
Chapter 11
Federal Efforts To Prevent
Groundwater Contamination

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Chapter 11

Federal Efforts To Prevent Groundwater Contamination

CHAPTER OVERVIEW

Activities authorized by Federal statutes related to the prevention of groundwater contamination are described in this chapter. They address prevention in terms of:

- sources of contamination;
- groundwater recharge areas; and
- potential contaminants.

The Federal Government does not have a formal plan or comprehensive strategy to prevent contamination. For example, programs for sources—

for design and operation, siting, and post-closure—do not use a consistent definition of the groundwater resource to be protected and do not systematically address the contamination potential of sources. The program for protecting recharge areas is not comprehensive because the designation of such areas is optional and only certain potential¹ contaminating projects are restricted. To date, the application of provisions that regulate the production and use of potential groundwater contaminants to prevent contamination has been limited.

PREVENTION OF CONTAMINATION BY SOURCES

Federal statutes and programs address prevention of contamination from sources in terms of three types of factors:

1. the scope of the groundwater resource covered (e. g., groundwater in general or drinking water supplies);
2. the specific sources addressed and the type of program (e. g., for design and operation—these may be either mandatory¹ or voluntary); and
3. the performance requirements specified (e. g., for the siting of sources and their closure).

Table 40 summarizes the provisions of Federal programs in terms of these factors. Federal monitoring and corrective action requirements are noted in the table but they are discussed in chapters 6 and 9, respectively.

¹Four statutes included in ch.3 are not applicable to this discussion and thus are not included in table 40: NEPA and WRDA do not establish requirements for sources; CERCLA and the Reclamation Act (RA) are not included because they provide for remedial actions, not preventive measures.

Scope of the Groundwater Resource Addressed

The scope of groundwater resources covered by Federal programs is an important consideration in preventing groundwater contamination. However, Federal programs are not consistent in defining the resource covered and the extent of degradation permitted. Table 40 (column 3) summarizes the way in which groundwater is addressed by Federal programs:

- **The scope of groundwater resources covered by Federal programs is not consistent.**
 - Four programs (authorized by AEA for low-level waste sites, FLPMA and associated mining laws, SMCRA, and TSCA) address *groundwater in general*.
 - Two programs are concerned with the *uppermost aquifer* (authorized by RCRA-Subtitle C and UMTRCA).
 - Three programs cover *underground drinking water supplies* (authorized by RCRA-Subtitle D, SDWA, and CWA-Section 405).

Table 40.-Federal Provisions To Prevent Groundwater Contamination From Sources

| Statute | Publication date of regulations | Relationship to groundwater | Type of program and sources addressed | Siting requirements | Monitoring requirements | Corrective action requirements | Post-closure requirements |
|-------------------------------|---|--|--|--|-------------------------|--------------------------------|--|
| Atomic Energy Act | NRC regulations (10 CFR 61)-12/27/82 (EPA has not promulgated environmental protection standards) | Radioactive material released into groundwater must not exceed levels specified in the regulations. | Design and operating standards are specified for low-level waste disposal sites. | Disposal sites must provide sufficient depth to the water table to prevent groundwater intrusion into the wastes. Hydrogeologic units used for disposal shall not discharge groundwater to the surface within the disposal site. Other requirements relate to seismic and other tectonic activity, flooding, location of natural resources, and population growth and development. | Yes | Yes | Active institutional controls (e.g., monitoring) may not be relied on for more than 100 years (the exact period to be determined by the NRC on a case-by-case basis). |
| | NRC proposed regulations (10 CFR 60)-718181, 46 FR 35280 EPA proposed environmental protection standards (40 CFR 191)-12/29/82, 47 FR 58196 ^d | Geologic repositories include the operations area and the geologic setting (the geologic, hydrologic, and geochemical system-s that provide isolation of the waste). | Design and operating standards are specified for geologic repositories for high-level radioactive wastes. | The geologic setting must exhibit structural, tectonic, hydrogeologic, geochemical, and geomorphic stability. Groundwater travel times (prior to waste deposition) through the geologic setting (i.e., the area that provides isolation of wastes) to the accessible environment must be at least 1,000 years. | Yes | None | Disposal systems must be designed to prevent releases of specific amounts of radioactive material for 10,000 years after disposal. Active institutional controls must not be relied on beyond a few hundred years. |
| Clean Water Act — Section 201 | EPA Criteria—2/n/76, 41 FR 6190 (EPA construction grant regulations are specified in 40 CFR 35) | Groundwater is separated into three categories concerning the land application of wastewater. — If groundwater is a potential drinking water supply, the National Interim Drinking Water Regulations (NIDWRs) must not be exceeded. If background levels are higher than NIDWRs, they must not be exceeded. | Criteria for best practicable waste treatment technology for land application of wastewater must be met by applicants for construction grant funds (for sewage treatment works). | None | Yes | Yes | None |

Table 40.—Federal Provisions To Prevent Groundwater Contamination From Sources— continued

| Statute | Publication date of regulations | Relationship to groundwater | Type of program and sources addressed | Siting requirements | Monitoring requirements | Corrective action requirements | Post-closure requirements |
|--|--|---|--|---|-------------------------|--------------------------------|---------------------------|
| Clean Water Act — Section 201 (cent'd) | | <p>— If groundwater is used as a drinking water supply, the conditions above must be met (except that levels for biological contaminants must not be exceeded in the supply if water is not disinfected).</p> <p>— If groundwater is used for purposes other than drinking water, criteria are established on a case-by-case basis.</p> | | | | | |
| — Section 208 | EPA State grant regulations (40 CFR 35, Subpart G)—5/23/79 | The program is oriented to surface water; however, States are authorized to undertake groundwater activities to the extent practicable. | Funds are authorized for States to develop water quality management plans. State plans provide for development of activities (e.g., Best Management Practices) related to certain non-point sources." | Not applicable | Not applicable | Not applicable | Not applicable |
| — Section 311 | EPA regulations (40 CFR 112)—12/11/73 | The program is oriented to surface water protection; groundwater is not directly addressed. | Spill Prevention and Countermeasure Control (SPCC) Plans must be prepared for above-ground and underground tanks of a specified size containing oil. The plan must describe design and operating conditions. | None | None | None | None |
| — Section 404 | EPA regulations (40 CFR 230)—12/24/80 | Protection is oriented to wetlands protection; groundwater is not directly addressed. | Permits must be obtained to dispose of dredged or fill material. Guidelines to be applied in the review of proposed discharges are specified. | General guidance is provided that relates to the selection of disposal sites such that the potential for erosion, slumping, or <i>/caching</i> of material into surrounding aquatic ecosystems will be reduced. | None | None | None |

Table 40.-Federal Provisions To Prevent Groundwater Contamination From Sources— continued

| Statute | Publication date of regulations | Relationship to groundwater | | Type of program and sources addressed ^a | Siting requirements | Monitoring requirements | Corrective action requirements | Post-closure requirements |
|--|---|--|---|---|---------------------|-------------------------|--------------------------------|---|
| — Section 405 | EPA Criteria (40 CFR 257)–9/13/79 | ion 405 | EPA Criteria (40 CFR 257)–9/13/79 | For undergrounding water s background National In ing Water ! (if higher tl ground) m exceeded t site bound. alternative established by-case ba | None | Yes | Yes | None |
| Coastal Zone Management Act | NOAA State grant regulations (15 CFR 923)–3/28/79 | I Zone agement | NOAA State grant regulations (15 CFR 923)–3/28/79 | The States ar to determin there are a ing special to protect . their recha and areas be subject hazard due intrusion (i ment were | Not applicable | Not applicable | Not applicable | Not applicable |
| Federal Insecticide, Fungicide, and Rodenticide Act ^b | | | | | | | | |
| — Section 3 | EPA regulations (40 CFR 162)–7/3/75 | Criteria for determining unreasonable adverse effects do not explicitly address groundwater. | The use of pesticides that may cause unreasonable adverse effects on the environment can be restricted or prohibited. | Use restrictions may be established for a pesticide. | | None | None | None |
| — Section 19 | EPA regulations (40 CFR 165)–5/1/74 | Regulations refer to water systems; groundwater is not explicitly addressed. | Recommended procedures are established for storage areas for pesticides. | Facilities should be located where flooding is unlikely and where soil and hydrogeologic characteristics will prevent contamination of any water system by runoff or percolation. | | None | None | None |
| Federal Land Policy and Management Act | | | | | | | | |
| — Mineral Leasing Act of 1920 and Materials Act of 1947 | BLM regulations (43 CFR 23)–1/18/69 | Regulations specify that a plan of operations must be developed that includes measures to prevent or control groundwater pollution. State and Federal water quality standards must be met. | Requirements for mining of leasable minerals on Federal lands are to be specified in the plan of operations. | Operations may be prohibited or restricted in areas if the regulatory authority determines that <i>water quality</i> will be lowered below State standards or levels set by DOI. Groundwater is not explicitly mentioned. | | None | None | Performance bond must be filed to cover reclamation activities. |

Table 40.—Federal Provisions To Prevent Groundwater Contamination From Sources— continued

| Statute | Publication date of regulations | Relationship to groundwater | Type of program and sources addressed | Slting requirements | Monitong requirements | Correct we action requirements ^a | Post-closure requirements |
|--|--|--|--|--|-----------------------|---|---|
| — U.S. Mining Laws | BLM regulations (43 CFR 3800)—3/3/80 | Groundwater is not directly addressed in the regulations; however, State and Federal water quality standards must be met. | Requirements for mining of locatable minerals on Federal lands are to be specified in the plan of operations. | None | None | None | Performance bond must be filed to cover reclamation activities. |
| — Geothermal Steam Act | BLM regulations (30 CFR 270)—6/27/79 and 6/30/829 | Regulations specify that a plan of operations must be developed which includes measures to prevent or control groundwater pollution. State and Federal water quality standards must be met. | Requirements for development of geothermal steam on Federal lands are to be specified in the plan of operations. | None | Yes | None | None |
| Hazardous Liquid Pipeline Safety Act | DOT regulations (49 CFR 195)—7/27/81 as amended | The objective of the regulations is to prevent leakage. However, groundwater is not directly addressed. | Design and operating standards are specified for pipelines used to transport hazardous liquids. | None | None | None | None |
| Hazardous Materials Transportation Act | DOT regulations (49 CFR Subtitle B, Subchapter C)—4/15/76 as amended | The objective of the regulations is to protect against risks to life and property. However, groundwater is not directly addressed. | Design and operating standards are specified for transportation of hazardous materials and hazardous wastes. | None | None | None | None |
| Resource Conservation and Recovery Act | | | | | | | |
| — Subtitle C | EPA regulations (40 CFR 264)—7/26/82 Note: Final regulations have not been promulgated for covered underground tanks or for some open burning and detonation sites. | Regulations specify that hazardous substances entering groundwater (in the uppermost aquifer) must not exceed background levels, the Maximum Contaminant Levels for 14 constituents specified by the National Interim Drinking Water Regulations (if higher than background), or alternative concentration limits (established on a case-by-case basis) at the compliance point. | Design and operating standards are specified for hazardous waste treatment, storage, and disposal facilities (e.g., landfills, surface impoundments, waste piles, and land treatment areas). | Facilities must not be located in areas subject to flooding or seismic conditions. | Yes | Yes | Specified activities (e.g., groundwater monitoring and operation of leachate collection system) must be continued for 30 years after closure unless the time period is increased or or decreased by the regulatory authority. |

Table 40.-Federal Provisions To Prevent Groundwater Contamination From Sources— continued

| Statute | Publication date of regulations | Relationship to groundwater | Type of program and sources addressed ^a | Siting requirements | Monitoring requirements | Corrective action requirements | Post-closure requirements |
|---|--|---|---|---------------------|-------------------------|--------------------------------|---|
| – Subtitle D | EPA regulations (40 CFR 257)–9/13/79 | The criteria specify that for underground drinking water sources, background levels or the National Interim Drinking Water Regulations (if higher than background) must not be exceeded beyond the application boundary or an alternative boundary established on a case-by-case basis. | Funds are authorized for States to develop optional State solid waste programs. Specified Federal criteria for sanitary landfills must be met by State program. | None | None | None | None |
| Safe Drinking Water Act – Part C (UIC Program) | EPA regulations (40 CFR 146)–6/24/80 as amended Note: Regulations have not been promulgated for certain wells. ¹ | Regulations specify that it must be demonstrated that activities will not be conducted in a manner that allows movement of contaminants into an underground source of drinking water (defined as an aquifer or its portion that supplies any public water system or contains sufficient water to supply a public water system and that currently serves as a drinking water supply or contains fewer than 10,000mg/1 TDS). Aquifers may be exempted if they are not currently drinking water supplies, cannot and will not be supplies in the future, or contain 3,000-10,000 mg/1 TDS and are not reasonably expected to supply a public water system. | Design and operating standards are specified for underground injection wells. | None | Yes | None | None ^b |
| Surface Mining Control and Reclamation Act | OSM regulations (30 CFR 816 and 817)–revised 9/12/6183 (Regulations were first published in 1979) | Regulations specify that groundwater quality must be protected by handling earth materials and runoff in a manner that minimizes acidic. | Requirements are specified in operating permit for surface coal mining and underground coal mining (for surface effects). | None | Yes | Yes | Performance bond must be filed to cover reclamation activities. |

Table 40.-Federal Provisions To Prevent Groundwater Contamination From Sources— continued

| Statute | Publication date of regulations | Relationship to groundwater | Type of program and sources addressed | Siting requirements | Monitoring requirements | Corrective action requirements | Post-closure requirements |
|---|--|--|--|---|-------------------------|--------------------------------|---|
| | | toxic, or other harmful infiltration to ground-water systems and by managing excavations and other disturbances to prevent and control the discharge of pollutants into ground-water. State and Federal water quality standards must be met. | | | | | |
| Toxic Substances Control Act ^a — Section 6 | EPA regulations (40 CFR 761)—5/31/79 | The objective of regulations is to ensure against an unreasonable risk of injury to health or the environment (e.g., water) from the manufacture, processing, distribution, use, or disposal of a chemical substance or mixture. | Design and operating standards are specified for PCB disposal sites. | Facilities must be located in areas of low to moderate relief and must avoid floodplains, shorelands, and groundwater recharge areas. Bottom of landfill must be 50 feet from historical high water table. | Yes | None | Operating records must be retained for 20 years after closure. |
| Uranium Mill Tailings Radiation Control Act | NRC regulations (10 CFR 40)—10/3/60 EPA regulations (40 CFR 192)—10/7/83, 48 FR 45926 | Same as RCRA—Subtitle C (except that levels for certain radioactive substances are specified). | Design and operating standards are specified for uranium mill tailings disposal sites (same as RCRA Subtitle C requirements for surface impoundments). | NRC requirements specify that the selection process must consider hydrologic and other conditions as they contribute to continued immobilization and isolation of contaminants from usable groundwater sources. EPA regulations do not establish siting requirements. | Yes | Yes | Long-term surveillance is specified by NRC on a case-by-case basis. EPA regulations require that sites be developed to be effective for 1,000 years to the extent reasonable achievable and in any case for at least 200 years. |

^aSee table 13 and app. H for additional information on sources, types of programs, and design and operating requirements.

^bSee table 30 and app. E for additional information on monitoring requirements.

^cSee table 36 and app. G for additional information on corrective action provisions.

^dThe provisions cited in the table are EPA's proposed protection standards.

^eProvisions apply to non-point sources including irrigation return flows, agricultural sources, livestock areas, minerunoff, saltwater intrusion, and construction activity.

^fSee the text for a more detailed discussion of FIFRA and TSCA.

^gRegulations for the Geothermal Steam Act were redesignated, with minor revisions, as 43 CFR 3260 on Sept. 30, 1983.

^hThere are plugging requirements at closure.

ⁱRegulations have not been promulgated for Class IV and V wells under the UIC Program; see app. H and 40 CFR 146.

SOURCE: Office of Technology Assessment

- One program (under Section 201 of CWA) separates groundwater into three categories—drinking water supplies, potential drinking water supplies, and groundwater used for other purposes—with different standards for each category.
- The programs authorized by five statutes do *not directly address* groundwater in any way (CWA—Sections 311 and 404, CZMA, FIFRA, HLPSA, and HMTA).
- The requirements for selecting geologic repositories for high-level radioactive wastes (under AEA) include *surrounding hydrogeologic systems* as part of the repository.
- The extent of degradation permitted by Federal programs is not consistent.
- Under the Subtitle C program of the Resource Conservation and Recovery Act (RCRA, which addresses the uppermost

aquifer), the Environmental Protection Agency (EPA) may establish alternative concentration limits on a case-by-case basis (instead of requiring that groundwater contamination not exceed background levels or Maximum Contaminant Levels). EPA regulations specify the factors that must be considered in approving the alternative concentration limits.² However, decisions are to be made by permit writers on a site-specific basis.

- Under the Underground Injection Control Program of the Safe Drinking Water Act (SDWA), certain aquifers maybe exempted. Thus, underground injection into those aquifers is not controlled.

²See 40 CFR 264.94(b).

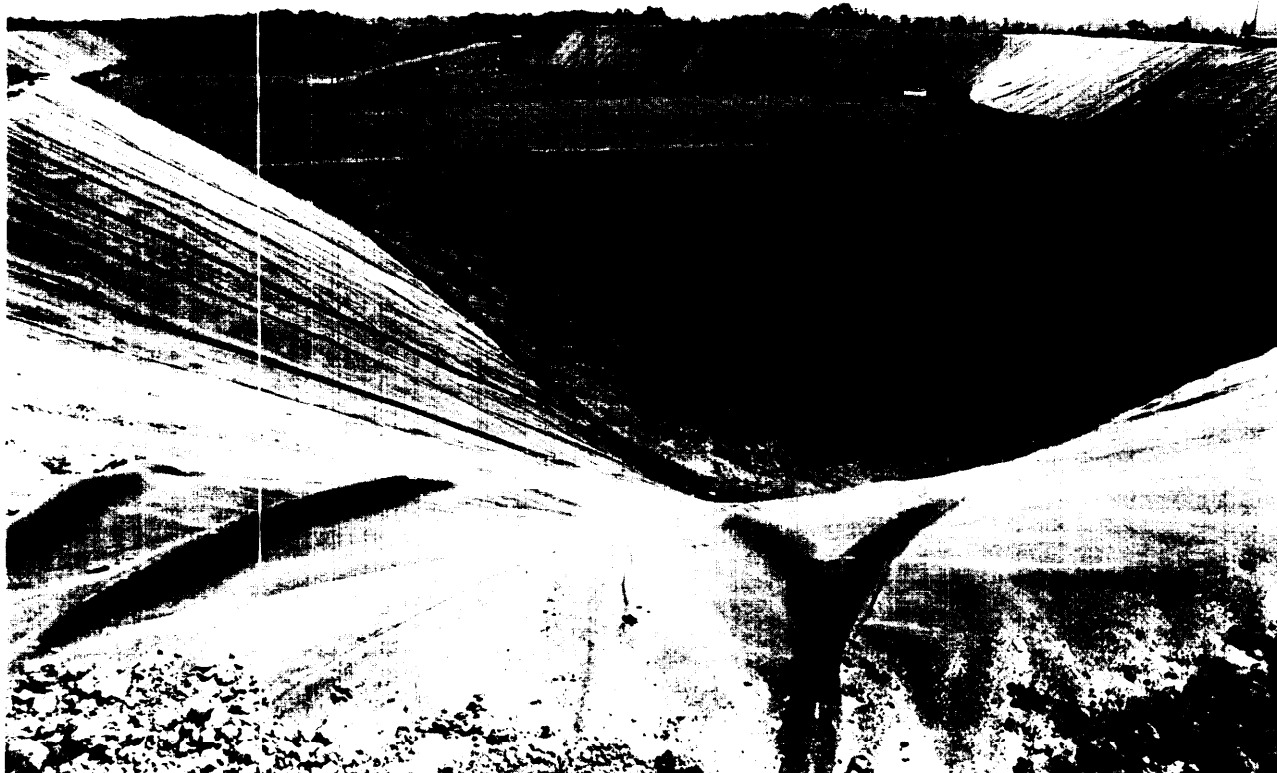


Photo credit: CECOS International

Liners and leachate control systems are included in the design and operating requirements for hazardous waste landfills and surface impoundments under Subtitle C of RCRA. This photograph shows a synthetic and clay-lined hazardous waste disposal facility prior to use.

Types of Programs and Sources Addressed

The principal type of program related to the prevention of contamination from sources is for design and operation. As indicated in chapter 2, potential sources of contamination have different characteristics for releasing substances (e. g., point v, non-point discharges) which necessitate different design specifications and operating procedures to prevent groundwater contamination. Programs may be either mandatory or voluntary; and they are specified for particular sources of contamination. Design and operating requirements are summarized in table 40 (column 4) and described in detail in appendix H in relation to each Federal program and OTA source categories (refer to ch. 2, table 5). The following observations can be made about the types of programs that have been developed. (Note that the technical adequacy of these programs has not been evaluated in this study.)

- Mandatory design and operation requirements apply to subsets of sources within Categories I, II, III, and V. As noted in chapter 3, the sources addressed by programs with mandatory requirements are, for the most part, associated with hazardous wastes or other toxic materials.
- With the exception of certain mining activities and the application of certain pesticides, sources in Category IV are not subject to mandatory requirements. However, Best Management Practices or recommended procedures have been developed for some of these sources.
- There are no mandatory requirements for any sources in Category VI.

It is significant that many of the programs' requirements were established fairly recently. Table 40 (column 2) indicates that the majority of regulations were published within the past 5 years. Thus, the impacts of some of these programs on the prevention of groundwater contamination cannot yet be ascertained. Further, despite the fact that programs have been authorized by Federal legislation for certain sources, regulations specifying design and operating (as well as monitoring and corrective action) requirements have not been pro-

mulgated for certain sources. These sources include:

- covered underground tanks (under RCRA);
- injection wells used to dispose of hazardous wastes *into* or above underground sources of drinking water and all other injection wells except those used for the following purposes: disposal of hazardous or radioactive materials and other wastes (e. g., municipal or industrial) *beneath* underground sources of drinking water; wells used in association with oil and gas production; and wells used for in-situ or solution mining (under SDWA);
- open burning and detonation sites (under RCRA); and
- low-level radioactive disposal sites (under AEA).³

In addition, the purview of the Hazardous Liquid Pipeline Safety Act (HLPESA), which establishes requirements for interstate pipelines (used to transport petroleum products and anhydrous ammonia), includes the *storage* of liquids incidental to their movement by pipeline. Although regulations have been promulgated for pipelines, the Department of Transportation has not established requirements for storage facilities (e. g., tanks).

Performance Requirements

This study also examined the extent to which Federal programs address the prevention of groundwater contamination with performance requirements for siting new sources and post-closure. As indicated in table 40 (column 5), siting provisions for new sources are specified by six programs: high- and low-level radioactive waste programs under the Atomic Energy Act (AEA); pesticide storage provisions under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA); mineral mining provisions for leasable minerals under the Mineral Leasing Act; the hazardous waste program (Subtitle C) under RCRA; the PCB disposal requirements under the Toxic Substances Control Act (TSCA); and the Nuclear Regulatory Commission

³The Nuclear Regulatory Commission has issued licensing regulations for these facilities. However, EPA has not issued environmental protection standards.

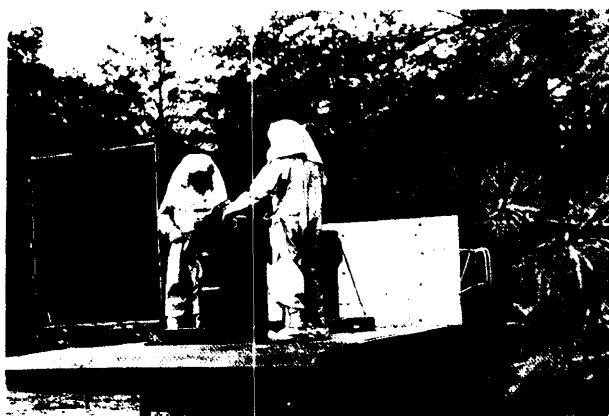


Photo credits: U.S. Environmental Protection Agency

Open burning and detonation of waste explosives are addressed under RCRA but regulations have not yet been promulgated. These photographs show white phosphorus drums being prepared for disposal . . . and their subsequent detonation.

requirements for uranium mill tailings sites established under the Uranium Mill Tailings Radiation Control Act (UMTRCA). Of the six programs, the requirements established under RCRA and the Mineral Leasing Act do not explicitly address the protection of areas vulnerable to groundwater contamination.⁴

Provisions that address any contamination that may occur after a source is no longer in use ('post-closure' are also important for the prevention of contamination. Table 40 (column 8) summarizes these provisions.⁵ Post-closure provisions are specified for a limited number of sources: disposal facilities for hazardous and certain radioactive substances and mining operations. There is also an inconsistency between the requirements for hazardous waste facilities and high-level radioactive waste sites: in spite of the fact that many of the chemicals found in hazardous waste disposal facilities are non-degradable, a post-closure period of

only 30 years has been set. ⁶In comparison, it has been proposed that high-level radioactive waste disposal sites which contain radioactive substances that do degrade over time (e. g., half-lives of radioactive substances range from tens to more than millions of years) must be designed to prevent releases for 10,000 years.⁷

There are two additional points about the post-closure requirements in table 40 with respect to specific sources:

1. There are no post-closure monitoring requirements established for PCB disposal facilities. Thus, any groundwater contamination that may occur following closure is not likely to be detected.
2. Specific requirements have not been established for uranium mill tailings sites. Post-closure provisions will be required only at the discretion of the regulatory authority.

⁴Proposed RCRA regulations issued by EPA on Dec. 18, 1978 (43 FR 59000) did contain siting requirements with respect to aquifer recharge areas, but the provisions were not adopted in the final regulations issued by the agency (40 CFR 264.18).

⁵In this assessment, reclamation activities conducted as part of mining operations are considered post-closure provisions.

⁶Although the post-closure period can be extended by the regulatory authority if necessary, it is possible that a site will appear to be secure at the end of the 30-year period but subsequently release substances into groundwater.

⁷47 FR 58196, Dec. 29, 1982.

AQUIFER PROTECTION

A second approach of Federal statutes related to the prevention of groundwater contamination is to protect recharge areas. The Sole Source Aquifer provision of the Safe Drinking Water Act, Section 1424(e), allows the Administrator of EPA to designate the aquifers that serve as sole or principal drinking water sources and to prevent any commitments of *Federal* financial assistance to projects that may create significant hazards to public health by contaminating such aquifers.

The Sole Source Aquifer provision 'does not establish a comprehensive program for protecting aquifer recharge areas. The process for designating sole source aquifers is optional, and only certain projects are restricted from receiving Federal financial assistance. In addition, funding decisions are based on findings regarding the significance of the hazard posed to human health.⁸

EPA issued proposed regulations in September 1977 establishing procedures for designating sole source aquifers and reviewing projects proposed in these areas (final regulations have not been published by EPA).⁹ The proposed regulations define several key terms used in this section of the statute:

- A *sole or principal source aquifer* is defined as one which supplies 50 percent or more of the drinking water for an area. The proposed regulations also specify six factors that must be considered in deciding whether to *designate* a sole source aquifer:
 1. the availability of alternative sources of drinking water;
 2. the size of the area and population served by the aquifer;
 3. the susceptibility of the aquifer to contamination through the recharge zone;
 4. the location of the aquifer;
 5. the number of public water systems using water from the aquifer, the number of people served by the systems, and the treatment provided by the systems; and
 6. such other factors as are deemed relevant.¹⁰

⁸The Sole Source Aquifer provision originated as a floor amendment to the Safe Drinking Water Act. See Hemphill, 1976.

⁹42 FR 51620, Sept. 29, 1977.

¹⁰42 FR 51623.

- A *significant hazard to public health* means any level of a contaminant: a) which causes or may cause the aquifer to exceed any Maximum Contaminant Level set forth in any promulgated National Primary Drinking Water Regulation at any point where the water may be used for drinking purposes or which may otherwise adversely affect human health, or b) which may require a public water system to install additional treatment to prevent such adverse effects.
- *Federal financial assistance* includes any financial benefits provided directly as aid to a project by a department, agency, or instrumentality of the Federal Government in any form, including contracts, grants, and loan guarantees. Actions or programs carried out by the Federal Government itself (e.g., dredging performed by the Army Corps of Engineers) and actions performed for the Federal Government by contractors (e.g., construction of roads on Federal lands) are not included. Federal financial assistance is limited to benefits earmarked for a specific program or action and awarded directly to the program or action.¹¹

As of July 1984, EPA had designated 17 sole source aquifers (see EPA, 1983, 1984).

¹¹45 FR 51621. EPA has indicated that it "will not be concerned with reviewing on an individual basis, small isolated commitments of financial assistance such as individual home mortgage loans.

¹²Designated aquifers are:

1. Edwards Aquifer, TX (petition received 1/3/75, designated 12/16/75)
2. Nassau/Suffolk Counties Long Island, NY (petition received 1/21/75, designated 6/21/78)
3. Maryland Piedmont (petition received 10/1/75, designated 8/27/80)
4. Northern Guam (petition received 11/20/75, designated 4/26/78)
5. Fresno County, CA (petition received 8/9/76, designated 9/10/79)
6. Spokane-Rathdrum Prairie, WA-ID (petition received 10/4/76, designated 2/9/78)
7. Biscayne Aquifer, FL (petition received 5/8/78, designated 10/1/79)
8. Buried Valley, NJ (petition received 1/16/79, designated 5/8/80)
9. Cape Cod, MA (petition received 3/4/81, designated 7/31/82)
10. Whidbey Island, WA (petition received 4/31/81, designated 4/6/82)
11. Camon Island, WA (petition received 4/31/81, designated 4/6/81)
12. Kings/Queens Counties, NY (designated 1/24/84)

After an area is designated as having a sole or principal source aquifer, the Regional Administrator may review any project located in that area for which Federal financial assistance is proposed. The proposed regulations specify the review procedures that must be followed by EPA. Anyone

(footnote 12 continued)

13. Ridgewood, NJ (designated 1/24/84)

14. Upper Rockaway River Basin, NJ (designated 1/24/84)

15. Upper Santa Cruz and Avra-Altar Basin, AZ (designated 1/24/84)

16. Nantucket Island, MI (designated 1/24/84)

17. Block Island, RI (designated 1/24/84)

If an area is designated, EPA must identify the boundaries of the recharge zone or streamflow source zone (or portions thereof) through

may petition EPA to review a project, or EPA may initiate the review. In addition, Federal agencies are required to maintain a list of projects in the recharge or streamflow zone of a designated aquifer for which environmental impact statements (under the National Environmental Policy Act, NEPA) will be prepared. EPA has stated that "the process of project review pursuant to Section 1424(e) will be integrated as fully as possible with the review of Federal actions subject to NEPA."¹⁴

which contamination could affect the area and the water body or bodies which contact the recharge zone. 42 FR 51623.

¹⁴42 FR 51621.

REGULATING THE PRODUCTION AND USE OF POTENTIAL CONTAMINANTS

There are two Federal statutes that provide for regulation of the production and use of potential groundwater contaminants: the Toxic Substances Control Act and the Federal Insecticide, Fungicide, and Rodenticide Act. Both require submission of data on the environmental effects of chemicals and authorize the regulation of potential groundwater contaminants. To date, however, their use for the prevention of contamination has been limited.

Toxic Substances Control Act

The Toxic Substances Control Act (TSCA) provides for the regulation of chemical substances and mixtures whose manufacture, processing, distribution in commerce, use or disposal may present an unreasonable risk of injury to health or the environment.¹⁵ Unlike other statutes analyzed in this study (e. g., RCRA and SDWA), TSCA does not focus on specific sources of groundwater contamination. However, because it encompasses all aspects of a chemical's pathway through society, including use and disposal, TSCA has the potential for directly addressing groundwater contamination (see ch.

2 for a discussion of pathways). In addition, TSCA provides a mechanism for obtaining data on the properties of certain chemicals associated with sources of groundwater contamination.

Two provisions of TSCA are most relevant to the prevention of contamination.

1. Section 5 requires that manufacturers or importers of 'new' chemicals submit a premanufacture notice (PMN) to EPA 90 days before the substance enters commerce. The PMN is to include sufficient data for EPA to **determine** whether the manufacture, processing, distribution in commerce, use, or disposal of the new chemical—or any combination of such activities—will present an unreasonable risk of injury to health or the environment.¹⁶
2. Section 6 provides for *regulation* of the manufacture, 'processing, distribution in commerce, use, or disposal of chemical substances or mixtures that present or will present an un-

¹⁵ 'Environment' is defined to include water, air, and land and the interrelationship which exists among and between these media and all living things (Section 3(5)). 'Groundwater' is not explicitly mentioned.

¹⁶TSCA does not define 'unreasonable risk. In 1979, EPA stated that it "intends to balance the magnitude of risks and social benefits associated with a chemical substance. In doing this, EPA will consider the seriousness of the risk (including the nature, extent, and reversibility of the adverse effects), the availability of alternatives to the substance and their associated risks, and the benefits (economic and otherwise) which accrue to society from the production and use of the substance. 44 FR 16243, Mar. 16, 1979.

reasonable risk of injury to health or the environment.¹⁷

Section 5. TSCA specifies that the PMN submitted to EPA by a manufacturer must include information regarding the chemistry of the new substance, proposed uses, the amounts to be manufactured or processed, the byproducts, the number of workers to be exposed and the duration of exposure, and methods of disposal. General classes of information are also to be submitted to EPA, including any available test data in the possession or control of the manufacturer related to environmental and health effects and a description of any other data, insofar as known to the manufacturer or reasonably ascertainable.¹⁸ EPA can then take one of four actions following the review of a PMN: 1) allow the substance to be manufactured without restriction; 2) allow the substance to be manufactured for specified uses (EPA would have to be notified about other uses); 3) if a decision about unreasonable risk cannot be reached because of the lack of information, delay the manufacture, processing, distribution, use, or disposal until additional information is developed; or 4) regulate the manufacture, processing, distribution, use, or disposal of the substance.

A previous OTA study reviewed the information contained in the 740 PMNs submitted to EPA from July 1, 1979 to June 1981 and in June 1982 (OTA, 1980). The study found that 62 percent of the PMNs reported all the information specified by TSCA (e. g., chemistry, proposed uses, amounts, byproducts, exposure, and disposal methods). However, only 10 percent of the PMNs reported any information from tests used to estimate environmental effects. Physical-chemical data most directly related to predicting the behavior of chemicals in groundwater—density, vapor pressure, solubility (in water), and partition coefficient—were reported, respectively, on 19 percent, 24 percent,

42 percent, and 4 percent of all PMNs (OTA, 1983; Gough, 1983). In addition, although approximately 50 percent reported toxicity information, only 17 percent had any test information about the likelihood that the chemical could cause cancers, birth defects, or mutations.

In the absence of data on the physical-chemical properties of chemicals used to assess environmental effects under the PMN review process, EPA relies on estimates of chemical properties and the use of computer models to determine whether the use of a new chemical may affect groundwater.¹⁹

Section 6. This section provides EPA with broad authority to address sources of groundwater contamination directly by regulating the use or disposal of a chemical substance or mixture.²⁰ To date, EPA

¹⁹EPA's Office of Toxic Substances has undertaken two projects to support the premanufacture review process. One involves a computer program, CHEMEST, which estimates certain chemical properties on the basis of molecular structure information (Arthur D Little, 1983). The program is capable of providing estimates of the following properties: volatility in water; the soil adsorption coefficient; bioaccumulation or the bioconcentration factor (in fish); the activity coefficient; the boiling point; the vapor pressure; the rate of volatilization from water; and Henry's Law Constant.

The second project involves the development of two models used to assess the behavior of a chemical in soil and groundwater. One model predicts *movement* through the unsaturated zone (Bonazountas, et al., 1981), and the other simulates the transport of contaminants through an aquifer (Yeh, 1981). Information compiled on 70 locations in the United States is the data base for these computer modeling efforts (Versar, 1983).

²⁰Section 6 requires the Administrator of EPA to take one or more of the following actions if there is a reasonable basis to conclude that the manufacture, processing, distribution in commerce, use, or disposal of a chemical substance or mixture (or any combination of activities) presents or will present an unreasonable risk of injury to health or the environment:

1. prohibit or limit the amount of such substance or mixture which can be manufactured, processed, or distributed;
2. prohibit or limit the amount of such substance or mixture which can be manufactured, processed, or distributed for a particular use or a particular use in excess of a specified level;
3. require that such substance or mixture be accompanied by clear and adequate warnings and instructions with respect to its use, distribution in commerce, and/or disposal;
4. require manufacturers or processors of such substance or mixture to make and retain records of certain processes;
5. prohibit or otherwise regulate any manner or method of commercial use of such substance or mixture;
6. prohibit or otherwise regulate the manner or method of disposal of such substance or mixture provided that State (or other level of government) laws or requirements are not violated, and require notification of the appropriate level of government; and
7. direct manufacturers or processors of such substance or mixture to give notice of such unreasonable risk of injury and replace or repurchase such substance or mixture.

The factors which must be considered in promulgating a Section 6 rule include:

¹⁷Other Sections of TSCA provide for: the compilation of an inventory of existing chemicals manufactured or processed in the United States and the recording and reporting of certain health and environmental data (Section 8); the development of test rules on health and environmental effects of existing chemicals (Section 4); the commencement of civil actions when chemical substances pose an imminent hazard (Section 7); and the authorization of State grants for establishment and operation of programs to prevent or eliminate unreasonable risks (Section 28).

¹⁸Section 5(d)(1).

has regulated four chemicals or groups of chemicals under Section 6 1) fully halogenated chlorofluorocarbons, 2) waste materials containing tetrachlorodibenzo-p-dioxin (TCDD), 3) asbestos, and 4) polychlorinated biphenyls (PCBs).²¹ Only the PCB regulations involve disposal provisions related to preventing groundwater contamination. However, one State in responding to OTA's State survey noted that the PCB disposal regulations are not being strictly enforced by EPA and that TSCA does not provide for the transfer of regulatory authority to the States. The TCDD requirements prohibit the disposal of wastes containing TCDD by a particular chemical company (which is under court order to undertake remedial actions at a hazardous waste site under RCRA); the company is required to store and monitor the wastes until a long-term solution is found.

Federal Insecticide, Fungicide, and Rodenticide Act

The overall thrust of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), which regulates pesticides in the United States, is to ensure that the use of a pesticide will not cause unreasonable adverse effects on the environment. 22 FIFRA defines an unreasonable adverse effect on the environment as "any unreasonable risk to man or the environment, taking into account the economic, social and environmental costs and benefits of the use of any pesticide. FIFRA contains two

- A. the effects of such substance or mixture on health and the magnitude of the exposure of human beings to such substance or mixture;
- B. the effects of such substance or mixture on the environment and the magnitude of the exposure on the environment to such substance or mixture;
- C. the benefits of such substance or mixture for various uses and the availability of substitutes for such uses; and
- D. the reasonably ascertainable economic consequences of the rule, after consideration of the effect on the national economy, small business, technological innovation, the environment, and public health (Section 6(c)(1)).

²¹See 40 CFR 762, 40 CFR 775, 40 CFR 763, and 40 CFR 761, respectively. Procedures for rulemaking under Section 6 are specified in 40 CFR 750. Congress explicitly directed EPA to promulgate disposal and labeling requirements for PCBs within 6 months of the effective date of TSCA and to phase out their use over a 2-year period; the PCB disposal requirements established by EPA with respect to monitoring, correction actions, and design and operation are discussed in chs. 6, 9, and 11, respectively.

²²See Section 2(bb). Like TSCA, FIFRA does not explicitly include groundwater in the definition of environment.

principal provisions relevant to the prevention of groundwater contamination: 1) Section 3 provides for the registration of all pesticides based on the submission of data specified by EPA and for the classification of pesticides for general or restricted use; and 2) Section 6 authorizes EPA to suspend and cancel the registrations of pesticides that cause unreasonable adverse effects on the environment. 23

Section 3. Section 3 of FIFRA requires the registration of all pesticides. In addition to registering new pesticides, EPA is also mandated to review all existing registrations to ensure that they meet current requirements. 24 There are 40,000 pesticides (containing some 1,400 active ingredients in 578 generic categories) now registered by EPA.

For a pesticide to be registered, FIFRA requires determinations including that it will function as intended without unreasonable adverse effects on the environment, and when used in accordance with widespread and commonly recognized practice, it will not generally cause unreasonable adverse effects on the environment.²⁵

EPA issued final regulations establishing basic registration requirements in July 1975.²⁶ The pesticide registration regulations enumerate three risk criteria for EPA use in determining whether a pesticide causes an unreasonable adverse effect: 1) acute toxicity in humans, other mammals, or birds, 2) chronic toxicity in humans, test animals, or endangered species, or population reductions in non-target organisms, and 3) lack of emergency treatment for ameliorating the toxic effects of a pesticide in people.²⁷ The regulations did not iden-

²³Other sections of FIFRA authorize EPA to: certify pesticide applicators to ensure that they are competent with respect to the use and handling of restricted pesticides (Section 4); establish procedures and regulations for the disposal or storage of packages and containers of pesticides or excess amounts of pesticides (Section 19); formulate a National Monitoring Plan (Section 20); and authorize certain State responsibilities (Sections 24 and 26).

²⁴The 1972 amendments to FIFRA established the re-registration requirement. Subsequent amendments have attempted to streamline the re-registration process by authorizing EPA to develop generic standards for pesticide ingredients. These standards are used to review both new and existing registrations of individual products containing those ingredients. As of April 1984, EPA had issued 75 generic standards. Anticipating that generic standards are needed for 400-500 categories of pesticides, EPA is currently developing such standards at a rate of 25 per year (Auerbach, 1984).

²⁵Section 3(c)(5).

²⁶40 CFR 162, Subpart A.

²⁷40 CFR 162.11(a)(3).



Photo credit: State of Florida Department of Environmental Regulation

Pesticides may be introduced into groundwater from non-point sources such as land application, as well as from point sources of hazardous wastes (e.g., landfills), non-hazardous wastes (e.g., residential disposal), and non-waste products (e.g., storage tanks).

tify' the types of data needed to satisfy the statutory registration requirements. However, EPA developed guidelines between 1975 and 1981 describing such data requirements. In November 1982, EPA proposed regulations that reorganized the guidelines and listed the specific types of data and information needed to support a pesticide registration.²⁸

Guidelines published by EPA as a companion document to the 1982 proposed regulations identify the following characteristics of a pesticide as being most pertinent to an evaluation of its potential to contaminate groundwater: leachability; adsorption/desorption characteristics; resistance to chemical, photochemical, and biological degradation; volatility in water; and volatility (EPA, 1982).²⁹ For the assessment of these characteristics,

²⁸47 FR 53192, Nov. 24, 1982.

²⁹This EPA document supports 40 C FR 158, Subdivision N, proposed Data Requirements for the Registration of Pesticides, 47 CFR 53192.

EPA's proposed regulations require the submission of data resulting from degradation, metabolism, mobility, dissipation, and accumulation studies.³⁰

Section 3(d) of FIFRA requires EPA to classify pesticides (as part of the registration process) for general or restricted use. A pesticide is classified for restricted use:

... if, the Administrator determines that the pesticide, when applied in accordance with its directions for use, warnings and cautions and for the uses for which it is registered, or for one or more of such uses, or in accordance with a widespread and commonly recognized practice, may generally cause, without additional regulatory restrictions, unreasonable adverse effects on the environment, including injury to the applicator. ...³¹

³⁰40 CFR 158.130, 47 FR 53205. Environmental fate data requirements were issued as a public draft in 1978 and again in October 1980; see 47 FR 53194 and EPA, 1982.

³¹Section 3(d)(1)(C).

The statute provides that if a pesticide is classified for restricted use on the basis of *human health hazards caused by acute dermal or inhalation toxicity, the pesticide can be applied only by a certified applicator*.³² If a pesticide is classified for restricted use because it may cause an unreasonable **adverse effect on the environment**, the Administrator of EPA must require that it be applied by a certified applicator **or** be subject to such other restrictions as may be provided by regulation.³³

The regulations regarding restricted use classifications do not state the specific types of actions that could be included in the "other restrictions" category.³⁴ However, the legislative history of FIFRA indicates that other restrictions might include geographic controls over the use of a pesticide (Costello, 1983).³⁵ The regulations do specify that a pesticide product classified for restricted use must bear a label that contains the statements of the restricted use classification and directions for use;³⁶ these label restrictions could be used to prohibit the use of certain pesticides in specified areas (e. g., recharge areas) or to specify application procedures that prevent ground water contamination (e. g., limiting the amounts or the rate of application) (Severn, et al., 1983).³⁷

³²Section 3(d)(1)(C)(i). A certified applicator must be competent in the use and handling of pesticides. EPA regulations identify competency standards. They include a demonstration of practical knowledge with respect to the environmental effects of the use or misuse of pesticides. See 40 CFR 171.

³³Section 3(d)(1)(C)(ii).

³⁴See 40 CFR 162.30. The regulations indicate, however, that the risk criteria specified by 40 CFR 162.11(a)(3) are to be used in determining whether the use of a pesticide should be restricted.

³⁵The report of the Senate Committee on Agriculture and Forestry explained that although a third type of classification (permit only) was rejected, EPA was not constrained "from regulating the quantity to be applied for a given use for a particular application to a particular crop in a given area at a given time, from limiting the number of applications, or from prohibiting the use thereof. . . ." (U.S. Senate, 1972).

³⁶40 CFR 162.30(q).

³⁷Label restrictions have been imposed for the use of aldicarb on Long Island, NY, in response to a request from the manufacturer.

Section 6. This section of the act allows the EPA Administrator to suspend and cancel the registration or change the registration of a pesticide (e. g., from general to restricted use). A suspension order may be issued by EPA if it is determined necessary for preventing an imminent hazard during the time required for cancellation or change in classification proceedings.³⁸

A pesticide registration can be canceled or its classification changed if the pesticide causes unreasonable adverse effects on the environment when used in accordance with widespread and commonly recognized practice or if its labeling or other material required for submission to EPA does not appear to comply with the provisions of FIFRA.³⁹ Although actions taken under Section 6 are based on a finding of unreasonable risk to humans and the environment (i. e., a determination that acute toxicity or chronic toxicity exceed criteria or that there is no emergency treatment), information regarding the potential of a pesticide to leach through the soil into groundwater can be factored into EPA's assessment of exposure to pesticides that do meet the risk criteria.⁴⁰

³⁸Section 6(c)(1). An imminent hazard is defined in FIFRA, in Section 2(l), as "a situation which exists when the continued use of a pesticide during the time required for a cancellation proceeding would be likely to result in unreasonable adverse effects on the environment or will involve unreasonable hazard to the survival of a species declared endangered by the Secretary of the Interior under Public Law 91-135."

³⁹Section 6(b)(1). pursuant to Section 6(a)(1) of FIFRA, a pesticide registration shall also be canceled at the end of any 5-year period which begins on the date of its registration unless a continuation is requested.

⁴⁰See for example, 48 FR 46234, Oct. 11, 1983 (46238). It is also important to underscore the fact that a finding of unreasonable risk under FIFRA involves a process that weighs health risks against the benefits of continued use of the pesticide.

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