

Appendix H

Federal Efforts To Prevent Groundwater Contamination

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H.1 DESIGN AND OPERATING PROVISIONS FOR CATEGORY I SOURCES

Source	Statutory Authority	Definition of Source	Performance Objective/Criteria	Design and Operating Requirements	Closure Requirements	Post-Closure Care Requirements
Subsurface Percolation	Clean Water Act Section 201 (40 CFR 35, Subpart E)	Individual systems defined as privately owned alternative wastewater treatment works serving one or more principal residences or small commercial establishments which are neither connected into nor part of any conventional treatment works (e.g., on-site system with localized treatment and disposal of wastewater).	Achieve established water quality goals of the act.	<ul style="list-style-type: none"> No specific design requirements. States are required to consider the cost-effective use of individual systems as part of overall systems or part of overall planning efforts for construction of municipal waste treatment systems. 	Not applicable.	Not applicable.
	Safe Drinking Water Act - Underground Injection Control Program (40 CFR 144 and 146)	Cesspools or other waste receiving devices with open bottoms and sometimes perforated sides (included in Class V well category). Applies only to units serving 20 or more persons.	Demonstrate that activity will not be conducted in a manner that allows movement of contaminants into underground sources of drinking water such that there may not be compliance with National Interim Drinking Water Regulations or SO that the health of persons may not be otherwise adversely effected.	<ul style="list-style-type: none"> Regulations specifying design and operating requirements for Class V wells have not been promulgated. Owners and operators are only required to submit well inventory information (e.g., location, type and operating status of the well). 	Regulations have not been promulgated for Class V wells.	No requirements established under the UIC Program.

Source	Statutory Authority	Definition of Source	Performance Objective/Criteria	Design and Operating Requirements	Closure Requirements	Post-Closure Care Requirements
Injection Wells-Hazardous Waste	Safe Drinking Water Act Underground Injection Control Program ^a (40 CFR 144 and 146)	Wells that inject hazardous waste (as defined by RCRA) beneath the deepest formation containing, within one-quarter mile of the well bore, an underground source of drinking water (class I wells)	Demonstrate that activity will not be conducted in a manner that allows movement of contaminants into underground sources of drinking water.	<ul style="list-style-type: none"> o Location must be identified of all known wells within the injection zone, and measures must be undertaken for wells which are improperly sealed, completed, or abandoned to prevent any movement of fluid into underground sources of drinking water. o Well location and construction requirements (well casing, cementing, and use of packers to prevent contaminant migration) must be complied with. o Appropriate tests and logs must be conducted during drilling and construction. o Information on fluid pressure, temperature, fracture pressure and other data on the physical and chemical characteristics of injection matrix and formation fluids must be collected. o During operation, injection pressure must not exceed a maximum calculated level to assure that new fractures are not initiated, that existing fractures are not propagated, and that injection fluids do not move into underground sources of drinking water. <p>Injection between outermost well casing and underground source of drinking water is prohibited. Pressure must be maintained on annulus between well tubing and casing and it must be filled with fluid. (Any failure associated with a well during operation must be corrected.)</p>	Certification by an independent registered professional engineer must be submitted to regulatory authority (pursuant to RCRA).	No requirements established under the UIC Program.
		Wells that inject hazardous wastes (as defined by RCRA) into or above a formation containing, within one-quarter mile of the well bore, an underground source of drinking water (class IV wells)	Regulations have not been promulgated for Class IV wells.	Regulations prohibit permitting of new Class IV wells which inject hazardous waste into an underground source of drinking water and require such existing wells to be prohibited over a period of 6 months following approval of a State UIC Program. Regulations specifying design and operating requirements for Class IV wells have not been promulgated.	Regulations have not been promulgated for Class IV wells.	Regulations have not been promulgated for Class IV wells.

Source	Statutory Authority	Definition of Source	Performance Objective/Criteria	Design and Operating Requirements	Closure Requirements	Post-Closure Care Requirements
InjectionWells- Non-Hazardous waste	Safe Drinking Water Act - Underground Injection Control Program (40 CFR 144 and 146)	Wells that inject waste <u>beneath</u> the deepest formation containing, within one-quarter mile of the well bore, an underground source of drinking water (Class I wells)	Same as objective for hazard- ous waste injection wells that inject beneath the deepest underground sources of drinking water.	Same as requirements for hazardous waste wells that inject beneath the deepest underground sources of drinking water.	wells must be plugged with cement in accord- ance with speci- fied methods (unless an alter- native method is approved by regu- latory authority) So that movements of fluids into or between under- ground sources of drinking water are not allowed.	Same as require- ments for hazard- ous waste injec- tion wells that inject beneath the deepest under- ground sources of drinking water.
		Wells used in connection with oil and gas production which inject fluids (Class II wells). Includes wells used for enhanced recovery, for storage of liquid hydrocarbons and for wells where injected fluids are brought to the surface and may combine with waste waters from gas plants.	Same as objective for hazardous waste injection wells that inject beneath the deepest underground sources of drinking water.	o Compliance is required with siting and construction (casing and cementing requirements). Exemption from casing and cementing requirements for existing wells is allowed if earlier regulations and any State regulations were met and injected fluid will not migrate into underground sources of drinking water and create a significant risk to the health of persons. o Appropriate tests and logs must be conducted during drilling and construction. o Information on fluid pressure, estimated fracture pressure, and physical and chemical characteristics of the injection zone must be collected. o Operating requirements are the same as for hazardous waste wells that inject beneath the deepest underground sources of drinking water.	Same as requirements for class I wells (non-hazardous waste).	Same as require- ments for hazard- ous waste injec- tion wells that inject beneath the deepest under- ground sources of drinking water.

Source	Statutory Authority	Definition of Source	Performance Objective/ Criteria	Design and Operating Requirements	Closure Requirements	Post-Closure Care Requirements
Injection Wells - Non-Hazardous Wrote (Continued)	Safe Drinking Water Act - Underground Injection Control Program (40 CFR 144 and 146) (Continued)	Wells used for extraction of minerals (Class III wells). Includes mining of sulfur by Frasch process, in-situ production of uranium and other metals, and solution mining of salts or potash.	Same as objective for hazardous waste injection wells that inject beneath the deepest underground sources of drinking water.	<ul style="list-style-type: none"> o Compliance is required with construction (casing and cementing) requirements. Exemption from requirements is allowed where there is substantial evidence that no contamination or underground source of drinking water would result. o Appropriate tests and logs must be considered during drilling and construction. o Information on fluid pressure, estimated fracture pressure, and physical and chemical characteristics of the injection zone must be collected. o Operating requirements are the same as for hazardous waste wells that inject beneath the deepest underground sources of drinking water. 	Same as requirements for Class I wells (non-hazardous waste).	Same as requirements for hazardous waste injection wells that inject beneath the deepest underground sources of drinking water.
		Wells not included in Categories I, II, III, and IV (i.e., class V wells). Examples of Class V wells include artificial recharge wells, and cooling water or air conditioning return flow wells.	Demonstrate that activity will not be conducted in a manner that allows movement of contaminants into underground sources of drinking water so that there may not be compliance with National Interim Drinking Water Regulations or so that the health of persons may not be otherwise adversely affected.	<ul style="list-style-type: none"> o -- specifying design and operating requirements for Class V wells have not been promulgated. o Owners and operators are only required to submit inventory information (e.g., location, type, and operating status of the well). 	Regulations have not been promulgated for Class V wells.	No requirements established under the UIC Program.
Lard Application - Wastewater	Clean Water Act - Section 201 (40 CFR 35)	Wastewater land treatment processes (includes slow rate, rapid infiltration and over-land flow methods). May be funded under Innovative and Alternative Technologies Program.	If groundwater is a potential supply of drinking water, the National Interim Drinking Water Regulations must not be exceeded. If background levels are higher than the NIDWRs, there should not be an increase in that level. (Continued next page)	<ul style="list-style-type: none"> o Criteria for best practicable waste treatment technology must be met. Design and operating requirements are not specified. o Technical Manual contains information on site planning (includes selection of site), investigations (pre-design), process design, and operation and maintenance. 	No requirements established.	No requirements established (see discussion of corrective actions, app. G.1).

Source	Statutory Authority	Definition of Source	Performance Objective/Criteria	Design and Operating Requirements	Closure Requirements	Post-Closure Care Requirements
Land Application - Wastewater (Continued)	Clean Water Act - Section 201 (40 CFR 35) (Continued)		<p>If groundwater is used as drinking water supply, conditions above should be met (levels for biological contaminants should not be exceeded where water is used without disinfection).</p> <p>If groundwater is used for purposes other than drinking water, criteria established on a case-by-case basis based on present or potential use of the groundwater.</p>			
Land Application - Wastewater Byproducts	Clean Water Act - Section 201 and 405 (40 CFR 257)	Sewage sludge application (includes agricultural, forest and land reclamation utilization and dedicated land disposal). May be funded under Innovative and Alternative Technologies Program.	For underground drinking water sources, background levels or National Interim Primary Drinking Water Regulations (if higher than background level) must not be exceeded beyond the application boundary or an alternative boundary established on a site-specific basis.	<p>o In addition to the performance standard for groundwater, performance criteria are also established for floodplains, surface water, application to land used for food-chain crops, disease, air and safety. Design and operating requirements not specified.</p> <p>o Technical guidance manual contains information on site planning, field investigations, process design and operation and maintenance.</p>	No requirements established.	No requirements established (See discussion on corrective action, app. G.1).

Source	Statutory Authority	Definition of Source	Performance Standard	Design and Operating Requirements	Closure Requirements	Post-Closure Care Requirements
Land Application - Hazardous Waste	Resource Conservation and Recovery Act - Subtitle C (40 CFR 264)	Land treatment of hazardous waste (as defined by RCRA). Requirements do not apply to land treatment facilities (or portions of facilities) that received waste prior to the effective date of the RCRA regulations (Jan. 28, 1983).	Hazardous constituents entering the groundwater must not exceed background levels, the Maximum Contaminant Level for 14 constituents specified by the National Interim Drinking Water Regulations (if higher than background) or alternative concentration limits (established on a site-specific basis) beyond a specified compliance point.	<ul style="list-style-type: none"> o Site requirements limited to floodplain and seismic considerations. o Prior to application of hazardous waste, it must be demonstrated (by fixed tests, laboratory analyses, available data) that hazardous waste constituents can be completely degraded, transformed or immobilized in the treatment zone. o Design and operating conditions will be specified in permit based on demonstration conditions. o Runoff must be minimized; run-on controls and runoff management systems must be installed. o Wind dispersal of particulates must be controlled. o Growth of food-chain crops may be allowed if it can be demonstrated that it will not cause substantial risk to human health. 	<ul style="list-style-type: none"> o Design and operating conditions must be met through closure period. o Vegetative cover must be established on portion of facility being closed (so that cover will not substantially impede degradation, transformation, or immobilization of hazardous constituents in treatment zone). Cover should not require extensive maintenance. o Exemption from cover requirement is allowed if treatment zone soil does not exceed background values by a statistically significant amount. o Monitoring (See app. E1) is to be continued through closure period (unsaturated zone monitoring may be terminated after 90 days). 	<ul style="list-style-type: none"> o Post closure care period is 30 years (unless period is reduced or extended by regulatory authority). o All design, operating, monitoring (see app. E1), and cover requirements must be met through post-closure period. o Exemption from post-closure requirements is allowed if treatment zone soil does not exceed background values by a statistically significant amount.

Source	Statutory Authority	Definition of Source	Performance Objective/Criteria	Design and Operating Requirements	Closure Requirements	Post-Closure Care Requirements
Land Application - Non-Hazardous waste	Clean Water Act Section 404 (40 CFR 230)	Disposal site for dredged or fill material	Restore and maintain the chemical, physical, and biological integrity of waters of the United States.	<ul style="list-style-type: none"> No specific design requirements. Guidelines include actions that can be undertaken to minimize the adverse effects of discharge or dredged or fill material. One such action (specified in the regulations) is selecting discharge methods and disposal sites where the potential for erosion, slumping or <u>leaching</u> of material into the surrounding aquatic ecosystem will be reduced. Another action is to select the disposal site, the discharge point, and the method of discharge to minimize the extent of any plume. 	No requirements established under the 404 program.	No requirements established under the 404 program.

* RCRA and SMDA have overlapping jurisdiction for injection wells used to dispose of hazardous wastes. A permit-by-rule approach has been instituted to coordinate the requirements of both programs. An owner or operator of such a well must comply with all applicable SMDA technical requirements pursuant to the Underground Injection Control Program and certain RCRA administrative requirements.

Source: Office of Technology Assessment.

H.2 DESIGN AND OPERATING PROVISIONS FOR CATEGORY II SOURCES

Source	Statutory Authority	Definition of Source	Performance Objective/Criteria	Design and Operating Requirements	Closure Requirements	Post-Closure Care Requirements
Landfills - Hazardous Waste	Resource Conservation and Recovery Act - Subtitle C (40 CFR 264)	Landfills used for the disposal of hazardous wastes (as defined by RCRA). Requirements do not apply to facilities (or portions of facilities) that received waste prior to the effective date of the RCRA regulations (Jan. 2, 1983).	Hazardous constituents in the groundwater must not exceed background levels. Maximum Contaminant Levels (or portions of facilities) that received waste prior to the effective date of the RCRA regulations (Jan. 2, 1983), or alternative concentration limits (established on a site-specific basis) beyond a specific compliance point.	Siting requirements are limited to floodplain and seismic conditions. All landfills must have a liner and leachate collection and removal system. Design and operating requirements are established in the facility permit (including Run-on controls and runoff management systems must be installed. Wind dispersal of particulates must be controlled. Special requirements apply to ignitable, reactive, incompatible wastes and to containers in overfilled drums. Bulk liquids may only be disposed in leakable drums. Bulk liquids may only be disposed in leakable drums with liners and leachate collection systems. Exemption from liner and leachate collection requirements may be granted if the location and subsurface design and operating provisions prevent migration of hazardous constituents. Exemption from all groundwater monitoring requirements (see app. E.2) may be granted if regulatory authority finds there is no potential for migration of liquid from the facility to the uppermost aquifer through the post-closure period. Exemption from detection monitoring program (see app. E.2) may be granted for facilities with double liners and leak detection systems between the liners. Liners must be repaired or replaced if a failure is detected.	Establish cover that minimizes leachate migration. Requires minimal maintenance, promotes drainage, resists erosion or subsidence, accommodates settling, and cover requirements should be met through post-closure period. Leachate collection system must be operated until leachate is no longer detected.	Post-closure care period is 30 years (unless period is reduced or extended by regulatory authority). All design and operating, monitoring, and cover requirements should be met through post-closure period. Leachate collection system must be operated until leachate is no longer detected.
Toxic Substances Control Act - section 6 (40 CFR 761)	Chemical waste landfills used for the disposal of PCBs at concentrations of 50 ppm and above.	Not specified.		Disposal facility shall be located in areas of moderate relief, flood plains, shorelands, and groundwater recharge areas met be avoided, and there shall not be a hydraulic connection between the facility and surface water. Diversion dike are required to divert surface water runoff. (Continued next page)	No requirements established.	Surface water analysis reports (see monitoring requirements, app. E.2) and operating records must be retained for at least 20 years.

Source	Statutory Authority	Def i nit ion of Source	Perf ormance Object ive /Criteria	Design and Operating Requirements	Closure Requirement a	Pos t-Clos ure Care Requi rements
Landfills - Hazardous Waste (Continued)	Toxic Substances Control Act - Section 6 (40 CFR 761) (Continued)			<ul style="list-style-type: none"> o Bottom of landfill liner or soils must be 50 feet from historical high water table. o Landfill must be underlain by soils or synthetic membrane liner with permeability equal to or less than 10^{-7} cm/sec. o Leachate collection system must be installed. o Site must be operated and maintained in a manner to prevent safety problems or hazardous conditions resulting from spilled liquids and windblown material. o Bulk liquids exceeding 500 ppm may be disposed of provided such waste is pretreated and/or stabilized. o A waiver from any requirement may be approved by the regulatory authority if it can be demonstrated that operation of the landfill will meet the performance standard. 		
Landfills - Sanitary	Resource Conservation and Recovery Act - Subtitle D (40 CFR 257)	Sanitary landfills defined as facilities which pose no reasonable potability of adverse effects on health or the environment from disposal of solid waste (as defined by RCRA).	For underground drinking water sources, background levels or National Interim Primary Drinking Water Regulations (if higher than background) must not be exceeded beyond the application boundary or an alternative boundary established on a site-specific basis.	<ul style="list-style-type: none"> o Design and operating requirements are not specified. o In addition to groundwater performance criteria, performance criteria are established for floodplain, surface water, application to land used for food-chain crops, disease, air, and safety. 	No requirements established.	No requirements established.
Open Dumps (including Illegal dumping) - Waste	Resource Conservation and Recovery Act - Subtitle D (40 CFR 257)	Open dumps defined as facilities which do not meet the criteria for sanitary landfills under RCRA.	Same as objective for sanitary landfills under Subtitle D of RCRA.	Open dumps must be closed or upgraded to meet the criteria established for sanitary landfills under Subtitle D of RCRA.	No requirements established.	No requirements established.

Source	Statutory Authority	Definition of Source	Performance Objective/Criteria	Design and Operating Requirements	Closure Requirements	Post-Closure Care Requirements
Residential Disposal	Federal Insecticide, Fungicide, and Rodenticide Act - Section 19 (40 CFR 165)	Burial of small quantities of pesticide containers in open fields (containers which held organic or metallo-organic pesticides except organic organic mercury, Lead, cadmium, or arsenic compounds). ^a	Show due regard for protection of surface and subsurface water.	<ul style="list-style-type: none"> o Requirements are not specified. o Containers should be rinsed prior to disposal. (Rinse water and pesticide residues should be added to spray mixtures in the field or incinerated, disposed of in specially designated landfills, or chemically deactivated. Other disposal methods such as soil injection or chemical degradation should be undertaken with EPA guidance). o State and Federal pollution control standards should not be violated. 	No requirements established.	No requirements established.
Surface Impoundments - Hazardous Waste	Resource Conservation and Recovery Act- Subtitle C (40 CFR 264)	Surface impoundments used for the treatment, storage, or disposal of hazardous waste (as defined by RCRA). Requirements do not apply to facilities (or portions of facilities) that received waste prior to the effective date of the RCRA regulation (Jan. 26, 1983).	Same as objective for hazardous waste landfills under RCRA.	<ul style="list-style-type: none"> o Siting requirements are limited to floodplains and seismic conditions. o All surface impoundments must have a liner. Design and operating specifications are established in the facility permit. o All surface impoundments must be designed and operated to prevent overtopping and must have dikes to prevent massive failure. o Special contingency plan to address leaks or spills must be prepared (including provisions for immediate shut-down and emptying of the impoundment). o Special requirements apply to ignitable, reactive or incompatible waste. o Exemptions from certain design and monitoring requirements are the same as those for hazardous waste landfills. 	<ul style="list-style-type: none"> o For storage or treatment impoundments: wastes and residue must be removed and sent to a permitted facility, and equipment must be decontaminated. o For disposal impoundments: eliminate free liquids and/or solidify wastes and residues, and stabilize remaining waste to support cover. o Cover requirements are the same as those for hazardous waste landfills. 	Same as requirements for hazardous waste landfills.

Source	Statutory Authority	Definition of Source	Performance Objective/Criteria	Design and Operating Requirements	Closure Requirements	Post-Closure Care Requirements
surface Impoundments – Non-Hazardous Waste	Surface Mining Control and Reclamation Act (30 CFR 816 and 817)	Impoundments defined as all water, sediment, slurry, or other liquid or semi-liquid holding structures and depressions, either naturally formed or artificially built. Structures may be temporary or permanent. Applies to all surface and underground coal mining operations.	Groundwater quality shall be protected by having earth materials and runoff in a manner that minimizes acidic, toxic, or other harmful infiltration to groundwater systems and by managing excavations and other disturbances to prevent or control the discharge of pollutants into the groundwater.	<ul style="list-style-type: none"> o All impoundments must meet requirements for stability, prevention of overtopping and provision of spillways, and protection against surface erosion. Installation of a liner is not a mandatory requirement but may be required by the regulatory authority on a site-specific basis to meet the performance standard. o Permanent impoundments must not result in the diminution of the quality of water utilized by adjacent or surrounding landowners for agricultural, industrial, recreational or domestic use. The quality of water in the impoundment must be suitable on a permanent basis for its intended use, and after reclamation, must meet all applicable State and Federal standards. 	<ul style="list-style-type: none"> o Temporary impoundments must be removed and reclaimed. o Permanent impoundments must meet all design and operating requirements, be maintained properly, meet the requirements of the reclamation plan and the requirements of the groundwater monitoring plan. 	<ul style="list-style-type: none"> o A hydrologic reclamation plan must be submitted with a permit application which specifies the measures to be taken during the mining and reclamation operations to protect groundwater (on-site and off-site) from adverse effects (e.g., acid or toxic drainage). o A performance bond must be filed covering the reclamation activities. o Monitoring must be continued until bond release.

Source	Statutory Authority	Definition of Source	Performance Objective/Criteria	Design and Operating Requirements	Closure Requirements	Post-Closure Care Requirements
Surface Impoundments - Non-Hazardous waste (Continued)	Federal Land Policy and Management Act ^b	Impoundments used for the treatment or control of runoff and drainage during mining operations on Federal lands.	Take adequate measures to avoid, minimize, or correct damage to the environment and to public health and safety while encouraging development of mineral resources.	<ul style="list-style-type: none"> o A mining plan must be submitted to the regulatory authority which includes a description of measures to be taken to prevent or control groundwater pollution. o Operations may be prohibited or restricted in areas where it is determined by the regulatory authority that water quality will be lowered below State standards or levels set by the Department of Interior (unless it is found that the lowering of water quality is necessary to economic and social development and will not preclude any assigned user of the water; EPA must be consulted to ensure that the Clean Water Act would not be violated). 	<ul style="list-style-type: none"> o No specific requirements. o Mining plan must include provisions for reclamation of disturbed areas. 	<ul style="list-style-type: none"> o No specific requirements. o Performance bond must be filed in an amount sufficient to satisfy the reclamation requirements of an approved mining plan (at least \$2000).
	- U.S. Mining Laws (43 CFR 3800). Cover locatable minerals such as gold, silver, lead, iron and copper.	Not explicitly mentioned in the regulations. However, impoundments are considered part of mining operations. Applies only to Federal lands.	Prevent unnecessary or undue degradation of Federal lands which may result from mining operations.	<ul style="list-style-type: none"> o A plan of operations must be submitted to the regulatory authority which includes a description of measures to be taken to meet the performance standard. 	<ul style="list-style-type: none"> o No specific requirements. o Plan of operations must include provisions for reclamation of disturbed areas. 	<ul style="list-style-type: none"> o No specific requirements. o Performance bond must be filed in an amount based on the estimated cost of reasonable stabilization and reclamation of disturbed areas.

Source	Statutory Authority	Definition of Source	Performance Objective/Criteria	Design and Operating Requirements	Closure Requirements	Post-Closure Care Requirements
Surface Impoundments - Non-Hazardous Waste (Continued)	Federal Land Policy and Management Act (continued) - Geothermal Steam Act (30 CFR 270 and BLM Operational Order No.4)	Pits and sumps used to retain materials and fluids as necessary to drilling production or other operations on Federal lands.	Groundwaters must not be contaminated (specifies compliance with all Federal and State water quality standards).	Sources must be lined with impervious material.	o Impoundments must be filled, covered, and returned to a near natural state. o Impoundments must be purged of environmentally harmful chemicals and precipitates before backfilling.	o No requirements established.
Waste Tailings	Federal Land Policy and Management Act - Mineral Leasing Act of 1920 and Materials Act of 1947 (43 CFR 23)	Not explicitly mentioned in the regulations. However, they are part of mining operations. Applies only to Federal lands.	Same as objective for non-hazardous waste surface impoundments under these laws.	Same as requirements for non-hazardous waste surface impoundments under these laws.	Same as requirements for non-hazardous waste surface impoundments under these laws.	Same as requirements for non-hazardous waste surface impoundments under these laws.
	- U.S. Mining Laws (43 CFR 3800)	Not explicitly defined in the regulations, but disposal of waste tailings is mentioned as part of a mining operation.	Same as objective for non-hazardous waste surface impoundments under these laws.	Same as requirements for non-hazardous waste surface impoundments under these laws.	Same as requirements for non-hazardous waste surface impoundments under these laws.	Same as requirements for non-hazardous waste surface impoundments under these laws.

Source	Statutory Authority	Definition of Source	Performance Objective/Criteria	Design and Operating Requirements	Closure Requirements	Post-Closure Care Requirements
Waste Tailings (Continued)	Uranium Mill Tailings Radiation Control Act—Active Sites (40 CFR 192)	Disposal areas covered by the regulations containing waste tailings from uranium processing activities. Such areas include the region within the perimeter of an impoundment or pile.	Same as objective for hazardous waste surface impoundments under RCRA except that compliance with the standard is required at all points at a greater distance than 500 meters from the edge of the disposal area and/or outside the site boundary.	Same as requirements for hazardous waste surface impoundments under RCRA except that the exemption from groundwater monitoring requirements for double-lined facilities with leak detection systems does not apply.	<ul style="list-style-type: none"> o With respect to non-radiological hazards, site must be closed in a manner that: <ul style="list-style-type: none"> - minimizes the need for further maintenance; and - controls, minimizes, or eliminates, to the extent necessary to prevent threats to human health and the environment, post-closure escape of hazardous waste constituents, leachate, contaminated rainfall, or waste decomposition products to the ground or surface waters or to the atmosphere. o With respect to radiological hazards, site must be designed to be effective for 1000 	<ul style="list-style-type: none"> o See closure requirements. o No specific requirements established by EPA. NRC may require long term surveillance of the site as part of the license requirement.

Source	Stat u ry Authority	Definition of Source	Performance Objective/Criteria	Design and Operating Requirements	Closure Requirements	Pos t-Closure Care Requirements
Waste Tailings (Continued)	Uranium Mill Tail- ings Radiation Control Act -Active Sites 40 CFR 192) (Continued)				years, to the ex- tent reasonably achievable, and, in any case, for at least 200 years (limits for atmo- spheric releases are also spec- ified).	
Waste Piles - Hazardous Waste	Resource Conser- vation and Recovery Act - Subtitle C (40 CFR 264)	waste piles used for the treatment or storage of hazardous wastes (as de fined by RCRA). Requirements do not apply to facilities (or por- tions of facilities) that re- ceived waste prior to the ef- fective date of the RCRA regu- lations (Jan. 26, 1983).	Same as objective for hazard- ous waste landfills under RCRA.	o Siting requirements are limited to floodplain and seismic conditions. o All waste piles must have a liner and leachate col- lection and removal system. Design and operating spe- cifications are established in the facility permdt. o Run-on controls and moff management systems must be installed. o Wird dispersal of particulates must be controlled. o Special requirements apply to ignitable, reactive or incompatible wastes. o Exemption from liner and leachate collection system requirements may be granted if: - the waste pile is located inside or under a struc- ture that provides protection from precipitation to prevent runoff generation of leachate; and - the location and alternative design and operating provisions prevent migration of hazardous consti- tuents. o Exemption from all groundwater monitoring require- ments (see app. E.2) may be granted if the regulatory authority finds there is no potential for migration of liquid from the facility to the uppermost aquifer through the post-closure pried.	Wastea, waste residues, contam- inated structures and equipment, and contaminated sub- soils must be re- moved and sent to permitted fa- cility.	If all contam- inated subsoils are not removed, the post-closure requirements for hazardous waste landfills apply.

Source	Statutory Authority	Definition of Source	Performance Objective/Criteria	Design and Operating Requirements	Closure Requirements	Post-Closure Care Requirements
Waste Piles - Hazardous Waste (Continued)	Resource Conservation and Recovery Act - Subtitle c (40 CFR 264) (Continued)			<p>0 Exemption from detection monitoring program (see app. E.2) may be granted for:</p> <ul style="list-style-type: none"> - facilities with double liners and leak detection systems between the liners (liners must be repaired or replaced if a failure is detected); - facilities located inside or under a structure that provides protection from precipitation to prevent runoff generation of leachate; and - facilities with single liners and leachate collection systems located above the seasonal high water table (a liner inspection system must also be implemented). 		
Waste Piles - Non-Hazardous Waste	surface Mining Control and Reclamation Act (30 CFR 816 and 817)	Refuse piles containing coal mine waste (includes coal processing waste and underground development waste). ^e Applies to all surface and underground coal mining operations except those on Federal lands (leased coal).	Groundwater quality shall be protected by handling earth materials and runoff in a manner that minimizes acidic, toxic, or other harmful infiltration to groundwater systems and by managing excavations and other disturbances to prevent or control the discharge of pollutants into the groundwater.	<ul style="list-style-type: none"> o All waste must be placed in disposal areas certified by registered professional engineer and approved by the regulatory authority.^f Waste must be controlled to: minimize adverse effects of leachate and surface water runoff on surface and groundwater; ensure mass stability and prevent mass movement; ensure that the final disposal facility is suitable for reclamation; not create a public hazard; and prevent combustion. o If disposal area contains springs, natural or man-made inter courses, or wet weather seeps, design must include diversions and underdrains as necessary to control erosion, prevent water infiltration, and ensure stability. 	<ul style="list-style-type: none"> o Disposal area must be graded and covered. o No permanent impoundments are allowed on the completed refuse pile. 	Same as requirements for non-hazardous waste surface impoundments under SMCR.

Source	Statutory Authority	Definition of Source	Performance Objective/Criteria	Design and Operating Requirements	Closure Requirement	Post-Closure Care Requirements
Waste Piles - Non-Hazardous Waste	Federal Land Policy and Management Act - Mineral Leasing Act of 1920 and Materials Act of 1947 (43 CFR 23)	Not explicitly mentioned in the regulations. However, they are considered part of mining operations. Applies only to Federal lands.	Same as objective for non-hazardous waste surface impoundments under these laws.	Same as requirements for non-hazardous waste surface impoundments under these laws.	Same as requirements for non-hazardous waste surface impoundments under these laws.	Same as requirements for non-hazardous waste surface impoundments under these laws.
	- U.S. Mining Laws (43 CFR 3800)	Not explicitly defined in the regulations, but waste piles are mentioned as part of a mining operation.	Same as objective for non-hazardous waste surface impoundments under these laws.	Same as requirements for non-hazardous waste surface impoundments under these laws.	Same as requirements for non-hazardous waste surface impoundments under these laws.	Same as requirements for non-hazardous waste surface impoundments under these laws.
Materials Stockpiles	Federal Insecticide, Fungicide, and Rodenticide Act (40 CFR 165)	Storage of packages and containers of pesticides.	Provide for the safe storage of pesticides.	<p>0 No mandatory requirements are established.</p> <p>o Storage sites should be located:</p> <ul style="list-style-type: none"> - where flooding is unlikely and where soil texture/structure and hydrogeologic characteristics will prevent contamination of any water system by runoff or percolation; and - with due regard to the amount, toxicity, and environmental hazard of pesticides, and the number and sizes of containers. <p>o Drainage from the site should be contained (e.g. runoff or washwater from the decontamination of personnel and equipment) and if contaminated, disposed of in accordance with regulations (see Residential Disposal under FIFRA above).</p> <p>o Pesticides should be labeled and segregated by formulation as appropriate.</p> <p>o State and Federal pollution control standards should not be violated.</p>	No requirements established.	No requirements established.

Source	statutory Authority	Definition of Source	Performance Objective/Criteria	Design and Operating Requirements	Closure Requirements	Post-Closure Care Requirements
Graveyards	—	—	—	—	—	—
Animal Burial	—	—	—	—	—	—
Aboveground Storage Tanks - Hazardous Waste	Resource Conservation and Recovery Act - Subtitle C (40 CFR 264)	Aboveground tanks used for the treatment or storage of hazardous wastes (as defined by RCRA).	Prevent spills or leakage.	<ul style="list-style-type: none"> o Tank shell must have sufficient strength to prevent rupture or collapse. Design specifications are established in the facility permit for the tank shell and for the foundation, structural support, seams and pressure controls of tank. o Tank or liner must be compatible with wastes. o Controls to prevent overfilling must be used. o Special requirements are established for ignitable, reactive, and incompatible wastes. 	Wastes and waste residues must be removed and sent to a permitted facility.	No requirements established.
	Toxic Substances Control Act (40 CFR 761)	See TSCA requirements, below, for hazardous waste containers.				
Aboveground Storage Tanks - Non-Hazardous Waste	—	—	—	—		—
Above-ground Storage Tanks - Non-Waste	CleanWaterAct - Section 311 (40 CFR 112)	Onshore facilities with above ground capacities equal to or greater than 1,320 gallons of oil (or single tanks with capacities greater than 660 gallons). ⁸	Prevent discharged oil from reaching a navigable water course.	<ul style="list-style-type: none"> o No specific requirements are established. o A Spill Prevention Control and Countermeasure (SPCC) Plan must be submitted to the regulatory authority. The plan must discuss provisions for the compatibility of the tank with stored material, containment of spills, installation of engineering devices that provide warnings of tank failures, and other safeguards. Leakage due to defective internal heating coils should be controlled. Portable or mobile tanks should be located to prevent discharge into navigable waters. 	No requirements established.	No requirements established.

Source	Statutory Authority	Definition of Source	Performance Objective / Criteria	Design and Operating Requirements	Closure Requirements	Post-Closure Care Requirements
Aboveground Storage Tanks - Non-Hazardous (Continued)	Hazardous Liquid Pipeline Safety Act (49 CFR 195)	Storage of hazardous liquids (as defined by HLPFA) incidental to their movement by pipeline in or affecting interstate or foreign commerce. Regulations explicitly define aboveground "breakout tanks" which are used to relieve surges in a hazardous liquid pipeline system or to receive and store hazardous liquid transported by a pipeline. Requirements do not apply to Federal facilities. ¹	Contain hazardous liquids in the event of a spill or leak.	Tank area must be adequately protected against unauthorized entry and relief venting must be provided for each tank.	No requirements established.	No requirements established.
Underground Storage Tanks - Hazardous Waste	Resource Conservation and Recovery Act Subtitle C (40 CFR 264)	Covered underground tanks used for the treatment or storage of hazardous waste as defined by RCRA.	Regulations have not been promulgated.	Regulations have not been promulgated.	Regulations have not been promulgated.	Regulations have not been promulgated.
Underground Storage Tanks - Non-Hazardous waste	-	-	-	-	-	-

Source	Statutory Authority	Definition of Source	Performance Objective/Criteria	Design and Operating Requirements	Closure Requirements	Post-Closure Care Requirements
Underground Storage Tanks - Non-Waste	Clean Water Act - Section 311 (40 CFR 112)	Onshore facilities with underground storage capacities equal to or greater than 42,000 gallons.	Prevent discharged oil from reaching a navigable water course.	<ul style="list-style-type: none"> o No specific requirements are established. o A Spill Prevention Control and Countermeasure (SPCC) Plan must be submitted to the regulatory authority. The plan must discuss provisions for the compatibility of the tank with stored material, protection from corrosion by coatings, cathodic protection or other effective methods compatible with local soil conditions, and the installation of engineering devices that provide warnings of tank failures, and other safeguards. Leakage due to defective internal heating coils should be controlled. 	No requirements established.	No requirements established.
Containers - Hazardous Waste	Resource Conservation and Recovery Act - Subtitle C (40 CFR 264)	Containers used for the storage of hazardous wastes (as defined by RCRA).	Prevent spills or leakage.	<ul style="list-style-type: none"> o Container or liner must be compatible with wastes. o Storage area for containers must have an impervious base, controls and collection system for the control and removal of liquids, spills, and run-on (unless containers are elevated or protected from contact with liquid). spill containment system is not required if containers do not contain liquids. o special requirements are established for ignitable, reactive, and incompatible wastes. 	<ul style="list-style-type: none"> o Wastes and waste residues must be removed and sent to a permitted facility. o Containers, liners, bases and soil contaminated with waste must be decontaminated or removed. 	No requirements established.

Source	Statutory Authority	Definition of Source	Performance Objective/Criteria	Design and Operating Requirements	Closure Requirements	Post-Closure Care Requirements
Containers - Hazardous Waste (Continued)	Toxic Substances Control Act - Section 6 (40 CFR 761)	Containers used to store PCBs at concentrations of 50 ppm and above.	Not specified.	<ul style="list-style-type: none"> o Storage facilities for containers may not be located below the 100-year flood water elevation. o Storage facilities must provide adequate roofing, walls, floors and curbing to prevent rainwater from reaching containers and to contain any spills or leaks. o Temporary storage in areas that do not meet these requirements may be allowed for certain containers. o Containers must meet specified DOT regulations for shipping containers. o Containers above a specified size must meet SPOC requirements under Section 311 of the Clean Water Act and specified OSHA standards. 	No requirements established.	No requirements established.
Containers - Non-Hazardous Waste		—		—	—	—
Containers - Non-Waste	Federal Insecticide, Fungicide and Rodenticide Act (40 CFR 165)	Pesticide containers	See objective for Material Stockpiles under FIFRA	See requirements for Materials Stockpiles under FIFRA.	see requirements for Materials Stockpiles under FIFRA.	see requirements for Materials Stockpiles under FIFRA.
Open Burning and Detonation sites	Resource Conservation and Recovery Act - Subtitle c (40 CFR 264)	Open burning and detonation of waste explosives	Regulations have not been promulgated.	— have not been promulgated.	Regulations have not been promulgated.	Regulations have not been promulgated.

Source	Statutory Authority	Definition of Source	Performance Objective/Criteria	Design and Operating Requirements	Closure Requirements	Post-Closure Care Requirements
Open Burning and Detonation sites (Continued)	Federal Insecticide, Fungicide, and Rodenticide Act (40 CFR 165)	Open burning of small quantities of combustible pesticide containers which hold organic or metallo-organic pesticides (except organic mercury, lead, cadmium, or arsenic compounds).	Same as standard for residential disposal (burial) under FIFRA.	Same as requirements for residential disposal (burial) under FIFRA.	Same as requirements for residential disposal (burial) under FIFRA.	Same as requirements for residential disposal (burial) under FIFRA.
Radioactive Disposal Sites	Atomic Energy Act (40 CFR 191)	Geologic repositories for high-level radioactive wastes.	Disposal systems must be designed to provide a reasonable expectation that for 10,000 years after disposal, reasonably foreseeable releases of waste into the accessible environment are projected to be less than specified amounts (very unlikely releases are projected to be less than ten times specified amounts).	<ul style="list-style-type: none"> Disposal systems must not be located where there has been mining for resources or where there is a reasonable expectation of exploration in the future. Disposal systems must be selected and designed to keep releases as small as reasonably achievable (taking technical, social and economic considerations into account) and so that removal of most wastes is not precluded for a reasonable period of time after disposal. Disposal systems must use several types of barriers (engineered and natural) to isolate wastes. 	sites must be identified by markers and records.	Disposal systems must not rely on active institutional controls (e.g. controlling or containing releases, maintenance operations, or remedial actions) to isolate wastes beyond a reasonable time period (e.g. a few hundred years) after disposal.

Source	Statutory Authority	Definition of Source	Performance Objective/Criteria	Design and Operating Requirements	Closure Requirements	Post-Closure Care Requirements
Radioactive Disposal Sites (Continued)	Atomic Energy Act (10 CFR 61)	Low-level radioactive waste disposal sites.	Radioactive material released into groundwater must not exceed levels specified in the regulations.	<ul style="list-style-type: none"> o Requirements specified are for near-surface disposal. o Site design features must be directed toward long-term isolation and avoidance of the need for continuing active maintenance after closure. o Site design and operation must be compatible with closure and stabilization plan and lead to closure that provides reasonable assurance that performance objectives will be met. o Site must be designed to complement and improve the ability of the site's natural characteristics to assure that performance objectives will be met. o Site must be designed to minimize to the extent practicable the contact of water with waste during and after disposal. o Requirements related to the placement of wastes in the disposal site are specified. o A buffer zone of land must be maintained between any buried waste and the disposal site boundary and beneath the disposed waste. 	<ul style="list-style-type: none"> o Covers must be designed to minimize to the extent practicable water infiltration, to 100 years. o Post-closure direct percolating or surface water surveillance period will be away from the waste and to resist degradation by surface geologic processes and biotic activity. o Boundaries and locations of each disposal unit must be accurately located and mapped by means of a land survey. 	<ul style="list-style-type: none"> o Active institutional controls may not be relied upon for more than 100 years. o Post-closure surveillance period will be determined by NRC on a case-by-case basis.

Source: Office of Technology Assessment.

- ^a A farmer disposing of pesticides from his own use, which are hazardous wastes, is exempt from RCRA requirements, provided each emptied pesticide container is triple rinsed in accordance with EPA regulations and pesticide residues are disposed of on his own farm in a manner consistent with the disposal instructions on the pesticide label (40 CFR 262.51).
- ^b The Federal Land Policy and Management Act (FLPMA) of 1976 (P.L. 94-579) requires that public lands be managed in a manner that will protect the quality of environmental values. In addition, there are a number of laws regulating certain mining activities on Federal lands. The mining regulations are authorized by both the FLPMA and the specific mining laws and are thus presented together in this table. Note that regulations for the Geothermal Steam Act were redesignated, with minor revisions, as 43 CFR 3260 on Sept. 30, 1983.
- ^c The requirements presented in this table are the Health and Environmental Protection Standards promulgated by EPA. The NRC also has promulgated licensing requirements for uranium mill tailings (see 10 CFR 30, 40, 70, and 150).
- ^d Concentration limits for combined radium-226 and radium-228 (5 PC/liter) and gross alpha-particle activity (15 PC/liter excluding radon and uranium) are added to the standard.
- ^e Coal processing waste means earth materials which are separated and mined from the product coal during cleaning, concentrating, or other processing or preparation of coal. Underground development waste means waste-rock mixtures of coal, shale, claystone, siltstone, sandstone, limestone, or related materials that are excavated, moved, and disposed of from underground workings in connection with underground mining activities (30 CFR 701.5).
- ^f Coal mine waste may be disposed of in underground mine workings if approved by the regulatory authority and the Mine Safety and Health Administration.
- ^g Facilities include those engaged in drilling, producing, gathering, storing, processing, refining, transferring, distributing, or consuming oil and oil products. Oil is defined as oil of any kind or in any form, including but not limited to petroleum, fuel oil, sludge, oil refuse, and oil mixed with wastes other than dredged spoil.
- ^h The provisions of Section 311 of the Clean Water Act are directed towards surface water. However, the design and operating requirements seem to protect against the discharge of oil that may also impact groundwater.
- ⁱ Hazardous liquids include petroleum, petroleum products, and anhydrous ammonia.
- ^j Waste explosives include waste which has the potential to detonate and bulk military propellants which cannot safely be disposed of through other modes of treatment. Regulations for permitted facilities have not been promulgated. Interim status regulations for open burning and detonation establish minimum distance requirements for such activities from the property of others (See 40 CFR 265).
- ^k The requirements presented in this table are the health and environmental protection standards proposed by EPA (see 47 FR 58196, Dec. 29, 1982). NRC has also published proposed regulations for geologic repositories. (See 46 FR 35280, July 8, 1981.)
- ^l The requirements in this table are the NRC licensing requirements. EPA has not promulgated health and environmental protection standards.

H.3 DESIGN AND OPERATING PROVISIONS FOR CATEGORY III SOURCES

Source	Statutory Authority	Definition of Source	Performance Objective/Criteria	Design and Operating Requirements	Closure Requirement a	Post-Closure Care Requirements
Pipelines - Hazardous Materials	Hazardous Liquid pipeline Safety Act (49 CFR 195)	pipelines used to transport hazardous liquids (includes hazardous liquids, petroleum, petroleum products and anhydrous ammonia).	To prevent leakage of hazardous liquids.	<ul style="list-style-type: none"> o Pipelines must be chemically compatible with hazardous liquids. o Design requirements cover considerations of temperature, pressure (internal and external to pipeline), valves and other appurtenances connected to a pipe, and pumping units (and fabricated assemblies). o New pipelines must be constructed of steel. o Pipelines must be protected against corrosion. o Safety devices and spill or leak containment systems are required. 	No requirements established.	No requirements established.
Pipelines - Non-Hazardous Waste	—	—	—	—	—	—
Materials Transport and Transfer Operations - Hazardous Materials and Waste	Hazardous Materials Transportation Act (49 CFR 171)	The transportation of hazardous materials and hazardous waste (as defined by HMTA) by rail car, aircraft, vessel and motor vehicles used in interstate and foreign commerce (and rotor vehicles used to transport hazardous waste in intrastate commerce).	To protect against risks to life and property which are inherent in the transportation of hazardous materials in commerce.	Regulations specify requirements regarding the preparation of materials for transport (e.g., packaging and container specifications); handling and loading; and labeling.	No requirements established.	No requirements established.

Source: Office of Technology Assessment.

H.4 DESIGN AND OPERATING PROVISIONS FOR CATEGORY IV SOURCES

Source	Statutory Authority	Definition of Source	Performance Objective/Criteria	Design and Operating Requirements	Closure Requirements	Post-Closure Care Requirements
Irrigation Practices	Clean Water Act Section 208 (40 CFR 35, Subpart G)	-Return flows from irrigated agriculture.	Achieve established water quality goals of the act.	<ul style="list-style-type: none"> No specific requirements are established. States are required to submit water quality management plans which must describe the regulatory and non-regulatory activities and Best Management Practices (BMPs) selected to meet non-point source control needs. BMPs are methods, measures, or practices to prevent or reduce water pollution (they include but are not limited to structural and nonstructural controls, and operation and maintenance procedures). BMPs can be applied before, during, and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters. Economic, institutional, and technical factors must be considered. 	No requirements established.	No requirements established.
Pesticide Applications	Clean Water Act Section 208 (40 CFR 35, Subpart G)	-Agriculturally related point sources of pollution.	Same as standards for irrigation practices under CWA.	Same as requirements for irrigation practices under CWA.	Same as requirements for irrigation practices under CWA.	Same as requirements for irrigation practices under CWA.
	Federal Insecticide, Fungicide, and Rodenticide Act - Section 3 (40 CFR 162)	-Application of certain pesticides which may cause unreasonable adverse effects on the environment.	Prevent unreasonable adverse effects on the environment.	<ul style="list-style-type: none"> No specific requirements. A pesticide can be classified for "restricted use." (Restricted use Classification= require that pesticides be applied by certified applicators. Restricted use is not explicitly defined to include geographic restrictions.) 	No requirements established.	No requirements established.
Fertilizer Applications	Clean Water Act Section 208 (40 CFR 35, Subpart G)	-Agriculturally related point sources of pollution.	Same as requirements for irrigation practices under CWA.	Same as requirements for irrigation practices under CWA.	Same as requirements for irrigation practices under CWA.	Same as requirements for irrigation practices under CWA.

Source	Statutory Authority	Definition of Source	Performance Objective/Criteria	Design and Operating Requirements	Closure Requirements	Post-Closure Care Requirements
Animal Feeding Operations	Clean Water Act Section 208 (40 CFR 35, Subpart C)	Runoff from manure disposal areas and from land used for livestock.	Same as requirements for irrigation practices under CWA.	Same as requirements for irrigation practices under CWA.	Same as requirements for irrigation practices under CWA.	Same as requirements for irrigation practices under CWA.
De-icing Salts Applications	—	—	—	—	—	—
Urban Runoff	Clean Water Act - Section 208 (40 CFR 35, Subpart C)	Urban stormwater runoff systems	Same as requirements for irrigation practices under CWA.	Same as requirements for irrigation practices under CWA.	Same as requirements for irrigation practices under CWA.	Same as requirements for irrigation practices under CWA.
Percolation of Atmospheric Pollutants	—	—	—	—	—	—
Mining and Mine Drainage - Surface Mining	Clean Water Act - Section 208 (40 CFR 35, Subpart C)	Mine-related sources of pollution including runoff from new, active, and abandoned surface and underground mines.	Same as requirements for irrigation practices under CWA.	Same as requirements for irrigation practices under CWA.	Same as requirements for irrigation practices under CWA.	Same as requirements for irrigation practices under CWA.

Source	Statutory Authority	Definition of Source	Performance Objective/Criteria	Design and Operating Requirements	Closure Requirements	Post-Closure Care Requirements
Mining and Mine Drainage - Surface Mining (Continued)	Federal Land Policy and Management Act ^b - Mineral Leasing Au of 1920 and Materials Act of 1947 (43 CFR 23)	Mining of minerals such as coal, phosphate, asphalt, sodium, potassium, sand, stone, gravel and clay (on Federal lands).	Take adequate measures to avoid, minimize, or correct damage to the environment and to public health and safety while encouraging development of mineral resources.	<ul style="list-style-type: none"> o Mining plan must be submitted to the regulatory authority which includes - - of measures to be taken to prevent or control groundwater pollution. o Operations may be prohibited or restricted in areas if it is determined by the regulatory authority that water quality will be lowered below State standards or levels set by DOI (unless it is found that the lowering of water quality is necessary to economic and social development and will not preclude any assigned uses of the water. EPA must be consulted to ensure that the Clean Water Act would not be violated.) 	<ul style="list-style-type: none"> o No specific requirements. o Mining plan must include provisions for reclamation of disturbed areas. 	<ul style="list-style-type: none"> o No specific requirements. o Performance bond must be filed in an amount sufficient to satisfy the reclamation requirements of an approved mining plan (at least \$2000).
	- U.S. Mining Laws (43 CFR 3800)	Mining of minerals such as gold, silver, lead, iron and copper (on Federal lands).	Prevent unnecessary or undue degradation of Federal lands which may result from mining operations.	<ul style="list-style-type: none"> o Plan of operations must be submitted to the regulatory authority which includes a description of measures to be taken to meet the performance standard. 	<ul style="list-style-type: none"> o No specific requirements. o Plan of operations must include provisions for reclamation of disturbed areas. 	<ul style="list-style-type: none"> o No specific requirements. o Performance bond must be filed in an amount based on the estimated cost of reasonable stabilization and reclamation of disturbed areas.

Source	Statutory Authority	Definition of Source	Performance Objective/Criteria	Design and Operating Requirements	Closure Requirements	Post-Closure Care Requirements
Mining and Mine Drainage - surface Mining (Continued)	surface Mining Control and Reclamation Act (30 CFR 816)	surface mining of coal.	Groundwater quality shall be protected by handling earth materials and runoff in a manner that minimizes acidic, toxic, or other harmful infiltration to groundwater systems and by managing excavations and other disturbances to prevent or control the discharge of pollutants into the groundwater.	<ul style="list-style-type: none"> Regulatory authority is required to assess the cumulative hydrologic impacts of the mining operation prior to permit approval. Permit application must contain a determination of the probable hydrologic consequences on the quality and quantity of ground and surface water under seasonal flow conditions for the proposed permit and adjacent areas. Hydrologic reclamation plan must be submitted with the permit application. It must contain steps to be taken during mining and reclamation through bond release period to: minimize disturbances to the hydrologic balance within the permit and adjacent areas; prevent material damage outside the permit area; meet Federal and State water quality regulations; and protect the rights of present users. Specific measures to avoid acid or toxic drainage and to provide water treatment facilities, as necessary must be included in the plan. 	Compliance with the hydrologic reclamation plan.	<ul style="list-style-type: none"> A hydrologic reclamation plan must be submitted with a permit application which specifies the measures to be taken during mining and reclamation operations to protect groundwater (on-site and off-site) from adverse effects (e.g. acid or toxic drainage). A performance bond must be filed covering the duration of mining and reclamation activities. Monitoring must be continued until bond release.
Mining and Mine Drainage - Underground Mining	Federal Land Policy and Management Act - Mineral Leasing Act of 1920 and Materials Act of 1947 (43 CFR 23)	Mining of minerals such as coal, phosphate, asphalt, sodium, potassium, sand, stone, gravel and clay (on Federal lands).	Same as standard for surface mining under these laws.	Same as requirements for surface mining under these laws.	Same as requirements for surface mining under these laws.	Same as requirements for surface mining under these laws.

Source	Statutory Authority	Definition of Source	Performance Objective/Criteria	Design and Operating Requirements	Closure Requirements	Post-Closure Care Requirements
Mining and Mine Drainage - Underground Mining (Continued)	- U.S. Mining Laws (43 CFR 3800)	Mining of minerals such as gold, silver, lead, iron and copper (on Federal lands).	Same as requirements for surface mining under these laws.	Same as requirements for surface mining under these laws.	Same as requirements for surface mining under these laws.	Same as requirements for surface mining under these laws.
	Surface Mining Control and Reclamation Act (30 CFR 816)	Underground coal mining ^c	Same as standard for surface mining under SMCR.	Same as requirements for surface mining under SMCR.	Same as requirements for surface mining under SMCR.	Same as requirements for surface mining under SMCR.

^a 40 CFR 35, Subpart G are the regulation for State grants for Water Quality Planning, Management, and Implementation. Although the Clean Water Act is directed at the protection of surface waters, some States have chosen to include groundwater quality programs in their water quality management plans. Such plans are required by the regulations to indicate recognition that groundwaters and surface water intermix.

^b The Federal Land Policy and Management Act (FLPMA) Act of 1976 (P.L. 94-579) requires that public lands be managed in a manner that will protect the quality of environmental values. In addition, there are a number of laws regulating certain mining activities on Federal lands. The mining regulations are authorized by both the FLPMA and the specific mining laws and are thus presented together in this table.

^c Applies to surface effects of underground mining.

Source: Office of Technology Assessment.

H.5 DESIGN AND OPERATING PROVISIONS FOR CATEGORY V SOURCES

Source	Statutory Authority	Definition of Source	Performance Objective / Criteria	Design and Operating Requirements	Post-Closure	
					Closure Requirements	Care Requirements
Production Wells Geothermal and Heat Recovery	Federal Land Policy and Management Act - Geothermal Steam Act (30 CFR 270 and BLM Operational Order No.4) ^a	Wells used for the development of geothermal steam (on Federal lands)	Must not contaminate groundwaters (compliance with Federal and State water quality standards)	necessary precautions must be taken to keep wells under control, utilize trained and competent personnel, utilize properly maintained equipment in a manner the safety and life and property. o A plan of operation must be approved (prior to commencing operations) by the regulatory authority which describes the proposed measures to be taken for the protection of the environment, including the prevention or control of pollution of surface and groundwater.	wells must be plugged and abandoned in a manner approved by the regulatory authority.	No requirements established.
production Wells - Water Supply		---	---			
Other Wells (non-waste) - Monitoring wells		---	---	---		
Other wells (non-waste) - Exploration	Federal Land Policy and Management Act ^a Mineral Leasing Act of 1920 and Materials Act of 1949 (43 CFR 23)	Exploration wells used in mining operations for minerals such as coal, phosphate, asphalt, sodium, potassium, sand, stone, gravel, and clay when encouraging development of mineral resources.	Take adequate measures to avoid, minimize, or correct damage to the environment and to public health and safety.	o Exploration plan must be filed with the regulatory authority including a description of measures to be taken to prevent or control pollution of surface and groundwater.	No requirements established.	No requirements established.

Source	Statutory Authority	Definition of Source	Performance Objective/Criteria	Design and Operating Requirements	Closure Requirements	Post-Closure Care Requirements
Construction Excavation	Clean Water Act - Section 208 (40 CFR 35) Subpart G) ^b	Construction activity related to sources of pollution.	Achieve established water quality goals of the act.	<ul style="list-style-type: none"> o No specific requirements established. o States are required to submit water quality management plans which must describe the regulatory and non-regulatory activities and Best Management Practices (BMPs) selected to meet non-point source control needs. (BMPs are methods, measures, or practices to prevent or reduce water pollution. They include but are not limited to structural and nonstructural controls, and operation and maintenance procedures). BMPs can be applied before, during, and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters. Economic, institutional, and technical factors must be considered. 	No requirements established.	No requirements established.

^a The Federal Land Policy and Management Act (FLPMA) of 1976 (P.L. 94-579) requires that public lands be managed in a manner that will protect the quality of environmental values. In addition, there are a number of laws regulating certain mining activities on Federal lands. The mining regulations are authorized by both the FLPMA and the specific mineral laws and thus presented together in this table. Note that regulations for the Geothermal Steam Act were redesignated, with minor revisions, as 43 CFR 3260 on Sept. 30, 1983.

^b 40 CFR 35, Subpart G are the regulations for State Grants for Water Quality Planning, Management, and Implementation. Although the Clean Water Act is directed at the protection of surface waters, some States have chosen to include groundwater quality programs in their water quality management plans. Such plans are required by the regulations to indicate recognition that groundwaters and surface water intermix.

Source: Office of Technology Assessment.

H.6 DESIGN AND OPERATING PROVISIONS FOR CATEGORY VI SOURCES

Source	Statutory Authority	Definition of Source	Performance Objective/Criteria	Design and Operating Requirements	Closure Requirement	Post-Closure Care Requirements
Groundwater — Surface Water Interactions	Clean Water Act — Section 208 (40 CFR 35, Subpart G) ^a	Intermixing of groundwater and surface water.	Achieve established water quality goals of the act.	<ul style="list-style-type: none"> o No specific requirements established. o States are required to submit water quality management plans which must indicate recognition that groundwaters and surface water intermix. 	No requirements established.	No requirements established.
Natural Leaching	Reclamation Act	Natural salt deposits affecting underground water supplies.	No objective specified.	<ul style="list-style-type: none"> o No specific requirements established. o Reclamation Act authorizes the Federal Government to develop water supplies for municipal, industrial, and other purposes. 	No requirements established.	No requirements established.
Salt-water Intrusion	Clean Water Act — Section 208 (40 CFR 35, subpart G) ^a	Salt-water intrusion into rivers, lakes, and estuaries resulting from reduction of freshwater flow from any cause, including <u>groundwater extraction</u> .	Achieve established water quality goals of the act.	<ul style="list-style-type: none"> o No specific requirements established. o States are required to submit water quality management plans which must describe the regulatory and non-regulatory activities and Best Management Practices (BMPs) selected to meet non-point source control needs. (BMPs are methods, measures, or practices to prevent or reduce water pollution. They include but are not limited to structural and nonstructural controls, and operation and maintenance procedures). BMPs can be applied before, during, and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters. Economic, institutional, and technical factors must be considered. 	No requirements established.	No requirements established.
	Coastal Zone Management Act	Salt-water intrusion.	Minimize the loss of property — by saltwater intrusion.	<ul style="list-style-type: none"> o No specific requirements. o States may include provisions in their Coastal Zone Management Plans to address salt-water intrusion as appropriate. 	No requirements established.	No requirements established.

^a40 CFR 35, Subpart G are the regulations for State grants for Water Quality Management, and Implementation. Although the Clean Water Act is directed at the protection of surface waters, some States have chosen to include groundwater quality programs in their water management plan.

Source: Office of Technology Assessment.