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PUBLIC HEALTH ASSESSMENT  
**Final Version**

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**HARBOR OIL**  
**PORTLAND, MULTNOMAH COUNTY, OREGON**

**EPA Facility ID: ORD071803985**

Oregon Department of Human Services  
Superfund Health Investigation and Education Program  
Under a Cooperative Agreement with the  
Agency for Toxic Substances and Disease Registry  
Atlanta, Georgia

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## **Purpose and Health Issues**

Harbor Oil was proposed for the National Priorities List (NPL) on September 5, 2002. In this public health assessment, the Superfund Health Investigation and Education program (SHINE) in the Oregon Department of Human Services (ODHS) evaluated the public health significance of Harbor Oil as mandated by Congress<sup>1</sup>. SHINE has reviewed the available environmental data to determine whether adverse health effects are likely from exposure to contaminants at this site. Contaminants of concern at the Harbor Oil facility include volatile organic compounds, semi-volatile organic compounds (SVOC), chlorinated pesticides, petroleum products and polychlorinated biphenyls. In addition, this assessment recommends actions to prevent, reduce, or further identify possible site-related adverse health effects.

Based on a review of the environmental sampling conducted at Harbor Oil and the potential for human exposure, SHINE considers this site to be a *no apparent public health hazard*.

## **Background**

### **Site Description**

This site description comes in part from the 2001 EPA START Preliminary Assessment/Site Inspection [1] and the Review of Existing Environmental Data prepared by Coles Environmental Consulting [2]. Harbor Oil is located at 11535 N. Force Avenue in Portland, Oregon on about 4.2 acres of industrial land. It is located in Section 33 of the Willamette Meridian, between the Columbia Slough and Columbia River. The coordinates of the site are approximately latitude 45 36' 23" N and longitude 122 41' 30" W. Harbor Oil is situated about 15 feet above mean sea level and is located within the Columbia Slough watershed, near sensitive wildlife habitat. Immediately south of the Harbor Oil facility is Force Lake and a wetland area. The facility is located within Multnomah County, in a region referred to as West Delta Park (Figure 1).

### **History**

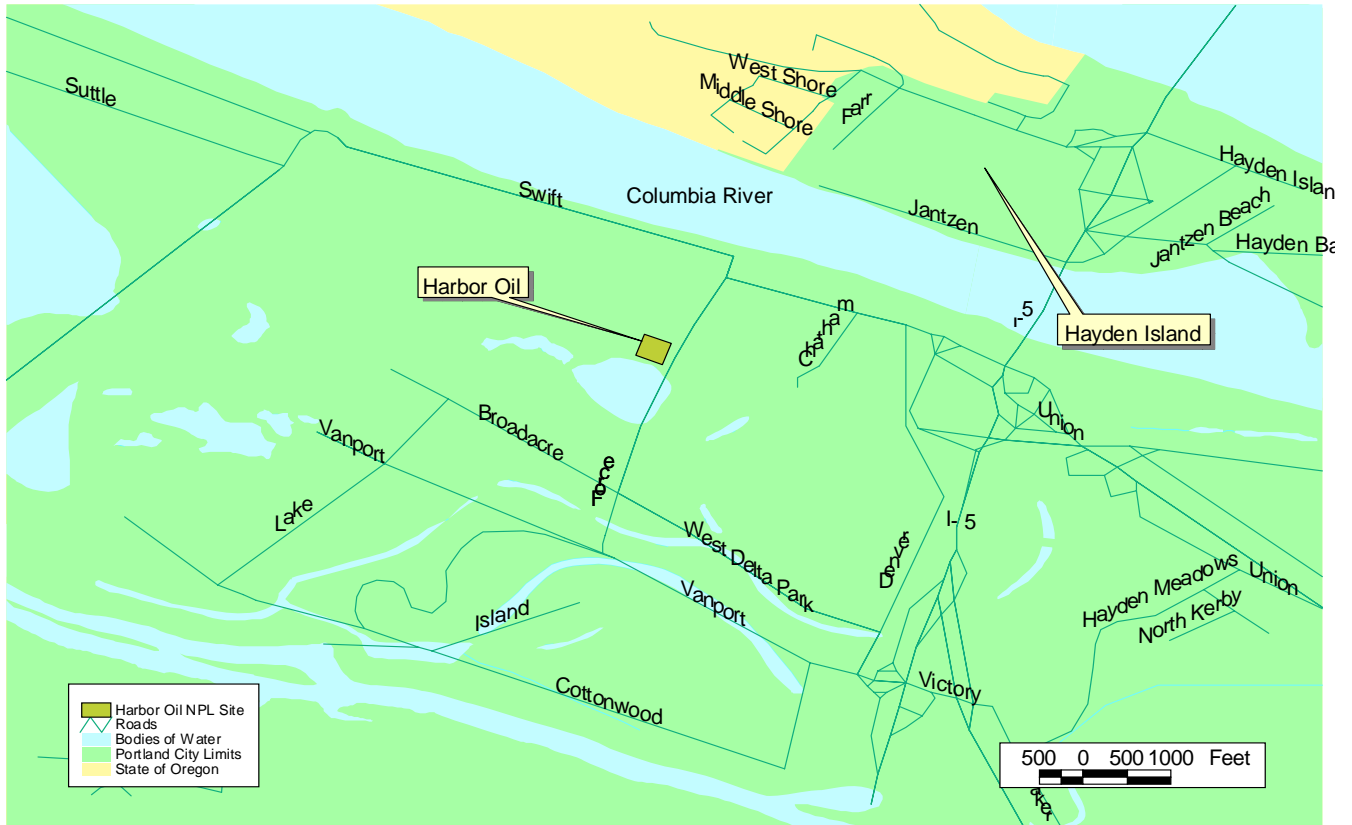
In the early 1900s, the area surrounding Harbor Oil was diked and partially drained. The region was farmed and became the city of Vanport during World War II. Vanport was utilized to house workers who supported the Kaiser Company ship building efforts, and the population swelled to 80,000. In 1948, the Columbia River flooded and destroyed the town, which was never rebuilt. Since this time, the area around Harbor Oil was used as a dust suppression service, a fertilizer plant, a stockyards, and a Farmers Plant Aid building.

Since 1961, the facility that is currently operating as Harbor Oil has been sold numerous times. The site was originally Empire Industries, which sold the business to Chempro of Oregon in 1974. Chempro of Oregon sold the business to the Harbor Oil Company. Harbor Oil abandoned the site in October 1999, at which time Energy and Materials Recovery, Inc. took over the

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<sup>1</sup> ODHS evaluates NPL sites under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR).

**Figure 1. Harbor Oil and Surrounding Area**



operation of the used-oil reprocessing facility. The property has been used as an oil-recycling business since 1956 and had been functioning as a truck cleaning facility for various periods until 1994.

Harbor Oil has had several site inspections by the Oregon Department of Environmental Quality (ODEQ) and USEPA based on numerous incidents and releases of contaminants. In March 1974, waste oil was released from on site storage tanks. The resulting runoff of waste oil caused a large fish kill in Force Lake, with a sheen spreading over 2 acres of water [3]. In 1979, the Chempro facility was destroyed by a fire that originated in the tank farm area. The heat of the fire caused at least five 20,000-gallon tanks and numerous 55-gallon drums to explode. Large volumes of used oils and some paints and solvents were released as a result of the fire. The facility was rebuilt in 1980 after the property was regraded and covered with gravel. During regrading, an earthen dike was constructed along the north and west sides of the site. In 1994, a diesel leak from the adjacent business, Limex Transportation, Inc., resulted in 50-150 gallons of diesel flowing into the drainage ditch and entering the wetlands area. In 1987, 1988, 1992, 1993 and 1994, Harbor Oil was cited for numerous violations including hazardous waste being stored prior

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to obtaining a permit, storing unknown contents in drums, failure to properly characterize or label waste, and inadequate posting of emergency information.

After Chempro of Oregon sold the property, Harbor Oil's stated business was to collect and process waste oil, as indicated by their Resource Conservation and Recovery Act (RCRA) Part A Permit Application. Tank truck cleaning used TCE to clean asphalt residue from the inside of trucks [4]. Energy and Materials Recovery, Inc. took over the operation of the used-oil reprocessing facility. Initially, waste oil received at the facility is transferred into heated tanks for dehydration, distillation and blending. The blended oil is then sent through an oil/water separator after the heating process. The separated oil is transferred into settling tanks equipped with filters. The processed oils are moved into storage tanks to be resold.

In early 2000, the EPA began a preliminary assessment to determine whether Harbor Oil should be nominated to the National Priorities List (NPL) at the request of the Oregon Department of Environmental Quality. Harbor Oil was proposed for nomination on September 5, 2002, based on concerns for surface water pathway contamination [5].

Current structures on-site include six 20,000-gallon cold storage tanks, a 205,000-gallon and 320,000-gallon cold storage tank, six 20,000-gallon heated storage tanks and a 4,000-gallon diesel fuel storage tank. The tanks used to store petroleum products appear to be diked properly in order to contain unintended releases [6]. Three on-site sumps serve to collect surface water that may escape from the dikes, as well as general run-off. This run-off is diverted to an on-site oil/water separator. Treated storm water is ultimately discharged into the wetlands south and west of the site.

### **Demographics**

According to the EPA, 35 people live within 0.25 miles of Harbor Oil, 295 people live within 0.25 to 0.5 miles of Harbor Oil and 1,079 people live within 0.5 to 1 mile of Harbor Oil [7]. The total population living within 1 mile of Harbor Oil is 1,409 people. To the south and west of Harbor Oil is Heron Lakes Golf Course.

### **Land and Natural Resource Use**

The area around Harbor Oil has industrial and recreational uses. Heron Lakes Golf Course is located to the south and west of Force Lake. A Portland Parks and Recreation trail shelter exists near the southern shoreline of Force Lake. During a site visit on November 15, 2002, a person was observed fishing at the lake. In addition to fishing, activities that have been noted at Force Lake include hiking, remote control boating and bird watching [8]. During a secondary site visit, people were observed retrieving golf balls from the lake sediment and nearby trees for resale. The land south and west of the facility has been zoned for environmental protection by the City of Portland, Bureau of Planning. Harbor Oil is zoned as General Industrial 2 by the City. To the east of Harbor Oil is Limex Transportation Inc., a trucking distribution facility. Immediately south of the facility is the Portland Metropolitan Exposition Center.

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The City of Portland Parks and Recreation has focused on the area around Heron Lakes Golf Course as a place to promote public access and recreation [9]. Portland Parks and Recreation considered developing the north bank of Force Lake (adjacent to Harbor Oil) as a walking trail. However, due to environmental concerns and recommendations by an advisory committee, this section of trail will not be developed [10]. There are no drinking water intakes from Force Lake. Drinking water to the Harbor Oil facility is supplied by the City of Portland. No irrigation or livestock uses are known to occur with surface water from Force Lake.

There are seven drinking water wells located within 4 miles of the site that range in depth from 163 to 252 below ground surface. The nearest three wells are located on Haden Island (located approximately .75 miles to the NE of Harbor Oil and separated from the mainland by the Columbia River) and serve approximately 2000 people. Approximately 1¼ mile to the SE of the site is Portland Mobile Home Court, with a groundwater well serving around 600 people (located upgradient of the site). There is an existing groundwater well on-site, which is not currently used for domestic or industrial purposes. A search of the Oregon Department of Human Services Drinking Water Program and the Oregon Water Resource Department well log website did not find additional residential wells in the immediate area.

There are no known schools, daycares, hospitals or assisted living facilities within 500 feet of the site. Harbor Oil is located in the Kenton Neighborhood, encompassing an area of over 2192 acres.

## Discussion

### Data Used

Numerous environmental investigations have been conducted at Harbor Oil, including samples collected from Force Lake and surrounding wetlands. The majority of historical data for Harbor Oil can be found in the Golder Sample Analysis Report [11] and the EPA's Summer 2000 Sample Analysis Results [1]. The Golder results are based predominately on the analysis of samples using an on-site, "field" laboratory. The EPA 2000 data were collected during a Preliminary Assessment/Site Inspection for Harbor Oil and validated by a quality assurance program [1]. Therefore, the EPA data will be used as the basis for this report. The EPA investigation included soil, groundwater, surface water and wetland data.

ODHS visited the site with EPA and Harbor Oil staff<sup>2</sup> on November 15, 2002, to better understand the physical and geographical setting of the site. During the tour, ODHS discussed the waste treatment process, historical aspects of the site and the sampling locations with the owner and environmental consultant of the facility. The site visit included walking throughout the Harbor facility, the drainage ditch and wetlands adjacent to Force Lake.

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<sup>2</sup> ODHS staff present on the site visit included Dave Stone and Janice Panichello. EPA staff included Harbor Oil project manager Harry Craig and Community Involvement Specialist Judy Smith. Harbor Oil staff included Bill Briggs and John Oxford. In addition, David Coles, the environmental consultant for Harbor Oil was present.

### **Evaluation Process**

The process by which ATSDR evaluates the possible health impact of contaminants is summarized here and described in more detail in Appendix A. ATSDR uses comparison values (CVs) to determine which chemicals require further examination. CVs are health-based thresholds below which no known or anticipated human health effects occur. Exceeding a CV does not mean that health effects will occur, just that more evaluation is needed. Additional information about CVs is presented in Appendix B.

Further evaluation focuses on identifying which chemicals and exposure situations could be a health hazard. The first step is the calculation of child and adult exposure doses, as described in Appendix B. These are compared to an appropriate health guideline for a chemical. Any exposure situation resulting in an exposure dose lower than the appropriate health guideline is eliminated from further evaluation.

The next step is the revision of the exposure dose to better match probable rather than worst-case exposure scenarios. Lastly, these revised exposure doses are compared to known toxicological health effects levels identified in ATSDR toxicological profiles. If the chemical of concern is a carcinogen, the cancer risk is recalculated using the revised exposure dose. These comparisons are the basis for stating whether the exposure is a health hazard.

### **Harbor Oil Contaminants of Concern**

#### *Off-site Soils Contamination*

The EPA sampled five wetland sediment locations, south and west of Harbor Oil. Two wetland samples were taken at the western boundary of the facility. This area received storm water runoff from Harbor Oil. Drainage is facilitated by a collection ditch, which formerly diverted the water towards Force Lake. Another sample was taken at the end of the collection ditch at Force Lake. The remaining wetland samples were collected along the north bank of Force Lake. All samples were collected at 0-6 inches below ground surface. The drainage area has thick brush and tree coverage and the wetlands area is characterized by muddy soils and litter (old tires, bottles and other debris).

Contaminants that were detected in wetland soil samples include arsenic, cadmium, polychlorinated biphenyls (PCBs), lead, mercury, DDT, polycyclic aromatic hydrocarbons (PAHs) and phthalates. Diesel and oil were found at 6300 and 23000 parts per million (ppm), respectively. Several contaminants, especially the metals, were found in a decreasing gradient along the drainage pathway. Contaminants that exceeded the comparison values were arsenic and Aroclor 1260 (a commercial PCB formulation), shown in Table 1. It should be noted that only five sites were sampled in the drainage area and shoreline of Force Lake, limiting the scope of this assessment. No samples were collected along most of the banks.

**Table 1. Wetland/off-site Soil Samples Above Comparison Values**

Contaminants	Range in Soil (ppm <sup>*</sup> )	Samples > DL <sup>†</sup> /Total	Samples > CV <sup>‡</sup>	CV in ppm	CV Source <sup>§</sup>
Arsenic	1.68-25.7	5/5	5/5	0.5	CREG <sup>¶</sup>
Aroclor 1260	ND-2.3	2/5	2/5	0.74	PRG <sup>**</sup>

<sup>\*</sup>ppm = parts per million of chemical in soil. ppm = mg (milligram) per kg (kilogram of soil).  
<sup>†</sup>DL = Detection Limit  
<sup>‡</sup>CV = Comparison Value  
<sup>§</sup>These comparison values are described in Appendix A  
<sup>¶</sup>CREG = cancer risk evaluation guide  
<sup>\*\*</sup>PRG = preliminary remediation goal for industrial soils

**On-site Soils Contamination**

All of the EPA soil samples analyzed in this report were collected from native soil beneath a 12 inch layer of hard-packed gravel fill. Soil depths ranged from 12 to 26 inches below ground surface. No true on-site surface soils were analyzed, due to the presence of the gravel layer. A backhoe had to be used to reach the soil beneath the gravel. The EPA soil samples were collected from 10 different locations. Samples were collected from the former truck wash area, the storm water collection drain, the oil/water separator and the storage tanks. Contaminants that were detected include several heavy metals (arsenic, lead, mercury, cadmium), numerous organochlorine pesticides (DDD, DDT, DDE and endrin), polychlorinated biphenyls, and various volatile organic compounds. The contaminants that exceeded comparison values are shown in Table 2.

**Table 2. On-Site Soil Contaminants Above Comparison Values**

Contaminants	Range in Soil (ppm <sup>*</sup> )	Samples > DL <sup>†</sup> /Total	Samples > CV <sup>‡</sup>	CV in ppm	CV Source <sup>§</sup>
Arsenic	1.7-7.2	10/10	10/10	0.5	CREG <sup>¶</sup>
DDD	ND-64	8/10	3/10	3	CREG
DDT	ND-8.4	2/10	1/10	2	CREG
Aroclor 1248	ND-12	2/10	2/10	0.74	PRG <sup>**</sup>
Aroclor 1260	ND-4.6	5/10	3/10	0.74	PRG
Benzo(a)pyrene	ND-0.949	2/10	2/10	0.1	CREG
TCE	ND-0.28	1/10	1/10	0.11	PRG

<sup>\*</sup>ppm = parts per million of chemical in soil. ppm = mg (milligram) per kg (kilogram of soil).  
<sup>†</sup>DL = Detection Limit  
<sup>‡</sup>CV = Comparison Value  
<sup>§</sup>These comparison values are described in Appendix A  
<sup>¶</sup>CREG = cancer risk evaluation guide  
<sup>\*\*</sup>PRG = preliminary remediation goal for industrial soils

**Groundwater Contamination**

Groundwater samples were collected from seven monitoring wells located on-site at the Harbor Oil facility. Six of the seven monitoring wells are shallow and one is deep. The average depth of the monitoring wells is 16.5 feet below ground surface [12]. The depth to groundwater at Harbor



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Oil is approximately 10 feet. Floating oil was found in one of the monitoring wells. In addition to the monitoring wells, there is a production well on-site, intended for emergency firefighting.

Metals frequently detected in the groundwater include manganese [ranging from 2200 to 7860 parts per billion (ppb)], lead (0.36 ppb to 19.6 ppb) and arsenic (9.4-25.3 ppb). Pesticides, VOCs and SVOCs were detected as well. Groundwater contaminants that exceeded comparison values are shown in Table 3.

**Table 3. Groundwater Contaminates Above Comparison Values**

Contaminants	Range in Water (ppb <sup>*</sup> )	Samples > DL <sup>†</sup> /Total	Samples > CV <sup>‡</sup>	CV in ppb	CV Source <sup>§</sup>
Arsenic	9.45-25.3	7/7	7/7	3	EMEG <sup>¶</sup>
Lead	0.36-19.6	7/7	7/7	NA	
Manganese	2200-7860	7/7	7/7	500	RMEG <sup>**</sup>
Vanadium	ND-54.4	6/7	1/7	30	EMEG
DDD	ND-0.24	3/7	1/7	0.1	CREG <sup>††</sup>
Trichloroethene	ND-6.1	1/7	1/7	5	MCL <sup>‡‡</sup>

<sup>\*</sup>ppb = parts per billion of chemical in soil.  
<sup>†</sup>DL = Detection Limit  
<sup>‡</sup>CV = Comparison Value  
<sup>§</sup>These comparison values are described in Appendix A  
<sup>¶</sup>EMEG = environmental media evaluation guide  
<sup>\*\*</sup>RMEG = remedial media evaluation guide  
<sup>††</sup>CREG = cancer risk evaluation guide  
<sup>‡‡</sup>MCL = Maximum Contaminant Level

### Harbor Oil Exposure Pathways

The next step in the exposure pathway evaluation is to estimate doses, or amounts of the chemicals that adults and children would be exposed to, and to compare these doses with health guidelines. This procedure is detailed in Appendix B. The health guidelines are doses below which no adverse health effects are likely to occur. Exposure situations that result in doses lower than the health guideline are excluded from further consideration. Since Harbor Oil is an industrial site with no residences immediately nearby, childhood or infant exposure was not considered for on-site soils. The possibility of off-site soil exposure, including Force Lake wetlands and sediment and the drainage area, was considered for a 10-year old child.

Discussion of specific human exposure pathways in this section does not imply that adverse health effects will develop. ATSDR categorizes an exposure pathway as a completed or potential exposure pathway if the exposure pathway cannot be eliminated. Five factors are required to qualify a pathway as completed: 1) a source of contamination, 2) transportation through an environmental medium, 3) a point of exposure, 4) a route of human exposure and 5) an exposed population. The presence of a completed pathway indicates that human exposure to contaminants could have occurred in the past, could be occurring, or could occur in the future. Potential pathways require that at least one of these factors is missing, but could be present in the future. An exposure pathway can be eliminated if at least one of the five factors will always be absent.

### **Complete Exposure Pathways**

#### *Off-site Soils Pathway*

No fencing separates the Heron Lakes Golf Course or trails around Force Lake from the drainage area and wetlands that were sampled. It is possible for site trespassers and nearby recreational visitors to access this area. During the November 15, 2002 site visit, bottles, lighters and other items were noted. In addition, people have been observed collecting golf balls from the area around Force Lake. Two elderly men regularly collect golf balls for Heron Lakes Golf Course while wearing waders [13]. Management at the golf course indicated that they would inform the men to cease golf ball collection activities at Force Lake. Due to the lack of controlled access to the wetlands and drainage ditch area, this site is considered to be a complete exposure pathway.

Exposure doses were calculated based on a year-round exposure scenario and 100% bioavailability (except a default of 80% bioavailability for arsenic) for soil ingestion. For off-site areas such as the wetlands soil around Force Lake, it was assumed that a 10 year old child could regularly access the site. The average soil concentration was used to derive a chronic exposure as a result of incidental soil ingestion, as it is highly unlikely that someone would come into contact with only one location, as opposed to contacting multiple soil locations. Based on this evaluation, none of the contaminants listed in Table 1 exceeded levels calculated for health guidelines. Therefore, no adverse health effects would be anticipated for this pathway. Appendix B outlines the evaluation conducted to determine estimated exposure doses to wetland soil.

### **Potential Exposure Pathways**

#### *On-Site Soils Pathway*

During the initial screening, sample results were compared to the appropriate comparison values (CVs), which are health-based thresholds below which no known or anticipated adverse health effects would occur. If a contaminant exceeded a CV, it was evaluated further. As shown in Table 2, several contaminants in soil at the Harbor Oil site exceeded their corresponding CV at least once. Since the soil contaminants in Table 2 were sampled below a layer of hard packed gravel, no complete pathway for incidental soil ingestion or dermal contact with soil contaminants was considered. Therefore, exposure doses were not calculated or compared with health guidelines. Short-term exposure to contaminants beneath the hard packed gravel would be possible during construction or remediation work (for instance trench workers or other subsurface work conducted onsite). However, chronic ingestion and dermal exposure to these contaminants would be highly unlikely as long as the layer of hard packed gravel is present.

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### *Fish ingestion*

Force Lake supports a small population of fish. An evaluation of the fisheries found at Force Lake concluded that the Lake supports bullhead and limited bluegill populations [8]. Dead carp from Force Lake were noted during a recent fish kill in 2003 (thought to be a result of low oxygen levels from an algal bloom). Fishing activity was observed from the eastern bank of Force Lake during our site visit. When asked, the fisherman responded that he was practicing catch and release and had no intention of eating the fish. However, it is possible that others catch and consume fish from Force Lake.

Fish found within Force Lake may have high levels of tissue contamination. Contaminants of concern at the Harbor Oil facility include persistent organic pollutants that are known to bioaccumulate in fish tissue, such as PCBs and organochlorine pesticides. No fish tissue data are known to exist for Force Lake. The lack of fish tissue data is a critical data gap since sensitive populations, including women of childbearing age, children under six and immunocompromised individuals may be consuming fish from Force Lake.

### *Soil vapor exposure*

Numerous volatile organic compounds exist underneath a layer of hard packed gravel at the Harbor Oil facility. It is possible that exposure to low levels of soil vapor from these contaminants is occurring to workers and visitors on-site. However, this pathway is considered to be a potential exposure pathway because the point of exposure and concentration of soil vapors are unknown. No known soil gas measurements were taken at Harbor Oil.

Soil vapor intrusion from petroleum contaminants is common, especially if they are found in the “free product” state, as measured in one of the monitoring wells. Soil vapor exposure would be of most concern for indoor structures or enclosed spaces with compromised foundations near an active source of contamination.

### *Ambient Air Pathway*

Volatilization of organic compounds, including total petroleum hydrocarbons, is occurring to some degree at Harbor Oil, especially during warmer months. No point of exposure is currently known, making this site a potential exposure pathway. Furthermore, no known ambient air monitoring has been conducted at the Harbor Oil facility. Management at Heron Lakes Golf Course has noted noxious odors coming from the general direction of Harbor Oil [13].

### *Groundwater*

Since there is no known drinking water well on-site or in the immediate vicinity of Harbor Oil, this pathway is considered a potential exposure pathway. Shallow groundwater is not used for drinking and the deeper groundwater is limited to commercial/industrial use. In addition, there are no known irrigation or livestock uses for the groundwater or surface water in Force Lake.

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### *Surface Water*

There is no information to suggest that swimming or other contact recreational activity occurs in Force Lake. Dermal contact with the surface water is possible while retrieving golf balls. However, no data are available to evaluate potential human exposures. Therefore, this pathway is considered a potential exposure pathway.

### **Evaluation of Health Outcome Data**

The Superfund law requires that health outcome (i.e., mortality and morbidity) data (HOD) be considered in a public health assessment [14]. This consideration is done using specific guidance in ATSDR's *Public Health Assessment Guidance Manual* and a 1996 revision to that guidance [15][16]. The main requirements for evaluating HOD are presence of a completed human exposure pathway, contaminant levels that are high enough to result in measurable health effects, sufficient persons in the completed pathway for health effects to be measured, and a health outcome database in which disease rates for the population of concern can be identified [16].

Harbor Oil does not meet the requirements for including an evaluation of HOD in this public health assessment. Although a completed human exposure pathway was identified at this site, the potentially exposed population is not large enough to permit meaningful measurements of possible site-related health effects, and the contamination levels were not present at high enough concentrations to evaluate HOD.

### **Child Health Considerations**

ATSDR recognizes that infants and children may be more vulnerable to exposures than adults in communities faced with contamination of their air, water, soil, or food. This vulnerability is a result of the following factors:

- Children are more likely to play outdoors and bring food into contaminated areas.
- Children are shorter, resulting in a greater likelihood to breathe dust, soil, and heavy vapors close to the ground.
- Children are smaller, resulting in higher doses of chemical exposure per body weight.
- The developing body systems of children can sustain permanent damage if toxic exposures occur during critical growth stages.

Because children depend on adults for risk identification and management decisions, ATSDR is committed to evaluating their special interests at Harbor Oil.

Children should be restricted from playing around the drainage area and wetlands of Force Lake. Children should be discouraged from collecting golf balls and engaging in other recreational activities around Force Lake.

## **Community Health Concerns**

### **Community Survey**

The Portland Parks and Recreation Department conducted a survey of community members for the Master Plan for Heron Lakes Golf Course and West Delta Park [9]. Forty-one percent indicated that they might use a recreational trail system several times a month, with 24% indicating that they would use the trails several times per week. A trail system that provided opportunity for strolling was supported by 80% of respondents.

SHINE attended a Kenton Neighborhood Association meeting on July 9, 2003, and asked attendees to fill out a questionnaire regarding behaviors and activities around Force Lake. Twelve respondents stated that they were moderately to very concerned about their family's exposure to contaminants from Harbor Oil. One respondent was concerned about exposure while using the nearby golf course. Three people had heard or seen people fishing at Force Lake and three people had seen others collect golf balls or engaged in other activities around Force Lake. In addition, SHINE wrote an article in the August-September 2003 Historic Kenton newsletter describing our role and the assessment of Harbor Oil.

The only concern expressed by management at Heron Lakes Golf Course was the noxious odors emanating from nearby the Harbor Oil facility [13]. Workers were instructed to discontinue collecting golf balls at Force Lake.

### **Public Review**

This health assessment was available for public review at the North Portland Public Library and the St. Johns Public Library. The document was released on January 27, 2004, and was available for public comment until March 12, 2004. The document was available at the Kenton Neighborhood Association meeting to discuss the formation of a Harbor Oil Citizens Advisory Group (CAG), on January 29, 2004. The document was also available on the web at <http://www.healthoregon.org/superfund>.

The health assessment was sent to EPA project manager Kevin Rochlin; DEQ project manager Mavis Kent; EPA health educator Judy Smith; Mr. Bill Biggs of ORRCO; Mr. Steven Gunther; Heron Lakes Golf Course and David Coles of Coles Environmental Consulting. No comments were received for the public comment version of the Harbor Oil public health assessment.

## **Conclusions**

1. Exposure to off-site contaminants found in the drainage area and wetlands adjacent to Force Lake represents a completed exposure pathway. Based on our evaluation, exposure to this area is not anticipated to result in adverse health effects. However, the existing data for this area are limited in sample number and geographic location.

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2. The level of contamination in fish tissue and information regarding populations that may consume fish from Force Lake are unknown. This lack of data limits the ability to completely characterize the risks to human health from contact with the site.
3. On-site soils, ground water, ambient air, soil vapor and surface water pathways from Harbor Oil were considered to be potential exposure pathways, based on the lack of data for these pathways.
4. Based on the existing environmental data, SHINE considers this site to be a *no apparent public health hazard*.

### **Recommendations**

1. Fish tissue from Force Lake should be sampled to determine the potential for health effects to occur for people who catch and consume fish at this site.
2. Signs informing people to avoid eating fish should be posted along Force Lake by the potentially responsible party. The signs should include numerous languages and be developed in consultation with the Oregon Department of Human Services.
3. Additional sediment and bank samples should be collected by the potentially responsible party. This includes sampling the southern banks of Force Lake, where recreational contact to sediment is most likely to occur.
4. Ambient air, soil vapor and surface water sampling would allow for further characterization of these potential exposure pathways and a better understanding of potential risks to human health.

### **Public Health Action Plan**

The Public Health Action Plan for the Harbor Oil site contains a description of actions to be taken by SHINE at the site after the completion of this public health assessment. The purpose of the Public Health Action Plan is to ensure that this public health assessment not only identifies public health hazards, but provides a plan of action designed to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances in the environment. Included is a commitment on the part of SHINE to follow up on this plan to ensure that it is implemented.

The following public health action is ongoing.

- SHINE is working with the potentially responsible parties to have appropriate and effective signs to warn anglers about consuming fish caught at Force Lake.

The following public health actions are completed.

- SHINE is informing and educating community members near Harbor Oil about the risks associated with this site, including discussions at the Kenton and Portsmouth

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Neighborhood Association meetings and continued discussions with Heron Lakes Golf Course.

- In addition, SHINE is developing a summary fact sheet on the major findings of the Harbor Oil public health assessment.

SHINE will reevaluate and expand the Public Health Action Plan as needed. New environmental, toxicological, or health outcome data, or the results of implementing the above proposed action may determine the need for additional actions at this site.

## Site Team

Author of Report

Dave Stone, Ph.D.  
Toxicologist  
Oregon Department of Human Services, SHINE program

Oregon Department of Human Services, SHINE program staff

Amanda M. Guay, M.P.H.  
Health Educator, SHINE

Janice Davin Panichello, M.P.A.  
Program Coordinator, SHINE

Jae Douglas, PhD  
Epidemiologist, SHINE

Agency for Toxic Substances and Disease Registry

Karen L. Larson, Ph.D.  
Regional Representative  
ATSDR Region 10  
Division of Regional Operations

John R. Crellin, Ph.D.  
Senior Environmental Epidemiologist & Technical Project Officer  
Superfund Site Assessment Branch  
Division of Health Assessment and Consultation



## Harbor Oil Public Health Assessment

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## Appendix A. - Explanation of Evaluation Process

### Screening Process

In evaluating these data, ATSDR used comparison values (CVs) to determine which chemicals to examine more closely. CVs are the contaminant concentrations below which no known or anticipated health effects are expected to occur. CVs incorporate assumptions of daily exposure to the chemical and a standard amount of air, water, and soil that someone could inhale or ingest each day.

Different CVs are developed for cancer and non-cancer health effects. Non-cancer levels are based on valid toxicological studies for a chemical, with appropriate safety factors included. They are also based on the assumption that small children (22 pounds) and adults are exposed every day. Cancer levels are the media concentrations at which there could be a one in a million excess cancer risk for an adult eating contaminated soil or drinking contaminated water every day for 70 years. For chemicals for which both cancer and non-cancer numbers exist, to be protective the lower level is used. Also, exceeding a CV does not mean that health effects will occur—just that more evaluation is needed.

CVs used in this document are listed below:

*Environmental Media Evaluation Guides (EMEGs)* are estimated contaminant concentrations in a media where non-carcinogenic health effects are unlikely. The EMEG is derived from the Agency for Toxic Substances and Disease Registry's (ATSDR) minimal risk level (MRL).

*Remedial Media Evaluation Guides (RMEGs)* are estimated contaminant concentrations in a media where non-carcinogenic health effects are unlikely. The RMEG is derived from the Environmental Protection Agency's (EPA's) reference dose (RfD).

*Cancer Risk Evaluation Guides (CREGs)* are estimated contaminant concentrations that would be expected to cause no more than one additional excess cancer in 1 million persons exposed over a lifetime. CREGs are calculated from EPA's cancer slope factors (CSFs).

*Preliminary Remediation Goals (PRGs)* are the estimated contaminant concentrations in a media where carcinogenic or non-carcinogenic health effects are unlikely. The PRGs used in this public health assessment were derived using provisional reference doses or cancer slope factors calculated by EPA's Region 9 toxicologists.

*EPA Soil Screening Levels (SSLs)* are estimated contaminant concentrations in soil at which additional evaluation is needed to determine if action is required to eliminate or reduce exposure.

## **Evaluation of Public Health Implications**

### ***Estimation of Exposure Dose***

The next step is to take those contaminants that are above the CVs and further identify which chemicals and exposure situations are likely to be a health hazard. Child and adult exposure doses are calculated for the site-specific exposure scenario, using our assumptions of who goes on the site and how often they contact the site contaminants. The exposure dose is the amount of a contaminant that gets into a person's body.

Appendix B describes the assumptions used in calculating exposure dose for the pathway.

### ***Non-cancer Health Effects***

The calculated exposure doses are then compared to an appropriate health guideline for that chemical. Health guideline values are considered safe doses; that is, health effects are unlikely below this level. The health guideline value is based on valid toxicological studies for a chemical, with appropriate safety factors built in to account for human variation, animal-to-human differences, the use of the lowest adverse effect level, or a combination of all three. For non-cancer health effects, the following health guideline values are used.

#### ***Minimal Risk Level (MRLs)*** - developed by ATSDR

An estimate of daily human exposure—by a specified route and length of time—to a dose of chemical that is likely to be without a measurable risk of adverse, non-cancerous effects. An MRL should not be used as a predictor of adverse health effects. A list of MRLs can be found at <http://www.atsdr.cdc.gov/mrls.html>.

#### ***Reference Dose (RfD)*** - developed by EPA

An estimate, with safety factors built in, of the daily, lifetime exposure of human populations to a possible hazard that is not likely to cause non-cancerous health effects. The RfDs can be found at <http://www.epa.gov/iris/>.

If the estimated exposure dose for a chemical is less than the health guideline value, then the exposure is unlikely to cause a non-carcinogenic health effect in that specific situation. If the exposure dose for a chemical is greater than the health guideline, then the exposure dose is compared to known toxicological values for that chemical and is discussed in more detail in the public health assessment. These toxicological values are doses derived from human and animal studies summarized in the ATSDR toxicological profiles. A direct comparison of site-specific exposure and doses to study-derived exposures and doses found to cause adverse health effects is the basis for deciding whether health effects are likely or not.

### ***Risk of Carcinogenic Effects***

The estimated risk of developing cancer from exposure to the contaminants was calculated by multiplying the site-specific adult exposure dose by EPA's corresponding Cancer Slope Factor

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(which can be found at <http://www.epa.gov/iris/>). The results estimate the maximum increase in risk of developing cancer after 70 years of exposure to the contaminant.

The actual risk of cancer is probably lower than the calculated number. The method used to calculate EPA's Cancer Slope Factor assumes that high-dose animal data can be used to estimate the risk for low dose exposures in humans. The method also assumes there is no safe level for exposure. But little experimental evidence exists to confirm or refute those two assumptions. Lastly, the method computes the 95% upper bound for the risk, rather than the average risk, suggesting that the cancer risk is actually lower, perhaps by several orders of magnitude.

Because of uncertainties involved in estimating carcinogenic risk, ATSDR employs a weight-of-evidence approach in evaluating all relevant data. Therefore, the carcinogenic risk is described in words (qualitatively) rather than as only a numerical risk estimate. A numerical risk estimate must be considered in the context of the variables and assumptions involved in their derivation and in the broader context of biomedical opinion, host factors, and actual exposure conditions. The actual parameters of environmental exposures must be given careful consideration in evaluating the assumptions and variables relating to both toxicity and exposure.

## **Appendix B. Exposure Dose Assumptions for Completed Exposure Pathway**

To determine the risk associated with completed exposure pathways, a health assessment was conducted. This assessment applies to exposure with off-site soils at the Harbor Oil facility. A combined exposure scenario for soil ingestion and dermal exposure was assessed for adults and children, using the assumptions below.

### **Soil Ingestion**

Exposure doses for soil ingestion were calculated in the following manner. The average concentration for soil, in milligrams per kilogram (mg/kg) (or ppm), was multiplied by the soil ingestion rate for adults, 0.0001 kilograms per day (kg/d), or children, 0.0002 kg/d. The multiplication product was divided by the average weight for an adult, 70 kg (154 pounds) or a child. For on-site soil contamination, a child's body weight of 36 kg (80 pounds) was used, given that the likelihood of an infant contacting on-site soil is very small. For residential, off-site exposure, a body weight of 10 kg (22 pounds) was assumed in residential soils and 36 kg was assumed for a child playing in ditch sediment. The result is the exposure dose, in units of mg/kg/day. These calculations assume daily exposure to soil contaminated at the average concentration shown for soil in contamination data tables.

### **Calculation of Risk of Carcinogenic Effects**

Carcinogenic risk from exposure to contaminants was calculated through the following procedure. The adult and childhood exposure doses for soil ingestion (calculated as described previously) were multiplied by EPA's Cancer Slope Factor for ingestion of the contaminants of concern. The results represent the maximum risk for excess cancer after 70 years of exposure to the maximum concentration of the contaminant.

Neither childhood nor adult scenarios resulted in exposures that exceeded health guidelines. Based on this assessment, no adverse health effects would be anticipated.

## Appendix C: ATSDR Glossary of Environmental Health Terms

The Agency for Toxic Substances and Disease Registry (ATSDR) is a federal public health agency with headquarters in Atlanta, Georgia, and 10 regional offices in the United States. ATSDR's mission is to serve the public by using the best science, taking responsive public health actions, and providing trusted health information to prevent harmful exposures and diseases related to toxic substances. ATSDR is not a regulatory agency, unlike the U.S. Environmental Protection Agency (EPA), which is the federal agency that develops and enforces environmental laws to protect the environment and human health.

This glossary defines words used by ATSDR in communications with the public. It is not a complete dictionary of environmental health terms. If you have questions or comments, call ATSDR's toll-free telephone number, 1-888-42-ATSDR (1-888-422-8737).

### **Absorption**

The process of taking in. For a person or animal, absorption is the process of a substance getting into the body through the eyes, skin, stomach, intestines, or lungs.

### **Acute**

Occurring over a short time [compare with **chronic**].

### **Acute exposure**

Contact with a substance that occurs once or for only a short time (up to 14 days) [compare with **intermediate duration exposure** and **chronic exposure**].

### **Adverse health effect**

A change in body function or cell structure that might lead to disease or health problems.

### **Ambient**

Surrounding (for example, *ambient* air).

### **Biota**

Plants and animals in an environment. Some of these plants and animals might be sources of food, clothing, or medicines for people.

### **Cancer**

Any one of a group of diseases that occurs when cells in the body become abnormal and grow or multiply out of control.

### **Cancer risk**

A theoretical risk for getting cancer if exposed to a substance every day for 70 years (a lifetime exposure). The true risk might be lower.

### **Carcinogen**

A substance that causes cancer.

**CERCLA** [see **Comprehensive Environmental Response, Compensation, and Liability Act of 1980**]

**Chronic**

Occurring over a long time (more than 1 year) [compare with **acute**].

**Chronic exposure**

Contact with a substance that occurs over a long time (more than 1 year) [compare with **acute exposure** and **intermediate duration exposure**].

**Comparison value (CV)**

Calculated concentration of a substance in air, water, food, or soil that is unlikely to cause harmful (adverse) health effects in exposed people. The CV is used as a screening level during the public health assessment process. Substances found in amounts greater than their CVs might be selected for further evaluation in the public health assessment process.

**Completed exposure pathway** [see **exposure pathway**].

**Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)**

CERCLA, also known as **Superfund**, is the federal law that concerns the removal or cleanup of hazardous substances in the environment and at hazardous waste sites. ATSDR, which was created by CERCLA, is responsible for assessing health issues and supporting public health activities related to hazardous waste sites or other environmental releases of hazardous substances.

**Concentration**

The amount of a substance present in a certain amount of soil, water, air, food, blood, hair, urine, breath, or any other media.

**Contaminant**

A substance that is either present in an environment where it does not belong or is present at levels that might cause harmful (adverse) health effects.

**Dermal**

Referring to the skin. For example, dermal absorption means passing through the skin.

**Dermal contact**

Contact with (touching) the skin [see **route of exposure**].

**Detection limit**

The lowest concentration of a chemical that can reliably be distinguished from a zero concentration.

**Disease registry**



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A system of ongoing registration of all cases of a particular disease or health condition in a defined population.

### **Dose (for chemicals that are not radioactive)**

The amount of a substance to which a person is exposed over some time period. Dose is a measurement of exposure. Dose is often expressed as milligram (amount) per kilogram (a measure of body weight) per day (a measure of time) when people eat or drink contaminated water, food, or soil. In general, the greater the dose, the greater the likelihood of an effect. An **Aexposure dose@** is how much of a substance is encountered in the environment. An **Aabsorbed dose@** is the amount of a substance that actually got into the body through the eyes, skin, stomach, intestines, or lungs.

### **Environmental media**

Soil, water, air, **biota** (plants and animals), or any other parts of the environment that can contain contaminants.

### **Environmental media and transport mechanism**

Environmental media include water, air, soil, and **biota** (plants and animals). Transport mechanisms move contaminants from the source to points where human exposure can occur. The **environmental media and transport mechanism** is the second part of an **exposure pathway**.

### **EPA**

United States Environmental Protection Agency.

### **Exposure**

Contact with a substance by swallowing, breathing, or touching the skin or eyes. Exposure may be short-term [**acute exposure**], of intermediate duration, or long-term [**chronic exposure**].

### **Exposure pathway**

The route a substance takes from its source (where it began) to its end point (where it ends), and how people can come into contact with (or get exposed to) it. An exposure pathway has five parts: a **source of contamination** (such as an abandoned business); an **environmental media and transport mechanism** (such as movement through groundwater); a **point of exposure** (such as a private well); a **route of exposure** (eating, drinking, breathing, or touching); and a **receptor population** (people potentially or actually exposed). When all five parts are present, the exposure pathway is termed a **completed exposure pathway**.

### **Geographic information system (GIS)**

A mapping system that uses computers to collect, store, manipulate, analyze, and display data. For example, GIS can show the concentration of a contaminant within a community in relation to points of reference such as streets and homes.

**Groundwater**

Water beneath the earth=s surface in the spaces between soil particles and between rock surfaces [compare with **surface water**].

**Hazard**

A source of potential harm from past, current, or future exposures.

**Hazardous waste**

Potentially harmful substances that have been released or discarded into the environment.

**Health consultation**

A review of available information or collection of new data to respond to a specific health question or request for information about a potential environmental hazard. Health consultations are focused on a specific exposure issue. Health consultations are therefore more limited than a public health assessment, which reviews the exposure potential of each pathway and chemical [compare with **public health assessment**].

**Health education**

Programs designed with a community to help it know about health risks and how to reduce these risks.

**Health investigation**

The collection and evaluation of information about the health of community residents. This information is used to describe or count the occurrence of a disease, symptom, or clinical measure and to estimate the possible association between the occurrence and exposure to hazardous substances.

**Indeterminate public health hazard**

The category used in ATSDR=s public health assessment documents when a professional judgment about the level of health hazard cannot be made because information critical to such a decision is lacking.

**Ingestion**

The act of swallowing something through eating, drinking, or mouthing objects. A hazardous substance can enter the body this way [see **route of exposure**].

**Inhalation**

The act of breathing. A hazardous substance can enter the body this way [see **route of exposure**].

**Intermediate duration exposure**

Contact with a substance that occurs for more than 14 days and less than a year [compare with **acute exposure** and **chronic exposure**].

**Lowest-observed-adverse-effect level (LOAEL)**

The lowest tested dose of a substance that has been reported to cause harmful (adverse) health effects in people or animals.

**mg/kg**

Milligram per kilogram.

**Minimal risk level (MRL)**

An ATSDR estimate of daily human exposure to a hazardous substance at or below which that substance is unlikely to pose a measurable risk of harmful (adverse), noncancerous effects. MRLs are calculated for a route of exposure (inhalation or oral) over a specified time period (acute, intermediate, or chronic). MRLs should not be used as predictors of harmful (adverse) health effects [see **reference dose**].

**Morbidity**

State of being ill or diseased. Morbidity is the occurrence of a disease or condition that alters health and quality of life.

**Mortality**

Death. Usually the cause (a specific disease, condition, or injury) is stated.

**National Priorities List for Uncontrolled Hazardous Waste Sites (National Priorities List or NPL)**

EPA=s list of the most serious uncontrolled or abandoned hazardous waste sites in the United States. The NPL is updated on a regular basis.

**No apparent public health hazard**

A category used in ATSDR=s public health assessments for sites where human exposure to contaminated media might be occurring, might have occurred in the past, or might occur in the future, but where the exposure is not expected to cause any harmful health effects.

**No-observed-adverse-effect level (NOAEL)**

The highest tested dose of a substance that has been reported to have no harmful (adverse) health effects on people or animals.

**No public health hazard**

A category used in ATSDR=s public health assessment documents for sites where people have never and will never come into contact with harmful amounts of site-related substances.

**NPL [see National Priorities List for Uncontrolled Hazardous Waste Sites]**

**ODEQ**

Oregon Department of Environmental Quality

**ODHS**

Oregon Department of Human Services

**Point of exposure**

The place where someone can come into contact with a substance present in the environment [see **exposure pathway**].

**Population**

A group or number of people living within a specified area or sharing similar characteristics (such as occupation or age).

**Potentially responsible party (PRP)**

A company, government, or person legally responsible for cleaning up the pollution at a hazardous waste site under Superfund. There may be more than one PRP for a particular site.

**ppb**

Parts per billion.

**ppm**

Parts per million.

**Public health action**

A list of steps to protect public health.

**Public health assessment (PHA)**

An ATSDR document that examines hazardous substances, health outcomes, and community concerns at a hazardous waste site to determine whether people could be harmed from coming into contact with those substances. The PHA also lists actions that need to be taken to protect public health [compare with **health consultation**].

**Public health hazard**

A category used in ATSDR's public health assessments for sites that pose a public health hazard because of long-term exposures (greater than 1 year) to sufficiently high levels of hazardous substances or **radionuclides** that could result in harmful health effects.

**Public health hazard categories**

Public health hazard categories are statements about whether people could be harmed by conditions present at the site in the past, present, or future. One or more hazard categories might be appropriate for each site. The five public health hazard categories are **no public health hazard**, **no apparent public health hazard**, **indeterminate public health hazard**, **public health hazard**, and **urgent public health hazard**.

**RCRA** [see **Resource Conservation and Recovery Act (1976, 1984)**]

**Receptor population**

People who could come into contact with hazardous substances [see **exposure pathway**].

**Reference dose (RfD)**

An EPA estimate, with uncertainty or safety factors built in, of the daily lifetime dose of a substance that is unlikely to cause harm in humans.

**Registry**

A systematic collection of information on persons exposed to a specific substance or having specific diseases [see **exposure registry** and **disease registry**].

**Remedial investigation**

The CERCLA process of determining the type and extent of hazardous material contamination at a site.

**Resource Conservation and Recovery Act (1976, 1984) (RCRA)**

This Act regulates management and disposal of hazardous wastes currently generated, treated, stored, disposed of, or distributed.

**RfD**

See **reference dose**.

**Risk**

The probability that something will cause injury or harm.

**Risk communication**

The exchange of information to increase understanding of health risks.

**Route of exposure**

The way people come into contact with a hazardous substance. Three routes of exposure are breathing [**inhalation**], eating or drinking [**ingestion**], or contact with the skin [**dermal contact**].

**Sample**

A portion or piece of a whole. A selected subset of a population or subset of whatever is being studied. For example, in a study of people the sample is a number of people chosen from a larger population [see **population**]. An environmental sample (for example, a small amount of soil or water) might be collected to measure contamination in the environment at a specific location.

**SHINE**

Superfund Health Investigation and Education program

**Solvent**

A liquid capable of dissolving or dispersing another substance (for example, acetone or mineral spirits).

**Source of contamination**

The place where a hazardous substance comes from, such as a landfill, waste pond, incinerator, storage tank, or drum. A source of contamination is the first part of an **exposure pathway**.

**Surface water**

Water on the surface of the earth, such as in lakes, rivers, streams, ponds, and springs [compare with **groundwater**].

**Survey**

A systematic collection of information or data. A survey can be conducted to collect information from a group of people or from the environment. Surveys of a group of people can be conducted by telephone, by mail, or in person. Some surveys are done by interviewing a group of people [see **prevalence survey**].

**Toxicological profile**

An ATSDR document that examines, summarizes, and interprets information about a hazardous substance to determine harmful levels of exposure and associated health effects. A toxicological profile also identifies significant gaps in knowledge on the substance and describes areas where further research is needed.

**Toxicology**

The study of the harmful effects of substances on humans or animals.

**Urgent public health hazard**

A category used in ATSDR's public health assessments for sites where short-term exposures (less than 1 year) to hazardous substances or conditions could result in harmful health effects that require rapid intervention.

**Volatile organic compounds (VOCs)**

Organic compounds that evaporate readily into the air. VOCs include substances such as benzene, toluene, methylene chloride, and methyl chloroform.

***Other Glossaries and Dictionaries***

Environmental Protection Agency

National Center for Environmental Health (CDC)

National Library of Medicine (NIH)

<http://www.epa.gov/OCEPATERMS/>

<http://www.cdc.gov/nceh/dls/report/glossary.htm>

<http://www.nlm.nih.gov/medlineplus/dictionaries.html>

## **Certification**

The Superfund Health Investigation and Education Program of the Oregon Department of Human Services prepared the Harbor Oil Public Health Assessment under a cooperative agreement with the Agency for Toxic Substances and Disease Registry. This document is in accordance with approved methodology and procedures.

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John R. Crellin, Ph.D.  
Technical Project Officer for Oregon, SSAB, DHAC

I have reviewed this public health assessment, as the designated representative of the Agency for Toxic Substances and Disease Registry and concur with its findings.

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Roberta Erlwein  
Leader, Cooperative Agreement Team, SSAB, DHAC