

# SITE HAZARD ASSESSMENT

## WORKSHEET 1

### Summary Score Sheet

#### **SITE INFORMATION:**

**Crowley Marine Services Inc 8<sup>th</sup> Ave S**  
7400 8<sup>th</sup> Avenue South  
Seattle, King County, WA 98108-3460

Section/Township/Range: Sec 2/T24N/R4E  
Latitude: 47° 32' 8.77" Longitude: 122° 19' 17.62"

Ecology Facility Site ID No.: 1940187

*Site scored/ranked for the February 20, 2008 update*  
February 5, 2008 (minor correction made 04/10/08)

#### **BACKGROUND/SITE DESCRIPTION**

The Lower Duwamish Waterway (LDW), Seattle, WA, was added to the National Priorities List (NPL or Superfund) by the U.S. Environmental Protection Agency (EPA) in September 2001. It is comprised of the downstream portion of the Duwamish River, extending from the southern tip of Harbor Island to just south of Turning Basin 3, and is a major shipping route for bulk and containerized cargo. Most of the upland areas adjacent to the LDW have been developed for industrial and commercial operations. These include cargo handling and storage, marine construction, boat manufacturing, marina operations, concrete manufacturing, paper and metals fabrication, food processing, and airplane parts manufacturing.

Beginning in 1913, the LDW was dredged and straightened to promote navigation and industrial development, resulting in the Duwamish River's current form. Shoreline features within the waterway include constructed bulkheads, piers, wharves, buildings extending over the water, and steeply sloped banks armored with riprap or other fill materials.

The presence of chemical contamination in the LDW has been recognized by regulatory agencies since the 1970's. The LDW Superfund listing was based on the contamination of waterway sediments by polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs, and of special concern are the carcinogenic PAHs, or cPAHs), mercury and other heavy metals, phthalates, and other organics.

The Washington Department of Ecology (Ecology), along with EPA, had already entered into an order in December 2000 with King County, the Port of Seattle, the City of Seattle, and the Boeing Company to perform a remedial investigation/feasibility study (RI/FS) of sediment contamination in the LDW. Whereas EPA was designated the lead agency for the RI/FS, Ecology was the lead agency for controlling current sources of pollution to the waterway.

Phase I of the RI/FS used existing environmental data to identify potential human health and ecological risks, information needs, and high priority areas for cleanup (“early action areas” or EAAs). The Slip 4 EAA, located on the east bank of the LDW at river mile 2.8, was one of seven EAAs identified by EPA and Ecology, and has as major contaminants of concern PCBs and bis(2-ethylhexyl)phthalate (BEHP). The slip is approximately 1,400 feet long, with an average width of 200 feet, and encompasses about 6.4 acres in area. Properties immediately adjacent to Slip 4 are currently owned by: Crowley Marine Services, First South Properties, King County, and the Boeing Company. The former owns the majority of the submerged land within the Slip 4 EAA, and is the subject of this site hazard assessment (SHA) under the Model Toxics Control Act (MTCA), and scoring/ranking under the Washington Ranking Method (WARM).

The Crowley Marine Services Inc 8<sup>th</sup> Ave S site (hereinafter referred to as CMS, or site) is located at 7400 8<sup>th</sup> Avenue South, south of East Marginal Way South, and adjacent to the north end of Slip 4 on the western side. The area is used by CMS for storage of shipping containers to support its freight hauling and barge terminal on the slip. The CMS property is made up of two parcels: Parcel D comprises the southern two-thirds and Parcel F forms the northern third. Historic commercial/industrial uses of the site date back to the early 1900’s and include such businesses as steel fabrication, paint manufacturing, concrete products, and hydraulic supply. A sawmill/lumber yard was formerly located on and adjacent to the site property.

The CMS portion of the Slip 4 Upland Area is paved or gravel surfaced where materials are stored, Surface drainage from the site discharges through six 8-inch outfalls located along the north side of Slip 4.

The site was listed on the Ecology Confirmed and Suspected Contaminated Sites List on August 31, 2007, with a site status of Awaiting SHA. Site drive-bys were made in December 2007 and January 2008 to confirm environmental features of the site regarding containment features such as paving and buildings.

### **Environmental Sampling**

Four Slip- 4 sediment investigations were conducted between 1990 and 1999, as well as in 2004, as referenced in the July 2006 Ecology/SAIC Source Control Action Plan. Other surface/subsurface soil sampling events occurred on the upland area as detailed in the July 2006 HWA GeoSciences Phase II ESA.

Contaminants of concern (COCs) associated with the CMS site documented in both sediment and soil samples during these studies (based on their respective MTCA Method A Cleanup levels and/or Sediment Management Standards) included: arsenic, several carcinogenic polycyclic aromatic hydrocarbons (PAHs), copper, PCBs, total petroleum hydrocarbons-diesel (TPH-diesel), and TPH-heavy oil. COCs in groundwater reportedly are: arsenic, copper, cPAHs, and BEHP.

**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.

**ROUTE SCORES:**

Surface Water/Human Health:	<u>28.5</u>	Surface Water/Environmental.:	<u>60.4</u>
Air/Human Health:	<u>11.1</u>	Air/Environmental:	<u>NS</u>
Groundwater/Human Health:	<u>26.2</u>		

**OVERALL RANK:** 2

WORKSHEET 2  
Route Documentation

**1. SURFACE WATER ROUTE**

- a. List those substances to be considered for scoring: Source: 1-3  
Arsenic, carcinogenic polyaromatic hydrocarbons (PAHs) – will score using benzo(a) pyrene, copper, polychlorinated biphenyls (PCBs), total petroleum hydrocarbons-diesel (TPH-diesel), TPH-heavy oil.
- 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/seep samples in significant concentrations with respect to their MTCA Method A Cleanup Levels and are potentially available to this 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: 1-3  
Arsenic, carcinogenic polyaromatic hydrocarbons (PAHs) – will score using benzo(a) pyrene, polychlorinated biphenyls (PCBs), total petroleum hydrocarbons-diesel (TPH-diesel), TPH-heavy oil.
- b. Explain basis for choice of substance(s) to be used in scoring:  
These substances were detected on-site in either surface or shallow subsurface soil samples in significant concentrations with respect to their MTCA Method A Cleanup Levels and are potentially available to this 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: 1-3

Arsenic, carcinogenic polyaromatic hydrocarbons (PAHs) – will score using benzo(a) pyrene, copper, polychlorinated biphenyls (PCBs), total petroleum hydrocarbons-diesel (TPH-diesel), TPH-heavy oil.

- 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/seep samples in significant concentrations with respect to their MTCA Method A Cleanup Levels and are potentially available to this 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 surface or subsurface soil and groundwater samples in significant concentrations.

WORKSHEET 4  
Surface Water Route

**1.0 SUBSTANCE CHARACTERISTICS**

<b>1.1 Human Toxicity</b>										
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 (RfD)	5	A=1	1.75 = 7	7
2	Benzo(a)pyrene	0.2	10	50 (rat)	10	ND	-	B2= 0.8	12 = 9	7
3	Copper	1300	2	ND	-	0.037	1	ND	ND	-
4	PCBs	0.5	10	1315 (rat)	3	ND	-	B2= 0.8	7.7= 7	6
5	TPH-diesel	160	4	490 (rat)	5	0.004 (RfD)	3	ND	ND	-
6	TPH-Other (Heavy oil)	ND	-	ND	-	0.040 (RfD)	1	ND	ND	-

\* Potency Factor

Source: 1-3,5

**Highest Value: 10**

(Max = 10)

**Plus 2 Bonus Points? 2**

**Final Toxicity Value: 12**

(Max = 12)

<b>1.2 Environmental Toxicity ( ) Freshwater (X) Marine</b>					
Substance	Acute Water Quality Criteria		Non-Human Mammalian Acute Toxicity		
	(µg/L)	Value	(mg/kg)	Value	
1	Arsenic	69	6	-	-
2	Benzo(a)pyrene	300	4	-	-
3	Copper	2.9	8	-	-
4	PCBs	10	8	-	-
5	TPH-diesel	2350	2	-	-
6	TPH-Other	ND	-	ND	-

\* Fresh/Marine

Source: 1-3,5

**Highest Value: 8**

(Max = 10)

1.3 Substance Quantity	
Explain Basis: Unknown, use default value = 1	Source: <u>1,6</u> Value: <u>1</u> (Max = 10)

## 2.0 MIGRATION POTENTIAL

		Source	Value
	<b>Containment:</b> Maximum value of 10 points scored.		
2.1	<b>Explain basis:</b> Surface contamination, no run-on/runoff control system or cover, adjacent to surface water, adjacent sediments contaminated, stormwater drains to surface water.	1-4,6	<u>10</u> (Max = 10)
2.2	<b>Surface Soil Permeability:</b> Sands/sandy gravels	1-3	<u>1</u> (Max = 7)
2.3	<b>Total Annual Precipitation:</b> 34.8"	7	<u>3</u> (Max = 5)
2.4	<b>Max 2yr/24hr Precipitation:</b> 2.0" – 2.5"	6	<u>3</u> (Max = 5)
2.5	<b>Flood Plain:</b> Not in flood plain	1-4	<u>0</u> (Max = 2)
2.6	<b>Terrain Slope:</b> Ditched/piped/culverted (stormwater drains) = 3	1-4	<u>3</u> (Max = 5)

## 3.0 TARGETS

		Source	Value
3.1	<b>Distance to Surface Water:</b> <1000 feet (adjacent to site)	4,10	<u>10</u> (Max = 10)
3.2	<b>Population Served within 2 miles (see WARM Scoring Manual Regarding Direction):</b> 0	8,9	<u>0</u> (Max = 75)
3.3	<b>Area Irrigated by surface water within 2 miles : <math>(0.75)^* \sqrt{\# \text{ acres}} = 0.75 * \sqrt{0} = 0</math></b>	8,9	<u>0</u> (Max = 30)
3.4	<b>Distance to Nearest Fishery Resource:</b> <1000 feet (adjacent to site)	4,10	<u>12</u> (Max = 12)
3.5	<b>Distance to, and Name(s) of, Nearest Sensitive Environment(s):</b> fishery resource, <1000 feet	4,10	<u>12</u> (Max = 12)

## 4.0 RELEASE

Explain Basis: Documented by analytical evidence: sediment contamination attributable to the upland component of the site.	Source: <u>1-3</u> Value: <u>5</u> (Max = 5)
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## 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 ( $\mu\text{g}/\text{m}^3$ )	Value	Acute Toxicity ( $\text{mg}/\text{m}^3$ )	Value	Chronic Toxicity ( $\text{mg}/\text{kg}/\text{day}$ )	Value	Carcinogenicity		Value
								WOE	PF*	
1	Arsenic	0.00023	10	ND	-	ND	-	A=1	50=9	9
2	Benzo(a)pyrene	0.5	10	ND	-	ND	-	ND	ND	-
3	Copper	3.3	9	ND	-	ND	-	ND	ND	-
4	PCBs	ND	-	ND	-	ND	-	ND	ND	-
5	TPH-diesel	166.5	4	ND	-	ND	-	ND	ND	-

\* Potency Factor

Source: 1-3,5

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	Particulate	Sands, silty gravels	>30 – 80 (best fit range)	1-10
2	Particulate			
3	Particulate			
4	Particulate			
5	8.2E-02 = 3			

Source: 5

Value: 3

(Max = 4)

Source: 1-3,6

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 –					
Substance	Non-human Mammalian Inhalation Toxicity (mg/m <sup>3</sup> )	Acute Value	Mobility (mmHg)	Value	Matrix Value
1	No data			-	-
2					

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: 1-3 Value: <u>1</u> (Max = 10)

## 2.0 MIGRATION POTENTIAL

		Source	Value
2.1	Containment: Cover >2', spill/discharge in subsurface with no vapor collection system	1-4	<u>5</u> (Max = 10)

## 3.0 TARGETS

		Source	Value
3.1	Nearest Population: < 1000'	4,10	<u>10</u> (Max = 10)
3.2	Distance to [and name(s) of] nearest sensitive environment(s): NA	NS	<u>NS</u> (Max = 7)
3.3	Population within 0.5 miles: $\sqrt{1857} = 43$	11	<u>43</u> (Max = 75)

## 4.0 RELEASE

Explain Basis for scoring a release to air: None documented.	Source: 1-4 Value: <u>0</u> (Max = 5)
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WORKSHEET 6  
Groundwater Route

**1.0 SUBSTANCE CHARACTERISTICS**

<b>1.1 Human Toxicity</b>										
Substance	Drinking Water Standard (µg/L)	Value	Acute Toxicity (mg/ kg-bw)	Value	Chronic Toxicity (mg/kg/day)	Value	Carcinogenicity		Value	
							WOE	PF*		
1 Lead	15	6	ND	-	0.001 (NOAEL)	10	ND	ND	-	
2 Benzo(a)pyrene		10	763 (rat)	5	0.001 (RfD)	5	A=1	1.75 = 7	7	
3 Copper	1300	2	ND	-	ND	-	ND	ND	-	
4 PCBs	0.5	10	1315 (rat)	3	ND	-	B2= 0.8	7.7= 7	6	
5 TPH-diesel	160	4	490 (rat)	5	0.004 (RfD)	3	ND	ND	-	
6 TPH-Other (Heavy oil)	ND	-	ND	-	0.040 (RfD)	1	ND	ND	-	

\* Potency Factor

Source: 1-3,5

**Highest Value: 10**

(Max = 10)

**Plus 2 Bonus Points? 2**

**Final Toxicity Value: 12**

(Max = 12)

<b>1.2 Mobility (use numbers to refer to above listed substances)</b>	
Cations/Anions [Coefficient of Aqueous Migration (K)]	OR Solubility (mg/L)
1= K is 0.1 to 1.0 = 2	1=
2=	2= 1.2 E-03 = 0
3= K is 0.1 - 1.0 = 2	
4	3= 3.1E-02 = 0
5	4= 3.0E+01 = 1
6	5= = 0

Source: 1-3,6

**Value: 2**

(Max = 3)

<b>1.3 Substance Quantity:</b>	
Explain basis: : Unknown, use default value = 1	Source: 1-3,6 Value: <u>1</u> (Max=10)

**2.0 MIGRATION POTENTIAL**

		Source	Value
2.1	<b>Containment (explain basis):</b> Contaminated area capped, scored as a landfill: i) No liner (3); ii) Low permeability cover (1); No leachate collection system (2)	1-4	<u>6</u> (Max = 10)
2.2	<b>Net precipitation:</b> 24.4" – 5.2" = 19.2"	7	<u>2</u> (Max = 5)
2.3	<b>Subsurface hydraulic conductivity:</b> Sands/sandy gravels	1-3	<u>4</u> (Max = 4)
2.4	<b>Vertical depth to groundwater:</b> Obs. release to groundwater = 0'	1-3	<u>8</u> (Max = 8)

**2.0 TARGETS**

		Source	Value
3.1	<b>Groundwater usage:</b> Public supply, unthreatened alts. avail.	8,9	<u>4</u> (Max = 10)
3.2	<b>Distance to nearest drinking water well:</b> 5000 – 10,000 feet	8,9	<u>1</u> (Max = 5)
3.3	<b>Population served within 2 miles:</b> $\sqrt{15} = 4$	8,9	<u>4</u> (Max = 100)
3.4	<b>Area irrigated by (groundwater) wells within 2 miles:</b> (0.75)* $\sqrt{0}$ acres = 0	8,9	<u>0</u> (Max = 50)

**3.0 RELEASE**

		Source	Value
	<b>Explain basis for scoring a release to groundwater:</b> Confirmed by presence of many contaminants in groundwater.	1-3	<u>5</u> (Max = 5)

## SOURCES USED IN SCORING

1. Technical Memorandum, Potential for Slip 4 Sediment Recontamination via Groundwater Discharge, Crowley and First South Properties, Science Applications International Corporation, October 16, 2006.
2. Phase II Environmental Site Assessment, Slip 4 Upland Area, 7400 8<sup>th</sup> Avenue South, HWA GeoSciences, July 24, 2006.
3. Lower Duwamish Waterway Source Control Action Plan for the Slip 4 Early Action Area, Dan Cargill, WA Dept. of Ecology/Science Applications International Corporation, July 2006.
4. SHA Site Drive By Visits, Michael Spencer, WA Ecology, December 18, 2007, and January 31, 2008..
5. Washington State Department of Ecology, Toxicology Database for Use in Washington Ranking Method Scoring, January 1992
6. Washington State Department of Ecology, WARM Scoring Manual, April 1992.
7. Washington Climate – Net Rainfall Table
8. Washington State Department of Ecology, Water Rights Application System (WRATS) printout for two-mile radius of site.
9. Washington Department of Health, Sentry Internet Database printout for public water supplies.
10. U.S.G.S. Topo map for site area.
11. Personal memo, Peter Isaksen, Public Health – Seattle & King County, December 19, 2007.