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Groundwater Conditions At Many Hazardous
Waste Disposal Facilities Remain Uncertain

Statement of Richard L. Hembra, Director
Environmental Protection Issues
Resources, Community, and Economic
Development Division

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Subcommittee on Oversight and Investigations
Committee on Energy and Commerce
House of Representatives



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Mr. Chairman and Members of the Subcommittee:

We appreciate the opportunity to discuss our views on the Environmental Protection Agency's (EPA) program for protecting groundwater from contamination caused by the disposal of hazardous wastes. My testimony today is based on our report, Hazardous Waste: Groundwater Conditions at Many Land Disposal Facilities Remain Uncertain (GAO/RCED-88-29), which we issued to the Subcommittee in February 1988, and on follow-up work performed at your request.

Mr. Chairman, the protection of our groundwater is a major objective of the Resource Conservation and Recovery Act (RCRA) of 1976, as amended. Our work, however, shows that weaknesses in EPA's groundwater monitoring program have resulted in data that has generally been inadequate for achieving the act's objective. As a result, groundwater conditions at many hazardous waste land disposal facilities remain uncertain and there is little assurance that such facilities are being operated in an environmentally safe manner. We found four specific weaknesses:

- EPA has had little success in getting facilities to meet established groundwater program goals. Delays in achieving these goals delayed the issuance of both operating and post-closure permits. Nevertheless, some permits were issued to facilities even though unanswered questions remained regarding groundwater conditions.
- EPA has not established criteria for the type, amount, and quality of data needed to make permit and groundwater program decisions. As a result, EPA used data of unknown quality in its permit decisions.
- EPA has not established sufficient technical standards and requirements for facility owners and operators to follow in monitoring groundwater. Major weaknesses in standards for

subsurface site characterization, well location and construction, and groundwater sampling practices, among others, have prolonged and hampered efforts to determine groundwater conditions.

- EPA has not developed nor required owners and operators to implement quality control and quality assurance mechanisms necessary to reasonably ensure that data collected by owners and operators is appropriate. As a result, regulatory decisions on whether or not to undertake clean-up efforts may have been questionable.

Overall, these deficiencies cast doubt on groundwater conditions at hazardous waste facilities and on the quality of permits that have been issued to some facilities. Further, we believe these deficiencies, when viewed in their totality, illustrate a more basic underlying problem. That is, EPA has not instituted an adequate system of management controls over the RCRA groundwater monitoring program and has not committed sufficient resources to evaluate and monitor compliance with issued permits.

Before I discuss these weaknesses in greater detail, let me briefly explain the importance of groundwater, the process for obtaining monitoring data, and EPA's program for facility owners and operators to follow in obtaining this data.

IMPORTANCE OF GROUNDWATER

Groundwater plays a major role in the nation's water supply. About one-half of the nation's population depends on groundwater for drinking water, and it accounts for about 25 percent--approximately 82 billion gallons--of all fresh water used daily. More importantly, consumption of groundwater is increasing at twice the rate of surface water.

Groundwater is most often used untreated, just as it comes from the ground, and the importance of protecting its purity cannot be overstated. Contaminated groundwater can cause cancer and other serious health problems, and clean-up of this resource is difficult to achieve, takes many years, and can cost millions of dollars. According to EPA, groundwater clean-up actions are many times more costly than prevention and, in some cases, it may not be possible to restore groundwater to its original quality. Additionally, well documented incidents such as Love Canal show us that the social costs of contamination can far outweigh the economic costs.

NEED FOR GROUNDWATER MONITORING

For the reasons I've mentioned, groundwater monitoring around hazardous waste land disposal facilities is crucial. Hazardous waste facilities present one of the most direct contamination threats to groundwater. Rain and snowmelt percolating down through the soil can leach the hazardous constituents from such facilities and carry these contaminants to the groundwater. Depending upon the underlying terrain, the rate of groundwater flow, and the type and amount of constituents released from facilities, contaminated groundwater can easily migrate off-site and adversely affect groundwater users.

Unfortunately, the risk of contamination by land disposal facilities is not small. As of March 1989, there were 1,451 RCRA hazardous waste land disposal facilities throughout the country, of which 166 have received operating permits, 29 others are expected to obtain operating permits, and 57 have received post-closure permits. According to EPA, the nearly 1200 remaining facilities are closed or closing. As constructed and managed in the past, many land disposal facilities did not minimize the leakage or release of hazardous contaminants into the groundwater. In fact, EPA has estimated that the size and scope of actions needed to

prevent and correct leakages from RCRA facilities could equal that of the Superfund program.

Monitoring of groundwater is the principal mechanism for detecting contamination at these facilities; in most cases, it is the only mechanism. A monitoring system normally consists of a number of wells located in strategic locations and depths around a facility's disposal units. Since groundwater generally flows in a downgradient direction, upgradient wells are required to determine the quality of the groundwater before it gets to a facility, and downgradient wells are needed to determine the groundwater quality after it passes under or by the facility. By analyzing samples of the water from both the upgradient and downgradient wells and comparing the results, it can be determined whether the facility is contaminating the groundwater. (App. I shows a cross section of a simple groundwater monitoring system).

RCRA GROUNDWATER MONITORING PROGRAM
RELIES ON OWNERS AND OPERATORS

Because of the risk to groundwater supplies posed by hazardous waste facilities, EPA requires facility owners and operators to monitor the groundwater underlying their facilities. As implemented by EPA, owners and operators must design and install groundwater monitoring systems, collect samples, and perform sample analyses. Where the monitoring system detects contamination that exceeds the groundwater protection standards, the owners and operators are responsible for assessing the extent of the problem and correcting the environmental damage caused by the facility.

EPA is responsible for establishing the groundwater monitoring requirements owners and operators must follow and for ensuring that the requirements are properly implemented. In this regard, EPA is to establish data quality acceptance criteria and issue regulations governing the activities involved in collecting and analyzing groundwater monitoring data. Additionally, EPA is to establish the

quality controls necessary to ensure that data collected can be used in making regulatory decisions.

MONITORING PROBLEMS IDENTIFIED BY GAO

As we reported in February 1988, EPA's groundwater monitoring program at hazardous waste disposal facilities has not ensured that the groundwater is being adequately protected. Because of a lack of effective management controls, groundwater data submitted by facility owners and operators has varied in completeness and quality, and generally has been less than adequate for making informed regulatory decisions. We identified four specific weaknesses that have contributed to the magnitude and duration of problems encountered in this program.

Groundwater Program Goals Not Met

In 1982, EPA established three groundwater program goals for facilities to achieve prior to receiving permits. These three goals were (1) to determine whether the facility is leaking contaminants, (2) to assess the rate, extent, and magnitude of any leaks, and (3) to design any needed corrective action measures. These goals were established to measure the impacts and trends that a facility's disposal operations might be having on the groundwater. EPA had planned to accomplish these goals, and issue all disposal facilities operating or post-closure permits, by the end of 1984.

However, we found that facilities were far behind in accomplishing these goals. Of the 50 facilities we reviewed, only 11 were viewed by EPA and state officials as having met EPA's groundwater monitoring goals. The other 39 facilities had not developed sufficient groundwater information to demonstrate that these goals had been met. Six of these facilities had not met the first goal of determining whether or not there was leakage, and 31

facilities known to be leaking had not accomplished the second goal of determining the rate, extent, and magnitude of the contamination. Two facilities that met the first two goals had not designed a corrective action program, the third goal.

The inability to demonstrate that these goals had been met delayed the issuance of operating and post-closure permits. Of the 50 facilities we reviewed, 43 had not received their permit by late 1987. In view of these delays, EPA issued a Federal Register notice in June 1987 deferring the requirement to design corrective actions until after permit issuance to expedite the permit process.

However, despite the additional time and deferral of one goal, EPA did not always ensure that facilities with issued permits met the remaining groundwater program goals. We found that one of the seven facilities with permits had not satisfied any of the three groundwater program goals. In this instance, the facility did not have an adequate background well needed to determine whether the facility was leaking and to assess the magnitude of such leaks. EPA instead chose to require that the necessary background well data be obtained after the permit was issued.

As of April 1989, only 11 of the 50 facilities had obtained an operating or post-closure permit. However, we are currently unable to determine the extent to which facilities either with or without permits now meet EPA's groundwater monitoring goals because EPA does not maintain this data at the national level.

Quality of Reported Data Unknown

The second weakness is that EPA has not developed criteria for the type, amount, and quality of data needed to support and defend regulatory decisions. Termed "data quality objectives," these criteria have been required for all EPA regulatory programs since

mandated by the EPA Administrator in 1979. The requirement was reaffirmed in an April 1984 EPA order that also required five key attributes of environmentally collected data--precision, accuracy, completeness, comparability, and representativeness--to be of known quality and well documented before the information is used for regulatory decisions.

As a consequence, the data being provided to, and used by, EPA were of unknown quality. We found that sufficient data satisfying all 5 attributes were lacking for all 50 facilities, including the 7 already holding permits. EPA and state permit writers said they had never been tasked with evaluating the quality of facility-supplied data in accordance with the order. Twenty-seven of the 33 EPA and state officials we interviewed concerning the order were unaware of its requirements for data quality. Further, in instances in which more precise data had been sought, the lack of quality objectives frustrated EPA and state efforts to obtain quality data from owners and operators and forced permit writers to negotiate with facilities to get the basic data needed to issue a permit.

Insufficient Technical Guidance and Regulatory Requirements

The third weakness we identified is that EPA has not developed a system of technical guidance and regulatory requirements for designing, constructing, and operating groundwater monitoring systems. As a result, monitoring systems were being designed and built that may not have provided necessary and/or reliable data and may have resulted in additional cost. For example, one facility drilled 76 monitoring wells in 1985 but kept no drilling logs showing the geologic conditions encountered. EPA's regulations did not require that these logs be maintained. However, the authorizing state delayed this facility's permit activity because it had no information about the site's subsurface hydrogeology. The facility was required to drill bore holes close to the

monitoring wells and keep detailed logs in order to establish the site's geologic conditions, resulting in additional costs and delaying permit efforts by more than 1 year.

Another facility was unable to detect contamination because of poorly constructed wells. EPA's regulations specified only minimal standards for well construction, and the facility used local dirt to seal the space around wells instead of more appropriate, and expensive, materials such as cement grout. These construction practices allowed other water to enter the well and dilute groundwater samples. EPA issued an order against the facility and required that at least six new wells be installed and properly sealed. Groundwater contamination at this facility was subsequently confirmed.

Insufficient technical guidance and regulatory requirements have also affected enforcement attempts. For example, in October 1985 EPA issued a compliance order against a facility that the agency believed had failed to develop sufficient information about its subsurface hydrogeology. According to EPA, the facility had not adequately determined groundwater flow, and this rendered the monitoring system "meaningless." However, at a hearing on this order, an administrative law judge ruled that the facility had complied with the applicable regulatory requirements and that EPA's basis for bringing the action was "completely indefensible." In this case, the company filed a claim against EPA to recover legal fees and expenses and was awarded over \$36,000 in October 1987.

Few Quality Assurance and Quality Control Mechanisms in Place

The fourth weakness is that EPA has few quality assurance and quality control mechanisms in place to ensure groundwater monitoring methods are properly carried out. According to EPA, quality controls must be developed and used in the critical steps of the data collection process to ensure that data is

representative of the environmental conditions. In the RCRA groundwater monitoring program, these would include such things as calibration standards for analytical machinery to ensure that equipment is functioning properly and the use of control samples to ensure that field samples were correctly handled and laboratory analysis properly conducted.

Our work found that these quality control mechanisms were generally lacking. One state official pointed out that disposal facilities in his region had "experienced what seemed like every possible error that could be made in collecting samples." Such errors included collecting and storing groundwater samples containing volatile organic constituents by methods that allow the organics to escape prior to analysis, and using contaminated equipment, both of which provide incorrect data on the groundwater conditions. According to one EPA region that responded to the questionnaire used in our review, the absence of quality assurance and quality control techniques "renders the entire process subjective and places the burden of accountability on the shoulders of the data user."

EPA ACTIONS TO ADDRESS PROBLEMS INCOMPLETE

To correct these weaknesses, we recommended in our February 1988 report that EPA put into place the management controls necessary to achieve the goals of the RCRA groundwater monitoring program. We specifically recommended that the Administrator (1) develop data quality objectives specifying the type, amount, and quality of data needed for regulatory decision-making and (2) use these objectives to develop specific regulatory requirements and quality assurance/quality control mechanisms for the groundwater monitoring program.

In its August 1988 response to our report, EPA disagreed with our findings and recommendations. The agency maintained that its

regulations already contain many data quality objectives and as a result, the agency further did not intend to implement our recommendations.

It is interesting to note that, although EPA disagreed with our assessment, EPA's own Hazardous Waste Groundwater Task Force identified significant problems with the groundwater monitoring program at RCRA facilities. The Task Force's October 1988 report, which I understand will be discussed later in this hearing, made a number of similar recommendations, including calling for the development of data quality objectives and standards, to correct the identified problems. The National Research Council--the research arm of the National Academy of Sciences--also faulted EPA's commitment to establishing data quality objectives. The Council, in a September 1988 report, stated that the pace at which EPA was institutionalizing data quality objectives was unreasonably slow.

EPA has recently taken some actions to improve groundwater data collection activities by owners and operators. Under an October 1988 rule, EPA requires owners and operators to take enough samples to ensure the water is representative of the environmental conditions. The owners and operators are also required to analyze all samples down to specific detection levels. Further, a proposed rule would require owners and operators to meet an EPA-established quality control program. Still another proposal would require owners and operators to document the quality of groundwater data generated from their efforts and provide such documentation to EPA and state officials on request.

Nevertheless, while these proposals are steps in the right direction, they appear insufficient to rectify all the problems that exist in the groundwater monitoring program. For example, EPA's actions do not fully address two of the key issues:

- EPA has not established the minimal data quality standards required by its own procedures, and
- EPA has not developed the specific standards and requirements necessary to ensure that owners and operators properly implement their groundwater monitoring activities.

As we pointed out, the prompt and proper development of these standards and requirements is essential for obtaining valid data upon which to ensure that facilities are not contaminating the groundwater and, in situations where contamination is detected, to develop appropriate response actions. Without developing these standards and requirements, the problems that appeared in the past --delays, confusion, and an inability to meet the stated groundwater monitoring goals--are likely to continue.

In addition, our follow-up work indicates that the groundwater monitoring problems will continue to be inadequately funded within EPA. For example, we reported in February 1988 that EPA estimated that \$1.7 million was needed to make basic improvements in the development of data quality standards and that \$3.25 million would be required for a more thorough development of such standards. EPA allocated about \$270,000 towards this effort in fiscal year 1988, but suspended all work and funding on this effort in November 1988 because of higher priorities.

Further, resources to monitor and evaluate facility actions after permit issuance may not be adequate. Many permits appear to have been issued with permit conditions requiring the facilities to carry out basic groundwater monitoring activities after issuance. For example, one site at which EPA's task force found severe deficiencies was nevertheless issued a permit in March 1988 without anyone knowing the extent to which this facility was leaking hazardous constituents. As a condition of the permit, this facility is to determine this information. It is highly likely

that more resources--not less--will be needed to ensure that permit conditions such as corrective action are adequately and appropriately performed. However, our review of EPA's latest budget figures and work load model, as well as discussions with EPA budget officials, provide no indication that additional resources will be provided. As pointed out in a previous report Hazardous Waste: Corrective Action Cleanups Will Take Years to Complete (GAO/RCED-88-48), over 70 percent of the RCRA hazardous waste facilities may be leaking and over 50 percent may require corrective action to mitigate groundwater contamination.

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In summary, Mr. Chairman, our groundwater resources need greater protection from hazardous waste disposal facilities than has been obtained in the past. To provide this protection, accurate and reliable data must be obtained if leaks are to be detected promptly, the spread of contamination minimized, and successful corrective actions taken. However, the current federal program for monitoring groundwater at these facilities simply does not provide the controls needed to ensure that this important resource is adequately protected. Flaws in both program design and implementation have resulted in goals designed to protect the public health and environment not being achieved. From our perspective, these flaws raise serious questions about the quality of permits issued to hazardous waste disposal facilities.

We recommended in our February 1988 report that EPA establish an appropriate system of management controls over all the critical data collection steps in this program, including (1) data quality objectives that delineate, among other things, the quality of data needed to support decisions in this program, (2) specific standards and requirements that translate and communicate these objectives into regulations that owners and operators must follow in collecting data, and (3) quality assurance/quality control

mechanisms that ensure that the data actually obtained is acceptable. We continue to believe that these recommendations are valid and need to be fully implemented. Further, we believe EPA needs to follow through on these efforts at every program level, including ensuring that already issued permits are closely evaluated and monitored until they have developed reliable data and used this in accomplishing groundwater program goals.

This concludes our testimony. We would be pleased to respond to any questions you or other members of the Subcommittee may have. Thank you.

CROSS SECTION OF A SIMPLE
GROUNDWATER MONITORING SYSTEM

