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Criteria For Classification Of Solid Waste Disposal Facilities
And Practices

TITLE 40--PROTECTION OF ENVIRONMENT

PART 257--CRITERIA FOR CLASSIFICATION OF SOLID WASTE DISPOSAL FACILITIES AND PRACTICES

Subpart A--Classification of Solid Waste Disposal Facilities and Practices

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Authority: 42 U.S.C. 6907(a)(3), 6912(a)(1), 6944(a) and 6949(c), 33 U.S.C. 1345 (d) and (e).

Source: 44 FR 53460, Sept. 13, 1979, unless otherwise noted.

Subpart A--Classification of Solid Waste Disposal Facilities and Practices

Sec. 257.1 Scope and purpose.

- (a) Unless otherwise provided, the criteria in Secs. 257.1 through 257.4 are adopted for determining which solid waste disposal facilities and practices pose a reasonable probability of adverse effects on health or the environment under sections 1008(a)(3) and 4004(a) of the Resource Conservation and Recovery Act (The Act). Unless otherwise provided, the criteria in Secs. 257.5 through 257.30 are adopted for purposes of ensuring that non-municipal non-hazardous waste disposal units that receive conditionally exempt small quantity generator (CESQG) waste do not present risks to human health and the environment taking into account the practicable capability of such units in accordance with section 4010(c) of the Act.
- (1) Facilities failing to satisfy either the criteria in Secs. 257.1 through 257.4 or Secs. 257.5 through 257.30 are considered open dumps, which are prohibited under section 4005 of the Act.
 - (2) Practices failing to satisfy either the criteria in Secs. 257.1 through 257.4 or Secs. 257.5 through 257.30 constitute open dumping, which is prohibited under section 4005 of the Act.
- (b) These criteria also provide guidelines for the disposal of sewage sludge on the land when the sewage sludge is not used or disposed through a practice regulated in 40 CFR part 503.
- (c) These criteria apply to all solid waste disposal facilities and practices with the following exceptions:
- (1) The criteria do not apply to agricultural wastes, including manures and crop residues, returned to the soil as fertilizers or soil conditioners.
 - (2) The criteria do not apply to overburden resulting from mining operations intended for return to the mine site.
 - (3) The criteria do not apply to the land application of domestic sewage or treated domestic sewage.
 - (4) The criteria do not apply to the location and operation of septic tanks. The criteria do, however, apply to the disposal of septic tank pumpings.
 - (5) The criteria do not apply to solid or dissolved materials in irrigation return flows.
 - (6) The criteria do not apply to industrial discharges which are point sources subject to permits under section 402 of the Clean Water Act, as amended.

- (7) The criteria do not apply to source, special nuclear or byproduct material as defined by the Atomic Energy Act, as amended (68 Stat. 923).
- (8) The criteria do not apply to hazardous waste disposal facilities which are subject to regulation under subtitle C of the Act.
- (9) The criteria do not apply to disposal of solid waste by underground well injection subject to the regulations (40 CFR part 146) for the Underground Injection Control Program (UICP) under the Safe Drinking Water Act, as amended, 42 U.S.C. 3007 et seq.
- (10) The criteria of this part do not apply to municipal solid waste landfill units, which are subject to the revised criteria contained in part 258 of this chapter.
- (11) The criteria do not apply to the use or disposal sewage sludge on the land when the sewage sludge is used or disposed in accordance with 40 CFR part 503.

[44 FR 53460, Sept. 13, 1979, as amended at 46 FR 47052, Sept. 23, 1981; 56 FR 51016, Oct. 9, 1991; 58 FR 9385, Feb. 19, 1993; 61 FR 34269, July 1, 1996]

Effective Date Note: At 61 FR 34269, July 1, 1996, in Sec. 257.1, paragraph (a) was revised, effective Jan. 1, 1998. For the convenience of the user, the superseded text is set forth as follows:

Sec. 257.1 Scope and purpose.

- (a) These criteria are for use under the Resource Conservation and Recovery Act (the Act) in determining which solid waste disposal facilities and practices pose a reasonable probability of adverse effects on health or the environment. Unless otherwise provided, these criteria are adopted for purposes of both sections 1008(a)(3) and 4004(a) of the Act.
 - (1) Facilities failing to satisfy criteria adopted for purposes of section 4004(a) will be considered open dumps for purposes of State solid waste management planning under the Act.
 - (2) Practices failing to satisfy criteria adopted for purposes of section 1008(a)(3) constitute open dumping, which is prohibited under section 4005 of the Act.

* * * * *

Sec. 257.2 Definitions.

The definitions set forth in section 1004 of the Act apply to this part. Special definitions of general concern to this part are provided below, and definitions especially pertinent to particular sections of this part are provided in those sections.

- Disposal means the discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid waste or hazardous waste into or on any land or water so that such solid waste or hazardous waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including ground waters.
- Domestic septage is either liquid or solid material removed from a septic tank, cesspool, portable toilet, Type III marine sanitation device, or similar treatment works that receives only domestic sewage. Domestic septage does not include liquid or solid material removed from a septic tank, cesspool, or similar treatment works that receives either commercial wastewater or industrial wastewater and does not include grease removed from a grease trap at a restaurant.

- Facility means all contiguous land and structures, other appurtenances, and improvements on the land used for the disposal of solid waste.
- Land application unit means an area where wastes are applied onto or incorporated into the soil surface (excluding manure spreading operations) for agricultural purposes or for treatment and disposal.
- Landfill means an area of land or an excavation in which wastes are placed for permanent disposal, and that is not a land application unit, surface impoundment, injection well, or waste pile.
- Leachate means liquid that has passed through or emerged from solid waste and contains soluble, suspended or miscible materials removed from such wastes.
- Municipal solid waste landfill (MSWLF) unit means a discrete area of land or an excavation that receives household waste, and that is not a land application unit, surface impoundment, injection well, or waste pile, as those terms are defined in this section. A MSWLF unit also may receive other types of RCRA Subtitle D wastes, such as commercial solid waste, nonhazardous sludge, and industrial solid waste. Such a landfill may be publicly or privately owned. An MSWLF unit may be a new MSWLF unit, an existing MSWLF unit or a lateral expansion.
- Open dump means a facility for the disposal of solid waste which does not comply with this part.
- Practice means the act of disposal of solid waste.
- Sanitary landfill means a facility for the disposal of solid waste which complies with this part.
- Sewage sludge means solid, semi-solid, or liquid residue generated during the treatment of domestic sewage in a treatment works. Sewage sludge includes, but is not limited to, domestic septage; scum or solids removed in primary, secondary, or advanced wastewater treatment processes; and a material derived from sewage sludge. Sewage sludge does not include ash generated during the firing of sewage sludge in a sewage sludge incinerator or grit and screenings generated during preliminary treatment of domestic sewage in a treatment works.
- Sludge means any solid, semisolid, or liquid waste generated from a municipal, commercial, or industrial wastewater treatment plant, water supply treatment plant, or air pollution control facility or any other such waste having similar characteristics and effect.
- Solid waste means any garbage, refuse, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities, but does not include solid or dissolved materials in domestic sewage, or solid or dissolved material in irrigation return flows or industrial discharges which are point sources subject to permits under section 402 of the Federal Water Pollution Control Act, as amended (86 Stat. 880), or source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954, as amended (68 Stat. 923).
- State means any of the several States, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands.
- Surface impoundment or impoundment means a facility or part of a facility that is a natural topographic depression, human-made excavation, or diked area formed primarily of earthen materials (although it may be lined with human-made materials), that is designed to hold an accumulation of liquid wastes or wastes containing free liquids and that is not an injection well. Examples of surface impoundments are holding storage, settling, and aeration pits, ponds, and lagoons.

- Waste pile or pile means any noncontainerized accumulation of solid, nonflowing waste that is used for treatment or storage.

[44 FR 53460, Sept. 13, 1979; 44 FR 58910, Oct. 12, 1979; 56 FR 51016, Oct. 9, 1991; 58 FR 9385, Feb. 19, 1993]

Sec. 257.3 Criteria for classification of solid waste disposal facilities and practices.

Solid waste disposal facilities or practices which violate any of the following criteria pose a reasonable probability of adverse effects on health or the environment:

Sec. 257.3-1 Floodplains.

(a) Facilities or practices in floodplains shall not restrict the flow of the base flood, reduce the temporary water storage capacity of the floodplain, or result in washout of solid waste, so as to pose a hazard to human life, wildlife, or land or water resources.

(b) As used in this section:

(1) Based flood means a flood that has a 1 percent or greater chance of recurring in any year or a flood of a magnitude equalled or exceeded once in 100 years on the average over a significantly long period.

(2) Floodplain means the lowland and relatively flat areas adjoining inland and coastal waters, including flood-prone areas of offshore islands, which are inundated by the base flood.

(3) Washout means the carrying away of solid waste by waters of the base flood.

[44 FR 53460, Sept. 13, 1979; 44 FR 54708, Sept. 21, 1979]

Sec. 257.3-2 Endangered species.

(a) Facilities or practices shall not cause or contribute to the taking of any endangered or threatened species of plants, fish, or wildlife.

(b) The facility or practice shall not result in the destruction or adverse modification of the critical habitat of endangered or threatened species as identified in 50 CFR part 17.

(c) As used in this section:

(1) Endangered or threatened species means any species listed as such pursuant to section 4 of the Endangered Species Act.

(2) Destruction or adverse modification means a direct or indirect alteration of critical habitat which appreciably diminishes the likelihood of the survival and recovery of threatened or endangered species using that habitat.

(3) Taking means harassing, harming, pursuing, hunting, wounding, killing, trapping, capturing, or collecting or attempting to engage in such conduct.

Sec. 257.3-3 Surface water.

- (a) For purposes of section 4004(a) of the Act, a facility shall not cause a discharge of pollutants into waters of the United States that is in violation of the requirements of the National Pollutant Discharge Elimination System (NPDES) under section 402 of the Clean Water Act, as amended.
- (b) For purposes of section 4004(a) of the Act, a facility shall not cause a discharge of dredged material or fill material to waters of the United States that is in violation of the requirements under section 404 of the Clean Water Act, as amended.
- (c) A facility or practice shall not cause non-point source pollution of waters of the United States that violates applicable legal requirements implementing an areawide or Statewide water quality management plan that has been approved by the Administrator under section 208 of the Clean Water Act, as amended.
- (d) Definitions of the terms "Discharge of dredged material", "Point source", "Pollutant", "Waters of the United States", and "Wetlands" can be found in the Clean Water Act, as amended, 33 U.S.C. 1251 et seq., and implementing regulations, specifically 33 CFR part 323 (42 FR 37122, July 19, 1977).[44 FR 53460, Sept. 13, 1979, as amended at 46 FR 47052, Sept. 23, 1981]

Sec. 257.3-4 Ground water.

- (a) A facility or practice shall not contaminate an underground drinking water source beyond the solid waste boundary or beyond an alternative boundary specified in accordance with paragraph (b) of this section.
- (b)
 - (1) For purposes of section 1008(a)(3) of the Act or section 405(d) of the CWA, a party charged with open dumping or a violation of section 405(e) with respect to sewage sludge that is not used or disposed through a practice regulated in 40 CFR part 503 may demonstrate that compliance should be determined at an alternative boundary in lieu of the solid waste boundary. The court shall establish an alternative boundary only if it finds that such a change would not result in contamination of ground water which may be needed or used for human consumption. This finding shall be based on analysis and consideration of all of the following factors that are relevant:
 - (i) The hydrogeological characteristics of the facility and surrounding land, including any natural attenuation and dilution characteristics of the aquifer;
 - (ii) The volume and physical and chemical characteristics of the leachate;
 - (iii) The quantity, quality, and direction of flow of ground water underlying the facility;
 - (iv) The proximity and withdrawal rates of ground-water users;
 - (v) The availability of alternative drinking water supplies;
 - (vi) The existing quality of the ground water, including other sources of contamination and their cumulative impacts on the ground water;
 - (vii) Public health, safety, and welfare effects.
 - (2) For purposes of sections 4004(a) and 1008(a)(3), the State may establish an alternative boundary for a facility to be used in lieu of the solid waste boundary only if it finds that such a change would not result in the contamination of ground water which may be needed or used for human consumption. Such a finding shall be based on an analysis and consideration of all of the factors identified in paragraph (b)(1) of this section that are relevant.
- (c) As used in this section:
 - (1) Aquifer means a geologic formation, group of formations, or portion of a formation capable of yielding usable quantities of ground water to wells or springs.
 - (2) Contaminate means introduce a substance that would cause:

- (i) The concentration of that substance in the ground water to exceed the maximum contaminant level specified in appendix I, or
- (ii) An increase in the concentration of that substance in the ground water where the existing concentration of that substance exceeds the maximum contaminant level specified in appendix I.

(3) Ground water means water below the land surface in the zone of saturation.

(4) Underground drinking water source means:

- (i) An aquifer supplying drinking water for human consumption, or
- (ii) An aquifer in which the ground water contains less than 10,000 mg/1 total dissolved solids.

(5) Solid waste boundary means the outermost perimeter of the solid waste (projected in the horizontal plane) as it would exist at completion of the disposal activity.

[44 FR 53460, Sept. 13, 1979, as amended at 46 FR 47052, Sept. 23, 1981; 58 FR 9386, Feb. 19, 1993]

Sec. 257.3-5 Application to land used for the production of food-chain crops (interim final).

(a) Cadmium. A facility or practice concerning application of solid waste to within one meter (three feet) of the surface of land used for the production of food-chain crops shall not exist or occur, unless in compliance with all requirements of paragraphs (a)(1) (i) through (iii) of this section or all requirements of paragraphs (a)(2) (i) through (iv) of this section.

(1)

- (i) The pH of the solid waste and soil mixture is 6.5 or greater at the time of each solid waste application, except for solid waste containing cadmium at concentrations of 2 mg/kg (dry weight) or less.
- (ii) The annual application of cadmium from solid waste does not exceed 0.5 kilograms per hectare (kg/ha) on land used for production of tobacco, leafy vegetables or root crops grown for human consumption. For other food-chain crops, the annual cadmium application rate does not exceed:

| Time period | Annual Cd application rate (kg/ha) |
|--|------------------------------------|
| Present to June 30, 1984..... | 2.0 |
| July 1, 1984 to December 31, 1986..... | 1.25 |
| Beginning January 1, 1987..... | 0.5 |

(iii) The cumulative application of cadmium from solid waste does not exceed the levels in either paragraph (a)(1)(iii)(A) or (B) of this section.

(A)

| | Maximum cumulative application (kg/ha) |
|-------------------------------|--|
| Soil cation exchange capacity | Background Background |

| (meq/100g) | soil pH less than 6.5 | soil pH more than 6.5 |
|-------------------|-----------------------------|-----------------------------|
| Less than 5..... | 5 | 5 |
| 5 to 15..... | 5 | 10 |
| More than 15..... | 5 | 20 |

(B) For soils with a background pH of less than 6.5, the cumulative cadmium application rate does not exceed the levels below: Provided, That the pH of the solid waste and soil mixture is adjusted to and maintained at 6.5 or greater whenever food-chain crops are grown.

| Soil cation exchange capacity (meq/100g) | Maximum cumulative application (kg/ha) |
|---|---|
| Less than 5..... | 5 |
| 5 to 15..... | 10 |
| More than 15..... | 20 |

(2)

- (i) The only food-chain crop produced is animal feed.
- (ii) The pH of the solid waste and soil mixture is 6.5 or greater at the time of solid waste application or at the time the crop is planted, whichever occurs later, and this pH level is maintained whenever food-chain crops are grown.
- (iii) There is a facility operating plan which demonstrates how the animal feed will be distributed to preclude ingestion by humans. The facility operating plan describes the measures to be taken to safeguard against possible health hazards from cadmium entering the food chain, which may result from alternative land uses.
- (iv) Future property owners are notified by a stipulation in the land record or property deed which states that the property has received solid waste at high cadmium application rates and that food-chain crops should not be grown, due to a possible health hazard.

(b) Polychlorinated Biphenyls (PCBs). Solid waste containing concentrations of PCBs equal to or greater than 10 mg/kg (dry weight) is incorporated into the soil when applied to land used for producing animal feed, including pasture crops for animals raised for milk. Incorporation of the solid waste into the soil is not required if it is assured that the PCB content is less than 0.2 mg/kg (actual weight) in animal feed or less than 1.5 mg/kg (fat basis) in milk.

(c) As used in this section:

- (1) Animal feed means any crop grown for consumption by animals, such as pasture crops, forage, and grain.
- (2) Background soil pH means the pH of the soil prior to the addition of substances that alter the hydrogen ion concentration.
- (3) Cation exchange capacity means the sum of exchangeable cations a soil can absorb expressed in milli-equivalents per 100 grams of soil as determined by sampling the soil to the depth of cultivation or solid waste placement, whichever is greater, and analyzing by the summation method for distinctly acid soils or the sodium acetate method for neutral, calcareous or saline soils (``Methods

of Soil Analysis, Agronomy Monograph No. 9." C. A. Black, ed., American Society of Agronomy, Madison, Wisconsin. pp 891-901, 1965).

- (4) Food-chain crops means tobacco, crops grown for human consumption, and animal feed for animals whose products are consumed by humans.
- (5) Incorporated into the soil means the injection of solid waste beneath the surface of the soil or the mixing of solid waste with the surface soil.
- (6) Pasture crops means crops such as legumes, grasses, grain stubble and stover which are consumed by animals while grazing.
- (7) pH means the logarithm of the reciprocal of hydrogen ion concentration.
- (8) Root crops means plants whose edible parts are grown below the surface of the soil.
- (9) Soil pH is the value obtained by sampling the soil to the depth of cultivation or solid waste placement, whichever is greater, and analyzing by the electrometric method. ("Methods of Soil Analysis, Agronomy Monograph No. 9," C.A. Black, ed., American Society of Agronomy, Madison, Wisconsin, pp. 914-926, 1965.)

[44 FR 53460, Sept. 13, 1979; 44 FR 54708, Sept. 21, 1979]

Sec. 257.3-6 Disease.

- (a) Disease Vectors. The facility or practice shall not exist or occur unless the on-site population of disease vectors is minimized through the periodic application of cover material or other techniques as appropriate so as to protect public health.
- (b) Sewage sludge and septic tank pumpings (Interim Final). A facility or practice involving disposal of sewage sludge or septic tank pumpings shall not exist or occur unless in compliance with paragraphs (b) (1), (2) or (3) of this section.
 - (1) Sewage sludge that is applied to the land surface or is incorporated into the soil is treated by a Process to Significantly Reduce Pathogens prior to application or incorporation. Public access to the facility is controlled for at least 12 months, and grazing by animals whose products are consumed by humans is prevented for at least one month. Processes to Significantly Reduce Pathogens are listed in appendix II, section A. (These provisions do not apply to sewage sludge disposed of by a trenching or burial operation.)
 - (2) Septic tank pumpings that are applied to the land surface or incorporated into the soil are treated by a Process to Significantly Reduce Pathogens (as listed in appendix II, section A), prior to application or incorporation, unless public access to the facility is controlled for at least 12 months and unless grazing by animals whose products are consumed by humans is prevented for at least one month. (These provisions do not apply to septic tank pumpings disposed of by a trenching or burial operation.)
 - (3) Sewage sludge or septic tank pumpings that are applied to the land surface or are incorporated into the soil are treated by a Process to Further Reduce Pathogens, prior to application or incorporation, if crops for direct human consumption are grown within 18 months subsequent to application or incorporation. Such treatment is not required if there is no contact between the solid waste and the edible portion of the crop; however, in this case the solid waste is treated by a Process to Significantly Reduce Pathogens, prior to application; public access to the facility is controlled for at least 12 months; and grazing by animals whose products are consumed by humans is prevented for at least one month. If crops for direct human consumption are not grown within 18 months of

application or incorporation, the requirements of paragraphs (b) (1) and (2) of this section apply. Processes to Further Reduce Pathogens are listed in appendix II, section B.

(c) As used in this section:

- (1) Crops for direct human consumption means crops that are consumed by humans without processing to minimize pathogens prior to distribution to the consumer.
- (2) Disease vector means rodents, flies, and mosquitoes capable of transmitting disease to humans.
- (3) Incorporated into the soil means the injection of solid waste beneath the surface of the soil or the mixing of solid waste with the surface soil.
- (4) Periodic application of cover material means the application and compaction of soil or other suitable material over disposed solid waste at the end of each operating day or at such frequencies and in such a manner as to reduce the risk of fire and to impede vectors access to the waste.
- (5) Trenching or burial operation means the placement of sewage sludge or septic tank pumpings in a trench or other natural or man-made depression and the covering with soil or other suitable material at the end of each operating day such that the wastes do not migrate to the surface.

[44 FR 53460, Sept. 13, 1979; 44 FR 54708, Sept. 21, 1979]

Sec. 257.3-7 Air.

- (a) The facility or practice shall not engage in open burning of residential, commercial, institutional or industrial solid waste. This requirement does not apply to infrequent burning of agricultural wastes in the field, silvicultural wastes for forest management purposes, land-clearing debris, diseased trees, debris from emergency clean-up operations, and ordnance.
- (b) For purposes of section 4004(a) of the Act, the facility shall not violate applicable requirements developed under a State Implementation Plan (SIP) approved or promulgated by the Administrator pursuant to section 110 of the Clean Air Act, as amended.
- (c) As used in this section "open burning" means the combustion of solid waste without (1) control of combustion air to maintain adequate temperature for efficient combustion, (2) containment of the combustion reaction in an enclosed device to provide sufficient residence time and mixing for complete combustion, and (3) control of the emission of the combustion products.

[44 FR 53460, Sept. 13, 1979; 44 FR 54708, Sept. 21, 1979, as amended at 46 FR 47052, Sept. 23, 1981]

Sec. 257.3-8 Safety.

- (a) Explosive gases. The concentration of explosive gases generated by the facility or practice shall not exceed:
 - (1) Twenty-five percent (25%) of the lower explosive limit for the gases in facility structures (excluding gas control or recovery system components); and
 - (2) The lower explosive limit for the gases at the property boundary.
- (b) Fires. A facility or practice shall not pose a hazard to the safety of persons or property from fires. This may be accomplished through compliance with Sec. 257.3-7 and through the periodic application of cover material or other techniques as appropriate.

- (c) Bird hazards to aircraft. A facility or practice disposing of putrescible wastes that may attract birds and which occurs within 10,000 feet (3,048 meters) of any airport runway used by turbojet aircraft or within 5,000 feet (1,524 meters) of any airport runway used by only piston-type aircraft shall not pose a bird hazard to aircraft.
- (d) Access. A facility or practice shall not allow uncontrolled public access so as to expose the public to potential health and safety hazards at the disposal site.
- (e) As used in this section:
 - (1) Airport means public-use airport open to the public without prior permission and without restrictions within the physical capacities of available facilities.
 - (2) Bird hazard means an increase in the likelihood of bird/aircraft collisions that may cause damage to the aircraft or injury to its occupants.
 - (3) Explosive gas means methane (CH₄).
 - (4) Facility structures means any buildings and sheds or utility or drainage lines on the facility.
 - (5) Lower explosive limit means the lowest percent by volume of a mixture of explosive gases which will propagate a flame in air at 25 deg.C and atmospheric pressure.
 - (6) Periodic application of cover material means the application and compaction of soil or other suitable material over disposed solid waste at the end of each operating day or at such frequencies and in such a manner as to reduce the risk of fire and to impede disease vectors' access to the waste.
 - (7) Putrescible wastes means solid waste which contains organic matter capable of being decomposed by microorganisms and of such a character and proportion as to be capable of attracting or providing food for birds.

Sec. 257.4 Effective date.

These criteria become effective October 15, 1979.

Subpart B--Disposal Standards for the Receipt of Conditionally Exempt Small Quantity Generator (CESQG) Wastes at Non-Municipal Non-Hazardous Waste Disposal Units

Source: 61 FR 34269, July 1, 1996, unless otherwise noted.

Effective Date Note: At 61 FR 34269, July 1, 1996, subpart B to part 257 was added, effective Jan. 1, 1998, with the exception of Secs. 257.21-257.28, which will become effective July 1, 1998, and Secs. 257.24, 257.25, and 257.27, which contain information collection and recordkeeping requirements and will not become effective until approval has been given by the Office of Management and Budget.

Subpart B--Disposal Standards for the Receipt of Conditionally Exempt Small Quantity Generator (CESQG) Wastes at Non-Municipal Non-Hazardous Waste Disposal Units

Sec. 257.5 Disposal standards for owners/operators of non-municipal non-hazardous waste disposal units that receive Conditionally Exempt Small Quantity Generator (CESQG) waste.

- (a) Applicability.

- (1) The requirements in this section apply to owners/operators of any non-municipal non-hazardous waste disposal unit that receives CESQG hazardous waste, as defined in 40 CFR 261.5. Non-municipal non-hazardous waste disposal units that meet the requirements of this section may receive CESQG wastes. Any owner/operator of a non-municipal non-hazardous waste disposal unit that receives CESQG hazardous waste continues to be subject to the requirements in Secs. 257.3-2, 257.3-3, 257.3-5, 257.3-6, 257.3-7, and 257.3-8 (a), (b), and (d).
- (2) Any non-municipal non-hazardous waste disposal unit that is receiving CESQG hazardous waste as of January 1, 1998, must be in compliance with the requirements in Secs. 257.7 through 257.13 and Sec. 257.30 by January 1, 1998, and the requirements in Secs. 257.21 through 257.28 by July 1, 1998.
- (3) Any non-municipal non-hazardous waste disposal unit that does not meet the requirements in this section may not receive CESQG wastes.
- (4) Any non-municipal non-hazardous waste disposal unit that is not receiving CESQG Hazardous waste as of January 1, 1998, continues to be subject to the requirements in Secs. 257.1 through 257.4.
- (5) Any non-municipal non-hazardous waste disposal unit that first receives CESQG hazardous waste after January 1, 1998, must be in compliance with Secs. 257.7 through 257.30 prior to the receipt of CESQG hazardous waste.

(b) Definitions.

- Active life means the period of operation beginning with the initial receipt of solid waste and ending at the final receipt of solid waste.
- Existing unit means any non-municipal non-hazardous waste disposal unit that is receiving CESQG hazardous waste as of January 1, 1998.
- Facility means all contiguous land and structures, other appurtenances, and improvements on the land used for the disposal of non-municipal non-hazardous waste.
- Lateral expansion means a horizontal expansion of the waste boundaries of an existing non-municipal non-hazardous waste disposal unit.
- New unit means any non-municipal non-hazardous waste disposal unit that has not received CESQG hazardous waste prior to January 1, 1998.
- State means any of the several States, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands, and Indian Tribes.
- State Director means the chief administrative officer of the lead State/Tribal agency responsible for implementing the State/Tribal permit program for Subtitle D regulated facilities.
- Uppermost aquifer means the geologic formation nearest the natural ground surface that is an aquifer, as well as, lower aquifers that are hydraulically interconnected with this aquifer within the facility's property boundary.
- Waste management unit boundary means a vertical surface located at the hydraulically down gradient limit of the unit. This vertical surface extends down into the uppermost aquifer.

Location Restrictions

Sec. 257.7 [Reserved]

Sec. 257.8 Floodplains.

- (a) Owners or operators of new units, existing units, and lateral expansions located in 100-year floodplains must demonstrate that the unit will not restrict the flow of the 100-year flood, reduce the temporary water storage capacity of the floodplain, or result in washout of solid waste so as to pose a hazard to human health and the environment. The owner or operator must place the demonstration in the operating record and notify the State Director that it has been placed in the operating record.
- (b) For purposes of this section:
- (1) Floodplain means the lowland and relatively flat areas adjoining inland and coastal waters, including flood-prone areas of offshore islands, that are inundated by the 100-year flood.
 - (2) 100-year flood means a flood that has a 1-percent or greater chance of recurring in any given year or a flood of a magnitude equalled or exceeded once in 100 years on the average over a significantly long period.
 - (3) Washout means the carrying away of solid waste by waters of the base flood.

Sec. 257.9 Wetlands.

- (a) Owners or operators of new units and lateral expansions shall not locate such units in wetlands, unless the owner or operator can make the following demonstrations to the Director of an approved State:
- (1) Where applicable under section 404 of the Clean Water Act or applicable State wetlands laws, the presumption that a practicable alternative to the proposed landfill is available which does not involved wetlands is clearly rebutted:
 - (2) The construction and operation of the unit will not:
 - (i) Cause or contribute to violations of any applicable State water quality standard;
 - (ii) Violate any applicable toxic effluent standard or prohibition under Section 307 of the Clean Water Act;
 - (iii) Jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of a critical habitat, protected under the Endangered Species Act of 1973; and
 - (iv) Violate any requirement under the Marine Protection, Research, and Sanctuaries Act of 1972 for the protection of a marine sanctuary;
 - (3) The unit will not cause or contribute to significant degradation of wetlands. The owner/operator must demonstrate the integrity of the unit and its ability to protect ecological resources by addressing the following factors:
 - (i) Erosion, stability, and migration potential of native wetland soils, muds and deposits used to support the unit;
 - (ii) Erosion, stability, and migration potential of dredged and fill materials used to support the unit;
 - (iii) The volume and chemical nature of the waste managed in the unit;
 - (iv) Impacts on fish, wildlife, and other aquatic resources and their habitat from release of the waste;
 - (v) The potential effects of catastrophic release of waste to the wetland and the resulting impacts on the environment; and
 - (vi) Any additional factors, as necessary, to demonstrate that ecological resources in the wetland are sufficiently protected.

- (4) To the extent required under section 404 of the Clean Water Act or applicable State wetlands laws, steps have been taken to attempt to achieve no net loss of wetlands (as defined by acreage and function) by first avoiding impacts to wetlands to the maximum extent practicable as required by paragraph (a)(1) of this section, then minimizing unavoidable impacts to the maximum extent practicable, and finally offsetting remaining unavoidable wetland impacts through all appropriate and practicable compensatory mitigation actions (e.g., restoration of existing degraded wetlands or creation of man-made wetlands); and
- (5) Sufficient information is available to make a reasonable determination with respect to these demonstrations.

(b) For purposes of this section, wetlands means those areas that are defined in 40 CFR 232.2(r).

Secs. 257.10-257.12 [Reserved]

Sec. 257.13 Deadline for making demonstrations.

Existing units that cannot make the demonstration specified in Sec. 257.8(a) pertaining to floodplains by January 1, 1998, must not accept CESQG hazardous waste for disposal.

Ground-Water Monitoring and Corrective Action

Sec. 257.21 Applicability.

- (a) The requirements in this section apply to units identified in Sec. 257.5(a), except as provided in paragraph (b) of this section.
- (b) Ground-water monitoring requirements under Secs. 257.22 through 257.25 may be suspended by the Director of an approved State for a unit identified in Sec. 257.5(a) if the owner or operator can demonstrate that there is no potential for migration of hazardous constituents from that unit to the uppermost aquifer during the active life of the unit plus 30 years. This demonstration must be certified by a qualified ground-water scientist and approved by the Director of an approved State, and must be based upon:
 - (1) Site-specific field collected measurements, sampling, and analysis of physical, chemical, and biological processes affecting contaminant fate and transport; and
 - (2) Contaminant fate and transport predictions that maximize contaminant migration and consider impacts on human health and environment.
- (c) Owners and operators of facilities identified in Sec. 257.5(a) must comply with the ground-water monitoring requirements of this section according to the following schedule unless an alternative schedule is specified under paragraph (d) of this section:
 - (1) Existing units and lateral expansions must be in compliance with the ground-water monitoring requirements specified in Secs. 257.22 through 257.25 by July 1, 1998.
 - (2) New units identified in Sec. 257.5(a) must be in compliance with the ground-water monitoring requirements specified in Secs. 257.22 through 257.25 before waste can be placed in the unit.
- (d) The Director of an approved State may specify an alternative schedule for the owners or operators of existing units and lateral expansions to comply with the ground-water monitoring requirements specified in Secs. 257.22 through 257.25. This schedule must ensure that 50 percent of all existing units are in

compliance by July 1, 1998, and all existing units are in compliance by July 1, 1999. In setting the compliance schedule, the Director of an approved State must consider potential risks posed by the unit to human health and the environment. The following factors should be considered in determining potential

risk:

- (1) Proximity of human and environmental receptors;
 - (2) Design of the unit;
 - (3) Age of the unit;
 - (4) The size of the unit; and
 - (5) Resource value of the underlying aquifer, including:
 - (i) Current and future uses;
 - (ii) Proximity and withdrawal rate of users; and
 - (iii) Ground-water quality and quantity.
- (e) Once established at a unit, ground-water monitoring shall be conducted throughout the active life plus 30 years. The Director of an approved State may decrease the 30 year period if the owner/operator demonstrates that a shorter period of time is adequate to protect human health and the environment and the Director approves the demonstration.
- (f) For the purposes of this section, a qualified ground-water scientist is a scientist or engineer who has received a baccalaureate or post-graduate degree in the natural sciences or engineering and has sufficient training and experience in ground-water hydrology and related fields as may be demonstrated by State registration, professional Certifications, or completion of accredited university programs that enable that individual to make sound professional judgments regarding ground-water monitoring, contaminant fate and transport, and corrective-action.
- (g) The Director of an approved State may establish alternative schedules for demonstrating compliance with Sec. 257.22(d)(2), pertaining to notification of placement of certification in operating record; Sec. 257.24(c)(1), pertaining to notification that statistically significant increase (SSI) notice is in operating record; Sec. 257.24(c) (2) and (3), pertaining to an assessment monitoring program; Sec. 257.25(b), pertaining to sampling and analyzing appendix II of Part 258 constituents; Sec. 257.25(d)(1), pertaining to placement of notice (appendix II of 40 CFR part 258 constituents detected) in record and notification of notice in record; Sec. 257.25(d)(2), pertaining to sampling for appendix I and II of 40 CFR Part 258; Sec. 257.25(g), pertaining to notification (and placement of notice in record) of SSI above ground-water protection standard; Secs. 257.25(g)(1)(iv) and 257.26(a), pertaining to assessment of corrective measures; Sec. 257.27(a), pertaining to selection of remedy and notification of placement in record; Sec. 257.28(c)(4), pertaining to notification of placement in record (alternative corrective action measures); and Sec. 257.28(f), pertaining to notification of placement in record (certification of remedy completed).
- (h) Directors of approved States can use the flexibility in paragraph (i) of this section for any non-municipal non-hazardous waste disposal unit that receives CESQG waste, if the non-municipal non-hazardous waste disposal unit:
- (1) Disposes of less than 20 tons of non-municipal waste daily, based on an annual average; and
 - (2) Has no evidence of ground-water contamination; and either
 - (3) Serves a community that experiences an annual interruption of at least three consecutive months of surface transportation that prevents access to a regional waste management facility; or

- (4) Serves a community that has no practicable waste management alternative and the non-municipal solid waste disposal facility is located in an area that annually receives less than or equal to 25 inches of precipitation.
 - (5) Owners/operators of any non-municipal non-hazardous waste disposal unit that meets the criteria in paragraph (h) of this section must place in the operating record information demonstrating this.
- (i) Directors of approved States may allow any non-municipal non-hazardous waste disposal unit meeting the criteria in paragraph (h) of this section to:
- (1) Use alternatives to the ground-water monitoring system prescribed in Secs. 257.22 through 257.25 so long as the alternatives will detect and, if necessary, assess the nature or extent of contamination from the non-municipal non-hazardous waste disposal unit on a site-specific basis; or establish and use, on a site-specific basis, an alternative list of indicator parameters for some or all of the constituents listed in appendix I (Appendix I of 40 CFR Part 258. Alternative indicator parameters approved by the Director of an approved State under this section must ensure detection of contamination from the non-municipal non-hazardous waste disposal unit.
 - (2) If contamination is detected through the use of any alternative to the ground-water monitoring system prescribed in Secs. 257.22 through 257.25, the non-municipal non-hazardous waste disposal unit owner or operator must perform expanded monitoring to determine whether the detected contamination is an actual release from the non-municipal solid waste disposal unit and, if so, to determine the nature and extent of the contamination. The Director of the approved State shall establish a schedule for the non-municipal non-hazardous waste disposal unit owner or operator to submit results from expanded monitoring in a manner that ensures protection of human health and the environment.
 - (i) If expanded monitoring indicates that contamination from the non-municipal non-hazardous waste disposal unit has reached the saturated zone, the owner or operator must install ground-water monitoring wells and sample these wells in accordance with Secs. 257.22 through 257.25.
 - (ii) If expanded monitoring indicates that contamination from the non-municipal non-hazardous waste disposal unit is present in the unsaturated zone or on the surface, the Director of an approved State shall establish a schedule for the owner or operator to submit a description of any necessary corrective measures. The schedule shall ensure corrective measures, where necessary, are undertaken in a timely manner that protects human health and the environment. The proposed corrective measures are subject to revision and approval by the Director of the approved State. The owner or operator must implement the corrective measures according to a schedule established by the Director of the approved State.
 - (3) When considering whether to allow alternatives to a ground-water monitoring system prescribed in Secs. 257.22 through 257.25, including alternative indicator parameters, the Director of an approved State shall consider at least the following factors:
 - (i) The geological and hydrogeological characteristics of the site;
 - (ii) The impact of manmade and natural features on the effectiveness of an alternative technology;
 - (iii) Climatic factors that may influence the selection, use, and reliability of alternative ground-water monitoring procedures; and
 - (iv) The effectiveness of indicator parameters in detecting a release.
 - (4) The Director of an approved State can require an owner or operator to comply with the requirements of Secs. 257.22 through 257.25, where it is determined by the Director that using alternatives to ground-water monitoring approved under this paragraph are inadequate to detect contamination and, if necessary, to assess the nature and extent of contamination.

Sec. 257.22 Ground-water monitoring systems.

(a) A ground-water monitoring system must be installed that consists of a sufficient number of wells, installed at appropriate locations and depths, to yield ground-water samples from the uppermost aquifer (as defined in Sec. 257.5(b)) that:

(1) Represent the quality of background ground water that has not been affected by leakage from a unit. A determination of background quality may include sampling of wells that are not hydraulically upgradient of the waste management area where:

- (i) Hydrogeologic conditions do not allow the owner or operator to determine what wells are hydraulically upgradient; or
- (ii) Sampling at other wells will provide an indication of background ground-water quality that is as representative or more representative than that provided by the upgradient wells; and

(2) Represent the quality of ground water passing the relevant point of compliance specified by the Director of an approved State or at the waste management unit boundary in an unapproved State. The downgradient monitoring system must be installed at the relevant point of compliance specified by the Director of an approved State or at the waste management unit boundary in an unapproved State that ensures detection of ground-water contamination in the uppermost aquifer. The relevant point of compliance specified by the Director of an approved State shall be no more than 150 meters from the waste management unit boundary and shall be located on land owned by the owner of the facility. In determining the relevant point of compliance the State Director shall consider at least the following factors: the hydrogeologic characteristics of the unit and surrounding land, the volume and physical and chemical characteristics of the leachate, the quantity, quality and direction of flow of ground water, the proximity and withdrawal rate of the ground-water users, the availability of alternative drinking water supplies, the existing quality of the ground water, including other sources of contamination and their cumulative impacts on the ground water, and whether the ground water is currently used or reasonably expected to be used for drinking water, public health, safety, and welfare effects, and practicable capability of the owner or operator. When physical obstacles preclude installation of ground-water monitoring wells at the relevant point of compliance at existing units, the down-gradient monitoring system may be installed at the closest practicable distance hydraulically down-gradient from the relevant point of compliance specified by the Director of an approved State that ensures detection of groundwater contamination in the uppermost aquifer.

(b) The Director of an approved State may approve a multi-unit ground-water monitoring system instead of separate ground-water monitoring systems for each unit when the facility has several units, provided the multi-unit ground-water monitoring system meets the requirement of Sec. 257.22(a) and will be as protective of human health and the environment as individual monitoring systems for each unit, based on the following factors:

- (1) Number, spacing, and orientation of the units;
- (2) Hydrogeologic setting;
- (3) Site history;
- (4) Engineering design of the units; and
- (5) Type of waste accepted at the units.

(c) Monitoring wells must be cased in a manner that maintains the integrity of the monitoring well bore hole. This casing must be screened or perforated and packed with gravel or sand, where necessary, to enable collection of ground-water samples. The annular space (i.e., the space between the bore hole and well

casing) above the sampling depth must be sealed to prevent contamination of samples and the ground water.

- (1) The owner or operator must notify the State Director that the design, installation, development, and decommission of any monitoring wells, piezometers and other measurement, sampling, and analytical devices documentation has been placed in the operating record; and
 - (2) The monitoring wells, piezometers, and other measurement, sampling, and analytical devices must be operated and maintained so that they perform to design specifications throughout the life of the monitoring program.
- (d) The number, spacing, and depths of monitoring systems shall be:
- (1) Determined based upon site-specific technical information that must include thorough characterization of:
 - (i) Aquifer thickness, ground-water flow rate, ground-water flow direction including seasonal and temporal fluctuations in ground-water flow; and
 - (ii) Saturated and unsaturated geologic units and fill materials overlying the uppermost aquifer, materials comprising the uppermost aquifer, and materials comprising the confining unit defining the lower boundary of the uppermost aquifer; including, but not limited to: thicknesses, stratigraphy, lithology, hydraulic conductivities, porosities and effective porosities.
 - (2) Certified by a qualified ground-water scientist or approved by the Director of an approved State. Within 14 days of this certification, the owner or operator must notify the State Director that the certification has been placed in the operating record.

Sec. 257.23 Ground-water sampling and analysis requirements.

- (a) The ground-water monitoring program must include consistent sampling and analysis procedures that are designed to ensure monitoring results that provide an accurate representation of ground-water quality at the background and downgradient wells installed in compliance with Sec. 257.22(a). The owner or operator must notify the State Director that the sampling and analysis program documentation has been placed in the operating record and the program must include procedures and techniques for:
 - (1) Sample collection;
 - (2) Sample preservation and shipment;
 - (3) Analytical procedures;
 - (4) Chain of custody control; and
 - (5) Quality assurance and quality control.
- (b) The ground-water monitoring program must include sampling and analytical methods that are appropriate for ground-water sampling and that accurately measure hazardous constituents and other monitoring parameters in ground-water samples. Ground-water samples shall not be field-filtered prior to laboratory analysis.
- (c) The sampling procedures and frequency must be protective of human health and the environment.
- (d) Ground-water elevations must be measured in each well immediately prior to purging, each time ground water is sampled. The owner or operator must determine the rate and direction of ground-water flow each time ground water is sampled. Ground-water elevations in wells which monitor the same waste

management area must be measured within a period of time short enough to avoid temporal variations in ground-water flow which could preclude accurate determination of ground-water flow rate and direction.

- (e) The owner or operator must establish background ground-water quality in a hydraulically upgradient or background well(s) for each of the monitoring parameters or constituents required in the particular ground-water monitoring program that applies to the unit, as determined under Sec. 257.24(a), or Sec. 257.25(a). Background ground-water quality may be established at wells that are not located hydraulically upgradient from the unit if it meets the requirements of Sec. 257.22(a)(1).
- (f) The number of samples collected to establish ground-water quality data must be consistent with the appropriate statistical procedures determined pursuant to paragraph (g) of this section. The sampling procedures shall be those specified under Sec. 257.24(b) for detection monitoring, Sec. 257.25 (b) and (d) for assessment monitoring, and Sec. 257.26(b) for corrective action.
- (g) The owner or operator must specify in the operating record one of the following statistical methods to be used in evaluating ground-water monitoring data for each hazardous constituent. The statistical test chosen shall be conducted separately for each hazardous constituent in each well.
 - (1) A parametric analysis of variance (ANOVA) followed by multiple comparisons procedures to identify statistically significant evidence of contamination. The method must include estimation and testing of the contrasts between each compliance well's mean and the background mean levels for each constituent.
 - (2) An analysis of variance (ANOVA) based on ranks followed by multiple comparisons procedures to identify statistically significant evidence of contamination. The method must include estimation and testing of the contrasts between each compliance well's median and the background median levels for each constituent.
 - (3) A tolerance or prediction interval procedure in which an interval for each constituent is established from the distribution of the background data, and the level of each constituent in each compliance well is compared to the upper tolerance or prediction limit.
 - (4) A control chart approach that gives control limits for each constituent.
 - (5) Another statistical test method that meets the performance standards of paragraph (h) of this section. The owner or operator must place a justification for this alternative in the operating record and notify the State Director of the use of this alternative test. The justification must demonstrate that the alternative method meets the performance standards of paragraph (h) of this section.
- (h) Any statistical method chosen under paragraph (g) of this section shall comply with the following performance standards, as appropriate:
 - (1) The statistical method used to evaluate ground-water monitoring data shall be appropriate for the distribution of chemical parameters or hazardous constituents. If the distribution of the chemical parameters or hazardous constituents is shown by the owner or operator to be inappropriate for a normal theory test, then the data should be transformed or a distribution-free theory test should be used. If the distributions for the constituents differ, more than one statistical method may be needed.
 - (2) If an individual well comparison procedure is used to compare an individual compliance well constituent concentration with background constituent concentrations or a ground-water protection standard, the test shall be done at a Type I error level no less than 0.01 for each testing period. If a multiple comparisons procedure is used, the Type I experiment wise error rate for each testing period shall be no less than 0.05; however, the Type I error of no less than 0.01 for individual well comparisons must be maintained. This performance standard does not apply to tolerance intervals, prediction intervals, or control charts.

- (3) If a control chart approach is used to evaluate ground-water monitoring data, the specific type of control chart and its associated parameter values shall be protective of human health and the environment. The parameters shall be determined after considering the number of samples in the background data base, the data distribution, and the range of the concentration values for each constituent of concern.
 - (4) If a tolerance interval or a predictional interval is used to evaluate ground-water monitoring data, the levels of confidence and, for tolerance intervals, the percentage of the population that the interval must contain, shall be protective of human health and the environment. These parameters shall be determined after considering the number of samples in the background data base, the data distribution, and the range of the concentration values for each constituent of concern.
 - (5) The statistical method shall account for data below the limit of detection with one or more statistical procedures that are protective of human health and the environment. Any practical quantitation limit (pql) that is used in the statistical method shall be the lowest concentration level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions that are available to the facility.
 - (6) If necessary, the statistical method shall include procedures to control or correct for seasonal and spatial variability as well as temporal correlation in the data.
- (i) The owner or operator must determine whether or not there is a statistically significant increase over background values for each parameter or constituent required in the particular ground-water monitoring program that applies to the unit, as determined under Secs. 257.24(a) or 257.25(a).
- (1) In determining whether a statistically significant increase has occurred, the owner or operator must compare the ground-water quality of each parameter or constituent at each monitoring well designated pursuant to Sec. 257.22(a)(2) to the background value of that constituent, according to the statistical procedures and performance standards specified under paragraphs (g) and (h) of this section.
 - (2) Within a reasonable period of time after completing sampling and analysis, the owner or operator must determine whether there has been a statistically significant increase over background at each monitoring well.

Sec. 257.24 Detection monitoring program.

- (a) Detection monitoring is required at facilities identified in Sec. 257.5(a) at all ground-water monitoring wells defined under Secs. 257.22 (a)(1) and (a)(2). At a minimum, a detection monitoring program must include the monitoring for the constituents listed in appendix I of 40 CFR Part 258.
- (1) The Director of an approved State may delete any of the appendix I (Appendix I of 40 CFR Part 258) monitoring parameters for a unit if it can be shown that the removed constituents are not reasonably expected to be contained in or derived from the waste contained in the unit.
 - (2) The Director of an approved State may establish an alternative list of indicator parameters for a unit, in lieu of some or all of the constituents in appendix I to 40 CFR Part 258, if the alternative parameters provide a reliable indication of releases from the unit to the ground water. In determining alternative parameters, the Director shall consider the following factors:
 - (i) The types, quantities, and concentrations of constituents in waste managed at the unit;
 - (ii) The mobility, stability, and persistence of waste constituents or their reaction products in the unsaturated zone beneath the unit;

- (iii) The detectability of indicator parameters, waste constituents, and reaction products in the ground water; and
 - (iv) The concentration or values and coefficients of variation of monitoring parameters or constituents in the groundwater background.
- (b) The monitoring frequency for all constituents listed in appendix I to 40 CFR Part 258, or in the alternative list approved in accordance with paragraph (a)(2) of this section, shall be at least semiannual during the active life of the unit plus 30 years. A minimum of four independent samples from each well (background and downgradient) must be collected and analyzed for the appendix I (Appendix I of 40 CFR, Part 258) constituents, or the alternative list approved in accordance with paragraph (a)(2) of this section, during the first semiannual sampling event. At least one sample from each well (background and downgradient) must be collected and analyzed during subsequent semiannual sampling events. The Director of an approved State may specify an appropriate alternative frequency for repeated sampling and analysis for appendix I (Appendix I of 40 CFR Part 258) constituents, or the alternative list approved in accordance with paragraph (a)(2) of this section, during the active life plus 30 years. The alternative frequency during the active life shall be no less than annual. The alternative frequency shall be based on consideration of the following factors:
- (1) Lithology of the aquifer and unsaturated zone;
 - (2) Hydraulic conductivity of the aquifer and unsaturated zone;
 - (3) Ground-water flow rates;
 - (4) Minimum distance between upgradient edge of the unit and downgradient monitoring well screen (minimum distance of travel); and
 - (5) Resource value of the aquifer.
- (c) If the owner or operator determines, pursuant to Sec. 257.23(g), that there is a statistically significant increase over background for one or more of the constituents listed in appendix I to 40 CFR Part 258, or in the alternative list approved in accordance with paragraph (a)(2) of this section, at any monitoring well at the boundary specified under Sec. 257.22(a)(2), the owner or operator:
- (1) Must, within 14 days of this finding, place a notice in the operating record indicating which constituents have shown statistically significant changes from background levels, and notify the State Director that this notice was placed in the operating record; and
 - (2) Must establish an assessment monitoring program meeting the requirements of Sec. 257.25 within 90 days except as provided for in paragraph (c)(3) of this section.
 - (3) The owner/operator may demonstrate that a source other than the unit caused the contamination or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in ground-water quality. A report documenting this demonstration must be certified by a qualified ground-water scientist or approved by the Director of an approved State and be placed in the operating record. If a successful demonstration is made and documented, the owner or operator may continue detection monitoring as specified in this section. If, after 90 days, a successful demonstration is not made, the owner or operator must initiate an assessment monitoring program as required in Sec. 257.25.

Sec. 257.25 Assessment monitoring program.

- (a) Assessment monitoring is required whenever a statistically significant increase over background has been detected for one or more of the constituents listed in appendix I of 40 CFR Part 258 or in the alternative list approved in accordance with Sec. 257.24(a)(2).

- (b) Within 90 days of triggering an assessment monitoring program, and annually thereafter, the owner or operator must sample and analyze the ground water for all constituents identified in appendix II of 40 CFR Part 258. A minimum of one sample from each downgradient well must be collected and analyzed during each sampling event. For any constituent detected in the downgradient wells as the result of the complete appendix II (Appendix II of 40 CFR Part 258) analysis, a minimum of four independent samples from each well (background and downgradient) must be collected and analyzed to establish background for the new constituents. The Director of an approved State may specify an appropriate subset of wells to be sampled and analyzed for appendix II (Appendix II of 40 CFR Part 258) constituents during assessment monitoring. The Director of an approved State may delete any of the appendix II (Appendix II of 40 CFR Part 258) monitoring parameters for a unit if it can be shown that the removed constituents are not reasonably expected to be in or derived from the waste contained in the unit.
- (c) The Director of an approved State may specify an appropriate alternate frequency for repeated sampling and analysis for the full set of appendix II (Appendix II of 40 CFR part 258) constituents, or the alternative list approved in accordance with paragraph (b) of this section, during the active life plus 30 years considering the following factors:
- (1) Lithology of the aquifer and unsaturated zone;
 - (2) Hydraulic conductivity of the aquifer and unsaturated zone;
 - (3) Ground-water flow rates;
 - (4) Minimum distance between upgradient edge of the unit and downgradient monitoring well screen (minimum distance of travel);
 - (5) Resource value of the aquifer; and
 - (6) Nature (fate and transport) of any constituents detected in response to this section.
- (d) After obtaining the results from the initial or subsequent sampling events required in paragraph (b) of this section, the owner or operator must:
- (1) Within 14 days, place a notice in the operating record identifying the appendix II (appendix II of 40 CFR part 258) constituents that have been detected and notify the State Director that this notice has been placed in the operating record;
 - (2) Within 90 days, and on at least a semiannual basis thereafter, resample all wells specified by Sec. 257.22(a) to this section, conduct analyses for all constituents in appendix I (Appendix I of 40 CFR part 258) to this part or in the alternative list approved in accordance with Sec. 257.24(a)(2), and for those constituents in appendix II to 40 CFR part 258 that are detected in response to paragraph (b) of this section, and record their concentrations in the facility operating record. At least one sample from each well (background and downgradient) must be collected and analyzed during these sampling events. The Director of an approved State may specify an alternative monitoring frequency during the active life plus 30 years for the constituents referred to in this paragraph. The alternative frequency for appendix I (Appendix I of 40 CFR part 258) constituents, or the alternative list approved in accordance with Sec. 257.24(a)(2), during the active life shall be no less than annual. The alternative frequency shall be based on consideration of the factors specified in paragraph (c) of this section;
 - (3) Establish background concentrations for any constituents detected pursuant to paragraphs (b) or (d)(2) of this section; and

- (4) Establish ground-water protection standards for all constituents detected pursuant to paragraph (b) or (d) of this section. The ground-water protection standards shall be established in accordance with paragraphs (h) or (i) of this section.
- (e) If the concentrations of all appendix II (Appendix II of 40 CFR part 258) constituents are shown to be at or below background values, using the statistical procedures in Sec. 257.23(g), for two consecutive sampling events, the owner or operator must notify the State Director of this finding and may return to detection monitoring.
- (f) If the concentrations of any appendix II (Appendix II of part 258) constituents are above background values, but all concentrations are below the ground-water protection standard established under paragraphs (h) or (i) of this section, using the statistical procedures in Sec. 257.23(g), the owner or operator must continue assessment monitoring in accordance with this section.
- (g) If one or more appendix II (Appendix II of CFR part 258) constituents are detected at statistically significant levels above the ground-water protection standard established under paragraphs (h) or (i) of this section in any sampling event, the owner or operator must, within 14 days of this finding, place a notice in the operating record identifying the appendix II (Appendix II of 40 CFR part 258) constituents that have exceeded the ground-water protection standard and notify the State Director and all appropriate local government officials that the notice has been placed in the operating record. The owner or operator also:
- (1)
- (i) Must characterize the nature and extent of the release by installing additional monitoring wells as necessary;
 - (ii) Must install at least one additional monitoring well at the facility boundary in the direction of contaminant migration and sample this well in accordance with paragraph (d)(2) of this section;
 - (iii) Must notify all persons who own the land or reside on the land that directly overlies any part of the plume of contamination if contaminants have migrated off-site if indicated by sampling of wells in accordance paragraph (g)(1) of this section; and
 - (iv) Must initiate an assessment of corrective measures as required by Sec. 257.26 within 90 days;
- or
- (2) May demonstrate that a source other than the non-municipal non-hazardous waste disposal unit caused the contamination, or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in ground-water quality. A report documenting this demonstration must be certified by a qualified ground-water scientist or approved by the Director of an approved State and placed in the operating record. If a successful demonstration is made the owner or operator must continue monitoring in accordance with the assessment monitoring program pursuant to this Sec. 257.25, and may return to detection monitoring if the appendix II (Appendix II of 40 CFR part 258) constituents are at or below background as specified in paragraph (e) of this section. Until a successful demonstration is made, the owner or operator must comply with Sec. 257.25(g) including initiating an assessment of corrective measures.
- (h) The owner or operator must establish a ground-water protection standard for each appendix II (Appendix II of 40 CFR part 258) constituent detected in the ground-water. The ground-water protection standard shall be:
- (1) For constituents for which a maximum contaminant level (MCL) has been promulgated under section 1412 of the Safe Drinking Water Act (codified) under 40 CFR part 141, the MCL for that constituent;
 - (2) For constituents for which MCLs have not been promulgated, the background concentration for the constituent established from wells in accordance with Sec. 257.22(a)(1); or

- (3) For constituents for which the background level is higher than the MCL identified under subparagraph (h)(1) of this section or health based levels identified under paragraph (i)(1) of this section, the background concentration.
- (i) The Director of an approved State may establish an alternative ground-water protection standard for constituents for which MCLs have not been established. These ground-water protection standards shall be appropriate health based levels that satisfy the following criteria:
 - (1) The level is derived in a manner consistent with Agency guidelines for assessing the health risks of environmental pollutants (51 FR 33992, 34006, 34014, 34028, September 24, 1986);
 - (2) The level is based on scientifically valid studies conducted in accordance with the Toxic Substances Control Act Good Laboratory Practice Standards (40 CFR part 792) or equivalent;
 - (3) For carcinogens, the level represents a concentration associated with an excess lifetime cancer risk level (due to continuous lifetime exposure) within the 1×10^{-4} to 1×10^{-6} range; and
 - (4) For systemic toxicants, the level represents a concentration to which the human population (including sensitive subgroups) could be exposed to on a daily basis that is likely to be without appreciable risk of deleterious effects during a lifetime. For purposes of this subpart, systemic toxicants include toxic chemicals that cause effects other than cancer or mutation.
 - (j) In establishing ground-water protection standards under paragraph (i) of this section, the Director of an approved State may consider the following:
 - (1) Multiple contaminants in the ground water;
 - (2) Exposure threats to sensitive environmental receptors; and
 - (3) Other site-specific exposure or potential exposure to ground water.

Sec. 257.26 Assessment of corrective measures.

- (a) Within 90 days of finding that any of the constituents listed in appendix II (Appendix II of 40 CFR Part 258) have been detected at a statistically significant level exceeding the ground-water protection standards defined under Sec. 257.25 (h) or (i), the owner or operator must initiate an assessment of corrective measures. Such an assessment must be completed within a reasonable period of time.
- (b) The owner or operator must continue to monitor in accordance with the assessment monitoring program as specified in Sec. 257.25.
- (c) The assessment shall include an analysis of the effectiveness of potential corrective measures in meeting all of the requirements and objectives of the remedy as described under Sec. 257.27, addressing at least the following:
 - (1) The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination;
 - (2) The time required to begin and complete the remedy;
 - (3) The costs of remedy implementation; and

- (4) The institutional requirements such as State or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s).
- (d) The owner or operator must discuss the results of the corrective measures assessment, prior to the selection of remedy, in a public meeting with interested and affected parties.

Sec. 257.27 Selection of remedy.

- (a) Based on the results of the corrective measures assessment conducted under Sec. 257.26, the owner or operator must select a remedy that, at a minimum, meets the standards listed in paragraph (b) of this section. The owner or operator must notify the State Director, within 14 days of selecting a remedy, that a report describing the selected remedy has been placed in the operating record and how it meets the standards in paragraph (b) of this section.
- (b) Remedies must:
 - (1) Be protective of human health and the environment;
 - (2) Attain the ground-water protection standard as specified pursuant to Secs. 257.25 (h) or (i);
 - (3) Control the source(s) of releases so as to reduce or eliminate, to the maximum extent practicable, further releases of appendix II (Appendix II of 40 CFR part 258) constituents into the environment that may pose a threat to human health or the environment; and
 - (4) Comply with standards for management of wastes as specified in Sec. 257.28(d).
- (c) In selecting a remedy that meets the standards of Sec. 257.27(b), the owner or operator shall consider the following evaluation factors:
 - (1) The long- and short-term effectiveness and protectiveness of the potential remedy(s), along with the degree of certainty that the remedy will prove successful based on consideration of the following:
 - (i) Magnitude of reduction of existing risks;
 - (ii) Magnitude of residual risks in terms of likelihood of further releases due to waste remaining following implementation of a remedy;
 - (iii) The type and degree of long-term management required, including monitoring, operation, and maintenance;
 - (iv) Short-term risks that might be posed to the community, workers, or the environment during implementation of such a remedy, including potential threats to human health and the environment associated with excavation, transportation, and re-disposal or containment;
 - (v) Time until full protection is achieved;
 - (vi) Potential for exposure of humans and environmental receptors to remaining wastes, considering the potential threat to human health and the environment associated with excavation, transportation, re-disposal, or containment;
 - (vii) Long-term reliability of the engineering and institutional controls; and
 - (viii) Potential need for replacement of the remedy.
 - (2) The effectiveness of the remedy in controlling the source to reduce further releases based on consideration of the following factors:
 - (i) The extent to which containment practices will reduce further releases;
 - (ii) The extent to which treatment technologies may be used.
 - (3) The ease or difficulty of implementing a potential remedy(s) based on consideration of the following types of factors:

- (i) Degree of difficulty associated with constructing the technology;
 - (ii) Expected operational reliability of the technologies;
 - (iii) Need to coordinate with and obtain necessary approvals and permits from other agencies;
 - (iv) Availability of necessary equipment and specialists; and
 - (v) Available capacity and location of needed treatment, storage, and disposal services.
- (4) Practicable capability of the owner or operator, including a consideration of the technical and economic capability.
- (5) The degree to which community concerns are addressed by a potential remedy(s).
- (d) The owner or operator shall specify as part of the selected remedy a schedule(s) for initiating and completing remedial activities. Such a schedule must require the initiation of remedial activities within a reasonable period of time taking into consideration the factors set forth in paragraphs (d)(1) through (d)(8) of this section. The owner or operator must consider the following factors in determining the schedule of remedial activities:
- (1) Extent and nature of contamination;
 - (2) Practical capabilities of remedial technologies in achieving compliance with ground-water protection standards established under Secs. 257.25 (g) or (h) and other objectives of the remedy;
 - (3) Availability of treatment or disposal capacity for wastes managed during implementation of the remedy;
 - (4) Desirability of utilizing technologies that are not currently available, but which may offer significant advantages over already available technologies in terms of effectiveness, reliability, safety, or ability to achieve remedial objectives;
 - (5) Potential risks to human health and the environment from exposure to contamination prior to completion of the remedy;
 - (6) Resource value of the aquifer including:
 - (i) Current and future uses;
 - (ii) Proximity and withdrawal rate of users;
 - (iii) Ground-water quantity and quality;
 - (iv) The potential damage to wildlife, crops, vegetation, and physical structures caused by exposure to waste constituent;
 - (v) The hydrogeologic characteristic of the unit and surrounding land;
 - (vi) Ground-water removal and treatment costs; and
 - (vii) The cost and availability of alternative water supplies.
 - (7) Practicable capability of the owner or operator.
 - (8) Other relevant factors.
- (e) The Director of an approved State may determine that remediation of a release of an appendix II (Appendix II of 40 CFR part 258) constituent from the unit is not necessary if the owner or operator demonstrates to the Director of the approved state that:
- (1) The ground-water is additionally contaminated by substances that have originated from a source other than the unit and those substances are present in concentrations such that cleanup of the release from the unit would provide no significant reduction in risk to actual or potential receptors; or

(2) The constituent(s) is present in ground water that:

- (i) Is not currently or reasonably expected to be a source of drinking water; and
- (ii) Is not hydraulically connected with waters to which the hazardous constituents are migrating or are likely to migrate in a concentration(s) that would exceed the ground-water protection standards established under Sec. 257.25 (h) or (i); or

(3) Remediation of the release(s) is technically impracticable; or

(4) Remediation results in unacceptable cross-media impacts.

(f) A determination by the Director of an approved State pursuant to paragraph (e) of this section shall not affect the authority of the State to require the owner or operator to undertake source control measures or other measures that may be necessary to eliminate or minimize further releases to the ground-water, to prevent exposure to the ground-water, or to remediate the ground-water to concentrations that are technically practicable and significantly reduce threats to human health or the environment.

Sec. 257.28 Implementation of the corrective action program.

(a) Based on the schedule established under Sec. 257.27(d) for initiation and completion of remedial activities the owner/operator must:

(1) Establish and implement a corrective action ground-water monitoring program that:

- (i) At a minimum, meets the requirements of an assessment monitoring program under Sec. 257.25;
- (ii) Indicates the effectiveness of the corrective action remedy; and
- (iii) Demonstrates compliance with ground-water protection standard pursuant to paragraph (e) of this section.

(2) Implement the corrective action remedy selected under Sec. 257.27; and

(3) Take any interim measures necessary to ensure the protection of human health and the environment. Interim measures should, to the greatest extent practicable, be consistent with the objectives of and contribute to the performance of any remedy that may be required pursuant to Sec. 257.27. The following factors must be considered by an owner or operator in determining whether interim measures are necessary:

- (i) Time required to develop and implement a final remedy;
- (ii) Actual or potential exposure of nearby populations or environmental receptors to hazardous constituents;
- (iii) Actual or potential contamination of drinking water supplies or sensitive ecosystems;
- (iv) Further degradation of the ground-water that may occur if remedial action is not initiated expeditiously;
- (v) Weather conditions that may cause hazardous constituents to migrate or be released;
- (vi) Risks of fire or explosion, or potential for exposure to hazardous constituents as a result of an accident or failure of a container or handling system; and
- (vii) Other situations that may pose threats to human health and the environment.

(b) An owner or operator may determine, based on information developed after implementation of the remedy has begun or other information, that compliance with requirements of Sec. 257.27(b) are not being achieved through the remedy selected. In such cases, the owner or operator must implement other methods or techniques that could practicably achieve compliance with the requirements, unless the owner or operator makes the determination under Sec. 257.28(c).

- (c) If the owner or operator determines that compliance with requirements under Sec. 257.27(b) cannot be practically achieved with any currently available methods, the owner or operator must:
- (1) Obtain certification of a qualified ground-water scientist or approval by the Director of an approved State that compliance with requirements under Sec. 257.27(b) cannot be practically achieved with any currently available methods;
 - (2) Implement alternate measures to control exposure of humans or the environment to residual contamination, as necessary to protect human health and the environment; and
 - (3) Implement alternate measures for control of the sources of contamination, or for removal or decontamination of equipment, units, devices, or structures that are:
 - (i) Technically practicable; and
 - (ii) Consistent with the overall objective of the remedy.
 - (4) Notify the State Director within 14 days that a report justifying the alternative measures prior to implementing the alternative measures has been placed in the operating record.
- (d) All solid wastes that are managed pursuant to a remedy required under Sec. 257.27, or an interim measure required under Sec. 257.28(a)(3), shall be managed in a manner:
- (1) That is protective of human health and the environment; and
 - (2) That complies with applicable RCRA requirements.
- (e) Remedies selected pursuant to Sec. 257.27 shall be considered complete when:
- (1) The owner or operator complies with the ground-water protection standards established under Secs. 257.25 (h) or (i) at all points within the plume of contamination that lie beyond the ground-water monitoring well system established under Sec. 257.22(a).
 - (2) Compliance with the ground-water protection standards established under Secs. 257.25 (h) or (i) has been achieved by demonstrating that concentrations of appendix II (Appendix II of Part 258) constituents have not exceeded the ground-water protection standard(s) for a period of three consecutive years using the statistical procedures and performance standards in Sec. 257.23 (g) and (h). The Director of an approved State may specify an alternative length of time during which the owner or operator must demonstrate that concentrations of appendix II (Appendix II of 40 CFR part 258) constituents have not exceeded the ground-water protection standard(s) taking into consideration:
 - (i) Extent and concentration of the release(s);
 - (ii) Behavior characteristics of the hazardous constituents in the ground-water;
 - (iii) Accuracy of monitoring or modeling techniques, including any seasonal, meteorological, or other environmental variabilities that may affect the accuracy; and
 - (iv) Characteristics of the ground-water.
 - (3) All actions required to complete the remedy have been satisfied.
- (f) Upon completion of the remedy, the owner or operator must notify the State Director within 14 days that a certification that the remedy has been completed in compliance with the requirements of Sec. 257.28(e) has been placed in the operating record. The certification must be signed by the owner or operator and by a qualified ground-water scientist or approved by the Director of an approved State.

Sec. 257.29 [Reserved]

Recordkeeping Requirements

Sec. 257.30 Recordkeeping requirements.

- (a) The owner/operator of a non-municipal non-hazardous waste disposal unit must record and retain near the facility in an operating record or in an alternative location approved by the Director of an approved State the following information as it becomes available:
 - (1) Any location restriction demonstration required under Secs. 257.7 through 257.12; and
 - (2) Any demonstration, certification, finding, monitoring, testing, or analytical data required in Secs. 257.21 through 257.28.
- (b) The owner/operator must notify the State Director when the documents from paragraph (a) of this section have been placed or added to the operating record, and all information contained in the operating record must be furnished upon request to the State Director or be made available at all reasonable times for inspection by the State Director.
- (c) The Director of an approved State can set alternative schedules for recordkeeping and notification requirements as specified in paragraphs (a) and (b) of this section, except for the notification requirements in Sec. 257.25(g)(1)(iii).

Appendix I to Part 257--Maximum Contaminant Levels (MCLs)

Maximum Contaminant Levels (MCLs) Promulgated Under the Safe Drinking Water Act

| Chemical | CAS No. | MCL (mg/l) |
|---|-----------|------------|
| Arsenic..... | 7440-38-2 | 0.05 |
| Barium..... | 7440-39-3 | 1.0 |
| Benzene..... | 71-343-2 | 0.005 |
| Cadmium..... | 7440-43-9 | 0.01 |
| Carbon tetrachloride..... | 56-23-5 | 0.005 |
| Chromium (hexavalent)..... | 7440-47-3 | 0.05 |
| 2,4-Dichlorophenoxy acetic acid..... | 94-75-7 | 0.1 |
| 1,4-Dichlorobenzene..... | 106-46-7 | 0.075 |
| 1,2-Dichloroethane..... | 107-06-2 | 0.005 |
| 1,1-Dichloroethylene..... | 75-35-4 | 0.007 |
| Endrin..... | 75-20-8 | 0.0002 |
| Fluoride..... | 7 | 4.0 |
| Lindane..... | 58-89-9 | 0.004 |
| Lead..... | 7439-92-1 | 0.05 |
| Mercury..... | 7439-97-6 | 0.002 |
| Methoxychlor..... | 72-43-5 | 0.1 |
| Nitrate..... | | 10.0 |
| Selenium..... | 7782-49-2 | 0.01 |
| Silver..... | 7440-22-4 | 0.05 |
| Toxaphene..... | 8001-35-2 | 0.005 |
| 1,1,1-Trichloroethane..... | 71-55-6 | 0.2 |
| Trichloroethylene..... | 79-01-6 | 0.005 |
| 2,4,5-Trichlorophenoxy acetic acid..... | 93-76-5 | 0.01 |

Vinyl chloride..... 75-01-4 0.002

[56 FR 51016, Oct. 9, 1991]

Appendix II to Part 257

A. Processes to Significantly Reduce Pathogens

- **Aerobic digestion:** The process is conducted by agitating sludge with air or oxygen to maintain aerobic conditions at residence times ranging from 60 days at 15 deg. C to 40 days at 20 deg. C, with a volatile solids reduction of at least 38 percent.
- **Air Drying:** Liquid sludge is allowed to drain and/or dry on under-drained sand beds, or paved or unpaved basins in which the sludge is at a depth of nine inches. A minimum of three months is needed, two months of which temperatures average on a daily basis above 0 deg. C.
- **Anaerobic digestion:** The process is conducted in the absence of air at residence times ranging from 60 days at 20 deg. C to 15 days at 35 deg. to 55 deg. C, with a volatile solids reduction of at least 38 percent.
- **Composting:** Using the within-vessel, static aerated pile or windrow composting methods, the solid waste is maintained at minimum operating conditions of 40 deg. C for 5 days. For four hours during this period the temperature exceeds 55 deg. C.
- **Lime Stabilization:** Sufficient lime is added to produce a pH of 12 after 2 hours of contact.
- **Other methods:** Other methods or operating conditions may be acceptable if pathogens and vector attraction of the waste (volatile solids) are reduced to an extent equivalent to the reduction achieved by any of the above methods.

B. Processes to Further Reduce Pathogens

- **Composting:** Using the within-vessel composting method, the solid waste is maintained at operating conditions of 55 deg. C or greater for three days. Using the static aerated pile composting method, the solid waste is maintained at operating conditions of 55 deg. C or greater for three days. Using the windrow composting method, the solid waste attains a temperature of 55 deg. C or greater for at least 15 days during the composting period. Also, during the high temperature period, there will be a minimum of five turnings of the windrow.
- **Heat drying:** Dewatered sludge cake is dried by direct or indirect contact with hot gases, and moisture content is reduced to 10 percent or lower. Sludge particles reach temperatures well in excess of 80 deg. C, or the wet bulb temperature of the gas stream in contact with the sludge at the point where it leaves the dryer is in excess of 80 deg. C.
- **Heat treatment:** Liquid sludge is heated to temperatures of 180 deg. C for 30 minutes.
- **Thermophilic Aerobic Digestion:** Liquid sludge is agitated with air or oxygen to maintain aerobic conditions at residence times of 10 days at 55-60 deg. C, with a volatile solids reduction of at least 38 percent.
- **Other methods:** Other methods or operating conditions may be acceptable if pathogens and vector attraction of the waste (volatile solids) are reduced to an extent equivalent to the reduction achieved by any of the above methods.

- Any of the processes listed below, if added to the processes described in Section A above, further reduce pathogens. Because the processes listed below, on their own, do not reduce the attraction of disease vectors, they are only add-on in nature.
- Beta ray irradiation: Sludge is irradiated with beta rays from an accelerator at dosages of at least 1.0 megarad at room temperature (ca. 20 deg. C).
- Gamma ray irradiation: Sludge is irradiated with gamma rays from certain isotopes, such as ^{60}Co , Cobalt and ^{137}Cs , Cesium, at dosages of at least 1.0 megarad at room temperature (ca. 20 deg. C).
- Pasteurization: Sludge is maintained for at least 30 minutes at a minimum temperature of 70 deg. C.
- Other methods: Other methods or operating conditions may be acceptable if pathogens are reduced to an extent equivalent to the reduction achieved by any of the above add-on methods.