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November 15, 2013

North Carolina Department of Environmental and Natural Resources
Division of Waste Management
Solid Waste Section
2090 U.S. Highway 70
Swannanoa, North Carolina 28778
(electronically submitted)

Permit No.	Scan Date	DIN
1809-INDUS-	**November 18, 2013**	**20177**

RECEIVED
November 15, 2013
Solid Waste Section
Asheville Regional Office

APPROVED DOCUMENT
Division of Waste Management
Solid Waste Section
Date **December 6, 2013** By **LY Frost**

Attn: Mr. Larry Frost

Re: Operations Plan Modification Request
FGD Landfill Permit No. 1809-INDUS
Marshall Steam Station
Terrell, North Carolina 28682

Dear Mr.Frost,

Attached you will find a revised Operations Plan (OP) for Marshall Steam Station FGD Landfill, NCDENR Solid Waste Permit No. 1809-INDUS. The OP has been revised to include recent approvals:

- Operational Flexibility, approval received 8/28/2012
- Waste Stream, approval received 9/16/2013
- Intermediate Cover, approval received 1/30/2013

This revision also contains a request for the installation of a chimney drain system. Updates for the chimney drain system are included in Section 2.3. The phasing diagrams have been updated and an additional drawing, PD-9-Chimney Drain Details, has been included. Additionally, Detail B on permit drawing MM6451.00-0007.001 has been modified to incorporate the Chimney Drain modifications.

This submittal includes Appendices A, B, and C for reference. No changes or alterations have occurred to the appendices.

This request is being submitted electronically. Please let me know if you would like to receive paper copies.

Respectfully submitted,

Digitally signed by Kimberlee Hutchinson
DN: cn=Kimberlee Hutchinson, o=Duke Energy Corporation, ou=Environmental Services, email=kim.hutchinson@duke-energy.com, c=US
Date: 2013.11.15 12:04:02 -05'00'

Kimberlee Hutchinson, PE
Environmental Services

Attachments: 1809-INDUS Operations Plan, Rev 2 2013-11-13
Drawing MM6451 00-0007 001, Rev 4 2013-11-1

cc (via e-mail): Scott Parks, Duke Energy
George Tolbert, Duke Energy
Elizabeth Werner, NCDENR Solid Waste
Dan Brewer, WSP

Landfill Operations Plan

Duke Energy Carolinas, LLC—Marshall Steam Station
Flue Gas Desulfurization (FGD) Residue Landfill Phase 1, Cell 1
Catawba County, North Carolina

Permit No. 1809

November 13, 2013
Revision 2

Prepared for:
Duke Energy Carolinas, LLC
526 South Church Street
Charlotte, North Carolina 28202

Prepared by:
WSP
128 Talbert Road, Suite A
Mooresville, NC 28117

Landfill Operations Plan

Duke Energy Carolinas, LLC—Marshall Steam Station
Flue Gas Desulfurization (FGD) Residue Landfill Phase 1, Cell 1
Catawba County, North Carolina

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NORTH CAROLINA PROFESSIONAL SEAL 17582 ENGINEER DAN E. BREWER

Dan E. Brewer 11-13-13

Dan E. Brewer, P.E.
WSP
North Carolina Professional Engineering Firm No. F-0891

Description of Revisions

The following table provides a brief description of the revisions to the Operations Plan. The Operations Plan was originally submitted to the North Carolina Department of Environment and Natural Resources (DENR) on August 19, 2011. Comments from DENR on the submittal were provided in a *Completeness Determination and Technical Review* letter from Mr. Larry Frost, DENR, to Mr. Ed Sullivan, P.E., Duke Energy Carolinas, LLC, dated September 27, 2011 (see Appendix C).

Revision	*Date of Document*	*Description of Revisions*
Initial Issue	August 19, 2011	Initial issuance of document.
Revision 1	December 9, 2011	The following revisions were performed to respond to the Permit to Operate *Completeness Determination and Technical Review* performed by DENR and to provide consistent requirements for Operational and Intermediate Cover between this landfill and the Marshall Steam Station Industrial Landfill No. 1, Permit No. 1812 (MSS ILF#1). Editorial changes to the text are not noted. *Landfill Operations Plan* • Section 2.1.1—Revised acreage for landfill footprint to 17.9 acres to include stormwater basin. • Section 2.1.6.3—Revised to delete reference to cover requirements for asbestos from this section. • Section 2.1.8.1—Revised cover requirements for asbestos per DENR comments. • Section 2.1.8.3—Revised cover requirements to be consistent with MSS ILF#1 Operations Plan. • Section 2.1.8.4—Revised cover requirements to be consistent with MSS ILF#1 Operations Plan. • Section 2.1.8.5—Deleted previous section (Interim Cover) to be consistent with MSS ILF#1 Operations Plan. (Initial Issue Section 2.1.8.6 Final Cover becomes Section 2.1.8.5). • Section 2.7—Revised wording to state that monitoring of landfill gas is not required until the final cover system is installed. • Section 6.0—Revised section for 10-Year Waste Management Plan to include annual submittal of implementation report per DENR comments.

(Continued on next sheet)

Revision	*Date of Document*	*Description of Revisions -Continued*
Revision 1	December 9, 2011	*Landfill Operations Plan* *Appendix A Dust Control Plan* • Section 1.0—Deleted acreage of landfill footprint. • Section 2.0—Revised section to delete reference to thickness of soil cover. • Section 4.0—Revised cover requirements for asbestos per DENR comments. *Appendix C* • Added Letter from Mr. Larry Frost, DENR to Mr. Ed Sullivan, P.E., Duke Energy Carolinas, LLC, dated September 27, 2011, Permit to Operate, Amendment, Five (5) Year Renewal, Completeness Determination and Technical Review, Marshall Steam Station Flue Gas Desulfurization (FGD) Residue Landfill, Permit No. 1809, Catawba County, DIN 15221
Revision 2	November 13, 2013	*Landfill Operations Plan* Section 1.5 Operating Hours – Included language for Operational Flexibility Section 2.1 Waste Acceptance • Revised approved waste and operational process for handling waste • Updated intermediate cover requirements Section 2.3 Leachate Collection System – Included chimney drain system and modified leachate collection pipe maintenance plan. Phasing Diagrams – Added chimney drain locations and added Drawing PD-9 for chimney drain details.

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Appendices

A. Dust Control Plan
B. Closure/Post-Closure Plan
C. Letter from Mr. Larry Frost, DENR to Mr. Ed Sullivan, P.E., Duke Energy Carolinas, LLC, dated September 27, 2011, Permit to Operate, Amendment, Five (5) Year Renewal, Completeness Determination and Technical Review, Marshall Steam Station Flue Gas Desulfurization (FGD) Residue Landfill, Permit No. 1809, Catawba County, DIN 15221

1.0 General Facility Operations

1.1 Overview

The purpose of this Operations Plan is to provide a plan for the safe and efficient operations of the Marshall Steam Station (Marshall) Flue Gas Desulfurization (FGD) Residue Landfill (Marshall FGD Landfill). This Operations Plan presents the operational requirements for: 1) General Facility Operations, 2) Operations Management, 3) Erosion and Sedimentation Control, and 4) Vegetation Management, along with guidance for Landfill Closure and Required Regulatory Submittals. This Operations Plan was prepared consistent with 15A NCAC 13B .0505 Operational Requirements for Sanitary Landfills rules. Table 1 provides a cross-reference between the 15A NCAC 13B .0505 requirements and the applicable section in this Operations Plan.

The Marshall FGD Landfill is owned and operated by Duke Energy Carolinas, LLC (Duke). The landfill is located in Catawba County, North Carolina on Duke property, northwest of the Marshall plant and to the west of the Marshall Ash Basin.

1.2 Contact Information

Correspondence and questions concerning the operation of the Marshall FGD Landfill should be directed to the appropriate entity as follows:

<u>Owner</u>

Duke Energy Carolinas, LLC—Marshall Steam Station
8320 East NC Highway 150, Terrell, North Carolina 28682
(828) 478-7700
Facility Contact: Station Sponsor for Landfill Operations or Environmental Professional

<u>State Regulatory Agency</u>

North Carolina Department of Environment and Natural Resources
Division of Waste Management, Solid Waste Section
Asheville Regional Office
2090 US Highway 70, Swannanoa, North Carolina 28778
(828) 296-4500
Environmental Engineer: Larry Frost

1.3 Safety

Landfill operations at the Marshall FGD Landfill were developed considering the health and safety of the facility's operating staff. The operating staff is provided with site-specific safety training prior to landfill operations, and on-site activities are to be conducted according to the applicable sections of Duke's Safe Work Practices.

1.4 Access and Security Requirements

The Marshall FGD Landfill is located entirely within Duke property. Security for the site is currently in place, consisting of fencing, gates, berms, wooded buffers, and security check stations. Unauthorized vehicle access to the site is prevented around the landfill property by woods, fencing, gates, and stormwater conveyance features.

The access road to the site is of all-weather construction and will be maintained in good condition. Potholes, ruts, and debris on the road(s) will receive immediate attention in order to avoid damage to vehicles.

1.5 Operating Hours

The Marshall FGD Landfill is open seven days a week, as required.

On weekends and holidays when the Landfill Operator may be offsite but when the station wastewater treatment system remains operational

- the landfill Operator shall place and compact all existing waste in the landfill prior to leaving the site;
- the Landfill Operator shall clearly and visibly indicate the location for weekend clarifier sludge placement in the landfill through use of signs, barrels, or other delineation aid prior to leaving the site;
- only designated station personnel who are properly equipped and informed shall transport and place clarifier sludge in the landfill during the weekend or holiday;
- a certified landfill operator shall be available by phone to address issues should they arise during the weekend or holiday; and
- On the first business day following the weekend or holiday, the landfill operator shall incorporate any clarifier sludge placed in the FGD Landfill during the weekend or holiday in accordance with the Operations Plan.

1.6 Signs

A sign providing the landfill permit number, hours of operation, and a statement reading, “NO HAZARDOUS OR LIQUID WASTE PERMITTED,” is posted at the site entrance and shall be maintained in good condition.

Directional signs are placed along the access road to the landfill and shall be maintained in good condition at all times.

Edge-of-waste markers are installed to delineate the edge of waste. These markers shall be maintained in good condition and remain visible at all times.

1.7 Training

Due to the diversity and nature of job tasks required at the Marshall FGD Landfill, personnel shall be adequately trained to handle facility operations and maintenance.

The Station Sponsor for Landfill Operations shall have a general understanding of all the tasks required for site operations. Individuals performing the various tasks shall have adequate training for the site-specific tasks they are assigned. Duke shall provide a site-specific training program for facility personnel.

Noteworthy operations and maintenance tasks to be addressed in training include:

- Maintaining accurate records of waste loading (quantitative and qualitative)
- Operating requirements for stormwater segregation from exposed waste areas
- Operating and maintaining the leachate collection system (LCS)

All training will be documented and training records will be kept on-site. The Station Sponsor for Landfill Operations will complete operator training courses in accordance with the permit requirements.

1.8 Record Keeping

An operating record is to be maintained on-site and include the following records:

- Leachate Collection System (LCS)—Line Cleanout and Camera Monitoring Documentation
- Stormwater Maintenance and Inspection Logs
- Erosion and Sedimentation Control Inspection Logs
- Periodic Landfill Inspection Logs
- Dust Control Monitoring Logs
- Groundwater Monitoring (and Sampling) Documentation
- Operations Plan

The above records are to be kept in the operating record for the active life of the Marshall FGD Landfill and the post-closure care period. Information contained in the operating record must be furnished upon request to the North Carolina Department of Environment and Natural Resources Division of Waste Management, Solid Waste Section (Division) or be made available for inspection by the Division. Additional records kept on-site should include:

- Solid waste facility permits
- Record of the amount of solid waste received summarized on a monthly basis based on scale records
- Documentation of LCS system performance observations
- Documentation of erosion and sedimentation control observations
- Regulatory agency inspection reports
- Permit-to-Construct Application
- Employee training program and records
- Landfill drawings and specifications

1.9 Design Drawings

A list of the landfill design drawings is provided in Table 2. The design drawings provide the location of landfill features, landfill construction details, and technical design and construction notes.

2.0 Operations Management

The primary objective of operations management at the Marshall FGD Landfill is to dispose of waste material in compliance with permit conditions while operating in a safe manner. Landfilling operations will generally proceed from the northwest toward the southeast. In general, landfilling operations in the cell will be limited to an exposed surface area of approximately 2 acres or less, at the operator's discretion, with waste in other areas covered with operational or intermediate cover as appropriate.

2.1 Waste Handling and Landfill Sequencing

2.1.1 Landfill Capacity

The Marshall FGD Landfill Phase I, Cell 1 was permitted to operate on November 21, 2006. The Cell 1 footprint consists of approximately 17.9 acres. The landfill began receiving waste in late fall 2006. The total available airspace volume of Cell 1, as shown on drawing MM6451.00-0005.001, Revision 1, is approximately 1.17 million cubic yards. This volume corresponds to 1,326,780 tons of capacity based on an average unit weight of 84.0 pounds per cubic foot. The expected annual quantity of waste to be placed in the landfill is 288,800 tons per year. This is based on design waste receipts of 950 tons per day for 304 operating days per year. The expected annual quantity of waste placement is from the Permit to Operate dated November 21, 2006.

Included below are the Actual Annual Quantities placed in the landfill for the first five years of operation (2006-2011).

The yearly periods listed below correspond to the period July 1 through June 30 for the respective year.

Year	Period	Actual Annual Quantity
Year 1	2006-2007	2,548 tons (Actual)
Year 2	2007-2008	22,273.96 tons (Actual)
Year 3	2008-2009	30,937.12 tons (Actual)
Year 4	2009-2010	125,032.39 tons (Actual)
Year 5	2010-2011	93,784.63 tons (Actual)

The remaining capacity of the landfill is 1,052,204 tons. Landfill sequencing is further described in Section 2.1.5.

2.1.2 Waste Acceptance, Disposal, and Screening Requirements

The Marshall FGD Landfill can accept the following waste types:

- Marshall-generated gypsum
- Marshall-generated clarifier sludge
- Marshall-generated fly ash
- Marshall-generated bottom ash
- Marshall-generated construction and demolition (C&D) debris
- Duke Energy Carolinas-generated asbestos
- Allen Steam Station (Allen)-generated gypsum

- Allen-generated clarifier sludge
- Cliffside Steam Station (CSS)-generated gypsum
- CSS-generated clarifier sludge
- Marshall Mill Rejects (pyrites)
- Marshall-generated waste limestone material
- Marshall-generated land clearing and inert debris
- Marshall-generated boiler slag
- Marshall-generated ball mill rejects
- Marshall-generated sand blast material
- Marshall-generated coal waste

The landfill owner or operator shall notify the Division within 24 hours of attempted disposal of any wastes the landfill is not permitted to receive.

At a minimum, hazardous waste, yard trash, liquid wastes, regulated medical waste, sharps not properly packaged, polychlorinated biphenyls (PCB) waste as defined in 40 Code of Federal Regulations (CFR) 761, and wastes banned from disposal in North Carolina by General Statute 130A-309.10(f), must not be accepted at the landfill.

The removal of waste from the landfill is prohibited unless the owner or operator approves and the removal is not performed on the working face. Waste will be hauled and disposed of by dedicated and consistent operators from the waste source to the landfill.

2.1.3 Dust, Litter, Odor, and Vector Control

Litter, odors, and vectors are not anticipated to be concerns at the Marshall FGD Landfill. The waste placed in the landfill does not attract vectors, and windblown material is not anticipated to be a problem. Odors are typically not a problem at FGD residue landfills.

Dust control is addressed in the *Dust Control Plan* included as Appendix A. Generally, dust control measures will be implemented when necessary and will include at a minimum watering of dusty roads and exposed work areas. The gypsum surface typically generates a crust, which reduces the dust potential for the gypsum. Additionally, final cover will be vegetated as soon as is practical in order to minimize the blowing of dust on-site.

2.1.4 Fire Control

No open burning shall be permitted at the Marshall FGD Landfill. There are no explosive gas concerns with gypsum, ash waste, mill rejects, or asbestos waste; therefore, the threat of fire is considered to be minimal.

Although it is unlikely, if a fire occurs at the landfill, the Station Control Room (phone number: 828-478-7521) shall be notified and equipment and stockpiled soil shall be provided to control accidental fires. Marshall Steam Station (MSS) will notify the local fire department, which will be immediately dispatched to assist with fire control. Any fire that occurs at the landfill shall be reported to the Division within 24 hours and a written notification will be submitted within 15 days by the Station Sponsor for Landfill Operations.

2.1.5 Landfill Sequencing

The Marshall FGD Landfill will be developed within the area shown on the Phasing Diagrams (Figures PD-1 through PD-8 [Cell 1 Phasing Diagrams]). A 200-foot buffer will be maintained around the entire perimeter of the landfill. A 500-foot buffer will be maintained from existing residences and water supply wells. The majority of the areas within the buffer will remain in its current condition.

2.1.6 Waste Placement

2.1.6.1 Limestone, Boiler Slag, Ball Mill Rejects, Sand Blast Material, and Waste Coal

The waste limestone, boiler slag, ball mill rejects, sand blast material, and waste coal are transported to the landfill in dump trucks. The waste is dumped from trucks and placed on the smallest active face practical in the center of the operational area and shall not be placed within 25 feet of the exterior slopes. The waste is then spread and compacted using compactors and dozers in lifts no greater than 12 inches thick. In-place density testing is not required for waste limestone, boiler slag, ball mill rejects, sand blast material, and waste coal

Loads of waste that exhibit higher moisture content than anticipated will be placed no closer than 50 feet from the active face in thin lifts and dozed into place. No waste shall be placed in areas of accumulated water. Waste will be covered with intermediate and final cover as applicable, in accordance with the following cover sections in this plan.

2.1.6.2 Gypsum, Ash, and Mill Rejects

A conveyor system transports the gypsum from the FGD facility and stockpiles it adjacent to the Marshall FGD Landfill. The gypsum is then loaded onto dump trucks and hauled to the landfill active face. The ash (fly ash and bottom ash) and mill rejects are transported to the landfill in dump trucks. The waste is dumped from trucks and placed on the smallest active face practical. The waste is then spread and compacted using compactors and dozers in lifts no greater than 12 inches thick. Gypsum and fly ash shall be placed and compacted in accordance with requirements outlined in Section 2.1.7. Bottom ash and mill rejects shall be placed and compacted as densely as practical. In-place density testing is not required for bottom ash and mill rejects.

Waste will generally be placed from upslope to downslope, but as higher waste elevations are achieved, waste may be placed from downslope to upslope on the active face slopes as long as landfill surfaces are graded to allow for proper drainage and segregation. The waste placement surface will be graded to promote surface water runoff. Soil berms are to be constructed as necessary to divert run-on from entering the working face or allowing runoff to drain from active areas.

Loads of bottom ash and mill reject waste that exhibit higher moisture content than anticipated will be placed no closer than 50 feet from the active face in thin lifts and dozed into place. No waste shall be placed in areas of accumulated water.

Waste will be covered with intermediate and final cover as applicable, in accordance with the following cover sections in this plan. Operational soil cover is not required provided the *Dust Control Plan*, included as Appendix A, is followed.

2.1.6.3 Clarifier Sludge

Clarifier sludge will be loaded onto dump trucks and hauled to the landfill active face. The waste will be end-dumped on the active face and allowed to dry, and mixed as necessary to expedite the drying process, before it is spread with a dozer. The clarifier sludge will be mixed in with ash or gypsum during the spreading

operations in lifts no greater than 12 inches thick. The waste will be compacted in thin lifts as densely as practical with a dozer. Specific monitoring and in-place density testing for clarifier sludge is not required.

Loads of clarifier sludge waste that exhibit higher moisture content than anticipated will be placed no closer than 50 feet from the active face in thin lifts and dozed into place. No waste shall be placed in areas of accumulated water.

Waste will be covered with intermediate and final cover as applicable, in accordance with the following cover sections in this plan. Operational soil cover is not required provided the *Dust Control Plan*, included as Appendix A, is followed.

2.1.6.4 Asbestos

Asbestos waste shall be packaged in accordance with 40 CFR 61, and it shall be disposed of away from the working face or in an area not contiguous with other disposal areas. Separate areas shall be clearly marked so that asbestos is not exposed by future land-disturbing activities. From lift to lift, asbestos disposal areas can be relocated, provided that records of the areas are maintained.

Asbestos material shall not be placed within 25 feet of the exterior slopes. Asbestos material shall be placed in relatively thin lifts limited to only a few feet thick. Asbestos material shall be compacted as densely as practical and specific monitoring and in-place density testing for asbestos materials is not required. Asbestos material shall be covered as described in Section 2.1.8.1.

2.1.6.5 Construction and Demolition (C&D) Waste and Land Clearing and Inert Debris (LCID)

The landfill may receive construction and demolition waste, land clearing waste, inert debris, untreated wood, and yard trash (leaves, sticks). These materials shall not be placed within 25 feet of the exterior slopes. Waste will be placed on the smallest active face as practical and compacted with a dozer as densely as practical. Specific monitoring and in-place density testing of C&D waste and LCID is not required. Compacted C&D waste and LCID will be covered as described in Section 2.1.8.2.

2.1.7 Compaction Requirements

Generally, waste and soil cover will be spread with a dozer in lifts no greater than 12 inches thick and compacted with a dozer.

Gypsum and fly ash are fine-grained materials that compact well during waste placement and resemble characteristics of natural soil placed in an engineered fill. Field testing of in-place density and moisture content shall be performed to monitor the compaction and moisture conditioning during waste placement. Waste shall be compacted to a minimum 95 percent of its Standard Proctor (ASTM D 698) maximum dry density. Compacted moisture content shall be plus or minus (±) 5 percent of optimum moisture content.

In-place density and moisture content testing shall be performed at a frequency of one test per 10,000 cubic yards of gypsum and/or fly ash placed. In-place density testing shall be performed using the Sand-Cone Method (ASTM D 1556), Nuclear Methods (ASTM D 6938), or the Drive-Cylinder Method (ASTM D 2937). Moisture content testing shall be performed using the Direct Heating Method (ASTM D 4959) or Nuclear Methods (ASTM D 6938).

In the event that an in-place density and moisture content test fails, the area of waste placement shall be reworked, reconditioned, and retested until the minimum compaction requirement is met. Density test locations shall be documented on a referenced grid system. Waste placement testing records shall be maintained with the on-site operations records.

Laboratory testing shall be performed at a frequency of one Standard Proctor test (ASTM D 698) for every 50,000 cubic yards of gypsum or ash waste placed. Laboratory testing records shall be maintained with the on-site operations records.

Specific monitoring and in-place density testing is not required for wastes other than gypsum and fly ash.

2.1.8 Cover Requirements

2.1.8.1 Operational Cover—Asbestos Material

Asbestos waste material that has been deposited in the Marshall FGD Landfill will be covered within eight hours of placement with at least 6 inches of soil, ash, and/or gypsum material and compacted by a dozer.

2.1.8.2 Operational Cover—C&D Waste

When the C&D waste disposal area exceeds one-half acre, and at least weekly, the compacted C&D waste will be covered with a minimum of 6 inches of earthen material (i.e., soil, ash and/or gypsum material).

2.1.8.3 Operational Cover—Other Wastes

For wastes other than asbestos waste and C&D waste, operational cover consisting of soil, will be applied as needed for dust control and stormwater management. The operational cover may be applied at a thickness suited to its purpose. For example, the operational soil cover may be applied in thinner layers to provide dust control and it may be applied in thicker layers where protection from surface erosion is desired.
Refer to Appendix A—*Dust Control Plan* for dust control requirements.

2.1.8.4 Intermediate Cover

A 12-inch thick interim cover layer shall be placed on exterior slopes and areas where final grades have been reached. Interim cover will be seeded within 7 days in accordance with Erosion and Sediment Control requirements. Vegetation shall be removed and the interim cover soil shall be scarified or removed prior to placing any overlying waste.

For areas where waste placement will be inactive for 12 months or more, interim soil cover is not required, provided the Dust Control Plan included as Appendix I is followed.

2.1.8.5 Final Cover

The final cover system for the Marshall FGD Landfill will be completed within 180 days following the beginning of closure activities unless otherwise approved by the Division.

The final cover will consist of a compacted intermediate soil cover (on top of the waste), 40-mil textured linear low density polyethylene (LLDPE) geomembrane liner, a geocomposite drainage layer, and minimum 2 feet of vegetative cover soil. The vegetative layer will consist of on-site soil suitable for maintaining grass cover and controlling erosion. Surface water that percolates through the vegetative layer and 18-inch thick compacted soil layer will drain through the geocomposite drainage layer. The final cover will be vegetated with native grasses within six months following closure.

See *Closure/Post-Closure Plan* in Appendix B for final cover specifications and maintenance and operations requirements.

2.2 Leachate and Stormwater Management

A leachate collection system (LCS) is in place to drain the leachate within the active cell to the downgradient stormwater storage basin. A 12-inch thick layer of operational cover is over the geomembrane liner and leachate collection and removal system.

Leachate and stormwater are collected in the stormwater storage basin and routed to the Marshall Ash Basin, which discharges in accordance with the MSS plant's National Pollutant Discharge Elimination System (NPDES) permit.

2.3 Leachate Collection System (LCS)

The leachate collection system consists of a geonet/geotextile with a perforated collection/header piping system that drains to the stormwater storage basin. The slope on the geomembrane is positive to promote leachate transport from the collection system to the stormwater storage basin. The geonet is a polyethylene synthetic mesh that transmits leachate to the leachate collection pipe. The leachate collection header pipes drain directly to the stormwater storage basin where the stormwater riser pipe routes leachate and stormwater to the Marshall Ash Basin.

A series of three chimney drains with a header pipe are designed through the center of the landfill and are connected to the sump. The landfill grading will be sloped toward each chimney drain to facilitate drainage of contact storm water through the landfill. As each lift of waste is filled, a section of chimney drain will be added until final landfill grades are achieved. The chimney drain will have an inverted filter with No. 57 stone, No. 78M stone, and C-33 sand or bottom ash. The inverted filter will reduce the clogging potential of the chimney drain. The chimney drain design and details are presented in the Phasing Diagrams.

As waste placement proceeds, the leachate collection system will be modified as shown on the design drawings.

2.3.1 LCS Maintenance

The maintenance of the leachate management system's physical facilities (consisting of high-density polyethylene [HDPE] piping and the stormwater storage basin) and records will be performed by or under the direct supervision of Duke. Visual observations of proper LCS system performance will be made monthly by Duke staff.

Clean-out pipes are located on the LCS leachate lateral and header pipes. LCS pipes will be cleaned out by the use of a clean-out snake or high-pressure water flushing at least once a year, and the LCS piping will be remote-camera monitored if cleaning indicates a blockage in the leachate collection system pipes. The frequency of clean-out and camera inspections may be modified based on consecutive inspection results and observed operating conditions.

2.3.2 LCS Record Keeping and Sampling

Records will be maintained at MSS documenting the leachate line cleanout and camera monitoring.

Leachate from the LCS system is not sampled on a routine basis.

2.3.3 Contingency Plan

In the unlikely event that leachate cannot be drained to the active Marshall Ash Basin, leachate will be temporarily stored within the landfill until such time that draining operations to the active ash basin can be restored. In such an event, the Division shall be notified in writing, within 30 days, about the events and corrective actions taken.

2.4 Stormwater Collection and Conveyance

Non-contact stormwater runoff onto the landfill is prevented by diversion ditches around the landfill.

To improve operations, surface water should be diverted from the operational area. Excessive surface water at the working face creates difficulties for maneuvering equipment and prevents the operator from achieving maximum compaction of waste. To divert surface water runoff away from the working face, temporary diversion berms will be installed on the current lift, upslope of the working face and in other locations as dictated by the direction of grade. The area between the temporary berm and the working face should be limited to prevent excessive ponding. The soil cover in the areas beyond the diversion berms will be uniformly graded and compacted to prevent the formation of erosion channels. In the event that channels do form, the cover should be promptly repaired.

Stormwater collection and conveyance measures will be checked regularly and maintained such that necessary repairs can be made as early as practical.

2.4.1 Stormwater Discharge

The stormwater system at the landfill was designed to prevent the discharge of pollutants. Landfill operation shall not cause a discharge of pollutants into waters of the United States, including wetlands, that violates any requirement of the Clean Water Act, including, but not limited to NPDES requirements, pursuant to Section 402. In addition, under the requirements of Section 404 of the Clean Water Act, the discharge of dredged or fill material into waters of the state that would be in violation of the requirements shall not be allowed by landfill operations.

Operations at the landfill shall not cause the discharge of a non-point source of pollution to waters of the United States, including wetlands, that violates any requirement of an area-wide or statewide water quality management plan that has been approved under Section 208 or 319 of the Clean Water Act, as amended.

A jurisdictional wetland and stream are located to the west of the landfill. Maintenance of the stormwater system shall be performed to ensure these areas are not impacted by stormwater or sediment.

2.5 Stormwater Basin Maintenance Requirements

All stormwater features (i.e., diversion ditches, berms, riser, discharge pipe, etc.) associated with Cell 1 until final closure will be inspected and documented monthly for signs of damage, settlement, clogging, silt buildup, or washouts. If necessary, repairs to stormwater control features will be made as early as practical.

2.6 Groundwater Monitoring Well Access Requirements

Groundwater monitoring wells are located around the landfill perimeter. A readily accessible, unobstructed, path shall be maintained so that monitoring wells may be accessed using four-wheel drive vehicles. Care must be taken around the wells to prevent any damage to the wells.

2.7 Landfill Gas Management

Marshall FGD Landfill waste consists of gypsum and ash waste, clarifier sludge, asbestos, C&D, and coal mill reject wastes. The majority of the waste stream will consist of FGD gypsum and ash. The remaining small portion of the waste stream will consist of the other aforementioned waste products. Duke does not anticipate that methane or hydrogen sulfide gas will be generated or that odor will be an issue during operations.

Landfill gas monitoring is not required until the final cover is installed. A landfill gas venting system is provided as part of the engineered cover system.

3.0 Erosion and Sedimentation Control

Erosion and sedimentation control (E&SC) during operations consist of monitoring E&SC stormwater conveyance features and surface erosion.

3.1 E&SC Measures Monitoring and Maintenance

Adequate measures are to be practiced to prevent erosion in general accordance with E&SC measures included on Drawing No. MM6451.00-0005.001 (Cell 1 Final Configuration) and Drawing No. MM6451.01-0004.001 (Gypsum Landfill Erosion Control Details), both dated August 19, 2011.

Erosion control measures include:

- Disturbing as little area as practical at any one time for landfilling operations.
- Seeding/mulching of all disturbed areas commencing as soon as practically possible. Employing erosion netting or sod on steep slopes and other erosion prone areas.
- Use of earthen berms, hay bales, silt fences, riprap, or equivalent devices downgradient of disturbed areas, stockpiles, drainage pipe inlets and outlets, and at intervals along grassed waterways, until such time as permanent vegetation is established.
- Placement of riprap at the inlets and outlets of stormwater piping.

Prior to landfill closure, E&SC features will be checked monthly or at a minimum after every significant rainfall event. Sediment will be removed from structures to their original dimensions when conditions are warranted. Necessary repairs shall be made as soon as practical. Riprap-lined channel sections and outlet-protection aprons will be checked for washouts periodically. Riprap will be added to these areas as needed to maintain the integrity of the structure.

3.2 Surface Erosion Monitoring

Adequate erosion control measures shall be practiced to prevent silt from leaving the site. Channels will be inspected monthly or at a minimum after every significant rainfall event for sediment buildup.

Vegetative ground cover sufficient to control erosion must be provided within 15 working days or 90 calendar days upon completion of any phase of landfill development as per the North Carolina Erosion and Sedimentation Control Guidelines. Seedbed preparation, seeding, soil amendments, and mulching for the establishment of vegetative ground cover will be applied in accordance with North Carolina Erosion and Sedimentation Control Guidelines.

Slopes will be periodically checked for erosion and vegetative quality, fertilized, and mowed. A slope or portion thereof shall be identified as needing maintenance if it meets any one of the following conditions:

- Exposed waste on exterior slopes
- Areas of cracking, sliding, or sloughing
- Areas of seepage

Slopes identified as needing maintenance shall be repaired as soon as practical and as appropriate to correct deficiencies. Repair activities may include re-dressing the slope, filling in low areas, and/or seeding.

4.0 Vegetation Management

Within six months after final termination of disposal operations at the site, the area shall be stabilized with vegetation as required by design drawings and *Closure/Post-Closure Plan* (Appendix B). Temporary seeding will be applied as required.

Riprap, hay bales, or other acceptable temporary methods of erosion control may be required until permanent cover is established. Mulching, until a vegetative cover is established, can stabilize areas where final grade has been reached. Soil mulching can be achieved using wood chips, straw, hay, asphalt emulsion, jute matting, and synthetic fibers. Mulches allow for greater water retention; reduce the amount of runoff; retain seeds, fertilizer, and lime in place; and improve soil moisture and temperature conditions.

4.1 Temporary Seeding

Temporary seeding will be applied as follows (source: *NC Erosion and Sediment Control Planning and Design Manual* [June 2006, Revised March 2009]):

LATE WINTER TO EARLY SPRING

Seeds	Pounds Per Acre	Dates of Planting
Rye (grain)	120	January 1 to May 1
Annual lespedeza (kobe)	50	January 1 to May 1

Note: Omit lespedeza when duration of temporary cover is not to extend beyond June.

SUMMER

Seeds	Pounds Per Acre	Dates of Planting
German millet	40	May 1 to August 15

FALL

Seeds	Pounds Per Acre	Dates of Planting
Rye (grain)	50	August 15 to December 31

Soil Amendments	Pounds Per Acre
Agricultural limestone	2,000
Fertilizer (10-10-10)	1,000
Mulch	4,000

Note: Soil amendments are for all-season temporary seeding applications.

4.2 Permanent Seeding

Permanent seeding will be applied as follows (source: NC *Erosion and Sediment Control Planning and Design Manual* [June 2006, Revised March 2009]):

Seeds	Pounds Per Acre	Dates of Planting
Tall fescue	100	September 1 to April 15
Sericea lespedeza	15	September 1 to May 1
Kobe lespedeza	10	May 1 to September 1
Rye	40	August 15 to April 15

Soil Amendments	Pounds Per Acre
Agricultural limestone	4,000
Fertilizer (10-10-10)	1,000
Mulch	4,000

Note: Perform soil test to determine proper soil amendments; if not available, use the quantities above.

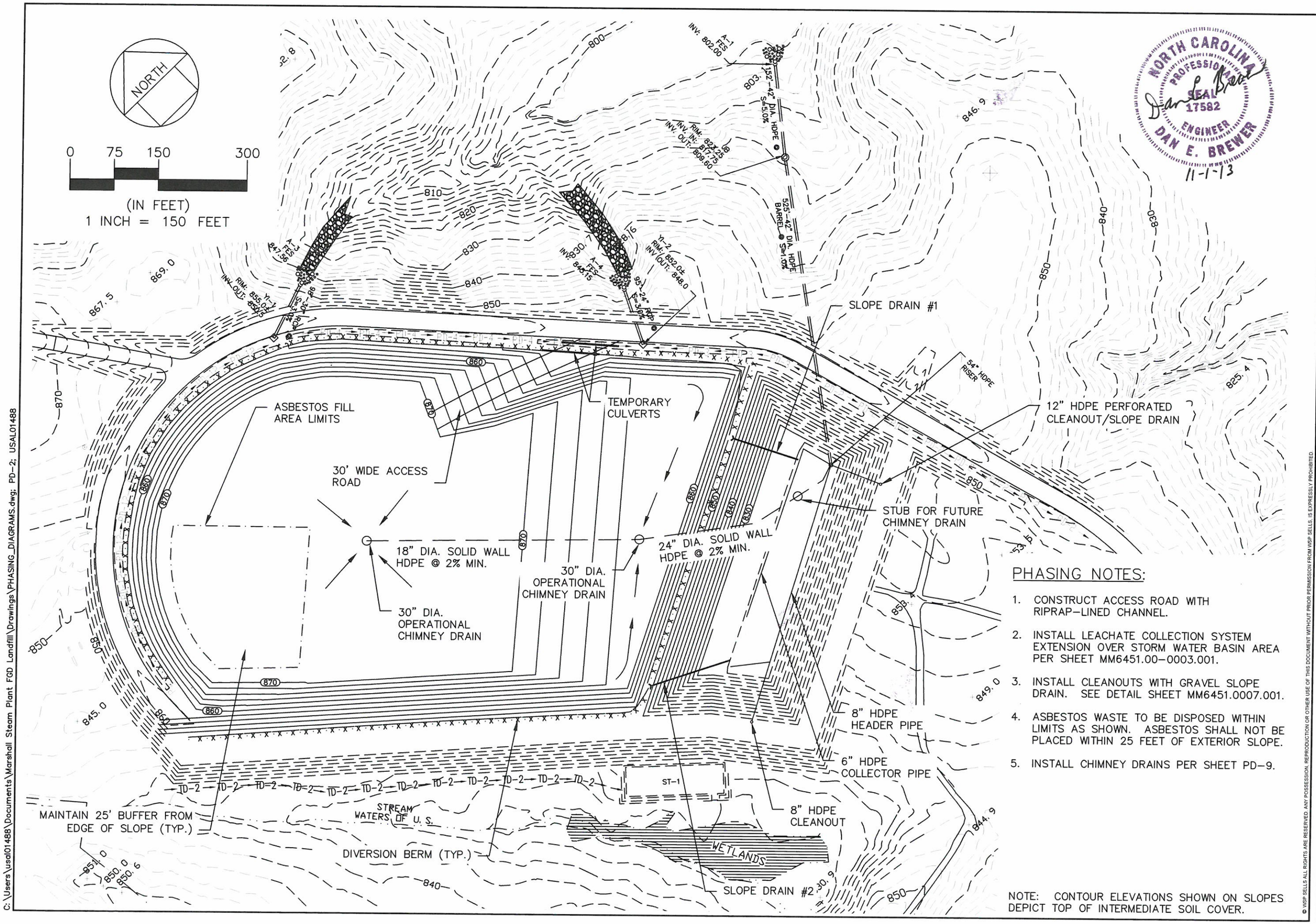
5.0 Landfill Closure

The Marshall FGD Landfill will be closed in accordance with the design drawings and *Closure/Post-Closure Plan* (Appendix B). The *Closure/Post-Closure Plan* outlines the sequence for closing the landfill and the post-closure maintenance activities. Closure is designed to minimize the need for long-term maintenance and to control the post-closure release of contaminants. Closure activities may be revised as appropriate for materials, specifications, technology advancements, or changes in regulations at the time the landfill is closed or in post-closure. In general, the landfill development is designed so that final cover can be established as soon as possible.

6.0 Required Regulatory Submittals

Submittal	Requirement	Reporting/Action Frequency
Groundwater Monitoring Reports	Maintain a record of all monitoring events and analytical data in accordance with the Groundwater Monitoring Plan. Reports of the analytical data for each water quality monitoring sampling event shall be submitted to DENR Division of Waste Management (DWM) in a timely manner.	Semiannually
Annual Tonnage Reports	Tons of waste received and disposed of in the landfill shall be reported to the DWM and to all counties from which waste was accepted on forms prescribed by the DWM. Refer to the Permit to Operate for annual reporting requirement information.	Annually Must submit no later than August 1 each year
10-Year Waste Management Plan	Per North Carolina G.S. 130A-309.09D (c): • A 10-year waste management plan shall be developed for this landfill and submitted to DWM. • The plan shall be updated and submitted to DWM at least every three years. • A report on the implementation of the plan is required to be submitted to DWM by August 1 of each year.	10-year plan prepared every 10 years 10-year plan updated every 3 years Implementation report annually

Figures



PHASING NOTES:

1. CONSTRUCT ACCESS ROAD WITH RIPRAP-LINED CHANNEL.
2. INSTALL LEACHATE COLLECTION SYSTEM EXTENSION OVER STORM WATER BASIN AREA PER SHEET MM6451.00-0003.001.
3. INSTALL CLEANOUTS WITH GRAVEL SLOPE DRAIN. SEE DETAIL SHEET MM6451.0007.001.
4. ASBESTOS WASTE TO BE DISPOSED WITHIN LIMITS AS SHOWN. ASBESTOS SHALL NOT BE PLACED WITHIN 25 FEET OF EXTERIOR SLOPE.
5. INSTALL CHIMNEY DRAINS PER SHEET PD-9.

NOTE: CONTOUR ELEVATIONS SHOWN ON SLOPES DEPICT TOP OF INTERMEDIATE SOIL COVER.

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CATAWBA COUNTY, NC PERMIT NO. 18-09

DUKE ENERGY CAROLINAS, LLC

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CHARLOTTE, NC, 28202

REVISIONS

10.30.13	ADDED CHIMNEY DRAINS
10.9.12	MOVED ACCESS ROAD
3.9.12	REVISED PER DUKE COMMENTS
2.29.12	REVISED ASBESTOS AREA
2.3.12	ADDED ASBESTOS AREA
8.19.11	UPDATED FOR CELL 1

PROJECT #: 10-6014 DATE: 8-12-11

DRAWN BY: JAC CHECKED BY: DEB

TITLE
PHASING PLAN

SHEET
PD-2

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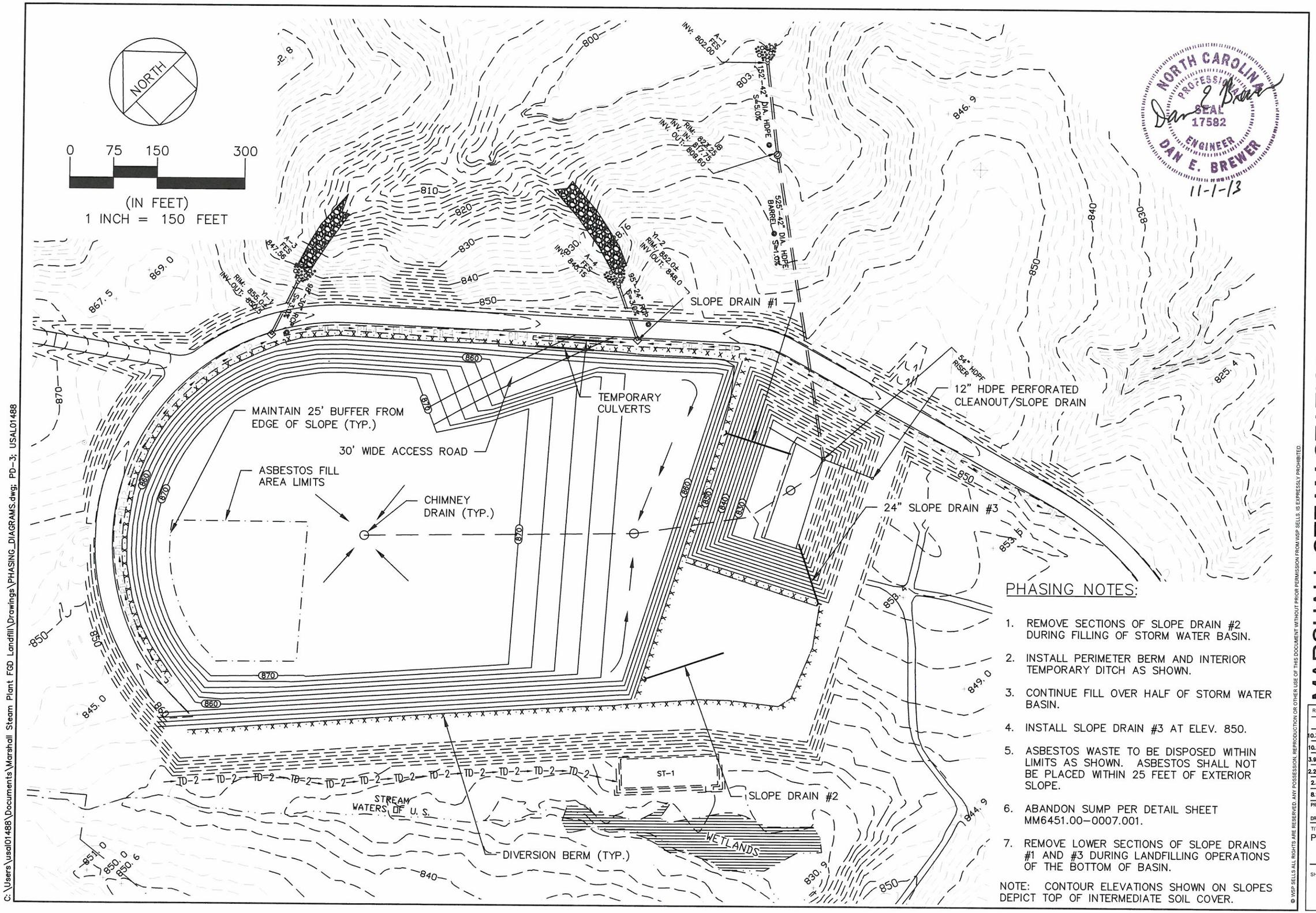

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PHASING NOTES:

1. REMOVE SECTIONS OF SLOPE DRAIN #2 DURING FILLING OF STORM WATER BASIN.
2. INSTALL PERIMETER BERM AND INTERIOR TEMPORARY DITCH AS SHOWN.
3. CONTINUE FILL OVER HALF OF STORM WATER BASIN.
4. INSTALL SLOPE DRAIN #3 AT ELEV. 850.
5. ASBESTOS WASTE TO BE DISPOSED WITHIN LIMITS AS SHOWN. ASBESTOS SHALL NOT BE PLACED WITHIN 25 FEET OF EXTERIOR SLOPE.
6. ABANDON SUMP PER DETAIL SHEET MM6451.00-0007.001.
7. REMOVE LOWER SECTIONS OF SLOPE DRAINS #1 AND #3 DURING LANDFILLING OPERATIONS OF THE BOTTOM OF BASIN.

NOTE: CONTOUR ELEVATIONS SHOWN ON SLOPES DEPICT TOP OF INTERMEDIATE SOIL COVER.

REVISIONS

10.30.13	ADDED CHIMNEY DRAINS
10.9.12	MOVED ACCESS ROAD
3.9.12	REVISED PER DUKE COMMENTS
2.29.12	REVISED ASBESTOS AREA
2.3.12	ADDED ASBESTOS AREA
8.19.11	UPDATED FOR CELL 1

PROJECT #: 10-6014 DATE: 8-12-11

DRAWN BY: JAC CHECKED BY: DEB

TITLE
PHASING PLAN

SHEET
PD-3

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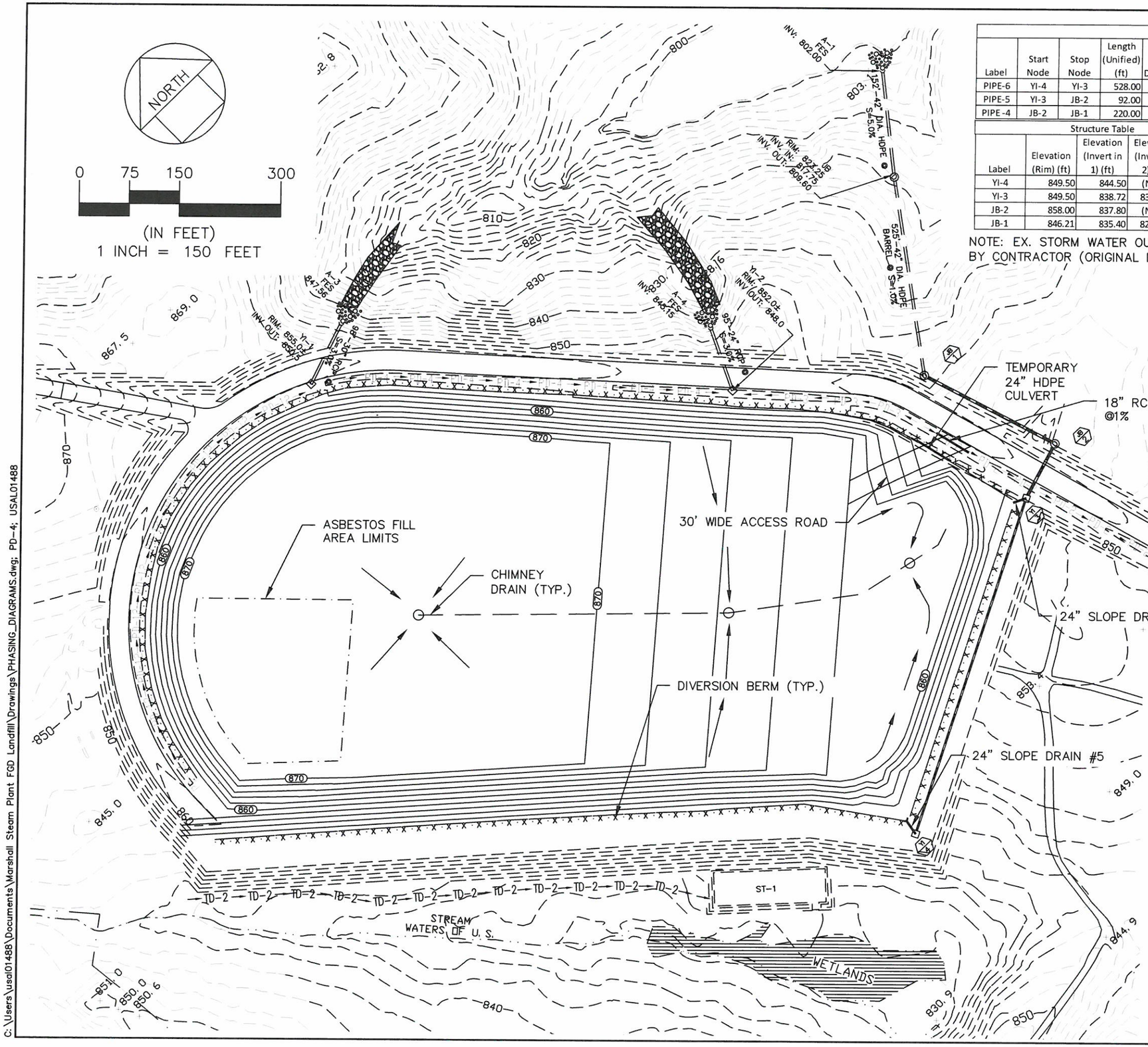

Pipe Table								
Label	Start Node	Stop Node	Length (Unified) (ft)	Diameter (in)	Invert (Upstream) (ft)	Invert (Downstream) (ft)	Slope (ft/ft)	Material
PIPE-6	YI-4	YI-3	528.00	30	844.50	839.22	0.010	HDPE
PIPE-5	YI-3	JB-2	92.00	42	838.72	837.80	0.010	HDPE
PIPE -4	JB-2	JB-1	220.00	42	837.60	835.40	0.010	HDPE

Structure Table				
Label	Elevation (Rim) (ft)	Elevation (Invert in 1) (ft)	Elevation (Invert in 2) (ft)	Elevation (Invert Out) (ft)
YI-4	849.50	844.50	(N/A)	844.50
YI-3	849.50	838.72	839.22	838.72
JB-2	858.00	837.80	(N/A)	837.60
JB-1	846.21	835.40	820.75	820.75

YI TO BE NCDOT 840.04
JB TO BE NCDOT 840.32

NOTE: EX. STORM WATER OUTFALL ELEVATIONS TO BE CONFIRMED BY CONTRACTOR (ORIGINAL DESIGN INFORMATION USED)

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PHASING NOTES:

1. REMOVE SLOPE DRAINS #2 AND #3.
2. EXTEND CHIMNEY DRAINS.
3. COMPLETE FILLING OF STORM WATER BASIN.
4. RELOCATE ACCESS ROAD TO NE CORNER.
5. AS GRADES APPROACH TOP OF PERIMETER BERM CONSTRUCT JB–1, JB–2, YI–3, AND YI–4 PER TABLE THIS SHEET.
6. CONSTRUCT DIVERSION BERM AND INTERIOR TEMPORARY DITCHES AROUND REMAINDER TOE OF SLOPE PER DETAIL SHEET MM6451.01–007.001.
7. INSTALL SLOPE DRAINS #4 AND #5 TO YI–3 AND YI–4 PER DETAIL SHEET MM6451.01–0001.001.
8. ASBESTOS WASTE TO BE DISPOSED WITHIN LIMITS AS SHOWN. ASBESTOS SHALL NOT BE PLACED WITHIN 25 FEET OF EXTERIOR SLOPE.

NOTE: CONTOUR ELEVATIONS SHOWN ON SLOPES DEPICT TOP OF INTERMEDIATE SOIL COVER.

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REVISIONS	
10.30.13	ADDED CHIMNEY DRAINS
10.9.12	MOVED ACCESS ROAD
3.9.12	REVISED PER DUKE COMMENTS
2.29.12	REVISED ASBESTOS AREA
2.3.12	ADDED ASBESTOS AREA
8.19.11	UPDATED FOR CELL 1

PROJECT #: 10-6014 DATE: 8-12-11
DRAWN BY: JAC CHECKED BY: DEB

TITLE
PHASING PLAN

SHEET
PD-4

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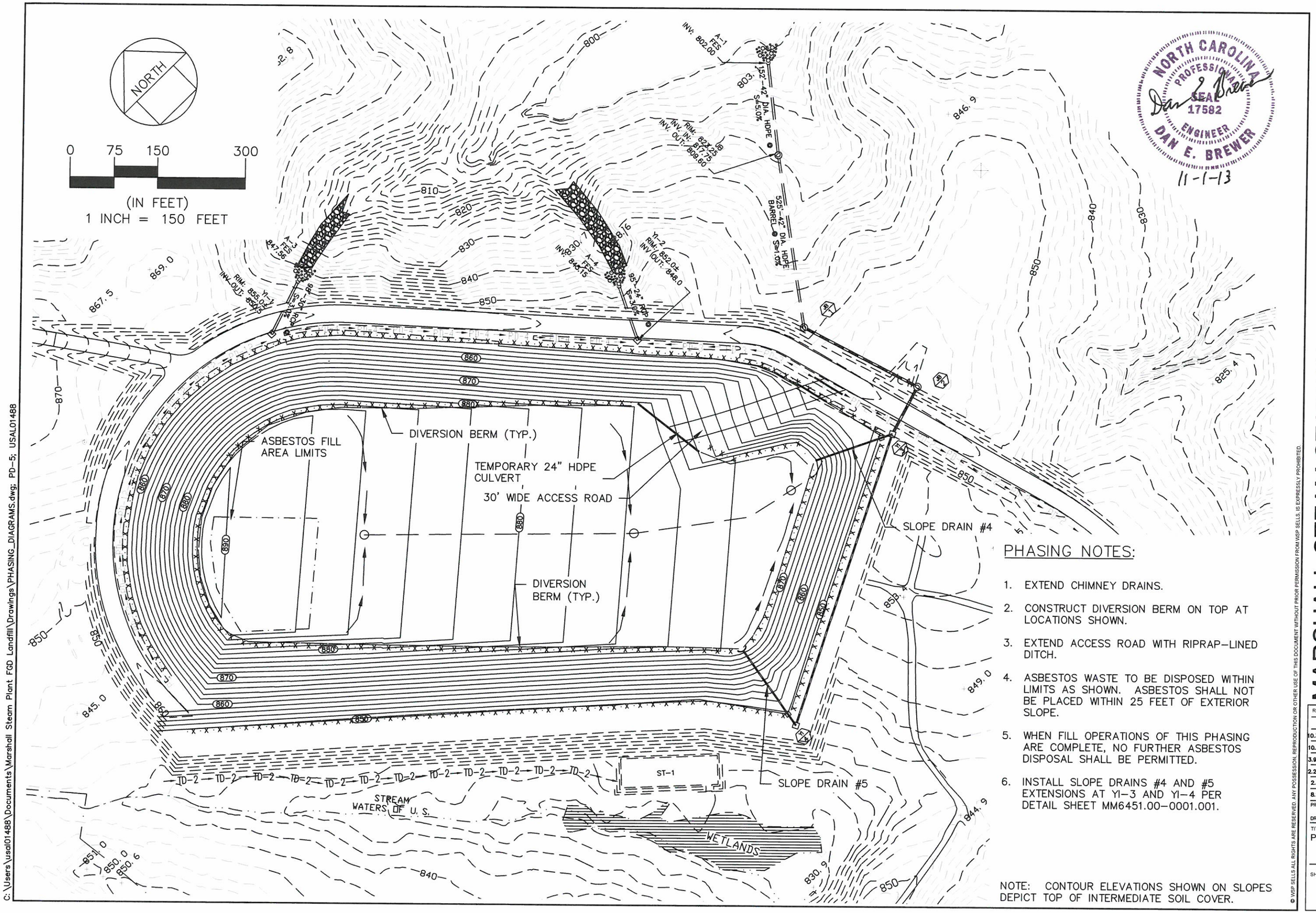

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PHASING NOTES:

1. EXTEND CHIMNEY DRAINS.
2. CONSTRUCT DIVERSION BERM ON TOP AT LOCATIONS SHOWN.
3. EXTEND ACCESS ROAD WITH RIPRAP-LINED DITCH.
4. ASBESTOS WASTE TO BE DISPOSED WITHIN LIMITS AS SHOWN. ASBESTOS SHALL NOT BE PLACED WITHIN 25 FEET OF EXTERIOR SLOPE.
5. WHEN FILL OPERATIONS OF THIS PHASING ARE COMPLETE, NO FURTHER ASBESTOS DISPOSAL SHALL BE PERMITTED.
6. INSTALL SLOPE DRAINS #4 AND #5 EXTENSIONS AT YI-3 AND YI-4 PER DETAIL SHEET MM6451.00-0001.001.

NOTE: CONTOUR ELEVATIONS SHOWN ON SLOPES DEPICT TOP OF INTERMEDIATE SOIL COVER.

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REVISIONS

10.30.13	ADDED CHIMNEY DRAINS
10.9.12	MOVED ACCESS ROAD
3.9.12	REVISED PER DUKE COMMENTS
2.29.12	REVISED ASBESTOS AREA
2.3.12	ADDED ASBESTOS AREA
8.19.11	UPDATED FOR CELL 1

PROJECT #: 10-6014 DATE: 8-12-11

DRAWN BY: JAC CHECKED BY: DEB

TITLE
PHASING PLAN

SHEET
PD-5

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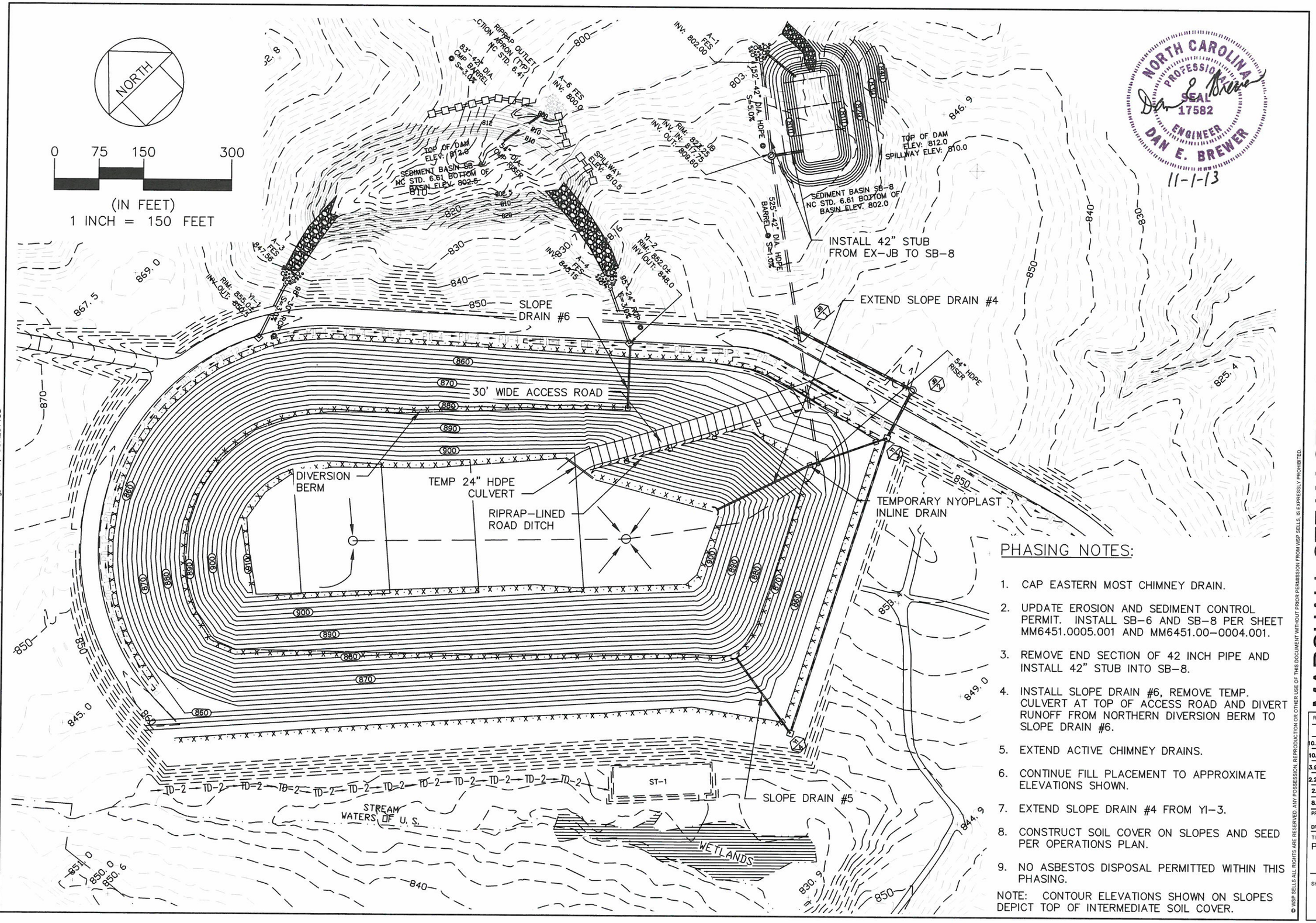

PHASING NOTES:

1. CAP EASTERN MOST CHIMNEY DRAIN.
2. UPDATE EROSION AND SEDIMENT CONTROL PERMIT. INSTALL SB-6 AND SB-8 PER SHEET MM6451.0005.001 AND MM6451.00-0004.001.
3. REMOVE END SECTION OF 42 INCH PIPE AND INSTALL 42" STUB INTO SB-8.
4. INSTALL SLOPE DRAIN #6, REMOVE TEMP. CULVERT AT TOP OF ACCESS ROAD AND DIVERT RUNOFF FROM NORTHERN DIVERSION BERM TO SLOPE DRAIN #6.
5. EXTEND ACTIVE CHIMNEY DRAINS.
6. CONTINUE FILL PLACEMENT TO APPROXIMATE ELEVATIONS SHOWN.
7. EXTEND SLOPE DRAIN #4 FROM Y1-3.
8. CONSTRUCT SOIL COVER ON SLOPES AND SEED PER OPERATIONS PLAN.
9. NO ASBESTOS DISPOSAL PERMITTED WITHIN THIS PHASING.

NOTE: CONTOUR ELEVATIONS SHOWN ON SLOPES DEPICT TOP OF INTERMEDIATE SOIL COVER.

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REVISIONS	
10.30.13	ADDED CHIMNEY DRAINS
10.9.12	MOVED ACCESS ROAD
3.9.12	REVISED PER DUKE COMMENTS
2.29.12	REVISED ASBESTOS AREA
2.3.12	ADDED ASBESTOS AREA
8.19.11	UPDATED FOR CELL 1

PROJECT #: 10-6014 DATE: 8-12-11
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TITLE
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SHEET
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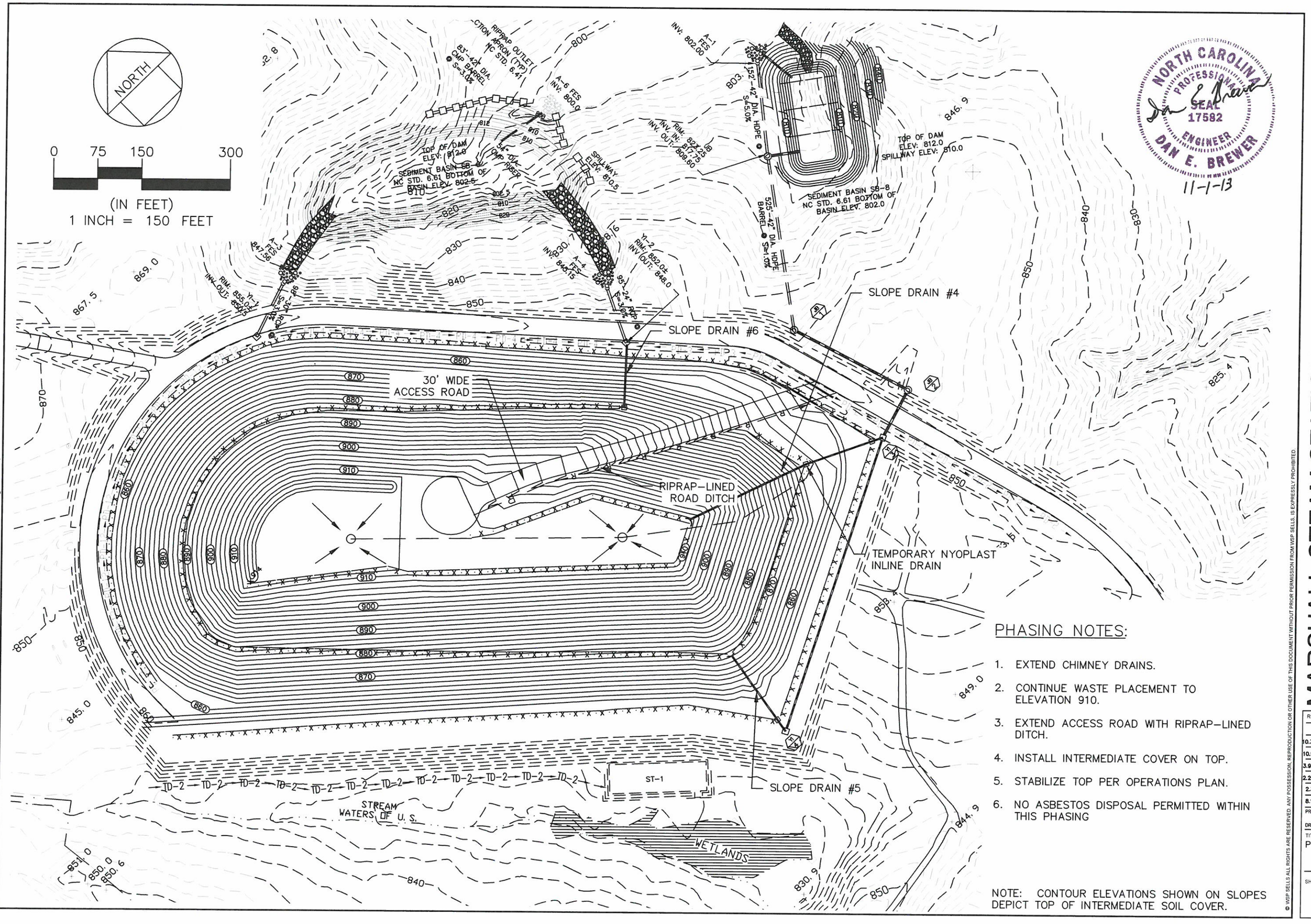

PHASING NOTES:

1. EXTEND CHIMNEY DRAINS.
2. CONTINUE WASTE PLACEMENT TO ELEVATION 910.
3. EXTEND ACCESS ROAD WITH RIPRAP-LINED DITCH.
4. INSTALL INTERMEDIATE COVER ON TOP.
5. STABILIZE TOP PER OPERATIONS PLAN.
6. NO ASBESTOS DISPOSAL PERMITTED WITHIN THIS PHASING

NOTE: CONTOUR ELEVATIONS SHOWN ON SLOPES DEPICT TOP OF INTERMEDIATE SOIL COVER.

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REVISIONS

10.30.13	ADDED CHIMNEY DRAINS
10.9.12	MOVED ACCESS ROAD
3.9.12	REVISED PER DUKE COMMENTS
2.29.12	REVISED ASBESTOS AREA
2.3.12	ADDED ASBESTOS AREA
8.19.11	UPDATED FOR CELL 1

PROJECT #: 10-6014 DATE: 8-12-11

DRAWN BY: JAC CHECKED BY: DEB

TITLE
PHASING PLAN

SHEET
PD-7

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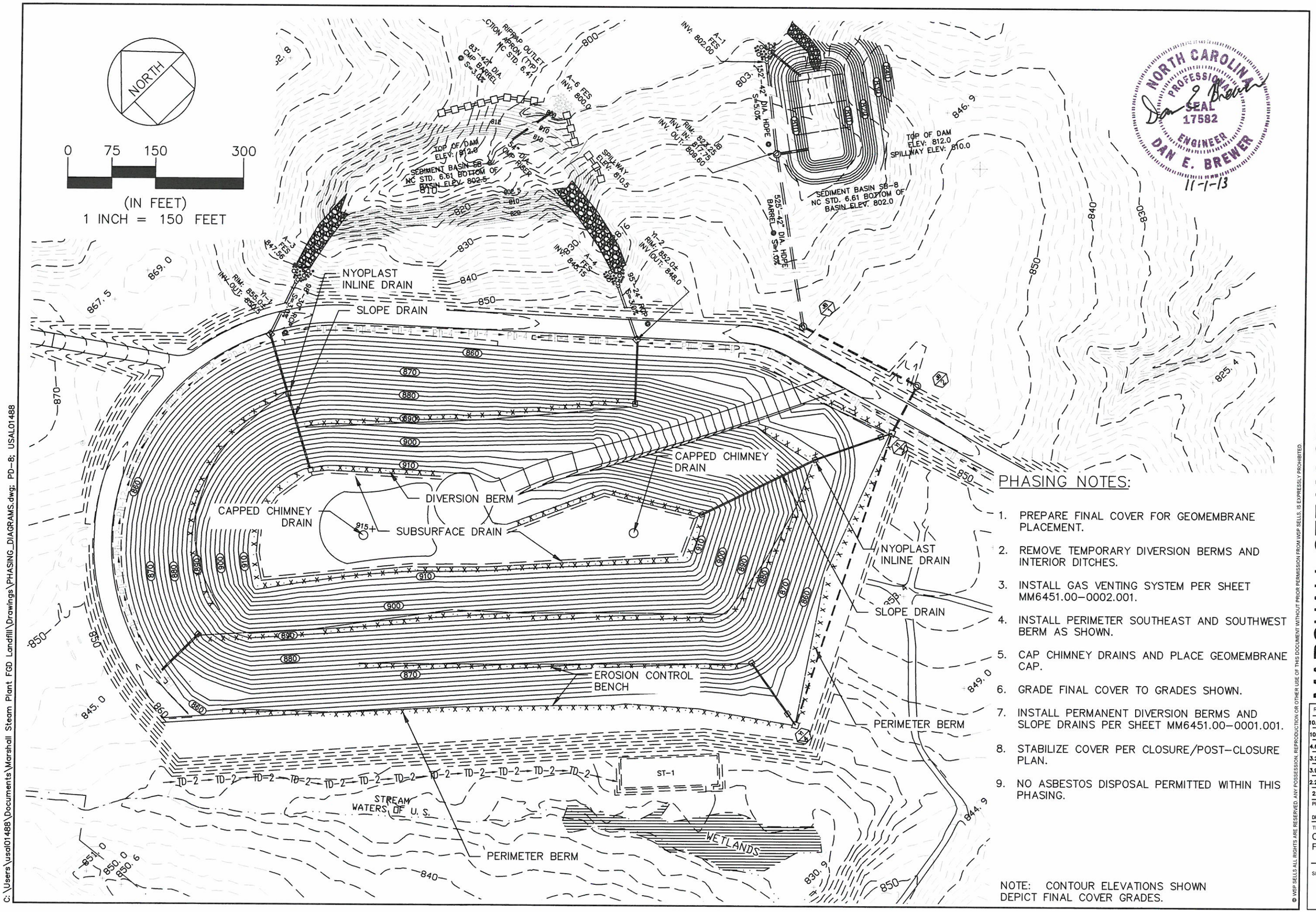

PHASING NOTES:

1. PREPARE FINAL COVER FOR GEOMEMBRANE PLACEMENT.
2. REMOVE TEMPORARY DIVERSION BERMS AND INTERIOR DITCHES.
3. INSTALL GAS VENTING SYSTEM PER SHEET MM6451.00–0002.001.
4. INSTALL PERIMETER SOUTHEAST AND SOUTHWEST BERM AS SHOWN.
5. CAP CHIMNEY DRAINS AND PLACE GEOMEMBRANE CAP.
6. GRADE FINAL COVER TO GRADES SHOWN.
7. INSTALL PERMANENT DIVERSION BERMS AND SLOPE DRAINS PER SHEET MM6451.00–0001.001.
8. STABILIZE COVER PER CLOSURE/POST–CLOSURE PLAN.
9. NO ASBESTOS DISPOSAL PERMITTED WITHIN THIS PHASING.

NOTE: CONTOUR ELEVATIONS SHOWN DEPICT FINAL COVER GRADES.

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REVISIONS	
10.30.13	ADDED CHIMNEY DRAINS
10.9.12	MOVED ACCESS ROAD
4.6.12	UPDATED PER DUKE COMMENTS
3.21.12	ADDED SLOPE DRAIN NW NEAR ACCESS ROAD
3.9.12	REVISED PER DUKE COMMENTS
2.29.12	REVISED ASBESTOS AREA
2.3.12	ADDED ASBESTOS AREA

PROJECT #: 10-6014 DATE: 8-12-11

DRAWN BY: JAC CHECKED BY: DEB

TITLE
CELL 1
FINAL CLOSURE

SHEET
PD-8

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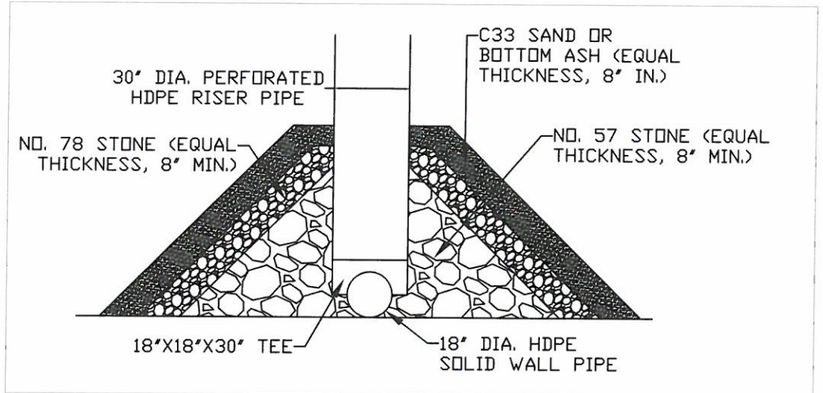
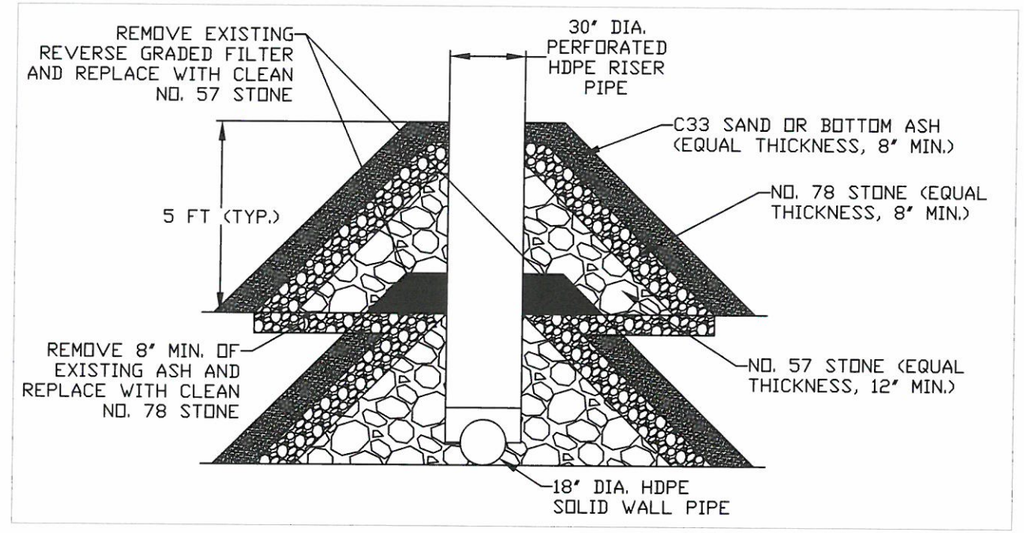


CHIMNEY DRAIN DETAIL – FIRST LIFT
NTS



CHIMNEY DRAIN DETAIL – REMAINING LIFTS
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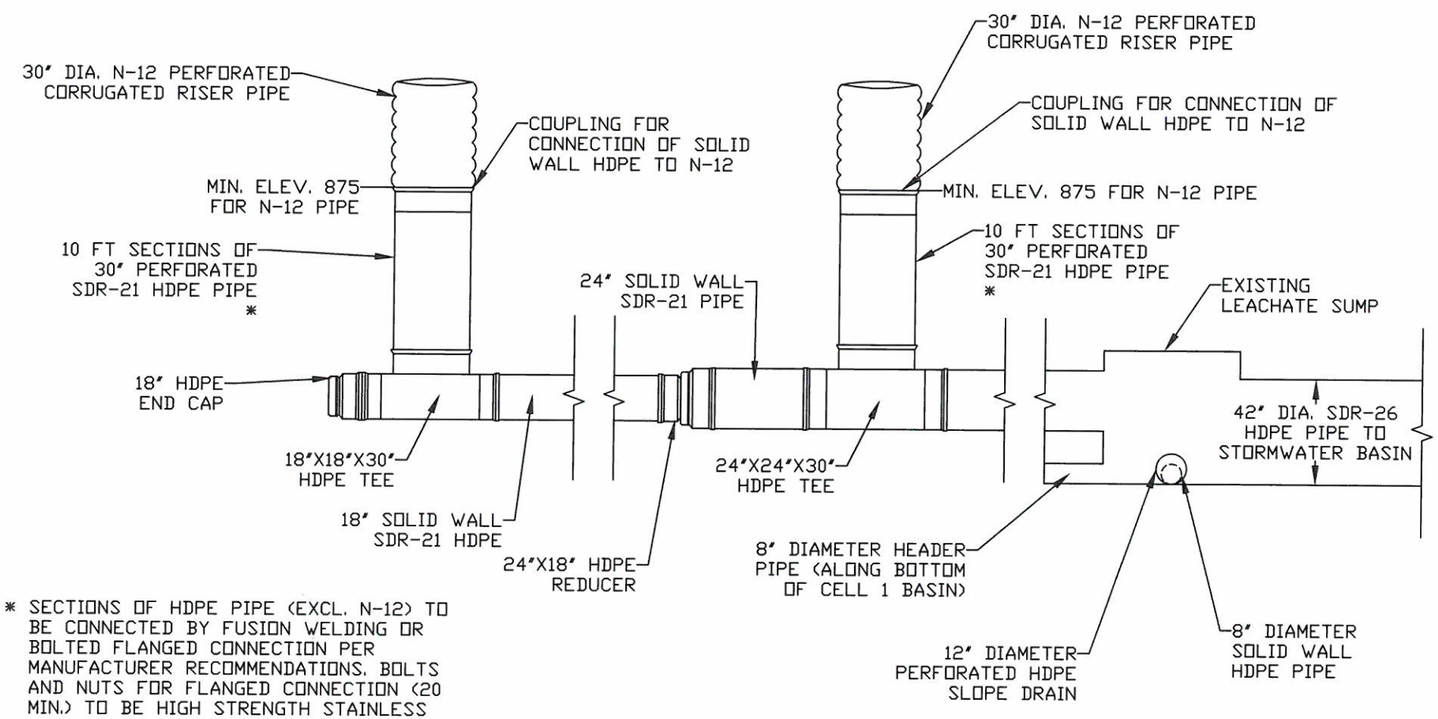

* SECTIONS OF HDPE PIPE (EXCL. N-12) TO BE CONNECTED BY FUSION WELDING OR BOLTED FLANGED CONNECTION PER MANUFACTURER RECOMMENDATIONS. BOLTS AND NUTS FOR FLANGED CONNECTION (20 MIN.) TO BE HIGH STRENGTH STAINLESS STEEL 1.25" DIA. BOLTS AND NUTS.

CHIMNEY DRAIN CONNECTIONS DETAIL
NTS

NOTE: IF FLANGED CONNECTIONS ARE TO BE USED, PIPE SECTIONS MUST BE SUPPLIED WITH HDPE FLANGE PRE-WELDED TO PIPE ENDS.

NORTH CAROLINA PROFESSIONAL SEAL 17582 ENGINEER DAN E. BREWER
11-1-13

WSP
128 Talbert Road
Suite A
Mooresville, NC 28117
(704) 662-0100
www.wspgroup.com/usa

MARSHALL STEAM STATION FGD RESIDUE LANDFILL

CATAWBA COUNTY, NC PERMIT NO. 18-09

DUKE ENERGY CAROLINAS, LLC
526 SOUTH CHURCH STREET
CHARLOTTE, NC 28202

REVISIONS

10.30.13	ADDED CHIMNEY DRAIN DETAILS	

PROJECT #: 10-6014 DATE: 10-30-13

DRAWN BY: ALL CHECKED BY: DEB

TITLE
CHIMNEY DRAIN DETAILS

SHEET
PD-9

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Tables

Table 1
15A NCAC 13B .0505 Operational Requirement Cross-Reference Table

15A NCAC 13B .0505 – Operational Requirements for Sanitary Landfills	Section Reference in Landfill Operations Plan
1. Plan and Permit Requirements	
a. Construction plans shall be approved and followed	Original Permit to Construct issued April 12, 2006. Attachment 1 – Permit to Operate: Phase 1, Cell issued November 21, 2006
b. Specified monitoring and reporting requirements shall be met.	1.8 – Record Keeping 2.6 – Groundwater Monitoring Well Access Requirements 3.1 – E&SC Measures Monitoring and Maintenance 3.2 – Surface Erosion Monitoring
2. Spreading and Compacting Requirements	
a. Solid waste shall be restricted into the smallest area feasible.	2.1.6 – Waste Placement
b. Solid waste shall be compacted as densely as practical into cells.	2.1.7 – Compaction Requirements
3. Cover Requirements	
a. Solid waste shall be covered after each day of operation, with a compacted layer of at least six inches of suitable cover or as specified by the Division.	2.1.8.1 – Operational Cover – Asbestos-Containing Material 2.1.8.2 – Operational Cover – C&D Waste 2.1.8.3 - Operational Cover – Other Wastes
b. Areas which will not have additional wastes placed on them for 12 months or more, but where final termination of disposal operations has not occurred, shall be covered with a minimum of one foot of intermediate cover.	2.1.8.4 – Intermediate Cover
c. After final termination of disposal operations at the site or a major part thereof, or upon revocation of a permit, the area shall be covered with at least two feet of suitable compacted earth.	2.1.8.5 – Final Cover
4. Erosion Control Requirements	
a. Adequate erosion control measures shall be practiced to prevent silt from leaving the site.	3.2 – Surface Erosion Monitoring
b. Adequate erosion control measures shall be practiced to prevent excessive on-site erosion.	3.2 – E&SC Measures Monitoring and Maintenance
5. Drainage Control Requirements	
a. Surface water shall be diverted from the operational area.	2.4 – Storm Water Collection and Conveyance
b. Surface water shall not be impounded over or in waste.	2.4 – Storm Water Collection and Conveyance
c. Completed areas shall be adequately sloped to allow surface water runoff in a controlled manner.	2.4 – Storm Water Collection and Conveyance

Table 1
15A NCAC 13B .0505 Operational Requirement Cross-Reference Table

15A NCAC 13B .0505 – Operational Requirements for Sanitary Landfills	Section Reference in Landfill Operations Plan
6. Vegetation Requirements	
a. Within six months after final termination of disposal operations at the site or a major part thereof or upon revocation of a permit, the area shall be stabilized with native grasses.	2.1.8.5 – Final Cover 4.0 – Vegetation Management
b. Temporary seeding will be utilized as necessary to stabilize the site.	4.1 – Temporary Seeding
7. Water Protection Requirements	
a. The separation distance of four feet between waste and water table shall be maintained unless otherwise specified by the Division in the permit.	NA – separation from water table addressed during construction phase.
b. Solid waste shall not be disposed of in water.	2.4 – Storm Water Collection and Conveyance
c. Leachate shall be contained on site or properly treated prior to discharge. An NPDES permit may be required prior to the discharge of leachate to surface waters.	2.2 – Leachate and Stormwater Management 2.2- Leachate Collection System (LCS)
8. Access and Security Requirements	
a. The site shall be adequately secured by means of gates, chains, berms, fences, and other security measures approved by the Division, to prevent unauthorized entry.	1.4 – Access and Security Requirements
b. An attendant shall be on duty at the site at all times while it is open for public use to ensure compliance with operational requirements.	1.4 – Access and Security Requirements
c. The access road to the site shall be of all-weather construction and maintained in good condition.	1.4 – Access and Security Requirements
d. Dust control measures shall be implemented where necessary.	2.1.3 – Dust, Litter, Odor and Vector Control
9. Sign Requirements	
a. Signs providing information on dumping procedures, the hours during which the site is open for public use, the permit number and other pertinent information shall be posted at the site entrance.	1.6 – Signs
b. Signs shall be posted stating that no hazards or liquid waste can be received without written permission from the Division.	1.6 – Signs
c. Traffic signs or markers shall be provided as necessary to promote an orderly traffic pattern and from the discharge area and to maintain efficient operation conditions.	1.6 – Signs

Table 1
15A NCAC 13B .0505 Operational Requirement Cross-Reference Table

15A NCAC 13B .0505 – Operational Requirements for Sanitary Landfills	Section Reference in Landfill Operations Plan
10. Safety Requirements	
a. Open burning of solid waste is prohibited.	2.1.4 – Fire Control
b. Equipment shall be provided to control accidental fires or arrangements shall be made with the local fire protection agency to immediately provide fire-fighting services when needed.	2.1.4 – Fire Control
c. Fires that occur at a sanitary landfill shall be reported to the Division within 24 hours and a written notification shall be submitted within 15 days.	2.1.4 – Fire Control
d. The removal of solid waste from a sanitary landfill is prohibited unless the owner/operator approves and the removal is not performed on the working face.	2.1.2 – Waste Acceptance, Disposal and Screening Requirements
e. Barrels and drums shall not be disposed of unless they are empty and perforated sufficiently to ensure that no liquid or hazardous waste is contained therein.	2.1.2 – Waste Acceptance, Disposal and Screening Requirements
11. Waste Acceptance and Disposal Requirements	
a. A site shall only accept those solid wastes which it is permitted to receive. The landfill operator shall notify the Division within 24 hours of attempted disposal of any waste the landfill is not permitted to receive, including waste from outside the area the landfill is permitted to serve.	2.1.2 – Waste Acceptance, Disposal and Screening Requirements
b. No hazardous or liquid waste shall be accepted or disposed of in a sanitary landfill.	2.1.2 – Waste Acceptance, Disposal and Screening Requirements
c. Spoiled foods, animal carcasses, abattoir waste, hatchery waste, and other animal waste delivered to the disposal site shall be covered immediately.	2.1.2 – Waste Acceptance, Disposal and Screening Requirements
d. Asbestos waste that is packaged in accordance with 40 CFR 61, which is adopted by reference in accordance with G.S. 150B-14(c), may be disposed of separate and apart from other solid wastes at the bottom of the working face or in an area not contiguous with other disposal areas, in either case, in virgin soil. Separate areas shall be clearly marked so that asbestos is not exposed by future land-disturbing activities. The waste shall be covered immediately with soil in a manner that will not cause airborne conditions. Copies of 40 CFR 61 may be obtained and inspected at the Division.	2.1.2 – Waste Acceptance, Disposal and Screening Requirements 2.1.6.4 – Asbestos (Waste Placement)
e. Wastewater treatment sludges may only be used as a soil conditioner and incorporated into the final two feet of cover. Sludges shall be examined for acceptance by Waste Determination procedures in Rule .0103(e) of this Subchapter.	2.1.6.3 – Clarifier Sludge
12. Miscellaneous Requirements	
a. Effectiveness vector control measures shall be applied to control flies, rodents, and other insects or vermin when necessary.	2.1.3 – Dust, Litter, Oder and Vector Control
b. Appropriate methods such as fencing and diking shall be provided within the area to confine solid waste subject to be blown by the wind. At the conclusion of each day of operation, all windblown material resulting from the operation shall be collected and returned to the area by the owner or operator.	1.4 – Access and Security Requirements

Table 2
List of Design Drawings

Duke Drawing #	Title
M-6024-02.00	Cell 1 Excavation
M-6024.03.00	Cell 1 Profile and Sections
M-6024.04.00	Cell 1 Perimeter Road Realignment
M-6024-08.00	Cell 1 and Cell 2 Perimeter Road Sections
M-6024-09.00	Cell 1 and Cell 2 Perimeter Road Profile
MM6451.00-0002.001*	Gas Venting System Plan
MM6451.01-0001.001	Cell 1 Erosion and Sediment Control Plan
MM6451.01-0002.001	Cell 2 Erosion and Sediment Control Plan
MM6451.01-0003.001	Final Closure Erosion and Sediment Control Plan
MM6451.01-0004.001*	Gypsum Landfill Erosion Control Details
MM6451.00-0001.001*	Final Closure Details
MM6451.00-0003.001*	Cell 1 Leachate Collection and Removal System
MM6451.00-0004.001	Cell 1 Operational Cover Grading Plan
MM6451.00-0005.001*	Cell 1 Final Configuration
MM6451.00-0006.001	Cell 1 Stormwater Basin
MM6451.00-0007.001**	Cell 1 and Cell 2 Details
MM6451.00-0008.001	Cell 1 and Cell 2 Leachate Collection and Removal System
MM6451.00-0009.001	Cell 2 Landfill Excavation
MM6451.00-0010.001	Cell 2 Leachate Collection and Removal System
MM6451.00-0011.001	Cell 2 Operational Cover Grading Plan
MM6451.00-0012.001	Cell 2 Stormwater Basin
MM6451.00-0012.001	Cell 1 Cell 2 Final Configuration
MM6451.00-0014.001	Cell 1 and Cell 2 Sections

Notes:

1. Unless otherwise noted, the design drawing is from the *Construction Plan Application* dated December 15, 2005.
2. *indicates design drawing revised August 19, 2011 and April 6, 2012.
3. **indicates sump closure detail revised November 1, 2013.

Appendices

APPENDIX A

DUST CONTROL PLAN

Dust Control Plan

Duke Energy Carolinas, LLC—Marshall Steam Station
Flue Gas Desulfurization (FGD) Residue Landfill Phase 1, Cell 1
Catawba County, North Carolina

Permit No. 1809

April 10, 2012
Revision 1

Prepared for:
Duke Energy Carolinas, LLC
526 South Church Street
Charlotte, North Carolina 28202

Prepared by:
Altamont Environmental, Inc.
231 Haywood Street
Asheville, North Carolina 28801

Description of Revisions

The following table provides a brief description of the revisions to the Dust Control Plan.

The *Operations Plan* was originally submitted to the North Carolina Department of Environment and Natural Resources (DENR) on August 19, 2011. Comments from DENR on the submittal were provided in a *Completeness Determination and Technical Review* letter from Mr. Larry Frost, DENR, to Mr. Ed Sullivan, P.E., Duke Energy Carolinas, LLC, dated September 27, 2011 (see Attachment C).

Revision	*Date of Document*	*Description of Revision*
Initial Issue	August 19, 2011	Initial issuance of document.
Revision 1	April 10, 2012	The following revisions were performed to respond to the Permit to Operate *Completeness Determination and Technical Review* performed by DENR and to provide consistent requirements for Operational and Intermediate Cover between this landfill and the Marshall Steam Station Industrial Landfill No. 1, Permit No. 1812 (MSS ILF#1). Editorial changes are not noted. *Appendix A Dust Control Plan* • Section 1.0—Deleted acreage of landfill footprint. • Section 2.0—Revised section to delete reference to thickness of soil cover. • Section 4.0—Revised cover requirements for asbestos per DENR comments.

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2.0 Dust Control Methods 2
3.0 Monitoring and Corrective Action Response 4
3.1 Monitoring 4
3.2 Corrective Action 4
4.0 Regulated Cover Requirements 5

Figure

1. Landfill Operations Grid

Appendices

A. Monitoring Worksheet

1.0 Introduction and Site Description

This Dust Control Plan is for the Marshall Steam Station (Marshall) Flue Gas Desulfurization (FGD) Residue Landfill (Marshall FGD Landfill). This Plan provides dust control methods for managing dust emissions at the Marshall FGD landfill in addition to a monitoring program and corrective action response to contain coal combustion products (CCPs) to prevent dust nuisances to employees and the public. The monitoring program will aid Duke and the landfill operator in evaluating the dust control methods, or combination of dust control methods, that prove effective with site-specific conditions.

The Marshall FGD landfill, Phase 1, Cell 1 is used primarily for CCP management. CCPs managed by the landfill primarily consist of FGD residue (i.e., gypsum, clarifier sludge), fly ash, bottom ash, and mill rejects. The landfill is also used for asbestos and construction and demolition debris (C&D) waste management.

This Plan is Appendix A to the *Operations Plan* for the Marshall FGD landfill.

2.0 Dust Control Methods

The primary potential source of dust emissions in the landfill is the active area of waste placement. These areas are at a higher risk for producing dust due to vehicular and equipment traffic and earthwork construction. Exterior landfill slopes are less of a dust control concern as they have operational and intermediate soil covers, which are vegetated as required in the *Operations Plan*. Operational and intermediate soil covers are defined in the *Operations Plan*.

Dust emissions from the landfill can be controlled through a variety of dust control methods. Possible dust control methods are identified herein. Dust control methods may be characterized as products and/or applications, structural wind breaks and/or covers, and operational methods.

Dust control methods for the landfill area include, but are not limited to:

- Watering
- Establishing vegetative cover
- Mulching
- Structural controls consisting of:
  - Wind breaks (i.e., fencing and/or berms)
  - Temporary coverings (i.e., tarps)
- Spray-applied dust suppressants consisting of, and not limited to:
  - Anionic asphalt emulsion
  - Latex emulsion
  - Resin in water
  - Polymer-based emulsion
  - Mineral mortar coatings (i.e., posi-shell)
- Calcium chloride
- Soil stabilizers (i.e., soil cements)
- Operational soil cover
- Modifying the active working area
- Modifying operations during dry and windy conditions

The operator may use, and is not limited to, combinations of these dust control methods or any method that is technically sound and environmentally acceptable to control dust for the specific site conditions. If the operator intends to use a dust control method not presented above, the proposed dust control method will be evaluated by Duke on a case-by-case basis to assess the effectiveness with specific site conditions. For the purposes of this Plan, operational soil cover will be defined as soil material applied at a suitable thickness to provide dust control. The effectiveness of the dust control methods implemented should be evaluated through a dust monitoring program outlined in Section 3.0.

Operational equipment generally consists of dump trucks, vibratory smooth drum roller, bulldozer, water truck, spray trailer, track hoe, and service truck. Operational equipment will be used to construct, install, apply, and/or repair dust control methods. The operator will make provisions to alleviate any on-site issues that arise when primary equipment is being maintained or is inoperable. Marshall contains multiple landfill

facilities, and the landfill operator will make provisions to have the necessary equipment to control multiple fugitive CCP dusting emission events.

3.0 Monitoring and Corrective Action Response

This section describes a dust monitoring program and suggests corrective action responses in case fugitive emissions are observed.

3.1 Monitoring

During landfill operations, a dust monitoring program will be implemented to evaluate the dust control measure performance and observe the areas for dust emissions. The dust monitoring program consists of performing visual observations of dust-prone areas, implementing dust-control measures, and monitoring existing and forecasted weather conditions.

Dust emissions can occur under many conditions. For the purposes of this Plan, dust emissions are characterized as fugitive emissions, where CCP dust is located outside the limit of landfill waste. This is most likely to occur during windy, dry, and hot weather conditions. Therefore, the operator will monitor both existing and forecasted weather conditions and use dust-control measures suited to the weather conditions. The dust-control measures shall be implemented prior to the forecasted weather conditions.

Equipment operators shall continuously observe the active face and other areas within the landfill limit for dust emissions. In addition, preventive dust-control measures should be observed and documented at least twice daily (morning and afternoon) when the landfill is in operation, to evaluate the dust control measure performance. Additional observations may be necessary as site and weather conditions dictate. Observations will be documented using the attached "Monitoring Worksheet," or online database/worksheet, etc. To minimize continual maintenance of moisture-conditioned and spray-applied areas, the operator shall pay particular attention to these areas. Structural controls shall be observed to monitor the performance of the controls. Observations in the landfill area may be made with reference to the grid system shown in the attached Figure 1.

Monitoring will be conducted during times when the landfill is in operation. The operator shall continue to provide necessary dust-control measures during periods when operations are inactive (i.e., outages, weekends, and holidays). Operators are to establish appropriate measures so that dust emissions are not reasonably likely to occur during inactive operations periods when monitoring is not being conducted.

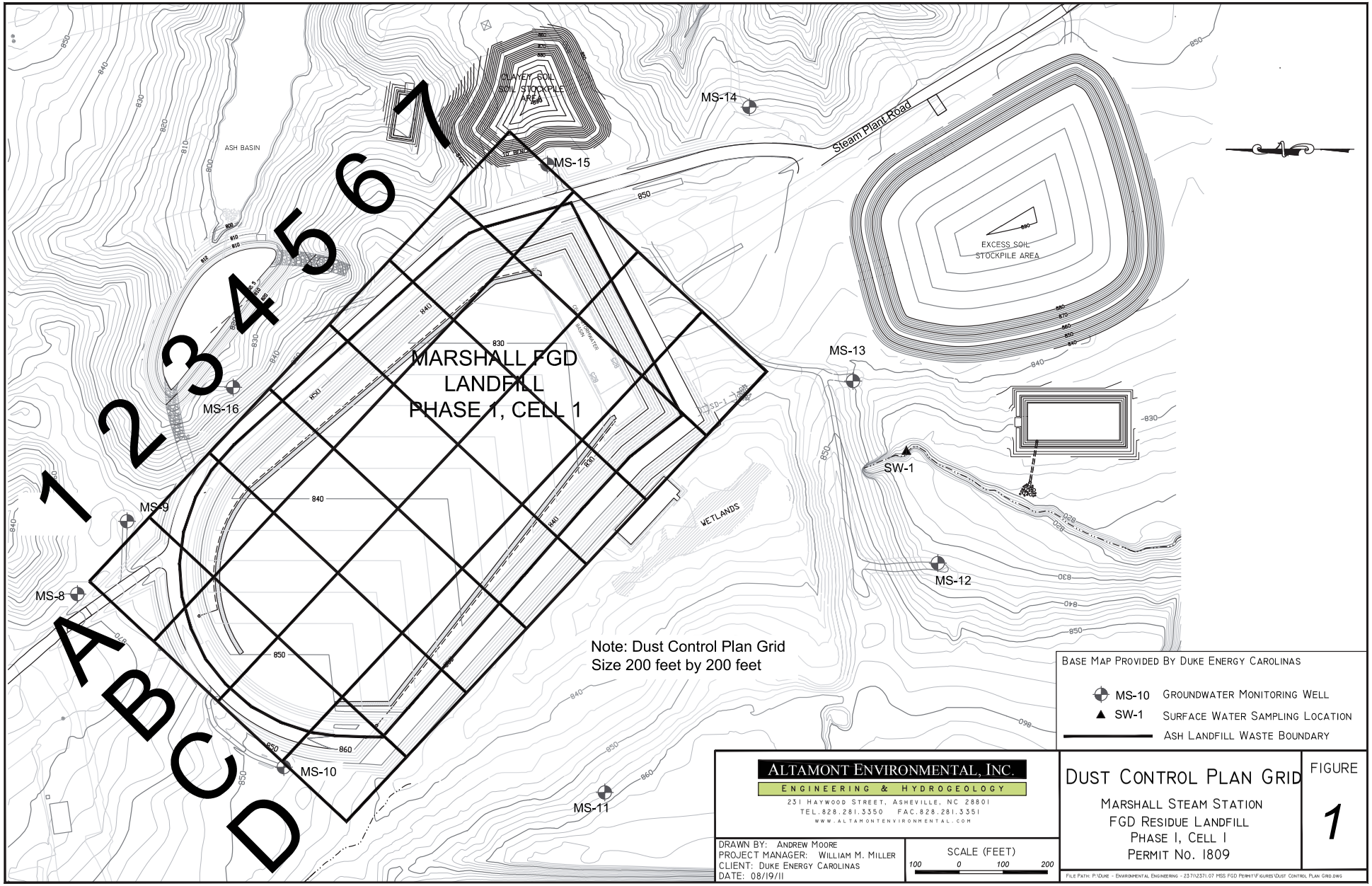
3.2 Corrective Action

If fugitive dust emissions are observed and observations indicate dust-control measures are not achieving their intended purpose, then appropriate corrective actions will be taken. Dust-control measures should be reapplied, repaired, or added, as necessary, to control dust emissions. The operator will construct, install, apply, and/or repair dust-control measures prior to the end of the work day to control dust emissions during non-operating hours. The operator will implement dust-control measures as preventive controls rather than in response to fugitive dust emissions.

4.0 Regulated Cover Requirements

The Marshall FGD landfill is permitted to accept non-CCP wastes including asbestos-containing material and C&D waste. Asbestos-containing material and C&D waste shall be placed in accordance with the approved *Operations Plan* and regulated cover requirements. In accordance with Solid Waste Rules Section 15A NCAC 13B.0505 (11)(d), asbestos material shall be covered within eight hours of placement. The material will be covered with 6 inches of soil, ash, and/or gypsum material and compacted by a dozer.

C&D waste shall be covered with 6 inches of earthen material (i.e., soil, ash, and/or gypsum material) whenever the disposal area exceeds one-half acre and at least once weekly.


MARSHALL FGD
LANDFILL
PHASE 1, CELL 1
1 2 3 4 5 6 7
A B C D
MS-8
MS-9
MS-10
MS-11
MS-12
MS-13
MS-14
MS-15
MS-16
SW-1
ASH BASIN
Steam Plant Road
EXCESS SOIL
STOCKPILE AREA
WETLANDS
Note: Dust Control Plan Grid
Size 200 feet by 200 feet
BASE MAP PROVIDED BY DUKE ENERGY CAROLINAS
MS-10 GROUNDWATER MONITORING WELL
SW-1 SURFACE WATER SAMPLING LOCATION
ASH LANDFILL WASTE BOUNDARY
ALTAMONT ENVIRONMENTAL, INC.
ENGINEERING & HYDROGEOLOGY
231 HAYWOOD STREET, ASHEVILLE, NC 28801
TEL.828.281.3550 FAX.828.281.3351
WWW.ALTAMONTENVIRONMENTAL.COM
DRAWN BY: ANDREW MOORE
PROJECT MANAGER: WILLIAM M. MILLER
CLIENT: DUKE ENERGY CAROLINAS
DATE: 08/19/11
SCALE (FEET)
100 0 100 200
DUST CONTROL PLAN GRID
MARSHALL STEAM STATION
FGD RESIDUE LANDFILL
PHASE I, CELL I
PERMIT NO. 1809
FIGURE
1

APPENDIX 1
DUST CONTROL PLAN MONITORING WORKSHEET

Marshall FGD Landfill
Permit No. 1809-INDUS

Dust Control Plan -
Monitoring Worksheet

Marshall Steam Station
Terrell North Carolina

Week:

Date/Time	Dust Control Method in Use	Effective at Controlling:		Observation Location	Preventative or Corrective Action Taken Yes/No	Observations/comments including: weather conditions, wind speeds, precipitation, forecast, preventative or corrective actions taken (if needed), additional operational notes	Name of Observer
		Dust? Yes/No	Erosion? Yes/No				

APPENDIX B

CLOSURE/POST CLOSURE PLAN

CLOSURE/POST CLOSURE PLAN

DUKE ENERGY

MARSHALL STEAM STATION

FLUE GAS DESULFURIZATION (FGD) GYPSUM LANDFILL, PHASE 1

CATAWBA COUNTY, NC

Prepared by:

Chas. H. Sells, Inc.
128 Overhill Drive, Suite 105
Mooresville, NC 28117

March 2004

NORTH CAROLINA PROFESSIONAL SEAL 17582 ENGINEER DAN E. BREWER

3/26/04

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1.0 INTRODUCTION

The purpose of the Closure/Post-Closure Plan is to outline the sequence for closing the landfill phase and the post-closure maintenance activities for each phase. Closure is designed to minimize the need for long term maintenance and to control the post-closure release of contaminants. Closure activities may be revised as appropriate for materials, specifications, technology advances or changes in regulations at that time.

Phasing of landfill development is designed so that final cover can be established as soon as possible. The final cover will be constructed in stages as cells of the landfill reach final grade, at the end of the cell's life. Intermediate grading, that indicate the contours prior to development of adjacent cells, is shown on the Phasing Diagrams in the Operations and Maintenance Plan. The final landfill contours will have erosion control benches and side slopes at a maximum 6H:1V. The central portion of the landfill will have a minimum 10% slope. Complete closure of Phase 1 will encompass a gross waste volume (including cover soils) of approximately 2.19 million cubic yards. Final closure of the FGD residue landfill will commence when Duke Energy declares that no more waste will be accepted or as directed by NCDENR, Division of Waste Management, Solid Waste Section.

The owner or operator shall notify the Division that a notice of intent to close the FGD gypsum landfill has been placed in the operating record. Closure activities for the FGD gypsum landfill shall begin no later than 30 days after final receipt of waste unless otherwise approved by NCDENR.

The final cover system for a completed phase will be completed within 180 days following the beginning of closure activities unless otherwise approved by NCDENR. The final cover system for the closed phase will be certified by a professional engineer as being completed in accordance with the Closure Plan. Duke Energy shall record a notation on the deed to the landfill property stating that the property has been used as a landfill and its use is restricted under the Closure Plan approved by the NCDENR Division of Waste Management. NCDENR will be notified by Duke Energy of the closure completion, certification, deed notation and placement in the operating record.

Following closure operations, the landfill will be developed as a grassed area. If the landfill must be closed prior to reaching the final contours, the surface of the landfill will be sloped to a minimum grade of 5 percent and a maximum grade of 17 percent. A final cover will be established over the landfill in accordance with the Technical Specifications for Closure, Section 4.

2.0 FINAL COVER SYSTEM

2.1 Compacted Soil Layer

The compacted soil layer will consist of an 18-inch thick compacted soil layer directly above the gypsum waste. The compacted soil layer provides a smooth surface for the geomembrane and reduces the infiltration of water into the waste.

2.2 Geomembrane

The geomembrane is a 40-mil thick, textured linear low density polyethylene (LLDPE) material. The geomembrane provides a barrier layer that reduces leachate generation.

2.3 Geocomposite

The geocomposite is a non-woven geotextile/ HDPE geonet/ non-woven geotextile composite. The geocomposite provides a drainage layer for water that percolates through the vegetative soil layer. The geocomposite also reduces the build-up of water directly on top of the geomembrane. A perimeter toe drain is provided at the toe of the landfill slope to drain out water flowing through the geocomposite.

2.4 Vegetative Soil Layer

The vegetative layer will consist of 18 inches of general fill with a 6-inch thick topsoil layer suitable for establishing a grass cover. The soil will be spread in two lifts and lightly compacted with a dozer. This layer will protect the geomembrane from damage due to ultraviolet degradation, desiccation (drying), freeze-thaw, erosion and vectors. A mixture of fertilizer and seed will be applied to the surface which will rapidly establish a continuous dense cover of grass.

2.5 Gas Venting System

A gas venting system will be incorporated into the final cap configuration. A passive gas venting system will be required to remove gas that collects beneath the geomembrane cap. The gas venting system will consist of screened pipes encased in a gravel trench. The vents will be connected to the upper geomembrane cap by means of a geomembrane boot to retard surface water infiltration into the landfilled waste. The locations and quantity of vents are shown on the Gas Venting System Plan.

3.0 POST-CLOSURE MAINTENANCE

3.1 Post-Closure Period

Post closure maintenance of the facility after closure will be conducted for 30 years and consist of the following elements:

- Inspection and maintenance of final cover,
- Control of access, and
- Operation, inspection and maintenance of surface water and erosion/sedimentation control systems.

The post-closure care period may be decreased by the NCDENR Division of Waste Management if the owner or operator demonstrates that the decreased period is sufficient to protect human health and the environment. However, the post-closure care period may also be increased by the NCDENR Division of Waste Management if the Division determines that an increased period is required to protect human health and the environment.

Following completion of the post-closure care period of the FGD residue landfill, the owner or operator shall notify the NCDENR Division of Waste Management that a certification, by a registered professional engineer, verifying that post-closure care has been completed in accordance with the post-closure plan and has been placed in the operating record.

3.2 Erosion and Sediment Control

Surface water running off the landfill during and after a rainfall event will be collected and routed off the cover by erosion control benches. Surface water that flows towards the landfill from off-site uphill areas (run-on) will be intercepted and channeled away from the landfill and final cover surface by diversion ditches and perimeter berms.

Erosion will be controlled by vegetation, erosion control benches and run-on diversion. Vegetation will aid in reducing soil erosion. Benches break the velocity of sheet flow, control development of erosion features before they damage the final cover, and divert runoff into manageable flow volumes. Run-on diversion helps eliminate the source of erosion. Sediment laden runoff will be collected in the sediment basins.

All diversion ditches and erosion control benches shall be inspected quarterly for signs of wash-outs or siltation. Riprap channels and outlet protection aprons shall be inspected for wash-outs. Damaged areas shall be repaired as soon as possible.

The sediment basins shall be inspected after significant rainfall events. Sediment shall be removed when the sediment accumulates to one half the design depth.

Culverts and inlets shall be inspected quarterly for signs of damage, siltation buildup, settlement or clogging. Repairs shall be made as soon as possible.

3.3 Final Cover

The final cover shall be inspected quarterly for signs of settlement, erosion, vector damage and bare spots. The grass cover shall be mowed at least twice a year. Bare spots shall be re-vegetated with grass seed. Any deep-rooted or woody vegetation that may have established itself on the cover soil shall be removed so that the deep root growth will not penetrate the geomembrane. Areas exhibiting settlement shall be filled to provide positive drainage. Eroded areas shall be filled and reseeded as needed.

3.4 Gas Venting System

The gas venting system shall be inspected quarterly for signs of damage. Geomembrane connections to each vent shall also be inspected. Any damaged vents shall be repaired.

3.5 Groundwater Monitoring Wells

All groundwater monitoring wells shall be inspected during groundwater sampling events. Any damaged wells shall be repaired immediately. Access to the wells shall be maintained to provide all-weather access.

4.0 POST-CLOSURE MONITORING

Following closure of the landfill, a monitoring program will be implemented to monitor the quality of groundwater and surface water in the areas surrounding the landfill. The monitoring program will be in accordance with the State approved monitoring plan and will continue for a period of 30 years after final closure. The length of the post-closure care period may be decreased or increased by the NCDENR Division of Waste Management if the reduced period is sufficient or the lengthened period is necessary to protect human health and the environment. Following completion of the post-closure period, the owner or operator shall notify the Division that a certification signed by a registered professional engineer, verifying that the post-closure care has been completed in accordance with the post-closure plan, has been placed in the operating record.

4.1 Groundwater

The Groundwater Monitoring Plan will be continued semi-annually (or as required) after final closure. The results of the analytical testing will be submitted to NCDENR as directed in the Groundwater Monitoring Plan.

4.2 Surface Water

Surface water monitoring of the downgradient tributaries to Lake Norman will be continued after closure as required by the NCDENR Division of Waste Management. Surface water discharged from the sediment basins will be sampled and analyzed if required by the NPDES stormwater permit.

APPENDIX C

Letter from Mr. Larry Frost, DENR to Mr. Ed Sullivan, P.E., Duke Energy Carolinas, LLC, dated September 27, 2011,
Permit to Operate, Amendment, Five (5) Year Renewal,
Completeness Determination and Technical Review, Marshall Steam Station Flue Gas Desulfurization (FGD) Residue Landfill, Permit No. 1809, Catawba County,
DIN 15221

COPY

NCDENR

North Carolina Department of Environment and Natural Resources
Division of Waste Management

Beverly Eaves Perdue
Governor

Dexter R. Matthews
Director

Dee Freeman
Secretary

SOLID WASTE SECTION
September 27, 2011

Mr. Ed Sullivan, P.E.
Duke Energy Carolinas, LLC
EC13K/Post Office Box 1006
Charlotte, North Carolina 28201-1006

Subject: Permit to Operate, Amendment, Five (5) Year Renewal
Completeness Determination and Technical Review
Marshall Steam Station Flue Gas Desulfurization (FGD) Residue Landfill, Permit No. 1809
Catawba County, DIN 15221

Dear Mr. Sullivan:

On August 22, 2011 the Division of Waste Management (Division) received your application for a Permit to Operate, Amendment – Five (5) year renewal, for the Marshall Steam Station Flue Gas Desulfurization (FGD) Residue Landfill, Permit No. 1809, located in Catawba County. The application is entitled;

Permit Amendment, Marshall Steam Station, Flue Gas Desulfurization (FGD) Residue Landfill, Phase 1, Cell 1, Permit Number 18-09, Duke Energy Carolinas, LLC, August 19, 2011. Prepared for Duke Energy Carolinas, LLC. Prepared by Altamont Environmental, Inc. August 2011. DIN 14913.

The Division has performed a review of your application for a determination of completeness and determined the application is complete in accordance North Carolina General Statute NCGS 130A-295.8(e). A determination of completeness means the application contains the required components in accordance with North Carolina Administrative Code 15A NCAC 13B .0500. In addition to the determination of completeness the Division has completed the technical review of the application and requests that you respond to the following items in order to expedite the processing of the application;

1. The **Landfill Operation Plan, Section 2.1.8.1 – Asbestos Material** states; *At the end of each operating day, or at least once every 24-hour period while the site is in continuous operation, asbestos waste material that has been deposited in the Marshall FGD Landfill during the operating day or previous 24-hour period will be covered with at least 6-inches of non-asbestos-containing material, placed, and compacted by a dozer.* North Carolina Administrative Code 15A NCAC 13B .0505 (11)(d) requires that asbestos be covered immediately. Change the Plan to reflect the requirement for immediate coverage of asbestos waste.

2. The **Landfill Operation Plan, Section 2.1.8.1 – Asbestos Material** states; *At the end of each operating day, or at least once every 24-hour period while the site is in continuous operation, asbestos waste material that has been deposited in the Marshall FGD Landfill during the operating day or previous 24-hour period will be covered with at least 6-inches of non-asbestos-containing material, placed, and compacted by a dozer.* North Carolina Administrative Code 15A NCAC 13B .0505 (11)(d) requires that

asbestos be covered with soil. In the past the Section as allowed the use of soil, ash and/or gypsum, and the Section will continue to allow the use of all three materials. Change the Plan to reflect that asbestos will be covered specifically with soil, ash and/or gypsum, rather than *non-asbestos containing material*.

3. The **Landfill Operations Plan, Section 6.0 – Required Regulatory Submittals** portion, regarding the submittal of the 10-year Waste Management Plan, includes the requirement in North Carolina General Statue NCGS 130A-309.09D to submit updated plan every 3 years. The requirements of the statue include not only the plan to be updated every 3 years, it also includes that the generator file a report on implementation of the plan each year of the 10 year plan. Update this section to include the annual implementation report.
4. On September 20, 2011, Ms. Shawn McKee Division Compliance Officer, sent a letter to Ms. Donna Burell of Duke Energy Carolinas regarding required compliance review information for the facility. The information requested in the letter must be received by the Division prior to issuance of the permit.
5. This letter approves the financial cost estimates presented by Duke Energy, in the amount of nine million, three hundred and ninety thousand, two hundred and six dollars ($9,390,206). It is the responsibility of Duke Energy to contact Ms. Shawn McKee, Division Compliance Officer at (919) 508-8512 or shawn.mckee@ncdenr.gov, regarding the establishment of a financial mechanism in the amount approved.

Closure	Post-Closure Care	Potential Assessment and Corrective Action	Total
$4,883,660	$1,506,546	$3,000,000	$9,390,206

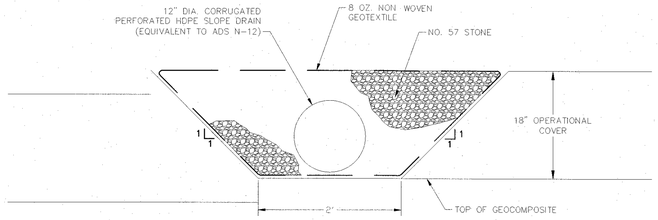
Note: The Groundwater Sampling and Analysis Plan, which was included in the permit application, has been forwarded to Ms. Elizabeth Werner Division Hydrogeologist for technical review. You may expect a written review of the Plan under separate cover. Should you have any questions regarding the Plan you may contact Ms. Werner at (919) 508-8496 or elizabeth.werner@ncdenr.gov.

Should you have any questions regarding these matters you may contact me at (828) 296-4704 or at larry.frost@ncdenr.gov.

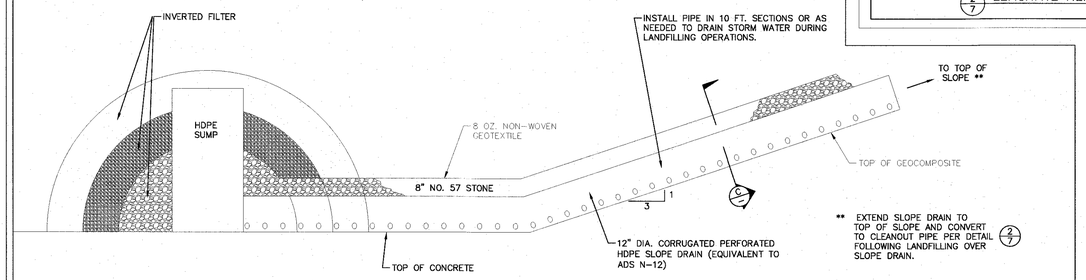
Sincerely,

Larry Frost
Environmental Engineer

cc: Donna Burrell – Duke Energy
Chris Ussery – Duke Energy
Bill Miller – Altamont Environmental
Deb Aja – DWM/ARO
Shawn McKee – DWM/RCO
Elizabeth Werner – DWM/RCO

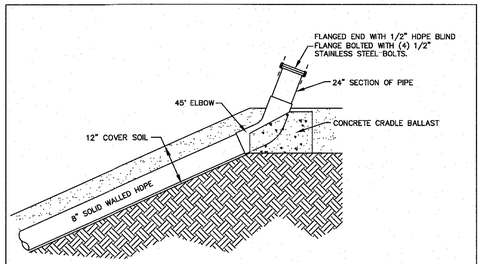


SECTION C-C



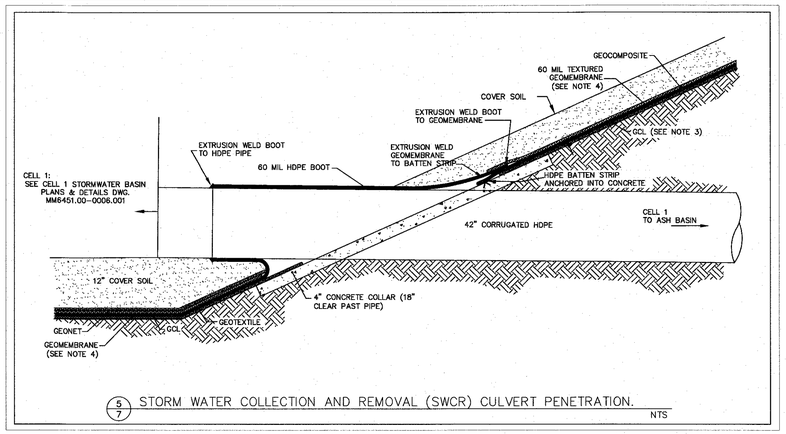
PLAN

CELL 1 INTERIOR SLOPE DRAIN TO SUMP



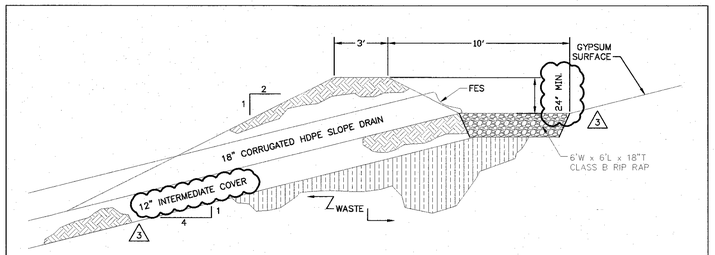
2/7 LEACHATE HEADER PIPE CLEANOUT

NTS



5/7 STORM WATER COLLECTION AND REMOVAL (SWCR) CULVERT PENETRATION.

NTS



TEMPORARY DIVERSION BERM

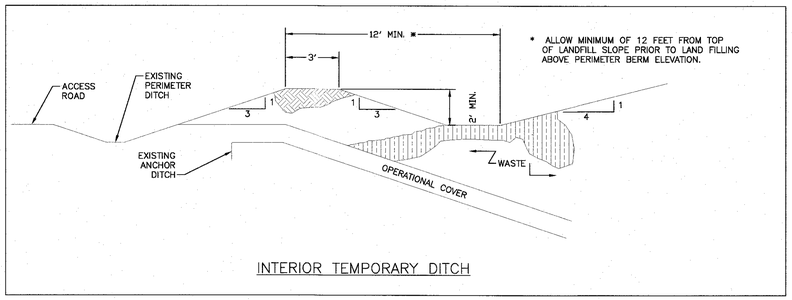
NOTES:

1) REFER TO CONSTRUCTION PLAN APPLICATION MM6451.01-0000.001 FOR MATERIALS AND CONSTRUCTION REQUIREMENTS.

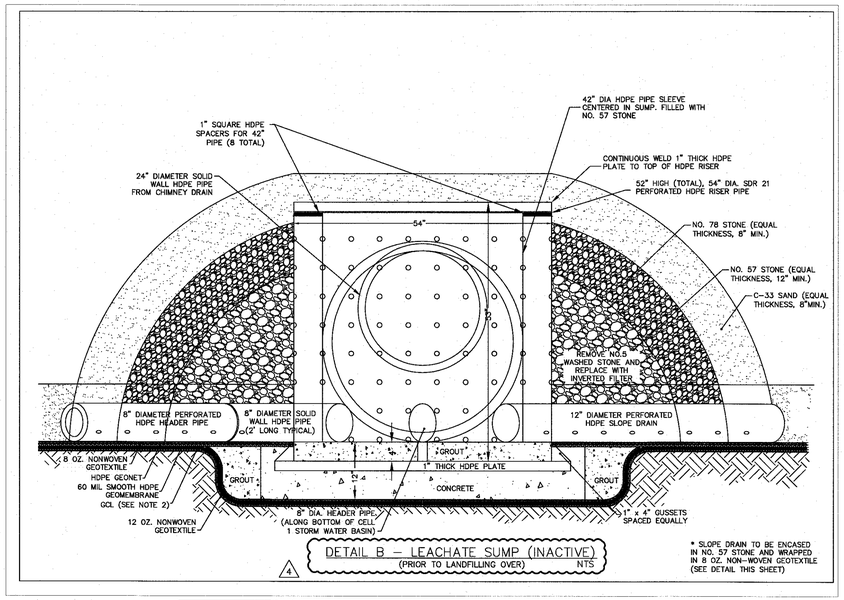
2) GCL ON BOTTOM SURFACE OF LANDFILL SHALL BE CLAYMAX 600 CL OR EQUIVALENT.

3) GCL ON SLOPES SHALL REINFORCED GCL EQUIVALENT TO BE BENTOMAT DN. REINFORCED GCL SHALL EXTEND 10 FEET PAST THE TOE OF SLOPE, ONTO THE LANDFILL FLOOR.

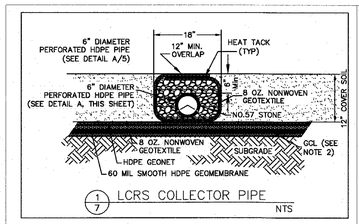
4) TEXTURED 60MIL HDPE GEOMEMBRANE SHALL BE USED ON THE SIDE SLOPES. THE TEXTURED GEOMEMBRANE SHALL EXTEND 10 FEET PAST THE TOE OF THE SLOPE, ONTO THE LANDFILL FLOOR.



INTERIOR TEMPORARY DITCH

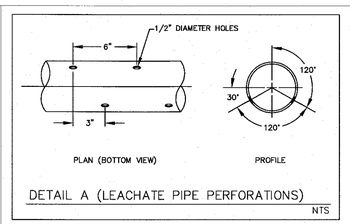


DETAIL B - LEACHATE SUMP (INACTIVE)
(PRIOR TO LANDFILLING OVER)
NTS



1/7 LCRS COLLECTOR PIPE

NTS



DETAIL A (LEACHATE PIPE PERFORATIONS)

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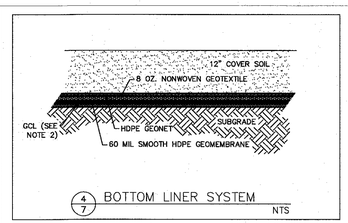

4/7 BOTTOM LINER SYSTEM

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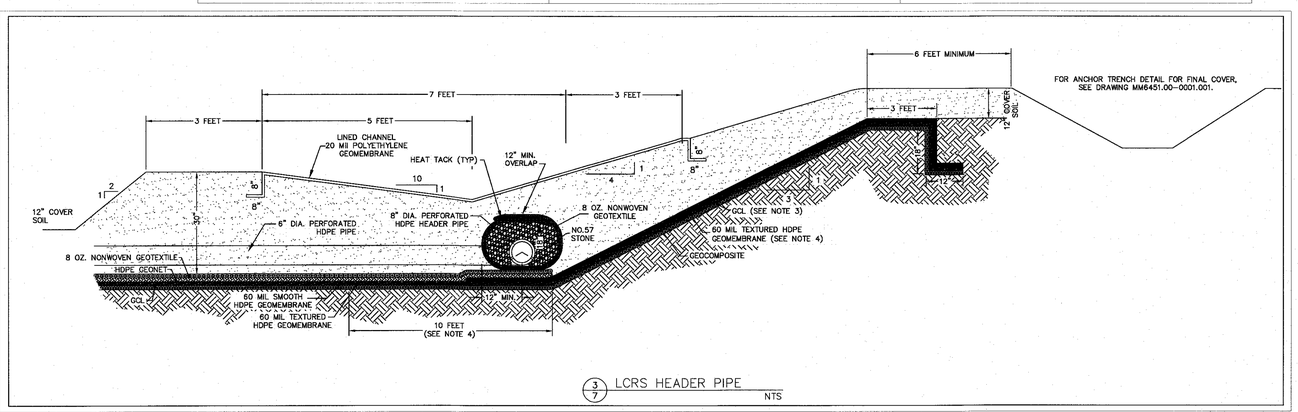

3/7 LCRS HEADER PIPE

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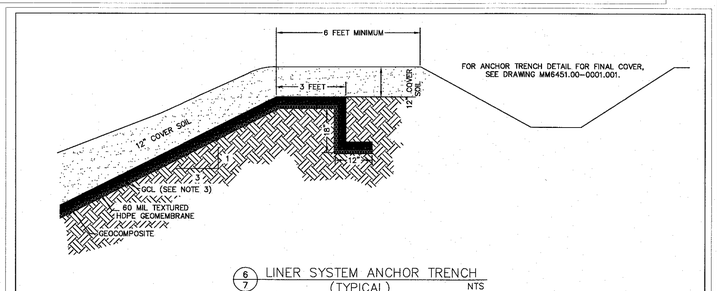

6/7 LINER SYSTEM ANCHOR TRENCH (TYPICAL)

NTS

ERN: FHS00774

C:\Users\jacc9148\Documents\Marshall Steam Plant FGD Landfill\Drawings\mm6451 00-0007 001.dwg, CELL DETAILS, USA01-48B

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MARSHALL STEAM STATION FGD RESIDUE LANDFILL

CATAWBA COUNTY, NC

DUKE ENERGY CAROLINAS, LLC
526 SOUTH CHURCH STREET
CHARLOTTE, NC 28202

NO	BY	DATE	REVISION
4	JAC	10/30/13	REVISED SUMP DETAIL B
3	JAC	4/6/12	REPLACED INTERM COVER AND WITH INTERMDIATE COVER
2	JAC	3/9/12	REVISED PER DUKE COMMENTS
1	JAC	8/19/11	UPDATED FOR CELL 1 FINAL CLOSURE, ADDED FINAL ES&C
D	DEB	9/11/06	REVISED DETAIL 3/7
C	DEB	7/17/06	ISSUED FOR CONSTRUCTION, REVISED DETAILS AS NOTED
B	DEB	1/24/04	REVISED FOR DENR COMMENTS
A	DEB	12/15/05	ISSUED FOR CPA

PROJECT #: 10-6014 DATE: 12/15/05

DRAWN BY: JAC CHECKED BY: DEB

TITLE
CELL 1 AND CELL 2 DETAILS

SHEET

DOCUMENT NO: MM6451.00-0007.001

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