

Code of Federal Regulations  
Title 40  
Chapter 1- Environmental Protection Agency  
Subchapter O- Sewage Sludge  
Part 503 Standards for the Use or Disposal of Sewage Sludge

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Subpart A- General Provisions

§503.1 Purpose and applicability

- (a)-(b) General applications for these regulations

§503.2 Compliance Period

- (a)-(c) Regulations came into effect 1993

§503.3 Permits and direct enforceability

- (a) Permits must be obtained

§503.4 Relationship to other regulations

Only pertinent to disposal of sewage sludge in municipal solid waste landfill unit.

§503.5 Additional or more stringent requirements

(a) The permitting authority may impose more strict regulations when necessary to protect public health and the environment from any adverse effect of a pollutant in the sewage sludge

(b) Nothing in this part precludes State or political subdivision thereof from imposing requirements more stringent than mentioned here

§ 503.6 Exclusions

(a) This part does not establish regulations for treatment of domestic sewage prior disposal or use except as provided in §503.32 and §503.33

(b) The selection of a use or disposal practice is not regulated in this part, it is a local decision

(c) N/A (re: Incineration)

(d) N/A (re: Industrial facility sludge)

(e) N/A (re: Hazardous sewage sludge)

(f) This part does not establish regulations for sewage sludge with high PCB (polychlorinated biphenyls)

(g) N/A (re: Incinerator ash)

(h) N/A (re: Grit screenings)

(i) N/A (re: Drinking water treatment of sewage sludge)

(j) This part does not establish requirements for the use or disposal of commercial, industrial, or a mix thereof of septage

§503.7 Requirement for a person who prepares sewage sludge

Any person who prepares sewage sludge shall ensure that all applicable requirements when sewage sludge is applied to the land are met

#### §503.8 Sampling and analysis

(a) Samples of sewage sludge applied to the land must be collected and analyzed

(b) Materials:

(1)-(7) Specific standard test methods needed to be performed (pg 281-282)

#### §503.9 General definitions

(a)-(bb) general definitions used throughout document

### Subpart B- Land Application

#### §503.10 Applicability

(a) This subpart applies to anyone who prepares sewage sludge, applies sewage sludge to the land, and the land where it is applied

(b)(1) Section 502.12 and 503.14 do not apply when bulk sewage sludge is applied to land and if sewage sludge *meets pollutant concentrations in Section 503.13(b)(3)*, the *Class A pathogen requirements in Section 503.32(a)*, and one of the vector attraction reduction requirements in *Section 503.33(b)(1) through (b)(8)*

(2) The Regional Administrator of the EPA may apply any or all of the requirements in §503.12 and management practices in §503.14 to the bulk sewage sludge in §503.10(b)(1)

(c)(1) The general requirements in §503.12 and §503.14 do not apply when a bulk material derived from sewage sludge meets the requirements for pollutant concentrations in §503.13(b)(1) and Class A pathogen requirements in §503.32(a) and one of the vector attraction reduction requirements in §503.33(b)(1) through (b)(8)

(2) The Regional Administrator of EPA may apply any or all of the general requirements after determining the need to protect public health and the environment

(d) The requirements in this subpart do not apply when a bulk material derived from sewage sludge is applied to the land if the sewage sludge from which the bulk material is derived meets the pollutant concentrations; Class A pathogen requirements and one of the vector attraction reduction requirements

(e)-(g) Requirements regarding selling or giving away in a bag or different container of sewage sludge

#### §503.11 Special Definitions

(a)-(n) *Annual pollutant loading rate*: maximum amount of a pollutant that can be applied to a unit area of land during a 365 day period

*Annual whole sludge application rate*: maximum amount of sewage sludge (dry weight basis) that can be applied to a unit area of land during a 365 day period

*Bulk sewage sludge*: sewage sludge that is not sold or given away in a bag or other container for application to the land

*Cumulative pollutant loading rate*: maximum amount of an inorganic pollutant that can be applied to an area of land

#### §503.12 General Requirements

(a) No person shall apply sewage sludge to the land except in accordance with the requirements in this subpart

(b) No person shall apply bulk sewage sludge subject to cumulative pollutant loading rates in 503.13(b)(2) if *any* of the cumulative pollutant loading rates have been reached

(c) No person shall apply domestic septage to land during a 365 day period if the annual application rate has been reached during that period

(d) Preparers of bulk sewage sludge must provide written notification of the concentration of total nitrogen to the person who applies the sewage to the land

(e)(1) The person who applies sludge to the land shall obtain information needed to comply with the requirements in this subpart

(2)(i) Before sewage sludge subject to cumulative pollutant loading rates in §503.13(b)(2) is applied to the land, the person who proposes to apply the sewage sludge must contact the permitting authority for the State to determine whether bulk sewage sludge subject to the cumulative pollutant loading rates have been applied to the site since July 20, 1993.

(ii) If bulk sewage sludge subject to the cumulative loading rates has not been applied since July 20, 1993, the cumulative amount for each pollutant may be applied to the site in accordance with §503.13(a)(2)(i)

(iii) If bulk sewage sludge subject to the cumulative loading rates have been applied to the site since July 20, 1993, the cumulative amount of each pollutant that can be applied to the site in accordance with §503.13(a)(2)(i) shall be determined

(iv) If bulk sewage sludge subject to the cumulative loading rates have been applied to the site since July 20, 1993, and the cumulative amount of each pollutant applied to the site since that date is not known, an additional amount of each pollutant shall not be applied to the site in accordance with §502.12(a)(2)(i)

(f) The person who applies sewage sludge to be applied to land must supply the person applying the sludge to the land with notice and necessary information to comply with requirements in this subpart

(g) If a person who supplies sewage sludge provides sewage sludge to another person who prepares sewage sludge, the person providing the sewage sludge must supply the notice and necessary information to comply with requirements in this subpart

(h) The person who applies sewage sludge to the land will provide the owner or lease holder of the land notice and necessary information to comply with requirements in this subpart

(i) Any person who prepares sewage sludge to be applied in a state other than the state in which it was prepared in will provide notice, prior to the application to the permitting authority of the state in which the bulk sewage sludge is proposed to be applied

(j) Any person who applies bulk sewage sludge subject to the cumulative loading rates to the land shall provide written notice, prior to the land application of bulk sewage sludge to the permitting authority for the state in which the bulk sewage sludge will be applied and the permitting authority shall retain and provide access to the notice

#### §503.13 Pollutant limits

(a) (1) Sewage sludge (bulk or sold in a bag or container) shall not be applied to land if the concentration of any pollutant in the sewage sludge exceeds the ceiling concentration for the pollutant in Table 1 of §503.13.

(2) If bulk sewage sludge is applied to agricultural land, forest, a public contact site or a reclamation site either:

(i) the cumulative loading rate for each pollutant shall not exceed loading rate for each pollutant, Table 2

(ii) the concentration of each pollutant shall not exceed the concentration in Table 3

(3) If bulk sewage sludge is applied to a lawn or home garden, the concentration of each pollutant shall not exceed the concentrations in Table 3 of §503.13

(4) If sewage sludge is sold or given away in a bag or other container for application to the land, either:

(i) the concentration of each pollutant shall not exceed the concentration for the pollutant in Table 3

(ii) the product of the concentration of each pollutant in the sewage sludge and the annual whole sludge application rate for the sewage sludge shall not cause the annual pollutant loading rate for the pollutant in Table 4 to be exceeded. The procedure to determine annual whole sludge application rate is in Appendix A.

Table 1 of § 503.13. – Ceiling Concentrations

Pollutant	Ceiling concentration (milligrams per kilogram) <sup>1</sup>
Arsenic .....	75
Cadmium .....	85
Chromium .....	3000
Copper .....	4300
Lead .....	840
Mercury .....	57
Molybdenum .....	75
Nickel .....	420
Selenium .....	100
Zinc .....	7500

<sup>1</sup> Dry weight basis.

(2) Cumulative pollutant loading rates.

Table 2 of § 503.13. – Cumulative Pollutant Loading Rates

Pollutant	Cumulative pollutant loading rate (kilograms per hectare)
Arsenic .....	41
Cadmium .....	39
Chromium .....	3000
Copper .....	1500
Lead .....	300

Pollutant	Cumulative pollutant loading rate (kilograms per hectare)
Mercury .....	17
Molybdenum .....	18
Nickel .....	420
Selenium .....	100
Zinc .....	2800

(3) Pollutant concentrations.

Table 3 of § 503.13 – Pollutant Concentrations

Pollutant	Monthly average concentrations (milligrams per kilogram) <sup>1</sup>
Arsenic .....	41
Cadmium .....	39
Chromium .....	1200
Copper .....	1500
Lead .....	300
Mercury .....	17
Molybdenum .....	18
Nickel .....	420
Selenium .....	36
Zinc .....	2800

<sup>1</sup> Dry weight basis.

(4) Annual pollutant loading rates.

Table 4 of § 503.13 – Annual Pollutant Loading Rates

Pollutant	Annual pollutant loading rate (kilograms per hectare per 365 day period)
Arsenic .....	2.0
Cadmium .....	1.9
Chromium .....	150
Copper .....	75
Lead .....	15
Mercury .....	0.85
Molybdenum .....	0.90
Nickel .....	21
Selenium .....	5.0
Zinc .....	140

\*Table 4 is only applicable if sewage sludge is sold in separate containers for home garden/lawn usage

(c) Domestic septage: The annual application rate for domestic septage applied to agricultural land, forest, or a reclamation site shall not exceed the annual application rate calculated using equation (1)  $AAR = N / 0.0026$  where AAR=annual application rate in gallons per acre per 365 day period and N=amount of nitrogen in pounds per acre per 365 day period needed by the crop or vegetation grown on the land

§503.14 Management Practices

(a) Bulk sewage sludge shall not be applied to land if it threatens endangered species under section 4 of the Endangered Species Act

(b) Bulk sewage sludge shall not be applied to a site that is flooded, frozen, or snow-covered so that sewage sludge enters a wetland or other US waters

(c) Bulk sewage sludge shall not be applied to a site that is 10 meters or less from waters of the US unless otherwise specified by permitting authority

(d) Bulk sewage sludge shall be applied to agricultural land, forest, public contact site or a reclamation site at a whole sludge application rate that is equal to or less than the agronomic rate unless specified by the permitting authority

(e) Sewage sludge that is sold or given away shall have a label or information sheet

§ 503.15 Operational standards- pathogens and vector attraction reduction

(a) Pathogens- sewage sludge

(1) The Class A pathogen requirements in §503.32(a) or Class B pathogen requirements in §503.32(b) shall be met when bulk sewage sludge is applied to land

(2) Class A pathogen requirements in §503.32(a) shall be met when bulk sewage sludge is applied to a lawn or home garden

(3) Class A pathogen requirements in §503.32(a) shall be met when bulk sewage sludge is sold or given away for land application

- (b) Pathogens- domestic septage- requirements in §503.32 (c)(1) or (c)(2) shall be met when domestic septage is applied to land
- (c) Vector attraction reduction-sewage sludge
  - (1) One of the vector attraction reduction requirements in §503.33 (b)(1) through (b)(10) will be met when bulk sewage sludge is applied to land
  - (2) One of the vector attraction reduction requirements in §503.33(b)(1) through (b)(8) shall be met when bulk sewage sludge is applied to a lawn or home garden
  - (3) One of the vector attraction reduction requirements in §503.33(b)(1) through (b)(8) shall be met when bulk sewage sludge is sold or given away in a bag or other container for application to the land
  - (d) Vector attraction reduction- domestic septage: requirements in §503.33 (b)(9), (b)(10) or (b)(12) shall be met when domestic septage is applied to land

§503.16 Frequency of monitoring

- (a) Sewage Sludge (1) The frequency of monitoring of pollutants is outlined in Table 1, 2, 3 and 4 of §503.13; pathogen density requirements in §503.32(a) and §503.33(b)(2) through (b)(4); vector attraction reduction requirements in §503.33(b)(1) through (b)(8) shall be the frequency in Table 1 of §503.16

**Table. 1 of § 503.16. – Frequency of Monitoring – Land Application**

Amount of sewage sludge <sup>1</sup> (metric tons per 365 day period)	Frequency
Greater than zero but less than 290	Once per year
Equal to or greater than 290 but less than 1,500	Once per quarter (four times per year)
Equal to or greater than 1,500 but less than 15,000	Once per 60 days (six times per year)
Equal to or greater than 15,000	Once per month (12 times per year)

<sup>1</sup> Either the amount of bulk sewage sludge applied to the land or the amount of sewage sludge received by a person who prepares sewage sludge that is sold or given away in a bag or other container for application to the land (dry weight basis).

- (2) After 2 years at the frequency shown in Table 1, the permitting authority may reduce frequency for monitoring pollutant and pathogen concentrations, but never less than once per year
- (b) N/A Domestic Septage

**§503.17 Recordkeeping**

**§503.18 Reporting**

- (a) Class I sludge management facilities with flow rate equal to or greater than one million gallons per day....(not applicable to thermopile project)

§503.32 Pathogens

- (a) Sewage Sludge- Class A (1) The requirements in §503.32(a)(2) and the requirements in either (a)(3) through (a)(8) shall be met for sewage sludge to be classified as Class A in regards to pathogens
- (2) Class A pathogen requirements must be met either prior to meeting or at the same time the vector attraction reduction requirements in §503.33, except the vector attraction reduction requirements in §503.33(b)(6) through (b)(8), are met
- (3) Class A-Alternative 1
  - (i) either the density of fecal coliform in the sewage sludge is less than 1000 Most Probable Number per gram of total solids (dry weight) or the density of Salmonella sp. In

the sewage sludge is less than three Most Probably Number per four grams of total solids (dry weight) at the time the sewage is used or disposed.

(ii) The temperature of the sewage sludge that is used or disposed shall be maintained at a specific value for a period of time

(a) When the % solids of the sewage sludge is 7% or higher, the temperature of the sewage sludge shall be 50 C or higher for 20 minutes or longer. Temperature and time period shall be determined using this equation: (except when small particles of sludge are heated by either warmed gases or an immiscible liquid)

$$D = \frac{131,700,000}{10^{0.1400t}} \quad \text{Eq. (2)}$$

Where,

D=time in days.

t=temperature in degrees Celsius.

(b) When the % solids of the sewage sludge is 7% or higher and small particles of the sewage sludge are heated by either warmed gases or an immiscible liquid, the temperature of the sewage sludge shall be 50 C or higher for 15 seconds or longer. Temperature and time shall be determined by Eq. (2) above

(4) Class A-Alternative 2

(i) either the density of fecal coliform in the sewage sludge is less than 1000 Most Probable Number per gram of total solids (dry weight) or the density of Salmonella sp. In the sewage sludge is less than three Most Probably Number per four grams of total solids (dry weight) at the time the sewage is used or disposed.

(ii)(a) the pH of the sewage sludge shall be raised to above 12 and remain above 12 for 72 hours

(b) The temperature of the sewage sludge shall be above 52 C for 12 hours or longer during the period where the pH is above 12

(c) At the end of the 72 hours, the sewage sludge will be air dried to achieve a % solids greater than 50%

(5) Class A- Alternative 3

(i) either the density of fecal coliform in the sewage sludge is less than 1000 Most Probable Number per gram of total solids (dry weight) or the density of Salmonella sp. In the sewage sludge is less than three Most Probably Number per four grams of total solids (dry weight) at the time the sewage is used or disposed.

(ii)(a) The sewage sludge shall be analyzed prior to pathogen treatment to determine whether the sewage sludge contains enteric viruses

(b) When the density of enteric viruses in the sewage sludge is less than one Plaque-forming Unit per four grams of total solids (dry weight), the sewage sludge is Class A with respect to enteric viruses until the next monitoring episode for the sewage sludge

(c) When the density of enteric viruses in the sewage sludge is equal to or greater than one Plaque-forming Unit per four grams of total solids (dry weight), the sewage sludge is Class A with respect to enteric viruses when the density of enteric viruses in the sewage sludge after pathogen treatment is less than one Plaque-forming Unit per four grams of total solids

(iii)(a) The sewage sludge shall be analyzed prior to pathogen treatment to determine whether the sewage sludge contains viable helminth ova

(b) When the density of viable helminth ova is less than one per four grams of total solids (dry weight) the sewage sludge is Class A with respect to viable helminth ova

(c) When the density of viable helminth ova prior to pathogen treatment is equal to or greater than one gram per four solids (dry), the sewage sludge is Class A with respect to viable helminth ova when the density of helminth ova in the sludge after pathogen treatment is less than one per four grams of total solids

(d) After helminth ova reduction is achieved in the above part, the sewage sludge continues to be Class A when the values for the pathogen treatment process operating parameters are consistent with the values or ranges of values documented in the above paragraph

(6) Class A-Alternative 4 (i) Either the density of fecal coliform in the sewage sludge shall be less than 1000 Most Probable Number per gram of total solids (dry weight), or the density of Salmonella sp. Bacteria in the sewage sludge shall be less than three Most Probable Number per four grams of total solids (dry weight) at the time the sewage sludge is used or disposed; at the time sewage sludge is prepared for sale or give away for land application; or at the time the sewage sludge or material derived from sewage sludge is prepared to meet the requirements in §503.10 (b), (c), (e) or (f).

(ii) The density of enteric viruses in the sewage sludge must be less than one Plaque-forming Unit per four grams of total solids (dry) at the time it is disposed; at the time it is prepared for sale or give away in a bag or other container for land application; or at the time the sewage sludge or material derived from sewage sludge is prepared to meet the requirements in §503.10 (b), (c), (e), or (f), unless otherwise specified by permitting authority.

(iii) The density of viable helminth ova in the sewage sludge shall be less than one per four grams of total solids (dry) at the time it is disposed; at the time it is prepared for sale or give away in a bag or other container for land application; or at the time sewage sludge or material derived from sewage sludge is prepared to meet the requirements in §503.10 (b), (c), (e), or (f), unless otherwise specified by permitting authority.

(7) Class A- Alternative 5 (i) Either the density of fecal coliform in the sewage sludge shall be less than 1000 Most Probable Number per gram of total solids (dry weight), or the density of Salmonella sp. Bacteria in the sewage sludge shall be less than three Most Probable Number per four grams of total solids (dry weight) at the time the sewage sludge is used or disposed; at the time sewage sludge is prepared for sale or give away for land application; or at the time the sewage sludge or material derived from sewage sludge is prepared to meet the requirements in §503.10 (b), (c), (e) or (f).

(ii) Sewage sludge that is used or disposed shall be treated in one of the Processes to Further Reduce Pathogens described in Appendix B of this part

(8) Class A- Alternative 6 (i) Either the density of fecal coliform in the sewage sludge shall be less than 1000 Most Probable Number per gram of total solids (dry weight), or the density of Salmonella sp. Bacteria in the sewage sludge shall be less than three Most Probable Number per four grams of total solids (dry weight) at the time the sewage sludge is used or disposed; at the time sewage sludge is prepared for sale or give



away for land application; or at the time the sewage sludge or material derived from sewage sludge is prepared to meet the requirements in §503.10 (b), (c), (e) or (f).

(ii) Sewage sludge that is used or disposed shall be treated in a process that is equivalent to a Process to Further Reduce Pathogens, as determined by the permitting authority.

(b) Sewage sludge- Class B

(1)(i) The requirements in either §503.32(b)(2), (b)(3), or (b)(4) shall be met for a sewage sludge to be classified Class B with respect to pathogens.

(ii) The site restrictions in §503.32(b)(5) shall be met when sewage sludge that meets the Class B pathogen requirements in §503.(b)(2), (b)(3) or (b)(4) is applied to the land.

(2) Class B- Alternative 1 (i) Seven samples shall be collected at the time the sewage sludge is used or disposed

(ii) The geometric mean of the density of fecal coliform in the samples collected in ¶2(b)(2)(i) of this section shall be less than either 2,000,000 Most Probable Number per gram of total solids (dry weight) OR 2,000,000 Colony Forming Units per gram of total solids (dry weight)

(3) Class B- Alternative 2 Sewage sludge that is used or disposed shall be treated in one of the Processes to Significantly Reduce Pathogens described in appendix B of this part

(4) Class B- Alternative 3 Sewage sludge that is used or disposed shall be treated in a process that is equivalent to a Process to Significantly Reduce Pathogens, as determined by the permitting authority

(5) Site Restrictions (i) Food crops with harvested parts that touch the sewage sludge/soil mixture are totally above the land surface shall not be harvested for 14 months after application of sewage sludge

(ii) Food crops with harvested parts below the surface of the land shall not be harvested for 20 months after the application of sewage sludge when the application remains on the land surface for four months or longer prior to incorporation into the soil

(iii) Food crops with harvested parts below the surface of the land shall not be harvested for 38 months after application of sewage sludge when the application remains on the land surface for four months or longer prior to incorporation into the soil

(iv) Food crops, feed crops, and fiber crops shall not be harvested for 30 days after application of sewage sludge

(v) Animals shall not be allowed to graze on the land for 30 days after the application of sewage sludge

(vi) Turf grown on land where sewage sludge applied shall not be harvested for one year after application when the harvested turf is placed either on land with a high potential for public exposure or a lawn, unless otherwise specified by the permitting authority

(vii) Public access to land with a high potential for public exposure shall be restricted for one year after application of sewage sludge

(viii) Public access to land with a low potential for public exposure shall be restricted for 30 days after application of sewage sludge

(c) Domestic septage (1) The site restrictions in §503.32(b)(5) shall be met when domestic septage is applied to agricultural land, forest or a reclamation site; or

(2) The pH of domestic septage applied to agricultural land, forest, or a reclamation site shall be raised to 12 or higher by alkali addition and, without the addition of more alkali, shall remain at 12 or higher for 30 minutes and the site restrictions in §503.32(b)(5)(i) through (b)(5)(iv) shall be met

#### §503.33 Vector attraction reduction

(a)(1) One of the vector attraction reduction requirements in §503.33(b)(1) through (b)(10) shall be met when bulk sewage sludge is applied to agricultural land, forest, a public contact site, or a reclamation site

(2) One of the vector attraction reduction requirements in §503.33(b)(1) through (b)(8) shall be met when bulk sewage sludge is applied to a lawn or a home garden

(3) One of the vector attraction reduction requirements in §503.33(b)(1) through (b)(8) shall be met when bulk sewage sludge is sold or given away in a bag or other container for application to the land

(4) N/A placement on an active sewage sludge unit

(5) One of the vector attraction reduction requirements in §503.33(b)(9), (b)(10), or (b)(12) shall be met when domestic septage is applied to land and one of the vector attraction reduction requirements in §503.33(b)(9) through (b)(12) shall be met when domestic septage is placed on an active sewage sludge unit

(b)(1) The mass of volatile solids in sewage sludge shall be reduced by a minimum of 38% (calculation located in EPA-625/R-92/013)

(2) When the 38% volatile solids reduction requirement cannot be met for anaerobically digested sewage sludge, vector attraction reduction can be demonstrated by digesting a portion of the previously digested sewage sludge anaerobically in the lab in a bench-scale unit for 40 additional days at a temperature between 30-37 C. When at the end of the 40 days, the volatile solids in the sewage sludge at the beginning of that period is reduced by less than 17%, vector attraction is achieved

(3) When the 38% volatile solids reduction requirement cannot be met for anaerobically digested sewage sludge, vector attraction reduction can be demonstrated by digesting a portion of the previously digested sewage sludge that has a percent solids of 2% or less aerobically in the laboratory in a bench-scale unit for 30 additional days at 20 C. When at the end of the 30 days, the volatile solids in the sewage sludge at the beginning of that period is reduced by less than 15%, vector attraction is achieved.

(4) The specific oxygen uptake rate (SOUR) for sewage sludge treated in an aerobic process shall be equal to or less than 1.5mg of O<sub>2</sub> per hour per gram of total solids (dry) at a temperature of 20 C.

(5) Sewage sludge shall be treated in an aerobic process for 14 days or longer. During that time, the temperature of the sewage sludge shall be higher than 40 C and the average temperature of the sewage sludge shall be higher than 45 C.

(6) the pH of the sewage sludge shall be raised to 12 or higher by alkali addition and, without the addition of more alkali, shall remain at 12 or higher for 2 hours and then at 11.5 or higher for an additional 22 hours

(7) The % solids of sewage sludge that does not contain unstabilized solids generated in a primary wastewater treatment process shall be equal to or greater than 75% based on the moisture content and total solids prior to mixing with other materials

(8) The % solids of sewage sludge that contains unstabilized solids generated in a primary wastewater treatment process shall be equal to or greater than 90% based on the moisture content and total solids prior to mixing with other materials

(9)(i) Sewage sludge shall be injected below the surface of the land

(ii) No significant amount of sewage sludge shall be present on the land surface within one hour after the sewage sludge is injected

(iii) When the sewage sludge is injected below the surface of the land is Class A with respect to pathogens, the sewage sludge shall be injected below the land surface within 8 hours of being discharged from the pathogen process

(10)(i) Sewage sludge applied to the land surface or placed on a surface disposal site shall be incorporated into the soil within 6 hours after application to or placement on the land

(ii) When sewage sludge that is incorporated into the soil is Class A with respect to pathogens, the sewage sludge shall be applied to or placed on the land within 8 hours after being discharged from the pathogen treatment process

(11) Sewage sludge placed on an active sewage sludge unit shall be covered with soil or other material at the end of each operating day

(12) the pH of domestic septage shall be raised to 12 or higher by alkali addition and, without the addition of more alkali, shall remain at 12 or higher for 30 minutes

#### **Appendix A** to Part 503- Procedure to Determine the Annual Whole Sludge Application Rate for a Sewage Sludge (AWSAR)

The relationship between the annual pollutant loading rate (APLR) for a pollutant and the annual whole sludge application rate (AWSAR) for a sewage sludge is shown in equation (1):

$$APLR=C \times AWSAR \times 0.001 \quad (1)$$

Where:

APLR= annual pollutant loading rate in kilograms per hectare per 365 day period

C= pollutant concentration in milligrams per kilogram of total solids (dry)

AWSAR= annual whole sludge application rate

0.001= conversion factor

To determine AWSAR, equation (1) is rearranged into equation (2)

$$AWSAR= APLR/C \times 0.001 \quad (2)$$

The procedure used to determine the AWSAR for a sewage sludge is presented below:  
Procedure:

- (1) Analyze a sample of the sewage sludge to determine the concentration for each of the pollutants listed in Table 4 of §503.13 in the sewage sludge
- (2) Using the pollutant concentrations from Step 1 and the APLRs from Table 4 of §503.13, calculate an AWSAR for each pollutant using equation (2) above.
- (3) The AWSAR for the sewage sludge is the lowest AWSAR calculated in Step 2.

## Appendix B to Part 503- Pathogen Treatment Process

### A. Processes to Significantly Reduce Pathogens (PSRP)

1. Aerobic digestion- Sewage sludge is agitated with air and oxygen to maintain aerobic conditions for a specific mean cell residence time at a specific temperature. Values for the mean cell residence time and temperature shall be between 40 days and 20 C and 60 days at 15 C
2. Air drying- sewage sludge is dried on sand beds or on paved or unpaved basins. The sewage sludge dries for a minimum of 3 months. During 2 of the 3 months, the ambient average daily temperature is above 0 C.
3. Anaerobic digestion- sewage sludge is treated in the absence of air for a specific mean cell residence time at a specific temperature. Values for the mean cell residence time and temperature shall be between 15 days at 35 to 55 C and 60 days at 20 C
4. **Composting- using either the within-vessel, static aerated pile, or windrow composting methods, the temperature of the sewage sludge is raised to 40 C or higher and remains at 40 C or higher for 5 days. For 4 hours out of the 5 days, the temperature in the compost pile exceeds 55 C.**
5. Lime stabilization- Sufficient lime is added to the sewage sludge to raise the pH of the sewage sludge to 12 after 2 hours of contact

### B. Process to Further Reduce Pathogens (PFRP)

1. Composting- Using either the within-vessel composting method or the static aerated pile composting method, the temperature of the sewage sludge is maintained at 55 C or higher for 3 days. Using the windrow composting method, the temperature is maintained at 55 C or higher for 15 days or longer. During these 15 days, there shall be a minimum of 5 turnings of the windrow.
2. Heat drying- sewage sludge is dried by direct or indirect contact with hot gases to reduce moisture content to 10% or lower. Either the temperature of the sewage sludge particles exceeds 80 C or the wet bulb temperature of the gas in contact with the sewage sludge as it leaves the dryer exceeds 80 C
3. Heat treatment- liquid sewage sludge is heated to a temperature of 180 C or higher for 30 minutes
4. Thermophilic aerobic digestion- liquid sewage sludge is agitated with air or oxygen to maintain aerobic conditions and the mean cell residence time of the sewage sludge is 10 days at 55 to 60 C
5. Beta ray irradiation- sewage sludge is irradiated with beta rays from an accelerator at dosages of at least 1.0 megarad at RT (20 C)
6. Gamma ray irradiation- sewage sludge is irradiated with gamma rays from certain isotopes, such as Cobalt 60 and Cesium 137 at RT (20 C)
7. Pasteurization- the temperature of the sewage sludge is maintained at 70 C or higher for 30 minutes or longer