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TITLE 7. ENVIRONMENTAL PROTECTION
CHAPTER 26. SOLID WASTE
SUBCHAPTER 2A. ADDITIONAL, SPECIFIC DISPOSAL REGULATIONS FOR SANITARY LANDFILLS

7:26-2A.1 Scope and applicability

(a) This subchapter shall constitute the rules of the Department governing the design, construction, operation, maintenance, closure and post-closure care of sanitary landfills.

(b) The requirements of this subchapter are in addition to the general engineering design submission requirements in *N.J.A.C. 7:26-2.10* and the general operational requirements in *N.J.A.C. 7:26-2.11*.

(c) This subchapter shall apply to the following facilities:

1. All newly proposed sanitary landfills and all existing sanitary landfills proposing to expand their existing operations onto previously unfilled permitted areas; and

2. Any existing sanitary landfills operating as an open dump or in an environmentally unsound manner which the Department determines needs to be environmentally upgraded.

(d) This subchapter does not apply to hazardous waste landfills. See *N.J.A.C. 7:26G*.

(e) The provision of this subchapter and *N.J.A.C. 7:26-2* shall not be interpreted as permitting the disposal of domestic sewage, sewage sludge, or septage in any manner other than that prescribed by law.

7:26-2A.2 Construction

These rules shall be liberally construed to permit the Department to discharge its statutory functions.

7:26-2A.3 Purpose

(a) This subchapter is promulgated for the following purpose:

1. To establish additional engineering design submission requirements for sanitary landfills;

2. To establish requirements and standards for the design and construction of sanitary landfills to insure that adverse impacts are minimized and controlled and that pollution of the environment is prevented; and

3. To establish additional requirements for the operation, maintenance, inspection and monitoring of sanitary landfills to ensure the proper operation of the sanitary landfill so as to minimize and control adverse impacts and prevent pollution of the environment.

7:26-2A.4. General prohibitions and requirements

(a) Open dumps are declared to be a nuisance, hazardous to human health, and are prohibited.

(b) No new sanitary landfill shall be constructed or any existing landfill continue to operate where solid waste is or would be in contact with the surface or ground waters. This provision shall not apply to cleanfill.

(c) Leachate from any sanitary landfill shall not be allowed to drain or discharge into the surface water or groundwater except as permitted pursuant to the NJPDES regulations, *N.J.A.C. 7:14A*.

(d) No sanitary landfill shall be operated in a manner that would result in the impairment of the quality of the surface or groundwaters to a degree that would degrade the quality of either the surface or ground waters beyond the classification established by the Department in the Surface Water Quality Standards, *N.J.A.C. 7:9-4*, or the Ground Water Quality Standards, *N.J.A.C. 7:9C*.

(e) No sanitary landfill shall be operated in a manner that would result in the degradation of the ambient air quality beyond the standards established by the Department pursuant to *N.J.A.C. 7:27*.

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(f) No sanitary landfill shall be operated in a manner that would result in soil erosion and sedimentation beyond the standards established by the Department of Agriculture pursuant to *N.J.A.C. 2:90*.

(g) No new sanitary landfill shall begin construction without first applying for a NJPDES permit pursuant to *N.J.A.C. 7:14A* and approval of its Soil Erosion and Sediment Control Plan pursuant to *N.J.A.C. 2:90*. No new sanitary landfill shall begin operation without first obtaining a NJPDES permit and approval of its Soil Erosion and Sediment Control Plan.

(h) No existing sanitary landfill shall continue to operate without obtaining a NJPDES permit, and approval of its Soil Erosion and Sediment Control plan in accordance with *N.J.A.C. 2:90*.

(i) No new sanitary landfill shall begin construction or operation if located within the following distances of an airport, as measured from the nearest runway to the nearest property line without the design and implementation of an effective bird deterrent plan approved by this Department and the New Jersey Department of Transportation.

1. Within 10,000 feet of any airport runway which is equal to or greater than 3,000 feet in length and that services turbo-engine planes; or

2. Within 5,000 feet of any airport runway which is less than 3,000 feet in length and that services prop-engine planes.

(j) The owner and/or operator proposing a new landfill or lateral expansion within a five-mile radius of any airport runway end used by turbojet or piston-type aircraft shall notify the affected airport and the appropriate Federal Aviation Administration (FAA) office.

(k) No existing sanitary landfill shall continue to operate, within the restricted zone of an airport as set forth in *N.J.A.C. 7:26-2A.6(g)11*, when it is determined by the Department and the Bureau of Aviation of the Department of Transportation to present a real or potential attraction for birds, until an effective deterrent plan is implemented.

(l) No person shall engage in the disposal of solid waste at a facility that does not meet the operational and maintenance requirements of this subchapter and *N.J.A.C. 7:26-2*. In addition, each permittee shall comply with any condition, limitation, or discharge requirement which may be specified in the SWF permit for that facility;

(m) The owner or operator of an existing sanitary landfill shall be required to design in accordance with *N.J.A.C. 7:26-2A.7(f)3* or 4, and after Departmental approval of the design, construct, operate and maintain, a gas collection, venting and monitoring system when gas is detected at the points set forth at *N.J.A.C. 7:26-2A.7(f)3* or 4;

(n) The owner or operator of an existing sanitary landfill shall install a groundwater monitoring system in accordance with the requirements of *N.J.A.C. 7:14A-6*.

(o) The owner or operator of an existing sanitary landfill shall be required to design and after Departmental approval of the design, construct, operate and maintain a leachate control collection and treatment system when leachate is determined to be impacting the quality of the surface and groundwaters of the area.

(p) The owner or operator of an existing sanitary landfill shall install a groundwater monitoring system in accordance with the requirements of *N.J.A.C. 7:14A*.

(q) The following waste types as defined in *N.J.A.C. 7:26-2.13(h)* and (i) shall not be disposed of in sanitary landfills:

1. Hazardous waste as defined by *N.J.A.C. 7:26G*;
2. Septic tank clean-out wastes, waste ID number 73;
3. Liquid sewage sludge, waste ID number 74;
4. Radioactive materials regulated by the Atomic Energy Act of 1954, *42 U.S.C. §§ 2011 et seq.*;
5. Regulated medical waste, Class 1 through 7, as defined in *N.J.A.C. 7:26-3A.5*, unless as otherwise provided at *N.J.A.C. 7:26-3A.20*; and
6. Bulk liquid and semiliquids, waste ID number 72.

7:26-2A.5 Additional engineering design submittal requirements for sanitary landfills

(a) In addition to the requirements of *N.J.A.C. 7:26-2.10*, the engineering design submission requirements for sanitary landfills shall include the following:

1. A regional map prepared and submitted in accordance with *N.J.A.C. 7:26-2.10(b)4* which shall include, but not be limited to, the following additional information:

i. Location of all public community water supply wells and all wells permitted to pump over 100,000 gallons per day or 70 gallons per minute within one and one-half miles of the property line of the landfill. The service areas, if any, of the public community water systems, as defined in *N.J.A.C. 7:10-1.3*, within one and one-half miles of the property line of the sanitary landfill; and

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ii. Location of all water wells within one-half mile of the property line of the sanitary landfill;

2. A site plan map delineating the existing contours of the proposed sanitary landfill area prepared and submitted in accordance with *N.J.A.C. 7:26-2.10(b)6* which shall include, but not be limited to, the following additional information:

i. Delineation of the area-wide modular development of the sanitary landfill's construction and operations and, where applicable, the lateral limits of previously filled areas;

ii. Delineation of the vertical and horizontal control monuments and property corner markers. The North American Datum of 1983 is required for mapping in the horizontal plane. The North American Vertical Datum of 1988 should be used when possible rather than the National Geodetic Vertical Datum of 1929 (Mean Sea Level 1929) for elevations;

iii. Location of all monitoring devices including, but not limited to, all groundwater monitoring wells, lysimeters, gas monitoring wells, gas vents, piezometers, inclinometers and bore hole extensometers. Elevations of the monitoring wells and piezometers shall be determined to the top of the outercasing and for the adjacent ground surface. The horizontal and vertical location shall be represented as required by *N.J.A.C. 7:26-2.10(b)6i*. In areas, as dictated by the site geology, the vertical location accuracy may be required to be accurate to the nearest 0.01 foot; and

iv. Location of all borings, excavations and test pits. The horizontal and vertical location of all borings shall be represented as required by *N.J.A.C. 7:26-2.10(b)6i*. In areas, as dictated by the site geology, the vertical location accuracy may be required to be accurate to the nearest 0.01 foot;

3. Additional site plan maps which delineate in plan view and in detailed cross-sectional view the following:

i. The initial elevations of the proposed sanitary landfill showing all grades of the liner and, where applicable, the subgrade;

ii. The final elevations of any excavation showing all grades of the excavation and, where applicable, all grades of the subgrade;

iii. The leachate collection system showing all grades of the collection pipe, pipe envelope drainage layer, filter manhole/clean-out risers and sumps;

iv. All berms, dikes, ditches, swales or other protection devices as needed to divert or collect surface water run-on or run-off;

v. The system utilized for venting and monitoring the gases generated within the sanitary landfill and, if applicable, from beneath the liner;

vi. The final elevations and grades of the capping system including the subgrade for the impervious cap, the drainage and vegetative layers, the drainage pipes and drainage envelope;

vii. All grades of leachate treatment and disposal systems including the leachate removal pipes, the equalization pond, treatment or pre-treatment ponds or storage facilities; and

viii. All proposed landscaping and screening techniques to be utilized to minimize the visual impact of the sanitary landfill.

4. Additional engineering drawings, designs or maps which describe, in sufficient detail, the construction specifications of the systems utilized in the sanitary landfill. These maps or drawings may be combined with those required by *N.J.A.C. 7:26-2A.5(a)3* so long as the required details are clearly distinguishable and identifiable. They shall include, but not be limited to, the following:

i. Subgrade;

ii. Liner/cut-off wall;

iii. Drainage layer and filter;

iv. Collection pipe and drain envelope;

v. Inlet/outlet structures;

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- vi. Manholes, sumps, pumps, and pump station;
- vii. Leachate storage tanks;
- viii. Leachate treatment impoundments or tanks;
- ix. Leachate disposal systems;
- x. Gas vents, manifolds and pump station;
- xi. Monitoring wells/devices;
- xii. Surface drainage and erosion controls; and
- xiii. Cap.

5. An engineering report which includes, but is not limited to, the following additional information:

i. A description of the general installation methods and procedures for construction of the facility including materials required, equipment utilized, and scheduling of construction events and phases. To insure that the construction requirements of this subchapter are properly implemented, the description shall include, but not be limited to, the following:

- (1) Site preparation;
- (2) Subgrade;
- (3) Liner/cut-off wall;
- (4) Drainage layer and filter;
- (5) Collection pipes and drain envelope;
- (6) Inlet/outlet structures;
- (7) Manholes, sumps, pumps, and pump station;
- (8) Leachate storage tanks;
- (9) Leachate treatment impoundments or tanks;
- (10) Leachate disposal;
- (11) Gas vents, manifolds and pump stations;
- (12) Monitoring wells;
- (13) Surface drainage and erosion controls; and
- (14) Caps.

ii. A description of the estimated solid waste capacity of the site in tons and cubic yards. Projection shall be made to determine the life expectancy of the site based on current and anticipated loading;

iii. The results with sufficient, clearly noted, calculations to verify the results, of the material testing required by this subchapter including, but not limited to, where applicable, the following:

- (1) *N.J.A.C. 7:26-2A.5(a)6vi(9)* and (10);
- (2) *N.J.A.C. 7:26-2A.7(b)3*;
- (3) *N.J.A.C. 7:26-2A.7(c)2i*, vii, and ix;
- (4) *N.J.A.C. 7:26-2A.7(c)3i*, ii, and x;
- (5) *N.J.A.C. 7:26-2A.7(c)4i*, iv(1) and (2), and ix;
- (6) *N.J.A.C. 7:26-2A.7(c)5i*;
- (7) *N.J.A.C. 7:26-2A.7(c)6i* and iv;
- (8) *N.J.A.C. 7:26-2A.7(c)7i*, ii and v;

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- (9) *N.J.A.C. 7:26-2A.7(c)8ii* and v;
- (10) *N.J.A.C. 7:26-2A.7(c)9i* and iv;
- (11) *N.J.A.C. 7:26-2A.7(c)10i*, ii, iii and iv;
- (12) *N.J.A.C. 7:26-2A.7(d)2ii*;
- (13) *N.J.A.C. 7:26-2A.7(d)3i*, iii, ix and xvii;
- (14) *N.J.A.C. 7:26-2A.7(f)6*, 12 and 14ii;
- (15) *N.J.A.C. 7:26-2A.7(g)4* and 8;
- (16) *N.J.A.C. 7:26-2A.7(i)3*;
- (17) *N.J.A.C. 7:26-2A.7(i)9iv*;
- (18) *N.J.A.C. 7:26-2A.7(i)10i*; and
- (19) *N.J.A.C. 7:26-2A.7(d)2x(1)*.

iv. A description of how the sanitary landfill will meet the environmental performance standards required by *N.J.A.C. 7:26-2A.6* and the design standards and construction requirements in *N.J.A.C. 7:26-2A.7*. The description shall provide sufficient, clearly notated design calculations to verify the results, including, but not limited to, the following:

- (1) Foundation and slope stability analysis;
- (2) Liner/cut-off wall efficiency and performance;
- (3) Leachate collection system's capacity, performance, and structural stability;
- (4) Mass transport modeling, or other modeling approved by the Department as provided for at *N.J.A.C. 7:26-2A.6(f)*, for the sanitary landfill performance;
- (5) Pumping system's performance;
- (6) Leachate treatment and disposal system's capacity and performance;
- (7) Run-on/run-off system's capacity and performance;
- (8) Gas venting and/or collection system's performance;
- (9) Monitoring system's efficiency;
- (10) Capping system's efficiency and performance; and
- (11) Cover material quantity analysis.

v. A delineation of the environmentally sensitive areas listed in *N.J.A.C. 7:26-2A.6(g)* that are impacted by the sanitary landfill and a description of the additional design and construction measures that will be implemented at the sanitary landfill to increase performance of the environmental control systems of the sanitary landfill that will be utilized to minimize and control the potential adverse impacts and prevent pollution in accordance with *N.J.A.C. 7:26-2A.6(h)*.

6. A geotechnical report prepared by a qualified geologist, or geotechnical engineer which includes, but is not limited to, the following requirements or items:

i. A narrative section which contains:

(1) A general description of the major characteristics of the geological formations of the region where the proposed sanitary landfill will be located including thickness, lithology, structural features, degree of weathering and amount of overburden; and

(2) A site specific description, based on the data collected pursuant to vi below, of the soils, rocks, water levels and flows. Soils test data and evaluations of the soils or rocks underlying the sanitary landfill shall be submitted, including any recommendations for site design which may be appropriate, to minimize any adverse impacts from the construction of the sanitary landfill;

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ii. A soils map shall be provided for the area including the sanitary landfill and vicinity. The soils map provided shall be a copy of the map published by the United States Department of Agriculture, Soil Conservation Service or by the State soils or geologic agencies;

iii. A generalized geologic map and geologic cross sections, based on published or unpublished material and mapping available from the United States Geological Survey and New Jersey Geological Survey or unpublished mapping acceptable to the New Jersey Geological Survey, shall be provided for the area including the sanitary landfill and region, and should include, but not be limited to, the following information:

- (1) Bedrock outcrop;
- (2) Dip and strike of sedimentary formations and foliation trend and dip angles of igneous and metamorphic rocks;
- (3) Faults and prominent shear zone trends;
- (4) Joint or fracture trends in bedrock including dip angles;
- (5) Trend direction of solution channels in carbonate rocks and sink holes; and
- (6) Location of any active or abandoned mine workings.

iv. A generalized potentiometric map shall be provided for the area, including the sanitary landfill and the region, based upon available data including, but not limited to, existing topography, surface drainage and existing well data;

v. A well report describing the use, depth, and yield of all wells located on the regional map required by 1i and ii above and the diversion allocation for all public community water supply wells and wells yielding 100,000 gallons per day or greater;

vi. In preparing the site specific report, required by (a)6i(2) above and the site specific geological maps and detailed cross sections required by (a)6vii and viii below, sufficient borings shall be made of the proposed landfill site to characterize and verify the geology and groundwater conditions beneath the site with respect to the types of material, uniformity, hydraulic conductivity, porosity, and depth to groundwater. Borings of the proposed sanitary landfill site shall be provided at a minimum, in accordance with Table I below:

TABLE I

Acreage	Total Number of Borings	Number of Deep Borings Required
Less than 10	4	1
10-49	8	2
50-99	14	4
100-200	20	5
More than 200	24 + 1 boring/each additional 10 acres	6 + 1 boring/each additional 40 acres

(1) The Department reserves the right to require additional borings in areas in which the number of borings required by Table I above is not sufficient to describe the geologic formations and groundwater flow patterns below the proposed sanitary landfill in regard to potential contaminant migration paths;

(2) In highly uniform geologic formations, the number of borings may be reduced, as approved by the Department, if other techniques are employed, as recommended in (a)6vi(6) below, to correlate data collected from these methods to the boring data;

(3) The borings should employ a grid pattern, wherever possible, such that there is, at a minimum, one boring in each major geomorphic feature. The borings pattern shall enable the development of detailed cross sections through the sanitary landfill in order to sufficiently define the geology. It is recommended that the soil borings be performed in a phased approach and that the number of borings in the proposed active landfilling area be minimized;

(4) Subsurface data obtained by borings shall be collected by standard undisturbed soil sampling techniques for engineering properties, and split spoon sampling or standard penetration tests for engineering indexes and

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classification. Diamond bit coring shall be used for rock boring. Samples shall not be composited. The sampling interval for the boring required by Table I above shall be determined by the geologist or geotechnical engineer and be approved by the Department. It is recommended that sampling be performed on a continuous basis for the first 20 feet below the lowest elevation of the sanitary landfill and collected at five foot intervals thereafter;

(5) All borings shall be a minimum depth of 20 feet below the lowest elevation of the sanitary landfill. The Department reserves the right to require a deeper minimum depth in areas in which 20 feet is not sufficient to describe the geological formation and groundwater flow patterns below the proposed sanitary landfill in regard to potential contaminant migration paths;

(6) The depth of deep borings shall be determined on a case by case basis. The depth should be, at a minimum, equal to or greater than the design height of the sanitary landfill;

(7) Excavations, test pits and geophysical methods may be employed to supplement the soil boring investigation;

(8) Field and final boring logs shall be submitted for each boring, recording soils or rock conditions encountered. Each log shall include a soil or rock description in accordance with the Unified Soil Classification System or the Rock Qualification Description System, the method of sampling, the depth of soil or rock, the water levels encountered, the blow counts, the soil tests and date. All depths of soil and rock as described within the boring log shall be corrected to National Geodetic Vertical Datum;

(9) In addition to the sampling and testing requirements for foundation analysis set forth in *N.J.A.C. 7:26-2A.7(b)*, at a minimum three separate soil samples for each significant soil/rock class encountered shall be analyzed for unit weight, porosity, laboratory classification, cation exchange capacity, and hydraulic conductivity. The soil samples shall be taken from three separate borings;

(10) It is recommended that a sufficient number of samples, as determined by the geologist or geotechnical engineer, be analyzed for the index properties to verify the uniformity or nonuniformity of the geological formation encountered and to correlate the soils engineering properties. A soil profile for the index properties should be developed at intervals determined on-site;

(11) At a minimum, four of the borings shall be converted to water level observation wells or well nests. The total number of wells or well nests shall be determined on a case-by-case basis as approved by the Department based on the complexity of the geology of the site;

(12) The groundwater shall be sampled and analyzed for each distinct aquifer encountered below the site in accordance with the NJPDES requirements, *N.J.A.C. 7:14A*. It is recommended that the groundwater be sampled and analyzed in accordance with *N.J.A.C. 7:14A*, for one year prior to operation of the sanitary landfill;

(13) All borings, not to be utilized as permanent monitoring wells, and wells within the active disposal area shall be sealed in accordance with *N.J.A.C. 7:9-9*, Sealing of Abandoned Wells, and excavations and test pits shall be backfilled and properly compacted to prevent possible paths of leachate migration.

vii. Geologic maps of the proposed sanitary landfill area, based on the site specific geologic investigation required by (a)6vi above or literature review, prepared at a scale of one inch equals 200 feet (1'=200') and with contour intervals which sufficiently define the ground surface contours, and various geologic formations and aquifers beneath the proposed landfill;

viii. Detailed site specific cross sections which shall sufficiently describe the geologic formations identified by the geologic maps prepared in accordance with (a)6vii above prepared at a scale which clearly defines the geologic formations; and

ix. Potentiometric maps prepared at a scale of one inch equals 200 feet (1'= 200') with contour intervals which sufficiently define the groundwater conditions in all aquifers encountered below the proposed sanitary landfill area based upon stabilized groundwater elevations developed as part of the site specific geologic investigation required by (a)6vi above. It is recommended that two seasonal contour maps based on stabilized water levels in the wells be developed, one representing the yearly low flow condition and the other representing yearly high flow condition.

7. A quality assurance (QA) and quality control (QC) plan for the construction phase meeting the requirements set forth at *N.J.A.C. 7:26-2A.7(a)7* through 24 shall be submitted. It shall include, but not be limited to, the following information:

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i. A delineation of the QA and QC management structures, including the chain of command of the QA and QC inspectors and describing the quality control and corrective action implementation responsibilities of the QA and QC inspectors and the contractors;

ii. A description of the required level of experience for the contractor and the contractor's crew for every major phase of construction which shall be sufficient to insure that the installation methods and procedures as required in (a)5i above are properly implemented;

iii. A description of the required level of experience of the QA and QC inspectors for every major phase of construction to insure that the QA and QC testing as required by (a)7vi below is properly implemented;

iv. A description of the required level of training, if necessary, to be provided for the contractor's personnel and the inspectors, to insure that the installation methods and procedures and the contingency methods, as required by (a)5i and ii above, are properly implemented and that corrective action will be properly employed, when necessary;

v. A description of the QA and QC testing and inspections for every major phase of construction, which shall include but not be limited to the following:

- (1) The frequency of inspections;
- (2) The frequency of field testing;
- (3) The frequency of sampling for laboratory testing;
- (4) The sampling and field testing procedures to be utilized;
- (5) The sampling and field testing equipment to be utilized;
- (6) The calibration of field testing equipment;
- (7) The frequency of system or performance audits;
- (8) The sampling size;
- (9) The soils or geotechnical laboratory to be used;
- (10) The laboratory procedures to be utilized; and
- (11) The calibration of laboratory equipment and QA/QC of laboratory procedures.

vi. The QC testing and inspections shall include, but not limited to, the following:

- (1) *N.J.A.C. 7:26-2A.7(b)4viii* and *x*;
- (2) *N.J.A.C. 7:26-2A.7(c)2v*, *vii*, *x* and *xi*;
- (3) *N.J.A.C. 7:26-2A.7(c)5iii* through *ix*.
- (4) *N.J.A.C. 7:26-2A.7(c)6v*;
- (5) *N.J.A.C. 7:26-2A.7(c)7vi*;
- (6) *N.J.A.C. 7:26-2A.7(c)9vii* and *viii*;
- (7) *N.J.A.C. 7:26-2A.7(c)10x*, *xi*, *xii*, and *xvii*;
- (8) *N.J.A.C. 7:26-2A.7(d)2vii* and *viii*;
- (9) *N.J.A.C. 7:26-2A.7(d)3viii* and *xxi*;
- (10) *N.J.A.C. 7:26-2A.7(g)6* and *7*; and
- (11) *N.J.A.C. 7:26-2A.7(i)9iv* and *10i*.

vii. The QA and QC plan shall include a report listing technical specifications for all materials to be used in the construction of the sanitary landfill. The report shall describe the product specifications for the materials used, and state the acceptable range of tolerances, if any. The QA and QC plan shall contain a construction contingency plan for the construction phase which shall describe procedures for responding to construction deficiencies resulting from circumstances including, but not limited to, inclement weather, defective materials or construction inconsistent with

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specifications as demonstrated by quality control testing. The plan shall provide a description of the criteria to be utilized in evaluating deficiencies, selecting corrective action methodology and implementing corrective action.

viii. For liner systems using a geomembrane, the QA and QC plan shall provide for an electrical leak location test of the primary geomembrane, or other equivalent post-construction test method, required at *N.J.A.C. 7:26-2A.7(a)19*.

8. The O and M manual for the sanitary landfill shall include the following, in addition to the O and M requirements set forth in the general engineering requirements, *N.J.A.C. 7:26-2.10(b)9*:

i. A description of how the operations and maintenance of the sanitary landfill will meet the requirements set forth in *N.J.A.C. 7:26-2A.8*;

ii. An occupational health and safety plan established in conformance with the safety and health standards of the Federal Department of Labor, Occupational Safety and Health Administration pursuant to 29 CFR 1926 and 1910 Safety and Health Standards and Industrial Standards;

iii. A community relations plan for facilities with a design capacity of 500 tons per day or greater, identifying the steps that the owner and/or operator will take to transfer information and solicit input from the community in which the facility is located. The community relations plan should contain the following:

(1) An opportunity for two open meetings with local officials, or their representatives, and the general public of the district affected by the proposed facility prior to and during facility construction. The purpose of such meetings will be to inform the community of the nature of operations proposed for the facility, including the progress of construction and projected initial tipping fees;

(2) An opportunity for an annual open meeting with the community or its representatives subsequent to the initial startup of operations. The purpose of these meetings is to allow community input and to provide a forum for exchanging ideas; and

(3) A notification procedure, whereby the community is provided a report of findings in the case of an emergency incident at the facility;

iv. A facility staffing plan containing the following:

(1) A written job description for each position, including duties and performance standards. The description shall include the requisite skills, education, and other qualifications deemed necessary for employees assigned to each position; and

(2) An explanation of the criteria and reasons used in selecting the required number and types of positions;

v. A written training plan which shall include the type and amount of both the initial and annual followup training to be provided to facility personnel;

vi. An emergency contingency plan which delineates procedures for responding to fire, explosions or any unplanned sudden or non-sudden releases of harmful constituents to the air, soil or surface water. The emergency contingency plan shall be submitted to the local police and fire departments, and to the local and county health departments or other offices of emergency management. The emergency contingency plan shall contain:

(1) A description of the actions facility personnel shall take in the event of various emergency situations;

(2) A description of arrangements made with the Department and local police and fire departments which allow for immediate entry into the facility by their authorized representatives should the need arise, such as in the case of personnel responding to an emergency situation; and

(3) A list of names, addresses and phone numbers (office and home) of all persons qualified to act as emergency coordinator for the facility. This list shall be kept up to date. Where more than one person is listed, one shall be named as primary emergency coordinator and the others shall be listed in the order in which they will assume responsibility as alternates; and

vii. A table that summarizes all inspection and maintenance programs, frequencies and reporting requirements for the landfill.

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7:26-2A.6. Sanitary landfill environmental performance standards

(a) Any sanitary landfill subject to regulation pursuant to *N.J.A.C. 7:26-2A.1(c)* shall contain a leachate containment system, leachate collection system, leachate treatment/disposal system, gas venting system, surface drainage control system, monitoring system, a final capping system and any other system or environmental control measure required by the Department, and shall be designed and constructed in accordance with the performance standards set forth in this section.

(b) In the design and construction of a sanitary landfill subject to regulation pursuant to *N.J.A.C. 7:26-2A.1(c)*, consideration shall be given to ground and surface water conditions, geology, soils, topographic features, solid waste types and quantities, social, geographic and economic factors, and esthetic and environmental impacts in order to protect the environment and to minimize and control adverse impacts.

(c) The following are the performance standards for sanitary landfills:

1. The sanitary landfill shall not cause or result in any decrease in the quality of the ground or surface water over background at the relevant point of compliance of the sanitary landfill, within the uppermost aquifer or surface water adjacent to the sanitary landfill, beyond that allowed by *N.J.A.C. 7:9B*, Ground Water Quality Standards or *N.J.A.C. 7:9C*, Surface Water Quality Standards, as applicable. The relevant point of compliance means the property boundary of the sanitary landfill, or 150 meters from the toe of slope of the landfilled area, whichever is less.

(d) For a sanitary landfill located in a stable low permeable defined geologic formation having a hydraulic conductivity of less than 1×10^{-6} cm/sec., the standard for the design for the containment and leachate collection systems shall consist, at a minimum, of the following:

1. An impervious liner consisting of three feet of clay or soil admixture having a hydraulic conductivity equal to or less than 1×10^{-7} cm/sec. designed and constructed in accordance with *N.J.A.C. 7:26-2A.7(c)*; and

2. A leachate collection system consisting of a one foot sand drainage layer having a hydraulic conductivity equal to or greater than 1×10^{-2} cm/sec. The collection pipe spacing and liner slope shall be designed to ensure that the leachate head on the liner does not exceed one foot at any time based on actual flows from the area of drainage at real time events. The leachate collection system shall be constructed as specified in *N.J.A.C. 7:26-2A.7(d)*;

3. An applicant may submit an alternate design for the containment and leachate collection system. The Department will only approve such alternate design if the applicant is able to demonstrate, to the satisfaction of the Department, that the alternate system design is an equivalent system in terms of structural integrity as (d)1 and 2 above, meets or exceeds the performance and efficiency requirements of (d)1 and 2 above and meets the performance standard established in (c) above.

(e) The standard design for all sanitary landfills, except as noted in (e)1 below, not located in stable low permeable geologic formations of sufficient thickness, having a hydraulic conductivity of less than 1×10^{-6} cm/sec., shall, at a minimum, construct a composite liner system consisting of a geomembrane liner in compressive contact with a two-foot layer of compacted clay or admixture liner with a hydraulic conductivity of no more than 1×10^{-7} cm/sec. The design and performance of the sanitary landfill shall insure an environmentally sound operation with consideration given to the geology, groundwater quality and groundwater usage of the area.

1. A sanitary landfill located in a geologic area in which the bedrock is at or near the surface and that serves as a direct source for a public community water system, shall, at a minimum, have a containment system consisting of a double composite liner system. The primary and secondary geomembrane liners in the double composite liner system shall be in compressive contact with a clay or admixture liner below the geomembrane liner. A leak detection/collection system shall be located between the primary composite liner and the secondary composite liner.

(f) The evaluation of the performance of the sanitary landfill in the geologic formation within which it is located shall be analyzed with a three-dimensional mass transport model. A two-dimensional mass transport model may be utilized, if approved by the Department, after the applicant demonstrates that the configuration of the site specific geology of vertical versus horizontal extent allows for an evaluation equal to an evaluation resulting from a three-dimensional mass transport model. The mass transport model shall have the capacity to represent the real world situation in accordance with the requirements set forth at Appendix A. Sanitary landfills that employ a double composite liner system are exempt from the requirements of this subsection.

(g) All sanitary landfills regulated pursuant to *N.J.A.C. 7:26-2A.1(c)* shall be designed and constructed, in accordance with (h) below, to protect environmentally sensitive areas including, but not limited to, the following:

1. The flood fringe areas of the flood hazard area as identified by the Department pursuant to the State Flood Hazard Area Control Act, *N.J.S.A. 58:16A-50* et seq.;

2. Wetland buffer areas as identified by the Department pursuant to the Wetlands Coastal Resource and Development Policies, *N.J.A.C. 7:7E*;

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3. Lands in municipally approved farmland preservation programs, farmland preservation programs or lands which have been dedicated to agricultural use by the purchase of their development easements pursuant to the provisions of the Agriculture Retention and Development Act, *N.J.S.A. 4:1C-11* et seq., or equivalent independent county/municipal programs;

4. The watershed area for waters classified by the Department as FW-1 waters or FW-2 Trout Protection Water pursuant to the Surface Water Quality Standards, *N.J.A.C. 7:9-4*;

5. Areas within 1000 feet of any lake or pond and 500 feet of any river or stream;

6. The Pinelands Area as established by *N.J.S.A. 13:18A-11a* of the Pinelands Protection Act, *N.J.S.A. 13:18A-1* et seq.;

7. Areas directly underlain by cavernous limestone, dolomite, or marble;

8. Areas directly overlying past or present subsurface mining activities;

9. Areas within three miles from either end of the nearest runway of any public-use airport owned by a public agency or designated by the Federal Aviation Administration as a reliever airport as determined by the Division of Aeronautics of the New Jersey Department of Transportation;

10. Areas which will encroach upon, damage or destroy any area, site, structure, or object included in the Register of Historic Places established by *N.J.S.A. 13:1B-15.128* et seq.;

11. Within the buffer zone area of specimen trees as determined and defined by the Division of Parks and Forestry; and

12. Areas with slopes exceeding 15 percent.

(h) In order to protect the environmentally sensitive areas identified in (g) above, the Department shall require the design, construction and operation of additional control systems or increased performance of the required systems to minimize and control adverse impacts and prevent pollution. The Department will consider documentation, submitted by the applicant, demonstrating that the topographical and geological conditions, in conjunction with the design, construction, operation and maintenance of the sanitary landfill in accordance with this subchapter, will adequately prevent pollution of the environmentally sensitive area.

1. The additional environmental control systems or increased performance of the systems required to protect the environmentally sensitive areas identified in (g) above shall at a minimum include the following for the particular identified area:

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(i) Sanitary landfill setback areas and buffer zones shall be designed and constructed in accordance with the following:

1. In areas in which the groundwater flow velocity, in the geologic formation in which the proposed sanitary landfill will be located, is equal to or greater than one foot per day, the minimum setback area shall be 300 feet from the toe of the slope of the landfill to the property boundary line.

2. In areas in which the groundwater flow velocity, in the geologic formation in which the proposed sanitary landfill will be located, is less than one foot per day, the setback may be reduced based on the geology and topography of the area, the groundwater quality and usage, and the performance standards set forth in (c) above and as determined in accordance with (f) above, but in no case shall the setback area be less than 150 feet.

3. A greater separation than that required by (i)1 or 2 above may be required based on the geology and topography of the area, the groundwater quality, usage, and proximity of potable water wells and the performance standards set forth at (c) above and as determined in accordance with (f) above to prevent pollution within the aquifers.

4. A minimum of 50 feet of buffer zone within the setback area shall be maintained at all landfills.

(j) Reductions in the performance of the sanitary landfill set forth in (d) and (e) above and the design standards and construction requirements set forth in *N.J.A.C. 7:26-2A.7* for Class II and III sanitary landfills shall be permitted by the Department based upon the following:

1. The performance required of Class II sanitary landfills shall be based upon the waste type to be disposed of at the sanitary landfill and shall be in accordance with the following analyses:

i. Historical data of the waste type proposed to be disposed of at the sanitary landfill demonstrating the degradation and immobilization of the waste within the soil matrix under similar conditions; or

ii. An analysis, by a New Jersey certified laboratory, of a composite sample of the waste, which shall include, but not be limited to, the following:

(1) A total analysis of metals listed in *N.J.A.C. 7:26G-5 (40 C.F.R. 261.24)*, performed in accordance with the most current version of the American Water Works Association, AWWA Standard Method, Part 300;

(2) Extraction procedures for the metals listed in *N.J.A.C. 7:26G-5 (40 C.F.R. 261.24)* using an extractant at a pH of 5 and with site water shall be performed in accordance with the most current version of the USEPA "Test

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Methods for Evaluating Solid Waste," SW 846 USEPA, Section 2 and USEPA "Solid Waste Leaching Procedure SW 924;"

(3) Steam distillation of any suspected organic shall be performed in accordance with the most current version of the USEPA "Test Methods for Evaluating Solid Waste SW 846;" Section 4.

iii. Background analysis shall be performed on soils taken from the proposed site in accordance with (j)ii(1) and (2) above.

iv. Split sampling, if required, shall be performed concurrently with the Department at a time and place to be agreed upon by the applicant and the Department. A certified copy of the bill for the Department's analysis of the waste and soils for split sampling performed in accordance with (j)1ii and iii above, shall be forwarded to the applicant, who shall pay the bill within 30 days thereafter. Payment of the bill in full shall be a condition of the final permit approval; and

v. A mass transport model meeting the requirements of (f) above shall be used to analyze the extent of any possible potential contaminant migration based on the site geology and groundwater flow at a maximum discharge rate.

2. The design standards and construction requirements set forth at N.J.A.C. 7:26A-2.7 may be reduced in as approved by the Department for Class II sanitary landfills as determined based upon the waste analysis performed in accordance with (j)1 above and the following:

i. Site access control and security;

ii. Length and scale of the operation; and

iii. Location of the proposed sanitary landfill in regards to the following:

(1) Geologic location in accordance with (d) and (e) above;

(2) Impacts on environmentally sensitive areas in accordance with (g) and (h) above;

(3) Groundwater flow velocity in accordance with (i)1 and 2 above; and

(4) The geologic and groundwater impacts and the geotechnical analysis needed for the two-dimensional model shall be determined based upon a preliminary investigation performed in accordance with *N.J.A.C. 7:26-2A.5(a)6*.

3. The performance required for Class III sanitary landfills may be reduced and Class III sanitary landfills may be exempted from one or more of the design standards or construction requirements of *N.J.A.C. 7:26-2A.7* based on the following:

i. Site access control and security;

ii. Length and scale of the disposal operation; and

iii. Location of the landfill in regards to the following:

(1) Geologic location in accordance with (d) and (e) above;

(2) Impacts on environmentally sensitive areas in accordance with (g) and (h) above; and

(3) Groundwater flow velocity in accordance with (i)1 and 2 above.

7:26-2A.7 Sanitary landfill engineering design standards and construction requirements

(a) The following are the general sanitary landfill engineering design standards and construction requirements:

1. All sanitary landfills regulated by *N.J.A.C. 7:26-2A.1(c)* shall be designed and constructed with a leachate containment system, leachate collection system, leachate treatment/disposal system, monitoring system, a surface drainage control system, gas venting system, a final capping system and any other systems or control measures required pursuant to the design standards and construction requirements set forth in this subchapter, unless exempted by *N.J.A.C. 7:26-2A.6(j)3*;

2. An on-site baseline consisting of two vertical and horizontal control monuments shall be constructed and installed in accordance with the New Jersey Map Filing Law, N.J.S.A. 46:23-9, and Department specifications, as provided in "Guidelines for Establishing Vertical and Horizontal Control Monuments on a Sanitary Landfill" contained in the technical manual entitled Division of Solid Waste Management, Bureau of Landfill Engineering, Landfill Permits, prepared and made available by the Department.

i. The control monuments shall be installed with, at a minimum, Second Order accuracy in accordance with the "Classification, Standards of Accuracy, and General Specifications of Geodetic Control Survey" published by the U.S. Department of Commerce 1980. The control monuments shall be tied into the national or state geodetic survey network and keyed into the North American Datum of 1983.

ii. Sanitary landfills equal to or greater than 50 acres may be required to construct and install secondary control points in accordance with the Department's specifications listed in "Guidelines for Establishing Vertical and Horizontal Control Monuments on a Sanitary Landfill".

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3. The sanitary landfill shall be constructed with a modular design. Each section of the modular design shall be hydraulically isolated from the adjoining section.

4. The degree of hydraulic isolation shall be determined based on the location of the landfill, and shall at a minimum include the following:

i. Sanitary landfills located in areas described in *N.J.A.C. 7:26-2A.6(d)* and (e), shall, at a minimum, include a temporary berm capable of isolating run-on from adjoining areas and run-off from the active landfill area and contain leachate generated within the sanitary landfill section.

ii. Sanitary landfills located in areas described in *N.J.A.C. 7:26-2A.6(e)1* which require, at a minimum, a double composite liner system and a leak detection system shall be designed so that each section drains, at a minimum, to separate sumps capable of isolating any potential leaks from that section.

5. The construction and operation of the modular sanitary landfill design should be initiated in the section which is most down gradient in relation to groundwater flow. Alternative designs to meet this requirement are acceptable in areas where the topography, such as steep surrounding slopes, make this requirement environmentally unsound.

6. The size of each section shall be designed to minimize the exposed active areas.

7. A quality assurance inspector, independent of the quality control inspector, approved by the Department and reporting directly to the Department, shall be at the site at all times during the initial construction phase of the containment and leachate collection systems to observe and perform all required systems audits of the quality control inspections, as set forth at (a)8, 9 and 10 below, to insure proper implementation of the design and permit requirements. For the purposes of this section, quality assurance means the periodic testing and observations performed by the owner and/or operator of a landfill as a check on the construction contractor's quality control activities.

8. A meeting shall be held between the quality assurance inspectors and the Department to establish reporting procedures and frequency, in accordance with the construction scheduling.

9. Quality control inspectors shall be at the site during all phases of construction to ensure and verify that the approved sanitary landfill design and SWF permit landfill construction requirements are properly implemented. The quality control inspectors shall, at a minimum, be at the site at all times during the construction of the containment and leachate collection systems. For the purposes of this section, quality control means those activities and responsibilities assigned to the construction contractor, manufacturer, installer or supplier to measure and regulate the characteristics or properties of an item in order to ensure that the applicable landfill construction requirements at *N.J.A.C. 7:26-2A.7*, SWF permit conditions and the requirements of (a)12 and 13 below are met. This includes those actions taken before, during, or after construction to ensure that the materials used and the completed workmanship are in conformance with the construction requirements at *N.J.A.C. 7:26-2A.7* and the SWF permit.

10. The quality control measures and tests required by this subchapter and described in the QA and QC plan submitted in accordance with *N.J.A.C. 7:26-2A.5(a)7* shall be employed to ensure that the construction requirements are properly implemented and that the design and performance standards are achieved.

11. The quality control inspector shall inspect those aspects of the subgrade preparation including, but not limited to, the following:

- i. Site preparation, clearing, and grubbing;
- ii. Excavation of subgrade to required elevations;
- iii. Subgrade preparation to eliminate incompatibilities with the liner system;
- iv. Proper application of vegetation suppressant;
- v. Compaction of subgrade to design density at proper moisture content to achieve required strength and stability to support the liner;
- vi. Moisture content density and field strength tests performed as required;
- vii. Compacted lift thickness;
- viii. Compaction equipment, weight, speed, and number of passes;
- ix. Method of moisture addition;
- x. Proof-rolling of subgrade;
- xi. Fine finishing of the subgrade to required grades; and
- xii. Final inspection of the subgrade for acceptability of area to be lined.

12. The quality control inspector shall inspect those aspects of the containment system including, but not limited to the following:

- i. Liner material to ensure that the material being used meets specifications;
- ii. Liner material stockpiling, storage, and handling to prevent damage;
- iii. Inlet/outlet structure or penetration through the liner to ensure compatibility with the liner system;
- iv. Final grades of liner to ensure that they are within acceptable tolerances;

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- v. Final inspection of liner for acceptability prior to backfill placement;
- vi. Backfill placement;
- vii. Geotextile placement;
- viii. Compacted liners with respect to the following:
 - (1) Compaction of liner to design density at the proper moisture content to achieve the required hydraulic conductivity and maintain strength and stability;
 - (2) Uniformity of compactive effort;
 - (3) Compacted lift thickness;
 - (4) Compacted liner thickness;
 - (5) Compaction equipment weight, speed, and number of passes;
 - (6) Moisture content, density, hydraulic conductivity and field infiltration tests to ensure that they are performed as required;
 - (7) Mixing and blending of liner material to ensure that the activity is being performed as required; and
 - (8) Repairs and corrective or remedial action performed as required.
- ix. Geomembranes with respect to the following:
 - (1) Liner panel placement is in accordance with required configuration;
 - (2) Permanent and temporary anchoring procedures are followed;
 - (3) The overlap and seam width are in accordance with the design;
 - (4) The area of seaming is clean and supported;
 - (5) The uniformity and continuity of seams or welds;
 - (6) Cap strips are installed on all field seams for bottom liners employing solvent or bodied solvent;
 - (7) Qualitative and quantitative field seaming tests are performed as required;
 - (8) Imperfections in seams, wrinkles at seams and fishmouth are repaired as required; and
 - (9) Corrective or remedial action taken.
- 13. The quality control inspector shall inspect those aspects of the leachate collection system including, but not limited to, the following:
 - i. Material stockpiling, storage, and handling to prevent damage;
 - ii. Drainage layer placement;
 - iii. Thickness of the drainage layer;
 - iv. Grain size analysis and relative density or compaction tests are performed as required;
 - v. Uniformity of the soil;
 - vi. Filter placement;
 - vii. Grades and alignments within acceptable tolerances;
 - viii. Envelope placement;
 - ix. Proper implementation of action taken to protect the collection pipe and liner from the loads and stresses due to the traffic of backfilling equipment;
 - x. Sump construction;
 - xi. Sump water tightness tests; and
 - xii. Pump placements.
- 14. Daily QC reports shall be prepared by the quality control inspector or quality assurance inspectors and maintained in a log book or by means of an electronic records storage system approved by the Department which shall be accessible at the job site at all times for inspection by the Department. All lab reports and field testing results shall be signed and dated by the inspector, and shall be attached to the daily QC reports. The daily QC reports shall include, but not be limited to, the following:
 - i. Identification of project name, location and date;
 - ii. Weather conditions including:
 - (1) Temperature (daily high and low);
 - (2) Barometric pressure;
 - (3) Wind direction and speed;
 - (4) Last precipitation event; and
 - (5) Amount of precipitation.
 - iii. Description and location of construction currently underway;
 - iv. Equipment and personnel at work at each unit;
 - v. Description and location of areas being tested or observed;
 - vi. Off-site material received and quality verification documentation;
 - vii. Calibration of test equipment;

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- viii. Description and location of remedial action taken;
 - ix. Decisions and comments including conversations, directives and directions for the following:
 - (1) Acceptance or failure of inspection or tests;
 - (2) Acceptance or failure of daily work unit performance;
 - (3) Problems encountered and corrective action taken;
 - (4) On-going corrective action;
 - (5) In-field modifications; and
 - (6) Assessment of overall project quality; and
 - x. Reference and list Manufacturer's Quality Assurance/Quality Control (MQA/MQC) tracking forms for each roll of geosynthetic materials at the time of delivery at the construction site.
15. The scheduled frequency of inspections by the independent quality assurance inspectors may be reduced or discontinued if approved by the Department. The reductions or discontinuance shall be based on the results of the initial construction tests and the precision and consistency of the quality control test results.
16. At such time as the independent quality assurance inspector is discontinued, as approved by the Department, the activities performed by the quality insurance inspector shall be carried out by the permittee's quality control inspectors in accordance with the approved Quality Assurance and Quality Control plan.
17. The Department may reinstate the independent quality assurance inspection at the site if the results of the construction tests and the precision and consistency of the quality control testing warrant such reinstatement.
18. Best available engineering construction practices shall be employed for all phases of the facility construction.
19. Following the completion of new liner construction involving geomembranes pursuant to (c)4 below, but prior to the submittal of the engineer's certification required at (a)20 below, an electrical leak location or equivalent test shall be undertaken on the newly constructed primary liner. Results of the test shall be appended in the engineer's final documentation report. The final documentation report shall list any repairs that were undertaken on the liner as a result of the electrical leak location test.
20. A New Jersey licensed professional civil or geotechnical engineer shall certify, in writing, to the Department that he or she has supervised the inspection of the construction of each major phase of the sanitary landfill's construction. He or she shall further certify that each phase has been prepared and constructed in accordance with the engineering design approved by the Department, prior to operations. The certification shall include a final documentation report which shall summarize the daily quality control of construction activities as required by (a)14 above, and shall include as-built drawings.
21. A New Jersey licensed professional civil or geotechnical engineer shall certify that the materials utilized in the containment system and leachate collection system are in conformance with and meet the specifications of the approved engineering design.
22. There shall be no deviation made from the approved engineering design specification without the prior written approval of the design engineer and, at a minimum, prior verbal approval by the Department.
23. All certifications shall bear the raised seal of the New Jersey licensed professional engineer, his signature, and the date of certification.
24. The certification required in (a)20 and 21 above shall include the following: "I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals under my supervision, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. I understand that, in addition to criminal penalties, I may be liable for a civil administrative penalty pursuant to N.J.A.C. 7:26-5 and that submitting false information may be grounds for denial, revocation or termination of any solid waste facility permit or vehicle registration for which I may be seeking approval or now hold."
25. The Department shall be notified within 24 hours at the Department hotline at 1-877-WARNDEP, should an emergency or accident involving personal injury occur.
- (b) The sanitary landfill shall be designed and constructed on an appropriate foundation meeting the following minimum requirements:
- 1. The foundation of the proposed sanitary landfill area shall provide firm, relatively unyielding, planar surfaces to support the liner.
 - 2. The foundation shall be capable of providing support to the liner and resistance to the pressure gradient above and below the liner resulting from settlement, compression or uplift.
 - 3. A foundation analysis shall be performed prior to construction, to determine the structural integrity of the foundation to support the loads and stresses imposed by the height and weight of the sanitary landfill and the design

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loading rate of the facility. These loads and loading rates shall not result or give cause to failure of the containment or leachate collection systems. The foundation analysis shall include the following:

i. The strength of the foundation shall be determined for all appropriate conditions. These conditions shall be evaluated utilizing appropriate American Society of Testing and Materials (hereinafter ASTM), American Association of State Highway and Transportation Officials (hereinafter AASHTO) or other equivalent methods for field testing and laboratory testing to determine properties for calculating settlement. The stability of the foundation shall be determined for static and seismic conditions as follows:

(1) The static analysis shall provide a minimum factor of safety of 1.5 unless otherwise approved by the Department; and

(2) The seismic analysis shall be performed pursuant to 40 C.F.R. Parts 257 and 258 (also known as Subtitle D of the Resource Conservation and Recovery Act of 1976 as amended) and the Department's Technical Manual for the Division of Solid and Hazardous Waste, Bureau of Landfill, Compost and Recycling Management, Landfill Permits. The foundation shall be designed to resist the maximum horizontal acceleration in lithified material for the sanitary landfill. The maximum expected horizontal acceleration, as defined by 40 C.F.R. Parts 257 and 258, shall mean the maximum expected acceleration depicted on a seismic hazard map, with a 90 percent or greater probability that the acceleration will not be exceeded in 250 years.

ii. The total settlement or swell of the foundation resulting from the initial, consolidation and compression settlement shall be determined utilizing appropriate ASTM, AASHTO or equivalent methods. The total settlement or percent consolidation shall not result or give cause to failure of the containment or leachate collection systems;

iii. The ultimate bearing capacity of the foundation shall be determined and the actual loads and stresses imposed by the surface impoundment dikes, storage tanks, manholes, clean-out risers, and sumps shall not result or give cause to failure with a factor of safety of 3 or greater;

iv. The compaction curves or relative density of the foundation shall be determined by the appropriate method in accordance with ASTM, AASHTO, or equivalent methods; and

v. Sampling shall be performed in accordance with the following schedule:

(1) In uniform geological formations, the sampling shall, at a minimum, be performed to give three replicate results per site. Sampling locations shall be in the areas of expected maximum loads and at the toe of the proposed slope. The sampling locations should be delineated in the scope of work submitted in accordance with *N.J.A.C. 7:26-2.4(a)*; and

(2) In non-uniform complex geological formations the number and depth of samples shall be determined on a case-by-case basis. The sampling locations should be delineated in the scope of work submitted in accordance with *N.J.A.C. 7:26-2.4(a)*.

4. The foundation shall be prepared in the following manner prior to placement of the liner:

i. All trees, brush, stumps, logs, tree roots, boulders, and debris shall be removed;

ii. All surface dissimilarities (for example, fractured rock, cobble, angular gravel, organic soils, top soils, etc.) that would result in a potential degradation or failure of the liner systems shall either be stabilized, removed, or covered with a minimum of six inches of sand classified as a SP in the Unified Soils Classification System or equivalent;

iii. If a soil sterilant is to be utilized to inhibit any potential vegetative growth, it shall be an approved United States Environmental Protection Agency product and shall be applied in accordance with label specifications and the requirements of the New Jersey Pesticide Control Code, *N.J.A.C. 7:30*;

iv. The subgrade shall be compacted by modification of the compactive effort utilizing stage compaction to the design density, at the proper moisture content if applicable, based on laboratory analysis to achieve the required strength;

v. All depressions within the subgrade shall be filled with a suitable soil approved by the quality control inspector, and shall be compacted to the design density, at the proper moisture content if applicable, to achieve the required strength;

vi. Any soil fill utilized shall be spread in horizontal layers not exceeding the effective depth of the compaction equipment utilized, and shall be compacted to the design density, at the proper moisture content if applicable, to achieve the required strength;

vii. Placement of soil fill into frozen ground or placement of soil fill which is in a frozen state is prohibited;

viii. The subgrade shall be proof-rolled with a rubber-tired roller. Any weaving of the subgrade shall be an indication of failure which shall be over-excavated and filled with a suitable soils approved by the quality control inspector, compacted to the design density, at the proper moisture content if applicable, to achieve the required strength;

ix. Construction of the liner on a saturated subgrade is prohibited. After a rainfall event, the subgrade shall be given sufficient time to dry or drain to the design moisture content;

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x. Prior to the construction of the liner system, the subgrade shall be tested for density and moisture content, where applicable, at 50 foot intervals on a grid pattern across the subgrade;

xi. In any area where the foundation is excavated, the side slope to the excavation prior to placement or construction of the liner shall not exceed a vertical rise of one foot for each horizontal distance of three feet; and

xii. Depth to groundwater from the top elevation of the foundation or bottom elevation of the liner shall be as follows:

(1) For sanitary landfills located in a stable low permeable formation having a hydraulic conductivity of less than 1×10^{-6} cm/sec., the depth, within the potentiometric surface, may be determined on a case-by-case basis as approved by the Department. This determination shall be based on the flow characteristics and attenuation capabilities of the geologic formation. There shall be, at a minimum, five feet of soil with a hydraulic of 1×10^{-6} cm/sec. or less between the bottom of the liner system and the aquifer. The depth to or within a perched water table may be less than five feet if this level can be cut-off by passive means, such as a cut-off wall or trench; and

(2) For all other sanitary landfills, depth to the seasonally high groundwater from the top elevation of the foundation shall be, at a minimum, three feet.

(c) The following are the design standards and construction requirements for containment systems:

1. The sanitary landfill containment system shall be designed and constructed in such a manner as to provide a closed system for the leachate generated therein during the operational, closure and post closure periods. The design and construction shall include the use of a liner consisting of recompacted or in-situ clay, an admixture material, geomembrance or composite material, or a cut-off wall consisting of clay or an admixture material.

2. A liner shall be provided to restrict the migration of leachate and to prevent pollution of the underlying aquifers. The minimum requirements for liner construction shall include the following:

i. The liner shall be constructed of materials that have appropriate chemical properties and sufficient strength and thickness to prevent failure due to pressure gradients (including static head and external hydrogeological forces), physical contact with the waste and leachate, climatic conditions, the stresses of installation, and the stresses of daily operations;

ii. The final grades of the liner shall result in a relatively smooth surface through either fine finishing of the subgrade with use of a scraper/roller or smooth drum rolling of the compacted liner;

iii. The minimum slopes of the liner shall be designed for two percent on controlling slopes and 0.5 percent on remaining slopes following the projected settlement and consolidation as determined in the analysis required at (b)3ii above. Liner slopes shall not exceed 3:1;

iv. The final grades of the liner shall be true to line and deviation of the controlling slopes of the liner shall not result in excessive ponding on the liner or decreased efficiency of the leachate drainage system. It is recommended that the deviation be less than 0.2 feet measured across any 10 foot section and less than 10 percent on the overall slope based on design elevations;

v. Survey stakes or plates shall be placed in such a manner as to ensure that the final grades meet the design specifications within the allowed tolerance;

vi. For penetrations through the liner (i.e. collection pipe to pump station), indicating devices, such as survey laths or stakes, shall be utilized at the area of penetration. The landfill should be designed to minimize the construction of penetrations through the liner;

vii. A soil backfill meeting the leachate drainage system requirements set forth in (d) below shall be placed on top of the liner to provide protection for the liner and leachate collection piping system in accordance with the following:

(1) Backfill soils should be placed on top of the liner immediately following completion of construction and testing procedures set forth in x. below. If backfilling operations are to be delayed, procedures as delineated in the approved construction contingency plan required by *N.J.A.C. 7:26-2A.5(a)5ii* shall be implemented to minimize degradation to the liner system;

(2) The depth of the soil backfill shall be of sufficient thickness to ensure that no damaging load is transmitted to the leachate collection pipe;

(3) The depth of the soil backfill shall be of sufficient thickness to ensure that no damaging load causes the leachate collection pipes to penetrate through the liner;

(4) When placed above a compacted liner the thickness of the soil backfill shall be, at a minimum, 12 inches;

(5) When placed above a geomembrane the thickness of the soil backfill shall be, at a minimum 18 inches;

(6) The soil backfill shall be stable, compatible with the liner system and relatively free of organic matter;

(7) Equipment utilized to place the soil backfill over the liner shall consist of tracked or bulbous tired vehicles or equivalent equipment with relatively low weight transfer ratios; and

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(8) Use of the backfill placement equipment shall not result in any damage to the liner system or the final grades. In cases utilizing geomembranes, the use of backfill placement equipment directly on the liner is prohibited and shall be permitted only over a minimum of 12 inches of soil backfill.

viii. All inlet/outlet structures installed through the liner shall be compatible with the liner system and shall be installed in such a manner as to minimize leaking through the penetration in accordance with the following:

(1) The subgrade around the penetration shall be properly compacted to the design density and at the proper moisture content, where applicable, to achieve the required strength;

(2) For compacted liners, the liner material around the penetration shall be hand compacted to the design density, at the proper moisture content to achieve the required hydraulic conductivity and maintain the strength and stability of the liner; and

(3) For geomembranes, a pipe shroud shall be utilized around the penetration. The leg of the pipe shroud shall be of a size equal to the diameter of the pipe. A flange shall be fastened to the leg by factory seaming, and shall overlap the opening in the liner material on all sides by a minimum distance equal to the diameter of the pipe. The pipe shroud leg shall be attached to the inlet-outlet structure by a three-quarter inch stainless steel band.

ix. The liner material shall have a demonstrated hydraulic conductivity or chemical and physical resistance not adversely affected by waste emplacement or leachate generated by the sanitary landfill. Absent historical test results acceptable to the Department, this shall be demonstrated by testing which shall include, but not be limited to, the following:

(1) For compacted liners, E.P.A. Test Method 9100 shall be performed utilizing a solid waste leachate (a synthetic leachate mix approved by the Department may be substituted if existing leachate is unavailable). Initially a baseline hydraulic conductivity of the material shall be established. It is recommended that a modified triaxial device equipped to apply back pressure throughout the entire test be used and that the hydraulic gradient be within the laminar flow range. If changes in the leachate conductivity occur, a minimum of two pore volumes of the leachate shall be exchanged and the changes in conductivity, versus the pore volumes passed, shall be analyzed. Any significant increase in leachate conductivity shall be considered to be an indication of incompatibility and will require a redesign of the containment system; and

(2) For geomembranes, E.P.A. Test Method 9090 shall be performed utilizing a solid waste leachate (a synthetic leachate mix approved by the Department may be substituted if existing leachate is unavailable). The specified physical parameter shall be tested before and after liner exposure. Any significant change in test properties shall be considered to be indicative of incompatibility and will require a redesign of the containment system.

x. The following quality control testing shall be performed on the as-built compacted liner system on an ongoing basis during the construction phase:

(1) Each lift or course of the liner shall be tested for moisture content and density at 50 foot intervals on a grid pattern across the surface. Two tests shall be performed in the immediate area around all inlet/outlet structures;

(2) Measurements shall be made periodically throughout the day during construction of the liner to insure that the lift or course thickness is within the allowable limits and in accordance with the design;

(3) Hydraulic conductivity testing shall be performed on undisturbed core samples of the final graded liner. Initially, such samples shall be taken at 200 foot (61 meter) intervals on a grid pattern across the surface. As the construction progresses, the number of samples may be reduced, as approved by the Department, based on the precision and consistency of the results of the initial sampling program, but at a minimum, one sample per every three acres shall be taken provided the material sources remain constant;

(4) Whenever a sample fails to meet the minimum hydraulic conductivity, the area of failure shall be localized, reconstructed and retested in accordance with the requirements set forth in this subsection;

(5) All core sample holes shall be backfilled and recompacted by hand tamping at the proper moisture content to achieve the minimum liner hydraulic conductivity;

(6) A modified triaxial device, equipped to apply backpressure throughout the entire test, shall be used to measure the hydraulic conductivity after primary consolidation ends. Backpressure should be sufficient to dissolve all air in the specimen and the confining or chamber pressure shall not exceed anticipated landfill design pressure. Deaired tap water or 0.005N CaSO₄ should be used as the permeant and the hydraulic gradient should be within the laminar flow range. Testing shall be conducted in accordance with ASTM Standard D5084-90; and

(7) As a means to verify laboratory permeability tests, field infiltrometer tests (for example, Sealed Double-Ring Infiltration Test, Two-Stage Borehole Test) are recommended. Alternatively, a second quality control laboratory may be used to verify the permeability results against the primary results obtained in (c)2x(6) above. The QA and QC plan, submitted in accordance with *N.J.A.C. 7:26-2A.5(a)7*, shall specify the method of field permeability verification used, if any.

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xi. The following quality control testing shall be performed on the as-built geomembrane liner system on an ongoing basis during the construction phase:

(1) All field seams shall be quality tested after they have been allowed to develop to full strength. Such testing shall be carried out through the use of an air lance with 50 pounds per square inch of air directed through a 3/16-inch nozzle or equivalent device. The lance shall be held no more than six inches from the seam edge and shall be utilized to detect any imperfections, tunnels or fishmouths. Any such imperfections in a seam shall be repaired and quality tested until a proper seam is achieved;

(2) Seams shall be tested for peel and shear strength, initially at the beginning of each workday and every 500 linear feet thereafter, on either specially prepared sample seams constructed under the same conditions as the actual seaming process used that day or on a sample cut from the in-place liner; and

(3) During the construction phase, the geomembrane shall be continuously inspected for uniformity, damage, and imperfections (for example, holes, cracks, thin spots, or foreign materials). Immediately after installation, the liner shall be inspected to ensure tight seams and joints. Additionally, the liner shall be inspected to ensure the absence of tears, punctures, or blisters. Any imperfections shall be immediately repaired and reinspected.

3. The minimum requirements and testing for clay material utilized as a sanitary landfill liner shall include the following:

i. The following tests shall be performed on the clay material proposed for use, and all data shall be submitted to the Department. These tests shall be performed in accordance with current ASTM, AASHTO or equivalent methods. The number of samples taken and tests performed shall be adequate to define the material. At a minimum, three analyses shall be performed on three separate samples for each source of clay material:

(1) Classification;

(2) Compaction;

(3) Specific gravity;

(4) Hydraulic conductivity (coefficient of permeability);

(5) Porosity;

(6) pH;

(7) Cation exchange capacity (total and inorganic);

(8) Pinhole test (required only for clay liner construction over a coarse grain subgrade); and

(9) Mineralogy (recommended, not required).

ii. The following tests shall be performed on the in-situ clay material or the clay mined from the borrow site for construction of a recompacted liner. A minimum of one analysis shall be performed on each 16,000 in-place cubic yards of clay:

(1) Grain size analysis;

(2) Compaction; and

(3) Hydraulic conductivity (Index properties and grain size analysis may be used to determine the hydraulic conductivity provided the clay has been calibrated to these tests).

iii. The clay liner shall have a hydraulic conductivity equal to or less than 1×10^{-7} cm/sec. A modified triaxial device, equipped to apply back pressure throughout the entire test, shall be used to measure the hydraulic conductivity after primary consolidation ends. Deaired tap water or 0.005N CaSO₄ should be used as the permeant and the hydraulic gradient should be within the laminar flow range. A range of confining pressures, water content, densities and degree of saturation shall be analyzed to determine the optimal design parameters of the clay. Testing shall be conducted in accordance with ASTM Standard D5084-90;

iv. The clay liner shall be applied and compacted in separate lifts, not to exceed the effective depth of the equipment utilized. The thickness of the first lift shall be such that kneading with the subgrade soil does not occur, resulting in even placement of clay on the subgrade. Subsequent lifts should be less than 2/3 of the length of the tamping feet or its equivalent;

v. Prior to compaction the clay shall be mixed by disc-harrowing or an equivalent method to a homogeneous consistency and each lift of the liner shall be compacted, by modification of the compactive effort, to the design density, and at the proper moisture content, based on the laboratory analysis, to achieve the required hydraulic conductivity and maintain the strength and stability of the clay;

vi. The liner shall be constructed in such a manner as to ensure that bonding between lifts is promoted;

vii. Placement of the clay liner on frozen ground or placement of clay material in a frozen state shall be prohibited;

viii. In-situ clay utilized in the design and construction of a liner system unless exempted by (c)ix below, shall be excavated, mixed by disc-harrowing or an equivalent method to a homogeneous consistency, and recompacted to the density at the proper moisture content, based on laboratory analysis to achieve the required hydraulic conductivity and maintain the strength and stability of the liner; and

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ix. In-situ clay liner designs shall be left in the undisturbed state only if it can be fully demonstrated through the use of excavations, test pits, borings, undisturbed permeability testing, or field infiltration/permeability testing that the undisturbed clay will possess a hydraulic conductivity no greater than 1×10^{-7} cm/sec. and will meet all the requirements and standards of this subchapter.

4. The minimum construction and testing requirements for geomembranes utilized as a sanitary landfill liner shall include the following:

i. The material properties of the geomembrane proposed for use shall meet the minimum requirements as outlined in the most recent version of the National Sanitation Foundation's publication, "Standard Number 54 Flexible Membrane Liners";

ii. The geomembrane shall be compounded from first quality virgin materials. No regrinded or reprocessed materials containing encapsulated scrim shall be used in the manufacturing of the geomembrane;

iii. The minimum thickness for geomembranes shall be 30 mils, 60 mils if High Density Polyethylene;

iv. Single geomembrane liner systems are prohibited. Liner systems utilizing geomembranes shall be either a composite or double liner system constructed in accordance with the following:

(1) A composite liner system may be used only if the clay or admixture material is demonstrated to achieve sufficient strength and stability to insure the integrity of the geomembrane;

(2) If excessive settlement of the foundation is evident, as determined in accordance with *N.J.A.C. 7:26-2A.8(b)4*, the compressive and tensile strength of the clay or admixture material in the composite system shall be determined. An analysis of the clay or admixture liner strength, in conjunction with the subgrade settlement analysis, shall demonstrate that the design will not result or give cause to failure of the geomembrane. The analysis shall include a factor of safety equal to or greater than 1.5;

(3) The clay or admixture liner within the composite liner system shall be constructed in accordance with the requirements and standards of this subsection;

(4) The thickness of the clay or admixture liner within the composite liner system shall be approved by the Department when the applicant demonstrates that it meets the standards set forth at *N.J.A.C. 7:26-2A.6*;

(5) In double geomembrane systems or double composite systems a leachate collection system to detect and collect leachate, shall be designed and constructed between the primary (top) and secondary (bottom) liner in accordance with (d) below;

v. The liner shall be installed by a company having a documented minimum qualification of two million square feet of previous landfill or comparative geomembrane systems installation experience. This experience shall be available, at a minimum, at the field crew foreman level;

vi. The liner shall be installed in a smooth but relaxed manner. The practice of inserting folds into the liner to compensate for future settlement is not an acceptable practice to prevent failure;

vii. All field seams within the area of an excavated slope shall be made perpendicular to the toe of slope;

viii. Parallel field seams made at the bottom of an excavated slope shall be made no closer than 24 inches in from the toe of slope;

ix. The adhesive system of the field seaming to be employed shall be defined;

x. The peel and shear strength data of the field seams shall be submitted; and

xi. The following field seaming requirements shall be employed, unless manufacturer's recommended procedures demonstrate equivalent or better systems:

(1) Field seams made by employing solvent or bodied solvent adhesive shall have a minimum of six inches of overlap and a seam width of four inches from the edge of the top geomembrane; and

(2) Field seams made by employing heat extrusion or welding shall have a minimum of three inches of overlap and a seam width of one inch from the edge of the top geomembrane;

(3) Field seams for bottom liners employing solvent or bodied solvent, after quality control testing and repairs, shall incorporate a cap-strip of unreinforced material a minimum of four inches in width centered over the seam. The cap-strip shall be field seamed in accordance with (c)4ix(1) and (2) above, and quality control tested as required by *N.J.A.C. 7:26-2A.7(c)2xi*;

xii. Field seaming procedures are prohibited when the ambient air temperature is less than 40 [degrees] F (4.5 [degrees] C), during storm events, or when winds are in the excess of 20 miles per hour (32 km/hr). Alternatively, temporary shelters equipped with a heat source may be used so that the ambient air temperature inside the shelter is not less than 40 [degrees] F; and

xiii. The geomembrane shall be anchored a minimum of 24 inches horizontally back from the edge of the top of the slope. The liner shall be anchored by cutting a trench 12 to 16 inches in depth, laying the liner across three sides of the trench, backfilling the trench, and compacting the backfill material.

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5. The minimum requirements and testing for geosynthetic clay liner (GCL) utilized in a composite landfill liner material shall include the following:

i. The following tests shall be performed on the geosynthetic clay liner proposed for use, and all data shall be submitted to the Department. All tests shall be performed in accordance with ASTM, AASHTO or equivalent methods.

- (1) Bentonite Mass/Unit Area;
- (2) Bentonite Moisture Content;
- (3) GCL Index Flux;
- (4) GCL Tensile Properties;
- (5) GCL Permeability;
- (6) GCL Hydrated Internal Shear Strength;
- (7) GCL Peel Strength;
- (8) Woven Geotextile Mass/Unit Area;
- (9) Non Woven Geotextile Mass/Unit Area;
- (10) Woven Grab Tensile;
- (11) Non Woven Grab Tensile;
- (12) GCL and Geotextile Metallic Fragment/Broken Needle Detection; and
- (13) Manufacturer's verification that metallic fragment and/or broken needles have been removed from the GCL and Geotextile products from (c)5i(12) above;

ii. The geosynthetic clay liner shall be installed by a company having a documented minimum qualification of two million square feet of previous landfill or comparative geomembrane/GCL systems installation experience. This experience shall be available, at a minimum, at the field crew foreman level;

iii. The surface on which the geosynthetic clay liner is to be installed shall be free of all rocks, stones, gravel, sticks, foreign objects or debris of any kind. The surface shall also be free of standing water or excessive moisture at the time of installation;

iv. The geosynthetic clay liner shall be installed in an unhydrated condition and be protected to preclude hydrating until after the geomembrane and drainage material have been installed. Should any or all of the geosynthetic clay liner become hydrated during construction, it shall be removed and replaced with unhydrated geosynthetic clay liner;

v. The geosynthetic clay liner shall be laid flat free of any wrinkles or folds and be in compressive contact with the underlying subgrade;

vi. The minimum overlap of longitudinal seams shall be six inches. The minimum end of roll overlaps shall be 24 inches. Seams at the end of panels shall be constructed such that they are shingled in the direction of the landfill slope;

vii. Granular sodium bentonite shall be applied at the seams at a minimum rate of 0.25 pounds dry bentonite per linear foot of seam;

viii. Only as much geosynthetic clay liner shall be deployed per working day as can be covered with the overlying liner system or temporary plastic sheets. The geosynthetic clay liner shall be covered each night and at the imminent threat of precipitation during the day; and

ix. Metal detection on geosynthetic clay liners with hand-held devices shall be used to verify the manufacturer's quality assurance/quality control data as the GCL is unrolled on the bottom liner system. Scanning may be discontinued following the Department's approval.

6. The minimum requirements and testing for soil cement utilized as a sanitary landfill liner material include the following:

i. The following tests, performed in accordance with appropriate ASTM, AASHTO or equivalent methods shall be performed on the soil cement mixture proposed for use, and all data shall be submitted to the Department.

- (1) Grain size analysis of aggregate;
- (2) Soil cement content;
- (3) Wetting and drying;
- (4) Freezing and thawing;
- (5) Compressive strength;
- (6) Compaction; and
- (7) Hydraulic conductivity.

ii. The soil cement liner for Class I sanitary landfills shall be designed and constructed to meet the performance requirements of *N.J.A.C. 7:26-2A.6(c)*1 and 2. In no case shall the soil cement liner for Class I sanitary landfills be less than two feet thick. For Class II sanitary landfills, the thickness of the liner may be reduced, as approved by the

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Department, depending on the waste material disposed of and the geologic siting of the sanitary landfill, but in no case shall the liner thickness be less than one foot;

iii. To ensure that complete mixing is accomplished, a central mixing plant shall be used. The plant shall include the means for accurately proportioning the material as determined by laboratory analysis, either by weighing or by volumetric measurement, in order that the mixture shall meet the designed hydraulic conductivity requirement;

iv. The plant shall be capable of producing a uniform mixture, within permissible variation, from the mix formula and shall include a continuous mixer of a twin pug mill type;

v. The following quality control testing shall be performed at the control mixing plant at a minimum of once per every 300 cubic yards of mixture to ensure uniformity of the mix:

(1) Grain size analysis of the aggregate; and

(2) Percent cement.

vi. Placement of soil cement liner is prohibited when the ambient air temperature is below 40 [degrees] F (4.5 [degrees] C) or during storm events;

vii. The transportation time from the central mixing plant to the construction site shall not exceed 30 minutes;

viii. No more than 60 minutes shall elapse between the start of mixing and the start of compaction. The compaction process shall be started within 30 minutes after the material is applied. The compaction process shall be completed within 1 1/2 hours after the mixing process is completed;

ix. It is recommended that the mixture be applied by a mechanical spreader in nine-inch loose lifts, and then compacted to six-inch layers. The soil cement should be compacted initially with a sheep foot roller, and then followed by a smooth wheeled vibrating roller;

x. The soil cement should be compacted to the design density, at the proper moisture content, based on the laboratory analysis, to achieve the required hydraulic conductivity and maintain the strength and stability of the liner;

xi. No later than 24 hours after compaction is completed, a bituminous or asphaltic emulsion seal (MC-20 or equivalent) shall be applied to the completed surface; and

xii. The addition of additives to the mix are prohibited except with the approval of the Department.

7. Minimum requirements and testing for bentonite utilized as a sanitary landfill liner material include the following:

i. The compatibility of leachate with the proposed bentonite amended soil admixture shall be evaluated. In addition, the following tests shall be performed on the bentonite proposed for use, and all data shall be submitted to the Department. All tests shall be performed in accordance with appropriate ASTM, AASHTO or equivalent methods:

(1) Swelling index;

(2) Layer permeability;

(3) Colloidal yield; and

(4) Cation exchange capacity.

ii. The following tests shall be performed on the bentonite/soil mixture proposed for use, mixed under field conditions with site water proposed for use, in accordance with ASTM, AASHTO or equivalent methods:

(1) Grain size analysis of aggregate;

(2) Bentonite content;

(3) Compaction; and

(4) Hydraulic conductivity.

iii. To ensure that complete mixing is accomplished, a central mixing plant shall be used. The plant shall include the means for accurately proportioning the material, as determined by laboratory analysis, either by weighing or by volumetric measurement, in order that the mixture shall meet the required design hydraulic conductivity;

iv. The plant shall be capable of producing a uniform mixture within permissible variation from the mix formula and should include a continuous mixer of a twin pug mill type;

v. The following quality control testing shall be performed at the central mixing plant at a minimum of one test per every 300 cubic yards of mixture to ensure uniformity of the mix:

(1) Grain size analysis of the soil; and

(2) Percent bentonite.

vi. Placement of the bentonite liner in a frozen state or on frozen ground is prohibited;

vii. The bentonite/soil mixture shall be applied by a mechanical spreader in a maximum of nine-inch loose lifts and compacted with a smooth drum vibratory compactor or rubber-tired compactor;

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viii. The bentonite/soil mixture shall be compacted to the design density at the proper moisture content range, based on the laboratory analysis, to achieve the required hydraulic conductivity, and maintain the strength and stability of the liner.

8. A cut-off wall shall be constructed in those areas, where needed, to restrict the lateral migration of leachate, provide for a closed containment system, and prevent pollution of the underlying aquifer. The minimum requirements for cut-off wall construction include the following:

i. Borings shall be taken at 200 foot intervals along the proposed route of the cut-off wall. These borings shall extend to a depth at least three feet into the confining layer. In clay cut-off wall constructions, the boring interval may be increased, but shall be no greater than 500 feet, provided the excavation is continuously logged and inspected for conformance with the boring data by a qualified geologist or geotechnical engineer;

ii. Hydraulic conductivity tests of the confining layer shall be performed on undisturbed core samples at every other boring location;

iii. The cut-off wall shall extend a minimum of three feet into the confining layer. A lesser distance may be acceptable, if approved by the Department, provided the wall extends to competent rock;

iv. The cut-off wall shall be stable under all conditions, including long term and end of construction conditions, and shall not be susceptible to displacement or erosion under stress or hydraulic gradient;

v. Prior to construction the cut-off wall material shall be tested in accordance with (c)2ix above, to ensure that the material has a conductivity or chemical and physical resistance which will not be adversely affected by waste emplacement or the leachate generated by the sanitary landfill.

9. In addition to the requirements of (c)8 above, the minimum requirements and testing for clay utilized for cut-off wall construction include the following:

i. The tests performed, as specified in (c)3i and ii above, shall be performed on the clay material proposed for use in the cut-off wall.

ii. The cut face of the excavation shall be stable for all conditions that will be encountered during the excavation, including appropriate factors of safety for the material encountered;

iii. The clay cut-off wall shall be constructed to a minimum thickness of three feet;

iv. The clay cut-off wall shall have a hydraulic conductivity equal to or less than 1×10^{-7} cm/sec.;

v. The clay cut-off wall shall be constructed in separate lifts not exceeding the effective depth of the equipment utilized and in a manner which will ensure that bonding between lifts is promoted;

vi. Each lift of the clay cut-off wall shall be compacted to the design density, at the proper moisture content, to achieve the required hydraulic conductivity and maintain the strength and stability of the cut-off wall;

vii. Each lift shall be tested for moisture content and density at 50-foot intervals along the length of the construction; and

viii. Hydraulic conductivity testing shall be performed on undisturbed core samples of the constructed, compacted clay cut-off wall at 200-foot intervals along the route of the wall in order to verify in-field permeability of the constructed wall. Whenever a section of the compacted clay cut-off wall fails to meet the minimum permeability standard established in the QA and QC Plan submitted in accordance with *N.J.A.C. 7:26-2A.5(a)7*, that section shall be retested and/or reconstructed as defined by the QA and QC Plan. All core sample holes shall be backfilled and recompacted by hand tamping at the proper moisture content to achieve the minimum requirement hydraulic conductivity. The modified triaxial device procedures, as set forth in (c)2x(6) above, shall be utilized to measure the hydraulic conductivity;

10. In addition to the requirements of (c)8 above, the minimum requirements and testing for soil and bentonite or cement utilized for slurry cut-off wall construction include the following:

i. The tests specified in (c)7i above, shall be performed on the bentonite proposed for use;

ii. The following tests shall be performed on the bentonite slurry proposed for use, mixed under field conditions with site water proposed for use in construction of the slurry wall, and all data shall be submitted to the Department:

(1) Bentonite content and cement content, where applicable;

(2) Marsh Cone viscosity;

(3) Marsh Cone gelation;

(4) Gel strength, initial and 10 minute strength;

(5) pH;

(6) Filtration loss;

(7) Filter cake-thickness and strength; and

(8) Sand content.

iii. The following tests shall be performed on the backfill proposed for use, mixed under field conditions, and all data shall be submitted to the Department:

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- (1) Grain size analysis;
 - (2) Slump;
 - (3) Blowout tests, if the design or existing gradient is greater than 30; and
 - (4) Cement content, where applicable.
- iv. The water utilized in the slurry mix and the backfill shall be analyzed for the following parameters:
- (1) pH;
 - (2) Chloride;
 - (3) Total dissolved solids;
 - (4) Hardness; and
 - (5) Total volatile organics.
- v. The water utilized in the slurry mix and the backfill shall be free of oil and organic matter, be relatively free of impurities and be in the neutral pH range;
- vi. When the depth to the confining layer is less than 100 feet, the thickness of the wall shall be 0.6 feet per 10 feet of hydrostatic head on the wall and shall, at a minimum, be three feet;
- vii. When the depth to the confining layer is greater than 100 feet, slurry wall thickness shall be determined on a case by case basis. This determination shall be based on a comprehensive engineering analysis of the ability of a given wall thickness to resist failure;
- viii. There shall be a sufficient percent of fines in the backfill material to achieve a hydraulic conductivity equal to or less than 1×10^{-7} cm/sec.;
- ix. The backfill material shall be completely mixed in such a manner as to ensure a consistent quality of the material;
- x. A slump test and gradation analysis shall be performed at a minimum of one sample for every 300 cubic yards of backfill mixture;
- xi. A viscosity and density analysis of the slurry shall be performed at a minimum of twice daily;
- xii. The backfill mixture shall not be put in place until the trench has been inspected, measured, approved, and certified by a New Jersey licensed professional engineer, or his agent who shall be a qualified geologist or geotechnical inspector, to ensure that the trench has penetrated a sufficient depth into the aquiclude;
- xiii. A minimum of three feet of slurry head shall be maintained in the excavation above the maximum anticipated groundwater level and the slurry head should not fall below one foot of the ground surface elevation;
- xiv. The backfilling of the slurry cut-off wall shall be performed by one of the two following methods. In either case, free dropping of the backfill into the trench through the slurry is prohibited;
- (1) Backfill shall be placed by use of a tremie process; or
 - (2) Backfill shall be placed into a pre-cut trench in which a minimum backfill slope of six horizontal to one vertical (6:1) has been established.
- xv. The backfill process shall continue until sufficient material has been placed in the slurry trench to permit the backfill material to become exposed at the top of the trench;
- xvi. A three-foot thick layer of clay core soil backfill shall be placed on top of the complete portion of the cut-off wall after it has reached its intended level and before it is allowed to dry out;
- xvii. Upon the completion and stabilization of the backfilling process of the cut-off wall, hydraulic conductivity testing of undisturbed core samples of the backfilled trench shall be performed at 200 foot intervals to verify the hydraulic conductivity of the wall. Whenever a section of the cut-off wall fails to meet the minimum permeability standard established in the QA and QC Plan submitted in accordance with *N.J.A.C. 7:26-2A.5(a)7*, that section shall be retested and/or reconstructed as defined by the QA and QC Plan. All core sampling holes shall be refilled and recompact to meet the minimum hydraulic conductivity; and
- xviii. In the event that a failure of the slurry trench or construction platform should occur, the trench and backfill material shall be excavated and reconstructed, at a minimum, for a length of 100 feet from the outside point of failure in each direction. The hydraulic conductivity of the reconstructed portion of the wall shall be verified through hydraulic conductivity testing of undisturbed core samples in accordance with xvii above.
- (d) The following are the design standards and construction requirements for leachate collection systems:
1. The leachate collection system shall consist of a leachate drainage system and a leachate removal system;
 2. A leachate drainage system shall be designed and constructed to provide for effective drainage of the leachate generated within the proposed sanitary landfill in accordance with the following:
 - i. The slope, hydraulic conductivity and porosity of the drainage layer and the spacing of the collection pipes of the leachate drainage system shall be designed in such a manner as to ensure that the performance and efficiency requirements of *N.J.A.C. 7:26-2A.6(d)1* and 2 are met during the operational life of the facility;

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ii. The following tests shall be performed on the soil proposed for use in the drainage layer and all data shall be submitted to the Department. These tests shall be performed in accordance with current ASTM, AASHTO or equivalent methods. The number of samples taken and tests performed shall be adequate to define the material. At a minimum, three analyses shall be performed on three separate samples for each source of drainage material.

- (1) Classification;
- (2) Porosity;
- (3) Relative density or compaction; and
- (4) Hydraulic conductivity.

iii. The leachate drainage system shall be designed utilizing the latest version of the Hydrologic Evaluation of Landfill Performance (HELP) model, developed by the United States Army Corp of Engineers (USAE) Waterfront Experiment Station, to evaluate liquid management systems.

iv. Data from the nearest meteorological station to the site with a minimum data base of five years, shall be utilized to design the leachate drainage system;

v. The hydraulic conductivity required by *N.J.A.C. 7:26-2A.6(d)2* for the drainage layer may be less than 1×10^{-2} cm/sec provided the performance and efficiency required by *N.J.A.C. 7:26-2A.6(d)1* and 2 and the performance standard in *N.J.A.C. 7:26-2A.6(c)* are met. The hydraulic conductivity of the drainage layer shall be equal to or greater than 1×10^{-3} cm/sec after compaction. It is recommended that a granular filter or geotextile be designed and constructed above the drainage layer to minimize the intrusion of fines into the drainage layer;

vi. The drainage layer shall be designed and constructed in such a manner as to maintain laminar flow throughout the system to prevent scouring of the liner;

vii. The following quality control tests shall be performed on the soil utilized within the drainage layer of the leachate collection system:

- (1) Hydraulic conductivity;
- (2) Relative density or compaction;
- (3) Grain size analysis; and
- (4) Drainage layer thickness.

viii. The tests required in vii above shall be performed in accordance with ASTM, AASHTO or equivalent methods and in accordance with the following schedule:

(1) Hydraulic conductivity and grain size analysis shall be performed once per every 3,000 cubic yards of in-place fill material. The hydraulic conductivity may be determined from the grain size analysis, provided the hydraulic conductivity is calibrated to the particular grain size distribution of the soil used;

(2) Relative density or compaction tests shall be performed on the complete drainage layer at 50 foot intervals on a grid pattern across the surface; and

(3) Drainage layer thickness shall be measured periodically throughout the day during construction to ensure that the thickness is within allowable limits and in accordance with the design.

ix. The drainage layer shall have the appropriate minimum thickness specified in (c)2vii above. Furthermore, based on the design permitted by i above, the drainage layer shall be constructed with a minimum depth equal to, or greater than, the maximum anticipated leachate head generated within the landfill during the operational life of the landfill.

x. A synthetic drainage net may be used in the place of a soil drainage layer required at (d)2i through ix above. A leachate removal system required at (d)3 below shall apply;

(1) The following tests shall be performed on the synthetic drainage net proposed for use in the drainage layer, and all data shall be submitted to the Department. These tests shall be performed in accordance with ASTM, AASHTO or equivalent methods in effect at the time of testing;

- (A) Polymer Composition;
- (B) Polymer Specific Gravity;
- (C) Polymer Melt Index;
- (D) Carbon Black Content;
- (E) Carbon Black Dispersion;
- (F) Thickness;
- (G) Mass per Unit Area;
- (H) Nominal Transmissivity;
- (I) Transmissivity under design conditions;
- (J) Wide Width Tensile Strength;
- (K) Geotextile AOS; and
- (L) Ply Adhesion;

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(2) The drainage nets shall be stored and installed in such a manner that they are free of dirt, dust, cuttings or any other damaging or deleterious materials;

(3) The minimum overlap of adjacent rolls shall be four inches;

(4) The overlaps shall be secured by tying achieved by strings, plastic fasteners or polymer braid. Metallic fasteners shall not be permitted; and

(5) Tying of drainage nets shall occur every five feet along the slope, every two feet across the slope and every six inches in the anchor trench;

3. A leachate removal system shall be designed and constructed to provide for removal of the leachate within the drainage system to a central collection point for treatment and disposal in accordance with the following:

i. The following tests shall be performed in accordance with ASTM methods, or an equivalent determination shall be performed on the material proposed to be utilized in the leachate collection piping system:

(1) For rigid pipes, a three-edge bearing test shall be performed under 0.1 inch crack loading and ultimate loading conditions;

(2) For flexible pipe, a parallel plate deflection test shall be performed under five percent deflection and buckling capacity loading conditions;

ii. The piping material utilized within the leachate removal system shall possess an adequate structural strength to support the maximum anticipated static and dynamic loads and stresses that will be imposed on the pipe by the drainage layer, gravel pack, overlying wastes, and any equipment used at the sanitary landfill. The supporting strength of the pipe shall be equal to, or greater than, the loads and stresses imposed on the pipe with, at a minimum, a factor of safety of 1.5;

iii. The material utilized for the piping system shall have demonstrated chemical resistance to the wastes to be disposed of in the landfill and the leachate expected to be produced within the proposed sanitary landfill. The requirement for demonstrated chemical resistance shall be satisfied either by the use of ASTM approved chemically resistant piping material or by testing the piping material in accordance with the requirements of (c)2ix(2) above;

iv. The piping system shall have a slope that will provide a self-cleaning velocity within the pipe based on actual maximum flows from the area of drainage. The minimum flow velocity should not be below two feet per second as designed based on full flow or half flow capacity;

v. The leachate collection piping located within the disposal area shall have, at a minimum, an inside diameter of six inches and shall be capable of handling peak flows;

vi. Leachate collection gravity mains located outside of the disposal area shall have, at a minimum, an inside diameter of eight inches and shall be capable of handling peak flows;

vii. The piping system shall employ flexible joints to allow for at least 0.5 degree movement between the pipe sections;

viii. The final grades of the piping system should be true to line and the departure from grade and alignment of the piping system shall not result in excess ponding on the liner or reduced efficiency of the leachate collection system. The maximum allowable departure from grade should not exceed 10 percent of the inside diameter of the collection pipe;

ix. The collection pipes shall be designed to function without clogging throughout the operational phase of the proposed sanitary landfill. The collection pipes shall be constructed within a coarse gravel envelope inside a geotextile fabric. The material utilized in the coarse gravel envelope shall meet the specifications, or equivalent, of the cumulative grain size distribution curves calculated in accordance with (d)3ix(1) through (5) below, where "D" equals the effective size or diameter of the soil particles;

(1) The envelope aggregate shall be compatible with the material with which it is placed in contact;

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(6) The envelope thickness should be a minimum of 10 cm. around the pipe and should be related to the D50 of the envelope/drainage layer ratio in accordance with Table II below:

TABLE II

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x. When the requirements of (d)3ix above cannot be satisfied by a one-layer envelope, a zoned envelope or equivalent shall be constructed that satisfies the specifications in ix. above;

xi. The collection pipe shall be installed within a depression constructed within the liner or liner and subgrade, and shall meet the following minimum specifications:

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- (1) A minimum of three inches of bedding material shall be placed at the bottom of the trench; and
- (2) The depth of the depression should, at a minimum, be equal to the outside diameter of the pipe plus the bedding material.
- xii. An interior grid herringbone or offset herringbone system shall be employed, when needed, to ensure that the maximum leachate head exerted on the liner does not exceed the design head and that it controls the leachate head throughout the proposed sanitary landfill;
- xiii. The drainage distance between the collection pipes shall not exceed 300 feet. This drainage distance may be increased if geonets are used in the design in conjunction with drainage pipes;
- xiv. Construction and earth-moving equipment shall be prohibited from operating over the piping system, and sanitary landfill equipment shall be prohibited from operating over the piping system until a minimum of five feet of refuse has been mounded over and around the pipe;
- xv. Manholes or cleanout risers shall be located along the perimeter of the leachate removal system. The number and spacing of the manholes or cleanout risers shall be sufficient to insure proper maintenance of the leachate removal system by water jet flushing or an equivalent method;
- xvi. A rubber gasket or an equivalent seal to ensure a tight joint shall be installed between the sump or manhole inlet and the collection pipe. A flexible pipe joint shall be connected to the manhole and a second flexible pipe joint shall be installed within the piping system within three feet of the first flexible pipe joint;
- xvii. Material used for the construction of the manhole or cleanout riser shall have a demonstrated chemical resistance to the leachate expected to be produced within the sanitary landfill;
- xviii. The leachate collection system shall be designed to drain by gravity to a sump system. In double lined systems, the leachate collection piping systems shall be designed to drain to separate independent sumps;
- xix. The sumps, pumps, and pumping station capacity shall be designed based on an evaluation of percolation, resulting from precipitation and infiltration into the system through the side or bottom of the liner or cut-off wall;
- xx. Sumps located outside of the lined area shall be a prefabricated structure coated inside and outside with a minimum of two coats of waterproofing sealant. The joints between the sump section shall be sealed with a rubber gasket or equivalent seal and grouted to ensure a watertight seal;
- xxi. All sumps shall be tested for watertightness prior to the startup of landfilling operations in accordance with the following:
 - (1) The sumps shall be filled with water and covered;
 - (2) The depth of water elevation shall be measured daily for a period of five days;
 - (3) Any significant decrease in the depth of water within the sump shall be an indication of failure. The sump which fails the test shall be recoated with waterproofing sealant and the joints regouted. The sump shall be retested for watertightness in accordance with this subparagraph. If failure of the retest should occur the sump shall be reconstructed.
- xxii. Should the sumps be located outside of the lined area, the sumps shall be lined with a geomembrane with a leak detection system;
- xxiii. The pump station shall be housed in a suitable structure capable of protecting the pumps, motors and electrical equipment in accordance with, but not be limited to, the following:
 - (1) Explosion-proof equipment for the pump motors and electrical equipment shall be utilized and shall be constructed in accordance with the most current version of the National Electrical Code, "Special Occupancy, Hazardous Location", Volume 6 of the National Fire Code published by the National Fire Prevention Association;
 - (2) Adequate lighting and ventilation, where necessary, shall be provided. The ventilation system of the pump station shall be constructed in accordance with the most current version of the National Fire Code, "Explosion Venting" Volume 14, published by the National Fire Prevention Association;
 - (3) The leachate pumping system shall be designed to prevent overflow in the event of a power outage. It is recommended that back-up electric power be provided at all times from an on-site generator or separate utility substation in the event that the overall leachate storage capacity is compromised during a power outage;
 - (4) Automatic sound alarms, operating independently of the pump station power, shall be installed to give warning of high water, power failure, or breakdown. The alarm system shall be wired to the location where assistance will be available to respond to the emergency;
 - (5) The total number of operating pumps as determined in accordance with (6) below, shall be designed to handle the maximum expected leachate production for the area of drainage based on the average peak monthly flow;
 - (6) A minimum of two pumps shall be provided in the leachate pump station. The number of pumps should be designed based on the requirements of Table III below:

TABLE III

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(7) If more than two pumps are provided, their capacity shall be such that upon failure of the largest pump the remaining pumps shall be capable of handling the maximum expected leachate production for the area of drainage based on the average peak monthly flow.

4. The leachate collection system shall be connected to the gas collection system required at (f) below as a means to control odors.

(e) A leachate treatment and disposal system shall be designed and constructed in accordance with the following:

1. All leachate treatment and disposal systems shall be required to obtain a NJPDES permit in accordance with the NJPDES regulations, *N.J.A.C. 7:14A*;

2. The leachate treatment and disposal system shall be designed in accordance with one of the following options:

i. Complete treatment on-site with direct discharge to surface or groundwater;

ii. Pretreatment on-site, if required, with discharge to an off-site treatment works for final treatment; or

iii. Storage on-site with discharge to an off-site treatment works for complete treatment.

3. Leachate recirculation within the sanitary landfill shall not be permitted as a sole leachate disposal option.

Leachate recirculation shall, however, be permissible as part of an overall leachate management system (that is, to enhance biodegradation of the landfilled solid waste) provided that the sanitary landfill has, at a minimum, a composite liner system with a leachate collection system which will ultimately discharge the leachate for disposal in accordance with (e)2 above;

4. Leachate storage prior to treatment shall be within tanks constructed and installed in accordance with (e)13 below;

5. Storage of leachate for a period exceeding one month shall be prohibited except as set forth at (e)10iii below during start-up operations;

6. The following requirements shall be met prior to start-up of sanitary landfilling operations:

i. The leachate treatment and disposal system shall be on line and fully operational;

ii. An agreement with a treatment works facility to accept the leachate shall be in place if either option (e)2ii or iii above was elected for use with the sanitary landfill; and

iii. All necessary Federal, State and local permits for the treatment and disposal system shall have been obtained.

7. All leachate treatment and disposal systems shall be designed and constructed to prevent anaerobic conditions from developing;

8. All leachate treatment and disposal systems shall be designed and constructed to control odors pursuant to *N.J.A.C. 7:27*;

9. For all leachate discharges planned for publicly owned treatment works (P.O.T.W.), the owner and/or operator shall determine the acceptability of such discharges on the operations of the P.O.T.W. in accordance with the NJPDES regulations, *N.J.A.C. 7:14A*;

10. In addition to complying with the requirements of the NJPDES regulations, *N.J.A.C. 7:14A*, the Rules and Regulations for the Preparation of Plans for Sewer Systems and Wastewater Treatment Plants, *N.J.A.C. 7:9-1*, and the Pretreatment Standards for Sewerage, *N.J.S.A. 58:11-49.1 et seq.*, on-site complete treatment or pretreatment facilities shall be designed and constructed in accordance with the following:

i. The on-site treatment unit shall be designed based on the results of a treatability study, the results of the operations of a pilot scale plant or written information documenting the performance of an equivalent leachate treatment system;

ii. On-site treatment units shall be designed and constructed by staging of the units to allow for on-line modification of the treatment facility to account for variability of the leachate quality and quantity; and

iii. The use of mobile or temporary treatment units may be permitted prior to the construction of a permanent facility satisfying the requirements of 6 above, provided that in all cases a permanent leachate treatment and disposal system shall be on-line within 12 months.

11. The residuals from any treatment facility shall be analyzed in accordance with the requirements of the Sludge Quality Assurance Regulation, *N.J.A.C. 7:14-4*, and disposal of in accordance with the following:

i. The analysis shall be submitted to the Bureau of Hazardous Waste Planning of the Division of Solid and Hazardous Waste for classification;

ii. Should the sludge be classified as a non-hazardous waste, the sludge shall be disposed of at a solid waste facility permitted to accept the waste type ID classification; and

iii. Should the sludge be classified as a hazardous waste the material shall be disposed of in accordance with *N.J.A.C. 7:26G*.

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12. In addition to complying with the requirements of *N.J.A.C. 7:14A-10.7*, the Dam Safety Standards, *N.J.A.C. 7:20*, and the Standards for Soil Erosion and Sedimentation Control, *N.J.A.C. 2:90*, surface impoundments utilized as on-site treatment units shall be designed and constructed in accordance with the following:

- i. Surface impoundments shall include a liner system that is designed to meet or exceed the performance standards set forth in *N.J.A.C. 7:26-2A.6(d)1* and 2 under the maximum anticipated hydrostatic head and the liner shall be constructed in accordance with (b) and (c) above;
- ii. Surface impoundments shall be designed and constructed to contain the expected flow with sufficient reserve capacity to contain accumulated precipitation from previous rainfall events and sediment and sludge accumulation;
- iii. The stability of the surface impoundment dikes shall be determined, as appropriate, for long term, short term or rapid drawdown conditions by modeling techniques and the factor of safety shall be within the minimum values set forth in Table II in (e)3i above;
- iv. The inner and outer slopes of all dikes of the surface impoundment shall not exceed a 3:1 slope;
- v. The inflow to the surface impoundment shall be designed and constructed so that any flow of waste into the impoundment can be immediately shut-off; and
- vi. Upon closure of the surface impoundment, unless the surface impoundment is within the containment and leachate collection systems of the landfill area, the surface impoundment shall be removed and disposed of in accordance with (e)11 above and NJPDES regulations, *N.J.A.C. 7:14A*.

13. The minimum standards for the design and construction of leachate storage tanks include the following:

- i. The tank shall be constructed of or lined with material which has a demonstrated chemical resistance to the leachate expected to be produced within the landfill and contained within the tank;
- ii. The storage tank area shall have a liner system consisting of a minimum of 18 inches of clay or a single 30 mil geomembrane and a leachate collection system. The liner system and leachate collection system shall be capable of containing and collecting any spills of leaks and shall be designed and constructed in accordance with (b), (c) and (d) above. Double walled tanks constructed on a concrete slab are acceptable alternatives.
- iii. The storage tank shall be designed in accordance with American Petroleum Institute (API), Underwriters Laboratory (UL), or American Concrete Institute (ACI) standards or an equivalent standard depending on the material used, such as metal, fiberglass reinforced plastic, or concrete, and the minimum shell thickness shall be equivalent to a 3/16th of an inch metal tank;
- iv. All storage tanks shall be equipped with a venting and odor control system. The venting system shall be Low-Pressure Storage Tank or an equivalent design and permitted in accordance with *N.J.A.C. 7:27-8*;
- v. Control of emissions and odors from the storage tank shall be in compliance with the rules and regulations of the Bureau of Air Pollution Control, *N.J.A.C. 7:27*;
- vi. All storage tanks shall be equipped with a high liquid level alarm or warning device. The alarm system shall be wired to the location where assistance will be available to respond to the emergency; and
- vii. All storage tanks shall be constructed and maintained in accordance with applicable provisions of the NJPDES regulations including, but not limited to, *N.J.A.C. 7:14A-10.7*.

14. Spray irrigation of treated effluent systems shall be designed and constructed in accordance with the NJPDES regulations, specifically *N.J.A.C. 7:14A-10.9*.

i. The spray irrigation system shall not result in increased hydraulic head on the liner system in excess of the design head.

(f) The following are the design standards and construction requirements for sanitary landfill gas collection and venting system:

1. Sanitary landfill gas collection and venting systems shall be designed and constructed to prevent and control the migration of sanitary landfill gases off-site and shall consist of a perimeter collection system or an interior collection system or both which shall:

- i. Prevent and control the accumulation of any methane concentrations in any structure;
- ii. Prevent and control damage to vegetation beyond the perimeter of the property on which the sanitary landfill is located; and
- iii. Contain malodorous gaseous emissions on-site.

2. Sanitary landfill gas collection and venting systems shall be subject to additional design and operational requirements set forth at the Federal New Source Performance Standards and Emissions Guidelines (NSPS/EG) established at 40 CFR 51, 52 and 60. Further guidance is set forth in the Department's Technical Manual prepared by the Department's Bureau of Landfill and Recycling Management for landfill gas collection and venting systems. All gas venting and collection systems shall be permitted in accordance with the rules of the Department's Bureau of Air Pollution Control, *N.J.A.C. 7:27*;

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3. The detection of 25 percent of the lower explosive limit of combustible landfill gases, at the perimeter of the sanitary landfill property, or any concentration of any landfill gases within any structures shall trigger the construction of an induced draft or active venting system which shall be designed and constructed in accordance with the following:

i. The perimeter gas collection and venting system shall be designed and constructed to prevent and control landfill gas migration;

ii. Passive gas venting systems may be designed and constructed initially as a preventive measure against sanitary landfill gas migration. In situations where gas migration is detected in amounts greater than or equal to the limits set forth in (f)3 above, passive gas venting systems are prohibited;

iii. The Department may require the construction of an active gas collection system if a significant concentration of gas is detected within the setback area which in the opinion of the Department poses a threat to the health and welfare of the surrounding community. The design of the gas extraction system shall be based on the following:

(1) The design of an active venting system shall be accompanied by engineering calculations computing the volumes influenced, extraction flow rates (based on zone of influence, ground surface and base grade elevations, gas generation rate and density of refuse) and blower sizing requirements (based on total negative head and volume of gas to be extracted); and

(2) The quantity of landfill gas condensate generated as a function of time shall be computed. Disposal methods for gas condensate shall be described.

(3) Detailed plans of the active venting system shall adequately delineate in plan views and in cross-sectional views, the elevations of all gas collection lines, invert, valves, extraction well locations and depth of construction materials.

iv. The number of collection well pipes shall be determined by (f)10 below and be sufficient to prevent any off-site gas migration; and

v. The depth of the gas collection wells shall be sufficient to prevent migration of sanitary landfill gases off-site in accordance with the following:

(1) When located within the lined area of the sanitary landfill, the gas collection wells shall not result in or give cause to failure of the liner or leachate collection systems; and

(2) When located outside of the lined area of the sanitary landfill, the gas collection wells shall be constructed, at a minimum, to the bottom of the liner system or to the top of the groundwater table whichever is higher.

4. The sanitary landfill shall not cause any air contaminant, including an air contaminant detectable by the sense of smell, to be present in the outdoor atmosphere in such quantity and duration which is, or tends to be, injurious to human health or welfare, animal or plant life or property, except for malodorous emissions emanating from the sanitary landfill which result in odors in areas over which the owner and/or operator has exclusive use or occupancy. Malodorous gaseous emissions emanating from the sanitary landfill which result in odors being detected in any off-site area of human use or occupancy shall be cause for requiring the construction of the interior gas collection and venting system which shall be designed and constructed in accordance with the following:

i. The interior gas collection and venting system shall be designed and constructed to control malodorous emissions resulting from gaseous emissions. The gas collection system shall also be connected to the leachate collection system to control odors;

ii. The interior collection system shall be an induced draft or active venting system;

iii. The number of collection wells shall be determined by (f)10 below and be sufficient to control malodorous emissions; and

iv. The depth of the collection wells shall not result in or give cause to failure of the liner or leachate collection systems.

5. Sanitary landfills in which active gas collection systems are constructed should, to the extent practicable, develop a gas recovery system in which the gas or converted energy is recovered and utilized;

6. The sanitary landfill gases, prior to the design and construction of the gas collection and venting system in accordance with (f)3 and 4 above, shall be sampled and analyzed to define the quality and quantity of the sanitary landfill gases. Air pollution control permits in accordance with *N.J.A.C. 7:27* shall be obtained for all gas venting systems. The sampling and analysis of sanitary landfill gases shall be in accordance with the air pollution control permit for the sanitary landfill gas venting system.

7. The gas collection system shall be designed to control condensate and to drain the condensate into the leachate collection system;

8. Each collection well shall be constructed with a valve to enable control and tuning of the system;

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9. The gas collection system within the landfill area shall be designed to compensate for settlement. Collection wells shall be designed with slip joints, telescoping joints or equivalent joints. The valves, condensation traps and manifold connections shall be designed with flexible joints;

10. A gas generation model, approved by the Department, and calculations shall be performed to properly size the number of collection wells required by (f)3iv and 4iii above. The collection well diameters, header lengths, pump capacities and recovery systems shall be properly sized, and designed and constructed in accordance with (f)6 above;

11. The pump station shall be a suitable, permanent structure, which affords protection to the pumps, motors, and electrical equipment, and shall include the following:

i. Explosion-proof equipment for the pumps, motors, and electrical equipment in accordance with the most current version of the National Electrical Code "Special Occupancy, Hazardous Location" Volume 6 of the National Fire Code published by the National Fire Prevention Association; and

ii. Adequate lighting and ventilation which shall be in accordance with the most current version of the National Fire Code's "Explosion Venting" Volume 14 published by the National Fire Prevention Association.

12. Materials used in the gas collection and venting systems shall be compatible with the sanitary landfill environment, sanitary landfill gases and condensate, and the material shall meet ASTM standards for chemically resistant materials;

13. Construction of any buildings on top of landfilled areas shall be prohibited during the operational and closure phases. Construction during the post-closure phase, as approved by the Department, shall be in accordance with the following:

i. The building shall be an above-grade structure. Construction of a basement is prohibited;

ii. The building shall be constructed to prevent gas accumulation within the structure in accordance with the requirements of (f)14 below or an equivalent method, which may include an active gas collection and venting system; and

iii. All utility connections shall be designed and constructed with flexible connections.

14. On-site buildings within the sanitary landfill properties should be designed and constructed in accordance with the following, or in accordance with an equivalent design which will prevent gas migration into the building:

i. A geomembrane or equivalent system with high gas impermeability should be installed between the slab and the subgrade or equivalent design;

ii. A permeable layer of open-graded material of clean aggregate, with a minimum thickness of 12 inches, should be installed between the membrane and the subgrade or slab. The material should be in accordance with the following requirements of the grain size distribution curves:

(1) $D_{85} < 4D_{15}$; and

(2) $D_{2} > 0.1$ inch;

iii. A geotextile filter should be utilized to prevent the intrusion of fines into the permeable layer;

iv. Perforated venting pipes shall be installed within the permeable blanket and shall be designed to operate without clogging;

v. The venting pipe shall be designed and constructed with the ability to be connected to an induced draft exhaust system;

vi. Automatic methane gas sensors shall be installed within the venting pipe/permeable blanket and inside the building to trigger an audible alarm when methane gas concentrations are detected; and

vii. All buildings shall be constructed in accordance with the National Fire Code's, Life Safety Code Volume 9 as published by the National Fire Prevention Association.

(g) The following are the design standards and construction requirements for surface drainage systems:

1. Sanitary landfills shall be designed and constructed in such a manner as to hydraulically isolate the sanitary landfill from surface water drainage in a controlled manner. The surface drainage system shall be designed and constructed to protect the sanitary landfill from run-on and control run-off, from, at a minimum, the peak discharge of a 24-hour, 25-year storm;

2. Run-on/run-off structures shall be designed utilizing the United States Department of Agriculture, Soil Conservation Service, methods and in accordance with the Standards for Soil Erosion and Sedimentation Control, *N.J.A.C. 2:90*;

3. Diversion structures shall be designed to minimize ponding behind the structure;

4. Laboratory classification, and compaction or relative density tests shall be performed on the soils to be utilized in the construction of the run-on/run-off structures in accordance with current ASTM, AASHTO or equivalent methods. The number of tests and samples shall be sufficient to define the material;

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5. The run-on/run-off structures shall be constructed by modification of the compactive effort utilizing stage compaction, not exceeding the effective depth of the compaction equipment. The compaction shall be performed to the design density and at the proper moisture content where applicable, based on the laboratory analysis performed pursuant to (g)4 above, to achieve the required strength or hydraulic conductivity;

6. The following quality control tests shall be performed on the soils utilized within the run-on/run-off structure construction:

- i. Grain size analysis; and
- ii. Relative density/compaction.

7. The tests required by (g)6 above shall be performed in accordance with ASTM, AASHTO or equivalent methods in accordance with the following:

- i. Grain size analysis shall be performed once per every 3000 cubic yards of in-place fill material; and
- ii. Relative density or compaction testing shall be performed on the completed structures at 50 foot intervals on a grid pattern across the surface;

8. The strength of the run-on/run-off structures shall be determined utilizing appropriate ASTM, AASHTO or equivalent methods for both in-situ and laboratory testing for the appropriate conditions. The stability of the structure shall be determined for long term, short term, or rapid drawdown conditions by modeling techniques and the factor of safety shall be within the minimum values set forth in Table II in *N.J.A.C. 7:26-2A.7(b)3i*;

9. Run-on controls shall meet the following requirements:

- i. Diversion structures shall be designed to minimize run-on onto the landfilled areas in accordance with (g)1 above and *N.J.A.C. 7:26-2A.6(g)* and (h);
- ii. Detention basins used for run-on control, shall be designed to provide temporary storage of the expected run-off from the design storm with sufficient reserve capacity to contain accumulated precipitation and sediment in accordance with the Standards for Soil Erosion and Sediment Control, *N.J.A.C. 2:90*;

10. Run-off controls shall meet the following requirements:

- i. Discharge of run-off from diversion structures installed on stabilized slopes with intermediate cover and graded in accordance with *N.J.A.C. 7:26-2A.82(b)11* shall comply with the NJPDES regulations, *N.J.A.C. 7:14A* where applicable; and
- ii. Discharge of run-off from the active face shall be directed to the leachate collection system. Run-off from the final capped areas may be directed to the detention ponds.

(h) The following are the design and construction requirements and standards for monitoring systems:

1. The monitoring system shall be designed and constructed in such a manner as to ensure its ability to observe and record the performance of the sanitary landfill and its various environmental control systems and to detect any potential malfunctions and possible pollutant migration;

2. The Department may require any or all of the following components for the landfill monitoring system designed and constructed pursuant to (h)1 above: groundwater monitoring system, hydrostatic pressure gradient monitoring system, gas monitoring system, leachate monitoring system, meteorological monitoring system and slope and settlement monitoring system;

3. All monitoring systems, where appropriate, shall be constructed and operated in accordance with the NJPDES regulations, *N.J.A.C. 7:14A*;

4. A ground water monitoring system shall be designed and constructed in accordance with the NJPDES regulations, *N.J.A.C. 7:14A*;

5. A hydrostatic pressure gradient monitoring system shall be designed and constructed in accordance with the following:

i. In facilities with cut-off wall designs, a system to measure the hydrostatic pressure across the wall shall be constructed in accordance with the following:

- (1) The location of the piezometers shall be directly opposite the groundwater saturated zone wells; and
- (2) The depth and location of the piezometers within the sanitary landfill shall not result in damage to the containment system.

6. A gas monitoring system shall be designed and constructed in accordance with the following:

i. The system shall be capable of detecting any possible methane gas migration from the sanitary landfill and shall be located as close to the toe of the slope of the sanitary landfill, depending on the gas flow characteristics of the soils, as is reasonably possible, in order to rapidly detect any possible gas migration;

ii. The methane gas monitoring wells shall be screened in the unsaturated zone to at least five feet below the lowest elevation of the landfill or to the top of the water table;

iii. A period gas survey performed in accordance with *N.J.A.C. 7:26-2A.8(h)9* may be substituted for the design and construction of methane gas monitoring wells; and

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iv. In accordance with the Permits and Certificates Rules of the Department, *N.J.A.C. 7:27-8*, a gas monitoring system for the gas collection systems, capable of defining the quality and quantity of the landfill gas, shall be designed and constructed.

7. A leachate monitoring system shall be designed and constructed which shall be capable of measuring the flow, and capable of sampling leaching influent and the treatment system effluent;

8. A meteorological monitoring system shall be installed within the landfill properties to measure and continuously record the daily precipitation onto the sanitary landfill, unless such data from a nearby meteorological station are available; and

9. A slope and settlement monitoring system shall be designed and constructed in accordance with the following:

i. In areas which exhibit a high degree of uncertainty of the strength data, such as meadow mat, peat, or expansive clay soils, a system to measure the settlement of the sanitary landfill and liner systems shall be installed which should include, but not be limited to, borehole settlement devices; and

ii. Sanitary landfills, when required by the Department, based on the final elevation and grades of the capping system and the foundation analysis, shall install slope inclinometers to adequately measure the slope stability and integrity.

(i) The following are the design standards and construction requirements for a final cover system:

1. The final cover system shall be designed and constructed to minimize long term infiltration and percolation of liquid into the sanitary landfill throughout the closure and post-closure periods;

2. A Class II or Class III sanitary landfill, as approved by the Department, may design and construct a final cover with a minimum of two feet of final cover, provided the performance standards of (i)1 above and *N.J.A.C. 7:26-2A.6(i)* are met.

3. The final cover system, in conjunction with the containment system required pursuant to (c) above, shall completely isolate the landfilled solid waste from the surrounding environment. In accordance with 40 C.F.R. Parts 257 and 258, and the Department's Technical Manual for the Division of Solid and Hazardous Waste, Bureau of Landfill, Compost and Recycling Management, Landfill Permits, a final cover system shall comply with the following performance standards:

i. The permeability of the final cover shall be less than or equal to that of the bottom liner system or natural subsoils present, or 1×10^{-5} cm/sec., whichever is less. The depth of final cover shall be a minimum of 18 inches overlain by a minimum of a six inch erosion layer.

ii. If the sanitary landfill has a synthetic membrane in the bottom liner system, then the final cover shall include a synthetic membrane.

(1) The synthetic membrane of the final cover does not have to be the same type or thickness as the membrane in the bottom liner system. However, a minimum thickness of 30 mils shall be used. In the case of High Density Polyethylene, a minimum thickness of 60 mils is required to ensure proper seaming of the synthetic membrane.

4. The long term stability of the final slopes shall be determined by modeling techniques in conjunction with the information gathered pursuant to (b)3 above and *N.J.A.C. 7:26-2A.5(a)6*, and the factor of safety shall be within the minimum values set forth at (b)3i and ii above;

5. The grades of the final slope shall be constructed in accordance with the following minimum standards:

i. The top slope final grades, after allowing for settlement and subsidence, shall be, at a minimum, three percent;

ii. The top slope final grades shall be, at a maximum, five percent, except as set forth at (i)5ii(1) below:

(1) Steeper top slopes which will promote drainage and not subject the closed sanitary landfill to excessive erosion shall be permitted provided the maximum erosion rate does not exceed two tons per acre as determined by the United States Department of Agriculture, Universal Soil Loss Equation; and

iii. The side slopes of the final grades shall be no steeper than three horizontal to one vertical (3:1).

6. The final grades of the final cover system shall have a surface drainage system, designed and constructed in accordance with the requirements of (g) above, capable of conducting run-off across the final grades without the development of erosion rills or gullies;

7. The construction of the final cover system shall accommodate initial settlement so that the integrity of the impermeable liner is maintained throughout the closure and post-closure period. A temporary cover may be constructed, provided the leachate collection system is operating properly in accordance with the following:

i. The temporary cover shall be capable of minimizing infiltration into the sanitary landfill unless the sanitary landfill is designed and operated to allow for leachate recirculation in accordance with (e)3 above;

ii. The depth of the temporary cover shall be a minimum of 12 compacted inches and shall be maintained to prevent erosion and exposure of solid waste; and

iii. The temporary cover shall be exposed for no greater than six months unless otherwise approved by the Department;

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8. The grading and stabilizing of the final lifts of solid waste shall result in a relatively planar surface and provide a sufficiently firm base for the placement and construction of the impermeable cap.

9. The final lifts of solid waste shall be physically or chemically stabilized in accordance with the following:

i. The density of the final lift shall be increased to the largest extent practicable by:

- (1) Reducing the thickness of the layers as compacted;
- (2) Increasing the ballast or load of the compaction equipment; and
- (3) Increasing the number of passes of the compaction equipment.

ii. Blending of gravel, stone, cobble, or selected demolition material (for example, brick, concrete, asphalt) into the upper 12 to 24 inches of the final lift of the solid waste; or

iii. Chemically stabilizing the upper 12 inches of the final lift of solid waste with the addition of soil cement or lime treated soil with silicates, kiln dust or other proprietary polymeric additives or soil asphalt. Ash-lime treated soil or ash-cement treated soil may be used, provided the ash-lime or ash-cement treated soil has received a beneficial use or reuse authorization pursuant to *N.J.A.C. 7:26-1.7(g)*.

10. The impermeable cap shall be designed and constructed in accordance with the following:

i. The cap shall, at a minimum, be as impermeable as the most impermeable component of the containment system;

ii. The minimum thickness for a clay impermeable cap shall be 12 inches;

iii. The minimum thickness for a geomembrane impermeable cap shall be 30 mils, or for High Density Polyethylene, 60 mils;

iv. The impermeable cap shall be constructed and tested in accordance with (c) above, except that (c)2vii, viii and ix above shall not apply;

v. Geomembranes utilized as an impermeable cap shall be designed and constructed to withstand the calculated tensile forces acting on the geosynthetic materials. The design shall consider the maximum friction angle of the geomembrane with regard to any interface and shall ensure that the overall slope stability and erosion control of the final cover system are maintained;

vi. The geomembrane shall be protected from below and above by a minimum thickness of six inches of bedding and cover which is no coarser than a poorly grade sand (SP), as determined in the Unified Soil Classification System (USCS), and which is free of rocks, fractured stones, debris, cobbles and solid waste. An equivalent geotextile may be utilized as approved by the Department; and

vii. The impermeable cap shall be located wholly below the average depth of frost penetration in the area as determined by United States Department of Agriculture and mapping.

11. A drainage layer shall be designed and constructed in accordance with the following:

i. The design testing of materials and the quality control testing of the drainage layer of the capping system shall be performed in accordance with (d)2ii, vii and viii above;

ii. The material used in the drainage layer shall be an open graded material of clean aggregate. The material shall be in accordance with the following criteria of the cumulative grain size distribution curves:

- (1) $D_{85} < 4D_{15}$; and
- (2) $D_{2} < 0.1$ inch;

iii. The drainage layer shall be designed and constructed so that the discharge flows freely in the lateral direction to minimize the hydrostatic head on the impermeable cap, flows through the drainage layer, and provides a path for infiltrated liquids to exit the capping system;

iv. The drainage layer shall have a thickness and hydraulic conductivity capable of transmitting all percolation through the overlying soils under saturated conditions. For design purposes, the drainage capacity of the drainage layer shall be greater than the percolation under saturated conditions. The drainage layer shall be constructed, at a minimum, in accordance with the following:

- (1) When located above a clay impermeable cap, the drainage layer shall be, at a minimum, six inches thick; and
- (2) When located above a geomembrane impermeable cap, the drainage layer shall be, at a minimum, 12 inches thick.

v. Drainage pipes and/or synthetic drainage nets, where necessary to control the hydrostatic head on the impermeable cap, should be located within the drainage layers in accordance with the following:

(1) The drainage pipe should be installed at a distance sufficient to ensure that the hydrostatic head on the impermeable layer does not exceed the thickness of the drainage layer during a 25 year, 24 hour storm;

(2) A coarse gravel envelope, within a geotextile fabric, shall be installed in accordance with *N.J.A.C. 7:26-2A.5(e)3ix* around the drainage pipe to minimize the movement of soil particles in the drainage pipe;

(3) Synthetic drainage nets shall comply with the test requirements set forth at (d)2x(l) above; and

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(4) The synthetic drainage net shall satisfy the design requirements at (d)11iii and iv above when accounting for calculated design loads imposed on the drainage net. A properly designed synthetic drainage layer shall result in no seepage forces in the overlying cover soil.

vi. A soil filter or geotextile should be designed and constructed above the open graded aggregate in order to minimize the intrusion of fines into the drainage layer.

12. The vegetative layer shall be designed and constructed in accordance with the following:

i. The vegetative layer shall be thick enough to contain the effective root depth or irrigation depth for the type of vegetation planted;

ii. Fertilizer, mulch, and seeding applications shall be performed in accordance with Standards for Soil Erosion and Sedimentation Control, *N.J.A.C. 2:90*, for permanent vegetative cover for soil stabilization;

iii. The minimum thickness of uncompacted topsoil in the upper layer of the vegetative layer shall be five inches. The topsoil shall meet the Topsoil Standard specified in Section 909.10 of the New Jersey Department of Transportation Standard Specifications for Road and Bridge Construction; and

iv. The application of sludge or the use of Sludge Derived Product (SDP) to the final grades of the vegetative layer shall be performed in accordance with the NJPDES rules, *N.J.A.C. 7:14A*.

13. A gas venting layer shall be designed and constructed in accordance with the following:

i. The gas venting layer shall be located directly below the impermeable layer and above the compacted waste layer.

ii. The gas venting layer shall be designed and constructed in accordance with the requirements set forth at (f) above.

14. The Hydrologic Evaluation of Landfill Performance (HELP) Model (EPA/600/R-94/168a, U.S. Environmental Protection Agency Risk Reduction Engineering Laboratory, Cincinnati, OH), incorporated herein by reference, as amended and supplemented, shall be used to estimate leachate generation quantities of the sanitary landfill with the impermeable cap during closure and post-closure periods.

7:26-2A.8 Sanitary landfill operational and maintenance requirements

(a) All sanitary landfills shall be operated in accordance with the requirements set forth in *N.J.A.C. 7:26-2.8*, and the following additional operational, maintenance, inspection and monitoring requirements.

(b) The sanitary landfill shall be operated in accordance with the following additional minimum requirements:

1. The working face shall be confined to the smallest practical area, as is consistent with the proper operation of trucks and equipment, in order that the area of waste material exposed during the operating day is minimized. The width of the working face shall be in accordance with the following:

i. Sanitary landfills receiving 400 or less truck loads of waste per day, shall have a working face no greater than 150 feet;

ii. Sanitary landfills receiving more than 400 truck loads of waste per day may submit a request for a working face greater than 150 feet or another 150 foot working face in a separate location. The size and number of the working faces approved by the Department will be based on the sanitary landfill equipment and cover material available on-site and the on-site traffic flow patterns.

2. All waste shall be thoroughly compacted throughout the operational day to yield the smallest practical volume;

3. Solid waste shall be compacted in shallow layers. The layers should be less than two feet in thickness and should be compacted with a minimum of four passes of the compaction equipment, except over leachate collection pipes where compacting shall be performed in accordance with *N.J.A.C. 7:26-2A.7(d)3xiv*;

4. The lift height of the daily cell, as measured vertically from the previous day's cover surface, shall not exceed 12 feet;

5. The slope of the working face shall be maintained so as to maximize compaction of the solid waste and minimize infiltration into the solid waste. The slope shall be no steeper than three horizontal to one vertical (3:1). For balefill operations, a vertical working face will be allowed at the disposal area where continued bale placement will take place within 24 hours.

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6. Separate areas designated on the site plan, as approved by the Department, may be used for the storage of demolition waste or recyclable materials in accordance with the following:

- i. The stockpiled solid waste or recyclable materials shall not contain putrescible material;
- ii. The stockpiled solid waste or recyclable materials shall not cause or result in a public health or environmental nuisance or impose a safety hazard as determined by the Department; and
- iii. A schedule or time frame for reuse of the material in a timely fashion, shall be submitted to and approved by the Department.

7. All exposed surfaces of solid waste shall be covered at the close of each operating day with daily cover consisting of six inches of compacted clean soil or alternate cover material subject to the approval of the Department;

8. Daily application of cover may be exempted if the solid waste meets the following criteria:

- i. The uncovered solid waste will not create an environmental or public health nuisance as determined by the Department;
- ii. The uncovered solid waste will not create a safety hazard as determined by the Department;
- iii. The solid waste is a clean fill; and
- iv. The solid waste is an inert material;

9. The daily covering of solid waste shall be a progressive operation so that no greater than 15,000 square feet of solid waste is exposed at any time throughout the operating day for each 150 feet of working face;

10. Intermediate cover, a minimum of 12 inches of cover material, shall be applied to all surfaces to be exposed for any period exceeding 24 hours;

11. The grade and thickness of the intermediate and final cover material on all surfaces shall be maintained until stabilized. All cracks, erosion swales, rills and uneven areas shall be maintained to prevent extrusion of solid waste and to minimize infiltration and ponded water;

12. All areas with intermediate cover shall be graded so as to facilitate drainage of run-off to the surface drainage system and minimize infiltration and ponded water;

13. The daily and intermediate cover material should be of a quality that is manageable under all weather conditions. Heavy clays and very fine grain materials, such as fly ash, shall not be used as daily and intermediate cover. A sufficient quantity of cover material shall be at the site to adequately meet the requirements of (b)7 through 10 above. For landfills without on-site supplies of cover material, a standby supply for cover material equal to 25 percent of the volume of waste received and compacted at the landfill in 10 normal disposal days shall be stored within the boundaries of the landfill property;

14. Final cover constructed in accordance with *N.J.A.C. 7:26-2A.7(i)* shall be applied to all surfaces where the final approved elevation has been reached and to all surfaces when the landfill operation is terminated;

15. An alternate material other than clean soil proposed for use as daily, intermediate or final cover material at a sanitary landfill shall be subject to the approval of the Department provided the following criteria are met. Further guidance is set forth in the Department's Technical Manual prepared by the Department's Bureau of Landfill and Recycling Management for Cover Material Requests:

- i. The alternate material impedes the entry of rodents and vectors into the waste fill;
- ii. The alternate material controls malodorous emissions;
- iii. The alternate material provides a firebreak;
- iv. The alternate material resists or has limited erosion potential and is not easily windblown; and
- v. The alternate material controls windblown litter;

16. The alternate cover material shall meet the following performance standards:

- i. The volatile solids, or combustible content of the cover shall not exceed 12 percent by weight;

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ii. No more than 20 percent of fine grained materials shall pass a No. 200 sieve;

iii. At least 40 percent by weight of the fragments in the soil admixture shall be capable of passing through a No. 10 mesh sieve; and

iv. Particle sizes shall not exceed six inches in diameter;

17. If possessing soil-like properties, the following laboratory testing for the alternate material shall be required depending on the material and its intended use:

i. For intermediate or daily cover, the following tests shall be required:

(1) Solids content;

(2) Percent volatile solids;

(3) Grain size analyses; and

(4) Moisture content;

ii. For final or temporary final cover, the following tests shall be required:

(1) Atterburg limits;

(2) Permeability testing;

(3) Solids content;

(4) Percent volatile solids;

(5) Grain size analyses; and

(6) Moisture content;

iii. In addition to the tests at (b)17ii above, materials intended for use in the topsoil layer in a final cover shall require the following tests:

(1) Nitrogen;

(2) Ammonia-n;

(3) Nitrate-n;

(4) Total kjeldahl nitrogen;

(5) Phosphorus;

(6) Calcium;

(7) Magnesium;

(8) Potassium; and

(9) Organic content;

18. Analytical chemical tests may be required for the alternate material depending on the material and its intended use;

19. An evaluation program in accordance with the requirements for RD&D projects as set forth at *N.J.A.C. 7:26-1.7(f)* shall be conducted for non-traditional cover materials such as cover foams and geotextiles. The evaluation program shall evaluate the cover material in actual use at the landfill.

i. The owner and/or operator of a sanitary landfill with an RD&D authorization for non-traditional cover materials shall evaluate the effectiveness of the material in meeting the requirements by monitoring its use under varying operational and weather conditions.

20. There shall be sufficient types of quantities of equipment for digging, spreading, compacting or covering waste or applying cover material to adequately meet the requirements of (b)7 through 10 above, to ensure a smooth flow of traffic at the working face and to achieve the maximum compaction efficiencies;

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21. At sanitary landfills that accept an annual waste flow of greater than 1,000,000 in-truck cubic yards (300,000 tons), the compaction equipment should include the use of steel wheel type compactors with a minimum operational weight of 45,000 pounds;

22. Sanitary landfill equipment shall be equipped with hand-portable fire extinguishers of a multipurpose dry chemical type, an automatic fire suppression system, and rollover protection structures and any other safety equipment required by the Occupational Health and Safety Administration standards;

23. In case of breakdown of the equipment required by (b)14 above, the permittee shall repair the equipment or obtain replacement equipment within 24 hours after breakdown. Unless sufficient types and quantities of replacement equipment meeting the requirements of 14 above are available on-site, written maintenance contracts with a local equipment dealer shall be in force at all times. A copy of the contract shall be submitted with the O and M plan to verify compliance with this requirement;

24. Access to the sanitary landfill for solid waste disposal shall be permitted only during the operating hours set by the Division of Solid and Hazardous Waste Management and shall be restricted to 7:00 A.M. to 7 P.M. in areas within 1000 feet of a residential zone;

25. The sanitary landfill shall be adequately secured with a six-foot high chain link fence with an entrance gate, posted with the operating hours, that can be locked to prevent unauthorized entry into the facility. Fencing may be exempted, as approved by the Department, in areas where topographic features restrict vehicular access to the sanitary landfill;

26. A scale house and scales meeting the requirements of *N.J.S.A. 13:1E-117* and the guidelines promulgated pursuant thereto, shall be constructed at the sanitary landfill. The location of the scale house and scales shall be situated so as to minimize the queuing-up of trucks onto the public roadway and so as to maintain a smooth and safe flow of traffic to and from the working face and while entering and exiting the landfill;

27. An all weather road shall be provided to the working face;

28. Litter shall be controlled through the use of moveable fences of sufficient height or by an equivalent means. The litter fence shall be policed daily and the litter collected shall be properly disposed of at the working face;

29. Dust control shall be effected by the spraying of water or the spreading of calcium chloride or an equivalent approved by the Department, as needed. Spraying of waste oil is prohibited;

30. The sanitary landfill shall not cause any air contaminant to be emitted in violation of *N.J.A.C. 7:27-5.2(a)*.

i. Malodorous emissions shall be controlled by the use of daily cover. In the event that this is not satisfactory, a suitable deodorant shall be used.

ii. Malodorous solid waste shall be covered immediately after unloading with a minimum of six inches of cover material or approved alternative material;

31. Mud, soil, and other materials shall not be tracked onto any public road by exiting vehicles. A rumble rack or wheel washing station may be used to control the off site tracking of mud, soil, and other material;

32. The sanitary landfill shall be operated in a manner which minimizes the propagation and harborage of insects, rodents, and birds;

33. The sanitary landfill shall be operated in a manner which will protect all monitoring devices and environmental systems from damage. Any damage shall be immediately reported to the Bureau of Solid Waste Compliance and Enforcement at (609) 584-4180;

34. Any monitoring device or environmental control system which is damaged so as to impair the proper operation of the monitoring device or environmental control system shall be reconstructed in accordance with the following:

i. The operator shall repair the monitoring device or environmental system in accordance with the plans and schedule approved by the Department; and

ii. The Department may require immediate remedial action for repair of the damaged monitoring device or environmental control system should such damage endanger human health or the environment.

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35. The sanitary landfill shall be operated in a manner which will facilitate the filling of each section to final grade and which will minimize the operational phase of each section;

36. An adequate number of qualified personnel shall be at the sanitary landfill to maintain the smooth flow of traffic at the sanitary landfill and to operate the sanitary landfill in a manner that is in compliance with the requirements of the Solid Waste Management Act, *N.J.S.A. 13:1E-1* et seq., this chapter, and the conditions of the SWF permit;

37. A supervisor shall be at the sanitary landfill during all operating hours to ensure proper operation of the sanitary landfill, to evaluate the monitoring data and inspection reports, to determine the performance of the sanitary landfill and to direct and implement all operational decisions to ensure the facility's compliance with the requirements of the Solid Waste Management Act, *N.J.S.A. 13:1 E-1* et seq., this chapter, and the conditions of the SWF permit;

38. All sanitary landfill personnel who are involved in waste management activities or who operate, service or monitor any facility equipment, machinery or system, shall complete a program of on-the-job training which shall include, at a minimum, the following:

i. The training program shall be directed by a person thoroughly familiar with the technology being utilized at the facility and the conditions of the SWF permit;

ii. The training shall include instruction in the operation and maintenance of the equipment, machinery and systems which facility personnel must operate, service or monitor in the course of their daily job duties. The training shall instruct facility personnel in the performance of their duties in a manner that ensures the facility's compliance with the requirements of the Solid Waste Management Act, *N.J.S.A. 13:1E-1* et seq., this chapter, and the conditions of the SWF permit;

iii. The training program shall ensure that the facility personnel are able to effectively respond to any equipment malfunction or emergency situation that may arise;

iv. The training program shall provide instruction in the use of safety and emergency equipment and the use of communication or alarm systems; and

v. The training program shall provide instruction in the procedures for emergency response for sanitary landfill fires or explosions, gas leaks, leachate treatment system failure or leaks, detention basin breaches or other emergencies and shall include procedures to shut down operations.

39. The sanitary landfill facility personnel shall complete the initial training program required by (b)38 above within six months after the date of their employment;

40. The sanitary landfill facility personnel shall take part in an annual update of the initial training program;

41. Training records that document the type and amount of training received by current facility personnel shall be kept until closure of the sanitary landfill;

42. The following actions shall be implemented in the case of an emergency:

i. The supervisor or emergency coordinator shall immediately identify the character, exact source, amount and extent of any discharged materials and notify appropriate State or local agencies with designated response roles if their help is needed;

ii. Concurrently, the supervisor or emergency coordinator shall assess possible hazards to public health or the environment that may result from the discharge, fire or explosion. This assessment shall consider both direct and indirect effects;

iii. If the supervisor or emergency coordinator determines that the facility has had an uncontrolled discharge, a discharge above standard levels permitted by the Department, or a fire or explosion, he or she shall:

(1) Immediately notify appropriate local authorities if the assessment indicates that evacuation of local areas may be advisable;

(2) Immediately notify the Department at 1-877-WARNDEP; and

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(3) When notifying the Department, report the type of substance and the estimated quantity discharged, if known, the location of the discharge, actions the person reporting the discharge is currently taking or proposing to take in order to mitigate the discharge and any other information concerning the incident which the Department may request at the time of notification.

iv. The supervisor shall take all reasonable measures to ensure that fires, explosions and discharges do not recur or spread to other areas of the facility. These measures shall include, where applicable, the cessation of operations and the collection and containment of released waste;

v. Immediately after an emergency, the supervisor or emergency coordinator shall provide for treating, storing or disposing of waste, contaminated soil or water or any other material contaminated as a result of the discharge, fire or explosion;

vi. The supervisor or emergency coordinator shall ensure that no waste is processed until cleanup procedures are completed and all emergency equipment listed in the contingency plan is again fit for its intended use;

vii. The supervisor or emergency coordinator shall notify the Department and appropriate local authorities when operations in the affected area of the facility have returned to normal; and

viii. Within 15 days after the incident, the supervisor or emergency coordinator shall submit a written report on the incident to the Department. The report shall include, but not be limited to:

(1) The name, address and telephone number of the facility;

(2) The date, time and description of the incident;

(3) The extent of injuries, if applicable, with names and responsibilities indicated;

(4) An assessment of actual damage to the environment, if applicable;

(5) An assessment of the scope and magnitude of the incident;

(6) A description of the immediate actions that have been initiated to clean up the affected area and prevent a recurrence of a similar incident; and

(7) An implementation schedule for undertaking longer term measures to effect cleanup and avoid recurrence of the incident, if applicable.

43. An on-site baseline consisting of two vertical and horizontal control monuments shall be constructed and installed in accordance with the Map Filing Law, *N.J.S.A. 46:23-9.9 et seq.*, and the Department's specifications in the "Guidelines for Establishing Vertical and Horizontal Control Monuments on Sanitary Landfills" available from the Division of Waste Management, Office of Engineering.

44. The control monuments shall be installed with, at a minimum, Second Order accuracy in accordance with the "Classification, Standards of Accuracy, and General Specifications of Geodetic Control Survey", published by the U.S. Department of Commerce, 1980;

45. The control monuments shall be tied into the national or State geodetic survey network and keyed into the North American Datum of 1983; and

46. Sanitary landfills equal to or greater than 50 acres in size may be required to construct and install secondary control points. The control points shall be installed in accordance with the Department's "Guidelines for Establishing Vertical and Horizontal Control Monuments on Sanitary Landfills."

(c) While the sanitary landfill is in operation all environmental control systems shall be maintained in a proper functioning manner and shall be inspected to ensure compliance with the operational and construction requirements and the design and performance standards.

(d) The inspections, required by (c) above, shall be performed, unless otherwise stated, on a weekly basis and after storm events to detect evidence of deterioration, malfunction or improper operation.

(e) The owner and/or operator shall record the results of the inspections in a log book or by means of an electronic records storage system approved by the Department which shall be maintained at the sanitary landfill office and be accessible, at all times, for inspection by the Department. These records shall include the date and

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time of the inspection, the name of the inspector, a notation of observations and recommendations and the date and nature of any repairs or other remedial action.

(f) If deterioration which would result in failure, malfunction or improper operation is evident during inspection, the operator shall make repairs in accordance with (b)34 above and as listed in the approval final O and M manual.

(g) The sanitary landfill shall be maintained and inspected by the owner and/or operator in accordance with the following additional minimum requirements:

1. The buffer zone shall be maintained free from litter. The entire area shall be policed on a daily basis, weather permitting, and the collected litter shall be properly disposed of at the working face;

2. The all weather road shall be maintained as necessary to provide access to the working face;

3. The public roads providing access to the sanitary landfill shall be maintained free of mud, dirt, and litter. The entrance shall be properly policed on a daily basis, weather permitting;

4. The vertical and horizontal control monuments shall be maintained and resurveyed by a licensed New Jersey Land Surveyor and certified for accuracy biennially. The survey shall be, at a minimum, second order accuracy in accordance with the "Classification, Standards of Accuracy, and General Specifications of Geodetic Control Survey" published by the U.S. Department of Commerce 1980. The control monuments shall be tied into the national or state geodetic survey network;

5. All emergency equipment shall be maintained in a proper functioning manner. The equipment shall be tested on an annual basis;

6. The cap on the cut-off wall, required by *N.J.A.C. 7:26-2A.7(c) 10xvi.*, shall be maintained at a three foot thickness to prevent the erosion of the cut-off wall;

7. The leachate collection pipes shall be maintained to ensure a free flow of leachate. The leachate collection pipes shall be inspected and if blockage and clogging of the system is evident the collection pipes shall be cleared by water jet flushing or an equivalent method. The mains shall be tested annually to ensure a free flow of leachate;

8. The structural integrity of the manholes or clean-out risers shall be maintained to ensure a free flow of leachate;

9. The structural integrity of the sumps shall be maintained to ensure water tightness of the sump;

10. The structural integrity of the leachate pump station and gas pump station, and the electrical, venting and alarm systems of the leachate pump station and the gas pump station shall be maintained to ensure a free flow of leachate and gas;

11. The leachate pumping system and gas pumping system shall be maintained as necessary. They shall be completely overhauled, at a minimum, on a biennial basis and shall be inspected on a daily basis to ensure a free flow of leachate or gas;

12. The leachate treatment and disposal systems shall be inspected on a daily basis and maintained in a manner which will prevent anaerobic and malodorous conditions from developing;

13. The structural integrity of the storage tanks shall be maintained to ensure containment of leachate. The tanks shall be inspected annually for leaks;

14. The structural integrity and erosion protection shall be maintained on all areas of the surface impoundments to ensure stability of the dike and emergency spillways and containment of the leachate and run-off. The surface impoundment shall be inspected on a daily basis to ensure that the minimum depth of freeboard is maintained;

15. The leachate treatment and disposal system units, storage tanks, surface impoundments, and detention/retention ponds shall be dredged, as necessary, to maintain the design capacity. Dredging shall not result in or cause damage to the containment system;

16. The structural integrity of the vents, manifolds and piping of the gas venting system shall be maintained to insure a free flow of gas;

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17. The structural integrity of the gas flaring or recovery/combustion systems shall be inspected on a daily basis and shall be maintained to ensure proper disposal or use of the collected gas;

18. The structural integrity of all monitoring devices shall be maintained to ensure their workability and reliability; and

19. The structural integrity and erosion protection of the surface run-on/run-off structures shall be maintained on all areas of the capping system to ensure the stability of the slope and prevent excess erosion. The top grades shall be maintained at their proper slopes to minimize ponding.

(h) Monitoring shall be performed in accordance with the following parameters and schedules:

1. Sampling and analysis of water from the groundwater monitoring wells and lysimeters shall be performed in accordance with the NJPDES regulations, *N.J.A.C. 7:14A*;

2. Sampling and analysis of surface water taken from the surface water monitoring locations shall be performed in accordance with *N.J.A.C. 7:14A*;

3. Leachate monitoring of the influent and effluent of the treatment and disposal system shall be performed in accordance with the appropriate section of the NJPDES regulations at *N.J.A.C. 7:14A*;

4. In addition to the requirement of (h)3 above, the flow of leachate in the primary and secondary leachate collection and detection systems shall be recorded on a daily basis;

5. The daily leachate monitoring results shall be compiled on a quarterly basis and submitted to the Division.

6. Residuals from the treatment and disposal systems shall be sampled and analyzed in accordance with the requirements of the Sludge Quality Assurance Regulations, *N.J.A.C. 7:14-4*;

7. Residuals from the treatment and disposal systems shall be sampled prior to the planned disposal and the results of the analysis shall be submitted to the Bureau of Technical Assistance for class identification 30 days prior to disposal;

8. The hydrostatic pressure of the cut-off wall and the liner system shall be monitored on a monthly basis, unless otherwise directed by the Department, and the results shall be submitted to the Division;

9. Sanitary landfill gases shall be sampled and analyzed in accordance with the following:

i. A gas quality analysis shall be performed on the gas venting and collection systems as constructed in accordance with *N.J.A.C. 7:26-2A.7(f)* 3 and 4 on an as needed basis as determined by the Division and the Bureau of Air Quality Engineering, pursuant to *N.J.A.C. 7:27*;

ii. A methane gas survey shall be performed on a quarterly basis and the results shall be submitted to the Division. If gas is detected within the buffer zone the Department may require more detailed and frequent surveys to be performed.

iii. The methane gas survey shall be performed with a hand-held portable explosimeter or equivalent and the minimum sampling depth shall be three feet below the ground surface or above the water table, whichever is higher; and

iv. The sampling for the methane gas survey shall be performed on a quarterly basis around the perimeters of the buffer zone of active landfill areas and annually around the entire perimeter of the buffer zone of the sanitary landfill. The maximum interval between sampling points shall be 300 feet. Sampling shall be performed around the perimeter of all on-site structures. The maximum interval between sampling points for structures shall be 50 feet; however, there shall be at least one sampling point along each side of the structure. If repeated methane gas surveys consistently detect no methane gas around the perimeters of the buffer zone of an active landfill area or at any location around the entire perimeter of the buffer zone of the sanitary landfill, the maximum interval between sampling points shall be increased and/or the sampling frequency shall be decreased, as approved by the Department, based on negative results at a particular location;

10. The daily precipitation data from the meteorologic monitoring system shall be compiled and submitted on a quarterly basis to the Division.

11. The settlement and slope data shall be compiled and submitted on a quarterly basis to the Division.

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(i) All sanitary landfills shall submit an annual topographic survey of all areas of the sanitary landfill. The topographic survey shall be made between January 1 and March 31 of each year and submitted on or before May 1 of each year in accordance with the following:

1. The topographic survey shall be prepared in accordance with the Map Filing Law, *N.J.S.A. 46:23-9.9* et seq., and shall be depicted at the same scale and contour intervals as the approved engineering site plan design;

2. All vertical and horizontal points all be located utilizing Third Order, Class I for property survey and Third Order, Class II from remaining points in accordance with the "Classification Standards of Accuracy and General Specification of Geodetic Control Survey" published by the U.S. Department of Commerce, 1980. Contour elevations and vertical and horizontal locations shall be based on the National Geodetic Vertical Coordinate Datum (Mean Sea Level Datum) and keyed into the New Jersey Plane Coordinate Datum, 1983;

3. The topographic survey shall delineate, at a minimum the following:

i. The vertical and horizontal control monuments and secondary control points installed in accordance with *N.J.A.C. 7:26-2A.7(a)2* or *N.J.A.C. 7:26-2A.8(a)1xxxiii*, delineating X (east) and Y (north) coordinates and elevations;

ii. All groundwater monitoring wells and piezometer delineating X (east) and Y (north) coordinates and elevations;

iii. The property lines of the sanitary landfill properties;

iv. The boundary lines of the approved landfill areas;

v. The boundary of areas currently being landfilled and which have been landfilled since the last topographic survey was submitted;

vi. The boundary of the areas which have not been landfilled within the approved landfill area;

vii. The boundary of the areas where final cover has been placed;

viii. The topographic survey shall be prepared by a licensed New Jersey Land Surveyor and the topographic survey report shall be certified by a licensed New Jersey Professional Engineer; and

ix. Information from previous annual topographic surveys may be reproduced in a current annual topographic submission provided that no change to any of (i)3i through vii above has occurred.

4. A report shall be submitted with the topographic survey which shall describe, with sufficient calculations clearly notated, the following:

i. The solid waste disposed of at the landfill since the last topographic survey. This quantity shall be reported in tons for landfills with scales and in cubic yards for landfills exempted from installing scales.

ii. The number of trucks which disposed of waste since the last topographic survey;

iii. The solid waste disposed of at the landfill since commencement of landfilling operations. This quantity shall be reported in cubic yards;

iv. The volume of daily and intermediate cover applied since the last topographic survey. This quantity shall be reported in cubic yards;

v. The volume of final cover applied since the last topographic survey. This quantity shall be reported in cubic yards;

vi. The in-place compaction achieved since the last topographic survey. This quantity shall be reported in pounds per cubic yard; and

vii. The remaining capacity of the landfill excluding final cover volume. This quantity shall be reported in cubic yards.

5. Closed sanitary landfills are exempt from the requirements of this subsection. For the purposes of this exemption, "closed" means the termination of all operations at the landfill and initiation of closure activities pursuant to *N.J.A.C. 7:26-2A.9*.

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(j) Approval of and standards for disruption of landfills shall be in accordance with the following:

1. Written approval for disruptions shall be obtained from the Department prior to any excavation, disruption, relocation or removal of any deposited material, which may or may not involve solid waste, from either an active, terminated, or closed sanitary landfill. Specific guidance for the preparation of an application for disruption approval is provided in the Department's Technical Manual for the Division of Solid and Hazardous Waste, Bureau of Landfill, Compost and Recycling Management, Landfill Permits. For the purposes of this section, disruptions are defined as follows:

i. Minor disruption means the performance of a site investigation at a landfill for the purpose of gathering and evaluating information about the landfill's environmental or physical properties. Minor disruptions include, but are not limited to, the performance of soil borings and test pits, methane gas surveys, and installation of piezometers and observation wells.

ii. Major disruption means the construction of buildings, roadways, parking areas and other site improvements on top of a landfill.

iii. In cases where the landfill owner and/or operator has submitted documentation and received prior approval from the Department in the form of a revised or renewed solid waste facility permit, closure and post-closure plan approval or other approval for specific construction activities, a separate disruption approval shall not be required.

2. All requests for approval shall include an operational plan stating the area involved, the depth of the excavation with final grades, estimated cubic yards of material to be excavated, the site where excavated material is to be redeposited, and the estimated time required for completion of excavation procedures;

3. All excavation shall be confined to an area consistent with the number of pieces of digging equipment or trucks used for haulage. The area of excavation shall be kept to the smallest practical area;

4. Adequate measures shall be taken during excavation to control dust, odors, fires, rodents, insects, blowing litter, surface water run-on and erosion; and

5. The disposal of all solid waste resulting from the excavation shall be in conformance with the requirements of *N.J.A.C. 7:26-2.11*.

(k) Control of smoking, smoldering or burning landfills shall be in accordance with the following:

1. In case of a fire on an active sanitary landfill, the responsibility for fire control shall lie with the SWF permit holder. In case of a fire on a terminated, closed or unpermitted landfill, the responsibility for fire control shall lie with the person having the title to the premise upon which the fire is located;

2. The owner or operator of any landfill wherein smoldering, smoking or burning is occurring shall immediately notify the local police and fire department having jurisdiction and the Department hot-line 1-877-WARNDEP;

3. The owner or operator of any active landfill shall be responsible for initiating and continuing fire-fighting actions until all smoldering, smoking and burning ceases;

4. The owner or operator of any landfill shall seek and obtain fire-fighting assistance if smoldering, smoking or burning persists for longer than 24 hours;

5. The owner or operator of any landfill shall not conduct disposal activities within the burning area. Precautions shall be taken to prevent disposal activities from interfering with fire-fighting activities; and

6. Any disruption of the finished grade or covered surface shall be repaired and recovered upon completion of fire-fighting activities.

(l) Rules concerning the disposal of asbestos and asbestos-containing waste material in sanitary landfills follow:

1. The owner and/or operator of a sanitary landfill shall only accept and dispose of asbestos and asbestos-containing waste materials which have been managed in accordance with *N.J.A.C. 7:26-2.12(a)*.

2. All asbestos and asbestos-containing waste materials accepted for disposal at a sanitary landfill shall be disposed of in the following manner:

i. Owners and/or operators of new landfills accepting asbestos or asbestos-containing waste materials shall meet the following requirements:

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(1) The owner and/or operator of the landfill shall develop a separate area of the landfill, apart from other waste disposal areas, for disposal of asbestos and asbestos-containing waste materials. It is recommended that the asbestos disposal area be operated by a trench method, with sufficient width and ramping to allow the transport vehicle to back up to or into the trench to allow for proper unloading of the asbestos and asbestos-containing waste materials in a manner that prevents the rupture of the containers during the unloading operation.

(2) Upon acceptance of the waste, the asbestos disposal area shall immediately be prepared. After unloading, the asbestos and asbestos containing waste materials shall be immediately covered with daily cover. To prevent disturbance of the buried asbestos and asbestos containing waste, truck traffic shall be excluded from the active asbestos disposal area.

(3) In areas in which asbestos and asbestos-containing waste materials has been previously deposited, as required by (1)2i(2) above, the current working face may be prepared by removal of cover material; however, no previously deposited asbestos and asbestos-containing waste materials shall be exposed and a minimum of six inches of cover material shall be maintained between the cells. After unloading, the asbestos and asbestos-containing waste materials shall be immediately covered with a minimum of three feet of daily cover.

(4) The final cover of the asbestos disposal area shall be a minimum of three feet of soil and shall be sufficient to minimize infiltration into the asbestos and asbestos-containing waste materials. The final slopes shall be graded to facilitate run-off away from the asbestos disposal area.

(5) The final cover shall be seeded and maintained to prevent erosion and exposure of the asbestos and asbestos-containing waste materials.

ii. Owners and/or operators of existing landfills shall comply with one of the following two options for disposal of asbestos and asbestos-containing waste materials:

(1) The owner or operator of the landfill may develop a separate area of the landfill for asbestos and asbestos-containing waste disposal, prepared and operated as required by (1)2i above; or

(2) A separate excavation may be prepared in the working face of the landfill. The excavation shall be of sufficient width and depth so as to allow the asbestos and asbestos-containing waste materials to be deposited such that a minimum of three feet of earth or other cover material may be placed between the top of the waste deposited and the top surface of the working face. A written notice must be recorded along with the deed for the landfill property, for all landfilled areas, with the appropriate county recording office, notifying future owners of the property that asbestos has been disposed in the landfill and that disruption or excavation is expressly prohibited under (1)2v below.

iii. The asbestos and asbestos-containing waste materials deposited in the disposal areas described in (1)2i and ii above, shall immediately be covered with three feet of earth or other approved cover material in a manner that prevents the rupture of the containers during the burying operation.

iv. For disposal areas identified in (1)2i and (1)2ii(1) above, a detailed metes-and-bounds description of the asbestos disposal area shall be recorded, along with the deed for the landfill property, with the appropriate county recording office, notifying future owners of the property that disruption or excavation is expressly prohibited pursuant to (1)2v below. This description shall also include the depths of asbestos and asbestos-containing waste materials and cover material and shall remain in the record in perpetuity.

v. For disposal areas identified in (1)2i and ii above, the intermediate and/or final landfill cover may not be disrupted, except as required for pollution control or remedial action, in which case such disruption must be managed in compliance with State regulations and 40 C.F.R. Part 61 governing the removal, disposal or other handling of asbestos or asbestos-containing waste materials.

vi. No person may enter an asbestos disposal area at a landfill during the unloading and covering of asbestos and asbestos-containing waste materials without wearing a respirator approved for asbestos by the National Institute for Occupational Safety and Health and the Mine Safety and Health Administration. This equipment shall be provided and maintained in good working order by the landfill owner and/or operator for its employees.

vii. With the approval of the Department, the owner and/or operator of the landfill may establish a secured drop-off and/or transfer area for the acceptance of asbestos and asbestos containing waste materials (ACWM) separate and apart from the disposal areas described in (1)2i and ii above. The owner and/or operator shall ensure that the container used for drop-off and/or transfer is fully enclosed and located on an impermeable surface. No person other

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than facility personnel or a licensed commercial asbestos removal contractor may load the asbestos or asbestos-containing waste materials into the container used for drop-off and/or transfer.

3. Either there shall be no visible air emissions during or after acceptance and disposal to the outside air from any active waste disposal site where asbestos-containing waste material has been deposited, or the requirements of (1)3i or ii below shall be met.

i. Rather than meet the no visible emission requirement of this paragraph, the owner and/or operator of the sanitary landfill shall ensure that the asbestos or asbestos-containing waste material that has been deposited at the site shall:

(1) Be covered with at least six inches of compacted non-asbestos-containing material; or

(2) Be covered with a resinous or petroleum-based dust suppression agent that effectively binds dust and controls wind erosion. Such an agent shall be used in the manner and frequency recommended for the particular dust by the dust suppression agent manufacturer to achieve and maintain dust control. Other equally effective dust suppression agents may be used upon prior approval by the Department. For purposes of this paragraph, any used, spent, or other waste oil is not considered a dust suppression agent.

ii. Rather than meet the no visible emission requirement of this paragraph, the owner and/or operator of the sanitary landfill may use an alternative emissions control method that has received prior written approval by the Department.

4. The requirements in this subsection do not apply to asbestos and asbestos containing waste materials generated in a renovation or demolition project wherein the total project involves less than 260 feet of asbestos-coated pipe or less than 160 square feet of asbestos-coated surface, such as ducts, boilers, tanks, structural members and the like.

7:26-2A.9 Closure and post-closure care of sanitary landfills

(a) This section shall govern the closure and post-closure care of all sanitary landfills. This section includes requirements for the preparation of a Closure and Post-Closure Plan, as defined in (d)1 below, for all new sanitary landfills and every sanitary landfill operating on or after January 1, 1982. It also establishes requirements concerning establishment and use of the escrow accounts required pursuant to the Sanitary Landfill Facility Closure and Contingency Fund Act, *N.J.S.A. 13:1E-100* et seq., and the Solid Waste Management Act, *N.J.S.A. 13:1E-1* et seq., for every sanitary landfill operating on or after January 1, 1982.

(b) The following words and terms, when used in this section, shall have the following meanings. Where words and terms are used which are not defined herein, the definitions of those words and terms will be the same as the definitions found in *N.J.A.C. 7:26-1.4*:

"Accredited financial institution" means any commercial bank, savings bank or savings and loan association with its principal office located in the State of New Jersey, and insured by the Savings Association Insurance Fund (SAIF) or the Federal Deposit Insurance Corporation (FDIC); or limited purpose trust company that meets the requirements set forth in *N.J.S.A. 17:9A-28* and *17:9A-31* with its principal office located in the State of New Jersey maintaining assets in excess of \$ 50,000,000.

"Closure" means the construction and implementation of all environmental safeguards required by law or by the sanitary landfill's approved Closure and Post-Closure Plan and the facility's approved engineering design subsequent to the termination of operations at any portion of that facility. Closure may include but is not limited to all activities and costs associated with the design, purchase, construction and maintenance of all items in order to prevent, minimize or monitor pollution or health hazards resulting from sanitary landfills subsequent to the termination of operations at any portion thereof, including but not necessarily limited to, the costs of placement of acceptable cover, the installation of methane gas monitoring, venting, or evacuation systems, the installation and monitoring of wells or leachate collection and control systems at the site or in the vicinity of any sanitary landfill.

"Closure period" means, unless otherwise specified, the period beginning after the landfill or a portion thereof has ceased to accept waste or the period as determined by the Department.

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"Escrow account" means an interest-bearing account with an accredited financial institution as escrow agent, wherein funds shall be deposited by the owner or operator of every sanitary landfill pursuant to *N.J.S.A. 13:1E-100* et seq., and this section. This account shall be based upon the standard escrow agreement provided by the Department for execution by and between the escrow agent and the owner or operator of the sanitary landfill. There shall be only one escrow account for each sanitary landfill, unless otherwise authorized by the Department.

"Liquidity" means that availability of funds for drawdowns consistent with a landfill's approved closure plan, or, if there is no approved closure plan, consistent with the Department's closure strategy for the landfill facility.

"Owner or operator" means and includes, in addition to the usual meanings thereof, every owner of record of any interest in land where on a sanitary landfill facility is or has been located, and any person, partnership or corporation which owns a majority interest in any other corporation which is the owner or operator of any sanitary landfill.

"Post-closure care" means those activities necessary to maintain and monitor a sanitary landfill in accordance with an approved engineering design and applicable laws and regulations after the landfill has been properly closed.

(c) General closure and post-closure care requirements are as follows:

1. Every owner or operator of a sanitary landfill shall be jointly and severally liable for the proper operation and closure of the sanitary landfill, as required by law, and for any damages, no matter by whom sustained, proximately resulting from the operations and closure.

2. The owner or operator of a sanitary landfill shall notify the Department in writing of his intention to suspend or terminate operations at that landfill. The Department shall receive notice at least 10 days prior to the date of suspension of operations, which notice shall include the duration of the suspension, and shall receive notice at least 180 days prior to the date of termination of operations.

3. No person shall contract to sell any land which has been utilized as a sanitary landfill facility at any time unless the contract of sale for the land describes such use and the period of time that the land was so utilized, as required in (c)4 below. Upon written request, any prospective purchaser of such land may obtain from the Department a history of the compliance by the landfill with all applicable statutes, rules and regulations administered by the Department.

4. Upon closure of the sanitary landfill, a detailed description of the landfill shall be recorded, along with the deed, with the appropriate county recording office. The description shall include the general types, locations, and depths of wastes on the site, the depth and type of cover material, the dates the landfill was in use and all such other information as may be of interest to potential landowners, and shall remain in the record in perpetuity. The deed shall also provide notice that any future disruption of the closed landfill shall require prior approval from the Department in accordance with *N.J.A.C. 7:26-2A.8(j)*.

5. The post-closure care period shall continue for 30 years after the date of completing closure of the sanitary landfill or as the following conditions apply:

i. The Department may reduce the post-closure care period to less than 30 years when it has been adequately demonstrated that the reduced period is sufficient to protect human health and the environment;

ii. Prior to the time that the post-closure care period is due to expire, the Department may extend the post-closure care period upon a finding that such extended period is necessary to protect human health and/or the environment; and

iii. Any aggrieved person may petition the Department for an extension or reduction of the post-closure care period, based on good cause.

6. If the Department intends to reduce or extend the post-closure care period to less than or more than 30 years, public notice of that intention shall be provided.

(d) General requirements for a Closure and Post-Closure Plan are as follows:

1. No person shall construct or operate a sanitary landfill without an approval from the Department of a Closure and Post-Closure Plan. Such Plan shall consist of both a Closure and Post-Closure Care Plan and a Closure and Post-Closure Financial Plan in accordance with the provisions of (e) and (f) below, except as otherwise authorized by the Department.

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2. The submission for approval by the Department of the Closure and Post-Closure Plan shall be made upon application for new sanitary landfill permit.

3. Existing sanitary landfills in operation after January 1, 1982 shall submit the Closure and Post-Closure Plan for approval by the Department in accordance with the following schedule:

i. Those sanitary landfills which ceased accepting waste during calendar year 1982 or which shall cease accepting waste during calendar year 1983 shall submit a Plan no later than three months from the effective date of this section;

ii. Those sanitary landfills not included in (d)3i above and which accept in excess of 100,000 cubic yards of waste per year, as delivered, shall submit a Plan no later than six months from the effective date of this section; and

iii. All remaining sanitary landfills not provided for in (d)3i and ii above shall submit a Plan no later than 12 months from the effective date of this section.

4. No owner or operator shall submit a Closure and Post-Closure Care Plan for approval which includes any unauthorized expansion of the proposed or actual sanitary landfill operation.

5. Any owner or operator who fails to submit the Closure and Post-Closure Plan, as required by this subsection, shall be subject to denial, revocation or suspension of the registration of the sanitary landfill and other regulatory or legal actions which the Department is allowed to institute by law.

6. The owner or operator may apply for Departmental approval to amend the Closure and Post-Closure Plan at any time during the sanitary landfill's operation, closure or post-closure care period.

7. The Department may require the amendment of an engineering design and a Closure and Post-Closure Plan at any time it is deemed necessary during the sanitary landfill's operation, closure or post-closure care period.

8. Any sanitary landfill that is closed under the provisions of this section shall be maintained in accordance with the approved Closure and Post-Closure Plan and must remain in compliance with all regulations of this subchapter.

9. A copy of the approved Closure and Post-Closure Plan shall be kept on file at the sanitary landfill during the course of the sanitary landfill's operation and, after closure, shall be filed with the municipal clerk.

10. Within six months of closure of the sanitary landfill, the owner and/or operator of the sanitary landfill shall obtain and submit to the Department an "as-built" certification by a New Jersey licensed professional engineer, certifying that each provision of the Closure and Post-Closure Plan has been implemented as designed and approved, subject to the following requirements:

i. A New Jersey licensed professional engineer shall certify, in writing, to the Department that he or she has supervised the inspection of the construction of each major phase of the sanitary landfill's closure. He or she shall further certify that each phase has been prepared and constructed in accordance with the closure design approved by the Department. The certification shall include as-built drawings.

ii. A New Jersey licensed professional engineer shall certify that the materials utilized in the closure of the sanitary landfill are in conformance with and meet the specifications of the approved closure design.

iii. There shall be no deviation from the approved closure design without the prior written approval of the design engineer and, at a minimum, prior verbal approval by the Department.

iv. All certifications shall bear the raised seal of the New Jersey licensed professional engineer, his or her signature, and the date of certification.

v. The certification shall include the following statement: "I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals under my supervision, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. I understand that, in addition to criminal penalties, I may be liable for civil administrative penalty pursuant to N.J.A.C. 7:26-5 and that submitting false information may be grounds for denial, revocation or termination of any solid waste facility permit or vehicle registration for which I may be seeking approval or now hold."

(e) The Closure and Post-Closure Care Plan shall meet the following specific requirements:

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1. The owner or operator of every sanitary landfill shall submit to the Department a Closure and Post-Closure Care Plan prepared, signed and sealed by a New Jersey licensed professional engineer to provide for closure and post-closure care of the sanitary landfill;

2. The Closure and Post-Closure Care Plan shall provide for the design and implementation of the following:

i. A Soil Erosion and Sediment Control Plan certified by the local soil conservation district in accordance with the Soil Erosion and Sediment Control Act of 1975, as amended (*N.J.S.A. 4:24-39 et seq.*);

ii. Final cover;

iii. Final cover vegetation;

iv. A program for the maintenance of final cover and final cover vegetation;

v. A program for the maintenance of side slopes;

vi. Institution of run-on and run-off control programs;

vii. A program for the maintenance of run-on and run-off control programs;

viii. Groundwater monitoring wells;

ix. A program for the maintenance of groundwater monitoring wells;

x. A program for the monitoring of groundwater in accordance with NJPDES rules, *N.J.A.C. 7:14A*, and any permit for that sanitary landfill issued pursuant thereto;

xi. A methane gas venting or evacuation system;

xii. A program for the maintenance of methane gas venting or evacuation system;

xiii. A leachate collection and/or control system;

xiv. A program for the operation and maintenance of a leachate collection and/or control system;

xv. A program for the installation of a facility access control system;

xvi. A program for the maintenance of the facility access control system;

xvii. Measures to conform the site to the surrounding area;

xviii. A program for the maintenance of measures to conform the site to the surrounding areas;

3. The Department may require additional closure and post-closure care measures or waive any of the above requirements, should specific health and/or environmental circumstances justify such action; and

4. The Closure and Post-Closure Care Plan shall include a schedule for the implementation of all the provisions of this section.

(f) The Closure and Post-Closure Financial Plan shall meet the following specific requirements:

1. The owner or operator of every sanitary landfill shall submit a Closure and Post-Closure Financial Plan to the Department which shall set forth the costs and expenses, and establish the means for meeting those costs and expenses, associated with full implementation of the approved Closure and Post-Closure Plan.

2. The Closure and Post-Closure Financial Plan shall include an estimate which details the cost of each provision of the Closure and Post-Closure Care Plan and a projection of funds that will be available from the escrow account. Where the total expenses projected for the Closure and Post-Closure Care Plan exceed the amount of funds projected in the escrow account, the owner or operator must identify specific alternative funds which are to be dedicated to ensure payment of all costs identified in the Closure and Post-Closure Plan. The Plan shall provide:

i. That no withdrawals may be made from the escrow account until such time as the funds projected in the escrow account are sufficient to pay for all closure costs identified in the Closure and Post-Closure Financial Plan;

or

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ii. That withdrawals may be made from the escrow account concurrent with the use of the alternative funds described above, provided that such alternative funds are established in a manner similar to the escrow account and the expenditures from such alternative funds are made subject to the approval of the Department.

3. The Closure and Post-Closure Financial Plan shall include an estimate which details the general and administrative costs, including but not limited to, fees for engineering, legal, accounting, auditing and banking services, property and sales taxes, environmental impairment and general liability insurance, Department permits and review fees, and utility costs.

i. The costs in (f)3 above for non-construction and/or maintenance services are allowable for reimbursement from the escrow accounts provided that:

(1) The costs are necessary and attendant to further the closure and post-closure requirements of the sanitary landfill;

(2) The Closure and Post-Closure Plan includes provisions for these costs and they are fully funded; and

(3) The projected costs are the same as or comparable to the costs for similar services.

ii. If there are insufficient funds available to complete the sanitary landfill's closure and post-closure requirements, as set forth in the Closure and Post-Closure Plan, reimbursement of costs for environmentally necessary construction and/or maintenance activities will take priority over general and administrative costs, unless otherwise approved in advance by the Department.

iii. The Department shall not disburse money from the escrow account for the expenses incurred by the owner and/or operator of the sanitary landfill in an effort to challenge, contest or defy the Department's rules and regulations, and any permits or orders issued pursuant thereto.

4. The Closure and Post-Closure Financial Plan shall include the intervals at which each closure provision is to be implemented as well as a projection of when each escrow account withdrawal is anticipated.

5. The Financial Plan shall take into consideration the effect of inflation on closure and post-closure expenses. Unless otherwise approved, the owner or operator shall calculate the latest closure cost estimate using a calculated adjusted inflation factor derived from the annual Implicit Price Deflator for the Gross Domestic Product as published by the U.S. Department of Commerce in its "Survey of Current Business." The adjusted inflation factor shall be the 10-year moving average inflation rate (average annual percentage) for the most current 10-year period of Gross Domestic Product Implicit Price Deflators, for example, 1987 compared with 1997 or 83.1 compared with 112.4 which yields a 3.06 percent average annual percentage change. The adjusted annual closure cost estimate shall equal the latest closure cost estimate times the adjusted inflation factor.

6. The owner or operator shall review the cost estimate every two years and, if necessary, revise the Closure and Post-Closure Financial Plan. The updated Financial Plan shall be submitted on the second anniversary of the date of the Financial Plan was last approved.

(g) Pursuant to *N.J.S.A. 13:1E-100* et seq., the requirements for the escrow account are as follows:

1. The owner and/or operator of every sanitary landfill shall deposit in an escrow account as defined in (a) above, on or before the 20th of each month, an amount equal to \$ 1.00 per ton of solids and \$ 0.004 per gallon of liquids of all solid waste accepted for disposal during the preceding month. It is noted that disposal of liquid waste in sanitary landfills is limited to only those few facilities permitted to accept such waste;

2. In the event that a measure other than the "ton" or "gallon" is used by the owner and/or operator of a sanitary landfill, the amount to be deposited shall be calculated by using equivalents established by the Division of Taxation;

3. Upon approval of the Department, those sanitary landfills which by the nature of their operation do not have the ability to measure the waste received in the manner provided for in this section may compute quantities of waste received by using an alternative, acceptable method;

4. The escrow account shall be for the closure and post-closure care of a particular sanitary landfill and all funds therein shall be used exclusively for the closure and post-closure care of that landfill in accordance with the approved Closure and Post-Closure Plan.

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5. The owner or operator of a sanitary landfill who shall fail to deposit funds into an escrow account, as provided herein, or uses those funds for any purpose other than closure and post-closure care costs, as approved by the Department, shall be guilty of a crime of the third degree.

6. Where an owner or operator has ownership or control over more than one sanitary landfill, a separate escrow account must be established for each facility;

7. The escrow account shall be kept separate and apart from all other accounts maintained by the owner or operator. The fact that the owner or operator has previously established an escrow account pursuant to another law, rule or regulation, does not relieve them of their responsibility to establish an escrow account under these rules;

8. Every escrow account established pursuant to this section shall be based upon and governed by the standard escrow agreement provided for such purpose by the Department. Any revision to an escrow agreement shall first be approved by the Department and filed by the Department with the accredited financial institution as escrow agent. A copy of the standard escrow agreement provided by the Department may be obtained from the Department of Environmental Protection, Division of Solid and Hazardous Waste, Bureau of Solid Waste Regulation, PO Box 414, Trenton, NJ 08625-0414, Attention: Landfill Closure Escrow Account.

9. The escrow agreement and any other document(s) evidencing the existence of the escrow account must contain a reference to the purpose of the account that will put the personal creditors of the owner or operator on notice as to the nature of the account.

10. The escrow account shall be established and maintained so as to maximize yield, minimize risk and maintain liquidity, and shall be subject to the approval of the Department.

11. All funds deposited in the escrow account must be readily available in the event that circumstances necessitate the closure or post-closure care of the sanitary landfill prior to the date originally contemplated.

12. All interest or other income that results from investment of funds in the escrow account shall be deposited into the escrow account and subjected to the same restrictions as the principal;

13. Withdrawals from the escrow account shall be authorized by the Department upon submission and approval of a written request which identifies the specific provision(s) of the Closure and Post-Closure Plan for which funding is sought. Authorization for such withdrawal will be granted only in accordance with the approved Closure and Post-Closure Care Plan, and after compliance with the following conditions:

i. The owner or operator has complied with all requests to amend the Closure and Post-Closure Plan;

ii. Except as otherwise authorized by the Department, the owner and/or operator submits to the Department, pursuant to (e)4 above, "as built" certifications by a New Jersey licensed professional engineer that the applicable provision(s) of the Closure and Post-Closure Plan for which the preceding withdrawal was obtained has been, or is being, implemented as set forth in the Closure and Post-Closure Plan; and

iii. Where the Department has approved a Closure and Post-Closure Financial Plan providing for the use of alternative funds pursuant to (f)2ii above, withdrawals from the escrow account will only be authorized to the extent that the cost exceeds the balance of the alternative fund. Where the alternative fund is an account, the Department shall allow the maintenance of the minimum balance necessary to keep such account open.

14. No withdrawals from an escrow account may be made without written approval of the Department, except as otherwise authorized by the Department;

15. The Department may withhold disbursements for closure or post-closure work performed if the amount to be expended in any calendar year exceeds or is projected to exceed the amount budgeted for any line item provision in the closure plan, by more than 10 percent of the line item, as updated biennially in accordance with (f)5 above. The owner and/or operator shall seek and obtain Department approval prior to expending funds which exceed or are projected to exceed budgeted costs, by letter, including revised financial schedules, identifying the overage or projected overage, the reasons for the overage and the source of the funds to cover the overage. The Department shall approve or deny disbursements based on the rationale provided by the owner and/or operator and the long term impact on closure or post-closure.

16. The Department, although acknowledging the need for fund expenditure totalling a specific sum may, at its discretion, grant approval for the withdrawal of only a portion thereof, conditioning subsequent approvals upon the

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owner or operator's verification that the sum(s) authorized have been used solely for closure or post-closure care costs;

17. The Department may, at its discretion, determine that there is a need for closure or post-closure care expenditures and may require the owner or operator to withdraw such funds from the escrow account at any time to meet such expenses;

18. Funds remaining in the escrow account after complete and proper closure and post-closure care operations shall be paid into the Sanitary Landfill Facility Contingency Fund. A sanitary landfill will be deemed to be properly and completely closed where the Department determines that no further post-closure care maintenance or monitoring is necessary at the facility. When the Department makes such a determination, it shall notify the escrow agent and the owner or operator of the determination and shall supply the owner or operator with written approval for the transfer of the excess funds. Upon receipt of this written approval, all funds in said account shall be transferred to the Sanitary Landfill Facility Contingency Fund established pursuant to *N.J.S.A. 13:1E-100* et seq. and the account will be closed;

19. The escrow account shall not constitute an asset of the owner or operator and shall be established in such a manner as to ensure that the funds in the account will not be available to any creditor other than the Department in the event of bankruptcy or reorganization of the owner or operator.

20. The owner and/or operator of every sanitary landfill must arrange, with the financial institution wherein the funds are to be deposited, for a monthly statement of the escrow account to be sent to Landfill Closure Escrow Account, Bureau of Solid Waste Regulation, Department of Environmental Protection, PO Box 414, Trenton, New Jersey 08625-0414, Attention: Landfill Closure Escrow Account; provided, however, the Department may at its discretion upon written petition from the owner and/or operator relieve the owner and/or operator from the requirement for the monthly statement of the escrow account and substitute a quarterly (that is, once every three months) statement requirement therefor if it determines that monthly reporting on an account of less than \$ 25,000 would impose an unnecessary burden on the financial institution;

21. The owner or operator of every sanitary landfill shall file with the Department, in duplicate, an annual audit of the escrow account established for the closure of the sanitary landfill. The annual audit of the escrow account shall be conducted by a New Jersey certified public accountant and shall be filed with the Department no later than October 31 of each year, including each of the post-closure care period years. For the purposes of the escrow account only, the fiscal year shall begin on October 1 and terminate on September 30 of the following year, except that fiscal year 1982 shall begin on January 1, 1982 and terminate on September 30, 1982;

22. The owner or operator of every sanitary landfill facility shall file, on or before the 20th of every month, with the Department of Environmental Protection, Division of Solid and Hazardous Waste, Bureau of Solid Waste Regulation, PO Box 414, Trenton, New Jersey 08625-0414, Attention: Landfill Closure Escrow Account, a statement showing the exact amounts of all solid waste accepted for disposal during the preceding month, the total amounts of solid waste received calendar year-to-date, the funds deposited in and withdrawn from the escrow account for the particular sanitary landfill during the current month, interest accrued, escrow account balance, and the total calendar year-to-date funds deposited in and withdrawn from the escrow account. These statements shall be filed on forms provided by the Department; provided, however, the Department may at its discretion upon written petition from the owner or operator relieve the owner or operator from the requirement for monthly reports and substitute a quarterly (that is, once every three months) reporting requirement therefor, if it determines that the monthly reporting on an account of less than \$ 25,000 would impose an unnecessary burden on the owner or operator.

N.J.A.C. 7:26-2A, Appx. A (2009)

APPENDIX A

GUIDELINES FOR A GROUND WATER MODELING EFFORT

1. The model of use must have a history that documents its ability to represent real world situations. In addition it should also be demonstrated that the model of choice has the ability for proposed management of ground water resources.

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2. The set of equations, that govern ground water flow and pollutant, and the derivations of these equations must be presented.

3. The numerical methods used to solve the set of ground water flow and pollutant transport equations must be presented.

4. The Boundary Conditions and Initial Conditions used in solving the ground water flow and pollutant transport equation sets should be presented both mathematically and in narrative form.

5. A technical narrative describing the model to be used and a justification for the application of this to the specific problem should be presented. This should include whether the model is finite element, finite difference or some other scheme. The objective of the model should be stated up front.

6. The unknown quantities that the model is solving for should be described and explained. In addition those parameters derived from the initial unknown quantities should also be described and explained.

7. Appropriate analytical methods should be used to verify the validity of the numerical technique used to solve the flow equations in the model.

8. A sensitivity study of the error tolerance used and modal spacing needs to be conducted. The results should be presented and explained.

9. Perform mass balance calculations on selected elements in the model to verify physical validity.

10. The model must be calibrated against field data. It is important to note that if there is insufficient field data available for calibration then the model will extrapolate values of unknown accuracies. This is particularly important since there is no one unique solution to a model and the most accurate solution (that closest to the real world situation) is a result of sufficient field data collection and model calibration with that data. It often takes more than 25 runs with the same data to properly calibrate a model to the real world situation. The level of field data considered to be sufficient should be agreed to before the modeling effort is initiated.

11. Limits and confidence on model predictions should be established and stated in the beginning of the modeling report.

12. All inputs and outputs to the computer program should be listed and explained in technical narrative.