



*Prepared for*

**Santee Cooper Power**  
1 Riverwood Drive  
Moncks Corner, South Carolina 29461

# **LOCATION RESTRICTIONS COMPLIANCE DEMONSTRATION**

## **LANDFILL AREA 2 WINYAH GENERATING STATION GEORGETOWN, SOUTH CAROLINA**

*Prepared by*

**Geosyntec**   
consultants

engineers | scientists | innovators

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Project Number GSC5242.40BT

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**Certification Statement – Demonstration of Compliance with Location Restrictions**

**Federal CCR Rule:** 40 CFR §257.60-64

**CCR Unit:** Landfill Area 2 of the WGS Class Three Landfill

**Certification:**

I, **Scott M. Graves**, a qualified professional engineer registered in the state of **South Carolina**, am the design engineer-of-record for the above-referenced coal combustion residual (CCR) Unit – the design of which is documented in the *Winyah Generating Station Class Three Landfill Permit Application* approved by the South Carolina Department of Health and Environmental Control (SCDHEC) on September 15, 2017 [Permit #LF3-00042]. Based on the evaluations presented in this Location Restrictions Compliance Demonstration Report, the above-referenced CCR Unit is, in my professional opinion, demonstrated to be in compliance with the United States Environmental Protection Agency (USEPA) minimum location restriction requirements for the siting criteria of 40 CFR §257.60-64 for new coal combustion residuals (CCR) landfills.



Seal and Signature:

Firm Seal

Printed Name: Scott M. Graves

PE License Number: 33535

State: South Carolina

## 1 INTRODUCTION

Geosyntec Consultants (Geosyntec) has prepared this *Location Restrictions Compliance Demonstration* on behalf of the South Carolina Public Service Authority doing business as (d.b.a.) Santee Cooper (Santee Cooper). The subject of this compliance demonstration is the coal combustion residual (CCR) unit known as “Landfill Area 2” at the Winyah Generation Station (WGS) located in Georgetown, South Carolina (Figure 1). The Landfill Area 2 is a new CCR landfill (classified under the South Carolina Department of Health and Environmental Control (SCDHEC) solid waste program as a “Class Three Landfill”), currently under construction and located in a portion of the area that was occupied by Ash Pond A at the WGS site; Ash Pond A is undergoing closure-by-removal.

On April 17, 2015, the Environmental Protection Agency (EPA) promulgated the federal Coal Combustion Residual Rule (CCR Rule) that establishes national minimum criteria for existing and new CCR landfills and surface impoundments. The landfill is subject to the CCR Rule as a new CCR landfill as defined in 40 CFR §257.53, and as such is required to make demonstrations documenting whether or not the CCR unit is in compliance with the location restriction requirements under 40 Code of Federal Regulations (CFR) §257.60 through §257.64. Initial waste placement within a new landfill cannot occur until these demonstrations have been completed and placed in the facility’s operating record. This document serves as WGS’s location restriction demonstrations for Landfill Area 2 at WGS.

### 1.1 Facility Location

The WGS is a coal-fired steam electric generating facility located at 661 Steam Plant Drive, Georgetown, SC 29440, owned and operated by Santee Cooper. The WGS site is located approximately 4 miles southwest of the city of Georgetown, South Carolina, and is accessed via US Hwy 17 to Pennyroyal Road. A general site vicinity map is presented on Figure 1 included with this report. The WGS includes an approximately 2,184-acre parcel for station operations and an adjacent approximately 344-acre parcel of land that is presently undeveloped.

The WGS generates CCRs during power generation and the air quality control process. The CCRs are recycled for beneficial use to the extent possible. Historically, some of the CCRs generated by the WGS were placed in six on-site ponds/surface impoundments.

Going forward, CCRs generated at WGS that are not beneficially used will be disposed of in an on-site CCR landfill. Additionally, CCRs from existing on-site impoundments being closed-by-removal will either be beneficially used or disposed of in an on-site CCR landfill. Accordingly, Santee Cooper is constructing a Class Three Landfill (CCR landfill) at the WGS, composed of two separate areas (i.e., units). The first area, Landfill Area 1, was constructed in 2018, is currently in operation, and was previously certified as being in compliance with the location restrictions in a stand-alone demonstration dated July 2018.

The second area to be developed, and the subject of this report, is Landfill Area 2, which will have a lined area of up to 75.3 acres and a net airspace (waste disposal) volume of up to approximately 9,684,000 cubic yards. Landfill Area 2 is being constructed over portions of Ash Pond A, with the landfill construction occurring after the closure-by-removal of the affected ash pond areas. A Notification of Intent to Close for Ash Pond A was placed in the Operating Record on April 9, 2021. Landfill Area 2 is shown on Figure 2.

## **1.2 Previous Investigations and Reports**

Santee Cooper has implemented a number of hydrogeologic and geotechnical investigations at the WGS site to collect geologic, hydrogeologic, and geotechnical data. This includes previous investigations in and around the footprint of Landfill Area 2. This information was used in the studies, characterization reports, and engineering design of Landfill Area 2, which culminated in approval and issuance of a Class Three Landfill Permit by the SCDHEC on September 15, 2017 [Permit #LF3-00042]. Through this permit application process, Landfill Area 2 was evaluated for siting criteria and designed in accordance with SCDHEC regulatory standards that are consistent with, and in some cases more stringent than, the Federal CCR Rule standards for siting and design of new CCR landfills. As such, this Federal CCR Rule Location Restrictions Compliance Demonstration is based on and supported by the detailed information contained in the approved SCDHEC permit application documents, which are as follows:

- *Landfill Siting Study*, Winyah Generating Station, Georgetown, South Carolina, April 2016, prepared by Geosyntec Consultants;

- *Site Hydrogeologic Characterization Study Report*, Winyah Generating Station, Georgetown, South Carolina, April 2016, prepared by Geosyntec Consultants; and
- *Class Three Landfill Permit Application*, Winyah Generating Station, Georgetown, South Carolina, August 2016, prepared by Geosyntec Consultants, (with revisions as contained in “Revised Technical Application received June 5, 2017” as approved by SCDHEC on September 15, 2017).

### **1.3 Site Geology and Hydrogeology**

The WGS site is located within the Atlantic Coastal Plain physiographic province which is a wedge of unconsolidated to well-consolidated, Cretaceous to recent sediments. A review of South Carolina Coastal Plain hydrostratigraphy (Campbell and Coes, 2010) identifies several hydrostratigraphic layers (aquifers and confining units). In ascending order, they include the Gramling Aquifer and confining unit, Charleston Aquifer and confining unit, McQueen Branch Aquifer and confining unit, Crouch Branch Aquifer and confining unit, Gordon Aquifer and confining unit, and the surficial aquifer.

The aquifers of most interest at this site are the surficial aquifer and Gordon Aquifer. The surficial aquifer is the water-table aquifer and consists mainly of terrace sediments that were deposited during transgressions and regressions of a post-Miocene sea. The surficial aquifer is lithologically heterogeneous but generally consists of quartz gravel and sand, silt, clay, and shelly sand and unconformably overlies the Gordon aquifer, which is the lowermost aquifer of the Floridan Aquifer system. The Gordon Aquifer represents the permeable portion of the Williamsburg Formation (upper Chicora Member) in the vicinity of the site. As detailed in the *Site Hydrogeologic Characterization Study Report* (Geosyntec, 2016b), the surficial aquifer and Gordon Aquifer exhibit similar hydrogeologic properties and are not separated hydrogeologically. Therefore, the Gordon Aquifer and surficial aquifer are collectively termed the surficial aquifer in Geosyntec (2016b) and are designated as the uppermost aquifer at the site in accordance with 40 CFR §257.40.

Historical groundwater elevation measurements in the surficial aquifer at the site were influenced by the water levels in the slurry ponds and ash ponds. In recent years, some ponds have been closed; others are in the process of being closed. Once the new landfill is constructed, an engineered liner and leachate control system will eliminate recharge to

the water table. For these reasons, Geosyntec (2016b) developed and presented a modeled seasonal high water table representing conditions after closure of the slurry ponds and ash ponds. In particular, this seasonal high water table includes conditions beneath the to-be-closed Ash Pond A where Landfill Area 2 is located. A map of the seasonal high water table conditions used for this location restrictions evaluation as well as for the engineering design of Landfill Area 2, taken from the *Site Hydrogeologic Characterization Study Report* (Geosyntec, 2016b), is included in this report as Figure 3.

## **2 LOCATION RESTRICTIONS EVALUATION**

The location restrictions under §257.60 through §257.64 include: (1) Placement above the uppermost aquifer; (2) wetlands; (3) fault areas; (4) seismic impact zones; and (5) unstable areas. Each of these locations is generally recognized as having the potential to impact the structure of any disposal unit.

### **2.1 Placement Above the Uppermost Aquifer**

40 CFR §257.60(a) states that new CCR landfills “must be constructed with a base that is located no less than 1.52 meters (five feet) above the upper limit of the uppermost aquifer, or must demonstrate that there will not be an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuations in groundwater elevations (including the seasonal high water table).” The “uppermost aquifer” is defined by §257.40 as the geologic formation nearest the natural ground surface that is an aquifer, as well as lower aquifers that are hydraulically interconnected with this aquifer within the facility’s property boundary. This definition includes a shallow, deep, perched, confined or unconfined aquifer, provided it yields usable water.

As mentioned, the uppermost aquifer at the site is the surficial aquifer, which is an unconfined aquifer consisting of mixtures of predominantly sand and minor amounts of silt and clay. A map of the modeled post-pond drainage seasonal high water table is included in Figure 3 of this report. As shown, the groundwater elevations range from 21 feet above mean sea level (ft, MSL) in the central portion of where Landfill Area 2 will occupy, to elevation 20 ft, MSL around the north, east, and west portions of the Landfill Area 2 perimeter.

The map of landfill base grades superimposed along with the seasonal high water table is included in Appendix A, and was taken from the set of Engineering Drawings included in the *Class Three Landfill Permit Application* (Geosyntec, 2016c). This map also shows the Landfill Area 2 subgrade (bottom of liner system) grading plan (i.e., base of the CCR unit). Accompanying landfill cross sections through Landfill Area 2 (Cross Sections “C”, “D”, and “E”) are also included in Appendix A. Inspection of this information reveals that Landfill Area 2 is designed with a base that is located greater than 5-ft above the seasonal high water table, with the exception of the “sumps” (i.e., low points) of the landfill cells. To address this location restriction, the sumps will be equipped with a “clay plug under-liner” constructed beneath the base of the CCR unit – engineering details of which are included in Appendix A. This under-liner beneath the CCR unit will supplement the landfill composite liner system present beneath all of Landfill Area 2 and will form the hydraulic barrier to prevent an intermittent, recurring, or sustained hydraulic connection between the sump areas (where the base is less than 5-ft above the seasonal high water table) and the uppermost aquifer.

For the foregoing reasons, Landfill Area 2 is judged to be in compliance with the requirements of 40 CFR §257.60 for placement above the uppermost aquifer.

## **2.2 Wetlands**

40 CFR §257.61(a) states that new CCR landfills “must not be located in wetlands, as defined in §232.2 of this chapter, unless the owner or operator demonstrates...that the CCR unit meets the requirements of paragraph (a)(1) through (5) of this section.” Wetlands, as defined in 40 CFR §232.2, means “those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.”

As stated in the *Landfill Siting Study* (Geosyntec, April 2016a), the landfill is being constructed within the limits of portions of the to-be-closed Ash Pond A. Waste treatment systems, including treatment ponds designed to meet the requirements of the Clean Water Act (CWA), are not waters of the United States and are exempt from permitting under Section 404 of the CWA. Any wetlands that may exist within these boundaries are exempt from permitting because the CCR ponds are considered part of the existing waste treatment system which is permitted and operated under National Pollutant Discharge



Elimination System (NPDES) Permit No. SC0022471. Therefore, Landfill Area 2 is judged to be in compliance with the requirements of 40 CFR §257.61 for wetlands. Because Landfill Area 2 is not located in wetlands, there is no need for the demonstrations to show that the CCR unit meets the requirements of paragraphs (a)(1) through (a)(5) of 40 CFR §257.61.

### **2.3 Fault Areas**

40 CFR §257.62(a) states that new CCR landfills “must not be located within 60 meters (200 feet) of the outermost damage zone of a fault that has had displacement in Holocene time unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that an alternative setback distance of less than 60 meters (200 feet) will prevent damage to the structural integrity of the CCR unit.”

A summary of the structural features in South Carolina are summarized in Maybin (1998) and is provided in the *Site Hydrogeologic Characterization Study* (Geosyntec, 2016b). From an assessment of this information, it is concluded that no structural features indicative of recent (Holocene-age) faulting have been identified within 20 miles of the WGS site. The lack of a nearby fault zone has been further confirmed through previous WGS site-specific subsurface investigations documented in Geosyntec (2016b), which have showed no evidence of recent faults (i.e., no linear features that could be indicative of surface expression of a fault and no evidence of any stratigraphic offsets at depth which could be suggestive of faulting).

For the foregoing reasons, Landfill Area 2 is judged to be in compliance with the requirements of 40 CFR §257.62 for fault areas.

### **2.4 Seismic Impact Zones**

40 CFR §257.63(a) states that new CCR landfills must not be located in seismic impact zones unless the owner or operator makes certain demonstrations. A seismic impact zone is defined as “an area having a 2% or greater probability that the maximum expected horizontal acceleration, expressed as a percentage of the earth’s gravitational pull (g), will exceed 0.10 g in 50 years.” Seismic zones, which represent areas of the United States with the greatest seismic risk, are identified on U.S. Geological Survey (USGS) national seismic hazard maps as well as regional seismic hazard maps developed by local experts considering the regional geologic setting and seismicity.

As documented in the *Seismic Hazard Evaluation and Site Response Analysis* (Appendix D-1 of the *Class Three Landfill Permit Application* (Geosyntec, 2016c)), the WGS site is located in a seismic impact zone. Accordingly, 40 CFR §257.63(a) requires a demonstration that “all structural components including liners, leachate collection and removal systems, and surface water control systems, are designed to resist the maximum horizontal acceleration in lithified earth material for the site.” This demonstration is made through the engineering analyses and design presented in the *Class Three Landfill Permit Application* (Geosyntec, 2016c) and summarized in the remainder of this section.

The first step to address this location restriction and design the landfill to resist the horizontal acceleration from the specified seismic event was to conduct a “site response analysis” to evaluate the effect of local site conditions on the expected seismic-induced ground motions at the site. The objective of the site response analysis is to calculate accelerations, shear strains, and shear stresses within the site soil profiles. The methodology for the site response analysis is summarized by the following approach: (i) evaluate published seismic hazard maps to assess the maximum horizontal acceleration in lithified earth material for the site area; (ii) develop the target response spectrum, including the peak ground acceleration (PGA), at a hypothetical firm ground outcrop at WGS corresponding to the appropriate seismic hazard level; (iii) select the earthquake magnitude that contributes predominantly to the seismic hazard at WGS; (iv) select a set of ground motion time histories that envelope the target spectrum, and are generally consistent with the source and path characteristics of expected ground motions at WGS; and (v) perform a “seismic site response” analysis using “DEEPSOIL<sup>®</sup>”, a one-dimensional, nonlinear site response analysis program. The outcome of the site response analysis, provided in the *Seismic Hazard Evaluation and Site Response Analysis* presented in the *Class Three Landfill Permit Application* (Geosyntec, 2016c), was a set of calculated maximum horizontal equivalent acceleration (MHEA) vs. depth profiles and cyclic stress ratios (CSR), which were subsequently used in the seismic slope stability analysis and the liquefaction potential analysis described below.

The second step to address this location restriction and design the landfill to resist the horizontal acceleration from the specified seismic event was to conduct seismic stability analyses and liquefaction analyses of the foundation and structural components of Landfill Area 2. Details are provided in the *Static and Seismic Global Slope Stability Analysis* (Appendix D-2), and the *Liquefaction Analysis* (Appendix D-3) of the *Class Three Landfill Permit Application* (Geosyntec, 2016c), and the results are summarized below.

- Analyses were performed to evaluate seismic (as well as static) global slope stability of the landfill (critical cross section at Landfill Area 2). The term “global slope stability” refers to sliding scenarios that pass through (i) the waste mass only (Waste Slope Stability); (ii) the waste mass and foundation soils (Foundation Stability); and (iii) the waste mass and along the liner system interface (Waste-Block Liner Stability). Final cover system (on which the surface drainage features are placed) seismic stability was also analyzed. The analysis results demonstrate that the minimum calculated factor of safety (FS) against failure under seismic loading conditions is greater than the required minimum, thereby showing that the structural components of the landfill are designed with adequate seismic stability (i.e., are designed to resist the maximum horizontal acceleration in lithified earth material for the site).
- Liquefaction analyses were performed to evaluate the potential for liquefaction of foundation soils during an earthquake event and the potential effect on the integrity of Landfill Area 2. The analysis used geotechnical information collected from standard penetration test (SPT) borings and cone penetration test (CPT) soundings advanced through the perimeter dikes and within areas proposed for waste disposal (i.e., the landfill footprint) during previous site investigations. The factor of safety against liquefaction ( $FS_{Liq}$ ) was computed at every depth interval where data was collected for SPT borings and CPT soundings. The results of the analyses indicate that liquefiable soils were not observed in the perimeter dikes or foundation soils beneath the perimeter dikes of Landfill Area 2. Liquefiable foundation soils beneath the proposed footprint of Landfill Area 2 were not observed under initial conditions, and the liquefaction resistance of these soils is expected to further increase with additional waste placement

For the foregoing reasons, Landfill Area 2 is judged to be in compliance with the requirements of 40 CFR §257.63 for seismic impact zones.

## **2.5 Unstable Areas**

40 CFR §257.64(a) indicates that new CCR landfills “must not be located in an unstable area unless the owner or operator demonstrates...that recognized and generally accepted good engineering practices have been incorporated into the design of the CCR unit to ensure that the integrity of the structural components of the CCR unit will not be disrupted.” An unstable area means a location that is susceptible to natural or human-

induced events or forces capable of impairing the integrity, including structural components of some or all of the CCR unit that are responsible for preventing releases from such unit. Unstable areas can include poor foundation conditions, areas susceptible to mass movements, and karst terrains. To assess whether Landfill Area 2 may be situated in an unstable area, following factors were considered:

- On-site or local soil conditions that may result in differential settling;
- On-site or local geologic or geomorphologic features; and
- On-site or local human-made features or events (both surface and subsurface).

Landfill Area 2 has been sited in consideration of available site-specific and local/regional data from the previous *Landfill Siting Study* and *Site Hydrogeologic Characterization Study Report* (Geosyntec 2016a and 2016b, respectively). With respect to the potential presence of unstable areas, these reports reveal the following about Landfill Area 2:

- The site is not situated in an area of karst terrain.
- The site is not situated in an area with geologic features or the potential for geomorphically-induced phenomena that could be indicators of susceptibility to mass movements (i.e., landslides, avalanches, debris slides and flows, soil flocculation, block sliding, rock falls, or excessive surface erosion).
- The site is not situated in an area that could be subject to coastal or river erosion.
- The site is not situated in an area of known subsurface mines, or in an area experiencing significant water or mineral withdrawal, nor do there appear to be evidence of other human-made features or man-induced events that could result in the downslope transport of soil and rock material that would make the CCR unit susceptible to mass movements or otherwise impair the integrity of the unit.
- The site is not situated (as previously discussed) in an area of active faulting.

The *Class Three Landfill Permit Application* (Geosyntec, 2016c) presents analyses to address on-site or local soil conditions in and around Landfill Area 2. The resulting design includes structural components and features appropriately selected based on these

calculations, which demonstrate that adequate performance is predicted. With respect to potentially unstable areas, the permitted landfill design reveals the following:

- The site does not appear to be situated on poor foundation conditions that could differentially settle significantly or provide inadequate foundation support to the extent that could make the CCR unit susceptible to mass movements or otherwise impair the integrity of the structural components. This is based on foundation settlement analyses, static slope stability calculations, and the aforementioned seismic analyses and liquefaction analyses – all presented in Geosyntec (2016c).

For the foregoing reasons, Landfill Area 2 is judged to be in compliance with the requirements of §257.64 for unstable areas.

### 3 CONCLUSIONS

Geosyntec is confident the data on which this report is based demonstrates compliance with location restrictions per 40CFR §257.60 through §257.64. A compliance summary of the CCR Rule location restrictions and design criteria requirements addressed in this document are provided in Table 1 below.

Table 1 Location Restriction Compliance Summary

<i>Winyah Area 2 Landfill</i>		Compliant?	
<b>Regulation</b>	<b>CCR Location Restriction</b>	<b>YES</b>	<b>NO</b>
257.60	Placement Above Uppermost Aquifer	X	
257.61	Wetlands	X	
257.62	Fault Areas	X	
257.63	Seismic Impact Zones	X	
257.64	Unstable Areas	X	

#### 4 REFERENCES

Campbell, B.G., and Coes, A.L., eds., 2010. Groundwater Availability in the Atlantic Coastal Plain of North and South Carolina: U.S. Geological Survey Professional Paper 1773, 241 p., 7 pls.

Geosyntec Consultants (Geosyntec), 2016a. *Landfill Siting Study*, Winyah Generating Station, Georgetown, South Carolina. April, 2016.

Geosyntec, 2016b. *Site Hydrogeologic Characterization Study Report*, Winyah Generating Station, Georgetown, South Carolina. April, 2016.

Geosyntec, 2016c. *Class Three Landfill Permit Application*, Winyah Generating Station, Georgetown, South Carolina. August 2016 (with revisions as contained in “Revised Technical Application received June 5, 2017” as approved by SCDHEC on September 15, 2017).

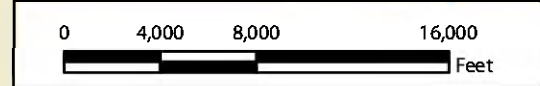
Maybin, A.H., Clendenin, C.W., Jr., and Daniels, D.L., 1998. Structural Features of South Carolina: South Carolina Geological Survey General Geologic Map Series 4, 1:500,000.

## FIGURES



**Legend**

- Approximate Limit of Pond
- Approximate Property Boundary



**Vicinity Map**  
 Santee Cooper Winyah Generation Station  
 Georgetown, South Carolina

**Geosyntec**  
 consultants

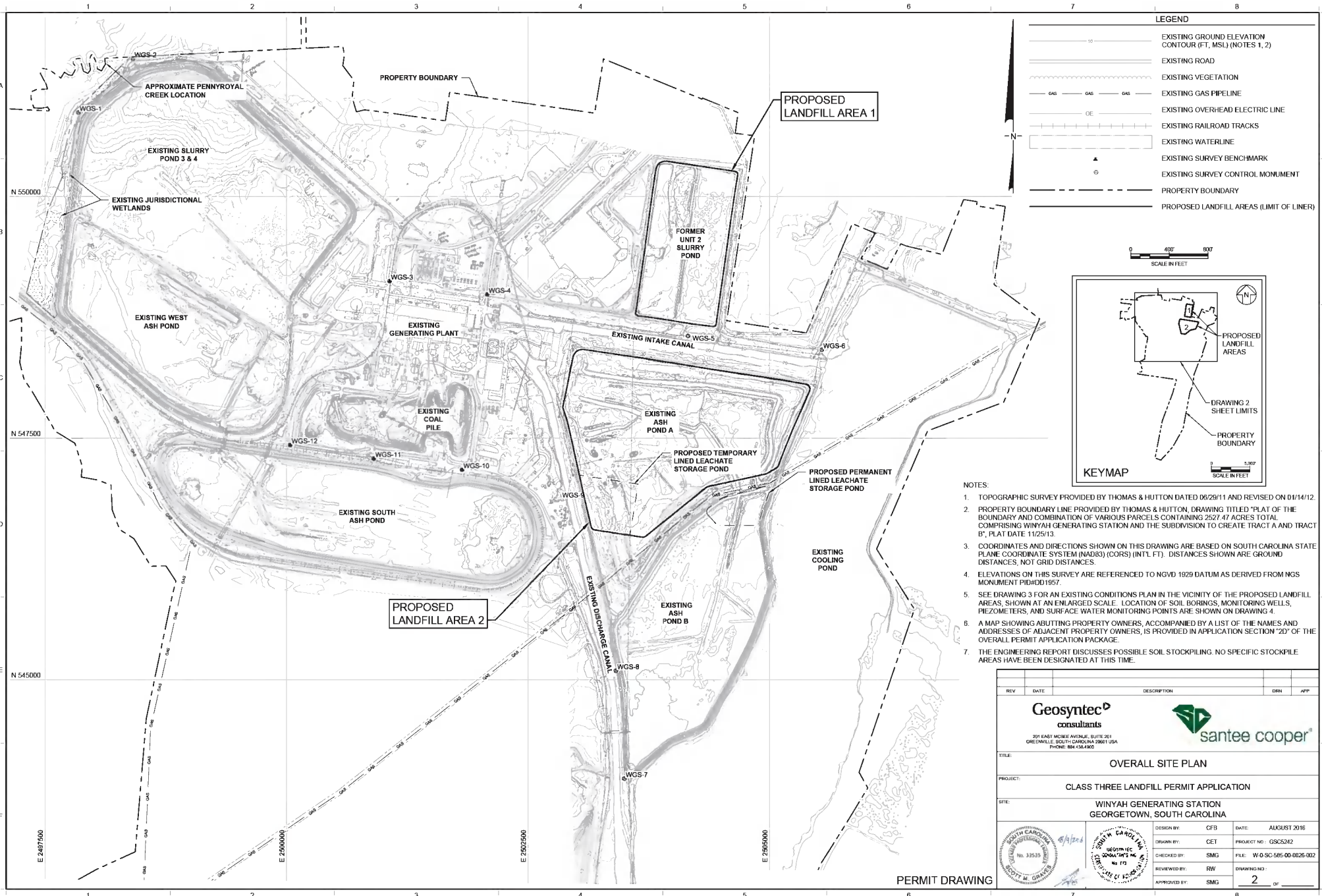
**Figure**  
**1**

PROJECT NO. GSC5242      November 2021

N:\Santee Cooper\GIS\MXD\2016\_April\Fig\_1\_Location.mxd

1. Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community  
 2. The WGS includes 2,527.47 acres zoned as Heave Industrial.  
 3. WGS boundary shown provided by Thomas & Hutton Dated 10 January 2014.



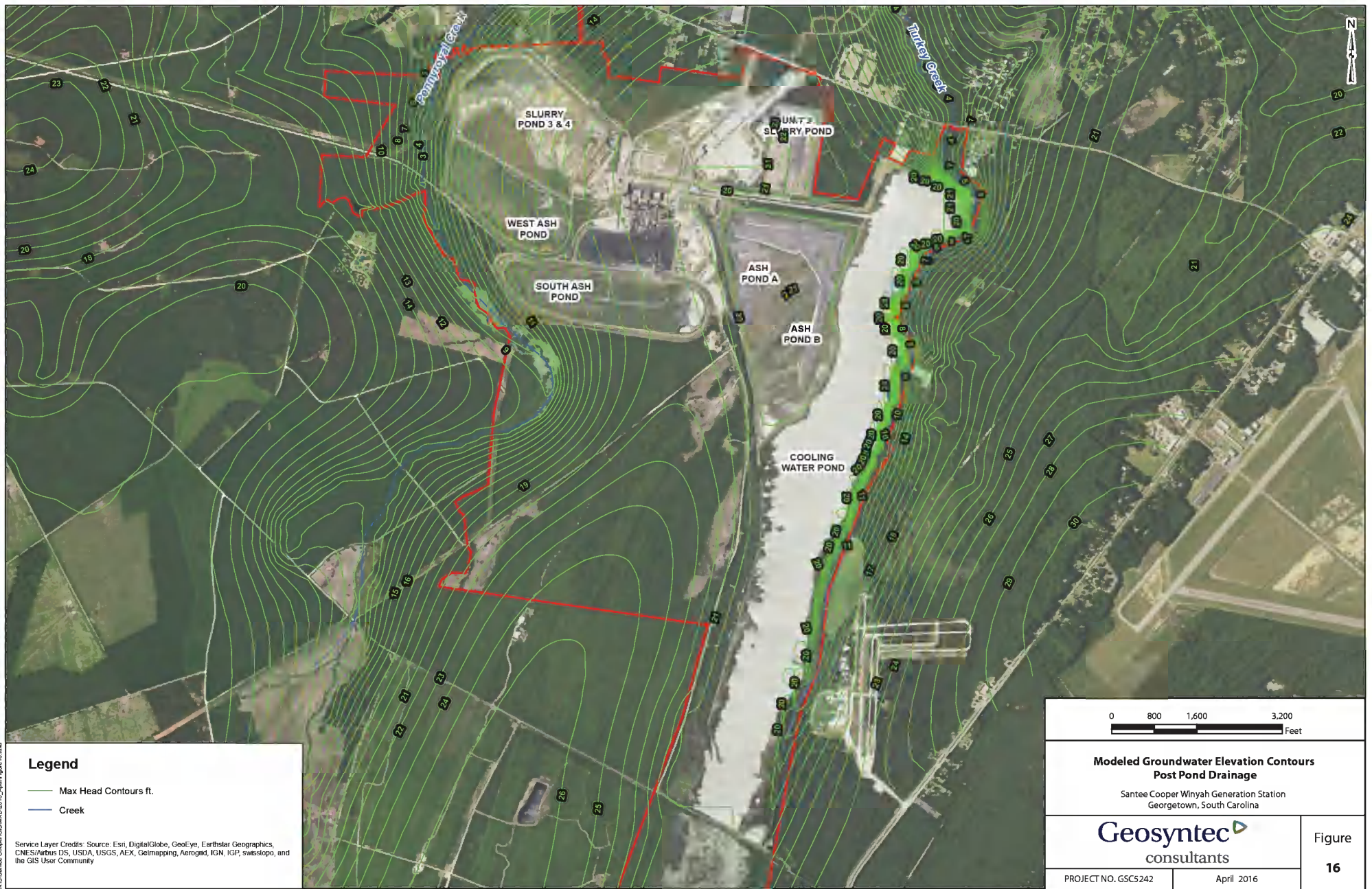


- NOTES:
1. TOPOGRAPHIC SURVEY PROVIDED BY THOMAS & HUTTON DATED 06/29/11 AND REVISED ON 01/14/12.
  2. PROPERTY BOUNDARY LINE PROVIDED BY THOMAS & HUTTON, DRAWING TITLED "PLAN OF THE BOUNDARY AND COMBINATION OF VARIOUS PARCELS CONTAINING 2527.47 ACRES TOTAL COMPRISING WINYAH GENERATING STATION AND THE SUBDIVISION TO CREATE TRACT A AND TRACT B", PLAT DATE 11/25/13.
  3. COORDINATES AND DIRECTIONS SHOWN ON THIS DRAWING ARE BASED ON SOUTH CAROLINA STATE PLANE COORDINATE SYSTEM (NAD83) (CORS) (INTL FT). DISTANCES SHOWN ARE GROUND DISTANCES, NOT GRID DISTANCES.
  4. ELEVATIONS ON THIS SURVEY ARE REFERENCED TO NGVD 1929 DATUM AS DERIVED FROM NGS MONUMENT PID#DD1957.
  5. SEE DRAWING 3 FOR AN EXISTING CONDITIONS PLAN IN THE VICINITY OF THE PROPOSED LANDFILL AREAS, SHOWN AT AN ENLARGED SCALE. LOCATION OF SOIL BORINGS, MONITORING WELLS, PIEZOMETERS, AND SURFACE WATER MONITORING POINTS ARE SHOWN ON DRAWING 4.
  6. A MAP SHOWING ABUTTING PROPERTY OWNERS, ACCOMPANIED BY A LIST OF THE NAMES AND ADDRESSES OF ADJACENT PROPERTY OWNERS, IS PROVIDED IN APPLICATION SECTION "2D" OF THE OVERALL PERMIT APPLICATION PACKAGE.
  7. THE ENGINEERING REPORT DISCUSSES POSSIBLE SOIL STOCKPILING. NO SPECIFIC STOCKPILE AREAS HAVE BEEN DESIGNATED AT THIS TIME.

REV	DATE	DESCRIPTION	DRN	APP
<p><b>Geosyntec consultants</b></p> <p>291 EAST MOORE AVENUE, SUITE 201 GREENVILLE SOUTH CAROLINA 29615 USA PHONE 884-354-4302</p>				
<p><b>santee cooper</b></p>				
<p>TITLE: <b>OVERALL SITE PLAN</b></p>				
<p>PROJECT: <b>CLASS THREE LANDFILL PERMIT APPLICATION</b></p>				
<p>SITE: <b>WINYAH GENERATING STATION GEORGETOWN, SOUTH CAROLINA</b></p>				
<p>DESIGNER: CFB</p>		<p>DATE: AUGUST 2016</p>		
<p>DRAWN BY: CET</p>		<p>PROJECT NO.: GSC25262</p>		
<p>CHECKED BY: SMG</p>		<p>FILE: W-0-SC-585-00-0026-002</p>		
<p>REVIEWED BY: RW</p>		<p>DRAWING NO.:</p>		
<p>APPROVED BY: SMG</p>		<p>2 OF 2</p>		

PERMIT DRAWING

**FIGURE 2**  
(NOV. 2021 LANDFILL AREA 2 LOCATION RESTRICTIONS DEMONSTRATION)



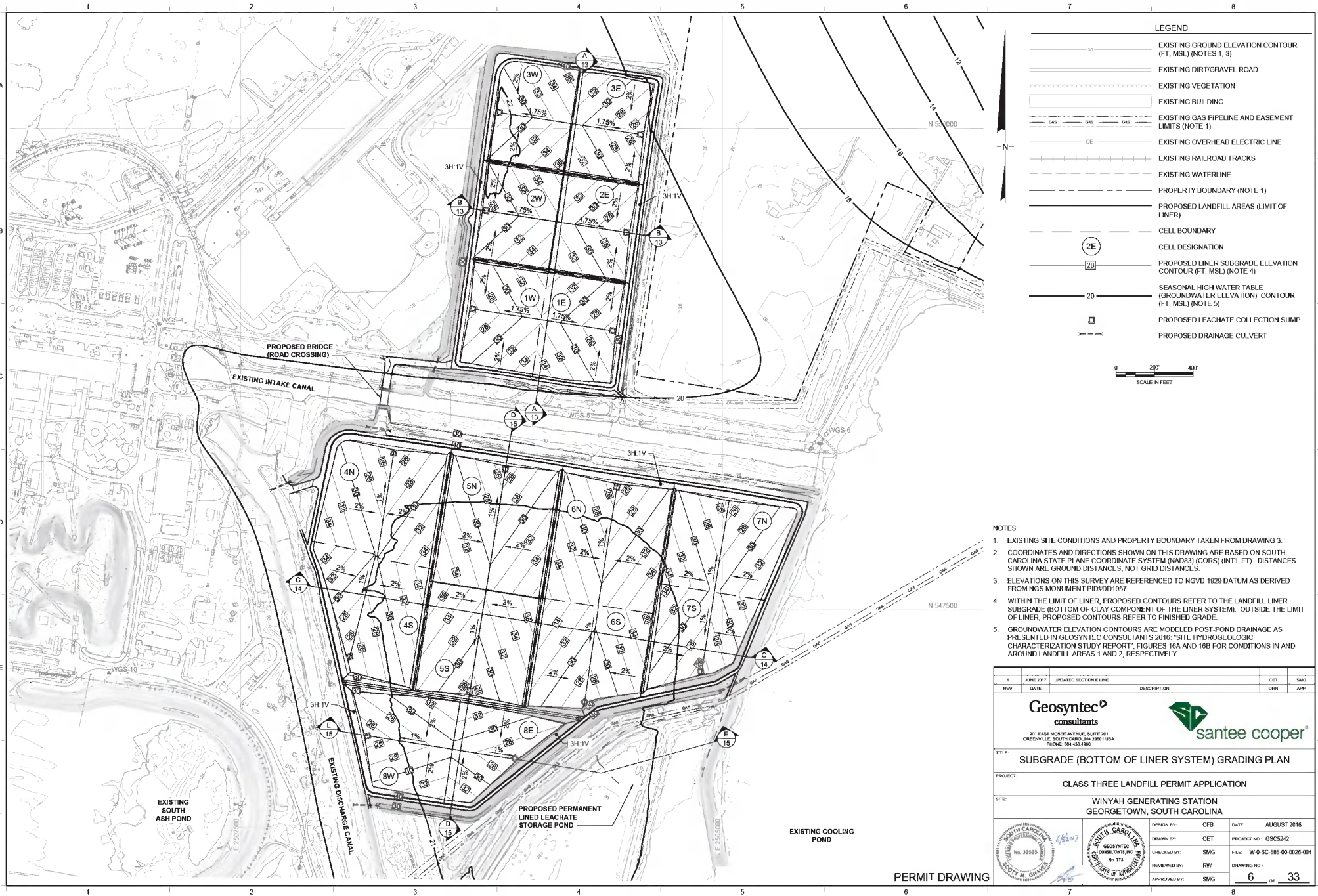
K:\Santee Cooper\GIS\Map\2016\_April\Figure 16.mxd

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

**FIGURE 3**  
(NOV. 2021 LANDFILL AREA 2 LOCATION RESTRICTIONS DEMONSTRATION)

# **APPENDIX A**

## **SUPPORTING DOCUMENTATION**



**LEGEND**

- EXISTING GROUND ELEVATION CONTOUR (FT, MSL) (NOTES 1, 3)
- EXISTING DIRT/GRAVEL ROAD
- EXISTING VEGETATION
- EXISTING BUILDING
- EXISTING GAS PIPELINE AND EASEMENT LIMITS (NOTE 1)
- EXISTING OVERHEAD ELECTRIC LINE
- EXISTING RAILROAD TRACKS
- EXISTING WATERLINE
- PROPERTY BOUNDARY (NOTE 1)
- PROPOSED LANDFILL AREAS (LIMIT OF LINER)
- CELL BOUNDARY
- CELL DESIGNATION
- PROPOSED LINER SUBGRADE ELEVATION CONTOUR (FT, MSL) (NOTE 4)
- SEASONAL HIGH WATER TABLE (GROUNDWATER ELEVATION) CONTOUR (FT, MSL) (NOTE 5)
- PROPOSED LEACHATE COLLECTION SUMP
- PROPOSED DRAINAGE CULVERT

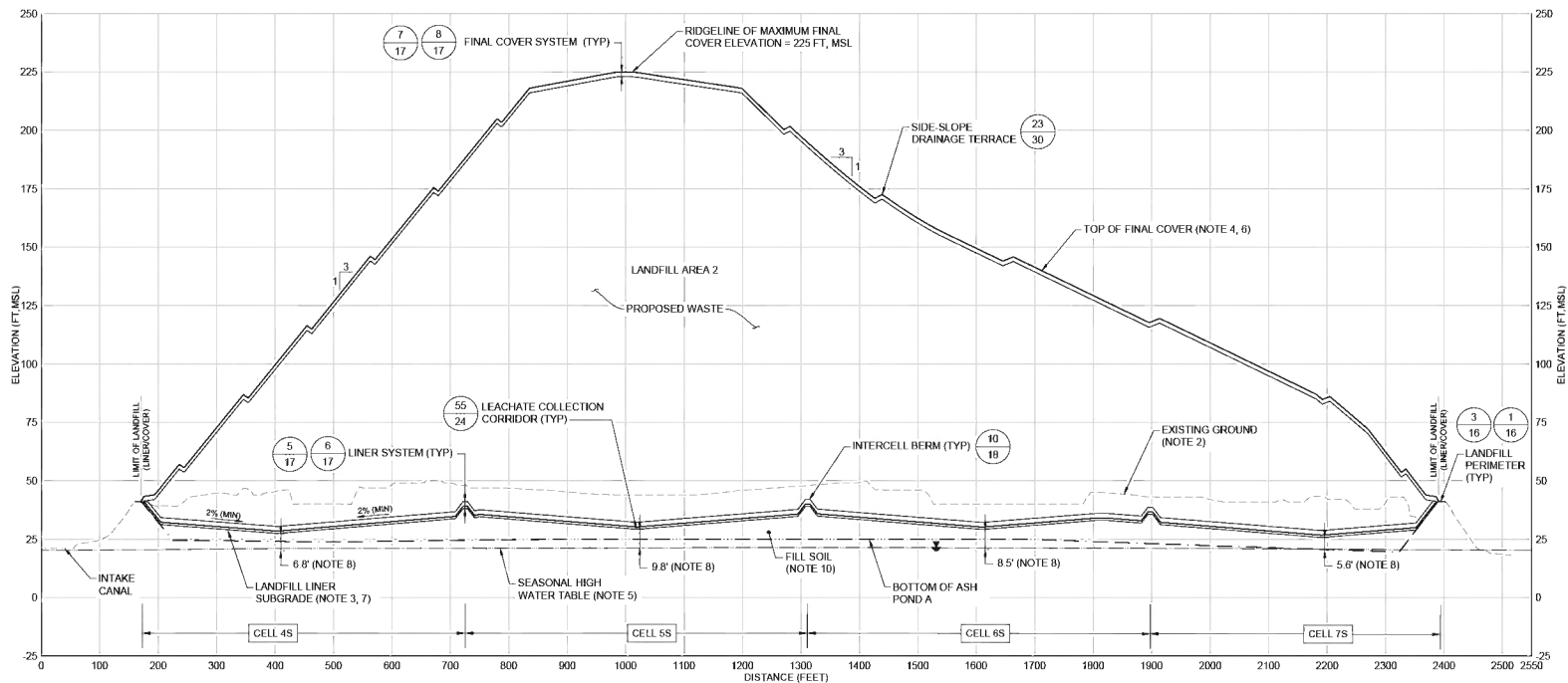


**NOTES**

1. EXISTING SITE CONDITIONS AND PROPERTY BOUNDARY TAKEN FROM DRAWING 3.
2. COORDINATES AND DIRECTIONS SHOWN ON THIS DRAWING ARE BASED ON SOUTH CAROLINA STATE PLANE COORDINATE SYSTEM (NAD83) (CORS) (INT'L FT). DISTANCES SHOWN ARE GROUND DISTANCES, NOT GRID DISTANCES.
3. ELEVATIONS ON THIS SURVEY ARE REFERENCED TO NGVD 1929 DATUM AS DERIVED FROM NGS MONUMENT PID#DD1957.
4. WITHIN THE LIMIT OF LINER, PROPOSED CONTOURS REFER TO THE LANDFILL LINER SUBGRADE (BOTTOM OF CLAY COMPONENT OF THE LINER SYSTEM). OUTSIDE THE LIMIT OF LINER, PROPOSED CONTOURS REFER TO FINISHED GRADE.
5. GROUNDWATER ELEVATION CONTOURS ARE MODELED POST-POND DRAINAGE AS PRESENTED IN GEOSYNTEC CONSULTANTS' 2016 "SITE HYDROGEOLOGIC CHARACTERIZATION STUDY REPORT"; FIGURES 16A AND 16B FOR CONDITIONS IN AND AROUND LANDFILL AREAS 1 AND 2, RESPECTIVELY.

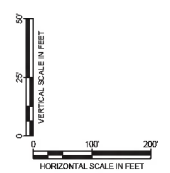
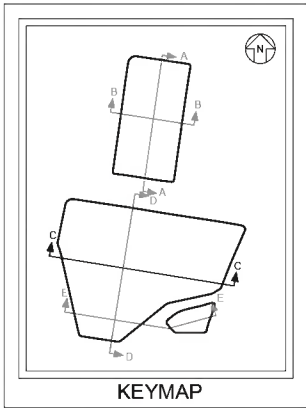
1	JUNE 2017	UPDATED SECTION E LINE	CET	SMG
REV	DATE	DESCRIPTION	DRN	APP
<p style="font-size: small; margin: 0;">201 EAST WEDGE AVENUE, SUITE 201 ORLANDO, SOUTH CAROLINA 29618 USA PHONE 864-438-4900</p>				
<p><b>TITLE:</b> SUBGRADE (BOTTOM OF LINER SYSTEM) GRADING PLAN</p>				
<p><b>PROJECT:</b> CLASS THREE LANDFILL PERMIT APPLICATION</p>				
<p><b>SITE:</b> WINYAH GENERATING STATION GEORGETOWN, SOUTH CAROLINA</p>				
		<p>DESIGN BY: CFB</p>	<p>DATE: AUGUST 2016</p>	
		<p>DRAWN BY: CET</p>	<p>PROJECT NO.: GSC5262</p>	
		<p>CHECKED BY: SMG</p>	<p>FILE: W-0-SC-595-00-0026-034</p>	
		<p>REVIEWED BY: RW</p>	<p>DRAWING NO.:</p>	
		<p>APPROVED BY: SMG</p>	<p>6</p>	<p>33</p>

PERMIT DRAWING



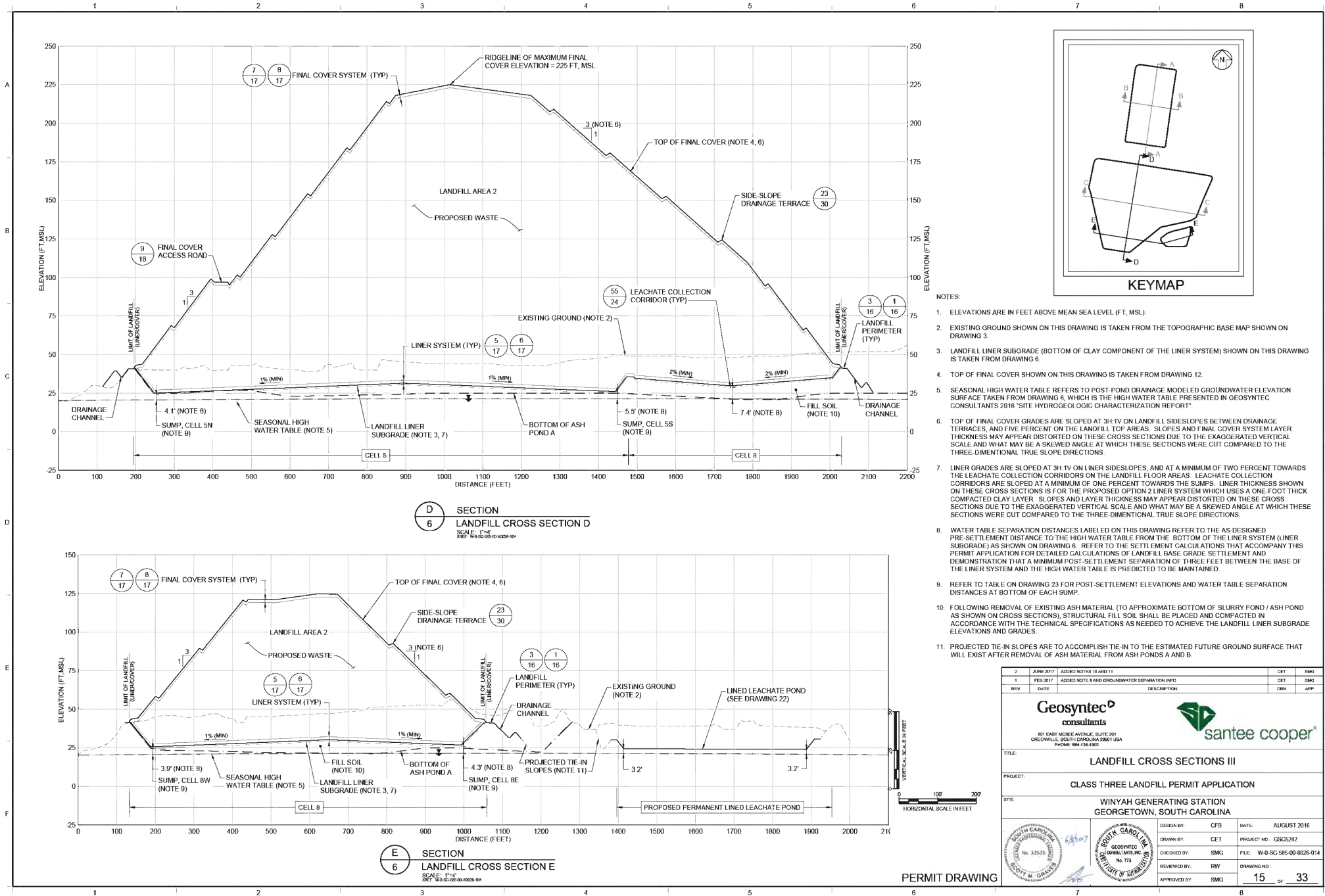
**C** SECTION  
**6** LANDFILL CROSS SECTION C  
 SCALE: 1"=4'  
 2025 710-52-595-00-05028-104

- NOTES
- ELEVATIONS ARE IN FEET ABOVE MEAN SEA LEVEL (FT, MSL).
  - EXISTING GROUND SHOWN ON THIS DRAWING IS TAKEN FROM THE TOPOGRAPHIC BASE MAP SHOWN ON DRAWING 3.
  - LANDFILL LINER SUBGRADE (BOTTOM OF CLAY COMPONENT OF THE LINER SYSTEM) SHOWN ON THIS DRAWING IS TAKEN FROM DRAWING 6.
  - TOP OF FINAL COVER SHOWN ON THIS DRAWING IS TAKEN FROM DRAWING 12.
  - SEASONAL HIGH WATER TABLE REFERS TO POST-POND DRAINAGE MODELED GROUNDWATER ELEVATION SURFACE TAKEN FROM DRAWING 6, WHICH IS THE HIGH WATER TABLE PRESENTED IN GEOSYNTEC CONSULTANTS 2016 "SITE HYDROGEOLOGIC CHARACTERIZATION REPORT".
  - TOP OF FINAL COVER GRADES ARE SLOPED AT 3H:1V ON LANDFILL SIDESLOPES BETWEEN DRAINAGE TERRACES, AND FIVE PERCENT ON THE LANDFILL TOP AREAS. SLOPES AND FINAL COVER SYSTEM LAYER THICKNESS MAY APPEAR DISTORTED ON THESE CROSS SECTIONS DUE TO THE EXAGGERATED VERTICAL SCALE AND WHAT MAY BE A SKEWED ANGLE AT WHICH THESE SECTIONS WERE CUT COMPARED TO THE THREE-DIMENSIONAL TRUE SLOPE DIRECTIONS.
  - LINER GRADES ARE SLOPED AT 3H:1V ON LINER SIDESLOPES, AND AT A MINIMUM OF TWO PERCENT TOWARDS THE LEACHATE COLLECTION CORRIDORS ON THE LANDFILL FLOOR AREAS. LEACHATE COLLECTION CORRIDORS ARE SLOPED AT A MINIMUM OF ONE PERCENT TOWARDS THE SUMPS. LINER THICKNESS SHOWN ON THESE CROSS SECTIONS IS FOR THE PROPOSED OPTION 2 LINER SYSTEM WHICH USES A ONE-FOOT THICK COMPACTED CLAY LAYER. SLOPES AND LAYER THICKNESS MAY APPEAR DISTORTED ON THESE CROSS SECTIONS DUE TO THE EXAGGERATED VERTICAL SCALE AND WHAT MAY BE A SKEWED ANGLE AT WHICH THESE SECTIONS WERE CUT COMPARED TO THE THREE-DIMENSIONAL TRUE SLOPE DIRECTIONS.
  - WATER TABLE SEPARATION DISTANCES LABELED ON THIS DRAWING REFER TO THE AS DESIGNED PRE-SETTLEMENT DISTANCE TO THE HIGH WATER TABLE FROM THE BOTTOM OF THE LINER SYSTEM (LINER SUBGRADE) AS SHOWN ON DRAWING 6. REFER TO THE SETTLEMENT CALCULATIONS THAT ACCOMPANY THIS PERMIT APPLICATION FOR DETAILED CALCULATIONS OF LANDFILL BASE GRADE SETTLEMENT AND DEMONSTRATION THAT A MINIMUM POST-SETTLEMENT SEPARATION OF THREE FEET BETWEEN THE BASE OF THE LINER SYSTEM AND THE HIGH WATER TABLE IS PREDICTED TO BE MAINTAINED.
  - REFER TO TABLE ON DRAWING 23 FOR POST-SETTLEMENT ELEVATIONS AND WATER TABLE SEPARATION DISTANCES AT BOTTOM OF EACH SUMP.
  - FOLLOWING REMOVAL OF EXISTING ASH MATERIAL (TO APPROXIMATE BOTTOM OF SLURRY POND / ASH POND AS SHOWN ON CROSS SECTIONS), STRUCTURAL FILL SOIL SHALL BE PLACED AND COMPACTED IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS AS NEEDED TO ACHIEVE THE LANDFILL LINER SUBGRADE ELEVATIONS AND GRADES.



2	JUNE 2017	ADDED NOTE 10		DET	SMG
1	FEB 2017	ADDED NOTE 9 AND GROUNDWATER SEPARATION INFO		DET	SMG
REV	DATE	DESCRIPTION	CRN	APP	
<b>Geosyntec consultants</b> 201 EAST MOORE AVENUE, SUITE 201 GREENVILLE, SOUTH CAROLINA 29614 USA PHONE 864-434-4302					
<b>santee cooper</b>					
<b>TITLE: LANDFILL CROSS SECTIONS II</b>					
<b>PROJECT: CLASS THREE LANDFILL PERMIT APPLICATION</b>					
<b>SITE: WINYAH GENERATING STATION          GEORGETOWN, SOUTH CAROLINA</b>					
				DESIGN BY: CFB DATE: AUGUST 2016 DRAWN BY: CET PROJECT NO.: GSC5262 CHECKED BY: SMG FILE: W-0-SC-595-00-0026-013 REVIEWED BY: RW DRAWING NO.: APPROVED BY: SMG	
				14 OF 33	

PERMIT DRAWING



- NOTES:**
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  - EXISTING GROUND SHOWN ON THIS DRAWING IS TAKEN FROM THE TOPOGRAPHIC BASE MAP SHOWN ON DRAWING 3.
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  - SEASONAL HIGH WATER TABLE REFERS TO POST-POND DRAINAGE MODELED GROUNDWATER ELEVATION SURFACE TAKEN FROM DRAWING 6, WHICH IS THE HIGH WATER TABLE PRESENTED IN GEOSYNTEC CONSULTANTS'S 2016 "SITE HYDROGEOLOGIC CHARACTERIZATION REPORT".
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  - LINER GRADES ARE SLOPED AT 3H:1V ON LINER SIDESLOPES, AND AT A MINIMUM OF TWO PERCENT TOWARDS THE LEACHATE COLLECTION CORRIDORS ON THE LANDFILL FLOOR AREAS. LEACHATE COLLECTION CORRIDORS ARE SLOPED AT A MINIMUM OF ONE PERCENT TOWARDS THE SUMPS. LINER THICKNESS SHOWN ON THESE CROSS SECTIONS IS FOR THE PROPOSED OPTION 2 LINER SYSTEM WHICH USES A ONE-FOOT THICK COMPACTED CLAY LAYER. SLOPES AND LAYER THICKNESS MAY APPEAR DISTORTED ON THESE CROSS SECTIONS DUE TO THE EXAGGERATED VERTICAL SCALE AND WHAT MAY BE A SKEWED ANGLE AT WHICH THESE SECTIONS WERE CUT COMPARED TO THE THREE-DIMENSIONAL TRUE SLOPE DIRECTIONS.
  - WATER TABLE SEPARATION DISTANCES LABELED ON THIS DRAWING REFER TO THE AS DESIGNED PRE-SETTLEMENT DISTANCE TO THE HIGH WATER TABLE FROM THE BOTTOM OF THE LINER SYSTEM (LINER SUBGRADE) AS SHOWN ON DRAWING 6. REFER TO THE SETTLEMENT CALCULATIONS THAT ACCOMPANY THIS PERMIT APPLICATION FOR DETAILED CALCULATIONS OF LANDFILL BASE GRADE SETTLEMENT AND DEMONSTRATION THAT A MINIMUM POST-SETTLEMENT SEPARATION OF THREE FEET BETWEEN THE BASE OF THE LINER SYSTEM AND THE HIGH WATER TABLE IS PREDICTED TO BE MAINTAINED.
  - REFER TO TABLE ON DRAWING 23 FOR POST-SETTLEMENT ELEVATIONS AND WATER TABLE SEPARATION DISTANCES AT BOTTOM OF EACH SUMP.
  - FOLLOWING REMOVAL OF EXISTING ASH MATERIAL, (TO APPROXIMATE BOTTOM OF SLURRY POND / ASH POND AS SHOWN ON CROSS SECTIONS), STRUCTURAL FILL SOIL SHALL BE PLACED AND COMPACTED IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS AS NEEDED TO ACHIEVE THE LANDFILL LINER SUBGRADE ELEVATIONS AND GRADES.
  - PROJECTED TIE-IN SLOPES ARE TO ACCOMPLISH THE TIE-IN TO THE ESTIMATED FUTURE GROUND SURFACE THAT WILL EXIST AFTER REMOVAL OF ASH MATERIAL FROM ASH POND A AND B.

2	JUNE 2017	ADDED NOTES 16 AND 17	DET	SMG
1	FEB 2017	ADDED NOTE 9 AND GROUNDWATER SEPARATION INFO	DET	SMG
REV	DATE	DESCRIPTION	CRN	APP

**Geosyntec**  
consultants

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GREENVILLE, SOUTH CAROLINA 29615 USA  
PHONE 864-436-4302

**santee cooper**

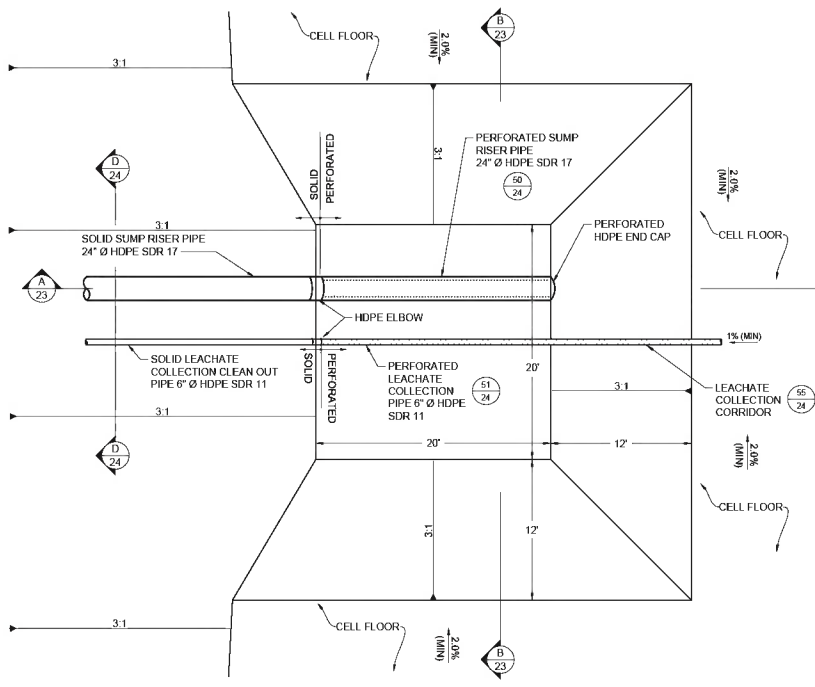
**TITLE:** LANDFILL CROSS SECTIONS III

**PROJECT:** CLASS THREE LANDFILL PERMIT APPLICATION

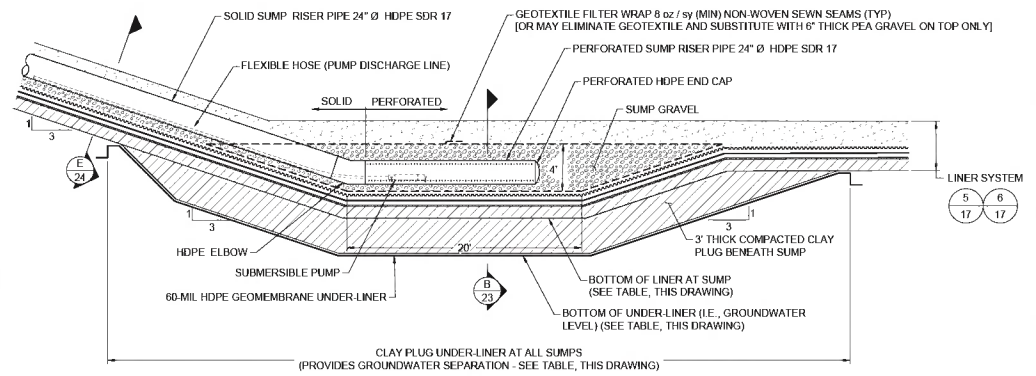
**SITE:** WINYAH GENERATING STATION  
GEORGETOWN, SOUTH CAROLINA

DESIGNER BY:	CFB	DATE:	AUGUST 2016
DRAWN BY:	CET	PROJECT NO.:	GSC262
CHECKED BY:	SMG	FILE:	W-0-SC-595-00-0026-014
REVIEWED BY:	RW	DRAWING NO.:	
APPROVED BY:	SMG		15 OF 33

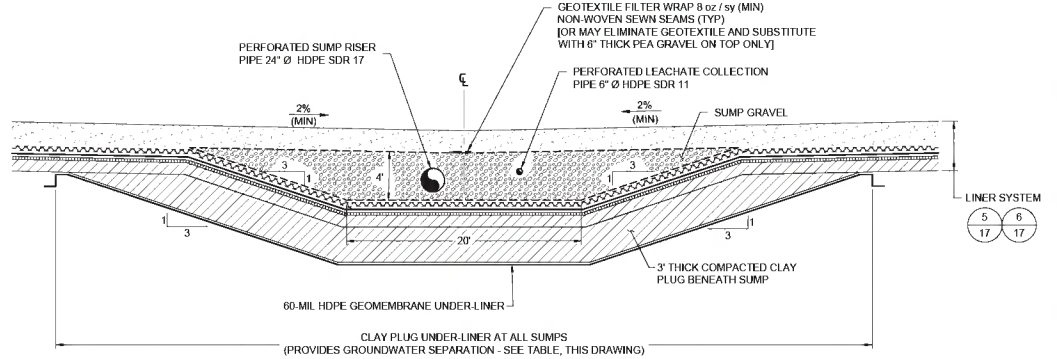
PERMIT DRAWING



**34** PLAN  
LEACHATE COLLECTION SUMP  
SCALE: N.T.S.

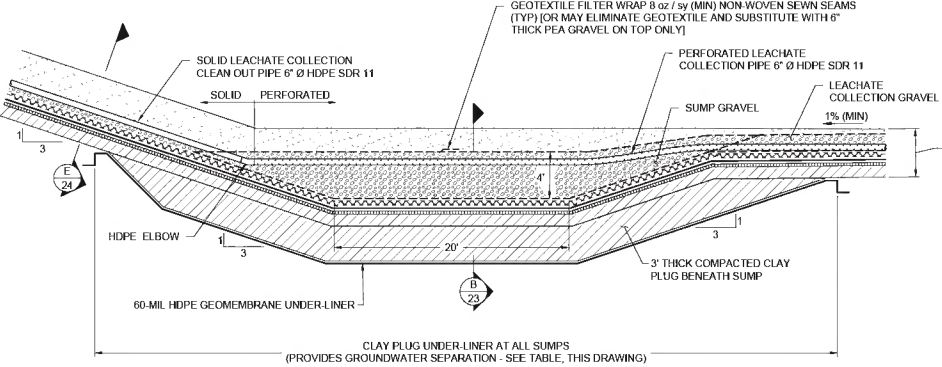


**A** SECTION  
**23** LEACHATE COLLECTION SUMP  
SCALE: N.T.S.  
REF: W-02-665-00-00226-147



**B** SECTION  
**23** LEACHATE COLLECTION SUMP  
SCALE: N.T.S.  
REF: W-02-665-00-00226-144

- NOTES:
1. ALL SUMP RISERS SHALL BE PROVIDED WITH SEALABLE BLIND FLANGES AS APPROVED BY THE ENGINEER. ALL FLANGES FOR ALL PIPE SIZES SHALL HAVE RED RUBBER GASKETS. THE NUTS, BOLTS, AND WASHERS USED TO SECURE THE BLIND FLANGES SHALL BE ZINC PLATED.
  2. ALL PIPE PENETRATIONS THROUGH LINER SYSTEM SHALL BE DOUBLE Banded WITH NON-ADJUSTABLE STAINLESS STEEL CLAMPS (SEE SHEET 25 FOR DETAIL).
  3. DETAILS ARE DRAWN SHOWING THE "OPTION 2" LINER SYSTEM WHICH IS ANTICIPATED TO BE USED. IF "OPTION 1" LINER SYSTEM IS USED, MAINTAIN CONSISTENCY WITH THE CONCEPTS SHOWN ON THESE DETAILS.



**C** SECTION  
**23** LEACHATE COLLECTION SUMP  
SCALE: N.T.S.

POST-SETTLEMENT GROUNDWATER SEPARATION AT SUMP LOCATIONS			
SUMP ID	BOTTOM OF SUMP ELEVATION (FT, MSL)	BOTTOM OF CLAY PLUG (I.E., WATER TABLE) ELEVATION (FT, MSL)	GROUNDWATER SEPARATION (FT)
1W	21.6	18.6	3.0
1E	21.3	18.3	3.0
2W	23.1	20.1	3.0
2E	21.4	18.4	3.0
3W	23.1	20.1	3.0
3E	20.8	17.8	3.0
4N	20.7	17.7	3.0
4S	20.6	17.6	3.0
5N	21.2	18.2	3.0
5S	23.3	20.3	3.0
6N	21.2	18.2	3.0
6S	22.3	19.3	3.0
7N	21.2	18.2	3.0
7S	21.4	18.4	3.0
8W	21.0	18.0	3.0
8E	22.2	19.2	3.0

2	JUNE 2017	UPDATED ELEVATION LABELS		DET	SMG
1	FEB 2017	REVISED SUMP DETAILS		DET	SMG
REV	DATE	DESCRIPTION		DRN	APP

**Geosyntec consultants**  
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**santee cooper**

TITLE: **LEACHATE SUMP PLAN**

PROJECT: **CLASS THREE LANDFILL PERMIT APPLICATION**

SITE: **WINYAH GENERATING STATION  
GEORGETOWN, SOUTH CAROLINA**

DESIGNED BY:	CFB	DATE:	AUGUST 2016
DRAWN BY:	CET	PROJECT NO.:	GSC5262
CHECKED BY:	SMG	FILE:	W-02-665-00-00226-024
REVIEWED BY:	RW	DRAWING NO.:	
APPROVED BY:	SMG	23	33

PERMIT DRAWING

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