



Closure Plan

LANDFILL CLOSURE PLAN

Chesapeake Energy Center Ash Landfill - Permit #440



Dominion

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Table of Contents

| | | |
|-------|---|----|
| 1.0 | CLOSURE PURPOSE | 1 |
| 1.1 | Facility Information | 1 |
| 1.2 | Closure Plan Implementation | 1 |
| 2.0 | CLOSURE TIMEFRAMES | 3 |
| 3.0 | CLOSURE OF SURFACE IMPOUNDMENTS | 4 |
| 4.0 | CLOSURE OF LANDFILL UNITS | 5 |
| 4.1 | Final Cover Design | 5 |
| 4.1.1 | Infiltration Layer | 5 |
| 4.1.2 | Liner Subgrade | 5 |
| 4.1.3 | Barrier Layer | 5 |
| 4.1.4 | Geocomposite Drainage Layer | 6 |
| 4.1.5 | Protective Cover Layer | 6 |
| 4.1.6 | Vegetative Support Layer | 6 |
| 4.2 | Final Slopes | 6 |
| 4.3 | Run-Off Controls | 6 |
| 4.4 | Settlement, Subsidence and Displacement | 7 |
| 5.0 | SCHEDULE FOR CLOSURE | 8 |
| 6.0 | CLOSURE IMPLEMENTATION | 9 |
| 6.1 | Closure Posting | 9 |
| 6.2 | Notification | 9 |
| 6.3 | Certification | 9 |
| 7.0 | CLOSURE COST ESTIMATE | 10 |

Figures

1. Frost Penetration Depth Map

Attachments

1. Design Plans
2. CQA Plan and Technical Specifications
3. Revised Universal Soil Loss Equation (RUSLE) Demonstration
4. Slope Stability and Cap Drainage Calculations
5. Stormwater Calculations
6. Settlement, Subsidence and Displacement Calculations (GAI Consultants, 1983)
7. Closure Cost Estimate

1.0 CLOSURE PURPOSE

This revised Closure Plan (Plan) has been prepared for the Ash Landfill Facility (Facility) at Dominion's Chesapeake Energy Center (CEC), located in Chesapeake, Virginia. The landfill operates as a captive industrial landfill under Virginia solid waste permit #440. Golder Associates Inc. of Richmond, Virginia, has prepared this plan for Dominion.

As a result of various economic and regulatory factors, Dominion has elected to cease burning coal for the production of electricity at the CEC by the end of 2014. Since the landfill will not be at its final design capacity grades, Dominion has prepared this revised Plan to provide a modified final grading plan as well as an updated final cover system that includes a perimeter leachate collection system and a revised cap liner section. The current solid waste permit does not include technical specifications or a construction quality assurance (CQA) plan for the landfill closure, therefore these have been developed and included as part of this Plan.

1.1 Facility Information

The Facility is a captive industrial landfill used by Dominion for disposal of Fossil Fuel Combustion Products (hereinafter referred as ash). The landfill footprint is approximately 23 acres. The Facility is located south of the power station on a peninsula of land that was formerly an ash pond serving the CEC. It was permitted as a dry disposal landfill in approximately 1985, and the solid waste permit's last major amendment took place in December 1997. This Plan incorporates several design changes to the final cover system, including the installation of a perimeter leachate collection system and a revised cap liner section in accordance with 9VAC20-81-160.D.2.e.

1.2 Closure Plan Implementation

The goals of the closure plan design at the Facility are to provide a low maintenance cover system with adequate stormwater run off controls to prevent erosion and exposure of the ash. The maximum facility sideslope is 6 Horizontal to 1 Vertical (6H:1V), and stormwater benches are located to intercept sheet flow before it can concentrate into an erosive flow. The final cover soil will have a vigorous stand of vegetation established to minimize soil erosion. A 40-mil High Density Polyethylene (HDPE) geomembrane liner serves as the infiltration barrier to prevent water percolation into the ash. Ash by nature is non-putrescible, and does not decompose or produce landfill gas. Gas migration and odor is not anticipated to be a post-closure concern. Leachate will be collected within the toe of slope of the perimeter containment berm as described below and in permit Attachment VIII – Leachate Management.

Leachate will be collected from the perimeter of the closed landfill and either be pumped or feed by gravity to the existing facility's Stormwater / Leachate Basin A, where it will be comingled with the facility's stormwater run-off in Stormwater / Leachate Basin B and discharged through a permitted outfall (Outfall

002) into Deep Creek. Outfall 002 is a permitted outfall regulated under Virginia Pollutant Discharge Elimination system (VPDES) Permit # VA0004081.

The Facility's bottom ash pond, located adjacent to the south side of the landfill, will also be closed at the same time as the landfill closure. The bottom ash pond will be re-graded using the on-site accumulated bottom ash to provide a smooth transition from the landfill and a similar final cover system of the landfill will be extended over the bottom ash pond area. Closure construction of the bottom ash pond, although simultaneous, is being undertaken under a separate regulatory action under the Station's VPDES permit. The adjacent Stormwater / Leachate Basin B will remain active to receive and attenuate stormwater and leachate flows from the closed landfill (leachate flowing initially into Basin A). It will receive a bottom liner system and a new outfall riser structure.

2.0 CLOSURE TIMEFRAMES

Prior to the initiation of closure activities (solicitation of bids for construction), the Department of Environmental Quality (DEQ) will be notified of the intent to close. As stated in the Virginia Solid Waste Management Regulations (VSWMR), final cover construction shall be initiated when the following conditions apply:

- An additional lift of solid waste is not to be applied within 1 year or a longer period as required by the facility's phased development.
- Any area of the landfill attains final elevation and within 90 days after such elevation is reached or longer if specified in the landfill's approved closure plan.
- The landfill's permit is terminated within 90 days of such denial or termination.

Closure of the facility will be completed in accordance with this Plan and within six months after initiation of the closure construction activities. If an extension of the closure construction time frame is needed, the facility will petition the Director of the DEQ. The maximum acreage for closure would be the entire permitted waste disposal area totaling 23 acres.

The landfill will receive its last waste following the shutdown of the CEC coal fired generating units. Within 90 days after shutdown, remaining ash material will be removed from the generating facility and placed in the landfill. Table 1 below outlines the estimated sequence of scheduled closure activities.

**TABLE 1
CLOSURE SCHEDULE**

| Activity | Tentative Date |
|-------------------------------|------------------|
| CEC cease operations | By December 2014 |
| Final ash placed in landfill | October 18, 2015 |
| Commence closure construction | By January 2017 |
| Closure construction complete | By July 2017 |
| Certification of closure | By October 2017 |

The landfill sideslopes are currently at their final design grades and are covered with intermediate cover soil. The sideslopes will be closed as part of the overall landfill closure activities. The landfill receives approximately 25,000 cubic yards (CY) of ash per year. At closure, the landfill will contain approximately 976,000 CY of ash.

3.0 CLOSURE OF SURFACE IMPOUNDMENTS

The bottom ash pond, located south of the landfill, will be closed in conjunction with the landfill closure construction. Stormwater / Leachate Basin B will remain open to receive and attenuate stormwater and leachate flows from the closed landfill (leachate flowing initially in to Basin A). Discharges from the Stormwater/Leachate Basin B are monitored under the Station's VPDES permit. Closure of the bottom ash pond and modifications to Stormwater / Leachate Basin B are being conducted under the Station's VPDES permit.

4.0 CLOSURE OF LANDFILL UNITS

4.1 Final Cover Design

The final cover system to be installed is designed in accordance with 9VAC20-81-160.D.2.e. This final cover system consists of, from the top down:

- A vegetative support layer consisting of six inches of soil;
- A protective cover layer consisting of a minimum of 18 inches of soil;
- A geosynthetic drainage layer consisting of a 250-mil, double sided geocomposite; and,
- A 40-mil textured HDPE geomembrane barrier layer.

The final cover system will be placed directly on the ash surface. Areas that have existing intermediate cover soil will be stripped of vegetation and the upper portion of the intermediate cover soil removed for later use as part of the protective cover soil layer. Care will be taken as not to disturb the underlying ash to prevent mixing with soils to be later used as part of the final cover system. After stripping and removal of recoverable intermediate cover soils, the landfill will be re-graded as needed to achieve the final design grades prior to placement of the capping system. The Design Plans included in Attachment 2 show the landfill final grades and the final cover system. Technical Specifications and the CQA plan for the closure system components are included in Attachment 3.

4.1.1 Infiltration Layer

An infiltration layer is not proposed for this cover system.

4.1.2 Liner Subgrade

The subgrade for the barrier layer geomembrane will consist of compacted soil or ash material that meets the liner subgrade requirements as specified in Sections 02200 (Earthwork) and 02597 (Polyethylene Geomembrane) of the Technical Specifications. The liner subgrade shall contain particles no larger than 1/2" and will be rolled with a smooth-drum roller to flatten out wheel ruts and protrusions that may damage the overlying geosynthetics. The CQA Plan stipulates that prior to geosynthetic panel deployment, the installer and CQA consultant will inspect the subgrade and provide a written subgrade acceptance indicating that the subgrade is acceptable.

4.1.3 Barrier Layer

The barrier layer is a 40-mil textured HDPE geomembrane. Section 02597 of the Technical Specifications describes the material requirements, installation and seaming procedures, and CQA documentation to be recorded during construction of the barrier layer. HDPE was selected due to its combined physical strength and chemical resistance properties when placed in direct contact with ash.

4.1.4 Geocomposite Drainage Layer

To provide subsurface drainage for the cover soils, a 250-mil geocomposite drainage layer will be placed on top of the geomembrane. The geonet core will be faced on both sides with a nonwoven geotextile to provide filtration and prevent the intrusion of soil into the drainage net. At the toe of slope, the geocomposite will terminate in a stone-filled drainage trench with a perforated pipe for relief drainage. This pipe will discharge at intervals around the toe into the perimeter stormwater drainage channel. Calculations for the adequacy of the geocomposite are presented in Attachment 4.

4.1.5 Protective Cover Layer

Immediately above the geocomposite drainage layer, an 18-inch thick layer of soil will be placed to serve as the protective cover layer (i.e., infiltration layer). The soil will be imported into the site from an offsite borrow source. Acceptable soil types for this layer are specified in Section 02200 of the Technical Specifications. The maximum expected frost depth for the Chesapeake, Virginia area is 18 inches; therefore, the thickness of the soil layer is adequate to protect against freeze/thaw effects. See Figure 1 for a map of the frost penetration depths.

4.1.6 Vegetative Support Layer

The six-inch vegetative support layer will be established immediately following the placement of protective cover soil. This soil will be placed and tracked in, but not compacted. The soil will be seeded with the mix as presented in Section 02936 of the Technical Specifications, or with a site-specific mix based on soil testing. Woody vegetation is not allowed on the final cover system.

4.2 Final Slopes

The maximum final slope for the Facility is 6H:1V (16.7%). The minimum final slope on the top deck per the closure design is 4%. Stormwater diversion channels are located at the change in grade on the top deck and on the sideslopes to intercept and collect sheet flow runoff before it concentrates into erosive shallow concentrated flow.

Calculations are included in Attachment 4 showing that the layers of the 6:1 final slope are stable under static conditions. A seismic analysis was not performed as the Facility is not located in a seismic impact zone.

4.3 Run-Off Controls

Sheet flow from the final cover surface will be collected in a series of stormwater diversion channels located at the change in grade on the top deck and on the sideslopes of the landfill. These channels are formed of soil and are sized to convey the runoff from at least the 25-year, 24-hour storm event and prevent overtopping during the 100-year storm event. The stormwater diversion channels are lined with a

non-biodegradable erosion control matting to resist erosion and support vegetative growth. The average longitudinal slope of the stormwater diversion channels is 1.0%.

The stormwater diversion channels collect water and flow to three downslope pipes that will collect water from the diversion channels and convey it down the slope to the perimeter channel system or discharge directly into Stormwater / Leachate Basin B. At the end of the downslope pipe, an energy dissipation device will be constructed to slow and distribute the flow and prevent erosion of the perimeter channels.

The perimeter channels drain to the existing stormwater basin for attenuation and eventual discharge through the VPDES permitted outfall point. Calculations for the stormwater channels, downslope pipes, and the basin are included in Attachment 5.

4.4 Settlement, Subsidence and Displacement

It is anticipated that the great majority of foundation settlement to be experienced by the facility has already occurred, as the facility has been in operation for approximately 30 years. When ash is placed and compacted in a bulk fill, such as a landfill, the material consolidates very rapidly and does not experience further secondary consolidation. This has been evidenced at other Dominion landfills where five years of post-closure survey have indicated little if any observable change in the dimensions of the closed facility. This indicates that once ash is placed, secondary consolidation is negligible. Additionally, the landfill is being closed at less than the original design height, resulting in lower than planned foundation loading.

Calculations performed by GAI Consultants (Attachment 6) show the post-closure settlement of the landfill is anticipated to have negligible impact on the ability of the cover to prevent infiltration. Localized settlement of the final cover is not anticipated to occur, as the ash is a non-biodegradable material. Global settlement of the landfill, however small, will cause the liner material to shorten, rather than stretch in tension. Small compressive forces resulting from minor settlement will not affect the integrity or performance of the final cover system.

5.0 SCHEDULE FOR CLOSURE

The landfill will receive its last waste following the shutdown of the CEC coal fired generating units. Within 90 days after shutdown, remaining ash material will be removed from the generating facility and placed in the landfill. The closure activities are anticipated to be completed within 180 days following beginning of closure. The DEQ may approve a longer closure period if it is demonstrated that the required or planned closure activities will take longer than 180 days to complete, and that steps have been taken to eliminate any significant threat to human health and the environment from the unclosed but inactive landfill. A professional engineer representing the facility will provide the DEQ with certification of the closure. Table 2 below outlines the estimated sequence of scheduled closure activities.

**TABLE 2
CLOSURE SCHEDULE**

| Activity | Tentative Date |
|-------------------------------|------------------|
| CEC cease operations | By December 2014 |
| Final ash placed in landfill | October 18, 2015 |
| Commence closure construction | By January 2017 |
| Closure construction complete | By July 2017 |
| Certification of closure | By October 2017 |

The closure construction activity is anticipated to take approximately six months to complete, based on Dominion's construction experience of similar size landfill closure projects. Proper sequencing of the construction will be made to minimize the ash exposure during construction to prevent erosion from rain and wind by the following means:

- Installation of stormwater runoff and run-on controls such as temporary diversion berms, silt fencing, slope drains, and sediment trapping measures as required by the specific construction activity;
- Sequencing the stripping of soil and fine grading for cap construction such that it occurs during periods of favorable weather; and,
- Limiting exposed areas to those that can be covered with geosynthetics in a short amount of time.

6.0 CLOSURE IMPLEMENTATION

6.1 Closure Posting

One sign will be posted at the site entrance to the Facility notifying all persons of the final closure of the Facility and prohibition against further receipt of ash. Unauthorized access to the site will be controlled by fencing (as needed) and lockable gates across the access roads.

6.2 Notification

The City of Chesapeake, Virginia will be notified upon the completion of closure of the Facility. The survey plat will be prepared showing the final closure grades and the locations of the groundwater monitoring wells. The survey plat and deed will have the following notification language:

This property has been used for the management and disposal of solid waste. Any future use of the site shall not disturb the integrity of the final cover, liners, or any other components of the containment systems, or the function of the monitoring system unless necessary to comply with the Virginia Solid Waste Management Regulations or approved by the Department of Environmental Quality.

6.3 Certification

Upon completion of closure construction, a certification statement, signed by a licensed professional engineer, will be submitted to the DEQ along with the results of the CQA plan. The certification statement shall read as follows:

I certify that closure has been completed in accordance with the Closure Plan dated [DATE] for permit number 440 issued to Dominion, with the exception of the following discrepancies:

In addition, a sign(s) was(were) posted on [DATE] at the landfill entrance notifying all persons of the closing [and state other notification procedures if applicable] and barriers [indicate type] were installed at [location] to prevent new waste from being deposited.

A survey plat prepared by [NAME] was submitted to the City of Chesapeake, Virginia on [DATE]. A copy of the survey plat is included with this certification.

A notation was recorded on the deed to the landfill property on [DATE]. A copy of the revised deed is attached to this certification.

[Signature, date and stamp of Professional Engineer]

7.0 CLOSURE COST ESTIMATE

The estimated cost for closure of the 23-acre landfill and bottom ash pond is \$4,364,000. Dominion will hire a construction contractor to provide closure construction services. Calculations for the closure cost estimate are included in Attachment 7.