United States
Environmental Protection
Agency

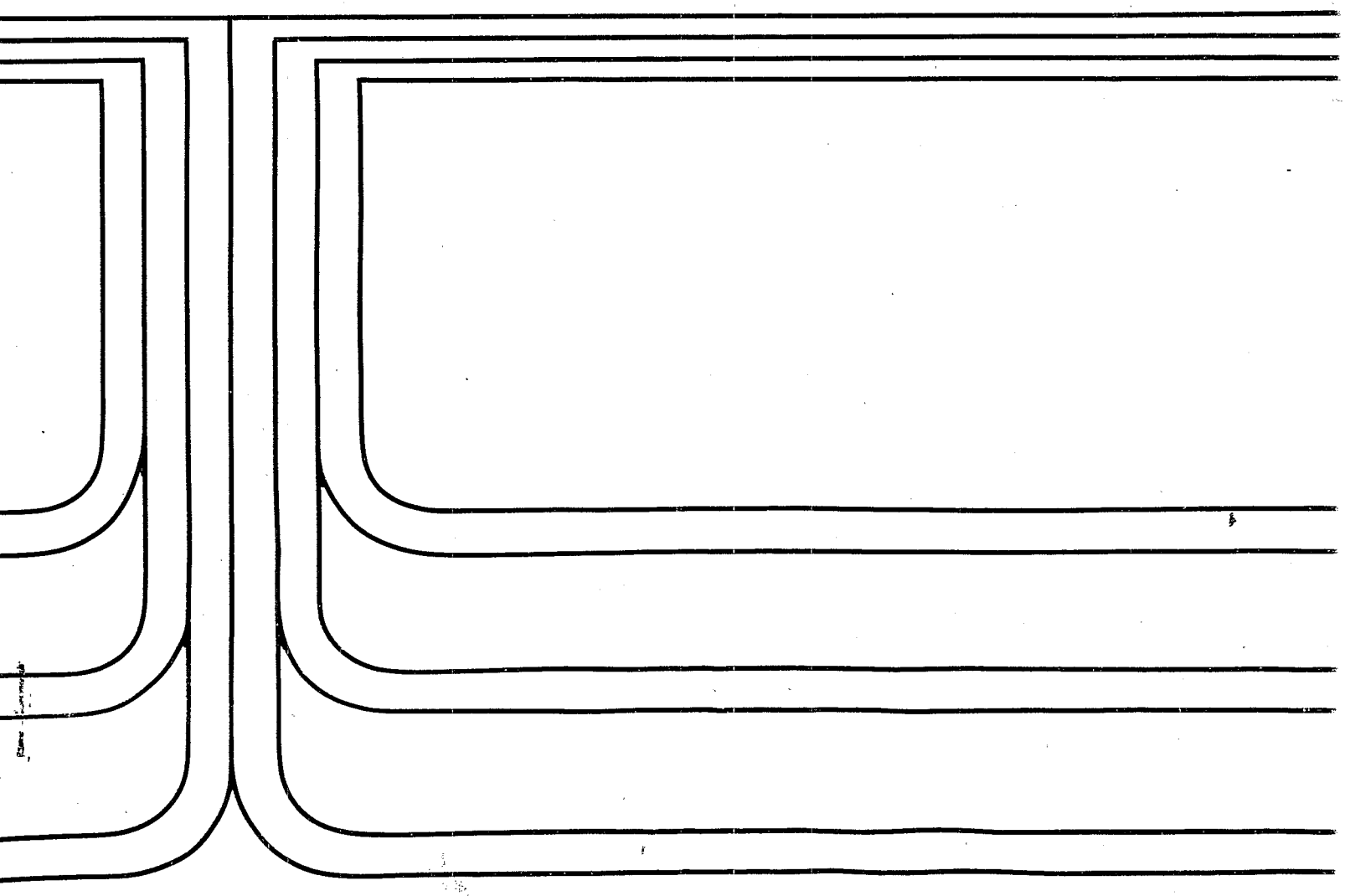
Office Of Water
(WH-550)

EPA 570/9-91-034
September 1991

EPA

Ground-Water Indicators State Pilot Studies For Idaho, Minnesota, And New Jersey

Findings Report



GROUND-WATER INDICATORS STATE PILOT STUDIES FOR IDAHO, MINNESOTA, AND NEW JERSEY: FINDINGS REPORT

OFFICE OF GROUND WATER AND DRINKING WATER
GROUND-WATER PROTECTION DIVISION
U.S. ENVIRONMENTAL PROTECTION AGENCY

September 30, 1991

EXECUTIVE SUMMARY

This Findings Report describes and presents general findings from the three ground-water indicator State pilot studies the U.S. Environmental Protection Agency conducted in Idaho, Minnesota, and New Jersey to investigate the use of indicators to track progress and trends in the ground-water protection effort. It is intended to provide a concise overview of the results of these studies. It addresses what it takes to implement ground-water indicators for 305(b) reporting by all the States from a base of three pilot studies. In doing so, it identifies the extent of existing ground-water data at the State or Federal level to support the use of indicators in the 305(b) process. EPA evaluated the following five indicators in these studies:

- Maximum Contaminant Level (MCL) violations by public drinking water supplies;
- On-site and off-site contamination at hazardous waste sites;
- Volatile Organic Compound (VOC) concentrations in ground water (as an indicator or waste site and industrial site activity);
- Nitrate concentrations in ground water (as an indicator of area-wide sources of contamination); and
- Extent of pesticide use (as an indicator of area-wide pesticide contamination).

For the three pilot studies, there was sufficient data available to partially meet the objectives of the MCL and nitrate indicators. Waste site data was available but difficult to compile because it was primarily located in paper files. In contrast, the limited geographic coverage of VOC data could not support State wide analyses adequately. Finally, it was difficult to implement the pesticide indicator because of the lack of information on pesticide usage and groundwater vulnerability information.

Maximum Contaminant Levels

The pilot studies demonstrated that sufficient data were available, at least through EPA's Federal Reporting Data System (FRDS-II), to use the MCL indicator. Maximum contaminant level data are available at the county level, lend themselves to visual representation, and allow for comparisons among counties and individual systems. In addition, FRDS-II contains data on the location of public water supply systems (PWSS) and the population served by PWSS.

On-site and Off-site Contamination at Hazardous Waste Sites

Much of the information needed for this indicator was obtained from paper files because the national computerized data bases contained only a limited amount of data for this indicator. Little information was available to characterize populations at risk at the State level. There are several sources at the National level which can be used directly or with simple calculations to estimate the population at risk around any given location.

Volatile Organic Compounds

The limited geographic distribution of the VOC data and the lack of consistent repeat analyses at many of the sampled wells limited the use of this data to provide a State analysis. The USGS National Water Information System (NWIS) was used as the data source to characterize this indicator in all three pilot study States. EPA was able to organize the data that was available from NWIS at the county level and display trends in VOC levels graphically.

Nitrate

Nitrate data were available to support, at least partially, the nitrate indicator. The data can be organized at the county level and trends can be displayed graphically. NWIS was chosen as the principal source of nitrate data in the States because it was identified as containing the greatest amount of data for the pilot study States. It was supplemented with information gathered from State and Regional data sources, such as the U.S. Forest Service's Intermountain Region campground water quality data base and Minnesota's Ambient Ground-Water Quality data base. Limitations, such as limited geographic coverage and inconsistent repeat sampling at well locations, was noted.

Extent of Agricultural Pesticide Use

Of the three pilot States, only New Jersey tracks pesticide use data needed for this indicator. While the New Jersey program can be used as a model, it is recognized that a variety of data collection approaches are available to the States and each State may want to select other approaches.

Conclusions

EPA is strongly promoting the wider use of indicator data across all Federal and State environmental programs as a means to report on the quality of the different environmental media and the progress in environmental protection programs using actual data. An EPA Task Force, with State participation, developed concrete principles and objectives to ensure effective and consistent decision-making in Agency programs which affect ground water, and will also institute State Comprehensive Ground-Water Protection Programs to promote complete protection at the State and local level. The indicators described above serve as measures of the condition of the nation's ground water, and the progress the nation is making in improving and protecting this resource, a measure of success. Collecting and reporting ground-water indicator data will help the Agency and States track trends in their ground-water quality and support better decision-making and priority-setting for their ground-water protection efforts.

The three pilot studies show that there are enough sources of data available to begin some indicator reporting right now. The pilot studies identified many activities that States can undertake to improve the accessibility, quality, and usefulness of their ground-water indicator data. For example, sampling and analytical consistency can be promoted among different groups collecting indicator data by establishing consistent scientific and data collection protocols and by promoting the development of ground-water monitoring networks, as appropriate, to provide trend data. To begin moving toward data consistency, EPA along with the States and other Federal agency work group participants developed a set of the most critical data elements for ground-water quality information. The use of this minimum set of data elements (MSDE) will ensure that EPA and the States can share and manipulate ground-water data to support environmental decision-making and facilitate cross-program integration. By supporting these activities, States can better support collection, management, and reporting of indicator data needed for future State 305(b) reports.

Each State has different ground-water data management needs and programs. Some States may already be collecting and maintaining the indicator data described above, while others may not. EPA is preparing a Technical Assistance Document (TAD), due early 1992, to the States on how to gather and use indicator data as part of their 1992 305(b) Reports. The TAD is also intended to help set the stage for those States that are moving toward developing comprehensive ground-water monitoring and information systems, particularly in relationship to ground-water indicator reporting, and to assist those States which are already in the process of doing so.

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1.0 INTRODUCTION

The U.S. Environmental Protection Agency (EPA), Office of Ground Water and Drinking Water (OGWDW) is responsible for coordinating ground-water protection with other EPA Programs and for working with the States to develop and implement State ground-water policies and guidelines which enhance ground-water protection. As part of this overall ground-water protection effort, EPA has been investigating the use of indicators to track progress and trends in State ground-water protection activities. These indicators can be used by each State in developing their State Water Quality Report for inclusion in the biennial National Water Quality Inventory Report to Congress under the Clean Water Act, Section 305(b). Section 305(b) mandates that States develop and report information concerning the quality of the nation's water resources to EPA and the U.S. Congress every two years.

2.0 BACKGROUND

In 1986 EPA began a three phase process to develop a set of ground-water indicators. The first phase was a two-day workshop comprising representatives from various EPA Offices, other Federal agencies, State governments, public interest groups, and technical organizations to identify the criteria to use when choosing and verifying potential indicators. Following the workshop a second phase was initiated to develop a preliminary list of indicators and conduct interviews with a number of State, EPA and Federal officials to further refine the list. The third phase consisted of a field study to test which indicators best met a set of screening questions, to develop various presentation methods employing charts and graphs, and to determine potential applications.

EPA published Indicators for Measuring Progress in Ground-Water Protection[1] in 1989, which presented the results of the three phase process used to develop the set of five ground-water indicators and the principles used to choose them. The principles and the indicators are presented below:

Principles

- Indicators should be based on actual data measurement;
- Indicators should lend themselves to graphic display to convey trends and other information readily;
- Whenever possible, existing data should be used rather than requiring new data collection;
- Ideally, data should be collected over time at the same locations; and
- Data can have limitations and still be useful as an "indicator" of ground-water problems or progress.

Ground-Water Indicators

- Maximum Contaminant Level (MCL) violations by public drinking water supplies;
- On-site and off-site contamination at hazardous waste sites;
- Volatile Organic Compound (VOC) concentrations in ground water (as an indicator or waste site and industrial site activity);
- Nitrate concentrations in ground water (as an indicator of area-wide sources of contamination); and
- Extent of pesticide use (as an indicator of area-wide pesticide contamination).

Finally during 1990 three pilot studies were conducted to determine whether the five ground-water indicators met the criteria as delineated in the workshop process and could be used to track progress in ground-water protection efforts. Three States (Idaho, Minnesota, and New Jersey)* agreed to serve as the focus for the pilot studies.

3.0 PURPOSE OF THE FINDINGS REPORT

This Findings Report describes and presents general findings from the three ground-water indicator State pilot studies. It is intended to provide a concise overview of the results of the studies and addresses what it takes to implement ground-water indicators for State 305(b) reporting. In doing so, it identifies the extent of existing ground-water data at the State or Federal level to support the use of indicators in the 305 (b) reporting process. It describes each indicator and the national objectives associated with that indicator, identifies appropriate data sources and the availability of those data, identifies issues and problems involved with using ground-water indicators in the 305(b) reporting process, and presents conclusions.

4.0 STATE PILOT STUDY METHODOLOGY

A five step process was followed in each State to demonstrate the manner in which ground-water indicator data are and can be collected and reported. Each step in the process is listed below:

1) State and Federal Agency officials were interviewed on-site in each State to introduce the project and discuss data sources;
2) Follow-up contacts were made with the individuals interviewed to discuss specific comments and to review data availability and usefulness;
3) A State project plan was prepared that described the data sources and laid out an approach for characterizing the indicators[2];
4) Data were collected and analyzed; and
5) A final project report was prepared for each State[3].

This approach was designed to identify appropriate data sources to support indicator reporting in the States; review whether the available data are of sufficient quality or quantity to support the objectives for the indicator reporting; document the resources needed to retrieve, analyze, and report the indicator data; and provide suggestions for improving indicator reporting nationwide. Indicator data were collected State-wide by county, where available.

5.0 DESCRIPTION AND DISCUSSION FOR EACH GROUND WATER INDICATOR

For each of the five ground-water indicators identified by EPA a description, an overview of the national objectives as applicable to that indicator (see Appendix A), principal data sources, and population at risk, when appropriate, are presented below. Additional indicators suggested by the States are also discussed.

5.1 Maximum Contaminant Levels

Description of the Indicator

Maximum Contaminant Levels (MCLs) are drinking water quality standards set under the authority of the Safe Drinking Water Act (SDWA). The Act authorized EPA to establish a cooperative program among local, State and Federal agencies to protect drinking water quality and ensure that

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* Idaho has a limited amount of automated ground-water data. Approximately 75 percent of the State's population relies wholly or in part on ground water for drinking water. Minnesota has collected automated ground-water data over time. Approximately 75 percent of the State's population relies wholly or in part on ground water for drinking water. New Jersey is considered to be ground-water data "rich." Over one-half of the State's population relies on ground water for drinking water.

human health is not adversely affected by water-borne pollutants. Maximum contaminant levels are set for inorganic, organic, and microbiological contaminants, radionuclides, and turbidity. An MCL is the highest amount of a specific contaminant allowed in the drinking water supplied by a public water system. Primary MCLs are established for contaminants that are known to occur in drinking water, cause adverse health effects, and can be measured with existing instrumentation.

National Objectives

The MCL indicator was designed to address the following national objectives:[4]

- Identify the degree to which ground-water based water supply systems meet all applicable MCLs;
- Identify the size of the population at risk from systems in violation;
- Provide an understanding of the geographic distribution of populations potentially at risk;
- Identify specific contaminants for which systems are failing to meet the MCLs; and
- Identify those contaminants which are responsible for the greatest number of MCL violations.

Principal Data Sources

EPA found that State and county level MCL data are available from both Federal and State databases. In limited instances, county health departments also maintain drinking water quality data. The data sources encountered in the pilot studies are described below.

Public water supply systems (PWSS) report maximum contaminant level compliance data to State drinking water agencies. In turn, the State agencies either report the data to the respective EPA Regions who periodically enter the data into the Federal Reporting Data System-II (FRDS-II) system or the State agencies enter the data directly into FRDS-II. FRDS-II is maintained by EPA Headquarters and tracks a number of data elements including:

- The public water system identification number;
- The location of the public water system;
- The population served by the public water system;
- The sources of drinking water (ground and/or surface);
- The MCL constituent violated;
- The concentration reported;
- The Federally mandated maximum allowable concentration level;
- The date of the violation; and
- The number of months that the system was in violation.

The State agencies that report MCL data to FRDS-II also typically maintain their own data tracking system. For example, data for public drinking water supplies in New Jersey are collected by the New Jersey Department of Environmental Protection, Bureau of Safe Drinking Water and are stored on the New Jersey Public Water file data base in a dBase format. The Idaho Department of Health and Welfare, Water Quality Bureau tracks MCL compliance for public drinking water systems on a PC-based system. MCL compliance data for public water systems in Minnesota are tracked by the Minnesota Department of Health, Division of Environmental Health. However, Minnesota does not maintain an automated data management system for these data. EPA also found that a small number of county and local health departments maintain drinking water quality data. Although these data bases provide supplementary material, their limited geographic coverage reduced their usefulness for the pilot studies.

Population at Risk

The pilot studies did not collect data to characterize the geographic distribution of the MCL violations beyond the county level. The FRDS-II data base records the population served by public water supply systems and the location of these systems by latitude and longitude though this locational information is optional in the system.

5.2 On-Site and Off-Site Contamination from Hazardous Waste Sites

Description of the Indicator

Active and abandoned hazardous waste sites can serve as significant sources of ground-water contamination and may pose serious risks to human health and the environment. The level of ground-water contamination at these hazardous waste sites, the potential risk to drinking water supplies, and the risk to the population served by those supplies are each assessed individually under this indicator.

This indicator also tracks changes in the number of CERCLA and RCRA sites with on-site and off-site ground-water contamination over time as a measure of the progress in managing waste sites. Such indicator data could also be used to monitor progress made in dealing with contaminated sites by evaluating changes in site identification, remedial investigations, corrective action, remedial design implementations, corrective actions, and site closures.

National Objectives

This indicator of on- and off-site contamination from hazardous waste sites was designed to support the following national objectives[5]:

- Identify the number of Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and Resource Conservation and Recovery Act (RCRA) sites with ground-water contamination on-site and off-site;
- Provide an indication of the risk posed by such contamination to populations surrounding the waste sites; and
- Identify the relative frequency with which various types of contaminants are responsible for ground-water contamination at CERCLA and RCRA sites.

Principal Data Sources

EPA found that the majority of data characterizing ground-water contamination at waste sites are maintained in paper files managed by the States and EPA regions, although some ground-water data are also maintained in State data bases. The Federal Hazardous Waste Data Management System (HWDMS) and Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) track the administrative status of sites, but have little information regarding the nature and extent of ground-water contamination at the sites. Hence, the principal data source for RCRA waste site information is found at the State level. For example, in Idaho, RCRA data are compiled by the Department of Environmental Quality Hazardous Materials Branch. The majority of these data are in paper files; however, Idaho has begun coding ground-water monitoring data in a spreadsheet system. Minnesota also collects data on RCRA facility status, but maintains this information primarily in paper files.

CERCLA site information in both Idaho and Minnesota is maintained by the EPA Regions, although Minnesota also tracks its own "Permanent List of Priority" sites. All of these data are in paper files. Of the three pilot study states, New Jersey maintained the most comprehensive, automated data

set for its CERCLA, RCRA and New Jersey Environmental Compensation and Reclamation Act (ECRA) sites. EPA identified New Jersey's Ground-Water Pollution Investigation Data Base (GWPIDB) as the major source of this information, although data were available for only seven of 21 counties and population at risk information was not tracked.

Population at Risk

Little information was available to characterize populations at risk at the State level. There are several sources at the National level which can be used to characterize the population at risk around any given location. U.S. Census information contains population density by census track. The Census TIGER files are data files containing detailed information on population. The Graphic Exposure Modelling System (GEMS), an EPA data base, contains data from the 1980 and 1990 census. Data from these files can be used directly or with simple calculations to estimate population at risk.

5.3 Volatile Organic Compounds

Description of the Indicator

Volatile Organic Compounds (VOCs) typically include solvents and other chlorinated hydrocarbons. They serve as indicators of ground water contamination resulting from industrial and non-industrial activities. These activities or sources can include landfills, septic systems, spills, hazardous waste sites, leaking underground storage tanks, underground injection control wells, industrial sites generally, and other potential point sources. Volatile organic compounds also serve as surrogates for other compounds that may be released from these sources. Volatile organic compounds can reach the ground water from improper material handling, and leakage of tanks and industrial equipment at the ground surface.

National Objective

The VOC indicator was designed to address the following national objective[6]:

- Identify the frequency with which various VOCs are found in ground water when around waste and industrial sites.

Principal Data Sources and Data Availability

VOC data are maintained on the U.S. Geological Survey's (USGS) National Water Information System (NWIS) (formerly WATSTORE) data base, on EPA's Storage and Retrieval System (STORET), and on several State and local data bases. For example, Idaho collects VOC data from three independent data bases: 1) Underground Storage Tank (UST) remedial response data base, 2) UST site characterization data base, and 3) Rathdrum Prairie data base. New Jersey uses two State data bases 1) Ground-Water Pollution Indicator data Base (GWPIDB) and 2) a VOC file maintained by the Bureau of Safe Drinking Water. Minnesota also maintains VOC data on the Minnesota Ambient Ground-Water Monitoring Network data base. On the local level, the City of Rochester, MN Department of Public Utilities maintains a record of its own VOC monitoring data.

5.4 Nitrate

Description of the Indicator

Nitrate is commonly found in ground water in regions that are affected by area-wide sources of contamination, such as agriculture and septic systems. Nitrate can leach into ground water from animal waste, normal agricultural practices (e.g., the use of nitrogen fertilizers), and wastewater disposal

because of its high solubility in water and its inability to adsorb to soil particles. The detection of nitrate may also indicate the possible presence of other ground-water contaminants. In addition, high nitrate concentrations in drinking water supplies are a recognized human health concern, especially for young children. Exposure to high levels of nitrate can result in methemoglobinemia or "blue baby syndrome." As a result, the primary drinking water standard for nitrate (as nitrogen) has been set at 10 mg/l[7].

National Objectives

EPA identified the following two national analytical objectives for the nitrate indicator[8]:

- Identify the pattern and level of ground-water quality with respect to the area-wide sources throughout the country by identifying the geographic pattern of contamination on a county-by-county basis over a given time span; and
- Display State-by-State trends over time in the area-wide quality of ground-water by identifying the number of counties where ground-water concentrations of nitrate are improving and deteriorating.

Principal Data Sources

Nitrate data are collected by a wide variety of Federal, State, and local entities, both to assess fundamental research questions and to gauge the quality of a drinking water supply. For example, nitrate data are compiled at the national level in the USGS's NWIS and on EPA's STORET. Such data are collect by USGS District Offices, State Geological Surveys, and other groups as part of research projects or ground-water quality investigations. USGS and State Geological Surveys use the NWIS as a central repository for their data. Data in the NWIS are updated monthly by USGS District Offices which upload their data to the system. Several States enter their ground-water monitoring data into STORET. In addition, the U.S. Forest Service (USFS) tracks nitrate data on a regional basis in its Intermountain Region data base. In Idaho and other Western States, the USFS records campground water quality data, including nitrate and coliform levels, in a central data base.

In addition to these Federal data sources, EPA identified several other nitrate data repositories within the States. Minnesota maintains its own State ground-water quality data base as part of its Ambient Ground-Water Monitoring Network, which includes nitrate data and data for other constituents monitored by the State. Examples of local data sources include the Southeastern Minnesota Cooperative Well Testing Program and the Brown-Nicollet Community Health Service which both report nitrate levels in ground water. On the county level, New Jersey's Ocean County Health Department compiles nitrate data collected during property transactions.

5.5 Extent of Agricultural Pesticide Use

Description of the Indicator

The use of pesticides, primarily associated with agricultural practices, has been identified as a potential source of ground-water degradation. This indicator is intended to track trends in pesticide usage to serve as a measure of likely changes in pesticide loadings to ground water.

National Objectives

The agricultural pesticide use indicator was designed to support the following objectives[9]:

- Identify the relative intensity of pesticide use on a county-by-county basis;
- Identify the relative vulnerability to ground-water contamination on a county-by-county basis; and
- Provide an indication of where potential ground-water problems from pesticide use might occur, based on geographic patterns of use and vulnerability.

Principal Data Sources

New Jersey's Bureau of Pesticide Operations maintains an extensive pesticide data base which tracks pesticide usage by private applicators. The New Jersey data were gathered through surveys completed in 1986 and 1988. Minnesota also compiles some pesticide data through the Minnesota Agricultural Statistics and the Minnesota Department of Health, although these data principally address sales information and do not include records on the location of pesticide usage. Pesticide use information was not available in Idaho.

5.6 Data Sources Used in Pilot Studies

The data sources that were identified in the pilot studies to support indicator reporting are presented in Appendix B and include national, State and local sources of indicator data. It should be noted, however, that although the Resources for the Future data base has been identified by EPA as a source of pesticide use information, it was not accessed for the pilot studies. Other national databases, such as EPA's STORET, which are dependent upon State input, are also available but were not used in the pilot studies. This was due to resource constraints or because the pilot study State had not entered the data into the system. These data sources are discussed generally under 6.0 Summary of Findings.

5.7 Additional Indicators

In addition to the indicators described above, Minnesota and New Jersey personnel cited two other constituents that could be tracked as ground-water indicators.

Minnesota personnel identified tritium analyses as indicators of ground-water vulnerability. Tritium was released into the environment as the result of atmospheric nuclear testing. Because tritium has a known decay rate, observing concentrations of tritium in ground water can indicate the travel time for the movement of constituents from the soil surface to ground water. In this way, estimates of an aquifer's recharge rate and vulnerability to contamination can be estimated.

New Jersey personnel identified sodium chloride levels in ground water as indicators of salt-water intrusion problems or roadway salt applications. A comparison of the ratio of chloride to sodium helps to verify the presence of saltwater. Information on sodium and chloride levels in raw water are tracked by the NJDEP, Bureau of Water Allocation in the "W Quality" data base.

These types of indicators may be applicable to specific regions of the country but not nationwide. For example, sodium chloride may be a good indicator for coastal States and States with icy winter conditions, but not for those which have no intrusion or road salt problems.

6.0 SUMMARY OF FINDINGS

For the three pilot studies, there was sufficient data available to partially meet the objectives of the MCL and nitrate indicators. Waste site data was available but difficult to compile because it was primarily located in paper files. In contrast, the limited geographic coverage of VOC data could not support State wide analyses adequately. Finally, it was difficult to implement the pesticide indicator because of the lack of information on pesticide usage and groundwater vulnerability information. The findings for each indicator are discussed below and are summarized in a table in Appendix C. Appendix D presents a summary of the achievement of national objectives by State.

6.1 Maximum Contaminant Levels

The pilot studies demonstrated that sufficient data were available, at least through FRDS-II, to address the national objectives of the MCL indicator. Maximum contaminant level data are available at the county level, lend themselves to visual representation, and allow for comparisons among counties and individual systems. In addition, FRDS-II contains data on the location of public water supply systems (PWSS) and the population served by PWSS. As a result, the geographic distributions of the PWSs and the sizes of the populations served by those systems could be assessed. There is some concern with data limitations in FRDS-II; specifically that latitude and longitude data is optional which makes it difficult to identify the population served by these systems unless provided by the PWSS, and that those systems supplied by both ground and surface water sources are designated only as surface water systems.

FRDS-II was used as the source of data for the analysis of the MCL indicator for all three states because the data were more readily accessible and because the data available through FRDS-II were believed to be consistent with those in the data bases maintained by the respective State agencies. Although the data bases maintained by New Jersey and Idaho could have provided much of the information needed to support the indicator reports, problems were encountered in accessing them.

6.2 On-site and Off-site Contamination at Hazardous Waste Sites

Much of the information needed for the pilot studies was available in paper files and was used to support use of this indicator. Currently available computerized data bases do not contain much of the data needed for this indicator. Because of the time required to obtain data from paper files, EPA was only able to develop a "snapshot" of waste site status in the three States for the period 1989 to 1990. In addition, little information was available from the States to characterize the populations at risk from exposure to contamination. Nonetheless, the waste site data available from the States and EPA Regions did identify the number of sites with ground-water contamination, in at least a portion of the State, and the principal constituents involved. Therefore, EPA was able to use the available data to at least partially support the national objectives, though the problem with the regular collection and automation of data remains a real concern.

6.3 Volatile Organic Compounds

The limited geographic distribution of the VOC data and the lack of consistent repeat analyses at many of the sampled wells could not support State wide analysis adequately. Moreover, EPA found considerable variation in the geographic coverage of VOC data. For example, USGS reported that virtually all of the VOC data collected in Idaho were focused on two sites with suspected contamination. This same pattern was also found in Minnesota and New Jersey; much of the VOC data collection centered on areas with known or suspected sources of contamination.

The USGS National Water Information System was used as the data source to characterize this indicator in all three pilot study States. EPA was able to organize the data that were available from NWIS at the county level and display trends in VOC levels graphically. If a State analysis of ambient VOC levels in ground water is desired, expanded geographic coverage of VOC data collection efforts is needed.

6.4 Nitrate

Nitrate data were available in the three pilot study States to support, at least partially, the objectives of the nitrate indicator. The data were organized at the county level and trends were displayed graphically. NWIS was chosen as the principal source of nitrate data in the States because it

was identified as containing the greatest amount of data for the pilot study States. Those data were supplemented with information gathered from State and Regional data sources, such as the U.S. Forest Service's Intermountain Region campground water quality data base and Minnesota's Ambient Ground-Water Quality data base. Limitations, such as narrow geographic coverage and inconsistent repeat sampling at well locations, were noted, though enough information was available to present trends in some portions of the States. Since nitrate data are also collected by a variety of State and local entities, the States should carefully review the data sources to select the best sources to use in reporting. Increased repeat sampling of well locations is needed to support nitrate trend analysis.

6.5 Extent of Agricultural Pesticide Use

In the three pilot study States, only New Jersey tracks pesticide use data. New Jersey has tracked pesticide usage from 1985 to 1988 at the county level and is currently completing a State-wide ground-water vulnerability mapping project. However, the State has not yet linked the pesticide use information with this vulnerability assessment. As a result, the objectives for the indicator were only partially addressed in New Jersey and no data were available to support the analysis in Minnesota or Idaho. While the New Jersey program can be used as a model, it is recognized that a variety of data collection approaches are available to the States and each State may want to select other approaches.

7.0 ISSUES AND PROBLEMS

In this section of the Findings Report, an overview of the significant issues and problems encountered in completing the pilot studies is presented.

Limitations in Data

EPA encountered a number of technical and data management problems relating to the quality and availability of the compiled data which limited their application to support the indicator objectives. In particular, EPA found that:

Data Limited in Geographic Coverage

Data characterizing ambient nitrate and VOC concentrations in ground water are generally collected to support local or regional assessments. As a result, the data may not support State-wide analyses adequately. In contrast, MCL data are reported for all public water supplies, thereby effectively serving as a census of drinking water quality. This characteristic allows for more thorough analyses of geographic patterns in MCL violations. Similarly, waste site and pesticide use information identified in the pilot studies could be used to track geographic trends in these indicators, but incomplete coverage limited the usefulness of this information at the State level.

Sampling Practices Not Consistent Over Time

Only the MCL data collected in the three States and the pesticide use data compiled in New Jersey are updated in a regular and consistent manner with the sampling repeated at the same locations and ground-water depths. For nitrate and, particularly, VOCs, repeat sampling at the same locations and ground-water depths is conducted infrequently at most sites. For waste sites, the sampling is not updated regularly and/or is difficult to access. Because of this, the ability to conduct trend analyses, especially for VOCs, is limited. Repeat sampling of ground water for MCL, nitrate, and VOCs and regular updates of the waste site and pesticide use information are needed to support analyses of indicator trends.

Data Collection Activities Not Consistent Over Time

Several problems which States may encounter when collecting ground-water indicator data from State and Federal agencies were identified during the pilot studies. They were not insurmountable but required a high level of attention to detail and involved considerable use of human resources. Examples of these problems include the following:

- Different agencies within the States were responsible for the collected data, leading to inconsistencies;
- Data sources were often fragmented;
- Ground-water indicator data from State and Federal agencies were collected in a variety of formats;
- Several data files had insufficient documentation;
- Several data files did not include Federal Information Processing Standard identifier codes as geographic locators (e.g., county codes, lat/long);
- Missing annual data or other gaps were not explicitly identified; and
- Data bases were originally organized to support objectives that differ from those the indicators were designed to address.

Population at risk not in each indicator

One of the objectives underlying the identification of the ground-water indicator parameters was the ability to track changes in the populations at risk from ground-water contamination. To account for this concern, the MCL and waste sites indicators include a measure of the populations at risk from contamination as a component of the data to be reported. In contrast, the remaining three indicators, nitrate concentrations, VOC concentrations, and pesticide use, are designed to track trends in ground-water quality alone.

8.0 RESOURCES FOR IMPLEMENTING

The resources required at the State level to implement national indicator reporting is extensive. The States cannot significantly improve their data collection and reporting without expending the necessary resources to solve the problem. As States establish monitoring networks and integrate their information systems, as many are beginning to do, data will become more accessible for use in

indicator development. Furthermore, after the information is collected and the data elements and data reporting formats for including ground-water indicators in 305(b) reports are identified and applied, the effort expended for completing the 305(b) report will be greatly reduced.

9.0 CONCLUSIONS

EPA is strongly promoting the wider use of indicator data across all Federal and State environmental programs as a means to report on the quality of the different environmental media and the progress in environmental protection programs using actual data. As more resources are invested in protecting ground water, the Agency and the States come under increasing pressure to demonstrate results with concrete measures of success. EPA is developing a game plan to coordinate ground-water indicator collection efforts across EPA offices to ensure that all data collection activities support the objectives of the various programs.

An EPA Task Force, with State participation, developed concrete principles and objectives to ensure effective and consistent decision-making in Agency program decisions affecting ground water, and will also institute State Comprehensive Ground-Water Protection Programs[10] to promote complete

protection at the State and local level. The indicators described above serve as measures of the condition of the nation's ground water, and the progress the nation is making in improving and protecting this resource, a measure of success. Collecting and reporting ground-water indicator data will help the Agency and States track trends in their ground-water quality and support better decision-making and priority-setting for their ground-water protection efforts.

States have different ground-water data management needs and programs. While some States may already collect and maintain indicator data, other States may not. This document illustrates the data collection activities of three States with regard to the five indicators described above. EPA is ready to work with States in implementing and maintaining a meaningful and practical program to collect and report data on indicators of ground-water quality. Since EPA depends almost exclusively on others for collection and analysis of ground-water data, EPA and the States must improve the consistency of the data, and use the data to demonstrate success in environmental protection.

As States continue their monitoring and data collection efforts and begin to develop comprehensive programs, it is important to keep the issues noted in the pilot studies in mind. For example, sampling and analytical consistency may be promoted by establishing consistent scientific and data collection protocols and by promoting the development of ground-water monitoring networks, as appropriate, to provide trend data. Data management activities may be enhanced by employing standard data collection formats for each of the indicators, and by maintaining standard data management protocols between agencies. Where data management systems do not exist, cooperative effort between EPA and the States will ensure that information collection activities support the objective of protecting the nation's ground-water resources.

To begin moving toward data consistency, EPA along with the States and other Federal agency work group participants developed a set of the most critical data elements for ground-water quality information. These data elements form the foundation upon which ground-water data users may build their own data base, adding elements to meet their specific needs. The use of this minimum set of data elements (MSDE)[11] will ensure that EPA and the States can share and manipulate ground-water data to support better environmental decision-making, and facilitate cross-program integration.

While State and Federal data management systems are undergoing development and enhancement, the States may organize and track their paper files to support indicator reports. Although pesticide use data may not be generally available for use as an indicator, EPA and the States should develop approaches to collect this information. Until such programs are implemented, however, it is recommended that the States report all available data describing pesticide use or ground-water pesticide concentrations.

EPA is preparing a Technical Assistance Document (TAD)[12], due early 1992 to provide technical guidance to the States on how to gather and use indicator data as part of their 1992 305(b) Reports. The TAD is also intended to help set the stage for those States that are moving toward developing comprehensive ground-water monitoring and information systems, particularly in relationship to ground-water indicator reporting, and to assist those which are already in the process. For those State that are already collecting and maintaining the indicator data described in this document, the TAD will provide assistance in reporting the data for their 305(b) reports. For those States that are not collecting these data, the TAD will provide assistance on the data to gather.

In conclusion, EPA has mentioned many activities that States can undertake to improve the accessibility, quality, and usefulness of their ground-water indicator data. By supporting these activities, States can promote better collection, management, and reporting of indicator data needed for future State 305(b) reports. However, efficient and effective implementation will require cross-program integration and a long-term commitment in time and resources. While all of the activities listed above will improve the collection and reporting of indicator data, the three pilot studies show that there are enough sources of data available to begin some indicator reporting right now.

APPENDIX A Summary of the Ground-Water Indicator National Objectives

	MCLs	Waste Sites	VOCs	Nitrate	Pesticides
Summary of the National Objectives	• Identify the degree to which ground-water based supply systems meet all applicable MCLs • Identify the size of the population at risk from systems in violation • Provide an understanding of the geographic distribution of populations potentially at risk • Identify specific contaminants for which systems are failing to meet the MCLs • Identify those contaminants which are responsible for the greatest number of MCL violations	• Identify the number of RCRA and CERCLA sites with ground-water contamination on site and off site • Provide an indication of the risk posed by such contamination to the population in the vicinity of off-site contamination • Identify the relative frequency with which various types of contaminants are responsible for ground-water contamination at RCRA and CERCLA sites	• Identify the frequency with which various VOCs are found in ground-water monitoring at waste and industrial sites	• Identify the pattern and level of ground-water quality with respect to area-wide sources throughout the country by identifying the geographic pattern of contamination on a county-by-county basis over a given time span • Display State-by-State trends over time in the area-wide quality of ground water by identifying the number of counties, State by State, where ground-water concentrations of nitrate are improving or deteriorating	• Identify the relative intensity of pesticide use on a county-by-county basis • Identify the relative vulnerability to ground-water contamination county by county • Provide an indication of where potential ground-water contamination from pesticide use might occur

APPENDIX B Summary of Ground-Water Indicator Data Sources for Pilot Studies

	MCLs	Waste Sites	VOCs	Nitrate	Pesticides
National Data Sources	• EPA Federal Reporting Data System (FRDS)	• EPA Hazardous Waste Data Management System (HWDMS) • EPA Comprehensive Environmental Response, Compensation, and Liability (Act) Information System (CERCLIS)	• USGS National Water Information System (NWIS)	• USGS National Water Information System (NWIS)	No National Data Base**
Regional, State, or Local Data Sources	• NJDEP, Bureau of Safe Drinking Water • ID State Water Quality Board • MN Department of Health • Local Departments of Public Utilities	• EPA Regional Offices • ID DEQ Hazardous Waste Branch • NJ Bureau of Planning and Assessment • NJ Bureau of Ground-Water Pollution Assessment • NJ Bureau of Information Systems • NJ Bureau of Environmental Evaluation and Risk Assessment Hazardous Site Mitigation Division • MN Pollution Control Agency	• ID Water Quality Board • MN Department of Health • MN Department of Agriculture • MN Pollution Control Agency • NJ Bureau of Ground-Water Pollution Assessment • NJDEP, Bureau of Safe Drinking Water • Local Departments of Health • U.S. Forest Service Campground Water Quality	• U.S. Forest Service Campground Water Quality Data • USGS QWDATA • ID Water Quality Board • MN Department of Health • MN Department of Agriculture • NJ Bureau of Safe Drinking Water • Local Departments of Health	• State Bureau of Pesticides Operations • State Agricultural Statistics • State Department of Health

** Resources for the Future maintains a data base which includes estimates of pesticide application rates at the county level nationwide. However, these data are based upon estimates of cropping practices and do not include actual pesticide use data collected at the county level.

APPENDIX C Summary of Findings of Three State Ground-Water Indicator Pilot Studies (Idaho, Minnesota, New Jersey)

Category	Indicator	Findings
Public Water Supplies	MCL Violations • Percent of systems with violations • Percent of Population affected • Specific MCL contaminant vs # of systems • Contaminant vs # of MCL violations	• Existing Data Available at State/County Level • Contains Location of PWS's and Population Served • Most Easily Accessed in OW FRDS-II Database • Concern About Several Data Limitations in FRDS-II
Hazardous Waste Sites	On- and Off-Site Contamination • CERCLA sites with contamination on-site only, off-site, or off-site and threatening drinking water • RCRA sites with no contamination, on-site only, or off-site • Population affected by off-site contamination • Contamination Frequency - at CERCLA sites by Contaminant Group - at RCRA sites by Contaminant Group	• Data Primarily Maintained in Paper Files • Managed by EPA Regions and States • National Databases Track Administrative Status and not the Nature and Extent of Contamination • Little Populations at Risk Data ; need to compute from census information
Waste Sites and Industrial Sites	VOC • Frequency and Level of Contamination at Landfills, Leaking Underground Storage Tanks, UIC Wells, Spills, Industrial Sites, etc.	• Limited Geographic Coverage, County by County • Inconsistent Repeat Sampling • Difficult For States to Report Trends • Data Collection Focuses on very few Sites • Difficult to Specifically Identify Source
Area-Wide Sources Generally	Nitrate • Levels in GW Indicative of Wide Range of Contamination from Agriculture and Animal and Human Waste (Septic Systems)	• Limited Geographic Coverage, County by County • Inconsistent Repeat Sampling • Enough Data to Present Trends in Portions of States
Area-Wide Sources of Potential Pesticides Contamination	Pesticides Use • In Sensitive GW Settings, GW Vulnerability and the Potential Problem Area are Identified	• Pesticide Use Data is Very Limited at State Level • Only NJ had Data From Surveys in 1985/88 Compiled and Automated • Vulnerability Assessments Not available

APPENDIX D Achievement of the Ground-Water Indicator National Objectives in the Pilot Study States

State	MCLs	Waste Sites	VOCs	Nitrate	Pesticides
Idaho	Sufficient data to meet the national objectives are available through FRDS, although information characterizing populations at risk may be limited.	Data characterizing on-site and off-site contamination at sites are available primarily from paper files. Information is available to characterize the population at risk for specific areas.	VOC data are very limited in geographic coverage, generally focusing on VOC hot-spots; therefore, the data do not fully support a State analysis.	The national objectives are partially addressed by current data, although greater geographic coverage should be achieved with time.	No data were available for indicator development.
Minnesota	Sufficient data to meet the national objectives are available through FRDS, although information characterizing populations at risk may be limited.	Data characterizing the extent of on-site and off-site contamination and trend analyses are available from paper files only. Data are available at the county level for estimate of population at risk.	Current data availability is limited in geographic coverage, and tends to center on areas with suspected contamination. Nonetheless, these data partially support a State analysis.	Available data address the national objective, and, with time, expanded sampling programs and the Ambient Ground-Water Monitoring Network will support trend analyses.	Only limited data characterizing pesticide use through agricultural co-op purchases were available.
New Jersey	Sufficient data to meet the national objectives are available through FRDS, although information characterizing populations at risk may be limited.	Automated data are available to identify the number of sites and the general extent of contamination. Paper files must be consulted to characterize the sites fully and to document trend analyses. The proximity of the site to the exposed population cannot be obtained from the GWPIDB data base.	VOC data vary in geographic coverage, but the data do partially support a State analysis. Additional cross-sectional sampling is necessary to develop a full picture of ambient VOC concentrations in ground water.	Available data support the national objective, although the scope and geographic coverage of the nitrate analyses should be broadened.	Pesticide use trends can be tracked from 1985 to 1988, but no information is yet available to relate these data to ground-water vulnerability.

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