
Chapter 4

State Institutional Framework To Protect Groundwater From Contamination

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State Institutional Framework To Protect Groundwater From Contamination

CHAPTER OVERVIEW

OTA State Survey

Information on the States presented in this report is based primarily on a survey of all the States conducted by OTA from June to September 1983. The objectives of the questionnaire, which was sent to the State Governors, were to obtain a common information base for assessing the extent to which individual States use available techniques for handling existing groundwater contamination problems and to learn the status of State efforts concerning groundwater quality protection. All 50 States responded. Summary information derived from State responses is discussed in this chapter regarding the institutional framework; technically oriented issues related to specific detection, correction, and prevention activities are covered in chapters 7, 10, and 12, respectively.

State responses to the OTA survey reflect the views of State personnel involved in groundwater quality programs. Questionnaires received by the Governors' offices were forwarded to the State agencies with groundwater quality responsibilities. Responses were prepared by a single agency in 36 States, although several programs within the agency often participated. Fourteen States coordinated their responses with more than one agency. The extent to which the response of a single agency reflects State activities is highly variable, depending on the relative role of that agency in dealing with groundwater contamination. In view of the fact that many States are actively developing or revising their contamination programs, responses reflect program status only as of the date of the questionnaire, i.e., summer 1983.

Survey questions were divided into eight categories: sources, detection, corrective actions, prevention, improving capabilities, State policies, Federal-State relations, and impacts. Emphasis was

on the detection and correction of existing contamination. Thus, further investigation would be required for a detailed analysis of prevention.

A list of the State agencies that responded and a copy of the questionnaire are presented in appendixes C. 1 and C.2, respectively. Because many of the questions asked in the survey are open-ended, the fact that only a few States commented on a particular issue does not necessarily imply that the issue is not of concern to other States. Issues raised by the State responses should thus be interpreted as potentially important to additional States as well.

State questionnaire responses discuss most, but not all, of the sources of contamination, techniques for hydrogeologic investigations, and correction alternatives presented in the technical chapters of this report. The technical chapters have additional coverage because they continued to evolve after the questionnaire was distributed. Nevertheless, State responses provide a factual and comprehensive basis for analysis of State activities and concerns.

State Institutional Framework

In this chapter, State perceptions of groundwater contamination problems and a general description and assessment of their efforts to handle these problems are presented.¹ The following topics are discussed:

- . State perceptions of groundwater contamination problems;
- . Overview of State activities to protect groundwater quality from contamination by selected sources;

¹For more detailed accounts of selected State programs see GAO, 1984; Pye, et al., 1983; Henderson, et al., 1984; National Conference of State Legislatures, 1983; and Magnuson, 1981.

- State efforts to improve capabilities to deal with groundwater contamination;
- State perspectives on Federal programs, including Federal water quality standards and guidance; and
- State strengths, problems with their programs to protect groundwater quality, and types of desired Federal assistance.

Conclusions drawn from this information are summarized below.

Problems with groundwater quality have been identified in every State, and all the States are working to improve their efforts to deal with contamination. State efforts to protect groundwater quality have increased markedly in the past 2 years; for example, the States are beginning to look at more types of activities and facilities that are potential sources of groundwater contamination than previously. However, there are differences in the ways the States perceive and address contamination problems—different States have different problems, priorities, capabilities, and approaches. Some sources of contamination are receiving more attention than others. Some potential sources are not being addressed by most of the States. The States are also at different stages in developing and implementing programs, and generally, are at the very early stages.

The States have been more successful addressing some types of sources of contamination than with others: new v. old, active v. inactive, large v. small, concentrated v. widespread, point v. non-point, non-agricultural v. agricultural, and industrial wastes v. residential wastes. They have also been generally more successful with sources for which there is a Federal mandate for action or for which they have explicit authority. In general, the focus of State programs is on point sources of wastes, rather than on non-point sources and non-waste sources. More States give priority to, and have developed programs for, prevention rather than detection or correction.

All the States recognize problems with their efforts to protect groundwater from contamination. The problems relate primarily to resources (e. g., funding, technical expertise, and information and data) and authority to develop and implement programs. Lack of authority to deal with some sources

is considered a serious problem by almost 40 percent of the States. Although there is a general lack of uniformity among the States about the sources for which they do not have authority, at least two sources—underground storage tanks and agricultural practices—were highlighted by one-half the States noting problems with authority.²

Current Federal laws and programs are generally helpful to the States. But the level of support is not perceived as adequate by most States, nor is support directed at all the specific areas where the States have identified problems (e. g., Federal guidance on water quality standards is perceived as insufficient by many States). In some cases, the States feel that Federal initiatives have actually hindered State efforts.

Problems have been created for some States by some Federal programs. For example:

- programs have resulted in the transferring of surface water quality problems to groundwater;
- resources have been shifted from groundwater issues to other Federal priorities;
- programs have failed to provide explicit

²The States obtain authority to address sources of groundwater contamination through a variety of mechanisms. For example, a State may establish authority through legislation specifically addressing a source (e. g., regulating solid waste landfills); legislation specifically addressing groundwater quality (e. g., many dating discharges to groundwater); or more general water quality legislation that enables a State to protect the quality of State waters (defined to include groundwater in many States). State legislation may be passed in response to Federal laws or programs, or legislation may be developed by the State independently of any Federal activities. For example, Federal laws may require that States establish a program (or the Federal Government will develop a program for the State, as in the Safe Drinking Water Act) or a Federal law or program may offer a State financial assistance if the State establishes a program meeting Federal criteria, as in the Coastal Zone Management Act.

Once a State has established authority to address groundwater contamination, specific programs are developed (unless they are specifically described in the legislation) and implemented. Program development may involve approval of administrative regulations and guidelines that describe the scope of the program in greater detail than the enabling legislation. For example, a State may have a law that authorizes the establishment of standards for groundwater quality, but the specific standards and the exact circumstances in which they are applied are established in administrative rules or regulations. Such administrative rules and regulations may require some type of approval by the State legislature, or they may be up to the discretion of the implementing agency. State program implementation may require that the legislature appropriate special funds for that purpose, or program funding may depend on the implementing agency's making allocations from its general operation budget.

authority to the States to deal with groundwater quality problems;

- programs have not provided adequate and sustained funding for both development and implementation;
- programs have not been applicable to the hydrogeologic conditions in all States; and
- programs have had technical deficiencies.

These problems are related to the lack of Federal goals for groundwater protection and the failure of Federal programs to recognize both the interrelationships among all environmental media

and the differences in State hydrogeologic conditions and institutional arrangements.

The States generally want Federal assistance in the form of funding, technical assistance, research and development, information management, administrative improvements, and policy development. Different States want different combinations of these kinds of assistance and would like assistance directed toward detection, correction, prevention, standards, or, more generally, improvement of State capabilities to handle contamination.

STATE PERCEPTIONS ABOUT GROUNDWATER CONTAMINATION PROBLEMS

Incidents of groundwater contamination have been identified in all 50 States (USGS, 1984), but perceptions about what constitutes a problem vary. For example, some States consider small areas of contamination or several incidents of contamination a statewide problem; others do not. The extent to which an isolated site-specific problem is of statewide concern is partly a function of the availability of alternative high-quality water supplies, the number of further incidents expected from various sources of contamination, and the capability of a State to detect and correct contamination from

existing sources and to prevent contamination from new sources.

Several States commented on the future of groundwater protection. Some are pessimistic about controlling contamination, given the complexity of the problems and the politics and emotions involved. Other States are optimistic that contamination will be controlled *if* they are able to establish and/or implement programs to: 1) prevent groundwater quality degradation from a variety of sources; 2) obtain a better understanding of hydrogeology, sources,

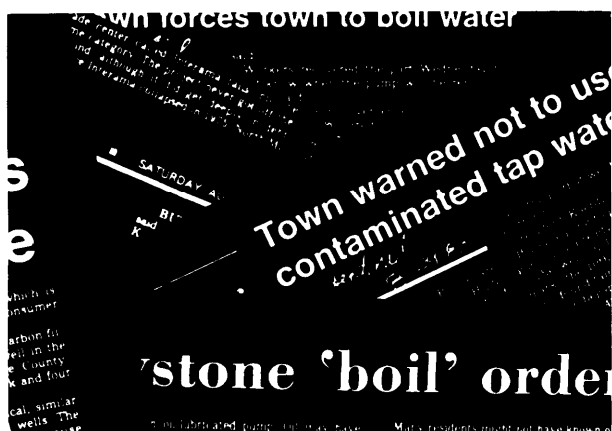


Photo credits: State of Florida Department of Environmental Regulation

Contaminated groundwater has been detected in every State.

and groundwater quality; and 3) detect and correct contamination from existing sources.

Regardless of their perceptions of contamination problems, all the States are working to improve their capabilities for protecting groundwater qual-

ity. Overall, the States are devoting more attention to preventing contamination than to detecting or correcting it. This pattern is consistent with State comments on present and future priorities. Most States give highest priority to prevention.

OVERVIEW OF STATE ACTIVITIES TO PROTECT GROUNDWATER FROM CONTAMINATION

Historical Perspective

State efforts regarding contamination have been changing rapidly in the past few years. The number of States working to address particular sources has increased substantially in the past 2 years. Some States that have only recently recognized particular sources as problems (e. g., underground storage tanks) are beginning to address them. Figure 1 compares the number of States with programs *either* to detect, correct, or prevent groundwater contamination from selected sources in 1981 with the number in 1983. Information in the figure does not imply that all types of facilities and activities for any given source are included, that the same facilities and activities are covered consistently from State to State, or that details of programs for sources have remained the same over time.

As discussed in chapter 3, the Federal Government has some type of program for nearly all these sources. The extent to which State activities are a response to Federal initiatives is not evident from available information. However, some State requirements are more stringent than available Federal guidance for some sources; other States are constrained from addressing certain sources by a lack of Federal initiatives. Further, some States commented that they can more easily address contamination from sources for which there is a Federal mandate.

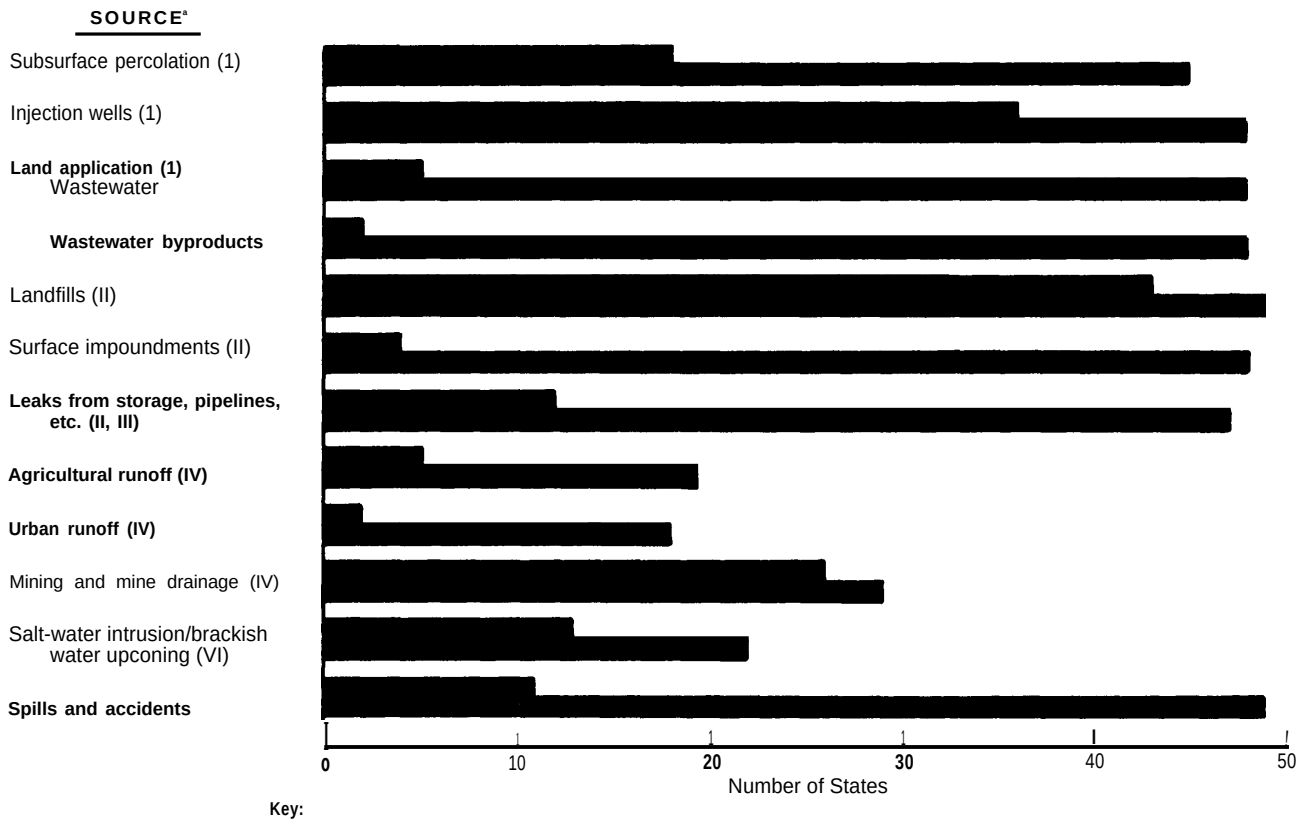
Current State Programs

The OTA State survey asked the States whether they had programs to detect, correct, or prevent contamination from various sources. Figure 2 shows

the number of States with no program to detect, correct, or prevent contamination from various sources. The fact that a State program is directed at a particular source does not necessarily imply that all aspects of contamination from that source are being addressed. A program may be limited to preventing further contamination from a particular source rather than focusing on detecting and/or correcting existing contamination. In addition, State programs may deal only with a subset of facilities and activities of any particular source type.

Two major points are apparent from figure 2: 1) **some sources of groundwater contamination are receiving attention from more States than others.** In general, sources in OTA Category I (sources designed to discharge substances) and Category II (sources designed to store, treat, and/or dispose of substances) are receiving the attention of more States than sources in Category IV (sources that discharge substances as a consequence of other planned activities); and 2) not all States are addressing all potential sources. The reasons given were: 1) the source is not commonly found or does not occur in the State; or 2) no problems with the source have been encountered. With respect to the first reason, sources that are most commonly found in particular regions include de-icing salts (northern States), salt-water intrusion/brackish water upconing (coastal and western States), and irrigation return flow (western agricultural lands). With respect to the reason that problems have not yet been found, it is possible that some problems will not be recognized until they are looked for. This point is especially true for the groundwater contaminants that are often not directly observable by taste, odor, color, or acute illness.

Figure I.—Number of States With Programs to Detect, Correct, or Prevent Groundwater Contamination From Selected Sources in 1981 and 1983



Based on OTA State Survey Responses, 1983. ■ Based on WRC, 1981.

^a Those included are those listed on both the OTA and WRC surveys, Roman numerals refer to OTA source Categories (see table 5). See also the footnotes to fig. 2 for a description of the sources included.

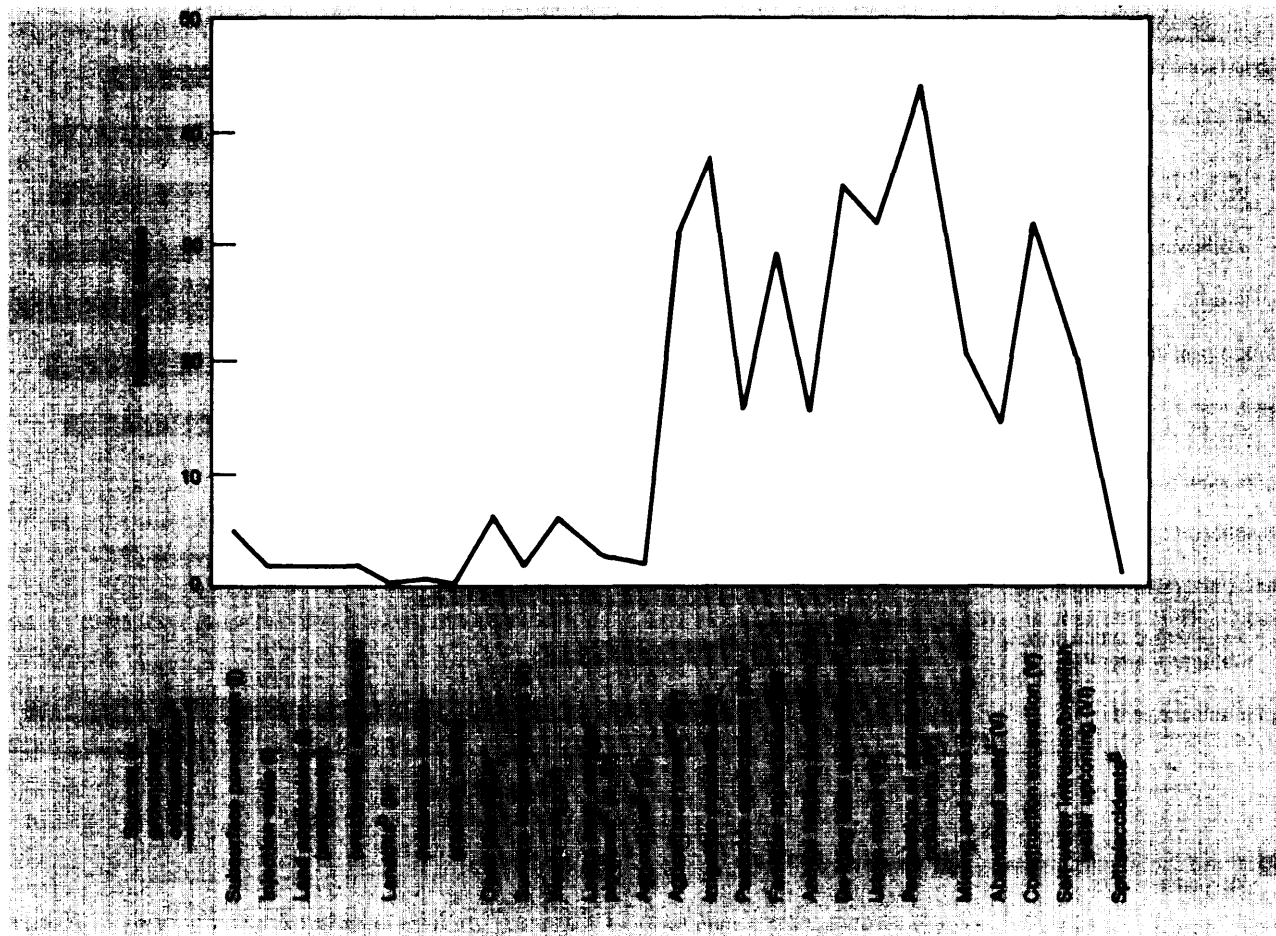
SOURCE: Water Resources Council (WRC), 1981; and the Office of Technology Assessment.

STATE EFFORTS TO IMPROVE CAPABILITIES TO DEAL WITH GROUNDWATER CONTAMINATION

States are undertaking a variety of activities to improve their capabilities to deal with groundwater contamination and are developing institutional frameworks to support their efforts. In this section, information provided in State survey responses about these activities is described. It demonstrates the general points which follow:

- The States are approaching the need to improve their efforts in many different ways.
- Most activity to improve capabilities is at an early stage of development. Training staff and developing their capabilities, detecting contamination, collecting data on particular sources or aquifers, and developing management strategies and programs are among the most commonly reported activities.
- All potential sources of contamination, as identified by OTA's study, are not being considered by all the States.

Figure 2.—OTA State Survey Responses: Number of States With No Programs To Detect, Correct, or Prevent Groundwater Contamination From Selected Sources



^aThe sources included are those listed on the OTA survey. Roman numerals refer to OTA source categories (see table 5).

^b**Landfills.** Some States did not specify whether programs were for hazardous or sanitary landfills. Thus information on the number of States without hazardous or sanitary landfill programs is uncertain. However, one State explicitly noted that it did not have any programs for hazardous waste landfills. All States have some kind of landfill program.

^c**Leaks from storage/pipelines.** The States were not specifically asked about storage tanks and containers (category II) and pipelines and materials transport and transfer operations (category III). These sources are combined into the general category of leaks from storage/pipelines about which the States were questioned.

More specific information on the status of State programs to address leakage of underground storage of petroleum products is available from (API, 1983b). State and local governments have been regulating underground storage at an increasing rate over the last several years.

Provisions of State underground leak laws are variable and may include one or more of the following basic elements: coverage of new or existing tanks; equipment or installation requirements exceeding those of the National Fire Protection Association or the Uniform Fire Code; secondary containment; replacement; inventory control; testing; monitoring; or abandonment provisions. Of the 18 States that have enacted statewide regulations, five States' programs include monitoring requirements, and two States had proposed monitoring requirements as of June 1983.

The Congressional Research Service (Feliciano, 1984) indicates that few State laws or regulations are directed toward prevention of leakage and groundwater contamination by underground storage tanks. And in several cases, the laws or regulations refer mainly to the need for preventing fire or explosion hazards caused by tank contents.

^d**Agriculture and agricultural runoff.** Some States referenced general programs for agriculture and agricultural runoff rather than reporting on programs for irrigation practices, pesticide and fertilizer applications, and animal feeding operations.

^e**De-icing salts.** The States were not asked to distinguish between the application of de-icing salts (IV) and the stockpiling of de-icing salts (II).

^f**Abandoned wells.** The States were not asked to distinguish among the various types of production and other wells (V). Improper abandonment of any type of well can result in groundwater contamination.

^g**Spills and accidents.** These have not been classified in a particular source category in OTA's assessment because a spill or accident can result in groundwater contamination from almost any type of source (e.g., rupture of storage tanks, spill in transport, and flooding of a surface impoundment) due to operational or management problems.

SOURCE: Office of Technology Assessment.

As shown in table 16, the highest number of States are working to improve staff capabilities, undertaking special studies, and improving coordination among programs. A large number of States is also involved in public education, facility development, and agency reorganization. Many States commented that their efforts—especially as related to staff development and training, public education, and facility development—were limited by insufficient funding. There is a wide variety of State activities, as shown in tables 17 and 18 and discussed below.

Staff Development and Training. Forty-five States reported staff development and training activities to improve their capabilities. Twenty-two States provided examples of activities, which can be classified as: classes and conferences (e. g., short courses, hands-on training, workshops, seminars, and safety training); benefits (e.g., improved salary structures, career ladders, continuing education funding, and management programs); and additional staff. Some States are engaging in more than one type of activity.

Special Studies. Forty-three States reported conducting special studies to improve their capabilities. All but two of these States provided examples of their studies, which cover five major areas: detection, sources and/or contaminants, aquifer characteristics, groundwater management and protection strategy development, and regulatory program development. The number of States reporting each type of activity and examples of their studies are presented in table 17. Some detail is provided about the types of sources being studied in table 18. Sources that discharge substances as a consequence of other planned activities (Category IV) are receiving the most attention.

Table 16.—OTA State Sunrey Responses: State Activities To Improve Capabilities To Deal With Groundwater Contamination

Number of States	Activity
45	Staff development and training
43	Special studies
42	Coordination programs
36	Public education
29	Facility development
24	Agency reorganization
10	Other

SOURCE Office of Technology Assessment.

Coordination Programs. Forty-two States reported special coordination programs. All but two of these States provided examples of their coordination activities, which may be classified as: interagency coordination (e. g., with Federal agencies, among State agencies, and with regional agencies); program coordination; and other activities (e. g., formation of special groundwater committees, designation of special staff for coordination, management program strategy development, written agreements, and data base improvements). The most commonly reported activity was interagency coordination. Of the eight States noting coordination with Federal agencies, seven specified the agencies; the U.S. Geological Survey (USGS) was listed by all seven.

Forty-two States also reported benefiting from information provided by other States. Most information exchange among States occurs informally through: personal contacts (e.g., direct inquiry, visits, and informal discussions); attendance at events (e. g., conferences, seminars, special training sessions, and workshops); written materials (e. g., publications, newsletters, rules, regulations, and guidelines); associations (e. g., Association of State and Interstate Water Pollution Control Administrators, National Governors' Association, and interstate commissions); and contact with consultants and experts. Contact through Federal agencies (e. g., Environmental Protection Agency and USGS) was reported by relatively few States.

Table 19 summarizes major categories of information that the States want from each other. They are primarily interested in learning about programs—types of approaches, successes, and failures—rather than about the details of individual sites.

Thirty-two States reported a need to change some of their own practices to facilitate the exchange of information among States. Two types of changes were reported by the majority of States: 1) *improving data management*, such as by establishing an information clearinghouse, and 2) *preparing reports on State experiences*. Several States expressed interest in sharing their experiences through a centralized, national data base, recognizing that much of the information would have to be keyed to specific hydrogeologic conditions. Several States also noted that to write, print, and distribute reports

Table 17.—OTA State Survey Responses: Examples of Special Studies To Improve State Capabilities To Deal With Groundwater Contamination

Type of study	Number of:		Examples
	States	Studies	
A. Detection studies	24	33	
Problem areas	18	25	Coal mining area studies—UT; TCE studies—AZ.
Program development	5	5	Groundwater quality monitoring assessment—PA; Study of techniques for detection of pollutants—CT.
Source-related	3	5	Monitoring coal-fired electric generating plant sludge and ash pits, selected municipal lagoons, and selected oil and gas drilling and production facilities—ND.
Use-related	1	1	Investigating water quality at non-municipal public supply wells—AR.
B. Source and contaminant studies	19	34	
Assessments/inventories	13	16	Surface impoundment assessment and injection well inventories—AL; Statewide toxic substances assessment—NM; behavior of organic contaminants in groundwater—FL; pesticide studies—CA, WI.
Program development	6	7	Bulk storage program development—NY; rules needed for drilling oil and gas in hydrogen sulfide areas—OK; irrigation disposal well alternatives study—ID; Statewide assessment of magnitude of groundwater contamination—MI.
Impacts	6	8	Coal mining impact studies—UT; effects of salt-water disposal associated with oil field activities—MS; impact of pesticides on groundwater—FL, AZ, HI.
C. Aquifer studies	17	21	
Baseline data	14	16	Near-surface permeability—FL; recharge area maps—WV; hydrogeologic studies—GA, DE, IL, KY, NE, NJ, SC, SD.
Modeling studies	2	2	Solute transport studies—MS.
Contamination potential	2	3	Potential for contamination of shallow aquifers from land disposal of municipal wastes—IL.
D. Groundwater management protection strategy . .	12	20	
Program development	10	14	Prevention strategies for particular region—WA, NY; statewide management/protection strategy—AR, MI, NE, NY, ND, OK.
Contamination response	4	4	Point/non-point tradeoff project—NY; evaluate aquifer restoration/cleanup schemes—MA; incident response—NY, VT; Hydrogeologic Investigation Team—NH.
Staff development	1	1	Staff evaluations—DE.
Data management improvement	1	1	Groundwater management information system project—NY.
E. Regulatory program development		5	
Standard development		3	Develop standards for hazardous chemicals in groundwater—FL; develop and adopt groundwater quality standards—OR.
Enforcement	2	2	Coordinated UIC program—AR; permittee or responsibility party studies—DE.

SOURCE: Office of Technology Assessment.

Table 18.—OTA State Survey Responses: Distribution of State Special Studies Among Source Categories

Sources	Total number of studies	Assessments/inventories	Program development	Impacts
Category I	5	4	1	—
Category II ^a	4	3	1	—
Category II ^b	2	—	2	—
Category III	—	—	—	—
Category IV	10	—	2	8
Category V	1	1	—	—
Category VI	—	—	—	—
Total ^c	22	8	6	8

^aWaste^bNon-waste^cNote that the totals do not add up to the totals in table 17 because some of the contaminant-related studies indicated in that table (sources and contaminant studies) are not linked to specific source categories.

SOURCE Office of Technology Assessment

Table 19.—OTA State Survey Responses: Types of Useful Information From Other States

Information	Number of States ^a	Major topics of interest
Corrective	35	Experience with techniques; case histories; cleanup standards.
Detection activities.	28	Experience with techniques; case histories; behavior of specific contaminants in particular hydrogeologic environments; monitoring programs.
Prevention activities	14	Experience with techniques, design criteria and siting requirements for some types of facilities; Best Management Practices.
Standards	14	General water quality standards; maximum contaminant levels; discharge standards; treatment or technology based standards.
Sources	11	Groundwater contamination problems associated with different sources.
Other	27	Groundwater quality management/protection strategies; risk assessment information; impacts of groundwater contamination; research results; legislation; interstate groundwater flow and quality; public education.

^aForty-eight states described the types of information that would be useful.

SOURCE Office of Technology Assessment

and studies on their experiences requires increased staff and support budgets.

Public Education. Thirty-six States reported public education activities, and 16 listed examples: written materials (e. g., pamphlets, magazine articles, and use of the news media) and personal contacts (e. g., workshops with consultants, seminars, and speaker bureaus). Some States noted that they have public information programs; the programs may be either general or targeted at particular sources or areas where groundwater contamination is of concern.

Facility Development. Twenty-nine States reported facility development activities, with 22 States listing examples. The most commonly reported activity is related to laboratory improvements (e. g., expansion of State water quality laboratories, certification and quality assurance checks on private laboratories, upgrading techniques, additional analysis of particular substances such as organic chemicals or radionuclides, and purchase of laboratory equipment). Other activities listed include improving computer capabilities, developing special waste disposal facilities (e. g., State hazardous waste facilities and agricultural chemical wash-

ing facilities), and establishing quality assurance programs.

Agency Reorganization. Twenty-four States reported some type of agency reorganization designed at least in part to improve their capabilities to deal with groundwater contamination. Twelve States gave examples, which may be categorized as: consolidating groundwater expertise in one group or establishing a special task force; creating

a single agency for the environment or for water resources; and establishing a special agency or group for special projects or sites of contamination.

Other Activities. The “other” category listed by 10 States relates primarily to either general program development (e. g., specific laws, priorities, or standards for groundwater) or data collection (e.g., improved drilling capability and monitoring and inventory efforts).

STATE PERSPECTIVE ON FEDERAL PROGRAMS

In this section, two major themes are discussed: 1) whether selected Federal laws and programs have helped or hindered State efforts to protect groundwater quality, and 2) how States use Federal water quality standards and guidance for groundwater contaminants.

State Responses About Selected Federal Laws

In the State survey, the States were asked whether selected Federal laws and programs have been a help to them or hindrance. For the most part, Federal laws and programs have helped many States address contamination. Several States pointed out problems with some Federal programs. In general, States have different problems. They relate primarily to Federal programs that: shift problems with the quality of another environmental medium to groundwater; divert resources to activities other than groundwater; do not explicitly authorize consideration of groundwater; lack flexibility to address specific conditions in a State; create administrative problems for a State; do not fund activities mandated by the Federal Government; and have provisions that the States view as technically unsound or inappropriate,

Table 20 shows the number of States commenting positively and/or negatively about the laws and programs. When a State commented both positively and negatively, the comments may apply to a single section of a law or to different sections. The “no impact” comment has several possible meanings:

1) that the law or program does not apply to the State (e. g., the Bureau of Indian Affairs (BIA) is active only in States with Indian lands and the Coastal Zone Management Act (CZMA) applies only to States bordering seacoasts or the Great Lakes); 2) that respondents to the questionnaire were not familiar with the applicability of the law or program to groundwater issues (e. g., the National Bureau of Standards (NBS)); or 3) that the law or program has no bearing on the efforts of a particular State (e.g., Surface Mining Control and Reclamation Act (SMCRA) and CZMA). Note that the number of States commenting that a law or program has no impact on their efforts to deal with groundwater contamination is relatively large.

In the following discussion, information on the negative comments is presented in detail. These comments provide a basis for determining needed changes in existing laws and programs, or approaches to avoid in establishing new programs, to help the States with their groundwater contamination problems.

The positive comments, not discussed in detail here, indicate the types of Federal laws, programs, and services that the States view as helpful. In general, the positive comments include many of the points made by the States in their response to questions about how the Federal Government can best assist them (see the next major section, e.g., technical assistance, funding, research and development, and information management). Positive comments were also made for Federal programs that, for example, are flexible and can be tailored to individual State needs and conditions.

Table 20.—OTA State Survey Responses: Number of States Reporting Positive and/or Negative Effects of Selected Federal Laws and Programs on Efforts To Deal With Groundwater Contamination^a

	State response			
	Positive	Negative	Both positive and negative	No impact
Laws				
CWA	33	2	12	3
SDWA	36	1	10	3
RCRA	33	2	10	5
CERCLA	31	0	4	15
TSCA	12	0	0	38
UMTRCA	7	0	2	41
FIFRA	11		1	37
CZMA	6	0	1	43
SMCRA	15	2	1	32
Programs				
SCS	26	2	1	21
ASCS	16	0	0	34
NBS	4	0	0	46
BIA	2	0	1	47
BLM	7	0	1	42
BuRec	8	0	0	42
USGS	43	0	1	6
WRDA	14	0	1	35

^aSee text and ch 3 for abbreviations.

SOURCE: Office of Technology Assessment

Federal laws and programs that have influenced the most States include: the Clean Water Act (CWA), the Safe Drinking Water Act (SDWA), the Resource Conservation and Recovery Act (RCRA), the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and programs of USGS. Most States view favorably the contribution these laws and programs have made to their handling of contamination programs. But, with the exception of USGS programs and CERCLA, a relatively large number of States noted that these Federal programs have also had negative (or both positive and negative) effects on their efforts.

It is important to recognize that although one State may view a particular section of a law as limited in its application to groundwater, another State may be using that same provision very effectively. Such discrepancies may reflect differences among States' groundwater problems as well as institutional differences (e. g., authority and priorities) which affect the use of a State's resources. Negative aspects of these laws and programs mentioned by the States are described below, with emphasis on the laws receiving the most negative comments (i.e., CWA, SDWA, and RCRA).

Clean Water Act. The States were asked to comment on Sections 104 (Research, Investigation, Training, and Information); 106 (Grants for Pollution Control); 201 (Grants for Construction of Treatment Works); 205j (Grants for Water Quality Management Planning); 208 (Areawide Waste Treatment); 303 (Water Quality Standards and Implementation Plans); and 402 (National Pollutant Discharge Elimination System, NPDES). Fourteen States made negative comments about the various sections. Two major issues were raised about how the act has hindered State efforts to deal with groundwater contamination:

1. Ten States noted that the act has promoted surface water quality protection efforts to the detriment of groundwater quality (e. g., land disposal practices, increased wastewater treatment, and point source discharges in normally dry streambeds) and has diverted resources away from groundwater issues.
2. One State noted that the lack of explicit **authority in the law to address discharges to groundwater** has prevented the State from doing so.

It should be noted that many States are actively using their discharge elimination permit systems

to regulate discharges to groundwater (20 States commented only positively on Section 402).

Safe Drinking Water Act. The States were asked to comment on the following portions of this law: Part B—Section 1412 (National Drinking Water Regulations); Part C—the Underground Injection Control Program and the Sole Source Aquifer Program; and Part E—Sections 1442 (Research, Technical Assistance, Information, and Training of Personnel) and 1443 (Grants for State Programs). The negative comments from 11 States about one or more of these provisions raised two major issues:

1. Six States noted that the provisions of the Sole Source Aquifer Program and the Underground Injection Control Program were not applicable to or were of little value for conditions in their States.
2. Six States noted administrative problems with implementation of the Underground Injection Program and Sections 1442 and 1443.

Resource Conservation and Recovery Act. The States were asked to comment on Subtitles C (Hazardous Waste Management) and D (State or Regional Solid Waste Plans) of the act. Twelve States made negative comments about one or both provisions, with three major points of concern:

1. Eight States cited problems with administration or implementation of program requirements (e. g., difficulties with requirements for authorization of State programs or conflicts between Federal requirements and ongoing State programs; difficulties in dealing with EPA staff and coordinating with other EPA programs; inflexibility of certain rules; and lack of Federal support for enforcement of Subtitle D).
2. Five States noted funding problems, particularly for Subtitle D, but also for monitoring, laboratory facilities, and staff to implement Subtitle C.
3. Three States cited technical shortcomings within the law: the emphasis on land disposal, mandated use of liners, and inadequate performance standards that, according to one State, hinder proper disposal; the lack of information about the adverse effects of various concentrations of contaminants; the omission of some known toxic or carcinogenic chemi-

cals from RCRA's hazardous waste list; and questions about the applicability of statistical methods used to evaluate concentrations of synthetic chemicals.

Other Laws and Programs. The negative comments made by a relatively few States about other Federal laws and programs generally relate to the same kinds of problems and concerns discussed above for the Clean Water Act, the Safe Drinking Water Act, and the Resource Conservation and Recovery Act.

That the law or program shifts surface water quality problems to groundwater was mentioned by three States with respect to the Soil Conservation Service, by one State with respect to studies supported by its Water Resources Research Institute, and by one State with respect to the Bureau of Land Management and the Bureau of Indian Affairs.

The lack of explicit authority to deal with groundwater quality problems has been a problem for one State with respect to the Surface Mining Control and Reclamation Act (SMCRA). Three other States noted that SMCRA has little impact on groundwater quality.

Administrative problems with the Uranium Mill Tailings Radiation Control Act (UMTRCA), noted by two States, relate to coordination between State and Federal agencies; with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), noted by three States, relate to problems with coordination and the slow rate of progress in program implementation; with SMCRA, noted by one State, relate to retaining State primacy; and with the Coastal Zone Management Act, noted by one State, relate to coordination problems among State agencies.

Funding problems with the USGS Cooperative Program were indicated by one State. The State was unable to participate in the Program because of the cash payments required for matching funds. One State mentioned the lack of funding to comply with Federal requirements under CERCLA to evaluate sites,

Technical shortcomings were noted by two States with respect to the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA); some registered pesticides have contaminated groundwater.

State Use of Federal Guidance on Quality Standards for Groundwater

Water quality standards provide a baseline for detection, correction, and prevention activities. The States apply standards to groundwater through their drinking water quality programs and/or groundwater quality programs.

As mentioned in chapter 3, the Federal statutes require the establishment of quality standards for drinking water and surface water. The Federal Government establishes minimum standards for selected substances in drinking water and provides guidance for additional substances in drinking water and surface water. Although the Federal Government does not require the States to set quality standards for groundwater, many States have done so, especially in the past 2 years, as shown in table 21. States have either established explicit authority for groundwater quality standards or have used their general authority over water quality (often based on Federal mandates to control surface water pollution) to address groundwater. Some States have not developed groundwater quality standards in the absence of explicit Federal guidance.

Also shown in table 21 are the types of State groundwater quality standards—i.e., whether standards are numerical, narrative, or both. Numerical standards specify concentration limits (e. g., parts per million of a substance). Narrative standards describe limits but do not specify concentrations (e. g., a non-degradation standard requiring that concentrations be at or below natural back-

ground levels) or even necessarily individual contaminants (e. g., a standard prohibiting the discharge of toxic, carcinogenic, teratogenic, or mutagenic substances into groundwater). Numerical standards are generally preferable to narrative standards because the substances that are covered and the concentrations that are acceptable are clearly stated. Because of difficulties in obtaining toxicological and risk-related information (discussed in ch. 2 and app. A. 1), there are many problems in developing numerical water quality standards.

State standards are based on available literature; the States have not conducted their own research to determine toxicological, risk, and impact information. Some standards are based on the detection limits of instrumentation, for practical purposes, rather than on the appraisal of risks associated with different concentrations of individual substances.

Major conclusions about State water quality standards applied to groundwater, compared with available Federal water quality standards and guidelines, are discussed below.

Federal drinking water standards and guidance on acceptable concentrations of substances in water are not adequate for State needs. When Federal standards or guidance are available, the States often do not rely on them. Although it is not required by Federal law, most States have developed or are developing groundwater quality standards. Some States have established drinking water standards for substances in addition to, and/or applied more stringent standards to, those substances cov-

Table 21.—Types of State Groundwater Quality Standards Programs in 1981 and 1983

State groundwater quality standards programs	Types of standards/number of States					
	1983					1981
	Numerical	Narrative	Both	Not specified	Total	Total
Programs exist specific to groundwater.	6	3	10	1	20	8
Programs exist based on general water quality standards that apply to both surface water and groundwater.	2	2	1	6	11	1
Developing programs specific to groundwater.	1	4	1	6	12	9
No program development	—	—	—	—	7	32

SOURCE: Office of Technology Assessment; American Petroleum Institute (API), 1983; and WRC, 1981

ered by Federal regulations. State standards include numerical limits for many substances for which the Federal Government has provided no guidance.

The standards States apply to groundwater are extremely diverse. They have developed standards for different substances, and when different States have standards for the same substance, the values are usually not the same. It is not clear, however, how different standards affect the level of groundwater quality protection, given the varying behavior of contaminants in different hydrogeologic environments and the many uses of groundwater.

Appendix C.3, a table on Federal and State water quality standards, indicates the range of drinking water and groundwater quality standards established by the States, the States with these standards, the standards established by the Federal National Interim Primary and Secondary Drinking Water Regulations, and Federal guidance provided by Health Advisories and Ambient Water Quality Criteria. A summary of comments, drawn from appendix C.3, follows:

- States have developed water quality standards for numerous substances for which the Federal Government has not established standards or provided guidance. The States have established drinking water or groundwater quality standards or other indicators of quality for over 150 substances. The Federal Government has established standards or provided guidance for developing water quality standards for less than half of this number. The Federal Government has provided guidelines for fewer than 20 substances for which no State has standards.
- Apart from the substances covered by the National Interim Primary Drinking Water Regulations, few States have developed standards for the same substances (i. e., different States

have generally developed standards for different substances).

- Even when States have standards for the same substances, the standards are usually not the same.
- State water quality standards differ in stringency from Federal standards or guidelines for the same substances. In general, State *drinking water standards* are more stringent than National Secondary Drinking Water Regulations and Ambient Water Quality Criteria. In general, *State groundwater quality standards* are also more stringent than Federal guidelines, but there are substantial numbers of substances for which the State groundwater quality standards are less stringent than Ambient Water Quality Criteria.
- Overall, the States have established groundwater quality standards for many more substances than they have established drinking water standards;³ this may reflect the States' orientation to the prevention of groundwater contamination. The substances for which a State has established groundwater quality standards are usually different than the ones for which it has established drinking water standards. If a State has established drinking water standards and groundwater quality standards for the same substance, the groundwater quality standard is usually more stringent than the drinking water standard.

³In New York, the State with groundwater quality standards for the highest number of substances, groundwater quality standards serve as guidelines for drinking water quality. Reconnaissance studies conducted by the State are used to identify water supplies that have the potential to be contaminated from these substances. More detailed investigations are undertaken if a potential problem is identified. The State has found that water suppliers are responsive to the use of guidelines and has not felt the need to establish formal regulations (Markusen, 1984).

STATE STRENGTHS AND PROBLEMS IN PROGRAMS TO DEAL WITH GROUNDWATER CONTAMINATION AND DESIRED FEDERAL ASSISTANCE

In response to survey questions about strengths and problems in State groundwater protection programs (e. g., program weaknesses, needed changes, and limiting factors) and how the Federal Government can be of most assistance, the States brought up a number of issues related to six topics: 1) sources of contamination, 2) general capabilities to deal with contamination, 3) standards for groundwater quality, 4) detection, 5) correction, and/or 6) prevention. Table 22 summarizes the State responses. Individual responses are presented in appendix C .4; and examples of issues for which each State appears to be particularly articulate are presented in appendix C.5. Major findings, presented below, are followed by details on each topic:

- Because the questions were basically open-ended (i. e., the States were not asked directly about strengths, problems, and the desire for Federal assistance with respect to detection, correction, and prevention), table 22 reflects the issues that questionnaire respondents voluntarily raised, perhaps feeling they were of the greatest concern to their groundwater programs. The fact that a State did not comment about a particular issue does not necessarily reflect a lack of strengths, problems, or desire for Federal assistance with respect to that topic.
- The fact that the highest number of States commented about improving capabilities and detection probably reflects the early stage of development of most State programs. That these issues dominate many States' concerns does not mean that they do not need assistance in other areas.
- Many States did not highlight any strengths, all the States noted problems, and nearly all want some change in Federal assistance efforts.
- Comments on strengths relate primarily to the existence of institutional mechanisms (e. g., authority and program regulations) to address various components of the problems in a State. Comments on problems relate primarily to resources (e. g., financial, staff, and information) or authority. Comments on desired Federal assistance address six major categories: 1) funding, 2) technical assistance, 3) research and development, 4) new policy development, 5) information management, and 6) administrative improvements. Funding, technical assistance, and R&D were suggested by the highest number of States. Six States mentioned the need for a national policy on protection of groundwater in order to overcome State program constraints in handling groundwater contamination; at least 14 other States want

Table 22.—OTA State Survey Responses: Strengths and Problems in Programs To Deal With Groundwater Contamination and Desired Federal Assistance

Issues	Number of States			
	Strengths	Problems	Desired Federal assistance	Total
Sources	22	20	—	33
Improving capabilities	12	48	41	50
Standards	3	19	19	28
Detection,	15	38	29	
Correction	6	19	23	35
Prevention	0	12	10	18
Total States	38	50	48	50

SOURCE: Office of Technology Assessment

Federal funds for development of State policies and programs.

- The States do not want Federal assistance on all the problems that they identified. In particular, they do not desire Federal assistance with problems related to water rights.
- Survey responses reveal a great deal of variability. One State's strengths may be another's problems. Different States highlight problems with different sources and different aspects of programs for improving capabilities, standards, detection, correction, and prevention. Some States are concerned about establishing authority, and others about either developing or implementing programs. A State may have different needs for different sources or for detection, correction, or prevention. In addition, the States seek different kinds of Federal assistance.

Sources

Strengths and Problems

Thirty-three States commented on the adequacy of their authority to deal with sources of contamination. Some States listed either strengths or *problems* with respect to authority for sources, and some listed *both*. When both strengths and problems were noted, they relate to different categories of sources, different sources within a single category, or different characteristics of facilities or sites of a particular source type. Other comments on sources are re-

lated to strengths and problems with detection, correction, prevention, or improving capabilities. They are discussed in that context below.

Although the States did not use the same terminology, apparently many sources for which some States reported having adequate authority are the same sources for which other States reported inadequate authority. These responses highlight the fact that the States have different capabilities for dealing with different sources of contamination and may indicate that individual States are most concerned about different sources of contamination. In addition, relatively few States commented on the adequacy of their authority for specific sources. However, a relatively large number of States commented on the inadequacy of their authority to deal with agriculturally related sources (including agricultural wastes, non-point source control, and pesticide and fertilizer use) and underground storage tanks. No States commented specifically on having adequate authority to deal with these sources.

A State may have adequate authority with regard to some facilities associated with a particular source but not regarding others. Table 23 lists characteristics of sources for which States reported their relative success in establishing and/or implementing programs to control groundwater contamination. The relative success of controlling contamination may reflect the ease with which States are able to acquire authority to regulate different types of operations (which may in turn relate to public support, available resources, number of facilities, and



Photo credits: Office of Technology Assessment (left) and State of Florida Department of Environmental Regulation (right)

Many States lack adequate authority to deal with agriculturally related activities that are potential sources of groundwater contamination including fertilizer applications and animal feedlot operations.

Table 23.—OTA State Survey Responses: Types of Sources for Which States Experience Variations in Their Ability To Deal Effectively With Groundwater Contamination

More success	Less success
New facilities	Old facilities
Active sites	Inactive sites
Large operators, facilities, sites	Small operators, facilities, sites
Regulation federally mandated	Regulation not federally mandated
Concentrated sources	Widespread sources
Nonagriculture	Agriculture
Point sources	Non-point sources
Industrial wastes	Household wastes

SOURCE: Off Ice of Technology Assessment

other factors). Success may also reflect the kinds of options that are available for controlling contamination from different sources (e. g., it may be easier and less expensive to design new facilities than to retrofit old ones to prevent contamination).

Federal Assistance

Sources of contamination were not mentioned specifically when the States listed desired Federal assistance. Rather, desired assistance related to improving capabilities, standards, detection, correction, and prevention, as described in the following sections.

Improving Capabilities

Strengths and Problems

All of the States commented on their strengths, problems, and/or desire for Federal assistance to improve their handling of contamination. Comments on strengths relate primarily to institutional mechanisms that provide flexibility for responding to newly recognized problems (e. g., coordination among State programs, staff training opportunities, and legislative support). Other strengths include availability of information on aquifer characteristics as an aid to decisionmaking.

Comments on problems relate primarily to having sufficient resources and support to establish or implement institutional mechanisms. Almost all of the States are concerned with having sufficient funds and staff. Funding problems were reported by the highest number of States. With staff, the

problems relate to having, attracting, and retaining sufficient numbers of adequately trained personnel.

The States also noted that a number of changes are required in their programs. Several States recognize problems with their institutional framework, including lack of authority to deal with contamination, and inability to develop and implement a coordinated strategy (e. g., because of factors related to regulations and their enforcement). Resolution of these institutional problems is complicated in some States by the lack of support of various interest groups, policy conflicts or coordination problems among State agencies and between State and Federal programs, and the low priority of groundwater relative to surface water.

Federal Assistance

Forty-one States expressed a desire for Federal assistance to improve their capabilities—apart from Federal assistance related to standards, detection, correction, and prevention. Desired types of Federal assistance to improve capabilities, indicated by the highest number of States, include: general technical assistance for groundwater quality programs; funding for development of groundwater policies and programs, State research and development, and staff training; and Federal activities related to information management and information/technology transfer. Suggested improvements to Federal regulatory programs include more flexible regulations to meet individual States' needs, coordination among Federal laws and among Federal and State agencies, and adequate funding for federally mandated programs.

Standards

Strengths and Problems

Twenty-eight States commented about their strengths and problems with quality standards for groundwater or drinking water and desire Federal assistance in this area. Strengths relate primarily to the existence of standards for groundwater quality. The most frequently reported problems are the lack of groundwater quality standards in general and the lack of numerical standards or toxicological or risk information for particular substances

(e.g., volatile or synthetic organics and radiological substances).

Federal Assistance

Nineteen States reported a desire for Federal assistance related to quality standards (two of them also commented on strengths in their own efforts). Research and development **was most** frequently cited (e. g., information on toxicology, impacts, and risk assessment). Other suggestions are for technical assistance and additional Federal drinking water standards.

Detection

Strengths and Problems

Forty-six States commented about the strengths and problems with their efforts, and about their **desire** for Federal assistance, **to** detect contamination. Strengths relate primarily **to** institutional resources and mechanisms (e. g., staff expertise and coordination among State agencies) to detect contamination, at least from some sources. More States noted strengths with respect **to** their detection efforts than they did with respect **to** any other category of **activity** related to dealing with contamination.

Nearly all the States commenting on the strengths of their detection programs also noted problems. Problems relate primarily to institutional concerns, particularly funding and other resource (e. g., staff) constraints that prevent a State from obtaining data on groundwater contamination. Not having the authority to obtain data on particular sources is a problem for many States. Many noted the need **to** modify and increase monitoring activities, although they differed on focus—whether the emphasis should be sources of contamination, aquifer characteristics, or ambient quality.

Federal Assistance

Twenty-nine States expressed a desire for Federal assistance specifically related to detection. Funding for data collection **was the most** commonly reported. Research and development for monitoring and technical assistance for hydrogeologic analysis and interpretation were also listed. In addition, funding, technical support, and R&D for laboratory analysis were noted.

Correction

Strengths and Problems

Thirty-five States commented about strengths and problems and their desire for Federal **assistance** with corrective action. In general, their strengths relate to the existence of institutional mechanisms (e. g., authority, funding, and priority ranking systems) to undertake corrective action for **at least some** sources. Their problems relate primarily **to** insufficient funding and other resources (e. g., staff). Other problems relate **to** inadequate institutional mechanisms (e. g., authority, including water rights, coordination, and enforcement) and **to** the lack of technology for correcting contamination in some environments (e. g., karst).

Federal Assistance

Twenty-three States expressed a desire for Federal **assistance** related specifically **to** corrective action, 12 of them noting neither strengths nor problems in this area. The highest number of States specified technical assistance (e. g., to implement corrective action, **to** train staff on safety and on the use of corrective action techniques, and **to** deal with the public when groundwater contamination is discovered); improvements through research and development (e. g., **low-cost** corrective action techniques for treating specific contaminants, for particular sources like on-site waste disposal or oil field **wastes**, or for aquifers in general; and cleanup standards); and funding assistance (e. g., to deal with contamination in general, existing problems, large problems, and sources for which Federal funding is not available). Other areas cited by a few States include: Federal program administration (e. g., continued support or improvements to the Federal "Superfund" program); Federal policy development (e. g., establishing a national groundwater policy for prevention and correction); and development of an information clearinghouse related to experience with corrective action.

Prevention

Strengths and Problems

Eighteen States commented about problems or desired Federal assistance for prevention of con-

lamination. No States commented specifically about strengths in their prevention programs.

Comments on problems were institutional in nature and relate either primarily to the absence of or deficiencies in some types of programs for prevention (e. g., classification systems, well-drilling standards, environmental impairment liability insurance, recharge area protection, and hazardous waste disposal facilities) or to the lack of resources to implement existing institutional mechanisms (e. g., funds for existing prevention programs to handle more potential sources of contamination). The technical adequacy of some prevention mechanisms was questioned by one State.

Federal Assistance

Ten States desire Federal assistance for prevention activities. Comments relate primarily to re-

search and development activities (e. g., developing control technologies or Best Management Practices (BMPs) for additional sources or contaminants and determining which substances should never be discharged to groundwater) and to funding (e. g., to implement BMPs and federally mandated programs). Additional Federal assistance is also desired for information management (e.g., a clearinghouse for information on State approaches and regulations to prevent groundwater contamination) and for changes to existing Federal programs (e. g., change in the emphasis of RCRA from land disposal to recycling and chemical destruction of toxic materials and improvements in FIFRA pesticide registration requirements to increase success in identifying contamination potential prior to marketing).

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