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Superfund's Remedial Response Program



In the 1970's, the United States made dramatic improvements in the quality of its air and water. In the 1980's, the Nation is pursuing additional environmental improvements of major significance:

- It has begun to control the hazardous waste by-products of its vast industrial complex.
- It is cleaning its land of hazardous wastes carelessly disposed of in the past.

The Resource Conservation and Recovery Act of 1976 (RCRA) established a regulatory system under which the States track hazardous wastes from the time of generation to disposal. RCRA requires safe and secure procedures to be used in treating, storing, and disposing of hazardous wastes. RCRA was designed to prevent the creation of new Love Canals, but it did not give general authority to the Federal or State governments to respond directly to problems caused by the uncontrolled hazardous

waste disposal sites already in existence. The Federal government had been able to respond to some of those problems under the Clean Water Act (CWA), which authorized EPA and the U.S. Coast Guard to take action when spills and accidents involving oil or some 300 hazardous substances threatened navigable waters. But CWA did not permit the government to act when hazardous substances were released elsewhere into the environment.

The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) — commonly known as the "Superfund" law — was passed to provide the needed general authority and to establish a Trust Fund for Federal and State governments to respond directly to any problems at uncontrolled hazardous waste disposal sites — not only in emergency situations, but also at sites where longer-term permanent remedies are required.

CERCLA filled the gap in the national system to protect public health and the environment from hazardous substances by authorizing Federal action to respond to the release (or threatened release) from any source, including abandoned hazardous waste sites, into any part of the environment.

Costs of this response are to be financed by the Trust Fund, which is supported largely by taxes on producers and importers of petroleum and 42 basic chemicals. Over the 5-year expected lifespan of this "Superfund," \$1.6 billion is to be collected, 86 percent from industry and the remainder from Federal appropriations.

Under the Superfund program, U. S. land can thus be freed of the most threatening of its abandoned wastes, the leaking drums, the contaminated soil. At the same time, the quality of the Nation's air and water resources will be significantly improved.

Superfund's Remedial Response Program

The blueprint for the Superfund program under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) is the National Contingency Plan (NCP), first published in 1968 as part of the Federal water pollution control program. CERCLA ordered revision of the NCP to provide new Federal authority to respond to the problems of abandoned or uncontrolled hazardous waste disposal sites and to a greater range of hazardous substances than previously controlled. In con-

sultation with 13 Federal agencies, EPA published the NCP in final form on July 16, 1982.

Oil spills will continue to be handled as they have been in the past. For spills threatening coastal waters, the Coast Guard takes the lead responsibility; for inland spills, EPA takes the lead.

The CERCLA-based NCP lays out three types of responses for incidents involving hazardous substances.

- *Immediate removal*, which requires prompt response to prevent immediate and significant harm to human life, health, or the environment. Generally, immediate removals must be completed in 6 months or after expenditure of \$1 million.

- *Planned removal*, which is needed when an expedited, but not necessarily immediate, response is required. The 6-month or \$1 million-limitation also applies.

These two types of responses are modifications of the earlier program under the Clean Water Act. The third is a new type of response intended to deal with the longer-term problem of abandoned or uncontrolled sites:

- *Remedial response*, which requires more time and money and is intended to achieve a solution consistent with permanent remedy. EPA, in partnership with the States, takes the Federal lead in all remedial response actions, coordinating its activities with the 13

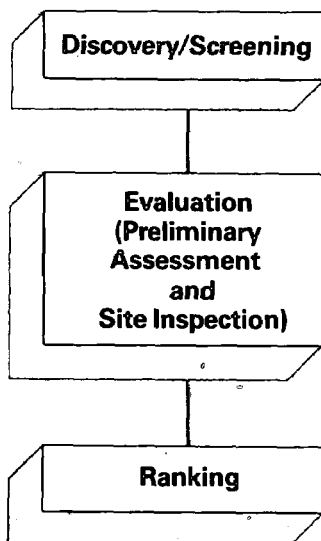
Federal agencies involved in the NCP. The agencies most often called upon are the Federal Emergency Management Agency, Department of Health and Human Services, and Department of Justice.



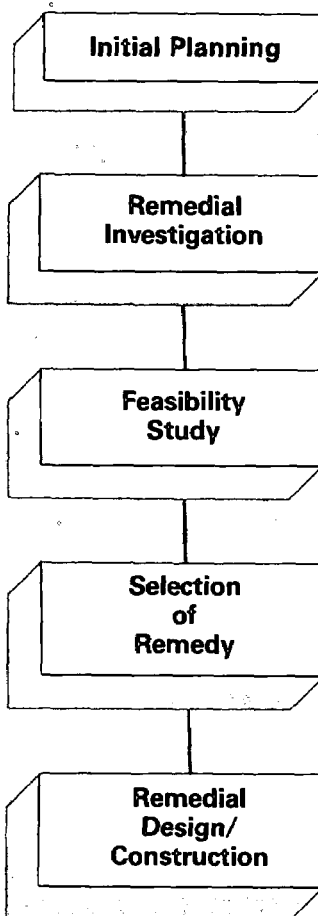
Cleanups financed by private industry — such as this one at the Chem-Dyne site in Hamilton, Ohio — are important for augmenting the Trust Fund. EPA negotiated an agreement in which 112 parties responsible for hazardous wastes at the site will pay \$2.4 million toward the cost of surface cleanup.

A Remedial Response Under Superfund Requires —

Defining the problem at the site



Planning the remedy



The Cleanup Process

Choosing the appropriate remedy is a lengthy process. First the problem must be defined. Then the remedial action must be planned in detail. EPA's Office of Emergency and Remedial Response, working closely with its Regional Offices, tailors each remedial response to the specific needs of the site.

Defining the Problem

Defining the problem involves three steps. First the site must be discovered and screened according to specific criteria. Then it is evaluated and ranked according to guidelines in the NCP.

Discovery/Screening

EPA learns of hazardous waste sites through a variety of ways. Some have been identified through other EPA programs — for example, those under the Safe Drinking Water Act and RCRA. EPA Regional Offices and many States have compiled inventories of sites in their jurisdictions. Also, CERCLA required

that owners or operators of facilities handling hazardous substances notify EPA by June 1981 of their activities. This process identified about 9,000 sites, many of them already known to EPA. Concerned citizens also called the toll-free number of the National Response Center to report sites. EPA screened these various sources of information and consolidated them into an inventory of currently over 16,000 potential sites where hazardous substances are stored, treated, or disposed of in an unregulated manner.

Evaluation

Site evaluation involves a sequence of investigations to determine the extent of contamination at a site and to provide a data base sufficient to identify the most appropriate response. This could be: no further action, additional investigation, emergency response, development of an enforcement action, or remedial response.

The following steps are taken to investigate — at least cost — the hazards at a site:

- *Preliminary assessment:* collection and review of all information available for a

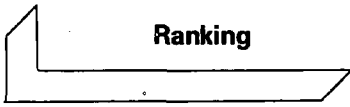
given site to evaluate the source and nature of the hazardous substances present and to determine if a responsible party can be identified.

- *Site inspection:* Various degrees of on-site investigations conducted to determine the extent of the problem and to gather the data needed to set priorities. The emphasis is on contamination pathways that affect human health. A typical site inspection involves sampling, surveying, monitoring, reconnaissance, and other field activities to define the problem. It may involve a hydrogeological and

geological assessment. These investigations become the basis for a report that identifies types of wastes present, estimates their amounts, and describes how they are stored or disposed of; proposes a safety plan to protect inspectors and nearby residents; and evaluates the impact on the area around the site.

Hazardous waste sites are evaluated primarily by Field Investigation Teams stationed at the EPA Regional Offices. These teams are staffed by over 230 trained professionals with a breadth of technical skills.





Ranking

CERCLA calls for compiling a National Priorities List of at least 400 hazardous waste sites as candidates for remedial action. The data gathered in the evaluation process provide the basis for ranking the sites, taking into account these criteria:

- Possible risk to the population
- Hazard potential of substances at the site
- Potential for contaminating drinking water supplies and other pathways that affect human health
- Potential for destruction of sensitive ecosystems

EPA also evaluates the need for removal actions at sites posing immediate threats to health or the environment. The potential for direct contact, fires, and explosions is given special consideration.

In October 1981, EPA compiled an Interim Priorities List of 115 hazardous waste sites. They were nominated by the EPA Regional Offices and the States, primarily on the basis of potential threat to public health, but the threat to the

environment was also taken into account. In addition, each State was encouraged to designate its top priority site. A State or Region rated each site it nominated according to a Hazard Ranking System, which measures pollution via three pathways — air, ground water, and surface water — for potential impacts.

In July 1982, with some kind of action under way on almost all of the 115 sites, EPA added 45 new sites to the Interim List. All 160 sites on the Interim List were considered for inclusion on the National Priority List (NPL). In December 1982, EPA proposed a list of 418 sites in the *Federal Register*. The sites were identified by the same process used to develop the Interim List. On March 4, 1983, Times Beach, Missouri, was added.

In September 1983, EPA published the first final NPL, which consisted of 406 sites. At the same time, 133 new sites were proposed for addition, meeting the CERCLA requirement that the list be updated at least annually.

Determining a Course of Action

A priority site can be cleaned up in several ways:

- The responsible party can clean it up voluntarily.
- The State or local government can choose to assume all, or almost all, of the responsibility to clean it up without tapping the Trust Fund.
- The responsible party may be forced to clean it up by legal action.
- The Trust Fund may be used to finance the cleanup if the site cannot be cleaned by any of the first three alternatives. If there are problems in getting the responsible party to act, EPA will proceed under Superfund and seek later to recover costs by legal action.

Superfund in the Field

Council Bluffs, Iowa

The Aidex Corp. site in Council Bluffs is the top-priority site in Iowa. Management practices at a now-abandoned plant for formulating and packaging pesticides had left a large quantity of liquid and solid pesticide material scattered about. A fire in 1976 worsened conditions by extensively contaminating the soil with water used in fighting the fire. To ensure the safety of workers on site, EPA's Field Investigation Team, wearing protective gear, checks the air for volatile organic compounds.



Planning the Remedy

Detailed planning is necessary if EPA is to make rapid, consistent, and rational decisions in implementing remedial actions under Superfund. The objective is to determine the "appropriate extent of remedy" — the least expensive remedy that is technologically feasible and reliable, effectively reduces the danger, and adequately protects public health, welfare, and the environment. The planning process consists of these elements:

- Initial planning
- Remedial investigation
- Feasibility study
- Selection of a remedy
- Remedial design/construction



Initial Planning

Determining the scope of prospective remedial activities is the primary focus of the initial planning phase. The NCP identifies three actions, based on the complexity, immediacy, and extent of the hazards. Some or all may be taken at any one site. The three actions are:

- *Initial remedial measures:* taken when appropriate actions are limited in nature and require a minimum of planning. Examples include construction of fences, stabilization of dikes or waste impoundments, temporary provision of alternative water supplies, and removal of above-ground drums or bulk tanks leaking hazardous substances.

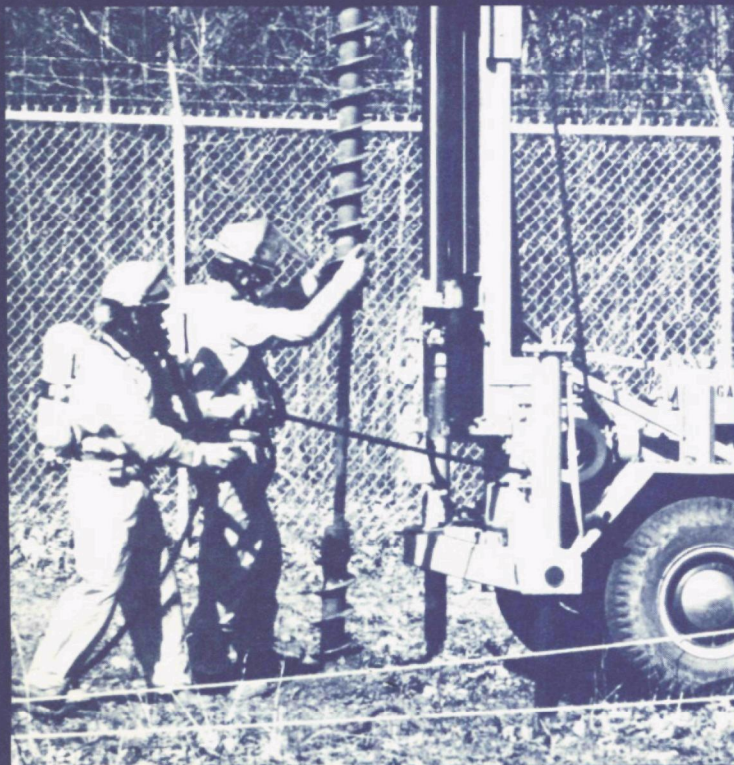
- *Source-control actions:* taken when substantial concentrations of hazardous substances remain on-site, barriers to retard their migration are inadequate, and there is a serious threat to public health, welfare, or the environment. Examples include installation of grout curtains, trenches, and drains, closure of surface impoundments, capping of contaminated areas, and excavation followed by off-site disposal of contaminated soil or buried waste.

Superfund in the Field

Verona, Mo.

After receiving an anonymous complaint, EPA investigated a wooded area on a farm near Verona, Mo. Suspecting the presence of dioxin, EPA (in 1979, before the Superfund law was passed) undertook a comprehensive site inspection and discovered a depression now known as the Denny Farm Site No. 1. As part of the inspection, EPA drilled soil borings around the 10-foot by 50-foot trench (below), then dug into it, exposing 13 drums. Analysis confirmed

the presence of dioxin. EPA then negotiated a cleanup agreement with a company that had purchased the facility responsible for generating and disposing of the wastes. In mid-1981, the company uncovered the drums and transferred the wastes to a nearby pit (right). The trench was filled, compacted with virgin soil, and capped. In cooperation with EPA, the company is evaluating the best means of disposing or treating the materials removed from the trench.



- *Off-site actions:* taken when source-control measures are inappropriate or would not effectively reduce migration of hazardous substances from the site. Examples include permanent provision of alternative water supplies, control of a contaminated aquifer, dredging of contaminated river sediments, and relocation of the affected population.

Because of their limited scope, initial remedial measures can be taken during the planning for additional source-control or off-site actions. The initial remedial measures, however, must be either cost effective — that is, the least expensive alternative that is technologically feasible, is reliable, and adequately protects the environment — or a necessary part of more extensive remedial actions to be taken later.

In making an initial planning decision, EPA works closely with the State. In particular, the State often provides site data

and other important information. Also, the State is given the opportunity to review and comment on EPA's planning efforts.

The planning decisions are addressed through a Remedial Action Master Plan (RAMP). In addition to the scope of remedial activities, the RAMP also considers project costs and schedules for anticipated remedial activities, as well as the extent and availability of existing data.

EPA will also prepare a Site Management Plan, which considers all cleanup alternatives, including enforcement actions and clean up by responsible parties.

Another important element of initial planning activities is the State's decision on the role it wants to take in the remedial action (including the IRM). CERCLA permits two arrangements:

- *A cooperative agreement,* in which the State takes the lead role. A cooperative agreement is much like a grant in that Federal money is transferred to the State. The State then develops a work plan, schedule, and budget, contracts for any services it needs, and is responsible for ensuring that all the conditions of the cooperative agreement are

fulfilled. In contrast to a grant, EPA continues to be substantially involved, monitoring the State's progress throughout the project. EPA encourages cooperative agreements because they allow maximum State participation, which is essential to the success of remedial actions under Superfund.

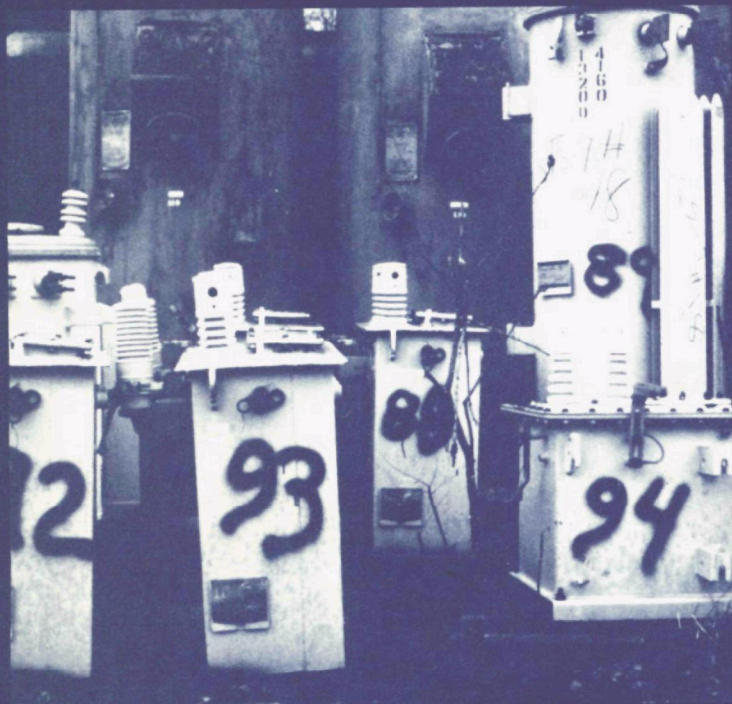
- *Superfund State contract,* in which EPA takes the lead. Early in remedial actions, the work is done by one of EPA's two major Superfund contractors. Later phases are managed by the Army Corps of Engineers. Under an interagency agreement, the Corps provides technical assistance in the design and construction of remedial actions. Using Superfund monies, the Corps contracts with private companies for the actual performance of design and construction.

Superfund in the Field

Old Forge, Pa.

EPA learned of the Lehigh Electric and Engineering Co. site in Old Forge, Pa., through an anonymous source in March 1981. The site covers 4.4 acres on the banks of the Lackawanna River and is immediately adjacent to a residential area with about 50 homes. Working with the Pennsylvania Department of Environmental Resources, EPA inspected the site and determined that the soil was grossly contaminated with polychlorinated biphenyls (PCB), an oil-like toxic organic chemical once widely used as insu-

lation in capacitors, transformers, and other electrical equipment. EPA decided to clean up the Lehigh site in two phases. The first was to remove all equipment and material from the surface. An EPA contractor compiled a detailed inventory of all equipment at the site (below) and sampled each one (right). Exposed workers wore protective gear. Phase I started in July 1982. While it was under way, engineering studies started for Phase II, which will consider the contaminated soil on the site.



Oswego, N.Y.

Pollution Abatement Services (PAS) in Oswego is the top-priority site in New York. The 15-acre tract is occupied by a waste disposal company that operated a high-temperature incinerator for liquid wastes (below) before going bankrupt in 1977. During the peak period of operation, the facility reportedly received over 1 million gallons of wastes per month. The area immediately around the site is sparsely populated, but two small creeks traversing the property discharge into Lake Ontario, less than one-third of a mile away.

Working under a Cooperative Agreement with the New York State Department of Environmental Conservation, EPA, assisted by a contractor, decided on initial



remedial measures to remove and dispose of all surface materials, including drums, wastes in drums, bulk wastes, equipment, and buildings. This approach was taken because it could be contracted for in a short period of time and did not require extensive design work. Also, cleaning up the surface was necessary to prepare the site for later field work to determine the extent of subsurface contamination.

The work plan developed for the initial remedial cleanup called for the following:

- Identification and review of all information concerning the site and wastes present.
- Establishment of health and safety procedures for future activities on site.
- Development of a protocol for the safe and economical handling, bulking of compatible wastes, transporting, and disposal of the wastes likely to be encountered.
- Sampling to determine the types of wastes present. EPA estimated that the site held 8,600 drums containing about 99,300 gallons of waste and 1,200 cubic yards of contaminated soils.
- Analysis of disposal options. The only viable option turned out to be transportation off-site. Empty drums were crushed on site and buried at a local sanitary landfill. Drums containing solid hazardous wastes were loaded into a truck (left) and shipped to a permitted land disposal facility.

The truck was then hosed down with water to decontaminate it (below left). The liquids were pumped into tanks and treated at the same permitted facility (below right).

- Layout of the site into clean and dirty zones based on level of contamination. The dirty zone is the controlled area where the waste is staged, sampled, bulked (if appropriate), and packed for transport.
- Development of standard operating procedures.

Work started on the initial cleanup in June 1982.



CERCLA also assigns other responsibilities to the States, requiring them:

- To share costs of the design and construction phases of remedial actions. States must contribute 10 percent on sites that were privately owned at the time of disposal of hazardous substances and at least 50 percent on sites that were publicly owned.
- To finance operation and maintenance costs, except for an initial period, when EPA will share in the cost to certify that the remedy actually functions as planned.

- To assure that approved facilities are available to treat, store, or dispose of any hazardous substances transported from the site.

Remedial Investigation

With the State role defined, the remedial investigation can begin. It is designed to collect and analyze the data necessary to justify remedial action and to support development of alternatives in the feasibility study. The scope of the investigation varies depending on which of the three types of remedial action (initial remedial, source-control, and off-site) is involved. During this phase, the initial scoping decision may be revised as additional information is gathered.

Typically, remedial investigations involve a sequence of activities such as:

- Preliminary activities — for example, visiting the site, defining the boundary conditions, preparing a site map, and establishing an office on site.
- Studies of the wastes, hydrogeologic conditions, soils, sediments, ground water, surface water, and air quality.
- Preliminary identification of appropriate remedial technology.

Sampling is an important part of investigations and other remedial activities.



Feasibility Study

The feasibility study, which is often conducted with the remedial investigation as one project, involves several steps:

- Development of alternatives, including establishing objectives, identifying possible technologies, and designing specific methods for cleanup at the site. Non-cleanup options such as relocating people or supplying alternative sources of water, as well as a no-action alternative, are also considered.
- Initial screening of alternatives on the basis of costs, effects on health and the environment, and technical feasibility
- Analysis of the remaining alternatives in detail.

- Recommendation of the alternative offering the most favorable results at the least cost.
- Development of a preliminary conceptual design of the recommended alternative.
- Review of the alternatives by citizens of the affected community.

Selection of Remedy

The EPA Regional Offices and States transmit their recommendations to the Assistant Administrator for Solid Waste and Emergency Response. In selecting the remedial alternative, EPA must determine the appropriate extent of remedy. Also, EPA must consider the CERCLA requirement to balance the need to protect public health, wel-

fare, and the environment at a specific site against the availability of Fund monies to respond to other sites, taking into account the need for immediate action.

Remedial Design/Construction

The last step is to prepare the remedial design, which clearly defines the selected remedy in a bid package, and implement the design. Formal advertisement for contracts is the preferred method for implementing remedial actions.

Therefore, the remedial design usually results in a set of contract documents, including detailed plans and specifications, that allow potential contractors to bid. At sites where EPA has the lead, the Corps manages the design and construction activities.



Butler County, Pa.

The Bruin Lagoon site occupies more than 4 acres along the banks of Bear Creek in Butler County, Pa. Its focal point is an open earth-diked lagoon of about 1 acre containing 35,000 cubic yards of asphaltic sludge and 130,000 gallons of liquid acid wastes floating on top. The site began operations in the 1930's. In 1968, a breach in the dike resulted in a spill of 3,000 gallons of waste liquid, which killed an

estimated 4 million fish and closed water-supply intakes downstream. The dike has been reinforced, but its stability remains a concern.

An EPA contractor performed a remedial investigation and feasibility study for the site. Sampling of the sludge (below) indicated that it is soluble and acidic, with high levels of oily and inorganic constituents. To get samples from the middle of the lagoon, a worker leans over the bank (right). As

safety measures, he wears a protective suit, carries a supply of oxygen, and is attached to a stationary object on shore.

The major conclusions of the remedial investigation were:

- Over its history, much of the site was used for disposal of petroleum refining residues.
- The site is releasing contaminants, primarily inorganic, to both surface and ground water. Drinking



water supplies do not appear to be affected.

After evaluating the analytical data from samples collected at Bruin Lagoon, EPA decided to focus on source-control measures. The objectives were to prevent catastrophic failure by stabilizing the dike and to eliminate the threat to public health and the environment by preventing wastes from migrating into surface and ground water. Eleven remedial action strategies were identified and evaluated on the basis of meeting the major objectives. An initial screening eliminated seven, leaving three on-site options (containment, encapsulation, or fixation of waste) and excavation followed by off-site disposal. A "no-action" alternative was also considered.

After reviewing the remedial investigation and feasibility study, EPA and the State selected waste containment as the lowest-cost alternative that met the desired objectives. This alternative called for action to:

- Clean up site in general
- Remove and dispose of acidic liquid
- Excavate and dispose of contaminated soil

- Stabilize sludge in situ
- Construct multilayer cap
- Cover, regrade, and revegetate
- Secure site
- Monitor and maintain site

After the feasibility study was completed, the contractor undertook three additional tasks:

- Development of an Environmental Impact Assessment.
- Evaluation of the stability of the dike. The conclusion was that minor slope im-

provements and surface erosion controls would stabilize the dike during and after lagoon closure.

- Bench-scale tests to evaluate the effectiveness of various techniques for stabilizing sludge so that the lagoon will be able to support the multilayer cap.

EPA awarded a contract to implement the remedy in August 1983. Construction is expected to be complete by spring 1984.



Keeping the Public Involved

The success of any Superfund remedial action depends in large measure on support of the local, affected public. Consequently, a community relations program is an integral part of every remedial action.

When a site is designated for funding, one of the first things EPA does is to meet with local officials, civic leaders, and community residents in order to gauge their concerns and information needs. These discussions form the basis of the community relations plan. The plan establishes how the public will be kept informed about activities at the site and how public

input will be obtained. A key focus of input from citizens is the 3-week public comment period on the draft feasibility study. The feasibility study specifies the options which EPA is considering for the long-term remedial cleanup.

A community relations plan is flexible and tailored to the characteristics of the site and the needs and concerns of the surrounding community.

Remedial Program in Perspective

Superfund's remedial action program is designed to deal with the worst uncontrolled hazardous waste sites where responsible parties do not clean up. The remedial program addresses poor waste

management practices of the past, while RCRA manages the hazardous wastes generated now and in the future.

EPA and the States have initiated a very strong RCRA program requiring financial and technical commitments, with mandatory reporting requirements designed to ensure safe handling, storage, transportation, and disposal of hazardous wastes. This program — built on knowledge gained from the past — will help the Nation avoid a repetition of mistakes and encourage the development and refinement of new, more effective waste technologies. In short, Superfund will clean up past mistakes, RCRA will prevent new ones.

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