



Prepared for

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

LOCATION RESTRICTIONS COMPLIANCE DEMONSTRATION

SOUTH ASH POND WINYAH GENERATING STATION GEORGETOWN, SOUTH CAROLINA

Prepared by

Geosyntec 
consultants

engineers | scientists | innovators

201 E. McBee Avenue, Suite 201
Greenville, South Carolina 29601

Project Number GSC5242.01BT

October 2018

Certification Statement – Demonstration of Compliance with Location Restrictions

Federal CCR Rule: 40 CFR §257.60-64

CCR Unit: South Ash Pond

Certification:

This Location Restrictions Compliance Demonstration was prepared in accordance with current practices and the standard of care exercised by scientists and engineers performing similar tasks in the field of civil engineering, and no other warranty is provided in connection therewith. The contents of this report are based solely on the observations of the conditions observed by Geosyntec personnel and information provided to Geosyntec by Santee Cooper. Consistent with applicable professional standards of care, our opinions and recommendations were based in part on data furnished by others. Although we were not able to independently verify such data, we found that it was consistent with other information that we developed in the course of our performance of the scope of services. The information contained in this report is intended for use solely by Santee Cooper and their subconsultants. Based on the evaluations presented in this Location Restrictions Compliance Demonstration Report, the South Ash Pond does not meet the requirements of 40 CFR §257.60 for placement 5 feet above the uppermost aquifer. Therefore, the above-referenced CCR Unit is not, 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 existing coal combustion residuals (CCR) surface impoundments.



Seal and Signature:

A handwritten signature in blue ink that reads "Carlos F. Benavente".



Firm Seal

Printed Name:

Carlos Fabian Benavente

PE License Number:

32067

State:

South Carolina

TABLE OF CONTENTS

CERTIFICATION STATEMENT

1	INTRODUCTION	1
1.1	Facility Location.....	1
1.2	Previous Investigations and Reports.....	3
1.3	Site Geology and Hydrogeology	5
2	LOCATION RESTRICTIONS EVALUATION.....	6
2.1	Placement Above the Uppermost Aquifer.....	7
2.2	Wetlands	7
2.3	Fault Areas.....	8
2.4	Seismic Impact Zones.....	9
2.5	Unstable Areas.....	10
3	CONCLUSIONS	12
4	REFERENCES	13

LIST OF TABLES

Table 1	Location Restriction Compliance Summary
---------	---

LIST OF FIGURES

Figure 1	Vicinity Map
Figure 2	Site Plan – South Ash Pond
Figure 3	Modeled Groundwater Elevation Contours Post Pond Drainage

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 the “South Ash Pond” at the Winyah Generating Station (WGS) located in Georgetown, South Carolina (Figure 1). The South Ash Pond is an existing CCR surface impoundment at the WGS site.

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 South Ash Pond is subject to the CCR Rule as an existing CCR surface impoundment 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. In March 2018, EPA proposed changes to the CCR Rule. The deadline for closure of units that do not meet the location restriction requirement pertaining to placement of CCR no less than five feet above the uppermost aquifer was extended until October 31, 2020.

This document serves as WGS’s location restriction demonstrations for the South Ash Pond 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. 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 have been disposed in six on-site ponds/surface impoundments. One of these ponds is the South Ash Pond, an unlined surface impoundment which was designed by Burns and Roe in 1977 and 1978, commissioned in 1980, and has a surface area of approximately 75 acres. The South Ash Pond is situated immediately south of the coal stockpile and power block and is encircled by a coal delivery railroad which loops around the impoundment. Outside of the rail loop, the northern side of the South Ash Pond is bounded by the Coal Pile, the southern side is bounded by a forested area, the western side is bounded by Pennyroyal Creek and the eastern side is bounded by an access road and the Discharge Canal. Vehicular access to the perimeter dike is limited by the rail loop and provided at a single location along the northern portion of the dike.

The unit historically received fly ash, boiler slag, bottom ash, low volume wastewater, and stormwater. Currently, the South Ash Pond receives low volume wastewater from Units 3 and 4, Unit 3 and 4 fly ash sluice (when fly ash is not handled dry), and blowdown and stormwater from the SEFA Star Facility. The South Ash Pond is permitted to receive Unit 3 and 4 bottom ash sluice, Coal Pile Runoff from the western half of the coal pile, and stormwater runoff from the exterior perimeter of the pond. The purpose of the South Ash Pond is to contain CCR and treat process wastewater and stormwater to remove solids by gravity settling. Decanted water is discharged through a riser structure to the Discharge Canal.

The design layout of the pond and perimeter dikes are provided in Drawings 3-CV-548, 3-CV-549, and 3-CV-550, which show that the perimeter dikes were constructed of compacted earth with 3H:1V interior side slopes. The downstream side slopes are typically 3H:1V, except in the western corner where the side slopes are 4H:1V due to the presence of a soft clay zone in the foundation materials (Drawing 3-CV-549). Typical perimeter dike cross sections are provided in Drawing 3-CV-551. The upstream base of dike of the South Ash Pond is located near existing grade (12.5 to 20 ft National Geodetic Vertical Datum of 1929 [NGVD 29]). Site plans and design cross sections depict toe drains that discharge to a shallow perimeter channel installed outside the perimeter dike of the South Ash Pond. Construction dewatering trenches were excavated to drawdown and route water through a 30-in diameter bituminous coated corrugated metal pipe located in the southwest corner (Drawing 3-CV-549). The drawdown pipe was connected to a new catch basin and an existing 54-in diameter corrugated metal pipe to route water away from the excavation.

Water from the West Ash Pond was originally routed to the South Ash Pond through a drawdown structure located in the south east corner of the West Ash Pond. Drawing 3-CV-555 depicts a 36-in diameter Class III and Class IV reinforced concrete pipe routed under the existing rail line into the South Ash Pond with invert elevations of 12.5 ft NGVD 29. This structure was abandoned in 2012. In 2013, Santee Cooper installed a supplementary toe drain in the northwest corner of the South Ash Pond. The 500-ft long toe drain, west of the existing pipe bridge from the West Ash Pond, was installed to address the presence of wet areas observed during dike inspections (Santee Cooper, 2014).

Drawings 3-CV-555 and 3-C-591 (Lockwood-Greene, 1978) show a concrete riser structure and 36-in diameter Class IV RCP horizontal pipe for managing the discharge from the South Ash Pond. The 36-in diameter Class IV RCP was installed using the jack-and-bore technique beneath the railroad and discharges to a small open channel outside of the railroad embankment. From the small open channel, water is conveyed through a 36-in diameter Class III RCP to the Discharge Canal. The concrete riser structure is equipped with adjustable stop logs. The design inlet and outlet inverts for each of the RCPs were 16.0 ft. Three (3) anti-seepage collars were installed at 25-ft intervals along the Class IV RCP. Each anti-seepage collar extended 2-ft around the diameter of the pipe and were 2-ft in length (Lockwood-Greene, 1978). A recent survey (Thomas and Hutton, 2016) shows the bottom of the riser structure is 15.7 ft (NGVD 29) and the top of the top wooden stop log is 28.73 ft (NGVD 29). The maximum height of the perimeter dike is approximately 22 ft with a top of dike elevation between 38.8 ft to 40.3 ft NGVD 29. The South Ash Pond is the subject of this demonstration and is shown on Figure 2.

1.2 Previous Investigations and Reports

Santee Cooper has implemented a number of investigations at the WGS site to collect geologic, hydrogeologic, and geotechnical data. This includes previous investigations in and around the footprint of the South Ash Pond. In 1977 and 1978, Soil and Materials Engineers, Inc. (S&ME) performed a general subsurface investigation in support of the construction of the CCR impoundments. Information collected by the S&ME investigation was utilized to assess the suitability of on-site materials for the construction and for the design of the dike structures. The investigation included soil test borings with Standard Penetration Tests (SPT) generally at five-foot (ft) intervals until refusal was encountered at the Chicora Member (dense cemented shell) at

approximately 26.5 to 41 ft below ground surface (bgs). A total of eighteen borings were performed within the footprint of the South Ash Pond prior to construction.

In October 2013, Geosyntec conducted a subsurface investigation that included five test borings and 12 CPT soundings for the purpose of seismic and liquefaction evaluations. One of the test borings and three of the CPT soundings were advanced within the interior of the South Ash Pond and were terminated once native foundation materials were encountered. Four of the test borings were drilled in the dike materials and advanced beyond the Chicora Member and five feet into the underlying Williamsburg Formation. Six CPT soundings were advanced through the perimeter dike center and three were advanced at the dike toe. In 2016, Geosyntec conducted a supplementary investigation in the west corner of the South Ash Pond that consisted of three test borings and four CPT soundings through the perimeter dike centerline and dike toe.

This Federal CCR Rule Location Restrictions Compliance Demonstration is based on and supported by the detailed information contained in the following documents:

- *Subsurface Investigation Ash and Slurry Pond Dikes*, Winyah Generating Station, Georgetown, South Carolina, 1978, prepared by Soil and Material Engineers, Inc.;
- *Report: Geotechnical/Hydrogeologic Investigation*, Winyah Generating Station, 1999, prepared by Paul C. Rizzo Associates, Inc.;
- *Site Hydrogeologic Characterization Study Report*, Winyah Generating Station, Georgetown, South Carolina, April 2016, prepared by Geosyntec Consultants;
- *History of Construction Report – South Ash Pond*, Winyah Generating Station, Georgetown, South Carolina, October 2016, prepared by Geosyntec Consultants; and
- *2016 Surface Impoundment Periodic Safety Factor Assessment Report – South Ash Pond*, Winyah Generating Station, Georgetown, South Carolina, October 2016, prepared by Geosyntec Consultants.

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). General information about the regional geologic units is summarized below, from the top unit to the bottom unit:

- **Undifferentiated Quaternary Sediments:** this geologic unit consists of yellowish-brown and reddish-orange poorly sorted, very fine to very coarse, clayey sand and gravel. Accessory minerals include opaque heavy minerals, mica, and feldspar. The Undifferentiated Quaternary sediments thickness ranges between 20 and 42 ft in the area.
- **The Williamsburg Formation (Williamsburg):** this geologic unit consists of gray to black interbedded clay and coarse quartz sand overlying shelly clay and calcareous clay. The Williamsburg can include sandy shale, fuller's earth, fossiliferous clayey sand (Lower Bridge Member), and fossiliferous clayey sand and mollusk-rich, bioclastic limestones (Chicora Member). The thickness of the Williamsburg in the vicinity of the site ranges between 30 and 90 ft.
- **The Lang Syne Formation:** As described in the literature by Muthig and Colquhoun (1988), this geologic unit consists of red and yellow (where weathered) or white, gray, and black (where freshly exposed) interbedded sand, silt, and clay and thin beds of silicified shell debris. Opaline clay stone is the most characteristic lithology of the Lang Syne Formation.
- **The Rhems Formation:** This geologic unit consists of light-gray to black shale interlaminated with thin seams of fine-grained sand and mica.
- **The Peedee Formation:** this geologic unit consists of a dark-green to gray, fossiliferous, glauconitic clayey sand and silt. The combined thickness of the Lang Syne, Rhems, and Peedee Formations ranges between 185 and 378 ft in the vicinity of the WGS.

Additional late Cretaceous Formations are present to a depth of approximately 2,200 ft bgs in the area. These formations, in descending order, include: Donoho Creek, Bladen, Coachman, Cane Acre, Caddin, Sheppard Grove, Pleasant Creek, Cape Fear, and undifferentiated Cretaceous sediments (Geosyntec, 2016a).

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, 2016c), 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 (Geosyntec, 2016c) 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, two ponds have been closed. Once the new landfill is operational and the remaining ponds are dewatered and closed, the effect of the ponds on recharge to the water table will be eliminated. For these reasons, a modeled seasonal high water table representing conditions after closure of the slurry ponds and ash ponds was developed (Geosyntec, 2016). A map of the seasonal high water table conditions used for this location restrictions evaluation 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 existing CCR surface impoundments “*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 seasonal high water table is included in Figure 3 of this report. As shown, the groundwater elevations range from 12 feet in the western portion of the South Ash Pond to elevation 18 feet in the eastern portion of the South Ash Pond, based on NGVD 29. Typical measured seasonal high water levels confirm the modeled results, with water levels ranging from 13.7 feet NGVD 29 at monitoring well WAP-3/PPZW-3D on the northwestern edge of the South Ash Pond to 22.4 feet NGVD 29 at well PPZ-14 on the northeastern side of the South Ash Pond, as recorded in 2014 and 2015, respectively (Geosyntec, 2016c).

Engineering construction drawings indicate the bottom of the South Ash Pond to be approximately 19 feet NGVD 29 in the western portion of the South Ash Pond (Lockwood Greene, 3-CV-549, 1979) to elevation 22.5 feet NGVD 29 in the eastern portion of the South Ash Pond (Lockwood Greene, 3-CV-540, 1979).

For the foregoing reasons, the South Ash Pond is not 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 existing CCR surface impoundments “*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.”

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. A demonstration to show that the South Ash Pond meets the requirements of paragraphs (a)(1) through (a)(5) of 40 CFR §257.61 is not necessary since the CCR unit is not located in areas delineated or defined as wetlands. The South Ash Pond is considered to be in compliance with the requirements of 40 CFR §257.61 for wetlands.

2.3 Fault Areas

40 CFR §257.62(a) states that existing CCR surface impoundments “*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, 2016). 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 (2016), 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, the South Ash Pond is considered 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 existing CCR surface impoundments 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.” While United States Geological Survey (USGS) national seismic hazard maps are the most commonly used resources for the selection of Peak Ground Acceleration (PGA), regional seismic hazard maps developed by local experts consider regional geologic setting and seismicity and are often the preferred alternatives.

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 Attachment 6 of the *2016 Surface Impoundment Periodic Safety Factor Assessment Report – South Ash Pond* (Geosyntec, 2016b), and is further evaluated in the remainder of this section.

The target spectrum for “geologically realistic” site conditions was selected using the South Carolina Department of Transportation (SCDOT) Geotechnical Design Manual (SCDOT, 2010) seismic hazard maps as described in the Attachments 6 and 8 of the *2016 Surface Impoundment Periodic Safety Factor Assessment Report – South Ash Pond* (Geosyntec, 2016b). The Site PGA is 0.16g for “geologically realistic” conditions. The “geologically realistic” target acceleration response spectrum has a PGA (represented by a spectral period of 0.01 seconds) of 0.16g and a peak spectral acceleration of 0.48g at a spectral period of 0.2 seconds. Site response analyses were performed to evaluate the effect of local site conditions on the expected ground motions at the Site. The objective of the site response analysis is to calculate accelerations and shear stresses within the Site soil profiles. Shear stresses were examined to evaluate the seismic stability analysis (Attachment 6 of the Safety Factor Assessment Report) and liquefaction potential analysis (Attachment 7 of the Safety Factor Assessment Report).

Computed cyclic shear stresses were applied for the liquefaction potential analysis and were also utilized to evaluate the seismic safety factor as a part of the safety factor assessment using DEEPSOIL® (Hashash et al., 2015), a one-dimensional nonlinear site response analysis program. The site response analysis presented in the *2016 Surface Impoundment Safety Factor Assessment Report* (Geosyntec, 2016b) considers the full depth of soil columns (i.e., 500 feet bgs), but results are presented for soil columns to a depth of 100 feet bgs to emphasize the near-surface response. The calculated FS for each of the cross sections exceed the respective target FS for static and seismic FS.

For the foregoing reasons, the South Ash Pond is considered 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 existing CCR surface impoundments “*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 is defined as “*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 the South Ash Pond may be situated in an unstable area, the following factors were considered:

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

Potentially liquefiable zones were encountered in the subsurface soils adjacent and downstream to the perimeter dikes in some areas. The “Safety Factor Assessment - South Ash Pond” calculation package, provided as Attachment 8 to the *2016 Periodic Safety Factor Assessment Report – South Ash Pond* (Geosyntec, 2016b)

presents analyses to address on-site or local soil conditions in and around the South Ash Pond. The liquefaction potential was evaluated for soil borings and cone penetration test (CPT) soundings advanced through the South Ash Pond perimeter dike based on geotechnical information collected during Geosyntec's 2013 geotechnical subsurface investigations and a historical investigation performed in 1999 (PCRA, 1999). Borings and soundings located at the perimeter dike toe were analyzed during an evaluation of "Unstable Areas" in accordance with the CCR Rule. The liquefaction analyses were performed on both the CPT soundings and SPT borings. The methodology to compute the potential of soils to liquefy and the factor of safety against liquefaction are described below.

Global slope stability analyses were performed using Spencer's method (Spencer, 1973), as implemented in the computer program SLIDE[®], version 6.037 (Rocscience, 2015). The Factors of Safety values calculated for static conditions under maximum normal storage pool, static maximum surcharge pool, and seismic maximum normal storage pool exceeded the target FS. Furthermore, the FS calculated for liquefaction slope stability also exceeded the target FS. The dike fill and foundation soils directly underlying the South Ash Pond (i.e., Cross Sections B, C, D, and E) were not found to be susceptible to liquefaction during the design earthquake, and thus the liquefaction safety factor of the perimeter dike is not required to be evaluated during the periodic safety factor assessment (Attachment 8, Geosyntec, 2016b).

For the foregoing reasons, the South Ash Pond is considered to be in compliance with the requirements of §257.64 for unstable areas.

3 CONCLUSIONS

A compliance summary of the CCR Rule location restrictions requirements addressed in this document are provided in Table 1 below.

Table 1 Location Restriction Compliance Summary

<i>Winyah South Ash Pond</i>		Compliant?	
Regulation	CCR Location Restriction	YES	NO
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, 2016a. *History of Construction Report – South Ash Pond*, Winyah Generating Station, Georgetown, South Carolina. October.
- Geosyntec, 2016b. *2016 Surface Impoundment Periodic Stability Report – South Ash Pond*, Winyah Generating Station, Georgetown, South Carolina. October.
- Geosyntec, 2016c. *Groundwater Modeling Report, Appendix M of the Site Hydrogeologic Characterization Study Report*, Winyah Generating Station, Georgetown, South Carolina. April.
- Geosyntec, 2016d. *Site Hydrogeologic Characterization Study Report*, Winyah Generating Station, Georgetown, South Carolina. October.
- Hashash, Y.M.A., Musgrove, M.I., Harmon, J.A., Groholski, D.R., Phillips, C.A., and Park, D., 2015. “DEEPSOIL[®] 6.1, User Manual”, Board of Trustees of University of Illinois at Urbana-Champaign, Urbana, Illinois.
- Lockwood Greene Engineers, 1978. *A Drawing Set for Santee Cooper Winyah Generating Station*. Drawings for Construction Numbers 3-CV-549 and 3-CV-550.
- 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.
- Muthig, M.G and D.J. Colquhoun (1988), Formal recognition of two members within the Rhems Formation in Calhoun County, South Carolina: South Carolina Geology, V. 32, nos. 1-2, p. 11-19.
- Paul C. Rizzo Associates, Inc.(PCRA), 1999. *Report: Geostecnical/Hydrogeologic Investigation* Winyah Generating Station, Georgetown, South Carolina.

Soil & Material Engineers, Inc. 1978. *Subsurface Investigation Ash and Slurry Pond Dikes Winyah Generating Station, Georgetown, South Carolina.*

South Carolina Department of Transportation (SCDOT), 2010. Geotechnical Design Manual (GDM), seismic hazard maps.

Spencer, 1973. "The Thrust Line Criterion in Embankment Stability Analysis," *Geotechnique*, Volume 23, No. 1, pp. 85-100. March.

Thomas and Hutton, 2016. "Topographic Survey of the Dike Crests at Santee Cooper, Winyah Generating Station", prepared for Santee Cooper.

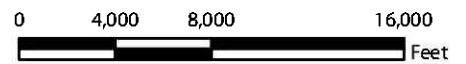
FIGURES



Legend

- Approximate Limit of Pond
- Approximate Property Boundary

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.



Vicinity Map

Santee Cooper Winyah Generation Station
 Georgetown, South Carolina

Geosyntec
 consultants





Figure
1

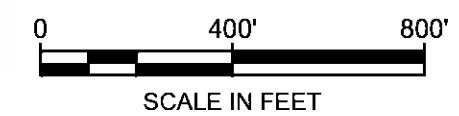
PROJECT NO. GSC5242


April 2016

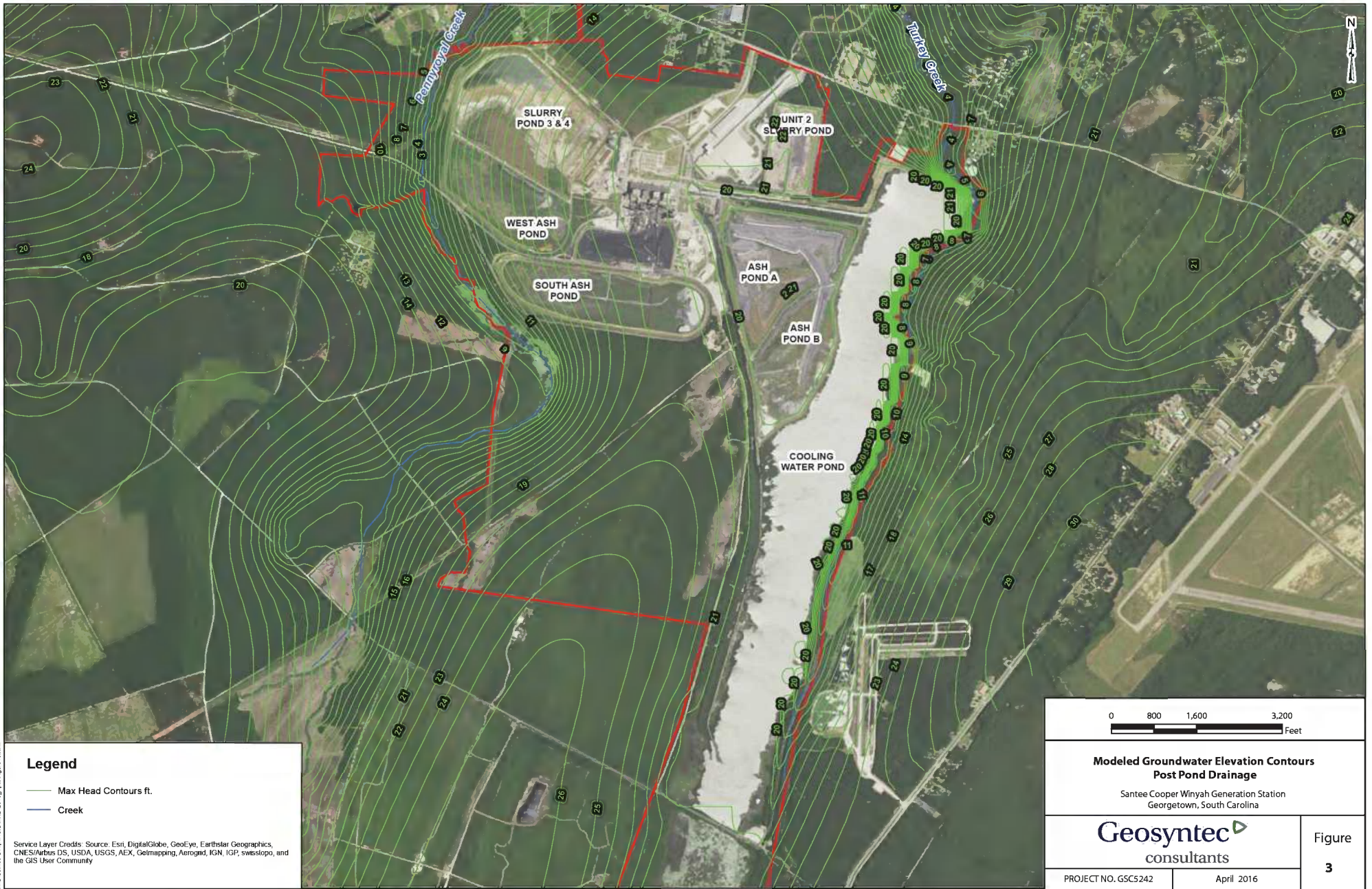


LEGEND

-  POND BOUNDARY
-  APPROXIMATE PIPE ALIGNMENT FROM COAL PILE PUMP STATION
-  PIPE ALIGNMENT FOR ADDITIONAL PROCESS INFLOWS
-  PIPE ALIGNMENT FROM DISCHARGE STRUCTURE TO DISCHARGE CANAL



Site Map - South Ash Pond Santee Cooper Winyah Generation Station Georgetown, South Carolina	
	FIGURE 2
PROJECT NO: GSC5242	FEBRUARY 2016



Legend

- Max Head Contours ft.
- Creek

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

0 800 1,600 3,200
Feet

**Modeled Groundwater Elevation Contours
Post Pond Drainage**

Santee Cooper Winyah Generation Station
Georgetown, South Carolina

Geosyntec
consultants

PROJECT NO. GSC5242

April 2016

Figure
3