



Mr. Allan Palmer
GSP Merrimack LLC
431 River Road
Bow, New Hampshire 03304

March 5, 2026
File No. 2025.017

Re: Closure and Post-Closure Plan Certification
Merrimack Station Coal Ash Landfill
Bow, New Hampshire

Dear Allan:

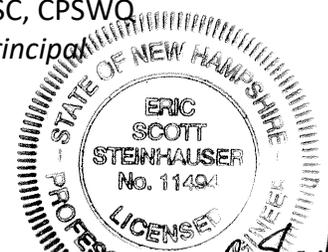
At your request, Sanborn Head and Associates, Inc. (Sanborn Head) hereby certifies that the enclosed Closure and Post-Closure Plan for the Merrimack Station Coal Ash, dated November 2023 (Plan), conforms with the 40 CFR 257.104(d) subject to the assumptions and limitations contained within the Plan.

Please contact Harrison Roakes hroakes@sanbornhead.com should you require additional information.

Very truly yours,
SANBORN, HEAD & ASSOCIATES, INC.

Harrison Roakes, PE
Lead Engineer
NH PE License No. 15920

Eric S. Steinhauser, PE, CPESC, CPSWQ
Senior Vice President and Principal
NH PE License No. 11494



HRR/ESS:ces

Enclosures: Closure and Post-Closure Plan of Record, dated November 2023





Report Cover Waste Management Division



Approved Closure and Post-Closure Plan of Record

Merrimack Station Coal Ash
Landfill 431 River Road
Bow, New Hampshire 03304

NHDES Site #: DPHS-SW-85-012
Project Type: Permit Modification
Project #: 123456789

Sanborn, Head & Associates, Inc.
Digitally signed by Sanborn, Head & Associates, Inc.
Date: 2024.06.28 11:27:19 -04'00'

PREPARED FOR
GSP Merrimack, LLC
431 River Road
Bow, New Hampshire 03304
(603) 230-7951

Allan Palmer
Allan.Palmer@graniteshorepower.com

PREPARED BY
Sanborn, Head & Associates, Inc.
6 Bedford Farms Drive, Suite 201
Bedford, NH 03110
603-229-1900

Eric Steinhauser, PE, CPESC, CPSWQ
esteinhauser@sanbornhead.com

Date of Report: June 28, 2024

Tina.A.Clark@des.nh.gov or phone (603) 271-7379
PO Box 95, Concord, NH 03302-0095
www.des.nh.gov

**Statement Regarding Approved Closure Plan of Record
Merrimack Station Coal Ash Landfill
Bow, New Hampshire
NHDES Permit No. DPHS-SW-85-012
June 25, 2024**

This statement of certification was prepared in response to Condition (9) of the New Hampshire Department of Environmental Services' May 31, 2024 approval of the Type IB modification to the solid waste management facility permit for the Merrimack Station Coal Ash Landfill located in Bow, New Hampshire.

Condition (9) states:

(9) Within 60 days of the effective date of this permit modification, the permittee shall submit to NHDES, in .pdf format, a complete and true copy of the Approved Closure Plan of Record, with a signed statement certifying that it is a complete and true copy of the Approved Closure Plan of Record, namely the closure plan submitted on 1/16/24, assigned WMD Log No. 2023-67180-01, with the effective date of this approval (May 31, 2024) shown on each page and the changes listed below:

- (a) Revise Section 3.0 to reflect the authorized wastes in the Approved Operating Plan of Record identified in Condition (6) herein.*

This statement certifies that it is a complete and true copy of the Approved Closure Plan of Record is submitted to NHDES in accordance with Condition (9) of the May 31, 2024 approval of the Type IB modification to the solid waste management facility permit for the Merrimack Station Coal Ash Landfill.



Eric S. Steinhauser, PE, CPESC, CPSWQ



June 25, 2024

Date



**CLOSURE AND POST-CLOSURE PLAN
MERRIMACK STATION COAL ASH LANDFILL**

*Bow, New Hampshire
NHDES Permit No. DPHS-SW-85-012*

*Prepared for GSP Merrimack, LLC
File No. 2025.14
November 2023*

CLOSURE AND POST-CLOSURE PLAN
Merrimack Station Coal Ash Landfill
Bow, New Hampshire

This Closure Plan describes the procedures for closure of the Merrimack Station Coal Ash Landfill. Closure involves terminating landfilling activities, constructing, and maintaining a final cover system over the landfilled material, and continued maintenance of the stormwater management and leachate collection systems. Information required by the New Hampshire Solid Waste Rules and the federal Standards for the Disposal of Coal Combustion Residuals (CCR) in Landfills and Surface Impoundments (40 CFR Part 257 Subpart D) is provided in this document.

1.0 FACILITY IDENTIFICATION

Facility Name: Merrimack Station Coal Ash Landfill

Mailing Address: GSP Merrimack LLC (GSP)
431 River Road
Bow, New Hampshire 03304

Location: 67 Ryan Road
Bow, New Hampshire

Permit No.: DPHS-SW-85-012

Facility Capacity: Approximately 300,000 yd³

Contact Information: Allan Palmer
Merrimack Station
431 River Road
Bow, New Hampshire 03304
(603) 230-7951
Allan.Palmer@graniteshorepower.com

2.0 CLOSURE SCHEDULE

Closure construction involves final grading and construction of the final cover system over those areas that have not yet received final cover. The final cover system will be constructed incrementally as the landfill is filled. However, following termination of ash placement, the final portion of the cover will be constructed.

As of 2022, final cover was constructed over approximately 1.6 acres of the landfill footprint, leaving approximately 3.8 acres of final cover system to be constructed as active portions of the landfill reach final grade. Disposal of ash at the facility will cease when final grades have been achieved throughout the entire permitted area. Installation of final cover system will occur incrementally, and the timing of construction events is greatly influenced by incoming waste quantities.

Based on the anticipated incoming waste quantities, GSP expects that the facility will be filled to capacity no sooner than year 2030.

It is anticipated that construction of the landfill cover system will take place during the spring through fall construction seasons. Closure construction involves fine grading in-place ash followed by the construction of final cover system over areas filled to final grade. A summary of work items and associated times frames to complete each phase of closure construction is provided in the table below. It is noted that the construction-related work items and their associated time frames may overlap during actual construction.

WORK ITEM	TIME FRAME TO COMPLETE (weeks)
Prepare Construction Documents and associated Application for a Type II Permit Modification for New Hampshire Department of Environmental Services (NHDES) Review (to be completed by March 1 each year final cover construction is proposed)	6
NHDES Review and Approval	8
Fine Grade Intermediate Cover	1
Place 12-inch-thick Sand Bedding Layer	1
Install textured 40-mil thick geomembrane, drainage geocomposite, and 12-inch-thick Sand Cover Layer	2 to 3
Place the 6-inch-thick Moisture Retention Layer and 4-inch-thick topsoil layer; hydroseed	1 to 2

3.0 WASTE IDENTIFICATION

As approved by the New Hampshire Department of Environmental Services (NHDES), the following coal combustion residuals and other related wastes from Merrimack Station operations may be disposed of at the landfill:

1. Coal ash and slag;
2. Dewatered Wastewater Treatment Facility sludge;
3. Pond and swale dredgings;
4. Waste coal and soil contaminated coal;
5. Waste demineralizer resins;
6. Waste activated carbon from well water filters;
7. Waste limestone and waste gypsum;
8. Catch basin grit;
9. Spent activated alumina and silica gels desiccants used in air dryers;
10. Intermittent and minor quantities of construction and demolition debris; and
11. Intermittent and minor quantities of waste sandblasting grit that pass metals limits per TCLP.

Also, as individually authorized by the NHDES, additional wastes have occasionally been disposed at the site. These wastes include:

1. Flyash, bottom ash and slag produced while co-firing refuse derived fuel (RDF); and
2. Coal ash from Schiller Station on a contingency basis.

4.0 NOTIFICATIONS

The landfill serves for disposal of ash generated by GSP. There are no other users of the facility that need to be notified prior to terminating receipt of waste.

5.0 CLOSURE REQUIREMENTS

The facility is to be closed in a manner consistent with the requirements of the New Hampshire Solid Waste Rules and the federal CCR rules. The objectives of the closure are to isolate the landfill from the environment, manage stormwater, and continue to remove leachate from the landfill, while monitoring leachate flow rates and composition.

The facility will be closed as final grades are attained and the final cover is placed. Proposed final grades are shown on Sheet MK-S-7.2 of the Design Drawings. At least eight weeks prior to the anticipated start of closure construction, construction drawings and specifications will be prepared and submitted to the NHDES for review and approval via a Type II Permit Modification.

An Existing Conditions Plan, is provided on Sheet 1 in Appendix A, which depicts the limits of the final cover system constructed in 1995, which consists of the following components, listed from top to bottom:

- 4-inch-thick topsoil layer, that is vegetated;
- 18-inch-thick Sand Cover layer;
- 36-mil-thick Hypalon geomembrane; and
- 12-inch-thick Sand Bedding layer.

The cover system to be used over the remainder of the landfill is proposed to include the following layers listed from top to bottom:

- 4-inch topsoil layer that will be fertilized and seeded;
- 6-inch-thick Moisture Retention Soil layer;
- 12-inch-thick Sand Cover layer;
- A drainage geocomposite;
- Textured 40-mil thick geomembrane; and
- 12-inch-thick Sand Bedding layer.

The cover system meets the requirements of the New Hampshire Solid Waste Rules Env-Sw 805.10 and 40 CFR Part 257.102(d)(3).

The Sand Bedding is a granular soil with 100 percent of the material passing a 1-inch sieve and with no more than 12 percent of the material passing the number 200 sieve on a weight basis. The geomembrane component of the cover system is proposed to consist of textured 40-mil thick material. The 40-mil thick geomembrane satisfies the requirements of Env-Sw 805.10 (e)(3)(b) and 40 CFR Part 257.102(d)(3)(i)(A). Textured geomembrane is proposed for stability.

The drainage geocomposite component of the cover system promotes drainage of water infiltrating through the cover system soils and limits the potential for head to build up on the geomembrane. Water flowing in the cover section above the geomembrane will discharge at the toe of slope. To stabilize the toe, a crushed stone drain constructed over 10-ounce per square yard nonwoven geotextile will be provided. The drain provides a high permeable zone allowing water within the cover section to discharge freely at the toe of slope.

Twelve inches of Sand Cover will be placed above the geocomposite followed by 6 inches of Moisture Retention Soil and 4 inches of topsoil. Sand Cover is a granular soil with 100 percent of the material passing a 1-inch sieve and not more than 10 percent passing the No. 200 sieve. The above-described drainage geocomposite and the 12 inches of Sand Cover meet the requirements of 40 CFR Part 257.102(d)(3)(i)(B) and is an approved infiltration layer alternative to 18 inches of Sand Cover in New Hampshire, as specified in Env-Sw 805.10(e)(4)(c)(2). The Moisture Retention Soil has a specified permeability range of 1×10^{-4} to 1×10^{-6} centimeters per second, which is expected to be 1 to 2 orders of magnitude lower than that of the Sand Cover. This layer was incorporated to promote moisture retention in the root zone to better support vegetative growth. The combination of the 4-inch topsoil layer and 6-inch-thick Moisture Retention Soil layer exceeds the 6-inch thick earthen material erosion layer requirement specified in 40 CFR Part 257.102(d)(3)(i)(C).

Cover section details are provided on Sheets 1 and 2 of the drawings provided in Appendix A for ease of reference. Relevant technical specifications for the closure construction work are included in Appendix B. **Specifications for the textured 40-mil thick geomembrane will be provided at the time of construction.**

Prior to placing final cover materials, existing grades are to be surveyed to verify surface elevations. In areas that are below final design grade, additional ash fill will be placed prior to closure construction. The surface should be fine graded in preparation for final cover system construction. After grading, the Sand Bedding soil will be placed in the area to receive final cover. The 40-mil thick textured geomembrane will be installed over the subgrade and overlain by the drainage geocomposite followed by the placement of the Sand Cover. A drainage swale will be constructed on the landfill in the location indicated on Sheet MK-S-7.2. The swale will be shaped using Sand Cover soil. Following placement of the Sand Cover, the Moisture Retention layer soil will be placed followed by topsoil, which will be fertilized and seeded. The crushed stone drain is to be provided at the toe of the north slope and in other areas where swales are to be constructed at the landfill perimeter to allow water above the cap to drain freely to the perimeter swale.

The design of the final cover system is consistent with modern landfill engineering practices to reduce post-closure infiltration of liquid, contain leachate, manage stormwater, and reduce post-closure maintenance.

6.0 POST-CLOSURE MONITORING PLAN

Following closure of the facility, Post-Closure Monitoring will be implemented to observe that the physical integrity of the site is maintained and to monitor groundwater quality. There are no anticipated planned uses of the property during the post-closure period. Post-closure inspections are to take place no less than twice each year. Inspection reports are to be provided to the NHDES. Post-closure inspections are to be performed for a 30-year period or as approved by the NHDES. Access to the property is to be maintained so that post-closure monitoring can be performed.

Post-closure monitoring will involve the following.

- Inspection of site security and access including fencing, gates, and access roads.
- Groundwater quality monitoring in accordance with the requirements of the Groundwater Permit for the facility, which is to be renewed as required.
- Inspection of the leachate collection system appurtenances to see that they are operating properly. This inspection is to include, but not be limited to, collection piping, cleanouts, storage tanks, and pumps. In addition, data is to be collected and reviewed regarding the quantity of leachate collected from the facility. An increase in the rate of leachate removed from the facility is to be evaluated to assess the cause. Leachate samples are to be collected for analysis in accordance with the NHDES requirements.
- Inspection of landfill area for evidence of erosion, settlement, and to observe the quality of the vegetation. Mowing is to be performed at least once per year to prevent growth of woody plants. Settlement monitoring will consist of visual observations focusing on evidence of differential settlement that results in damage to the final cover system or ponding water. Areas where damage or ponded water are noted are to be repaired.
- Inspection of the stormwater drainage system including the perimeter swales.

A post-closure facility inspection checklist similar to the one included as Appendix C will be used during post-closure inspections. The inspection will include the landfill itself and adjacent areas to observe that the final cover system, landfill drainage swales, perimeter drainage swales, leachate holding tank, and monitoring appurtenances are functioning properly. Items that are malfunctioning or damaged will be noted and repaired in a timely manner, to maintain the integrity of the closed landfill.

The following timing is anticipated for post-closure monitoring activities:

Task	Monitoring Frequency
Gas Monitoring	Not required due to nature of waste accepted
Settlement Monitoring	2x/year
Facility Inspections	2x/year
Annual Facility Report	Annual

7.0 RECORDKEEPING AND REPORTING

Following final closure construction, record drawings will be prepared and submitted to the NHDES. Post-closure facility inspection reports will be prepared and submitted to the NHDES following each site inspection. Annually, a report that summarizes the facility performance for the prior year, including a summary of environmental monitoring data, will be prepared and submitted to the NHDES. The report will include a statement by a Professional Engineer regarding the performance of the closed facility relative to expected performance and whether adjustments to the post-closure monitoring and maintenance provisions are recommended.

Following closure, facility records are to be maintained at GSP's offices. Records are not to be moved or destroyed unless such action is approved by the NHDES pursuant to a Type V Permit modification.

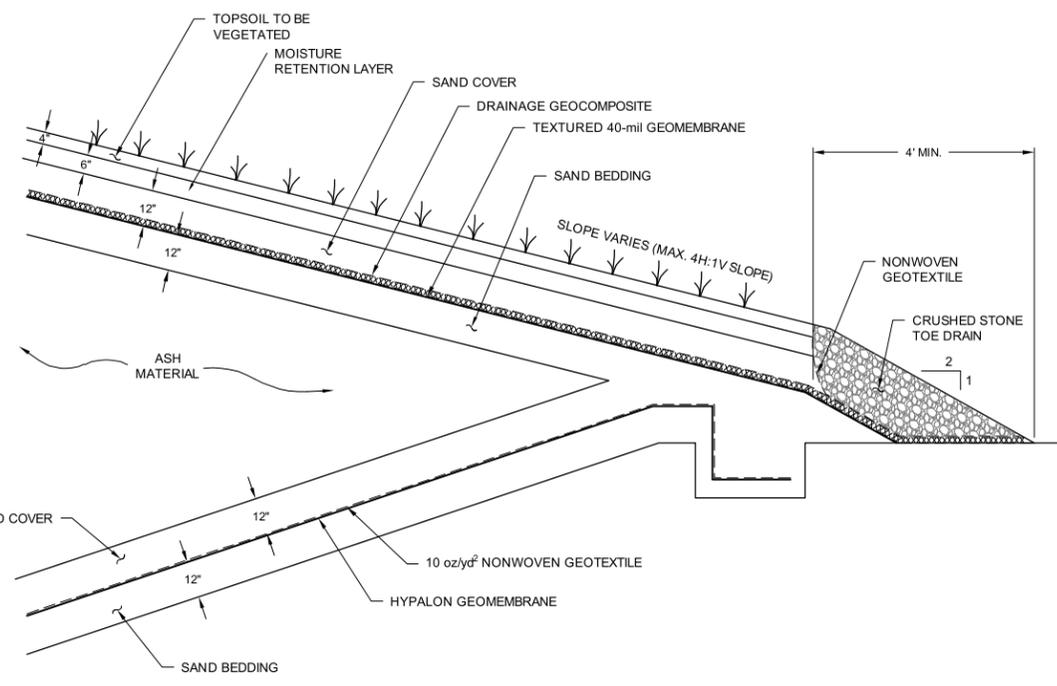
8.0 OTHER PERMITS

A Type II Permit Modification is required prior to closure construction. At this time, it is not anticipated that any other post-closure permits will be required. The facility has a Groundwater Permit that will be renewed as required.

9.0 CLOSURE AND POST CLOSURE COST ESTIMATE

A cost estimate developed for closure activities in accordance with this Closure Plan was prepared and submitted to the NHDES most recently in March 2021. The estimate was based on the current operating area of the facility. The costs used in the estimate are based on a third party performing the work. Post-closure costs for the existing facility were also prepared and submitted to the NHDES in March 2021 and were calculated for a 30-year post-closure period. The cost estimate is required to be updated and submitted periodically by the NHDES. Note that actual costs will be established based on final design requirements at the time of closure, bidding, and performance of the selected contractor.

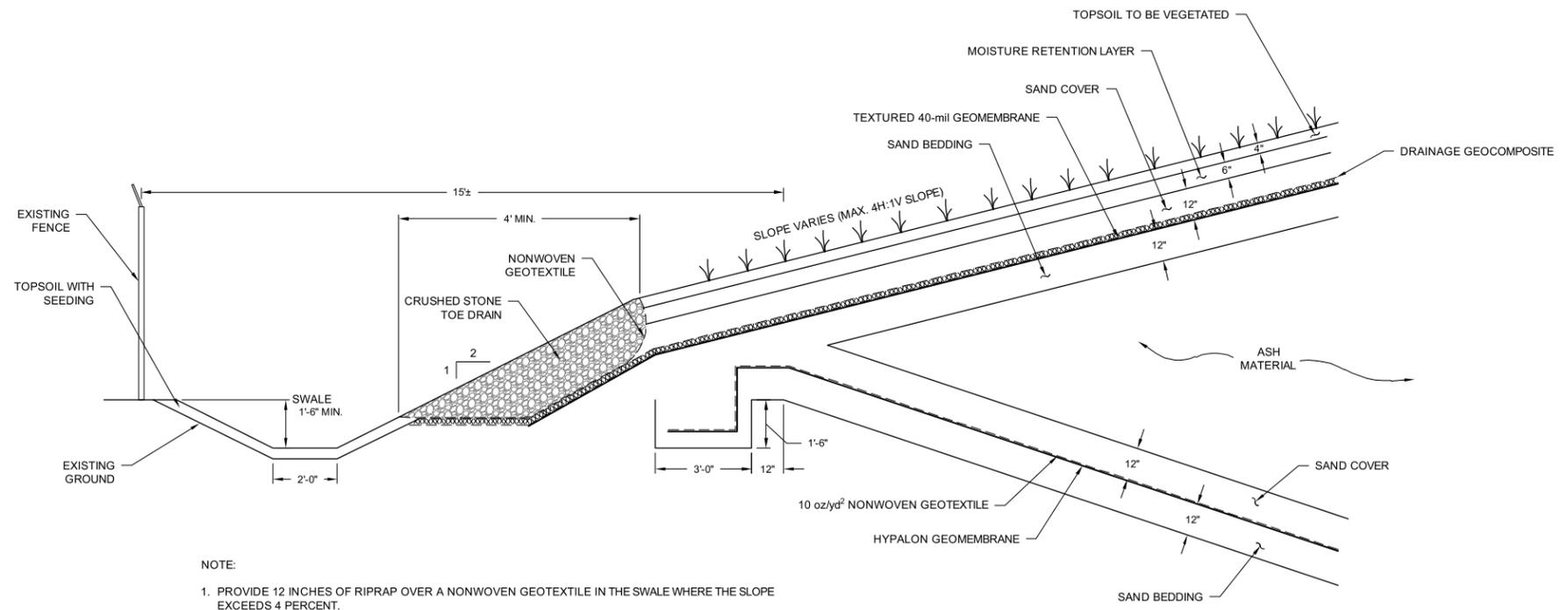
APPENDIX A
RELEVANT DESIGN DRAWING SHEETS



1 REVISED MEMBRANE LINER SYSTEM & ANCHORAGE AT HIGH SIDE

1

N.T.S.



NOTE:
 1. PROVIDE 12 INCHES OF RIPRAP OVER A NONWOVEN GEOTEXTILE IN THE SWALE WHERE THE SLOPE EXCEEDS 4 PERCENT.

2 REVISED MEMBRANE LINER SYSTEM & ANCHORAGE AT LOW SIDE

2

N.T.S.



SCALE: AS NOTED

NO.	DATE	DESCRIPTION	BY

DRAWN BY: L. ZUCHOWSKI
 DESIGNED BY: K. ANDERSON
 REVIEWED BY: K. ANDERSON
 PROJECT MGR: K. ANDERSON
 PIC: E. STEINHAUSER
 DATE: NOVEMBER 2023

PUBLIC SERVICES OF NEW HAMPSHIRE
MERRIMACK STATION
 BOW, NEW HAMPSHIRE
REVISED COVER SYSTEM
DETAILS

PROJECT NUMBER:
 2025.13
 SHEET NUMBER:
 2 OF 3

APPENDIX B

**RELEVANT TECHNICAL SPECIFICATIONS
FOR CLOSURE CONSTRUCTION**

CONTENTS

DIVISION 2 – SITE WORK

Section 02074 - Geotextiles

Section 02075 - Drainage Geocomposite

Section 02200 - Earthwork

Section 02920 - Topsoil, Hydroseeding and Turf Establishment

SECTION 02074

GEOTEXTILES

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Furnish all labor, materials, tools and equipment and perform all operations necessary to furnish, deploy, and install geotextiles in the areas indicated on the Drawings or as required by the Engineer or Owner.

1.2 QUALITY ASSURANCE

- A. Experience
 - 1. The Contractor shall be trained and experienced in field handling, storing, deploying, installing and protecting geotextiles.
- B. Submittals
 - 1. The Contractor shall submit to the Engineer samples of the proposed geotextiles, and certification that the geotextiles meet the required specifications, at least 15 days prior to delivery of materials to the site.

1.3 MATERIALS STORAGE AND HANDLING

- A. The Contractor shall be responsible for the handling, storage and care of geotextiles from the time of delivery to the site until final acceptance of the completed work by the Owner. The Contractor shall be liable for all damages to the materials during such time.

PART 2 - PRODUCTS

2.1 GENERAL

- A. The geotextiles provided shall meet or exceed the property values specified herein. Geotextiles shall be comprised of polymeric yarns of fibers or weld or drawn strands oriented into a stable network which will retain its structure during handling, placement, and long-term service. Geotextiles shall be capable of withstanding direct exposure to the sunlight for 30 days with no measurable deterioration.
- B. Synthetic fabrics shall be non-biodegradable. The Contractor shall follow the manufacturer's recommendations regarding handling and installation of such materials.
- C. Samples of the product selected for use by the Contractor shall be submitted to the Engineer for approval prior to the delivery of the materials to the site from the source.

2.2 GEOTEXTILES

- A. Nonwoven Geotextile shall be a nonwoven polypropylene or polyester material, which meets or exceeds the minimum average roll values tabulated below:

Fabric Property	Test Method	Minimum Fabric Requirement (10 oz/yd ²)
Mass per Unit Area, oz/yd ²	ASTM D5261	10
Grab Tensile Strength, lbs	ASTM D4632	250
Trapezoidal Tear Strength, lb	ASTM D4533	100
Puncture Resistance, lbs	ASTM D6241	700
Water Flow Rate, (sec ⁻¹)	ASTM D4491	1.2

2.3 THREAD

- A. Thread used to seam Nonwoven Geotextiles shall be a polymeric material with chemical resistance properties equal to or exceeding those of the Nonwoven Geotextile. The thread shall be different color than the Nonwoven Geotextile.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Geotextiles shall be installed in accordance with the manufacturer's recommendations, and as shown on the Drawings and specified herein.
- B. Where the use of adjacent sheets of a geotextile are required and are not to be sewn, a minimum overlap of 18 inches shall be maintained.
- C. In applications where geotextile surrounds pipe and crushed stone, the geotextile wrap shall be overlapped a minimum of 18 inches.
- D. Sheets of nonwoven geotextile used in drainage swales, or areas subject to concentrated stormwater flow, shall be shingled such that the upslope nonwoven geotextile overlies the adjacent downgradient sheet.
- E. All holes and tears in the geotextiles shall be noted and repaired as specified by the Engineer.

[END OF SECTION 02074]

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SECTION 02075

DRAINAGE GEOCOMPOSITE

PART 1 – GENERAL

1.1 SCOPE OF WORK

- A. The Contractor shall provide all labor, materials, tools, and equipment and perform all operations necessary to furnish, deploy, and install Drainage Geocomposite in the areas indicated on the Drawings or as required by the Engineer or Owner.

1.2 QUALITY ASSURANCE

- A. The Contractor shall be trained and experienced in field handling, storing, deploying, and installing Drainage Geocomposite. Alternatively, the Contractor shall engage an experienced Subcontractor who shall meet the experience requirements.
- B. The Contractor shall submit to the Engineer samples of the proposed Drainage Geocomposite, and certification that the material meets the required specifications, at least 15 days prior to delivery of materials to the site.

1.4 MATERIAL STORAGE AND HANDLING

- A. The Contractor shall be responsible for the handling, storage, and care of the Drainage Geocomposite from the time of delivery to the site until final acceptance of the completed work by the Owner. The Contractor shall be liable for all damages to the materials during such time.

PART 2 – PRODUCTS

2.1 GEONET

- A. Geonet shall be manufactured of HDPE which has a carbon black content of 2 to 3 percent by weight according to ASTM D4218.
- B. In addition to the properties specified above, Geonet shall meet or exceed the specifications tabulated below.

Property	Units	Value	Test
Polymer specific gravity	g/cm ³	0.94	ASTM D1505
Polymer melt index	g/10 min	<1.1	ASTM D1238
Thickness	mils	≥ 190	ASTM D5199

2.2 DRAINAGE GEOCOMPOSITE

- A. Drainage Geocomposite shall consist of a Geonet meeting the specifications described in Section 2.1 to which a nonwoven geotextile is heat-bonded to both sides.
- B. The geotextile portion of the Drainage Geocomposite shall meet or exceed the minimum average roll values tabulated below:

Geotextile Property	Unit	Test Method	Required Value
Mass per Unit Area	oz/y ²	ASTM D5261	5.5
Grab Strength	lbs	ASTM D4632	≥ 150
Puncture resistance	lbs	ASTM D6241	≥ 80
Permittivity	sec ⁻¹	ASTM D4491	1.5 minimum average

- C. The bond strength between the geotextile, Geonet, and the geocomposite shall be greater than or equal to 1.0 pound per inch in accordance with ASTM D7005.
- D. The minimum average roll value transmissivity measured in accordance with ASTM D4716 using a gradient of 0.25 under a compressive stress of 300 psf shall meet or exceed 2.2×10^{-4} meters squared per second when tested between steel plate and granular soil. ASTM D4716 shall be performed using a 100-hour seating time.
- E. The interface strength for the Geomembrane to Drainage Geocomposite and the Sand Cover to Drainage Geocomposite interfaces shall equal or exceed strength represented by a friction angle of 21° when measured in accordance with ASTM D5321. The testing should include the following:
 - a. A minimum of three tests at varying normal stresses of 150 psf, 300 psf, and 500 psf shall be run to develop a failure envelope using samples of materials proposed to be used in the cover system.
 - b. The tests should be run in a soaked condition. The shear displacement rate for these tests should not exceed 0.04 inches per minute.

2.3 TIES

- A. Ties used to secure adjacent sheets of Geonet shall be plastic fasteners, or polymer braid. Metallic ties will not be allowed. Ties shall be yellow or white to facilitate inspection.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Drainage Geocomposite shall be installed in accordance with manufacturer's recommendations, and as shown on the Drawings and specified herein.
- B. Care shall be taken to keep the Drainage Geocomposite clean prior to installation.
- C. Folds or excessive wrinkling of deployed Drainage Geocomposite shall be removed to the extent practicable. The Contractor shall exercise care not to entrap stones, excessive dust, or foreign objects in the material. Drainage Geocomposite shall be adequately weighted, using sand bags or equivalent until sand cover is placed.
- D. Adjacent sheets of Drainage Geocomposite shall be overlapped a minimum of 4 inches, and shall be secured using ties placed at intervals no greater than 4 feet. Additional ties spaced at intervals not exceeding 2 feet shall be used on seams running across slopes and located in anchor trenches. Spot welding of the Drainage Geocomposite to the geomembrane shall not be allowed.
- E. The geotextile on adjacent panels of Drainage Geocomposite shall be sewn together with continuous seam in the field prior to placement of overlying soil. All seams on sideslopes shall be oriented parallel to the slope. The adjacent sheets of geotextile shall be overlapped a minimum of 6 inches prior to seaming. All overlaps shall be such that the upslope sheet is placed over the downslope sheet.
- F. Drainage Geocomposite shall not be exposed to ultraviolet rays for more than fourteen (14) days before being covered. The Contractor shall place cover material over the Drainage Geocomposite as specified in Section 02200 and in such a manner as to ensure the Drainage Geocomposite is not damaged.

[END OF SECTION 02075]

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SECTION 02200

EARTHWORK

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals necessary to perform all excavation, backfill, fill and grading required to complete the work shown on the contract drawings and specified herein.

1.2 PROTECTION

A. Sheeting and Bracing

1. Protect excavations to prevent cave-in or loose soil from falling into excavation. Observe all applicable OSHA regulations and standards for trenching and excavation.
2. Protect bottom of excavations from freezing. Do not place fill over frozen soil without first obtaining approval from the Engineer or Owner.
3. Recompact fills subjected to vehicular traffic or other disturbances.

B. Pumping and Drainage

1. The Contractor shall at all times during construction provide and maintain proper equipment and facilities to remove all water entering the construction area and any excavations created as part of this Work. The Contractor shall keep excavations dry so as to obtain a satisfactory subgrade condition.
2. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.
3. Water entering the excavation from surface runoff shall be collected and pumped from the excavation to maintain a bottom free of standing water.
4. Drainage shall be disposed of in an approved area so that flow or seepage back into the excavated area will be prevented and any fines contained within the water will not be discharged to surface waters.
5. The Contractor shall take all necessary precautions to preclude the accidental discharge of fuel, oil, etc. in order to prevent adverse effects on surface water and groundwater quality. In the event of an accidental spill, the Engineer and Owner shall be immediately notified and all free liquids shall be cleaned up and all contaminated soils shall be excavated and disposed of properly by the Contractor at the Contractor's expense.

1.3 SUBMITTALS

- A. The Contractor shall submit to the Engineer and Owner for review the proposed Execution Plan for construction, including filling, compaction, and moisture control for the various portions of the work. The Contractor shall submit results of testing demonstrating proposed soil material meet the specifications, prior to delivery of materials to the site. Review shall be for method only. The Contractor shall remain responsible for the adequacy and safety of the methods.

1.4 SOIL TESTING AND CONSTRUCTION MONITORING

- A. Prior to the general placement of the fill, and during such placement, the Engineer or Owner may select areas within the limits of the fill for testing the degree of compaction obtained. The Contractor shall cooperate fully in obtaining the information desired and shall allow the Engineer sufficient time to make necessary observations and tests. See Section 2.2 for specific information.
- B. Payment for all testing, with the exception of the off-site source testing conducted by the Contractor, will be made by the Owner. If test results are unsatisfactory, all costs involved in correcting deficiencies to the satisfaction of the Engineer and Owner will be borne by the Contractor.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Sand Bedding

- 1. Sand Bedding to be used as the soil material on which the geomembrane cap is installed shall be a granular soil consisting of clean, inert, hard, durable grains of quartz or other hard durable rock, free from clay, organics surface coatings, or other deleterious material and shall be free of all angular materials. Sand Bedding shall conform to the following gradation:

Sieve Size	Percent Finer by Weight
1-inch	100
No. 4	85-100
No. 40	50-90
No. 200	0-12

B. Granular Fill

- 1. Granular fill is to be used as general fill as may be required. This material shall be soil containing no stone larger than four inches in largest dimension, be free of trash, ice, snow, tree stumps, roots, and other organic and deleterious material. Granular fill shall not contain more than 15 percent of soil material passing the No. 200 sieve. It shall be of such a nature and character that it can be compacted to the specified densities in a reasonable length of time.

Sieve Size	Percent Finer by Weight
4-inch	100
No. 40	15 – 95
No. 200	0 – 15

C. Sand Cover

- Sand Cover soil to be used above the drainage geocomposite in the landfill cover system shall conform to the following:

Sieve Size	Percent Finer by Weight
1-inch	100
No. 40	40 – 90
No. 200	0 – 10

In addition, the material shall have a calcium carbonate content of no more than 15%.

D. Moisture Retention Soil

- Moisture Retention soil to be used as above the Sand Cover and below the Topsoil in the cover system shall consist of inorganic soil with a maximum particle size of 3 inches, a silt content between 15 and 35 percent and a permeability range of 1×10^{-4} to 1×10^{-6} centimeters per second (cm/sec) when tested in accordance with ASTM D5084. The permeability test should be performed at a moisture content within 2 percent of the optimum water content and at a density that is 88 to 92 percent of the maximum density per ASTM D698.

E. Crushed Stone

- Crushed Stone for use in the toe drain shall be composed of hard, durable particles of crushed stone and mineral matter conforming to the requirements of #67 aggregate as specified by the New Hampshire Department of Transportation Standard Specifications (NHDOT Specifications).

2.2 MATERIALS TESTING

- The Contractor shall supply testing results for off-site sources showing the soils comply with the specifications. The testing shall include the following:
 - Particle Size (ASTM D6913)
 - Calcium Carbonate (ASTM D4373)

- C. The soils will be tested by the Quality Assurance Consultant retained by the Owner as they arrive onsite and are placed for Particle Size (ASTM D6913) at an approximate frequency of 1 test per 3000 yd³ for unprocessed soil materials and 1 test per 10,000 yd³ for processed soil materials.

PART 3 - EQUIPMENT

3.1 LOW GROUND PRESSURE (LGP) EQUIPMENT

- A. The Contractor's attention is brought to the need for LGP construction equipment. The LGP equipment is required during the placement of all materials over the geosynthetic cap system. All travel ways above the geomembrane for non-LGP equipment shall be a minimum of three (3) feet thick.

PART 4 - EXECUTION

4.1 EXCAVATION BELOW GRADE

- A. Excavation shall be made to the grades shown on the contract drawings and to such widths as will give suitable room for construction. The bottom of the excavations shall be rendered firm and dry and in all respects acceptable to the Engineer and Owner.
- B. When excavation has reached prescribed depths, the Engineer shall be notified and will inspect conditions. If materials and conditions are not satisfactory to the Engineer and Owner, the Engineer or Owner will issue instructions as to the procedures.
- C. If, in the opinion of the Engineer or Owner, the material in its undisturbed natural condition, at or below the normal grade of the excavation as indicated on the contract drawings is unsuitable, it shall be removed to such depth and width and replaced with suitable material as directed by the Engineer or Owner. The Contractor shall be responsible for the removal, relocation and stockpiling of unsuitable material in the area designated by the Owner or Engineer. Unsuitable material is classified here as stumps, excessively wet soil, ledge rock, ice, topsoil, subsoil, organics, existing fill or other deleterious material.
- D. The Contractor shall use a flat edge backhoe bucket to excavate to expose to the existing geosynthetic materials in the area where cap membrane will overlap existing cap or liner system geosynthetics. This excavation activity shall not damage the existing geosynthetics. Damage to geosynthetics shall be repaired at the Contractor's expense. This excavation will be maintained accessible and free of excessive water, soil, or other deleterious material until the new geosynthetics can be installed.

4.2 MISCELLANEOUS EXCAVATION

- A. The Contractor shall make all excavations necessary to permit the placing of topsoil, for constructing roadways, berms and any other miscellaneous earth excavation required.

4.3 SUBGRADE PREPARATION - GENERAL

- A. Prior to fill placement, the subgrade should be compact, dry, and free from debris, ice, and snow. Fill shall not be placed over frozen soil unless otherwise approved by the Engineer or Owner.
- B. Subgrade preparation should be followed immediately by fill placement. Deterioration of the subgrade between excavation or fine grading and initial fill placement or geomembrane installation shall be the responsibility of the Contractor and shall be repaired at the Contractor's expense.
- C. All subgrade surfaces must be inspected and approved by the Engineer and Owner prior to fill placement. Sufficient time must be given to the Engineer and Owner to inspect the subgrade.

4.4 FILL COMPACTION CRITERIA

- A. Unless otherwise waived by the Engineer, Sand Bedding soil shall be compacted with at least two passes of a smooth drum roller with a static weight of at least 8,000 pounds. Compaction shall take place when the water content of the soil is not more than 2% above the optimum moisture content per ASTM D698.

4.5 FILL PLACEMENT AND COMPACTION - GENERAL

- A. The Sand Cover fill shall be placed in one lift of 12 inches. This lift must be placed by pushing upslope only, using LGP equipment.
- B. All fill shall be placed "in the dry." The fill areas shall be graded to drain and provide a smooth surface, which will readily shed water.
- C. Fill containing ice, snow, frozen soil, large rocks, or other deleterious material shall not be placed without removal of unacceptable materials.
- D. Fill placement shall not be allowed during weather conditions, which do not allow for proper moisture and density controls.
- E. The Engineer will observe construction. During the course of construction, the Engineer will advise the Owner in writing if at any time in his opinion the work does not conform to the Contract Documents.
- F. The Engineer's presence does not include supervision or direction of the actual work by the Contractor, his employees, or agents. Neither the presence of the Engineer nor any observations and testing performed by him shall excuse the Contractor from defects discovered in his work.
- G. The Contractor shall have a "spotter" when dumping soils to construct the cover and to ensure no deleterious material is mixed in with the cover soils (i.e., rocks, sticks, etc.) and to minimize folding of wrinkles in the geosynthetics.

[END OF SECTION 02200]

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SECTION 02920

TOPSOIL, HYDROSEEDING, AND TURF ESTABLISHMENT

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required to furnish and place topsoil, finish grade, furnish and apply lime and fertilizer, furnish and hydraulically apply seed and mulch, and maintain all seeded areas as specified herein.
- B. Contractor shall seed all areas disturbed by his operations. All areas disturbed or not having sufficient vegetation to prevent erosion shall be seeded.

1.2 SAMPLES AND APPROVAL OF MATERIAL

- A. Samples of all materials shall be submitted for inspection and acceptance upon Engineer's request.
- B. The Contractor shall submit the proposed seed mix including the manufacturer's certificate of compliance to the Engineer for review prior to seeding.
- C. Seed bag tags shall be provided to the Engineer at the time of seeding.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Topsoil shall be fertile, natural soil capable of sustaining vigorous plant growth, typical of the locality, free from stones greater than 3 inches, roots, sticks, clay, peat, weeds and sod and obtained from naturally well drained areas. It shall not be excessively acidic or alkaline nor contain toxic material harmful to plant growth.
- B. Fertilizer shall be a complete commercial fertilizer, 10-10-10 grade for grass areas. It shall be delivered to the site in the original unopened containers each showing the manufacturer's guaranteed analysis. Fertilizer shall be stored so that when used it shall be dry and free flowing.
- C. Lime shall be ground limestone containing not less than eighty-five percent (85%) calcium and magnesium carbonates.
- D. Grass seed shall be from the same or previous year's crop; each variety of seed shall have a percentage of germination not less than ninety (90), a percentage of purity of not less than eighty-five (85) and shall have not more than one percent (1%) weed content. The seed mixture shall conform to the

requirements of Slope Seed Type 44 as specified in Section 644 of the 2010 New Hampshire Department of Transportation Standard Specifications (NHDOT Specifications), or other seed mix approved by the Engineer.

- E. The seed shall be furnished and delivered premixed in the proportions specified above. A manufacturer's certificate of compliance to the specified mix shall be submitted by the manufacturer for each seed type. These certificates shall include the guaranteed percentages of purity, weed content and germination of the seed, and also the net weight and date of shipment. No seed may be sown until the Contractor has submitted the certificates.
- F. Hay mulch shall be dry hay or straw mulch free of mold.
- G. Fertilizer, seed, and lime shall be furnished in new, clean, sealed, and properly labeled bags, with the following information clearly marked:
 - Manufacturer name
 - Type
 - Weight
 - Guaranteed analysis

PART 3 - EXECUTION

3.1 APPLICATION

- A. Unless otherwise shown on the Drawings, topsoil shall be placed to a minimum thickness of 4 inches.
- B. For all areas to be seeded:
 - 1. Lime shall be applied uniformly over the area at the rate of twenty-five (25) pounds per 1,000 square feet minimum and one-hundred (100) pounds per 1,000 square feet maximum.
 - 2. Fertilizer (10-10-10) shall be applied uniformly over the area at the rate of twenty (20) pounds per 1,000 square feet.
 - 3. Seed shall be applied uniformly over the area at the minimum rate of three (3) pounds per 1,000 square feet.
 - 4. Fiber mulch shall be applied uniformly over the area at the rate of seventy-five (75) pounds per 1,000 square feet minimum and one-hundred fifty (150) pounds per 1,000 square feet maximum.
- C. The application of fertilizer and lime shall be performed hydraulically in one operation with hydroseeding. The Contractor will be responsible for cleaning all structures and paved areas of unwanted deposits.
- D. The application of hay mulch is to be by pneumatic blower.

3.2 INSTALLATION

- A. The subgrade of all areas to be covered with topsoil and seeded shall be raked and all rubbish, sticks, roots and stones larger than 3 inches shall be removed. Subgrade surfaces in all areas shall be tracked immediately after fine grading and raking has been completed. Tracking is to be performed with bulldozers operating in the direction of water flow. The tracks of the bulldozers are to have grousers of sufficient height to leave visible depressions in the subgrade. The depressions are to be perpendicular to the direction of water flow to reduce erosion potential until topsoil is placed. During the tracking, all depressions caused by settlement or tracking shall be filled with additional topsoil and the surface shall be regraded and tracked until an even finished grade is created.
- B. Subgrades shall be observed and approved by the Engineer before topsoil is placed. After topsoil has been spread and fine graded, all large stiff clods, lumps, brush, roots, stumps, litter and other foreign material shall be removed from the area covered with topsoil and disposed of by the Contractor. The entire area where topsoil has been placed shall then be tracked as indicated in paragraph 3.2.A above.
- C. Application of fertilizer, lime, seed and mulch shall only be performed during those periods within the seasons that are normal for such work as determined by the weather and locally accepted practice, and as approved by the Engineer. Seeding and fertilizing shall be conducted between April 1 and June 1 or between August 15 and October 15, or as directed or permitted by the Engineer. The Contractor shall hydroseed and hay mulch only on a calm day.
- D. Schedules for seeding and fertilizing must be submitted to the Engineer and Owner for approval prior to the work being performed.
- E. Lime and fertilizer are to be spread hydraulically in one operation with the hydroseeding.
- F. Seeding shall be done within five (5) days following soil preparation. Seed shall be applied hydraulically at the rates and percentages indicated. The spraying equipment and mixture shall be so designed that when the mixture is sprayed onto an area, the lime, fertilizer and seed shall be equal in quantity to the specified rates. Prior to the start of work, the Engineer and Owner shall be furnished with a certified statement for approval as to the number of pounds of materials to be used per 100 gallons of water. This statement shall also specify the number of square feet of seeding that can be covered with the quantity of solution in the hydroseeder.
- G. When protection of newly graded areas is necessary at a time that is outside of the normal seeding season, the Contractor shall protect those areas by whatever means necessary (such as straw or erosion control mats) or by other measures as approved by the Engineer and Owner.

3.3 MAINTENANCE AND PROVISIONAL ACCEPTANCE

- A. The Contractor shall keep all seeded areas watered and in good condition, shall reseed if and when necessary until a good, healthy, uniform growth is established over the entire area seeded, and shall maintain these areas in an approved condition until provisional acceptance.
- B. On slopes, the Contractor shall protect against wash outs by an approved method. Any wash out that occurs shall be regraded and reseeded at the Contractor's expense until a good sod cover is established.
- C. The Engineer or Owner will observe work for provisional acceptance at the end of the eight (8) week grass maintenance period, and upon the written request of the Contractor, which must be received at least ten (10) days before the anticipated date of observation.
- D. A satisfactory stand will be defined as a section of grass of 10,000 square feet or larger that has:
 - 1. No bare spots larger than three (3) square feet.
 - 2. No more than ten percent (10%) of total area with bare spots larger than one (1) square foot.
 - 3. No more than fifteen percent (15%) of total area with bare spots larger than 6 inches square.
 - 4. The observations by the Engineer or Owner will determine whether maintenance shall continue in any area or manner.
- F. After all necessary corrective work and cleanup has been completed, the Engineer or Owner will acknowledge the provisional acceptance of the seeded areas. The Contractor's responsibility for maintenance of seeded areas, or parts of seeded areas shall cease on receipt of provisional acceptance.

3.4 GUARANTEE PERIOD AND FINAL ACCEPTANCE

- A. All seeded areas shall be guaranteed by the Contractor for not less than one (1) full year from the time of provisional acceptance.
- B. At the end of the guarantee period, the Engineer or Owner will make observations upon written request submitted by the Contractor at least ten (10) days before the anticipated date. Seeded areas not demonstrating satisfactory stands as outlined above, as determined by the Engineer or Owner, shall be renovated, reseeded, and maintained meeting all requirements as specified herein.
- C. After all necessary corrective work has been completed, the Engineer or Owner shall acknowledge in writing the final acceptance of the seeded areas.

[END OF SECTION 02920]

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APPENDIX C

POST-CLOSURE INSPECTION CHECKLIST

**MERRIMACK STATION COAL ASH LANDFILL
POST-CLOSURE FACILITY INSPECTION CHECKLIST**

INSPECTORS: _____

DATE: _____

WEATHER: Today:

Yesterday:

<u>FACILITY ACCESS</u>	YES	NO	NA	<u>COMMENTS/ ACTION ITEMS</u>
1. Is access controlled with gate and perimeter fence?	___	___	___	
2. Are the following signs/information posted? - emergency telephone number - no trespassing	___	___	___	
3. Is entrance/access road properly graded and drained?	___	___	___	
<u>DISPOSAL AREA – FINAL COVER</u>				
4. Is vegetation established over areas with final cover?	___	___	___	
<u>DRAINAGE</u>				
5. Is there evidence of erosion of final cover?	___	___	___	
6. Are drainage structures properly maintained?	___	___	___	
7. Are sediment controls provided and working adequately?	___	___	___	
<u>SETTLEMENT</u>				
8. Is there ponding on the cap or other indications of excessive settlement?	___	___	___	
9. Does the cap slope to promote runoff?	___	___	___	
<u>GROUNDWATER MONITORING</u>				
10. Is the structural integrity of the monitoring wells (i.e., riser pipe and protective casing) acceptable?	___	___	___	
11. Are all monitoring wells properly secured (i.e., locked?)	___	___	___	
12. Is groundwater monitoring performed as required by permit and are results acceptable?	___	___	___	
<u>LEACHATE COLLECTION</u>				
13. Is leachate contained as indicated by the lack of leachate seeps?	___	___	___	
14. Are leachate collection systems and appurtenances functioning properly?	___	___	___	
15. Is leachate properly removed and disposed?	___	___	___	
<u>PERMIT REPORTING REQUIREMENTS</u>				
16. Periodic reporting required by Solid Waste Rules permit completed and submitted?	___	___	___	
<u>COMMENTS</u>				

I have read and agree with the information provided above.

Signature

Date