PUBLIC HEALTH ASSESSMENT

Public Comment Release

Taylor Lumber & Treating, Inc.
Sheridan, Yamhill County, Oregon
EPA Facility ID: ORD009042532

Oregon Department of Human Services
Portland, Oregon 97232-2162
and
U.S. Department of Health and Human Services
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
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Purpose and Health Issues

Taylor Lumber and Treating was proposed for the National Priorities List (NPL) on December 1, 2000 and listed on June 14, 2001. In this public health assessment the Oregon Department of Human Services (ODHS) evaluates the public health importance of the site as mandated by Congress.[1] ODHS has reviewed available environmental data and community health concerns to determine whether adverse health effects are possible. In addition, this public health assessment recommends actions to prevent, reduce, or further identify the possibility for site-related adverse health effects.

Based on the environmental sampling conducted at the former Taylor Lumber and Treating facility, ODHS considers this site to be a **no apparent public health hazard.**

Background

Site Description

This site description comes in part from the Taylor Lumber and Treating (TLT) Site Integrated Assessment Report (July 2000) and the Taylor Lumber and Treating Community Involvement Plan (January 2002) [1,2]. The Taylor Lumber and Treating NPL site is located on the western edge of Sheridan, Yamhill County, Oregon (Figure 1), in the northeast quarter of Section 33 and the northwest quarter of Section 34, Township 5 South, Range 6 West. The coordinates of the site are approximately 45° 06' 00.0" north latitude and 123° 25' 30.0" west longitude [1].

The site covers about 234 acres and includes a maintenance shop, a sawmill, a tank farm with 13 above-ground storage tanks, and a laboratory [2]. Half of the site is agricultural land, and the other half is evenly split between wood treating and sawmill and planning facilities [1]. On the north, west, and south the surrounding area is agricultural land; the east side is mostly commercial/industrial properties and some residences [1,2]. The site is located just north of the Yamhill River and east of Rock Creek. TLT lies along State Highway 18B, a heavily used business loop.

History

The sawmill operated from 1946–2001 [1,2]. Its operations included the peeling, milling, planing, and chipping of raw wood to produce lumber products. The ends of the finished lumber products are painted to prevent moisture loss. Wood chips and bark are burned in the boiler, which generates steam for the facility. From the 1960s through the 1980s waste and debris from site operations were deposited in an area southeast of the planing mill.

[1] The Agency for Toxic Substances and Disease Registry (ATSDR) has delegated to ODHS the authority to evaluate NPL sites.

The wood-treating facility (west facility) operated from autumn 1966–2000 [1,2]. The purpose of the wood treating was to condition and pressure-treat wood products with preservatives to prolong their useful life. Wood products treated at the facility included lumber, poles, pilings, posts, railroad ties, and plywood. Wood-preserving chemicals, which historically have been used at this facility, include petroleum-based creosote and pentachlorophenol (PCP) solutions. From 1982 to 1996, Chemonite, a 3% water-based solution containing arsenic acid, copper salts, zinc, and ammonia, also was used as a wood-preserving chemical at the site. The wood-treating chemicals were stored in above-ground storage tanks (ASTs) located in two separate tank farms.

Numerous violations have occurred at this site over the past decade [1]. In February 1999, 3500 gallons of 5% P-9 oil spilled from the tank farm and collected in drainage ditches. During September 1999, approximately 27,500 gallons of reclaimed creosote and wastewater were released when their tanks topped over, with some contaminated wastewater spilling into nearby ditches. In June and August 1999, the EPA conducted an Integrated Assessment (IA) of the Taylor Lumber and Treating facility [1]. Phase I of the IA included surface and subsurface soil sampling, groundwater sampling, surface water, and river creek sediment sampling. Phase II of the IA consisted of an air-sampling event which was conducted from August 18 through August 30, 1999. Results of the IA documented the presence of several on-site sources of hazardous substances, including volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pentachlorophenol (PCP), metals, and dioxins and furans. Further, many of these hazardous substances were documented to have migrated to surface water, soil, and air targets. Air contamination is documented up to 1 mile from the site.

The EPA has conducted several remedial activities to abate some of the contamination. Abatement activities include the installation of a slurry wall to prevent the migration of the majority of groundwater pollutants within the West Facility of TLT. Also, several thousand tons of contaminated soil were removed and placed in storage cells in the western edge of the facility. The contaminated soil is covered with tarps and surrounded by an unsecured fence. To diminish contact with soil contaminants, asphalt was placed over sections of TLT.

Pacific Wood Preserving Companies (PWP), a large volume treater of low-environmental-impact wood, recently purchased the West Facility of TLT and began operations in approximately June 2002. PWP uses borate and copper-based products to treat their

Figure 1. Taylor Lumber Area

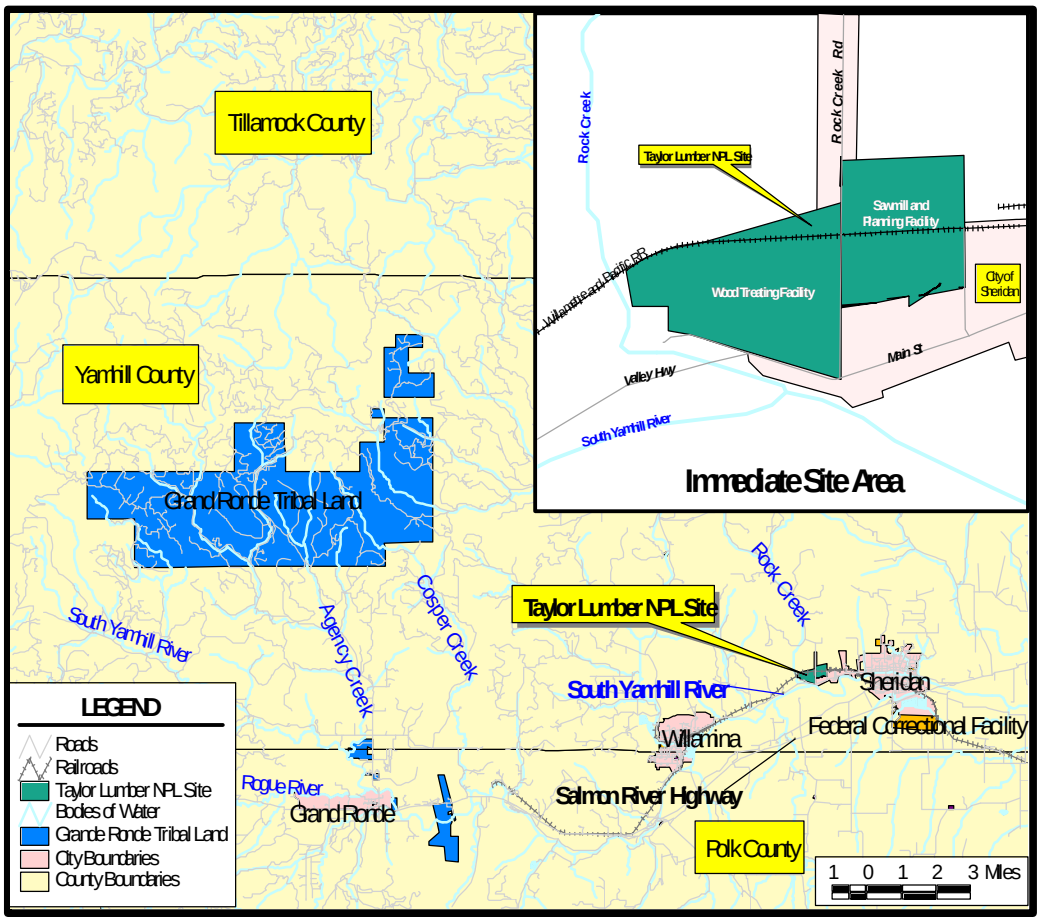


Figure 1 - Taylor Lumber NPL Site Area

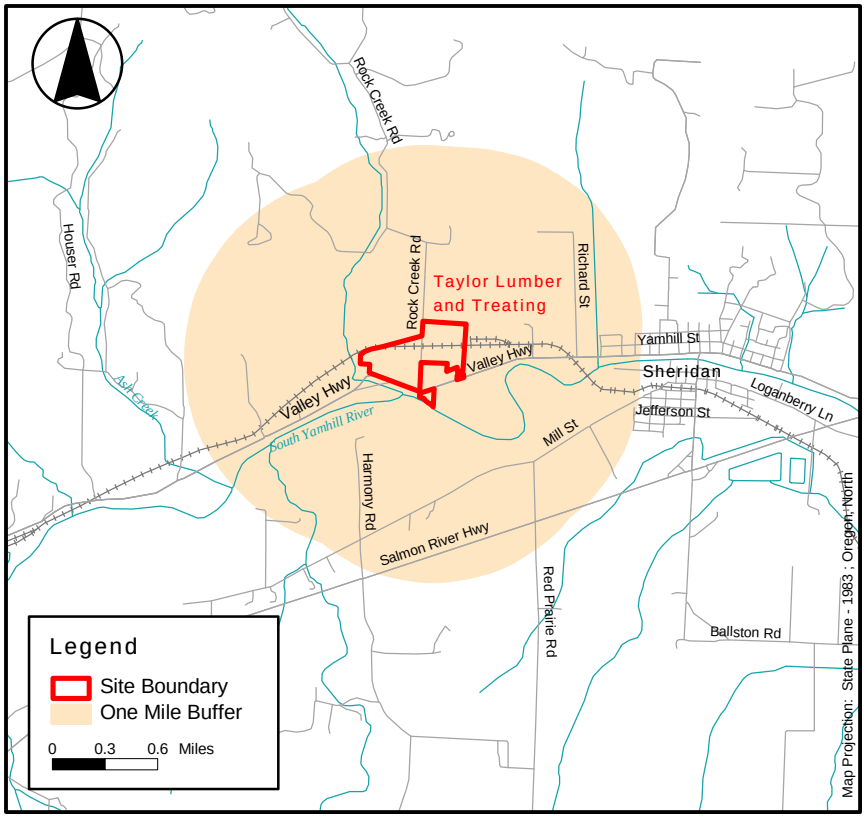
Figure 2 – Basic Demographics Map (next page)

Taylor Lumber and Treating

INTRO MAP

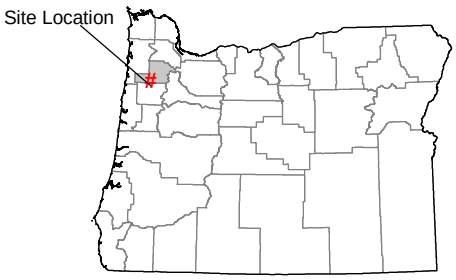
Sheridan, Oregon

EPA Facility ID ORD009042532



Base Map Source: 1995 TIGER/Line Files

Site Location

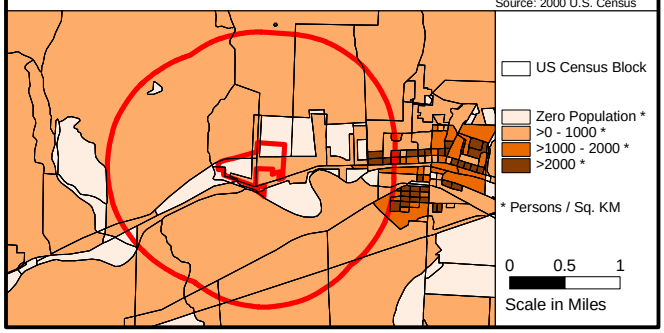


Yamhill County, Oregon

Demographic Statistics Within Area of Concern*	
Total Population	793
White alone	722
Black alone	0
Am. Indian and Alaska Native alone	32
Asian alone	5
Native Hawaiian and Other Pacific Islander alone	0
Some other race alone	17
Two or More races	15
Hispanic or Latino	33
Children Aged 6 and Younger	77
Adults Aged 65 and Older	86
Females Aged 15 - 44	157
Total Housing Units	308

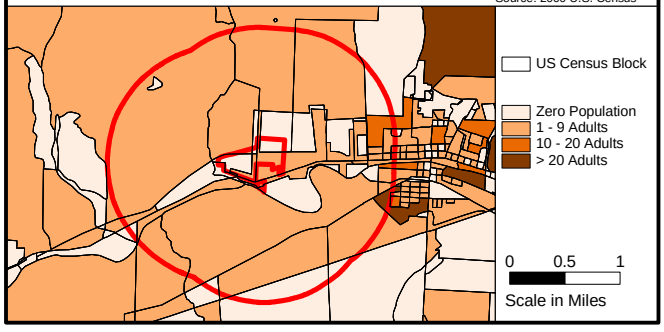
Demographics Statistics Source: 2000 US Census
*Calculated using an area-proportion spatial analysis technique

Population Density

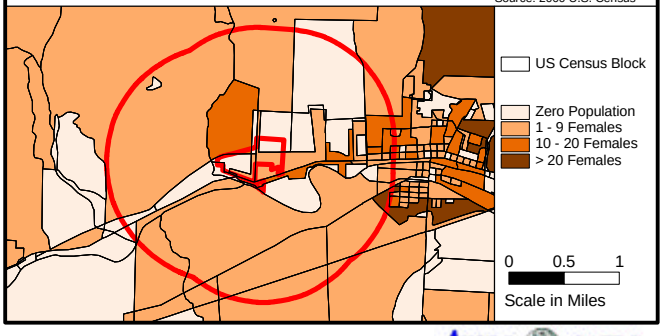


Children 6 Years and Younger

Adults 65 Years and Older



Females Aged 15 - 44



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wood. The company is operating an extraction system that prevents groundwater pollution from reaching the South Yamhill River.

Currently, several physical hazards exist on and around the West Facility of TLT. A large kiln oven and an abandoned control facility with exposed insulation are present between TLT property and a residence to the west of the facility. On site, numerous piles of debris, scrap metal and loose insulation exist, especially around the pole-drying area. New construction and refinishing of existing structures is underway, which could reduce the amount of debris.

Demographics

The demographics of the Taylor Lumber area are displayed on Figure 2. The area near TLT is sparsely populated. There are over 450 members of the Confederated Tribes of the Grande Ronde within 5 miles of the site, an area which includes Yamhill and Polk Counties.

Land and Natural Resource Use

The area around the former TLT site has industrial, commercial, agricultural and residential uses. The western boundaries of the City of Sheridan include the eastern portion of TLT. A Head Start facility has been approved for development approximately 500 feet southeast of the TLT facility, along Highway 18B. The Oregon Department of Environmental Quality (DEQ) has conducted an in-depth investigation of contamination on the Head Start property and concluded that no probable threat to human health exists at the site. Included in the construction of Head Start facility is the removal of the top 6 inches of soil and replacement with clean fill—a recommendation that is supported by ODHS. Farther east is an assisted living facility and numerous commercial and residential buildings.

To the north of the TLT facility, across from railroad tracks, is a hay field. Private residences line Rock Creek Road and Highway 18B, including homes adjacent to ditches and sediment receiving storm water runoff. An additional residence lies along TLT's western edge.

TLT has two main sections: the West Facility and East Facility. The West Facility, under the new ownership of Pacific Wood Preserving Companies, has begun operation. The East Facility is owned by "Dee" Industrial and by Esquire Investments Inc., which manufactures outdoor cedar furniture.

Our discussions with staff of the City of Sheridan indicate that residents inside the city limits obtain their drinking water from the Sheridan drinking water system. This system obtains most of its water from groundwater sources. During peak demand periods in summer, water from the Yamhill River is often obtained downstream of TLT. The residents immediately west of TLT currently get their water from a private well.

Discussion

Data Used

Several environmental investigations have been conducted within TLT and in the vicinity. The investigations have included sampling soil, sediment, air, water and groundwater. The majority of the data used are derived from two comprehensive sampling efforts. After the February 1999 spill, the EPA Superfund Technical Assessment and Response Team (START) conducted an Integrated Assessment (IA). The IA assessed the contamination at TLT West and East Facilities [3]. Data from a 2000 Removal Action (RA) report was reviewed in this assessment [4]. The RA data was collected to address imminent and substantial health concerns to the public. Recent groundwater data, collected in 2002—after the installation of a soil-bentonite barrier wall in the West Facility—is included. Residential soil samples and ditch samples at the intersection of Highway 18B and Rock Creek Road collected in July and August 2002 were analyzed as well. Several remedial activities have occurred at TLT to address the most imminent health hazards. Some of the contamination levels reported in this document were measured before removal and remediation actions occurred. The on-site surface soil samples were collected from 0–2 feet below ground surface, while the off-site surface soil samples were collected from 0–1 feet below ground surface [1].

ATSDR and ODHS visited the Taylor Lumber area on September 10–11, 2001 to better understand the physical setting of the site and its relationship to the people living and working nearby.[2] The first meeting occurred with members of the Confederated Tribes of the Grand Ronde. We also met with residents of Sheridan and local, state, and federal officials to learn more about the site and the health concerns of the community.

On June 12, 2002 ODHS and ATSDR staff visited the West Facility of Taylor Lumber to assess further the physical and geographical setting of the site.[3] During the tour, ODHS visited with the City Manager and Director of the Municipal Water Supply to learn about community concerns and drinking water distribution and monitoring.

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-

[2] ATSDR (Allan Crawford, John Crellin, Wayne Hall, and Richard Robinson) and ODHS staff (Karen Southwick) met with members of the Confederated Tribes of the Grand Ronde in Grand Ronde, OR on September 10, 2001. These same staff plus Michael Heumann and Harvey Crowder of ODHS toured the site on September 11. Also on September 11 the four ATSDR staff and Michael Heumann (ODHS) met with representatives of the City of Sheridan and conducted a public meeting. Information obtained during these activities are described in the pertinent sections of this document.

[3] Individuals involved in this visit on June 12, 2002 were David Stone, Janice Panichello, and Georgia Richmond from ODHS and Ric Robinson from ATSDR. They were accompanied by a representative of the Confederated Tribes of the Grand Ronde.

based thresholds below which no known or anticipated adverse human health effects occur. Exceeding a CV does not mean that health effects will occur—just that more evaluation is needed. Further 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 then 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.

Toxic equivalency quotients (TEQs) for dioxins, furans and polycyclic aromatic hydrocarbons (PAHs), were calculated using the Van den Berg method [5].

Taylor Lumber Exposure Pathways and Contaminants of Concern

Based on the available data, the most probable means of exposure to site contaminants are through incidental ingestion of contaminated soil and exposure to ditch sediment. Completed, potential and eliminated exposure pathways will be described in the following sections.

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 that 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. Potential pathways require that at least one of these factors is missing, but could be present. An exposure pathway can be eliminated if at least one of the five factors will always be absent.

The focus of this public health assessment is current exposure. Past exposures are discussed and referred to in the appendices.

Completed Exposure Pathways:

On-Site Soils Pathway:

Past, current and future exposures to site contaminants are likely to occur from contact with on-site surface soil. Incidental soil ingestion and skin contact with contaminants are routes of exposure for workers and visitors to the site. That said, however, the opportunity for contact with contaminants on site by children and adults trespassing on the site is limited by the presence of a fence around TLT, observed during our two site visits. Therefore, this exposure pathway is most relevant to TLT workers.

During the initial screening, sample results were compared to the appropriate comparison values (CVs)—health-based thresholds below which no known or anticipated adverse health effects occur. If a contaminant exceeds a CV, it was evaluated further. As shown in Table 1, several contaminants in Taylor Lumber soil exceeded their corresponding CV at least once. Table 1 describes the range of contaminants in the former West Facility of Taylor Lumber. The vast majority of contamination can be found on the West Facility compared with levels of pollution at the East Facility. This is a result of activities conducted by Taylor Lumber at the West Facility, including the two large spills that occurred in 1999.

Table 1. On-Site Soil Contaminants Above Comparison Values

Contaminants	Range in Soil (ppm*)	Samples > DL†/Total	Samples > CV‡	CV in ppm	CV Source§
Dioxin/Furan TEQs¶	0-0.044	44/44		0.001	ATSDR PHA**
Arsenic	ND-778	43/44	15/41††	0.5/20‡‡	CREG§§/EMEG¶¶
Chromium	14-156	44/44	4/44	64	PRG***
Manganese	200-5660	44/44	1/44	3000	RMEG†††
Pentachlorophenol	ND-960	27/66	11/66	3/50	PRG/EMEG
PAH TEQs¶	0-3.81	29/66		None	

*ppm = parts per million of chemical in soil. ppm = mg (milligram) per kg (kilogram of soil).
†DL = Detection Limit
‡CV = Comparison Value
§These comparison values are described in Appendix A
¶TEQ = toxicity equivalency quotient; based on the relative potency to 2,3,7,8-TCDD for dioxins/furans and benzo(a)pyrene for polyaromatic hydrocarbons
**ATSDR Public Health Advisory (1983)
††The first number is the number of samples above the CREG and the second is the number above the EMEG
‡‡The first comparison value is the CREG and second comparison value is the EMEG
§§CREG = cancer risk evaluation guide
¶¶EMEG = environmental media evaluation guide
***PRG = preliminary remediation goal
†††RMEG = remedial media evaluation guide

The next step in the exposure pathway evaluation is to estimate doses, or amounts of the chemicals 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 resulting in doses lower than the health guideline are dropped from further consideration.

The estimated exposure doses for soil contaminants of concern are presented in Table 2. Exposure doses were calculated based on a year-round exposure scenario and 100% bioavailability (except a default of 80% bioavailability for arsenic was used) for soil ingestion. It was assumed that a 10-year-old would be the youngest child that could regularly access the site, so a body weight of 36 kg was used. The average soil concentration was used to derive a chronic exposure, as it is highly unlikely that someone would contact only one location over several years.

Table 2. Estimated Exposure Doses and Cancer Risk for On-Site Soil Compared to Health Guidelines for Ingestion[*]

Contaminant	Concentration (ppm)[†]	Estimated Exposure Dose (mg/kg/day)[‡]		Health Guideline (mg/kg/day)	Source of Guideline	Cancer Risk
		Adult	Child			
Dioxin/Furan TEQs[§]	0.0016	2E-09	4E-9	1E-09	Chronic Oral MRL[¶]	6 in 10000[**]
PAH TEQs[§]	0.43	6.70E-07	1.2E-06	none		1 in 100000

[*]An explanation of how exposure doses and cancer risk were calculated can be found in Appendix B. No health guidelines are available for the PAHs.
[†] ppm = parts per million
[‡] mg/kg/day = milligrams of chemical per kilogram of body weight per day
[§]TEQ = toxicity equivalency quotient; based on the relative potency to 2,3,7,8-TCDD for dioxins/furans and benzo(a)pyrene for polyaromatic hydrocarbons
[¶]MRL = ATSDR's minimal risk level
[**]Maximum additional lifetime risk of cancer per 10,000 individuals

The exposure doses calculated above likely overestimate actual exposures that could occur from soil. It should be noted that several of the sample sites have been capped with asphalt or removed from the Taylor Lumber West Facility. Therefore, this scenario is highly protective of public health. Exposure during the rainy season could alter exposure. Outdoor activity and suspension of contaminated dust particles could be diminished, while skin adherence of contaminated mud could increase.

Off-Site Soils Pathway:

Movement of TLT contaminants to soil off site could have occurred through surface draining from the site, flood events and the blowing of contaminated soil off site. Off-site soil exposure to nearby-residents, especially children, can occur through ingesting soil and through skin contact with pollutants. Children who tend to play in residential and non-residential dirt have elevated hand-to-mouth activity, thus ingesting more soil as compared to adults. Playground equipment was evident in residences along Rock Creek Road and Highway 18B, adjacent to the site. Gardens were also noted, as was one residence that had treated wood and 55-gallon drums in the front yard.

Fourteen samples were collected from driplines in residences near TLT in previous sampling efforts. These off-site samples were collected from 0–1 foot below the surface. To properly evaluate the human health risk, shallower samples (0–3 or 0–6 inches) are preferred. Twelve additional soil samples were taken in July and August 2002 and collected from 0–6 inches. These samples were taken from residences located close to the Taylor Lumber facility.

The main contaminants of concern are listed in Table 3. For this off-site area, we assumed that 1–2 year old children could regularly contact off-site soil, so a 10 kg body weight was used.

Table 3. Off-Site Soil Contaminants Above Comparison Values

	Range in soil (ppm*)	samples > DL†	samples > CV‡	CV in ppm	CV Source§
Arsenic	3.4-14	24/24	24/0¶	0.5/20**	CREG††/EMEG‡‡
Iron	22700-68700	24/24	23/24	23000	PRG§§
Lead	9.1-2800	23/24	2/24	400	PRG
PAH TEQs¶¶	ND-1.1	3/14		none	
Chromium	16-78	24/24	19/24	30	PRG

*ppm = parts per million of chemical in soil. ppm = mg (milligram) per kg (kilogram of soil).
†DL = Detection Limit
‡CV = Comparison Value
§These comparison values are described in Appendix A.
¶The first number is the number of samples above the CREG and the second is the number above the EMEG.
**The first comparison value is the CREG and second comparison value is the EMEG
††CREG = cancer risk evaluation guide
‡‡EMEG = environmental media evaluation guide
§§PRG = preliminary remediation goal
¶¶TEQ = toxicity equivalency quotient; based on the relative potency to benzo(a)pyrene for polyaromatic hydrocarbons

Table 4. Estimated Exposure Doses and Cancer Risk for Off-Site Soil Compared to Health Guidelines for Ingestion[*]

Contaminant	Concentration (ppm)[†]	Estimated Exposure Dose (mg/kg/day)[‡]		Health Guideline (mg/kg/day)	Source of Guideline	Cancer Risk
		Adult	Child			
Iron	48941	0.07	0.98	0.3	pRfd[¶]	N/A[**]
PAH TEQs[††]	0.2	2.90E-07	4.00E-06	None		3 in 100000[§§]

[*]An explanation of how exposure doses and cancer risk were calculated can be found in Appendix B. No health guidelines are available for the PAHs.
[†] ppm = parts per million
[‡] mg/kg/day = milligrams of chemical per kilogram of body weight per day
[§]MRL = ATSDR's minimal risk level
[¶]provisional RfD = Reference Dose
[**]Not applicable; substance is not classified as a carcinogen
[††]TEQ = toxicity equivalency quotient; based on the relative potency to benzo(a)pyrene for polycyclic aromatic hydrocarbons
[§§]Maximum additional lifetime risk of cancer per 100,000 individuals

Toxicological Evaluation for On-site and Off-site Soils

Childhood exposure to contaminants in soils is especially problematic, given a child's lower body weight and accelerated hand-to-mouth activity, both of which lead to a higher potential for exposure. These factors increase the chance of children—if continually exposed to these sites throughout their lifetime—developing long-term effects. Still, because on-site access to Taylor Lumber is restricted for minors, the probability of developing health effects is diminished.

Dioxins/Furans:

Dioxins and furans consist of a family of approximately 210 different compounds with different levels of chlorination. The dioxins and furans could cause varying health effects. The most studied and toxic member of the dioxin family is 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD). Dioxins and furans occur at very low levels in the environment and can be found in food, water, air and cigarette smoke.

One of the most characteristic effects of exposure to TCDD is a severe skin disease known as chloracne. This condition consists of acne-like lesions, usually found on the face and upper neck. Other skin effects include red rashes, discoloration, and excessive body hair. In addition, liver damage and impaired immune function could result in people exposed to elevated levels of dioxins. Very few studies have examined how dioxins and furans affect children's health, but children do appear to be more sensitive compared to adults [6].

It is unlikely that non-cancer health effects would occur from exposure to dioxins and furans at Taylor Lumber. This is because both on-site and off-site soil exposure doses for adults and children are lower than the no observed adverse effects level (NOAEL)

reported for rhesus monkeys [7]. There are no health guidelines based on human exposure to dioxins and furans

Long-term exposure to dioxins and furans could increase the likelihood of developing cancer. Based on the exposure doses calculated in Table 2, an increased risk of cancer exists in people exposed to soil at or near the Taylor Lumber facility over long periods of time. Studies in rats and mice exposed to TCDD resulted in thyroid and liver cancer [8]. Nevertheless, it should be noted that the cancer potency number used to derive these numbers is highly controversial. Some scientists suggest that the cancer risks posed by low levels of dioxin exposure are overstated [9].

Polycyclic Aromatic Hydrocarbons:
Polycyclic aromatic hydrocarbons (PAHs) are structurally related compounds with similar properties. PAHs are formed during the incomplete combustion of carbon containing materials. Workers and visitors to Taylor Lumber and nearby residents might have been and might continue to be exposed to PAHs through inhalation, skin contact and incidental ingestion. The use of creosote and other wood preservatives at Taylor Lumber contributed to the elevated levels of PAHs found on site. Animal studies have shown that PAHs can harm liver and blood at high doses. The estimated exposure dose of PAHs in children ingesting soils in the vicinity of Taylor Lumber is 0.000004 mg/kg/day (parts per million per kg per day). This dose is far less than the concentrations that produced adverse effects in animal testing [10]. Therefore, it is unlikely that any health effects would result as a result of incidental ingestion of contaminated soils.

Iron:

Estimated childhood exposure to iron from soil is higher than the health guideline of 0.3 mg/kg/day. This does not imply that health effects will occur. Long-term exposure to elevated iron, however, at concentrations much greater than 0.3 mg/kg/day, could result in accumulated iron in the liver. One study demonstrated that severe effects would not be anticipated at doses below 30 mg/kg/day [11].

South Yamhill River and Ditch Sediment Pathway:

Sediment samples were collected from ditches surrounding the Taylor Lumber facility. The focus of this exposure pathway analysis is on a series of sampling sites near the junction between Rock Creek Road and Highway 18B, at the southeast corner of the West Facility. Elevated levels of arsenic, dioxin and PAHs were detected in the ditch and riverbank sediments around this area. Several residences are located near the junction of Rock Creek Road and Highway 18B, as well as near the proposed Head Start facility.

Children playing in ditches and recreational users of the South Yamhill River would most likely be exposed to river and ditch sediment. The exposure scenario for this area is outlined in Appendix B. Table 5 presents the contaminants that were detected above comparison values.

Table 5. Ditch Sediment Contaminants Above Soil Comparison Values

Contaminants	Range in Soil (ppm*)	Samples > DL†/Total	Samples > CV‡	CV in ppm	CV Source§
Arsenic	4.2-445	27/27	27/27	0.5/20¶	EMEG/CREG
Dioxin/furan TEQ**	3.5E-6 - 0.003	8/9	2/9	0.001	ATSDR PHA††
PAH TEQ†	0.07-2.2	21/24		none	
Benzo(a)anthracene	ND-0.7	16/24	1/24	0.6	R9 PRG‡‡
Benzo(a)pyrene	ND-1.8	22/25	21/25	0.06	R9 PRG
Benzo(b)fluoranthene	ND-2.4	19/25	5/25	0.62	R9 PRG
Indeno(1,2,3-cd)pyrene	ND-1.8	17/26	4/26	0.62	R9 PRG
Iron	31800-92900	25/25	25/25	23000	R9 PRG

*ppm = parts per million of chemical in soil. ppm = mg (milligram) per kg (kilogram of soil).
†DL = Detection Limit
‡CV = Comparison Value
§These comparison values are described in Appendix A.
¶The first number is the CREG and the second is the EMEG
**TEQ = toxicity equivalency quotient; based on the relative potency to 2,3,7,8-TCDD for dioxins/furans and benzo(a)pyrene for polyaromatic hydrocarbons
††ATSDR Public Health Assessment (1983)
‡‡R9 PRG = EPA Region 9 Preliminary Remediation Goal

No contaminants with known health guidelines were detected at levels that would be anticipated to cause adverse health effects. For ditch sediment, childhood exposure was assessed as a combination of dermal contact and incidental soil ingestion from playing in the ditches. The assessment of this area assumed a child would play in the ditch sediment at the intersection of Rock Creek Road and Highway 18B 1 day per week, over 6 years. If children play in the area more frequently, their exposure would increase accordingly. This area has some the highest levels of arsenic, PAHs and dioxins off site of the Taylor Lumber facility. Although no adverse health effects are anticipated, ODHS recommends restriction of this site by extending the fence line to include the ditches, or removal of the sediment in the ditches and replacing it with clean fill.

Potential Exposure Pathways:

Groundwater Offsite Pathway:

Based on limited testing of residential wells near the Taylor Lumber facility, groundwater is considered a potential exposure pathway. That said, groundwater samples taken at a residence immediately west of the Taylor Lumber facility did not detect contaminants at levels anticipated to result in adverse health effects.

Air Pathway:

Air is considered a potential exposure pathway—the new wood preserving process used by Pacific Wood Preserving Companies employs copper naphthenate and borate based products with uncertain air releases.

In fact, the wood preserving process TLT used previously resulted in numerous air releases [1]. Air samples were collected from three on-site locations and four sites of varying distance from the West Facility. Elevated levels of arsenic and chromium were detected on multiple days. Pentachlorophenol, PAHs, and naphthalene compounds were detected above comparison values as well. Nearby residents and Taylor Lumber workers were likely exposed to these contaminants to some degree. But none of the contaminants detected above comparison values exceeded health guidelines. Therefore, adverse health effects would not be expected. A comparison table and toxicological evaluation are presented in Appendix C.

To address potential future concerns for 1) the proposed Head Start facility, 2) the assisted living facility and 3) nearby residents, air monitoring should continue near Taylor Lumber. The new copper and borate-based products that will be used could affect susceptible individuals.

Eliminated Exposure Pathways:

Groundwater Onsite

Elevated levels of dioxins, arsenic, pentachlorophenol and polycyclic aromatic hydrocarbons are found inside the Taylor Lumber West Facility. In October 2000, a slurry wall containing 5% bentonite was constructed to prevent the migration of the majority of groundwater contamination at the site. No groundwater wells are planned for this area. If the slurry wall functions properly, off-site migration of contaminants should not occur. Therefore, exposure via this pathway is unlikely.

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 [12]. This is done using specific guidance in ATSDR's *Public Health Assessment Guidance Manual* and a 1996 revision to that guidance [13,14]. The main requirements for evaluating HOD are presence of a completed human exposure pathway, great enough contaminant levels 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 population of concern can be identified [14].

This site does not meet the requirements for including an evaluation of HOD in this public health assessment. Although completed human exposure pathways exist at this

site, the exposed population is not large enough to permit meaningful measurement of possible site-related health effects as identified in existing HOD.

Health Hazard

ODHS considers this site to be *a no apparent public health hazard***.**

Child Health Initiative

ATSDR recognizes that infants and children could be more vulnerable to exposures than are 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 than are adults, resulting in a greater likelihood to breathe dust, soil, and heavy vapors close to the ground.
- Children are smaller than adults, 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 the Taylor Lumber site as part of the ATSDR Child Health Initiative.

The major exposure route for children living near Taylor Lumber is ingestion of contaminated soils. Please refer to the appropriate section for discussion of the health effects that are possible for children.

Community Health Concerns

On September 10, 2001, staff from ODHS, ODEQ, EPA and ATSDR met with the members of the Grand Ronde. Tribal members expressed concerns about elevated cancer rates and the potential for tribal members living in Sheridan to be exposed to TLT contaminants in the municipal drinking water. On September 11, 2001, ATSDR, ODHS, and ODEQ met with Sheridan residents. The residents voiced concerns about groundwater contamination, exposure of TLT workers during facility operations, exposure of residents to contaminants blowing off site, allergic reactions to these contaminants, and water supply issues.

ODHS is working with the Grand Ronde to investigate their concerns about elevated cancer rates among tribal members. Still, because most tribal members live some distance from TLT, the opportunity for exposure of most tribal members to TLT contaminants ranges from limited to nonexistent.

To respond the concerns expressed about the municipal water supply, ODHS reviewed data for the Sheridan municipal drinking water supply. No contaminants were detected above the standards of the Safe Drinking Water Act. In addition, our discussions with City of Sheridan staff indicate that the amount of water used from the Yamhill River was small and that use of the Yamhill began after most of the TLT releases into the Yamhill occurred.

ODHS will work with EPA in the implementation of EPA's community involvement program to inform the public on issues related to the Superfund process for the Taylor Lumber site. EPA also has released documents for public review and comment.

Conclusions

1. Based on the evaluation of environmental data, ODHS considers the Taylor Lumber and Treating Site to be a *no apparent public health hazard*. No adverse health effects would be anticipated as a result of exposure to contamination found at the TLT site.
2. While it is highly unlikely that the concerns of the Grand Ronde are related to contaminants found at TLT, tribal member concerns should be addressed.
3. Access to TLT, especially the soil storage and the ditch along Rock Creek Road, should be restricted. In addition, physical hazards on- and off-site should be addressed.

Recommendations:

1. ODHS recommends extension of the fence along Rock Creek Road to include the ditch sediment or removal of that ditch sediment and its replacement with clean fill. While contaminants were not detected at levels anticipated to result in adverse health effects, simple removal or restriction measures would reduce exposure.
2. ODHS recommends that the concerns of the Grand Ronde about elevated cancer rates be evaluated independently of the Taylor Lumber Superfund Site investigation.
3. ODHS recommends that the contaminated soil storage area be completely enclosed by a security fence with posted warning signs. In addition, the soil should be covered to minimize the migration of off-site particulates, and ultimately, disposed of properly.

Public Health Action Plan

The Public Health Action Plan for the Taylor Lumber and Treating NPL Site contains a description of actions to be taken by ODHS 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 to prevent adverse human health effects resulting from exposure to hazardous substances in the environment. Included is a commitment on the

part of ODHS to follow up on this plan to ensure that it is implemented. The public health action to be implemented is as follows:

1. explore the feasibility of evaluating the concerns of the Grand Ronde about elevated cancer rates among tribal members,
2. continue to review new data as it becomes available, and
3. inform and educate community members, residents and workers near TLT about potential hazards

ODHS will reevaluate and expand the Public Health Action Plan when needed. New environmental, toxicological, or health outcome data, or the results of implementing the above proposed action plan could signal the need for additional actions at this site.

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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 found in a specific media (soil or water) and are used to select contaminants for further evaluation. 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.

As health-based thresholds, CVs are set at a concentration below which no known or anticipated adverse human health effects are expected to occur. 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 (see Discussion Section). 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 (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 [6]. 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 and Discussion of Health Guidelines

Comparison of Exposure Dose to Health Guidelines

Soil Ingestion

Exposure doses for soil ingestion were calculated in the following manner. The average concentration for soil, in mg/kg (or ppm), was multiplied by the soil ingestion rate for adults, 0.0001 kg/day, or children, 0.0002 kg/day. 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.

Estimation of Dermal Exposure Doses from Sediment:

For childhood exposure to ditch and sediments at the intersection of Rock Creek Road and Highway 18, a combined exposure dose of dermal contact and incidental soil ingestion was assessed. To calculate dermal exposure of a child playing in sediment, certain assumptions were made. The calculation assumes a 10-year old child weighing 36 kg with a body surface area of 13500 cm^2 [15]. A child wearing shorts, a short sleeve shirt and no shoes was estimated to have approximately 54% of exposed body surface area. It was also assumed that the child would play in the area 52 days out of the year, for a total of 6 years. The dermal absorption factors used were 3% for arsenic, 3% for dioxins and furans, and 13% for PAHs [16]. Incidental soil ingestion was calculated as described above.

Calculation of Risk of Carcinogenic Effects

Soil Ingestion

Carcinogenic risk from ingestion of soil was calculated through the following procedure. The adult 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.

Appendix C. Inhalation Exposure Evaluation

Air samples were collected from three on-site locations and four sites of varying distance from the West Facility. Elevated levels of arsenic were detected on multiple days. Pentachlorophenol, PAHs, naphthalene and chromium were detected above comparison values as well. These results are presented in Table 8. None of the contaminants listed below exceeded health guidelines.

Air Contaminants Above Comparison Values

	Range in Air (ug/m^3)*	Samples > DL† /Total	Samples > CV‡	CV in ug/m^3	CV Source§
Arsenic	ND-0.005	47/48	39/48	0.0002	CREG
Chromium	0.00001-0.003	48/48	47/48	0.00008	CREG
Methylnaphthalene	0.006-5.2	49/49	7/49	3.1	R9 PRG
Naphthalene	0.008-13	48/48	10/48	3.1	R9 PRG
Pentachlorophenol	ND-0.29	1/49	1/49	0.056	R9 PRG
Phenanthrene	ND-3.8	47/49	1/49	3.1	R9 PRG

Toxicological Evaluation:

The maximum level of arsenic measured near Taylor Lumber was 5 ng/m^3. Some cities have concentrations that range from 20 to 100 ng/m^3 [17]. Based on the average concentration of arsenic detected in a limited number of air samples, no adverse health effects would be anticipated as a result of arsenic inhalation.

Inhalation of arsenic contaminated dust over a long period of time can result in irritation of mucous membranes in the nose and throat. Epidemiological studies have demonstrated that exposure to inorganic arsenic can lead to numbness, muscle weakness, tremors, agitation and memory loss. Exposure to arsenic in the air could increase the chance of developing lung or gastrointestinal cancer as well.

Inhalation of chromium compounds could affect the respiratory tract. Workers exposed to high concentrations of chromium have reported shortness of breath, cough, and wheezing. Liver, kidney, gastrointestinal and cardiac effects have been reported as well. Cancer of the respiratory system, especially the bronchial and nasal, has been associated with occupational exposure. Based on the calculated exposure doses, adverse health effects as a result of inhaling chromium compounds would not be expected. From 1977–1984, chromium in the ambient air of U.S. cities and rural areas ranged from 0.005 to 0.525 ug/m^3 [18], higher than the maximum level of chromium measured near Taylor Lumber.

The remaining contaminants listed above were not frequently detected above their comparison value. No health effects would be anticipated from inhalation.

Appendix D. ATSDR Plain Language 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).

General Terms

Absorption
The process of taking in. For a person or an 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].

Additive effect
A biologic response to exposure to multiple substances that equals the sum of responses of all the individual substances added together [compare with antagonistic effect and synergistic effect].

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

Aerobic
Requiring oxygen [compare with anaerobic].

Ambient
Surrounding (for example, ambient air).

Anaerobic
Requiring the absence of oxygen [compare with aerobic].

Analyte
A substance measured in the laboratory. A chemical for which a sample (such as water, air, or blood) is tested in a laboratory. For example, if the analyte is mercury, the laboratory test will determine the amount of mercury in the sample.

Analytic epidemiologic study
A study that evaluates the association between exposure to hazardous substances and disease by testing scientific hypotheses.

Antagonistic effect
A biologic response to exposure to multiple substances that is less than would be expected if the known effects of the individual substances were added together [compare with additive effect and synergistic effect].

Background level
An average or expected amount of a substance or radioactive material in a specific environment, or typical amounts of substances that occur naturally in an environment.

Biodegradation
Decomposition or breakdown of a substance through the action of microorganisms (such as bacteria or fungi) or other natural physical processes (such as sunlight).

Biologic indicators of exposure study
A study that uses (a) biomedical testing or (b) the measurement of a substance [an analyte], its metabolite, or another marker of exposure in human body fluids or tissues to confirm human exposure to a hazardous substance [also see exposure investigation].

Biologic monitoring
Measuring hazardous substances in biologic materials (such as blood, hair, urine, or breath) to determine whether exposure has occurred. A blood test for lead is an example of biologic monitoring.

Biologic uptake
The transfer of substances from the environment to plants, animals, and humans.

Biomedical testing
Testing of persons to find out whether a change in a body function might have occurred because of exposure to a hazardous substance.

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

Body burden
The total amount of a substance in the body. Some substances build up in the body because they are stored in fat or bone or because they leave the body very slowly.

CAP [see Community Assistance Panel.]

Cancer
Any one of a group of diseases that occur 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.

Case study
A medical or epidemiologic evaluation of one person or a small group of people to gather information about specific health conditions and past exposures.

Case-control study
A study that compares exposures of people who have a disease or condition (cases) with people who do not have the disease or condition (controls). Exposures that are more common among the cases may be considered as possible risk factors for the disease.

CAS registry number
A unique number assigned to a substance or mixture by the American Chemical Society Abstracts Service.

Central nervous system
The part of the nervous system that consists of the brain and the spinal cord.

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

Chronic
Occurring over a long time [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]

Cluster investigation
A review of an unusual number, real or perceived, of health events (for example, reports of cancer) grouped together in time and location. Cluster investigations are designed to

confirm case reports; determine whether they represent an unusual disease occurrence; and, if possible, explore possible causes and contributing environmental factors.

Community Assistance Panel (CAP)
A group of people from a community and from health and environmental agencies who work with ATSDR to resolve issues and problems related to hazardous substances in the community. CAP members work with ATSDR to gather and review community health concerns, provide information on how people might have been or might now be exposed to hazardous substances, and inform ATSDR on ways to involve the community in its activities.

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. This law was later amended by the Superfund Amendments and Reauthorization Act (SARA).

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.

Delayed health effect
A disease or an injury that happens as a result of exposures that might have occurred in the past.

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].

Descriptive epidemiology
The study of the amount and distribution of a disease in a specified population by person, place, and time.

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

Disease prevention
Measures used to prevent a disease or reduce its severity.

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

DOD
United States Department of Defense.

DOE
United States Department of Energy.

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 "exposure dose" is how much of a substance is encountered in the environment. An "absorbed dose" is the amount of a substance that actually got into the body through the eyes, skin, stomach, intestines, or lungs.

Dose (for radioactive chemicals)
The radiation dose is the amount of energy from radiation that is actually absorbed by the body. This is not the same as measurements of the amount of radiation in the environment.

Dose-response relationship
The relationship between the amount of exposure [dose] to a substance and the resulting changes in body function or health (response).

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.

Epidemiologic surveillance [see Public health surveillance].

Epidemiology
The study of the distribution and determinants of disease or health status in a population; the study of the occurrence and causes of health effects in humans.

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 assessment
The process of finding out how people come into contact with a hazardous substance, how often and for how long they are in contact with the substance, and how much of the substance they are in contact with.

Exposure-dose reconstruction
A method of estimating the amount of people's past exposure to hazardous substances. Computer and approximation methods are used when past information is limited, not available, or missing.

Exposure investigation
The collection and analysis of site-specific information and biologic tests (when appropriate) to determine whether people have been exposed to hazardous substances.

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.

Exposure registry
A system of ongoing followup of people who have had documented environmental exposures.

Feasibility study
A study by EPA to determine the best way to clean up environmental contamination. A number of factors are considered, including health risk, costs, and what methods will work well.

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.

Grand rounds
Training sessions for physicians and other health care providers about health topics.

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

Half-life (t½)
The time it takes for half the original amount of a substance to disappear. In the environment, the half-life is the time it takes for half the original amount of a substance to disappear when it is changed to another chemical by bacteria, fungi, sunlight, or other chemical processes. In the human body, the half-life is the time it takes for half the original amount of the substance to disappear, either by being changed to another substance or by leaving the body. In the case of radioactive material, the half life is the amount of time necessary for one half the initial number of radioactive atoms to change or transform into another atom (that is normally not radioactive). After two half lives, 25% of the original number of radioactive atoms remain.

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

Hazardous Substance Release and Health Effects Database (HazDat)
The scientific and administrative database system developed by ATSDR to manage data collection, retrieval, and analysis of site-specific information on hazardous substances, community health concerns, and public health activities.

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 evaluate the possible association between the occurrence and exposure to hazardous substances.

Health promotion
The process of enabling people to increase control over, and to improve, their health.

Health statistics review
The analysis of existing health information (i.e., from death certificates, birth defects registries, and cancer registries) to determine if there is excess disease in a specific population, geographic area, and time period. A health statistics review is a descriptive epidemiologic study.

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.

Incidence
The number of new cases of disease in a defined population over a specific time period [contrast with prevalence].

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].

In vitro
In an artificial environment outside a living organism or body. For example, some toxicity testing is done on cell cultures or slices of tissue grown in the laboratory, rather than on a living animal [compare with in vivo].

In vivo
Within a living organism or body. For example, some toxicity testing is done on whole animals, such as rats or mice [compare with in vitro].

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.

Medical monitoring
A set of medical tests and physical exams specifically designed to evaluate whether an individual's exposure could negatively affect that person's health.

Metabolism
The conversion or breakdown of a substance from one form to another by a living organism.

Metabolite
Any product of metabolism.

mg/kg
Milligram per kilogram.

mg/cm2
Milligram per square centimeter (of a surface).

mg/m3
Milligram per cubic meter; a measure of the concentration of a chemical in a known volume (a cubic meter) of air, soil, or water.

Migration
Moving from one location to another.

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, a condition, or an injury) is stated.

Mutagen
A substance that causes mutations (genetic damage).

Mutation
A change (damage) to the DNA, genes, or chromosomes of living organisms.

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.

National Toxicology Program (NTP)
Part of the Department of Health and Human Services. NTP develops and carries out tests to predict whether a chemical will cause harm to humans.

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]

Physiologically based pharmacokinetic model (PBPK model)
A computer model that describes what happens to a chemical in the body. This model describes how the chemical gets into the body, where it goes in the body, how it is changed by the body, and how it leaves the body.

Pica
A craving to eat nonfood items, such as dirt, paint chips, and clay. Some children exhibit pica-related behavior.

Plume
A volume of a substance that moves from its source to places farther away from the source. Plumes can be described by the volume of air or water they occupy and the direction they move. For example, a plume can be a column of smoke from a chimney or a substance moving with groundwater.

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.

Prevalence
The number of existing disease cases in a defined population during a specific time period [contrast with incidence].

Prevalence survey
The measure of the current level of disease(s) or symptoms and exposures through a questionnaire that collects self-reported information from a defined population.

Prevention
Actions that reduce exposure or other risks, keep people from getting sick, or keep disease from getting worse.

Public availability session
An informal, drop-by meeting at which community members can meet one-on-one with ATSDR staff members to discuss health and site-related concerns.

Public comment period
An opportunity for the public to comment on agency findings or proposed activities contained in draft reports or documents. The public comment period is a limited time period during which comments will be accepted.

Public health action
A list of steps to protect public health.

Public health advisory
A statement made by ATSDR to EPA or a state regulatory agency that a release of hazardous substances poses an immediate threat to human health. The advisory includes recommended measures to reduce exposure and reduce the threat to human 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.

Public health statement
The first chapter of an ATSDR toxicological profile. The public health statement is a summary written in words that are easy to understand. The public health statement explains how people might be exposed to a specific substance and describes the known health effects of that substance.

Public health surveillance
The ongoing, systematic collection, analysis, and interpretation of health data. This activity also involves timely dissemination of the data and use for public health programs.

Public meeting
A public forum with community members for communication about a site.

Radioisotope
An unstable or radioactive isotope (form) of an element that can change into another element by giving off radiation.

Radionuclide
Any radioactive isotope (form) of any element.

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.

RFA
RCRA Facility Assessment. An assessment required by RCRA to identify potential and actual releases of hazardous chemicals.

RfD [see reference dose]

Risk
The probability that something will cause injury or harm.

Risk reduction
Actions that can decrease the likelihood that individuals, groups, or communities will experience disease or other health conditions.

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].

Safety factor [see uncertainty factor]

SARA [see Superfund Amendments and Reauthorization Act]

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.

Sample size
The number of units chosen from a population or an environment.

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.

Special populations
People who might be more sensitive or susceptible to exposure to hazardous substances because of factors such as age, occupation, sex, or behaviors (for example, cigarette smoking). Children, pregnant women, and older people are often considered special populations.

Stakeholder
A person, group, or community who has an interest in activities at a hazardous waste site.

Statistics
A branch of mathematics that deals with collecting, reviewing, summarizing, and interpreting data or information. Statistics are used to determine whether differences between study groups are meaningful.

Substance
A chemical.

Substance-specific applied research
A program of research designed to fill important data needs for specific hazardous substances identified in ATSDR's toxicological profiles. Filling these data needs would allow more accurate assessment of human risks from specific substances contaminating the environment. This research might include human studies or laboratory experiments to determine health effects resulting from exposure to a given hazardous substance.

Superfund [see Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and Superfund Amendments and Reauthorization Act (SARA)

Superfund Amendments and Reauthorization Act (SARA)
In 1986, SARA amended the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and expanded the health-related responsibilities of ATSDR. CERCLA and SARA direct ATSDR to look into the health effects from substance exposures at hazardous waste sites and to perform activities including health education, health studies, surveillance, health consultations, and toxicological profiles.

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

Surveillance [see public health surveillance]

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].

Synergistic effect
A biologic response to multiple substances where one substance worsens the effect of another substance. The combined effect of the substances acting together is greater than the sum of the effects of the substances acting by themselves [see additive effect and antagonistic effect].

Teratogen
A substance that causes defects in development between conception and birth. A teratogen is a substance that causes a structural or functional birth defect.

Toxic agent
Chemical or physical (for example, radiation, heat, cold, microwaves) agents that, under certain circumstances of exposure, can cause harmful effects to living organisms.

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.

Tumor
An abnormal mass of tissue that results from excessive cell division that is uncontrolled and progressive. Tumors perform no useful body function. Tumors can be either benign (not cancer) or malignant (cancer).

Uncertainty factor
Mathematical adjustments for reasons of safety when knowledge is incomplete. For example, factors used in the calculation of doses that are not harmful (adverse) to people. These factors are applied to the lowest-observed-adverse-effect-level (LOAEL) or the no-observed-adverse-effect-level (NOAEL) to derive a minimal risk level (MRL). Uncertainty factors are used to account for variations in people's sensitivity, for differences between animals and humans, and for differences between a LOAEL and a NOAEL. Scientists use uncertainty factors when they have some, but not all, the information from animal or human studies to decide whether an exposure will cause harm to people [also sometimes called a safety factor].

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 (http://www.epa.gov/OCEPAterms/)

National Center for Environmental Health (CDC)
(http://www.cdc.gov/nceh/dls/report/glossary.htm)

National Library of Medicine (NIH)
(http://www.nlm.nih.gov/medlineplus/mplusdictionary.html)