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OPERATIONS PLAN
INDUSTRIAL LANDFILL NO. 1
MARSHALL STEAM STATION
TERRELL, NORTH CAROLINA

S&ME Project No. 1356-08-122

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

Prepared by:
S&ME, Inc.
S&ME Engineering License No. F-0176

9751 Southern Pine Boulevard
Charlotte, North Carolina 28273

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1. GENERAL FACILITY OPERATIONS

1.1 Overview

This Operations Plan is part of the Permit to Construct Application for the Industrial Landfill No. 1 at Marshall Steam Station and presents the landfill's operational requirements for: (1) general facility operations; (2) waste handling and landfill sequencing; and (3) environmental management. This Operations Plan was prepared consistent with the requirements of Rules .0505 of 15A NCAC 13B of the North Carolina Solid Waste Management Rules.

The Industrial Landfill No. 1 is owned by Duke Energy Carolinas, LLC (Duke Energy). The operations of the facility will be overseen by a Duke Energy Operations Manager or subcontracted to an outside company.

1.2 Contact Information

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

- ***OWNER***
  Duke Energy Carolinas, LLC – Marshall Steam Station
  8320 East NC Highway 150, Terrell, NC 28682
  (828) 478-7700
  Facility Contact: Coordinator Material Handling or Environmental Professional

- ***STATE REGULATORY AGENCY***
  North Carolina Department of Environment and Natural Resources

  Division of Waste Management, Solid Waste Section
  Asheville Regional Office (Permitting)
  2090 US Highway 70, Swannanoa, NC 28778
  (828) 296-4500
  Regional Engineer: Larry Frost

  Mooresville Regional Office (Operations)
  610 East Center Avenue, Mooresville, NC 28115
  (704)-663-1699
  Regional Engineer: Charles Gerstell

- ***ENGINEER***
  S&ME, Inc.
  9751 Southern Pine Blvd., Charlotte, NC 28273
  (704) 523-4726
  Project Engineer: Ken Daly, P.E.

1.3 Safety

Landfill operations were developed considering the health and safety of the facility's operating staff. Duke Energy will provide each of the operating staff with site specific safety training prior to landfill operations and designate on-site safety protocols in accordance to Duke Energy's Safe Work Practices. An Emergency Action Plan (EAP) is included in Appendix I to provide guidance in the event of a slope failure.

1.4 Access and Security Requirements

Access roads to the landfill will be of all weather construction and maintained in good condition. To prevent unauthorized entry, access to the Duke Energy property is controlled by either perimeter fencing or steep terrain with dense vegetation. Site access into the plant is also controlled by a gate at the main entrance.

1.5 Signs

Signs providing the permit number, stating that no hazardous or un-permitted waste can be received, and other pertinent information will be posted at the site entrance. Traffic signs and markers will be provided as necessary to promote an orderly traffic pattern to and from the active disposal area and maintain efficient operating conditions. The entrance sign will state:

"Industrial Solid Waste Landfill Facility
Permit No. 18-12
No Hazardous or Un-Permitted Waste Allowed
Contact Plant Coordinator Materials Handling or Environmental Professional
(828) 478-7700"

1.6 Dust Control

Dust generated on haul roads and operational roads will be controlled through the application of water and road maintenance. Dust and windblown ash will be controlled through the use of cover soils and interim spray applied coverings such as cement-based coverings (i.e. posi-shell), hydroseed mulch, and approved alternative cover materials. Additionally, interim and final covers will be vegetated as soon as practical in order to minimize the blowing of dust on-site.

1.7 Fire Control

No open burning shall be permitted at the landfill. Ash is a non-combustible material and the threat of fire is minimal. However, if a fire occurs at the landfill the local fire department shall be notified and equipment and stockpiled soil shall be provided to control accidental fires. 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 Operations Manager.

1.8 Training

Due to the diversity and nature of job tasks required at the landfill, personnel should be adequately trained to handle facility operations and maintenance. The Operations Manager should have a general understanding of all the tasks required for site operations. Individuals performing the various tasks should have adequate training for the specific tasks they are assigned. 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; and
- operating and maintaining leachate collection system and leak detection system.

The facility operator will complete approved operator training courses in accordance with permit requirements.

1.9 Record Keeping

An operating record will be maintained on-site and will include the following:

- Leachate Collection System (LCS) monitoring information;
  - Amounts of leachate generated and pumped to the active ash basin;
  - Line cleanout and camera monitoring documentation;
- Leak Detection System (LDS) monitoring information;
  - Documentation of an approved response action plan from the Division;
  - Records of the amount of liquids removed at each sump;
  - Notice of exceedence of action leakage rate for sumps (if any);
  - Preliminary assessment report for exceedence of action leakage rate (if any);
  - Reports documenting remedial actions (if any);
  - Line cleanout and camera monitoring documentation;
- Closure and post-closure LDS monitoring plan and results;
- Operations Plan.

The above records will be kept in the operating record for the active life of the landfill and the post-closure care period. Information contained in the operating record must be furnished upon request to the Division or made available for inspection by the Division. Additional records kept on-site will include:

- Facility Permits;
  - Solid waste facility permits;
  - Erosion and Sediment Control Plan;
- Record of the amount of solid waste received summarized on a monthly basis based on scale records;
- Documentation of weekly LCS/LDS system performance observations;
- Documentation of erosion and sediment control observations;

- Regulatory agency inspection reports;
- Site Suitability Study;
- Permit to Construct Application;
- Employee training program and records; and
- Site drawings and specifications.

1.10 Erosion and Sedimentation Control

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

1.10.1 E&SC Features Monitoring

E&SC features include rain gutters, road ditches, outlet protection aprons, downchute piping, and direct runoff to perimeter ditches. Prior to landfill closure, E&SC features shall be checked weekly. During post closure, E&SC features shall be checked quarterly and after a 1-inch rainfall event. Sediment shall be removed from structures to their original dimensions when conditions warrant. Necessary repairs shall be made as soon as practical.

Prior to closure, channels shall be monitored after each runoff event. Following closure, channels shall be checked after each 1-inch rainfall event. Riprap-lined channel sections and outlet protection aprons shall be checked for washouts. Riprap shall be added to these areas as needed to maintain the integrity of the structure.

1.10.2 Surface Erosion Monitoring

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 shall be applied in accordance with Figure 11: Seeding Specification.

Slopes shall be periodically checked for erosion and vegetative quality, fertilized, and mowed at least once a year. 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;
- Bare spots larger than 25 square feet;
- Bare spots make up more than 2% of total seeded area;
- Rills exceeding 4 inches in depth;
- Areas of cracking, sliding, or sloughing; or
- 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 in accordance with Figure 11: Seeding Specification. In the event that cracking, sliding, sloughing, or seepage is identified on slopes, a slope failure

identification criteria is met , and the Notification Sequence provided in the EAP included in Appendix I should be followed accordingly.

2. WASTE HANDLING AND LANDFILL SEQUENCING

2.1 Landfill Capacity

The landfill is comprised of phases, which are further subdivided into cells. Phase 1 of the landfill consists of Cells 1, 2, 3, and 4 and has an operational life of approximately 5.2 years. Landfill sequencing is further described in Section 2.4 of this Operations Plan. The whole landfill is estimated to have a storage life of approximately 24.3 years, based on a projected disposal rate of 738,000 tons per year.

The landfill capacity was estimated using the proposed grading and closure plans in conjunction with the anticipated annual disposal rates. The volume of Phase 1 available for waste placement, which consists of the airspace between the protective cover soil and the proposed top of waste, was estimated to be on the order of 3,829,020 cubic yards. Landfill capacity is further described in Section 7.1 of the Engineering and Facility Plan.

2.2 Waste Acceptance, Disposal, and Screening Requirements

The landfill will only accept fly ash, bottom ash, flue gas desulfurization (FGD) gypsum, FGD clarifier sludge, asbestos material, land clearing and inert debris, coal mill rejects, waste limestone material, boiler slag, and construction and demolition waste generated at the Marshall Steam Station. 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. Hazardous, liquid, or infectious wastes shall not be disposed of in 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.

The proposed landfill will be receiving a relatively consistent and homogeneous waste stream of combustion products residuals generated solely from the Marshall Steam Station. Waste will be hauled and disposed of by dedicated and consistent operators from the waste source to the landfill. As hauling and disposal operations are wholly contained within the site, random inspections are not proposed. Rather loads will be monitored continuously through operations. Based on the consistent and homogeneous waste stream it is anticipated that municipal solid waste, hazardous, liquid, or non-permitted wastes will be readily distinguished from the ordinary waste stream.

2.3 Operating Concepts

The primary objective of the landfill is to operate safely and efficiently while minimizing leachate generation and controlling stormwater. The landfill development will be sequenced in Phases as indicated on Figure 1. The Facility's final closure grading plan is presented on Figure 2. Landfilling operations will generally proceed from the north towards the south by the use of phases. In general, waste placement will be performed in 10-foot lifts with

operations usually being focused within a particular cell area. Subsequent landfilling operations in the cell will generally be limited to an exposed surface area of approximately 2 acres, at the operator's discretion, with waste in other areas covered with operational, intermediate, or final cover as appropriate. Soil diversion berms will be used to collect and divert the non-contact stormwater runoff from exterior landfill slopes to areas where the runoff will be directed to an active ash basin. When the desired waste elevations are obtained within the cell, waste placement will move to the next cell where the process will be repeated.

2.4 Landfill Sequencing

The general steps for the operation of the landfill are summarized below and are shown on the operations diagrams provided as Figures 3 through 10. In general, the waste fill shall progress in approximate 10-ft thick operational lifts made up of approximately 1-ft thick compacted lifts. Waste placement shall be graded to shed contact water into the landfill cell. When the operator is ready to place operational (i.e. weekly) or interim cover soil, subject areas may be graded to shed stormwater runoff (that has not contacted waste) out of the landfill cell to the perimeter stormwater conveyance channels.

In general, waste filling shall progress from the high end toward the low end of each cell to promote management of contact and non-contact water. The landfill sump areas shall not be covered with waste during placement of the first two, 10-ft thick operational lifts. Rather the sump areas shall remain exposed to promote management of leachate and contact water, anticipated to be greater during early stages of landfill operations. After the first two, 10-ft thick operational lifts are placed, the sump areas may be covered with waste.

Three (3) chimney drains have been installed in each cell and shall be extended vertically along with the placement of each lift. Each chimney drain comprises a ten-foot long vertical, 18-inch-diameter, perforated, corrugated HDPE riser pipe surrounded by filter aggregate. At the base of the chimney drains, the riser pipe connects to a distribution pipe which conveys the flow from the riser pipe into the LCS, via infiltration through a constructed layer of drainage material.

Landfill operations will begin in Cell 2 and proceed sequentially to Cell 1, Cell 3, and Cell 4. A conceptual waste filling sequence is illustrated in the attached Figures and summarized below only for the first steps of filling Cells 1 and 2. Operations personnel shall fill the remainder of the Cells following a sequence similar to the one illustrated for Cells 1 and 2.

Waste placement shall begin in Cell 2 and shall progress into Cell 1 as shown in Figures 3 and 4. The general waste filling sequence is described as follows.

- Step 1 (Figure 3): Place a 10-ft thick operational lift in Cell 2. Fill from west to east (uphill to downhill). Maintain an active waste placement area, by application of

operational cover, of less than 2 acres in size. Grade exposed waste areas to promote contact water drainage towards the chimney drains and/or sump within the landfill cell.

- Step 2 (Figure 4): Place a 10-ft thick operational lift in Cell 1. Fill from west to east (uphill to downhill). Maintain an active waste placement area, by application of operational cover, of less than 2 acres in size. Grade exposed waste areas to promote contact water drainage towards the chimney drains and/or sump within the landfill cell.
- Step 3 (Figures 9 and 10): Extend the chimney drains in each cell consistent with the cross-sections provided in Figures 9 and 10.
- Step 4 (Figure 5): Continue to place lifts in the manner described in Steps 1 and 2. To minimize leachate generation, when large areas can be graded to the perimeter with operational cover, do so. Maintain separation by berms between exposed waste areas and areas covered with operational cover. Maintain an active waste placement area, by application of operational cover, of less than 2 acres in size. Grade exposed waste areas to promote contact water drainage towards the chimney drains and/or sump within the landfill cells.

This general pattern of filling shall be repeated until the interim cover grading plan for Cells 1 and 2 as illustrated in Figure 6 is achieved. This general pattern of filling is also illustrated in the cross section provided in Figure 9. During filling, exterior stormwater conveyance features shall be constructed to manage non-contact stormwater runoff consistent with the Cell 1 and 2 Stormwater Management Plan (Engineering and Facility Plan Drawing C8).

Waste placement shall progress in Cells 3 and 4 in the same general pattern of filling and "piggyback" over Cells 1 and 2 as illustrated on Figure 7. The interim cover grading plan for Phase 1 is illustrated in Figure 8. Exterior stormwater conveyance features shall be constructed to manage non-contact stormwater runoff consistent with the Phase 1 Stormwater Management Plan (Engineering and Facility Plan Drawing C14).

2.5 Waste and Cover Material Placement

Waste and cover material shall be placed to the lines and grades shown on the grading plans with slopes no steeper than 3 (horizontal) to 1 (vertical). The Cells 1 and 2 interim cover grading plan is provided in Figure 6. The Phase 1 interim cover grading plan is provided in Figure 8. Prior to waste placement, stakes indicating the limits of waste placement, as shown on the Engineering and Facility Plan Drawings, shall be located. Waste placement for the anticipated waste types is summarized in the following sub-sections.

The primary objective during operations is to manage and segregate contact leachate from non-contact stormwater runoff. Contact leachate should be contained within the landfill. In order to effectively manage leachate, the waste shall initially be placed from up-gradient to down-gradient to promote drainage to the sump. Waste placement on the

first few operational lifts shall terminate up-gradient of the sump to leave this area exposed. As higher waste elevations are achieved, the waste may be placed in the sump area, as long as landfill surfaces are graded to promote proper drainage into the landfill. A minimum five percent slope shall be graded on the landfill surface to promote surface water runoff. Waste shall not be disposed of in water.

2.5.1 Fly Ash, Bottom Ash, and FGD Gypsum

Fly ash, bottom ash, and FGD Gypsum shall be compacted using compactors and dozers in approximate 1-foot lifts to achieve a vertical operational lift thickness of 10 feet. As the waste stream was assumed for design to be comprised predominantly of fly ash, QA monitoring and testing is proposed only for fly ash. Fly ash shall be placed and compacted in accordance with the quality assurance plan requirements outlined in Appendix II. Bottom ash and FGD Gypsum shall be placed and compacted as densely as practical and in-place density testing for bottom ash and FGD is not required.

2.5.2 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 waste shall be covered immediately with soil or non-asbestos waste (i.e. ash).

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.

2.5.3 FGD Clarifier Sludge, Coal Mill Rejects, Waste Limestone Material, and Boiler Slag

FGD clarifier sludge, coal mill rejects, waste limestone material, and boiler slag will be spread in 6-inch lifts in the center of the operational area and shall not be placed within 25 feet of the exterior slopes. FGD clarifier sludge shall be blended with the other waste (i.e. ash) prior to placement of the next fill lift. FGD clarifier sludge, coal mill rejects, waste limestone material, and boiler slag shall be compacted as densely as practical and specific monitoring and in-place density testing of these materials is not required.

2.5.4 Construction and Demolition Waste and Land Clearing and Inert Debris

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. This material shall be compacted as densely as practical and specific monitoring and in-place density testing of these materials is not required.

2.5.5 Waste Stream Composition

The waste stream was assumed for design to be comprised predominantly of ash. Should the waste stream change at some time during operations, the design slope stability analyses must be reviewed for the changed conditions. No quality assurance testing is specified for Asbestos, FGD clarifier sludge, coal mill rejects, waste limestone material, boiler slag, construction and demolition waste, or land clearing and inert debris provided that these materials compose less than 15% of the monthly total waste tonnage.

2.5.6 Operational Cover

The landfill active face should, at the operator's discretion, generally be approximately a 2-acre area to reduce the amount of exposed waste. Operational soil cover shall be applied at least once every seven days or when the active area reaches approximately a 2-acre area. Operational soil cover shall be a 6-inch thick layer constructed of on-site soil or an approved alternative, such as tarps, spray applied cement based applications (i.e. posi-shell), or spray applied hydroseed mulch.

2.5.7 Interim Cover

A 12-inch thick interim cover layer shall be placed on areas where final grades have been reached or where waste placement will be inactive for 12 months or more.

2.6 Final Cover

The final cover system for a completed phase will be finished within 180 days following the beginning of closure activities unless otherwise approved by the Division.

The proposed final cover will consist of a compacted interim soil cover, 40-mil LLDPE geomembrane liner, geocomposite drainage layer, an 18-inch thick earthen barrier layer, and a 6-inch earthen vegetative layer. A proposed alternative is to use a 50-mil structured geomembrane with an integral drainage layer overlain with a geotextile. The geomembrane will provide a barrier layer to reduce leachate generation. The vegetative layer will consist of on-site soil suitable for maintaining a grass cover and controlling erosion. Surface water that percolates through the vegetative layer and 18-inch thick earthen barrier layer will drain through the geocomposite drainage layer. The geocomposite will day-light periodically across the cover system and at the toe of the landfill final cover slope to provide drainage.

3. ENVIRONMENTAL MANAGEMENT

3.1 Stormwater Collection and Conveyance

Stormwater runoff from the landfill will be directed via a system of rain gutters, tack-on benches, road ditches, downchute piping, and direct runoff to perimeter ditches surrounding the landfill limits. The perimeter ditches discharge directly to an active ash basin on the south side of the landfill. Final and interim E&SC plans are contained within the Permit to Construct Application.

During initial operations within the non-active cells, a geomembrane raincover may be used to reduce leachate generation and protect against erosion of the liner system protective cover layer prior to operations. The collected water can then be pumped into the active ash basin.

The stormwater collection and conveyance system shall be checked regularly and maintained such that necessary repairs will be made as early as practical.

3.2 Leachate Collection System (LCS)

The leachate collection system (LCS) consists of a geocomposite drainage layer and a header pipe that provides gravity drainage of the leachate to sumps. From the sumps, the leachate is pumped by force main to the active ash basin which discharges in accordance with the plant's existing NPDES permit.

The general operation required to begin waste placement includes the activation of the LCS. This task is accomplished by removing and replacing the sacrificial geotextile filter in the sump area. The Operations Manager shall document LCS activation within each cell and file the documentation in the facility operation records. The design engineer will be on-site to monitor and document the removal and replacement of the sacrificial geotextile filter and the activation of the LCS in the sump area.

The LCS sump shall be equipped with a dedicated pump system. The LCS pump system contains one low-flow pump and one high-flow pump. The pump system shall operate automatically based on level switches with a low level cutoff and high level run-start activations. Additionally, a high level alarm shall be in place which will also have a high level activation. See the table below for LCS specific sump operations levels. The LCS system control panels will be equipped with visual and audible alarms programmed to activate at the programmed sump liquid level. The alarms will be equipped with a test function.

Pump	Low level cutoff	High level run-start	High level alarm activation
Low-flow	12 inches	24 inches	64 inches
High-flow	28 inches	46 inches	

3.2.1 LCS Maintenance

The maintenance of the leachate management system's physical facilities (consisting of HDPE piping, sumps, and pumps) and records will be performed by or under the direct supervision of Duke Energy.

The sacrificial geotextile filter over the sump area may periodically need to be removed and replaced. The operator will know when the geotextile filter is clogged and needs removal and replacement when there are low head levels in the sump and simultaneously,

ponded water in the sump area. Following removal, a new geotextile should be heat welded or trenched in along the edges of the sump.

From the sumps, leachate will be pumped to the active ash basin on-site which discharges in accordance with the plant's existing NPDES permit. Water leaving the active ash basin will be sampled in accordance with the requirements of the plant's NPDES discharge permit.

Periodic equipment maintenance shall be performed as recommended by the equipment manufacturer. Equipment maintenance will consist of checking pumps, flow meters, valves, connections, and other system equipment for leaks, corrosion, wear, scale build-up, improper functioning, and other improper operations. Appropriate corrective measures shall be taken when equipment is not operating properly.

Observations shall be made weekly to confirm proper LCS system performance. Weekly observations shall include, but not be limited to, checking pump function, verifying flow meter function, testing visual and audible alarms, and monitoring for leaks.

Clean-out pipes are located at the ends of the LCS leachate header pipes. LCS lines and sumps shall be cleaned out by the use of a clean-out snake or high pressure water flushing at least once a year and remote camera monitored at least once every five (5) years. Leachate line cleanout and camera monitoring will be documented in the operating record.

3.2.2 LCS Record Keeping and Sampling

Records shall be maintained documenting the amounts of leachate generated and pumped to the active ash basin as well as leachate line cleanout and camera monitoring.

Leachate from the LCS system will be sampled semiannually from dedicated sample ports located on the LCS system. The following constituents will be analyzed for semi-annually:

Temperature	Arsenic	Barium
Boron	Cadmium	Chloride
Chromium	Copper	Fluoride
Iron	Lead	Manganese
Mercury	Nickel	Nitrate
pH	Selenium	Silver
Sulfate	Zinc	Total Dissolved Solids

3.2.3 Contingency Plan

In the unlikely event that leachate can not be pumped to the active ash basin (i.e. a power outage), leachate flow will be temporarily stored within the landfill until such time that pumping operations to the active ash basin can be restored. Please note that the design

provides for redundant electrical supply, such that the system will switch to the backup power supply line in the event that primary power is lost. In such an event, the Division shall be notified in writing, within 30 days, about the events and corrective actions taken.

3.3 Leak Detection System (LDS)

A leak detection system (LDS) has been incorporated into the design of the landfill. The LDS consists of a secondary 60 mil HDPE liner system overlain by a secondary geocomposite drainage layer connected to an LDS sump. Flow collected in the sump will be transferred to the active ash basin via the leachate force main.

The LDS sump shall be equipped with a dedicated pump system. The LDS pump system contains one low-flow pump. The LDS pump system shall operate automatically based on level switches with a low level cutoff and a high level run-start activation. Additionally, a high level alarm shall be in place which will also have a high level activation. See the table below for LDS specific sump operations levels. The LDS system control panels will be equipped with visual and audible alarms programmed to identify sump liquid levels. The alarms will be equipped with a test function.

Pump	Low level cutoff	High level run-start	High level alarm activation
Low-flow	12 inches	24 inches	36 inches

The LDS has been designed with an Initial Response Leakage Rate (IRLR) of 300 gallons per acre per day and an Action Leakage Rate (ALR) of 500 gallons per acre per day. Should fluid collected in the LDS exceed the IRLR or ALR based on routine flow meter readings, the owner or operator shall take steps as indicated in the facility's Response Action Plan presented in Section 3.3.3.

The management of the leak detection system's physical facilities (consisting of piping and flow meters) and monitoring records will be performed by or under the direct supervision of Duke Energy.

3.3.1 LDS Maintenance

Periodic equipment maintenance shall be performed as recommended by the equipment manufacturer. Equipment maintenance will consist of checking pumps, flow meters, valves, connections, and other system equipment for leaks, corrosion, wear, scale build-up, improper functioning, and other improper operations. Appropriate corrective measures shall be taken when equipment is not operating properly.

Observations shall be made weekly to confirm the proper LDS system performance. Weekly observations shall include, but not be limited to, checking pump function, verifying flow meter function, testing visual and audible alarms, and monitoring for leaks.

Clean-out pipes are located at the ends of the LDS leachate header pipes. LDS lines and sumps shall be remote camera monitored at least once every five (5) years. LDS line camera monitoring will be documented in the operating record.

3.3.2 Record Keeping and Monitoring

Flow will be measured at the discharge of the LDS sump by a totalizing flow meter. The facility shall maintain records of monthly flow rate data from the LDS sump from the activation of the cell drainage system and until the waste height reaches approximately 40 feet. From that point, flow rate data shall be collected on a quarterly basis until landfill closure.

During the post-closure care period, semi-annual monitoring is required. If the liquid level in the sump stays below the pump high level run-start (no pump flow) for more than 1 year, then flow rates can be recorded annually. However, if at any time during post-closure care the pump high level run-start level is exceeded on the semi-annual or annual schedules, the facility must return to monthly monitoring, until such time as the liquid level remains below the pump high-level run start activation level for two consecutive months.

The purpose of LDS monitoring is to monitor if the leakage rates have been exceeded. Specific leakage rates are identified in Section 3.3.3. To determine if exceedances of the leakage rates have occurred, the facility must convert monitored data to an average daily flow rate for the cell (in gallons per acre per day, gpad). For example, the average daily flow rate in gpad is equal to the total monthly flow rate divided by the number of days in the month, divided by the area of the cell in acres. For calculation purposes, cell areas are summarized for Cells 1 through 4 in the table below.

Cell	Areas
Cell 1	9.9 acres
Cell 2	9.6 acres
Cell 3	7.2 acres
Cell 4	9.1 acres

If a leakage rate is exceeded, then the Division must be notified as set forth in the Response Action Plan presented in Section 3.3.3.

3.3.3 Response Action Plan

The purpose of the response action plan is to describe the necessary course of action in the event the Initial Response Leakage Rate (IRLR) and/or the Action Leakage Rate (ALR) are exceeded. If the IRLR is exceeded, steps 1 through 4 will be followed. Should the ALR also be exceeded steps 1 through 6 will be followed. The IRLR and ALR are referenced collectively as “leakage rates” in the following response action plan steps.

The IRLR is 300 gallons per acre per day.

The ALR is 500 gallons per acre per day.

Monthly IRLR and ALR flow volumes are calculated in the table below, assuming a 30-day month.

Cell	**Areas**	**IRLR (Daily Rate Per Acre)**	**IRLR (30-Day, Monthly Volume)**	**ALR (Daily Rate Per Acre)**	**ALR (30-Day, Monthly Volume)**
Cell 1	9.9 acres	300 gallons per acre per day	89,100	500 gallons per acre per day	148,500
Cell 2	9.6 acres		86,400		144,000
Cell 3	7.2 acres		64,800		108,000
Cell 4	9.1 acres		81,900		136,500

If the monthly volumes exceed those for the IRLR and the ALR listed in the table above, the response action steps will include:

Step 1 (IRLR and ALR):
Review physical equipment (pump and flow meter) function and data to confirm flow readings. Review operations to evaluate where operating equipment may have contacted the landfill liner or how landfill operations may have influenced the exceedance.

If the exceedance is confirmed, the cell LDS flow shall be recorded daily. Should the daily monitored LDS flow exceed the IRLR or ALR after the initial exceedance, operational responses may include: the reduction of active face area; grading to provide improved drainage; and/or, the addition of interim soil cover.

Step 2 (IRLR and ALR):
Within 14 days of identifying that a leakage rate has been exceeded, the facility shall contact the Division in writing. Daily LDS flow recording shall continue. Should none of the daily measured LDS flow rates exceed the leakage rate within 14 days of initial identification of the exceedance, monthly LDS flow averaging shall resume.

Step 3 (IRLR and ALR):
Within 30 days of identifying that a leakage rate has been exceeded, the facility shall submit to the Division a written preliminary assessment which shall include at a minimum:

- the amount of the liquid exceedance including initial measurement and daily measurements, if necessary, to date;
- likely sources of the liquids;
- the possible leak location;
- the possible leak size;
- the probable cause of the leak; and
- an outline of the short-term actions being taken and planned.

Step 4 (IRLR and ALR):
To the extent practicable, evaluate the location, size and cause of the leak; and assess the potential for leakage escaping into the environment and its mobility. Leachate quality shall be sampled, including a chemical analysis of LDS fluids, to evaluate potential hazards (pH and RCRA metals).

Step 5 (ALR Only):
When the ALR is exceeded, establish whether or not the unit should be closed or receipt of waste should be curtailed; and conclude whether waste should be removed from the unit for inspection, engineered controls, or repair of the liner and drainage system. Evaluate and prepare to implement what other short-term or long-term measures shall be taken to mitigate or stop any leaks according to the stage (early operations, middle operations, or closed) of landfill development..

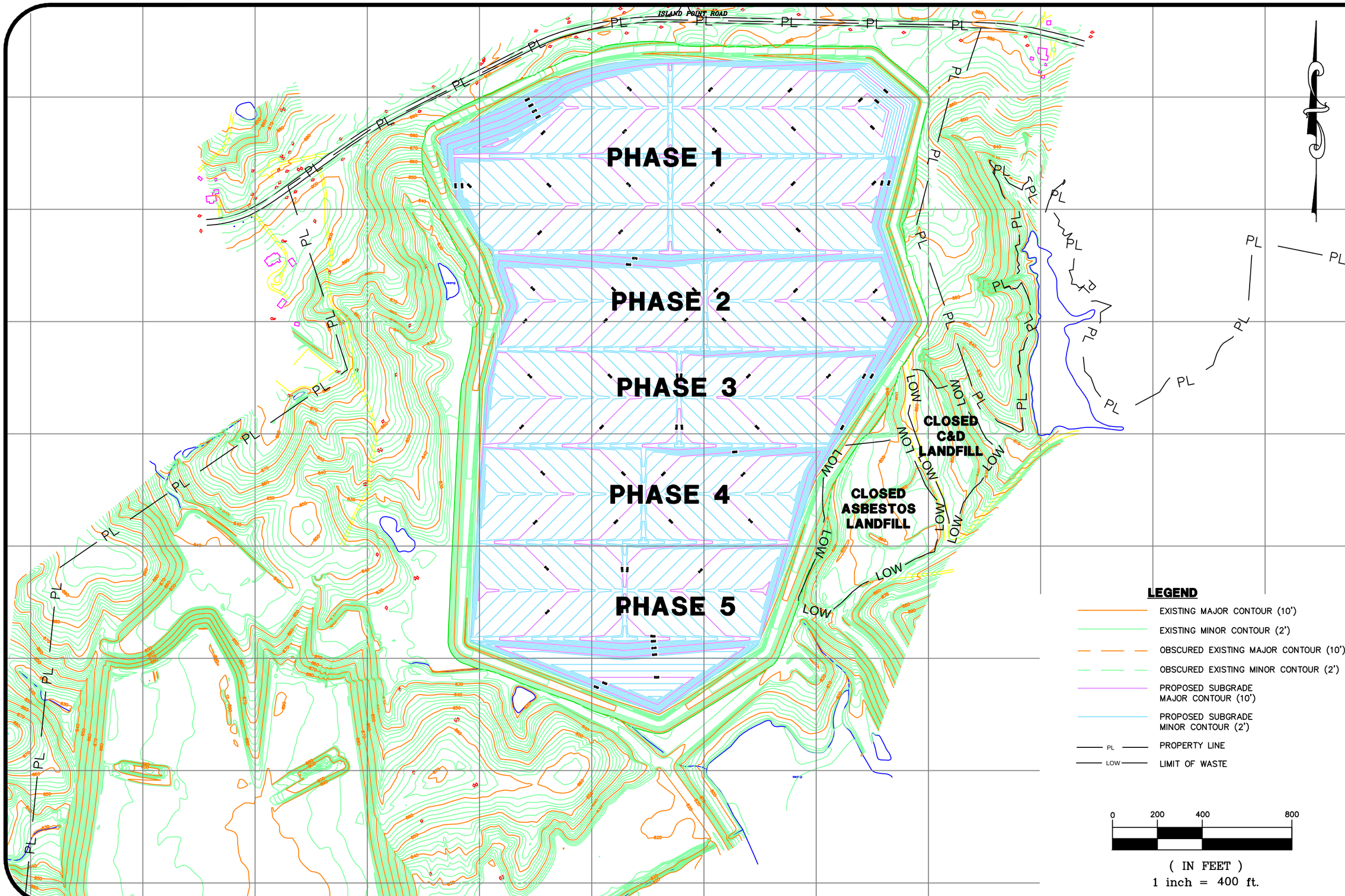
Step 6 (ALR Only):
Within 60 days of identifying that the ALR has been exceeded, submit to the Division the results of the evaluation performed in Step 4, any actions taken according to Step 5, and any further measures planned. For as long as there is an exceedance of the action leakage rate, the owner or operator shall submit monthly reports to the Division summarizing the results of the remedial actions taken and further actions planned.

3.4 Landfill Gas Management

Waste will consist of fly ash, bottom ash, flue gas desulfurization (FGD) gypsum, FGD clarifier sludge, asbestos material, land clearing and inert debris, coal mill rejects, waste limestone material, boiler slag, and construction and demolition waste generated at the Marshall Steam Station. The majority of the waste stream will consist of fly ash. The remaining small portion of the waste stream will consist of the other aforementioned waste products. Based on the nature of the waste it is not anticipated that methane or hydrogen sulfide gas will be generated or that odor will be an issue. Therefore, Duke Energy does not propose monitoring for landfill gas or providing landfill gas management measures.

In the event that methane or hydrogen sulfide gases are noticed during ordinary operations, actions will include monitoring for the presence of gas in the field with gas monitoring equipment and the final closure and post-closure plan will be developed to address gas management.

FIGURES



SCALE: 1 " = 400'

PROJECT NO. 1356-08-122

DATE: 12-17-10

DRAWN BY: CLD

CHECKED BY: KRD

ENGINEERING LICENSE NO: F-0176

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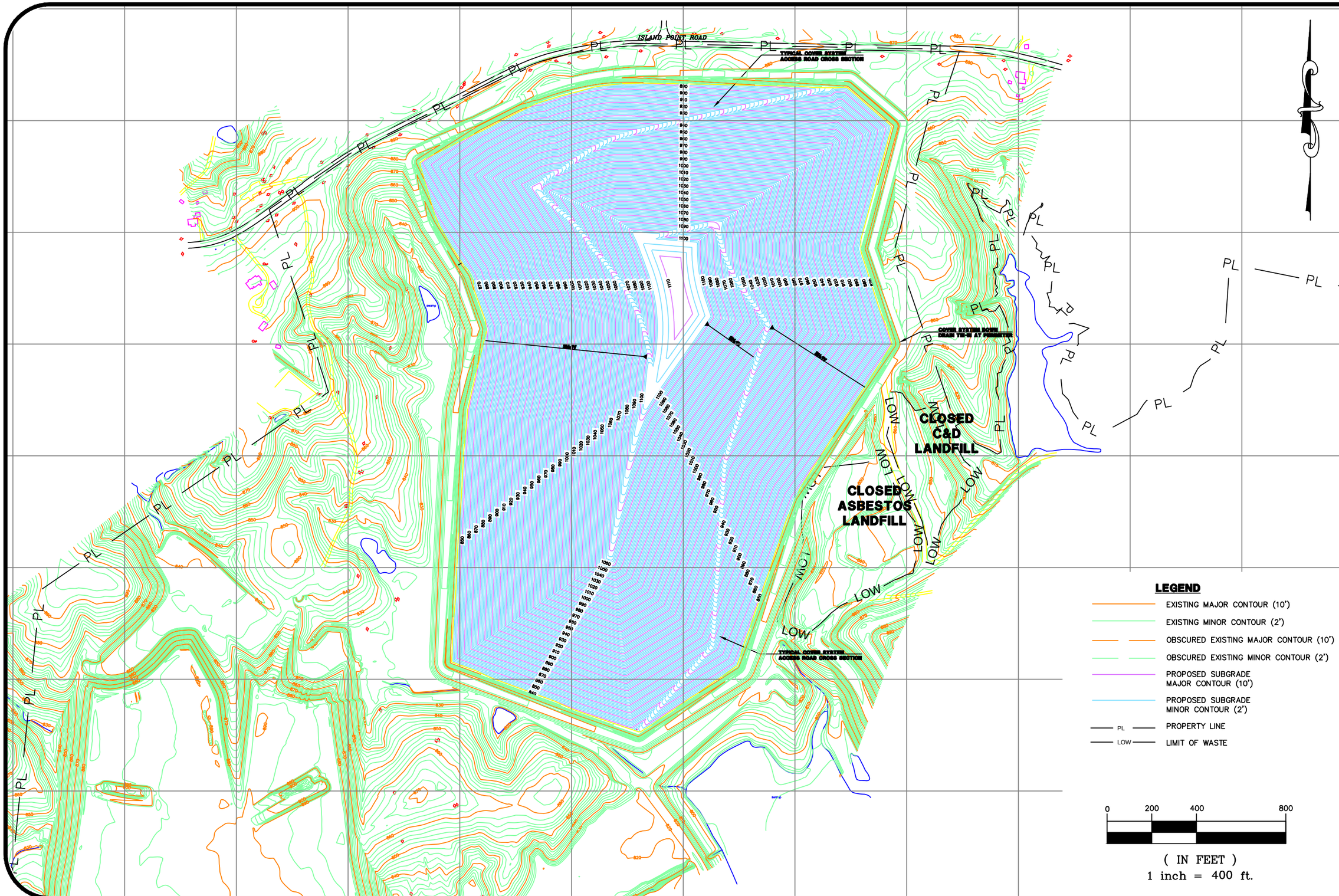
SUBGRADE GRADING PLAN
INDUSTRIAL LANDFILL NO. 1

MARSHALL STEAM STATION
TERRELL, NORTH CAROLINA

FIGURE NO.

1

Q:\1356\DUKE ENERGY\08-122 Marshall ILF#1\DWG\Industrial Landfill #1\PTC\op plans\Revised Ops Plan New\FIG 1.dwg



SCALE: 1 " = 400'

PROJECT NO. 1356-08-122

ENGINEERING LICENSE NO: F-0176

DATE: 12-17-10

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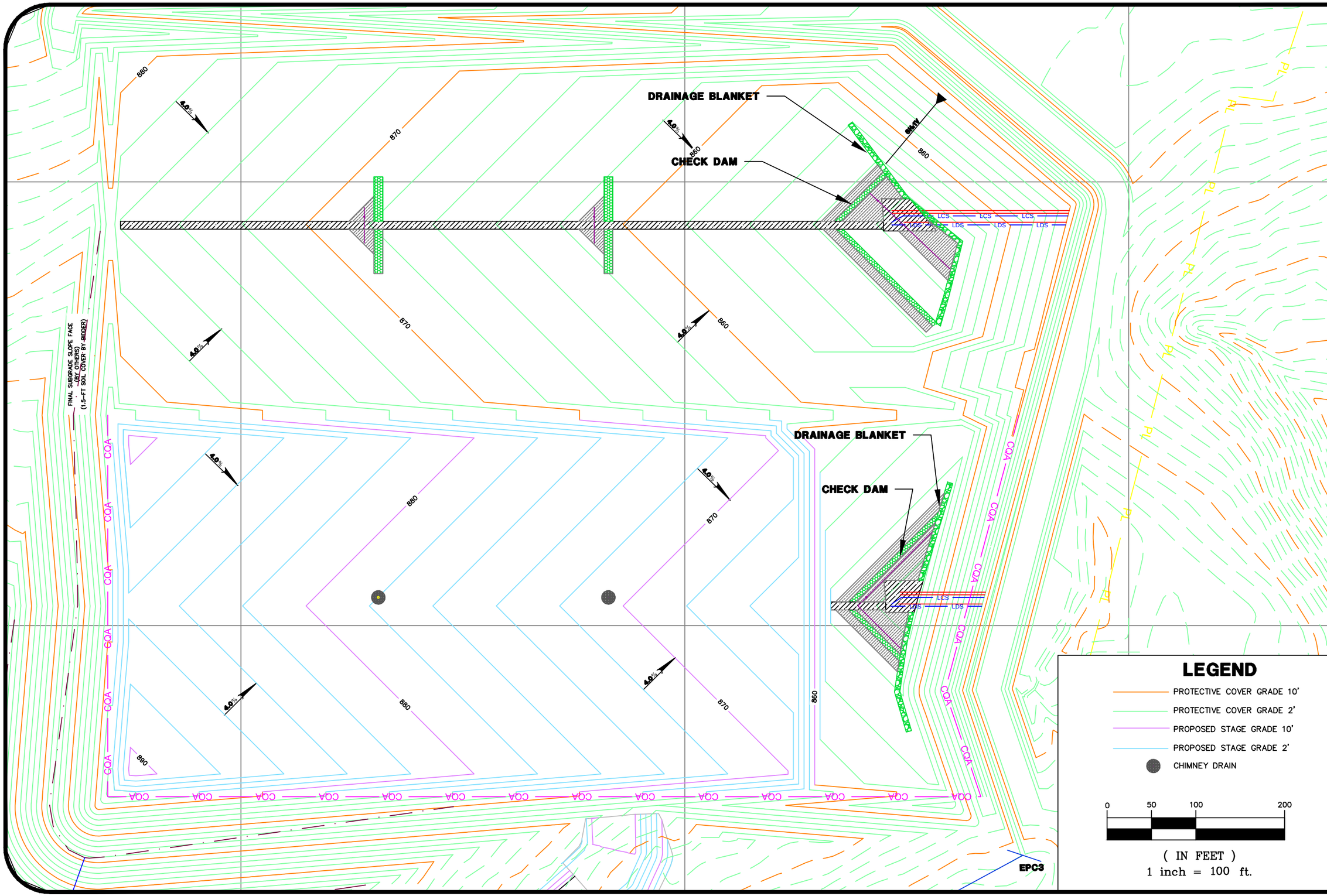
FINAL CLOSURE GRADING PLAN
INDUSTRIAL LANDFILL NO. 1

MARSHALL STEAM STATION
TERRELL, NORTH CAROLINA

FIGURE NO.

2

Q:\1356\DUKE ENERGY\08-122 Marshall ILF#1\DWG\Industrial Landfill #1\PTC\op plans\Revised Ops Plan New\FIG 2.dwg



SCALE: 1" = 100'

DATE: 12-17-10

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PROJECT NO. 1356-08-122

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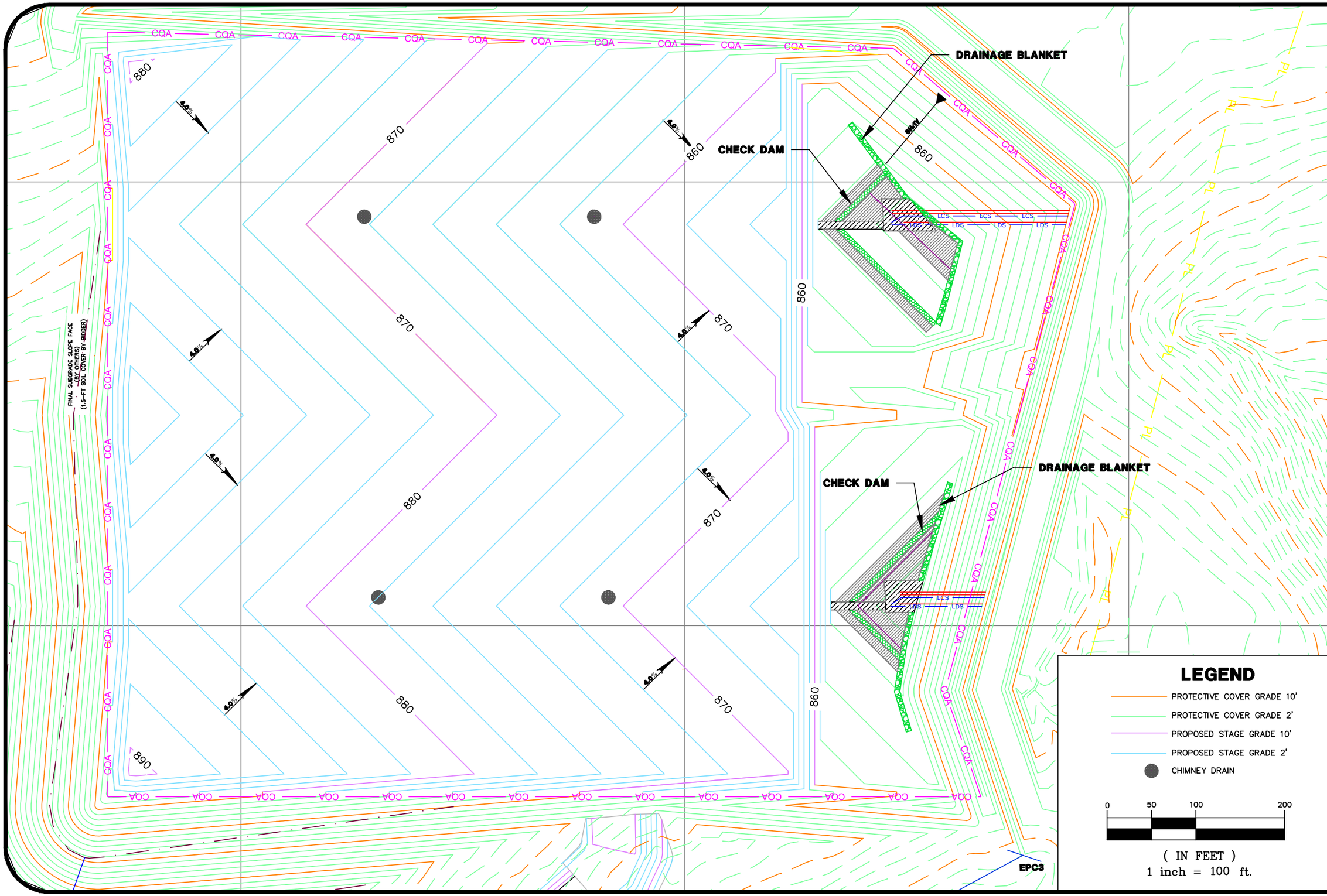
CELL 2 - FILL STEP 1
INDUSTRIAL LANDFILL NO. 1

MARSHALL STEAM STATION
TERRELL, NORTH CAROLINA

FIGURE NO.

3

Q:\1356\DUKE ENERGY\08-122 Marshall ILF#1\DWG\Industrial Landfill #1\PTC\op plans\Revised Ops Plan New\FIG 3.dwg



SCALE: 1" = 100'

DATE: 12-17-10

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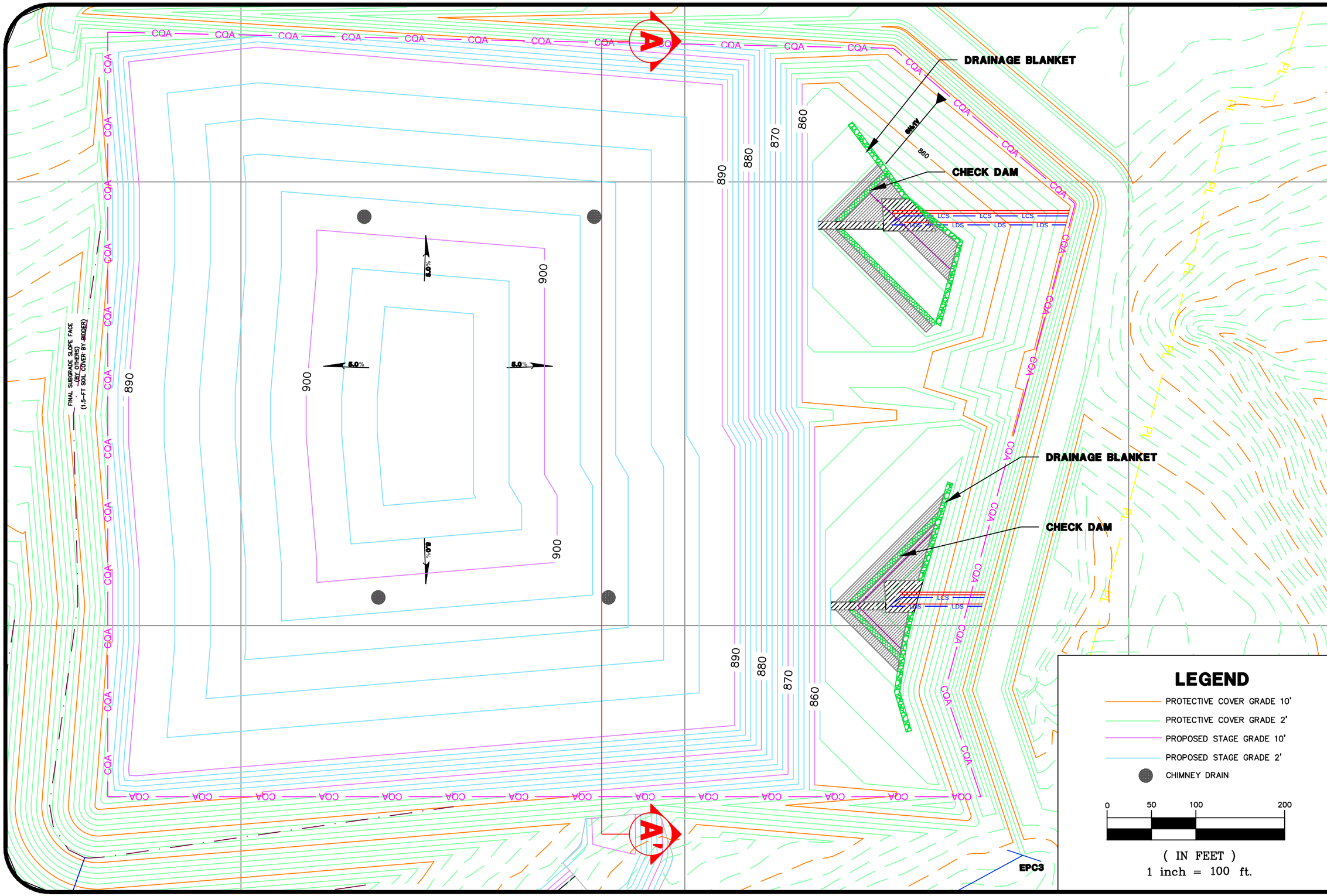
CELL 1 - FILL STEP 2
INDUSTRIAL LANDFILL NO. 1

MARSHALL STEAM STATION
TERRELL, NORTH CAROLINA

FIGURE NO.
4

Q:\1356\DUKE ENERGY\08-122 Marshall ILF#1\DWG\Industrial Landfill #1\PTC\op plans\Revised Ops Plan New\FIG 4.dwg



SCALE: 1" = 100'

DATE: 12-17-10

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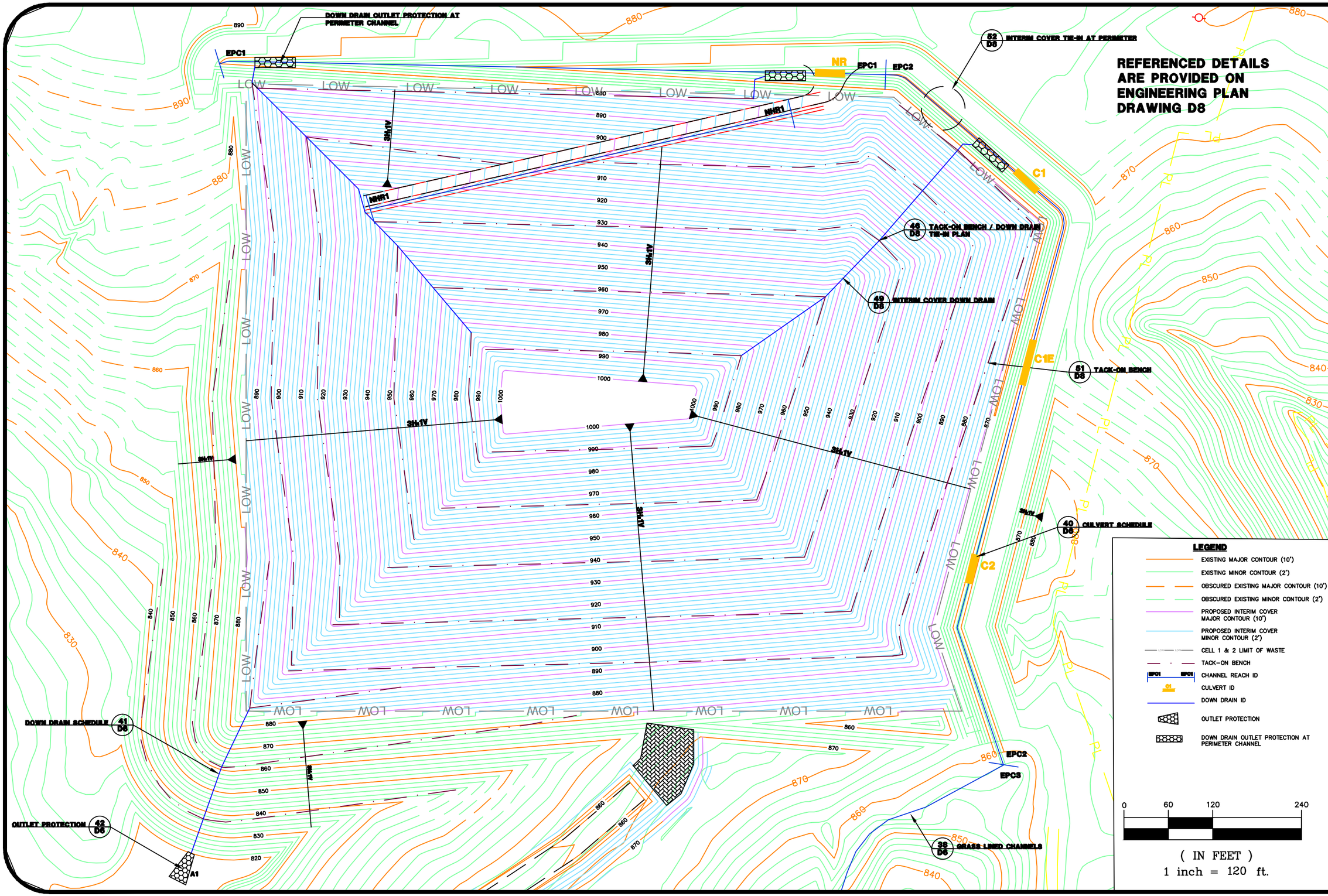
CELLS 1 AND 2 - FILL STEP 4
INDUSTRIAL LANDFILL NO. 1

MARSHALL STEAM STATION
TERRELL, NORTH CAROLINA

FIGURE NO.

5

Q:\1356\DUKE ENERGY\08-122 Marshall ILF#1\DWG\Industrial Landfill #1\PTC\op plans\Revised Ops Plan New\FIG 5.dwg



SCALE: 1" = 120'	DATE: 12-17-10
PROJECT NO. 1356-08-122	DRAWN BY: CLD
ENGINEERING LICENSE NO: F-0176	CHECKED BY: KRD

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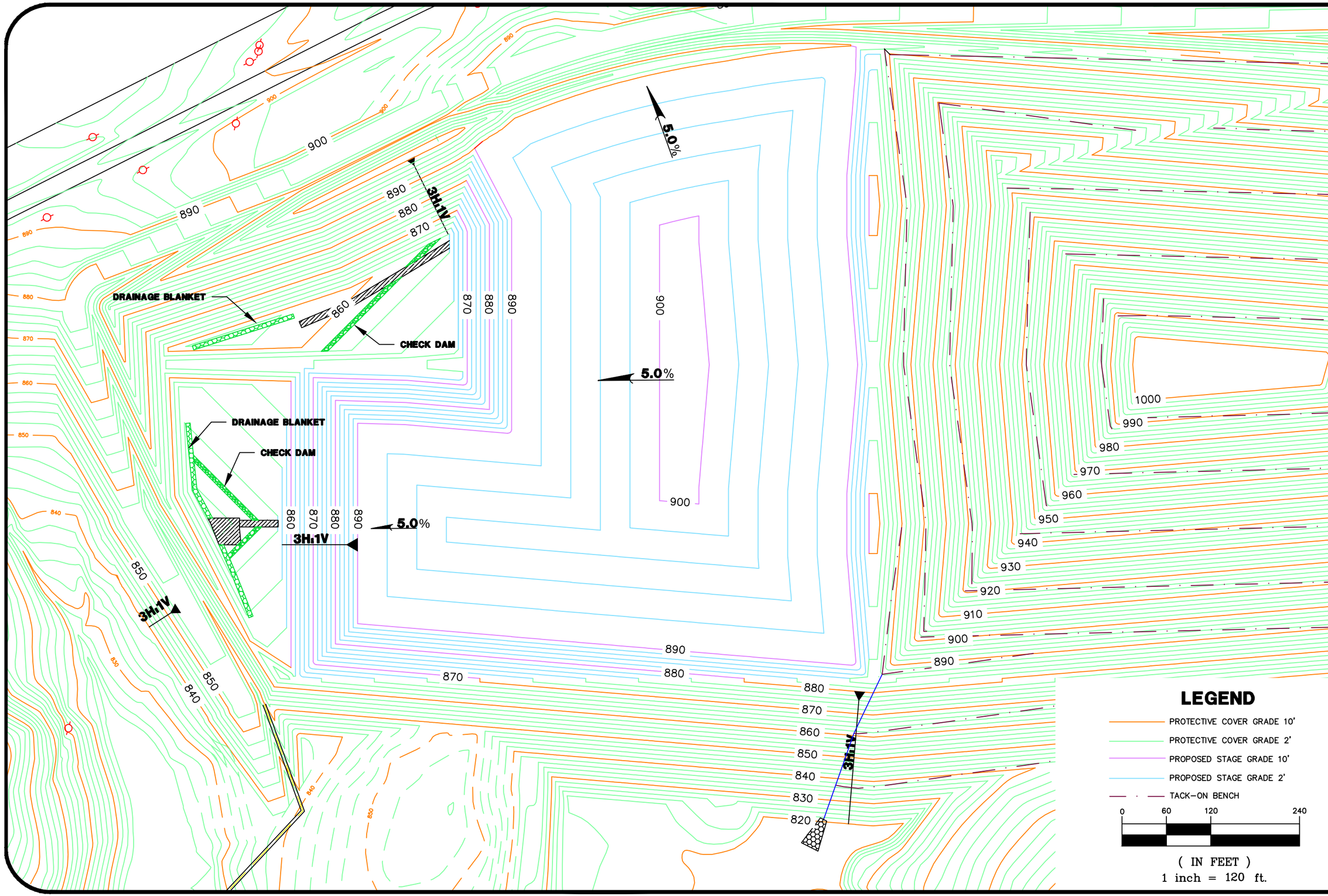
CELL 1 & 2 INTERIM COVER INDUSTRIAL LANDFILL NO. 1

MARSHALL STEAM STATION
TERRELL, NORTH CAROLINA

FIGURE NO.
6

Q:\1356\DUKE ENERGY\08-122 Marshall ILF#1\DWG\Industrial Landfill #1\PTC\op plans\Revised Ops Plan New\FIG 6.dwg



DATE: 12-17-10
DRAWN BY: CLD
CHECKED BY: KRD
SCALE: 1" = 120'
PROJECT NO. 1356-08-122
ENGINEERING LICENSE NO: F-0176

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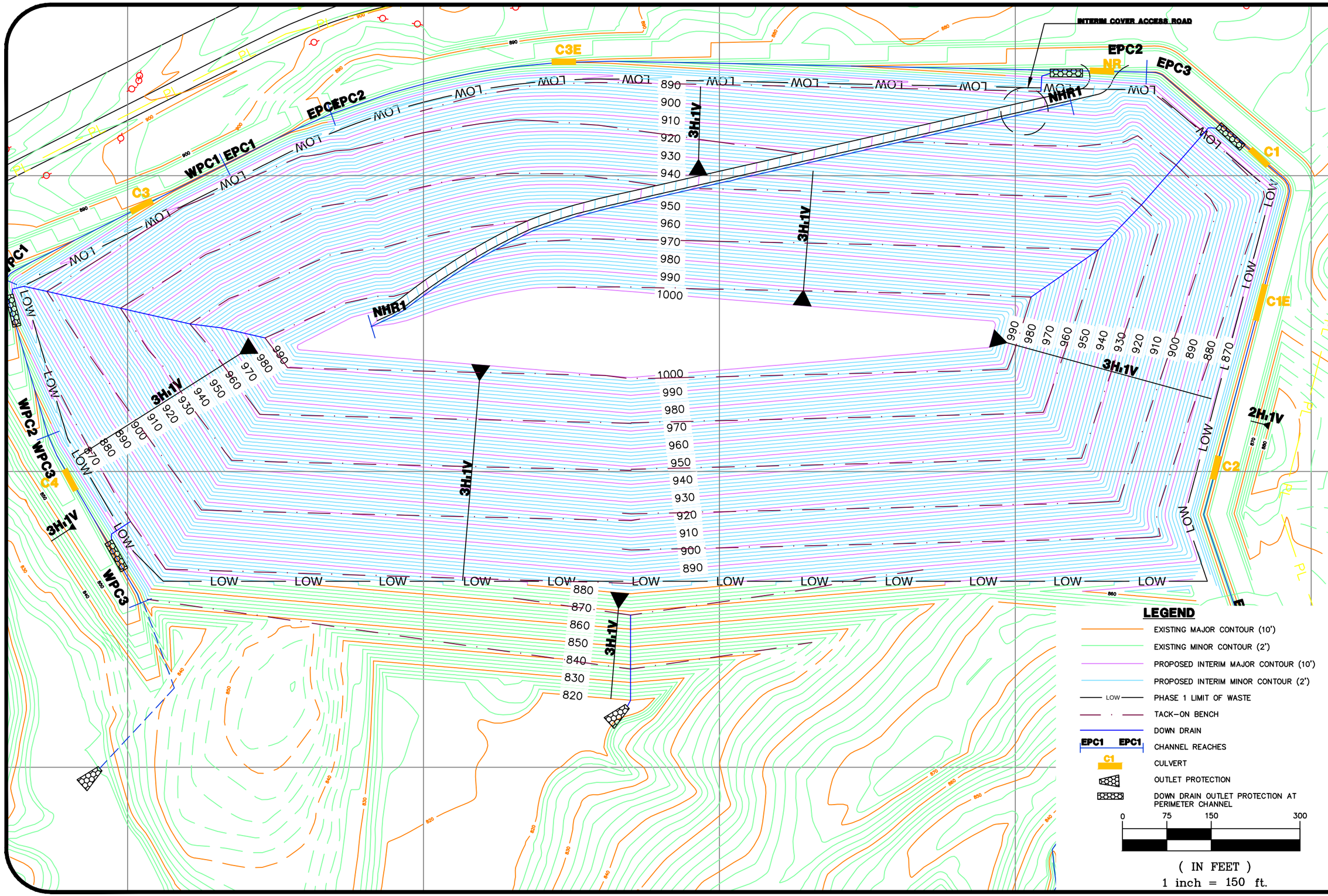
CELLS 3 AND 4 FILLING
INDUSTRIAL LANDFILL NO. 1
MARSHALL STEAM STATION
TERRELL, NORTH CAROLINA

FIGURE NO.
7

Q:\1356\DUKE ENERGY\08-122 Marshall ILF#1\DWG\Industrial Landfill #1\PTC\op plans\Revised Ops Plan New\FIG 7.dwg



DATE:	12-17-10
DRAWN BY:	CLD
CHECKED BY:	KRD
SCALE:	1" = 150'
PROJECT NO.	1356-08-122
ENGINEERING LICENSE NO:	F-0176

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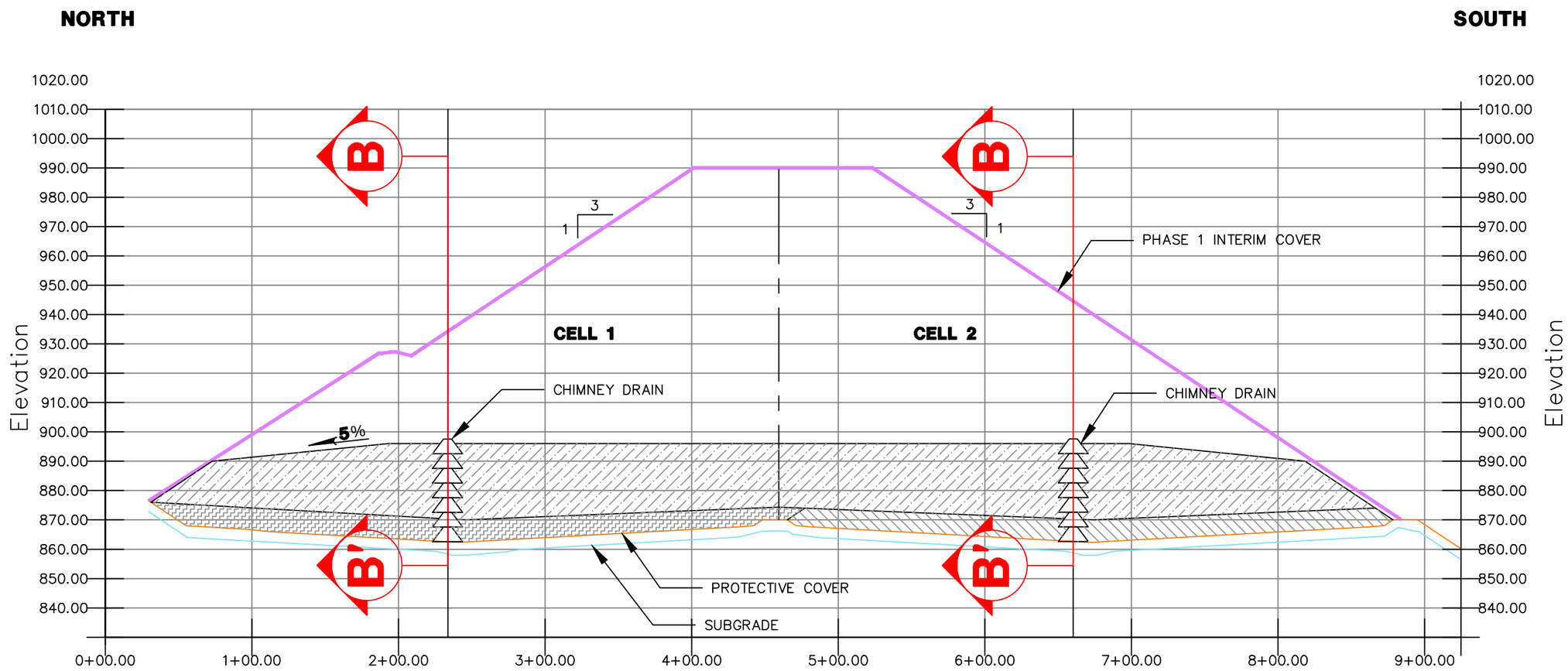
PHASE 1 INTERIM COVER PLAN
INDUSTRIAL LANDFILL NO. 1

MARSHALL STEAM STATION
TERRELL, NORTH CAROLINA

FIGURE NO.

8

Q:\1356\DUKE ENERGY\08-122 Marshall ILF#1\DWG\Industrial Landfill #1\PTC\op plans\Revised Ops Plan New\FIG 8.dwg



NOTE:

CELL 1 AND 2 FILLING SHALL PROGRESS IN 10-FT THICK OPERATIONAL LIFTS TO REACH PROPOSED INTERIM COVER GRADES IN A SEQUENCE SIMILAR TO THAT ILLUSTRATED HEREIN.

VERTICAL

0 20 40 80

(IN FEET)
1 inch = 40 ft.

HORIZONTAL

0 40 80 160

(IN FEET)
1 inch = 80 ft.

DATE: 12-17-10
DRAWN BY: CLD
CHECKED BY: KRD
SCALE: AS SHOWN
PROJECT NO. 1356-08-122
ENGINEERING LICENSE NO: F-0176

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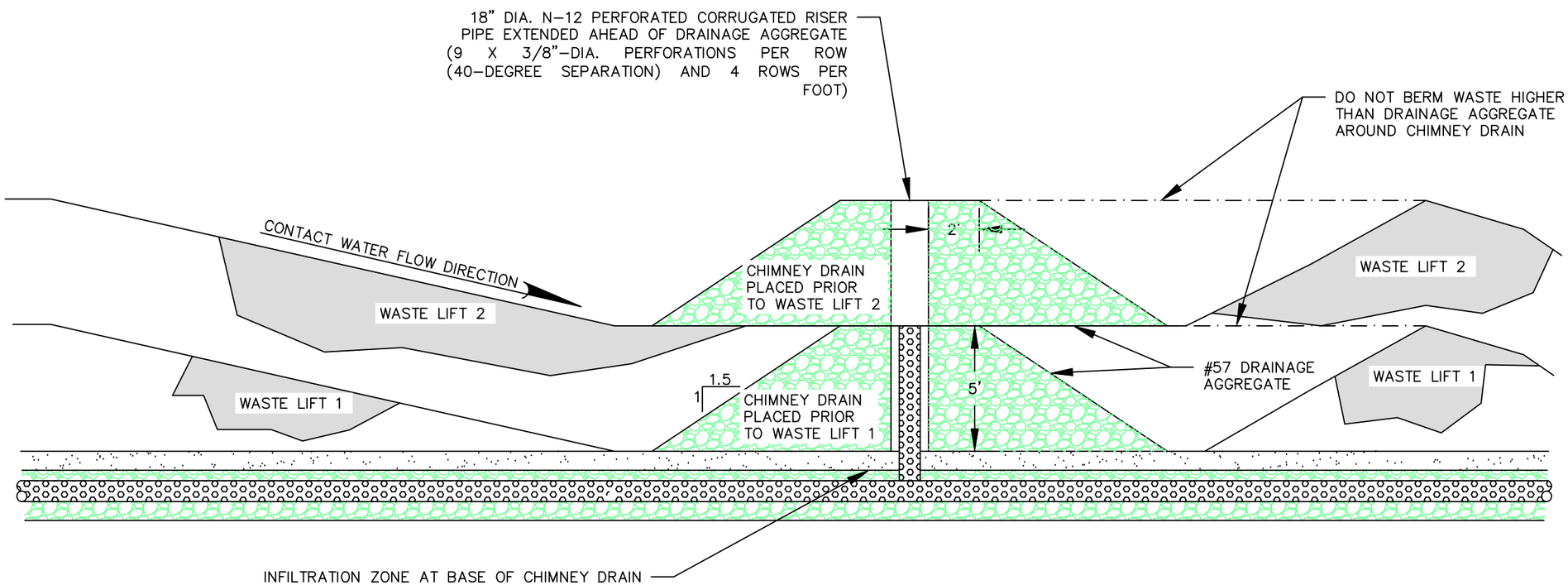
CROSS SECTION A - A'
INDUSTRIAL LANDFILL NO. 1
MARSHALL STEAM STATION
TERRELL, NORTH CAROLINA

FIGURE NO.
9



(IN FEET)
1 inch = 5 ft.

SCALE: AS SHOWN
DATE: 12-17-10
PROJECT NO. 1356-08-122
DRAWN BY: CLD
ENGINEERING LICENSE NO: F-0176
CHECKED BY: KRD

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CROSS SECTION B - B'
INDUSTRIAL LANDFILL NO. 1
MARSHALL STEAM STATION
TERRELL, NORTH CAROLINA

FIGURE NO.
10

DEFINITION
Controlling runoff and erosion on disturbed areas by establishing perennial vegetative cover with seed.

PURPOSE
To reduce erosion and decrease sediment yield from disturbed areas, and to permanently stabilize such areas in a manner that is economical, adapts to site conditions, and allows selection of the most appropriate plant materials.

SPECIFICATIONS

SEEDBED REQUIREMENTS
Establishment of vegetation should not be attempted on sites that are unsuitable due to inappropriate soil texture, poor drainage, concentrated overland flow, or steepness of slope until measures have been taken to correct these problems.

To maintain a good stand of vegetation, the soil must meet certain minimum requirements as a growth medium. The existing soil should have these criteria:

- Enough fine-grained (silt and clay) material to maintain adequate moisture and nutrient supply (available water capacity of at least .05 inches water to 1 inch of soil).
- Sufficient pore space to permit root penetration.
- Sufficient depth of soil to provide an adequate root zone. The depth to rock or impermeable layers such as hardpans should be 12 inches or more, except on slopes steeper than 2:1 where the addition of soil is not feasible.
- A favorable pH range for plant growth, usually 6.0 – 6.5.
- Free from large roots, branches, stones, large clods of earth, or trash of any kind. Clods and stones may be left on slopes steeper than 3:1 if they are to be hydro seeded.

If any of the above criteria are not met – i.e., if existing soil is too coarse, dense, shallow or acidic to foster vegetation – special amendments are required. The soil conditioners described below may be beneficial or, preferably, topsoil may be applied.

SEEDBED PREPARATION
Install necessary mechanical erosion and sedimentation control practices before seeding, and complete grading according to the approved plan.

Lime and fertilizer needs should be determined by soil tests. Directions, sample cartons, and information sheets are available through county Agricultural Extension offices. Testing is also done by commercial laboratories.

When soil tests results are not available, follow rates suggested in the seeding specifications shown at right. Application rates usually fall into the following ranges:

- Ground agricultural limestone:
  Light-textured, sandy soils: 1 to 1-1/2 tons/acre
  Heavy-textured, clayey soils: 2-3 tons/acre
- Fertilizer:
  Grasses: 800-1200 lb/acre of 10-10-10 (or the equivalent)
  Grass-legume mixtures: 800-1200 lb/acre of 5-10-10 (or the equivalent)

Apply lime and fertilizer evenly and incorporate into the top 4-6 inches of soil by disking or other suitable means. Operate machinery on the contour. When using a hydro seeder, apply lime and fertilizer to a rough, loose surface.

Roughen surfaces prior to seeding.

Complete seedbed preparation by breaking up large clods and raking into a smooth, uniform surface (slopes less than 3:1). Fill in or level depressions that can collect water. Broadcast seed into a freshly loosened seedbed that has not been sealed by rainfall.

SEEDING
Seeding dates given in the seeding mixture specifications are designated as "best" or "possible". Seedings properly carried out within the "best" dates have a high probability of success. It is also possible to have satisfactory establishment when seeding outside these dates. However, as you deviate from them, the probability of failure increases rapidly. Seeding on the last date shown under "possible" may reduce changes of success by 30-50%. Always take this into account in scheduling land-disturbing activities.

Use certified seed for permanent seeding whenever possible.

Labeling of non-certified seed is also required by law. Labels contain important information on seed purity, germination, and presence of wood seeds. Seeds must meet State standards for content of noxious weeds. Do no accept seed containing "prohibited" noxious weed seed.

Inoculate legume seed with the Rhizobium bacteria appropriate to the species of legume. Apply seed uniformly with a cyclone seeder, drop-type spreader, drill, cultipacker seeder, or hydro seeder on a firm, friable seedbed.

When using a drill or cultipacker seeder, plant small grains no more than 1 inch deep, grasses and legumes no more than 1/2 inch. Equipment should be calibrated in the field for the desired seeding rate.

When using broadcast-seeding methods, subdivide the area into workable sections and determine the amount of seed needed for each section. Apply one-half the seed while moving back and forth across the area, making a uniform pattern: then apply the second half in the same way, but moving at right angles to the first pass.

Mulch all plantings immediately after seeding.

HYDRO SEEDING
Surface roughening is particularly important when hydro seeding, as a roughened slope will provide some natural coverage for lime, fertilizer, and seed. The surface should not be compacted or smooth. Fine seedbed preparation is not necessary for hydro seeding operations: large clods, stones, and irregularities provide cavities in which seeds can lodge.

Rate of wood fiber (cellulose) application should be at least 2,000 lb/acre.

Apply legume inoculants at four times the recommended rate when adding inoculant to a hydro seeder slurry.

If a machinery breakdown of 1/2 to 2 hours occurs, add 50% more seed to the tank, based on the proportion of the slurry remaining. This should compensate for damage to seed. Beyond 2 hours, a full rate of new seed may be necessary.

Lime is not normally applied with a hydraulic seeder because it is abrasive. It can be blown onto steep slopes in dry form.

MAINTENANCE
Generally, a stand of vegetation cannot be determined to be fully established until soil cover has been maintained for one full year from planting. Inspect seeded areas for failure and make necessary repairs and reseedings within the same season, if possible.

Reseeding--If a stand has inadequate cover, re-evaluate choice of plant materials and quantities of lime and fertilizer. Re-establish the stand after seedbed preparation or over- seed the stand. Consider seeding temporary, annual species if the time of year is not appropriate for permanent seeding.

If vegetation fails to grow, soil must be tested to determine if acidity or nutrient imbalance is responsible.

Fertilization--On the typical disturbed site, full establishment usually requires re-fertilization in the second growing season. Fine turf requires annual maintenance fertilization. Use soil tests if possible or follow the guidelines given for the specific seeding mixture.

TEMPORARY SEEDING SPECIFICATIONS

Seeding mixture (fall)

Species*	Rate (lb/acre)
Rye (grain)	120

Seeding Mixture (late winter early spring)

Species*	Rate (lb/acre)
Rye (grain)	120
Red clover or winter wheat	

Omit Annual Lespedeza when duration of temporary cover is not to extend beyond July.

Seeding mixture (summer)

Species*	Rate (lb/acre)
German Millet	40

Seeding dates (Piedmont)

Fall:	Aug. 15 – Dec. 30
Late winter (early spring):	Jan. 1 – May 1 Late
Summer:	May 1 – Aug. 15

Soil amendments
Follow recommendations of soil tests or apply 2,000 lb/acre ground agricultural limestone and 750 lb/acre 10-10-10 fertilizer.

Mulch
Apply 4,000 lb/acre straw. Anchor mulch by tacking with asphalt, roving or a mulch anchoring tool. A disk with blades set nearly straight can be used as a mulch anchoring. tool.

Maintenance
Re-fertilize if growth is not fully adequate. Reseed, re-fertilize and mulch immediately following erosion or other damage.

Pursuant to G.S. 113A-57(2), the angle for graded slopes and fills shall be no greater than the angle that can be retained by vegetative cover or other adequate erosion-control devices or structures. In any event, slopes left exposed will, within 21 calendar days of completion of any phase of grading, be planted or otherwise provided with temporary or permanent ground cover, devices, or structures sufficient to restrain erosion.

Pursuant to G.S. 113A-57(3), provisions for permanent groundcover sufficient to restrain erosion must be accomplished for all disturbed areas within 15 working days or 90 calendar days (whichever is shorter) following completion of construction or development.

*REF: 6.10 A,B and C, NC Erosion and Sediment Control Planning and Design Manual, 2006

PERMANENT SEEDING SPECIFICATIONS

Seeding mixture

Species	Rate (lb/acre)
Annual ryegrass	40
Foxtail millet	30
Tall fescue	31
Red top	21
Durana clover	8

Nurse plants
Between May 1 and Aug. 15, add 10 lb/acre German millet or 15 lb/acre Sudan grass. Prior to May 1 or after Aug. 15, add 40 lb/acre rye (grain).

Seeding dates

	Best	Possible
Fall:	Aug. 25 – Sept. 15	Aug. 20 – Oct. 25
Late winter:	Feb. 15 – Mar. 21	Feb. 1 –Apr. 15

Fall is best for tall fescue and late winter for lespedezas. Over seeding of Kobe lespedeza over fall-seeded tall fescue is very effective.

Soil amendments
Apply lime and fertilizer according to soil tests, or apply 4,000 lb/acre ground agricultural limestone and 1,000 lb/acre 10-10-10 fertilizer.

Mulch
Apply 4,000-5,000 lb/acre grain straw or equivalent cover of another suitable mulching material. Anchor mulch by tacking with asphalt, roving, or netting. Netting is the preferred anchoring method on steep slopes.

Maintenance
Re-fertilize in the second year unless growth is fully adequate. May be mowed once or twice a year, but mowing is not necessary. Reseed, fertilize, and mulch damaged areas immediately.

Pursuant to G.S. 113A-57(3), provisions for permanent groundcover sufficient to restrain erosion must be accomplished for all disturbed areas within 15 working days or 90 calendar days (whichever is shorter) following completion of construction or development.

GENERAL SEEDING SPECIFICATIONS

SCALE: N.T.S.	DATE: 12-17-10	
PROJECT NO. 1356-08-122	DRAWN BY: CHR	
ENGINEERING LICENSE NO: F-0176	CHECKED BY: KRD	

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SEEDING SPECIFICATION
INDUSTRIAL LANDFILL NO.1
MARSHALL STEAM STATION
TERRELL, NORTH CAROLINA

FIGURE NO.
11

EMERGENCY ACTION PLAN (EAP)
INDUSTRIAL LANDFILL NO. 1
MARSHALL STEAM STATION
TERRELL, NORTH CAROLINA

S&ME Project No. 1356-08-122
S&ME Engineering License No. F-0176

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

Prepared by:
S&ME, Inc.
9751 Southern Pine Boulevard
Charlotte, North Carolina 28273

November 24, 2009

Revised February 3, 2010
Revised February 28, 2011

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1. STATEMENT OF PURPOSE 1
2. PROJECT DESCRIPTION & IMPACTS 1
3. SLOPE FAILURE IDENTIFICATION CRITERIA 1
3.1 Alert Status 1
3.2 Emergency Status 2
4. NOTIFICATION SEQUENCE 3

1. STATEMENT OF PURPOSE

The purpose of this Emergency Action Plan (EAP) is to provide guidance to identify potential slope failure events of the landfill, and minimize their impacts within the Marshall Steam Station property owned by Duke Energy Carolinas, LLC (Duke Energy).

This EAP establishes slope instability identification criteria, identifies emergency response entities, identifies impacted areas, establishes procedures for notification and provides contact information for emergency notifications. This EAP provides a framework for consistent and appropriate response to slope failure events, should they occur. Implementation and familiarity with the elements of the EAP will reduce the risk associated with landfill operations and help to mitigate impacts resulting from slope failure events.

2. PROJECT DESCRIPTION & IMPACTS

The proposed landfill is located on the northern portion of the Duke Energy – Marshall Steam Station property approximately 1.5 miles north of the Marshall Steam Station in parts within the footprint of an inactive ash basin. Waste fill heights are expected to be on the order of 240 feet with slopes constructed at 3 (horizontal) to 1 (vertical) slopes.

The proposed landfill is bound by existing ground and an earthen dike at the southeast corner. Adjacent to the inactive ash basin to the east is a closed asbestos landfill. To the west of the proposed landfill is the existing structural fill area. To the north of the proposed landfill is Island Point Road. Impacted areas are located on Duke Energy's Marshall Steam Station property.

3. SLOPE FAILURE IDENTIFICATION CRITERIA

3.1 Alert Status

The following conditions indicate a potential emergency situation. If one or more of these conditions are observed, the owner should initiate Notification Sequence 1 immediately:

i. cracking on landfill slope faces;

ii. bulging on landfill slope faces;

iii. wet spots, seepage, or flow emerging from or near the landfill slope faces; and

iv. shallow sloughing up to about three feet deep.

While under Alert Status, the owner shall continuously monitor slope conditions of the landfill. The owner shall communicate regularly with North Carolina Department of Environment and Natural Resources (NCDENR) personnel and the Engineer. The owner

shall evaluate if conditions warrant a transition to Emergency Status, and notify the emergency management authorities.

3.2 Emergency Status

The following conditions indicate slope failure is possible. If one or more of these conditions is observed, the owner should initiate Notification Sequence 2 immediately:

i. slope faces in the process of cracking, sliding, or sloughing.

ii. turbid seepage (that is, muddy seepage) and or boils emerging from the landfill slope faces.

4. NOTIFICATION SEQUENCE

Sequence 1: If one of the **Alert Conditions** listed in Section 3.1 of this plan has been observed, but slope failure does not appear imminent then the following notification sequence is followed by the **Owner**:

Owner

Solid Waste Section Staff
Mooresville Regional Office
Telephone #: 704-663-1699

OR

Raleigh Central Office
Telephone #: 919-508-8495

AND

Owner's Engineer

AND

Proceed to Sequence 2 if conditions warrant

Sequence 2: If one of the **Emergency Conditions** listed in Section 3.2 of this plan is occurring or slope failure appears to be otherwise imminent, the following notification sequence is followed by the Owner:

Owner

Duke Energy Health & Safety Contact
Telephone #: 828-478-7615

Plant Control Room
Telephone #: 828-478-7521
Telephone #: 828-478-7522

Duke Energy Environmental Contact
Telephone #: 828-478-7820

Duke Energy Coordinator Material Handling
Telephone #: 828-478-7705

AND

Catawba County Emergency Management
Telephone #: 828-465-8233
828-465-8989

AND

State Emergency Operations Center
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OPERATIONS QUALITY ASSURANCE PLAN
INDUSTRIAL LANDFILL NO. 1
MARSHALL STEAM STATION
TERRELL, NORTH CAROLINA

S&ME Project No. 1356-08-122

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

Prepared by:
S&ME, Inc.
S&ME Engineering License No. F-0176

9751 Southern Pine Boulevard
Charlotte, North Carolina 28273

November 24, 2009

Revised February 3, 2010
Revised February 28, 2011

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1. PROJECT DESCRIPTION

Quality assurance (QA) monitoring and testing of waste placement during operations of the Marshall Steam Station - Industrial Landfill No. 1 shall be performed as presented herein. QA monitoring and testing will be provided by an engineering and testing firm independent of the operator specializing in the observation and testing of soils.

The landfill will accept only fly ash, bottom ash, flue gas desulfurization (FGD) gypsum, FGD clarifier sludge, asbestos material, land clearing and inert debris, coal mill rejects, waste limestone material, boiler slag, and construction and demolition waste generated at the Marshall Steam Station. The waste stream was assumed for design to be comprised predominantly of fly ash. QA monitoring and testing is proposed only for fly ash. Other waste materials shall be placed consistent with Operations Plan requirements.

2. QA MONITORING AND TESTING

2.1 Waste Placement

Waste shall be placed and compacted using compactors and dozers in approximate 1-foot lifts to achieve a vertical operational lift thickness of 10 feet. The waste filling sequence shall be consistent with the Operations Plan. In general the waste filling sequence shall progress in 10-ft thick operational lifts, with each lift completed across a whole cell before beginning the next lift.

2.2 QA Field Monitoring

QA field monitoring shall be performed to verify that operations are being performed in accordance with the general steps outlined in Section 2 of the Operations Plan. The engineering technician responsible for field monitoring shall document the waste type, location of waste placement, and general placement and compaction methods during waste placement. Documentation shall include information, such as the operator's equipment types and number of passes to achieve the minimum compaction requirements. Waste placement monitoring documentation shall be maintained with the on-site operation records.

2.3 QA Field Testing

QA field testing 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 within 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 waste 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). Density

testing shall generally be performed and test locations documented on a one-acre grid, and including areas within 25 feet of exterior slopes. Waste placement testing records shall be maintained with the on-site operations records.

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.

2.4 Laboratory Testing

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

S&ME

February 28, 2011

North Carolina Department of Environment and Natural Resources
Solid Waste Section, Division of Waste Management
Asheville Regional Office
2090 US Highway 70
Swannanoa, North Carolina 28778

Attention: Mr. Larry Frost

Reference: **Operations Plan Revision**
Marshall Steam Station Industrial Landfill No. 1
Duke Energy Marshall Steam Station
8320 Highway 150 East, Terrell, Catawba County, North Carolina
S&ME Project No. 1356-08-122
North Carolina P.E. Firm License No. F-0176

Dear Mr. Frost:

On behalf of Duke Energy, S&ME has revised the Operations Plan from the previously submitted version (as referenced by NCDENR: *Operations Plan, Industrial Landfill No. 1, Marshall Steam Station, Terrell, North Carolina, S&ME Project No. 1356-08-122.* Prepared for Duke. Prepared by S&ME. November 24, 2009, revised February 3, 2010, revised January 31, 2011. DIN 12846). The revision includes removing reference to an "approved monitoring plan" from section 3.2.2 of the Operations Plan. We have provided the revised Operations Plan (Revised February 28, 2011) with this letter as well as a page showing the edits. Note that date changes were also made on the title page and header pages throughout the narrative of the Operations Plan.

S&ME and Duke Energy appreciate your attention to this matter. Please contact us should you have any questions or require additional information.

Respectfully Submitted,
S&ME, Inc.

NORTH CAROLINA PROFESSIONAL SEAL 032153 ENGINEER KENNETH R. DALY 2/28/11

William M. Harrison, E.I.
Staff Professional

Kenneth R. Daly, P.E.
Senior Project Engineer
Engineer of Record

Attachments:

-Operations Plan (Revised February 28, 2011)
-Edit Page (showing revisions)

Cc: Dean Snyder, Duke Energy
Ed Sullivan, Duke Energy

ponded water in the sump area. Following removal, a new geotextile should be heat welded or trenched in along the edges of the sump.

From the sumps, leachate will be pumped to the active ash basin on-site which discharges in accordance with the plant's existing NPDES permit. Water leaving the active ash basin will be sampled in accordance with the requirements of the plant's NPDES discharge permit.

Periodic equipment maintenance shall be performed as recommended by the equipment manufacturer. Equipment maintenance will consist of checking pumps, flow meters, valves, connections, and other system equipment for leaks, corrosion, wear, scale build-up, improper functioning, and other improper operations. Appropriate corrective measures shall be taken when equipment is not operating properly.

Observations shall be made weekly to confirm proper LCS system performance. Weekly observations shall include, but not be limited to, checking pump function, verifying flow meter function, testing visual and audible alarms, and monitoring for leaks.

Clean-out pipes are located at the ends of the LCS leachate header pipes. LCS lines and sumps shall be cleaned out by the use of a clean-out snake or high pressure water flushing at least once a year and remote camera monitored at least once every five (5) years. Leachate line cleanout and camera monitoring will be documented in the operating record.

3.2.2 LCS Record Keeping and Sampling

Records shall be maintained documenting the amounts of leachate generated and pumped to the active ash basin as well as leachate line cleanout and camera monitoring.

Leachate from the LCS system ~~shall be sampled in accordance with the approved monitoring plan. Leachate~~ will be sampled semiannually from dedicated sample ports located on the LCS system. ~~Leachate quality will be analyzed and reported consistent with the requirements of the approved monitoring plan.~~ The following constituents will be analyzed for semi-annually:

Temperature	Arsenic	Barium
Boron	Cadmium	Chloride
Chromium	Copper	Fluoride
Iron	Lead	Manganese
Mercury	Nickel	Nitrate
pH	Selenium	Silver
Sulfate	Zinc	Total Dissolved Solids