00	8.72E-09
	Vanadium	4.09E-04	4.38E-05	1.17E-04	0.00E+00	0.00E+00	0.00E+00	2.79E-08	2.79E-08	5.58E-09	5.84E-05	6.26E-06	1.67E-05	0.00E+00	0.00E+00	0.00E+00	7.97E-09	7.97E-09	1.59E-09	NA	7.97E-09	NA	7.97E-09	6.26E-06	0.00E+00	7.97E-09	1.03E-04	0.00E+00	1.99E-08
	Zinc	6.01E-03	6.44E-04	1.72E-03	0.00E+00	0.00E+00	0.00E+00	4.10E-07	4.10E-07	8.19E-08	8.58E-04	9.20E-05	2.45E-04	0.00E+00	0.00E+00	0.00E+00	1.17E-07	1.17E-07	2.34E-08	NA	1.17E-07	NA	1.17E-07	9.20E-05	0.00E+00	1.17E-07	1.52E-03	0.00E+00	2.93E-07
Rex Flats																													
	Aluminum	1.48E-01	1.58E-02	4.22E-02	0.00E+00	0.00E+00	0.00E+00	1.01E-05	1.01E-05	2.01E-06	2.11E-02	2.26E-03	6.03E-03	0.00E+00	0.00E+00	0.00E+00	2.88E-06	2.88E-06	5.76E-07	NA	2.88E-06	NA	2.88E-06	2.26E-03	0.00E+00	2.88E-06	3.73E-02	0.00E+00	7.19E-06
	Antimony	1.41E-04	1.51E-05	4.02E-05	0.00E+00	0.00E+00	0.00E+00	9.59E-09	9.59E-09	1.92E-09	2.01E-05	2.15E-06	5.74E-06	0.00E+00	0.00E+00	0.00E+00	2.74E-09	2.74E-09	5.48E-10	NA	2.74E-09	NA	2.74E-09	2.15E-06	0.00E+00	2.74E-09	3.55E-05	0.00E+00	6.85E-09
	Arsenic	5.63E-03	6.03E-04	1.61E-03	4.73E-04	7.21E-05	1.52E-04	3.84E-07	3.84E-07	7.67E-08	8.04E-04	8.61E-05	2.30E-04	1.35E-04	2.06E-05	4.35E-05	1.10E-07	1.10E-07	2.19E-08	NA	1.10E-07	NA	1.10E-07	8.61E-05	1.92E-05	1.10E-07	1.42E-03	1.28E-04	2.74E-07
	Barium	3.45E-03	3.70E-04	9.86E-04	0.00E+00	0.00E+00	0.00E+00	2.35E-07	2.35E-07	4.71E-08	4.93E-04	5.28E-05	1.41E-04	0.00E+00	0.00E+00	0.00E+00	6.72E-08	6.72E-08	1.34E-08	NA	6.72E-08	NA	6.72E-08	5.28E-05	0.00E+00	6.72E-08	8.72E-04	0.00E+00	1.68E-07
	Beryllium	1.79E-05	1.92E-06	5.11E-06	0.00E+00	0.00E+00	0.00E+00	1.22E-09	1.22E-09	2.44E-10	2.56E-06	2.74E-07	7.31E-07	0.00E+00	0.00E+00	0.00E+00	3.49E-10	3.49E-10	6.97E-11	NA	3.49E-10	NA	3.49E-10	2.74E-07	0.00E+00	3.49E-10	4.52E-06	0.00E+00	8.72E-10
	Cadmium	4.65E-05	4.98E-06	1.33E-05	1.30E-07	1.99E-08	4.20E-08	3.17E-09	3.17E-09	6.34E-10	6.64E-06	7.12E-07	1.90E-06	3.72E-08	5.68E-09	1.20E-08	9.06E-10	9.06E-10	1.81E-10	NA	9.06E-10	NA	9.06E-10	7.12E-07	5.28E-09	9.06E-10	1.17E-05	3.52E-08	2.27E-09
	Chromium	1.92E-04	2.05E-05	5.48E-05	0.00E+00	0.00E+00	0.00E+00	1.31E-08	1.31E-08	2.62E-09	2.74E-05	2.94E-06	7.83E-06	0.00E+00	0.00E+00	0.00E+00	3.74E-09	3.74E-09	7.47E-10	NA	3.74E-09	NA	3.74E-09	2.94E-06	0.00E+00	3.74E-09	4.84E-05	0.00E+00	9.34E-09
	Copper	1.59E-03	1.70E-04	4.54E-04	0.00E+00	0.00E+00	0.00E+00	1.08E-07	1.08E-07	2.16E-08	2.27E-04	2.43E-05	6.48E-05	0.00E+00	0.00E+00	0.00E+00	3.09E-08	3.09E-08	6.19E-09	NA	3.09E-08	NA	3.09E-08	2.43E-05	0.00E+00	3.09E-08	4.01E-04	0.00E+00	7.73E-08
	Cyanide	1.09E-05	1.16E-06	3.11E-06	0.00E+00	0.00E+00	0.00E+00	7.41E-10	7.41E-10	1.48E-10	1.55E-06	1.66E-07	4.44E-07	0.00E+00	0.00E+00	0.00E+00	2.12E-10	2.12E-10	4.23E-11	NA	2.12E-10	NA	2.12E-10	1.66E-07	0.00E+00	2.12E-10	2.74E-06	0.00E+00	5.29E-10
	Iron	1.53E+00	1.64E-01	4.38E-01	0.00E+00	0.00E+00	0.00E+00	1.05E-04	1.05E-04	2.09E-05	2.19E-01	2.35E-02	6.26E-02	0.00E+00	0.00E+00	0.00E+00	2.99E-05	2.99E-05	5.98E-06	NA	2.99E-05	NA	2.99E-05	2.35E-02	0.00E+00	2.99E-05	3.87E-01	0.00E+00	7.47E-05
	Lead	2.81E-02	3.01E-03	8.04E-03	0.00E+00	0.00E+00	0.00E+00	1.92E-06	1.92E-06	3.84E-07	4.02E-03	4.31E-04	1.15E-03	0.00E+00	0.00E+00	0.00E+00	5.48E-07	5.48E-07	1.10E-07	NA	5.48E-07	NA	5.48E-07	4.31E-04	0.00E+00	5.48E-07	7.10E-03	0.00E+00	1.37E-06
	Manganese	1.01E-02	1.08E-03	2.89E-03	0.00E+00	0.00E+00	0.00E+00	6.89E-07	6.89E-07	1.38E-07	1.44E-03	1.55E-04	4.12E-04	0.00E+00	0.00E+00	0.00E+00	1.97E-07	1.97E-07	3.94E-08	NA	1.97E-07	NA	1.97E-07	1.55E-04	0.00E+00	1.97E-07	2.55E-03	0.00E+00	4.92E-07
	Mercury	1.69E-05	1.81E-06	4.82E-06	0.00E+00	0.00E+00	0.00E+00	1.15E-09	1.15E-09	2.30E-10	2.41E-06	2.58E-07	6.89E-07	0.00E+00	0.00E+00	0.00E+00	3.29E-10	3.29E-10	6.58E-11	NA	3.29E-10	NA	3.29E-10	2.58E-07	0.00E+00	3.29E-10	4.26E-06	0.00E+00	8.22E-10
	Nickel	1.92E-04	2.05E-05	5.48E-05	0.00E+00	0.00E+00	0.00E+00	1.31E-08	1.31E-08	2.62E-09	2.74E-05	2.94E-06	7.83E-06	0.00E+00	0.00E+00	0.00E+00	3.74E-09	3.74E-09	7.47E-10	NA	3.74E-09	NA	3.74E-09	2.94E-06	0.00E+00	3.74E-09	4.84E-05	0.00E+00	9.34E-09
	Selenium	2.30E-05	2.47E-06	6.58E-06	0.00E+00	0.00E+00	0.00E+00	1.57E-09	1.57E-09	3.14E-10	3.29E-06	3.52E-07	9.39E-07	0.00E+00	0.00E+00	0.00E+00	4.48E-10	4.48E-10	8.97E-11	NA	4.48E-10	NA	4.48E-10	3.52E-07	0.00E+00	4.48E-10	5.81E-06	0.00E+00	1.12E-09
	Silver	6.65E-04	7.12E-05	1.90E-04	0.00E+00	0.00E+00	0.00E+00	4.53E-08	4.53E-08	9.07E-09	9.50E-05	1.02E-05	2.71E-05	0.00E+00	0.00E+00	0.00E+00	1.30E-08	1.30E-08	2.59E-09	NA	1.30E-08	NA	1.30E-08	1.02E-05	0.00E+00	1.30E-08	1.68E-04	0.00E+00	3.24E-08
	Thallium	2.30E-04	2.47E-05	6.58E-05	0.00E+00	0.00E+00	0.00E+00	1.57E-08	1.57E-08	3.14E-09	3.29E-05	3.52E-06	9.39E-06	0.00E+00	0.00E+00	0.00E+00	4.48E-09	4.48E-09	8.97E-10	NA	4.48E-09	NA	4.48E-09	3.52E-06	0.00E+00	4.48E-09	5.81E-05	0.00E+00	1.12E-08
	Vanadium	3.96E-04	4.25E-05	1.13E-04	0.00E+00	0.00E+00	0.00E+00	2.70E-08	2.70E-08	5.40E-09	5.66E-05	6.07E-06	1.62E-05	0.00E+00	0.00E+00	0.00E+00	7.72E-09	7.72E-09	1.54E-09	NA	7.72E-09	NA	7.72E-09	6.07E-06	0.00E+00	7.72E-09	1.00E-04	0.00E+00	1.93E-08
	Zinc	1.09E-02	1.16E-03	3.11E-03	0.00E+00	0.00E+00	0.00E+00	7.41E-07	7.41E-07	1.48E-07	1.55E-03	1.66E-04	4.44E-04	0.00E+00	0.00E+00	0.00E+00	2.12E-07	2.12E-07	4.23E-08	NA	2.12E-07	NA	2.12E-07	1.66E-04	0.00E+00	2.12E-07	2.74E-03	0.00E+00	5.29E-07
Roaster Pile 5																													
	Aluminum	1.25E-01	1.34E-02	3.58E-02	0.00E+00	0.00E+00	0.00E+00	8.54E-06	8.54E-06	1.71E-06	1.79E-02	1.92E-03	5.11E-03	0.00E+00	0.00E+00	0.00E+00	2.44E-06	2.44E-06	4.88E-07	NA	2.44E-06	NA	2.44E-06	1.92E-03	0.00E+00	2.44E-06	3.16E-02	0.00E+00	6.10E-06
	Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Arsenic	1.47E-03	1.58E-04	4.20E-04	1.24E-04	1.89E-05	3.98E-05	1.00E-07	1.00E-07	2.00E-08	2.10E-04	2.25E-05	6.00E-05	3.53E-05	5.39E-06	1.14E-05	2.86E-08	2.86E-08	5.73E-09	NA	2.86E-08	NA	2.86E-08	2.25E-05	5.01E-06	2.86E-08	3.71E-04	3.34E-05	7.16E-08
	Barium	3.45E-03	3.70E-04	9.86E-04	0.00E+00	0.00E+00	0.00E+00	2.35E-07	2.35E-07	4.71E-08	4.93E-04	5.28E-05	1.41E-04	0.00E+00	0.00E+00	0.00E+00	6.72E-08	6.72E-08	1.34E-08	NA	6.72E-08	NA	6.72E-08	5.28E-05	0.00E+00	6.72E-08	8.72E-04	0.00E+00	1.68E-07
	Beryllium	8.31E-06	8.90E-07	2.37E-06	0.00E+00	0.00E+00	0.00E+00	5.67E-10	5.67E-10	1.13E-10	1.19E-06	1.27E-07	3.39E-07	0.00E+00	0.00E+00	0.00E+00	1.62E-10	1.62E-10	3.24E-11	NA	1.62E-10	NA	1.62E-10	1.27E-07	0.00E+00	1.62E-10	2.10E-06	0.00E+00	4.05E-10
	Cadmium	1.21E-04	1.30E-05	3.47E-05	3.40E-07	5.19E-08	1.10E-07	8.28E-09	8.28E-09	1.66E-09	1.74E-05	1.86E-06	4.96E-06	9.72E-08	1.48E-08	3.13E-08	2.37E-09	2.37E-09	4.73E-10	NA	2.37E-09	NA	2.37E-09	1.86E-06	1.38E-08	2.37E-09	3.07E-05	9.20E-08	5.92E-09
	Chromium	1.66E-04	1.78E-05	4.75E-05	0.00E+00	0.00E+00	0.00E+00	1.13E-08	1.13E-08	2.27E-09	2.37E-05	2.54E-06	6.78E-06	0.00E+00	0.00E+00	0.00E+00	3.24E-09	3.24E-09	6.48E-10	NA	3.24E-09	NA	3.24E-09	2.54E-06	0.00E+00	3.24E-09	4.20E-05	0.00E+00	8.09E-09
	Copper	1.18E-03	1.26E-04	3.36E-04	0.00E+00	0.00E+00	0.00E+00	8.02E-08	8.02E-08	1.60E-08	1.68E-04	1.80E-05	4.80E-05	0.00E+00	0.00E+00	0.00E+00	2.29E-08	2.29E-08	4.58E-09	NA	2.29E-08	NA	2.29E-08	1.80E-05	0.00E+00	2.29E-08	2.97E-04	0.00E+00	5.73E-08
	Cyanide	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Iron	1.11E+00	1.19E-01	3.18E-01	0.00E+00	0.00E+00	0.00E+00	7.58E-05	7.58E-05	1.52E-05	1.59E-01	1.70E-02	4.54E-02	0.00E+00	0.00E+00	0.00E+00	2.17E-05	2.17E-05	4.33E-06	NA	2.17E-05	NA	2.17E-05	1.70E-02	0.00E+00	2.17E-05	2.81E-01	0.00E+00	5.42E-05
	Lead	2.30E-02	2.47E-03	6.58E-03	0.00E+00	0.00E+00	0.00E+00	1.57E-06	1.57E-06	3.14E-07	3.29E-03	3.52E-04	9.39E-04	0.00E+00	0.00E+00	0.00E+00	4.48E-07	4.48E-07	8.97E-08	NA	4.48E-07	NA	4.48E-07	3.52E-04	0.00E+00	4.48E-07	5.81E-03	0.00E+00	1.12E-06
	Manganese	2.68E-02	2.88E-03	7.67E-03	0.00E+00	0.00E+00	0.00E+00	1.83E-06	1.83E-06	3.66E-07	3.84E-03	4.11E-04	1.10E-03	0.00E+00	0.00E+00	0.00E+00	5.23E-07	5.23E-07	1.05E-07	NA	5.23E-07	NA	5.23E-07	4.11E-04	0.00E+00	5.23E-07	6.78E-03	0.00E+00	1.31E-06
	Mercury	9.21E-07	9.86E-08	2.63E-07	0.00E+00	0.00E+00	0.00E+00	6.28E-11	6.28E-11	1.26E-11	1.32E-07	1.41E-08	3.76E-08	0.00E+00	0.00E+00	0.00E+00	1.79E-11	1.79E-11	3.59E-12	NA	1.79E-11	NA	1.79E-11	1.41E-08	0.00E+00	1.79E-11	2.32E-07	0.00E+00	4.48E-11
	Nickel	1.92E-04	2.05E-05	5.48E-05	0.00E+00	0.00E+00	0.00E+00	1.31E-08	1.31E-08	2.62E-09	2.74E-05	2.94E-06	7.83E-06	0.00E+00	0.00E+00	0.00E+00	3.74E-09	3.74E-09	7.47E-10	NA	3.74E-09	NA	3.74E-09	2.94E-06	0.00E+00	3.74E-09	4.84E-05	0.00E+00	9.34E-09
	Selenium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Silver	3.58E-05	3.84E-06	1.02E-05	0.00E+00	0.00E+00	0.00E+00	2.44E-09	2.44E-09	4.88E-10	5.11E-06	5.48E-07	1.46E-06	0.00E+00	0.00E+00	0.00E+00	6.97E-10	6.97E-10	1.39E-10	NA	6.97E-10	NA	6.97E-10	5.48E-07	0.00E+00	6.97E-10	9.04E-06	0.00E+00	1.74E-09
	Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Vanadium	3.84E-04	4.11E-05	1.10E-04	0.00E+00	0.00E+00	0.00E+00	2.62E-08	2.62E-08	5.23E-09	5.48E-05	5.87E-06	1.57E-05	0.00E+00	0.00E+00	0.00E+00	7.47E-09	7.47E-09	1.49E-09	NA	7.47E-09	NA	7.47E-09	5.87E-06	0.00E+00	7.47E-09	9.69E-05	0.00E+00	1.87E-08
	Zinc	2.81E-02	3.01E-03	8.04E-03	0.00E+00	0.00E+00	0.00E+00	1.92E-06	1.92E-06	3.84E-07	4.02E-03	4.31E-04	1.15E-03	0.00E+00	0.00E+00	0.00E+00	5.48E-07	5.48E-07	1.10E-07	NA	5.48E-07	NA	5.48E-07	4.31E-04	0.00E+00	5.48E-07	7.10E-03	0.00E+00	1.37E-06

Notes:
A UCL95 was estimated only if n>10 and the detection frequency >85%
NA - Not applicable
Zeros indicate analyte not detected in surface soil at that location

Table 39 - Cancer Intakes – Surface Soil Pathway

Exposure Area	Analyte	On-Site Resident			Hiker			Rafter		Angler		Golfer			Worker		
		Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Particulate Inhalation (mg/m^3)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Particulate Inhalation (mg/m^3)	Incidental Ingestion (mg/kg-d)	Particulate Inhalation (mg/m^3)	Incidental Ingestion (mg/kg-d)	Particulate Inhalation (mg/m^3)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Particulate Inhalation (mg/m^3)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Particulate Inhalation (mg/m^3)
		Age Averaged	Age Averaged	Age Averaged	Age Averaged	Age Averaged	Age Averaged	Adult	Adult	Adult	Adult	Adult	Adult	Adult	Adult	Adult	Adult
Bolts Lake	Aluminum	1.57E-02	0.00E+00	9.09E-06	2.24E-03	0.00E+00	3.56E-08	NA	1.78E-07	NA	1.78E-07	8.39E-04	0.00E+00	1.78E-07	9.23E-04	0.00E+00	5.93E-08
	Antimony	7.98E-05	0.00E+00	4.64E-08	1.14E-05	0.00E+00	1.81E-10	NA	9.07E-10	NA	9.07E-10	4.28E-06	0.00E+00	9.07E-10	4.71E-06	0.00E+00	3.02E-10
	Arsenic	1.57E-05	1.48E-06	9.09E-09	2.24E-06	4.24E-07	3.56E-11	NA	1.78E-10	NA	1.78E-10	8.39E-07	1.87E-07	1.78E-10	9.23E-07	8.30E-08	5.93E-11
	Barium	8.45E-04	0.00E+00	4.91E-07	1.21E-04	0.00E+00	1.92E-09	NA	9.61E-09	NA	9.61E-09	4.53E-05	0.00E+00	9.61E-09	4.98E-05	0.00E+00	3.20E-09
	Beryllium	1.24E-05	0.00E+00	7.18E-09	1.77E-06	0.00E+00	2.81E-11	NA	1.41E-10	NA	1.41E-10	6.63E-07	0.00E+00	1.41E-10	7.29E-07	0.00E+00	4.68E-11
	Cadmium	3.60E-06	1.14E-08	2.09E-09	5.14E-07	3.25E-09	8.18E-12	NA	4.09E-11	NA	4.09E-11	1.93E-07	1.43E-09	4.09E-11	2.12E-07	6.37E-10	1.36E-11
	Chromium	2.50E-05	0.00E+00	1.45E-08	3.58E-06	0.00E+00	5.69E-11	NA	2.85E-10	NA	2.85E-10	1.34E-06	0.00E+00	2.85E-10	1.48E-06	0.00E+00	9.49E-11
	Copper	3.35E-05	0.00E+00	1.94E-08	4.78E-06	0.00E+00	7.61E-11	NA	3.80E-10	NA	3.80E-10	1.79E-06	0.00E+00	3.80E-10	1.97E-06	0.00E+00	1.27E-10
	Cyanide	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Iron	2.66E-01	0.00E+00	1.55E-04	3.80E-02	0.00E+00	6.05E-07	NA	3.02E-06	NA	3.02E-06	1.43E-02	0.00E+00	3.02E-06	1.57E-02	0.00E+00	1.01E-06
	Lead	1.06E-04	0.00E+00	6.18E-08	1.52E-05	0.00E+00	2.42E-10	NA	1.21E-09	NA	1.21E-09	5.70E-06	0.00E+00	1.21E-09	6.27E-06	0.00E+00	4.03E-10
	Manganese	8.45E-04	0.00E+00	4.91E-07	1.21E-04	0.00E+00	1.92E-09	NA	9.61E-09	NA	9.61E-09	4.53E-05	0.00E+00	9.61E-09	4.98E-05	0.00E+00	3.20E-09
	Mercury	7.83E-08	0.00E+00	4.55E-11	1.12E-08	0.00E+00	1.78E-13	NA	8.90E-13	NA	8.90E-13	4.19E-09	0.00E+00	8.90E-13	4.61E-09	0.00E+00	2.97E-13
	Nickel	1.11E-04	0.00E+00	6.45E-08	1.59E-05	0.00E+00	2.53E-10	NA	1.26E-09	NA	1.26E-09	5.95E-06	0.00E+00	1.26E-09	6.55E-06	0.00E+00	4.21E-10
	Selenium	1.57E-04	0.00E+00	9.09E-08	2.24E-05	0.00E+00	3.56E-10	NA	1.78E-09	NA	1.78E-09	8.39E-06	0.00E+00	1.78E-09	9.23E-06	0.00E+00	5.93E-10
	Silver	3.29E-05	0.00E+00	1.91E-08	4.70E-06	0.00E+00	7.47E-11	NA	3.74E-10	NA	3.74E-10	1.76E-06	0.00E+00	3.74E-10	1.94E-06	0.00E+00	1.25E-10
	Thallium	4.07E-04	0.00E+00	2.36E-07	5.81E-05	0.00E+00	9.25E-10	NA	4.63E-09	NA	4.63E-09	2.18E-05	0.00E+00	4.63E-09	2.40E-05	0.00E+00	1.54E-09
	Vanadium	1.72E-04	0.00E+00	1.00E-07	2.46E-05	0.00E+00	3.91E-10	NA	1.96E-09	NA	1.96E-09	9.23E-06	0.00E+00	1.96E-09	1.01E-05	0.00E+00	6.52E-10
	Zinc	5.95E-04	0.00E+00	3.45E-07	8.50E-05	0.00E+00	1.35E-09	NA	6.76E-09	NA	6.76E-09	3.19E-05	0.00E+00	6.76E-09	3.51E-05	0.00E+00	2.25E-09
Maloit Park	Aluminum	4.70E-02	0.00E+00	2.73E-05	6.71E-03	0.00E+00	1.07E-07	NA	5.34E-07	NA	5.34E-07	2.52E-03	0.00E+00	5.34E-07	2.77E-03	0.00E+00	1.78E-07
	Antimony	1.88E-05	0.00E+00	1.09E-08	2.68E-06	0.00E+00	4.27E-11	NA	2.13E-10	NA	2.13E-10	1.01E-06	0.00E+00	2.13E-10	1.11E-06	0.00E+00	7.12E-11
	Arsenic	5.87E-04	5.56E-05	3.41E-07	8.39E-05	1.59E-05	1.33E-09	NA	6.67E-09	NA	6.67E-09	3.15E-05	7.00E-06	6.67E-09	3.46E-05	3.11E-06	2.22E-09
	Barium	5.48E-04	0.00E+00	3.18E-07	7.83E-05	0.00E+00	1.25E-09	NA	6.23E-09	NA	6.23E-09	2.94E-05	0.00E+00	6.23E-09	3.23E-05	0.00E+00	2.08E-09
	Beryllium	2.19E-06	0.00E+00	1.27E-09	3.13E-07	0.00E+00	4.98E-12	NA	2.49E-11	NA	2.49E-11	1.17E-07	0.00E+00	2.49E-11	1.29E-07	0.00E+00	8.30E-12
	Cadmium	8.77E-06	2.77E-08	5.09E-09	1.25E-06	7.91E-09	1.99E-11	NA	9.96E-11	NA	9.96E-11	4.70E-07	3.48E-09	9.96E-11	5.17E-07	1.55E-09	3.32E-11
	Chromium	3.91E-05	0.00E+00	2.27E-08	5.59E-06	0.00E+00	8.90E-11	NA	4.45E-10	NA	4.45E-10	2.10E-06	0.00E+00	4.45E-10	2.31E-06	0.00E+00	1.48E-10
	Copper	1.31E-03	0.00E+00	7.63E-07	1.88E-04	0.00E+00	2.98E-09	NA	1.49E-08	NA	1.49E-08	7.04E-05	0.00E+00	1.49E-08	7.74E-05	0.00E+00	4.97E-09
	Cyanide	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Iron	3.91E-01	0.00E+00	2.27E-04	5.59E-02	0.00E+00	8.90E-07	NA	4.45E-06	NA	4.45E-06	2.10E-02	0.00E+00	4.45E-06	2.31E-02	0.00E+00	1.48E-06
	Lead	5.79E-03	0.00E+00	3.36E-06	8.28E-04	0.00E+00	1.32E-08	NA	6.58E-08	NA	6.58E-08	3.10E-04	0.00E+00	6.58E-08	3.41E-04	0.00E+00	2.19E-08
	Manganese	1.24E-02	0.00E+00	7.18E-06	1.77E-03	0.00E+00	2.81E-08	NA	1.41E-07	NA	1.41E-07	6.63E-04	0.00E+00	1.41E-07	7.29E-04	0.00E+00	4.68E-08
	Mercury	1.88E-06	0.00E+00	1.09E-09	2.68E-07	0.00E+00	4.27E-12	NA	2.13E-11	NA	2.13E-11	1.01E-07	0.00E+00	2.13E-11	1.11E-07	0.00E+00	7.12E-12
	Nickel	4.70E-05	0.00E+00	2.73E-08	6.71E-06	0.00E+00	1.07E-10	NA	5.34E-10	NA	5.34E-10	2.52E-06	0.00E+00	5.34E-10	2.77E-06	0.00E+00	1.78E-10
	Selenium	3.44E-06	0.00E+00	2.00E-09	4.92E-07	0.00E+00	7.83E-12	NA	3.91E-11	NA	3.91E-11	1.85E-07	0.00E+00	3.91E-11	2.03E-07	0.00E+00	1.30E-11
	Silver	6.26E-05	0.00E+00	3.64E-08	8.95E-06	0.00E+00	1.42E-10	NA	7.12E-10	NA	7.12E-10	3.35E-06	0.00E+00	7.12E-10	3.69E-06	0.00E+00	2.37E-10
	Thallium	1.88E-05	0.00E+00	1.09E-08	2.68E-06	0.00E+00	4.27E-11	NA	2.13E-10	NA	2.13E-10	1.01E-06	0.00E+00	2.13E-10	1.11E-06	0.00E+00	7.12E-11
	Vanadium	7.67E-05	0.00E+00	4.45E-08	1.10E-05	0.00E+00	1.74E-10	NA	8.72E-10	NA	8.72E-10	4.11E-06	0.00E+00	8.72E-10	4.52E-06	0.00E+00	2.91E-10
	Zinc	4.54E-03	0.00E+00	2.64E-06	6.49E-04	0.00E+00	1.03E-08	NA	5.16E-08	NA	5.16E-08	2.43E-04	0.00E+00	5.16E-08	2.68E-04	0.00E+00	1.72E-08

Table 39 - Cancer Intakes – Surface Soil Pathway

Exposure Area	Analyte	On-Site Resident			Hiker			Rafter		Angler		Golfer			Worker		
		Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Particulate Inhalation (mg/m^3)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Particulate Inhalation (mg/m^3)	Incidental Ingestion (mg/kg-d)	Particulate Inhalation (mg/m^3)	Incidental Ingestion (mg/kg-d)	Particulate Inhalation (mg/m^3)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Particulate Inhalation (mg/m^3)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Particulate Inhalation (mg/m^3)
		Age Averaged	Age Averaged	Age Averaged	Age Averaged	Age Averaged	Age Averaged	Adult	Adult	Adult	Adult	Adult	Adult	Adult	Adult	Adult	Adult
Old Tailings Pile (&Sump 3, Old Slurry Line)	Aluminum	1.56E-02	0.00E+00	9.03E-06	2.22E-03	0.00E+00	3.53E-08	NA	1.77E-07	NA	1.77E-07	8.33E-04	0.00E+00	1.77E-07	9.16E-04	0.00E+00	5.89E-08
	Antimony	1.27E-05	0.00E+00	7.36E-09	1.81E-06	0.00E+00	2.88E-11	NA	1.44E-10	NA	1.44E-10	6.79E-07	0.00E+00	1.44E-10	7.47E-07	0.00E+00	4.80E-11
	Arsenic	8.61E-05	8.16E-06	5.00E-08	1.23E-05	2.33E-06	1.96E-10	NA	9.78E-10	NA	9.78E-10	4.61E-06	1.03E-06	9.78E-10	5.07E-06	4.57E-07	3.26E-10
	Barium	2.82E-04	0.00E+00	1.64E-07	4.03E-05	0.00E+00	6.40E-10	NA	3.20E-09	NA	3.20E-09	1.51E-05	0.00E+00	3.20E-09	1.66E-05	0.00E+00	1.07E-09
	Beryllium	1.88E-06	0.00E+00	1.09E-09	2.68E-07	0.00E+00	4.27E-12	NA	2.13E-11	NA	2.13E-11	1.01E-07	0.00E+00	2.13E-11	1.11E-07	0.00E+00	7.12E-12
	Cadmium	1.55E-05	4.89E-08	9.00E-09	2.21E-06	1.40E-08	3.52E-11	NA	1.76E-10	NA	1.76E-10	8.30E-07	6.16E-09	1.76E-10	9.13E-07	2.74E-09	5.87E-11
	Chromium	2.50E-05	0.00E+00	1.45E-08	3.58E-06	0.00E+00	5.69E-11	NA	2.85E-10	NA	2.85E-10	1.34E-06	0.00E+00	2.85E-10	1.48E-06	0.00E+00	9.49E-11
	Copper	7.67E-05	0.00E+00	4.45E-08	1.10E-05	0.00E+00	1.74E-10	NA	8.72E-10	NA	8.72E-10	4.11E-06	0.00E+00	8.72E-10	4.52E-06	0.00E+00	2.91E-10
	Cyanide	5.64E-05	0.00E+00	3.27E-08	8.05E-06	0.00E+00	1.28E-10	NA	6.40E-10	NA	6.40E-10	3.02E-06	0.00E+00	6.40E-10	3.32E-06	0.00E+00	2.13E-10
	Iron	1.05E-01	0.00E+00	6.09E-05	1.50E-02	0.00E+00	2.38E-07	NA	1.19E-06	NA	1.19E-06	5.62E-03	0.00E+00	1.19E-06	6.18E-03	0.00E+00	3.97E-07
	Lead	2.97E-04	0.00E+00	1.73E-07	4.25E-05	0.00E+00	6.76E-10	NA	3.38E-09	NA	3.38E-09	1.59E-05	0.00E+00	3.38E-09	1.75E-05	0.00E+00	1.13E-09
	Manganese	7.51E-04	0.00E+00	4.36E-07	1.07E-04	0.00E+00	1.71E-09	NA	8.54E-09	NA	8.54E-09	4.03E-05	0.00E+00	8.54E-09	4.43E-05	0.00E+00	2.85E-09
	Mercury	1.57E-06	0.00E+00	9.09E-10	2.24E-07	0.00E+00	3.56E-12	NA	1.78E-11	NA	1.78E-11	8.39E-08	0.00E+00	1.78E-11	9.23E-08	0.00E+00	5.93E-12
	Nickel	1.72E-05	0.00E+00	1.00E-08	2.46E-06	0.00E+00	3.91E-11	NA	1.96E-10	NA	1.96E-10	9.23E-07	0.00E+00	1.96E-10	1.01E-06	0.00E+00	6.52E-11
	Selenium	2.50E-06	0.00E+00	1.45E-09	3.58E-07	0.00E+00	5.69E-12	NA	2.85E-11	NA	2.85E-11	1.34E-07	0.00E+00	2.85E-11	1.48E-07	0.00E+00	9.49E-12
	Silver	6.89E-05	0.00E+00	4.00E-08	9.84E-06	0.00E+00	1.57E-10	NA	7.83E-10	NA	7.83E-10	3.69E-06	0.00E+00	7.83E-10	4.06E-06	0.00E+00	2.61E-10
	Thallium	2.19E-05	0.00E+00	1.27E-08	3.13E-06	0.00E+00	4.98E-11	NA	2.49E-10	NA	2.49E-10	1.17E-06	0.00E+00	2.49E-10	1.29E-06	0.00E+00	8.30E-11
	Vanadium	5.01E-05	0.00E+00	2.91E-08	7.16E-06	0.00E+00	1.14E-10	NA	5.69E-10	NA	5.69E-10	2.68E-06	0.00E+00	5.69E-10	2.95E-06	0.00E+00	1.90E-10
	Zinc	7.36E-04	0.00E+00	4.27E-07	1.05E-04	0.00E+00	1.67E-09	NA	8.36E-09	NA	8.36E-09	3.94E-05	0.00E+00	8.36E-09	4.34E-05	0.00E+00	2.79E-09
Rex Flats	Aluminum	1.81E-02	0.00E+00	1.05E-05	2.58E-03	0.00E+00	4.11E-08	NA	2.06E-07	NA	2.06E-07	9.69E-04	0.00E+00	2.06E-07	1.07E-03	0.00E+00	6.85E-08
	Antimony	1.72E-05	0.00E+00	1.00E-08	2.46E-06	0.00E+00	3.91E-11	NA	1.96E-10	NA	1.96E-10	9.23E-07	0.00E+00	1.96E-10	1.01E-06	0.00E+00	6.52E-11
	Arsenic	6.89E-04	6.52E-05	4.00E-07	9.84E-05	1.86E-05	1.57E-09	NA	7.83E-09	NA	7.83E-09	3.69E-05	8.21E-06	7.83E-09	4.06E-05	3.65E-06	2.61E-09
	Barium	4.23E-04	0.00E+00	2.45E-07	6.04E-05	0.00E+00	9.61E-10	NA	4.80E-09	NA	4.80E-09	2.26E-05	0.00E+00	4.80E-09	2.49E-05	0.00E+00	1.60E-09
	Beryllium	2.19E-06	0.00E+00	1.27E-09	3.13E-07	0.00E+00	4.98E-12	NA	2.49E-11	NA	2.49E-11	1.17E-07	0.00E+00	2.49E-11	1.29E-07	0.00E+00	8.30E-12
	Cadmium	5.70E-06	1.80E-08	3.31E-09	8.14E-07	5.14E-09	1.29E-11	NA	6.47E-11	NA	6.47E-11	3.05E-07	2.26E-09	6.47E-11	3.36E-07	1.01E-09	2.16E-11
	Chromium	2.35E-05	0.00E+00	1.36E-08	3.35E-06	0.00E+00	5.34E-11	NA	2.67E-10	NA	2.67E-10	1.26E-06	0.00E+00	2.67E-10	1.38E-06	0.00E+00	8.90E-11
	Copper	1.94E-04	0.00E+00	1.13E-07	2.78E-05	0.00E+00	4.42E-10	NA	2.21E-09	NA	2.21E-09	1.04E-05	0.00E+00	2.21E-09	1.15E-05	0.00E+00	7.36E-10
	Cyanide	1.33E-06	0.00E+00	7.73E-10	1.90E-07	0.00E+00	3.02E-12	NA	1.51E-11	NA	1.51E-11	7.13E-08	0.00E+00	1.51E-11	7.84E-08	0.00E+00	5.04E-12
	Iron	1.88E-01	0.00E+00	1.09E-04	2.68E-02	0.00E+00	4.27E-07	NA	2.13E-06	NA	2.13E-06	1.01E-02	0.00E+00	2.13E-06	1.11E-02	0.00E+00	7.12E-07
	Lead	3.44E-03	0.00E+00	2.00E-06	4.92E-04	0.00E+00	7.83E-09	NA	3.91E-08	NA	3.91E-08	1.85E-04	0.00E+00	3.91E-08	2.03E-04	0.00E+00	1.30E-08
	Manganese	1.24E-03	0.00E+00	7.18E-07	1.77E-04	0.00E+00	2.81E-09	NA	1.41E-08	NA	1.41E-08	6.63E-05	0.00E+00	1.41E-08	7.29E-05	0.00E+00	4.68E-09
	Mercury	2.07E-06	0.00E+00	1.20E-09	2.95E-07	0.00E+00	4.70E-12	NA	2.35E-11	NA	2.35E-11	1.11E-07	0.00E+00	2.35E-11	1.22E-07	0.00E+00	7.83E-12
	Nickel	2.35E-05	0.00E+00	1.36E-08	3.35E-06	0.00E+00	5.34E-11	NA	2.67E-10	NA	2.67E-10	1.26E-06	0.00E+00	2.67E-10	1.38E-06	0.00E+00	8.90E-11
	Selenium	2.82E-06	0.00E+00	1.64E-09	4.03E-07	0.00E+00	6.40E-12	NA	3.20E-11	NA	3.20E-11	1.51E-07	0.00E+00	3.20E-11	1.66E-07	0.00E+00	1.07E-11
	Silver	8.14E-05	0.00E+00	4.73E-08	1.16E-05	0.00E+00	1.85E-10	NA	9.25E-10	NA	9.25E-10	4.36E-06	0.00E+00	9.25E-10	4.80E-06	0.00E+00	3.08E-10
	Thallium	2.82E-05	0.00E+00	1.64E-08	4.03E-06	0.00E+00	6.40E-11	NA	3.20E-10	NA	3.20E-10	1.51E-06	0.00E+00	3.20E-10	1.66E-06	0.00E+00	1.07E-10
	Vanadium	4.85E-05	0.00E+00	2.82E-08	6.93E-06	0.00E+00	1.10E-10	NA	5.52E-10	NA	5.52E-10	2.60E-06	0.00E+00	5.52E-10	2.86E-06	0.00E+00	1.84E-10
	Zinc	1.33E-03	0.00E+00	7.73E-07	1.90E-04	0.00E+00	3.02E-09	NA	1.51E-08	NA	1.51E-08	7.13E-05	0.00E+00	1.51E-08	7.84E-05	0.00E+00	5.04E-09
Roaster Pile 5	Aluminum	1.53E-02	0.00E+00	8.91E-06	2.19E-03	0.00E+00	3.49E-08	NA	1.74E-07	NA	1.74E-07	8.22E-04	0.00E+00	1.74E-07	9.04E-04	0.00E+00	5.81E-08
	Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Arsenic	1.80E-04	1.71E-05	1.05E-07	2.57E-05	4.87E-06	4.09E-10	NA	2.05E-09	NA	2.05E-09	9.64E-06	2.15E-06	2.05E-09	1.06E-05	9.55E-07	6.82E-10
	Barium	4.23E-04	0.00E+00	2.45E-07	6.04E-05	0.00E+00	9.61E-10	NA	4.80E-09	NA	4.80E-09	2.26E-05	0.00E+00	4.80E-09	2.49E-05	0.00E+00	1.60E-09

Table 39 - Cancer Intakes – Surface Soil Pathway

Exposure Area	Analyte	On-Site Resident			Hiker			Rafter		Angler		Golfer			Worker		
		Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Particulate Inhalation (mg/m^3)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Particulate Inhalation (mg/m^3)	Incidental Ingestion (mg/kg-d)	Particulate Inhalation (mg/m^3)	Incidental Ingestion (mg/kg-d)	Particulate Inhalation (mg/m^3)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Particulate Inhalation (mg/m^3)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Particulate Inhalation (mg/m^3)
		Age Averaged	Age Averaged	Age Averaged	Age Averaged	Age Averaged	Age Averaged	Adult	Adult	Adult	Adult	Adult	Adult	Adult	Adult	Adult	Adult
	Beryllium	1.02E-06	0.00E+00	5.91E-10	1.45E-07	0.00E+00	2.31E-12	NA	1.16E-11	NA	1.16E-11	5.45E-08	0.00E+00	1.16E-11	6.00E-08	0.00E+00	3.85E-12
	Cadmium	1.49E-05	4.70E-08	8.64E-09	2.12E-06	1.34E-08	3.38E-11	NA	1.69E-10	NA	1.69E-10	7.97E-07	5.91E-09	1.69E-10	8.76E-07	2.63E-09	5.63E-11
	Chromium	2.04E-05	0.00E+00	1.18E-08	2.91E-06	0.00E+00	4.63E-11	NA	2.31E-10	NA	2.31E-10	1.09E-06	0.00E+00	2.31E-10	1.20E-06	0.00E+00	7.71E-11
	Copper	1.44E-04	0.00E+00	8.36E-08	2.06E-05	0.00E+00	3.27E-10	NA	1.64E-09	NA	1.64E-09	7.72E-06	0.00E+00	1.64E-09	8.49E-06	0.00E+00	5.46E-10
	Cyanide	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Iron	1.36E-01	0.00E+00	7.91E-05	1.95E-02	0.00E+00	3.10E-07	NA	1.55E-06	NA	1.55E-06	7.30E-03	0.00E+00	1.55E-06	8.03E-03	0.00E+00	5.16E-07
	Lead	2.82E-03	0.00E+00	1.64E-06	4.03E-04	0.00E+00	6.40E-09	NA	3.20E-08	NA	3.20E-08	1.51E-04	0.00E+00	3.20E-08	1.66E-04	0.00E+00	1.07E-08
	Manganese	3.29E-03	0.00E+00	1.91E-06	4.70E-04	0.00E+00	7.47E-09	NA	3.74E-08	NA	3.74E-08	1.76E-04	0.00E+00	3.74E-08	1.94E-04	0.00E+00	1.25E-08
	Mercury	1.13E-07	0.00E+00	6.55E-11	1.61E-08	0.00E+00	2.56E-13	NA	1.28E-12	NA	1.28E-12	6.04E-09	0.00E+00	1.28E-12	6.64E-09	0.00E+00	4.27E-13
	Nickel	2.35E-05	0.00E+00	1.36E-08	3.35E-06	0.00E+00	5.34E-11	NA	2.67E-10	NA	2.67E-10	1.26E-06	0.00E+00	2.67E-10	1.38E-06	0.00E+00	8.90E-11
	Selenium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Silver	4.38E-06	0.00E+00	2.55E-09	6.26E-07	0.00E+00	9.96E-12	NA	4.98E-11	NA	4.98E-11	2.35E-07	0.00E+00	4.98E-11	2.58E-07	0.00E+00	1.66E-11
	Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Vanadium	4.70E-05	0.00E+00	2.73E-08	6.71E-06	0.00E+00	1.07E-10	NA	5.34E-10	NA	5.34E-10	2.52E-06	0.00E+00	5.34E-10	2.77E-06	0.00E+00	1.78E-10
	Zinc	3.44E-03	0.00E+00	2.00E-06	4.92E-04	0.00E+00	7.83E-09	NA	3.91E-08	NA	3.91E-08	1.85E-04	0.00E+00	3.91E-08	2.03E-04	0.00E+00	1.30E-08

Notes:

A UCL95 was estimated only if n>10 and the detection frequency >85%

Table 40 Noncancer and Cancer Intakes – Subsurface Soil Pathways

Table 40 - Noncancer and Cancer Intakes – Subsurface Soil Pathways

Exposure Area	Analyte	Worker Noncancer Intakes			Worker Cancer Intakes		
		Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Particulate Inhalation (mg/m^3)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Particulate Inhalation (mg/m^3)
Bolts Lake	Aluminum	1.45E-02	0.00E+00	9.34E-07	4.15E-04	0.00E+00	2.67E-08
	Arsenic	4.04E-05	3.63E-06	2.59E-09	1.15E-06	1.04E-07	7.41E-11
	Barium	1.03E-04	0.00E+00	6.64E-09	2.95E-06	0.00E+00	1.90E-10
	Beryllium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Chromium	6.46E-05	0.00E+00	4.15E-09	1.85E-06	0.00E+00	1.19E-10
	Iron	2.78E-02	0.00E+00	1.78E-06	7.93E-04	0.00E+00	5.10E-08
	Lead	9.04E-05	0.00E+00	5.81E-09	2.58E-06	0.00E+00	1.66E-10
	Manganese	8.72E-04	0.00E+00	5.60E-08	2.49E-05	0.00E+00	1.60E-09
	Nickel	1.97E-05	0.00E+00	1.27E-09	5.63E-07	0.00E+00	3.62E-11
	Silver	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Vanadium	3.87E-05	0.00E+00	2.49E-09	1.11E-06	0.00E+00	7.12E-11
	Zinc	4.84E-04	0.00E+00	3.11E-08	1.38E-05	0.00E+00	8.90E-10
Old Tailings Pile (&Sump 3)	Aluminum	2.90E-02	0.00E+00	1.86E-06	8.28E-04	0.00E+00	5.32E-08
	Arsenic	3.55E-04	3.20E-05	2.28E-08	1.01E-05	9.13E-07	6.52E-10
	Barium	3.55E-04	0.00E+00	2.28E-08	1.01E-05	0.00E+00	6.52E-10
	Beryllium	1.10E-05	0.00E+00	7.06E-10	3.14E-07	0.00E+00	2.02E-11
	Chromium	7.75E-05	0.00E+00	4.98E-09	2.21E-06	0.00E+00	1.42E-10
	Iron	7.10E-02	0.00E+00	4.57E-06	2.03E-03	0.00E+00	1.30E-07
	Lead	9.36E-05	0.00E+00	6.02E-09	2.68E-06	0.00E+00	1.72E-10
	Manganese	1.07E-03	0.00E+00	6.85E-08	3.04E-05	0.00E+00	1.96E-09
	Nickel	4.84E-05	0.00E+00	3.11E-09	1.38E-06	0.00E+00	8.90E-11
	Silver	3.55E-06	0.00E+00	2.28E-10	1.01E-07	0.00E+00	6.52E-12
	Thallium	5.49E-06	0.00E+00	3.53E-10	1.57E-07	0.00E+00	1.01E-11
	Vanadium	1.08E-04	0.00E+00	6.94E-09	3.08E-06	0.00E+00	1.98E-10
	Zinc	6.14E-04	0.00E+00	3.94E-08	1.75E-05	0.00E+00	1.13E-09
Rex Flats	Aluminum	2.95E-02	0.00E+00	1.90E-06	8.44E-04	0.00E+00	5.42E-08
	Arsenic	1.61E-03	1.45E-04	1.04E-07	4.61E-05	4.15E-06	2.97E-09
	Barium	6.78E-04	0.00E+00	4.36E-08	1.94E-05	0.00E+00	1.25E-09
	Beryllium	3.23E-06	0.00E+00	2.08E-10	9.23E-08	0.00E+00	5.93E-12
	Chromium	6.14E-05	0.00E+00	3.94E-09	1.75E-06	0.00E+00	1.13E-10
	Iron	1.78E-01	0.00E+00	1.14E-05	5.07E-03	0.00E+00	3.26E-07
	Lead	3.23E-03	0.00E+00	2.08E-07	9.23E-05	0.00E+00	5.93E-09
	Manganese	1.36E-03	0.00E+00	8.72E-08	3.87E-05	0.00E+00	2.49E-09
	Nickel	4.52E-05	0.00E+00	2.91E-09	1.29E-06	0.00E+00	8.30E-11
	Silver	9.04E-05	0.00E+00	5.81E-09	2.58E-06	0.00E+00	1.66E-10
	Thallium	2.23E-05	0.00E+00	1.43E-09	6.37E-07	0.00E+00	4.09E-11
	Vanadium	9.10E-05	0.00E+00	5.85E-09	2.60E-06	0.00E+00	1.67E-10
	Zinc	9.69E-04	0.00E+00	6.23E-08	2.77E-05	0.00E+00	1.78E-09

Notes:
A UCL95 was estimated only if n>10 and the detection frequency >85%
NA - Not applicable

Table 41 Noncancer and Cancer Intakes – Surface Water and Fish Pathways

Noncancer Intakes	On-Site Resident						Hiker						Rafter		Angler		Golfer	Worker	
	Incidental Ingestion (mg/kg-d)			Dermal Contact (mg/kg-d)			Incidental Ingestion (mg/kg-d)			Dermal Contact (mg/kg-d)			Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)
Analyte	Child	Adult	Age Averaged	Child	Adult	Age Averaged	Child	Adult	Age Averaged	Child	Adult	Age Averaged	Adult	Adult	Adult	Adult	Adult	Adult	Adult
Cadmium	1.89E-06	2.35E-07	5.65E-07	2.49E-07	8.45E-08	1.17E-07	6.29E-07	5.39E-08	3.21E-08	8.31E-08	1.94E-08	3.21E-08	2.70E-07	9.71E-08	2.70E-07	9.71E-08	NA	5.39E-08	1.94E-08
Lead	1.02E-06	1.27E-06	3.07E-06	1.35E-07	4.58E-08	6.37E-08	3.41E-06	2.92E-07	1.74E-08	4.50E-08	1.05E-08	1.74E-08	1.46E-06	5.26E-08	1.46E-06	5.26E-08	NA	2.92E-07	1.05E-08
Manganese	3.92E-04	4.87E-05	1.17E-04	5.17E-05	1.75E-05	2.44E-05	1.31E-04	1.12E-05	6.67E-06	1.72E-05	4.03E-06	6.67E-06	5.60E-05	2.01E-05	5.60E-05	2.01E-05	NA	1.12E-05	4.03E-06
Zinc	6.59E-04	8.19E-05	1.97E-04	5.22E-05	1.77E-05	2.46E-05	2.20E-04	1.88E-05	6.73E-06	1.74E-05	4.07E-06	6.73E-06	9.41E-05	2.03E-05	9.41E-05	2.03E-05	NA	1.88E-05	4.07E-06

Cancer Intakes	On-Site Resident		Hiker		Rafter		Angler		Golfer	Worker	
	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)
Analyte	Age Averaged	Age Averaged	Age Averaged	Age Averaged	Adult	Adult	Adult	Adult	Adult	Adult	Adult
Cadmium	2.42E-07	5.03E-08	7.24E-08	1.38E-08	1.16E-07	4.16E-08	1.16E-07	4.16E-08	NA	1.54E-09	5.55E-10
Lead	1.31E-06	2.73E-08	3.93E-07	7.47E-09	6.27E-07	2.26E-08	6.27E-07	2.26E-08	NA	8.36E-09	3.01E-10
Manganese	5.03E-05	1.04E-05	1.50E-05	2.86E-06	2.40E-05	8.63E-06	2.40E-05	8.63E-06	NA	3.20E-07	1.15E-07
Zinc	8.45E-05	1.05E-05	2.53E-05	2.88E-06	4.03E-05	8.71E-06	4.03E-05	8.71E-06	NA	5.38E-07	1.16E-07

	Fish Noncancer Intakes				Fish Cancer Intakes	
	On-Site Resident			Angler	On-Site Resident	Angler
	Ingestion (mg/kg-d)			Ingestion (mg/kg-d)	Ingestion (mg/kg-d)	Ingestion (mg/kg-d)
Analyte	Child	Adult	Age Averaged	Adult	Age Averaged	Adult
Cadmium	2.57E-04	1.47E-04	1.69E-04	1.47E-04	7.24E-05	6.29E-05
Lead	2.09E-03	1.19E-03	1.37E-03	1.19E-03	5.89E-04	5.12E-04
Manganese	1.07E-01	6.09E-02	7.01E-02	6.09E-02	3.00E-02	2.61E-02
Zinc	4.49E-01	2.56E-01	2.95E-01	2.56E-01	1.26E-01	1.10E-01

Notes:
NA – Not applicable

Table 42 Noncancer and Cancer Intakes – Sediment Pathways

Table 42 - Noncancer and Cancer Intakes – Sediment Pathways

Noncancer Intakes	On-Site Resident						Hiker						Rafter		Angler		Golfer	Worker	
	Incidental Ingestion (mg/kg-d)			Dermal Contact (mg/kg-d)			Incidental Ingestion (mg/kg-d)			Dermal Contact (mg/kg-d)			Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)
Analyte	Child	Adult	Age Averaged	Child	Adult	Age Averaged	Child	Adult	Age Averaged	Child	Adult	Age Averaged	Adult	Adult	Adult	Adult	Adult	Adult	Adult
Arsenic	1.33E-04	1.42E-05	3.80E-05	8.94E-05	1.60E-05	3.07E-05	8.86E-05	9.49E-06	2.53E-05	5.96E-05	1.07E-05	2.05E-05	1.90E-05	1.07E-05	1.90E-05	1.07E-05	NA	1.90E-05	1.13E-05
Cadmium	1.11E-05	1.19E-06	3.17E-06	2.49E-07	4.46E-08	8.55E-08	7.40E-06	7.93E-07	2.11E-06	1.66E-07	2.98E-08	5.70E-08	1.59E-06	2.98E-08	1.59E-06	2.98E-08	NA	1.59E-06	3.14E-08
Lead	1.11E-03	1.19E-04	3.17E-04	0.00E+00	0.00E+00	0.00E+00	7.40E-04	7.93E-05	2.11E-04	0.00E+00	0.00E+00	0.00E+00	1.59E-04	0.00E+00	1.59E-04	0.00E+00	NA	1.59E-04	0.00E+00
Manganese	3.01E-03	3.23E-04	8.61E-04	0.00E+00	0.00E+00	0.00E+00	2.01E-03	2.15E-04	5.74E-04	0.00E+00	0.00E+00	0.00E+00	4.31E-04	0.00E+00	4.31E-04	0.00E+00	NA	4.31E-04	0.00E+00
Zinc	3.42E-03	3.67E-04	9.78E-04	0.00E+00	0.00E+00	0.00E+00	2.28E-03	2.45E-04	6.52E-04	0.00E+00	0.00E+00	0.00E+00	4.89E-04	0.00E+00	4.89E-04	0.00E+00	NA	4.89E-04	0.00E+00

Table 42 - Noncancer and Cancer Intakes – Sediment Pathways

Cancer Intakes	On-Site Resident		Hiker		Rafter		Angler		Golfer	Worker	
	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)
Analyte	Age Averaged	Age Averaged	Age Averaged	Age Averaged	Adult	Adult	Adult	Adult	Adult	Adult	Adult
Arsenic	1.63E-05	1.32E-05	1.08E-05	8.78E-06	8.14E-06	4.58E-06	8.14E-06	4.58E-06	NA	5.42E-07	3.22E-07
Cadmium	1.36E-06	3.66E-08	9.06E-07	2.44E-08	6.79E-07	1.28E-08	6.79E-07	1.28E-08	NA	4.53E-08	8.97E-10
Lead	1.36E-04	0.00E+00	9.06E-05	0.00E+00	6.79E-05	0.00E+00	6.79E-05	0.00E+00	NA	4.53E-06	0.00E+00
Manganese	3.69E-04	0.00E+00	2.46E-04	0.00E+00	1.85E-04	0.00E+00	1.85E-04	0.00E+00	NA	1.23E-05	0.00E+00
Zinc	4.19E-04	0.00E+00	2.80E-04	0.00E+00	2.10E-04	0.00E+00	2.10E-04	0.00E+00	NA	1.40E-05	0.00E+00

Notes:

Zeros indicate there is no intake for this analyte/pathway combination

NA - Not applicable

Table 43 Noncancer and Cancer Intakes – Ground Water Potable Use Pathway

Table 43 - Noncancer and Cancer Intakes – Ground Water Potable Use Pathway						
Noncancer Intakes	**On-Site Resident**					
	Potable Use Ingestion (mg/kg-d)			**Potable Use Dermal Contact (mg/kg-d)**		
Analyte	**Child**	**Adult**	**Age Averaged**	**Child**	**Adult**	**Age Averaged**
Aluminum	2.62E-01	1.12E-01	1.42E-01	1.73E-03	5.86E-04	8.15E-04
Arsenic	7.03E-03	3.01E-03	3.82E-03	4.64E-05	1.57E-05	2.19E-05
Beryllium	8.31E-04	3.56E-04	4.51E-04	5.48E-06	1.86E-06	2.58E-06
Cadmium	2.49E-02	1.07E-02	1.35E-02	1.65E-04	5.58E-05	7.75E-05
Calcium	2.63E+01	1.13E+01	1.43E+01	1.73E-01	5.88E-02	8.17E-02
Cobalt	1.79E-01	7.67E-02	9.72E-02	1.18E-03	4.00E-04	5.57E-04
Copper	4.90E-03	2.10E-03	2.66E-03	3.23E-05	1.10E-05	1.52E-05
Free Cyanide	7.67E-04	3.29E-04	4.16E-04	5.06E-06	1.72E-06	2.39E-06
Iron	1.41E+02	6.03E+01	7.63E+01	9.28E-01	3.15E-01	4.37E-01
Lead	1.15E-03	4.93E-04	6.25E-04	7.59E-07	2.57E-07	3.58E-07
Magnesium	2.63E+01	1.13E+01	1.43E+01	1.73E-01	5.88E-02	8.17E-02
Manganese	1.27E+01	5.44E+00	6.88E+00	8.37E-02	2.84E-02	3.94E-02
Nickel	4.03E-02	1.73E-02	2.19E-02	5.32E-05	1.80E-05	2.50E-05
Silver	1.28E-03	5.48E-04	6.94E-04	5.06E-06	1.72E-06	2.39E-06
Sulfate	4.08E+02	1.75E+02	2.22E+02	2.70E+00	9.14E-01	1.27E+00
Thallium	1.02E-02	4.38E-03	5.55E-03	6.75E-05	2.29E-05	3.18E-05
Vanadium	1.21E-03	5.21E-04	6.59E-04	8.02E-06	2.72E-06	3.78E-06
Zinc	3.45E+01	1.48E+01	1.87E+01	1.37E-01	4.63E-02	6.44E-02

Table 43 - Noncancer and Cancer Intakes – Ground Water Potable Use Pathway

Cancer Intakes	On-Site Resident	
	Potable Use Ingestion (mg/kg-d)	Potable Use Dermal Contact (mg/kg-d)
Analyte	Age Averaged	Age Averaged
Aluminum	6.10E-02	3.49E-04
Arsenic	1.64E-03	9.37E-06
Beryllium	1.93E-04	1.11E-06
Cadmium	5.80E-03	3.32E-05
Calcium	6.11E+00	3.50E-02
Cobalt	4.16E-02	2.39E-04
Copper	1.14E-03	6.53E-06
Free Cyanide	1.78E-04	1.02E-06
Iron	3.27E+01	1.87E-01
Lead	2.68E-04	1.53E-07
Magnesium	6.12E+00	3.50E-02
Manganese	2.95E+00	1.69E-02
Nickel	9.37E-03	1.07E-05
Silver	2.97E-04	1.02E-06
Sulfate	9.50E+01	5.44E-01
Thallium	2.38E-03	1.36E-05
Vanadium	2.83E-04	1.62E-06
Zinc	8.03E+00	2.76E-02

Table 44 Noncancer and Cancer Intakes – Boulder Pathways

Table 44 - Noncancer and Cancer Intakes – Boulder Pathways						
Noncancer Intakes	**On-Site Resident**			**Hiker**		
	Incidental Ingestion (mg/kg-d)			**Incidental Ingestion (mg/kg-d)**		
Analyte	**Child**	**Adult**	**Age Averaged**	**Child**	**Adult**	**Age Averaged**
Arsenic	1.12E-03	9.60E-05	3.01E-04	3.20E-04	2.74E-05	8.60E-05
Cadmium	2.40E-05	2.05E-06	6.44E-06	6.85E-06	5.87E-07	1.84E-06
Chromium	3.56E-05	3.05E-06	9.57E-06	1.02E-05	8.73E-07	2.73E-06
Copper	5.53E-04	4.74E-05	1.49E-04	1.58E-04	1.35E-05	4.24E-05
Lead	1.55E-03	1.32E-04	4.15E-04	4.42E-04	3.78E-05	1.19E-04
Manganese	4.25E-03	3.64E-04	1.14E-03	1.21E-03	1.04E-04	3.26E-04
Zinc	9.05E-04	7.75E-05	2.43E-04	2.58E-04	2.22E-05	6.94E-05

Table 44 - Noncancer and Cancer Intakes – Boulder Pathways		
Cancer Intakes	**On-Site Resident**	**Hiker**
	Incidental Ingestion (mg/kg-d)	**Incidental Ingestion (mg/kg-d)**
Analyte	**Age Adjusted**	**Age Adjusted**
Arsenic	1.29E-04	3.68E-05
Cadmium	2.76E-06	7.88E-07
Chromium	4.10E-06	1.17E-06
Copper	6.36E-05	1.82E-05
Lead	1.78E-04	5.08E-05
Manganese	4.89E-04	1.40E-04
Zinc	1.04E-04	2.97E-05

Tables 45 Noncancer and Cancer Intakes – Diversion Trench Pathways

Table 45 - Noncancer and Cancer Intakes – Diversion Trench Pathways

Noncancer Intakes	On-Site Resident						Hiker						Rafter		Angler		Golfer	Worker	
	Incidental Ingestion (mg/kg-d)			Dermal Contact (mg/kg-d)			Incidental Ingestion (mg/kg-d)			Dermal Contact (mg/kg-d)			Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)
Analyte	Child	Adult	Age Averaged	Child	Adult	Age Averaged	Child	Adult	Age Averaged	Child	Adult	Age Averaged	Adult	Adult	Adult	Adult	Adult	Adult	Adult
Arsenic	7.81E-06	9.70E-07	2.34E-06	1.03E-06	3.49E-07	4.86E-07	2.60E-06	2.23E-07	6.99E-07	3.44E-07	8.03E-08	1.33E-07	NA	NA	1.12E-06	4.02E-07	NA	2.23E-07	8.03E-08
Manganese	2.60E-03	3.23E-04	7.79E-04	3.44E-04	1.16E-04	1.62E-04	8.68E-04	7.44E-05	2.33E-04	1.15E-04	2.68E-05	4.43E-05	NA	NA	3.72E-04	1.34E-04	NA	7.44E-05	2.68E-05

Table 45 - Noncancer and Cancer Intakes – Diversion Trench Pathways

Cancer Intakes	On-Site Resident		Hiker		Rafter		Angler		Golfer	Worker	
	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)
Analyte	Age Averaged	Age Averaged	Age Averaged	Age Averaged	Adult	Adult	Adult	Adult	Adult	Adult	Adult
Arsenic	1.00E-06	2.08E-07	3.00E-07	5.70E-08	NA	NA	4.78E-07	1.72E-07	NA	6.37E-09	2.29E-09
Manganese	3.34E-04	6.94E-05	9.99E-05	1.90E-05	NA	NA	1.59E-04	5.74E-05	NA	2.12E-06	7.65E-07

Notes:
NA - Not applicable

Table 46 Noncancer and Cancer Intakes – Seep Pathway

Table 46 - Noncancer and Cancer Intakes – Seep Pathway

Noncancer Intakes	On-Site Resident						Hiker						Rafter		Angler		Golfer	Worker	
	Incidental Ingestion (mg/kg-d)			Dermal Contact (mg/kg-d)			Incidental Ingestion (mg/kg-d)			Dermal Contact (mg/kg-d)			Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)
Analyte	Child	Adult	Age Averaged	Child	Adult	Age Averaged	Child	Adult	Age Averaged	Child	Adult	Age Averaged	Adult	Adult	Adult	Adult	Adult	Adult	Adult
Cadmium	1.64E-06	2.04E-07	4.92E-07	2.17E-07	7.35E-08	1.02E-07	5.48E-07	4.70E-08	1.47E-07	7.23E-08	1.69E-08	2.80E-08	NA	NA	2.35E-07	8.45E-08	NA	4.70E-08	1.69E-08
Manganese	4.52E-02	5.62E-03	1.35E-02	5.97E-03	2.02E-03	2.81E-03	1.51E-02	1.29E-03	4.05E-03	1.99E-03	4.65E-04	7.70E-04	NA	NA	6.46E-03	2.32E-03	NA	1.29E-03	4.65E-04
Zinc	6.71E-03	8.34E-04	2.01E-03	5.32E-04	1.80E-04	2.50E-04	2.24E-03	1.92E-04	6.01E-04	1.77E-04	4.14E-05	6.86E-05	NA	NA	9.59E-04	2.07E-04	NA	1.92E-04	4.14E-05

Table 46 - Noncancer and Cancer Intakes – Seep Pathway

Cancer Intakes	On-Site Resident		Hiker		Rafter		Angler		Golfer	Worker	
	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)
Analyte	Age Averaged	Age Averaged	Age Averaged	Age Averaged	Adult	Adult	Adult	Adult	Adult	Adult	Adult
Cadmium	2.11E-07	4.38E-08	6.31E-08	1.20E-08	NA	NA	1.01E-07	3.62E-08	NA	1.34E-09	4.83E-10
Manganese	5.80E-03	1.20E-03	1.73E-03	3.30E-04	NA	NA	2.77E-03	9.96E-04	NA	3.69E-05	1.33E-05
Zinc	8.61E-04	1.07E-04	2.58E-04	2.94E-05	NA	NA	4.11E-04	8.88E-05	NA	5.48E-06	1.18E-06

Notes:
NA - Not applicable

3.3 TOXICITY ASSESSMENT

The toxicity assessment describes the toxicity values used to address the potential for noncarcinogenic and carcinogenic effects of the Tier II COPCs. Information regarding site-specific modifications to the toxicity values is also provided.

Information regarding the toxicity of the contaminants detected in site media at levels that exceed the screening levels was compiled from regulatory sources such as the IRIS and the Health Effects Assessment Summary Tables ("HEAST") (EPA, 1997c). The most recent version of these databases was utilized. The Office of Emergency and Remedial Response ('OSWER") Directive 9285.7-53, issued on December 5, 2003 presents a revised hierarchy of toxicity values generally recommended for use in risk assessments and represents an update to Risk Assessment Guidance for Superfund Volume I, Part A, Human Health Evaluation Manual ("RAGS A") (EPA, 1989). The revised hierarchy is as follows:

- Tier 1 - EPA's IRIS
- Tier 2 - EPA's Provisional Peer Reviewed Toxicity Values ("PPRTVs")
- Tier 3 - Other toxicity values including additional EPA and non-EPA sources. These may include, but need not be limited to, the following sources.
    - HEAST toxicity values
    - **Agency for Toxic Substances and Disease Registry ("ATSDR")** Minimal Risk Levels
    - California Environmental Protection Agency ("Cal EPA") toxicity values

Toxicity values based on route-to-route extrapolation (available in both EPA Region 9 and EPA Region 3 screening guidance documents) were considered where data gaps exist.

The toxicity values pertinent to the risk assessment are the reference dose ("RfD"), reference concentration ("RfC"), slope factor ("CSF"), and unit risk factor ("URF"). The RfD and CSF values are further differentiated by exposure route (i.e., as oral (RfDo or CSFo) or inhalation (RfDi or CSFi)). The RfDo is used to predict the noncancer risks due to oral or dermal exposure. The CSFo is used to predict the cancer risks due to oral or dermal exposure. The URF was used to estimate the inhalation cancer risks; where a URF was lacking, an inhalation cancer slope factor (CSFi)

was used if available and route to route extrapolation was considered appropriate to estimate the URF. The RfC was used to estimate the inhalation noncancer risks; where an RfC was lacking, the RfDi was used if available to estimate the RfC if route-to-route extrapolation was considered appropriate. These conversions were made as follows:

$$RfC\ (mg/m^3) = RfDi(mg/kg\text{-}d) * 70\ kg * 1\ d/20\ m^3$$

$$URF\ (m^3/mg) = CSFi\ (mg/kg\text{-}d) * 20\ m^3/d * 1/70\ kg$$

Tables 47 and 48 present the toxicity values used in the Tier II risk assessment.

Table 47 Toxicity Values Used to Address Oral Exposures in the Tier II Risk Assessment

Table 47 - Toxicity Values Used to Address Oral Exposures in the Tier II Risk Assessment				
COPC	**Chronic RfD_{oral} (mg/kg-d)**		**CSF_{oral} $(mg/kg\text{-}d)^{-1}$**	
Aluminum	1.00E+00	9	NA	i,9
Antimony	4.00E-04	i	NA	i,9
Arsenic	3.00E-04	i	1.50E+00	i
Barium	2.00E-01	i	NA	i
Beryllium	2.00E-03	i	NA	9
Cadmium	5.00E-04	i	NA	i,9
Chromium	1.50E+00	i	NA	i,9
Copper	4.00E-02	9	NA	i,9
Free Cyanide	2.00E-02	i	NA	
Iron	3.00E-01	9	NA	i,9
Lead	NA	i	NA	i
Manganese	1.40E-01	i	NA	i,9
Mercury	3.00E-04	i	NA	i,9
Nickel	2.00E-02	i	NA	i
Selenium	5.00E-03	i	NA	i,9
Silver	5.00E-03	i	NA	i,9
Thallium	8.00E-05	i	NA	i,9
Vanadium	9.00E-03	i	NA	i
Zinc	3.00E-01	i	NA	i,9

Notes:
RfD values for Cr III used in the Tier II evaluation
i - IRIS Database Search, June 2005
3 - Region III RBCs rbc0405.xls
9 - Region 9 2004 PRGs
Cd RfD for food ingestion is 1E-3 mg/kg-d; water ingestion RfD is 5E-4 mg/kg-d
Hg RfDoral based on HgCl2
Tl value for thallium chloride and thallium sulfate

Table 48 ***Toxicity Values Used to Address Inhalation Exposures in the Tier II Risk Assessment***

Table 48 - Toxicity Values Used to Address Inhalation Exposures in the Tier II Risk Assessment								
COPC	**Chronic RfC (mg/m^3)**		**RfDi (mg/kg-d)**		**URF $(mg/m3)^{-1}$**		**CSFi $(mg/kg\text{-}d)^{-1}$**	
Aluminum	4.90E-03	c	1.40E-03	9	NA	i	NA	9
Antimony	NA	i,9	NA	i,9	NA	i	NA	i,9
Arsenic	NA	i,9	NA	i,9	4.30E+00	i	1.51E+01	
Barium	4.90E-04	c	1.40E-04	9	NA	i	NA	i
Beryllium	2.00E-05	i	5.71E-06		2.40E+00	i	8.40E+00	
Cadmium	NA	i,9	NA	i,9	1.80E+00	i	6.30E+00	
Chromium	NA	i,9,3	NA	i,9,3	12	c	42	9
Copper	NA	i,9	NA	9	NA	i,9	NA	9
Cyanide	3.01E-03	c	8.60E-04	9	NA	i	NA	i
Iron	NA	i,9,3	NA	i,9,3	NA	i	NA	i,9,3
Lead	NA	i	NA	i	NA	i	NA	i
Manganese	5.00E-05	i	1.43E-05		NA	i	NA	i,9
Mercury	NA	i	NA	9	NA	i	NA	i,9
Nickel	NA	i	NA	i	NA	i	NA	i
Selenium	NA	i,9,3	NA	i,9,3	NA	i	NA	i,9,3
Silver	NA	i,9,3	NA	i,9,3	NA	i	NA	i,9,3
Thallium	NA	i,9,3	NA	i,9,3	NA	i	NA	i,9,3
Vanadium	NA	i	NA	i	NA	i	NA	i
Zinc	NA	i,9	NA	i,9	NA	i,9	NA	i,9

Notes:
i - IRIS Database Search, June 2006
3 - Region III RBCs rbc0405.xls
9 - Region 9 2004 PRGs
c - calculated from RfDi or CSFi reported in EPA, 2004. See text for methodology.
Hg RfDoral based on HgCl2
Tl value for thallium chloride and thallium sulfate

3.4 RISK CHARACTERIZATION

The results of the quantitative risk analysis are presented by cancer and noncancer risk estimates. For determining whether noncancer health effects may be a concern, the hazard quotient ("HQ") was calculated. The HQ is the noncancer average daily exposure intake (mg/kg-day) divided by the RfD (mg/kg-day) for oral exposures:

Hazard Quotient (HQ) = CDI / RfDoral

Where:
HQ = Hazard Quotient (unitless)

CDI = Pathway Specific Intakes (mg/kg-d)
RfD = Reference Dose (mg/kg-d)[oral or inhalation]

The HQs are summed across exposure pathways and constituents to calculate a hazard index (HI). The target non-cancer HQ is 1 (CDPHE, 2002). A value of 1 or less indicates that exposure is below levels associated with noncarcinogenic health effects.

In the case of exposure to potential carcinogens, estimates of cancer risk are expressed as the lifetime probability of additional cancer risk associated with the given dose. The cancer risks are calculated as the cancer-based average daily exposure intake (mg/kg-day) times the slope factor (mg/kg-d^{-1}):

Cancer Risk = CDI * CSF

Where:
CDI = Pathway Specific Intakes (mg/kg-d)
CSF = Cancer Slope Factor (mg/kg-d^{-1})

The target risk range for carcinogenic effects is an excess cancer risk of $1x10^{-6}$ to $1x10^{-4}$, or 1 excess cancer per million exposed people to 1 excess cancer per 10,000 exposed people. Cancer risks were summed for all constituents to obtain an estimate of cumulative cancer risk.

3.4.1 Surface Soil Risk Estimates

Risk estimates for noncarcinogenic effects are discussed by medium below.

3.4.1.1 Noncancer Risks

Table 49 presents the risk estimates by exposure pathway for all receptors. HQs for surface soil exceeded one for residents, hikers, and construction workers.

Table 49 Noncancer Risks – Surface Soil Pathways

Exposure Area	Analyte	On-Site Resident: Incidental Ingestion (mg/kg-d)			On-Site Resident: Dermal Contact (mg/kg-d)			On-Site Resident: Particulate Inhalation			Hiker: Incidental Ingestion			Hiker: Dermal Contact (mg/kg-d)			Hiker: Particulate Inhalation			Rafter: Incidental Ingestion	Rafter: Particulate Inhalation	Angler: Incidental Ingestion	Angler: Particulate Inhalation	Golfer: Incidental Ingestion	Golfer: Dermal Contact (mg/kg-d)	Golfer: Particulate Inhalation	Worker: Incidental Ingestion	Worker: Dermal Contact (mg/kg-d)	Worker: Particulate Inhalation
		Child	Adult	Age Averaged	Child	Adult	Age Averaged	Child	Adult	Age Averaged	Child	Adult	Age Averaged	Child	Adult	Age Averaged	Child	Adult	Age Averaged	Adult	Adult	Adult	Adult	Adult	Adult	Adult	Adult	Adult	Adult
Bolts Lake																													
	Aluminum	1.28E-01	1.37E-02	3.65E-02	0.00E+00	0.00E+00	0.00E+00	1.78E-03	1.78E-03	3.56E-04	1.83E-02	1.96E-03	5.22E-03	0.00E+00	0.00E+00	0.00E+00	5.08E-04	5.08E-04	1.02E-04	NA	5.08E-04	NA	5.08E-04	1.96E-03	0.00E+00	5.08E-04	3.23E-02	0.00E+00	1.27E-03
	Antimony	**1.63E+00**	1.75E-01	4.66E-01	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	2.33E-01	2.50E-02	6.65E-02	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	2.50E-02	0.00E+00	No RfC	4.12E-01	0.00E+00	No RfC
	Arsenic	4.26E-01	4.57E-02	1.22E-01	3.58E-02	5.47E-03	1.15E-02	No RfC	No RfC	No RfC	6.09E-02	6.52E-03	1.74E-02	1.02E-02	1.56E-03	3.29E-03	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	6.52E-03	1.45E-03	No RfC	1.08E-01	9.69E-03	No RfC
	Barium	3.45E-02	3.70E-03	9.86E-03	0.00E+00	0.00E+00	0.00E+00	9.61E-04	9.61E-04	1.92E-04	4.93E-03	5.28E-04	1.41E-03	0.00E+00	0.00E+00	0.00E+00	2.74E-04	2.74E-04	5.49E-05	NA	2.74E-04	NA	2.74E-04	5.28E-04	0.00E+00	2.74E-04	8.72E-03	0.00E+00	6.86E-04
	Beryllium	5.05E-02	5.41E-03	1.44E-02	0.00E+00	0.00E+00	0.00E+00	3.44E-04	3.44E-04	6.89E-05	7.21E-03	7.73E-04	2.06E-03	0.00E+00	0.00E+00	0.00E+00	9.84E-05	9.84E-05	1.97E-05	NA	9.84E-05	NA	9.84E-05	7.73E-04	0.00E+00	9.84E-05	1.28E-02	0.00E+00	2.46E-04
	Cadmium	5.88E-02	6.30E-03	1.68E-02	1.65E-04	2.51E-05	5.30E-05	No RfC	No RfC	No RfC	8.40E-03	9.00E-04	2.40E-03	4.71E-05	7.18E-06	1.52E-05	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	9.00E-04	6.68E-06	No RfC	1.49E-02	4.46E-05	No RfC
	Chromium	1.36E-04	1.46E-05	3.90E-05	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	1.95E-05	2.09E-06	5.57E-06	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	2.09E-06	0.00E+00	No RfC	3.44E-05	0.00E+00	No RfC
	Copper	6.83E-03	7.32E-04	1.95E-03	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	9.76E-04	1.05E-04	2.79E-04	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	1.05E-04	0.00E+00	No RfC	1.73E-03	0.00E+00	No RfC
	Cyanide	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Iron	**7.25E+00**	7.76E-01	**2.07E+00**	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	**1.04E+00**	1.11E-01	2.96E-01	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	1.11E-01	0.00E+00	No RfC	**1.83E+00**	0.00E+00	No RfC
	Lead	No RfDo	No RfDo	No RfDo	No RfDo	No RfDo	No RfDo	No RfC	No RfC	No RfC	No RfDo	No RfDo	No RfDo	No RfDo	No RfDo	No RfDo	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	No RfDo	No RfDo	No RfC	No RfDo	No RfDo	No RfC
	Manganese	4.93E-02	5.28E-03	1.41E-02	0.00E+00	0.00E+00	0.00E+00	9.41E-03	9.41E-03	1.88E-03	7.05E-03	7.55E-04	2.01E-03	0.00E+00	0.00E+00	0.00E+00	2.69E-03	2.69E-03	5.38E-04	NA	2.69E-03	NA	2.69E-03	7.55E-04	0.00E+00	2.69E-03	1.25E-02	0.00E+00	6.72E-03
	Mercury	2.13E-03	2.28E-04	6.09E-04	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	3.04E-04	3.26E-05	8.70E-05	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	3.26E-05	0.00E+00	No RfC	5.38E-04	0.00E+00	No RfC
	Nickel	4.54E-02	4.86E-03	1.30E-02	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	6.48E-03	6.95E-04	1.85E-03	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	6.95E-04	0.00E+00	No RfC	1.15E-02	0.00E+00	No RfC
	Selenium	2.56E-01	2.74E-02	7.31E-02	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	3.65E-02	3.91E-03	1.04E-02	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	3.91E-03	0.00E+00	No RfC	6.46E-02	0.00E+00	No RfC
	Silver	5.37E-02	5.75E-03	1.53E-02	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	7.67E-03	8.22E-04	2.19E-03	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	8.22E-04	0.00E+00	No RfC	1.36E-02	0.00E+00	No RfC
	Thallium	**4.16E+01**	**4.45E+00**	**1.19E+01**	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	**5.94E+00**	6.36E-01	**1.70E+00**	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	6.36E-01	0.00E+00	No RfC	**1.05E+01**	0.00E+00	No RfC
	Vanadium	1.56E-01	1.67E-02	4.46E-02	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	2.23E-02	2.39E-03	6.38E-03	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	2.39E-03	0.00E+00	No RfC	3.95E-02	0.00E+00	No RfC
	Zinc	1.62E-02	1.74E-03	4.63E-03	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	2.31E-03	2.48E-04	6.61E-04	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	2.48E-04	0.00E+00	No RfC	4.09E-03	0.00E+00	No RfC
Maloit Park																													
	Aluminum	3.84E-01	4.11E-02	1.10E-01	0.00E+00	0.00E+00	0.00E+00	5.34E-03	5.34E-03	1.07E-03	5.48E-02	5.87E-03	1.57E-02	0.00E+00	0.00E+00	0.00E+00	1.52E-03	1.52E-03	3.05E-04	NA	1.52E-03	NA	1.52E-03	5.87E-03	0.00E+00	1.52E-03	9.69E-02	0.00E+00	3.81E-03
	Antimony	3.84E-01	4.11E-02	1.10E-01	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	5.48E-02	5.87E-03	1.57E-02	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	5.87E-03	0.00E+00	No RfC	9.69E-02	0.00E+00	No RfC
	Arsenic	**1.60E+01**	**1.71E+00**	**4.57E+00**	**1.34E+00**	2.05E-01	4.32E-01	No RfC	No RfC	No RfC	**2.28E+00**	2.45E-01	6.52E-01	3.84E-01	5.86E-02	1.24E-01	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	2.45E-01	5.45E-02	No RfC	**4.04E+00**	3.63E-01	No RfC
	Barium	2.24E-02	2.40E-03	6.39E-03	0.00E+00	0.00E+00	0.00E+00	6.23E-04	6.23E-04	1.25E-04	3.20E-03	3.42E-04	9.13E-04	0.00E+00	0.00E+00	0.00E+00	1.78E-04	1.78E-04	3.56E-05	NA	1.78E-04	NA	1.78E-04	3.42E-04	0.00E+00	1.78E-04	5.65E-03	0.00E+00	4.45E-04
	Beryllium	8.95E-03	9.59E-04	2.56E-03	0.00E+00	0.00E+00	0.00E+00	6.10E-05	6.10E-05	1.22E-05	1.28E-03	1.37E-04	3.65E-04	0.00E+00	0.00E+00	0.00E+00	1.74E-05	1.74E-05	3.49E-06	NA	1.74E-05	NA	1.74E-05	1.37E-04	0.00E+00	1.74E-05	2.26E-03	0.00E+00	4.36E-05
	Cadmium	1.43E-01	1.53E-02	4.09E-02	4.01E-04	6.12E-05	1.29E-04	No RfC	No RfC	No RfC	2.05E-02	2.19E-03	5.84E-03	1.15E-04	1.75E-05	3.69E-05	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	2.19E-03	1.63E-05	No RfC	3.62E-02	1.08E-04	No RfC
	Chromium	2.13E-04	2.28E-05	6.09E-05	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	3.04E-05	3.26E-06	8.70E-06	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	3.26E-06	0.00E+00	No RfC	5.38E-05	0.00E+00	No RfC
	Copper	2.68E-01	2.87E-02	7.66E-02	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	3.83E-02	4.10E-03	1.09E-02	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	4.10E-03	0.00E+00	No RfC	6.77E-02	0.00E+00	No RfC
	Cyanide	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Iron	**1.07E+01**	**1.14E+00**	**3.04E+00**	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	**1.52E+00**	1.63E-01	4.35E-01	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	1.63E-01	0.00E+00	No RfC	**2.69E+00**	0.00E+00	No RfC
	Lead	No RfDo	No RfDo	No RfDo	No RfDo	No RfDo	No RfDo	No RfC	No RfC	No RfC	No RfDo	No RfDo	No RfDo	No RfDo	No RfDo	No RfDo	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	No RfDo	No RfDo	No RfC	No RfDo	No RfDo	No RfC
	Manganese	7.21E-01	7.73E-02	2.06E-01	0.00E+00	0.00E+00	0.00E+00	1.38E-01	1.38E-01	2.75E-02	1.03E-01	1.10E-02	2.94E-02	0.00E+00	0.00E+00	0.00E+00	3.94E-02	3.94E-02	7.87E-03	NA	3.94E-02	NA	3.94E-02	1.10E-02	0.00E+00	3.94E-02	1.82E-01	0.00E+00	9.84E-02
	Mercury	5.11E-02	5.48E-03	1.46E-02	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	7.31E-03	7.83E-04	2.09E-03	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	7.83E-04	0.00E+00	No RfC	1.29E-02	0.00E+00	No RfC
	Nickel	1.92E-02	2.05E-03	5.48E-03	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	2.74E-03	2.94E-04	7.83E-04	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	2.94E-04	0.00E+00	No RfC	4.84E-03	0.00E+00	No RfC
	Selenium	5.63E-03	6.03E-04	1.61E-03	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	8.04E-04	8.61E-05	2.30E-04	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	8.61E-05	0.00E+00	No RfC	1.42E-03	0.00E+00	No RfC
	Silver	1.02E-01	1.10E-02	2.92E-02	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	1.46E-02	1.57E-03	4.17E-03	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	1.57E-03	0.00E+00	No RfC	2.58E-02	0.00E+00	No RfC
	Thallium	**1.92E+00**	2.05E-01	5.48E-01	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	2.74E-01	2.94E-02	7.83E-02	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	2.94E-02	0.00E+00	No RfC	4.84E-01	0.00E+00	No RfC
	Vanadium	6.96E-02	7.46E-03	1.99E-02	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	9.94E-03	1.07E-03	2.84E-03	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	1.07E-03	0.00E+00	No RfC	1.76E-02	0.00E+00	No RfC
	Zinc	1.24E-01	1.32E-02	3.53E-02	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	1.77E-02	1.89E-03	5.04E-03	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	1.89E-03	0.00E+00	No RfC	3.12E-02	0.00E+00	No RfC
Old Tailings Pile (&Sump 3, Old Slurry Line)																													
	Aluminum	1.27E-01	1.36E-02	3.63E-02	0.00E+00	0.00E+00	0.00E+00	1.77E-03	1.77E-03	3.53E-04	1.81E-02	1.94E-03	5.18E-03	0.00E+00	0.00E+00	0.00E+00	5.05E-04	5.05E-04	1.01E-04	NA	5.05E-04	NA	5.05E-04	1.94E-03	0.00E+00	5.05E-04	3.21E-02	0.00E+00	1.26E-03
	Antimony	2.59E-01	2.77E-02	7.40E-02	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	3.70E-02	3.96E-03	1.06E-02	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	3.96E-03	0.00E+00	No RfC	6.54E-02	0.00E+00	No RfC
	Arsenic	**2.34E+00**	2.51E-01	6.70E-01	1.97E-01	3.01E-02	6.34E-02	No RfC	No RfC	No RfC	3.35E-01	3.59E-02	9.57E-02	5.63E-02	8.59E-03	1.81E-02	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	3.59E-02	7.99E-03	No RfC	5.92E-01	5.33E-02	No RfC
	Barium	1.15E-02	1.23E-03	3.29E-03	0.00E+00	0.00E+00	0.00E+00	3.20E-04	3.20E-04	6.40E-05	1.64E-03	1.76E-04	4.70E-04	0.00E+00	0.00E+00	0.00E+00	9.15E-05	9.15E-05	1.83E-05	NA	9.15E-05	NA	9.15E-05	1.76E-04	0.00E+00	9.15E-05	2.91E-03	0.00E+00	2.29E-04
	Beryllium	7.67E-03	8.22E-04	2.19E-03	0.00E+00	0.00E+00	0.00E+00	5.23E-05	5.23E-05	1.05E-05	1.10E-03	1.17E-04	3.13E-04	0.00E+00	0.00E+00	0.00E+00	1.49E-05	1.49E-05	2.99E-06	NA	1.49E-05	NA	1.49E-05	1.17E-04	0.00E+00	1.49E-05	1.94E-03	0.00E+00	3.74E-05
	Cadmium	2.53E-01	2.71E-02	7.23E-02	7.09E-04	1.08E-04	2.28E-04	No RfC	No RfC	No RfC	3.62E-02	3.87E-03	1.03E-02	2.03E-04	3.09E-05	6.52E-05	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	3.87E-03	2.88E-05	No RfC	6.39E-02	1.92E-04	No RfC
	Chromium	1.36E-04	1.46E-05	3.90E-05	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	1.95E-05	2.09E-06	5.57E-06	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	2.09E-06	0.00E+00	No RfC	3.44E-05	0.00E+00	No RfC
	Copper	1.57E-02	1.68E-03	4.47E-03	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	2.24E-03	2.40E-04	6.39E-04	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	2.40E-04	0.00E+00	No RfC	3.95E-03	0.00E+00	No RfC
	Cyanide	2.30E-02	2.47E-03	6.58E-03	0.00E+00	0.00E+00	0.00E+00	1.04E-05	1.04E-05	2.09E-06	3.29E-03	3.52E-04	9.39E-04	0.00E+00	0.00E+00	0.00E+00	2.98E-06	2.98E-06	5.96E-07	NA	2.98E-06	NA	2.98E-06	3.52E-04	0.00E+00	2.98E-06	5.81E-03	0.00E+00	7.45E-06
	Iron	**2.86E+00**	3.06E-01	8.16E-01	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	4.08E-01	4.37E-02	1.17E-01	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	4.37E-02	0.00E+00	No RfC	7.21E-01	0.00E+00	No RfC
	Lead	No RfDo	No RfDo	No RfDo	No RfDo	No RfDo	No RfDo	No RfC	No RfC	No RfC	No RfDo	No RfDo	No RfDo	No RfDo	No RfDo	No RfDo	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	No RfDo	No RfDo	No RfC	No RfDo	No RfDo	No RfC
	Manganese	4.38E-02	4.70E-03	1.25E-02	0.00E+00	0.00E+00	0.00E+00	8.37E-03	8.37E-03	1.67E-03	6.26E-03	6.71E-04	1.79E-03	0.00E+00	0.00E+00	0.00E+00	2.39E-03	2.39E-03	4.78E-04	NA	2.39E-03	NA	2.39E-03	6.71E-04	0.00E+00	2.39E-03	1.11E-02	0.00E+00	5.98E-03
	Mercury	4.26E-02	4.57E-03	1.22E-02	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	6.09E-03	6.52E-04	1.74E-03	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	6.52E-04	0.00E+00	No RfC	1.08E-02	0.00E+00	No RfC
	Nickel	7.03E-03	7.53E-04	2.01E-03	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	1.00E-03	1.08E-04	2.87E-04	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	1.08E-04	0.00E+00	No RfC	1.78E-03	0.00E+00	No RfC
	Selenium	4.09E-03	4.38E-04	1.17E-03	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	5.84E-04	6.26E-05	1.67E-04	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	6.26E-05	0.00E+00	No RfC	1.03E-03	0.00E+00	No RfC
	Silver	1.13E-01	1.21E-02	3.21E-02	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	1.61E-02	1.72E-03	4.59E-03	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	1.72E-03	0.00E+00	No RfC	2.84E-02	0.00E+00	No RfC
	Thallium	**2.24E+00**	2.40E-01	6.39E-01	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	3.20E-01	3.42E-02	9.13E-02	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	3.42E-02	0.00E+00	No RfC	5.65E-01	0.00E+00	No RfC
	Vanadium	4.55E-02	4.87E-03	1.30E-02	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	6.49E-03	6.96E-04	1.86E-03	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	6.96E-04	0.00E+00	No RfC	1.15E-02	0.00E+00	No RfC
	Zinc	2.00E-02	2.15E-03	5.72E-03	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	2.86E-03	3.07E-04	8.18E-04	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	3.07E-04	0.00E+00	No RfC	5.06E-03	0.00E+00	No RfC
Rex Flats																													
	Aluminum	1.48E-01	1.58E-02	4.22E-02	0.00E+00	0.00E+00	0.00E+00	2.06E-03	2.06E-03	4.11E-04	2.11E-02	2.26E-03	6.03E-03	0.00E+00	0.00E+00	0.00E+00	5.87E-04	5.87E-04	1.17E-04	NA	5.87E-04	NA	5.87E-04	2.26E-03	0.00E+00	5.87E-04	3.73E-02	0.00E+00	1.47E-03
	Antimony	3.52E-01	3.77E-02	1.00E-01	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	5.02E-02	5.38E-03	1.44E-02	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	5.38E-03	0.00E+00	No RfC	8.88E-02	0.00E+00	No RfC
	Arsenic	**1.88E+01**	**2.01E+00**	**5.36E+00**	**1.58E+00**	2.40E-01	5.07E-01	No RfC	No RfC	No RfC	**2.68E+00**	2.87E-01	7.65E-01	4.50E-01	6.87E-02	1.45E-01	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	2.87E-01	6.39E-02	No RfC	**4.74E+00**	4.26E-01	No RfC
	Barium	1.73E-02	1.85E-03	4.93E-03	0.00E+00	0.00E+00	0.00E+00	4.80E-04	4.80E-04	9.61E-05	2.47E-03	2.64E-04	7.05E-04	0.00E+00	0.00E+00	0.00E+00	1.37E-04	1.37E-04	2.74E-05	NA	1.37E-04	NA	1.37E-04	2.64E-04	0.00E+00	1.37E-04	4.36E-03	0.00E+00	3.43E-04
	Beryllium	8.95E-03	9.59E-04	2.56E-03	0.00E+00	0.00E+00	0.00E+00	6.10E-05	6.10E-05	1.22E-05	1.28E-03	1.37E-04	3.65E-04	0.00E+00	0.00E+00	0.00E+00	1.74E-05	1.74E-05	3.49E-06	NA	1.74E-05	NA	1.74E-05	1.37E-04	0.00E+00	1.74E-05	2.26E-03	0.00E+00	4.36E-05
	Cadmium	9.30E-02	9.97E-03	2.66E-02	2.60E-04	3.98E-05	8.39E-05	No RfC	No RfC	No RfC	1.33E-02	1.42E-03	3.80E-03	7.44E-05	1.14E-05	2.40E-05	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	1.42E-03	1.06E-05	No RfC	2.35E-02	7.05E-05	No RfC
	Chromium	1.28E-04	1.37E-05	3.65E-05	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	1.83E-05	1.96E-06	5.22E-06	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	1.96E-06	0.00E+00	No RfC	3.23E-05	0.00E+00	No RfC
	Copper	3.97E-02	4.25E-03	1.13E-02	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	5.67E-03	6.07E-04	1.62E-03	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	6.07E-04	0.00E+00	No RfC	1.00E-02	0.00E+00	No RfC
	Cyanide	5.43E-04	5.82E-05	1.55E-04	0.00E+00	0.00E+00	0.00E+00	2.46E-07	2.46E-07	4.92E-08	7.76E-05	8.32E-06	2.22E-05	0.00E+00	0.00E+00	0.00E+00	7.03E-08	7.03E-08	1.41E-08	NA	7.03E-08	NA	7.03E-08	8.32E-06	0.00E+00	7.03E-08	1.37E-04	0.00E+00	1.76E-07
	Iron	**5.11E+00**	5.48E-01	**1.46E+00**	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	7.31E-01	7.83E-02	2.09E-01	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	7.83E-02	0.00E+00	No RfC	**1.29E+00**	0.00E+00	No RfC
	Lead	No RfDo	No RfDo	No RfDo	No RfDo	No RfDo	No RfDo	No RfC	No RfC	No RfC	No RfDo	No RfDo	No RfDo	No RfDo	No RfDo	No RfDo	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	No RfDo	No RfDo	No RfC	No RfDo	No RfDo	No RfC
	Manganese	7.21E-02	7.73E-03	2.06E-02	0.00E+00	0.00E+00	0.00E+00	1.38E-02	1.38E-02	2.75E-03	1.03E-02	1.10E-03	2.94E-03	0.00E+00	0.00E+00	0.00E+00	3.94E-03	3.94E-03	7.87E-04	NA	3.94E-03	NA	3.94E-03	1.10E-03	0.00E+00	3.94E-03	1.82E-02	0.00E+00	9.84E-03
	Mercury	5.63E-02	6.03E-03	1.61E-02	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	8.04E-03	8.61E-04	2.30E-03	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	8.61E-04	0.00E+00	No RfC	1.42E-02	0.00E+00	No RfC
	Nickel	9.59E-03	1.03E-03	2.74E-03	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	1.37E-03	1.47E-04	3.91E-04	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	1.47E-04	0.00E+00	No RfC	2.42E-03	0.00E+00	No RfC
	Selenium	4.60E-03	4.93E-04	1.32E-03	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	6.58E-04	7.05E-05	1.88E-04	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	7.05E-05	0.00E+00	No RfC	1.16E-03	0.00E+00	No RfC
	Silver	1.33E-01	1.42E-02	3.80E-02	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	1.90E-02	2.04E-03	5.43E-03	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	2.04E-03	0.00E+00	No RfC	3.36E-02	0.00E+00	No RfC
	Thallium	**2.88E+00**	3.08E-01	8.22E-01	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	4.11E-01	4.40E-02	1.17E-01	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	4.40E-02	0.00E+00	No RfC	7.27E-01	0.00E+00	No RfC
	Vanadium	4.40E-02	4.72E-03	1.26E-02	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	6.29E-03	6.74E-04	1.80E-03	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	6.74E-04	0.00E+00	No RfC	1.11E-02	0.00E+00	No RfC
	Zinc	3.62E-02	3.88E-03	1.04E-02	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	5.18E-03	5.54E-04	1.48E-03	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	5.54E-04	0.00E+00	No RfC	9.15E-03	0.00E+00	No RfC
Roaster Pile 5																													
	Aluminum	1.25E-01	1.34E-02	3.58E-02	0.00E+00	0.00E+00	0.00E+00	1.74E-03	1.74E-03	3.49E-04	1.79E-02	1.92E-03	5.11E-03	0.00E+00	0.00E+00	0.00E+00	4.98E-04	4.98E-04	9.96E-05	NA	4.98E-04	NA	4.98E-04	1.92E-03	0.00E+00	4.98E-04	3.16E-02	0.00E+00	1.25E-03
	Antimony	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	0.00E+00	0.00E+00	No RfC	0.00E+00	0.00E+00	No RfC
	Arsenic	**4.90E+00**	5.25E-01	**1.40E+00**	4.12E-01	6.29E-02	1.33E-01	No RfC	No RfC	No RfC	7.00E-01	7.50E-02	2.00E-01	1.18E-01	1.80E-02	3.79E-02	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	7.50E-02	1.67E-02	No RfC	**1.24E+00**	1.11E-01	No RfC
	Barium	1.73E-02	1.85E-03	4.93E-03	0.00E+00	0.00E+00	0.00E+00	4.80E-04	4.80E-04	9.61E-05	2.47E-03	2.64E-04	7.05E-04	0.00E+00	0.00E+00	0.00E+00	1.37E-04	1.37E-04	2.74E-05	NA	1.37E-04	NA	1.37E-04	2.64E-04	0.00E+00	1.37E-04	4.36E-03	0.00E+00	3.43E-04
	Beryllium	4.16E-03	4.45E-04	1.19E-03	0.00E+00	0.00E+00	0.00E+00	2.83E-05	2.83E-05	5.67E-06	5.94E-04	6.36E-05	1.70E-04	0.00E+00	0.00E+00	0.00E+00	8.09E-06	8.09E-06	1.62E-06	NA	8.09E-06	NA	8.09E-06	6.36E-05	0.00E+00	8.09E-06	1.05E-03	0.00E+00	2.02E-05
	Cadmium	2.43E-01	2.60E-02	6.94E-02	6.80E-04	1.04E-04	2.19E-04	No RfC	No RfC	No RfC	3.47E-02	3.72E-03	9.92E-03	1.94E-04	2.97E-05	6.26E-05	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	3.72E-03	2.76E-05	No RfC	6.14E-02	1.84E-04	No RfC
	Chromium	1.11E-04	1.19E-05	3.17E-05	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	1.58E-05	1.70E-06	4.52E-06	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	1.70E-06	0.00E+00	No RfC	2.80E-05	0.00E+00	No RfC
	Copper	2.94E-02	3.15E-03	8.40E-03	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	4.20E-03	4.50E-04	1.20E-03	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	4.50E-04	0.00E+00	No RfC	7.43E-03	0.00E+00	No RfC
	Cyanide	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Iron	**3.71E+00**	3.97E-01	**1.06E+00**	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	5.30E-01	5.68E-02	1.51E-01	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	5.68E-02	0.00E+00	No RfC	9.36E-01	0.00E+00	No RfC
	Lead	No RfDo	No RfDo	No RfDo	No RfDo	No RfDo	No RfDo	No RfC	No RfC	No RfC	No RfDo	No RfDo	No RfDo	No RfDo	No RfDo	No RfDo	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	No RfDo	No RfDo	No RfC	No RfDo	No RfDo	No RfC
	Manganese	1.92E-01	2.05E-02	5.48E-02	0.00E+00	0.00E+00	0.00E+00	3.66E-02	3.66E-02	7.32E-03	2.74E-02	2.94E-03	7.83E-03	0.00E+00	0.00E+00	0.00E+00	1.05E-02	1.05E-02	2.09E-03	NA	1.05E-02	NA	1.05E-02	2.94E-03	0.00E+00	1.05E-02	4.84E-02	0.00E+00	2.62E-02
	Mercury	3.07E-03	3.29E-04	8.77E-04	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	4.38E-04	4.70E-05	1.25E-04	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	4.70E-05	0.00E+00	No RfC	7.75E-04	0.00E+00	No RfC
	Nickel	9.59E-03	1.03E-03	2.74E-03	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	1.37E-03	1.47E-04	3.91E-04	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	1.47E-04	0.00E+00	No RfC	2.42E-03	0.00E+00	No RfC
	Selenium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	0.00E+00	0.00E+00	No RfC	0.00E+00	0.00E+00	No RfC
	Silver	7.16E-03	7.67E-04	2.05E-03	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	1.02E-03	1.10E-04	2.92E-04	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	1.10E-04	0.00E+00	No RfC	1.81E-03	0.00E+00	No RfC
	Thallium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	0.00E+00	0.00E+00	No RfC	0.00E+00	0.00E+00	No RfC
	Vanadium	4.26E-02	4.57E-03	1.22E-02	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	6.09E-03	6.52E-04	1.74E-03	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	6.52E-04	0.00E+00	No RfC	1.08E-02	0.00E+00	No RfC
	Zinc	9.38E-02	1.00E-02	2.68E-02	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	1.34E-02	1.44E-03	3.83E-03	0.00E+00	0.00E+00	0.00E+00	No RfC	No RfC	No RfC	NA	No RfC	NA	No RfC	1.44E-03	0.00E+00	No RfC	2.37E-02	0.00E+00	No RfC

Notes:
NA - Not applicable
RfD - Reference Dose, oral
Bold underlines - indicates value exceeds target noncancer or cancer risk values

The highest HQs for the surface soil ingestion pathway were for arsenic, iron, thallium, and manganese. The highest noncancer risk at one of the impacted exposure areas was indicated by an HQ of 18 for thallium for ingestion of surface soil at Rex Flats; this HQ was for resident children.

HQs for soil ingestion were above one for antimony, iron, and thallium at Bolts Lake, which is not part of the Eagle Mine Site. HQs were above one for arsenic, iron, and thallium at Maloit Park. There were HQs above one for arsenic, iron, and thallium at the OTP and Rex Flats. At Roaster Pile 5, arsenic and iron produced HQs above 1. There were no HQs for the particulate inhalation pathway that exceeded one for any receptor evaluated.

3.4.1.2 Cancer Risks

Table 50 presents the risk estimates by exposure pathway for all receptors for surface soils. Cancer risks for surface soil exceeded $1x10^{-6}$ for residents, hikers, golfers, and construction workers.

Arsenic produced excess cancer risks for incidental ingestion and dermal contact for residents at all exposure areas. At Maloit Park and Rex Flats, arsenic produce excess cancer risks for inhalation for residents as well. Arsenic produced cancer risks above the target risk level of $1x10^{-6}$ for soil ingestion for hikers, golfers, and workers at all locations. Dermal contact with arsenic in surface soils triggered excess risk at all locations except Bolts Lake.

3.4.2 Subsurface Soil

3.4.2.1 Noncancer Risks

Arsenic produced an HQ of 1.2 at the OTP, and an HQ of 5.4 at Rex Flats (Table 51), for workers for ingestion of subsurface soil. Dermal contact with soils by workers did not produce HQs above 1. The highest HQ for inhalation of particulates generated from subsurface soils was 0.002. No other COPCs produced HQs above one.

Table 50 - Cancer Risks – Surface Soil Pathways

Exposure Area	Analyte	On-Site Resident			Hiker			Rafter		Angler		Golfer			Worker		
		Incidental Ingestion	Dermal Contact	Particulate Inhalation	Incidental Ingestion	Dermal Contact	Particulate Inhalation	Incidental Ingestion	Particulate Inhalation	Incidental Ingestion	Particulate Inhalation	Incidental Ingestion	Dermal Contact	Particulate Inhalation	Incidental Ingestion	Dermal Contact	Particulate Inhalation
		Age Averaged	Age Averaged	Age Averaged	Age Averaged	Age Averaged	Age Averaged	Adult	Adult	Adult	Adult	Adult	Adult	Adult	Adult	Adult	Adult
Bolts Lake	Aluminum	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Antimony	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Arsenic	2.35E-05	2.22411E-06	3.91E-08	3.35E-06	6.35E-07	1.53E-10	NA	7.65E-10	NA	7.65E-10	1.26E-06	2.80E-07	7.65E-10	1.38E-06	1.25E-07	2.55E-10
	Barium	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Beryllium	No CSFo	No CSFo	1.72E-08	No CSFo	No CSFo	6.75E-11	NA	3.37E-10	NA	3.37E-10	No CSFo	No CSFo	3.37E-10	No CSFo	No CSFo	1.12E-10
	Cadmium	No CSFo	No CSFo	3.76E-09	No CSFo	No CSFo	1.47E-11	NA	7.37E-11	NA	7.37E-11	No CSFo	No CSFo	7.37E-11	No CSFo	No CSFo	2.46E-11
	Chromium	No CSFo	No CSFo	1.75E-07	No CSFo	No CSFo	6.83E-10	NA	3.42E-09	NA	3.42E-09	No CSFo	No CSFo	3.42E-09	No CSFo	No CSFo	1.14E-09
	Copper	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Cyanide	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Iron	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Lead	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Manganese	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Mercury	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Nickel	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Selenium	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Silver	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Thallium	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Vanadium	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Zinc	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
Maloit Park	Aluminum	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Antimony	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Arsenic	8.81E-04	8.34041E-05	1.47E-06	1.26E-04	2.38E-05	5.74E-09	NA	2.87E-08	NA	2.87E-08	4.72E-05	1.05E-05	2.87E-08	5.19E-05	4.67E-06	9.56E-09
	Barium	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Beryllium	No CSFo	No CSFo	3.05E-09	No CSFo	No CSFo	1.20E-11	NA	5.98E-11	NA	5.98E-11	No CSFo	No CSFo	5.98E-11	No CSFo	No CSFo	1.99E-11
	Cadmium	No CSFo	No CSFo	9.16E-09	No CSFo	No CSFo	3.59E-11	NA	1.79E-10	NA	1.79E-10	No CSFo	No CSFo	1.79E-10	No CSFo	No CSFo	5.98E-11
	Chromium	No CSFo	No CSFo	2.73E-07	No CSFo	No CSFo	1.07E-09	NA	5.34E-09	NA	5.34E-09	No CSFo	No CSFo	5.34E-09	No CSFo	No CSFo	1.78E-09
	Copper	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Cyanide	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Iron	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Lead	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Manganese	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Mercury	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Nickel	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Selenium	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Silver	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Thallium	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Vanadium	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Zinc	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF

Table 50 - Cancer Risks – Surface Soil Pathways

Exposure Area	Analyte	On-Site Resident			Hiker			Rafter		Angler		Golfer			Worker		
		Incidental Ingestion	Dermal Contact	Particulate Inhalation	Incidental Ingestion	Dermal Contact	Particulate Inhalation	Incidental Ingestion	Particulate Inhalation	Incidental Ingestion	Particulate Inhalation	Incidental Ingestion	Dermal Contact	Particulate Inhalation	Incidental Ingestion	Dermal Contact	Particulate Inhalation
		Age Averaged	Age Averaged	Age Averaged	Age Averaged	Age Averaged	Age Averaged	Adult	Adult	Adult	Adult	Adult	Adult	Adult	Adult	Adult	Adult
Old Tailings Pile (&Sump 3, Old Slurry Line)	Aluminum	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Antimony	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Arsenic	1.29E-04	1.22326E-05	2.15E-07	1.85E-05	3.50E-06	8.41E-10	NA	4.21E-09	NA	4.21E-09	6.92E-06	1.54E-06	4.21E-09	7.61E-06	6.85E-07	1.40E-09
	Barium	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Beryllium	No CSFo	No CSFo	2.62E-09	No CSFo	No CSFo	1.02E-11	NA	5.12E-11	NA	5.12E-11	No CSFo	No CSFo	5.12E-11	No CSFo	No CSFo	1.71E-11
	Cadmium	No CSFo	No CSFo	1.62E-08	No CSFo	No CSFo	6.34E-11	NA	3.17E-10	NA	3.17E-10	No CSFo	No CSFo	3.17E-10	No CSFo	No CSFo	1.06E-10
	Chromium	No CSFo	No CSFo	1.75E-07	No CSFo	No CSFo	6.83E-10	NA	3.42E-09	NA	3.42E-09	No CSFo	No CSFo	3.42E-09	No CSFo	No CSFo	1.14E-09
	Copper	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Cyanide	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Iron	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Lead	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Manganese	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Mercury	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Nickel	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Selenium	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Silver	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Thallium	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Vanadium	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Zinc	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
Rex Flats	Aluminum	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Antimony	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Arsenic	1.03E-03	9.78608E-05	1.72E-06	1.48E-04	2.80E-05	6.73E-09	NA	3.37E-08	NA	3.37E-08	5.54E-05	1.23E-05	3.37E-08	6.09E-05	5.48E-06	1.12E-08
	Barium	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Beryllium	No CSFo	No CSFo	3.05E-09	No CSFo	No CSFo	1.20E-11	NA	5.98E-11	NA	5.98E-11	No CSFo	No CSFo	5.98E-11	No CSFo	No CSFo	1.99E-11
	Cadmium	No CSFo	No CSFo	5.95E-09	No CSFo	No CSFo	2.33E-11	NA	1.16E-10	NA	1.16E-10	No CSFo	No CSFo	1.16E-10	No CSFo	No CSFo	3.88E-11
	Chromium	No CSFo	No CSFo	1.64E-07	No CSFo	No CSFo	6.40E-10	NA	3.20E-09	NA	3.20E-09	No CSFo	No CSFo	3.20E-09	No CSFo	No CSFo	1.07E-09
	Copper	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Cyanide	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Iron	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Lead	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Manganese	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Mercury	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Nickel	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Selenium	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Silver	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Thallium	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Vanadium	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Zinc	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF

Table 50 - Cancer Risks – Surface Soil Pathways

Exposure Area	Analyte	On-Site Resident			Hiker			Rafter		Angler		Golfer			Worker		
		Incidental Ingestion	Dermal Contact	Particulate Inhalation	Incidental Ingestion	Dermal Contact	Particulate Inhalation	Incidental Ingestion	Particulate Inhalation	Incidental Ingestion	Particulate Inhalation	Incidental Ingestion	Dermal Contact	Particulate Inhalation	Incidental Ingestion	Dermal Contact	Particulate Inhalation
		Age Averaged	Age Averaged	Age Averaged	Age Averaged	Age Averaged	Age Averaged	Adult	Adult	Adult	Adult	Adult	Adult	Adult	Adult	Adult	Adult
Roaster Pile 5	Aluminum	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Antimony	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Arsenic	**2.70E-04**	**2.55773E-05**	4.50E-07	**3.86E-05**	**7.31E-06**	1.76E-09	NA	8.80E-09	NA	8.80E-09	**1.45E-05**	**3.22E-06**	8.80E-09	**1.59E-05**	**1.43E-06**	2.93E-09
	Barium	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Beryllium	No CSFo	No CSFo	1.42E-09	No CSFo	No CSFo	5.55E-12	NA	2.78E-11	NA	2.78E-11	No CSFo	No CSFo	2.78E-11	No CSFo	No CSFo	9.25E-12
	Cadmium	No CSFo	No CSFo	1.55E-08	No CSFo	No CSFo	6.08E-11	NA	3.04E-10	NA	3.04E-10	No CSFo	No CSFo	3.04E-10	No CSFo	No CSFo	1.01E-10
	Chromium	No CSFo	No CSFo	1.42E-07	No CSFo	No CSFo	5.55E-10	NA	2.78E-09	NA	2.78E-09	No CSFo	No CSFo	2.78E-09	No CSFo	No CSFo	9.25E-10
	Copper	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Cyanide	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Iron	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Lead	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Manganese	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Mercury	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Nickel	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Selenium	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Silver	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Thallium	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Vanadium	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF
	Zinc	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF	NA	No URF	NA	No URF	No CSFo	No CSFo	No URF	No CSFo	No CSFo	No URF

Notes:
NA - Not applicable
CSFo - Cancer slope factor, oral
Bold underlines - indicates value exceeds target noncancer or cancer risk values

Table 51 Noncancer and Cancer Risks – Subsurface Soil Pathways

Table 51 - Noncancer and Cancer Risks – Subsurface Soil Pathways

Exposure Area	Analyte	Worker Noncancer (HQ)			Worker Cancer Risk		
		Incidental Ingestion	Dermal Contact	Particulate Inhalation	Incidental Ingestion	Dermal Contact	Particulate Inhalation
Bolts Lake	Aluminum	1.45E-02	0.00E+00	1.91E-04	No CSFo	No CSFo	No URF
	Arsenic	1.35E-01	1.21E-02	No RfC	**1.73E-06**	1.56E-07	3.19E-10
	Barium	5.17E-04	0.00E+00	1.36E-05	No CSFo	No CSFo	No URF
	Beryllium	0.00E+00	0.00E+00	0.00E+00	No CSFo	No CSFo	0.00E+00
	Chromium	4.31E-05	0.00E+00	No RfC	No CSFo	No CSFo	1.42E-09
	Iron	9.26E-02	0.00E+00	No RfC	No CSFo	No CSFo	No URF
	Lead	No RfD	No RfD	No RfC	No CSFo	No CSFo	No URF
	Manganese	6.23E-03	0.00E+00	1.12E-03	No CSFo	No CSFo	No URF
	Nickel	9.85E-04	0.00E+00	No RfC	No CSFo	No CSFo	No URF
	Silver	0.00E+00	0.00E+00	No RfC	No CSFo	No CSFo	No URF
	Thallium	0.00E+00	0.00E+00	No RfC	No CSFo	No CSFo	No URF
	Vanadium	4.31E-03	0.00E+00	No RfC	No CSFo	No CSFo	No URF
	Zinc	1.61E-03	0.00E+00	No RfC	No CSFo	No CSFo	No URF
Old Tailings Pile (&Sump 3)	Aluminum	2.90E-02	0.00E+00	3.80E-04	No CSFo	No CSFo	No URF
	Arsenic	**1.18E+00**	1.07E-01	No RfC	**1.52E-05**	**1.37E-06**	2.80E-09
	Barium	1.78E-03	0.00E+00	4.66E-05	No CSFo	No CSFo	No URF
	Beryllium	5.49E-03	0.00E+00	3.53E-05	No CSFo	No CSFo	4.84E-11
	Chromium	5.17E-05	0.00E+00	No RfC	No CSFo	No CSFo	1.71E-09
	Iron	2.37E-01	0.00E+00	No RfC	No CSFo	No CSFo	No URF
	Lead	No RfD	No RfD	No RfC	No CSFo	No CSFo	No URF
	Manganese	7.61E-03	0.00E+00	1.37E-03	No CSFo	No CSFo	No URF
	Nickel	2.42E-03	0.00E+00	No RfC	No CSFo	No CSFo	No URF
	Silver	7.10E-04	0.00E+00	No RfC	No CSFo	No CSFo	No URF
	Thallium	6.86E-02	0.00E+00	No RfC	No CSFo	No CSFo	No URF
	Vanadium	1.20E-02	0.00E+00	No RfC	No CSFo	No CSFo	No URF
	Zinc	2.05E-03	0.00E+00	No RfC	No CSFo	No CSFo	No URF

Table 51 - Noncancer and Cancer Risks – Subsurface Soil Pathways

Exposure Area	Analyte	Worker Noncancer (HQ)			Worker Cancer Risk		
		Incidental Ingestion	Dermal Contact	Particulate Inhalation	Incidental Ingestion	Dermal Contact	Particulate Inhalation
Rex Flats	Aluminum	2.95E-02	0.00E+00	3.87E-04	No CSFo	No CSFo	No URF
	Arsenic	**5.38E+00**	4.84E-01	No RfC	**6.92E-05**	**6.23E-06**	1.27E-08
	Barium	3.39E-03	0.00E+00	8.90E-05	No CSFo	No CSFo	No URF
	Beryllium	1.61E-03	0.00E+00	1.04E-05	No CSFo	No CSFo	1.42E-11
	Chromium	4.09E-05	0.00E+00	No RfC	No CSFo	No CSFo	1.35E-09
	Iron	5.92E-01	0.00E+00	No RfC	No CSFo	No CSFo	No URF
	Lead	No RfD	No RfD	No RfC	No CSFo	No CSFo	No URF
	Manganese	9.69E-03	0.00E+00	1.74E-03	No CSFo	No CSFo	No URF
	Nickel	2.26E-03	0.00E+00	No RfC	No CSFo	No CSFo	No URF
	Silver	1.81E-02	0.00E+00	No RfC	No CSFo	No CSFo	No URF
	Thallium	2.78E-01	0.00E+00	No RfC	No CSFo	No CSFo	No URF
	Vanadium	1.01E-02	0.00E+00	No RfC	No CSFo	No CSFo	No URF
	Zinc	3.23E-03	0.00E+00	No RfC	No CSFo	No CSFo	No URF

Notes:
NA - Not applicable
RfD - Reference Dose, oral
CSFo - Cancer slope factor, oral
Bold underlines - indicates value exceeds target noncancer or cancer risk values

3.4.2.2 *Cancer Risks*

At the OTP (Table 51), excess cancer risk was 1.52×10^{-5}, and at Rex Flats excess cancer risk was 6.92×10^{-5}, for workers for ingestion of subsurface soil. Cancer risks for dermal contact were lower than for soil ingestion. There were no excess cancer risks at Bolts Lake. There were no excess cancer risks for inhalation of particulates generated from subsurface soils.

3.4.3 *Surface Water, Fish, and Sediment*

3.4.3.1 *Noncancer Risks*

There were no HQs above one for any receptor for incidental ingestion of surface water (Table 52). There was one HQ above one for ingestion of trout from the Eagle River (Table 52). There were no HQs for sediment exposure that exceeded one.

3.4.3.2 *Cancer Risks*

There were no excess cancer risks for any receptor for incidental ingestion of surface water (Table 52) because there were no COPCs that were identified as carcinogens in surface water. Arsenic in sediments produced

cancer risks above $1x10^{-6}$ for nearly all receptors potentially exposed to sediments (Table 53). However, there were no cancer risks that exceeded $1x10^{-4}$ for exposure to sediments.

3.4.4 Ground Water

3.4.4.1 Noncancer Risks

Numerous metals in ground water produced HQs above one for the potable use pathway (Table 54). The highest HQs were for children for iron (469), thallium (128), and zinc (115). Dermal contact with ground water during potable use produced HQs above 1 for iron only.

Table 52 Noncancer and Cancer Risks – Surface Water and Fish Pathways

Table 52 - Noncancer and Cancer Risks – Surface Water and Fish Pathways

Surface Water Noncancer Risk	On-Site Resident						Hiker						Rafter		Angler		Golfer	Worker	
	Incidental Ingestion			Dermal Contact			Incidental Ingestion			Dermal Contact			Incidental Ingestion	Dermal Contact	Incidental Ingestion	Dermal Contact	Incidental Ingestion	Incidental Ingestion	Dermal Contact
Analyte	Child	Adult	Age Averaged	Child	Adult	Age Averaged	Child	Adult	Age Averaged	Child	Adult	Age Averaged	Adult	Adult	Adult	Adult	Adult	Adult	Adult
Cadmium	3.78E-03	3.78E-03	1.13E-03	4.98E-04	1.69E-04	2.35E-04	1.26E-03	1.08E-04	6.43E-05	1.66E-04	3.88E-05	6.43E-05	5.39E-04	1.94E-04	5.39E-04	1.94E-04	NA	1.08E-04	3.88E-05
Lead	No RfD	No RfD	No RfD	No RfD	No RfD	No RfD	No RfD	No RfD	No RfD	No RfD	No RfD	No RfD	No RfD	No RfD	No RfD	No RfD	NA	No RfD	No RfD
Manganese	2.80E-03	3.48E-04	8.38E-04	3.69E-04	1.25E-04	1.74E-04	9.33E-04	7.99E-05	4.76E-05	1.23E-04	2.88E-05	4.76E-05	4.00E-04	1.44E-04	4.00E-04	1.44E-04	NA	7.99E-05	2.88E-05
Zinc	2.20E-03	2.73E-04	6.57E-04	1.74E-04	5.89E-05	8.19E-05	7.32E-04	6.27E-05	2.24E-05	5.80E-05	1.36E-05	2.24E-05	3.14E-04	6.78E-05	3.14E-04	6.78E-05	NA	6.27E-05	1.36E-05

Table 52 - Noncancer and Cancer Risks – Surface Water and Fish Pathways

Surface Water Cancer Risk	On-Site Resident		Hiker		Rafter		Angler		Golfer	Worker	
	Incidental Ingestion	Dermal Contact	Incidental Ingestion	Dermal Contact	Incidental Ingestion	Dermal Contact	Incidental Ingestion	Dermal Contact	Incidental Ingestion	Incidental Ingestion	Dermal Contact
Analyte	Age Averaged	Age Averaged	Age Averaged	Age Averaged	Adult	Adult	Adult	Adult	Adult	Adult	Adult
Cadmium	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo
Lead	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo
Manganese	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo
Zinc	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo

Table 52 - Noncancer and Cancer Risks – Surface Water and Fish Pathways

Analyte	Fish Noncancer Risk				Fish Cancer Risk	
	On-Site Resident			Angler	On-Site Resident	Angler
	Ingestion			Ingestion	Ingestion	Ingestion
	Child	Adult	Age Averaged	Adult	Age Averaged	Adult
Cadmium	5.14E-01	2.94E-01	3.38E-01	2.94E-01	No CSFo	No CSFo
Lead	No RfD	No RfD	No RfD	No RfD	No CSFo	No CSFo
Manganese	7.62E-01	4.35E-01	5.01E-01	4.35E-01	No CSFo	No CSFo
Zinc	**1.50E+00**	8.54E-01	9.82E-01	8.54E-01	No CSFo	No CSFo

Notes:
NA - Not applicable
RfD - Reference Dose, oral
CSFo - Cancer slope factor, oral

Table 53 Noncancer and Cancer Risks – Sediment Pathways

Table 53 - Noncancer and Cancer Risks – Sediment Pathways

Noncancer Risks	On-Site Resident						Hiker						Rafter		Angler		Golfer	Worker	
	Incidental Ingestion			Dermal Contact			Incidental Ingestion			Dermal Contact			Incidental Ingestion	Dermal Contact	Incidental Ingestion	Dermal Contact	Incidental Ingestion	Incidental Ingestion	Dermal Contact
Analyte	Child	Adult	Age Averaged	Child	Adult	Age Averaged	Child	Adult	Age Averaged	Child	Adult	Age Averaged	Adult	Adult	Adult	Adult	Adult	Adult	Adult
Arsenic	4.43E-01	4.75E-02	1.27E-01	2.98E-01	5.35E-02	1.02E-01	2.95E-01	3.16E-02	8.44E-02	1.99E-01	3.56E-02	6.83E-02	6.33E-02	3.56E-02	6.33E-02	3.56E-02	NA	6.33E-02	3.76E-02
Cadmium	2.22E-02	2.38E-03	6.34E-03	4.98E-04	8.93E-05	1.71E-04	1.48E-02	1.59E-03	4.23E-03	3.32E-04	5.95E-05	1.14E-04	3.17E-03	5.95E-05	3.17E-03	5.95E-05	NA	3.17E-03	6.28E-05
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	2.15E-02	2.31E-03	6.15E-03	0.00E+00	0.00E+00	0.00E+00	1.44E-02	1.54E-03	4.10E-03	0.00E+00	0.00E+00	0.00E+00	3.08E-03	0.00E+00	3.08E-03	0.00E+00	NA	3.08E-03	0.00E+00
Zinc	1.14E-02	1.22E-03	3.26E-03	0.00E+00	0.00E+00	0.00E+00	7.61E-03	8.15E-04	2.17E-03	0.00E+00	0.00E+00	0.00E+00	1.63E-03	0.00E+00	1.63E-03	0.00E+00	NA	1.63E-03	0.00E+00

Table 53 - Noncancer and Cancer Risks – Sediment Pathways

Cancer Risks	On-Site Resident		Hiker		Rafter		Angler		Golfer	Worker	
	Incidental Ingestion	Dermal Contact	Incidental Ingestion	Dermal Contact	Incidental Ingestion	Dermal Contact	Incidental Ingestion	Dermal Contact	Incidental Ingestion	Incidental Ingestion	Dermal Contact
Analyte	Age Adjusted	Age Averaged	Age Averaged	Age Averaged	Adult	Adult	Adult	Adult	Adult	Adult	Adult
Arsenic	**2.44E-05**	**1.97E-05**	**1.63E-05**	**1.32E-05**	**1.22E-05**	**6.87E-06**	**1.22E-05**	**6.87E-06**	NA	8.14E-07	4.83E-07
Cadmium	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	NA	No CSFo	No CSFo
Lead	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	NA	No CSFo	No CSFo
Manganese	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	NA	No CSFo	No CSFo
Zinc	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	No CSFo	NA	No CSFo	No CSFo

Notes:
NA - Not applicable
RfD - Reference Dose, oral
CSFo - Cancer slope factor, oral
Bold underlines - indicates value exceeds target noncancer or cancer risk values
Zeros for the dermal ingestion pathway indicate that the ABS for dermal exposure estimates is lacking.

Table 54 Noncancer and Cancer Risks – Ground Water Potable Use Pathway

Table 54 - Noncancer and Cancer Risks – Ground Water Potable Use Pathway						
Noncancer Risks	**On-Site Resident**					
	Potable Use Ingestion			**Dermal Contact**		
Analyte	**Child**	**Adult**	**Age Averaged**	**Child**	**Adult**	**Age Averaged**
Aluminum	2.62E-01	1.12E-01	1.42E-01	1.73E-03	5.86E-04	8.15E-04
Arsenic	**2.34E+01**	**1.00E+01**	**1.27E+01**	1.55E-01	5.24E-02	7.29E-02
Beryllium	4.16E-01	1.78E-01	2.26E-01	2.74E-03	9.30E-04	1.29E-03
Cadmium	**4.99E+01**	**2.14E+01**	**2.71E+01**	3.29E-01	1.12E-01	1.55E-01
Calcium	**1.88E+00**	8.04E-01	**1.02E+00**	1.24E-02	4.20E-03	5.83E-03
Cobalt	**8.95E+00**	**3.84E+00**	**4.86E+00**	5.91E-02	2.00E-02	2.78E-02
Copper	1.22E-01	5.25E-02	6.65E-02	8.08E-04	2.74E-04	3.81E-04
Free Cyanide	3.84E-02	1.64E-02	2.08E-02	2.53E-04	8.58E-05	1.19E-04
Iron	**4.69E+02**	**2.01E+02**	**2.54E+02**	**3.09E+00**	**1.05E+00**	**1.46E+00**
Lead	NA	NA	NA	NA	NA	NA
Magnesium	**4.61E+00**	**1.98E+00**	**2.50E+00**	3.04E-02	1.03E-02	1.43E-02
Manganese	**9.06E+01**	**3.88E+01**	**4.92E+01**	5.98E-01	2.03E-01	2.82E-01
Nickel	**2.01E+00**	8.63E-01	**1.09E+00**	2.66E-03	9.01E-04	1.25E-03
Silver	2.56E-01	1.10E-01	1.39E-01	1.01E-03	3.43E-04	4.77E-04
Sulfate	**5.97E+00**	**2.56E+00**	**3.24E+00**	3.94E-02	1.34E-02	1.86E-02
Thallium	**1.28E+02**	**5.48E+01**	**6.94E+01**	8.44E-01	2.86E-01	3.98E-01
Vanadium	1.35E-01	5.78E-02	7.33E-02	8.91E-04	3.02E-04	4.20E-04
Zinc	**1.15E+02**	**4.93E+01**	**6.25E+01**	4.56E-01	1.54E-01	2.15E-01

Notes: The RDA of 14 mg/kg-d used as the RfDo for Ca; 5.7 mg/kg-d used for Mg; 68.4 mg/kg-d used for SO4 (see Section 3.1.1)

Table 54 - Noncancer and Cancer Risks – Ground Water Potable Use Pathway		
Cancer Risks	**On-Site Resident**	
	Potable Use Ingestion	**Dermal Contact**
Analyte	**Age Averaged**	**Age Averaged**
Aluminum	No CSFo	No CSFo
Arsenic	**2.45E-03**	**1.41E-05**
Beryllium	No CSFo	No CSFo
Cadmium	No CSFo	No CSFo
Calcium	No CSFo	No CSFo
Cobalt	No CSFo	No CSFo
Copper	No CSFo	No CSFo
Free Cyanide (4500-Cn-I)	No CSFo	No CSFo
Iron	No CSFo	No CSFo
Lead	No CSFo	No CSFo
Magnesium	No CSFo	No CSFo
Manganese	No CSFo	No CSFo
Nickel	No CSFo	No CSFo
Silver	No CSFo	No CSFo
Sulfate	No CSFo	No CSFo
Thallium	No CSFo	No CSFo
Vanadium	No CSFo	No CSFo
Zinc	No CSFo	No CSFo

Notes:
NA - Not applicable
RfD - Reference Dose, oral
CSFo - Cancer slope factor, oral
Bold underlines - indicates value exceeds target noncancer or cancer risk values

3.4.4.2 *Cancer Risks*

Arsenic was the only COPC in ground water that had a cancer slope factor. Arsenic in ground water produced an excess cancer risk of 2.45 x 10^{-3} (Table 54), well above the upper bound of the cancer risk range of $1x10^{-6}$ to $1x10^{-4}$. Dermal contact with ground water during potable use also produced excess cancer risks.

3.4.5 *Boulders*

3.4.5.1 *Noncancer Risks*

Arsenic was the only COPC in rock chip samples from boulders that produced an HQ above one for the incidental ingestion pathway. The HQ was 3.7 for child residents, 1 for age-averaged residential estimates, and 1.1 for child hikers (Table 55).

3.4.5.2 *Cancer Risks*

Arsenic was the only COPC in rock chip samples from boulders that produced an excess cancer risk for the incidental ingestion pathway. The cancer risk was $1.93x10^{-4}$ for residents and $5.53x10^{-5}$ for hikers (Table 55).

Table 55 Noncancer and Cancer Risks – Boulder Incidental Ingestion Pathway

Table 55 - Noncancer and Cancer Risks – Boulder Incidental Ingestion Pathway

Noncancer Risks	On-Site Resident			Hiker		
	Incidental Ingestion			Incidental Ingestion		
Analyte	Child	Adult	Age Averaged	Child	Adult	Age Averaged
Arsenic	3.73E+00	3.20E-01	1.00E+00	1.07E+00	9.15E-02	2.87E-01
Cadmium	4.79E-02	4.11E-03	1.29E-02	1.37E-02	1.17E-03	3.68E-03
Chromium	2.38E-05	2.04E-06	6.38E-06	6.79E-06	5.82E-07	1.82E-06
Copper	1.38E-02	1.18E-03	3.71E-03	3.95E-03	3.39E-04	1.06E-03
Lead	NA	NA	NA	NA	NA	NA
Manganese	3.03E-02	2.60E-03	8.15E-03	8.67E-03	7.43E-04	2.33E-03
Zinc	3.02E-03	2.58E-04	8.10E-04	8.61E-04	7.38E-05	2.31E-04

Table 55 - Noncancer and Cancer Risks – Boulder Incidental Ingestion Pathway		
Cancer Risks	**On-Site Resident**	**Hiker**
	Incidental Ingestion	**Incidental Ingestion**
Analyte	**Age Adjusted**	**Age Adjusted**
Arsenic	**1.93E-04**	**5.53E-05**
Cadmium	No CSFo	No CSFo
Chromium	No CSFo	No CSFo
Copper	No CSFo	No CSFo
Lead	No CSFo	No CSFo
Manganese	No CSFo	No CSFo
Zinc	No CSFo	No CSFo

Notes:
NA - Not applicable
RfD - Reference Dose, oral
CSFo - Cancer slope factor, oral
Bold underlines - indicates value exceeds target noncancer or cancer risk values

3.4.6 Diversion Trench and Seep Water

3.4.6.1 Noncancer Risks

There were no noncancer risks for incidental ingestion or dermal contact with diversion trench water (Table 56). There were no noncancer risks for incidental ingestion of or dermal contact with seep water (Table 57). Sediments were not sampled for these areas because they have a limited areal extent and it was presumed that soils would adequately characterize the solid media in the area. Soil risks were discussed by area above.

3.4.6.2 Cancer Risks

Arsenic was the only COPC in diversion trench water that has a cancer slope factor. Arsenic produced an excess cancer risk for the incidental ingestion pathway. The cancer risk was 1.50×10^{-6} for residents (Table 56). There were no excess cancer risks for ingestion of seep water by any receptor for which exposure was modeled because none of the COPCs were identified as oral carcinogens in the Integrated Risk Information System.

Table 56 - Noncancer and Cancer Risks - Diversion Trench Incidental Ingestion Pathway

Noncancer Intakes	On-Site Resident						Hiker						Rafter		Angler		Golfer	Worker	
	Incidental Ingestion (mg/kg-d)			Dermal Contact (mg/kg-d)			Incidental Ingestion (mg/kg-d)			Dermal Contact (mg/kg-d)			Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)
Analyte	Child	Adult	Age Averaged	Child	Adult	Age Averaged	Child	Adult	Age Averaged	Child	Adult	Age Averaged	Adult	Adult	Adult	Adult	Adult	Adult	Adult
Arsenic	2.60E-02	3.23E-03	7.79E-03	3.44E-03	1.16E-03	1.62E-03	8.68E-03	7.44E-04	2.33E-03	1.15E-03	2.68E-04	4.43E-04	NA	NA	3.72E-03	1.34E-03	NA	7.44E-04	2.68E-04
Manganese	1.86E-02	2.31E-03	5.57E-03	2.45E-03	8.32E-04	1.16E-03	6.20E-03	5.31E-04	1.66E-03	8.18E-04	1.91E-04	3.17E-04	NA	NA	2.66E-03	9.56E-04	NA	5.31E-04	1.91E-04

Table 56 - Noncancer and Cancer Risks - Diversion Trench Incidental Ingestion Pathway

Cancer Intakes	On-Site Resident		Hiker		Rafter		Angler		Golfer	Worker	
	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)
Analyte	Age Averaged	Age Averaged	Age Averaged	Age Averaged	Adult	Adult	Adult	Adult	Adult	Adult	Adult
Arsenic	**1.50E-06**	3.12E-07	4.49E-07	8.55E-08	NA	NA	7.17E-07	2.58E-07	NA	9.56E-09	3.44E-09
Manganese	No CSFo	No CSFo	No CSFo	No CSFo	NA	NA	No CSFo	No CSFo	NA	No CSFo	No CSFo

Notes:
NA - Not applicable
RfD - Reference Dose, oral
CSFo - Cancer slope factor, oral
Bold underlines - indicates value exceeds target noncancer or cancer risk values

Table 57 - Noncancer and Cancer Risks - Seep Incidental Ingestion Pathway

Noncancer Intakes	On-Site Resident						Hiker						Rafter		Angler		Golfer	Worker	
	Incidental Ingestion (mg/kg-d)			Dermal Contact (mg/kg-d)			Incidental Ingestion (mg/kg-d)			Dermal Contact (mg/kg-d)			Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)
Analyte	Child	Adult	Age Averaged	Child	Adult	Age Averaged	Child	Adult	Age Averaged	Child	Adult	Age Averaged	Adult	Adult	Adult	Adult	Adult	Adult	Adult
Cadmium	3.29E-03	4.09E-04	9.84E-04	4.34E-04	1.47E-04	2.04E-04	1.10E-03	9.39E-05	2.94E-04	1.45E-04	3.38E-05	5.60E-05	NA	NA	4.70E-04	1.69E-04	NA	9.39E-05	3.38E-05
Manganese	3.23E-01	4.01E-02	9.67E-02	4.26E-02	1.44E-02	2.01E-02	1.08E-01	9.23E-03	2.89E-02	1.42E-02	3.32E-03	5.50E-03	NA	NA	4.61E-02	1.66E-02	NA	9.23E-03	3.32E-03
Zinc	2.24E-02	2.78E-03	6.70E-03	1.77E-03	6.01E-04	8.35E-04	7.46E-03	6.39E-04	2.00E-03	5.91E-04	1.38E-04	2.29E-04	NA	NA	3.20E-03	6.90E-04	NA	6.39E-04	1.38E-04

Table 57 - Noncancer and Cancer Risks - Seep Incidental Ingestion Pathway

Cancer Intakes	On-Site Resident		Hiker		Rafter		Angler		Golfer	Worker	
	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Incidental Ingestion (mg/kg-d)	Dermal Contact (mg/kg-d)
Analyte	Age Averaged	Age Averaged	Age Averaged	Age Averaged	Adult	Adult	Adult	Adult	Adult	Adult	Adult
Cadmium	No CSFo	No CSFo	No CSFo	No CSFo	NA	NA	No CSFo	No CSFo	NA	No CSFo	No CSFo
Manganese	No CSFo	No CSFo	No CSFo	No CSFo	NA	NA	No CSFo	No CSFo	NA	No CSFo	No CSFo
Zinc	No CSFo	No CSFo	No CSFo	No CSFo	NA	NA	No CSFo	No CSFo	NA	No CSFo	No CSFo

Notes:
NA - Not applicable
RfD - Reference Dose, oral
CSFo - Cancer slope factor, oral
Bold underlines - indicates value exceeds target noncancer or cancer risk values

3.4.7 Lead

Because even low concentrations of lead have been linked to subtle neurological effects in children, lead is regulated on blood lead concentration. Residential screening values for lead derived with the IEUBK Model were used in Tier I. The default residential screening value for lead in soil that correlates to a blood lead level of 10 µg/dL no more than 5% of the time is 400 mg/kg.

Adjustments to model assumptions regarding the geometric standard deviation of lead in soils were made for Tier II, which in turn influence risk estimates. The revised FDA dietary parameters were downloaded from the TRW website (*http://www.epa.gov/superfund/lead/ieubkfaq.htm#FDA*) and loaded into the model. The contribution of soil lead ("PbS") to indoor household dust ("PbD") is known as the Mass Fraction ("MSD") in the IEUBK model. The MSD was reduced from the default value of 0.70 to 0.43 per direction from EPA Region 8. The geometric standard deviation ("GSD") for EPA Region 8 for children is 1.4 and this was used in addition to the national default of 1.6. The following risk estimates were obtained by running the IEUBK model with the site lead data for soil and ground water and varying the exposure parameters from highly conservative (GSD of 1.6; MSD of 0.7) to more realistic (GSD of 1.4; MSD of 0.7). The results, or the mean child blood lead concentration (micrograms per deciliter ("µg/dl")) and the percent of children in the exposure area with blood lead above the target blood lead concentration of 10 µg/dl are as follows:

Exposure Area	*Css*	*Dust Fraction*	*GSD*	*% Above 10 µg/dl*	*Geometric Mean (µg/dl)*
Bolts Lake	**68**	**0.43**	**1.4**	**0.000%**	**1.54**
		0.43	**1.6**	**0.004%**	**1.54**
		0.7	**1.4**	**0.000%**	**1.66**
		0.7	**1.6**	**0.007%**	**1.66**
Maloit Park	**3700**	**0.43**	**1.4**	**97.8%**	**19.65**
		0.43	**1.6**	**92.5%**	**19.65**
		0.7	**1.4**	**99.1%**	**22.25**
		0.7	**1.6**	**95.6%**	**22.25**
Old Tailings Pile (OTP)	**190**	**0.43**	**1.4**	**0.002%**	**2.49**
		0.43	**1.6**	**0.15%**	**2.49**
		0.7	**1.4**	**0.008%**	**2.80**
		0.7	**1.6**	**0.33%**	**2.80**
Rex Flats	**2200**	**0.43**	**1.4**	**83.4%**	**13.87**
		0.43	**1.6**	**75.7%**	**13.87**
		0.7	**1.4**	**91.5%**	**15.87**
		0.7	**1.6**	**83.7%**	**15.87**
Roaster Pile 5	**1800**	**0.43**	**1.4**	**71.0%**	**12.04**
		0.43	**1.6**	**65.4%**	**12.04**
		0.7	**1.4**	**83.2%**	**13.8**
		0.7	**1.6**	**75.4%**	**13.8**

Notes: Css – Site-specific exposure point concentration, Table 28

Bolts Lake and the OTP have lead concentrations within the acceptable range, as evidenced by less than a 5% chance of children having blood lead levels exceeding 10 µg/L. The other areas have lead concentrations likely to cause adverse effects in children under the assumptions used in the model.

Data were collected for the fines only fraction for a subset of the surface soil samples (Appendix B). The IEUBK lead model was run with these data only. The dust fraction and the GSD were varied in order to display a range of results based on highly conservative (GSD of 1.6; MSD of 0.7) to more realistic (GSD of 1.4; MSD of 0.7) exposure parameters. The results, or the mean child blood lead concentration (micrograms per deciliter (µg/dl) and the percent above the target blood lead concentration of 10 µg/dl are as follows:

Exposure Area	*Css (mg/kg)*	*Dust Fraction*	*GSD*	*% Above 10 µg/dl*	*Geometric Mean (µg/dl)*
Maloit Park	**1600**	**0.43**	**1.6**	**58.5%**	**11.07**
		0.43	**1.4**	**61.8%**	**11.07**
		0.7	**1.6**	**69.6%**	**12.73**
		0.7	**1.4**	**76.3%**	**12.73**
Old Tailings Pile (OTP)	**1100**	**0.43**	**1.6**	**35.6%**	**8.41**
		0.43	**1.4**	**30.4%**	**8.41**
		0.7	**1.6**	**47.6%**	**9.72**
		0.7	**1.4**	**46.6%**	**9.72**
Rex Flats	**2100**	**0.43**	**1.6**	**99.2%**	**31.21**
		0.43	**1.4**	**100%**	**31.21**
		0.7	**1.6**	**99.6%**	**34.94**
		0.7	**1.4**	**100%**	**43.94**

All areas for which fines data were collected exceed an acceptable level of lead in fines. It is difficult to recommend using the fines only fraction as the basis of risk, however. This is because the soil samples consist of at most, 50% fines. Therefore, any receptor who contacts bulk soils, contacts large rocks, pebbles, gravels, as well as fines. The uncertainty analysis discusses this in more depth.

3.4.8 Background Evaluation

The background data were statistically compared to the data for each exposure area (Appendix A). There were eight background samples collected that were used in the analysis. The results of this comparison indicate that arsenic and lead are statistically significantly higher than background at the OTP, Rex Flats, and Roaster Pile 5 areas at a 95% confidence level. Cadmium also is higher than background at the Roaster Pile 5 area; however, there were only five samples collected within Roaster Pile 5 and thus these results are uncertain. To be conservative, it was assumed that the statistical interpretation was correct for cadmium.

Other metals and other locations for arsenic and lead are not significantly higher than background. Thus, no metals exceed background at Bolts Lake or at Maloit Park.

Background arsenic averaged 12.6 mg/kg and the maximum detected arsenic in background was 48 mg/kg. Background lead was 46 mg/kg on average, and the maximum was 170 mg/kg in naturally occurring background materials. Cadmium averaged 1.4 mg/kg in background

samples, and the maximum was 5.5 mg/kg. Remedial goals and efforts should consider the contribution that ambient conditions make to the overall site risks.

Only concentrations that are known to be elevated relative to background should be remediated. This indicates that an upper bound on background (i.e., the 95th to 99th percentile on the background data, or the 95 percent upper tolerance level ("UTL") should be considered as the remedial goal; else, some background conditions could be subject to remediation.

3.4.9 Cumulative Risk Estimates

Table 58 shows cancer and non-cancer risks summed across media, exposure pathways, and contaminants in order to address cumulative potential risks. Cumulative Risks across media are presented in this document for illustrative purposes because the potential risks for a single medium are already above the acceptable levels or are significantly lower than the acceptable levels to make any impact on the cumulative risk estimates for multiple media. However, it should be noted that this approach could result in an unrealistic over-estimate of risk under reasonable exposure scenarios. For example, based on numerous soil tracer studies in children, EPA's Superfund and Resource Conservation and Recovery Act ("RCRA") programs selected a reasonable maximum soil ingestion rate of 200 mg/day and an average soil ingestion rate of 100 mg/day. These intakes account for intakes of all soil-derived materials, including indoor dust. Table 58 shows residential children receiving 200 mg/day of soil from outdoor soil and indoor dust for 350 days/year, 50 mg/day from sediment for 150 days/year, and 25 mg/day from boulders for 350 days/year. It is plausible that a residential child could be exposed to all of these sources on a single day, but it appears to be a physical impossibility that a child could be exposed to that combined amount of soil (275 mg/day) from a variety of media for 150 days/year. As a result, the risk estimates presented in Table 58 must be interpreted in perspective.

3.4.9.1 Noncancer Risk

Estimates of cumulative noncancer risk are made by calculating the hazard index, or HI. This involves summing all the HQs by exposure pathway and chemical. In doing so, an assumption of additive toxic effects is made (i.e., the sum of the 1 mg chemical A and 1 mg chemical B produces a similar effect as if 2 mg of either chemical been administered alone). Chemical effects can also be antagonistic (the combined concentrations produce an effect that is less than the effects observed when either chemical administered alone) or synergistic (the combined

Table 58. Cumulative Noncancer and Cancer Risk

NONCANCER RISKS

Exposure Area	Exposure Pathway	On-Site Resident			Hiker			Rafter	Angler	Golfer	Construction Worker
		Child	Adult	Age Averaged	Child	Adult	Age Averaged	Adult	Adult	Adult	Adult
Bolts Lake	Surface Soil - Incidental Ingestion	5.17E+01	5.54E+00	1.48E+01	7.39E+00	7.91E-01	2.11E+00	NA	NA	7.91E-01	1.31E+01
	Surface Soil - Dermal Contact	3.60E-02	5.49E-03	1.16E-02	1.03E-02	1.57E-03	3.31E-03	NA	NA	1.46E-03	9.73E-03
	Surface Soil -Particulate Inhalation	1.25E-02	1.25E-02	2.50E-03	3.57E-03	3.57E-03	7.14E-04	3.57E-03	3.57E-03	3.57E-03	8.93E-03
	Subsurface Soil - Incidental Ingestion	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.55E-01
	Subsurface Soil - Dermal Contact	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.21E-02
	Subsurface Soil - Particulate Inhalation	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.32E-03
	Surface Water-Incidental Ingestion	8.77E-03	1.09E-03	2.63E-03	2.92E-03	2.51E-04	1.34E-04	1.25E-03	1.25E-03	NA	2.51E-04
	Surface Water - Dermal Contact	1.04E-03	3.53E-04	4.91E-04	3.47E-04	8.12E-05	1.34E-04	4.06E-04	4.06E-04	NA	8.12E-05
	Fish Ingestion	2.77E+00	1.58E+00	1.82E+00	NA	NA	NA	NA	1.58E+00	NA	NA
	Sediment - Incidental Ingestion	4.98E-01	5.34E-02	1.42E-01	3.32E-01	3.56E-02	9.49E-02	7.12E-02	7.12E-02	NA	7.12E-02
	Sediment - Dermal Contact	2.99E-01	5.35E-02	1.03E-01	1.99E-01	3.57E-02	6.84E-02	3.57E-02	3.57E-02	NA	3.76E-02
	Diversion Trench Surface Water - Incidental Ingestion	4.46E-02	5.55E-03	1.34E-02	1.49E-02	1.27E-03	3.99E-03	NA	6.37E-03	NA	1.27E-03
	Diversion Trench Surface Water - Dermal Contact	5.89E-03	2.00E-03	2.78E-03	1.96E-03	4.59E-04	7.60E-04	NA	2.29E-03	NA	4.59E-04
	Seep Water - Incidental Ingestion	3.49E-01	4.33E-02	1.04E-01	1.16E-01	9.96E-03	3.12E-02	NA	4.98E-02	NA	9.96E-03
	Seep Water- Dermal Contact	4.48E-02	1.52E-02	2.11E-02	1.49E-02	3.49E-03	5.78E-03	NA	1.75E-02	NA	3.49E-03
	Groundwater Potable Use	9.00E+02	3.86E+02	4.89E+02	NA	NA	NA	NA	NA	NA	NA
	Groundwater - Dermal Contact	5.63E+00	1.91E+00	2.65E+00	NA	NA	NA	NA	NA	NA	NA
	Boulder - Incidental Ingestion	3.83E+00	3.28E-01	1.03E+00	1.09E+00	9.38E-02	2.94E-01	NA	NA	NA	NA
Total Noncancer HI		9.65E+02	3.95E+02	5.09E+02	9.18E+00	9.77E-01	2.61E+00	1.12E-01	1.77E+00	7.97E-01	1.35E+01
Maloit Park	Surface Soil - Incidental Ingestion	3.09E+01	3.31E+00	8.82E+00	4.41E+00	4.72E-01	1.26E+00	NA	NA	4.72E-01	7.79E+00
	Surface Soil - Dermal Contact	1.34E+00	2.05E-01	4.33E-01	3.84E-01	5.86E-02	1.24E-01	NA	NA	5.45E-02	3.63E-01
	Surface Soil -Particulate Inhalation	1.44E-01	1.44E-01	2.88E-02	4.11E-02	4.11E-02	8.21E-03	4.11E-02	4.11E-02	4.11E-02	1.03E-01
	Subsurface Soil - Incidental Ingestion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Subsurface Soil - Dermal Contact	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Subsurface Soil - Particulate Inhalation	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Surface Water-Incidental Ingestion	8.77E-03	1.09E-03	2.63E-03	2.92E-03	2.51E-04	1.34E-04	1.25E-03	1.25E-03	NA	2.51E-04
	Surface Water - Dermal Contact	1.04E-03	3.53E-04	4.91E-04	3.47E-04	8.12E-05	1.34E-04	4.06E-04	4.06E-04	NA	8.12E-05
	Fish Ingestion	2.77E+00	1.58E+00	1.82E+00	NA	NA	NA	NA	1.58E+00	NA	NA
	Sediment - Incidental Ingestion	4.98E-01	5.34E-02	1.42E-01	3.32E-01	3.56E-02	9.49E-02	7.12E-02	7.12E-02	NA	7.12E-02
	Sediment - Dermal Contact	2.99E-01	5.35E-02	1.03E-01	1.99E-01	3.57E-02	6.84E-02	3.57E-02	3.57E-02	NA	3.76E-02
	Diversion Trench Surface Water - Incidental Ingestion	4.46E-02	5.55E-03	1.34E-02	1.49E-02	1.27E-03	3.99E-03	NA	6.37E-03	NA	1.27E-03
	Diversion Trench Surface Water - Dermal Contact	5.89E-03	2.00E-03	2.78E-03	1.96E-03	4.59E-04	7.60E-04	NA	2.29E-03	NA	4.59E-04
	Seep Water - Incidental Ingestion	3.49E-01	4.33E-02	1.04E-01	1.16E-01	9.96E-03	3.12E-02	NA	4.98E-02	NA	9.96E-03
	Seep Water- Dermal Contact	4.48E-02	1.52E-02	2.11E-02	1.49E-02	3.49E-03	5.78E-03	NA	1.75E-02	NA	3.49E-03
	Groundwater Potable Use	9.00E+02	3.86E+02	4.89E+02	NA	NA	NA	NA	NA	NA	NA
	Groundwater - Dermal Contact	5.63E+00	1.91E+00	2.65E+00	NA	NA	NA	NA	NA	NA	NA
	Boulder - Incidental Ingestion	3.83E+00	3.28E-01	1.03E+00	1.09E+00	9.38E-02	2.94E-01	NA	NA	NA	NA
Total Noncancer HI		9.46E+02	3.93E+02	5.04E+02	6.61E+00	7.53E-01	1.89E+00	1.50E-01	1.81E+00	5.68E-01	8.38E+00

Table 58. Cumulative Noncancer and Cancer Risk

NONCANCER RISKS

Exposure Area	Exposure Pathway	On-Site Resident			Hiker			Rafter	Angler	Golfer	Construction Worker
		Child	Adult	Age Averaged	Child	Adult	Age Averaged	Adult	Adult	Adult	Adult
Old Tailings Pile (&Sump 3, Old Slurry Line)	Surface Soil - Incidental Ingestion	**8.41E+00**	9.01E-01	**2.40E+00**	**1.20E+00**	1.29E-01	3.43E-01	NA	NA	1.29E-01	**2.12E+00**
	Surface Soil - Dermal Contact	1.98E-01	3.02E-02	6.37E-02	5.65E-02	8.62E-03	1.82E-02	NA	NA	8.02E-03	5.35E-02
	Surface Soil -Particulate Inhalation	1.05E-02	1.05E-02	2.10E-03	3.01E-03	3.01E-03	6.01E-04	3.01E-03	3.01E-03	3.01E-03	7.51E-03
	Subsurface Soil - Incidental Ingestion	NA	NA	NA	NA	NA	NA	NA	NA	NA	**1.55E+00**
	Subsurface Soil - Dermal Contact	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.07E-01
	Subsurface Soil - Particulate Inhalation	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.83E-03
	Surface Water-Incidental Ingestion	8.77E-03	1.09E-03	2.63E-03	2.92E-03	2.51E-04	1.34E-04	1.25E-03	1.25E-03	NA	2.51E-04
	Surface Water - Dermal Contact	1.04E-03	3.53E-04	4.91E-04	3.47E-04	8.12E-05	1.34E-04	4.06E-04	4.06E-04	NA	8.12E-05
	Fish Ingestion	**2.77E+00**	**1.58E+00**	**1.82E+00**	NA	NA	NA	NA	**1.58E+00**	NA	NA
	Sediment - Incidental Ingestion	4.98E-01	5.34E-02	1.42E-01	3.32E-01	3.56E-02	9.49E-02	7.12E-02	7.12E-02	NA	7.12E-02
	Sediment - Dermal Contact	2.99E-01	5.35E-02	1.03E-01	1.99E-01	3.57E-02	6.84E-02	3.57E-02	3.57E-02	NA	3.76E-02
	Diversion Trench Surface Water - Incidental Ingestion	4.46E-02	5.55E-03	1.34E-02	1.49E-02	1.27E-03	3.99E-03	NA	6.37E-03	NA	1.27E-03
	Diversion Trench Surface Water - Dermal Contact	5.89E-03	2.00E-03	2.78E-03	1.96E-03	4.59E-04	7.60E-04	NA	2.29E-03	NA	4.59E-04
	Seep Water - Incidental Ingestion	3.49E-01	4.33E-02	1.04E-01	1.16E-01	9.96E-03	3.12E-02	NA	4.98E-02	NA	9.96E-03
	Seep Water- Dermal Contact	4.48E-02	1.52E-02	2.11E-02	1.49E-02	3.49E-03	5.78E-03	NA	1.75E-02	NA	3.49E-03
	Groundwater Potable Use	**9.00E+02**	**3.86E+02**	**4.89E+02**	NA	NA	NA	NA	NA	NA	NA
	Groundwater - Dermal Contact	**5.63E+00**	**1.91E+00**	**2.65E+00**	NA	NA	NA	NA	NA	NA	NA
	Boulder - Incidental Ingestion	**3.83E+00**	3.28E-01	**1.03E+00**	**1.09E+00**	9.38E-02	2.94E-01	NA	NA	NA	NA
Total Noncancer HI		**9.22E+02**	**3.91E+02**	**4.97E+02**	**3.04E+00**	3.21E-01	8.61E-01	1.12E-01	**1.77E+00**	1.40E-01	**3.97E+00**
Rex Flats	Surface Soil - Incidental Ingestion	**2.78E+01**	**2.97E+00**	**7.93E+00**	**3.97E+00**	4.25E-01	**1.13E+00**	NA	NA	4.25E-01	**7.01E+00**
	Surface Soil - Dermal Contact	**1.58E+00**	2.41E-01	5.08E-01	4.50E-01	6.87E-02	1.45E-01	NA	NA	6.39E-02	4.26E-01
	Surface Soil -Particulate Inhalation	1.64E-02	1.64E-02	3.27E-03	4.68E-03	4.68E-03	9.35E-04	4.68E-03	4.68E-03	4.68E-03	1.17E-02
	Subsurface Soil - Incidental Ingestion	NA	NA	NA	NA	NA	NA	NA	NA	NA	**6.33E+00**
	Subsurface Soil - Dermal Contact	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.84E-01
	Subsurface Soil - Particulate Inhalation	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.23E-03
	Surface Water-Incidental Ingestion	8.77E-03	1.09E-03	2.63E-03	2.92E-03	2.51E-04	1.34E-04	1.25E-03	1.25E-03	NA	2.51E-04
	Surface Water - Dermal Contact	1.04E-03	3.53E-04	4.91E-04	3.47E-04	8.12E-05	1.34E-04	4.06E-04	4.06E-04	NA	8.12E-05
	Fish Ingestion	**2.77E+00**	**1.58E+00**	**1.82E+00**	NA	NA	NA	NA	**1.58E+00**	NA	NA
	Sediment - Incidental Ingestion	4.98E-01	5.34E-02	1.42E-01	3.32E-01	3.56E-02	9.49E-02	7.12E-02	7.12E-02	NA	7.12E-02
	Sediment - Dermal Contact	2.99E-01	5.35E-02	1.03E-01	1.99E-01	3.57E-02	6.84E-02	3.57E-02	3.57E-02	NA	3.76E-02
	Diversion Trench Surface Water - Incidental Ingestion	4.46E-02	5.55E-03	1.34E-02	1.49E-02	1.27E-03	3.99E-03	NA	6.37E-03	NA	1.27E-03
	Diversion Trench Surface Water - Dermal Contact	5.89E-03	2.00E-03	2.78E-03	1.96E-03	4.59E-04	7.60E-04	NA	2.29E-03	NA	4.59E-04
	Seep Water - Incidental Ingestion	3.49E-01	4.33E-02	1.04E-01	1.16E-01	9.96E-03	3.12E-02	NA	4.98E-02	NA	9.96E-03
	Seep Water- Dermal Contact	4.48E-02	1.52E-02	2.11E-02	1.49E-02	3.49E-03	5.78E-03	NA	1.75E-02	NA	3.49E-03
	Groundwater Potable Use	**9.00E+02**	**3.86E+02**	**4.89E+02**	NA	NA	NA	NA	NA	NA	NA
	Groundwater - Dermal Contact	**5.63E+00**	**1.91E+00**	**2.65E+00**	NA	NA	NA	NA	NA	NA	NA
	Boulder - Incidental Ingestion	**3.83E+00**	3.28E-01	**1.03E+00**	**1.09E+00**	9.38E-02	2.94E-01	NA	NA	NA	NA
Total Noncancer HI		**9.43E+02**	**3.93E+02**	**5.03E+02**	**6.20E+00**	6.79E-01	**1.78E+00**	1.13E-01	**1.77E+00**	4.93E-01	**1.44E+01**

Table 58. Cumulative Noncancer and Cancer Risk

NONCANCER RISKS

Exposure Area	Exposure Pathway	On-Site Resident			Hiker			Rafter	Angler	Golfer	Construction Worker
		Child	Adult	Age Averaged	Child	Adult	Age Averaged	Adult	Adult	Adult	Adult
Roaster Pile 5	Surface Soil - Incidental Ingestion	**9.38E+00**	**1.00E+00**	**2.68E+00**	**1.34E+00**	1.44E-01	3.83E-01	NA	NA	1.44E-01	**2.37E+00**
	Surface Soil - Dermal Contact	4.12E-01	6.30E-02	1.33E-01	1.18E-01	1.80E-02	3.80E-02	NA	NA	1.67E-02	1.12E-01
	Surface Soil -Particulate Inhalation	3.89E-02	3.89E-02	7.77E-03	1.11E-02	1.11E-02	2.22E-03	1.11E-02	1.11E-02	1.11E-02	2.78E-02
	Subsurface Soil - Incidental Ingestion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Subsurface Soil - Dermal Contact	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Subsurface Soil - Particulate Inhalation	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Surface Water-Incidental Ingestion	8.77E-03	1.09E-03	2.63E-03	2.92E-03	2.51E-04	1.34E-04	1.25E-03	1.25E-03	NA	2.51E-04
	Surface Water - Dermal Contact	1.04E-03	3.53E-04	4.91E-04	3.47E-04	8.12E-05	1.34E-04	4.06E-04	4.06E-04	NA	8.12E-05
	Fish Ingestion	**2.77E+00**	**1.58E+00**	**1.82E+00**	NA	NA	NA	NA	**1.58E+00**	NA	NA
	Sediment - Incidental Ingestion	4.98E-01	5.34E-02	1.42E-01	3.32E-01	3.56E-02	9.49E-02	7.12E-02	7.12E-02	NA	7.12E-02
	Sediment - Dermal Contact	2.99E-01	5.35E-02	1.03E-01	1.99E-01	3.57E-02	6.84E-02	3.57E-02	3.57E-02	NA	3.76E-02
	Diversion Trench Surface Water - Incidental Ingestion	4.46E-02	5.55E-03	1.34E-02	1.49E-02	1.27E-03	3.99E-03	NA	6.37E-03	NA	1.27E-03
	Diversion Trench Surface Water - Dermal Contact	5.89E-03	2.00E-03	2.78E-03	1.96E-03	4.59E-04	7.60E-04	NA	2.29E-03	NA	4.59E-04
	Seep Water - Incidental Ingestion	3.49E-01	4.33E-02	1.04E-01	1.16E-01	9.96E-03	3.12E-02	NA	4.98E-02	NA	9.96E-03
	Seep Water- Dermal Contact	4.48E-02	1.52E-02	2.11E-02	1.49E-02	3.49E-03	5.78E-03	NA	1.75E-02	NA	3.49E-03
	Groundwater Potable Use	**9.00E+02**	**3.86E+02**	**4.89E+02**	NA	NA	NA	NA	NA	NA	NA
	Groundwater - Dermal Contact	**5.63E+00**	**1.91E+00**	**2.65E+00**	NA	NA	NA	NA	NA	NA	NA
	Boulder - Incidental Ingestion	**3.83E+00**	3.28E-01	**1.03E+00**	**1.09E+00**	9.38E-02	2.94E-01	NA	NA	NA	NA
Total Noncancer HI		**9.24E+02**	**3.91E+02**	**4.97E+02**	**3.24E+00**	3.53E-01	9.22E-01	1.20E-01	**1.78E+00**	1.71E-01	**2.63E+00**

Table 58. Cumulative Noncancer and Cancer Risk

CANCER RISKS

Exposure Area	Exposure Pathway	On-Site Resident Age Averaged	Hiker Age Averaged	Rafter Adult	Angler Adult	Golfer Adult	Worker Adult
Bolts Lake	Surface Soil - Incidental Ingestion	2.35E-05	3.35E-06	NA	NA	1.26E-06	1.38E-06
	Surface Soil - Dermal Contact	2.22E-06	6.35E-07	NA	NA	2.80E-07	1.25E-07
	Surface Soil -Particulate Inhalation	2.35E-07	9.18E-10	4.59E-09	4.59E-09	4.59E-09	1.53E-09
	Subsurface Soil - Incidental Ingestion	NA	NA	NA	NA	NA	1.73E-06
	Subsurface Soil - Dermal Contact	NA	NA	NA	NA	NA	1.56E-07
	Subsurface Soil - Particulate Inhalation	NA	NA	NA	NA	NA	1.74E-09
	Surface Water-Incidental Ingestion	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
	Surface Water - Dermal Contact	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
	Fish Ingestion	0.00E+00	NA	NA	0.00E+00	NA	NA
	Sediment - Incidental Ingestion	2.44E-05	1.63E-05	1.22E-05	1.22E-05	NA	8.14E-07
	Sediment - Dermal Contact	1.97E-05	1.32E-05	6.87E-06	6.87E-06	NA	4.83E-07
	Diversion Trench Surface Water - Incidental Ingestion	1.50E-06	4.49E-07	NA	7.17E-07	NA	9.56E-09
	Diversion Trench Surface Water - Dermal Contact	3.12E-07	8.55E-08	NA	2.58E-07	NA	3.44E-09
	Seep Water - Incidental Ingestion	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00
	Seep Water- Dermal Contact	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00
	Groundwater Potable Use	2.45E-03	NA	NA	NA	NA	NA
	Groundwater - Dermal Contact	1.41E-05	NA	NA	NA	NA	NA
	Boulder - Incidental Ingestion	1.93E-04	5.53E-05	NA	NA	NA	NA
Total Cancer Risk		2.73E-03	8.92E-05	1.91E-05	2.01E-05	1.54E-06	4.71E-06
Maloit Park	Surface Soil - Incidental Ingestion	8.81E-04	1.26E-04	NA	NA	4.72E-05	5.19E-05
	Surface Soil - Dermal Contact	8.34E-05	2.38E-05	NA	NA	1.05E-05	4.67E-06
	Surface Soil -Particulate Inhalation	1.75E-06	6.85E-09	3.43E-08	3.43E-08	3.43E-08	1.14E-08
	Subsurface Soil - Incidental Ingestion	NA	NA	NA	NA	NA	NA
	Subsurface Soil - Dermal Contact	NA	NA	NA	NA	NA	NA
	Subsurface Soil - Particulate Inhalation	NA	NA	NA	NA	NA	NA
	Surface Water-Incidental Ingestion	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
	Surface Water - Dermal Contact	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
	Fish Ingestion	0.00E+00	NA	NA	0.00E+00	NA	NA
	Sediment - Incidental Ingestion	2.44E-05	1.63E-05	1.22E-05	1.22E-05	NA	8.14E-07
	Sediment - Dermal Contact	1.97E-05	1.32E-05	6.87E-06	6.87E-06	NA	4.83E-07
	Diversion Trench Surface Water - Incidental Ingestion	1.50E-06	4.49E-07	NA	7.17E-07	NA	9.56E-09
	Diversion Trench Surface Water - Dermal Contact	3.12E-07	8.55E-08	NA	2.58E-07	NA	3.44E-09
	Seep Water - Incidental Ingestion	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00
	Seep Water- Dermal Contact	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00
	Groundwater Potable Use	2.45E-03	NA	NA	NA	NA	NA
	Groundwater - Dermal Contact	1.41E-05	NA	NA	NA	NA	NA
	Boulder - Incidental Ingestion	1.93E-04	5.53E-05	NA	NA	NA	NA
Total Cancer Risk		3.67E-03	2.35E-04	1.91E-05	2.01E-05	5.77E-05	5.79E-05

Table 58. Cumulative Noncancer and Cancer Risk

CANCER RISKS

Exposure Area	Exposure Pathway	On-Site Resident Age Averaged	Hiker Age Averaged	Rafter Adult	Angler Adult	Golfer Adult	Worker Adult
Old Tailings Pile (&Sump 3, Old Slurry Line)	Surface Soil - Incidental Ingestion	1.29E-04	1.85E-05	NA	NA	6.92E-06	7.61E-06
	Surface Soil - Dermal Contact	1.22E-05	3.50E-06	NA	NA	1.54E-06	6.85E-07
	Surface Soil -Particulate Inhalation	4.08E-07	1.60E-09	7.99E-09	7.99E-09	7.99E-09	2.66E-09
	Subsurface Soil - Incidental Ingestion	NA	NA	NA	NA	NA	1.52E-05
	Subsurface Soil - Dermal Contact	NA	NA	NA	NA	NA	1.37E-06
	Subsurface Soil - Particulate Inhalation	NA	NA	NA	NA	NA	4.56E-09
	Surface Water-Incidental Ingestion	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
	Surface Water - Dermal Contact	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
	Fish Ingestion	0.00E+00	NA	NA	0.00E+00	NA	NA
	Sediment - Incidental Ingestion	2.44E-05	1.63E-05	1.22E-05	1.22E-05	NA	8.14E-07
	Sediment - Dermal Contact	1.97E-05	1.32E-05	6.87E-06	6.87E-06	NA	4.83E-07
	Diversion Trench Surface Water - Incidental Ingestion	1.50E-06	4.49E-07	NA	7.17E-07	NA	9.56E-09
	Diversion Trench Surface Water - Dermal Contact	3.12E-07	8.55E-08	NA	2.58E-07	NA	3.44E-09
	Seep Water - Incidental Ingestion	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00
	Seep Water- Dermal Contact	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00
	Groundwater Potable Use	2.45E-03	NA	NA	NA	NA	NA
	Groundwater - Dermal Contact	1.41E-05	NA	NA	NA	NA	NA
	Boulder - Incidental Ingestion	1.93E-04	5.53E-05	NA	NA	NA	NA
Total Cancer Risk		2.85E-03	1.07E-04	1.91E-05	2.01E-05	8.47E-06	2.62E-05
Rex Flats	Surface Soil - Incidental Ingestion	1.03E-03	1.48E-04	NA	NA	5.54E-05	6.09E-05
	Surface Soil - Dermal Contact	9.79E-05	2.80E-05	NA	NA	1.23E-05	5.48E-06
	Surface Soil -Particulate Inhalation	1.89E-06	7.41E-09	3.70E-08	3.70E-08	3.70E-08	1.23E-08
	Subsurface Soil - Incidental Ingestion	NA	NA	NA	NA	NA	6.92E-05
	Subsurface Soil - Dermal Contact	NA	NA	NA	NA	NA	6.23E-06
	Subsurface Soil - Particulate Inhalation	NA	NA	NA	NA	NA	1.41E-08
	Surface Water-Incidental Ingestion	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
	Surface Water - Dermal Contact	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
	Fish Ingestion	0.00E+00	NA	NA	0.00E+00	NA	NA
	Sediment - Incidental Ingestion	2.44E-05	1.63E-05	1.22E-05	1.22E-05	NA	8.14E-07
	Sediment - Dermal Contact	1.97E-05	1.32E-05	6.87E-06	6.87E-06	NA	4.83E-07
	Diversion Trench Surface Water - Incidental Ingestion	1.50E-06	4.49E-07	NA	7.17E-07	NA	9.56E-09
	Diversion Trench Surface Water - Dermal Contact	3.12E-07	8.55E-08	NA	2.58E-07	NA	3.44E-09
	Seep Water - Incidental Ingestion	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00
	Seep Water- Dermal Contact	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00
	Groundwater Potable Use	2.45E-03	NA	NA	NA	NA	NA
	Groundwater - Dermal Contact	1.41E-05	NA	NA	NA	NA	NA
	Boulder - Incidental Ingestion	1.93E-04	5.53E-05	NA	NA	NA	NA
Total Cancer Risk		3.84E-03	2.61E-04	1.91E-05	2.01E-05	6.77E-05	1.43E-04

Table 58. Cumulative Noncancer and Cancer Risk

CANCER RISKS

Exposure Area	Exposure Pathway	On-Site Resident Age Averaged	Hiker Age Averaged	Rafter Adult	Angler Adult	Golfer Adult	Worker Adult
Roaster Pile 5	Surface Soil - Incidental Ingestion	**2.70E-04**	**3.86E-05**	NA	NA	**1.45E-05**	**1.59E-05**
	Surface Soil - Dermal Contact	**2.56E-05**	**7.31E-06**	NA	NA	**3.22E-06**	**1.43E-06**
	Surface Soil -Particulate Inhalation	6.08E-07	2.38E-09	1.19E-08	1.19E-08	1.19E-08	3.97E-09
	Subsurface Soil - Incidental Ingestion	NA	NA	NA	NA	NA	NA
	Subsurface Soil - Dermal Contact	NA	NA	NA	NA	NA	NA
	Subsurface Soil - Particulate Inhalation	NA	NA	NA	NA	NA	NA
	Surface Water-Incidental Ingestion	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
	Surface Water - Dermal Contact	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NA	0.00E+00
	Fish Ingestion	0.00E+00	NA	NA	0.00E+00	NA	NA
	Sediment - Incidental Ingestion	**2.44E-05**	**1.63E-05**	**1.22E-05**	**1.22E-05**	NA	8.14E-07
	Sediment - Dermal Contact	**1.97E-05**	**1.32E-05**	**6.87E-06**	**6.87E-06**	NA	4.83E-07
	Diversion Trench Surface Water - Incidental Ingestion	**1.50E-06**	4.49E-07	NA	7.17E-07	NA	9.56E-09
	Diversion Trench Surface Water - Dermal Contact	3.12E-07	8.55E-08	NA	2.58E-07	NA	3.44E-09
	Seep Water - Incidental Ingestion	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00
	Seep Water- Dermal Contact	0.00E+00	0.00E+00	NA	0.00E+00	NA	0.00E+00
	Groundwater Potable Use	**2.45E-03**	NA	NA	NA	NA	NA
	Groundwater - Dermal Contact	**1.41E-05**	NA	NA	NA	NA	NA
	Boulder - Incidental Ingestion	**1.93E-04**	**5.53E-05**	NA	NA	NA	NA
Total Cancer Risk		**3.00E-03**	**1.31E-04**	**1.91E-05**	**2.01E-05**	**1.77E-05**	**1.87E-05**

Notes:
NA - Not applicable
Bold underlines - indicates value exceeds target noncancer or cancer risk values
Zeros - indicate there were no cancer risks because there were no identified carcinogens as COPCs

concentrations produce a stronger effect than either chemical administered alone). Table 58 shows the HIs by location and receptor.

3.4.9.2 Cancer Risk

Estimates of cumulative cancer risk are made by summing the cancer risks by pathway and COPC. Table 58 also shows the cumulative cancer risks for each location.

3.5 UNCERTAINTY ANALYSIS

A qualitative evaluation of uncertainty was performed as part of the risk assessment. Possible factors that may contribute to uncertainty in the risk estimates include:

- Uncertainty in the adequacy of the site characterization data and historical information about the North Property
- Uncertainty in selection of contaminants of concern
- Uncertainty in the toxicity criteria used
- Uncertainty in the exposure assessment

3.5.1 Uncertainty in the Adequacy of the Site Characterization Data and Historical Information about the North Property

The method in which site data are collected can lead to an overestimation or an underestimation of risk for the site. Collection of samples from historically impacted areas can bias the results and lead to a higher proportion of contaminated samples than would be obtained due to random sampling throughout the area. The concentrations of mine-related contaminants in the samples are likely to be higher than in surrounding, undisturbed, native soils. Thus, the exposure and risk estimates for inorganics are likely biased high.

There are a limited number of RI samples for organics. This is because field measurements did not indicate their presence and historic data did not indicate widespread contamination of organic chemicals. Most organics were not detected in the samples collected, suggesting the data are adequate by which to address risk and that organic contamination is not widespread across the site. Of the organics detected, only two exceeded conservative screening levels. Dropping the organics from Tier II analysis may have biased risk results low.

The number of site samples in any given media also lends to uncertainty. There are numerous surface and subsurface soil samples collected from across the site; thus, soils are likely adequately characterized. Sediment and surface water samples were collected at relatively short intervals along the river. There are few ground water, diversion trench, or seep samples in current RI dataset, making characterization of these media more uncertain. No bias is suggested by the number of site samples.

The surface water concentrations in the Tier II analysis are likely to be biased high because only total fraction data were used in the Tier II analysis. All of these data were collected during the high runoff period, where the sediment load is higher and metal concentrations are higher. Therefore, risks due to the surface water ingestion pathway may be overestimated.

The fish concentrations were modeled, which is highly uncertain. This is because numerous variables influence uptake of metals by fish, including but not limited to seasonal or more frequent fluctuations in contaminant concentration and species of fish. BCFs or BAFs from the literature typically are developed for steady-state tissue concentrations; often in field situations steady state is not achieved due to water quality variability or movement of animals in and out of contaminated areas. Because the fish concentrations were based on the Tier II surface water EPC, which is likely biased high, fish tissue concentrations also may be biased high simply for this reason. Modeling fish tissue concentrations is likely to bias the risk results high because with each parameter, conservative assumptions were made and the combined multiple of these assumptions is likely to overestimate true concentrations in fish fillet.

The primary sampling approach used in the RI data collection process was stratified random sampling, whereby sampling was randomized by stratifying the area into exposure areas and sampling from within each exposure area. This provides data that statistically represents each exposure area. Biased sampling for soils introduces uncertainty since sample data are likely to overestimate average concentrations of site-wide EPCs; however, biasing sample data high is more conservative and protective than underestimating site-wide COPC concentrations.

3.5.2 Uncertainty in Selection of Contaminants of Concern

There is some uncertainty in the selection of contaminants of concern based on the review of historical data and the current RI data set. Because less sampling has occurred for organics than inorganics, there is the potential that some source of organic contamination was missed. However, the historic use of the site was as a repository for mining waste.

Therefore, the available evidence indicates that the most probable COPCs were adequately identified and characterized.

All inorganics on the TAL list were evaluated for potential toxicity relative to conservative screening levels. Most inorganics were retained in at least one medium. Uncertainty in the COPC selection is unlikely to bias the risk characterization results, but including more analytes than necessary increases cumulative risk estimates. Site-specific background data were not available for all analytes (e.g., antimony, iron, thallium). Because the area is in a mineralized zone, national background concentrations may not represent local site conditions. Because some analytes without a site-specific background were carried forward, they could artificially bias risk estimates high.

Arsenic was identified as a COPC in nearly every media except surface water, seep water, and fish. In surface and seep water, arsenic was not detected and thus was not carried forward in these media. Therefore, arsenic was not modeled as occurring in fish.

3.5.3 Uncertainty in the Toxicity Criteria

The toxicity criteria used in the risk assessment were obtained from either IRIS or EPA Region 9. Region 9 includes the NCEA, HEAST, and PPTRV sources current as of fall 2004. These documents have the most current toxicity research available to the public. Human toxicity data has a level of confidence associated with it and the level of confidence that the EPA and other regulatory agencies has in the toxicity data provided in the above documents was addressed in the uncertainty analysis.

The toxicity criteria contain inherent uncertainties. While many have a strong basis in human epidemiological research (i.e., lead), others are not as well studied and the criteria are dependent primarily on animal studies. There are uncertainty factors built into the IRIS toxicity criteria on a chemical-specific, as needed basis. These factors can be up to a total uncertainty of 10,000 (a factor of 10 for animal to human extrapolation; a factor of 10 for subchronic to chronic extrapolation; a factor of 10 for protection of sensitive subpopulations; and a modifying factor that can be applied as necessary). Toxicity of metals can also vary with the form (e.g., arsenite, arsenate), and where the more toxic form is likely to occur, the more stringent criterion was applied.

Tier I soil criteria were applied to evaluate sediments in the Tier I analysis. This is highly conservative as sediments are not expected to be contacted on as frequent a basis as are soils. This application would serve to retain more analytes than necessary for the Tier II evaluation, and is thus

protective. The ultimate results of the risk characterization should not be affected.

Bioavailability of most metals in soil was not considered or estimated. It is expected that bioavailability of metals in site-related media will be lower than bioavailability of metals in diets fed to laboratory animals (i.e., metals in diet are more toxic than metals adsorbed to soil particles). Therefore, the toxicity data are more stringent than necessary. This may lead to a substantial overestimation of risk for some metals.

Bioavailability data was considered for arsenic and lead. Data for both metals indicates that bioavailability in a soil matrix is less than 50%. The lead IEUBK model incorporates default values of bioavailability; these were used in the current analysis. A bioavailability factor of 50% (i.e., only half the total arsenic is bioavailable) was applied to the surface soil and subsurface soil media. No bioavailability factor for arsenic was applied in the forward risk analysis for water, boulders, or sediment media as these media may have different bioavailability characteristics than soils. Therefore, the risk estimates for soils are reduced by a factor of 2, and thus potentially underestimate risk. This is not likely given the known bioavailability of arsenic in soil at other sites.

3.5.4 Uncertainty in the Exposure Assessment

The exposure assessment proposed receptors, defined exposure areas, and estimated intakes. Assumptions in the exposure assessment also contribute to the likelihood of biasing the risk estimates high, particularly where professional judgment was necessary due to lack of site-specific information (e.g., risk from surface water based on assumption of potable use; exposure frequency and duration assumptions for recreational scenarios).

3.5.4.1 Fines Fractions in Surface Soil

A total of 70 surface soil samples were analyzed for the seven primary metals from: a) the total volume of soil collected from a sample location and b) the fines only fraction of that sample. These two analyses were conducted to assess whether the fines fraction of a soil sample contained a higher, lower, or equal portion of the metals as compared to the total soil sample. These samples were collected from the OTP, Rex Flats, and Maloit Park, and the comparisons of the total to fines fractions metals concentrations are presented in Appendix B.

The data show that the metals concentrations in the fine fraction are typically, but not always, greater than the concentrations in the total

sample. This is not unexpected considering the method by which the sample locations were selected. Specifically, and in accordance with the work plan, the sample section was biased towards the presence of the tailings-like material. This was accomplished by the field team: a) approaching the pre-selected sample grid point, b) then surveying the ground within a 50-foot radius of the pre-selected grid point for indications of tailings-like material (very fine grained soil and/or yellow to orange color soil), and c) then sampling from the area with the greatest visual indication of tailings like material. Also, samples in addition to the prescribed work plan locations were collected from areas exhibiting tailings-like material.

Grain size analysis was conducted for 10 samples located throughout the North Property at various concentrations of arsenic (Appendix B). The data showed that the samples were biased towards tailings like material, that the fines fraction percentage varies, and that the overall average of the fines fraction is 52%.

That is:
Total Sample = 100%
Fines Fraction = 52%
Coarse Fraction = 48%

3.5.4.2 Receptor Identification

A North Property tour was performed and receptors identified. Numerous recreational receptors were evaluated, as well as residential receptors. Therefore, the assumptions used in the analysis are likely to be protective of residential and recreational receptors occurring in the area.

A single worker receptor was selected for evaluation. This was the construction worker, for which noncancer ingestion rates exceeded other potential receptors. However, risk estimates for the construction worker underestimate the potential for adverse effects due to the inhalation pathway. In addition, cancer risks are potentially underestimated.

Table 59 compares risks for various worker receptors based on different exposure assumptions. The construction worker has a short duration (2 years) because the site is small and construction will not take long, but a high soil ingestion rate (330 mg/d). The outdoor worker employed at the site for 25 years was assumed to be involved in landscape duties and also was modeled with a soil ingestion rate of 330 mg/d. The golf course worker is modeled as working for 30 years but at a soil ingestion rate of only 100 mg/d.

Inhalation risks are so much lower than risks due to ingestion that the inhalation pathway essentially becomes insignificant and the underestimation due to evaluation of the construction worker is not critical to the risk analysis. Table 59 presents a summary of risks to other workers such as an outdoor/golf course worker (based on a soil ingestion rate of 100 mg/d and exposure duration of 30 years; all other exposure parameters equivalent to the construction worker). In addition, cancer risks are potentially underestimated for workers who are likely to work longer than the assumption of 2 years used in this risk assessment. For example, the EPA default assumption for maintenance workers is the exposure duration of 25 years. Additionally, construction workers might work for 5 years if the site development is prolonged for more than 2 years.

3.5.4.3 Exposure Parameters

The values used to represent exposure parameters were biased high (conservative) and in general were 95th percentile values. This means for any given parameter, for any given 100 people, 95 would have a lower exposure rate than the one used in the analysis.

When multiple 95th percentile parameters are combined, the result is an upper bound estimate on intake or risk. It is unlikely that most people would have this level of risk. The advantage of such a highly conservative characterization of risk is that it is very likely to be protective of receptors at the North Property. A major disadvantage of this approach, however, is that it may not accurately represent actual risks at the North Property. Using highly conservative input parameters may falsely elevate risk characterizations at the site and can lead to excessive remediation costs.

When exposure parameters were unavailable from EPA, attempts were made to obtain them elsewhere. In the event data were lacking, professional judgment was used to estimate an exposure parameter. This could lead to over- or under-estimation of risk to an unknown degree.

Table 59 Comparison of Risks for Different Worker Receptors

Table 59 - Comparison of Risks for Different Worker Receptors							
CANCER RISKS							
Exposure Area	**Exposure Pathway**	**On-Site Resident Age Averaged**	**Hiker Age Averaged**	**Rafter Adult**	**Angler Adult**	**Golfer Adult**	**Worker Adult**
Bolts Lake	Surface Soil - Incidental Ingestion	**1.31E+01**	**1.38E-06**	**1.31E+01**	**1.73E-05**	**3.96E+00**	**6.29E-06**
	Surface Soil - Dermal Contact	9.73E-03	1.25E-07	9.73E-03	**1.56E-06**	9.73E-03	**1.87E-06**
	Surface Soil -Particulate Inhalation	8.93E-03	1.53E-09	8.93E-03	1.91E-08	8.93E-03	2.30E-08
	Subsurface Soil - Incidental Ingestion	2.55E-01	**1.73E-06**	2.55E-01	**2.16E-05**	7.74E-02	**7.86E-06**
	Subsurface Soil - Dermal Contact	1.21E-02	1.56E-07	1.21E-02	**1.95E-06**	1.21E-02	**2.34E-06**
	Subsurface Soil - Particulate Inhalation	1.32E-03	1.74E-09	1.32E-03	2.18E-08	1.32E-03	2.61E-08
	Surface Water-Incidental Ingestion	2.51E-04	0.00E+00	2.51E-04	0.00E+00	2.51E-04	0.00E+00
	Surface Water - Dermal Contact	8.12E-05	0.00E+00	8.12E-05	0.00E+00	8.12E-05	0.00E+00
	Fish Ingestion	NA	NA	NA	NA	NA	NA
	Sediment - Incidental Ingestion	7.12E-02	8.14E-07	7.12E-02	**1.02E-05**	7.12E-02	**1.22E-05**
	Sediment - Dermal Contact	3.76E-02	4.83E-07	3.76E-02	**6.04E-06**	3.76E-02	**7.25E-06**
	Diversion Trench Surface Water - Incidental Ingestion	1.27E-03	9.56E-09	1.27E-03	1.20E-07	1.27E-03	1.43E-07
	Diversion Trench Surface Water - Dermal Contact	4.59E-04	3.44E-09	4.59E-04	4.30E-08	4.59E-04	5.16E-08
	Seep Water - Incidental Ingestion	9.96E-03	0.00E+00	9.96E-03	0.00E+00	9.96E-03	0.00E+00
	Seep Water- Dermal Contact	3.49E-03	0.00E+00	3.49E-03	0.00E+00	3.49E-03	0.00E+00
	Groundwater Potable Use	NA	NA	NA	NA	NA	NA
	Groundwater - Dermal Contact	NA	NA	NA	NA	NA	NA
	Boulder - Incidental Ingestion	NA	NA	NA	NA	NA	NA
Total		**1.35E+01**	**4.71E-06**	**1.35E+01**	**5.88E-05**	**4.19E+00**	**3.81E-05**

Table 59 - Comparison of Risks for Different Worker Receptors							
CANCER RISKS							
Exposure Area	**Exposure Pathway**	**On-Site Resident Age Averaged**	**Hiker Age Averaged**	**Rafter Adult**	**Angler Adult**	**Golfer Adult**	**Worker Adult**
Maloit Park	Surface Soil - Incidental Ingestion	**7.79E+00**	**5.19E-05**	**7.79E+00**	**6.49E-04**	**2.36E+00**	**2.36E-04**
	Surface Soil - Dermal Contact	3.63E-01	**4.67E-06**	3.63E-01	**5.84E-05**	3.63E-01	**7.01E-05**
	Surface Soil -Particulate Inhalation	1.03E-01	1.14E-08	1.03E-01	1.43E-07	1.03E-01	1.71E-07
	Subsurface Soil - Incidental Ingestion	NA	NA	NA	NA	NA	NA
	Subsurface Soil - Dermal Contact	NA	NA	NA	NA	NA	NA
	Subsurface Soil - Particulate Inhalation	NA	NA	NA	NA	NA	NA
	Surface Water-Incidental Ingestion	2.51E-04	0.00E+00	2.51E-04	0.00E+00	2.51E-04	0.00E+00
	Surface Water - Dermal Contact	8.12E-05	0.00E+00	8.12E-05	0.00E+00	8.12E-05	0.00E+00
	Fish Ingestion	NA	NA	NA	NA	NA	NA
	Sediment - Incidental Ingestion	7.12E-02	8.14E-07	7.12E-02	**1.02E-05**	7.12E-02	**1.22E-05**
	Sediment - Dermal Contact	3.76E-02	4.83E-07	3.76E-02	**6.04E-06**	3.76E-02	**7.25E-06**
	Diversion Trench Surface Water - Incidental Ingestion	1.27E-03	9.56E-09	1.27E-03	1.20E-07	1.27E-03	1.43E-07
	Diversion Trench Surface Water - Dermal Contact	4.59E-04	3.44E-09	4.59E-04	4.30E-08	4.59E-04	5.16E-08
	Seep Water - Incidental Ingestion	9.96E-03	0.00E+00	9.96E-03	0.00E+00	9.96E-03	0.00E+00
	Seep Water- Dermal Contact	3.49E-03	0.00E+00	3.49E-03	0.00E+00	3.49E-03	0.00E+00
	Groundwater Potable Use	NA	NA	NA	NA	NA	NA
	Groundwater - Dermal Contact	NA	NA	NA	NA	NA	NA
	Boulder - Incidental Ingestion	NA	NA	NA	NA	NA	NA
Total		**8.38E+00**	**5.79E-05**	**8.38E+00**	**7.24E-04**	**2.95E+00**	**3.26E-04**

Table 59 - Comparison of Risks for Different Worker Receptors							
CANCER RISKS							
Exposure Area	**Exposure Pathway**	**On-Site Resident Age Averaged**	**Hiker Age Averaged**	**Rafter Adult**	**Angler Adult**	**Golfer Adult**	**Worker Adult**
Old Tailings Pile (&Sump 3, Old Slurry Line)	Surface Soil - Incidental Ingestion	**2.12E+00**	**7.61E-06**	**2.12E+00**	**9.51E-05**	6.44E-01	**3.46E-05**
	Surface Soil - Dermal Contact	5.35E-02	6.85E-07	5.35E-02	**8.56E-06**	5.35E-02	**1.03E-05**
	Surface Soil -Particulate Inhalation	7.51E-03	2.66E-09	7.51E-03	3.33E-08	7.51E-03	4.00E-08
	Subsurface Soil - Incidental Ingestion	**1.55E+00**	**1.52E-05**	**1.55E+00**	**1.90E-04**	4.70E-01	**6.92E-05**
	Subsurface Soil - Dermal Contact	1.07E-01	**1.37E-06**	1.07E-01	**1.71E-05**	1.07E-01	**2.06E-05**
	Subsurface Soil - Particulate Inhalation	1.83E-03	4.56E-09	1.83E-03	5.70E-08	1.83E-03	6.84E-08
	Surface Water-Incidental Ingestion	2.51E-04	0.00E+00	2.51E-04	0.00E+00	2.51E-04	0.00E+00
	Surface Water - Dermal Contact	8.12E-05	0.00E+00	8.12E-05	0.00E+00	8.12E-05	0.00E+00
	Fish Ingestion	NA	NA	NA	NA	NA	NA
	Sediment - Incidental Ingestion	7.12E-02	8.14E-07	7.12E-02	**1.02E-05**	7.12E-02	**1.22E-05**
	Sediment - Dermal Contact	3.76E-02	4.83E-07	3.76E-02	**6.04E-06**	3.76E-02	**7.25E-06**
	Diversion Trench Surface Water - Incidental Ingestion	1.27E-03	9.56E-09	1.27E-03	1.20E-07	1.27E-03	1.43E-07
	Diversion Trench Surface Water - Dermal Contact	4.59E-04	3.44E-09	4.59E-04	4.30E-08	4.59E-04	5.16E-08
	Seep Water - Incidental Ingestion	9.96E-03	0.00E+00	9.96E-03	0.00E+00	9.96E-03	0.00E+00
	Seep Water- Dermal Contact	3.49E-03	0.00E+00	3.49E-03	0.00E+00	3.49E-03	0.00E+00
	Groundwater Potable Use	NA	NA	NA	NA	NA	NA
	Groundwater - Dermal Contact	NA	NA	NA	NA	NA	NA
	Boulder - Incidental Ingestion	NA	NA	NA	NA	NA	NA
Total		**3.97E+00**	**2.62E-05**	**3.97E+00**	**3.28E-04**	**1.41E+00**	**1.54E-04**

Table 59 - Comparison of Risks for Different Worker Receptors							
CANCER RISKS							
Exposure Area	**Exposure Pathway**	**On-Site Resident Age Averaged**	**Hiker Age Averaged**	**Rafter Adult**	**Angler Adult**	**Golfer Adult**	**Worker Adult**
Rex Flats	Surface Soil - Incidental Ingestion	**7.01E+00**	**6.09E-05**	**7.01E+00**	**7.61E-04**	**2.12E+00**	**2.77E-04**
	Surface Soil - Dermal Contact	4.26E-01	**5.48E-06**	4.26E-01	**6.85E-05**	4.26E-01	**8.22E-05**
	Surface Soil -Particulate Inhalation	1.17E-02	1.23E-08	1.17E-02	1.54E-07	1.17E-02	1.85E-07
	Subsurface Soil - Incidental Ingestion	**6.33E+00**	**6.92E-05**	**6.33E+00**	**8.65E-04**	**1.92E+00**	**3.15E-04**
	Subsurface Soil - Dermal Contact	4.84E-01	**6.23E-06**	4.84E-01	**7.78E-05**	4.84E-01	**9.34E-05**
	Subsurface Soil - Particulate Inhalation	2.23E-03	1.41E-08	2.23E-03	1.76E-07	2.23E-03	2.12E-07
	Surface Water-Incidental Ingestion	2.51E-04	0.00E+00	2.51E-04	0.00E+00	2.51E-04	0.00E+00
	Surface Water - Dermal Contact	8.12E-05	0.00E+00	8.12E-05	0.00E+00	8.12E-05	0.00E+00
	Fish Ingestion	NA	NA	NA	NA	NA	NA
	Sediment - Incidental Ingestion	7.12E-02	8.14E-07	7.12E-02	**1.02E-05**	7.12E-02	**1.22E-05**
	Sediment - Dermal Contact	3.76E-02	4.83E-07	3.76E-02	**6.04E-06**	3.76E-02	**7.25E-06**
	Diversion Trench Surface Water - Incidental Ingestion	1.27E-03	9.56E-09	1.27E-03	1.20E-07	1.27E-03	1.43E-07
	Diversion Trench Surface Water - Dermal Contact	4.59E-04	3.44E-09	4.59E-04	4.30E-08	4.59E-04	5.16E-08
	Seep Water - Incidental Ingestion	9.96E-03	0.00E+00	9.96E-03	0.00E+00	9.96E-03	0.00E+00
	Seep Water- Dermal Contact	3.49E-03	0.00E+00	3.49E-03	0.00E+00	3.49E-03	0.00E+00
	Groundwater Potable Use	NA	NA	NA	NA	NA	NA
	Groundwater - Dermal Contact	NA	NA	NA	NA	NA	NA
	Boulder - Incidental Ingestion	NA	NA	NA	NA	NA	NA
Total		**1.44E+01**	**1.43E-04**	**1.44E+01**	**1.79E-03**	**5.09E+00**	**7.87E-04**

Table 59 - Comparison of Risks for Different Worker Receptors							
CANCER RISKS							
Exposure Area	**Exposure Pathway**	**On-Site Resident Age Averaged**	**Hiker Age Averaged**	**Rafter Adult**	**Angler Adult**	**Golfer Adult**	**Worker Adult**
Roaster Pile 5	Surface Soil - Incidental Ingestion	**2.37E+00**	**1.59E-05**	**2.37E+00**	**1.99E-04**	7.18E-01	**7.23E-05**
	Surface Soil - Dermal Contact	1.12E-01	**1.43E-06**	1.12E-01	**1.79E-05**	1.12E-01	**2.15E-05**
	Surface Soil -Particulate Inhalation	2.78E-02	3.97E-09	2.78E-02	4.96E-08	2.78E-02	5.95E-08
	Subsurface Soil - Incidental Ingestion	NA	NA	NA	NA	NA	NA
	Subsurface Soil - Dermal Contact	NA	NA	NA	NA	NA	NA
	Subsurface Soil - Particulate Inhalation	NA	NA	NA	NA	NA	NA
	Surface Water-Incidental Ingestion	2.51E-04	0.00E+00	2.51E-04	0.00E+00	2.51E-04	0.00E+00
	Surface Water - Dermal Contact	8.12E-05	0.00E+00	8.12E-05	0.00E+00	8.12E-05	0.00E+00
	Fish Ingestion	NA	NA	NA	NA	NA	NA
	Sediment - Incidental Ingestion	7.12E-02	8.14E-07	7.12E-02	**1.02E-05**	7.12E-02	**1.22E-05**
	Sediment - Dermal Contact	3.76E-02	4.83E-07	3.76E-02	**6.04E-06**	3.76E-02	**7.25E-06**
	Diversion Trench Surface Water - Incidental Ingestion	1.27E-03	9.56E-09	1.27E-03	1.20E-07	1.27E-03	1.43E-07
	Diversion Trench Surface Water - Dermal Contact	4.59E-04	3.44E-09	4.59E-04	4.30E-08	4.59E-04	5.16E-08
	Seep Water - Incidental Ingestion	9.96E-03	0.00E+00	9.96E-03	0.00E+00	9.96E-03	0.00E+00
	Seep Water- Dermal Contact	3.49E-03	0.00E+00	3.49E-03	0.00E+00	3.49E-03	0.00E+00
	Groundwater Potable Use	NA	NA	NA	NA	NA	NA
	Groundwater - Dermal Contact	NA	NA	NA	NA	NA	NA
	Boulder - Incidental Ingestion	NA	NA	NA	NA	NA	NA
Total		**2.63E+00**	**1.87E-05**	**2.63E+00**	**2.33E-04**	9.81E-01	**1.14E-04**

Notes:
NA - Not applicable
Bold underlines - indicates value exceeds target noncancer or cancer risk values
Zeros - indicate there were no cancer risks because there were no identified carcinogens as COPCs

3.5.4.4 Exposure Point Concentrations

Surface soil samples were collected from throughout the North Property using initially: a one-acre grid spacing (approximately 208 linear feet at the OTP and Rex Flats; additional surface soil samples from within the boulders at the OTP and Rex Flats (5 each); a two-acre grid at Bolts Lake area and vicinity since wastes were not placed in these areas; ten surface soil samples at Maloit Park area since this area has been remediated to human health and vegetation stress levels; and five surface soils samples at the 0.5 acre former Roaster Pile #5 area. The sample patterns were modified, as stated in the Work Plan, to sample the tailings-like material within a 50-foot radius of the predetermined sample point. Additional samples were collected to assist in defining extent and to sample tailings-like material outside of the grid pattern protocol (opportunity samples). Also, as requested by the CDPHE, infill samples were collected at the OTP and Rex Flats, resulting in a spacing of less than 1 acre throughout a majority of these areas. Infill samples were also collected at Maloit Park. Approximately 301 surface soil samples were collected from the OTP/Sump #3, Rex Flats, Bolts Lake, Maloit Park, and Roaster Pile #5 areas.

Conservative estimates were used to represent the EPCs. The minimum of the maximum detected value or the UCL95 was used as the EPC. These statistics are likely to overestimate exposure since sampling was systematically biased, with more samples collected within impacted areas than outlying, undisturbed areas. Thus, concentrations of site related analytes are likely to be overestimated within each exposure area.

The effects of uncertainty on the risk characterization results are summarized as follows:

Uncertainty	*Effect on Risk Characterization Results*
Uncertainty in the adequacy of the site characterization data and historical information about the site	Sampling focused in historically contaminated areas. Biased High ⇪
Uncertainty in selection of contaminants of concern	No Bias ⃠
Uncertainty in the toxicity criteria used	No Bias ⃠
Uncertainty in the exposure assessment	EPCs (UCL95s) – No Bias ⃠ 2. Fish BCF Modeling - Biased High ⇪ 3. Use of construction workers to represent all worker categories – noncancer risk biased high ⇪ -inhalation risk biased low ⇓ -cancer risk biased low ⇓

4.0 CONCLUSIONS

All exposure areas demonstrate excess noncancer and cancer risks for at least one receptor. The major contributors to noncancer risk are arsenic, iron, manganese, and thallium. The major contributor to cancer risk is arsenic. Lead causes excess risk levels at all locations except Bolts Lake and the OTP.

The results of this risk assessment were incorporated into the selection of site-specific remediation goals for the North Property (Appendix C).

5.0 REFERENCES

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The revised FDA dietary parameters were downloaded from the TRW website (*http://www.epa.gov/superfund/lead/ieubkfaq.htm#FDA*) and loaded into the model.

Appendix A
Statistical Analysis of Background Data Compared to Exposure Area Data

Appendix A
Statistical Analysis of Background Data Compared to Exposure Area Data

The data were evaluated statistically to determine which analytes exceeded naturally occurring background conditions. The data were divided into exposure area, since some exposure areas may have had more mine-site impacts than others, and Bolts Lake was expected to be unimpacted. The number of samples for each analyte by exposure area varied from 1 to well over 100. When there are fewer than five to 10 samples, the statistical analysis is more uncertain because the area of representation is more limited. When a sample was nondetect for a given analyte, a value of ½ the reporting limit was used as a surrogate for the detected value. All of the Tier II COPCs by definition had a detection frequency greater than 5%. However, when the detection frequency is lower than 50 to 85%, the statistical analysis becomes more uncertain.

The data were analyzed with Statgraphics©. Summary statistics were estimated, including indications of kurtosis and skewness. A one-way Analysis of Variance (ANOVA) and a nonparametric Kruskal-Wallis test were run on the data. The ANOVA applies when the data are normal or lognormal. If the data were indicated as nonnormal and log-transformation did not make the data normal, the appropriate statistical test is the Kruskal-Wallis test. The Kruskal-Wallis test applies to other conditions, as the underlying assumptions of this test are not violated by nonnormality in the data. Box and whisker plots with a median notch at the 95% confidence interval were used to examine the overall pattern in the data by area.

The ANOVA was performed with the data as the dependent variable. Each analyte was run separately, with the exposure area and background as different factors. When an ANOVA is used, the differences between the various factors are determined with a multiple range test. The Least Significant Differences (LSD) test was applied. When the Kruskal-Wallis test was used to identify differences between areas, the Box and whisker plots with a median notch to indicate 95th percent confidence limits were used to identify which area differed significantly from another.

Table A-1 summarizes the results of the statistical comparison. Arsenic and lead clearly differ from background at the OTP, Rex Flats, and Roaster Pile 5. All statistics for Roaster Pile 5 area are suspect, however, since the number of surface soil samples was low at this area. The output from Statgraphics is attached for each analyte.

Table A-1. Sample Size and Statistical Analysis of Exposure Area Data

Tier II COPC	Bolts Lake	Maloi t Park	OTP	Rex Flats	Roaster Pile 5	Distribution	ANOVA p-value	Kruskal Wallis p-value
Antimony	3	5	19	14	3	Nonnormal; Not lognormal	NA	0.2
Arsenic	29	20	144	96	5	Lognormal	<0.000	<0.0
Barium	3	5	19	14	3	Lognormal	0.09	0.2
Beryllium	3	5	19	14	3	Nonnormal; Not lognormal	NA	0.07
Cadmium	29	21	145	106	5	Nonnormal; Not lognormal	NA	<0.000
Chromium	29	21	145	106	5	Nonnormal; Not lognormal	NA	<0.000
Iron	3	5	19	14	3	Lognormal	0.68	0.53
Lead	29	20	141	73	3	Nonnormal; Not lognormal	NA	<0.000
Manganese	29	14	136	88	2	Nonnormal; Not lognormal	NA	0.02
Nickel	3	5	19	14	3	Nonnormal; Not lognormal	NA	0.009
Selenium	3	5	19	14	3	Nonnormal; Not lognormal	NA	0.07
Silver	3	5	19	14	3	Lognormal	0.7	0.6
Thallium	3	5	19	14	3	Nonnormal; Not lognormal	NA	0.4
Vanadium	3	5	19	14	3	Nonnormal; Not lognormal	NA	0.3
Zinc	29	16	138	83	1	Nonnormal; Not lognormal	NA	0.001

Notes:

Shaded cells - area not significantly different than background at 95% confidence

Hatched cells- area significantly lower than background at 95% confidence level

Clear cells - area significantly higher than background at 95% confidence

For n<10, results are suspect due to low sample size

NA - not applicable; data are not normal or violate assumptions for parametric ANOVA

Appendix B
Table of Total and Fines Fraction Metals Concentrations in Surface Soil

Appendix B
Table of Total and Fines Fraction Metals Concentrations in Surface Soils

Sample Location	*Chemical Name*	*Detection Flag (Total)*	*Result - Total (mg/kg)*	*Detection Flag (Fines)*	*Result - Fines (mg/kg)*
MPSS101	ARSENIC		3.7		5.3
MPSS102	ARSENIC		51		240
MPSS103	ARSENIC		30		300
MPSS104	ARSENIC		2.3		3.3
MPSS105	ARSENIC		3.7		5.6
MPSS106	ARSENIC		8.0		12
OTPSS101	ARSENIC		16		26
OTPSS102	ARSENIC		47		87
OTPSS103	ARSENIC		5.5		8.5
OTPSS104	ARSENIC		18		25
OTPSS105	ARSENIC		9.4		16
OTPSS106	ARSENIC		4.8		9.1
OTPSS107	ARSENIC		18		74
OTPSS108	ARSENIC		12		25
OTPSS109	ARSENIC		0.85		2.3
OTPSS110	ARSENIC		37		45
OTPSS111	ARSENIC		1.2		6.5
OTPSS112	ARSENIC		43		57
OTPSS113	ARSENIC		3.3		11
OTPSS114	ARSENIC		280		450
OTPSS115	ARSENIC		240		390
OTPSS116	ARSENIC		4.7		4.2
OTPSS117	ARSENIC		4.2		7.7
OTPSS118	ARSENIC		3.8		8.8
OTPSS119	ARSENIC		140		370
OTPSS120	ARSENIC		19		27
OTPSS121	ARSENIC		67		130
OTPSS122	ARSENIC		6.0		9.6
OTPSS123	ARSENIC		7.4		13
OTPSS124	ARSENIC		4.4		6.7
OTPSS125	ARSENIC		4.9		10
OTPSS126	ARSENIC		130		200
OTPSS127	ARSENIC		10		14
OTPSS128	ARSENIC		37		57
OTPSS129	ARSENIC		150		210
OTPSS130	ARSENIC		50		100
RXSS101	ARSENIC		120		230

Sample Location	*Chemical Name*	*Detection Flag (Total)*	*Result - Total (mg/kg)*	*Detection Flag (Fines)*	*Result - Fines (mg/kg)*
RXSS102	ARSENIC		42		150
RXSS103	ARSENIC		1.9		3.0
RXSS104	ARSENIC		72		120
RXSS105	ARSENIC		130		230
RXSS106	ARSENIC		75		140
RXSS107	ARSENIC		240		250
RXSS108	ARSENIC		11		15
RXSS109	ARSENIC		13		34
RXSS110	ARSENIC		74		120
RXSS111	ARSENIC		10		28
RXSS112	ARSENIC		39		68
RXSS113	ARSENIC		120		240
RXSS114	ARSENIC		53		120
RXSS115	ARSENIC		39		45
RXSS116	ARSENIC		2.7		3.3
RXSS117	ARSENIC		120		180
RXSS118	ARSENIC		490		400
RXSS119	ARSENIC		7.1		10
RXSS120	ARSENIC		810		690
RXSS121	ARSENIC		120		120
RXSS122	ARSENIC		1400		2900
RXSS123	ARSENIC		170		2700
RXSS124	ARSENIC		33		49
RXSS125	ARSENIC		930		750
RXSS126	ARSENIC		1300		1500
RXSS127	ARSENIC		750		1300
RXSS128	ARSENIC		1000		1000
RXSS129	ARSENIC		550		710
RXSS130	ARSENIC		55		130
RXSS131	ARSENIC		140		260
RXSS132	ARSENIC		54		120
RXSS133	ARSENIC		250		430
RXSS134	ARSENIC		270		440
MPSS101	CADMIUM		0.45		0.82
MPSS102	CADMIUM		26		98
MPSS103	CADMIUM		3.9		32
MPSS104	CADMIUM		0.12		0.20
MPSS105	CADMIUM		0.31		0.43
MPSS106	CADMIUM		0.56		0.86
OTPSS101	CADMIUM		0.28		0.61
OTPSS102	CADMIUM		0.28		0.41

Sample Location	*Chemical Name*	*Detection Flag (Total)*	*Result - Total (mg/kg)*	*Detection Flag (Fines)*	*Result - Fines (mg/kg)*
OTPSS103	CADMIUM		0.38		0.90
OTPSS104	CADMIUM		0.48		0.75
OTPSS105	CADMIUM		2.5		4.9
OTPSS106	CADMIUM		0.79		1.6
OTPSS107	CADMIUM		0.50		2.7
OTPSS108	CADMIUM		0.42		1.0
OTPSS109	CADMIUM	<	0.11	<	0.11
OTPSS110	CADMIUM	<	0.12		0.13
OTPSS111	CADMIUM		0.16		0.32
OTPSS112	CADMIUM	<	0.11	<	0.11
OTPSS113	CADMIUM		0.18		0.58
OTPSS114	CADMIUM	<	0.58	<	0.23
OTPSS115	CADMIUM	<	0.12	<	0.12
OTPSS116	CADMIUM		0.19		0.18
OTPSS117	CADMIUM		0.18		0.31
OTPSS118	CADMIUM		0.41		0.80
OTPSS119	CADMIUM		0.24		0.46
OTPSS120	CADMIUM		1.7		2.4
OTPSS121	CADMIUM		3.8		6.2
OTPSS122	CADMIUM	<	0.12		0.16
OTPSS123	CADMIUM		0.32		0.44
OTPSS124	CADMIUM		0.56		1.0
OTPSS125	CADMIUM		0.18		0.41
OTPSS126	CADMIUM		0.13		0.22
OTPSS127	CADMIUM		0.30		0.91
OTPSS128	CADMIUM		0.15		0.22
OTPSS129	CADMIUM	<	0.11		0.15
OTPSS130	CADMIUM		2.9		5.6
RXSS101	CADMIUM		0.72		1.4
RXSS102	CADMIUM		0.51		0.96
RXSS103	CADMIUM		0.17		0.26
RXSS104	CADMIUM		1.0		1.6
RXSS105	CADMIUM	<	0.12		0.12
RXSS106	CADMIUM		5.6		14
RXSS107	CADMIUM		0.15		0.24
RXSS108	CADMIUM		1.4		1.5
RXSS109	CADMIUM		0.50		1.1
RXSS110	CADMIUM		0.49		0.66
RXSS111	CADMIUM		1.0		2.4
RXSS112	CADMIUM		0.96		2.0
RXSS113	CADMIUM		9.2		14

Sample Location	*Chemical Name*	*Detection Flag (Total)*	*Result - Total (mg/kg)*	*Detection Flag (Fines)*	*Result - Fines (mg/kg)*
RXSS114	CADMIUM		5.8		11
RXSS115	CADMIUM		2.9		3.4
RXSS116	CADMIUM		0.25		0.30
RXSS117	CADMIUM		1.5		2.6
RXSS118	CADMIUM		0.31	<	0.66
RXSS119	CADMIUM		0.61		0.90
RXSS120	CADMIUM	<	2.5		0.65
RXSS121	CADMIUM		0.31		0.46
RXSS122	CADMIUM		0.21		0.44
RXSS123	CADMIUM		1.1		0.34
RXSS124	CADMIUM		3.9		5.3
RXSS125	CADMIUM		0.57		0.63
RXSS126	CADMIUM	<	0.58	<	1.2
RXSS127	CADMIUM		0.35	<	1.1
RXSS128	CADMIUM		0.26	<	1.2
RXSS129	CADMIUM		0.84		1.6
RXSS130	CADMIUM		10		17
RXSS131	CADMIUM		16		24
RXSS132	CADMIUM		2.4		2.6
RXSS133	CADMIUM		1.3		1.9
RXSS134	CADMIUM		0.18		0.19
MPSS101	CHROMIUM		36		49
MPSS102	CHROMIUM		24		77
MPSS103	CHROMIUM		7.9		55
MPSS104	CHROMIUM		18		25
MPSS105	CHROMIUM		20		25
MPSS106	CHROMIUM		19		47
OTPSS101	CHROMIUM		14		25
OTPSS102	CHROMIUM		19		26
OTPSS103	CHROMIUM		13		18
OTPSS104	CHROMIUM		23		29
OTPSS105	CHROMIUM		20		20
OTPSS106	CHROMIUM		15		21
OTPSS107	CHROMIUM		7.0		25
OTPSS108	CHROMIUM		16		31
OTPSS109	CHROMIUM		13		22
OTPSS110	CHROMIUM		14		20
OTPSS111	CHROMIUM		8.6		20
OTPSS112	CHROMIUM		11		15
OTPSS113	CHROMIUM		11		24
OTPSS114	CHROMIUM		7.6		13

Sample Location	*Chemical Name*	*Detection Flag (Total)*	*Result - Total (mg/kg)*	*Detection Flag (Fines)*	*Result - Fines (mg/kg)*
OTPSS115	CHROMIUM		7.2		10
OTPSS116	CHROMIUM		20		24
OTPSS117	CHROMIUM		22		26
OTPSS118	CHROMIUM		13		26
OTPSS119	CHROMIUM		14		22
OTPSS120	CHROMIUM		17		24
OTPSS121	CHROMIUM		12		18
OTPSS122	CHROMIUM		20		25
OTPSS123	CHROMIUM		21		28
OTPSS124	CHROMIUM		21		28
OTPSS125	CHROMIUM		19		26
OTPSS126	CHROMIUM		17		22
OTPSS127	CHROMIUM		14		22
OTPSS128	CHROMIUM		11		12
OTPSS129	CHROMIUM		8.6		11
OTPSS130	CHROMIUM		33		57
RXSS101	CHROMIUM		11		16
RXSS102	CHROMIUM		17		16
RXSS103	CHROMIUM		19		23
RXSS104	CHROMIUM		18		24
RXSS105	CHROMIUM		12		15
RXSS106	CHROMIUM		13		23
RXSS107	CHROMIUM		17		22
RXSS108	CHROMIUM		21		29
RXSS109	CHROMIUM		16		23
RXSS110	CHROMIUM		17		20
RXSS111	CHROMIUM		23		38
RXSS112	CHROMIUM		16		21
RXSS113	CHROMIUM		9.5		20
RXSS114	CHROMIUM		22		45
RXSS115	CHROMIUM		19		27
RXSS116	CHROMIUM		36		41
RXSS117	CHROMIUM		11		16
RXSS118	CHROMIUM		15		23
RXSS119	CHROMIUM		20		24
RXSS120	CHROMIUM		13		22
RXSS121	CHROMIUM		15		17
RXSS122	CHROMIUM		6.3		3.0
RXSS123	CHROMIUM		15		3.3
RXSS124	CHROMIUM		15		19
RXSS125	CHROMIUM		9.5		12

Sample Location	*Chemical Name*	*Detection Flag (Total)*	*Result - Total (mg/kg)*	*Detection Flag (Fines)*	*Result - Fines (mg/kg)*
RXSS126	CHROMIUM		7.7		8.0
RXSS127	CHROMIUM		7.3		14
RXSS128	CHROMIUM		10		14
RXSS129	CHROMIUM		11		14
RXSS130	CHROMIUM		17		22
RXSS131	CHROMIUM		12		20
RXSS132	CHROMIUM		14		20
RXSS133	CHROMIUM		8.9		14
RXSS134	CHROMIUM		14		18
MPSS101	COPPER		24		44
MPSS102	COPPER		300		1400
MPSS103	COPPER		31		410
MPSS104	COPPER		21		32
MPSS105	COPPER		18		26
MPSS106	COPPER		31		41
OTPSS101	COPPER		17		38
OTPSS102	COPPER		34		57
OTPSS103	COPPER		26		39
OTPSS104	COPPER		23		39
OTPSS105	COPPER		21		40
OTPSS106	COPPER		12		25
OTPSS107	COPPER		16		69
OTPSS108	COPPER		17		48
OTPSS109	COPPER		7.8		19
OTPSS110	COPPER		36		46
OTPSS111	COPPER		6.9		15
OTPSS112	COPPER		20		25
OTPSS113	COPPER		13		27
OTPSS114	COPPER		41		71
OTPSS115	COPPER		28		45
OTPSS116	COPPER		34		38
OTPSS117	COPPER		26		32
OTPSS118	COPPER		13		25
OTPSS119	COPPER		29		54
OTPSS120	COPPER		29		41
OTPSS121	COPPER		32		52
OTPSS122	COPPER		17		24
OTPSS123	COPPER		28		36
OTPSS124	COPPER		19		33
OTPSS125	COPPER		10		22
OTPSS126	COPPER		29		47

Sample Location	*Chemical Name*	*Detection Flag (Total)*	*Result - Total (mg/kg)*	*Detection Flag (Fines)*	*Result - Fines (mg/kg)*
OTPSS127	COPPER		25		48
OTPSS128	COPPER		23		31
OTPSS129	COPPER		37		63
OTPSS130	COPPER		29		57
RXSS101	COPPER		53		77
RXSS102	COPPER		47		61
RXSS103	COPPER		8.2		12
RXSS104	COPPER		40		61
RXSS105	COPPER		27		43
RXSS106	COPPER		36		67
RXSS107	COPPER		63		76
RXSS108	COPPER		26		40
RXSS109	COPPER		14		26
RXSS110	COPPER		39		57
RXSS111	COPPER		31		74
RXSS112	COPPER		31		52
RXSS113	COPPER		62		90
RXSS114	COPPER		55		120
RXSS115	COPPER		28		46
RXSS116	COPPER		22		25
RXSS117	COPPER		39		64
RXSS118	COPPER		140		120
RXSS119	COPPER		16		23
RXSS120	COPPER		220		260
RXSS121	COPPER		60		65
RXSS122	COPPER		250		650
RXSS123	COPPER		65		710
RXSS124	COPPER		21		29
RXSS125	COPPER		170		110
RXSS126	COPPER		300		480
RXSS127	COPPER		180		460
RXSS128	COPPER		110		300
RXSS129	COPPER		230		340
RXSS130	COPPER		37		84
RXSS131	COPPER		110		210
RXSS132	COPPER		50		90
RXSS133	COPPER		90		130
RXSS134	COPPER		62		79
MPSS101	LEAD		16		25
MPSS102	LEAD		330		1600
MPSS103	LEAD		76		790

Sample Location	*Chemical Name*	*Detection Flag (Total)*	*Result - Total (mg/kg)*	*Detection Flag (Fines)*	*Result - Fines (mg/kg)*
MPSS104	LEAD		8.8		16
MPSS105	LEAD		15		19
MPSS106	LEAD		20		45
OTPSS101	LEAD		27		50
OTPSS102	LEAD		50		100
OTPSS103	LEAD		18		30
OTPSS104	LEAD		26		38
OTPSS105	LEAD		19		29
OTPSS106	LEAD		19		32
OTPSS107	LEAD		28		140
OTPSS108	LEAD		13		27
OTPSS109	LEAD		2.4		6.6
OTPSS110	LEAD		30		36
OTPSS111	LEAD		2.6		11
OTPSS112	LEAD		51		72
OTPSS113	LEAD		6.2		22
OTPSS114	LEAD		610		1100
OTPSS115	LEAD		130		250
OTPSS116	LEAD		16		22
OTPSS117	LEAD		19		28
OTPSS118	LEAD		7.8		19
OTPSS119	LEAD		130		370
OTPSS120	LEAD		57		90
OTPSS121	LEAD		200		400
OTPSS122	LEAD		9.5		18
OTPSS123	LEAD		17		25
OTPSS124	LEAD		24		34
OTPSS125	LEAD		14		29
OTPSS126	LEAD		170		280
OTPSS127	LEAD		26		38
OTPSS128	LEAD		38		59
OTPSS129	LEAD		230		400
OTPSS130	LEAD		100		220
RXSS101	LEAD		410		940
RXSS102	LEAD		280		400
RXSS103	LEAD		12		21
RXSS104	LEAD		380		580
RXSS105	LEAD		95		180
RXSS106	LEAD		190		410
RXSS107	LEAD		1600		520
RXSS108	LEAD		51		80

Sample Location	*Chemical Name*	*Detection Flag (Total)*	*Result - Total (mg/kg)*	*Detection Flag (Fines)*	*Result - Fines (mg/kg)*
RXSS109	LEAD		44		99
RXSS110	LEAD		150		280
RXSS111	LEAD		65		180
RXSS112	LEAD		100		170
RXSS113	LEAD		320		560
RXSS114	LEAD		450		1100
RXSS115	LEAD		150		180
RXSS116	LEAD		9.6		12
RXSS117	LEAD		280		370
RXSS118	LEAD		2500		1200
RXSS119	LEAD		38		53
RXSS120	LEAD		3700		3900
RXSS121	LEAD		340		290
RXSS122	LEAD		1600		3100
RXSS123	LEAD		370		2900
RXSS124	LEAD		140		200
RXSS125	LEAD		2400		1600
RXSS126	LEAD		7600		7900
RXSS127	LEAD		2500		4100
RXSS128	LEAD		1700		2000
RXSS129	LEAD		2400		3000
RXSS130	LEAD		230		450
RXSS131	LEAD		1600		2400
RXSS132	LEAD		78		180
RXSS133	LEAD		390		520
RXSS134	LEAD		330		540
MPSS101	MANGANESE		830		920
MPSS102	MANGANESE		9800		120000
MPSS103	MANGANESE		680		6800
MPSS104	MANGANESE		250		460
MPSS105	MANGANESE		320		560
MPSS106	MANGANESE		550		1700
OTPSS101	MANGANESE		360		690
OTPSS102	MANGANESE		100		150
OTPSS103	MANGANESE		180		740
OTPSS104	MANGANESE		700		900
OTPSS105	MANGANESE		3300		5000
OTPSS106	MANGANESE		560		830
OTPSS107	MANGANESE		510		2900
OTPSS108	MANGANESE		390		670
OTPSS109	MANGANESE		94		130

Sample Location	*Chemical Name*	*Detection Flag (Total)*	*Result - Total (mg/kg)*	*Detection Flag (Fines)*	*Result - Fines (mg/kg)*
OTPSS110	MANGANESE		140		160
OTPSS111	MANGANESE		68		110
OTPSS112	MANGANESE		74		79
OTPSS113	MANGANESE		120		270
OTPSS114	MANGANESE		57		100
OTPSS115	MANGANESE		41		61
OTPSS116	MANGANESE		310		430
OTPSS117	MANGANESE		310		570
OTPSS118	MANGANESE		140		260
OTPSS119	MANGANESE		140		230
OTPSS120	MANGANESE		820		1300
OTPSS121	MANGANESE		550		1100
OTPSS122	MANGANESE		410		1200
OTPSS123	MANGANESE		490		640
OTPSS124	MANGANESE		560		850
OTPSS125	MANGANESE		420		540
OTPSS126	MANGANESE		79		99
OTPSS127	MANGANESE		1300		1300
OTPSS128	MANGANESE		130		150
OTPSS129	MANGANESE		60		68
OTPSS130	MANGANESE		760		1700
RXSS101	MANGANESE		220		370
RXSS102	MANGANESE		450		550
RXSS103	MANGANESE		180		250
RXSS104	MANGANESE		560		910
RXSS105	MANGANESE		110		110
RXSS106	MANGANESE		730		1300
RXSS107	MANGANESE		110		190
RXSS108	MANGANESE		1200		2100
RXSS109	MANGANESE		580		1100
RXSS110	MANGANESE		320		480
RXSS111	MANGANESE		1100		3300
RXSS112	MANGANESE		460		1300
RXSS113	MANGANESE		1200		2000
RXSS114	MANGANESE		450		950
RXSS115	MANGANESE		580		750
RXSS116	MANGANESE		580		630
RXSS117	MANGANESE		640		1200
RXSS118	MANGANESE		120		200
RXSS119	MANGANESE		310		400
RXSS120	MANGANESE		190		290

Sample Location	*Chemical Name*	*Detection Flag (Total)*	*Result - Total (mg/kg)*	*Detection Flag (Fines)*	*Result - Fines (mg/kg)*
RXSS121	MANGANESE		270		280
RXSS122	MANGANESE		360		760
RXSS123	MANGANESE		1100		930
RXSS124	MANGANESE		730		1400
RXSS125	MANGANESE		280		270
RXSS126	MANGANESE		340		600
RXSS127	MANGANESE		200		460
RXSS128	MANGANESE		110		200
RXSS129	MANGANESE		1000		1200
RXSS130	MANGANESE		2400		2500
RXSS131	MANGANESE		2500		3400
RXSS132	MANGANESE		730		1000
RXSS133	MANGANESE		290		460
RXSS134	MANGANESE		220		260
MPSS101	ZINC		110		220
MPSS102	ZINC		7700		42000
MPSS103	ZINC		600		6200
MPSS104	ZINC		53		79
MPSS105	ZINC		66		87
MPSS106	ZINC		910		2200
OTPSS101	ZINC		72		130
OTPSS102	ZINC		100		150
OTPSS103	ZINC		250		580
OTPSS104	ZINC		170		230
OTPSS105	ZINC		1200		2800
OTPSS106	ZINC		230		500
OTPSS107	ZINC		280		1300
OTPSS108	ZINC		190		480
OTPSS109	ZINC		36		67
OTPSS110	ZINC		87		100
OTPSS111	ZINC		35		62
OTPSS112	ZINC		45		49
OTPSS113	ZINC		61		140
OTPSS114	ZINC		200		300
OTPSS115	ZINC		93		130
OTPSS116	ZINC		47		67
OTPSS117	ZINC		65		94
OTPSS118	ZINC		310		500
OTPSS119	ZINC		150		230
OTPSS120	ZINC		280		450
OTPSS121	ZINC		620		980

Sample Location	*Chemical Name*	*Detection Flag (Total)*	*Result - Total (mg/kg)*	*Detection Flag (Fines)*	*Result - Fines (mg/kg)*
OTPSS122	ZINC		170		390
OTPSS123	ZINC		64		83
OTPSS124	ZINC		160		240
OTPSS125	ZINC		51		110
OTPSS126	ZINC		97		130
OTPSS127	ZINC		47		110
OTPSS128	ZINC		72		84
OTPSS129	ZINC		110		130
OTPSS130	ZINC		450		960
RXSS101	ZINC		160		260
RXSS102	ZINC		220		220
RXSS103	ZINC		46		65
RXSS104	ZINC		210		330
RXSS105	ZINC		57		97
RXSS106	ZINC		1100		2200
RXSS107	ZINC		220		160
RXSS108	ZINC		270		290
RXSS109	ZINC		110		210
RXSS110	ZINC		120		190
RXSS111	ZINC		270		1300
RXSS112	ZINC		150		350
RXSS113	ZINC		1900		2600
RXSS114	ZINC		1200		2500
RXSS115	ZINC		630		740
RXSS116	ZINC		72		78
RXSS117	ZINC		290		610
RXSS118	ZINC		280		240
RXSS119	ZINC		160		200
RXSS120	ZINC		780		620
RXSS121	ZINC		120		140
RXSS122	ZINC		270		800
RXSS123	ZINC		320		750
RXSS124	ZINC		910		1700
RXSS125	ZINC		850		730
RXSS126	ZINC		1300		1300
RXSS127	ZINC		370		930
RXSS128	ZINC		260		510
RXSS129	ZINC		760		890
RXSS130	ZINC		610		1200
RXSS131	ZINC		2300		3000
RXSS132	ZINC		100		130

Sample Location	*Chemical Name*	*Detection Flag (Total)*	*Result - Total (mg/kg)*	*Detection Flag (Fines)*	*Result - Fines (mg/kg)*
RXSS133	ZINC		370		610
RXSS134	ZINC		150		200

Note:

< = less than

mg/kg = milligrams per kilogram

Appendix B
Gradation Analysis on a Subset of the Surface Soil Samples

Sample	*Arsenic Concentrations (mg/kg)*	*Observations*	*Percent Fines*
MP-SS-104	2.3	No observed tailings-like material	30.2%
MP-SS-102	51	Area of apparent tailings-like material	87.7%
OTP-SS-111	1.2	Area of apparent tailings-like material	29.1%
OTP-SS-124	4.4	No observed tailings-like material	62.1%
OTP-SS-126	130	Area of apparent tailings-like material	53.9%
OTP-SS-114	280	Area of apparent tailings-like material	46.9%
RX-SS-111	10	No observed tailings-like material	34.4%
RX-SS-124	33	No observed tailings-like material	70.4%
RX-SS-127	750	Area of apparent tailings-like material	42.6%
RX-SS-122	1,400	Area of apparent tailings-like material	61.35%
Average	266.19		51.87%

mg/kg = milligrams per kilogram

Appendix C
Site-Specific Remediation Goals Evaluation

Appendix C
Development of Site-Specific Remedial Goals
OU-3 of the Eagle Mine Site

1.0 INTRODUCTION

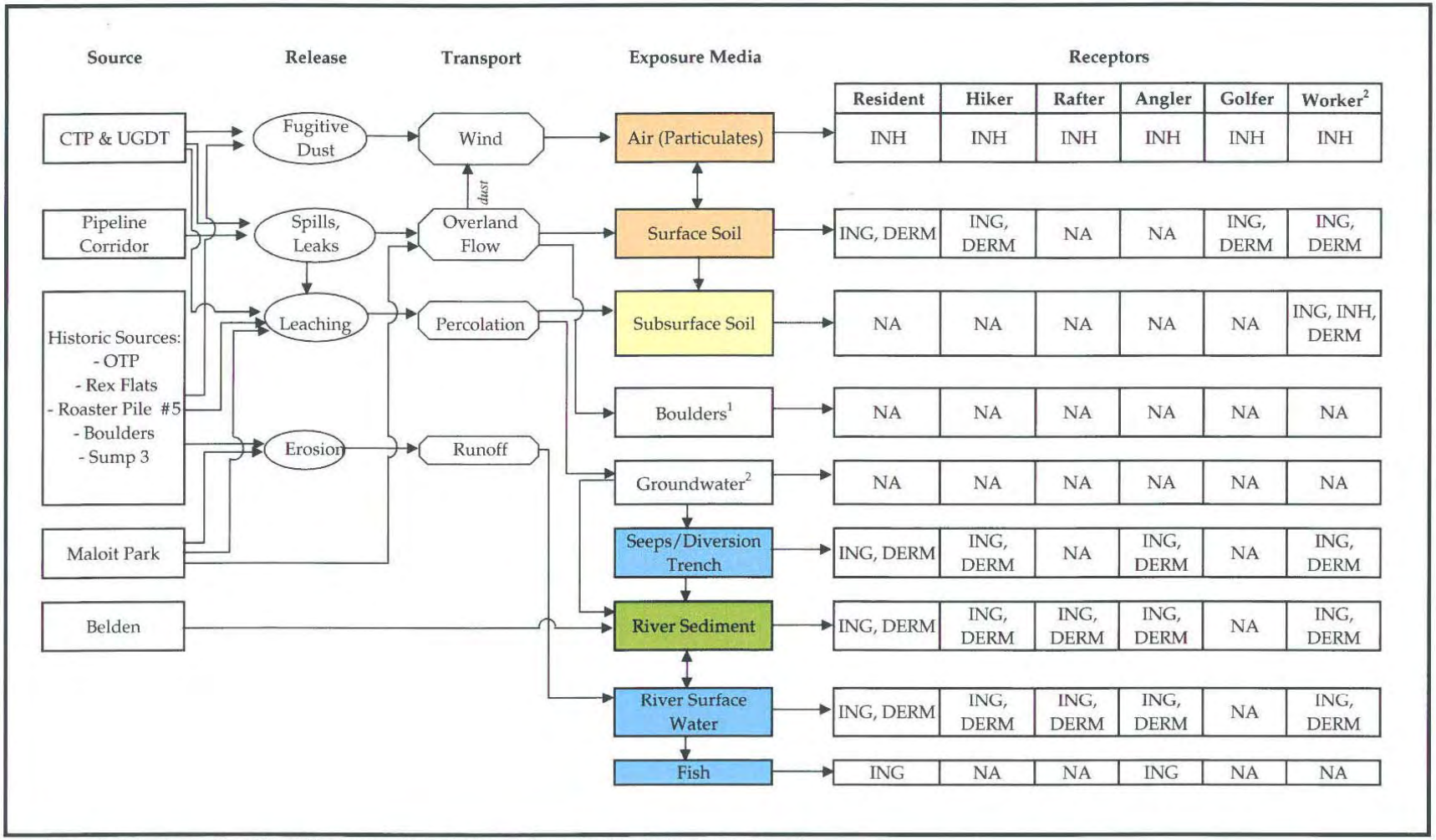
The conceptual site model for exposure pathways at Operable Unit-3 of the Eagle Mine Superfund Site (also known as The North Property) is shown in Figure 1. A Human Health Risk Assessment (HHRA) was prepared that identified several contaminants of potential concern (COPCs) that pose risk at the North Property. The COPCs are divided into two groups, the Primary Metals and the Expanded List of Analytes. The Primary Metals are those metals that have been previously identified as posing risk at the Eagle Mine Site, including arsenic, cadmium, chromium, copper, lead, manganese and zinc. The Expanded Analyte list includes additional metals that are commonly associated with mining sites. The Expanded Analytes are included to verify previous conclusions about site-specific risk.

In order to select practical Remediation Goals (RGs) for the North Property, several values were considered, including site-specific background, EPA Region 9 Preliminary Remediation Goals (PRGs) and site-specific risk-based concentrations using a range of differing exposure assumptions. The Site-specific RGs are derived using assumptions and information from the HHRA. The reader is referred to the HHRA for more detailed information regarding risk calculations.

1.1 DERIVATION OF RISK-BASED CONCENTRATION

Risk-based concentrations (RBCs) are soil concentrations of the COPCs, which are not likely to result in adverse health effects for receptors in contact with them. RBCs are estimated by applying standard risk assessment equations and assumptions; however, the equations used to estimate risk due to exposure to measured soil concentrations (i.e., forward risk assessment) are solved instead for soil concentrations corresponding to a Target Risk or Target Hazard Quotient. The target risk level for noncancer effects is a Hazard Quotient (HQ) of 1. There are multiple target risk levels for cancer effects because there is a target risk range between 10^{-6} (1 excess cancer per million exposed people) and 10^{-4} (1 excess cancer per 10,000 exposed people). Generally, a probability of risk above 10^{-4} is considered unacceptable, and a probability of excess cancer risk below 10^{-6} is considered *de minimus*. The remaining variables were defined in the Exposure Assessment, Quantification of Exposure (Section 3.2.5) of the HHRA report.

Figure 1 Conceptual Site Model for RGs



1 Groundwater is not currently used for potable purposes, and future development plans are based on use of municipal water supplies.

2 Workers modeled as construction workers. This is protective of other workers including groundskeepers or golf course workers

ING	*Ingestion*
INH	*Inhalation*
DERM	*Dermal*
NC	*Incomplete*
NA	*Not applicable*

1 NA; Boulders will be removed

2 NA; Institutional controls- no potable use

The HHRA evaluated several different receptors that are likely to occur on site under future development plans. The receptors are:

- Future residents
- Hikers
- Rafters
- Golfers
- Workers

Based on the results of the HHRA, it was determined that the Future Resident receptor scenario was the most conservative. Therefore, RBCs developed using the Resident exposure assumptions would be sufficiently protective of all receptors.

To be consistent with the EPA's Risk Assessment Guidance (RAGs) Part B (EPA, 1991), the risk-based RG for each chemical should be calculated by considering all of the relevant exposure pathways. It is necessary to ensure that all significant exposure pathways associated with a particular medium at the site are included in the development of RGs. Because of the uncertainty associated with dermal adsorption of arsenic, this pathway was also evaluated in the derivation of the RG for soil.

To provide a full range of possible exposure scenarios, reasonable maximum exposure (RME) parameters were used to develop potential risk-based remedial goals. These RME parameters are detailed in the HHRA. According to EPA RAGs Part B (EPA, 1991), the RME assumptions should be incorporated in the development of RGs. However, RGs may be revised based on the consideration of appropriate exposure factors including, but not limited to: site-specific exposure factors; cumulative effects of multiple chemicals; the potential for exposure from other pathways and media at the site; cross-media impacts of alternatives; and population sensitivities (EPA, 1991).

RME parameters represent the upper bound of exposure (e.g., a person exposed to all parameters at the 95th percentile), and therefore result in a much lower, more conservative, remedial goal for soils. While it is reasonable to predict that at some time a receptor could be exposed at the RME rate to any given parameter, it is unlikely that for any individual, exposure would occur at the 95th percentile to all parameters concurrently. It is also unlikely that this condition would occur daily, nearly every day of the year, for 30 or more years or up through the entire lifetime. Therefore, RME-based RBCs are conservative and are believed to be fully protective for the RME individual(s) (EPA, 1991).

1.2 CONSIDERATION OF MULTIPLE MEDIA

In addition to soils, other media of potential concern exist at this site and may contribute to the overall intake of some metals. These media are surface water including fish, groundwater, boulders, and sediments, all of which contain metals. Risk estimates for consumption of fish were calculated in HHRA. Ground water will not be used as a drinking water source, and thus will not contribute metals to the total site exposure and is not discussed further in this section.

According to the EPA RAGs Part B (EPA, 1991), if significant risk is presented by contaminants in other media and it is not anticipated that remediation will reduce such risks, it is appropriate to calculate media-specific remediation goals (e.g., sediment, soil, and groundwater) when there are multiple media of potential concern. It is also important to note that the EPA RAGs Part B (EPA, 1991) emphasizes the importance of addressing cumulative risks from multiple media of potential concern in the development of preliminary remediation goals (PRGs). For example, EPA (1991) states (Section 2.8.2, p. 17):

> " ....the existence of the same contaminants in multiple media or of multiple chemicals affecting the same population(s), may lead to a situation where, even after attainment of all PRGs, a protectiveness is not clearly achieved (e.g., cumulative risks may fall outside the risk range). The more likely it is that multiple contaminants, pathways, operable units, or other sources of toxicants will affect the RME individual(s), the more likely it will be that protectiveness is not achieved. This likelihood should be addressed when identifying uncertainties."

Risks for each media and exposure pathway were developed in the HHRA. For most analytes, soils are the primary medium of concern and other media do not offer a contribution (i.e., most analytes are not above screening levels in other media and are not evaluated as contaminants of concern). Numerous analytes were investigated in all media. Antimony, thallium, and iron did produce excess noncancer risks for soil exposure; however, as discussed later herein, concentrations of these analytes are not related to mine waste. Zinc produced excess risk for children ingesting fish; however, the hazard quotient was very low and the fish ingestion estimates likely over-estimates. Arsenic was the only contaminant that poses risk in non-soil abiotic media such as boulders, sediment, and surface water. Seeps will be captured via interception trenches following development, and thus be unavailable as an exposure media. Boulders that contain metals and could be a possible exposure source will be removed or buried. The contribution of risk from exposure to sediments is not likely to be significant because risk estimates are within the acceptable cancer risk range of

10-6 to 10-4 (HHRA Table 53). Thus, soils are the only medium for which remedial goals need to be established. Therefore, media-specific RGs for other media are not derived in this document. Moreover, a significant reduction in overall risk will occur as a result of remediation of soils. In addition, as recommended in RAGs, a conservative approach to RG selection for arsenic is considered as part of the uncertainty analysis (see Section 3.0 below).

2.0 DERIVATION OF SITE-SPECIFIC REMEDIAL GOALS

2.1 METALS OTHER THAN ARSENIC

RME-based RGs for contaminants of concern other than arsenic and lead at the site are shown in Table 1. These RGs are derived for using the exposure assumptions used in the HHRA. It is important to note that to be consistent with the HHRA, RGs for noncarcinogenic metals are derived separately for children and adults. It is EPA Region 8 policy to time-weight adult and childhood exposures for exposures that occur over a chronic time period. EPA's Risk Assessment Guidance for Superfund defines chronic exposures as 7 years or greater. Exposure to children only (which is CDPHE policy) is considered to occur over a time period of less than 7 years. RGs for both children and time-weighted averages for children and adults are shown in Table 1.

Table 1 RME-Based Site-Specific Remedial Goals (RG)s for COPCs other than Arsenic and Lead in Soil

Surface Soil COPCs	**On-site child Resident (mg/kg)**	**On-site Resident (mg/kg)**
	Child	**Combined (child+adult)**
Aluminum	76,000	261,037
Antimony	31	110
Barium	5,400	49,891
Beryllium	150	535
Cadmium	37	136
Chromium (III)	210[a]	410,625
Copper	3,100	10,950
Cyanide	1,200	5,466
Iron	23,000	82,125
Manganese	1,800	22,974
Mercury	23	82
Nickel	1,600	5,475
Selenium	390	1,369
Silver	390	1,369
Thallium	5.2	22
Vanadium	78	2,464
Zinc	23,000	8,2125

Notes: These RGs only include soil contact pathways, other media are not incorporated into the equation as this would require solving an equation with multiple variables or performing extensive intermedia modeling

Combined – time-weighted exposure is averaged across a lifetime

[a] Child RG for chromium is based on chromium VI, child + adult is based on chromium III

Dermal uptake of metals is presumed insignificant and not included in the PRG calculation

2.2 ARSENIC

An additional consideration must be applied when dealing with arsenic, and that is the concept of bioavailability. Bioavailability is the amount of substance in the environment that is available for uptake into the bloodstream and transport to the target organ where toxic effects occur. An intravenous injection provides 100% bioavailability; exposure by other routes typically provides an absorbed dose that is a fraction of the administered dose. Certain constituents in soil are known to have limited bioavailability relative to that in diet or water. Arsenic is one of these. For example, if 100 mg of arsenic dissolved in drinking water was ingested and a total of 90 mg entered the blood stream, the absolute bioavailability (i.e., the ratio of the amount of arsenic absorbed to the amount ingested; ABA) would be 0.90 (90%). If 100 mg of arsenic in soil was ingested and 30 mg were absorbed into the body, the ABA for soil would be 0.30 (30%) (EPA, 2005).

Based on bioavailability studies conducted by Roberts et al. (2006) in cynamologus monkeys and USEPA (2005) in immature swine, the evidence strongly supports reduced bioavailability of arsenic from soil. In Roberts et al. (2006), arsenic bioavailability was measured for 14 soil samples from 12 different sites, including mining and smelting sites, pesticide facilities, cattle dip vat soil,

and chemical plant soil. The relative bioavailabilities ranged from 5 to 31%. In EPA (2005), 26 test materials from mining and smelting sites were investigated with relative bioavailabilities ranging from 10 to 60%. Based on these studies, USEPA Region 8 has used 50% as a conservative default bioavailability estimate for arsenic in soils, when site-specific bioavailability studies or speciation data is unavailable.

The State of Colorado's policy differs from EPA policy on the use of a bioavailability factor other than 100%. In the case when site-specific bioavailability studies have not been conducted, the State may require the use of 100% bioavailability. Therefore, RGs were also calculated considering 100% bioavailability.

Another consideration in the derivation of RGs for arsenic has to do with dermal adsorption. Most metals tend to bind to soils, reducing the likelihood that they would dissociate from the soil and cross the skin. Even when contact does occur, speciation of the inorganic compound determines the extent to which dermal adsorption occurs. Inorganic arsenic in soil is adsorbed to a lesser extent than solutions of arsenic salts (ATSDR, 2005). The dermal adsorption factor used in the risk assessment for arsenic is based on dermal adsorption of soluble arsenic acid (Webster et al, 1993). Studies by Lowney (225) have shown that while 2 to

6% of soluble arsenic acid is absorbed percutaneously (similar to Webster et al., 1993), Colorado and New York soils containing arsenic (both wet and dry) exhibited negligible dermal absorption of arsenic. Additionally, in a number of the risk calculations, a residential receptor receives far greater exposure and risk via the dermal pathway from arsenic in sediment than the oral pathway. Therefore, EPA Region 8 advocates an approach of evaluating dermal exposure to organics in soil/sediment on a qualitative basis rather than a quantitative one. CDPHE policy, on the other hand, includes the evaluation of all pathways, including the dermal adsorption pathway. Thus, RGs derived both with and without dermal adsorption are presented herein.

Remedial goals are presented for arsenic in soil in Table 2 that correspond to cancer risk levels of $1x10^{-6}$, $1x10^{-5}$, and $1x10^{-4}$, respectively, with and without applying a bioavailability factor. In addition, arsenic is considered both including the dermal pathway and excluding the dermal pathway.

Table 2 RME--Based Site-Specific Remedial Goals (RGs) for Arsenic in Soil

100% Bioavailability with Dermal Contact		**50% Bioavailability with No Dermal Contact**	
Cancer risk of 10^{-6}	0.39 mg/kg	*Cancer risk of 10^{-6}*	0.85 mg/kg
Cancer risk of 10^{-5}	3.9 mg/kg	*Cancer risk of 10^{-5}*	8.5 mg/kg
Cancer risk of 10^{-4}	**38.9 mg/kg**	*Cancer risk of 10^{-4}*	85.1 mg/kg

Notes: These RGs only include soil contact pathways, other media are not incorporated into the equation as this would require solving an equation with multiple variables or performing extensive intermedia modeling
Exposure is averaged across a lifetime so identification of age not appropriate

2.3 LEAD

Toxicity due to exposure to lead is evaluated differently from that of other chemicals by using predicted blood lead levels. EPA recommends the use of two toxicokinetic models to predict the potential lead levels in children and adults exposed to lead in soils as primary risk assessment tools for establishing risk-based remediation goals at residential and non-residential sites. These models are the *Integrated Exposure Uptake Biokinetic* (IEUBK) model for lead in children (EPA, 1994, 1998) and the *Adult lead Methodology* (ALM) (EPA, 2003a). The IEUBK model limits exposure to lead in soil such that a typical child or a group of similarly exposed children would have an estimated risk of no more than 5% of exceeding a 10 µg/dL blood lead level. The ALM model is designed to be protective of a fetus of a worker as a result of non-residential exposure to lead. According to EPA Technical review Workgroup (TRW) for lead, protection of the

fetus is the most sensitive endpoint for adults. The ALM model also identifies remediation goals that equate to no more than a 5% probability that fetuses of women exposed to soil lead would exceed a blood lead of 10 µg/dL.

Several parameters in the IEUBK model can be varied. However, EPA's national guidance recommends use of default values unless site-specific data are available. Therefore, in the absence of site-specific data, emphasis should be placed on the IEUBK predictions using default values, and use alternative values for exploratory analysis. Children exposed to similar concentrations of lead can develop different blood lead concentrations due to differences in behavior, household characteristics, and individual patterns of lead uptake and biokinetics; this blood lead information was used to develop the geometric standard deviation (GSD). The default GSD is 1.6. The GSD value is an inter-individual GSD, which eliminates the contribution of environmental variability and focuses on variability due to physiology and behavior. The default GSD of 1.6 is a total GSD from a nationwide survey, which does not subtract out the environmental variability component. Therefore, use of the 1.6 GSD double counts variability in blood lead distributions from the environmental component, giving a more biased result. When populations are more homogenous, a lower GSD is appropriate. It is expected that in this future development, the population will be more homogenous than the U.S. population, particularly with respect to behavior and household characteristics. A GSD value of 1.4 is based on paired blood lead and environmental lead samples collected from a number of mining and smelting sites in Region 8.

The default mass fraction of dust (MSD) was estimated with methodology that is becoming outdated (EPA, 2006). More recently, ASTM-approved methods have been applied to provide a lower estimate of dust. Because the site lies along a river and thus has good natural vegetative cover, dust is expected to be lower as well. A dust fraction of 0.43, based on those calculated by soil to dust correlations and paired blood lead/environmental studies (Griffin et al., 1999) was applied in addition to 0.7, which is the model default value.

The IEUBK model was applied using a GSD ranging from the EPA Region 8 recommended value of 1.4 to the default of 1.6, the current dietary input values, and a MSD ranging from the EPA Region 8 recommended value of 0.43 to the default of 0.7. The model contains default contributions from other sources besides soils, in particular, diet and drinking water. It was assumed that the drinking water concentration was the default value of 4 micrograms per liter (µg/L). The RG for lead is based on <5% of the exposed children having a blood lead concentration above 10 micrograms per deciliter (µg/dl). The results are shown in Table 3.

Table 3 Summary of Lead RGs based on the IEUBK Model s for Varying Input Parameters

GSD	MSD	Geomean (µg/dl)	Remedial Goal (mg/kg)
1.6	0.43	4.601	485
1.4	0.43	5.746	658
1.4	0.7	5.738	540
1.6	0.7	4.611	400

The RGs that are derived using the adult lead model are shown in Table 4. As briefly discussed above for the IEUBK model, RGs based on the adult model are also derived using a GSD ranging from the EPA Region recommended values of 1.8 to the default value of 2.1. Additionally, a variable averaging time of 365 days to 150 days is used based on the activities of hikers and workers occurring throughout the year (AT=365 days) or during 5 months of summer (AT = 150 days). A variable soil ingestion rate of 0.05 g/day (default value) and 0.33 g/day 9for soil intensive activities) is also applied for the worker exposure scenario. It should be noted that the EPA default preliminary remediation goal for the worker exposure scenario is 1,235 parts per million (ppm).

Table 4 Lead Remediation Goals (RG) based on the RME Adult ALM Model for the Protection of the Fetus

Exposure Parameter [a]	RG for Hiker (ppm)	RG for Worker (ppm)
GSD = 2.1 (Model default) AT = 365 days	2705	328
GSD = 1.8 (EPA Region 8) AT = 365 days	4144	502

Note: GSD = Geometric Standard Deviation of blood lead (PbB)
AT = Averaging time
[a] Other exposure parameters for the ALM model are as follows:
Exposure Frequency is 100 and 125 days for hiker and worker, respectively
Soil ingestion rates are 0.05 g/day and 0.33 g/day for hiker and worker, respectively; 95th percentile
PbB in fetus = 0.4 µg/L
Fetal/Maternal PbB ratio = 0.9
Biokinetic Slope factor = 0.4 per µg/dL per µg/day
Baseline PbB = 1.5
[b] Based on the EPA default soil ingestion rate of 0.05 g/day for the ALM model

3.0 UNCERTAINTY

Inherent within any calculation of RGs and exposure risk there are areas of uncertainty. In developing and selecting appropriate RGs, Risk Managers should take these uncertainties into consideration. For example, the uncertainty associated with the selected future land use should be considered. Other factors related to uncertainty may include: the reliability of alternatives; the weight of scientific evidence concerning exposures and individual and cumulative health effects; and the reliability of exposure data (EPA, 1991). Thus, it is appropriate to provide analysis of the uncertainties related to the various assumptions used in the derivation of remedial goals.

- Uncertainties in Exposure Point Concentrations. In all exposure calculations, the desired input parameter is the true mean concentration of a contaminant within a medium, averaged over the area where random exposure occurs. However, because the true mean cannot be calculated based on a limited set of measurements, the USEPA (1989, 1992) recommends that the exposure estimate be based on the 95% upper confidence limit (UCL) of the mean. When data are plentiful and inter-sample variability is not large, the EPC may be only slightly higher than the mean of the data. However, when data are sparse or are highly variable, the EPC may be far greater than the mean of the available data. Such EPCs (substantially higher than the sample mean) reflect the substantial uncertainty that exists when data are sparse or highly variable, and in general are likely to result in an overestimate of risk. At this site, the EPC was the 95th UCL or the maximum concentration. The 95th UCL was calculated when 10 or more sample results were available for a chemical. In cases where less than 10 sample results were available, the maximum concentration was used as the EPC. For soil and fish tissue, the number of samples available for each exposure unit was sufficient to calculate a 95th UCL and to limit the magnitude uncertainty introduced by a small data set. This is probably not a significant source of uncertainty in the risk estimates, unless the data are highly variable. The data sets for surface water, sediment and groundwater were somewhat more limited, and the maximum concentration was often used as the EPC at the majority of these exposure units. In cases where the inter sample variability is small, this is not likely to overestimate the mean concentration and risk estimates. However, in cases where the data are highly variable the maximum could result in an overestimate of risk. Overall, uncertainties in exposure point concentrations are more likely to overestimate than underestimate risks.

- Uncertainties in Human Exposure Parameters. Accurate calculation of risk values requires accurate estimates of the level of human exposure that is occurring. However, many of the required exposure parameters are not known with certainty and must be estimated from limited data or knowledge. For example, data on the actual frequency and duration of exposures of current site visitors (hikers, ATV riders) are not known. Likewise, data are absent on the amount of exposure to site media (soil, water, sediment) by current or future on-site workers and visitors, and values were derived based mainly on professional judgment. In general, the exposure parameters were chosen in a way that was intended to be conservative. Therefore, the values selected are thought to be more likely to overestimate than underestimate actual exposure and risk.

- Uncertainties in Chemical Absorption (RBA). The risk from an ingested chemical depends on how much of the ingested chemical is absorbed from the gastrointestinal tract into the body. This issue is especially important for metals in soil at mining sites, because some of the metals may exist in poorly absorbable forms, and failure to account for this may result in a substantial overestimation of exposure and risk. In the absence of data, the default approach (followed in this document) is to assume that the RBA is 100% for most chemicals, with the exception of 50% for arsenic and 60% for lead in soil. Use of these default assumptions is more likely to overestimate than underestimate true exposures.

- Uncertainty due to bioavailability. Bioavailability can vary based on soil type. RGs calculated based on the relative bioavailability of 50% are uncertain because site-specific studies have not been conducted. In addition, more information is needed on the appropriate animal model for measuring the relative bioavailability and variations in the relative bioavailability based on different types of soil. The available information may not yet be adequate to derive reliable conclusions regarding the assumption of relative bioavailability when site-specific data are unavailable.

- Uncertainties in Toxicity Values. Toxicity information for many chemicals is often limited. Consequently, there are varying degrees of uncertainty associated with toxicity values (i.e., cancer slope factors, reference doses). For example, uncertainties can arise from extrapolation from animal studies to humans, extrapolation from high dose to low dose, and extrapolation from continuous exposure to intermittent exposure. In addition, in some cases, only a few studies are available to characterize the toxicity of a chemical, and uncertainties exist not only in the dose response curve, but also in the nature and severity of the adverse effects which the

chemical may cause. USEPA typically deals with this uncertainty by applying an uncertainty factor of 10 - 100 to account for limitations in the database. Thus, in cases where available data do identify the most sensitive endpoint of toxicity, risk estimates will substantially overestimate true hazard. In general, uncertainty in toxicity factors is one of the largest sources of uncertainty in risk estimates at a site. Because of the conservative methods USEPA uses in dealing with the uncertainties, it is much more likely that the uncertainty will result in an overestimation rather than an underestimation of risk.

- Uncertainty due to cancer slope factor for arsenic. In accordance with EPA (1991), consideration should also be given to the uncertainty associated with the cancer slope factor for arsenic. The current EPA IRIS oral cancer slope factor is under evaluation and the various cancer slope factors derived by the NRC (2001), CAL EPA (OEHHA, 2004), and the EPA IRIS SAB Review Draft (July, 2005) are more conservative than the current EPA IRIS cancer slope factor of 1.5 per mg/kg/day (or Unit Risk Factor of $5x10^{-5}$ per µg/L). For example, CAL EPA calculated the oral cancer slope factor of 9.5 per mg/kg/day (or Unit Risk Factor of $2.7x10^{-4}$ per µg/L); the NRC (2001) calculated cancer slope factors of up to 23.4 per mg/kg/day; and the EPA IRIS SAB Review Draft cancer calculated the slope factor of 5.5 per mg/kg/day (or Unit Risk Factor of $1.6x10^{-4}$ per µg/L). Use of a different cancer slope factor in the calculation of RGs would result in more conservative values (i.e., lower soil concentrations) being derived.

- Uncertainty due to higher concentrations in the fine-grained fraction. During the Remedial Investigation, it was also determined that higher concentrations of metals, in particular arsenic, are present in the fine-grained fraction of the on-site soils. As a result, the exposure point concentration (EPC) for bulk soil samples should be adjusted to account for the enrichment of metals in the fine fractions compared to the bulk fraction. For example, the recent EPA Superfund risk assessment for the Vasquez Boulevard and I-70 adjusted the value of EPC for arsenic and lead in the bulk soil to account for the enrichment of metals in the fine fractions (EPA, 2001; Baseline Human Health Risk Assessment Vasquez Boulevard and I-70 Superfund Site, Denver). This adjustment is necessary because exposure is suspected to be associated mainly with the fine fraction, and all exposure parameters are based on this assumption. The adjustment is also consistent with the EPA (2000; TRW recommendations for sampling and analysis of soil at lead sites) that ingested soil and dust is best represented by the lead concentration in the fine fraction that sticks to hands and other objects that may be mouthed, and bulk soil

concentrations are more representative of deliberate soil ingestion (pica) than fine fraction concentrations. The EPA (2000) guidance also recommends that the relative lead concentrations in the two fractions may be used to develop a site-specific "adjusted" cleanup level that would be applicable to total sampling data. Adjustment, or selection of a lower RG for arsenic, is appropriate based on the site-specific information that indicates that arsenic is more concentrated in the fine-grained fraction.

- Uncertainties in Risk Estimates. A number of limitations are associated with the risk characterization approach for carcinogens and non-carcinogens. First, because risk estimates for a chemical are derived by combining uncertain estimates of exposure and toxicity (see above), the risk estimates for each chemical are more uncertain than either the exposure estimate or the toxicity estimate alone. However, even if the risk estimates for individual chemicals were quite certain, there is considerable uncertainty in how to combine risk estimates across different chemicals. In some cases, the effects caused by one chemical do not influence the effects caused by other chemicals. In other cases, the effects of one chemical may interact with effects of other chemicals, causing responses that are approximately additive, greater than additive (synergistic), or less than additive (antagonistic). In most cases, available toxicity data are not sufficient to define what type of interaction is expected, so EPA generally assumes effects are additive for non carcinogens that act on the same target tissue and for carcinogens (all target tissues). Because documented cases of synergistic interactions between chemicals are relatively uncommon; this approach is likely to be conservative for most chemicals.

For non-carcinogens, summing HQ values across different chemicals is properly applied only to compounds that induce the same effect by the same mechanism of action. Consequently, summation of HQ values for compounds that are not expected to include the same type of effects or that do not act by the same mechanisms could overestimate the potential for effects. Thus, all of the HI values in this report, which sum HQ values across multiple metals, are likely to overestimate the true level of human health non-cancer hazard.

- Uncertainty due to risk from multiple media and contaminants. The EPA RAGs Part B (EPA, 1991) emphasizes the importance of addressing cumulative risks from multiple media of potential concern in the development of RGs as mentioned previously. Because remediation at OU-3 will focus primarily on soils, only RGs for soil were developed. In the case of arsenic, other media at the site do pose some risk. Therefore, selection of a lower RG for arsenic is appropriate, since all media are not being addressed.

4.0 SELECTION OF REMEDIATION GOALS

In the selection of RGs, the various values taken into consideration include: site-specific background data in accordance with the EPA guidance, , EPA Region 9 soil screening values, and Site-Specific RGs derived earlier in this document.

It is generally considered unnecessary to remediate to levels below those occurring naturally in nearby, unimpacted areas (EPA, 2002: Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites: Role of background in CERCLA Cleanup Program). For commonly occurring toxic metals, the risk-based concentrations can often be less than concentrations found in the ambient environment. Therefore, background concentrations (BKG) of inorganics play an important role in developing appropriate site-specific remedial goals in addition to consideration of risk-based concentrations.

A statistical analysis was used in the HHRA to determine if concentrations within an exposure area exceeded background. The background upper 95th confidence limit on the mean (UCL95) for each analyte for which background data were collected is shown in Table 6. For the analytes that had background values, all background values were well below the lowest RGs (Table 6). Generally, background concentrations are used as the RG when they exceed the lowest RBC.

Table 6 Comparison of RGs, Background and On-site Data Primary Metals

Metal - 7 Primary (mg/kg)	*Calculated Background (95% UCL)*	*EPA Region 9 RGs (residential)*	*Site-Specific Risk-Based Values (combined adult+child)*	*Site-Specific Noncancer Risk-Based Values (child)*	*Background Range (19 samples)*	*Range of Metal Concentrations for Former Mine Waste Areas*[2]
Arsenic	18.4	0.39	0.39 – 85.1 [1]	NA	0.67 - 48	0.85-2,700
Cadmium	2.12	37	136	136	<0.1 - 5.5	<0.1-26
Chromium	17.4	210[3]	410,625	210	10 - 22	<2.3-62
Copper	17.2	3,100	10,950	3,100	3.2 - 25	6.9-1,300
Lead	61.1	400	658 [4]	400	4.3 - 170	2.4-14,000
Manganese	605	1,800	22,974	1,800	83 - 1,300	22-9,800
Zinc	359	23,000	82,125	23,000	24 - 920	29-7,700

Metal - Extended Analytes (reported in mg/kg)	*Calculated Background (95% UCL)*	*EPA Region 9 RGs (residential)*	*Site-Specific Risk Based Values*	*Background Range (4 Site samples)*	*Range of Metal Concentrations for Former Mine Waste Areas*[2]
Aluminum	NA	76,000	no Site risk	8,800 - 24,000	1,800-30,000
Antimony	NA	31	110	<1.1 - 41	<1 – 12
Barium	NA	5,400	49,891	140 - 440	45-410
Beryllium	NA	150	535	<0.59 - 6.5	<0.52 – 1.4
Calcium	NA	not established	no Site risk	4,900 - 79,000	320 – 83,000
Cobalt	NA	900	no Site risk	8.1 - 55	1.8-20
Cyanide	NA	1,200[4]	5,466	<0 55 - <0.62	<0.52-36
Iron	NA	23,000	82,125	16,000 - 160,000	11,000 - 260,000
Magnesium	NA	not established	no Site risk	3,800 - 14,000	330 – 17,000
Mercury	NA	23	82	<0.036 - 0.046	<0.034 – 2.7
Nickel	NA	1,600[6]	5,475	11 - 57	<4.6-31
Potassium	NA	not established	no Site risk	2,800 - 11,000	1,400 - 7,300
Selenium	NA	390	1,369	<1.4 - 210	<1.4 - <8
Silver	NA	390	1,369	<1.1 - 21	<1 – 52
Sodium	NA	not established	no Site risk	<590 - 7,000	<520 - <2,700
Sulfate	NA	not established	no Site risk	<55 - 78	<52 – 42,000
Thallium	NA	5.20	22	<1.3 - 210	<1.2 – 18
Vanadium	NA	78	2,464	17 - 89	5.3 – 59

[1] *Arsenic cancer risk range based on Table 3*
[2] *Maloit Park, Roaster Pile #5, OTP/Sump Area #3, Rex Flats*
[3] *chromium RG is for 'total chromium'*
[4] *IEUBK (Integrated Exposure Uptake BioKinetic) model*
[5] *cyanide RG is for 'free' cyanide*
[6] *nickel RG is for 'soluble salts'*
< = less than
NA – No background samples were collected for these analytes

Considering the wide range of available values to apply as RGs at the site, the uncertainty inherent in the calculations and assumptions, and site-specific background concentrations, EPA and the State of Colorado have selected the Site-Specific RGs as follows:

The analytes **antimony, iron, thallium, and vanadium** occur at naturally high concentrations at the Site and are not indicative of mine waste. As such, these analytes are not considered further for remediation goals.

Arsenic is indicative of mine waste but is also found naturally in the background soil. The UCL95 background concentrations (18.4 mg/kg) produce an inherent risk above target risk levels. Application of an RG based on a target cancer risk of $1x10^{-6}$ is not appropriate because the $1x10^{-6}$ point of departure for evaluating cancer risks results in a risk-based RG that falls below the site background value of 18.4 mg/kg. The RG based on a $1x10^{-5}$ cancer risk level also falls below site background. However, because arsenic is the only contaminant of concern that poses a cancer risk, use of the 1×10^{-4} value is acceptable.

Given the uncertainty in bioavailability and cancer slope factor; the consideration of the dermal pathway; the higher concentration of arsenic in the fine-grained fraction; and the fact that arsenic is also present in other media, a lower, more conservative RG for arsenic is merited. Therefore, the State and EPA have selected the RG for arsenic in soil as 40 mg/kg (see Table 3). This value will result in the ability to discern mine-impacted soil from naturally occurring arsenic, but will also result in the reduction of risk posed by exposure to arsenic at the site. It should be noted that a concentration of 70 mg/kg for arsenic in soil has been used by the EPA to remediate several other mine waste sites in Region 8. However, site-specific bioavailability studies were conducted at these other sites.

For **lead**, the IEUBK model, using default values, results in a RG of 400 mg/kg, (see Table 4) which is also the same as the Region 9 screening value. Since the site-specific background is less than 400 mg/kg, the site-specific RG was selected to be 400 mg/kg to be consistent with RGs at other Colorado sites.

The site-specific RGs for the remainder of the primary metals (**cadmium, chromium, copper, manganese and zinc**) were selected to be the conservative Region 9 RGs.

Table 7 below, presents the Site-specific soil RGs selected by Risk Managers with EPA and the State of Colorado, which are protective of human health and the environment and also discern between naturally occurring higher metals concentrations and mine waste.

Table 7 Final Remedial Goals (RGs) for Primary Metals in Soil for Operable Unit 3 (North Property) of the Eagle Mine Superfund Site

COPC	Soil RG (mg/kg)	Basis
Arsenic	40	100% bioavailability, dermal contact included, RME parameters
Cadmium	37	Region 9
Chromium	210	Region 9
Copper	3,100	Region 9
Lead	400	IEUBK model default, Region 9, consistent with other sites
Manganese	1,800	Region 9
Zinc	23,000	Region 9

Notes: Values are designed to be protective of Future Residents at the Site.

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