SITE HAZARD ASSESSMENT

WORKSHEET 1

Summary Score Sheet

SITE INFORMATION:

Former Irondale Iron & Steel Plant
562 Moore Street
Irondale, WA 98339
Parcel # 001353001 & 901021002
Section 35, Township 30N, Range 1W
Section 02, Township 29N, Range 1W
Latitude: 48 degrees, 02 minutes, 36 seconds
Longitude: 122 degrees, 45 minutes, 54 seconds
Ecology Facility Site ID No.: 95275518

Site scored/ranked for the August 22, 2007 update
July 20, 2007

The Irondale Iron and Steel Plant site is located along the western shore of Port Townsend Bay in Irondale, Washington, approximately four miles south of Port Townsend on the northeast region of the Olympic Peninsula. This property contains the remnants of the Irondale Iron and Steel Plant (Irondale Plant). In 1983, this site was listed on the National Park Service Historic American Building Survey and Historic American Engineering Record (HABS/HAER). Large concrete and brick foundations of the former Irondale Plant still exist as well as significant quantities of operational debris. The entire site, with the exclusion of the beach area, is overgrown by mature alder and maple trees with a thick understory of shrubs, vines and forest duff.

The Irondale Plant produced its first batch of iron in 1881. Over the next 25 years it operated sporadically, having several owners. In 1906, James Moore purchased the plant and began raising funds to rebuild the iron smelter and develop the steel production plant. Iron production resumed late in 1907, but due to production problems, the plant closed down for all of 1908 and much of 1909. Despite production problems, Moore obtained adequate financial commitments and began constructing the steel plant in the summer of 1909. The plant consisted of a blast furnace and cast house, steel production building including three open-hearth furnaces and a steel rolling mill, a boiler plant, miscellaneous support buildings, a 600-foot wharf, and a 6,000 barrel above-ground fuel oil tank. Raw materials were obtained locally as well as imported from British Columbia and China.

At its peak in 1910 the Irondale Plant produced more than 700 tons of steel per day and employed 600 men. The plant fell into bankruptcy in 1911 and was closed. It was briefly revived between 1917 and 1919 due to demand for iron generated by World War I. Between 1881 and 1919, the plant operated for a total of five years. After the final closing of the Plant, the buildings and above-ground fuel oil tank were either torn down of moved. To our knowledge, no environmental cleanup was conducted as evidenced by piles of furnace slag and other operational debris located on the beach and in the vicinity of the blast furnace and cast house. The concrete foundation for the fuel tank was left intact and appears to contain oil debris.

As a result of an Environmental Report Tracking System (ERTS) complaint received by Washington Department of Ecology (Ecology), Jefferson County Public Health (JCPH) and Ecology personnel conducted an Initial Investigation (II), and a Site Hazard Assessment (SHA) for this site. The following is the Conclusion/Recommendation of the SHA, dated December 28, 2001:

> Based on the knowledge of previous site activities, the inspection of the property, interviews, the amount of time that has passed since industrial activities were conducted at the site (approx 80 years), and the soil test results from October 25, 2001, it is the conclusion of this SHA that the site does not pose a significant threat to human health or the environment. It is the recommendation of Jefferson County Health Department that a No Further Action (NFA) is required at this site under the Model Toxics Control Act. It is further recommended that since the site is easily accessible by the public, it is highly probable that the site will be developed for future recreational use, that the oil residue found inside the former fuel tank foundation be removed to prevent human exposure or release to the environment.

As a normal part of a NFA recommendation, should additional information regarding the site be received, a reevaluation of this recommendation will be conducted.

In the May 3, 1996 HartCrowser Environmental Assessment report prepared for the Port Townsend Paper Corporation, the following constituents were found during the sampling of this site.

Table 1. GROUNDWATER SAMPLING RESULTS

Boring No.	Analyte Found	Sample Result (ug/l or ppb)	Applicable Standard	(ug/l or ppb)
W-4	Arsenic	22	MTCA*	5
W-5	Arsenic	40		5

*MTCA A refers to the Model Toxics Control Act Table 720-1 Method A Cleanup Levels for Groundwater

On July 29, 2005, a second ERTS was received by Ecology regarding this site. This information, received from a person requesting to remain confidential, stated:

> There is a black strip on the sand and a sheen on the water. Caller believes that there may have been an industrial/manufacturing plant there at some time, and the oil might be from an old fuel tank. There is a petroleum odor associated with the sheen.

An Initial Investigation determined that this site should be assessed again by a SHA. A SHA sediment sampling event for this site occurred on January 16, 2007; 36 sediment samples were taken to include one control sample, 10 samples on the beach down-gradient from the kiln locations, and one sample was taken from adjacent to the concrete fuel tank. The control sample (1-6, 1-12, and 1-18) was taken at a location approximately 750 feet north from the fuel tank and kilns. All sampling locations were taken at 6", 12" and 18" depths and identified by the "-" after the respective sample number. (See report for all sample results.) The result from the January 16, 2007, sampling event with a concentration about MTCA is provided in Table 2.

Table 2: SOIL SAMPLING RESULTS

Sample No.	Analyte Found	Sample Result (ppm)	Applicable Standard	(ppm)
3-12	TPH-Diesel	2,300	MTCA A Unrestricted Use	2,000

MTCA A Unrestricted Land Uses refers to the Model Toxics Control Act Table 740-1 Method A Soil Cleanup Levels for Unrestricted Land Uses.

In reviewing the May 3, 1996 HartCrowser report, it was noted that copper, zinc and lead were found at sample locations at levels above recommended environmental screening levels.

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):

A composite shellfish sample was collected concurrent with the January 16, 2007 sediment sampling event: the shellfish tissue was analyzed for heavy metals. Given the results from this analysis, the Washington State Department of Health determined that consuming shellfish from this beach could be detrimental to human health and subsequently recommended that no shellfish should be harvested or consumed from this beach.

Table 3: TISSUE SAMPLING RESULTS

Sample No.	Analyte Found	Sample Result (ppm)
Composite	Arsenic	2
Composite	Cadmium	0.46
Composite	Chromium*	0.6
Composite	Copper	8.44
Composite	Lead	0.8
Composite	Zinc	21

*Chromium was not analyzed to determine Chromium III or Chromium IV

ROUTE SCORES:

Surface Water/Human Health: **21.9**
Air/Human Health: **16.0**
Groundwater/Human Health: **58.2**

Surface Water/Environmental.: **57.6**
Air/Environmental: **NS**

OVERALL RANK: 1

WORKSHEET 2
Route Documentation

1. **SURFACE WATER ROUTE**

   a. List those substances to be considered for scoring: Source: 1, 2, 4-7

   Arsenic, cadmium, chromium, copper, lead, total petroleum hydrocarbons-diesel (TPH-diesel), zinc

   b. Explain basis for choice of substance(s) to be used in scoring.

   With the exception of arsenic, all of these substances were detected on-site in either surface/subsurface soil and/or groundwater samples in significant concentrations, and are potentially available to the route of concern.

   c. List those management units to be considered for scoring: Source 1-3,5

   Surface and subsurface soils and groundwater.

   d. Explain basis for choice of unit to be used in scoring:

   The contaminating substances were detected on-site in either surface or subsurface soil and groundwater samples in significant concentrations.

2. **AIR ROUTE**

   a. List those substances to be considered for scoring: Source: 1-8

   Arsenic, cadmium, chromium, copper, lead, total petroleum hydrocarbons-diesel (TPH-diesel), zinc.

   b. Explain basis for choice of substance(s) to be used in scoring:

   With the exception of arsenic, all of these substances were detected on-site in either surface or shallow subsurface soil samples in significant concentrations, and are potentially available to the route of concern.

   c. List those management units to be considered for scoring: Source: 1-3,5

   Surface and subsurface soils.

   d. Explain basis for choice of unit to be used in scoring:

   The contaminating substances were detected on-site in surface and subsurface soil samples in significant concentrations.

3. **GROUNDWATER ROUTE**

a. List those substances to be considered for scoring: Source: 1-8

Arsenic, lead, total petroleum hydrocarbons-diesel (TPH-diesel)

b. Explain basis for choice of substance(s) to be used in scoring:

These substances were detected on-site in either surface/subsurface soil and/or groundwater samples in significant concentrations, and are potentially available to the route of concern.

c. List those management units to be considered for scoring: Source: 1-3,5, 11, 12

Surface and subsurface soils and groundwater.

d. Explain basis for choice of unit to be used in scoring:

The contaminating substances were detected on-site in surface or subsurface soil and groundwater samples in significant concentrations.

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 WOE	Carcinogenicity PF*	Value
1	Copper	1300	2	ND	-	0.037	1	ND	ND	-
2	Lead	15	6	ND	-	<0.001 (NOAEL)	10	ND	ND	-
3	TPH-diesel	160	4	490 (rat)	5	0.004 (RfD)	3	ND	ND	-
4	Zinc	4000	2	ND	-	0.2	1	ND	ND	-

* *Potency Factor*

Source: 1-8, 14

Highest Value: 10
(Max = 10)

Plus 2 Bonus Points No

Final Toxicity Value: 10
(Max = 12)

1.2 Environmental Toxicity ( ) Freshwater (X) Marine

	Substance	Acute Water Quality Criteria (µg/L)	Value	Non-Human Mammalian Acute Toxicity (mg/kg)	Value
1	Copper	2.9	8		
2	Lead	140	4	-	-
3	TPH-Diesel	2300	2		
4	Zinc	95	6		

Source: 1-8, 14

Highest Value: 8
(Max = 10)

1.3 Substance Quantity

Explain Basis: Unknown, use default value = 1.

Source: 1-8

Value: 1
(Max = 10)

2.0 MIGRATION POTENTIAL

		Source	Value
2.1	**Containment:** Maximum value of 10 points scored. **Explain basis:** No run-on/runoff control systems	1-8, 12	**10** (Max = 10)
2.2	**Surface Soil Permeability:** Sands/sandy gravels	3	**1** (Max = 7)
2.3	**Total Annual Precipitation:** 18.3"	12	**2** (Max = 5)
2.4	**Max 2yr/24hr Precipitation:** 1.0" – 2.0"	12	**2** (Max = 5)
2.5	**Flood Plain:** Not in flood plain	11	**0** (Max = 2)
2.6	**Terrain Slope:** Adjacent (same as piped/culverted)	3, 10, 11	**3** (Max = 5)

3.0 TARGETS

		Source	Value
3.1	**Distance to Surface Water:** <1000 feet (adjacent to site)	3, 10, 11	**10** (Max = 10)
3.2	**Population Served within 2 miles (see WARM Scoring Manual Regarding Direction):** 0	3, 10, 11, 13, 15, 16	**0** (Max = 75)
3.3	**Area Irrigated by surface water within 2 miles : (0.75)*√ # acres =** 0.75 * √0 = 0	3, 11, 15	**0** (Max = 30)
3.4	**Distance to Nearest Fishery Resource:** Adjacent to site	3, 10, 11	**12** (Max = 12)
3.5	**Distance to, and Name(s) of, Nearest Sensitive Environment(s):** fishery resource adjacent to site	3, 10, 11	**12** (Max = 12)

4.0 RELEASE

Explain Basis: Contamination was documented in sediment	Source: 1-8 **Value: 5** (Max = 5)

WORKSHEET 5
Air Route

1.0 SUBSTANCE CHARACTERISTICS

1.1. Introduction (WARM Scoring Manual) – Please review before scoring

1.2 Human Toxicity

	Substance	Air Standard ($\mu g/m^3$)	Value	Acute Toxicity (mg/m^3)	Value	Chronic Toxicity (mg/kg/day)	Value	Carcinogenicity WOE	Carcinogenicity PF*	Value
1	Copper									
2	Lead	0.5	10	NS	-	ND	-	ND	ND	-
3	TPH-diesel	166.5	4	NS	-	ND	-	ND	ND	-
4	Zinc	ND	-	NS	-	ND	-	ND	ND	-

* *Potency Factor*

Source:

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				
2		Sands, silty gravels	>30 – 80 (best fit range)	1-10
3				
4	TPH-diesel = 8.3E-02 = 3			

Source: 5
Value: 3
(Max = 4)

Source: 1,4,7
Value: 1
(Max = 4)

1.4 Highest Human Health Toxicity/ Mobility Matrix Value (from Table A-7)
(Use highest of: 4/3 = 6 or 12/1 = 6)

Final Matrix Value: 6
(Max = 24)

1.5 Environmental Toxicity/Mobility – No data – Not Scored						
	Substance	Non-human Mammalian Inhalation Toxicity (mg/m^3)	Acute Value	Mobility (mmHg)	Value	Matrix Value
1						

Highest Environmental Toxicity/Mobility Matrix Value (Table A-7) = **Final Matrix Value: NS**
(Max = 24)

1.6 Substance Quantity	
Explain Basis: Unknown, use default value = 1	Source: 1-8 **Value: 1** (Max = 10)

2.0 MIGRATION POTENTIAL

		Source	Value
2.1	**Containment:** No cover, liner or run-on/runoff controls	10	**10** (Max = 10)

3.0 TARGETS

		Source	Value
3.1	**Nearest Population:** < 1000'	3, 10, 11,13, 15	**10** (Max = 10)
3.2	**Distance to [and name(s) of] nearest sensitive environment(s):** A park is adjacent to the site.	10	**7** (Max = 7)
3.3	**Population within 0.5 miles:** $\sqrt{1000}$ = 31.62	15	**32** (Max = 75)

4.0 RELEASE

Explain Basis for scoring a release to air: None documented.	Source: **Value: 0** (Max = 5)

WORKSHEET 6
Groundwater 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	5	0.001	5	1.0	1.75	7
2	Copper	1300	2	ND	-	0.037	1	ND	ND	-
3	Lead	15	6	ND	-	<0.001 (NOAEL)	10	ND	ND	-
4	TPH-diesel	160	4	490 (rat)	5	0.004 (RfD)	3	ND	ND	-
5	Zinc	4000	2	NS	-	0.2	1	ND	ND	-

* *Potency Factor*

Source: 14

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= K is > 1.0 = 1	1=
2= K is 0.1 to 1.0 = 2	2=
3= K is 0.1 to 1.0 = 2	3 =
4=	4= 3.0E+01 = 1
5= K is >1.0 = 3	5=

Source: 16

Value: 3
(Max = 3)

1.3 Substance Quantity:

Explain basis: Unknown, use default value = 1

Source:
Value: 1
(Max=10)

2.0 MIGRATION POTENTIAL

		Source	Value
2.1	**Containment (explain basis):** Contaminated soil, no cover, no liner = 10	10	**10** (Max = 10)
2.2	**Net precipitation:** 11.2" – 6.1" = 6.1"	12	**1** (Max = 5)
2.3	**Subsurface hydraulic conductivity:** Sands/sandy gravels	3	**4** (Max = 4)
2.4	**Vertical depth to groundwater:** Obs. release to groundwater = 0'	3	**8** (Max = 8)

2.0 TARGETS

		Source	Value
3.1	**Groundwater usage:** Public supply, unthreatened alts. avail.	13, 15	**4** (Max = 10)
3.2	**Distance to nearest drinking water well:** 5000 – 10,000 feet	13, 15	**1** (Max = 5)
3.3	**Population served within 2 miles:** $\sqrt{}$ 4000 = 63.244	11, 13, 15	**63** (Max = 100)
3.4	**Area irrigated by (groundwater) wells within 2 miles: (0.75)*$\sqrt{}$0 acres** = 0	13, 15	**0** (Max = 50)

3.0 RELEASE

	Source	Value
Explain basis for scoring a release to groundwater: Confirmed by presence of arsenic in groundwater.	3	**5** (Max = 5)

SOURCES USED IN SCORING

1. Analytical Resources Incorporated. Inorganics Analysis: Tissue. Lab Sample ID: NB-020607, February 13, 2007.
2. Analytical Resources Incorporated. Organics Analysis: Tissue. Lab Sample ID KL72A, February 13, 2007.
3. Hart Crowser. Environmental Assessment, Log Chipping Facility, Irondale, WA. May 3, 1996.
4. Manchester Environmental Laboratory. Irondale SHA Project, Case Narrative: samples 07034906-09, -034912 and 034918. NWTPH-Dx Analysis, February 16, 2007.
5. Manchester Environmental Laboratory. Irondale SHA Project, Case Narrative: samples 07034906, -034912 and 034918. Semivolatiles PAH, February 23, 2007.
6. Manchester Environmental Laboratory. Irondale SHA Project. EPA Method 245.5 (CVAA); EPA Method 3050B; EPA Method 200.7; EPA Method 200.8 (ICPMS). Case Narrative: March 15, 2007.
7. Manchester Environmental Laboratory. Irondale SHA Project. Case Narrative: Sample 07034900-35. Hydrocarbon Identification Analysis: EPA Method SW-846; EPA Method 8015B; ASTM Method D-3328. January 19, 2007.
8. Manchester Environmental Laboratory. Irondale SHA Project. General Chemistry: PSEP-TOC. Case Narrative: March 21, 2007.
9. Site Hazard Assessment: Recommendation for No Further Action, December 28, 2001. Karen Lull.
10. SHA Site Visit, January 16, 2007.
11. U.S.G.S. Topo map for site area.
12. Washington Climate – Net Rainfall Table
13. Washington Department of Health, Sentry Internet Database printout for public water supplies.
14. Washington State Department of Ecology, Model; Toxics Control Act Cleanup Regulation: Chapter 173-340 WAC, Publication No. 94-06, Amended February 12, 2001.
15. Washington State Department of Ecology, Water Rights Application System (WRATS) printout for two-mile radius of site.
16. Washington State Department of Ecology, WARM Scoring Manual, April 1992.