Public Health Assessment

Sauget Area 2 Landfill

Site O and Landfill S

Sauget, St. Clair County, Illinois

EPA Facility ID # ILD000672329

Prepared by

Illinois Department of Public Health
under cooperative agreement with the
Agency for Toxic Substances and Disease Registry

Table of Contents

Summary 1

Purpose and Health Issues 1

Background 1
- Location and History 1
- Demographics and Land Use 3
- Environmental Sampling 3
- Site Visit 4

Discussion 4
- Chemicals of Interest 4
- Exposure Analysis 5
- Completed Exposure Pathways 5
- Potential Exposure Pathways 5
- Toxicological Evaluation 5

Community Health Concerns 6

Child Health Initiative 6

Conclusions 6

Recommendations 6

Public Health Action Plan 6

Preparers of Report 6

References 7

Figures 9

Tables 12

Attachments 18

Summary

Sauget Area 2 is a proposed National Priorities List site. The Illinois Department of Public Health (IDPH) has prepared this public health assessment to evaluate Site O, the Sauget Waste Water Treatment Plant and its lagoons, and Landfill S, which is adjacent to Site O. Sources of contamination include: industrial sludge in the lagoons on Site O, underground waste oil storage tanks, dioxins and polychlorinated biphenyls (PCBs) in surface soil near these tanks, and land-filled chlorinated solvent wastes. The landfilled wastes are now coming to the surface and affecting surface soil at Landfill S. Chemicals of interest in the surface soils at Landfill S include 1,1-dichloroethane, 1,1,1-trichloroethane, vinyl chloride, PCBs, and mercury.

This is an active industrial area and exposure to these chemicals is expected to occur to adults only. Most of the areas of contamination are fenced and are located across a four-lane highway from the nearest residential area. Exposure dose estimates for on-site workers found no apparent increased cancer risk or other health hazards due to exposure to on-site contamination. IDPH concludes that Site O and Landfill S pose no apparent public health hazard. IDPH recommends that workers at Landfill S limit or avoid contact with any on-site waste material.

Purpose and Health Issues

The Sauget Area 2 site was proposed for addition to the National Priorities List on September 13, 2001. Area 2 consists of Site O, and landfills P, Q, R, and S. In this public health assessment, IDPH will examine whether exposure to contaminants at Site O and Landfill S has occurred in the past, is occurring, or might occur in the future. Exposure issues are different for Landfills P, Q, and R, and will be addressed in a separate public health assessment.

Since the site is in an industrial area, with the nearest homes 0.5 miles east across a four-lane highway, the main population of interest is the employees of the nearby industries. Due to proximity, employees of the American Bottoms Regional Waste Water Treatment Plant (ABRWWTP) plant are currently most likely to be exposed to site-related contaminants, particularly from Landfill S. Past and future exposures might occur to workers sampling or monitoring the sites, and to workers excavating or otherwise disturbing the contaminated areas.

Background

Location and History

Sauget is in St. Clair County, Illinois, south of East St. Louis and across the Mississippi River from St. Louis, Missouri. Sauget is surrounded by several large industries and has many areas of contamination. These contaminated areas are collectively known as the Sauget Sites. The Sauget Sites are divided into two areas, Area 1 and Area 2. The dividing line for Areas 1 and 2 is Illinois Route 3, with the sites east of Route 3 belonging to Area 1 and those to the west in Area 2. This public health assessment evaluates Site O and Landfill S, in Area 2 (Figure 1).

Site O

Site O is near Mobile Avenue in Sauget. About 45 acres in size, the site includes the Sauget Waste Water Treatment Plant (SWWTP) and its four unlined lagoons (1). SWWTP was a primary treatment facility that discharged its effluent to the Mississippi River. SWWTP has a laboratory that is still in use, but the lagoons are closed (2). Figure 2 shows the site features of Site O.

SWWTP is in the northern section of the site, and its four sludge dewatering lagoons are in the southern portion. From 1965 to the late 1970s, clarified sludge was disposed in these unlined lagoons (1). These inactive sludge lagoons cover about 20 acres, are capped with clay and are vegetated. No waste is evident on the surface. Two contaminated areas are west of the SWWTP, and another contaminated area is inside the fence just south of the buildings at SWWTP (1). This site has chain-link fencing around most of it, but vehicles are not restricted on the access road.

The history of Site O includes activities at SWWTP, which began operation in the early 1950s. The plant treats wastewater from area industries and the residents of Sauget. About 10 million gallons of wastewater per day are treated at the facility. More than 95 % of the wastewater is from area industries, including Solutia (previously Monsanto), Cerro Copper, and Big River Zinc. Effluent from the plant is permitted to discharge to the Mississippi River under a National Pollutant Discharge Elimination System (NPDES) permit.

The treatment plant has had many past violations of the NPDES permit. These violations are primarily due to the chemical quality of the plant effluent (1). Mercury, polychlorinated biphenyls (PCBs), and organic solvents have been detected at levels that violated the permit limits on several occasions. A 1982 U.S. Environmental Protection Agency (USEPA) study concluded that the effluent from the wastewater treatment plant annually contributed a substantial volume of toxic pollutants to the Mississippi River.

Site O is adjacent to Clayton Chemical, which reclaimed used solvents. A section of Clayton Chemical was leased for waste oil storage. This waste oil was contaminated with dioxins. The Illinois Environmental Protection Agency (Illinois EPA) found a ruptured underground storage tank on the property. The storage tank, contaminated wastes, and contaminated soils were removed from the Clayton Chemical property in 1983.

In 1984, there was an attempt to install a water line and sewer lines to the new treatment plant through the lagoons. Wastes were encountered while trenching. The trench was filled and the waterline was subsequently installed above the ground (1).

Landfill S

Landfill S was identified from aerial photographs as a drum disposal area in the early 1970s. It is located just west and north of the American Bottoms Regional Waste Water Treatment Plant (ABRWWTP), a secondary and tertiary treatment facility that began operating in 1986. Although wastes were land-filled, surface leachate seeps are visible in the southern portion of the site.

Access to two areas of Landfill S is restricted by fences with locked gates. The surface leachate seeps are within a fenced area in the southwestern portion. This area is covered with gravel. No plant activities are being carried out in these areas; however, the southwestern graveled portion of the site is sometimes used for parking. Grass cutting and herbicide application has been contracted out for both of the fenced areas of Landfill S (2).

Demographics and Land Use

About 815 people live within a 1-mile radius of Area 2, including all of Sauget, and small parts of East St. Louis and Cahokia. The nearest home is approximately 0.5 miles southeast of the site. Nearby businesses include ABRWWTP, SWWTP, Trade Waste Incinerator, Phillips Petroleum, Cerro Copper, and Solutia. The estimated number of workers within 0.25 miles of the site is 100.

Land use near Site O and Landfill S is industrial. Landfills and land disposal areas are the dominant land use west of Route 3 between Monsanto Avenue and Cargill Road. The nearest down-gradient well that could be used for drinking water is located at the Cargill facility more than 1 mile from Site O, but the well is not it use. Extensive groundwater contamination exists, but no known contact with groundwater occurs near the site (Paul Takacs, former Illinois EPA project manager, personal communication, June 2001). Cropland is south of Area 2. The nearest residential areas are east of Illinois Route 3 in Sauget and Cahokia (Figure 1).

Environmental Sampling at Site O

In February and March 1983, 33 soil samples were collected in the area south of the SWWTP buildings and north of Mobile Avenue. The location of these samples is shown in Figure 2. The samples, collected from surface and subsurface soils, were analyzed for PCBs and dioxins (1). At Site O, subsurface samples were collected from depths of more than 1 foot below the surface and as deep as 25 feet in some locations. Surface soil samples were collected to a depth of 6 inches.

In February 1983, Illinois EPA was informed of a leaking underground storage tank on Clayton Chemical property. Illinois EPA found the tank and conducted sampling. The storage tank, contaminated wastes, and contaminated soils were removed from the Clayton Chemical property by December 1983. In 1984, two soil samples were collected during a water line construction project in the lagoons. These samples were analyzed for PCBs, benzene, oil, and grease. Due to heavy subsurface contamination, the water line was installed above the ground (1).

In February 1987, Ecology and Environment collected 11 subsurface soil samples from Site O and Landfill S. Nine subsurface samples came from the lagoons (Figure 2) and two subsurface soil samples were taken near the lagoons. Background samples were collected east of SWWTP on Site O and from the southeastern portion of Landfill S. Three monitoring wells were installed in the lagoons, one was placed east of the SWWTP, and one was set on the southeastern portion of Landfill S (Fig. 2). Groundwater samples were collected in February and July 1987.

Illinois EPA collected a subsurface soil sample and two groundwater samples at Site O in May 1999 (3). These samples were analyzed for volatile organic compounds, semi-volatile organic compounds, pesticides, PCBs, and inorganic compounds.

Environmental Sampling at Landfill S

Three sampling events have taken place at Landfill S. The first samples were part of the remedial investigation conducted by Ecology and Environment and consisted of one subsurface soil sample and two well water samples collected in 1987. In March 1994, Illinois EPA collected three surface soil samples and two subsurface soil samples (4). One surface sample was collected near a surface leachate seep. The most recent sampling was also performed by Illinois EPA in May 1999 and included one subsurface soil sample and two well samples. These samples were analyzed for volatile and semi-volatile organic compounds, pesticides, PCBs, inorganic compounds, dioxins, and furans (3). The locations of the samples are shown in Figure 2.

Site Visit

IDPH has made several site visits, with the most recent occurring on October 2, 2003. Conditions at the site were the same as those observed on previous visits. The area is industrial and Mobile Avenue is the only road leading to the sites. SWWTP is fenced and rock piles covering dioxin-contaminated soil are located north of Mobile Avenue. The closed SWWTP lagoons are fenced except where Mobile Avenue runs through to ABRWWTP. The northern portion of Landfill S is fenced and the western section, where the chlorinated solvents are coming to the surface, is also fenced and covered with gravel.

Discussion

Chemicals of Interest

IDPH compared the results of soil and groundwater samples with appropriate screening values to select chemicals needing further evaluation for carcinogenic and non-carcinogenic health effects. An explanation of each comparison value used is found in Attachment 1. Chemicals found at levels greater than comparison values, or chemicals for which no comparison values exist, were selected for further evaluation.

Table 1 shows the chemicals of interest for groundwater. While groundwater contamination is present, no drinking water wells are used near the site. Table 2 shows the chemicals of interest in soil. Chemicals of interest in soil at Landfill S (1,1-dichloroethane, 1,1,1-trichloroethane, vinyl chloride, PCBs, and mercury) were found in both surface and subsurface soil. Wastes leaching to the surface at Landfill S are the most likely sources and exposure points.

Exposure Analysis

Exposure to a chemical at a level exceeding a comparison value does not necessarily mean that adverse health effects will result. The potential for exposed persons to experience adverse health effects depends on:

- how much of each chemical a person is exposed to,
- how long a person is exposed,
- the health condition of the exposed person.

People can be affected by a chemical only if they contact it through an exposure pathway at a sufficient concentration to cause a toxic effect. This requires a source of exposure, an environmental transport medium, a point of exposure, a route of exposure, and a receptor population. A pathway is complete if all of its components are present and if people were exposed in the past, are currently exposed, or will be exposed in the future. If parts of a pathway are absent, data are insufficient to decide whether it is complete, or exposure might occur at some time (past, present, future), then it is a potential pathway. If part of a pathway is not present and will never exist, the pathway is incomplete and can be eliminated from further consideration.

Completed Exposure Pathways

A completed exposure pathway (Table 3) exists for contaminants in surface soil and surfacing wastes at Landfill S. The chemicals of interest are 1,1-dichloroethane, 1,1,1-trichloroethane, vinyl chloride, PCBs, and mercury. Exposure can occur by breathing contaminated air, coming into direct contact with the soil or waste, ingesting the chemicals, or absorbing them through the skin. Exposure would be low and infrequent and not be expected to cause adverse health effects.
The dioxin contamination located just south of SWWTP is covered with 1 to several feet of gravel and is fenced, so exposure is not expected to occur under these circumstances.

Potential Exposure Pathways

Potential exposure pathways (Table 4) could occur during remediation or otherwise disturbing or contacting surface soil, subsurface soil, and groundwater. Workers doing remediation at this site should be wearing protective clothing to minimize the likelihood of exposure.

The nearest down-gradient drinking water well is more than 1 mile south of Site O and should not be affected by the site. No drinking water wells are used near the facility. Although groundwater contamination exists (Table 1), no known contact with groundwater occurs near the site. Very few buildings in the area have basements because of their proximity to the river. Contamination has not been found in groundwater near the residential areas, and groundwater contaminants will not be considered further in this assessment.

Toxicological Evaluation

No children are expected to be exposed to site-related chemicals either now or in the future. IDPH estimated exposures for adult workers at Landfill S and assumed that workers who were either mowing or applying herbicides on Landfill S would be the most highly exposed population. The length of exposure to the chemicals for these adults was estimated to be 1 day/week for 26 weeks.

The estimated exposure doses were compared with health guidelines for noncancer health effects. Cancer risks were estimated for those chemicals that are known or suspected carcinogens. From these estimates, IDPH found that no noncancer adverse health effects would be expected and no apparent increased cancer risk exists for exposure to on-site contamination.

Community Health Concerns

No community health concerns were identified for Site O or Landfill S. Sauget and Cahokia residents have concerns about other areas in the Sauget Sites which have been addressed in previous health consultations, or will be addressed in future health evaluations of these areas.

This public health assessment was made available for public comment from December 18, 2002 to April 11, 2003. No public comments were received.

Child Health Considerations

IDPH recognizes that children are especially sensitive to some contaminants. Children were not included in this assessment because it is an active industrial area and the areas of surface contamination are fenced. The nearest homes are more than 0.5 miles away and are east of Illinois Route 3, a four-lane highway.

Conclusions

IDPH concludes that Site O and Landfill S, within Sauget Sites Area 2, in Sauget, Illinois, poses no apparent public health hazard for exposure to contaminated soil and groundwater. This conclusion is based on estimated exposures to the highest levels of contaminants detected during environmental sampling not being expected to cause adverse health effects. Contamination exists in subsurface soil and in groundwater, but no one is exposed to these chemicals.

Recommendations

IDPH recommends that workers at Landfill S avoid contact with wastes at, or moving to, the surface.

Public Health Action Plan

IDPH has contacted the site operators and encouraged them to notify workers of this recommendation.

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1. Ecology and Environment Inc. Draft remedial investigation Dead Creek project sites at Cahokia/Sauget, Illinois. Vols 1 & 2. Lancaster, NY: Ecology and Environment Inc.; March 1988.

2. Illinois Department of Public Health. Letter to David Webb from George Schillinger, plant manager, American Bottoms Regional Waste Water Treatment Plant. Springfield, Illinois. December 21, 2000.

3. Illinois Environmental Protection Agency. Data package for samples collected from Area 2. Springfield, Illinois. May 1999.

4. Illinois Environmental Protection Agency. Sauget Area 2—Site S sample results. Springfield, Illinois. March 1994.

5. Agency for Toxic Substances and Disease Registry. Public health assessment guidance manual. Atlanta: US Department of Health and Human Services; 1992.

Certification

This Sauget Area 2 (Site O and Landfill S) public health assessment was prepared by the Illinois Department of Public Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It was done in accordance with methodology and procedures approved when the health assessment was begun.

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The Division of Health Assessment and Consultation, ATSDR, has reviewed this health assessment and concurs with its findings.

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Figures

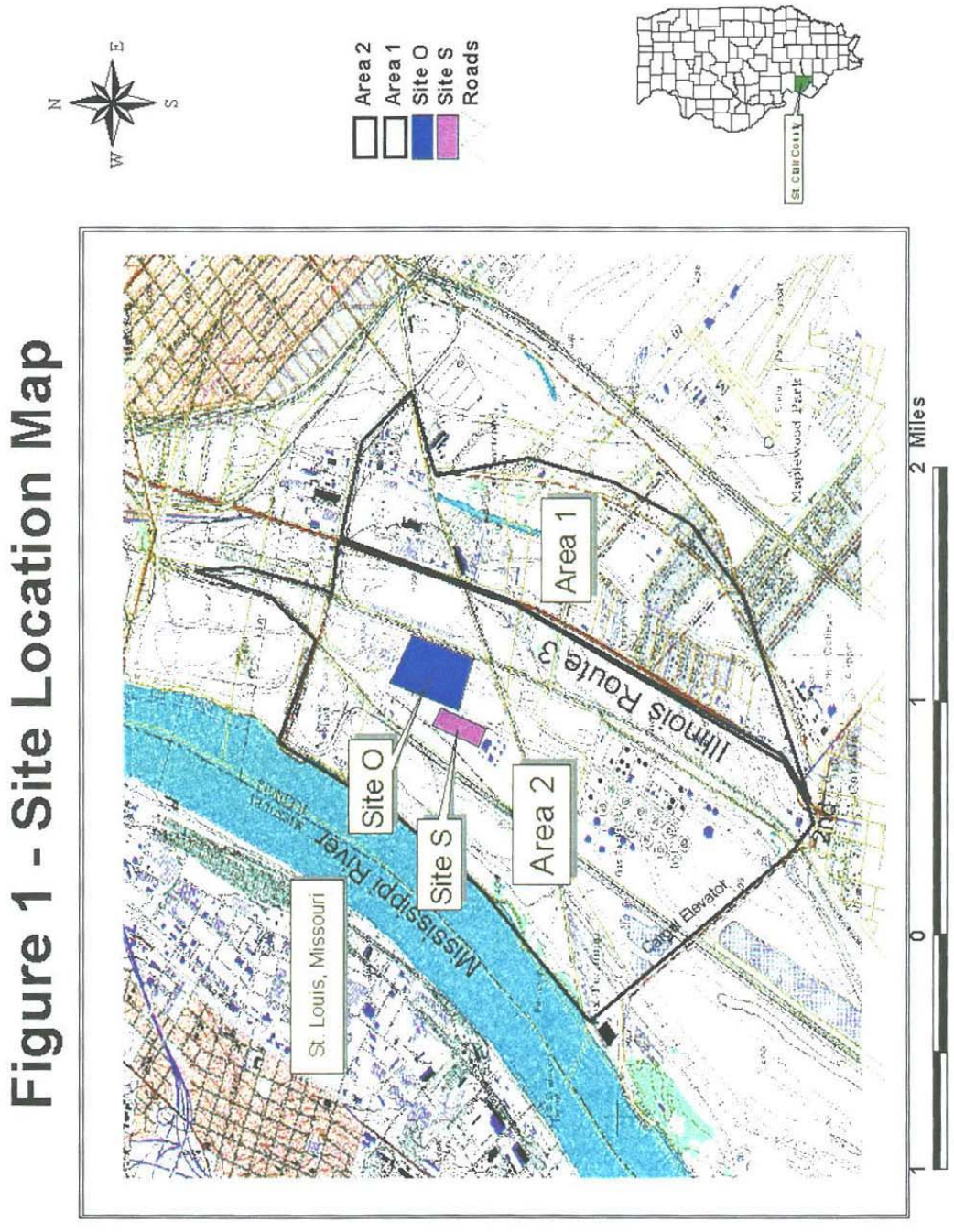
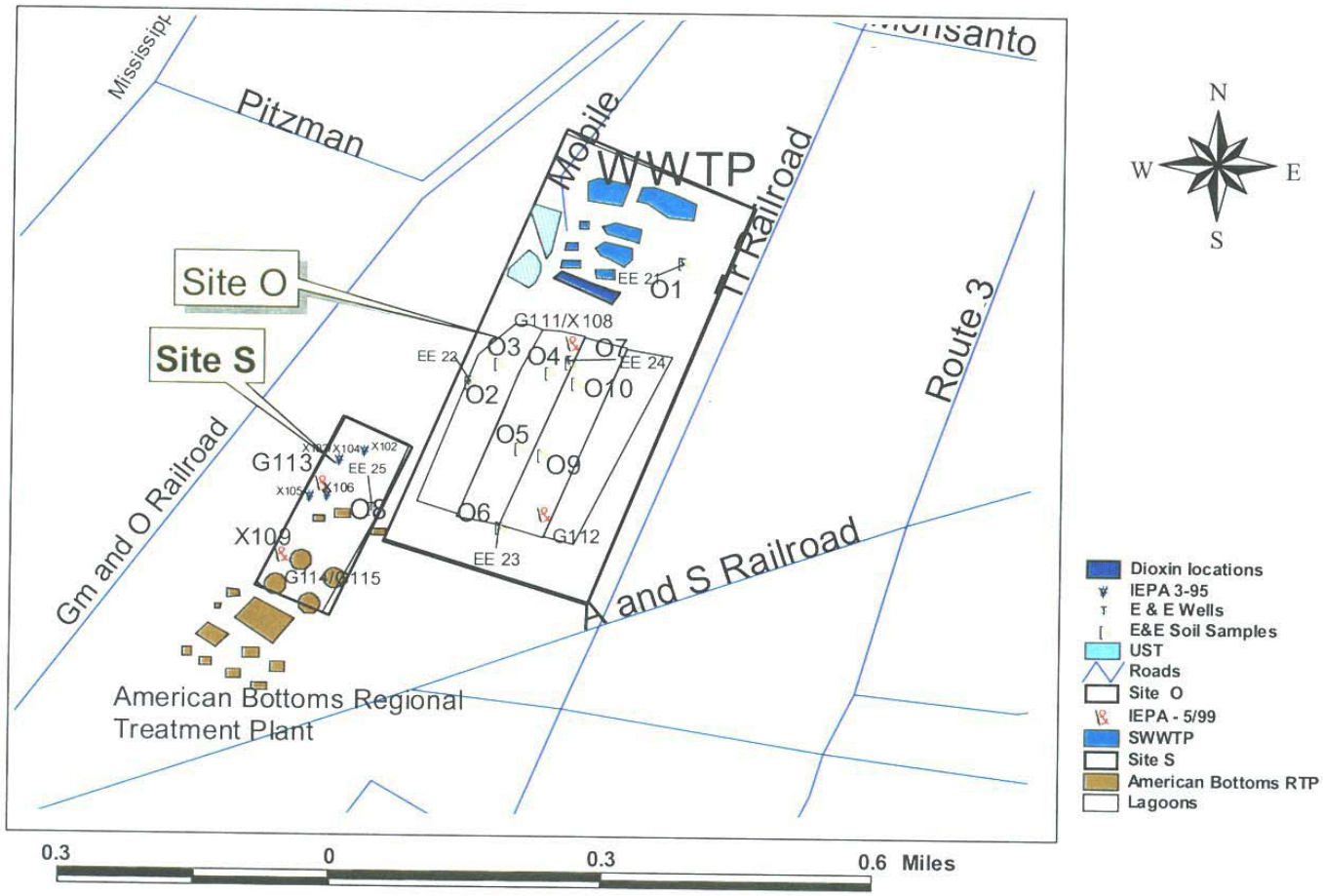


Figure 1 - Site Location Map
N
E
S
W
Area 2
Area 1
Site O
Site S
Roads
St. Clair County
Area 1
Site O
Site S
Area 2
Illinois Route 3
Mississippi River
St. Louis, Missouri
Maplewood Park
Cargill Elevator
1
0
1
2 Miles

Figure 2 - Detailed Site Map with Sample Locations



Tables

Table 1. Chemicals of Interest in Groundwater at Site O and Landfill S in parts per billion (ppb).

Chemical	Maximum Level at Site O	Detections Out of 6 Samples	Maximum Level at Landfill S	Detections Out of 3 Samples	CV in (ppb)	CV Source
Volatile Organic Compounds						
Methylene Chloride	31,000	1	nd	0	5	CREG
1,1-Dichloroethane	1,700	1	4 J	1	NV	NV
1,1-Dichlorothene	nd	0	1 J	1	0.06	CREG
trans-1,2-Dichloroethene	14,000	1	nd	0	100	LTHA
Chloroform	1,800	1	nd	0	100/400	C EMEG
1-2-Dichloroethane	2,600	1	nd	0	0.4	CREG
2-Butanone	54,000	3	5 BJ	1	6,000/20,000	RMEG
1,1,1-Trichloroethane	5,000	2	3 J	1	200	LTHA
1,1,2,2-Tetrachloroethane	12,000	1	nd	0	1	CREG
Benzene	150,000	2	54	1	0.6	CREG
Toluene	1,300	2	18	1	200/700	I EMEG
Ethylbenzene	850	1	14	1	700	LTHA
Chlorobenzene	180,000	4	8 J	1	100	LTHA
Semi-volatile Organic Compounds						
1,4-Dichlorobenzene	15,000 E	2	nd	0	75	LTHA
1,2-Dichlorobenzene	11,000 E	2	11	1	600	LTHA
1,2,4-Trichlorobenzene	200	1	nd	0	70	LTHA
Naphthalene	100	1	550	1	20	LTHA
Pentachlorophenol	280	2	nd	0	0.3	CREG
Pesticides/PCBs						
Dieldrin	0.0076 JP	2	0.0066J	1	0.002	CREG
Inorganic Compounds						
Arsenic	123	4	124	1	3/10	C EMEG
Cadmium	11	1	nd	0	2/7	C EMEG
Cobalt	22.9 B	6	2.5 B	2	NV	NV
Lead	6,350	3	nd	0	NV	NV
Manganese	6,030	3	4,140	3	500/2,000	RMEG
Vanadium	70	2	2.1 B	1	30/100	I EMEG

J = an estimated value
E = an estimated value on the high end of detection limit
P = indicates a pesticide/Arochlor analyte when there is greater than 25% difference for the detected concentrations between two columns.
B = the reported value is less than the CRDL but greater than the instrument detection limit.
nd = chemical not detected
NV = no comparison value
C EMEG = chronic environmental media evaluation guide
I EMEG = intermediate environmental media evaluation guide
RMEG = reference dose media evaluation guide
CREG = cancer risk media evaluation guide
LTHA = lifetime health advisory for drinking water

Table 2. Soil Sample Analyses at Site O and Landfill S, Sauget Sites Area 2, in parts per million (ppm).

Chemical	Subsurface Samples				Surface Samples			
	Site O	Detection Frequency	Site S	Detection Frequency	Site S	Detection Frequency	CV in ppm	CV Source
Volatile Organic Compounds								
1,1-Dichloroethane	0-0.01 J	1/14	-	-	0-6.5	1/3	NV	NV
trans-1,2-Dichloroethene	0-0.2	2/14	-	-	0-0.31	1/3	1,000	RMEG
1,1,1-Trichloroethane	0-12	2/14	0-0.004 J	1/3	0-12	2/3	NV	NV
Trichloroethene	0-3.7	1/14	-	-	0-2.8	2/3	UR	CREG
Benzene	0-30.8	6/14	-	-	1.8	1/3	10	CREG
4-Methyl-2-pentanone	0-30	3/14	0-4.5	1/3	0-70E	2/3	NL	NL
2-Hexanone	0-0.063	1/14	-	-	-	-	NL	NL
Vinyl Chloride	-	-	-	-	0-1.4	1/3	0.1	CREG
Semi-volatile Organic Compounds								
1,3-Dichlorobenzene	200	1/14	-	-	-	-	NV	NV
2,4-Dichlorophenol	250	2/14	-	-	-	-	200	RMEG
2,4,6-Trichlorophenol	130	1/14	-	-	-	-	60	CREG
2-Nitroaniline	180	1/14	-	-	-	-	NL	NL
2-Nitrophenol	120	1/14	-	-	-	-	NV	NV
Pentachlorophenol	1,300	9/14	-	-	-	-	6	CREG
Phenanthrene	0-218	6/14	0-0.11	1/3	0-81	1/3	NL	NL
Benz(a)Anthracene	0-400	3/14	-	-	-	-	NL	NL
bis(2-ethylhexyl)phthalate	0-2.4	5/14	0-12	2/3	64-5,600	3/3	NONE	NONE
Chrysene	870	6/14	-	-	-	-	NV	NV
Butyl Benzyl phthalate	0-12,000E	4/14	-	-	4.6-490	3/3	10,000	RMEG
Benzo(b)Fluoranthene	160	3/14	-	-	-	-	NV	NV
Benzo(a)Pyrene	160	3/14	-	-	-	-	0.1	CREG
Benzo(g,h,i)Perylene	52.5	2/14	-	-	-	-	NV	NV
2-Methylnaphthalene	0-580	1/14	-	-	0-180	2/3	NL	NL
Dibenz(a,h)anthracene	0-100 J	1/14	-	-	-	-	NV	NV

Chemical	Subsurface Samples				Surface Samples			
	Site O	Detection Frequency	Site S	Detection Frequency	Site S	Detection Frequency	CV in ppm	CV Source
4-Methylphenol	-	-	-	-	0-140	1/3	NL	NL
Pesticides\PCBs\Dioxins								
Arochlor-1232	0-30.4	2/14	-	-	-	-	0.4	CREG
Arochlor-1242	0-2,900	7/14	-	-	-	-	0.4	CREG
Arochlor-1248	-	-	0.074-1.3	2/3	0.016-85	3/3	0.4	CREG
Arochlor-1254	0-930	3/14	0.045-3.3	2/3	0.037-69	3/3	1	C EMEG
Arochlor-1260	0-530	3/14	0.056-1.9	2/3	0.027-41	3/3	0.4	CREG
OCDD	-	-	2.9 J	1/1	-	-	NL	NL
OCDF	-	-	2J	1/1	-	-	NL	NL
Inorganic Compounds								
Arsenic	120 R	11/14	5	3/3	5.2	3/3	0.5	CREG
Cadmium	2,370	6/14	12	2/3	4.0	3/3	10	C EMEG
Cobalt	26	3/14	10.2	3/3	20.5	3/3	NV	NV
Lead	7,180	12/14	324	3/3	392	3/3	NV	NV
Mercury	1,564	6/14	0.36	3/3	3.5	3/3	NV	NV
Zinc	60,400	12/14	327	3/3	283	3/3	20,000	RMEG

J = an estimated value
ND = chemical not detected
NV = no comparison value
C EMEG = chronic environmental media evaluation guide
CREG = cancer risk media evaluation guide
UR = under review
NA = chemical not analyzed for in these samples
R = spike sample recovery not within control limits
RMEG = reference dose media evaluation guide

Table 3. Completed exposure pathways

Pathway Name	Source	Medium	Exposure Point	Exposure Route	Receptor Population	Time of Exposure	Exposure Activities	Estimated Number Exposed	Chemicals
On-site surface soil	On-site soil Surfacing waste	Surface soil	Surface of Landfill S	Ingestion Inhalation Dermal	Employees and workers at or near Landfill S	Past Present Future	Contacting contaminated soil	70	Table 2
Ambient air	Surfacing waste	Air	Surface of Landfill S	Inhalation	Employees and workers at or near Landfill S	Past Present Future	Breathing	70	Table 2
Surfacing waste	Surfacing waste	Waste	Surface of Landfill S	Ingestion Inhalation Dermal	Employees and workers at or near Landfill S	Past Present Future	Contacting contaminated waste	70	Table 2

Table 4. Potential exposure pathways

Pathway Name	Source	Medium	Exposure Point	Exposure Route	Receptor Population	Time of Exposure	Exposure Activities	Estimated Potential Number Exposed	Chemicals
Covered contaminated soil at Site O	Dioxin and PCB contaminated soil at Site O	On-site soil	Site O	Ingestion Inhalation	Remedial workers Soil samplers	Future	Soil excavation or removal.	150	Table 2
Subsurface contamination	Contaminated soil Contaminated groundwater	Subsurface soil Groundwater	Site O & Landfill S	Ingestion Inhalation Dermal	Remedial workers	Future	Subsurface soil and waste excavation or removal Groundwater monitoring or remediation	150	Tables 1 and 2
Surface waste and contaminated surface soil	Waste Surface soil	On-site soil Waste	Landfill S	Ingestion Inhalation Dermal	Remedial workers	Future	Soil excavation or removal	150	Table 2

Attachment 1

Comparison Values Used in Screening Contaminants for Further Evaluation

Environmental media evaluation guides (EMEGs) are developed for chemicals on the basis of their toxicity, frequency of occurrence at National Priorities List (NPL) sites, and potential for human exposure. They are derived to protect the most sensitive populations and are not action levels, but rather are comparison values. They do not consider carcinogenic effects, chemical interactions, multiple route exposure, or other media-specific routes of exposure, and are very conservative concentration values designed to protect sensitive members of the population.

Reference dose media evaluation guides (RMEGs) are another type of comparison value derived to protect the most sensitive populations. They do not consider carcinogenic effects, chemical interactions, multiple route exposure, or other media-specific routes of exposure, and are very conservative concentration values designed to protect sensitive members of the population.

Cancer risk evaluation guides (CREGs) are estimated contaminant concentrations on the basis of a probability of 1 excess cancer in 1 million persons exposed to a chemical over a lifetime. These are also very conservative values designed to protect sensitive members of the population.

Maximum contaminant levels (MCLs) have been established by the U.S. Environmental Protection Agency for public water supplies to reduce the chances of adverse health effects from contaminated drinking water. These standards are well below levels for which health effects have been observed and take into account the financial feasibility of achieving specific contaminant levels. These are enforceable limits that public water supplies must meet.

Lifetime health advisories for drinking water (LTHAs) have been established by USEPA for drinking water and are the concentration of a chemical in drinking water that is not expected to cause any adverse noncarcinogenic effects over a lifetime of exposure. These are conservative values that incorporate a margin of safety.

Attachment 2

ATSDR Glossary of Terms

The Agency for Toxic Substances and Disease Registry (ATSDR) is a federal public health agency headquartered in Atlanta, Georgia, with 10 regional offices in the United States. The mission of ATSDR is to serve the public using the best science, taking responsive public health actions, and providing trusted health information to prevent harmful exposures and diseases related to toxic substances. Unlike the US Environmental Protection Agency (EPA), which enforces laws, ATSDR is not a regulatory agency. This glossary defines words used by ATSDR in communicating with the public; it is not a complete dictionary of environmental health terms. If you have comments or questions, please 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 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].

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

Ambient - surrounding (for example, ambient air).

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.

Biota - plants and animals in an environment; can be sources of food, clothing or medicines.

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.

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.

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

CERCLA - 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.

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) - 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.

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 measured.

Disease registry – 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 "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.

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 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.

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.

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 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 - collection and evaluation of information about the health of community residents 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 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 - category used in ATSDR public health assessment documents when professional judgment about the level of health hazard cannot be made because critical information critical 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].

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 - 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; 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].

National Priorities List (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]

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].

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 plan – 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 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.

Remedial investigation - CERCLA process of determining the type and extent of hazardous material contamination at a site.

Resource Conservation and Recovery Act (1976, 1984) (RCRA) - 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 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 - how people come into contact with a hazardous substance. Breathing [inhalation], eating or drinking [ingestion], or skin contact [dermal] are three of these.

Safety factor - [see uncertainty factor]

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.

Substance – a chemical.

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

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.

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)

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