

PERMIT MODULE III SANITARY LANDFILL DESIGN

III.A. LINER DESIGN

The landfill shall be underlain by the composite liner system, consisting of the following, in descending order:

- 18 inches of protective cover, including drainage aggregate and leachate collection system;
- 16 oz/yd² nonwoven geotextile;
- 60 mil textured High Density Polyethylene (HDPE) geomembrane;
- Geosynthetic Clay Liner (GCL);
- Geocomposite Drainage Net (GDN) including double sided, nonwoven geotextile;
- 60 mil textured HDPE geomembrane;
- GCL;
- 40 mil textured HDPE geomembrane;
- 12 inches of geological buffer, consisting of compacted clay layer with hydraulic conductivity of equal or less than 1×10^{-5} cm/s;
- Compacted structural fill subgrade of varying thickness, as required;

The liner system on the perimeter side slopes shall consist of the following, in descending order:

- 18 inches of protective cover, including drainage aggregate and leachate collection system;
- 16 oz/yd² nonwoven geotextile;
- 60 mil textured HDPE geomembrane;
- GDN including double sided, nonwoven geotextile;
- 60 mil textured HDPE geomembrane;
- 12 inches of geological buffer, consisting of compacted clay layer with hydraulic conductivity of equal or less than 1×10^{-5} cm/s;
- Compacted structural fill subgrade of varying thickness, as required;

III.B. LINER CONSTRUCTION & CERTIFICATION

The following landfill Cells: 1A, 1B, 1C, 2A, 2B, 2C, 3A, 3B, 4A, 4B, 4C, 5A, 5B, 6A, 6B, 7A, 7B, 8A, 8B, 9A, 9B, 10A, 10B, 11, 12, 13, 14A, 14B, 15, 16A, 16B, 17A, and 17B have been constructed, and the base liner for the remaining Cells: 18A, 18B, and 18C, shall be constructed in accordance with the approved Design Plans, Technical Specifications, and Construction Quality Assurance Plan.

Prior to expansion into each new Cell, the permittee shall submit all required certification documents as indicated in Permit Module I, Section I.D., Point I.D.3., and required by 9VAC20-81-490.A. Once this documentation has been submitted by the permittee, and approved by the Department, and a site inspection of the new Cell has been conducted, a

Certificate to Operate (CTO) must be issued by the Regional Office prior to the facility accepting waste in the newly constructed Cell.

III.C. LANDFILL GAS MANAGEMENT SYSTEM

- III.C.1. The facility shall implement and maintain a gas management plan in accordance with 9VAC20-81-200 to provide for the protection of public health, safety, and the environment during the periods of operation, closure, and post-closure care, in accordance with the following requirements:
 - III.C.1.a. The concentration of methane gas generated by the facility shall not exceed 25 percent of the Lower Explosive Limit (LEL) for methane, i.e. 1.25% methane, in facility structures, excluding gas control or recovery system components; and
 - III.C.1.b. The concentration of methane gas shall not exceed the LEL for methane, i.e. 5.0% methane, at the facility boundary.
- III.C.2. The facility shall perform quarterly landfill gas monitoring of the perimeter gas monitoring network probes and occupied structures, in accordance with 9VAC20-81-200.B.4.
- III.C.3. Unless an alternate repair timeframe is requested and approved, the facility shall perform regular maintenance of the gas monitoring network and the gas management and remediation systems, including, but not limited to, dewatering the probes, repairing probe concrete pads, caps, locks, and covers, if necessary, prior to each quarterly gas monitoring event.
- III.C.4. Perimeter Gas Monitoring Network
 - III.C.4.a. The facility shall install and maintain perimeter gas monitoring probes at the locations shown on Drawing 2, Gas Probe Location Plan, included in the Landfill Gas Monitoring Plan. The perimeter gas monitoring network will consist of a series of sixty one (61) landfill gas monitoring probes located along the property boundary.
 - III.C.4.b. If the perimeter gas monitoring network is expanded with the installation of new, or replacement gas monitoring probes, the facility shall submit copies of the boring logs, and the probe as-built drawings, for inclusion in the Landfill Gas Management Plan within 30 days following construction completion.
 - III.C.4.c. All existing and future onsite structures shall be monitored in accordance with condition III.C.2., or have explosive gas monitoring equipment installed.

III.C.5. Landfill Gas Control Components

The existing and planned gas control system at the landfill consists of the following main elements:

- III.C.5.a. A series of vertical extraction wells and horizontal gas collector pipes installed within the landfill and connected to vacuum source, in order to provide gas collection and control throughout the waste mass.
- III.C.5.b. A network of header and lateral piping installed to connect the vertical extraction wells and horizontal collectors, to convey the collected gas to the onsite electrical power generation facility and to the utility flare.
- III.C.5.c. A condensate control system consists of transmission pipes equipped with condensate drains and sumps. The condensates flow into drains and sumps by gravity, and are subsequently removed from the sumps, and introduced into the leachate collection system.
- III.C.5.d. An on-site electrical power generation facility, consisting of four (4) Solar Centaur Combustion Turbines, producing 3,330 kW each; and three (3) utility flares, capable of processing 13,000 standard cubic feet per minute (ft³/min) of landfill gas in total. The components of the power generation facility, and the utility flare system, are subject to the conditions of the facility's Title V Operating Permit.

III.C.6. Landfill Gas Monitoring Response and Remediation

- III.C.6.a. Should the results of landfill gas monitoring indicate concentrations of methane in excess of the methane action level, i.e. 1.25% of methane, or 25% of the LEL, in the facility structures; or 4% of methane, or 80% of the LEL, at the facility boundary, the Operator shall:
 - III.C.6.a.(1) Take immediate steps necessary to protect public health and take safety precautions, which should include: evacuation of occupied structures, if affected; notifying local fire/safety officials of potential landfill gas migration; and coordinating for off-site monitoring of structures located within 1,000 feet of the facility boundary;
 - III.C.6.a.(2) Investigate any active or passive gas control or remediation systems for proper connections and operation and make adjustments to vacuum, flow, or control valves, remove condensate, or make any other adjustments or repairs necessary to ensure proper operation, if applicable;

- III.C.6.a.(3) Notify the Department in writing, within five (5) working days of the methane action level exceedance, indicating how the problem has been, or will be resolved;
- III.C.6.b. Should the results of landfill gas monitoring indicate concentrations of methane in excess of the methane compliance level, i.e. 1.25% of methane, or 25% of the LEL in facility structures, or 5% of methane, or 100% of the LEL at the facility boundary, the Operator shall:
- III.C.6.b.(1) Perform the response actions as outlined under III.C.6.a.1., and III.C.6.a.2.;
- III.C.6.b.(2) Provide 24-hour oral notification of the methane compliance level exceedance;
- III.C.6.b.(3) Provide written notification within five (5) working days of the methane compliance level exceedance containing a description of the circumstances and cause of the incident; the period of occurrence, including exact dates and times, and, if the problem has not been corrected, the anticipated timeframe required for remediation it is expected to continue. The notification shall also contain the description of steps taken or planned to reduce, eliminate, and prevent reoccurrence of the circumstances resulting in an unusual condition or noncompliance;
- III.C.6.b.(4) Increase the gas monitoring frequency per the requirements of III.C.6.c.;
- III.C.6.b.(5) Implement the next phase of the approved remediation plan within 60 days, or implement a revised remediation plan within 60 days and submit the plan to DEQ for approval;
- III.C.6.b.(6) Assess the spacing of the entire perimeter monitoring network. If the spacing between any probes exceeds 250 feet, the Operator shall install additional perimeter probes, unless it can be demonstrated based on site-specific conditions, that installing additional gas monitoring probes is unwarranted;
- III.C.6.c. The facility shall monitor a subset of the perimeter monitoring network, consisting of the noncompliant probes and facility structures, and those probes and structures immediately adjacent, such that at least one (1) additional probe on either side of each noncompliant probe, or structure, shall be monitored at the increased frequency.
- III.C.6.c.(1) Unless an alternate monitoring frequency is approved by the Department, weekly monitoring shall continue until four (4) consecutive weekly readings yield methane concentrations below 80%

of the LEL at the facility boundary, or 25% of the LEL in facility structures. At that time, the facility shall implement monthly monitoring of the network subset until three (3) consecutive monthly readings yield methane concentrations below 80% of the LEL at the facility boundary, or 25% of the LEL in facility structures. At that time, the facility may return to quarterly monitoring.

- III.C.6.c.(2) Once the required minimum number of consecutive monitoring events resulting in gas concentrations below action level are completed per III.C.6.c.(1) to justify returning to a lesser monitoring frequency, the facility shall submit monitoring data for ALL monitoring events since the implementation of the remedial action or remediation plan phase in order to assess progress towards return to compliance. If the return to a lesser monitoring frequency takes longer than six (6) months, monitoring data shall be submitted in tabular form with an accompanying graph to clearly document trends in data over time to justify the change in monitoring frequency.

III.C.7. Odor Management

- III.C.7.a. The facility shall implement and maintain an odor management plan in accordance with 9VAC20-81-200.D., to minimize the impact of odors beyond the facility boundary. The plan shall be reviewed annually and updated as appropriate to include such items as:

- III.C.7.a.(1) Proximity of operations and/or potential odor sources to the property boundary and receptors;
- III.C.7.a.(2) Planned short-term activities such as gas well installation, waste excavation, or other activities that may cause odor;
- III.C.7.a.(3) New waste streams with odor characteristics that differ from the current waste streams;
- III.C.7.a.(4) The need for system upgrades or repairs; and
- III.C.7.a.(5) Changes in personnel responsible for the review or operation of the odor management plan.

- III.C.7.b. The facility shall implement corrective actions to address odors that have migrated off of the site. The facility shall take one or more of the steps described below to address odors, including:

- III.C.7.b.(1) Maintenance, expansion, and/or upgrading of the gas control and collection system;

- III.C.7.b.(2) Minimizing the size and number of the working faces and placement of additional cover at the end of the day at the offending working faces;
 - III.C.7.b.(3) Placement of additional landfill cover in areas where odors are detected;
 - III.C.7.b.(4) The use of odor counteractive and suppressant at the odor causing areas through direct application or by misting the material through a dispersal system; and
 - III.C.7.b.(5) Following best management practices when performing solidification of wastes.
- III.C.7.c. Should the facility be unable to control odors from migrating off of the landfill in an effective manner, the DEQ may request additional monitoring or control measures to be taken. These measures shall be put in place within a timeframe agreed upon by the facility and the DEQ.

III.D. LEACHATE MANAGEMENT

III.D.1. Leachate Storage

All leachate collected in sumps will be pumped and conveyed via force main system into the leachate storage tanks. Five (5) storage tanks, 250,000 gallons each, have been constructed to provide a combined storage capacity of 1,250,000 gallons, which exceeds the anticipated 7-day storage volume of 945,000 gallons.

III.D.2. Leachate Treatment

Leachate from the storage tanks may be conveyed into two (2) leachate concentrator units, which utilize heat exhaust from the landfill gas to energy turbines, in order to evaporate leachate. The residual solids from the leachate evaporation process will be subsequently removed from the concentrator units and disposed of in the landfill.

III.D.3. Leachate Disposal

In addition to the leachate concentration treatment, and the disposal of residual solids in the landfill, the leachate stored in the storage tanks may be either transported to an offsite waste water treatment facility, or recirculated into the waste mass at the working face. The volume of leachate recirculated at the working face shall not exceed 6 gallons per ton of accepted waste per day, and shall not exceed 30,000 gallons per day in total, assuming a daily waste acceptance of 5,000 tons. Leachate shall be analyzed for hazardous characteristics, in accordance with the Virginia Hazardous Waste Management Regulations (9VAC20-60).

III.D.4. Leachate Monitoring System

The leachate collection system is designed to utilize stainless steel submersible pumps equipped with pressure transducers, in order to monitor the level of leachate in sumps and control the pump operations accordingly. The pumping system is designed not to exceed 30 cm of leachate head on the liner. Instantaneous and cumulative leachate flow rates are measured to determine performance of sump pumps. Leachate detection system, also referred to as the secondary leachate collection system, is designed to collect leachate seeping through the primary geomembrane underlined by GCL and is conveyed within the GDN. The leachate detection system is equipped with flow meters to determine the amount of leachate penetrating the primary liner.

END OF MODULE III