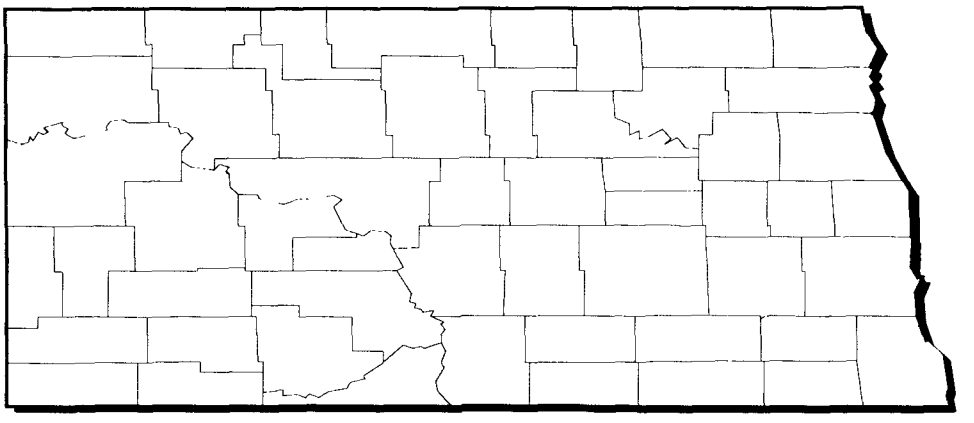
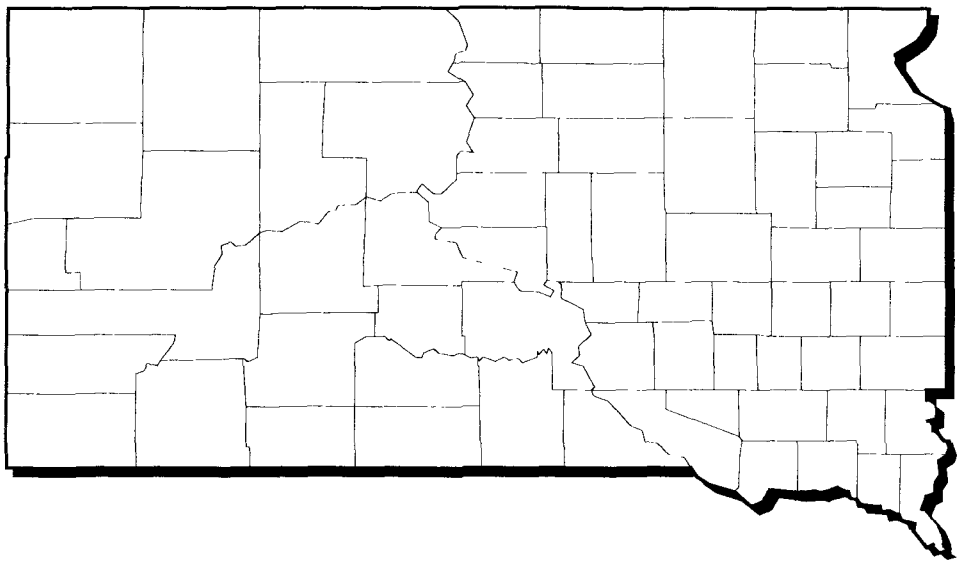
United States
Environmental Protection
Agency

Solid Waste And
Emergency Response
(5102 G)

EPA/540/R-93/032
December 1992
PB93-963233

SUPERFUND: Progress at National Priority List Sites





NORTH & SOUTH DAKOTA 1992 UPDATE

Printed on Recycled Paper

Publication #9200.5-734B
December 1992

NATIONAL PRIORITIES LIST SITES:

North and South Dakota

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Office of Emergency & Remedial Response
Office of Program Management
Washington, DC 20460

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The complete set of the 49 State reports may be ordered as PB93-963250.

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INTRODUCTION

A BRIEF OVERVIEW OF SUPERFUND

During the second half of the Twentieth Century, the environmental consequences of more than 100 years of industrialization in the United States became increasingly clear. Authors such as Rachel Carson wrote passionately about the often-hidden environmental effects of our modern society's widespread use of chemicals and other hazardous materials. Their audience was small at first, but gradually their message spread. Growing concern turned to action, as people learned more about the environment and began to act on their knowledge

The 1970s saw environmental issues burst onto the national scene and take hold in the national consciousness. The first Earth Day was observed in 1970, the year that the U.S. Environmental Protection Agency (EPA) was founded. By the end of the 1970s, Love Canal in New York and the Valley of the Drums in Kentucky had entered the popular lexicon as synonyms for pollution and environmental degradation.

Superfund Is Established

The industrialization that gave Americans the world's highest standard of living also created problems that only a national program could address. By 1980, the U.S. Congress had passed numerous environmental laws, implemented by the EPA, but many serious hazardous waste problems were slipping through the cracks.

Responding to growing concern about public health and environmental threats from uncontrolled releases of hazardous materials, the U.S. Congress passed the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Popularly known as Superfund, CERCLA had one seemingly simple job—to uncover and clean up hazardous materials spills and contaminated sites.

A Big Job

Few in Congress, the EPA, the environmental community, or the general public knew in 1980 just how big the nation's hazardous materials problem is. Almost everyone thought that Superfund would be a short-lived program requiring relatively few resources to clean up at most a few hundred sites. They were quite mistaken.

As the EPA set to work finding sites and gauging their potential to harm people and the environment, the number of sites grew. Each discovery seemed to lead to another, and today almost 36,000 hazardous waste sites have been investigated as potential hazardous waste sites. They are catalogued in the EPA's computerized database, CERCLIS (for the Comprehensive Environmental Re-

sponse, Compensation, and Liability Information System).

The damage to public health and the environment that each site in CERCLIS might cause is evaluated; many sites have been referred to State and local governments for cleanup. The EPA lists the nation's most serious hazardous waste sites on the National Priorities List, or NPL. (These Superfund sites are eligible for federally-funded cleanup, but whenever possible the EPA makes polluters pay for the contamination they helped create.) The NPL now numbers 1,275 sites, with 50 to 100 added each year. By the end of the century, the NPL may reach as many as 2,100 sites.

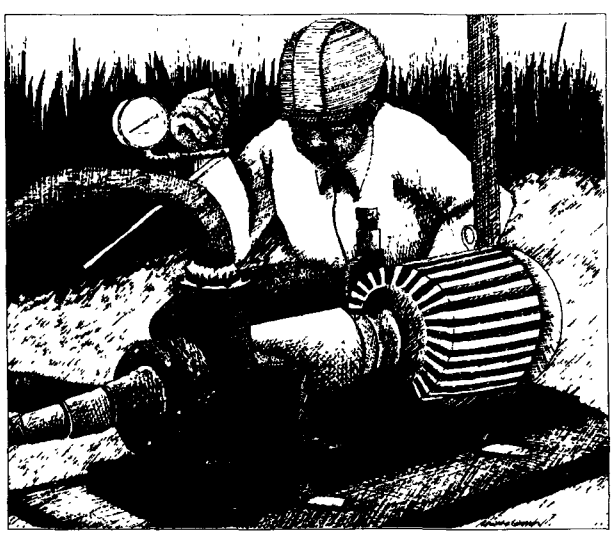
Superfund faces some of the most complex pollution problems ever encountered by an environmental program. Improperly stored or disposed chemicals and the soil they contaminate are one concern. More difficult to correct are the wetlands and bays, and the groundwater, lakes, and rivers often used for drinking water that are contaminated by chemicals spreading through the soil or mixing with storm water runoff. Toxic vapors contaminate the air at some sites, threatening the health of people living and working near by.

Superfund aims to control immediate public health and environmental threats by tackling the worst problems at the worst sites first. Wherever possible, Superfund officials use innovative treatment techniques—many developed or refined by the EPA—to correct hazardous materials problems once and for all. Many of the treatment techniques they use did not exist when the program was created.

The EPA Administrator had challenged Superfund to complete construction necessary for cleanup work at 130 NPL sites by the end of the 1992 federal fiscal year. By September 30, 1992, the end of fiscal year 1992, construction had been completed at a total of 149 NPL sites. Superfund is well on its way of meeting the Administrator's goal of completing construction at 200 NPL sites by the end of fiscal year 1993, and 650 sites by the end of fiscal year 2000.

Quick Cleanup at Non-NPL Sites

Long-standing hazardous waste sites are not Superfund's only concern. The EPA also responds to hazardous spills and other emergencies, hauling away chemicals for proper treatment or disposal. Superfund teams perform or supervise responses at rail and motor vehicle accidents, fires, and other emergencies involving hazardous substances. They also evacuate people living and working near by, if necessary, and provide clean drinking water to people whose own water is contaminated. Removal crews also post warning signs and take other precautions to keep people and animals away from hazardous substances.



Superfund employee prepares equipment for groundwater treatment.

Quick Cleanups, or Removals, are not limited to emergencies. When cleanup crews at contaminated sites find hazardous substances that immediately threaten people or the environment, they act right away to reduce the threat or to remove the chemicals outright. As the EPA implements the Superfund Accelerated Cleanup Model (SACM), more and more sites will undergo quick cleanups, and many of these will be cleaned up completely without ever being included on the NPL. (See "Streamlining Superfund: The Superfund Accelerated Cleanup Model.")

Some of Superfund's most significant gains in public health and environmental protection have been won by the removal program. As of March 31, 1992, the Emergency Response Program had logged more than 2,300 removal completions since Superfund was established.

Superfund employee removing drums from a Superfund site.

The Public's Role

Superfund is unique among federal programs in its commitment to citizen participation. Although the EPA is responsible for determining how dangerous a site is and how best to clean it up, the Agency relies on citizen input as it makes these decisions.

Community residents are often invaluable sources of information about a hazardous waste site, its current and previous owners, and the activities that took place there. Such information can be crucial to experts evaluating a site and its potential dangers.

Residents also comment on EPA cleanup plans by stating their concerns and preferences at public meetings and other forums and in formal, written comments to Agency proposals. The EPA takes these comments and concerns seriously, and has modified many proposals in response to local concerns. For, ultimately, it is the community and its citizens that will live with the results of the EPA's decisions and actions; it is only fair that citizens participate in the process.

A Commitment to Communication

The Superfund program is very serious about public outreach and communication. Community relations coordinators are assigned to each NPL site to help the public understand the potential hazards present, as well as the cleanup alternatives. Local information repositories, such as libraries or other public buildings, have been established near each NPL site to ensure that the public has an opportunity to review all relevant information and the proposed cleanup plans.

The individual State volumes contain summary fact sheets on NPL sites in each State and territory. Together, the fact sheets provide a concise report on site conditions and the progress made toward site cleanups as of March 1992. The EPA revises these volumes periodically to provide an up-to-date record of program activities. A glossary of key terms relating to hazardous waste management and Superfund site cleanup is provided at the back of this book.

INTRODUCTION

Superfund is, of course, a public program, and as such it belongs to everyone of us. This volume, along with other State volumes, comprises the EPA's report on Superfund progress to the program's owners for the year 1992.

STREAMLINING SUPERFUND: THE SUPERFUND ACCELERATED CLEANUP MODEL

Historically, critics and supporters alike have measured Superfund's progress by the number of hazardous waste sites deleted from the NPL. Although easy enough to tally, this approach is too narrow. It misses the major gains Superfund makes by reducing major risks at the nation's worst hazardous sites long before all clean-up work is done and the site deleted. It also ignores the Removal Program's contributions to meeting Superfund's twin mandates of maximizing public health and environmental protection.

Renewing Superfund's commitment to rapid protection from hazardous materials, the EPA is streamlining the program. The Superfund Accelerated Cleanup Model, or SACM, will take Early Actions, such as removing hazardous wastes or contaminated materials, while experts study the site. SACM also will combine similar site studies to reduce the time required to evaluate a site and its threats to people and the environment. This way, immediate public health and environmental threats will be addressed while long-term cleanups are being planned.

Emergencies such as train derailments and motor vehicle accidents will continue to be handled expeditiously. Teams of highly trained technicians will swing into action right away, coordinating the cleanup and removal of hazardous substances to ensure public safety as quickly as possible.

Breaking With Tradition

The traditional Superfund process begins with a lengthy phase of study and site assessment, but SACM will save time by combining separate, yet similar, activities. Each EPA Region will form a Decision Team of site managers, risk assessors, community relations coordinators, lawyers, and other experts to monitor the studies and quickly determine whether a site requires Early Action (taking less than five years), Long-term Action, or both.

While the site studies continue, the Decision Team will begin the short-term work required to correct immediate public health or environmental threats from the site. Besides removing hazardous materials, Early Actions include taking precautions to keep contaminants from moving off the site and restricting access to the site. Early Actions could eliminate most human risk from these sites, and Superfund will further focus its public participation and public information activities on site assessment and Early Action.

Long-Term Solutions

While Early Actions can correct many hazardous waste problems—and provide the bulk of public health and environmental protection—some contamination will take longer to correct. Cleanups of mining sites, wetlands, estuaries, and projects involving incineration of contaminants or restoration of groundwater can take far longer than the three to five years envisioned for Early Actions. Under SACM, these sites will be handled much as they are now.

Also under SACM, the EPA will continue its pursuit of potentially responsible parties who may have caused or contributed to site contamination. Expedited enforcement and procedures for negotiating potentially responsible party settlements will secure their participation. Superfund personnel will continue to oversee clean-up work performed by potentially responsible parties.

HOW SUPERFUND WORKS

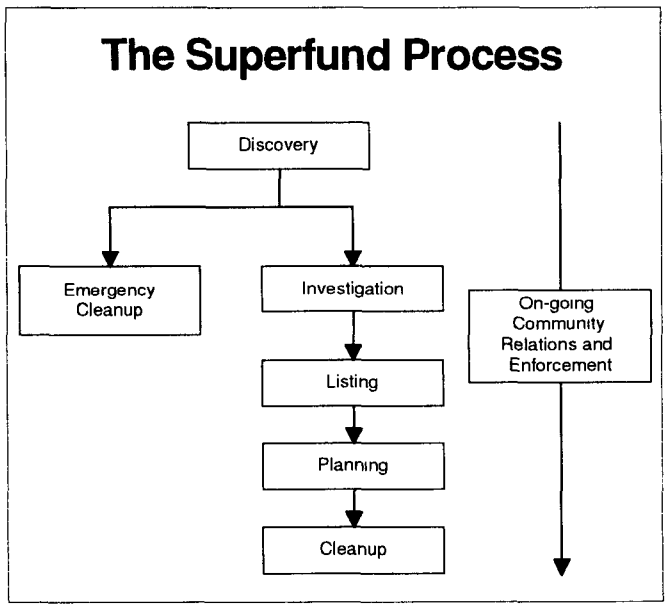
Each Superfund site presents a different set of complex problems. The same hazardous materials and chemicals often contaminate many sites, but the details of each site are different. Almost always, soil is contaminated with one or more chemicals. Their vapors may taint the air over and around the site. Contaminants may travel through the soil and reach underground aquifers which may be used for drinking water, or they may spread over the site to contaminate streams, ponds, and wetlands. The contaminating chemicals may interact with each other, presenting even more complicated cleanup problems.

Superfund's cleanup process is arduous and exacting. It requires the best efforts of hundreds of experts in science and engineering, public health, administration and management, law, and many other fields.

The average NPL site takes from seven to ten years to work its way through the system, from discovery to the start of long-term cleanup. Actual cleanup work can take years, decades if contaminated groundwater must be treated. Of course, imminent threats to public health or the environment are corrected right away.

The diagram to the right presents a simplified view of the cleanup process. The major steps in the Superfund process are:

- Site discovery and investigation to identify contaminants and determine whether emergency action is required;
- Emergency site work such as removing contaminants for proper treatment or disposal, and securing the site to keep people and animals away, if warranted by conditions at the site;
- Site evaluation to determine how people living and working nearby, and the environment, may be exposed to site contaminants;
- Detailed studies to determine whether conditions are serious enough to add the site to the National Priorities List of sites eligible for federally funded cleanup under Superfund;
- Selection, design, and implementation of a cleanup plan, after a thorough review of the most effective cleanup options, given site conditions, contaminants present, and their potential threat to public health or the environment.
- Follow-up to ensure that the cleanup work done at the site continues to be effective over the long term.



From the earliest stages, EPA investigators work hard to identify those responsible for the contamination. As their responsibility is established, the EPA negotiates with these "responsible parties" to pay for cleaning up the problem they helped create. This "enforcement first" policy saves Superfund Trust Fund monies for use in cleanups where the responsible parties cannot be identified, or where they are unable to fund cleanup work.

THE VOLUME

How to Use the State Book

The site fact sheets presented in this book are comprehensive summaries that cover a broad range of information. The fact sheets describe hazardous waste sites on the NPL and their locations, as well as the conditions leading to their listing ("Site Description"). The summaries list the types of contaminants that have been discovered and related threats to public and ecological health ("Threats and Contaminants"). "Cleanup Approach" presents an overview of the cleanup activities completed, underway, or planned. The fact sheets conclude with a brief synopsis of how much progress has been made in protecting public health and the environment. The summaries also pinpoint other actions, such as legal efforts to involve polluters responsible for site contamination and community concerns.

The fact sheets are arranged in alphabetical order by site name. Because site cleanup is a dynamic and gradual process, all site information is accurate as of the date shown on the bottom of each page. Progress always is being made at NPL sites, and the EPA periodically will update the site fact sheets to reflect recent actions and will publish updated State volumes. The following two pages show a generic fact sheet and briefly describe the information under each section.

How Can You Use This State Book?

You can use this book to keep informed about the sites that concern you, particularly ones close to home. The EPA is committed to involving the public in the decision making process associated with hazardous waste cleanup. The Agency solicits input from area residents in communities affected by Superfund sites. Citizens are likely to be affected not only by hazardous site conditions, but also by the remedies that combat them. Site cleanups take many forms and can affect communities in different ways. Local traffic may be rerouted, residents may be relocated, temporary water supplies may be necessary.

Definitive information on a site can help citizens sift through alternatives and make decisions. To make good choices, you must know what the threats are and how the EPA intends to clean up the site. You must understand the cleanup alternatives being proposed for site cleanup and how residents may be affected by each one. You also need to have some idea of how your community intends to use the site in the future, and you need to know what the community can realistically expect once the cleanup is complete.

The EPA wants to develop cleanup methods that meet community needs, but the Agency only can take local concerns into account if it understands what they are. Information must travel both ways in order for cleanups to be effective and satisfactory. Please take this opportunity to learn more, become involved, and assure that hazardous waste cleanup at "your" site considers your community's concerns.

THE VOLUME

NPL LISTING HISTORY

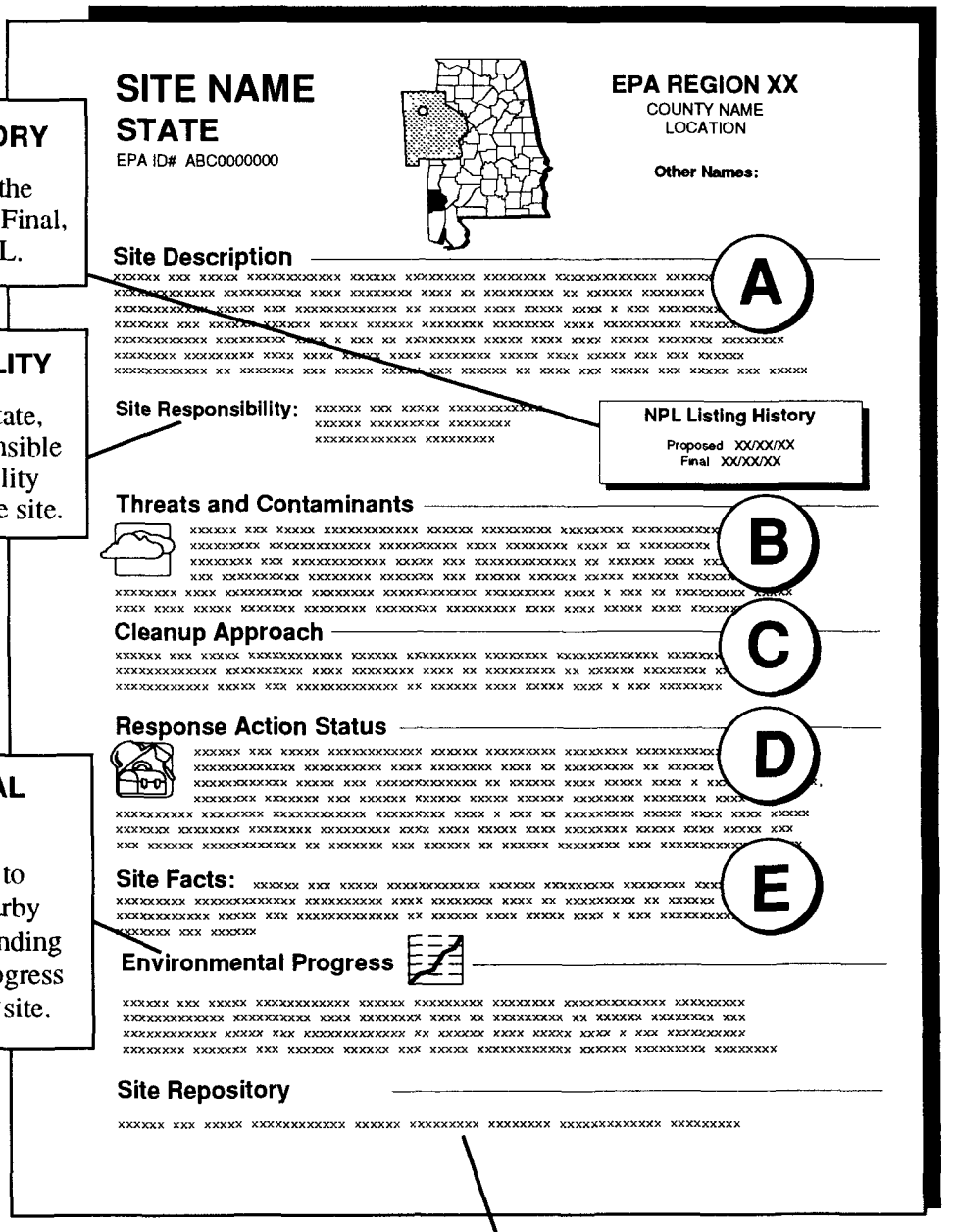
Provides the dates when the site was Proposed, made Final, and Deleted from the NPL.

SITE RESPONSIBILITY

Identifies the Federal, State, and/or potentially responsible parties taking responsibility for cleanup actions at the site.

ENVIRONMENTAL PROGRESS

Summarizes the actions to reduce the threats to nearby residents and the surrounding environment and the progress towards cleaning up the site.



SITE REPOSITORY

Lists the location of the primary site repository. The site repository may include community relations plans, public meeting announcements and minutes, fact sheets, press releases, and other site-related documents.

A

SITE DESCRIPTION

This section describes the location and history of the site. It includes descriptions of the most recent activities and past actions at the site that have contributed to the contamination. Population estimates, land usages, and nearby resources give readers background on the local setting surrounding the site.

B

THREATS AND CONTAMINANTS

The major chemical categories of site contamination are noted, as well as which environmental resources are affected. Icons representing each of the affected resources (may include air, groundwater, surface water, soil, and contamination to environmentally sensitive areas) are included in the margins of this section. Potential threats to residents and the surrounding environments arising from the site contamination also are described.

C

CLEANUP APPROACH

This section contains a brief overview of how the site is being cleaned up.

D

RESPONSE ACTION STATUS

Specific actions that have been accomplished or will be undertaken to clean up the site are described here. Cleanup activities at NPL sites are divided into separate phases, depending on the complexity and required actions at the site. Two major types of cleanup activities often are described: initial, immediate, or emergency actions to quickly remove or reduce imminent threats to the community and surrounding areas; and long-term remedial phases directed at final cleanup at the site. Each stage of the cleanup strategy is presented in this section of the summary. Icons representing the stage of the cleanup process (initial actions, site investigations, EPA selection of the cleanup remedy, engineering design phase, cleanup activities underway, and completed cleanup) are located in the margin next to each activity description.

E

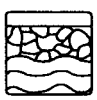
SITE FACTS

Additional information on activities and events at the site are included in this section. Often details on legal or administrative actions taken by the EPA to achieve site cleanup or other facts pertaining to community involvement with the site cleanup process are reported here.

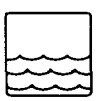
THE VOLUME

The "icons," or symbols, accompanying the text allow the reader to see at a glance which environmental resources are affected and the status of cleanup activities at the site.

Icons in the Threats and Contaminants Section



Contaminated *Groundwater* resources in the vicinity or underlying the site. (Groundwater is often used as a drinking water source.)



Contaminated *Surface Water and Sediments* on or near the site. (These include lakes, ponds, streams, and rivers.)

Contaminated *Air* in the vicinity of the site. (Air pollution usually is periodic and involves contaminated dust particles or hazardous gas emissions.)

Contaminated *Soil and Sludges* on or near the site. (This contamination category may include bulk or other surface hazardous wastes found on the site.)

Threatened or contaminated *Environmentally Sensitive Areas* in the vicinity of the site. (Examples include wetlands and coastal areas or critical habitats.)

Icons in the Response Action Status Section

Initial, Immediate, or Emergency Actions have been taken or are underway to eliminate immediate threats at the site.

Site Studies at the site to determine the nature and extent of contamination are planned or underway.

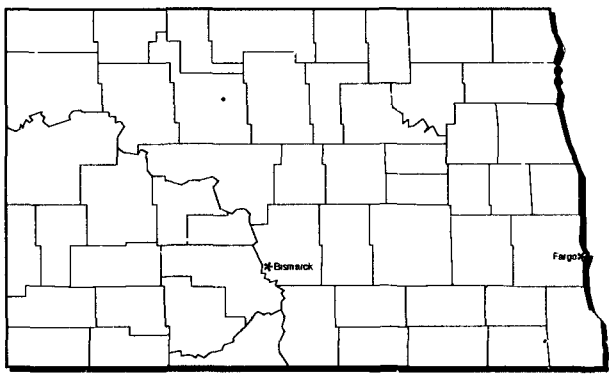
Remedy Selected indicates that site investigations have been concluded, and the EPA has selected a final cleanup remedy for the site or part of the site.

Remedy Design means that engineers are preparing specifications and drawings for the selected cleanup technologies.

Cleanup Ongoing indicates that the selected cleanup remedies for the contaminated site, or part of the site, currently are underway.

Cleanup Complete shows that all cleanup goals have been achieved for the contaminated site or part of the site.

A SUMMARY OF THE STATE PROGRAM



Superfund Activities in North Dakota

The State of North Dakota is located within EPA Region 8, which includes the six northern central States extending from the central plains to the Rocky Mountains. The State covers 70,702 square miles. According to the 1990 Census, North Dakota experienced a 2 percent decrease in population between 1980 and 1990, and is ranked forty-seventh in U.S. population with approximately 638,800 residents.

North Dakota does not have its own State Superfund law. However, the Hazardous Waste Management Act of 1981, most recently amended in 1991, and the Water Pollution Control Law of 1967, most recently amended in 1989, authorize administrative orders, injunctions, and criminal and civil penalties. In 1989, the State legislature enacted a bill creating the Environmental Quality Restoration Fund and granting the State the right to recover costs from polluters who refuse to conduct or pay for cleanup activities. This bill applies to all environmental programs. The fund, which receives moneys from cost recovery activities and settlements, is used for emergency response actions, removal and long-term cleanup actions, operation and maintenance activities, studies and designs, administrative expenses, and provides the 10 percent contribution from the State required by the Federal Superfund program. Currently, two sites in the State of North Dakota have been listed as final on the NPL. No new sites have been proposed for listing in 1992.

The Department of Health & Consolidated Laboratories' Environmental Health Section

implements the Superfund Program in the State of North Dakota

Activities responsible for hazardous waste contamination in the State of North Dakota include:

Food Production/Agriculture Operations	**50%**
Landfills	**50%**

Facts about the two NPL sites in North Dakota:

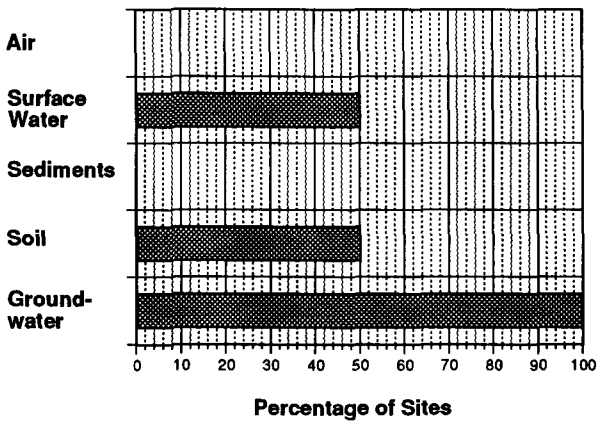
Immediate Actions (such as removing hazardous substances or restricting site access) were performed at both sites.

No sites endanger sensitive environments.

One site is located near residential areas.

Most Sites Have Multiple Contaminants and Contaminated Media:

Media Contaminated at Sites



Contaminants Found at Sites

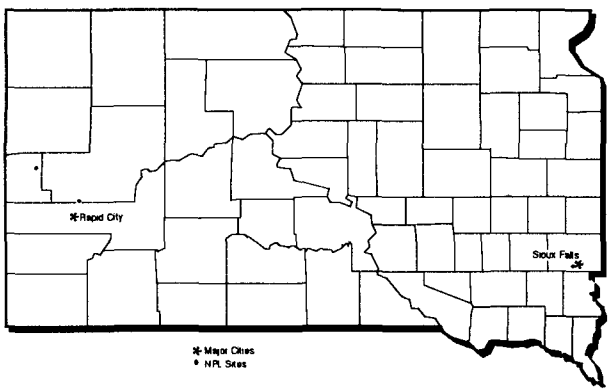
	Percentage of Sites
Heavy Metals	100%
Presticides/Herbicides	100%
VOCs	50%

The Potentially Responsible Party Pays...

In the State of North Dakota, no potentially responsible parties are paying for or conducting cleanup activities.

For Further Information on NPL Sites and Hazardous Waste Programs in the State of North Dakota Please Contact:

EPA Region 8 Public Affairs Branch	For information concerning community involvement	(303) 294-1120
National Response Center	To report a hazardous waste emergency	(800) 424-8802
The Department of Health & Consolidated Laboratories: Environmental Health Section: Division of Waste Management	For information about the State's responsibility in the Superfund Program	(701) 221-5166
EPA Region 8 Hazardous Waste Management Division	For information about the Regional Superfund Program	(303) 294-7630
EPA Superfund Hotline	For information about the Federal Superfund Program	(800) 424-9068



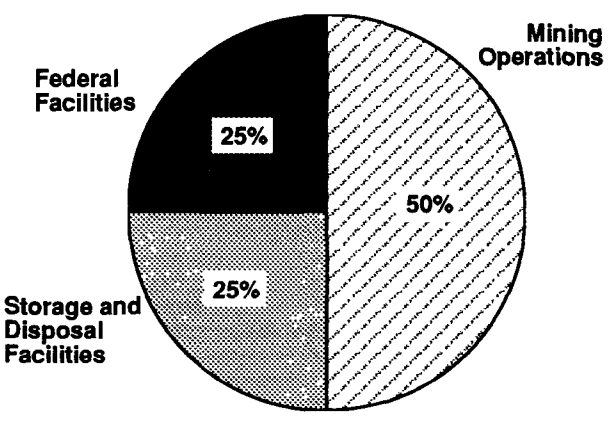
Superfund Activities in South Dakota

The State of South Dakota is located within EPA Region 8, which includes the six north central States extending from the central plains to the Rocky Mountains. The State covers 77,116 square miles. According to the 1990 Census, South Dakota experienced a less than 1 percent increase in population between 1980 and 1990, and is ranked forty-fifth in U.S. population with approximately 696,000 residents.

The Hazardous Waste Management Act of 1983, most recently amended in 1988, and the Regulated Substance Discharge Law of 1988, amended in 1989, authorize the State to clean up Superfund sites. Under these laws, any discharge of a regulated substance constitutes a violation and can result in corrective action on the part of the State. In practice, the State either compels polluters to conduct or pay for cleanup activities or, if the polluters refuse, conducts cleanup activities itself and recovers the cost of cleanup at a later time. The Regulated Substances Response Fund was created to fund administrative activities, emergency response actions, removals, investigations, and managerial activities at Superfund sites as well as provide for the 10 percent contribution from the State required by the Federal Superfund program. Appropriations, moneys from cost recovery activities, penalties, and interest contribute to this fund. Currently, three sites in the State of South Dakota have been listed as final on the NPL. One new site has been proposed for listing in 1992.

The Department of Environment and Natural Resources
implements the Superfund Program in the State of South Dakota

Activities responsible for hazardous waste contamination in the State of South Dakota include:



Facts about the four NPL sites in South Dakota:

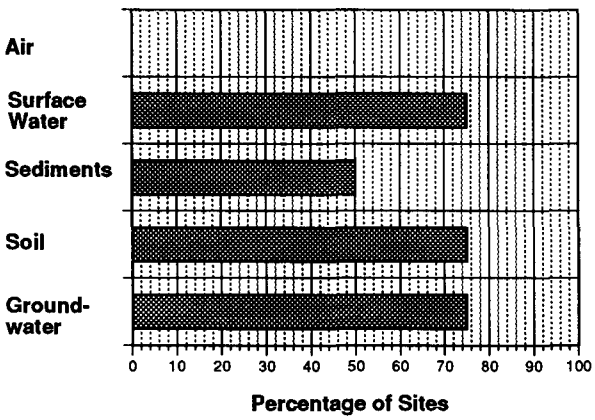
Immediate Actions (such as removing hazardous substances or restricting site access) were not performed at any sites.

One site endangers sensitive environments.

Two sites are located near residential areas.

Most Sites Have Multiple Contaminants and Contaminated Media:

Media Contaminated at Sites



Contaminants Found at Sites

	Percentage of Sites
Heavy Metals	100%
VOCs	50%
Creosotes	25%
Pesticides/Herbicides	25%
Other *	25%

*Other contaminants include cyanide and sulfates.

The Potentially Responsible Party Pays...

In the State of South Dakota, potentially responsible parties are paying for or conducting cleanup activities at three sites.

For Further Information on NPL Sites and Hazardous Waste Programs in the State of South Dakota Please Contact:

EPA Region 8 Public Affairs Branch	For information concerning community involvement	(303) 294-1120
National Response Center	To report a hazardous waste emergency	(800) 424-8802
The Department of Environment and Natural Resources: Division of Environmental Regulation, Groundwater Quality Section	For information about the State's responsibility in the Superfund Program	(605) 773-3296
EPA Region 8 Hazardous Waste Management Division	For information about the Regional Superfund Program	(303) 294-7630
EPA Superfund Hotline	For information about the Federal Superfund Program	(800) 424-9068

THE NPL REPORT

PROGRESS TO DATE

The following Progress Report lists all sites currently on, or deleted from, the NPL and briefly summarizes the status of activities for each site at the time this report was prepared. The steps in the Superfund cleanup process are arrayed across the top of the chart, and each site's progress through these steps is represented by an arrow (⇨) indicating the current stage of cleanup.

Large and complex sites often are organized into several cleanup stages. For example, separate cleanup efforts may be required to address the source of the contamination, hazardous substances in the groundwater, and surface water pollution, or to clean up different areas of a large site. In such cases, the chart portrays cleanup progress at the site's *most advanced* stage, reflecting the status of site activities rather than administrative accomplishments.

- ⇨ An arrow in the "Initial Response" category indicates that an emergency cleanup, immediate action, or initial action has been completed or currently is underway. Emergency or initial actions are taken as an interim measure to provide immediate relief from exposure to hazardous site conditions or to stabilize a site to prevent further contamination.

- ⇨ A final arrow in the "Site Studies" category indicates that an investigation to determine the nature and extent of the contamination at the site currently is ongoing or planned.

- ⇨ A final arrow in the "Remedy Selection" category means that the EPA has selected the final cleanup strategy for the site. At the few sites where the EPA has determined that initial response actions have eliminated site contamination, or that any remaining contamination will be naturally dispersed without further cleanup activities, a "No Action" remedy has been selected. In these cases, the arrows are discontinued at the "Remedy Selection" step and resume in the "Construction Complete" category.

- ⇨ A final arrow at the "Remedial Design" stage indicates that engineers currently are designing the technical specifications for the selected cleanup remedies and technologies.

- ⇨ A final arrow in the "Cleanup Ongoing" column means that final cleanup actions have been started at the site and currently are underway.

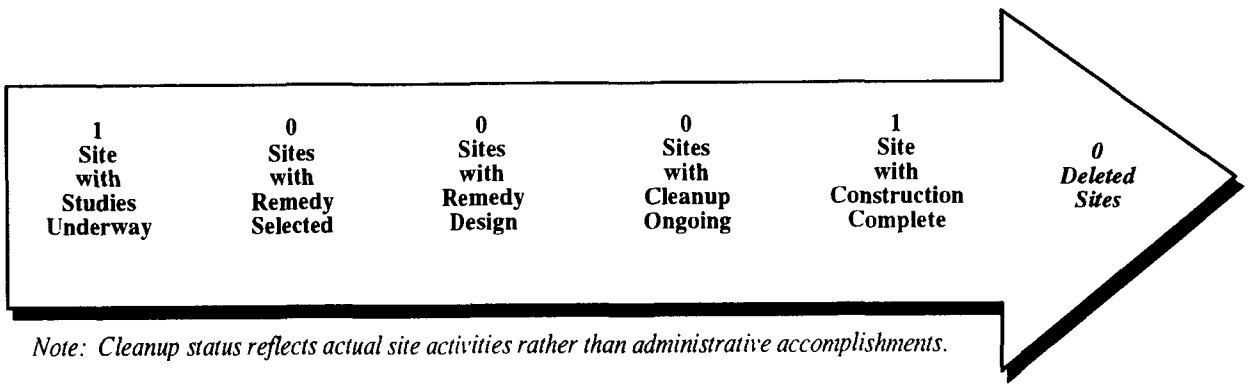
- ⇨ A final arrow in the "Construction Complete" category is used only when all phases of the site cleanup plan have been performed, and the EPA has determined that no additional construction actions are required at the site. Some sites in this category currently may be undergoing long-term operation and maintenance or monitoring to ensure that the cleanup actions continue to protect human health and the environment.

- ✓ A check in the "Deleted" category indicates that the site cleanup has met all human health and environmental goals and that the EPA has deleted the site from the NPL.

Further information on the activities and progress at each site is given in the site "Fact Sheets" published in this volume.

Progress Toward Cleanup at NPL Sites in the State of North Dakota

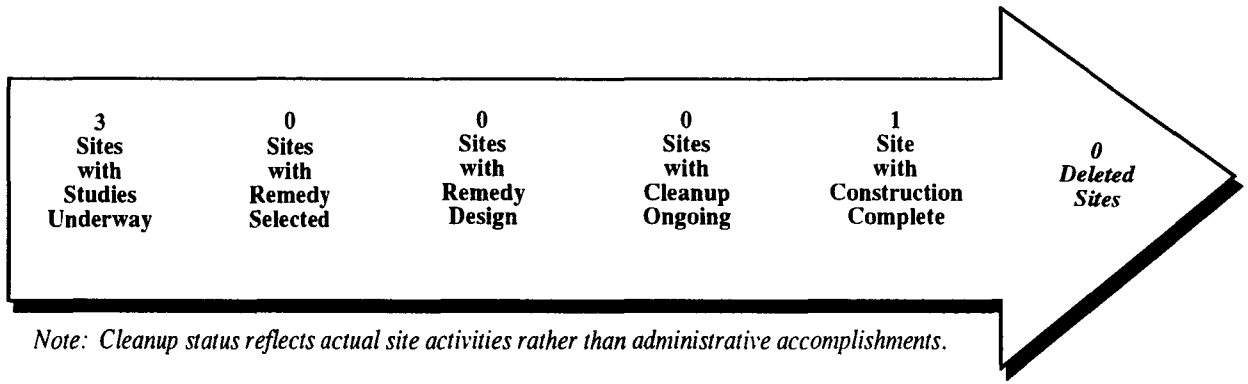
Site Name	County	NPL	Date	Initial Response	Site Studies	Remedy Selected	Remedy Design	Cleanup Ongoing	Construction Complete	Deleted
ARSENIC TRIOXIDE SITE	RICHMOND/ RANSOM/SARGENT	Final	09/08/83	⇨	⇨	⇨	⇨	⇨	⇨	
MINOT LANDFILL	WARD	Final	03/24/89	⇨	⇨					



Note: Cleanup status reflects actual site activities rather than administrative accomplishments.

Progress Toward Cleanup at NPL Sites in the State of South Dakota

Site Name	County	NPL	Date	Initial Response	Site Studies	Remedy Selected	Remedy Design	Cleanup Ongoing	Construction Complete	Deleted
ANNIE CREEK MINE AND PROCESSING	LAWRENCE	Proposed	07/29/91		⇨					
ELLSWORTH AIR FORCE BASE	MEADE/ PENNINGTON	Final	08/30/90		⇨					
WHITEWOOD CREEK	LAWRENCE/ MEADE/BUTTE	Final	09/08/83		⇨	⇨	⇨	⇨	⇨	
WILLIAMS PIPE LINE COMPANY DISPOSAL PIT	MINNEHAHA	Final	08/30/90		⇨					

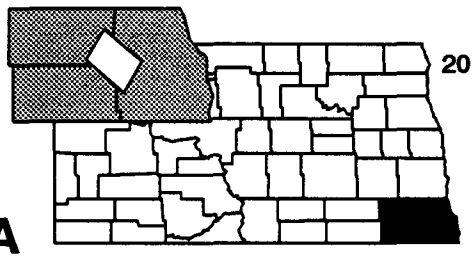


Note: Cleanup status reflects actual site activities rather than administrative accomplishments.

ARSENIC TRIOXIDE SITE

NORTH DAKOTA

EPA ID# NDD980716963



EPA REGION 8

20 townships in Richland, Ransom, and Sargent Counties

Site Description

The Arsenic Trioxide Site consists of 20 townships covering approximately 500 square miles of land. Heavy grasshopper infestations of agricultural crops in the 1930s and 1940s resulted in widespread and frequent applications of arsenic-based pesticides. In 1979, it was discovered that the public and private water supplies for the City of Lidgerwood exceeded the maximum contaminant level for arsenic. Naturally occurring arsenic in shale found in the area also may have contributed to the contamination problem. Approximately 4,500 people reside in the area. In 1970, the residents of 278 homes in Lidgerwood that used private wells were considered to be at a health risk due to arsenic exposure. Presently, groundwater is used for agricultural and domestic purposes.

Site Responsibility: The site is being addressed through Federal and State actions.

NPL LISTING HISTORY
Proposed Date: 10/23/81
Final Date: 09/08/83

Threats and Contaminants

The groundwater was contaminated with arsenic as a result of the use of arsenic-based pesticides. Those who drank from private wells in the area could have been adversely affected prior to treatment. Public water supplies in several small cities have been made safe, including the Cities of Lidgerwood, Wyndmere, and Milnor.

Cleanup Approach

This site is being addressed in three stages: initial actions and two long-term remedial phases focusing on the cleanup of the rural areas water system and treatment of the water supplies of Lidgerwood and Wyndmere.

Response Action Status

Initial Actions: In 1986, 10,000 square feet of contaminated surface area were covered with clay. Individual water treatment units were installed in 116 private homes, and five residences were hooked up to a rural water supply system. Also, an abandoned bait station was cleaned up. In 1988 and 1989, the City of Lidgerwood's water treatment plant was repaired, and the filter sand was changed. A design to modify this treatment plant was approved by the EPA and the State.

Rural Areas Water System: Based on the results of the site investigation, the EPA expanded the hookup of homes to the existing rural water treatment and distribution system in Richland and evaluated institutional controls on well use and well drilling. Construction of this phase of the cleanup plan, begun in late 1989, has been completed. The City of Milnor was included as part of this phase in mid-1991.

Lidgerwood/Wyndmere: Based on the results of the site investigation, the EPA assisted the City of Lidgerwood with its efforts to improve the water treatment plant. Construction to improve the Lidgerwood water treatment plant began in 1989 and was completed in early 1991. In 1990, the City of Lidgerwood, the North Dakota State Department of Health, and the EPA conducted an inspection of the treatment plant and completed minor modifications as part of the now completed cleanup activities. The EPA also provided funds to the City of Wyndmere to increase its water treatment plant's capability to handle periods of high demand. Site work for the Wyndmere water treatment system was completed in 1991. This included monitoring of the treatment plant's operating procedures and equipment for one year, in coordination with the State, to ensure that the treatment plant consistently operated as designed and produced high quality, colorless drinking water. Treated water is now being pumped to residents of both cities.

Site Facts: In 1982, a Cooperative Agreement was awarded to the North Dakota State Department of Health to conduct site studies. In 1985, the State of North Dakota was awarded a second Cooperative Agreement to conduct an investigation into the nature and extent of site contamination as well as the most effective methods to clean up the site. Cleanup was initiated with the award of a third Cooperative Agreement to the State in March 1989.

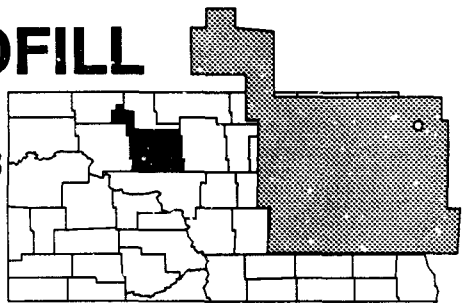
Environmental Progress

The EPA and the State have installed water treatment facilities and provided waterline hookups to affected residences. Construction of both city water treatment plants has been completed and is currently providing residents with safe drinking water. Additional activities resulted in waterline hookups being provided to all affected residences.

Site Repository

North Dakota State Library, Liberty Memorial Building, 604 East Boulevard, Bismarck, ND 58505

MINOT LANDFILL
NORTH DAKOTA
EPA ID# NDD980959548



EPA REGION 8
Ward County
Minot

Site Description

The 45-acre Minot Landfill, although privately owned, was operated by the City of Minot from 1962 to 1971. A 15-acre portion of the landfill received refuse from several nearby industries from 1962 to 1970. While the exact composition of the disposed materials is unknown, available sources indicate that municipal and industrial wastes, oily wastes, spent battery casings, calcium carbide, lime sludge from acetylene production, and wastes from the construction of nearby missile sites are probable elements of the wastes. Runoff from the site flows toward the Souris River, a source of drinking water for the City of Minot, which has a population of approximately 34,000 people. Additional residential and commercial development has been proposed for the area. The nearest home and business are approximately 750 feet from the site.

Site Responsibility: This site is being addressed through Federal and Municipal actions.

NPL LISTING HISTORY
Proposed Date: 06/24/88
Final Date: 03/24/89

Threats and Contaminants

Hazardous compounds detected in on-site groundwater include volatile organic compounds (VOCs), barium, and magnesium. Soils contain chlorinated organic pesticides and inorganic contaminants similar to those in the groundwater. Surface water analysis showed the presence of zinc, toluene, benzene compounds, and xylene. Potential risks may exist for individuals who touch or ingest the contaminated groundwater or leachate. The Souris River may be threatened by runoff from the site.

Cleanup Approach

This site is being addressed in two stages: an initial action and a long-term remedial phase focusing on cleanup of the entire site.

Response Action Status

Initial Action: The City of Minot installed a fence around the landfill in mid-1990. The City also introduced surface erosion control measures at the site to halt pesticide and metal contamination in the landfill, from seeping to the surface.

Entire Site: The City of Minot started an investigation in late 1990 to determine the extent of the groundwater contamination and to identify alternative technologies to clean up the groundwater and areas surrounding the site. Cleanup is scheduled to begin in 1993, after the scheduled completion of the site investigation.

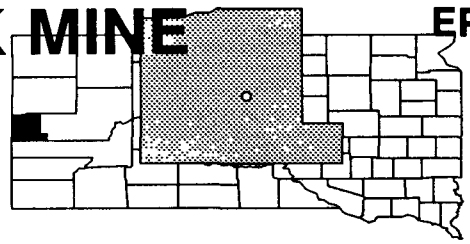
Environmental Progress

The installation of a fence has restricted access to the site and reduced the potential for exposure to hazardous substances at the Minot Landfill site. Surface erosion control measures have been completed to prevent the possible migration of contaminants to the Souris River, while further cleanup investigations are underway.

Site Repository

Minot Public Library, 516 Second Avenue, SW, Minot, ND 58701

ANNIE CREEK MINE TAILINGS
SOUTH DAKOTA
EPA ID# SDD987666013



EPA REGION 8
Lawrence County

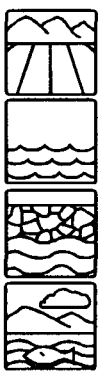
Site Description

The Annie Creek Mine Tailings site covers approximately 5 acres and is located in the Black Hills National Forest, 35 miles west of Lead, South Dakota. Between 1907 and 1916, gold ore was processed at the mine in a small cyanide mill. Tailings were disposed of in an impoundment at the head-waters of Annie Creek, where a timber crib dam was constructed. This impoundment is located approximately 2 miles up Annie Creek above its confluence with Spearfish Creek. High concentrations of arsenic have been detected in Annie Creek water and sediment. The current owner of the site stabilized the deteriorating timber crib dam with a rock buttress on its downstream side. In 1989, the EPA sampled tailings, springs, stream water, and sediment. This sampling detected arsenic in the tailings and in Annie Creek below the timber crib dam. Arsenic was also detected downstream in Spearfish Creek approximately 3 miles from the site. In 1990, in order to provide more space for disposal of waste rock from current mining operations, the owner constructed a french drain across the top of the old tailings to provide drainage from existing springs, constructed a low permeability sediment cap over the tailings and french drain, and began disposal of waste rock above the old tailings. All remnants of the old tailings impoundment and dam, and Annie Springs, are now buried beneath newly placed waste rock from current open pit mining operations. The mining operations have disturbed the entire head-water area of the upper Annie Creek watershed above the old tailings impoundment.

Site Responsibility: This site may be addressed through Federal and potentially responsibility parties' actions.

NPL LISTING HISTORY
Proposed Date: 07/29/91

Threats and Contaminants



On-site soils and sediments in Annie Creek and Spearfish Creek contain heavy metals such as arsenic, aluminum, cobalt, iron, manganese, mercury, nickel, selenium, silver, vanadium and zinc. The site investigation conducted in 1989 identified the major pathway of concern as surface water and the major contaminant of concern as arsenic. Both Annie Creek and Spearfish Creek are designated as trout spawning areas and Spearfish Creek is used for trout fishing.

Cleanup Approach

This site is being addressed through a long-term remedial phase focusing on cleanup of the entire site.

Response Action Status

Entire Site: An in-depth investigation is planned to determine the nature and extent of contamination problems at the site and will recommend the best strategies for cleanup.

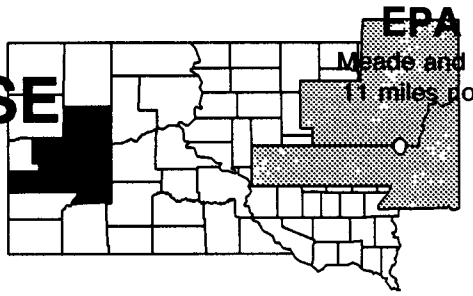
Environmental Progress

In October 1991, as part of the Make Sites Safe Program, the EPA reviewed the available information on the site and conducted a site inspection. Based on this information, the EPA determined that the Annie Creek Mine Tailings site is safe while further investigations are being planned.

Site Repository

Not established.

ELLSWORTH AIR FORCE BASE
SOUTH DAKOTA
EPA ID# SD2571924644



Site Description

The 4,858-acre Ellsworth Air Force Base was established in 1942 and is now the site of the 44th Strategic Missile Wing of the Strategic Air Command (SAC). Activities at the base generate a variety of chlorinated solvents, waste oils contaminated with solvents, pesticides, and other hazardous wastes that the Department of Defense (DOD) disposed of at various areas on the Base throughout its history of operations. Five contaminated areas at the Base have been identified. Of these, four are unlined landfills, and one is the burn pit for the Fire Protection Training area. The DOD has identified an additional seven contaminated areas on the site. Between 1987 and 1988, the U.S. Army Corps of Engineers monitored the groundwater on site and found that wells downslope from two landfills and the burn pit are contaminated with volatile organic compounds (VOCs) and heavy metals. Approximately 1,600 people obtain drinking water from wells within 3 miles of the site. The nearest surface water intake is approximately 6,400 feet from the site.

Site Responsibility: This site is being addressed through Federal actions.

NPL LISTING HISTORY
Proposed Date: 10/26/89
Final Date: 08/30/90

Threats and Contaminants

Groundwater, soil, and surface water on site are contaminated with VOCs and heavy metals including arsenic and chromium. People who drink contaminated surface water or groundwater could be exposed to site-related contaminants. Contamination of an off-site drinking water well was discovered in 1991. Bottled water has been provided to the residences with known contaminated wells.

Cleanup Approach

This site is being addressed in two stages: an immediate action and a long-term remedial phase focusing on cleanup of the entire site.

Response Action Status

Immediate Action: Contamination of an off-site drinking water well was discovered in 1991. The Air Force is providing bottled water to the affected residents until cleanup actions are completed.

Entire Site: The DOD will begin a four phase study of the nature and extent of contamination at the site in 1992. Interpretation of historical and remote sensing photographs has identified numerous possible contamination sources. The first phase is scheduled to be completed in 1994. Based on this study, cleanup methods will be selected to address site contamination by 1994.

Site Facts: Ellsworth Air Force Base is participating in the DODs Installation Restoration (IRP) Program, a specially funded program established by the DOD in 1978 to identify, investigate, and control the migration of hazardous contaminants at military and other DOD facilities.

Environmental Progress

The provision of bottled water has reduced the threat of exposure to contaminants from the Ellsworth Air Force Base site while studies and cleanup activities are being planned. A Federal Facility Agreement (FFA) was completed and became effective in April, 1992.

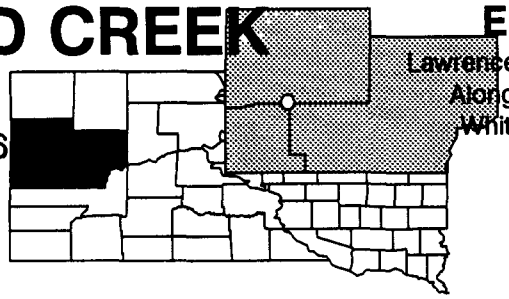
Site Repository

Not established.

WHITEWOOD CREEK

SOUTH DAKOTA

EPA ID# SDD980717136



EPA REGION 8

Lawrence, Meade, and Butte Counties
Along an 18-mile stretch of the
Whitewood Creek flood plain

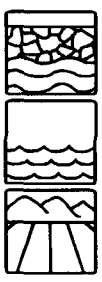
Site Description

The Whitewood Creek site contains approximately 22 million tons of mining-related wastes such as mine tailings containing toxic metals. Since the 1870s, millions of tons of mine waste have been discharged from gold mining operations and deposited along the Whitewood Creek flood plain. Wastes continued to be discharged to Whitewood Creek until 1977, when the only mine in the area that still followed this practice closed. The EPA has detected arsenic in shallow groundwater in amounts above the standards set for drinking water. Whitewood Creek contains low amounts of site-related contaminants, and local residents use it to water livestock and for fishing. Approximately 280 people live within a mile of the site. The site lies adjacent to the town of Whitewood.

Site Responsibility: This site is being addressed through Federal, State, and potentially responsible parties' actions.

NPL LISTING HISTORY
Proposed Date: 10/23/81
Final Date: 09/08/83

Threats and Contaminants



Surface water and soils contained heavy metals including arsenic, cadmium, chromium, lead, selenium, and cyanide. Soil also was contaminated with sulfates, and heavy metals were found in the groundwater. People could potentially have been exposed to site-related contaminants by drinking or touching contaminated groundwater, surface water, or soil. In 1974 and 1975, approximately 50 Holstein cattle from a dairy operation next to Whitewood Creek died of unknown causes. Later, a study conducted by the South Dakota State University showed that the cattle had died of arsenic poisoning, caused by eating corn contaminated with mining wastes.

Cleanup Approach

This site is being addressed in a single long-term remedial phase focusing on cleanup of the entire site.

Response Action Status

Entire Site: In 1990, the EPA selected a remedy to clean up the site which included: removing and covering the contaminated soil at the existing residential properties; continuing the monitoring of Whitewood Creek surface water quality; and establishing institutional controls to limit future uses of contaminated areas. The institutional controls involved continuing the ban on water wells in the 100-year flood plain, implementing zoning regulations to prohibit development in the tailings deposits areas, and instituting an educational program that informs future buyers of the condition of the properties within the site area. All cleanup actions were completed in 1992.

Site Facts: By 1977, Homestake Mining Company was the only operator continuing to discharge wastes into Whitewood Creek when other milling operations ceased. In 1982, the EPA, the South Dakota Department of Water and Natural Resources, and Homestake Mining Company entered into an agreement to conduct a study of the site. The study investigated the quality of surface waters, groundwater, soils, sediments, and vegetation in the site area and selected aquatic life of Whitewood Creek. A Consent Decree was signed in early 1991, in which Homestake agreed to pay past cleanup costs incurred by the EPA, to conduct the remaining cleanup activities, and to pay any future costs incurred by the EPA or the State.

Environmental Progress

By removing contaminated soil, capping the site, and instituting controls on the use of the area, the EPA has eliminated threats posed by the Whitewood Creek site. All cleanup activities have been completed and the EPA is moving the site towards deletion.

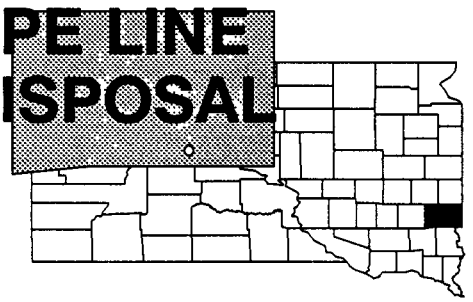
Site Repository

Rapid City Public Library, 610 Quincy Street, Rapid City, SD 55701

WILLIAMS PIPE LINE COMPANY DISPOSAL PIT

SOUTH DAKOTA

EPA ID# SDD000823559



EPA REGION 8

Minnehaha County
Sioux Falls

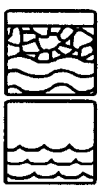
Site Description

The 50-acre Williams Pipe Line Company Disposal Pit site operated as a disposal pit in the 1970s for leaded stillbottoms and storage tank sludge. The facility was an unlined pit where the Company disposed of metals, oily wastes, pesticides, and solvents. The Company burned the wastes in the pit periodically until the 1970s. The pit now is dry and covered with a plastic sheet. From 1986 to 1987, the EPA tested the sediments in the pit for contaminants and determined that they contained volatile organic compounds (VOCs), heavy metals, pesticides, and polycyclic aromatic hydrocarbons (PAHs). The EPA found that groundwater near the pit is contaminated with pesticides and heavy metals. Approximately 33,500 people live within 3 miles of the site. Approximately 100,000 people in the Sioux Falls area obtain drinking water from two sets of public wells that are within 3 miles of the site. The site is directly west of a housing development and is 2 miles west of the Big Sioux River and Skunk River.

Site Responsibility: This site is being addressed through Federal, State, and potentially responsible parties' actions.

NPL LISTING HISTORY
Proposed Date: 10/26/89
Final Date: 08/30/90

Threats and Contaminants



Groundwater underlying the disposal pit contains pesticides and lead. Sediments in the pit are contaminated with various heavy metals, VOCs, PAHs, and pesticides. People in the site vicinity who use or come into direct contact with contaminated groundwater or sediments could be exposed to hazardous chemicals.

Cleanup Approach

This site is being addressed in a single long-term remedial phase focusing on cleanup of the entire site.

Response Action Status

Entire Site: A study into the nature and extent of contamination at the site began in early 1991. The EPA will use the results of this study to select cleanup technologies to address contaminated groundwater and sediments at the site.

Site Facts: An Administrative Order was signed by Williams Pipe Line in early 1991, requiring the company to conduct the site study. Williams Pipe Line has been conducting a cleanup of a petroleum release under a State Order. Efforts under this State Order will be evaluated as part of the site study that began in 1991.

Environmental Progress

The EPA performed preliminary studies and determined that no immediate actions are required at the Williams Pipe Line Company Disposal Pit site while investigations and cleanup activities are being planned.

Site Repository

Sioux Falls Public Library, 201 North Main Avenue, Sioux Falls, SD 57102

GLOSSARY

Terms Used in the NPL Book

This glossary defines terms used throughout the NPL Volumes. The terms and abbreviations contained in this glossary apply specifically to work performed under the Superfund program in the context of hazardous waste management. These terms may have other meanings when used in a different context. A table of common toxic chemicals found at NPL sites, their sources, and their potential threats is located on page G-15

Acids: Substances, characterized by low pH (less than 7.0), that are used in chemical manufacturing. Acids in high concentration can be very corrosive and react with many inorganic and organic substances. These reactions possibly may create toxic compounds or release heavy metal contaminants that remain in the environment long after the acid is neutralized.

Administrative Order On Consent: A legal and enforceable agreement between the EPA and the parties potentially responsible for site contamination. Under the terms of the Order, the potentially responsible parties (PRPs) agree to perform or pay for site studies or cleanups. It also describes the oversight rules, responsibilities, and enforcement options that the government may exercise in the event of non-compliance by potentially responsible parties. This Order is signed by PRPs and the government; it does not require approval by a judge.

Administrative Order [Unilateral]: A legally binding document issued by the EPA, directing the parties potentially responsible to perform site cleanups or studies (generally, the EPA does not issue Unilateral Orders for site studies). This type of Order is not signed by the PRPs and does not require approval by a judge.

Aeration: A process that promotes breakdown of contaminants in soil or water by exposing them to air.

Agency for Toxic Substances and Disease Registry (ATSDR): The Federal agency within the U.S. Public Health Service charged with carrying out the health-related responsibilities of CERCLA.

Air Stripping: A process whereby volatile organic chemicals (VOCs) are removed from contaminated material by forcing a stream of air through the contaminated material in a pressurized vessel. The contaminants are evaporated into the air stream. The air may be further treated before it is released into the atmosphere.

Ambient Air: Any unconfined part of the atmosphere. Refers to the air that may be inhaled by workers or residents in the vicinity of contaminated air sources.

Applicable or Relevant and Appropriate Requirements (ARARs): Federal, State, or local laws which apply to Superfund activities at NPL sites. Both emergency and long-term actions must comply with these laws or provide sound reasons for allowing a waiver. ARARs must be identified for each site relative to the characteristics of the site, the substances found at the site, or the cleanup alternatives being considered for the site.

GLOSSARY

Aquifer: An underground layer of rock, sand, or gravel capable of storing water within cracks and pore spaces, or between grains. When water contained within an aquifer is of sufficient quantity and quality, it can be tapped and used for drinking or other purposes. The water contained in the aquifer is called groundwater. A "sole source aquifer" supplies 50 percent or more of the drinking water of an area.

Artesian (Well): A well made by drilling into the earth until water is reached, which, due to internal pressure, flows up like a fountain.

Asbestos: A mineral fiber that can pollute air or water and is known to cause cancer or asbestosis when inhaled.

Attenuation: The naturally occurring process by which a compound is reduced in concentration over time through adsorption, degradation, dilution, or transformation.

Background Level: The amount of a substance typically found in the air, water, or soil from natural, as opposed to human, sources.

Baghouse Dust: Dust accumulated in removing particulates from the air by passing it through cloth bags in an enclosure.

Bases: Substances characterized by high pH (greater than 7.0), which tend to be corrosive in chemical reactions. When bases are mixed with acids, they neutralize each other, forming salts.

Berm: A ledge, wall, or a mound of earth used to prevent the migration of contaminants.

Bioaccumulate: The process by which some contaminants or toxic chemicals gradually collect and increase in concentration in living tissue, such as in plants, fish, or people, as they breathe contaminated air, drink contaminated water, or eat contaminated food.

Biological Treatment: The use of bacteria or other microbial organisms to break down toxic organic materials into carbon dioxide and water.

Bioremediation: A cleanup process using naturally occurring or specially cultivated microorganisms to digest contaminants and break them down into non-hazardous components.

Bog: A type of wetland that is covered with peat moss deposits. Bogs depend primarily on moisture from the air for their water source, are usually acidic, and are rich in plant residue [see Wetland].

Boom: A floating device used to contain oil floating on a body of water or to restrict the potential overflow of waste liquids from containment structures.

Borehole: A hole that is drilled into the ground and used to sample soil or ground-water.

Borrow Pit: An excavated area where soil, sand, or gravel has been dug up for use elsewhere.

Cap: A layer of material, such as clay or a synthetic material, used to prevent rainwater from penetrating and spreading contaminated materials. The surface of the cap generally is mounded or sloped so water will drain off.

Carbon Adsorption: A treatment system in which contaminants are removed from groundwater and surface water by forcing water through tanks containing activated carbon, a specially treated material that attracts and holds or retains contaminants.

Carbon Disulfide: A degreasing agent formerly used extensively for parts washing. This compound has both inorganic and organic

properties, which increase cleaning efficiency. However, these properties also cause chemical reactions that increase the hazard to human health and the environment.

Carbon Treatment: [see Carbon Adsorption].

Cell: In solid waste disposal, one of a series of holes in a landfill where waste is dumped, compacted, and covered with layers of dirt.

CERCLA: [see Comprehensive Environmental Response, Compensation, and Liability Act].

Characterization: The sampling, monitoring, and analysis of a site to determine the extent and nature of toxic releases. Characterization provides the basis for acquiring the necessary technical information to develop, screen, analyze, and select appropriate cleanup techniques.

Chemical Fixation: The use of chemicals to bind contaminants, thereby reducing the potential for leaching or other movement.

Chromated Copper Arsenate: An insecticide/herbicide formed from salts of three toxic metals: copper, chromium, and arsenic. This salt is used extensively as a wood preservative in pressure-treating operations. It is highly toxic and water-soluble, making it a relatively mobile contaminant in the environment.

Cleanup: Actions taken to eliminate a release or threat of release of a hazardous substance. The term "cleanup" sometimes is used interchangeably with the terms remedial action, removal action, response action, or corrective action.

Closure: The process by which a landfill stops accepting wastes and is shut down under Federal guidelines that ensure the protection of the public and the environment.

Comment Period: A specific interval during which the public can review and comment on various documents and EPA actions related to site cleanup. For example, a comment period is provided when the EPA proposes to add sites to the NPL. Also, there is minimum 3-week comment period for community members to review and comment on the remedy proposed to clean up a site.

Community Relations: The EPA effort to establish and maintain two-way communication with the public. The goals of community relations programs include creating an understanding of EPA programs and related actions, assuring public input into decision-making processes related to affected communities, and making certain that the Agency is aware of, and responsive to, public concerns. Specific community relations activities are required in relation to Superfund cleanup actions [see Comment Period].

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): Congress enacted the CERCLA, known as Superfund, in 1980 to respond directly to hazardous waste problems that may pose a threat to the public health and the environment. The EPA administers the Superfund program.

Confluence: The place where two bodies of water, such as streams or rivers, come together.

Confined Aquifer: An aquifer in which groundwater is confined under pressure that is significantly greater than atmospheric pressure.

Consent Decree: A legal document, approved and issued by a judge, formalizing an agreement between the EPA and the parties potentially responsible for site contamination. The decree describes cleanup actions that the potentially responsible parties are required to perform, or the costs incurred by the government that the parties will reimburse, and the roles, responsibilities, and enforcement options that the government may exercise in the event of non-compliance by potentially responsible parties. If a settlement between the EPA and a potentially responsible party includes cleanup actions, it must be in the form of a Consent Decree. A Consent Decree is subject to a public comment period.

Consent Order: [see Administrative Order on Consent].

Containment: The process of enclosing or containing hazardous substances in a structure, typically in a pond or a lagoon, to prevent the migration of contaminants into the environment.

Contaminant: Any physical, chemical, biological, or radiological material or substance whose quantity, location, or nature produces undesirable health or environmental effects.

Contingency Plan: A document setting out an organized, planned, and coordinated course of action to be followed in case of a fire, explosion, or other accident that releases toxic chemicals, hazardous wastes, or radioactive materials into the environment.

Cooperative Agreement: A contract between the EPA and the States, wherein a State agrees to manage or monitor certain site cleanup responsibilities and other activities on a cost-sharing basis.

Cost Recovery: A legal process by which potentially responsible parties can be required to pay back the Superfund program for money it spends on any cleanup actions [see Potentially Responsible Parties].

Cover: Vegetation or other material placed over a landfill or other waste material. It can be designed to reduce movement of water into the waste and to prevent erosion that could cause the movement of contaminants.

Creosotes: Chemicals used in wood preserving operations and produced by distillation of tar, including polycyclic aromatic hydrocarbons and polynuclear aromatic hydrocarbons [see PAHs and PNAs]. Contaminating sediments, soils, and surface water, creosotes may cause skin ulcerations and cancer through prolonged exposure.

Culvert: A pipe used for drainage under a road, railroad track, path, or through an embankment.

Decommission: To revoke a license to operate and take out of service.

Degradation: The process by which a chemical is reduced to a less complex form.

Degrease: To remove grease from wastes, soils, or chemicals, usually using solvents.

Deletion: A site is eligible for deletion from the NPL when Superfund response actions at the site are complete. A site is deleted from the NPL when a notice is published in the Federal Register.

De minimis: This legal phrase pertains to settlements with parties who contributed small amounts of hazardous waste to a site. This process allows the EPA to settle with small, or *de minimis* contributors, as a single group rather than as individuals, saving time, money, and effort.

Dewater: To remove water from wastes, soils, or chemicals.

Dike: A low wall that can act as a barrier to prevent a spill from spreading.

Dioxin: An organic chemical by-product of pesticide manufacture which is known to be one of the most toxic man-made chemicals.

Disposal: Final placement or destruction of toxic, radioactive, or other wastes; surplus or banned pesticides or other chemicals; polluted soils; and drums containing hazardous materials. Disposal may be accomplished through the use of approved secure landfills, surface impoundments, land farming, deep well injection, or incineration.

Downgradient: A downward hydrologic slope that causes groundwater to move toward lower elevations. Therefore, wells *downgradient* of a contaminated groundwater source are prone to receiving pollutants.

Ecological Assessment: A study of the impact of man-made or natural activity on living creatures and their environment.

Effluent: Wastewater, treated or untreated, that flows out of a treatment plant, sewer, or industrial outfall. Generally refers to wastes discharged into surface waters.

Emission: Pollution discharged into the atmosphere from smokestacks, other vents, and surface areas of commercial or industrial facilities.

Emulsifiers: Substances that help in mixing materials that do not normally mix; e.g., oil and water.

Endangerment Assessment: A study conducted to determine the risks posed to public health or the environment by contamination at NPL sites. The EPA or the State conducts the study when a legal action is to be taken to direct the potentially responsible parties to clean up a site or pay for the cleanup. An endangerment assessment supplements an investigation of the site hazards.

Enforcement: EPA, State, or local legal actions taken against parties to facilitate settlements; to compel compliance with laws, rules, regulations, or agreements; or to obtain penalties or criminal sanctions for violations. Enforcement procedures may vary, depending on the specific requirements of different environmental laws and related regulatory requirements. Under CERCLA, for example, the EPA will seek to require potentially responsible parties to clean up a Superfund site or pay for the cleanup [see Cost Recovery].

Erosion: The wearing away of land surface by wind or water. Erosion occurs naturally from weather or surface runoff, but can be intensified by such land-related practices as farming, residential or industrial development, road building, or timber-cutting. Erosion may spread surface contamination to off-site locations.

Estuary (estuarine): Areas where fresh water from rivers and salt water from nearshore ocean waters are mixed. These areas may include bays, mouths of rivers, salt marshes, and lagoons. These water ecosystems shelter and feed marine life, birds, and wildlife.

Evaporation Ponds: Areas where sewage sludge or other watery wastes are dumped and allowed to dry out.

Feasibility Study: The analysis of the potential cleanup alternatives for a site. The feasibility study usually starts as soon as the remedial investigation is underway. In this volume, the feasibility study is referred to as a site study [see also Remedial Investigation].

Filtration: A treatment process for removing solid (particulate) matter from water by passing the water through sand, activated carbon, or a man-made filter. The process is often used to remove particles that contain contaminants.

Flood Plain: An area along a river, formed from sediment deposited by floods. Flood plains periodically are innundated by natural floods, which can spread contamination.

Flue Gas: The air that is emitted from a chimney after combustion in the burner occurs. The gas can include nitrogen oxides, carbon oxides, water vapor, sulfur oxides, particles, and many chemical pollutants.

Fly Ash: Non-combustible residue that results from the combustion of flue gases. It can include nitrogen oxides, carbon oxides, water vapor, sulfur oxides, as well as many other chemical pollutants.

French Drain System: A crushed rock drain system constructed of perforated pipes, which is used to drain and disperse wastewater.

Gasification (coal): The conversion of soft coal into gas for use as a fuel.

General Notice Letter: [See Notice Letter].

Generator: A facility that emits pollutants into the air or releases hazardous wastes into water or soil.

Good Faith Offer: A voluntary offer, generally in response to a Special Notice letter, made by a potentially responsible party, consisting of a written proposal demonstrating a potentially responsible party's qualifications and willingness to perform a site study or cleanup.

Groundwater: Water that fills pores in soils or openings in rocks to the point of saturation. In aquifers, groundwater occurs in sufficient quantities for use as drinking and irrigation water and other purposes.

Groundwater Quality Assessment: The process of analyzing the chemical characteristics of groundwater to determine whether any hazardous materials exist.

Halogens: Reactive non-metals, such as chlorine and bromine. Halogens are very good oxidizing agents and, therefore, have many industrial uses. They are rarely found by themselves; however, many chemicals such as polychlorinated biphenyls (PCBs), some volatile organic compounds (VOCs), and dioxin are reactive because of the presence of halogens.

Hazard Ranking System (HRS): The principal screening tool used by the EPA to evaluate relative risks to public health and the environment associated with abandoned or uncontrolled hazardous waste sites. The HRS calculates a score based on the potential of hazardous substances spreading from the site through the air, surface water, or groundwater and on other factors such as nearby population. The HRS score is the primary factor in deciding if the site should be on the NPL.

Hazardous Waste: By-products of society that can pose a substantial present or potential hazard to human health and the environment when improperly managed. Hazardous waste possesses at least one of four characteristics (ignitability, corrosivity, reactivity, or toxicity), or appears on special EPA lists.

Heavy Metals: Metallic elements with high atomic weights, such as arsenic, lead, mercury, and cadmium. Heavy metals are very hazardous even at low concentrations and tend to accumulate in the food chain.

Herbicide: A chemical pesticide designed to control or destroy plants, weeds, or grasses.

Hot Spot: An area or vicinity of a site containing exceptionally high levels of contamination.

Hydrocarbons: Chemical compounds that consist entirely of hydrogen and carbon.

Hydrology: The properties, distribution, and circulation of water.

Hydrogeology: The geology of groundwater, with particular emphasis on the chemistry and movement of water.

Impoundment: A body of water or sludge confined by a dam, dike, floodgate, or other barrier.

Incineration: A group of treatment technologies involving destruction of waste by controlled burning at high temperatures, e.g., burning sludge to reduce the remaining residues to a non-burnable ash that can be disposed of safely on land, in some waters, or in underground locations.

Infiltration: The movement of water or other liquid down through soil from precipitation (rain or snow) or from application of wastewater to the land surface.

Influent: Water, wastewater, or other liquid flowing into a reservoir, basin, or treatment plant.

Injection Well: A well into which waste fluids are placed, under pressure, for purposes of disposal.

Inorganic Chemicals: Chemical substances of mineral origin, not of basic carbon structure.

Installation Restoration Program: The specially funded program established in 1978 under which the Department of Defense has been identifying and evaluating its hazardous waste sites and controlling the migration of hazardous contaminants from those sites.

Intake: The source from where a water supply is drawn, such as from a river or water body.

Interagency Agreement: A written agreement between the EPA and a Federal agency that has the lead for site cleanup activities, setting forth the roles and responsibilities of the agencies for performing and overseeing the activities. States often are parties to interagency agreements.

Interim (Permit) Status: Conditions under which hazardous waste treatment, storage, and disposal facilities, that were operating when regulations under the RCRA became final in 1980, are temporarily allowed by the EPA to continue to operate while awaiting denial or issuance of a permanent permit. The facility must comply with certain regulations to maintain interim status.

Lagoon: A shallow pond or liquid waste containment structure. Lagoons typically are used for the storage of wastewaters, sludges, liquid wastes, or spent nuclear fuel.

Landfarm: To apply waste to land or incorporate waste into the surface soil, such as fertilizer or soil conditioner. This practice commonly is used for disposal of composted wastes and sludges.

Landfill: A disposal facility where waste is placed in or on land. *Sanitary* landfills are disposal sites for non-hazardous solid wastes. The waste is spread in layers, compacted to the smallest practical volume, and covered with soil at the end of each operating day. Secure *chemical* landfills are disposal sites for hazardous waste. They are designed to minimize the chance of release of hazardous substances into the environment [see Resource Conservation and Recovery Act].

Leach, Leaching [v.t.]: The process by which soluble chemical components are dissolved and carried through soil by water or some other percolating liquid.

Leachate [n]: The liquid that trickles through or drains from waste, carrying soluble components from the waste.

Leachate Collection System: A system that gathers liquid that has leaked into a landfill or other waste disposal area and pumps it to the surface for treatment.

Liner: A relatively impermeable barrier designed to prevent leachate (waste residue) from leaking from a landfill. Liner materials include plastic and dense clay.

Long-term Remedial Phase: Distinct, often incremental, steps that are taken to solve site pollution problems. Depending on the complexity, site cleanup activities can be separated into several of these phases.

Long-term Response Action: An action which requires a continuous period of on-site activity before cleanup goals are achieved. These actions typically include the extraction and treatment of groundwater and monitoring actions.

Marsh: A type of wetland that does not contain peat moss deposits and is dominated by vegetation. Marshes may be either fresh or saltwater and tidal or non-tidal [see Wetland].

Migration: The movement of oil, gas, contaminants, water, or other liquids through porous and permeable soils or rock.

Mill Tailings: [See Mine Tailings].

Mine Tailings: A fine, sandy residue left from mining operations. Tailings often contain high concentrations of lead, uranium, and arsenic or other heavy metals.

Mitigation: Actions taken to improve site conditions by limiting, reducing, or controlling toxicity and contamination sources.

Modeling: A technique using a mathematical or physical representation of a system or theory that tests the effects that changes on system components have on the overall performance of the system.

Monitoring Wells: Special wells drilled at specific locations within, or surrounding, a hazardous waste site where groundwater can be sampled at selected depths and studied to obtain such information as the direction in which groundwater flows and the types and amounts of contaminates present.

National Priorities List (NPL): The EPA's list of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term cleanup under Superfund. The EPA is required to update the NPL at least once a year.

Natural Attenuation: [See Attenuation].

Neutrals: Organic compounds that have a relatively neutral pH, complex structure and, due to their organic bases, are easily absorbed into the environment. Water is the most commonly known neutral, however, naphthalene, pyrene, and trichlorobenzene also are examples of neutrals.

Nitroaromatics: Common components of explosive materials, which will explode if activated by very high temperatures or pressures; 2,4,6-Trinitrotoluene (TNT) is a nitroaromatic.

Notice Letter: A General Notice Letter notifies the parties potentially responsible for site contamination of their possible liability. A Special Notice Letter begins a 60-day formal period of negotiation during which the EPA is not allowed to start work at a site or initiate enforcement actions against potentially responsible parties, although the EPA may undertake certain investigatory and planning activities.

The 60-day period may be extended if the EPA receives a good faith offer from the PRPs within that period. [See also Good Faith Offer].

On-Scene Coordinator (OSC): The predesignated EPA, Coast Guard, or Department of Defense official who coordinates and directs Superfund removal actions or Clean Water Act oil- or hazardous-spill corrective actions.

Operation and Maintenance: Activities conducted at a site after a cleanup action is completed to ensure that the cleanup or containment system is functioning properly.

Organic Chemicals/Compounds: Chemical substances containing mainly carbon, hydrogen, and oxygen.

Outfall: The place where wastewater is discharged into receiving waters.

Overpacking: Process used for isolating large volumes of waste by jacketing or encapsulating waste to prevent further spread or leakage of contaminating materials. Leaking drums may be contained within oversized barrels as an interim measure prior to removal and final disposal.

Pentachlorophenol (PCP): A synthetic, modified petrochemical that may be used as a wood preservative because of its toxicity to termites and fungi. It is a common component of creosotes and can cause cancer.

Perched (groundwater): Groundwater separated from another underlying body of groundwater by a confining layer, often clay or rock.

Percolation: The downward flow or filtering of water or other liquids through subsurface rock or soil layers, usually continuing downward to groundwater.

Pesticide: A substance or mixture of substances intended to prevent, destroy, or repel any pest. If misused, pesticides can accumulate in the foodchain and contaminate the environment.

Petrochemicals: Chemical substances produced from petroleum in refinery operations and as fuel oil residues. These include fluoranthene, chrysene, mineral spirits, and refined oils. Petrochemicals are the bases from which volatile organic compounds (VOCs), plastics, and many pesticides are made. These chemical substances often are toxic to humans and the environment.

Phenols: Organic compounds that are used in plastics manufacturing and are by-products of petroleum refining, tanning, textile, dye, and resin manufacturing. Phenols are highly poisonous.

Physical Chemical Separation: The treatment process of adding a chemical to a substance to separate the compounds for further treatment or disposal.

Pilot Testing: A small-scale test of a proposed treatment system in the field to determine its ability to clean up specific contaminants.

Plugging: The process of stopping the flow of water, oil, or gas into or out of the ground through a borehole or well penetrating the ground.

Plume: A body of contaminated groundwater flowing from a specific source. The movement of the groundwater is influenced by such factors as local groundwater flow patterns, the character of the aquifer in which groundwater is contained, and the density of contaminants [see Migration].

Pollution: Generally, the presence of matter or energy whose nature, location, or quantity produces undesired health or environmental effects.

Polycyclic Aromatic Hydrocarbons or Polyaromatic Hydrocarbons (PAHs): PAHs, such as pyrene, are a group of highly reactive organic compounds found in motor oil. They are a common component of creosotes and can cause cancer.

Polychlorinated Biphenyls (PCBs): A group of toxic chemicals used for a variety of purposes including electrical applications, carbonless copy paper, adhesives, hydraulic fluids, microscope immersion oils, and caulking compounds. PCBs also are produced in certain combustion processes. PCBs are extremely persistent in the environment because they are very stable, non-reactive, and highly heat resistant. Chronic exposure to PCBs is believed to cause liver damage. It also is known to bioaccumulate in fatty tissues. PCB use and sale was banned in 1979 with the passage of the Toxic Substances Control Act.

Polynuclear Aromatic Hydrocarbons (PNAs): PNAs, such as naphthalene, and biphenyls, are a group of highly reactive organic compounds that are a common component of creosotes, which can be carcinogenic.

Polyvinyl Chloride (PVC): A plastic made from the gaseous substance vinyl chloride. PVC is used to make pipes, records, raincoats, and floor tiles. Health risks from high concentrations of vinyl chloride include liver cancer and lung cancer, as well as cancer of the lymphatic and nervous systems.

Potable Water: Water that is safe for drinking and cooking.

Potentially Responsible Parties (PRPs): Parties associated with a Superfund site who may be liable for the cost of remedying the release of hazardous substances. This may include owners or operators of the site or transporters who disposed of materials at the site. PRPs may admit liability, or liability may be determined by a court of law. PRPs may sign a Consent Decree or Administrative Order on Consent to participate in the site cleanup without admitting liability.

Precipitation: The removal of solids from liquid waste so that the solid and liquid portions can be disposed of safely; the removal of particles from airborne emissions. Electrochemical precipitation is the use of an anode or cathode to remove the hazardous chemicals. Chemical precipitation involves the addition of some substance to cause the solid portion to separate.

Preliminary Assessment: The process of collecting and reviewing available information about a known or suspected waste site or release to determine if a threat or potential threat exists.

Pump and Treat: A groundwater cleanup technique involving the extracting of contaminated groundwater from the subsurface and the removal of contaminants, using one of several treatment technologies.

Radionuclides: Elements, including radium and uranium-235 and -238, which break down and produce radioactive substances due to their unstable atomic structure. Some are man-made, and others are naturally occurring in the environment. Radon, the gaseous form of radium, decays to form alpha particle radiation, which cannot be absorbed through skin. However, it can be inhaled, which allows alpha particles to affect unprotected tissues directly and thus cause cancer. Radiation also occurs naturally through the breakdown of granite.

RCRA: [See Resource Conservation and Recovery Act].

Recharge Area: A land area where rainwater saturates the ground and soaks through the earth to reach an aquifer.

Record of Decision (ROD): A public document that explains which cleanup alternative(s) will be used to clean up sites listed on the NPL. It is based on information generated during the remedial investigation and feasibility study and consideration of public comments and community concerns.

Recovery Wells: Wells used to withdraw contaminants or contaminated groundwater.

Recycle: The process of minimizing waste generation by recovering usable products that might otherwise become waste.

Remedial Action (RA): The actual construction or implementation phase of a Superfund site cleanup following the remedial design [see Cleanup].

Remedial Design: A phase of site cleanup where engineers design the technical specifications for cleanup remedies and technologies.

Remedial Investigation: An in-depth study designed to gather the data necessary to determine the nature and extent of contamination at a Superfund site, establish the criteria for cleaning up the site, identify the preliminary alternatives for cleanup actions, and support the technical and cost analyses of the alternatives. The remedial investigation is usually done with the feasibility study. In this volume, the remedial investigation is referred to as a site study [see also Feasibility Study].

Remedial Project Manager (RPM): The EPA or State official responsible for overseeing cleanup actions at the site.

Remedy Selection: The selection of the final cleanup strategy for the site. At the few sites where the EPA has determined that initial response actions have eliminated site contamination, or that any remaining contamination will be naturally dispersed without further cleanup activities, a "No Action" remedy is selected [see Record of Decision].

Removal Action: Short-term immediate actions taken to address releases of hazardous substances [see Cleanup].

Residual: The amount of a pollutant remaining in the environment after a natural or technological process has taken place, e.g., the sludge remaining after initial wastewater treatment, or the particulates remaining in air after the air passes through a scrubber.

Resource Conservation and Recovery Act (RCRA): A Federal law that established a regulatory system to track hazardous substances from the time of generation to disposal. The law requires safe and secure procedures to be used in treating, transporting, storing, and disposing of hazardous substances. RCRA is designed to prevent new, uncontrolled hazardous waste sites.

Retention Pond: A small body of liquid used for disposing of wastes and containing overflow from production facilities. Sometimes retention ponds are used to expand the capacity of such structures as lagoons the store waste.

Runoff: The discharge of water over land into surface water. It can carry pollutants from the air and land and spread contaminants from its source.

Scrubber: An air pollution control device that uses a spray of water or reactant or a dry process to trap pollutants in emissions.

Sediment: The layer of soil, sand, and minerals at the bottom of surface waters such as streams, lakes, and rivers, that absorbs contaminants.

Seeps: Specific points where releases of liquid, usually leachate, form from waste disposal areas, particularly along the lower edges of landfills.

Seepage Pits: A hole, shaft, or cavity in the ground used for the storage of liquids, usually in the form of leachate, from waste disposal areas. The liquid gradually leaves the pit by moving through the surrounding soil.

Septage: Residue remaining in a septic tank after the treatment process.

Sinkhole: A hollow depression in the land surface in which drainage collects; associated with underground caves and passages that facilitate the movement of liquids.

Site Characterization: The technical process used to evaluate the nature and extent of environmental contamination, which is necessary for choosing and designing cleanup measures and monitoring their effectiveness.

Site Inspection: The collection of information from a hazardous waste site to determine the extent and severity of hazards posed by the site. It follows, and is more extensive than, a preliminary assessment. The purpose is to gather information necessary to score the site, using the Hazard Ranking System, and to determine if the site presents an immediate threat that requires a prompt removal action.

Slag: The fused refuse or dross separated from a metal in the process of smelting.

Sludge: Semi-solid residues from industrial or water treatment processes that may be contaminated with hazardous materials.

Slurry Wall: Barriers used to contain the flow of contaminated groundwater or subsurface liquids. Slurry walls are constructed by digging a trench around a contaminated area and filling the trench with an impermeable material that prevents water from passing through it. The groundwater or contaminated liquids trapped within the area surrounded by the slurry wall can be extracted and treated.

Smelter: A facility that melts or fuses ore, often with an accompanying chemical change, to separate the metal. Emissions from smelters are known to cause pollution.

Soil Gas: Gaseous elements and compounds that occur in the small spaces between particles of soil. Such gases can move through or leave the soil or rock, depending on changes in pressure.

Soil Vapor Extraction: A treatment process that uses vacuum wells to remove hazardous gases from soil.

Soil Washing: A water-based process for mechanically scrubbing soils in-place to remove undesirable materials. There are two approaches: dissolving or suspending them in the wash solution for later treatment by conventional methods, and concentrating them into a smaller volume of soil through simple particle size separation techniques [see Solvent Extraction].

Stabilization: The process of changing an active substance into inert, harmless material, or physical activities at a site that act to limit the further spread of contamination without actual reduction of toxicity.

Solidification/Stabilization: A chemical or physical reduction of the mobility of hazardous constituents. Mobility is reduced through the binding of hazardous constituents into a solid mass with low permeability and resistance to leaching.

Solvent: A substance capable of dissolving another substance to form a solution. The primary uses of industrial solvents are as cleaners for degreasing, in paints, and in pharmaceuticals. Many solvents are flammable and toxic to varying degrees.

Solvent Extraction: A means of separating hazardous contaminants from soils, sludges, and sediment, thereby reducing the volume of the hazardous waste that must be treated. It generally is used as one in a series of unit operations. An organic chemical is used to dissolve contaminants as opposed to water-based compounds, which usually are used in soil washing.

Sorption: The action of soaking up or attracting substances. It is used in many pollution control systems.

Special Notice Letter: [See Notice Letter].

Stillbottom: Residues left over from the process of recovering spent solvents.

Stripping: A process used to remove volatile contaminants from a substance [see Air Stripping].

Sumps: A pit or tank that catches liquid runoff for drainage or disposal.

Superfund: The program operated under the legislative authority of the CERCLA and Superfund Amendments and Reauthorization Act (SARA) to update and improve environmental laws. The program has the authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health, welfare, or the environment. The "Superfund" is a trust fund that finances cleanup actions at hazardous waste sites.

Surge Tanks: A holding structure used to absorb irregularities in flow of liquids, including liquid waste materials.

Swamp: A type of wetland that is dominated by woody vegetation and does not accumulate peat moss deposits. Swamps may be fresh or saltwater and tidal or non-tidal [see Wetlands].

Thermal Treatment: The use of heat to remove or destroy contaminants from soil.

Treatability Studies: Testing a treatment method on contaminated groundwater, soil, etc., to determine whether and how well the method will work.

Trichloroethylene (TCE): A stable, colorless liquid with a low boiling point. TCE has many industrial applications, including use as a solvent and as a metal degreasing agent. TCE may be toxic to people when inhaled, ingested, or through skin contact and can damage vital organs, especially the liver [see Volatile Organic Compounds].

Unilateral [Administrative] Order: [see Administrative Order].

Upgradient: An upward hydrologic slope; demarks areas that are higher than contaminated areas and, therefore, are not prone to contamination by the movement of polluted groundwater.

Vacuum Extraction: A technology used to remove volatile organic compounds (VOCs) from soils. Vacuum pumps are connected to a series of wells drilled to just above the water table. The wells are sealed tightly at the soil surface, and the vacuum established in the soil draws VOC-contaminated air from the soil pores into the well, as fresh air is drawn down from the surface of the soil.

Vegetated Soil Cap: A cap constructed with graded soils and seed for vegetative growth, to prevent erosion [see Cap].

Vitrification: The process of electrically melting wastes and soils or sludges to bind the waste in a glassy, solid material more durable than granite or marble and resistant to leaching.

Volatile Organic Compounds (VOCs): VOCs are manufactured as secondary petrochemicals. They include light alcohols, acetone, trichloroethylene, perchloroethylene, dichloroethylene, benzene, vinyl chloride, toluene, and methylene chloride. These potentially toxic chemicals are used as solvents, degreasers, paints, thinners, and fuels. Because of their volatile nature, they readily evaporate into the air, increasing the potential exposure to humans. Due to their low water solubility, environmental persistence, and widespread industrial use, they are commonly found in soil and groundwater.

Waste Treatment Plant: A facility that uses a series of tanks, screens, filters, and other treatment processes to remove pollutants from water.

Wastewater: The spent or used water from individual homes or industries.

Watershed: The land area that drains into a stream or other water body.

Water Table: The upper surface of the groundwater.

Weir: A barrier to divert water or other liquids.

Wetland: An area that is regularly saturated by surface or groundwater and, under normal circumstances, is capable of supporting vegetation typically adapted for life in saturated soil conditions. Wetlands are critical to sustaining many species of fish and wildlife. Wetlands generally include swamps, marshes, and bogs. Wetlands may be either coastal or inland. Coastal wetlands have salt or brackish (a mixture of salt and fresh) water, and most have tides, while inland wetlands are non-tidal and freshwater. Coastal wetlands are an integral component of estuaries.

Wildlife Refuge: An area designated for the protection of wild animals, within which hunting and fishing are either prohibited or strictly controlled.

Some Common Contaminants at NPL Sites

Contaminant Category	Example Chemical Types	Sources	Potential Health Threats*
Heavy Metals	Arsenic, Barium, Beryllium, Cadmium, Cobalt, Copper, Chromium, Lead, Manganese, Mercury, Nickel, Silver, Selenium, Zinc	Electroplating, batteries, paint pigments, photography, smelting, thermometers, fluorescent lights, solvent recovery	Tumors, cancers, and kidney, brain, neurological, bone and liver damage
Volatile Organic Compounds (VOCs)	Trichloroethylene (TCE), Perchloroethylene (PCE), Acetone, Benzene, Ketone, Methyl chloride, Toluene, Vinyl Chloride, Dichlorethylene	Solvents and degreasers, gasoline octane enhancers, oils and paints, dry cleaning fluids, chemical manufacturing.	Cancers, kidney and liver damage, impairment of the nervous system resulting in sleepiness and headaches, leukemia
Pesticides/ Herbicides	Chlordane, DDT 4-4, DDE, Heptachlor, Aldrin, Endrin, Atrazine, Dieldrin, Toxaphene	Agricultural applications, pesticide and herbicide production	Various effects ranging from nausea to nervous disorders. Dioxin is a common by-product of the manufacture of pesticides and is both highly toxic and a suspected carcinogen.
Polychlorinated biphenyls (PCBs)	—	Electric transformers and capacitors, insulators and coolants, adhesives, caulking compounds, carbonless copy paper, hydraulic fluids.	Cancer and liver damage.
Creosotes	Polyaromatic hydrocarbons (PAHs), Polynuclear aromatics (PNAs), Phenolic Tars, Pentachlorophenol (PCP)	Wood preserving, fossil fuel combustion	Cancers and skin ulcerations with prolonged exposure
Radiation (Radionuclides)	Radium-226, Radon, Uranium-235, Uranium-238	Mine tailings, radium products, natural decay of granites	Cancer

Sources: *Toxic Chemicals—What They Are, How They Affect You (EPA, Region 5)*
Glossary of Environmental Terms (EPA, 1988)

**The potential for risk due to these contaminants is linked to a number of factors; for example, the length and level of exposure and environmental and health factors such as age.*

* U.S. G.P.O.:1993-341-835:81048