Superfund Program Fact Sheet

EPA Region I

Shaffer Landfill,
Iron Horse Park
Billerica, Massachusetts

August 1989

EPA Investigation Results for the Shaffer Landfill

The U.S. Environmental Protection Agency (EPA) is preparing a **Remedial Investigation** (RI) for Shaffer Landfill at the Iron Horse Park Superfund site in Billerica, Massachusetts (see map on page 2).

Although the Shaffer Landfill has been closed and covered in response to a court agreement with the Commonwealth of Massachusetts, the landfill is also part of the Iron Horse Park Superfund site and, therefore, is subject to the requirements of the federal **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)**, commonly known as Superfund. (For more information on the Superfund process see Figure 3 on page 8)

To ensure that Superfund's requirements are met, EPA conducted an independent investigation to evaluate the landfill's cover and to provide information on the nature and extent of contamination caused by the landfill. For its study, EPA compiled available information previously collected at the landfill by the state and the landfill's owners. This information was supplemented with additional sampling of groundwater, surface water and sediments, and the testing of the landfill cover.

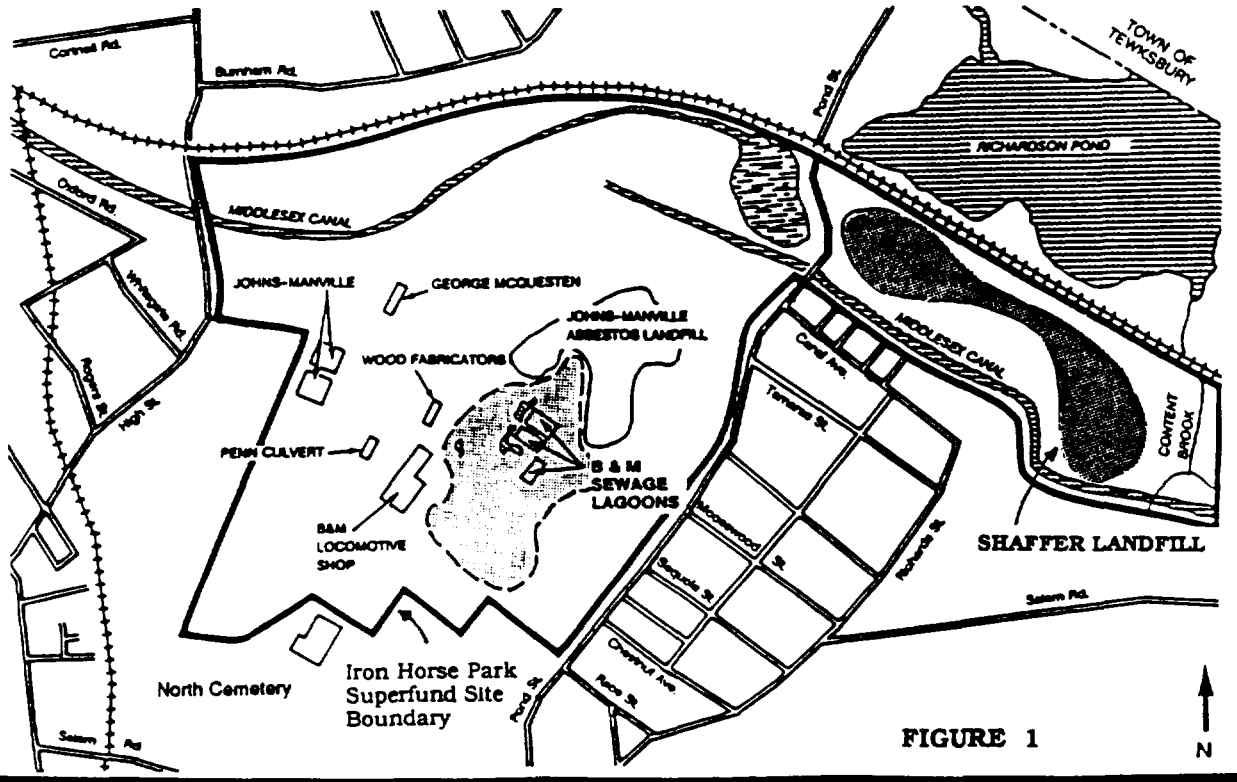
This fact sheet summarizes the on-going Remedial Investigation. The fact sheet also provides background information about Shaffer Landfill and describes future EPA action for the site. The complete Remedial Investigation is being finalized and should be available in the fall for public review at the **site information repository** at Billerica Public Library. EPA will issue a press release when the report is issued. Words that appear in bold print in this fact sheet are defined in the glossary on pages 9 and 10.

Site History

The Shaffer Landfill, also known as the Billerica or Pond Street Landfill, is a 60-acre landfill located in North Billerica. It is part of the Iron Horse Park Superfund site which was put on the **National Priorities List (NPL)** in September of 1984. Other areas of this Superfund site are in different stages of remedial action.

Shaffer Landfill is bounded on the west by Pond Street, on the north by the Boston & Maine railroad tracks, on the east by Gray Street and residential properties and on the south by the Middlesex Canal. Prior to its use as a landfill, the area was **wetlands**. The landfill area is divided into two sections: the "residential" section on the western half, and the

Key Site Features Map: Iron Horse Park Site, Billerica, MA



"commercial" section on the eastern half (see Figure 2 on page 3).

The landfill was used to dispose of residential and commercial solid waste since 1946. The site was also used as an open-burning dump for over 20 years until 1968. New regulations by the Town of Billerica in 1968 prohibited the burning of **refuse** and required operation of the dump as a **sanitary landfill**. By 1966 approximately 60 acres had been filled; and in that year Phillip Shaffer, trustee of the Gray Pond Realty Trust, purchased the site from Boston & Maine Railroad.

Closure of Landfill

In 1984, after a series of violation notices and **administrative orders**, the Massachusetts Department of Environmental Quality Engineering (DEQE) [now the Department of Environmental Protection (DEP)], sued the owners of the landfill for violations of Massachusetts regulations. In June 1984, the lawsuit resulted in a **Consent Agreement** between the Commonwealth of Massachusetts and the site owners to close and cover the landfill. The Consent Agreement established a series of cleanup activities and a schedule for their implementation at the landfill.

In compliance with the Consent Agreement, the Shaffer Landfill stopped accepting refuse in the "commercial" section in 1984 and in the "residential" section in 1986. The site owners have been working to close the landfill in accordance with DEP requirements. The closure has included installing a cover over the landfill that consists of two layers, the bottom layer of low permeable (clay) material and a top layer of soil capable of supporting vegetation. The low permeable layer prevents some of the rain from reaching the refuse and producing **leachate**, and the top layer supports vegetation to reduce erosion. In

addition, a gas collection and a gas vent/flare system has been installed to reduce odors from the landfill. Under the agreement with Massachusetts DEP, the landfill owners are also responsible for the maintenance of the final cover and gas collection system, and may also be required to install a leachate collection and control system.

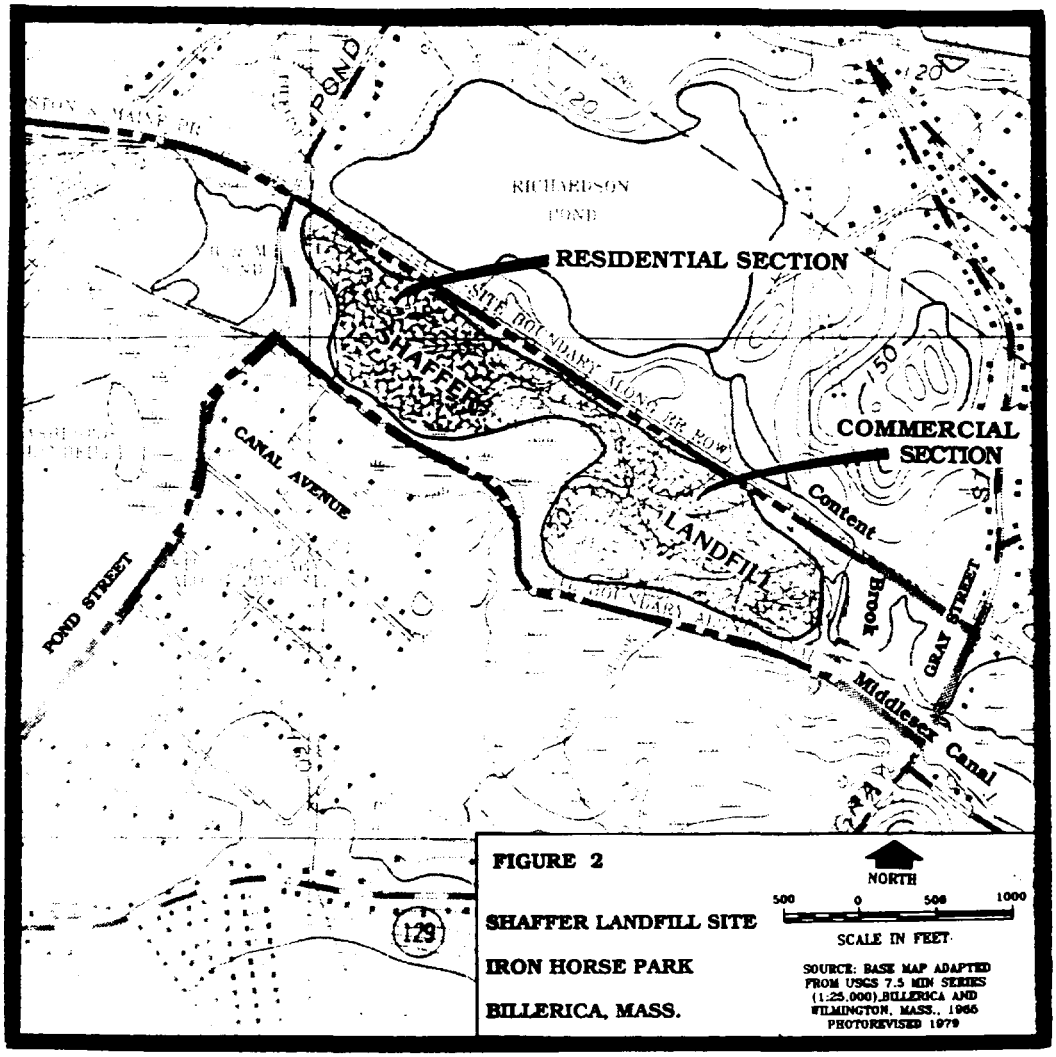
Landfill Cover

The majority of the landfill cover has been certified as completed by a professional engineer in accordance with the Consent Agreement. However the depth of the clay layer may not meet the agreement's requirements and the approved specifications on the top and side slopes of the landfill. In addition, the **permeability** of the clay has not been verified to meet DEP's requirements. It is questionable whether the topsoil layer is thick enough to support adequate vegetation.

The cover does not include a drainage layer between the topsoil and clay layers to carry water off the top of the landfill.

Landfill Gas Control

A gas collection system to control methane and other gases created by the decomposing of refuse and to reduce odor, has been installed and tested by the landfill's owners, but DEP has not issued a permit for it. Problems with the gas control system have been caused by landfill subsidence and lack of maintenance.



Erosion Potential and Vegetation

Vegetation is well established on large sections of the landfill cover, but where grass has been unable to grow, erosion has occurred. To prevent future erosion, vegetation may have to be replanted and should be maintained on a regular basis.

Landfill Slope Stability

Besides some erosion problems, the top and side slopes of the landfill are structurally sound and should not deteriorate significantly. Well established vegetation that is properly maintained will ensure the landfill top and side slopes remain intact.

Frost Protection

The current cover may not be thick enough to protect freezing of the clay layer. Freezing and thawing can cause cracks in the layer and lead to water leaking into the landfill.

Maintenance

On-going maintenance of the landfill's cover and gas collection system is necessary and corrective action should address causes of the problems, such as leachate outbreaks, for maintenance to be effective.

Wetland Impacts

The landfill was built on wetlands and the loss of these wetlands has been its largest impact. EPA believes future erosion control and good maintenance of the landfill is needed to prevent future loss of wetlands.

Field Activities for the Investigation

As part of the Remedial Investigation, EPA studied **groundwater** in the area surrounding Shaffer Landfill. This groundwater investigation supplements other groundwater studies previously conducted for the landfill. The groundwater investigation determined the direction of groundwater flow and measured the contamination in groundwater caused by the landfill. To do this, the types and thickness of **overburden** and **bedrock** in the **aquifer** were studied. Also, EPA conducted environmental sampling of **sediments**, **surface water**, and groundwater in the vicinity of Shaffer Landfill. Samples were analyzed for **Volatile Organic Compounds** (VOCs), **Acid/Base/Neutral (ABN) Compounds, pesticides, Polychlorinated Biphenyls** (PCBs), and **heavy metals**.

Results of the Field Activities

The following are the results of the groundwater, sediment and surface water sampling undertaken in the vicinity of the landfill.

Groundwater

EPA installed 12 new wells and used 37 existing wells for its groundwater study. Groundwater flows in three directions around the landfill. Groundwater movement west and southwest of the landfill is towards Richardson Pond. In the central portion of the landfill, groundwater flow is both to the north, towards Richardson Pond, and to the south toward Middlesex Canal. East of the landfill, groundwater moves in an easterly direction. The velocity of the groundwater movement is estimated between 40 to 500 feet per year. These areas are **upgradient** from the landfill.

Significant concentrations of VOC's have also been detected in earlier studies by the landfill owner. These include benzene, xylenes, and a number of other chemicals above **Maximum Contaminant Levels (MCLs)**.

VOC's, such as benzene and trichloroethene, were detected in the groundwater west and northwest of the landfill, at concentrations much lower than found just north of the landfill along Richardson Pond. The only significant levels of ABN compounds were found in groundwater **downgradient** from, and southeast of, the landfill along Gray

Street. However, some of the groundwater monitoring wells downgradient from the landfill did not detect ABN compounds.

In the areas north and upgradient from the landfill, metals including chromium, lead and arsenic were found in groundwater at elevated concentrations. Lead was also found in concentrations above MCLs in groundwater south of the Middlesex Canal.

Sediment

Sediment samples were taken in 33 locations throughout the site. The results indicate that such VOCs were found in the highest concentrations and broadest range to the north of the landfill on the southern edge of Richardson Pond. Widespread distribution of less volatile ABN compounds were found both upstream and downstream from the landfill. The highest concentrations were found in the upstream area, west of the landfill, near Pond Street and the B&M Lagoons. Low levels of pesticides were found in the vicinity of the landfill. The pesticides are probably not from the landfill, but from simply being used in the area on lawns and crops.

Surface Water

EPA collected surface water samples from 19 locations. The highest concentrations of VOCs were found north of Shaffer Landfill on the southern edge of Richardson Pond and along Content Brook downstream of the landfill. The Richardsons Pond area corresponds to the area of highest VOC concentrations identified in the sediment analysis.

Heavy metals (barium, cadmium, chromium, lead, nickel and mercury) were detected at concentrations above MCLs both upstream and downstream of the landfill. However, areas immediately downstream from the landfill had more contamination than areas upstream.

There were no significant levels of ABN compounds found in surface water.

Conclusions

The results of EPA's sampling and previous sampling and analysis conducted to meet DEP's requirements indicate that contamination from the Shaffer Landfill is spreading into groundwater and surface water around the landfill.

The highest levels of contaminants from Shaffer Landfill are found in the sediment, surface water, and groundwater directly adjacent to the eastern, northern and southern sections of the landfill. Elevated levels of chloride, manganese, iron, arsenic and VOCs have been found in the groundwater along the eastern section of the landfill.

Contaminants from the landfill have also been found in surface water, sediments and groundwater near the southwestern edge of Richardson Pond. This indicates that both the landfill and other parts of Iron Horse Park are the source of contaminants to the pond. ABN compounds and a variety of metals such as arsenic, lead and zinc were found in the sediments along the Middlesex Canal, Content Brook and Richardson Pond.

Endangerment Assessment

The testing results from all the investigations done to date were used to conduct the **Endangerment Assessment**. An Endangerment Assessment is conducted to evaluate the potential human health and environmental risks that contamination may be causing.

Results of the Endangerment Assessment

What are the potential health risks of drinking groundwater?

Although EPA believes that no groundwater in the area around the site is being used for drinking water, if

groundwater were used from the most contaminated on-site well, a risk of getting cancer of approximately two cases out of 100 would result if approximately two quarts of groundwater was consumed daily for 70 years. For consumption of groundwater from wells away from the landfill, the risk was estimated at 4.5 cases of cancer out of one million, again if two quarts were consumed daily for 70 years. The contaminants responsible for these risks are **arsenic** and **vinyl chloride** for the on-site well, and **1,1,2-trichloroethane** for the off-site wells. For non-carcinogens (non-cancer causing agents), groundwater consumption from the on-site well may result in adverse health effects, but it is not likely that exposure to noncarcinogens in groundwater from the off-site wells will result in adverse health affects.

What are the potential effects of skin contact with contamination in soil and stream sediment?

Children are known to play in the area surrounding Shaffer Landfill, including the Middlesex Canal. EPA estimated the risk that may be posed to children through skin contact with contaminated sediment. The results indicated that the carcinogenic risk of skin contact with sediments is very low - approximately five cases in 10 million. This is a conservative estimate that assumes daily contact with the landfill for a period of ten years; the actual risk might be much smaller. In terms of exposure to non-carcinogens, there are no apparent hazards.

Will landfill leachate affect Tewksbury's drinking water supply?

EPA conducted an analysis on the Town of Tewksbury's groundwater supplies in the vicinity of and potentially downgradient from Shaffer Landfill. Tewksbury's water supplies are both groundwater and surface water. Several of the Town's wells are within a one and one-half mile radius of the landfill. The results of samples taken from these wells do not show contamination from the landfill. Also, Tewksbury's public water supply wellfields are not likely to become contaminated by leachate from Shaffer Landfill in the future.

What is being done about the air quality around the Shaffer Landfill?

As part of the landfill's gas collection system, the owners installed a gas vent/flare system for air pollution control. This is an appropriate technology to minimize air emissions. A permit must be issued by the DEP for operation of the gas vent/flare. As part of the permit application, the owners have tested the emissions from the system and performed modelling to estimate potential off-site effects.

Results of their work indicate that the concentration of contaminants in the air away from the landfill would be very low and would be well below the DEP's allowable levels. However, odor problems have been reported. These odors are caused by sulfur containing gases that can be smelled at very low concentrations. On-going operation and maintenance procedures are necessary to ensure continued proper emission and odor control.

Effects of Landfill Contaminants on the Environment

Wetlands / Fish

Leachate seeps, or outbreaks, are not significantly affecting wetlands around the landfill. Evaluation of fish tissue reveals that there are several pesticides and PCBs found in samples collected in the Iron Horse Park Superfund site. However, higher levels of contamination were found in fish from an upgradient location in Long Pond than from those in Richardsons Pond. Based on the study, pesticides and PCB contaminants detected in fish cannot be attributed to Shaffer Landfill. However, contamination in groundwater that flows into the wetlands and Richardsons Pond may be at concentrations that exceed the allowable **Ambient Water Quality Standards**. Also, erosion of the landfill's

cover is causing loss of wetlands and sedimentation problems.

What is EPA's Next Step?

The complete Remedial Investigation will be available later this year for public review at the information repository located at Billerica Public Library.

EPA will determine what, if any, additional cleanup measures are needed for the landfill. This will be in the form of a **Feasibility Study (FS)** that evaluates the present landfill cap and other capping options. In addition, EPA will consider leachate collection and controls to protect groundwater, wetlands and surface water that surrounds the landfill.

These studies will be added to the Administrative Record. The Administrative Record contains all the reports and other documents on the site and will be used as the basis for EPA's selection of a cleanup remedy for the Shaffer Landfill portion of the Iron Horse Park Superfund site.

Upcoming EPA Community Relations Activities

The Feasibility Study for the Shaffer Landfill is expected to be released later this year, along with EPA's Proposed Plan for the cleanup of the landfill. Upon release of the FS and Proposed Plan, EPA will hold a public informational meeting presenting the results of these documents.

Following the meeting, EPA will hold a public comment period and will accept written comments on the Proposed Plan and FS. An informal Public Hearing will be held by EPA during the comment period to accept oral comments on the documents. Oral comments accepted at the hearing will be transcribed and made part of the Administrative Record along with written comments received during the comment period. All comments received during the comment period will be taken into consideration prior to EPA's selection of a cleanup remedy at the Shaffer Landfill.

If you have any questions or need any information about the site, please call or write to:

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or

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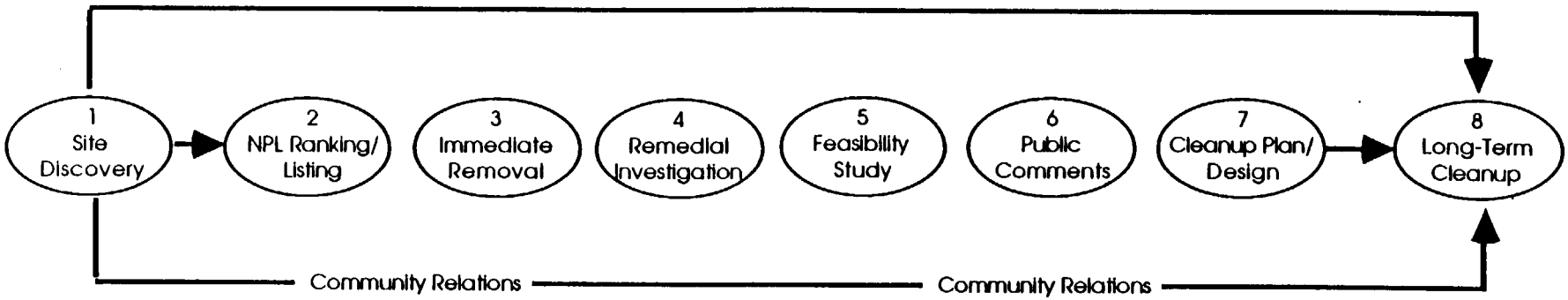
Figure 3
Superfund Process



This figure provides a simplified explanation of how a long-term Superfund response works.

1. After a site is discovered, it is investigated, usually by the State.
2. The State then ranks the site using a system that takes into account:
   - Possible Health risks to the human population.
   - Potential hazards, (e.g., from direct contact, inhalation, fire or explosion) of substances at the site.
   - Potential for the substances at the site to contaminate drinking water supplies.
   - Potential for the substances at the site to pollute or otherwise harm the environment.

If the problems at a site are deemed serious by the State and the EPA, the site will be listed on the National Priorities List (NPL), a roster of the nation's worst hazardous waste sites. Every site on the NPL is eligible for federal Superfund money.

3. If a site or any portion thereof poses an imminent threat to public health or the environment at any time, EPA may conduct an emergency response referred to as an immediate removal or an initial remedial measure.

4. Next, EPA usually conducts a remedial investigation (RI). The RI assesses how serious the contamination is, what kind of contaminants are present, and characterizes potential risks to the community.

5. Following completion of the RI, EPA performs a feasibility study (FS), which examines the feasibility of various cleanup alternatives.

6. EPA holds a minimum three-week public comment period to receive citizen input concerning the recommended alternatives. Citizens may provide comments either orally at public meetings or through written correspondence to EPA.

7. After public comments have been received, EPA then chooses a specific cleanup plan.

8. Once the design is finished, the actual remedial activities at the site can begin.

The time necessary to complete each of these steps varies with every site. In general, a remedial investigation/ feasibility study takes from one to two years. Designing the cleanup plan may take six months. Implementing the remedy – the actual containment or removal of the waste – may take from one to three years. If groundwater is involved, the final cleanup may take many more years.

Ongoing community relations activities during a cleanup include public meetings and other activities designed to keep citizens and officials informed and encourage public input. These activities are scheduled throughout the remedial cleanup process. Specific activities vary from site to site depending on the level and nature of concern. The range of community relations activities that can occur is described in EPA's Community Relations Plan for the site.

Glossary

Acid/Base/Neutral (ABN) compounds: Compounds that do not quickly or readily dissolve into water. They tend to stick to soil and sediment particles.

Administrative Order: A document issued to a landfill owner or other responsible party by EPA or DEP, that orders cleanup work or other action be taken.

Aquifer: A layer of rock or soil below the ground surface that can supply usable quantities of groundwater to wells and springs. Aquifers can be a source of drinking water.

Arsenic: A toxic chemical that can cause cancer if ingested.

Bedrock: Rock beneath the earth's surface that underlies all layers of soil. Groundwater can move through cracks or fractures in this base rock layer.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): A federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act (SARA) The acts created a special tax that goes into a trust fund, commonly known as Superfund, to investigate and clean up abandoned or uncontrolled hazardous waste sites. Under the program, EPA can either: 1) pay for site cleanup when parties responsible for the contamination cannot be located or are unwilling or unable to perform the work or 2) take legal action to force parties responsible for site contamination to clean up the site or pay back the federal government for the cost of the cleanup.

Consent Agreement: An agreement between the state and landfill owner or responsible party that sets forth steps to be taken to cleanup a site and prevent future problems.

Downgradient: The direction to which groundwater flows.

Endangerment Assessment: A study conducted as a supplement to a remedial investigation to determine the nature and extent of contamination at a Superfund site and the risks posed to public health and/or the environment. EPA or state agencies conduct the study when legal action is pending to require PRPs to perform or pay for the site cleanup.

Feasibility Study (FS): a report that summarizes the development and analysis of remedial alternatives that EPA considers for the cleanup for Superfund sites.

Groundwater: The water beneath the earth's surface that flows through soil and rock openings and sometimes serves as a principal source of drinking water.

Heavy metals: Dense metallic chemicals, that may be toxic. Examples include: lead, cadmium, cobalt and chromium.

Leachate: A contaminated liquid resulting when water percolates, or trickles, through waste materials and collects components of those wastes. Leaching may occur at landfills and may result in hazardous substances entering soil, surface water, or groundwater.

Maximum Containment Levels (MCLs): Maximum concentration of a chemical that is allowed in drinking water. These levels are set by the Safe Drinking Water Act.

National Priorities List (NPL): EPA's list of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial response using money from the Trust Fund (Superfund). The list is based primarily on the score a site receives on the Hazard Ranking System (HRS). EPA is required to update the NPL at least once a year.

Overburden: The layers of soil beneath the earth's surface through which groundwater can move.

Permeability: A measure of the ability of water to pass through soil.

Pesticides: An agent, often a toxic chemical, used to control insects.

Polychlorinated Biphenyls (PCBs): A family of organic compounds used in electrical transformers, lubricants and adhesives. PCBs are extremely persistent in the environment and do not break down into less harmful substances. EPA banned the use of PCBs in 1979 because long-term exposure to PCBs can cause liver damage and other adverse human health effects.

Refuse: Garbage and trash produced by households and businesses that is discarded in landfills.

Remedial Investigation (RI): An investigation to determine the type and distribution of contamination at a Superfund site. The Remedial Investigation is usually performed prior to a Feasibility Study, which identifies and analyzes cleanup alternatives for the site.

Sanitary Landfill: Method of disposing of refuse on land. Refuse is disposed, covered by clean soil and eventually contained by a final landfill cap.

Saturation: The movement of water through soil or other material at a landfill that can lead to the formation of leachate.

Sediments: Materials that settle to the bottom of a stream, lake, wetland area or other body of water.

Site Information Repository: A place, often a library, where project information is stored and is available for public review.

Surface water: Bodies of water on the earth's surface that are exposed to the air, such as streams, rivers, lakes and oceans.

Upgradient: The direction from which groundwater flows

Vinyl Chloride: A chemical compound that can cause cancer if ingested. It is formed from the decomposition of other chemicals, such as trichloroethene

Volatile Organic Compounds (VOCs): A group of organic (i.e. carbon containing) compounds characterized by their tendency to evaporate into the air from water or soil.

Wetland: An area that is covered or saturated with water long enough each year that it effects the types of soil and vegetation found in the area. Wetlands are federally protected because they purify water, prevent floods, feed and shelter fish and wildlife, and offer recreational opportunities.

1,1,2-trichloroethane: A chemical compound used as a solvent. Contact with it may cause cancer if ingested and skin irritation.

Mailing List Additions

If you or someone you know would like to be included on the mailing list to receive information about Shaffer Landfill at the Iron Horse Park Superfund site, please fill out and mail this form to:

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