



Project Summary

Survey of On-Going and Completed Remedial Action Projects

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During the summer of 1980, a nationwide survey was conducted to determine the status of remedial measures applied at uncontrolled hazardous waste disposal sites. Over 130 individuals were contacted to obtain information on remedial action projects. A total of 169 sites were subsequently identified as having had some kind of corrective measures.

Remedial actions had been implemented at many kinds of hazardous waste disposal facilities including drum storage areas, incinerators, and injection wells, but most frequently at landfills/dumps and surface impoundments. At the sites receiving such remedial actions, groundwater was the most commonly affected media, followed closely by surface water.

Although several types of technologies were identified, remedial activities usually consisted of containment and/or removal of the wastes. Sufficient money was often not available for complete environmental cleanup (e.g., groundwater extraction and treatment). A lack of sufficient funds and/or improper selection of corrective technologies were responsible for remedial actions having been applied effectively at only a portion of the uncontrolled hazardous waste disposal sites. Where applied, remedial actions were completely effective only 16 percent of the time.

Nine sites were studied in detail to document typical pollution problems and remedial actions at uncontrolled

hazardous waste disposal sites. Of the nine sites, remedial actions were completely effective at two and partially effective at the other seven. Technologies used represented (1) containment, (2) removal of waste for incineration or secure burial, (3) institution of surface water controls, and/or (4) institution of groundwater controls.

This Project Summary was developed by EPA's Municipal Environmental Research Laboratory, Cincinnati, OH, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Introduction

The U.S. Environmental Protection Agency (EPA), other government agencies, and private citizens have become increasingly aware of environmental problems involving the unsound disposal or transport of hazardous materials. It has been estimated that up to 90 percent of all hazardous waste has been disposed of in an unsound manner. Uncontrolled hazardous waste sites are those at which unsound disposal practices have led to immediate and/or long term environmental hazards.

In an effort to determine the status of past corrective technology applied at uncontrolled sites, a nationwide survey of on-going and completed remedial action projects at uncontrolled hazard-

ous waste sites was implemented in the summer of 1980. The purpose of the survey was to provide information and examples of applied remedial action technologies. Examples provided in the form of case histories identify typical environmental problems and the technology's effectiveness and costs.

During the initial phase of the survey, a list was compiled of disposal sites where remedial actions had been or were being implemented. Remedial action sites were identified based on file and literature review and face-to-face discussions with federal and state personnel. In identifying hazardous waste disposal facilities that had undergone remedial measures, emphasis was placed on landfills, surface impoundments, drum storage facilities, incinerators, and deep well injection facilities. Although the intent of the survey did not include hazardous material spill sites, if such a site was identified from the above sources and remedial actions had been performed, these facilities were also recorded.

After the remedial action sites were identified, all were prioritized to determine candidate sites where case histories would be conducted. Subsequently, a total of nine high-priority sites were investigated in detail as case history sites.

Survey Findings

As a result of the nationwide survey, 169 sites were identified as having some form of remedial action. Remedial measures included a variety of technologies such as containment onsite, chemical treatment, biological treatment, incineration, burial in a secure landfill, and ocean disposal. Chemical treatment included neutralization of acids and bases using weak bases and acids, respectively, and precipitation of heavy metal ions. Biological treatment included land spreading, oxidation ponds, and enhancement of native microbes using fertilizers. Hazardous substances were sometimes removed from their location and incinerated or buried in a secure landfill. In one case, ocean disposal was used to dispose of a recovered hazardous substance.

The most common remedial action, containment, was often approved based upon the concept that it is better to deal with the problem in-place rather than to relocate. When a hazardous material was contained in its original location, surface water controls (grading,

diversion, revegetation, and surface sealing) were generally constructed.

In most instances where groundwater was contaminated, a major portion of the waste was removed and sent to a secure landfill or incinerator, and surface water controls were constructed to secure the remaining contaminants. If groundwater controls were implemented, then one of the following remedial measures would be installed: bentonite slurry-trench cutoff wall, grout curtain, or groundwater pumping. Groundwater pumping, using barrier wells, was the most often applied groundwater control at remedial action disposal sites whereas other remedial measures were more frequently encountered at spill sites.

Survey findings were analyzed to determine the major types of disposal facilities experiencing cleanup, the location of remedial action sites, affected media, funding sources, and pollution status upon completion of remedial actions. Surface impoundments and landfills were identified as experiencing remedial measures more often than other types of disposal facilities. Geographically speaking, a preponderance of remedial action sites were found in the states of Pennsylvania, New York, Michigan, New Jersey, and Tennessee. These concentrations appeared to be a function of (1) the number of uncontrolled hazardous waste sites in the state, (2) the length of time since such uncontrolled sites had been known to be problems, and (3) the environmental consciousness of the people involved with the site including regulators, local government officials, and nearby residents.

The survey indicated that groundwater was the most often affected media at a site that had received remedial measure. Surface water was the next most often affected media, followed by soil, air, and the food chain. Frequently a site would contaminate more than one media.

Remedial activities were funded by a variety of sources. Generally, the state, county, and/or municipal governments attempted to persuade the operator/owner of the uncontrolled facility to voluntarily remedy problems at the site. If this effort failed, legal proceedings were instituted against the "responsible" party. Depending on the magnitude and type of endangerment presented by the uncontrolled site, various government agencies funded the remedial activities

while legal responsibility was determined by the courts.

Table 1 indicates survey findings with regard to improvement at sites that had undergone remedial actions. At the time of the survey, a total of 180 separate remedial action efforts had been initiated at the 169 sites. The last column in Table 1 indicates that corrective actions were totally ineffective (unimproved) 46 percent of the time; partially effective (improved) 38 percent of the time; and completely effective (remedied) only 16 percent of the time.

Case Study Findings

Case study sites included in the report were selected based on a desire to represent a wide range of facility type, pollution type and media, and remedial action technology. Tables 2 and 3 present an overview of the nine case histories, including two remedied and seven improved sites. Remedial action applied at the seven improved sites showed varying degrees of effectiveness. The combination of all nine sites covered contamination of all media including groundwater, surface water, soil, air, and the food chain. Waste involved included mercury, arsenic, solvents, oil, tires, inorganic and organic waste, and septic waste. The types of facilities examined included surface impoundments, landfills, drum storage, and incinerators. The technology used consisted mainly of containment, removal of waste for incineration or secure burial, and institution of surface water and/or groundwater controls.

Conclusions

The survey and case histories indicated that remedial measures were usually confined to containment and/or removal of the hazardous wastes with a primary goal being to prevent further contamination of the environment rather than complete cleanup. Complete environmental cleanup of groundwater or surface water can require sophisticated technologies, large sums of money, and/or long periods of time. Therefore, a responsible party with sufficient funds and expertise must be located to effect complete cleanup. In most cases, sufficient funds have not been available for effective remedial action. The EPA is able to provide only limited remedial funding under Section 311 of the Clean Water Act. Further, state and local govern-

Table 1. Pollution and Remedial Action Status of 169 Sites

Pollution Status	Number of Remedial Actions			Total
	Planned Actions	On-Going Actions	Completed Actions	
Unimproved	16	49	17	82
Improved	12	36	21	69
Remedied	0	3	26	29
Total	28	88	64	180*

*A total of 180 remedial activities were identified at the 169 sites.

ments cannot typically provide sufficient money for total cleanup since any one site may require millions of dollars to correct its problems.

Based on the case studies and survey, the present state-of-the-practice for remedial actions does not look favorable when considering that the applied remedial action was ineffective 46 percent of the time and only a portion of all uncontrolled sites have received some form of remedial action. In addition, remedial action applied at a site experiencing problems was totally effective only 16 percent of the time.

The full report is based on work performed pursuant to Contract No. 68-01-

Table 2. Case Study Site Identification

Site No.	Name	Location	Waste Type	Remedial Action Technology
A	Olin Corporation	Saltville, PA	Mercury	Graded and constructed erosion control structures. Removed contaminants. Planning extensive remedial action (\$23 million).
B	Firestone Tire and Rubber	Pottstown, PA	Tires, SO ₂ scrubber waste, organic waste, pigments, PVC sludge	Recovery wells intercepted polluted ground water and recycled it through their plant. Expected to be 100 percent effective.
C	Anonymous	East Central, NY	Solvents, oils, paint waste with PCB	Lagoons filled and capped. Diversion ditches and test wells installed.
D	Destructo/Carolawn	Kernersville, NC	Volatile/flammable waste	Two Phases: 1. Waste removed, incinerated or land-filled. Contaminated soil removed and landfilled. 2. Waste removed, incinerated, land-filled, and deep well injected.
E	Whitmoyer Laboratories	Myerstown, PA	Arsenic compounds	Removed arsenic waste from lagoon, treated and discharged. Waste piles of arsenic placed in concrete vault. Ground water treated using purging wells. Some contaminated soil remains.
F	Western Sand and Gravel	Burrillville, RI	Septic plus hazardous wastes	Four lagoons pumped, dried, and contents stored off-and on-site. Monitoring wells installed. Future remedial action planned.
G	Ferguson Property	Rock Hill, SC	Solvents, heavy metals	Two Phases: 1. Contained with polyethylene and and clay cap. Installed surface water diversion ditches and vent pipes in contained area. 2. Since Phase 1 ineffective, removed liquid. Still some sludge and drums left.
H	3M Company	Woodbury, MN	Spent solvents, acid sludge	Pits emptied and contents burned. Barrier wells installed to stop spread of contaminated ground water.
I	Whitehouse/Allied Petroleum	Jacksonville, FL	Oil, PCB	Mobile activated carbon unit dewatered pit, oil absorbed using solid waste and earth. Future remedial action planned.

Table 3. Case Study Site Background

Site No.	Facility Type						Pollution Affected					Remedial Action Funding					Status			Litigation							
	Landfill	Illegal Dump	Drum Storage	Surface Impoundment	Injection Well	Incineration	Spill	Status		Affected		Media		Status		Funding			Status			Litigation					
								Active	Inactive	Ground Water	Surface Water	Air	Soil	Food Chain	Remedied	Unimproved	Improved	Federal	State	County	Municipal	Private	Completed	On-Going	Planned	Current	No
A	x		x						x	x		x						x							x		
B	x		x					x				x			x			x								x	
C	x		x						x		x	x	x		x			x							x		x
D			x			x	x		x			x	x		x			x							x		
E	x		x						x		x		x		x										x		x
F			x						x		x	x		x				x	x						x		x
G			x						x				x		x			x							x		
H			x						x		x				x									x			x
I			x			x			x		x	x		x				x	x		x			x	x	x	

4885, Directive of Work No. 13, by SCS Engineers under the sponsorship of the U.S. Environmental Protection Agency. This report has also been printed as "Remedial Actions at Hazardous Waste Sites: Survey and Case Studies" (EPA-430/9-81-05) by the Oil and Special Materials Control Division, EPA, Washington, DC.

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The complete report, entitled "Survey of On-Going and Completed Remedial Action Projects," (Order No. PB 82-134 115; Cost: \$19.50, subject to change) will be available only from:

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