

DRAFT VERSION
SITE HAZARD ASSESSMENT
WORKSHEET 1
Summary Score Sheet

SITE INFORMATION:

Triune Mine
Wannacut Lake Rd.
Oroville, Okanogan County, WA 98844

Section/Township/Range: S10 – T39N – R26E
Latitude: 48.89833
Longitude: 119.54067

Ecology Facility Site ID No.: 1856824

Site scored/ranked for the February, 2011 update:

SITE DESCRIPTION (management areas, substances of concern, and quantities):

The Triune Mine (also known as the Tribune Mine) is located in undeveloped forest and scrub land in rolling hills approximately one mile northwest of Wannacut Lake, on land administered by the Bureau of Land Management. It is situated about six miles west of Oroville and four miles south of the Canadian border. The site is accessed off of the Wannacut Lake Road, a public county-maintained road, through privately owned and federally administered land.

This mine is considered abandoned, but once produced gold, silver, copper, lead, and molybdenum prior to 1939. Development consisted of a 140' shaft, several adits, 2,000' of drifts, and substantial surface workings. It is difficult to determine today whether the surface disturbances evidenced on the Triune claim are surface excavations or collapsed stopes and drifts. The workings on the Triune claim are located on open upland areas, immediately north of a permanently flowing creek. There is a spring that drains away from the site to the south and into the creek.

Some ore was milled on site, and although the mill building is no longer standing, some tailings remain on site. The mill site, a lower adit and waste rock pile, and other less significant features are located on the Security claim—a separate parcel from the Triune claim located immediately to the east. These workings are situated southeast of the Triune workings, and are located along the south bank of the stream. Because these claims are both held in common ownership, and were likely worked together, the entire area has been addressed as a single site for the purposes of this assessment.

South of the Triune Mine is the Spokane Mine. This operation was likely developed at the same time as the Triune Mine. However, because it is controlled by a separate owner, this mine will be addressed under a separate assessment. Another claim, known as the Mariposa, lies directly west, and the only features identified were three small adits and minimal waste rock piles that were entirely re-vegetated. These were likely explored and abandoned at the same time that the Triune, Spokane, and Security claims were operating. A separate assessment was performed for the Mariposa claim, and it was the opinion of Okanogan Public Health that no further action was warranted at that site.



One of the main adits for the Triune Mine.



A portion of the surface workings and stopes associated with the Triune Mine.



Lower mine portal on the Security claim, with drainage from the adit.



Waste rock pile associated with the lower adit.

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An Initial Investigation, conducted on September 7th, 1995, by Michael Huchton of Okanogan County Public Health, revealed drainage from the main adit with a pH of 6.5. A sample from this drainage was analyzed for metals concentrations, and the results are presented in the table below. A soil sample was collected and composited from four points on the site, and these results are also included in the table.

Analyte	Surface Water Concentrations (ug/l)	Cleanup Level (ug/l)	Soil Concentrations (mg/kg)	Cleanup Level (mg/kg)
Arsenic	4.9	5.0	6.08	20
Cadmium	2.4	5.0	1.79	2.0
Chromium	<4.7	50.0	<0.1	2000
Lead	1.4	15.0	807	250
Mercury	<0.3	2.0	8.11	2.0
Selenium	8.2	--	<1.8	--
Silver	<4.7	--	<0.13	--
Copper	<20	--	44.7	--
Zinc	<20	--	86.9	--
Nickel	25.4	--	<0.26	--
Antimony	<5	--	<1.8	--
Beryllium	<0.2	--	2.88	--

The site was revisited on November 18th, 2009 by Douglas Hale, of Okanogan Public Health. All of the previously described features were located, with the most notable change being the absence of any standing water in the adits. Two soil samples were collected from the waste rock piles, and the lab results are summarized in the table below. Additional adits and exploratory pits are located along an overgrown road that traverses the property from south to north, and then doubles back on the ridge above the main workings. The waste rock piles associated with these small features are very limited in size, and many are re-vegetating.

2009 Soil Sample Results

Analyte	Sample TR001 Waste Rock Concentrations (mg/kg)	Sample TR002 Waste Rock Concentrations (mg/kg)	Sample TR003 Waste Rock Concentrations (mg/kg)	Sample TR005 Waste Rock Concentrations (mg/kg)	Sample TR007 Waste Rock Concentrations (mg/kg)	Cleanup Level (mg/kg)
Arsenic	11.80	205.5	45.40	5.70	96.0	20
Barium	258	95.5	122	116	81.0	--
Cadmium	2.44	26.8	21.8	7.45	19.2	2.0
Chromium	5.65	11.7	6.75	4.78	14.2	2000
Lead	159	5550	580	393	3990	250
Mercury	0.68	0.07	0.08	0.71	4.93	2.0
Selenium	<2.5	<2.5	<2.5	<2.5	<2.5	--
Silver	1.40	7.00	2.76	2.90	9.80	--

Cleanup level values reflect Model Toxics Control Act (MTCA) Method A Soil Cleanup Levels for Unrestricted Land Uses.

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2009 Water Sample Results

Analyte	Sample TR004 Surface Water Concentrations (ug/l)	Sample TR006 Surface Water Concentrations (ug/l)	Cleanup Level (ug/l)
Arsenic	5.0	<2	5.0
Barium	68	17	--
Cadmium	17.4	<0.3	5.0
Chromium	5.4	<4.7	50.0
Lead	27.4	2.0	15.0
Mercury	<0.3	<0.3	2.0
Selenium	<5	<5	--
Silver	<4.7	<4.7	--

Cleanup level values reflect Model Toxics Control Act (MTCA) Method A Cleanup Levels for Ground Water.

SPECIAL CONSIDERATIONS (include limitations in site file data or data which cannot be accommodated in the model, but which are important in evaluating the risk associated with the site, or any other factor(s) over-riding a decision of no further action for the site): None identified.

ROUTE SCORES:

Surface Water/Human Health: 28.0
 Air/Human Health: 4.0
 Groundwater/Human Health: 29.5

Surface Water/Environmental: 52.4
 Air/Environmental: 30.9

OVERALL RANK: 1

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WORKSHEET 2
Route Documentation

1. **SURFACE WATER ROUTE**

- a. List those substances to be considered for scoring: Source: 1,2
Arsenic, cadmium, lead, mercury.
- b. Explain basis for choice of substance(s) to be used in scoring.
Soil and water sample analysis shows metals contamination in excess of MTCA Method A Cleanup Levels for Unrestricted Land Use.
- c. List those management units to be considered for scoring: Source 1,2
Contaminated on-site soils and surface water.
- d. Explain basis for choice of unit to be used in scoring:
Analytical confirmation of these contaminants in on-site soils and surface water.

2. **AIR ROUTE**

- a. List those substances to be considered for scoring: Source: 1,2
Arsenic, cadmium, lead, mercury.
- b. Explain basis for choice of substance(s) to be used in scoring:
Soil sample analysis shows metals contamination of on-site soils in excess of MTCA Method A Cleanup Levels for Unrestricted Land Use.
- c. List those management units to be considered for scoring: Source: 1,2

3. **Contaminated on-site soils.**

- a. Explain basis for choice of unit to be used in scoring:
Analytical confirmation of these contaminants in on-site soils.

4. **GROUNDWATER ROUTE**

- a. List those substances to be considered for scoring: Source: 1,2
Arsenic, cadmium, lead, mercury.
- b. Explain basis for choice of substance(s) to be used in scoring:
Soil and water sample analysis shows metals contamination in excess of MTCA Method A Soil Cleanup Levels for Unrestricted Land Use.
- c. List those management units to be considered for scoring: Source: 1,2

5. **Contaminated on-site soils and surface water.**

- a. Explain basis for choice of unit to be used in scoring:
Analytical confirmation of these contaminants in on-site soils and surface water.

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WORKSHEET 4

Surface Water Route

1.0 SUBSTANCE CHARACTERISTICS

1.1 Human Toxicity										
Substance	Drinking Water Standard (µg/L)	Value	Acute Toxicity (mg/kg-bw)	Value	Chronic Toxicity (mg/kg/day)	Value	Carcinogenicity		Value	
							WOE	PF*		
1	Arsenic	10	8	763 (rat)	5	0.001	3	1	1.75	7
2	Cadmium	5	8	225 (rat)	5	0.0005	5	0.8	ND	--
3	Lead	5	8	ND	--	<0.001 NOAEL	10	0.8	ND	--
4	Mercury	2	8	ND	--	0.0003	5	ND	ND	--

*Potency Factor

Source: 1, 2, 5
Highest Value: 10
 (Max = 10)
Plus 2 Bonus Points? 2
Final Toxicity Value: 12
 (Max = 12)

1.2 Environmental Toxicity					
Substance	Acute Water Quality Criteria		Non-Human Mammalian Acute Toxicity		
	(µg/L)	Value	(mg/kg)	Value	
1	Arsenic	360	4	NS	--
2	Cadmium	3.9	8	NS	--
3	Lead	82	6	NS	--
4	Mercury	2.4	8	NS	--

Source: 1, 2, 5
Highest Value: 8
 (Max = 10)

1.3 Substance Quantity	
<p>Explain Basis: Approximately 21,770 sq. ft., based on GIS data.</p>	<p>Source: <u>1, 6, 11, 15</u> Value: 8 (Max = 10)</p>

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2.0 MIGRATION POTENTIAL

		Source	Value
2.1	Containment: Management unit scored as a waste pile with no cover, and no runoff control. Explain basis: Bare waste rock piles are open to erosion.	<u>1, 6, 15</u>	<u>10</u> (Max = 10)
2.2	Surface Soil Permeability: Gravelly sandy loam	<u>1, 3, 6, 15</u>	<u>1</u> (Max = 7)
2.3	Total Annual Precipitation: 11.6 inches (based on Oroville station)	<u>6, 7</u>	<u>1</u> (Max = 5)
2.4	Max 2yr/24hr Precipitation: 1.20 in	<u>6, 14</u>	<u>2</u> (Max = 5)
2.5	Flood Plain: Not in a flood plain	<u>8, 11</u>	<u>0</u> (Max = 2)
2.6	Terrain Slope: $120' / 570' \times 100 = 21\%$	<u>11</u>	<u>5</u> (Max = 5)

3.0 TARGETS

		Source	Value
3.1	Distance to Surface Water: Two adits discharge directly to a permanently flowing stream.	<u>11</u>	<u>10</u> (Max = 10)
3.2	Population Served within 2 miles (see WARM Scoring Manual Regarding Direction): $\sqrt{0} = 0$	<u>10</u>	<u>0</u> (Max = 75)
3.3	Area Irrigated by surface water within 2 miles downstream: $0.75 \times \sqrt{0}$ acres = 0	<u>10</u>	<u>0</u> (Max = 30)
3.4	Distance to Nearest Fishery Resource: ~4,320' to Wannacut Lake.	<u>11</u>	<u>4</u> (Max = 12)
3.5	Distance to, and Name(s) of, Nearest Sensitive Environment(s): Immediately adjacent to wetlands associated with the permanently flowing stream.	<u>11</u>	<u>12</u> (Max = 12)

4.0 RELEASE

Explain Basis: Elevated level of cadmium in one surface water sample. Sample exceeded MTCA standards, and is more than 3 times what would be expected in a background sample.	Source: <u>1, 2, 6, 15</u> Value: <u>5</u> (Max = 5)
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WORKSHEET 5

Air Route

1.0 SUBSTANCE CHARACTERISTICS

1.1 Introduction – Review WARM Scoring Manual before scoring

1.2 Human Toxicity										
Substance	Amb. Air Standard (µg/m ³)	Value	Acute Toxicity (mg/ m ³)	Value	Chronic Toxicity (mg/kg/day)	Value	Carcinogenicity		Value	
							WOE	PF*		
1 Arsenic	0.00023	10	ND	--	ND	--	1	50	9	
2 Cadmium	0.00056	10	25 (rat)	10	ND	--	0.8	6.1	7	
3 Lead	0.5	10	ND	--	ND	--	0.8	ND	--	
4 Mercury	0.3	10	ND	--	ND	--	ND	ND	--	

* Potency Factor

Source: 5, 6

Highest Value: 10

(Max = 10)

Plus 2 Bonus Points? 2

Final Toxicity Value: 12

(Max = 12)

1.3 Mobility (Use numbers to refer to above listed substances)				
1.3.1 Gaseous Mobility		1.3.2 Particulate Mobility		
Vapor Pressure(s) (mmHg)		Soil Type	Erodibility	Climatic Factor
1		Sandy loam	86	1 - 10

Source: NA

Value: NS

(Max = 4)

Source: 3, 6

Value: 1

(Max = 4)

1.4 Highest Human Health Toxicity/ Mobility Matrix Value (from Table A-7)

Final Matrix Value: 6

(Max = 24)

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1.5 Environmental Toxicity/Mobility						
Substance		Non-human Mammalian Inhalation Toxicity (mg/m³)	Acute Value	Mobility (mmHg)	Value	Matrix Value
1	Arsenic	ND	--	ND	--	--
2	Cadmium	25 (rat)	10	(particulate)	1	5
3	Lead	ND	--	ND	--	--
4	Mercury	ND	--	ND	--	--

Highest Environmental Toxicity/Mobility Matrix Value (from Table A-7)

Final Matrix Value: 5
(Max = 24)

1.6 Substance Quantity	
Explain Basis: Estimated extent of surface soil contamination = approx. 21,770 s.f.	Source: <u>1, 6, 11, 15</u> Value: <u>6</u> (Max = 10)

2.0 MIGRATION POTENTIAL

		Source	Value
2.1	Containment: Waste pile outdoors, and uncovered.	<u>1, 6, 15</u>	<u>10</u> (Max = 10)

3.0 TARGETS

		Source	Value
3.1	Nearest Population: Approximately 1,045 ft.	<u>1, 6, 11</u>	<u>8</u> (Max = 10)
3.2	Distance to [and name(s) of] nearest sensitive environment(s) [fisheries excluded]: Site is located on federally managed game land.	<u>6, 11</u>	<u>7</u> (Max = 7)
3.3	Population within 0.5 miles: $\sqrt{\text{pop.}} = \sqrt{6} = 2.4$	<u>6, 11</u>	<u>2</u> (Max = 75)

4.0 RELEASE

Explain Basis for scoring a release to air: None documented	Source: <u>6</u> Value: <u>0</u> (Max = 5)
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WORKSHEET 6
Groundwater Route

1.0 SUBSTANCE CHARACTERISTICS

1.2 Human Toxicity										
Substance	Drinking Water Standard (µg/L)	Value	Acute Toxicity (mg/ kg-bw)	Value	Chronic Toxicity (mg/kg/day)	Value	Carcinogenicity		Value	
							WOE	PF*		
1	Arsenic	10	8	763 (rat)	5	0.001	3	1	1.75	7
2	Cadmium	5	8	225 (rat)	5	0.0005	5	0.8	ND	--
3	Lead	5	8	ND	--	<0.001 NOAEL	10	0.8	ND	--
4	Mercury	2	8	ND	--	0.0003	5	ND	ND	--

* Potency Factor

Source: 1, 2, 5

Highest Value: 10

(Max = 10)

Plus 2 Bonus Points? 2

Final Toxicity Value: 12

(Max = 12)

1.2 Mobility (use numbers to refer to above listed substances)	
Cations/Anions [Coefficient of Aqueous Migration (K)]	OR Solubility (mg/L)
1 Arsenic >1.0 = 3	
2 Cadmium >1.0 = 3	
3 Lead 0.1 – 1.0 = 2	
4 Mercury >1.0 = 3	

Source: 5, 6

Value: 3

(Max = 3)

1.3 Substance Quantity:	
<p>Explain basis: Cubic yard estimations for waste rock piles: 340 s.f. x 1' depth = 340 c.f. / 27 = 12 c. yds. 1240 s.f. x 3' depth = 3720 c.f. / 27 = 138 c. yds. 1830 s.f. x 2' depth = 3660 c.f. / 27 = 135 c. yds. 6515 s.f. x 4' depth = 26060 c.f. / 27 = 965 c. yds. 2275 s.f. x 1' depth = 2275 c.f. / 27 = 84 c. yds. 1540 s.f. x 2' depth = 3080 c.f. / 27 = 114 c. yds. 8030 s.f. x 12' depth = 96360 c.f. / 27 = 3569 c. yds.</p>	<p>Source: <u>1, 6, 15</u> Value: <u>5</u> (Max=10)</p>
Total = 5017 cubic yards	

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2.0 MIGRATION POTENTIAL

		Source	Value
2.1	Containment (explain basis): Waste pile with no liner, no cover, and no runoff control (3 + 2 + 2 + 3 = 10).	<u>3</u>	<u>10</u> (Max = 10)
2.2	Net precipitation: 6.4" – 3.0" = 3.4"	<u>7</u>	<u>1</u> (Max = 5)
2.3	Subsurface hydraulic conductivity: Sands/gravels/gravelly sandy loam	<u>1, 3</u>	<u>4</u> (Max = 4)
2.4	Vertical depth to groundwater: Nearest recorded wells are located in T39 R26 Section 11, NW/NW. Shallowest depth to groundwater was 100'.	<u>4, 6</u>	<u>4</u> (Max = 8)

3.0 TARGETS

		Source	Value
3.1	Groundwater usage: Private supply, no alternates available	<u>1, 9</u>	<u>5</u> (Max = 10)
3.2	Distance to nearest drinking water well: ~1,045 feet	<u>6, 11</u>	<u>4</u> (Max = 5)
3.3	Population served within 2 miles: $\sqrt{\text{pop.}} = \sqrt{75} = 8.66$ (25 houses on aerial photo x 3 residents per household = 93)	<u>6, 11</u>	<u>9</u> (Max = 100)
3.4	Area irrigated by wells within 2 miles: $0.75 \times \sqrt{\text{acres}} = 0.75 \times \sqrt{85} = 9.22$	<u>4, 6</u>	<u>9</u> (Max = 50)

4.0 RELEASE

		Source	Value
	Explain basis for scoring a release to groundwater: No analytical confirmation of groundwater contamination.	<u>6</u>	<u>0</u> (Max = 5)

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SOURCES USED IN SCORING

1. Initial Investigation by Michael Huchton, September 7th, 1996.
2. Soil and water sample analysis reports by Cascade Analytical and White Earth Analytical.
3. Soil log(s) on file at Okanogan County Health District.
4. Water Well Reports on file at Okanogan County Health District.
5. Washington Department of Ecology, Toxicology Database for Use in Washington Ranking Method Scoring, January 1992.
6. Washington Department of Ecology, WARM Scoring Manual, April 1992.
7. See attached table identified as Reference 7.
8. Flood Insurance Rate Maps (FIRM).
9. Ecology Water Rights Information System (WRIS).
10. Washington Department of Fish & Wildlife StreamNet database.
11. GIS data layers provided by Okanogan County Planning Department, composite map is attached as Reference 11.
12. US Census 2000 data.
13. SENTRY Public Water system data from Washington Department of Health.
14. NOAA Atlas II Precipitation Frequency Data Output, site specific estimate.
15. Site Hazard Assessment visit by Douglas Hale, November 12th, 2009.