October 1988

HAZARDOUS WASTE GROUND WATER TASK FORCE

1987 Status Report
and
1988/1989 Program Recommendations

U.S. Environmental Protection Agency

OSWER, Office of Program Management & Technology

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HAZARDOUS WASTE GROUND WATER TASK FORCE (HWGWTF)

REFERENCE LIST

1. HWGWTF,[1] Facility Assessment Program Plan, October 1, 1985.

2. HWGWTF, Ground-Water Task Force Operations Assessment Report, Operations Assessment Group, January 25, 1986.

3. HWGWTF, Protocol For Ground-Water Evaluation, September 1986.

4. HWGWTF, Quality Assurance Project Plan, September 12, 1986.

5. HWGWTF, Regional Infrastructure Assessment, September 1987.

6. Office of Waste Programs Enforcement, Resource Conservation and Recovery Act (RCRA) Ground-Water Monitoring Technical Enforcement Guidance Document, (commonly referred to as the TEGD), September 1986.

7. Office of Waste Programs Enforcement, Comprehensive Ground-Water Monitoring Evaluation (CME) Guidance Document, December 1986.

8. Office of Ground-Water Protection and Office of Information Resource Management, Ground-Water Data Requirements Analysis, May 1987.

9. Ground-Water Workstation User's Manual, (undated).

10. McGraw, memorandum to Division Directors, November 22, 1985.

11. Skinner, memorandum to Division Directors, September 24, 1984.

12. Stephen R. Wassersug, "Hydrogeologists Efforts on Recruitment/ Training," memorandum to James Barnes, July 5, 1985.

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[1] All of the HWGWTF reports are referenced throughout the 1987 Status Report and have been submitted as separate documents. These documents are available from the Office of Solid Waste and Emergency Response.

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Subtitle C of the Resource Conservation and Recovery Act (RCRA) created a "cradle-to-grave" management system to ensure that hazardous wastes are transported, treated, stored, and disposed of in a manner that ensures the protection of human health and the environment. Since the passage of RCRA, the Environmental Protection Agency (EPA) has codified extensive regulations under 40 CFR Parts 264 and 265 imposing a variety of administrative and technical requirements on owners and operators of hazardous waste facilities. These requirements are intended to minimize the release of hazardous waste into the environment.

An essential component of EPA's hazardous waste program is the Subpart F ground-water monitoring requirements. Ground-water monitoring is required only of owners or operators of surface impoundments, landfills, land treatment facilities, and certain waste piles used to manage hazardous waste. The purpose of these requirements is to assess the impact of land treatment or disposal facilities on ground water beneath the facilities. Monitoring must be conducted for the life of the facilities, and land disposal facilities must continue monitoring for up to thirty years following closure.

Complying with ground-water monitoring regulations is the most reliable method by which an owner or operator can determine if a land disposal facility is leaking into and contaminating ground water. The importance of such monitoring cannot be overstated, as the volume and toxicity of disposed wastes pose an enormous threat to the nation's ground-water supply. Additionally, in recent years wastes and waste residues from numerous CERCLA clean-up actions have been designated for disposal at operating RCRA land disposal facilities. Only by accurately determining whether these facilities are adequately protective of ground water can the Agency ensure that it will not be necessary to transfer these wastes again in the future at a significantly greater cost. More important, a failure on the part of the regulated community to comply with the Subpart F standards could lead to ground-water contamination and threaten human health and the environment.

Following the promulgation of ground-water protection standards in May 1980, it became clear that many land disposal facilities had not fully complied with the ground-water monitoring requirements. Inspections conducted by the Agency revealed that some facilities had not installed adequate ground-water monitoring systems, and EPA surveys demonstrated that the regulated community needed additional technical assistance to achieve full compliance.

1.2 TASK FORCE MISSION AND STRATEGY

Cognizant of the importance of ground-water monitoring to the overall success of the hazardous waste management program, the Administrator established the Hazardous Waste Ground Water Task Force in Fall 1984. The Task Force was charged with two major efforts: (1) evaluating the level of compliance with ground-water monitoring regulations at hazardous waste disposal facilities; and (2) assessing the ability of EPA and States to implement and enforce the ground-water monitoring standards. These efforts were undertaken over a three-year period. The activities composing each of these efforts are discussed below.

1.2.1 Compliance Evaluation

To accomplish this goal, the Task Force established a joint Regional, State and Headquarters facility evaluation team to determine the status of ground-water monitoring at operating RCRA hazardous waste facilities. This team was also directed to develop recommendations to correct any problems discovered. Specifically, the inspection team evaluated 58 commercial and private land disposal facilities for compliance with the Subpart F standards and potential compliance with Parts 264/270. The team also investigated for ground-water contamination and other monitoring system deficiencies.

The Hazardous Waste Ground Water Task Force ceased activities as an OSWER program function on September 30, 1987. Taking into consideration the one-year phased process time to complete a facility investigation, the Task Force completed all phases of work at 24 sites. Work on the remaining 34 sites was transferred to the Office of Waste Programs Enforcement (OWPE). OWPE completed these sites by the third quarter of FY 88. The results of the Task Force evaluation of the 24 sites are discussed in Chapter 2 of this report.

1.2.2 Operations Assessment

The Task Force conducted an operations assessment of EPA and State ground-water monitoring programs to identify problems inhibiting the ability of both EPA and States to implement and enforce the Subpart F rule. The assessment evaluated existing and planned training, guidance, regulatory, and research programs in order to identify significant problems (e.g., consistency) and additional needs. In addition, the study evaluated the organizational infrastructure which support ground-water decisions at Headquarters and in the Regions to identify areas that must be improved to ensure the efficient implementation and enforcement of ground-water monitoring standards. With the exception of the Regional infrastructure review, the results of this effort were submitted in a January 25, 1986 report to the Assistant Administrator for the Office of Solid Waste and Emergency Response (Operations Assessment Group Task Force Report). On April 20, 1986, the Assistant Administrator adopted twenty of the recommendations contained therein. The results of the Regional

infrastructure review are discussed in Chapter 3 of this report.

1.3 ORGANIZATION OF THE REPORT

The remainder of the Hazardous Waste Ground Water Task Force 1987 Status Report is organized as follows:

Chapter 2: Facility Investigations. This chapter outlines the procedures the Task Force used for the facility investigations. In addition, it presents weaknesses under each of four technical areas, briefly presents Task Force recommendations to improve performance, highlights steps EPA has already taken to improve compliance, and describes current status of ground-water monitoring at the facilities examined.

Chapter 3: Regional Infrastructure Assessment. This chapter examines four aspects of Regional ground-water program infrastructure, including personnel, resource utilization, communications and coordination, and information management. In addition, it presents problems with this infrastructure, recommendations to improve Regional performance, and current status of Regional programs.

Chapter 4: FY 88/89 Ground-Water Program Recommendations. This chapter outlines three recommendations to improve implementation and enforcement of ground-water monitoring requirements. These recommendations include modifying the Ground-Water Technical Assistance program, improving the Ground-Water Information Systems, and improving ground-water training.

CHAPTER 2

FACILITY INVESTIGATIONS

During the field investigation phase of its activities, the Task Force mission was to determine the level of compliance with ground-water monitoring regulations. Field investigations were conducted at 58 hazardous waste facilities selected to represent the total universe of land disposal facilities in the United States. All ten Regions and each of the 50 States were represented in this sample.

The Task Force completed 24 of the 58 facility investigations. Work on the remaining 34 sites was transferred to OWPE. The Task Force does not believe that the results of the remaining investigations will alter the picture we now have of the level of compliance and the nature of non-compliance. In this chapter, the procedures used to conduct facility investigations and the Task Force's major findings are presented.

2.1 PROCEDURES FOR FACILITY INSPECTIONS

In this section, the components of the facility investigation team and the procedures used during the facility investigation phase of the Task Force's activities are discussed.

2.1.1 The Facility Investigation Team

For each of the 58 facilities examined by the Task Force, an investigation team reviewed available information, conducted field inspections, performed sampling and analysis, and evaluated compliance with ground-water monitoring requirements. In most cases, the team included field inspectors, permit writers, enforcement staff, legal counsel, sampling and analytical personnel. In addition, each inspection team was composed of experts from the State and Region in which the facility was located and a Core Team member (see below). All decisions made by the inspection teams were reached by consensus between the State, Regional and Core Team members.

The Core Team was the headquarters-managed component of the Task Force's field evaluation effort. The Core Team was composed of investigators with significant hydrogeologic training and extensive field experience and were selected from the technical staffs of Headquarters, the Regions, and the States. The Core Team's weekly and quarterly meetings, as well as the individual Task Force investigations, provided an ample opportunity for information exchange; as a result, the Core Team's activities allowed the Task Force to develop a comprehensive picture of the national state of ground-water monitoring under the RCRA program.

The Core Team organized individual facility assessments based upon EPA-developed guidance and protocols, including the Technical Enforcement Guidance Document and the Comprehensive Monitoring Evaluation. In addition,

the Core Team served to:

- Ensure consistency and uniformity in the facility evaluation effort;
- Accumulate, on a nationwide basis, information concerning safe land disposal sites for Superfund wastes;
- Identify and evaluate problems encountered in the field, and direct the further development of guidance, training, regulation, and research programs;
- Provide a vehicle for technology transfer and training among Regions and States; and
- Provide contractor and organizational support to the program, and develop work plans, checklists, communications plans and other tools to assure smooth functioning of the effort.

The National Enforcement Investigation Center (NEIC) also provided valuable support to the Task Force's field investigation activities. The NEIC inspected the first facility in each Region. This approach ensured intra-Regional consistency by bringing a single team to the first evaluation in each Region. NEIC also used its extensive experience in conducting investigations of this type to assist the Core Team's development of protocols and standard operating procedures.

2.1.2 Facility Investigation and Analysis Procedures

The Task Force took great care to ensure the consistency and quality of the facility investigation and analysis effort. The NEIC's activities in this regard are discussed above. In addition, the Task Force developed a program plan to coordinate the wide variety of activities associated with this effort. This program plan established a series of six steps that the Task Force followed in evaluating specific sites. An outline of the plan follows.

Step 1: Planning and Protocol Development. Before commencing facility evaluation work, the Core Team, with the assistance of the NEIC, developed plans, strategies, and protocols to ensure that Task Force activities were consistent, well reasoned, and properly coordinated. These activities included the following preliminary work:

- Field inspection protocols. The Core Team developed field inspection protocols, including entry plans, inspection standard operating procedures (SOPs), sampling protocols, chain-of-custody procedures, QA/QC procedures, and document control SOPs.
- Safety training. The Core Team ensured that field staff obtained the proper safety training certification.
- Sampling contract. The Core Team procured a sampling contractor,

which ensured consistency by conducting sampling and providing necessary sampling equipment and glassware at all sites.

- Laboratory capacity. The Core Team contracted reference laboratories, and evaluated them for RCRA methods.

- Communications Strategy. The Core Team developed a communications strategy for both the press and to handle community relations. Since Regional communications staff implemented the strategy, specific plans were tailored to local situations.

- Technical Advisory Panel. The Core Team assembled a team of experts with national stature to provide prompt advice and review on technical aspects of the investigation.

- Aerial photography. The Core Team collected historic work-ups of aerial photos to establish the location of old units and glean other valuable site information.

Step 2: Data Procurement. A contractor, under the direction of the Core Team, collected all existing background information on each facility. This work took approximately six weeks per site. The following protocol guided work at each site:

- Preliminary meeting. Personnel from the Core Team, Region, and contractor attended a preliminary meeting at the Regional office to confirm the location of relevant information (including aerial photo work-ups), logistics for data gathering, and the CBI/sensitivity clearance status of Regional and State personnel. These personnel also determined the need to obtain additional information from the owner or operator. In addition, the preliminary meeting established the composition of the following components of the Regional team:

  - The field inspection team (a small group) that would continue and complete facility evaluations after Core Team/NEIC involvement ceased; and

  - The document control officer who coordinated activities regarding Toxic Substances Control Act (TSCA) confidential information.

- Record search by contractor. The contractor then gathered relevant information with support from Regional personnel. The Regions assisted this effort either by accompanying the contractor during the record search or by making preliminary calls to facilitate access at appropriate program offices. In most cases, the contractor searched the following sources of information: (1) Regional Office (RO) permit files; (2) RO enforcement/compliance files; (3) Headquarters' enforcement and compliance files, if useful; (4) RO State implementation files; (5) Environmental Services Division (ESD) files; (6) State files, if useful; and (7) on-site records of the facility (e.g., well logs and QA/QC data), if useful.

- Information management. The contractor organized, copied, and forwarded these records to the Regional Office, State, NEIC, and Core Team Document Control Officers.

- Communications plan. The Task Force Communications Coordinator developed a facility-specific communications plan after consulting with the Regional Team leader and Regional communications (press and community relations) staff.

Step 3: Data Analysis. After collecting background information on the facility, the Task Force analyzed the data and planned a site visit. This step involved the following tasks:

- Data evaluation. One or more staff members from each of the participating groups (i.e., Region, State, NEIC, and Core Team) conducted an in-depth evaluation of the material gathered by the contractor. Members from each group then prepared notes regarding the following issues:

  - possible areas of noncompliance with Subpart F requirements;

  - possible existence and nature of ground-water contamination;

  - other potential shortcomings in ground-water monitoring system design and operation;

  - validity and comprehensiveness of existing data; and

  - activities that would be useful during the site inspection.

- Project inspection plan. The NEIC (for the first facility in each Region) or the Region then developed a project plan for the facility inspection. Such a plan determined the date and the objectives of the facility visit. These objectives included, but were not necessarily limited to:

  - observing the owner/operator's sampling techniques;

  - taking samples;

  - determining whether information submitted by the owner/operator is valid; and

  - closing information gaps identified during the record search.

- Redrafting the project plan. Each group presented comments on the proposed project plan to NEIC or the Region, as appropriate. NEIC or the Region then issued a second draft.

- Consensus meeting. A small group (maximum of two personnel from each participating group) of team leaders and managers met at the Regional

office to resolve remaining differences, set schedules, designate site visit team members, and provide direction for finalizing the project plan.

Step 4: Site Inspection. In most cases, the inspection team conducted the facility inspection within a few weeks of the Step 3 consensus meeting. The Regional team leader scheduled the site visit and coordinated activities with all participants, including the facility owner or operator, NEIC, Core Team members, State personnel and contractors. The following protocol was followed during facility inspections:

- Inspection plan. The field team conducted the site visit in accordance with the inspection plan, and used contractor support to manage samples.

- Sampling and Analysis. A contractor managed the packaging and distribution of samples. All samples were submitted to the Contract Laboratory Program laboratory for analyses and were occasionally split with the Regional Environmental Services Division (ESD) laboratory for quality control. The inspection team made an offer to split samples with the owner or operator's laboratory and the State laboratory. Duplicates, spikes and blanks were also distributed.

- Consensus development. Immediately following the facility visit, the inspection team met on a daily basis to compare inspection logs and reach a consensus on the team's findings. Consensus was reached on the following:

  - layout of the facility and surrounding area;

  - observations and evaluation of the sampling and analytical protocols used by the owner or operator;

  - decisions concerning the adequacy of well placement and other aspects of the ground-water monitoring system; and

  - judgements concerning whether the owner or operator was following the procedures established in his assessment plan, where applicable.

Step 5: Technical Report. After the facility visit, the on-site coordinator (NEIC or Region) drafted a facility evaluation report containing:

- observations and findings from the data review and on-site inspection; and

- conclusions regarding regulatory compliance and probable nature and level of ground-water contamination.

All regulatory groups involved with the inspection reviewed the draft report, after which the technical staff met to present comments and reach a consensus. NEIC or the Region revised the report accordingly and issued a

second draft. The Regional team leader then scheduled a technical consensus meeting to discuss problems that arose during the evaluation. Finally, NEIC or the Region finalized the report in accordance with decisions reached at this meeting.

Step 6: Follow-up. The Regional team leader arranged a management consensus meeting of team leaders and managers to discuss appropriate actions, develop a schedule for action, and determine which personnel would take the lead on problems identified in the technical report. The Regional Office or State (as appropriate) then drafted orders or permit conditions, or took other actions in accordance with their normal responsibilities.

2.2 TECHNICAL FINDINGS FROM THE FACILITY INVESTIGATIONS

During its investigations, the Task Force found that nationwide compliance with ground-water monitoring regulations can be hindered by several problems resulting from poor facility management and faulty laboratory methods. In general, the deficiencies are related to the following technical areas:

- hydrogeologic site characterization;
- monitoring well location and construction;
- sampling and analysis; and
- contaminant plume definition and corrective action.

This section considers each of the technical areas separately. First, it summarizes the findings of the Task Force investigation, identifying the most prevalent weaknesses under each program area. In addition, it presents the Task Force recommendations to improve performance under each technical area, and highlights the steps EPA has taken to implement the recommendations. Finally, this section briefly describes the current compliance status under each technical area, and notes any improvements made since the initial investigation.

2.2.1 Hydrogeologic Site Characterization

Proper design of a ground-water monitoring program requires that an owner or operator describe a complete and accurate hydrogeologic characterization of the site. Defining hydrogeology is an iterative process that requires a series of data collection efforts and analytical studies; the result of one study guides the direction of the next and the result of each study complements the previous one.

In general, an adequate hydrogeologic characterization identifies geologic and structural formations, soil and ground-water constituents, information on the number and location of the different water-bearing zones, the depth to ground water, and the direction and velocity of ground-water

flow. The hydrogeologic characterization is singularly the most important aspect of a ground-water program because all other components of the program (e.g., well location, density, construction, capability of detection, and plume assessment and cleanup programs) depend on it. Where site hydrogeology is not adequately characterized, facilities cannot monitor all potential contamination pathways, and releases from disposal units may remain undetected.

- Task Force Findings. The Task Force found that of the 24 facilities for which it has completed its investigation, none had performed an adequate initial hydrogeologic characterization. The most common reason for this was a failure to obtain enough data to make accurate hydrogeologic characterizations. For example, some facilities did not conduct enough exploratory borings or monitor enough piezometers. At times, valuable information was lost or never obtained owing to incomplete and poorly maintained boring logs. Since many hydrogeologic characterizations were conducted over five years ago, the Task Force was unable to locate original consultants to explain how they arrived at their conclusions.

  However, at the time of the investigation, almost every facility was in the process of upgrading its hydrogeologic site characterization in response to an enforcement action by the implementing agency. Some facilities were conducting their third hydrogeologic investigation, which is not uncommon. In addition, some facilities were in the final stages of hydrogeologic characterization, close to permit issuance; others were beginning detailed comprehensive investigations that may last 2 to 3 years.

- Task Force Recommendations and EPA Follow-up. The Task Force recommendations included in each site-specific report were, in most cases, the addition of field data (borings, well samples, etc.) or a clarification of the interpretation of existing data. In many cases, conclusions reached by the Task Force served to settle long-standing disputes between facility experts and the regulatory agency. Task Force recommendations were incorporated in proposed enforcement actions, formed the basis for new enforcement actions, or, in some cases, were used to modify an existing state permit.

- Current Compliance Status. The Agency found that facilities enhanced their efforts after the implementing agency took further enforcement actions pursuant to Task Force recommendations. The facilities' responses to these actions were generally adequate; consequently, the Regions report that most of the 24 facilities are now in compliance with the hydrogeologic characterization requirements.

2.2.2 Monitoring Well Location and Construction

Proper location of ground-water monitoring wells is also an essential component of an effective ground-water monitoring and remediation program. To ensure that contamination is detected as soon as practical, an owner or

operator and implementing agency must have the ability to compare background ground-water quality (i.e., ground water unaffected by contaminants from the facility) with ground-water quality in aquifers affected by leaks from the facility. This comparison requires that monitoring wells measuring background quality be located upgradient from the facility in an area unaffected by the facility. In addition, owners or operators should locate monitoring wells assessing ground water contaminated by the facility in areas downgradient from the facility, with each well installed within the same discrete aquifer. Owners or operators must also ensure that wells do not provide a conduit for cross contamination between different aquifers.

Proper well construction is equally important. Wells must be constructed with sand and gravel packs of appropriate length and screen slots of appropriate size. In addition, owners or operators should install annular seals between aquifers to prevent cross contamination.

- Task Force Findings. All 24 facilities had some defects in either the construction or location of their monitoring wells. The Task Force found that wells at some facilities were not located close enough to the point of compliance to immediately detect contamination at the waste management area. Monitoring wells were located hundreds or, in one case, thousands of feet from the point of compliance. In addition, some monitoring wells were spaced more than 1000 feet from each other. Well spacing of this magnitude could only detect the largest contaminant plumes.

  At some facilities, the well designated to monitor background ground-water quality was, in fact, not located upgradient in an area unaffected by the facility. Consequently, the samples intended to represent background water quality were affected by contaminants from the waste management units. In these situations, statistical comparisons between upgradient and downgradient wells are of little use. The inappropriate location of background monitoring wells hampered the ground-water monitoring efforts of at least five of the facilities evaluated, and was usually the result of an inadequate hydrogeologic site characterization.

  In addition, failure to install monitoring wells in correct water-bearing zones was a problem:

  - At least three facilities had repeatedly compared the results of samples from wells screened in different water-bearing zones.

  - Three other facilities overlooked shallow water-bearing zones and instead monitored deeper aquifers. These shallow zones, which the drillers ignored, are thin, and yield little water; however, samples from these formations are the first to indicate contamination.

  - Some facilities had such long screens that they collected water from a number of water-bearing zones. An influx of

water from other zones dilutes concentrations of contaminants, masks the source of contaminants, and provides a conduit for cross contamination of the aquifers.

The Task Force also found that improper well construction hampered ground-water monitoring efforts:

- Sand and gravel packs (filter packs) in wells were too long, some between 50 to 200 feet. Excessively long filter packs cause the same problems as those caused by excessively long well screens: water from several aquifers is collected, contaminants are diluted, and the source of contaminants is masked.

- Facilities were not selecting proper well screen slot sizes (i.e., based on the grain size of the aquifer and filter pack). Several monitoring wells were found to be constructed with certain screen slot sizes and filter packs because "that is what the driller always uses." The Task Force noted that proper intake design, a relatively simple technique, should be more rigorously practiced by the monitoring well industry.

- At least two facilities did not have annular seals between aquifers to prevent cross contamination; while others had seals that were poorly constructed.

- Task Force Recommendations and EPA Follow-up. The Task Force recommendations included sealing and abandoning inadequate wells, a better identification of upgradient areas and the increased training of State and Regional enforcement staff on proper well design, installation and maintenance. The Regions responded by issuing enforcement orders or modifying existing orders. EPA has increased field investigation training which includes monitoring well management.

- Current Compliance Status. Facilities generally responded satisfactorily to the enforcement actions. Many of the cases of non-compliance were remediated by the addition of monitoring wells, the abandonment of poorly constructed wells, or locating missing drilling records. The Regions now report that almost all of the 24 facilities have approvable monitoring systems.

2.2.3 Sampling and Analysis

Sampling and analysis is another major component in any ground-water monitoring program. Facilities conducting ground-water assessments must collect samples in a systematic and precise manner to ensure the validity and accuracy of data obtained. Proper sampling procedures require, among other things, the collection of blank and duplicate samples and the strict application of quality assurance/quality control (QA/QC) plans. Similarly, appropriate laboratory analysis requires the application of QA/QC procedures

and the use of spikes and blanks to verify the accuracy of data.

- Task Force Findings. The Task Force found that few of the investigated facilities strictly adhered to acceptable sampling and analysis standards and procedures. Problems often arose when facilities used field procedures that are discouraged in the Technical Enforcement Guidance Document (TEGD). Specifically, the Task Force discovered the following:

  - Facilities were not consistently applying established quality assurance/quality control (QA/QC) procedures to verify the accuracy of lab results.

  - Facilities did not routinely obtain blank and duplicate samples, while those facilities that took these samples did not use the results obtained from the lab in a data usability analysis.

  - Facilities that had written QA/QC plans were not consistently using them.

  - Some facilities did not use sampling equipment dedicated to each well or used impeller driven pumps and intermediate containers which allow degassing of the sample. Other facilities filtered all of their samples.

  In addition, laboratory audits conducted by the Task Force revealed that some labs still used inappropriate test methods. Others did not take into account the interferences from general water chemistry and QA/QC procedures. Finally, laboratories did not always use spikes and blanks to verify the precision and accuracy of data.

- Task Force Recommendations and EPA Follow-up. The Task Force recommended that the Agency take enforcement actions against those facilities that deviated significantly from standard sampling and analysis procedures. The Agency initiated enforcement actions at each facility to require the upgrading of sampling and analysis plans.

- Current Compliance Status. The Regions now report that the facilities have resubmitted their sampling and analysis plans, and that the Agency has approved these plans. However, systematic laboratory audits have not been implemented in every Region. The Agency has continued to pursue this issue.

2.2.4 Definition of Contaminated Plume and Corrective Action

Before effectively remediating ground-water contamination, a facility must first correctly define the contaminated plume. Plume definition relies substantially upon an accurate hydrogeologic characterization, adequate monitoring wells, correct statistical procedures, as well as sound laboratory

procedures. When a facility completely assesses the nature and extent of a plume, it can then initiate a comprehensive and technically sound corrective action. The basic objective of corrective action is to reduce ground-water contaminant levels below background or health-based standards.

- Task Force Findings. During its investigation, the Task Force discovered that some states are far more advanced in knowledge and experience with corrective action than others. These states, which tend to be highly industrialized, quickly recognized and addressed ground-water contamination problems. Some effective and highly complex ground-water restoration programs have been in effect since 1980.

  The Task Force found, however, that inadequate ground-water monitoring efforts at many sites often resulted in unsatisfactory plume definition and ground-water remediation efforts. Facilities with ground-water contamination did not adequately assess the nature or extent of the contaminated plume.

  - The hydrogeologic characteristics of some sites were not adequately described or understood. Without complete and accurate hydrogeologic data, a facility cannot properly design a ground-water monitoring program (see Section 2.2.1).

  - Some facilities attempted to define contaminant plumes only in terms of their length and width, while ignoring depth. The depth of the plume is rarely described because wells were poorly constructed and/or poorly sited.

  - Some facilities did not correctly follow the statistical procedures required by the regulations to measure ground-water contamination levels. Other facilities that did follow these procedures failed to apply an adequate response to the results.

  - Although a number of facilities conducted a plume characterization in response to State or Federal enforcement action, many of these enforcement efforts needed to be improved. Notices of Deficiency (NODs) and orders requiring an assessment often resulted in contentious discussions between the Agency and the facility concerning the extent of the required investigation.

  With respect to corrective action, the Task Force found that of those facilities that had ground-water contamination, few had active ground-water cleanup programs in progress. In addition, many corrective action programs did not meet Subpart F standards under 40 CFR 264.100. In some cases, poorly designed or poorly constructed monitoring systems were at fault. Facilities were still in the process of assessing the extent of contamination, or, in some cases, still installing an adequate detection monitoring system. The major problems with the existing corrective action programs were:

- Facilities initiated corrective action without an adequate hydrogeologic characterization.

- Some facilities had not thoroughly defined the type of contamination through an analysis of Appendix IX compounds (see 40 CFR 264, Appendix IX - Ground-Water Monitoring List).

- There was little or no basis for the design of some monitoring or remedial response systems.

- Some corrective action projects were inadequately supervised.

- Some facilities were attempting to clean up ground water containing contaminants for which cleanup levels had not been established.

- In some cases, the technology necessary to achieve adequate removal of certain types of contamination in complex geologic settings was unavailable. For example, dense viscous hydrocarbons and low-yielding aquifers pose very difficult extraction problems.

- Task Force Recommendations and EPA Follow-up. When devising its recommendations to the Agency, the Task Force concluded that access to a large data base of geologic information and ground-water quality is necessary for characterizing contaminant plumes. In addition, it determined that analyzing and interpreting data requires highly developed skills and knowledge and demands an extraordinary amount of time. To respond to these needs, the Task Force developed the Ground-Water Computer Workstation, a system designed to provide mathematical and graphic aids to facilitate and expedite compiling, illustrating, and interpreting data. In addition, OSWER is currently developing proposed rules and amendments designed to provide a consistent and practical approach to establishing cleanup levels at RCRA facilities.

- Current Compliance Status. The Agency expects that efforts to define plumes and conduct corrective action will improve as hydrogeologic characterizations and ground-water monitoring systems improve in response to enforcement actions. It also expects these efforts to benefit from the greater use of the Ground-Water Computer Workstation, training and increased use of existing ground-water models, and the implementation of the new procedures to establish cleanup levels.

2.2.5 Conclusions

During the field investigation phase of its activities, the Task Force found that the level of compliance with ground-water monitoring regulations could be improved. Facilities had not established adequate ground-water

monitoring programs, owing to incomplete hydrogeologic site characterizations, improper monitoring well location and construction, and careless sampling and analysis techniques. Deficiencies in ground-water monitoring programs resulted in incorrect plume definition and inadequate corrective action efforts.

In response to these problems, the Task Force recommended that the Agency take several steps for corrective action of facilities that did not comply with ground-water protection regulations or standard ground-water monitoring procedures. The Agency followed through on these recommendations by enhancing enforcement activities against facilities that were out of compliance. Enforcement efforts ensured that facilities were made aware of program areas that needed improvement and pressured facilities to correct significant faults in their programs. In general, enforcement activities elicited a positive response from facilities, as the Agency noted substantial improvement in the facilities' ground-water monitoring systems and remediation efforts. It is clear that the Task Force investigation and subsequent response by the Agency and facilities have improved the ground-water protection systems at these facilities.

To improve compliance performance on a nationwide basis, the Task Force believes that the regulatory agencies (Regions and States) must maintain staffs with enough field experience to detect problems early in the investigation process. In many cases, the Task Force's field experience enabled it to discover the incorrect methods and faulty reasoning that resulted in ineffective ground-water monitoring, which may have been overlooked by less experienced staff.

The Agency is cognizant of these problems, and is examining ways in which it can improve its role in technical assistance and as coordinator and enforcer. To accomplish this goal, the Task Force believes that EPA should continue efforts to improve training programs for ground-water professionals and increase the level of technical expertise at the Regional level. For instance, EPA recognized that ground-water professionals with adequate field experience are in great demand, and has responded by developing programs to train Regional staff in methods and strategies for field investigations. The Task Force encourages this training effort, and suggests that each ground-water professional include as part of his or her individual training program an opportunity to observe field inspections and subsurface investigations.

The Agency is further augmenting national compliance by involving technical staff in quality control reviews of technical aspects of enforcement decisions. In addition, the Agency is enhancing its oversight of enforcement actions to mitigate the need to conduct multiple actions. (Issues concerning Regional personnel and infrastructure are discussed further in Chapter 3 of this report.)

CHAPTER 3

REGIONAL INFRASTRUCTURE ASSESSMENT

The primary mission of the Hazardous Waste Ground Water Task Force was to evaluate the level of facility compliance with RCRA-mandated ground-water monitoring requirements, to determine the probable causes of noncompliance and to recommend ways to increase the level of compliance. While the Task Force field evaluations of hazardous waste facilities addressed many of the technical issues, which will enable the Agency to create a standard protocol for use in evaluating a facility's ground-water monitoring program, EPA recognized that two, non-technical program elements were equally important for solving the problem of noncompliance: (1) the elements of the RCRA ground-water monitoring program itself (e.g., guidance documents, research and development, training) as well as the EPA-promulgated regulations pertaining to ground-water monitoring; and (2) the effects of the Agency's infrastructure on program implementation. The Task Force addressed RCRA program content issues in the Operations Assessment Group (OAG) report completed January 25, 1986.

This chapter summarizes the results of the Task Force Study of the Agency's infrastructure[2] which focussed on the organizational and operational aspects of RCRA program implementation. Specifically, Section 3.1 outlines the goals and findings of the Infrastructure Assessment project. Subsequent sections present the Task Force's findings relating to specific components of the Agency's infrastructure: personnel (Section 3.2), resource utilization (Section 3.3), communication and coordination (Section 3.4), and information management (Section 3.5).

3.1 PROJECT GOALS AND REVIEW OF FINDINGS

The goal of the Infrastructure Assessment project was twofold: (1) to identify those aspects of the various Regional programs that are effective in promoting the successful implementation of the ground-water monitoring program, and (2) to identify those aspects that seem to impede successful implementation and to recommend solutions.

The infrastructure project team consisted of four members of the Task Force. With input from EPA headquarters managers, other Task Force Core Team members, and several Regional RCRA Branch Chiefs, the team drafted a project plan and questionnaire, which would be used as the vehicle for gathering information from Regional staff and management. The questionnaire focussed on how Regional programs were organized, staff expertise, how

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[2] The term "infrastructure," as used in this report, refers to the organizational framework, including personnel; how information is managed and communicated; how authority and responsibility are delegated; and how resources are used.

ground-water-related work was conducted, how data were managed, how information was communicated, and how responsibilities were delegated within Regional, State, and Headquarters program offices. After receiving additional input from the OSWER Ground-Water Steering Committee, the team presented the plan to the Regional Hazardous Waste Division Directors in March 1987. The final project plan and questionnaire were completed a month later, and the information-gathering interviews were conducted from May to the end of August, 1987.

The results of the study are based on interviews conducted in all ten Regions. The interview team usually consisted of Task Force Core Team members and other Task Force Regional members. Approximately 150 people were interviewed, each for about one hour. Interviewees included RCRA Branch Chiefs, Section and Unit Chiefs, hydrogeologists and other RCRA staff, and representatives from Superfund, the Environmental Services Division (ESD), the Regional Office of Ground Water (OGW), Underground Injection Control (UIC), and the Office of Regional Counsel (ORC).

The Task Force found that the organization and operation of each Regional office is unique and based upon management perceptions of how to best coordinate the various tasks involved in implementing their ground-water management programs. As a result, there are, in effect, ten different Regional infrastructures. Nevertheless, the Task Force found that a number of problems and issues were common to all ten of the Regional offices. These problems concern hiring and retaining staff, resource utilization, communication and coordination, and data management. These areas were reported to affect the ability of the Agency and the authorized States to produce complete and technically accurate work.

The remainder of this chapter presents the findings of the Task Force's infrastructure study and its recommendations for improving the efficiency of the ground-water management program.

3.2 PERSONNEL

3.2.1 Issues and Observations

Compliance with ground-water monitoring regulations is largely achieved by meeting the performance standards that EPA developed in response to RCRA's mandate concerning the protection of ground water. To enforce the ground-water monitoring regulations the Agency must have on their staff personnel who have the technical expertise to judge whether standards are being met, and if they are not, to assist facilities in achieving the required performance standards.

Although Regional staff often consisted of individuals with a wide variety of geologic experience, few were found to have specific academic or field experience in the specialty of hydrogeology. Most Regions reported that the level of hydrogeologic expertise needed by the Agency was above entry GS levels. As a result, some Regions attempt to hire only highly skilled staff at the upper GS levels. Several of the Regions interviewed

have had success in hiring experienced staff. One Region attracted several experienced and field-trained geologists and hydrogeologists with 5 to 10 years of well drilling and field mapping work from the U.S. Army Corps of Engineers (USACOE). Another Region reported that it had found staff with experience in drilling wells and conducting pump tests at the U.S. Geological Survey (USGS). Two Regions have used information booths at geological conferences or job fairs to attract job applicants.

Hiring of the best possible skill mix also has been impeded by the inability to "direct hire" ground-water specialists. The Office of Personnel Management (OPM) registers are often fully subscribed with "geologist," but it can be difficult to find highly qualified individuals with hydrogeologic and RCRA skills. Two Regions have overcome this situation by obtaining Regional direct-hire authority (as recommended in the Operations Assessment Group (OAG) report). Another Region has hired staff first as temporary employees and later converted them to permanent when permanent positions were available.

Hiring qualified staff is not the only problem. Retaining experienced hydrogeologists in the RCRA program continues to be a challenge. Some staff interviewees reported that when experienced people leave, complex technical projects are often reassigned to junior-level staff who receive little or no supervision or guidance from a senior-level hydrogeologist. Most of the hydrogeologic staff had only 1 to 3 years of experience. The interviews identified two major causes of turnover among technical staff: low salary and promotion potential; and lack of opportunity for skills enhancement.

Nearly all technical staff identified low salary and limited promotion potential as one of the major issues affecting their decision to stay with the RCRA program. In two of the Regions staff transferred to the Superfund program and to the Office of Ground Water, which provided promotions to GS-13 positions. In each of these cases, GS-13 positions did not exist in the RCRA program and, in the staff's opinion, the creation of advanced technical positions in RCRA was not likely to occur.

Two Regions have pursued the OAG recommendation to create advanced technical positions in RCRA for a hydrogeologist. In both cases these positions were created at the GS-13 level, and in both cases even this level was insufficient to hold staff for very long. No Region has created technical track career ladders equivalent to middle and upper management grades. Several Regions expressed opposition to the policy of career technical tracks. They stated an unwillingness to single out one skill for advanced salary potential, a reluctance to expend the time needed to implement the policy, and a lack of funds to pay for the positions.

The most often reported reason for hydrogeologist turnover is under-utilization of professional expertise and lack of educational or skill enhancement opportunities. Advanced technical training was cited as a common need. In many cases sufficient training funds for advanced academic and field courses were not available. In other cases it was reported that even when funds for tuition were available, travel dollars were not. In a few cases, lack of equipment, such as ground-water modeling software and map work

facilities, was cited as a limiting factor; however, this particular equipment has since been provided.

3.2.2 Recommendations

The Task Force supports the recommendations concerning the issues expressed in the memorandum from Stephen Wassersug to James Barnes on July 5, 1985, and in Chapter 7 of the Operations Assessment Group (OAG) report dated January 25, 1986.

3.2.3 Current Status

The overall career ladder for CERCLA technical professionals is being evaluated within the On-Scene Coordinator/Remedial Project Manager (OSC/RPM) support project. This project can serve as a model for RCRA technical professionals, and this possibility will be explored.

3.3 RESOURCE UTILIZATION

3.3.1 Issues and Observations

It is important to point out that as a relatively new area of responsibility for EPA, the RCRA ground-water program has been especially hard hit by the lack of rapid growth. Other technical areas of responsibility in the hazardous waste program (such as construction and design of waste management units) require staff with professional engineering backgrounds; a substantial number of the original engineering staff and management of the Agency have been successfully redirected and their skills applied to these areas of the RCRA program. However, there was no pool of hydrogeologists from which the Agency could draw to fill ground-water staff positions. Consequently, ground-water program management is forced to add on hydrogeologic expertise. Managers reported, however, that it is much easier to fill vacancies with engineers, who can be brought on at senior level, than with hydrogeologists, who are not covered by EPA's direct-hire authorities. Since neither Agency growth nor a redirection of staff resources can be counted on to solve the problems created by lack of hydrogeologic expertise, the only remaining option is to make the best of hiring opportunities the Agency does have to optimize the use of the current staff.

The following comments about resource utilization were raised during the interviews with Regional staff.

- The Agency should require that a hydrogeologist be present at land disposal facilities during some portion of site characterization and remedial activities. Technical staff indicated that on those occasions that they have been present to inspect construction and other field activities, they had discovered and corrected problems that otherwise would have been overlooked if the oversight process had consisted only of a review of the project plan.

- Using contractors for RCRA investigations has often been

unsatisfactory because contractor staff very often lack the necessary qualifications.

- There is a significant discrepancy between the full-time equivalent factors in workload models and what the Regions actually spend to complete ground-water evaluations.

- EPA must amend the workload models and State RCRA grants to include post-permit inspection of hydrogeologic field work, data review, and enforcement of special permit conditions, particularly as the RCRA facility investigations are conducted.

- There is not enough time to oversee and conduct technical reviews of State actions.

- The Task Force discovered cases in which Regions failed to follow up on progress made by facilities that were directed to take some specific action.

- Headquarters' program staff and review teams generally lack technical capabilities in ground-water management, and completing tasks is considered to be OSWER's top priority.

3.3.2 Recommendations

Based on the results derived from the interviews with Regional Staff, the Task Force made the following recommendations:

- OSWER, in coordination with the Regions, should conduct a comprehensive review of workload models and resource analysis with input from experienced hydrogeology staff.

- The Regions should be directed through Strategic Planning and Management System (SPMS) measures to conduct regular field activity inspections to ensure that permit and order conditions are being met.

- The Regions should anticipate the increase in workloads that will occur in the future as a result of permit compliance schedules, 3004(u) orders, and 3008(h) orders -- and staff accordingly. The follow-up work required will be resource-intensive as reports are reviewed, field presence is required, and appropriate enforcement actions are taken. Work force planning similar to that for OSCs/RPMs is being considered to fulfill staffing needs.

3.3.3 Current Status

EPA has already implemented two out of the three Task Force recommendations. OSWER has an ongoing process for workload model review, and field inspections are now included in SPMS commitments. Work force planning is in its early stages.

3.4 COMMUNICATION AND COORDINATION

3.4.1 Issues and Observations

Effective communication and coordination within and among Regions and between Regions and Headquarters is vital to the successful implementation of the RCRA Subpart F program. Historically, EPA Headquarters has not required its Regional offices to follow specific organizational or communication procedures, preferring to allow them the flexibility to develop a structure that best meets their needs. This approach allows individual management styles to flourish and maximizes the strengths of their particular Regional offices; however, it also relies heavily on the ability of Regional management to compensate for the difficulty of coordinating ten different organizations at the national level.

The Task Force found numerous cases in which a specific organizational structure worked well in one Region but was perceived as failing in another. According to many interviewees, the central factor in either the success or failure of any particular organizational structure was the degree to which management was able to recognize problems when they arose and to set up mechanisms to overcome them.

In the Regions where dissatisfaction with the organization was expressed, the Task Force found that staff and management often had completely different perspectives on the existence and nature of organizational and communication problems. Managers tended to feel that any difficulties were minimal, while their staff often felt that significant problems existed and that communication of technical issues between management and staff was ineffective or nonexistent.

In the Regions where there was general satisfaction with the organizational arrangement and internal RCRA communication, not only did staff and management have similar perceptions, but there was other evidence that they were committed to promoting effective communication and task coordination. The following are examples of the kinds of mechanisms found in these Regions:

- Frequent (bi-weekly) formal meetings between all RCRA hydrogeologists and all RCRA section chiefs and the Branch Chief to discuss priorities, adjust workloads, and identify upcoming needs for technical support.

- Adherence to a formal concurrence policy requiring all parties with ground-water responsibilities to review and concur on actions before management signs a decision document.

- Active enforcement by management of performance expectations -- for example, that their staff continually share information and take all perspectives into account before taking action.

- Keeping Regional management and technical staff informed of upcoming regulations, policies, guidance, and research by assigning a Subpart F lead.

- Assigning a single geologist to manage a site through enforcement and permitting actions even though hydrogeologic staff were divided between the permits and compliance parts of the program.

- Meetings held among hydrogeologists to discuss technical issues and national guidance and policy.

- Peer review of all hydrogeologic work by other hydrogeologic staff, or review of significant reports by a senior hydrogeologist.

- Using a ground-water routing slip to circulate technical journals, notices of training courses, and other professional notices among hydrogeologic staff.

3.4.2 Recommendations

Based on its observations and the information gathered during interviews, the Task Force made the following recommendations concerning communication and task coordination:

- Regional performance is linked to the SPMS, which tracks the number of permits and orders issued to facilities. The Task Force recommends that OSWER hydrogeologists review draft permits for technical adequacy as well as for general completeness as part of the quality criteria in the RCRA Implementation Plan.

- Regional Management should assure the exchange of technical issues, ORD results, and Headquarters' policies and guidance among ground-water staff.

- Hydrogeologic work products should be reviewed internally for technical accuracy by hydrogeologists with experience in the RCRA program.

- Regions must assure consistency of their actions. This function could be implemented by convening a peer review panel for exchanging information about various approaches as well as for conducting a technical accuracy review.

3.4.3 Current Status

The Agency, at both the Headquarters and Regional level, recognizes the importance of effective communication and coordination of program responsibilities. The following action has been taken.

- The recent creation of the CERCLA Ground-Water Forums and the OSWER

Bulletin Board has reduced the problem of exchange of information (e.g., ORD results, Headquarters' policies, and guidance) among ground-water staff.

- Some Regions have revised their organizational structure in order to improve communication among technical staff.

- Regional Division Directors are having OSWER hydrogeologists review draft permits for technical accuracy as well as for completeness.

3.5 INFORMATION MANAGEMENT

3.5.1 Issues and Observations

The Regions were nearly unanimous in expressing the need for an automated data management system to manage the increasing amounts of RCRA ground-water data. Currently, a tremendous amount of site-specific geologic and ground-water data are generated at RCRA-regulated facilities. As voluminous as the data now are, the amount is expected to continue to increase in the future, especially as plumes from solid waste management units are mapped and their threats assessed. According to the interviewees, neither EPA nor State technical staff can adequately evaluate existing information, which is often in the form of reports containing hundreds of pages that in turn, contain thousands of individual analytical results. As a result, interviewees reported, permit writers and enforcement officers are often forced to make decisions without the benefit of having reviewed all of the hydrogeologic data.

However, even if staff could thoroughly review all the collected data, decisionmakers still might arrive at faulty conclusions because the quality of the data is suspect. RCRA-regulated facilities have the primary responsibility for taking ground-water samples, analyzing the contents, and reporting the results to EPA. There are no uniform data quality standards or reporting requirements. Data of unknown quality are now submitted in varying units of measure, in numerous formats, and without cross references to the sampling method used, well location, well construction, or geologic unit in which the well is screened. All of this further compounds the obstacles faced by Agency hydrogeologists.

The data management issue is well known. Nine out of ten Regions expressed concerns about the resource drain caused by manual data management The Office of Solid Waste earlier recognized the need for automated data management and issued policy memoranda in 1984 and 1985 directing the Regions to implement automated data management programs (see: Skinner to Division Directors, 9/24/84; and McGraw to Division Directors, 11/22/85). In addition, Headquarters revised the STORET program to make it usable for RCRA ground-water and geologic data.

The infrastructure interview teams, however, found that the system had not been implemented because of competing program priorities and the lack of specific implementation goals (e.g., State grant conditions, SPMS measures)

for completing data automation and analysis. Failure to allocate sufficient resources to develop and maintain a data management system has been another impediment. Thus, Regions are left with two options: to expend an inordinate amount of time on manual examination of data or to review only selected portions of the data.

The Task Force interview team made the following observations concerning data management within the Regions:

- Staff in one Region reported that it has already entered over nine megabytes of data from a commercial facility into a site-specific computer system designed by contractors. The enormity of this data file suggests that any national system will need substantial storage capacity.

- In another Region, staff reported that the single personal computer available to them was constantly in use, limiting its availability for hydrogeological reviews. This was especially true for modeling, which can involve days of computer time for calibrating, conducting sensitivity analyses, and running simulations.

- One Region used contractor assistance to develop a personal-computer-based data management and analysis system and then used contractor support to enter the RCRA ground-water data into the system. The Region also has linked its personal computer to its word-processors so that technical staff can create and edit reports on one terminal and then send them electronically to clerical staff for final production.

- One Region reported a successful pilot project using the revised STORET to store geologic information, well construction information, and RCRA ground-water data.

3.5.2 Recommendations

Based on the observations just discussed the Task Force made the following recommendations:

- As a first step, the Agency should develop and promote a standard data reporting format.

- Even though having a uniform reporting format will ease the difficulty of tracking and entering data into a computer system, the ultimate goal of the Agency should be the electronic capture of facility data (e.g., reports submitted on diskette) thus eliminating the need for manual entering of the data and resource drain that results.

- OSWER, in coordination with the Regions, should implement a nationally consistent automated data management system with compatible hardware and software components in all Regions.

- OSWER must give clear program office direction to Regions and States, including performance goals and resources, in order to implement a ground-water data management system and to enter the relevant 1981 to present data that will be used as the bases for permitting, setting alternate concentration limits (ACLs), closure/post-closure, and/or enforcement decisions.

- OSWER must provide, build and maintain a central technical support group both to provide technical assistance to system users and to design system improvements.

- OSWER should direct the Regions to promote, through the grant process, the involvement of authorized States in continuing automated data management and doing adequate analysis in support of permit, ACL, closure/post-closure, and clean-up decisions.

- Regional management should show its support for an automated ground-water data system by allocating staff and contract dollars, and by promoting computer training and use among current staff.

3.5.3 Current Status

The Agency recognizes the need for improving data management and has adopted several of the Task Force recommendations.

- The Agency is addressing the problem of lack of computer resources by authorizing the installation of additional personal computers and a ground-water work station in each Region.

- A special Agency task force is currently investigating the feasibility of developing a national automated data management system with a storage capacity sufficient to hold all data supplied by facilities and generated from facility reviews.

- A task force chaired by the Office of Water with OSWER participation is in the process of developing a standard data reporting format.

CHAPTER 4

FY 88/89 GROUND-WATER PROGRAM RECOMMENDATIONS

Since the promulgation of EPA's ground-water monitoring requirements in 1980, efforts to protect the nation's ground water have benefited from dramatic improvements in ground-water related knowledge, capabilities, and technological skills. For example, advances in research and development (R&D), analytical methods and technical capacity have led to a greater understanding of subsurface hydrogeology. These advances, in turn, have allowed environmental scientists to better characterize the migration of contaminant plumes, and hence conduct more precise and effective remediation activities.

During its tenure, the Task Force has both experienced and contributed to this evolution in ground-water technology. While progress in this area has undoubtedly enhanced the ability of environmental scientists to protect ground water, the rapid pace and wide breadth of these scientific advances present a significant management challenge to both Regional and State ground-water programs. Environmental program staff in both the public and private sectors have defined this challenge as the need to:

- understand the changes being made to current regulations and guidance;
- use advances in ground-water technology and intelligence to measure the Agency's success in implementing existing regulations and guidance;
- recognize each site as a geologic configuration requiring individual attention; and
- balance statutory and administrative management procedures with the need to employ the level of technical quality criteria necessary to protect human health and the environment.

In assessing and adapting to advances in ground-water intelligence and technology, EPA managers must also remain cognizant of horizontal and vertical management imperatives. Vertical management is required to assure continued maintenance and efficient utilization of ground-water technical staff skills and management systems. On the other hand, managers must recognize that the ground-water program fits horizontally into the hazardous waste program as a whole (i.e., permit approval, land ban, waste characterization, closure, risk assessment, etc.). Assessing how these two imperatives interact and balancing their respective requirements has been and will continue to be a primary consideration of EPA managers.

Finally, EPA managers are and will be continuously challenged by some facilities' unwillingness or inability to comply fully with the ground-water monitoring requirements. Although facilities often respond positively when

granted a certain degree of attention by the implementing agency (as demonstrated in Chapter 2 of this report), it is unlikely that the Regions or States will have the resources to closely supervise the activities of all land-based facilities. Consequently, EPA managers must develop mechanisms by which the Agency can ensure the greatest degree of compliance with the personnel resources on hand.

With these challenges in mind, the Task Force has been asked to use its experience to make program recommendations for EPA's ground-water regulatory program. When developing its recommendations, the Task Force relied upon its analysis and evaluation of data, information and experiences obtained through (1) the investigation of 58 major land disposal facilities throughout the nation, (2) recommendations made by the Task Force Operations Assessment Group, and (3) information collected by the Regional Ground Water Infrastructure Assessment Group. In addition, the Task Force based its FY 88/89 program recommendations (see Sections 4.1 through 4.3) upon the following principles:

- A recognition that authority and responsibility must be allocated vertically within the ground-water program and horizontally across governmental and program area lines;

- An understanding that implementing the Subpart F technology requirements demands rigorous attention to balancing a need for technical quality with the need to make timely environmental management decisions;

- A demand that management and staff have a clear understanding of system standards, process checks and balances, program objectives, and individual roles as defined by reasonable performance measures; and

- Cognizance that ground water, while remaining a very important environmental program element, does not stand alone, but is influenced by a number of human and scientific factors, some of which are unknown. Consequently, the ground-water program must be flexible enough to consider technological change.

The Task Force also believes that proper implementation of its program recommendations is indispensible to the success of its effort. To this end, the Task Force has established two general goals to serve as foundations for the implementation of the recommendations that follow. These goals are:

- Focusing continued ground-water program assistance on improving field performance, developing high-quality data and information objectives, and facilitating the improvement of Region and State management of the site-specific decision making process; and

- Application by the Office of Solid Waste and Emergency Response (OSWER), Office of Program Management and Technology (OPMT) of its technology transfer and training strategies to provide improved ground-water program assistance to key management and staff

professionals in the Regions and States.

When reviewing the recommendations presented in this chapter, it is essential to keep in mind the findings of Chapters 2 and 3 of this report. For example, Chapter 2 illustrates that gathering scientific data, analyzing information, designing and implementing remedies, and ensuring compliance in the field requires a substantial amount of time, special staff skills, and persistance on the part of management. Chapter 3 reinforces these findings by further clarifying the communications and coordination challenges EPA managers must surmount to implement and enforce an effective ground-water program.

4.1 RECOMMENDATION 1: ESTABLISH GROUND-WATER TECHNICAL ASSISTANCE PROGRAM

The ground-water technical assistance program consists primarily of satisfying needs by providing direct assistance. This type of assistance is consistently recognized as among the best and most effective means of transferring technology, as evidenced by the number of government agencies employing some form of direct technical assistance.

In fact, the OSWER Superfund Technology Support Centers program with ORD addresses the need to transfer technology to technical staff in the Regions. To provide for and fund technical assistance activities related to ground water, the Task Force recommends that OSWER establish a similar comprehensive ground-water technical assistance program for RCRA regional ground-water staff by the third quarter of FY 89. The Task Force believes that a well coordinated technical assistance program will promote the use of results from applied research in the field. This section outlines the fundamental elements of this program.

The Task Force believes that there are three fundamental elements of any technical assistance program: (1) the individual requesting assistance, (2) the provider of assistance, and (3) the program that facilitates technology transfer. These elements are discussed below.

- Individual requesting assistance. An EPA staff member who requires technical assistance to complete an assigned task and requests the delivery of such assistance.

- Provider of assistance. An EPA staff member or ORD technical expert who has the capacity to screen requests, is familiar with issues relating to ground water, has access to and knowledge of a broad spectrum of assistance, and can provide financial support to deploy assistance.

- Assistance program. A program that allows direct assistance either at the point of need (i.e., the requester's location) or at the point of knowledge (i.e., the provider's location). The Task Force recommends that the program should perform the following functions:

-- Provide a proactive coordinator who can easily receive requests;

-- Develop a criteria for screening assistance requests;

-- Establish performance measures that guarantee swift action on all requests;

-- Develop an efficient system for evaluating requests for technical assistance services and cost advance/reimbursements;

-- Monitor assistance delivery and quality; and

-- Document delivery of technical assistance.

4.2 RECOMMENDATION 2: IMPROVE GROUND-WATER INFORMATION SYSTEMS

Throughout this report, the Task Force has argued that the Agency must enhance its ground-water information systems to more effectively implement and enforce the ground-water monitoring requirements. For example, the Regional Infrastructure Assessment, as discussed in Chapter 3 of this report, found a serious need for improved information management in the ground-water program. In making this finding, the Assessment cited the following conditions:

- The copious amount of geologic and ground-water data being generated at RCRA facilities;
- The varied nature of data input, which makes proper data analysis extremely difficult;
- Poor data quality;
- A lack of uniform data requirements or standards exist; and
- The general failure of owner/operators to improve their information collection processes.

In this section, the Task Force presents three recommendations to improve OSWER's ground-water information systems. Collectively, these recommendations provide a tactical foundation for ground-water information issues that must be addressed over the next 3 to 5 years. The Task Force urged that the Agency initiate implementation of these recommendations in FY 88. The recommendations are outlined below.

4.2.1 Cooperate with the OGWP/OIRM Data Management Process

In May 1987, the Office of Ground-Water Protection (OGWP) and the Office of Information Resource Management (OIRM), with the assistance of OSWER, completed a report entitled Ground-Water Data Requirements Analysis for the

EPA. The Data Requirements Analysis Policy Committee reached consensus on the following issues:

- Investment in improved ground-water data management is necessary and justified, although improvements should be phased in over time to limit risk and minimize disruption;

- Existing and proposed projects for improving ground-water data management must be carefully coordinated and managed to maximize their benefits; and

- States, EPA Regions, and EPA offices must voluntarily adopt new ground-water data standards and practices, since they cannot be imposed effectively from above.

To address these issues, the Committee urged the Agency to develop data management standards, policy and guidance, improve access to ground-water data across program lines and automation, and enhance ground-water data analysis capabilities. In light of findings, the Task Force recommends that OSWER establish an ongoing ground-water information management strategy for hazardous waste programs.

4.2.2 Develop Data Quality Objectives and Standards

The States, Regions and Headquarters depend upon the submission of high-quality data by the public and private sectors to make proper regulatory and enforcement decisions. Poor data quality hinders these efforts, and is often the direct result of unclear data quality standards or objectives. Since data providers often provide only the information they believe is required, unclear data quality standards harm the Agency's ground-water program. As such, the Task Force strongly recommends that the OSWER program offices develop data quality objectives for use at hazardous waste sites.

4.2.3 Develop and Implement the EASI-GW Computer Workstation

In 1987, the Task Force initiated a project with the Oak Ridge National Laboratory (ORNL) to research and develop a ground-water computer workstation capable of integrating certain useful independent applications software programs. By initiating this project, the Task Force hoped to facilitate improved analyses of ground-water conditions at hazardous waste sites, assess more accurately the extent of further monitoring needed at a site, and develop a tool to improve data access, control and presentation capabilities.

The first stage of the project was completed in September 1987, when the Environmental Applications Software Integrator for Ground-Water (EASI-GW), was pilot tested in Region 8 and National Enforcement Investigation Center (NEIC), both in Denver. The pilot tests were successful, and the Agency approved the EASI-GW for implementation in each of the Regional RCRA Branch Offices. The systems were installed between October 1987 and October 1988.

4.3 RECOMMENDATION 3: IMPROVE GROUND-WATER TRAINING AND GUIDANCE

Effective ground-water technology transfer requires that the Agency establish a comprehensive training program and issue relevant guidance documents. In this section, the Task Force reviews recent efforts made by the Agency in this area and outlines several recommendations for improving ground-water training and guidance.

4.3.1 Recent Efforts in Ground-Water Training and Guidance

OSWER has devoted a great deal of time and effort towards improving ground-water training and guidance. The following documents reflect the work accomplished by EPA and other agencies or institutes in this field:

- Ground-Water Protection Strategy, Office of Ground-water Protection, EPA, 1984.
- Ground-Water: Strategies for State Action, Timothy R. Henderson, et al., Environmental Law Institute, 1984.
- Assessment of EPA's Hazardous Waste Enforcement, GAO, 1985.
- OSWER Training Needs Assessment, ETI, 1985.
- Porter, J. Winston, Ground-Water Training, memorandum, August 26, 1985.
- Guidance on Remedial Investigations Under CERCLA, Office of Emergency and Remedial Response, et al., EPA, 1985.
- Revised Draft Protocol for Ground-Water Inspections at Hazardous Waste Treatment, Storage and Disposal Facilities, Hazardous Waste Ground Water Task Force, EPA, 1986.
- Hazardous Waste: Federal Civil Agencies Slow to Comply with Regulatory Requirements, GAO, 1986.
- Evaluation of the RCRA Subpart F Ground-Water Monitoring Program, Final Report, Hazardous Waste Ground Water Task Force, EPA, 1986.
- OSWER Training Implementation Plan, OSWER Work Group, April 1987.
- OSWER Ground-Water Curriculum Plan, OSWER, Office Program Management and Technology, 1987.
- OSWER Ground-Water Curriculum Implementation Plan, OSWER, Office of Program Management and Technology, August 1987.
- Resource Conservation and Recovery Act (RCRA) Ground-Water Monitoring Technical Enforcement Guidance Document, Office of Waste Programs

Enforcement, September 1986.

- Comprehensive Ground-Water Monitoring Evaluation (CME) Guidance Document, Office of Waste Programs Enforcement, December 1986.

Perhaps the most significant documents in this list are OSWER's Ground-Water Curriculum Plan and Ground-Water Curriculum Implementation Plan. Both documents emphasize the top priority given to the topic of ground-water. After examining 72 ground-water training and regulatory courses, the Ground-Water Curriculum Implementation Plan prioritized 10 ground-water topics. Exhibit 4-1 outlines these topics.

During its tenure, Task Force management has played an active role in developing ground-water training recommendations. The Task Force's most recent recommendations, classified as "fast track" topics, are included within the 10 prioritized training topics in Exhibit 4-1. "Fast track" topics are the most crucial topics, and could deliver the most immediate impact.

4.3.2 Training and Guidance Recommendations

To improve ground-water training and guidance, the Task Force outlines the following recommendations.

Focus Contractor Support on Developing Ground-Water Training Program. The Task Force recommends that a single support contractor develop and deliver a comprehensive ground-water training program. The Agency should require the contractor to establish a data base that incorporates EPA hazardous waste ground-water information as it is generated throughout the training design process. The contractor should also demonstrate the technical ability and depth to be responsive to the varied demands of the total ground-water program. The Task Force believes that developing a foundation of ground-water information will provide a progressive systematic linkage between subject matters. Such information should be maintained in a manner facilitating transfer to other contractors should the need arise.

Include Management Training Course in Ground-Water Training Program. The Task Force recommends that the OSWER Training Work Group seriously consider adding an advanced management training course for all Regional and State managers that assess ground-water recommendations from technical staff. The management course should focus on assessing the quality and quantity of work performed. In addition, the course should provide management with an enhanced understanding of ground-water technology and an improved ability for technical investigation and management/staff dialogue. In short, the training course should raise management's comprehension of ground-water issues and enhance its capacity to coordinate technical staff utilization processes.

Modify Training Delivery Methods. Because the technical skills employed by Regional and State ground-water personnel often determine the measure of success or failure of the ground-water program, training delivery methods are

of utmost importance. Moreover, the Task Force believes that several conditions, including management and staff changes, varied staff skill levels, the rate of attrition of Agency personnel, the complexity of hiring requirements, and program reorganization, makes it important for the Agency to re-examine traditional methods of training delivery.

The traditional lecture, case study, hands on demonstration, and practical exercises will always be practical delivery methods and, in many instances, are the best methods for teaching certain subjects. Nevertheless, the Task Force recommends that the Agency modify its training delivery methods and consider other methodologies that are being successfully utilized in the technical training process.

EXHIBIT 4-1

GROUND-WATER CURRICULUM IMPLEMENTATION PLAN
SUBJECT MATTER PRIORITY RECOMMENDATIONS

Topic	Level a/	Est. Cost b/	Course Days c/	# Existing Course Coordination d/
1. Field Inspection Training	B,I	$49,710	3	17
2. Monitoring In the Unsaturated Zone	B,I	$49,710	3	7
3. Hydrogeology/Hydrogeology	B,I	$64,470	3	14
4. Geophysics: Methods, Techniques, Equipment	I,A	$140,610	3	8
5. Site Characterization	B	$72,060	3	6
6. Computer Modeling	I,A	$115,920	3	4
7. Well Technology	I,A	$184,290	3	9
8. Transport and Geochemistry	I,A	$184,290	3	7
9. RCRA Regulations	B	$58,750	3	4
10. Sampling	I	$208,100	3	14

(a) B = Basic, I = Intermediate, A = Advanced: The implementation plan recommends 3 basic, 3 basic to intermediate, 1 intermediate and 4 intermediate to advanced courses.

(b) Estimated "high" cost of the course. Costs actually could be higher or lower than estimated after actual development, depending on extent of technological advances.

(c) Estimated number of days required to deliver a "live" training course. For example, if each Region received a single 3-day course in a single fiscal year, the schedule time required would be 30 days. For cost purposes, curriculum development, pilot testing, course adjustment and evaluation must be added to the actual number of delivery days.

(d) The number of other existing courses that could contribute to help build the recommended course. Based on review by the Training Work Group of 72 ground-water related courses.

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