CA

66264.228 Closure and Postclosure Care

(a)

At closure, the owner or operator shall: (1) remove or decontaminate all waste residues, contaminated containment system components (liners, etc.), contaminated subsoils, and structures and equipment contaminated with waste and leachate, and manage them as hazardous waste unless section 66261.3(d) applies; or (2) (A) eliminate free liquids by removing liquid wastes or solidifying the remaining wastes and waste residues; (B) stabilize remaining wastes to a bearing capacity sufficient to support final cover; and (C) cover the surface impoundment with a final cover designed and constructed to:1. prevent the downward entry of water into the closed impoundment throughout a period of at least 100 years; 2. function with minimum maintenance; 3. promote drainage and minimize erosion or abrasion of the final cover; 4. accommodate settling and subsidence so that the cover's integrity is maintained; and 5. have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present; 6. accommodate lateral and vertical shear forces generated by the maximum credible earthquake so that the integrity of the cover is maintained; 7. preclude ponding of rainfall and surface run-on over the closed area.

(1)

remove or decontaminate all waste residues, contaminated containment system

components (liners, etc.), contaminated subsoils, and structures and equipment contaminated with waste and leachate, and manage them as hazardous waste unless section 66261.3(d) applies; or

(2)

(A) eliminate free liquids by removing liquid wastes or solidifying the remaining wastes and waste residues; (B) stabilize remaining wastes to a bearing capacity sufficient to support final cover; and (C) cover the surface impoundment with a final cover designed and constructed to:1. prevent the downward entry of water into the closed impoundment throughout a period of at least 100 years; 2. function with minimum maintenance; 3. promote drainage and minimize erosion or abrasion of the final cover; 4. accommodate settling and subsidence so that the cover's integrity is maintained; and 5. have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present; 6. accommodate lateral and vertical shear forces generated by the maximum credible earthquake so that the integrity of the cover is maintained; 7. preclude ponding of rainfall and surface run-on over the closed area.

(A)

eliminate free liquids by removing liquid wastes or solidifying the remaining wastes and waste residues;

(B)

stabilize remaining wastes to a bearing capacity sufficient to support final cover; and

(C)

cover the surface impoundment with a final cover designed and constructed to:1. prevent the downward entry of water into the closed impoundment throughout a period of at least 100 years; 2. function with minimum maintenance; 3. promote drainage and minimize erosion or abrasion of the final cover; 4. accommodate settling and subsidence so that the cover's integrity is maintained; and 5. have a permeability less than or equal to the

permeability of any bottom liner system or natural subsoils present; 6. accommodate lateral and vertical shear forces generated by the maximum credible earthquake so that the integrity of the cover is maintained; 7. preclude ponding of rainfall and surface run-on over the closed area.

1.

prevent the downward entry of water into the closed impoundment throughout a period of at least 100 years;

2.

function with minimum maintenance;

3.

promote drainage and minimize erosion or abrasion of the final cover;

4.

accommodate settling and subsidence so that the cover's integrity is maintained; and

5.

have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present;

6.

accommodate lateral and vertical shear forces generated by the maximum credible earthquake so that the integrity of the cover is maintained;

7.

preclude ponding of rainfall and surface run-on over the closed area.

(b)

If some waste residues, contaminated materials or contaminated soils are left in place at final closure, the owner or operator shall comply with all postclosure requirements contained in sections 66264.117 through 66264.120, including maintenance and monitoring throughout the postclosure care period (specified in

the permit under section 66264.117). The owner or operator shall:(1) close the facility in a manner that will minimize any chance of postclosure release of hazardous waste or discarded hazardous material; facilitate postclosure maintenance, monitoring and emergency response; and require minimum maintenance of containment structures, leachate collection systems and surface drainage collection or diversion systems; (2) maintain the integrity and effectiveness of the final cover, including making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion or other events; (3) maintain and monitor the leachate collection and removal system which also serves as a leak detection system; (4) maintain and monitor the groundwater monitoring system and comply with all other applicable requirements of article 6 of this chapter; (5) prevent run-on and run-off from eroding or otherwise damaging the final cover, and (6) Maintain and monitor the leak detection system in accordance with sections 66264.221(c)(2)(D) and (c)(3) and 66264.226(d), and comply with all other applicable leak detection system requirements of this chapter;

(1)

close the facility in a manner that will minimize any chance of postclosure release of hazardous waste or discarded hazardous material; facilitate postclosure maintenance, monitoring and emergency response; and require minimum maintenance of containment structures, leachate collection systems and surface drainage collection or diversion systems;

(2)

maintain the integrity and effectiveness of the final cover, including making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion or other events;

(3)

maintain and monitor the leachate collection and removal system which also serves as a leak detection system;

(4)

maintain and monitor the groundwater monitoring system and comply with all other applicable requirements of article 6 of this chapter;

(5)

prevent run-on and run-off from eroding or otherwise damaging the final cover, and

(6)

Maintain and monitor the leak detection system in accordance with sections 66264.221(c)(2)(D) and (c)(3) and 66264.226(d), and comply with all other applicable leak detection system requirements of this chapter;

(c)

(1) If an owner or operator plans to close a surface impoundment in accordance with subsection (a)(1) of this section, then: (A) the closure plan for the impoundment under section 66264.112 shall include both a plan for complying with subsection (a)(1) of this section and a contingent plan for complying with subsection (a)(2) of this section in case not all contaminated subsoils can be practicably removed at closure; and (B) the owner or operator shall prepare a contingent postclosure plan under section 66264.118 for complying with subsection (b) of this section in case not all contaminated subsoils can be practicably removed at closure. (2) The cost estimates calculated under sections 66264.142 and 66264.144 for closure and postclosure care of an impoundment subject to this paragraph shall include the cost of complying with the contingent closure plan and the contingent postclosure plan.

(1)

If an owner or operator plans to close a surface impoundment in accordance with

subsection (a)(1) of this section, then: (A) the closure plan for the impoundment under section 66264.112 shall include both a plan for complying with subsection (a)(1) of this section and a contingent plan for complying with subsection (a)(2) of this section in case not all contaminated subsoils can be practicably removed at closure; and (B) the owner or operator shall prepare a contingent postclosure plan under section 66264.118 for complying with subsection (b) of this section in case not all contaminated subsoils can be practicably removed at closure.

(A)

the closure plan for the impoundment under section 66264.112 shall include both a plan for complying with subsection (a)(1) of this section and a contingent plan for complying with subsection (a)(2) of this section in case not all contaminated subsoils can be practicably removed at closure; and

(B)

the owner or operator shall prepare a contingent postclosure plan under section 66264.118 for complying with subsection (b) of this section in case not all contaminated subsoils can be practicably removed at closure.

(2)

The cost estimates calculated under sections 66264.142 and 66264.144 for closure and postclosure care of an impoundment subject to this paragraph shall include the cost of complying with the contingent closure plan and the contingent postclosure plan.

(d)

During the postclosure care period, if liquids leak into a leak detection system, the owner or operator shall notify the Department of the leak in writing within seven (7) days after detecting the leak.

(e)

If waste is to remain in a unit after closure, the owner or operator shall comply

with, and plan for compliance with the following: (1) The unit shall be compacted before any portion of the final cover is installed. (2) (reserved). (3) (reserved). (4) A foundation layer shall be provided for the compacted barrier layer of the final cover. If needed, the foundation layer shall contain herbicide sufficient to prevent vegetative growth, and shall be free of decomposable organic matter. The layer shall be compacted at a moisture content sufficient to achieve the density required to provide adequate support for the nonearthen membrane. (5) A compacted barrier layer of clean earth shall be provided above the foundation layer, and shall be provided around the unit to a depth as low as the level at which the owner or operator has deposited waste, to prevent lateral migration of waste and gas and vapor from the waste. The layer of earth shall be wholly below the average depth of frost penetration, and shall be compacted at a moisture content sufficient to achieve a percent compaction that has been demonstrated, with the specific cover material to be used, to prevent the downward entry of water into the foundation layer for a period of at least 100 years. (6) The earthen material shall contain herbicide sufficient to prevent growth of vegetation. The slope of the final top surface of the compacted barrier layer shall be sloped after allowance for settling and subsidence to prevent the build up of hydraulic head. (7) the owner or operator may use nonearthen materials for the barrier layer provided it is demonstrated to the satisfaction of the Department that a barrier layer of alternative composition will equally impede movement of fluid and be as durable as a compacted earthen barrier. (8) If hazardous waste is underlain by a liner containing a synthetic membrane, then a synthetic membrane shall be provided in the final cover above the compacted barrier layer. The membrane shall be made of material chemically resistant to the waste at the facility, whether or not contact between the membrane and the waste is anticipated, and shall

have thickness and strength sufficient to withstand the stresses to which it shall be including shear forces, puncture from rocks or penetration from roots. (9) If a synthetic membrane is used in the final cover system, the owner or operator shall provide a layer of material above the synthetic membrane of the final cover, and a layer of material below this synthetic membrane, to protect the membrane from damage. (10) The owner or operator shall provide a water drainage layer, blanket or channel above the compacted barrier layer of the final cover to provide a path for water to exit rapidly. (11) The owner or operator shall provide a filter layer above the water drainage layer to prevent soils from clogging the drainage layer. (12) The owner or operator shall provide a layer of top soil of thickness sufficient to support vegetation for erosion controlled deep enough to prevent root penetration into the filter layer. The top soil shall have characteristics to protect the compacted layer against drying that would lead to cracking, to resist erosion and to support vegetation growth. (13) Permanent disposal areas shall be graded at closure so that with allowance for settling and subsidence, the slope of the land surface above all portions of the cover, shall be sufficient to prevent ponding of water. Such areas shall be graded to drain precipitation away from the disposal area. Portions of the land surface above the cover unavoidably slopes great enough to invite erosion which cannot be readily controlled by vegetation shall be protected by gunite, riprap or other material sufficient to provide erosion control. (14) Unless vegetation on the cover would pose a significant fire hazard unacceptable to the fire prevention authority or would interfere with a planned postclosure use of the site that is acceptable to the Department, the owner or operator shall provide conditions favorable for hearty growth of vegetation that will provide erosion control without forming roots that would penetrate the compacted earth cover, and shall estimate the cost of providing such conditions

and vegetation as part of the cost of closure. Vegetation for closed disposal areas shall be selected to require minimum watering and maintenance. Plantings shall not impair the integrity of containment structures or the final cover. (15) At and after closure, permanent disposal areas shall have drainage systems capable of transporting water from the water drainage layer away from the closed facility and capable of diverting surface runoff away from or around disposal areas, containment structures, leachate collection systems and monitoring facilities. Drainage systems shall be capable of preventing erosion of containment structures. Drainage system components themselves shall be lined or otherwise protected against erosion. (16) (A) When closing a permanent disposal site, the owner or which the horizontal location and elevation of the cover and other containment features, monitoring facilities and drainage features can be determined throughout the entire postclosure care period. All survey work shall conform to accepted survey practices and be performed and certified by a licensed land surveyor or registered professional engineer licensed to practice surveying. (B) The owner or operator shall submit a copy of the surveyor's notes used to establish the benchmarks described in this subsection in accordance with section 66264.116. (17) The owner or operator shall provide in the closure plan predictions of the magnitude of the drops in elevation that will occur at various portions of the top surface of the final cover as a result of settling and subsidence. The prediction shall account for compression of material underlying the liner (or underlying the waste if there is no liner) and compression of the liner, waste, fill and cover. The prediction of the drop in elevation due to compression shall account for immediate settlement, primary consolidation, secondary consolidation and creep, liquefaction and dynamic consolidation due to earthquake loads. (18) If the following information has not already been submitted to the Department and

if dikes and hazardous waste will remain at the site after closure, the owner or operator shall provide in the closure plan proof that the dikes have sufficient structural integrity to withstand forces to which they can be exposed during and after closure, including the following: (A) descriptions of topography and site conditions as required by section 66270.14(b)(18); (B) depiction of the design layout, sections and details of the impoundment and its components, including cover, dike, liner, drainage and leak detection system; (C) a description of, and the results of, stability analyses for the following conditions: 1. foundation soil bearing failure; 2. failure in the dike slopes; and 3. build-up of hydrostatic pressure due to failure of drainage system and cover, considering the potential for piping and erosion; (D) strength and compressibility test results pertaining to the dike material; (E) descriptions of dike construction and postclosure maintenance procedures with schedules and specifications; (F) descriptions of subsurface soil conditions, groundwater levels, bedrock conditions and seismic setting of the site; (G) discussion of the occurrence or nonoccurrence of the following factors and the significance of those factors to the integrity of the dikes: 1. frost, freezing, wind, rain, temperature variations, effects of vegetation and animals and activities of humans; 2. adversely oriented joints, slickensides or fissured material, faults, seams of soft materials and weak layers; 3. potential for liquefaction during earthquakes coincident with existence of saturated conditions due to failure of drainage system and cover; (H) a certification by a professional engineer registered in California that the dikes have sufficient structural integrity to withstand forces to which they can be exposed during and after closure, based on analyses, tests and inspections that include the following: 1. a review of all the geologic, geotechnical, geohydrologic and other pertinent design, construction and service data; 2. a review of all climatic data, and special geologic events,

such as earthquakes, which occurred during the entire period the impoundment was in service; 3. a field inspection to detect signs of settlement, subsidence, cracks, scouring, erosion, slides, holes, piping, seepage, sloughing, condition of vegetation, etc.; and 4. a determination if the original design was adequate and a review of possible changes in parameters used in the original design. (19) The owner or operator shall include in the closure plan an explanation of how the cover, construction procedures and planned postclosure care are designed to accommodate or avoid the effects of differential settlement and consolidation without loss of integrity of the cover.

(1)

The unit shall be compacted before any portion of the final cover is installed.

(2)

(reserved).

(3)

(reserved).

(4)

A foundation layer shall be provided for the compacted barrier layer of the final cover. If needed, the foundation layer shall contain herbicide sufficient to prevent vegetative growth, and shall be free of decomposable organic matter. The layer shall be compacted at a moisture content sufficient to achieve the density required to provide adequate support for the nonearthen membrane.

(5)

A compacted barrier layer of clean earth shall be provided above the foundation layer, and shall be provided around the unit to a depth as low as the level at which the owner or operator has deposited waste, to prevent lateral migration of waste and gas and vapor from the waste. The layer of earth shall be wholly below the average depth of

frost penetration, and shall be compacted at a moisture content sufficient to achieve a percent compaction that has been demonstrated, with the specific cover material to be used, to prevent the downward entry of water into the foundation layer for a period of at least 100 years.

(6)

The earthen material shall contain herbicide sufficient to prevent growth of vegetation. The slope of the final top surface of the compacted barrier layer shall be sloped after allowance for settling and subsidence to prevent the build up of hydraulic head.

(7)

the owner or operator may use nonearthen materials for the barrier layer provided it is demonstrated to the satisfaction of the Department that a barrier layer of alternative composition will equally impede movement of fluid and be as durable as a compacted earthen barrier.

(8)

If hazardous waste is underlain by a liner containing a synthetic membrane, then a synthetic membrane shall be provided in the final cover above the compacted barrier layer. The membrane shall be made of material chemically resistant to the waste at the facility, whether or not contact between the membrane and the waste is anticipated, and shall have thickness and strength sufficient to withstand the stresses to which it shall be including shear forces, puncture from rocks or penetration from roots.

(9)

If a synthetic membrane is used in the final cover system, the owner or operator shall provide a layer of material above the synthetic membrane of the final cover, and a layer of material below this synthetic membrane, to protect the membrane from damage.

(10)

The owner or operator shall provide a water drainage layer, blanket or channel above the compacted barrier layer of the final cover to provide a path for water to exit rapidly.

(11)

The owner or operator shall provide a filter layer above the water drainage layer to prevent soils from clogging the drainage layer.

(12)

The owner or operator shall provide a layer of top soil of thickness sufficient to support vegetation for erosion controlled deep enough to prevent root penetration into the filter layer. The top soil shall have characteristics to protect the compacted layer against drying that would lead to cracking, to resist erosion and to support vegetation growth.

(13)

Permanent disposal areas shall be graded at closure so that with allowance for settling and subsidence, the slope of the land surface above all portions of the cover, shall be sufficient to prevent ponding of water. Such areas shall be graded to drain precipitation away from the disposal area. Portions of the land surface above the cover unavoidably slopes great enough to invite erosion which cannot be readily controlled by vegetation shall be protected by gunite, riprap or other material sufficient to provide erosion control.

(14)

Unless vegetation on the cover would pose a significant fire hazard unacceptable to the fire prevention authority or would interfere with a planned postclosure use of the site that is acceptable to the Department, the owner or operator shall provide conditions favorable for hearty growth of vegetation that will provide erosion control without forming roots that would penetrate the compacted earth cover, and shall estimate the

cost of providing such conditions and vegetation as part of the cost of closure. Vegetation for closed disposal areas shall be selected to require minimum watering and maintenance. Plantings shall not impair the integrity of containment structures or the final cover.

(15)

At and after closure, permanent disposal areas shall have drainage systems capable of transporting water from the water drainage layer away from the closed facility and capable of diverting surface runoff away from or around disposal areas, containment structures, leachate collection systems and monitoring facilities. Drainage systems shall be capable of preventing erosion of containment structures. Drainage system components themselves shall be lined or otherwise protected against erosion.

(16)

(A) When closing a permanent disposal site, the owner or which the horizontal location and elevation of the cover and other containment features, monitoring facilities and drainage features can be determined throughout the entire postclosure care period. All survey work shall conform to accepted survey practices and be performed and certified by a licensed land surveyor or registered professional engineer licensed to practice surveying. (B) The owner or operator shall submit a copy of the surveyor's notes used to establish the benchmarks described in this subsection in accordance with section 66264.116.

(A)

When closing a permanent disposal site, the owner or which the horizontal location and elevation of the cover and other containment features, monitoring facilities and drainage features can be determined throughout the entire postclosure care period. All survey work shall conform to accepted survey practices and be performed and certified by a licensed land surveyor or registered professional engineer licensed to practice surveying.

(B)

The owner or operator shall submit a copy of the surveyor's notes used to establish the benchmarks described in this subsection in accordance with section 66264.116.

(17)

The owner or operator shall provide in the closure plan predictions of the magnitude of the drops in elevation that will occur at various portions of the top surface of the final cover as a result of settling and subsidence. The prediction shall account for compression of material underlying the liner (or underlying the waste if there is no liner) and compression of the liner, waste, fill and cover. The prediction of the drop in elevation due to compression shall account for immediate settlement, primary consolidation, secondary consolidation and creep, liquefaction and dynamic consolidation due to earthquake loads.

(18)

If the following information has not already been submitted to the Department and if dikes and hazardous waste will remain at the site after closure, the owner or operator shall provide in the closure plan proof that the dikes have sufficient structural integrity to withstand forces to which they can be exposed during and after closure, including the following: (A) descriptions of topography and site conditions as required by section 66270.14(b)(18); (B) depiction of the design layout, sections and details of the impoundment and its components, including cover, dike, liner, drainage and leak detection system; (C) a description of, and the results of, stability analyses for the following conditions: 1. foundation soil bearing failure; 2. failure in the dike slopes; and 3. build-up of hydrostatic pressure due to failure of drainage system and cover, considering the potential for piping and erosion; (D) strength and compressibility test results pertaining to the dike material; (E) descriptions of dike construction and postclosure maintenance procedures with schedules and specifications; (F) descriptions

of subsurface soil conditions, groundwater levels, bedrock conditions and seismic setting of the site; (G) discussion of the occurrence or nonoccurrence of the following factors and the significance of those factors to the integrity of the dikes: 1. frost, freezing, wind, rain, temperature variations, effects of vegetation and animals and activities of humans; 2. adversely oriented joints, slickensides or fissured material, faults, seams of soft materials and weak layers; 3. potential for liquefaction during earthquakes coincident with existence of saturated conditions due to failure of drainage system and cover; (H) a certification by a professional engineer registered in California that the dikes have sufficient structural integrity to withstand forces to which they can be exposed during and after closure, based on analyses, tests and inspections that include the following: 1. a review of all the geologic, geotechnical, geohydrologic and other pertinent design, construction and service data; 2. a review of all climatic data, and special geologic events, such as earthquakes, which occurred during the entire period the impoundment was in service; 3. a field inspection to detect signs of settlement, subsidence, cracks, scouring, erosion, slides, holes, piping, seepage, sloughing, condition of vegetation, etc.; and 4. a determination if the original design was adequate and a review of possible changes in parameters used in the original design.

(A)

descriptions of topography and site conditions as required by section 66270.14(b)(18);

(B)

depiction of the design layout, sections and details of the impoundment and its components, including cover, dike, liner, drainage and leak detection system;

(C)

a description of, and the results of, stability analyses for the following conditions: 1. foundation soil bearing failure; 2. failure in the dike slopes; and 3. build-up of hydrostatic pressure due to failure of drainage system and cover, considering the potential for piping and

erosion;

1.

foundation soil bearing failure;

2.

failure in the dike slopes; and

3.

build-up of hydrostatic pressure due to failure of drainage system and cover, considering the potential for piping and erosion;

(D)

strength and compressibility test results pertaining to the dike material;

(E)

descriptions of dike construction and postclosure maintenance procedures with schedules and specifications;

(F)

descriptions of subsurface soil conditions, groundwater levels, bedrock conditions and seismic setting of the site;

(G)

discussion of the occurrence or nonoccurrence of the following factors and the significance of those factors to the integrity of the dikes: 1. frost, freezing, wind, rain, temperature variations, effects of vegetation and animals and activities of humans; 2. adversely oriented joints, slickensides or fissured material, faults, seams of soft materials and weak layers; 3. potential for liquefaction during earthquakes coincident with existence of saturated conditions due to failure of drainage system and cover;

1.

frost, freezing, wind, rain, temperature variations, effects of vegetation and animals and activities of humans;

2.

adversely oriented joints, slickensides or fissured material, faults, seams of soft materials and weak layers;

3.

potential for liquefaction during earthquakes coincident with existence of saturated conditions due to failure of drainage system and cover;

(H)

a certification by a professional engineer registered in California that the dikes have sufficient structural integrity to withstand forces to which they can be exposed during and after closure, based on analyses, tests and inspections that include the following: 1. a review of all the geologic, geotechnical, geohydrologic and other pertinent design, construction and service data; 2. a review of all climatic data, and special geologic events, such as earthquakes, which occurred during the entire period the impoundment was in service; 3. a field inspection to detect signs of settlement, subsidence, cracks, scouring, erosion, slides, holes, piping, seepage, sloughing, condition of vegetation, etc.; and 4. a determination if the original design was adequate and a review of possible changes in parameters used in the original design.

1.

a review of all the geologic, geotechnical, geohydrologic and other pertinent design, construction and service data;

2.

a review of all climatic data, and special geologic events, such as earthquakes, which occurred during the entire period the impoundment was in service;

3.

a field inspection to detect signs of settlement, subsidence, cracks, scouring, erosion, slides, holes, piping, seepage, sloughing, condition of vegetation, etc.; and

4.

a determination if the original design was adequate and a review of possible changes in parameters used in the original design.

(19)

The owner or operator shall include in the closure plan an explanation of how the cover, construction procedures and planned postclosure care are designed to accommodate or avoid the effects of differential settlement and consolidation without loss of integrity of the cover.

(f)

Before installing the compacted barrier layer of the final cover the owner or operator shall accurately establish the correlation between the desired permeability and the density at which that permeability is achieved. To accomplish this the owner or operator shall: (1) provide a representative foundation area for a test compacted barrier layer having drainage conditions representative of the closed facility under the compacted barrier layer; (2) install a compacted barrier layer over that test area that has the depth and materials of construction that the compacted barrier layer for the entire landfill is planned to have, and that is compacted in the manner planned for the compacted barrier layer for the entire landfill; (3) undertake permeability tests in the test area saturated conditions that represent the maximum hydraulic could be exerted on the compacted barrier layer of the final cover. A sufficient number of tests shall be run to verify the results. A permeability test shall commence after the test apparatus has run for a time long enough to allow the required daily rate of replenishment water to maintain constant head or to follow an asymptotic or constant trend. The rate of evaporation from the test equipment used to determine permeability shall be established; (4) undertake a sufficient number of

tests in the test area to determine the average density at which permeability complying with subsection (e)(5) of this section is obtained.

(1)

provide a representative foundation area for a test compacted barrier layer having drainage conditions representative of the closed facility under the compacted barrier layer;

(2)

install a compacted barrier layer over that test area that has the depth and materials of construction that the compacted barrier layer for the entire landfill is planned to have, and that is compacted in the manner planned for the compacted barrier layer for the entire landfill;

(3)

undertake permeability tests in the test area saturated conditions that represent the maximum hydraulic could be exerted on the compacted barrier layer of the final cover. A sufficient number of tests shall be run to verify the results. A permeability test shall commence after the test apparatus has run for a time long enough to allow the required daily rate of replenishment water to maintain constant head or to follow an asymptotic or constant trend. The rate of evaporation from the test equipment used to determine permeability shall be established;

(4)

undertake a sufficient number of tests in the test area to determine the average density at which permeability complying with subsection (e)(5) of this section is obtained.

(g)

The owner or operator shall comply with the following when installing the compacted barrier layer of the final cover. (1) In each day in which final cover

material is compacted, the owner or operator shall establish a grid on the upper surface of each layer compacted that day and randomly conduct density tests. A sufficient number of tests shall be conducted to confirm the effectiveness and uniformity of the compaction. (2) If the Department indicates areas where compaction tests will be needed, the owner or operator shall undertake such tests in those areas. (3) If the average of the values of compaction from the tests is lower than the average density pursuant to subsection (f)(4) of this section, the entire layer installed on the day represented by the tests shall be removed and replaced with another layer compacted so that compaction tests taken indicate a density higher than the average density determined pursuant to subsection (f)(4) of this section. (4) An independent, qualified person registered in California as a professional engineer or certified in California as an engineering geologist shall supervise the undertaking of all tests for permeability and percent compaction, shall supervise the construction of the final cover and shall prepare a report to be submitted to the Department which bears his or her signature and the date of the signature, and describes the results of all tests and indicates whether or not the cover, as installed, complies with the requirements of this chapter. (5) Before starting compaction of earthen material to form the compacted barrier layer of the cover, the owner or operator shall submit to the Department the results of the following determinations, on material to be used for the compacted barrier layer of the final cover: (A) percent fines; (B) plastic limit, liquid limit, plasticity index and shrinkage factors; (C) soil classification; (D) carbon content; (E) concentration of soluble salts in soil pore water.

(1)

In each day in which final cover material is compacted, the owner or operator shall establish a grid on the upper surface of each layer compacted that day and randomly

conduct density tests. A sufficient number of tests shall be conducted to confirm the effectiveness and uniformity of the compaction.

(2)

If the Department indicates areas where compaction tests will be needed, the owner or operator shall undertake such tests in those areas.

(3)

If the average of the values of compaction from the tests is lower than the average density pursuant to subsection (f)(4) of this section, the entire layer installed on the day represented by the tests shall be removed and replaced with another layer compacted so that compaction tests taken indicate a density higher than the average density determined pursuant to subsection (f)(4) of this section.

(4)

An independent, qualified person registered in California as a professional engineer or certified in California as an engineering geologist shall supervise the undertaking of all tests for permeability and percent compaction, shall supervise the construction of the final cover and shall prepare a report to be submitted to the Department which bears his or her signature and the date of the signature, and describes the results of all tests and indicates whether or not the cover, as installed, complies with the requirements of this chapter.

(5)

Before starting compaction of earthen material to form the compacted barrier layer of the cover, the owner or operator shall submit to the Department the results of the following determinations, on material to be used for the compacted barrier layer of the final cover: (A) percent fines; (B) plastic limit, liquid limit, plasticity index and shrinkage factors; (C) soil classification; (D) carbon content; (E) concentration of soluble salts in soil pore water.

(A)

percent fines;

(B)

plastic limit, liquid limit, plasticity index and shrinkage factors;

(C)

soil classification;

(D)

carbon content;

(E)

concentration of soluble salts in soil pore water.

(h)

All slopes shall be designed and constructed to minimize the potential for failure. Any slope failure occurring within the site shall be promptly stabilized and the Department and the appropriate regional board shall be notified immediately by the owner or operator of such failure and the methods taken for stabilization.

(i)

Adequate facilities shall be provided to ensure for a 100 year period that no leachate shall be discharged to surface waters or groundwater, except as authorized by the hazardous waste facility permit.

(j)

Hazardous waste and discarded hazardous material contained in the closed facility shall be protected from washout and erosion as the result of tides or floods having a predicted frequency of once in 100 years.

(k)

An inspection and monitoring program shall be established at every closed disposal area wherein an independent, qualified engineer registered in California

shall annually evaluate and document the condition of all surface improvements, drainage facilities, erosion control facilities, vegetative cover, gas control facilities and monitoring facilities. This program shall also document the presence of any water or leachate flowing from the disposal area. The engineer shall evaluate the following and the effects of the following: (1) condition of access control (fences and gates), (2) condition of vegetation, (3) erosion, (4) cracking, (5) disturbance by cold weather, (6) seepage, (7) slope stability, (8) subsidence, (9) settlement, (10) monitoring the leak detection system, if there is one, (11) operation of the leachate collection and removal system, (12) monitoring the groundwater monitoring system, (13) condition of run-on and run-off control systems, and (14) condition of surveyed benchmarks. The program shall be continued by the owner or operator of the disposal area throughout the postclosure care period. A copy of the annual report containing the above-cited observations shall be filed in a timely manner with the Department and the appropriate regional board.

(1)

condition of access control (fences and gates),

(2)

condition of vegetation,

(3)

erosion,

(4)

cracking,

(5)

disturbance by cold weather,

(6)

seepage,

(7)

slope stability,

(8)

subsidence,

(9)

settlement,

(10)

monitoring the leak detection system, if there is one,

(11)

operation of the leachate collection and removal system,

(12)

monitoring the groundwater monitoring system,

(13)

condition of run-on and run-off control systems, and

(14)

condition of surveyed benchmarks. The program shall be continued by the owner or operator of the disposal area throughout the postclosure care period. A copy of the annual report containing the above-cited observations shall be filed in a timely manner with the Department and the appropriate regional board.

(l)

[Reserved]

(m)

All constructed features which will remain at permanent disposal areas containing hazardous waste material shall be able to withstand the maximum credible earthquake without significant damage to foundations, structures, waste

containment features and features which control leachate, surface drainage, erosion and gas.

(n)

(Reserved)

(o)

If monitoring equipment or other features which are required to be operable after closure of the facility pursuant to this chapter are rendered inoperable, the owner or operator shall render it operable or replace it with operable equipment or other features.

(p)

Postclosure care which the owner or operator shall provide for shall include the conducting of surveys by a licensed land surveyor, to determine the horizontal location and elevation of the cover and other containment features, monitoring facilities and drainage features, and markers installed at the site pursuant to subsection (e)(16) of this section. Such surveys shall be taken annually.

(q)

The owner or operator shall reconstruct the closed facility to restore slopes and other conditions to conform to the requirements of this chapter when movement at the site has caused them not to comply with such requirements.

(r)

The owner or operator shall submit annual reports to the Department describing measures undertaken at the site during the postclosure maintenance period.