APPENDIX H

Geologic and Hydrogeologic Report (Golder 2018)

GEOLOGIC AND HYDROGEOLOGIC REPORT

PLANT WANSLEY

CARROLL COUNTY, GEORGIA

FOR

Georgia Power

NOVEMBER 2018

GOLDER

Table of Contents

Table of Contents - continued

FIGURES

Certification

This *Geologic and Hydrogeologic Report, Georgia Power Company, Plant Wansley* has been prepared in compliance with applicable Georgia Solid Waste Management Rule by a qualified groundwater scientist or engineer with Golder Associates Inc. References to the appropriate 391-3-4 Rules are incorporated throughout this document.

I hereby certify that this Geologic and Hydrogeologic Report was prepared by, or under the direct supervision of, a "Qualified Groundwater Scientist," in accordance with the Georgia Environmental Protection Division (EPD) Rules of Solid Waste Management. According to 391-3-4-.01(57), a Qualified Groundwater Scientist is "a professional engineer or geologist registered to practice in Georgia who has received a baccalaureate or post-graduate degree in the natural sciences or engineering and has sufficient training and experience in groundwater hydrology and related fields that enable individuals to make sound professional judgments regarding groundwater monitoring, contaminant fate and transport, and corrective action." This report was prepared in compliance with the Georgia EPD Rules of Solid Waste Management, Chapter 391-3-4.10(9)(c)(6)(ii).

Golder Associates Inc.

11/1/2018

Dawn L. Prell
Senior Hydrogeologist

Date

RACHEL P. KIRKMAN
Rachel
11-1-18
PG001756

11/1/2018

Rachel P. Kirkman, PG
Georgia Registered Professional Geologist No.1756

Date

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1.0 INTRODUCTION

Georgia Environmental Protection Division (EPD) Rule 391-3-4-.10 of the Georgia Solid Waste Management Regulations provides the requirements for permitting and closure of CCR regulated facilities in Georgia (GA). A technical report of geologic and hydrogeologic units within the disposal site is required for inactive surface impoundments as specified in Georgia EPD Rule 391-3-4-.10(9)(c)(6). This report describes geologic and hydrogeologic information for Georgia Power's Plant Wansley and will act as the technical geologic and hydrogeologic report to meet the requirement for permitting and closure.

2.0 BACKGROUND INFORMATION

2.1 Site Description and Physiography

Plant Wansley is located in southeast Carroll County, GA and northeast Heard County, GA, and is owned and operated by the Georgia Power Company. The Plant occurs approximately 15 miles west of Newnan, GA, 9 miles northeast of Franklin, GA, and 12 miles southeast of Carrollton, GA and is surrounded primarily by agricultural and residential land use. The property occupies approximately 5,100 acres and is bounded to the east-southeast by the Chattahoochee River.

Plant Wansley consists of four gas-fired combined cycle units and two coal-fired units. Flue gas desulfurization (FGD) equipment (i.e., scrubbers) has been installed on both coal-fired units, generating between approximately 386,000 and 900,000 tons per year of gypsum that requires disposal. An ash pond and a cooling pond have been developed on site through impoundment of natural, unnamed tributaries to the Chattahoochee River. These ponds are elongated, oriented northeast-southwest. The ash pond occupies approximately 354 acres and the cooling pond occupies approximately 589 acres. Three monofill cells have also been developed within the southeastern portion of the site, occupying approximately 325 acres. A site location map is included as Figure 1, Site Location Map and a detailed site map is included as Figure 2, Existing Conditions.

The site occurs within the Piedmont Physiographic Province of western Georgia, which is characterized by gently rolling hills and narrow valleys, with locally pronounced linear ridges. The site has two topographic ridges that are located northwest and southeast of the ponds; the ponds being constructed in the intervening valley, as shown on Figure 1. Two small hills also occur along the western property boundary near the monofill cells and the remainder of the property slopes gently south and southeast toward the Chattahoochee River. Topographic relief across the site is greater than 300 feet, with a natural topographic high of over 960 feet above mean sea level (ft. msl) occurring along the topographic ridge northwest of the ponds, and a topographic low of less than 660 ft. msl near the Chattahoochee River. Several relatively small, intermittent and perennial creeks and streams form tributaries to the Chattahoochee, discharging into the river along the southern and eastern property boundaries.

2.2 Regional Geologic and Hydrogeologic Setting

The following section and subsections include a general description of regional geologic and hydrogeologic characteristics of formations that occur beneath the site. Information presented in this section is based on published literature, discussion with local geologic experts, and experience working in this geologic terrain. This information is intended to serve as a framework for site specific conditions presented below.

Plant Wansley is located within the southeastern corner of the Lowell, GA United States Geological Survey (USGS) 7.5-minute topographic quadrangle. The Piedmont/Blue Ridge geologic province contains some of the oldest rocks in the Southeastern United States. Since their origin, approximately 276 to 1100 million years ago

(Ma), these late Precambrian (Neoproterozoic) to late Paleozoic (Permian) rocks have undergone repeated cycles of igneous intrusions and extrusions, metamorphism, folding, faulting, shearing, and silicification. The latest regional metamorphism and associated deformation has been attributed to the collision of the North America plate with the Eurasian plate approximately 200 to 230 Ma. More recent deformation and emplacement of mafic dikes is associated with the rifting of the North American craton during the Mesozoic and Cenozoic Eras.

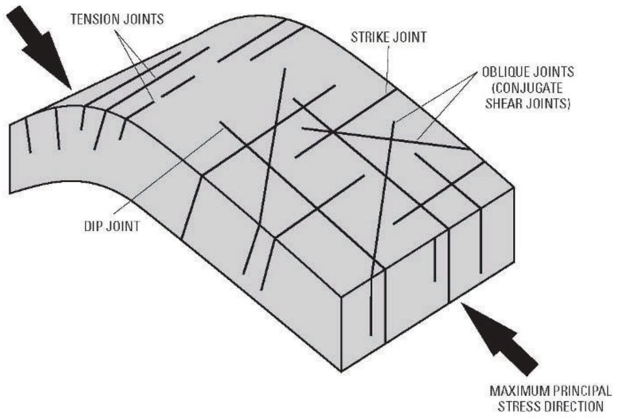
The metamorphic and igneous rocks that underlie the area have been subjected to physical and chemical weathering which has created a landscape dissected by creeks and streams forming a rectangular drainage pattern. These rocks are deeply weathered due to the humid climate and bedrock is typically overlain by a variably thick blanket of residual soils and saprolite. The overall depth of weathering in the Piedmont/Blue Ridge is generally about 20 to 60 feet; however, the depth of weathering along discontinuities and/or very feldspathic rock units may extend to depths greater than 100 feet. Because of such variations in rock types and structure, the depth of weathering can vary significantly over short horizontal distances.

2.2.1 Regional Geologic Structure

Four regional faults traverse northeast-southwest through this area, referred to as the Chattahoochee Fault, Orkin Lake Fault, Long Island Creek Fault and the Katy Creek Fault. The Chattahoochee, Orkin Lake and Long Island Creek Faults are all characterized by near-vertical, strike-slip movement and were formed at significant depth within the crust. These faults endured ductile deformation, forming in a high pressure, low-temperature environment. The Katy Creek Fault is a thrust fault, dipping at a lower angle than the strike-slip faults. This thrust fault developed at a relatively shallower depth in the crust than the strike-slip faults, resulting in less-pronounced ductile structural fabrics. Uplift associated with building of the Appalachian Mountains and subsequent erosion has allowed modern exposure of these structural features.

The Chattahoochee Fault and Katy Creek Fault bound a regional zone of deformation, referred to as the Brevard Zone that extends from Alabama to Virginia. Lithologic contacts and major structural features in the Brevard Zone generally trend northeast-southwest. In addition to strike-slip and thrust faults, structural features within this shear zone consist of northwest-verging, doubly-plunging, overturned folds that have been overprinted by a shear-induced foliation. The Centralhatchee Synclinorium is a regional fold-system that occurs within the Brevard. Discreet zones of intense shearing occur within the Brevard Zone that have locally reduced the grain size of the parent rocks forming a variety of tectonic rock types, including phyllonite, button schist, and mylonitic rocks. Generally, the Brevard Zone and associated shear foliation are subparallel to compositional layering and lithologic unit contacts, with discordance of less than 10 degrees. Discordance significantly increases between the shear foliation and regional foliation in areas of fold noses and hinges.

Typically, up to four different joint sets formed in this area due to tectonic stresses imposed upon the bedrock. Dip joints form parallel to the regional dip direction of foliation/compositional layering and are typically



Schematic diagram showing the typical joint patterns

perpendicular to fold limbs, representing extension perpendicular to the maximum principal stress direction or direction of compression. These joints are commonly near vertical. Strike joints develop parallel to the strike of foliation/compositional layering and fold limbs, typically forming from tension during relaxation of the maximum principal stress. The dip direction and angle of these joints is orthogonal to the dip direction and angle of compositional layering. Oblique joints develop diagonal (± 30^{o}) to the principal stress direction and represent conjugate sets formed from shear along the intermediate principal stress.

2.2.2 Regional Stratigraphy

Three major structural/stratigraphic packages occur within the Piedmont/Blue Ridge around the site. A regionally extensive unit of mixed lithologies occurs northwest of the Brevard Zone, within the core of the Austell-Frolona Anticlinorium. This sequence is referred to as the OZmu (Proterozoic- to Ordovician-age mixed unit) and primarily consists of a broad area of interlayered granofelsic gneiss, graphitic schist, and muscovite and biotite schist that have been pegmatized with muscovite, quartz, and feldspar. This unit is lithologically heterogeneous and displays uneven, differential weathering, with depth to competent bedrock being highly variable over short horizontal distances.

The Brevard Zone includes fine-grained and porphyroblastic schists, button schists, phyllonitic schists, biotite schists, and schists locally interlayered with amphibolite/hornblende gneiss, and ultamafic bodies; mylonites, ultramylonites, and flinty crush rock; metagraywacke and feldspathic quartzite; and granitic gneiss. Rocks within these various lithologic units have been intensely deformed, sheared, chemically altered, silicified and are generally repeated because of movement along faults both within and outside of the Brevard Zone.

The Dadeville Complex occurs southeast of the Brevard Zone and is considered to represent an Ordovician-age Island Arc. Rocks within this complex are generally more mafic, primarily consisting of biotite gneiss and thick, mappable layers of amphibolite/hornblende gneiss. The biotite gneiss is also interlayered with thin, discontinuous layers, lenses and pods of amphibolite. The continuous and discontinuous amphibolite layers and lenses weather more deeply but less uniformly than the surrounding biotite gneiss in this area.

2.2.3 Regional Hydrogeology

Groundwater in the Piedmont/Blue Ridge geologic province can occur as perched water within residual soils, as an unconfined regional aquifer within residual soils and transitionally weathered materials, and as a series of confined to semi-confined, discreet but locally interconnected aquifer systems within the bedrock. Perched groundwater occurs above the local or regional groundwater table and is locally developed above lithologies with relatively lower permeability which temporarily retard the natural downward infiltration of groundwater. This groundwater is unconfined, recharged by precipitation, and is laterally discontinuous and temporally transient.

The regional groundwater table is laterally consistent and generally occurs within overburden overlying fresh bedrock. In general, this overburden consists of residual soils and a transitionally weathered zone typical of most southeastern Piedmont settings. Due to chemical weathering, saprolitic-soil retains relict structural features of the parent rock such as foliation and compositional layering while having the texture of a soil. Saprolitic rock is similar to the saprolitic soil but less decomposed. This saprolitic material is generally more permeable than the overlying residuum, and the underlying fresh rock, and serves to concentrate groundwater along a tabular zone of enhanced permeability. Although weathering generally increases porosity and permeability within this zone, some processes taking place in this zone, such as the growth of clay minerals, mineral deposition in fractures, and development of iron oxide ‘hardpan,’ can significantly decrease the permeability. This tabular zone of enhanced permeability is referred to as the transitionally weathered zone, which is characterized by heterogeneously interlayered, fresh to completely weathered (saprolitic) rock.

Groundwater within the overburden (comprised of both residual soils and transitionally weathered rock) is generally unconfined, the surface of which is generally a subdued reflection of topography. It is recharged by precipitation stored in residual soils and typically discharges into major streams and rivers. During drought, the water levels within the overburden are overall lower. In areas where bedrock is relatively shallow and when water levels are seasonally depressed, the regional groundwater table also occurs within the upper zones of weathered bedrock.

Bedrock aquifer systems are recharged by groundwater that is stored in the overburden. This groundwater slowly infiltrates underlying bedrock aquifer systems by moving through preferentially weathered discontinuities in the bedrock mass, such as foliation/compositional layering, joints, and faults. The occurrence and characteristics of discontinuities (e.g., size, orientation, dilation, infilling, spacing, and persistence) are dependent on the mineralogy of the rock and the type of stresses applied to the overall rock mass. These discontinuities are locally enlarged along individual planes as well as at the intersection of planes due to physical and chemical weathering, providing preferential pathways for enhanced groundwater flow. Groundwater can move readily, both vertically and horizontally, through these isolated areas of enhanced secondary porosity and permeability, and depending upon the size, concentration, and interconnection of these secondary openings, the bedrock can either be dry or host to high-yield wells.

3.0 SITE GEOLOGIC CONDITIONS

3.1 Geologic Mapping Methodology

Detailed geologic mapping was performed by Petrologic Solutions, Inc. (Petrologic) in 2015 within and around the site using the Lowell, GA USGS 7.5-minute topographic quadrangle as a base map. Figures 3-1 and 3-2, Geologic Map and Schematic Cross Section, present interpretation of structural and lithologic features encountered during mapping of the area. Information recorded at each map station included: lithology and mineralogy; orientation and characteristics of structural discontinuities including, shearing, faulting, jointing, cleavage, and compositional layering; and depth and type of weathering characteristics of the rock. Map station locations were recorded using a hand-held, Wide Area Augmentation System (WAAS)-enabled Global Positioning System (GPS).

3.2 Residual Soil and Saprolite

To develop a better understanding of subsurface conditions, available boring and monitoring well installation logs were reviewed. Interpretations were made, primarily related to depth to bedrock and the material that constitutes bedrock, considering criteria such as blow counts, rock core recovery, and rock quality designation (RQD) values. These data were used as the basis for Figure 4, Estimated Top of Rock Map and two geologic cross sections, presented as Figure 5, Geologic Cross Sections Schematic.

Based on this review, residual soils, primarily sandy silt, silty sand, sandy clay and silty clay, occur as a variably-thick blanket overlying bedrock across most of the site, as illustrated on Figure 5. The thickness of the soil encountered in the borings is variable, ranging from less than five feet to as much as 130 feet. Laboratory tests generally classify the soils as ML, MH, SM and CL. Thickness of saprolitic soils and/or saprolitic rock range in thickness across the site but were generally encountered at or near ground surface. Saprolitic rock is also considered to be partially weathered rock (PWR), which is defined by Standard Penetration Test (SPT) blow counts that exceed 50 blows/foot.

Based on the detailed geologic mapping, rock types present at the site variably include graphitic schist, muscovite schist, biotite schist, schist with interlayered mafic units, amphibolite/hornblende gneiss, granitic gneiss, and feldspathic quartizite. Because these rock types have different mineralogy, texture, and chemistry, they will weather differently. In general, the overall degree of weathering, from least weathered to most weathered, is: granitic gneiss (OZli); graphitic schist (OZmu), muscovite schist (OZsg), and biotite schist (OZbs); schist with interlayered mafics (OZsau); feldspathic quartzite (OZq); and amphibolite (OZa). However, because of structural attitudes, zones of intensely-weathered rock may be present at depth, underlying units that are very resistant to weathering, creating a relatively thick transitional weathering zone at the site.

The criterion used for identifying top of bedrock was largely based on the depth at which a significant thickness of fresh, relatively competent (i.e., RQD>50%) bedrock was encountered. Observations made in nearby borings, experience working in the Piedmont, and professional judgment were also used in interpreting top of rock elevations. These elevations were used to develop the top of rock contour map (Figure 4). The cross sections were also used to bolster three-dimensional interpretation of the surface. As shown on Figure 4, the top of rock surface generally follows topography which has been influenced by differential weathering of the underlying rocks. For example, the ridge north of the pond is underlain by OZsg, and the ridge south of the pond adjacent to the tailings pile is underlain by OZli. These units are generally more resistant to weathering than others on the site; consequently, a top of rock ridge has developed which mirrors the topographic ridge that occurs in these areas. Alternatively, the ponds are underlain by the OZsau and OZq. Both of these units are less resistant to weathering; consequently, a top of rock trough has developed which is reflected by the topographic valley that occurs in this area.

Material overlying the top of rock surface, including residual soils, saprolite, and transitionally weathered rock, is collectively referred to as overburden in this report.

3.3 Lithologic Units

During geologic mapping by Petrologic, distinct lithologic units were identified to underlie the site. A brief description of these lithologies along with other characteristics is presented below. Characteristics of these lithologies are also presented below, and the aerial distribution of each unit is shown on Figure 3.

Mixed Unit (OZmu): Interlayered graphitic mica schist with illminite, feldspathic gneiss, and metagraywacke with numerous metamorphic pegmatites. This unit is non-uniform and massive, poorly foliated, and weathers unevenly. Large relatively unweathered blocks of rock are commonly observed within the residual and saprolitic soils. Domestic water wells in this unit typically yield less than 10 gallons per minute (gpm). The Chattahoochee Fault divides the Mixed Unit from the muscovite schist located adjacent and to the southeast. This fault also marks the northwestern boundary of the Brevard Zone.

Muscovite Schist (OZsg): Muscovite schist with small, disseminated garnets, locally interlayered with quartzose schist and metagraywacke. Although the muscovite schist is poorly jointed, the metagraywackes are well jointed but laterally discontinuous, yielding poor groundwater-bearing characteristics. Additionally, this unit does not weather deeply. The muscovite schist occurs upgradient of the ash pond; weathering of garnets within this unit may promote naturally enriched Fe, Mn, and Ca in groundwater. The Orkin Lake Fault occurs near the northwest shoreline of the ash pond and divides the muscovite schist from a schist with mafic interlayers located adjacent and to the southeast.

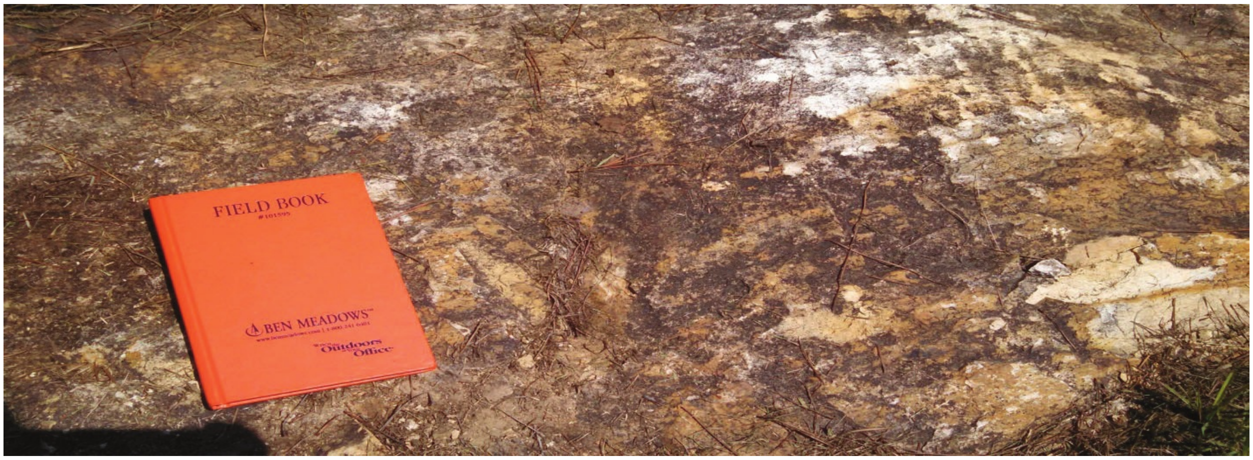
Schist-Amphibolite Unit (OZsau): Quartzose Schist and feldspathic gneiss interlayered with amphibolite/hornblende gneiss and local, small ultramafic bodies. Primarily occurs beneath the ash pond on site. Weathering of abundant naturally occurring pegmatites may yield Uranium and daughter products (e.g., Radium 226/228) in groundwater. If ultramafic bodies are present on site, weathering could produce naturally elevated metals in groundwater.

Quartzite (OZq): Feldspathic, micaceous guartzite. Three limbs are observed to cross the site primarily beneath the ash pond. The southern two limbs, shown on Figure 3, form the Centralhatchee Synclinorium, a regional fold within the Brevard Zone. These quartzite layers are variably slightly to highly weathered, depending upon the concentration of feldspar, deform brittle, and are highly fractured with multiple, continuous joint sets. The well-jointed nature of this unit, in combination with well-developed shear and regional foliation, significantly enhances secondary permeability, providing the conditions for preferential groundwater flow. This is the most transmissive unit underlying the Plant Wansley property.

Photograph showing exposure of Quartzite Layer at Plant Wansley

Garnet Schist (OZgs): Mica Schist with porphyroblastic garnet with abundant pegmatite pods and lenses. Occurs within the middle of the Centralhatchee Synclinorium, overlain and underlain by quartizite.

Long Island Creek Gneiss (OZli): Weakly foliated, massive, unfractured, granitic gneiss. A discreet zone of intense shearing related to the Brevard Zone occurs within this unit at the site. Bedrock is intensely sheared, crushed, and ground into a silicified cataclasite that is highly resistant to weathering. Titinite (sphene) and epidote are ubiquitous within this unit, the weathering of which may promote naturally enriched titanium in groundwater. Due to its poorly weathered, weakly foliated, and unfractured nature, this unit may function more as an aquitard than aquifer in bedrock. The Long Island Creek Gneiss is separated from the OZsau unit to the northwest by the Long Island Creek Fault.



Photograph showing the exposure of Long Island Creek Gneiss at Plant Wansley (this is the pavement-looking outcrop)

Sheared Button Schist (OZbs): Interlayered muscovite-rich button schist, phyllonite, and metagraywacke. The well-developed shear and regional foliation create the button appearance of muscovite in the schist. Mafic interlayers are absent, and garnet is sparse in this unit. This unit is resistant to weathering due to its crushed/fine-grained nature and has relatively poor groundwater-bearing characteristics. The Katy Creek Fault marks the southeastern boundary of this unit and the Brevard Zone.

Biotite Gneiss (OZbg): Biotite-quartz-feldspar gneiss interlayered with thin, discreet amphibolite layers, lenses, and pods. This unit weathers differentially, with the biotite gneiss weathering more uniformly due to feldspar content, and mafic bodies weathering more deeply and less uniformly than the gneiss. Distinguishable due to absence of Brevard Zone shear foliation and subparallel nature of regional foliation with compositional layering. This unit occurs within the Dadeville Complex, which occurs southeast of the Katy Creek Fault and had been interpreted to represent a former Ordovician-age island arc.

Amphibolite (OZa): Regionally continuous, mappable, thinly laminated, fine-grained amphibolite that occurs within the surrounding Biotite Gneiss (OZbg). Jointing is closely spaced, abundant and well developed. Foliation is well developed and subparallel to regional foliation; shear foliation is absent. This unit weathers differentially and deeply but less uniformly than the Biotite Gneiss, providing better groundwater-bearing characteristics focused within this unit.

3.4 Geologic Structure

The structures within and adjacent to the Brevard Zone are complex and have been debated in the geologic literature for many years. Two prominent features of the Brevard Zone are a granulation of the rocks and shear-induced foliation (shear foliation). A discussion of these and other structural features follows.

3.4.1 Foliation

One of the most prominent features of the Brevard Zone is the presence of a well-developed shear foliation. Bedrock discontinuity orientations were statistically analyzed by Petrologic using lower hemisphere equal-area stereonets, presented as Figure 6, Discontinuity Data from Geologic Mapping, to determine dominant orientations for each discontinuity type (i.e., faults, joints, bedding, and cleavage). Regional foliation is also observed at the site; the intersection of the regional and shear foliation locally creates shear fabrics such as button-shaped mica in schists. Like regional foliation, the shear foliation is subparallel to compositional layering except in fold noses and hinges where the shear foliation is discordant and overprints the regional foliation. Equal-area, lower-hemisphere stereonet analyses of the foliation measurements for the site and immediate vicinity have an average pole concentration representing a foliation of N43E, dipping 53 degrees to the southeast (Figure 6).

3.4.2 Faults

Igneous and metamorphic rocks in the Piedmont/Blue Ridge have been extensively faulted. There are faults coincident with lithologic contacts, faults which cut across lithologic units, and faults within single mappable units. The major criteria for recognizing faulting in the southern Piedmont/Blue Ridge are: discontinuity of lithologic units; omission or repetition of lithologic units in a sequence; and the presence of shear textures, mylonite, or breccia.

Major faults within the Brevard Zone are interpreted to be sub-parallel or parallel to the shear foliation. The Chattahoochee Fault marks the northwestern boundary of the Brevard Zone at Plant Wansley. The Orkin Lake and Long Island Creek Faults are also located on site within the Brevard Zone. Each of these three faults are near-vertical and display dextral (left-lateral) strike-slip movement. The Katy Creek Fault is characterized as a thrust fault that dips to the southeast, marking the southeastern boundary of the Brevard Zone to the northwest and juxtaposing the Dadeville Complex to the southeast.

Most of the faults in the southern Piedmont/Blue Ridge occurred at great depths, under high confining pressures and elevated temperatures. Consequently, brittle deformation was minimal and/or was healed during the tectonic processes, and resulted in little, if any, increase in porosity or permeability. Deformation within the Brevard Zone was dominated by high-pressure crushing and shearing; shear foliations and faults were produced as a result of these stresses. In addition, the crushing reduced the grain size of the rocks, which generally reduces permeability. Further, silica-rich metamorphic fluids associated with this crushing tended to heal fractures that were generated. Because of this healing, the permeability along the zones of intense shearing and silicification is expected to be very low and the rocks along these zones are expected to be strong and of high quality. None of the healed faults mapped on site are considered to have Holocene movement based on their age (230+ million years), depth of formation (deep crust), and conditions of formation (high pressure and high temperature).

3.4.3 Joints

Because the evaluation of joints is visual and judgmental, an effort is made for consistency in describing the relative frequency of occurrence using the following designations: Abundant (A); Common (C); and Scarce (S). These designations are relative to one another but are used consistently in descriptions made throughout the study area. An effort is made to record all of the different joint sets and, if an exposure is large, several same (or similar) joints may be recorded at the same Map Station. This deliberate method of visual evaluation in the field is more scientifically relevant and efficient than saturation-measurement of joints.

Joints within the Brevard Zone are common and persistent in most of the rock types. The joints are generally spaced on the order of a few inches to a few feet; however, there are more massive parts of various rock units which have a wider joint spacing. Joint sets in units outside of the Brevard Zone are variably developed, largely dependent upon the lithologic character of the unit.

Three major joint sets were recorded by Petrologic during the detailed geologic mapping. Equal-area stereonet analysis of all joints measured in all lithologies is presented in Figure 7, Remote Sensing Lineament Map.

The three major joint sets are (quadrant and azimuth, right hand rule):

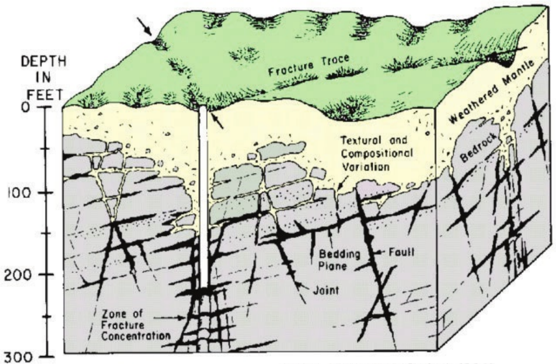
1) N51W 79NE (309/79) – dip joint
2) N39E 72NW (219/72) – strike joint
3) N89W 87NE (271/87) – oblique joint

Locally, some of the joints contain clay infilling; however, most of the joints do not contain any infilling in surface exposures. The plane-surface morphology of each joint was noted in the field descriptions. Most of the joints are planar and smooth with little to no evidence of high fluid flow except in the feldspathic quartzite units.

3.5 Lineament Analysis

3.5.1 Methodology

Subsurface geologic discontinuities such as lithologic contacts between resistant or non-resistant units, fracture zones, jointing, shear planes, and faults often have ground surface expressions that can be identified through analysis of photographic and topographic images. The discontinuities expressed as lineaments at ground surface commonly have enhanced porosity and permeability in the rock mass due to differential weathering. Groundwater in igneous and metamorphic rocks generally moves along discontinuities in the bedrock, enhancing the differential weathering processes.



(After Lattman and Parizek 1964)

Inset - Block diagram shows how lineament/fracture trace is a surface manifestation of an underlying bedrock fracture zone.

Because discontinuity zones are typically less resistant to weathering, they are often expressed as natural topographic lows, such as straight stream valley segments, swales, aligned depressions and gaps in ridges or as linear tonal or vegetative alignments due to variations in soil thickness and moisture (see inset). These surface manifestations are referred to as fracture traces or lineaments and were identified for this project by remote-sensing techniques using topographic maps, aerial photographs, and shaded relief maps generated from USGS 10-meter digital elevation model (DEM) data.

Lineament analyses were conducted on USGS topographic maps, USGS Digital Elevation Models (DEM), and USGS low-altitude aerial photographs (verified with National High-Altitude Photography Program (NHAP) high-altitude aerial photographs). Linear features or linear groups of features were identified and traced on digital overlays of the maps, presented as Figure 7. Lineaments arise from a number of sources. Many lineaments observed on the small-scale imagery or maps are related to fence, property, and section lines. However, many lineaments are related to local and regional geologic anomalies. Rectilinear segments of streams may be associated with local weakness in the underlying bedrock related to persistent joint sets. Faults tend to be long linear features that are often difficult to detect at ground surface, but generally form photographic and topographic lineaments.

3.5.2 Discussion of Lineaments

Based on a total of 538 lineaments identified on the topographic maps, aerial photographs, and DEM, two major groups of lineament orientations were identified within and around the site by the lineament analyses and both are consistent in orientation with measured discontinuities in the bedrock:

- L1: N30 to 50W – oriented subparallel to dip joint
- L2: N40 to 60E – oriented parallel to strike-slip and thrust faults, regional strike of shear and regional foliation, and compositional layering

These lineaments are considered to be the ground surface expression of preferential weathering related to discontinuities in the bedrock. Structural weaknesses in rocks are reflected by the fractures formed, which subsequently can be weathered to form lineaments. These fractures are caused by application of directional stresses to the rock body. Generally, the stress is due to regional tectonics and/or unloading due to weathering and erosion.

3.5.3 Discontinuity Mapping and Lineament Analysis Correlation

Lineaments identified are considered to be the ground-surface expression of preferential weathering related to discontinuities in rock. Figure 8, Comparison of Measured Discontinuities and Lineaments shows a comparison of measured discontinuities and lineaments for this study. Based on this evaluation, the project area appears to be characterized by several persistent lineament sets whose orientations are consistent with the structural stresses experienced in this area (i.e., L1 is related in orientation to J1; L2 is related in orientation to J2).

The orientation of these discontinuities forms a classic joint pattern that develops in rock formations in the Appalachians due to compressional stress. Because lineament orientations correlate with known regional tectonic fabrics, it is likely that most are true manifestations of subsurface fracture zones or low-resistance stratigraphic layers within the rock formations underlying the site.

4.0 CONCEPTUAL SITE HYDROGEOLOGIC MODEL

4.1 Uppermost Groundwater Aquifer

Boring logs and monitoring/piezometer installation logs were used to evaluate hydrostratigraphy of the site. Material types identified included residual soils, saprolitic soils, saprolitic rock (or PWR if blow counts were provided), transitionally weathered rock, and competent bedrock. Based on review of the logs, the screen/filter pack interval for most of the piezometers and monitoring wells installed on site provides connection to the overburden, indicating that the site is underlain by a regional groundwater aquifer that occurs within the overburden. Based on data reported by SCS that was collected in the area, the wettest months of the year are December through March. Figure 9, Potentiometric Surface Elevation Contour Map, presents a potentiometric surface map of the site constructed using the February 2015 dataset. The February 2015 water level readings are considered to represent seasonally high groundwater levels for the site.

As illustrated on Figure 9, the water table surface is a subdued reflection of topography at the site, with groundwater generally flowing to the south and east. As discussed, the top of rock surface also generally follows topography and likely controls groundwater flow direction in the uppermost aquifer as well. Local complexities in groundwater flow within this aquifer are influenced by topographic and related top of rock variations on site. For example, groundwater beneath the ridge northwest of the ash pond and service-water pond locally flows to the north-northwest and north-northeast toward an unnamed tributary that discharges into the service water pond. However, groundwater south of the ridgeline in this area flows southeast and east toward the ponds.

The water levels for the ash pond and service-water ponds are reported to be 795 ft. msl and 785 ft. msl, respectively. Based on the potentiometric surface map, groundwater emanating from the ridge north of the ponds is interpreted to discharge into these ponds. During 2015, several anomalously high-water level readings were measured in piezometers installed within the wet tailings south of the ash pond as well as borings adjacent to these tailings piles. Additionally, boring logs indicate a relatively thick layer of fat clay and/or silt beneath the tailings and above bedrock in borings advanced through the tailings. Water levels in the borings advanced in this area are interpreted to represent mounding of groundwater beneath the saturated mass of tails, within the bermed area surrounding the tailings. This mounding may locally induce groundwater flow to the northwest toward the ash pond.

Groundwater might also mound locally as it flows southeast of the pond and encounters the Long Island Creek Gneiss, shown on Figure 3. Due to its poorly weathered, weakly foliated, and unfractured nature, this unit may function more as an aquitard than aquifer in bedrock. As groundwater flows within the overburden near the top of bedrock and/or within the quartzite layers, flow may locally be diverted along geologic strike (i.e., northeast or southwest) if the Long Island Creek Gneiss prevents flow along the natural horizontal gradient.

Several tributaries that dissect the site and two small hills located along the western property boundary also appear to locally control direction of groundwater flow. Downcutting related to tributaries occurring in this area isolate these hilltops topographically, significantly reducing the area of recharge and promoting radial flow from the hill tops toward the adjacent valleys. Groundwater flow in this area is locally toward the north, east and south, but eventually flows southeast.

Because of the topographic setting, recharge to the site is primarily through precipitation, which appears to be limited to the topographic ridge north of the site and the two small hills on the western side of the site. The vertical gradient is downward in topographically higher areas, as indicated by water levels measured in the paired piezometers PZ-3S and PZ-3D, which are located along the ridge north of the ponds. Groundwater flows towards the onsite tributaries and ponds based on available data. As shown on Figure 9, groundwater appears to be supporting base flow in these tributaries, as indicated by the local overlap in topographic and groundwater contours of similar elevation. This support of base flow indicates an upward vertical gradient in topographic lows, which is supported by water levels reported in the paired piezometers PZ-2S and PZ-2D. These piezometers are located adjacent to the tributary that discharge into the ash pond on the west side of the site.

Based on review of the potentiometric contours, horizontal hydraulic gradient is also variable and reflects topography at the site. The horizontal gradient appears to be steeper along the topographically isolated ridge and hilltops where recharge area is limited due to incision of ground surface by surface water. The horizontal gradient is shown to be flatter on Figure 9 where the ground surface gently slopes toward the Chattahoochee River. Field hydraulic conductivity tests (slug tests) performed by SCS in a variety of geologic materials in selected GS-series and PZ-series piezometers indicate an average hydraulic conductivity on the order of 1×10^{-4} centimeters per second (cm/s). This hydraulic conductivity is consistent with regional measurements within Piedmont overburden. In general, groundwater flow is potentially faster through the transitionally weathered zone; however, the magnitude of difference is nominal enough to not be considered relevant at this site.

As indicated on Figure 9, upgradient areas on the site are underlain by different geologic units than downgradient areas. Weathering of different parent rocks with variable geochemical characteristics may yield overburden with variable geochemical characteristics, which likely impacts hydrochemical conditions at the site. For example, the area upgradient of the ponds is underlain by the OZsg unit, which has very different geochemical characteristics as compared to the OZsau, OZsg, and OZq units which occur downgradient of the ponds. Similarly, the upgradient area of monofill cell 1 is underlain by OZsau and OZli, which have very different geochemical characteristics as compared to the OZbs, which occurs downgradient of the cell. The area upgradient of monofill cells 2 and 3 is underlain by similar units downgradient of the cells.

4.2 Bedrock Aquifer System

Bedrock aquifer systems also occur beneath the site, as indicated by the presence of two pumping wells previously installed on site that are reportedly capable of yielding more than 150 gpm. Although geologic logs for these wells were not available for review, the wells were reportedly drilled several hundred feet and are completed entirely within bedrock with no direct connection to the overburden (i.e., cased into bedrock).

As discussed in Section 3.3, some of the rock units mapped on site are more transmissive than others with respect to groundwater flow. Specifically, the quartzite layers shown to underlie the ash pond and the amphibolite layers shown to underlie portions of the monofill cells (Figure 3) are more transmissive relative to the surrounding units and likely control groundwater flow within the bedrock aquifer systems. Preferential groundwater flow is also anticipated in the mappable amphibolite layers near the monofill cells. Relatively thick overburden occurs in this area, however, likely impeding direct connection between the uppermost aquifer and underlying bedrock aquifer systems.

Conversely, the Long Island Creek Gneiss that occurs southeast of the pond and quartizite layers generally does not transmit groundwater in the region. This unit may locally function as an aquitard to groundwater flow in bedrock systems emanating from the northwest due to its silicified nature at the site. Regionally, it is understood that this unit generally does not form productive bedrock aquifer systems.

4.3 Anticipated Interaction Between Site Aquifers

Recharge to bedrock aquifer systems comes from water stored in overlying residual soils and saprolite. This low permeability, high porosity, clay- and silt-rich overburden material functions as a sponge of sorts, slowly allowing groundwater to infiltrate the bedrock through areas of enhanced permeability. This rate of infiltration is very slow, as indicated by dating of groundwater in other areas in the Piedmont exceeding 60 years, Vermillion and Williams, 2005.

Limited information is available regarding the interaction between the uppermost aquifer and bedrock aquifer systems. Some indication of this connection was provided by Georgia Power and SCS representatives who confirmed that overburden was likely removed during construction of the ponds at many locations. Removal of these materials would have allowed a more direct connection between surface water in the ponds and the underlying bedrock. Based on their projected occurrence beneath the ponds, it is considered likely that the quartzite layers provide a preferential pathway for surface water from the ponds to recharge bedrock aquifer systems beneath the site.

Regional hydrogeologic characteristics of the Long Island Creek Gneiss indicate that this unit may act as a barrier to groundwater flowing down dip along quartzite layers. If so, groundwater would likely mound as it encounters the Long Island Creek Gneiss, locally redirecting flow along strike (i.e., northeast and southwest) until a relatively more permeable zone in the Long Island Creek Gneiss is encountered.

Based on the geologic mapping, it appears that at least one of the pumping wells on site is within a mappable amphibolite. Review of geologic logs of the wells is required to confirm this. The overburden overlying the amphibolite layers likely serves as recharge to bedrock aquifer systems in the amphibolite; however, the degree of direct vertical connection is unknown, and the rate of flow is likely to be extremely slow.

4.4 Conceptual Site Hydrogeologic Model Summary

1) The site is directly underlain by a variably thick blanket of overburden, which is comprised of residual- and saprolitic-soils, saprolitic-rock, PWR, and transitionally weathered rock.

2) Geologic units beneath the site are variable and exhibit differential weathering and water-bearing characteristics. Lineaments identified around the site are consistent in orientation with structural features observed during geologic mapping, indicating that development of surface lineations are likely controlled by preferential weathering related to discontinuities in bedrock.

3) Four prehistoric faults occur beneath the site. These faults are ancient (formed 280+ million years ago), formed at great depth under high confining pressures and temperatures, and have been subsequently healed; consequently, Holocene movement related to these faults is highly unlikely.

4) Site topography and top of rock surfaces are reflective of the differential weathering experienced by underlying rock units. The top of rock surface reflects a series of troughs and ridges that appear to coincide with units generally more and less prone to weathering, respectively.

5) The uppermost aquifer occurs within the overburden at the site. Degree of connection between the overburden and underlying bedrock aquifer systems is not known.

6) Although the potentiometric surface for the uppermost aquifer is complex, being influenced by topopgraphic and top of rock surfaces and effects of mounding related to saturated tailings as well as presence of the relatively impermeable Long Island Creek Gneiss, in general, groundwater flow is toward the southeast.

7) Groundwater flow is anticipated to roughly follow the top of rock surface northwest of the Long Island Creek Fault and generally flows through the overburden in the more deeply weathered material southeast of this fault.

8) Groundwater in the uppermost aquifer appears to be supporting base flow of creeks on site (many groundwater contours cross topographic contours of similar elevation at headwaters of creek). Additionally, vertical gradients in paired wells are upward in a creek bottom and downward on a hilltop.

9) Weathering of different parent rock types provides geochemical variation in the overburden. These geochemical variations will impact groundwater chemistry at this site.

10) Information on groundwater flow within bedrock aquifer systems is limited. Although no site information is currently available for evaluation, based on our experience, groundwater flow in bedrock aquifer systems is anticipated to be toward the southeast along extensional dip joints, and northeast-southwest along the strike of contacts, faults and the strike joint set. Aquifer systems are more likely to develop in quartzite and

amphibolite layers beneath the site. The Long Island Creek Gneiss likely functions as an aquitard in the bedrock.

11) Local groundwater mounding effects may induce gradients towards the ash pond in the overburden.

5.0 REFERENCES

Publicly Available Information

Lowell, GA USGS 7.5-minute topographic quadrangle

LiDAR data for Heard and Coweta Counties

Crawford, T.C. and Medlin, J.H., 1973, The Western Georgia Piedmont Between the Cartersville and Brevard Fault Zones: American Journal of Science, v. 273, p. 712-722.

Medlin, J.H. and Crawford, T.C., 1973, Stratigraphy and Structure along the Brevard Fault Zone in Western Georgia and Eastern Alabama: American Journal of Science, v. 273-A, p. 89-104.

Crawford, T.J. and Medlin, J. H., 1970, Stratigraphic and Structural Features between the Cartersville and Brevard Fault Zones: Georgia Geological Society 5th Annual Field Trip.

Vermillion N. and Williams, LJ, 2005, Preliminary Choloroflurocarbon ages for Groundwater Samples from Production Wells in the Lawrenceville, Georgia, Area: 2005 Georgia Water Resources Conference, Georgia Tech Library.

Site reports completed by Southern Company Services, Inc. (SCS), including:

- Site Acceptability Report – October 2007
- Groundwater Monitoring Report – September 2014

A**vailable boring logs from previous SCS site investigations, including:**

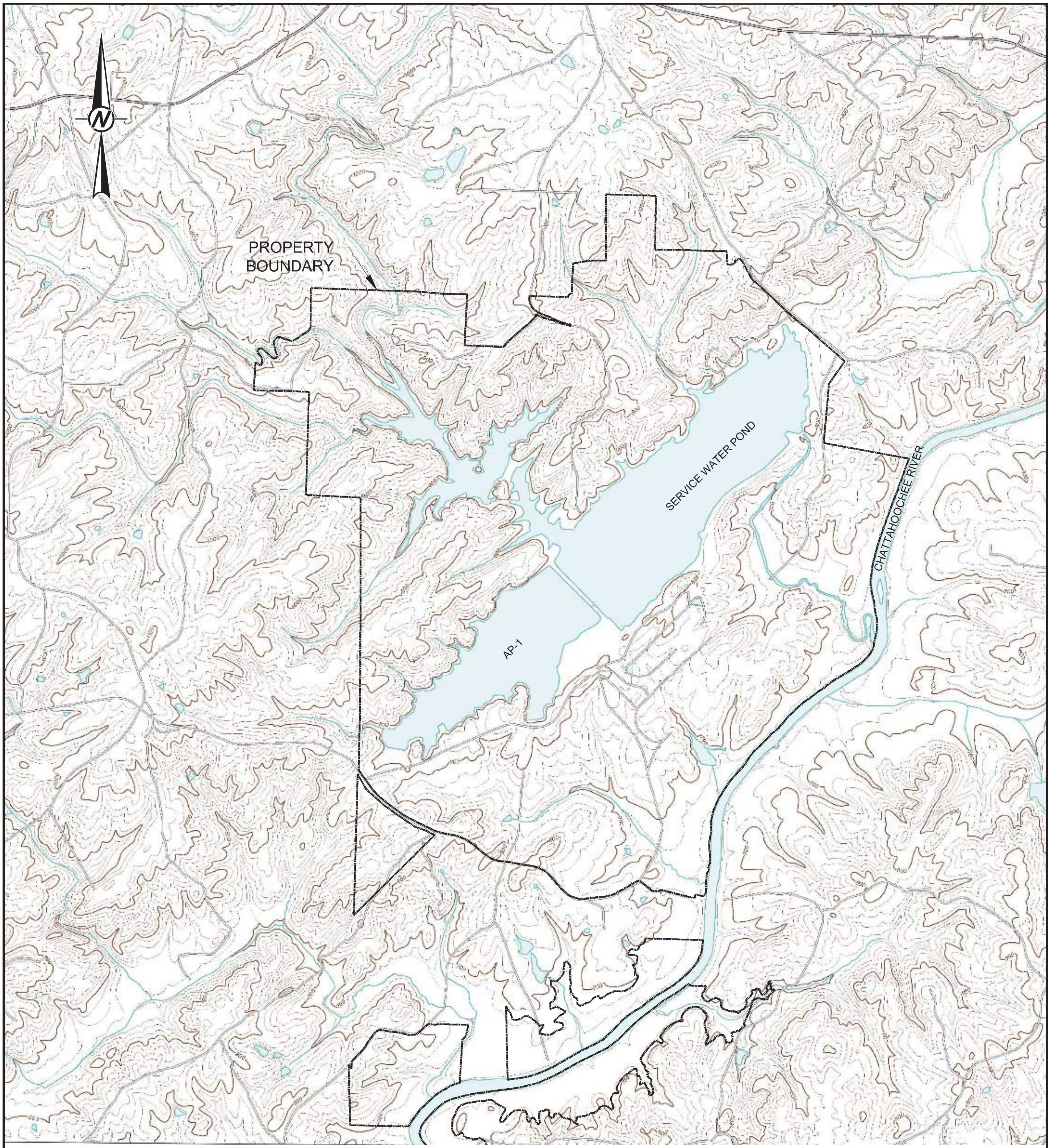
- GWA/GWC-series monitoring wells – 35 compliance wells installed in 2011 for regulatory monitoring of the monofill.
- GS-series piezometers – 31 temporary piezometers installed in 2006 to determine site acceptability for use as SWDF. Piezometers were reportedly been decommissioned in 2006.
- SPT-series borings – 18 geotechnical test borings installed in 2014-2015 (note some logs have wrong date, showing Dec 2015 dates) around and within CCR pond tailings. SPT borings were abandoned in 2015.
- PZ-series piezometers – 20 piezometers installed in 2015 to establish ambient groundwater conditions around CCR pond.

SCS Field and Laboratory data:

- Field hydraulic conductivity test results from selected GS-series piezometers (GS-3, GS-4, GS-18, GS-21, GS-25, GS-27, and GS-29) and PZ-series piezometers (PZ-1, PZ-18, PZ-2D, and PZ-3D)
- Lab permeability testing

- Groundwater level readings – February 13, 2015 dataset, includes water levels from GWA/GWC-series, SPT-series, and PZ-series wells, and considered to represent seasonal high groundwater readings based on available data from 2007-2015.

FIGURES



REFERENCES
USGS 7.5 MINUTE QUADRANGLE, LOWELL, 2011.

LEGEND
—·—·—·— PROPERTY BOUNDARY

CLIENT
Georgia Power

PROJECT
GEOLOGIC AND HYDROGEOLOGIC SUMMARY REPORT
PLANT WANSLEY

CONSULTANT
GOLDER

YYYY-MM-DD	2018-11-07
DESIGNED	DLP
PREPARED	DJC
REVIEWED	DLP
APPROVED	RPK

TITLE
SITE LOCATION MAP

PROJECT NO.	CONTROL	REV.	FIGURE
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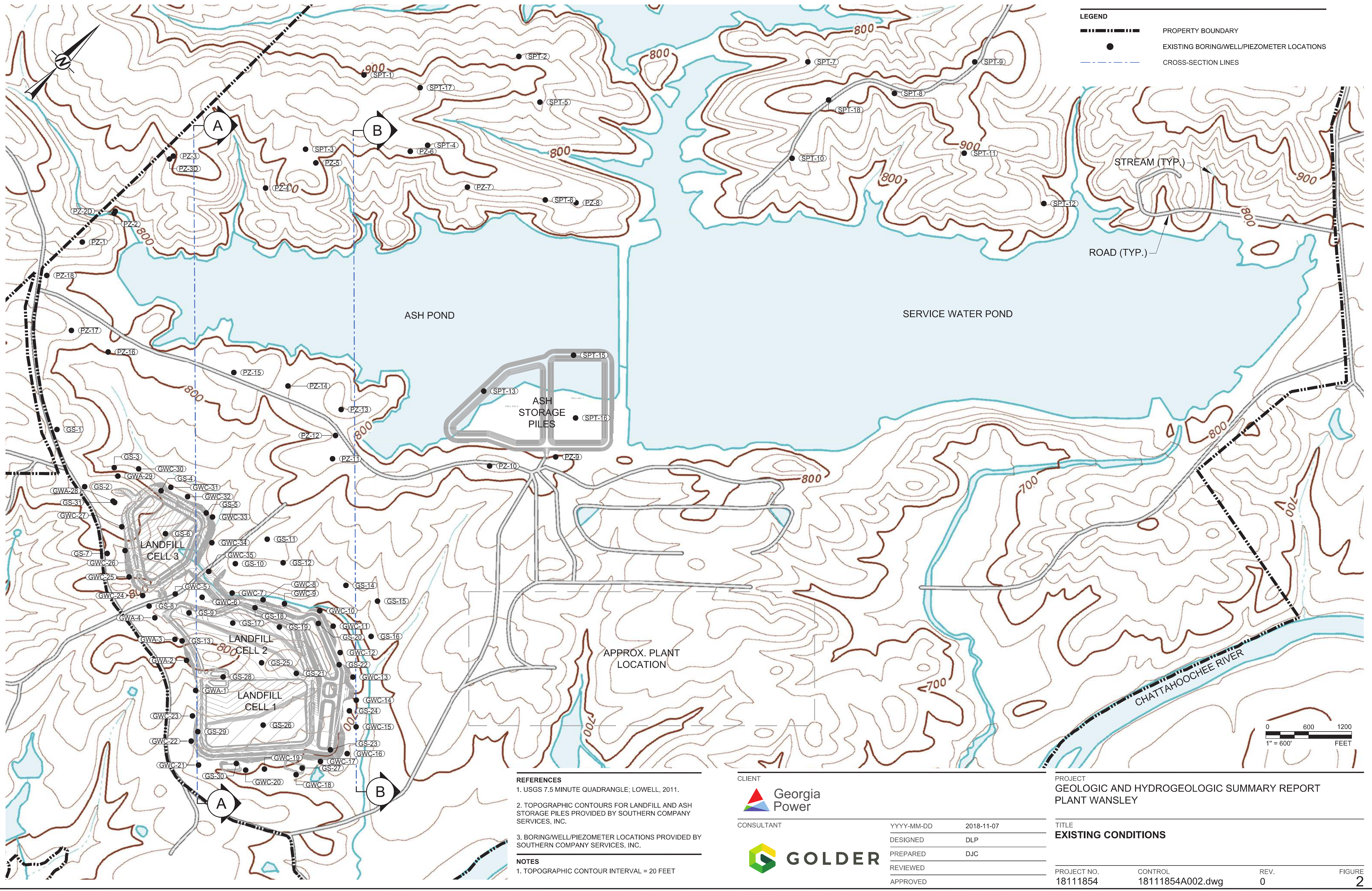

LEGEND

PROPERTY BOUNDARY

● EXISTING BORING/WELL/PIEZOMETER LOCATIONS

CROSS-SECTION LINES

REFERENCES

1. USGS 7.5 MINUTE QUADRANGLE; LOWELL, 2011.
2. TOPOGRAPHIC CONTOURS FOR LANDFILL AND ASH STORAGE PILES PROVIDED BY SOUTHERN COMPANY SERVICES, INC.
3. BORING/WELL/PIEZOMETER LOCATIONS PROVIDED BY SOUTHERN COMPANY SERVICES, INC.

NOTES

1. TOPOGRAPHIC CONTOUR INTERVAL = 20 FEET

CLIENT

Georgia Power

CONSULTANT

GOLDER

YYYY-MM-DD	2018-11-07
DESIGNED	DLP
PREPARED	DJC
REVIEWED	
APPROVED	

PROJECT

GEOLOGIC AND HYDROGEOLOGIC SUMMARY REPORT
PLANT WANSLEY

TITLE

EXISTING CONDITIONS

PROJECT NO.	CONTROL	REV.	FIGURE
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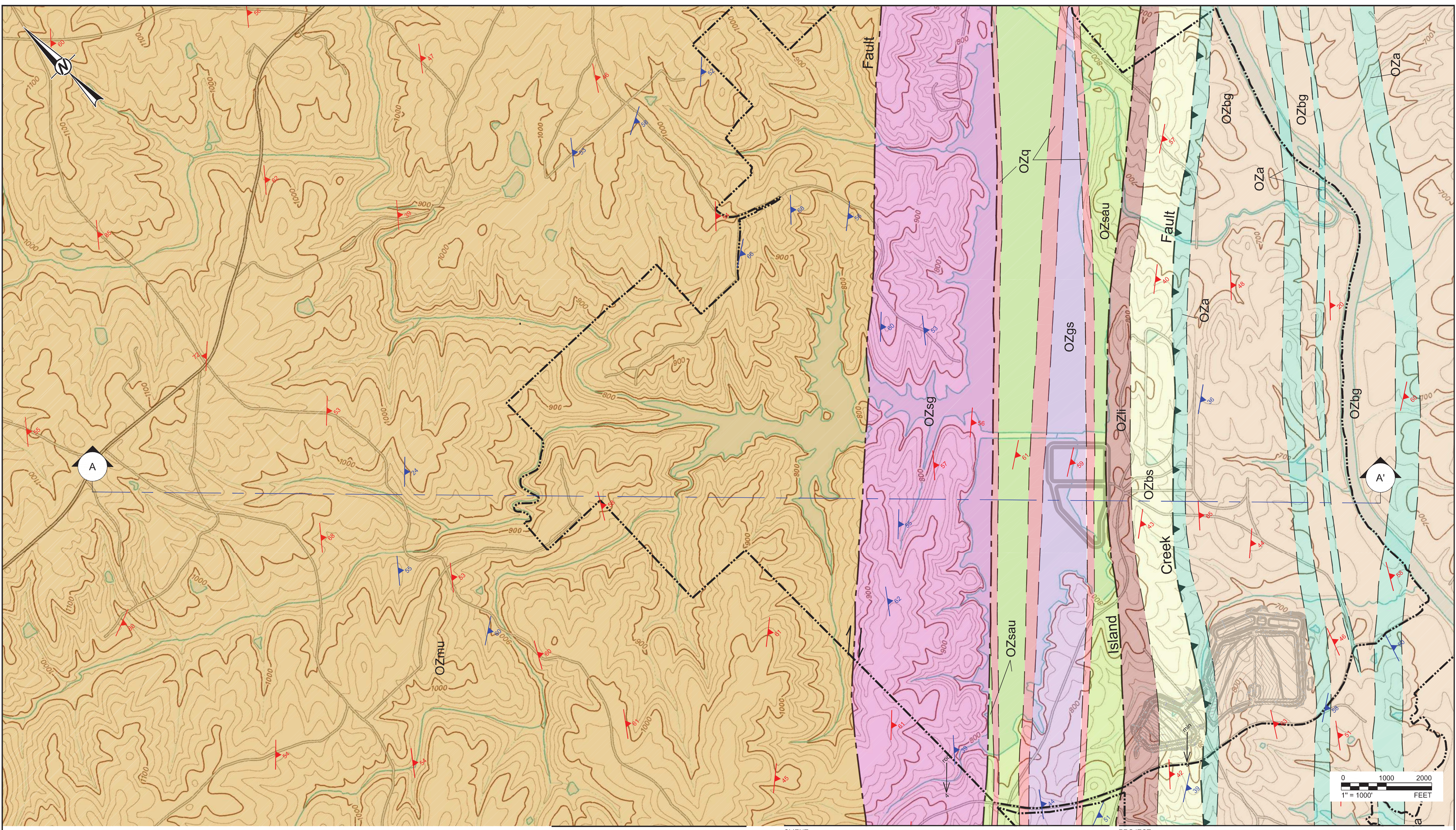

NOTES

1. GEOLOGIC MAPPING AND CROSS SECTION COMPLETED BY PETROLOGIC SOLUTIONS, INC. (2015)

CLIENT

Georgia Power

CONSULTANT

GOLDER

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DESIGNED	DLP
PREPARED	DJC
REVIEWED	DLP
APPROVED	RPK

PROJECT

GEOLOGIC AND HYDROGEOLOGIC SUMMARY REPORT
PLANT WANSLEY

TITLE

GEOLOGIC MAP AND SCHEMATIC CROSS SECTION

(FIGURE 1 OF 2)

PROJECT NO.	CONTROL	REV.	FIGURE
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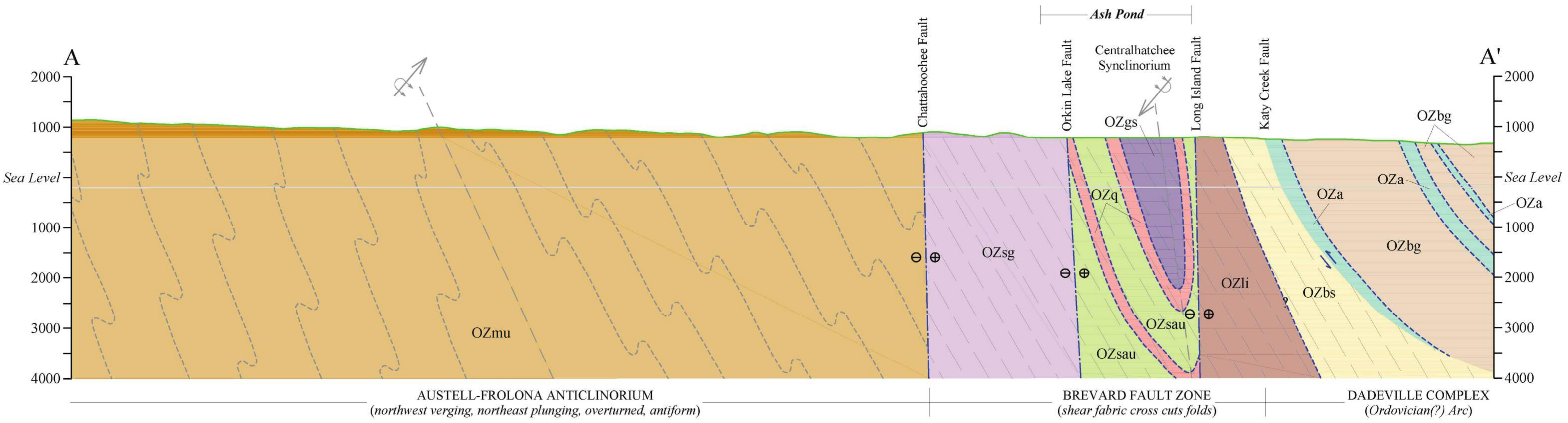

NOT TO SCALE

NOTES

1. GEOLOGIC MAPPING AND CROSS SECTION COMPLETED BY PETROLOGIC SOLUTIONS, INC. (2015)

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CONSULTANT
GOLDER

YYYY-MM-DD	2018-11-07
DESIGNED	DLP
PREPARED	DJC
REVIEWED	DLP
APPROVED	RPK

PROJECT
GEOLOGIC AND HYDROGEOLOGIC SUMMARY REPORT
PLANT WANSLEY

TITLE
GEOLOGIC MAP AND SCHEMATIC CROSS SECTION
(FIGURE 2 OF 2)

PROJECT NO.	CONTROL	REV.	FIGURE
18111854	18111854A003.dwg	0	3-2

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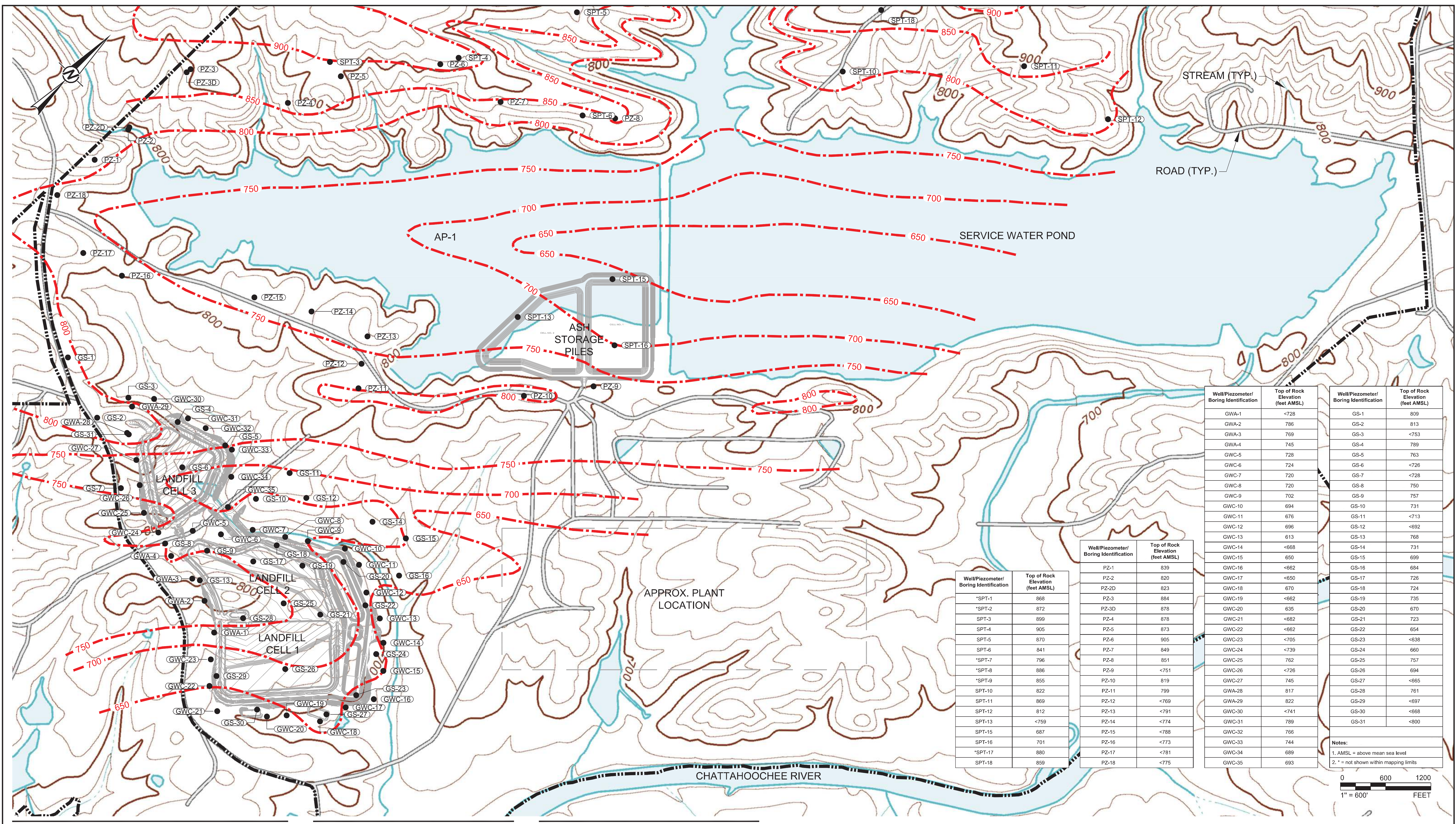

Well/Piezometer/ Boring Identification	Top of Rock Elevation (feet AMSL)
*SPT-1	868
*SPT-2	872
SPT-3	899
SPT-4	905
SPT-5	870
SPT-6	841
*SPT-7	796
*SPT-8	886
*SPT-9	855
SPT-10	822
SPT-11	869
SPT-12	812
SPT-13	<759
SPT-15	687
SPT-16	701
*SPT-17	880
SPT-18	859

Well/Piezometer/ Boring Identification	Top of Rock Elevation (feet AMSL)
PZ-1	839
PZ-2	820
PZ-2D	823
PZ-3	884
PZ-3D	878
PZ-4	878
PZ-5	873
PZ-6	905
PZ-7	849
PZ-8	851
PZ-9	<751
PZ-10	819
PZ-11	799
PZ-12	<769
PZ-13	<791
PZ-14	<774
PZ-15	<788
PZ-16	<773
PZ-17	<781
PZ-18	<775

Well/Piezometer/ Boring Identification	Top of Rock Elevation (feet AMSL)
GWA-1	<728
GWA-2	786
GWA-3	769
GWA-4	745
GWC-5	728
GWC-6	724
GWC-7	720
GWC-8	720
GWC-9	702
GWC-10	694
GWC-11	676
GWC-12	696
GWC-13	613
GWC-14	<668
GWC-15	650
GWC-16	<662
GWC-17	<650
GWC-18	670
GWC-19	<662
GWC-20	635
GWC-21	<682
GWC-22	<662
GWC-23	<705
GWC-24	<739
GWC-25	762
GWC-26	<726
GWC-27	745
GWA-28	817
GWA-29	822
GWC-30	<741
GWC-31	789
GWC-32	766
GWC-33	744
GWC-34	689
GWC-35	693

Well/Piezometer/ Boring Identification	Top of Rock Elevation (feet AMSL)
GS-1	809
GS-2	813
GS-3	<753
GS-4	789
GS-5	763
GS-6	<726
GS-7	<728
GS-8	750
GS-9	757
GS-10	731
GS-11	<713
GS-12	<692
GS-13	768
GS-14	731
GS-15	699
GS-16	684
GS-17	726
GS-18	724
GS-19	735
GS-20	670
GS-21	723
GS-22	654
GS-23	<638
GS-24	660
GS-25	757
GS-26	694
GS-27	<665
GS-28	761
GS-29	<697
GS-30	<668
GS-31	<800

Notes:

1. AMSL = above mean sea level
2. * = not shown within mapping limits

0 600 1200
1" = 600' FEET

LEGEND

▬ ▪ ▪ ▬	PROPERTY BOUNDARY
▬ ▪ ▬	ESTIMATED TOP OF ROCK SURFACE CONTOUR (ft MSL)
●	EXISTING BORING/WELL/PIEZOMETER LOCATIONS

NOTES

1. TOPOGRAPHIC CONTOUR INTERVAL = 20 FEET
2. TOP OF ROCK SURFACE CONTOUR INTERVAL = 50 FEET

REFERENCES

1. USGS 7.5 MINUTE QUADRANGLE; LOWELL, 2011.
2. TOPOGRAPHIC CONTOURS FOR LANDFILL AND ASH STORAGE PILES PROVIDED BY SOUTHERN COMPANY SERVICES, INC.
3. BORING/WELL/PIEZOMETER LOCATIONS PROVIDED BY SOUTHERN COMPANY SERVICES, INC.

CLIENT
Georgia Power

CONSULTANT
GOLDER

YYYY-MM-DD	2018-11-07
DESIGNED	DLP
PREPARED	DJC
REVIEWED	DLP
APPROVED	RPK

PROJECT
GEOLOGIC AND HYDROGEOLOGIC SUMMARY REPORT
PLANT WANSLEY

TITLE
ESTIMATED TOP OF ROCK MAP

PROJECT NO.	CONTROL	REV.	FIGURE
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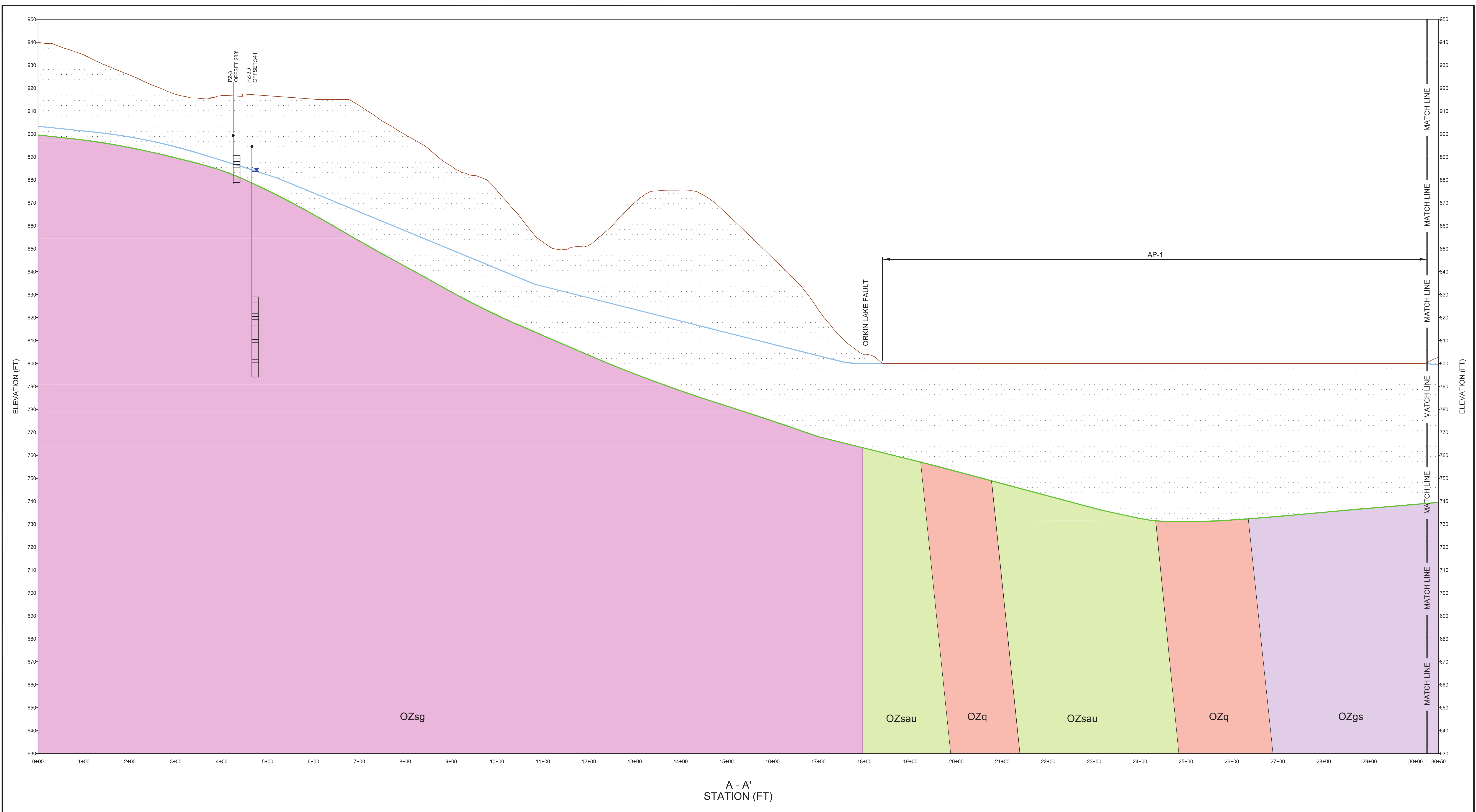

LEGEND

━	EXISTING GRADE
━	ESTIMATED GROUNDWATER SURFACE (2-13-15)
━	ESTIMATED TOP OF ROCK SURFACE
▭	OVERBURDEN/RESIDUUM

REFERENCES

1. EXISTING GRADE FROM USGS
7.5 MINUTE QUADRANGLE; LOWELL, 2011.

2. BORING/WELL/PIEZOMETER LOCATIONS AND
ELEVATIONS PROVIDED BY SOUTHERN COMPANY
SERVICES, INC.

3. GEOLOGIC UNITS TAKEN FROM MAPPING COMPLETED
BY PETROLOGIC SOLUTIONS, INC. IN 2015.

0 100 200
1" = 100' FEET
5X VERTICAL EXAGGERATION

CLIENT
Georgia Power

CONSULTANT
GOLDER

YYYY-MM-DD	2018-11-07
DESIGNED	DLP
PREPARED	DJC
REVIEWED	DLP
APPROVED	RPK

PROJECT
GEOLOGIC AND HYDROGEOLOGIC SUMMARY REPORT
PLANT WANSLEY

TITLE
GEOLOGIC CROSS SECTIONS SCHEMATIC
(FIGURE 1 OF 6)

PROJECT NO.	CONTROL	REV.	FIGURE
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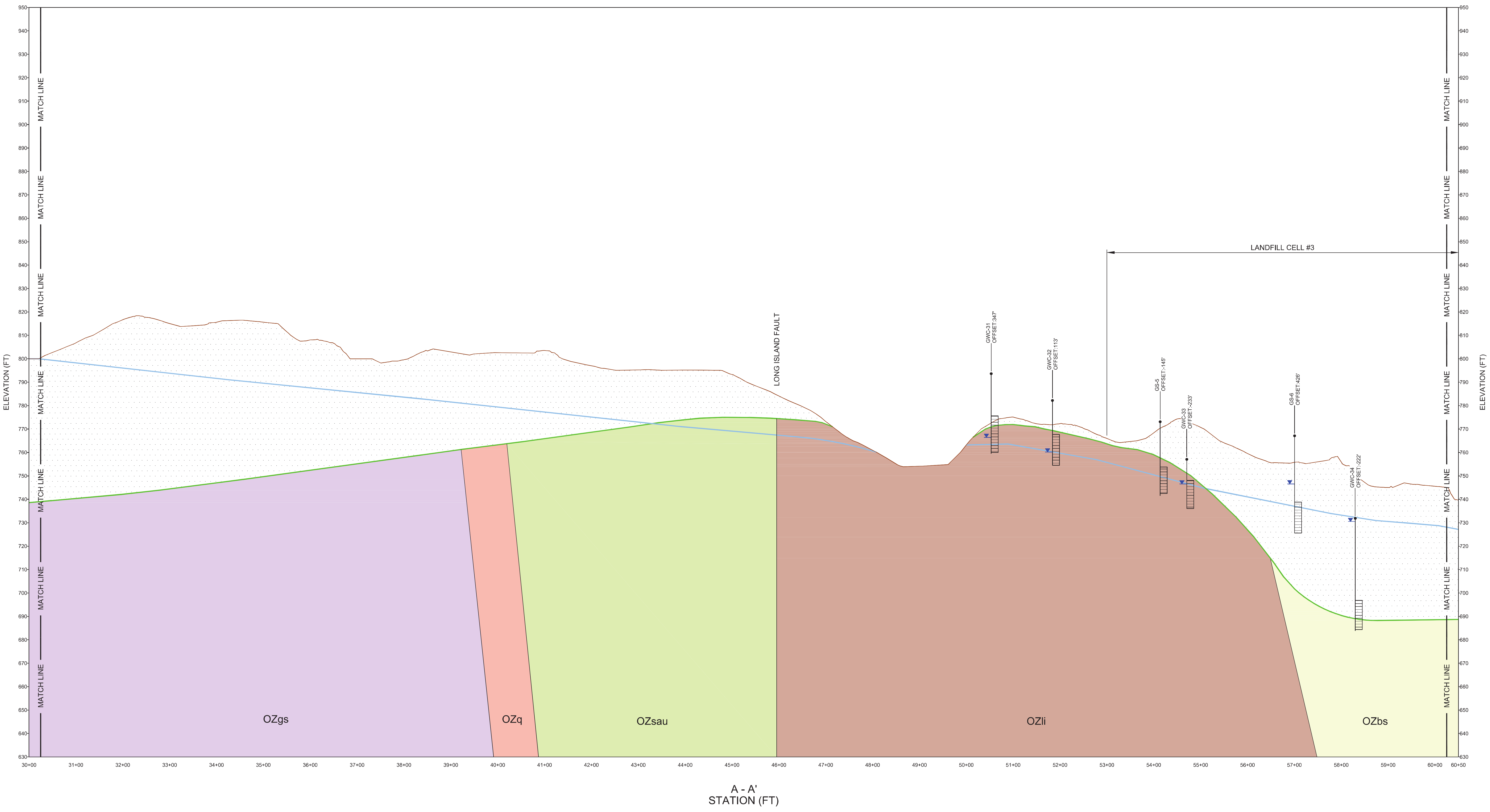

A - A'
STATION (FT)

LEGEND

—	EXISTING GRADE
—	ESTIMATED GROUNDWATER SURFACE (2-13-15)
—	ESTIMATED TOP OF ROCK SURFACE
☐	OVERBURDEN/RESIDUUM

REFERENCES

1. EXISTING GRADE FROM USGS
7.5 MINUTE QUADRANGLE; LOWELL, 2011.

2. BORING/WELL/PIEZOMETER LOCATIONS AND
ELEVATIONS PROVIDED BY SOUTHERN COMPANY
SERVICES, INC.

3. GEOLOGIC UNITS TAKEN FROM MAPPING
COMPLETED BY PETROLOGIC SOLUTIONS, INC. IN 2015.

0 100 200
1" = 100' FEET
5X VERTICAL EXAGGERATION

CLIENT
Georgia
Power

CONSULTANT
GOLDER

YYYY-MM-DD	2018-11-07
DESIGNED	DLP
PREPARED	DJC
REVIEWED	DLP
APPROVED	RPK

PROJECT
GEOLOGIC AND HYDROGEOLOGIC SUMMARY REPORT
PLANT WANSLEY

TITLE
GEOLOGIC CROSS SECTIONS SCHEMATIC
(FIGURE 2 OF 6)

PROJECT NO.	CONTROL	REV.	FIGURE
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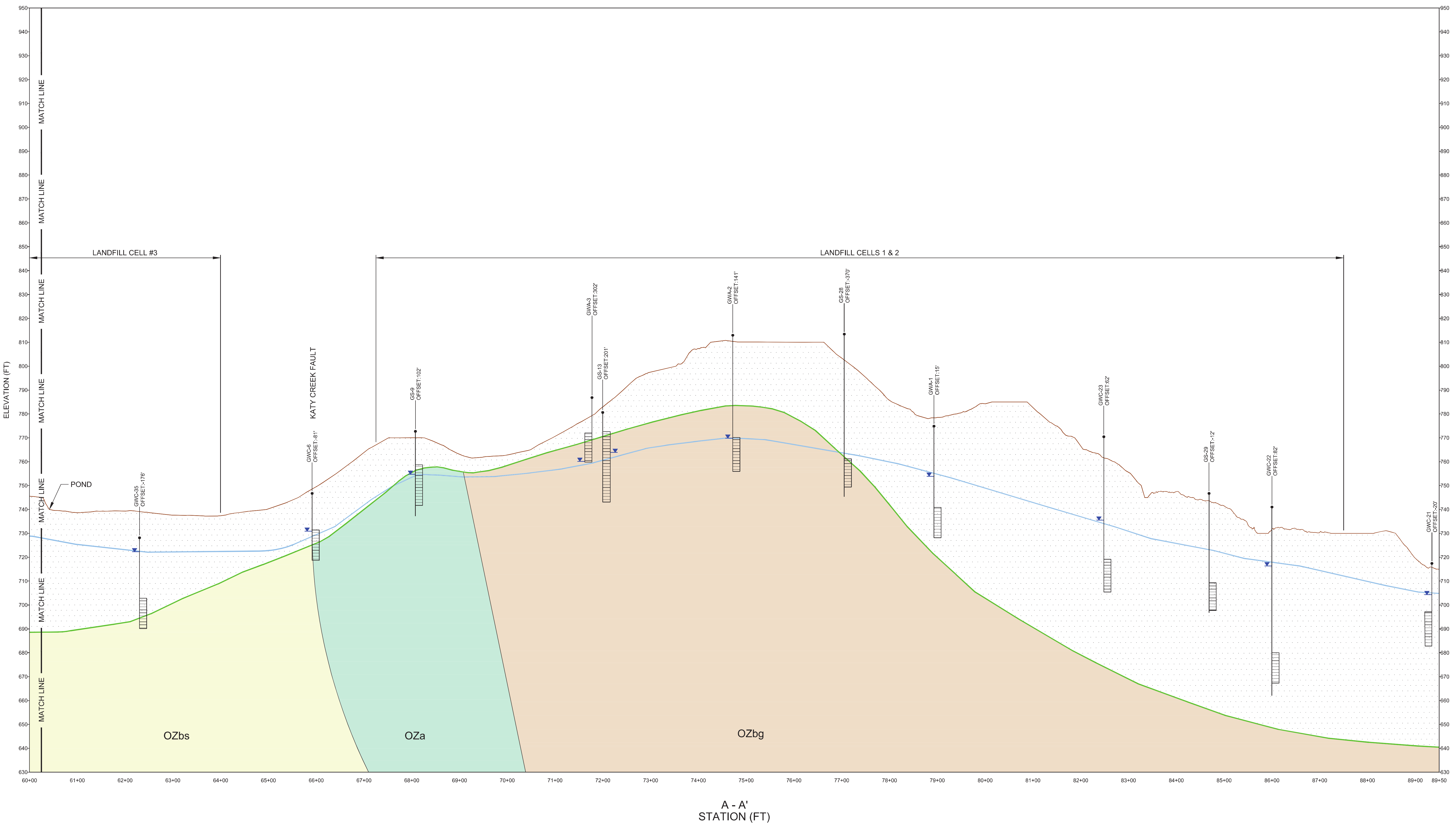

LEGEND

―	EXISTING GRADE
―	ESTIMATED GROUNDWATER SURFACE (2-13-15)
―	ESTIMATED TOP OF ROCK SURFACE
▭	OVERBURDEN/RESIDUUM

REFERENCES

1. EXISTING GRADE FROM USGS 7.5 MINUTE QUADRANGLE; LOWELL, 2011.

2. BORING/WELL/PIEZOMETER LOCATIONS AND ELEVATIONS PROVIDED BY SOUTHERN COMPANY SERVICES, INC.

3. GEOLOGIC UNITS TAKEN FROM MAPPING COMPLETED BY PETROLOGIC SOLUTIONS INC. IN 2015.

0 100 200
1" = 100' FEET
5X VERTICAL EXAGGERATION

CLIENT
Georgia Power

CONSULTANT
GOLDER

YYYY-MM-DD	2018-11-07
DESIGNED	DLP
PREPARED	DJC
REVIEWED	DLP
APPROVED	RPK

PROJECT
GEOLOGIC AND HYDROGEOLOGIC SUMMARY REPORT
PLANT WANSLEY

TITLE
GEOLOGIC CROSS SECTIONS SCHEMATIC
(FIGURE 3 OF 6)

PROJECT NO.	CONTROL	REV.	FIGURE
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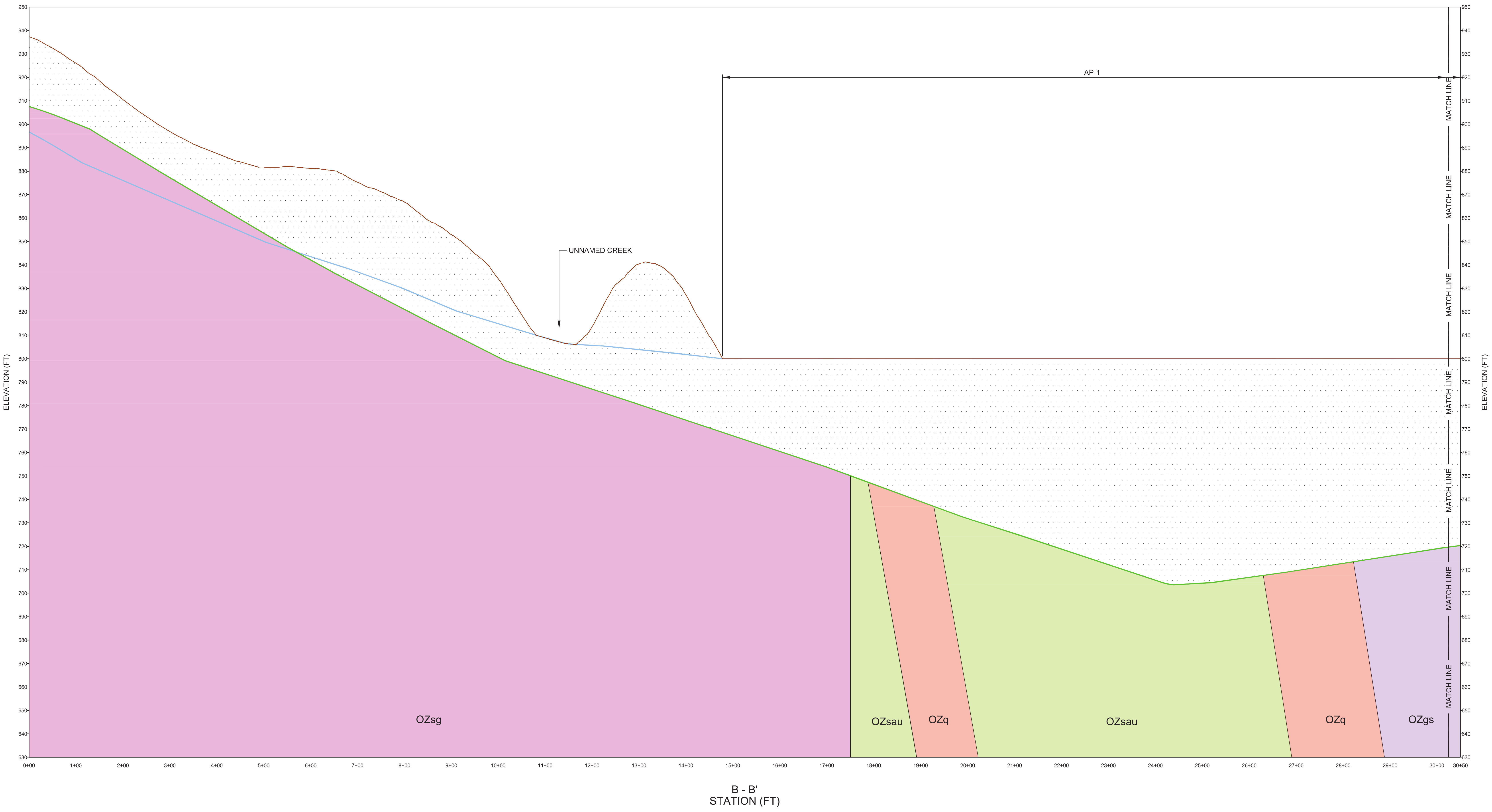

B - B'
STATION (FT)

LEGEND

—	EXISTING GRADE
—	ESTIMATED GROUNDWATER SURFACE (2-13-15)
—	ESTIMATED TOP OF ROCK SURFACE
☐	OVERBURDEN/RESIDUUM

REFERENCES

1. EXISTING GRADE FROM USGS
7.5 MINUTE QUADRANGLE; LOWELL, 2011.

2. BORING/WELL/PIEZOMETER LOCATIONS AND ELEVATIONS PROVIDED BY SOUTHERN COMPANY SERVICES, INC.

3. GEOLOGIC UNITS TAKEN FROM MAPPING COMPLETED BY PETROLOGIC SOLUTIONS INC. IN 2015.

0 100 200
1" = 100' FEET
5X VERTICAL EXAGGERATION

CLIENT
Georgia Power

CONSULTANT
GOLDER

YYYY-MM-DD	2018-11-07
DESIGNED	DLP
PREPARED	DJC
REVIEWED	DLP
APPROVED	RPK

PROJECT
GEOLOGIC AND HYDROGEOLOGIC SUMMARY REPORT
PLANT WANSLEY

TITLE
GEOLOGIC CROSS SECTIONS SCHEMATIC
(FIGURE 4 OF 6)

PROJECT NO.	CONTROL	REV.	FIGURE
18111854	18111854A004.dwg	0	5-4

Path: C:\Users\dcoss\Documents\CAD Workspace\18111854-Georgia Power-Plant Wansley\PRODUCTION\A-GEOLOGIC AND HYDROGEOLOGIC SUMMARY REPORT\ | File Name: 18111854A004.dwg

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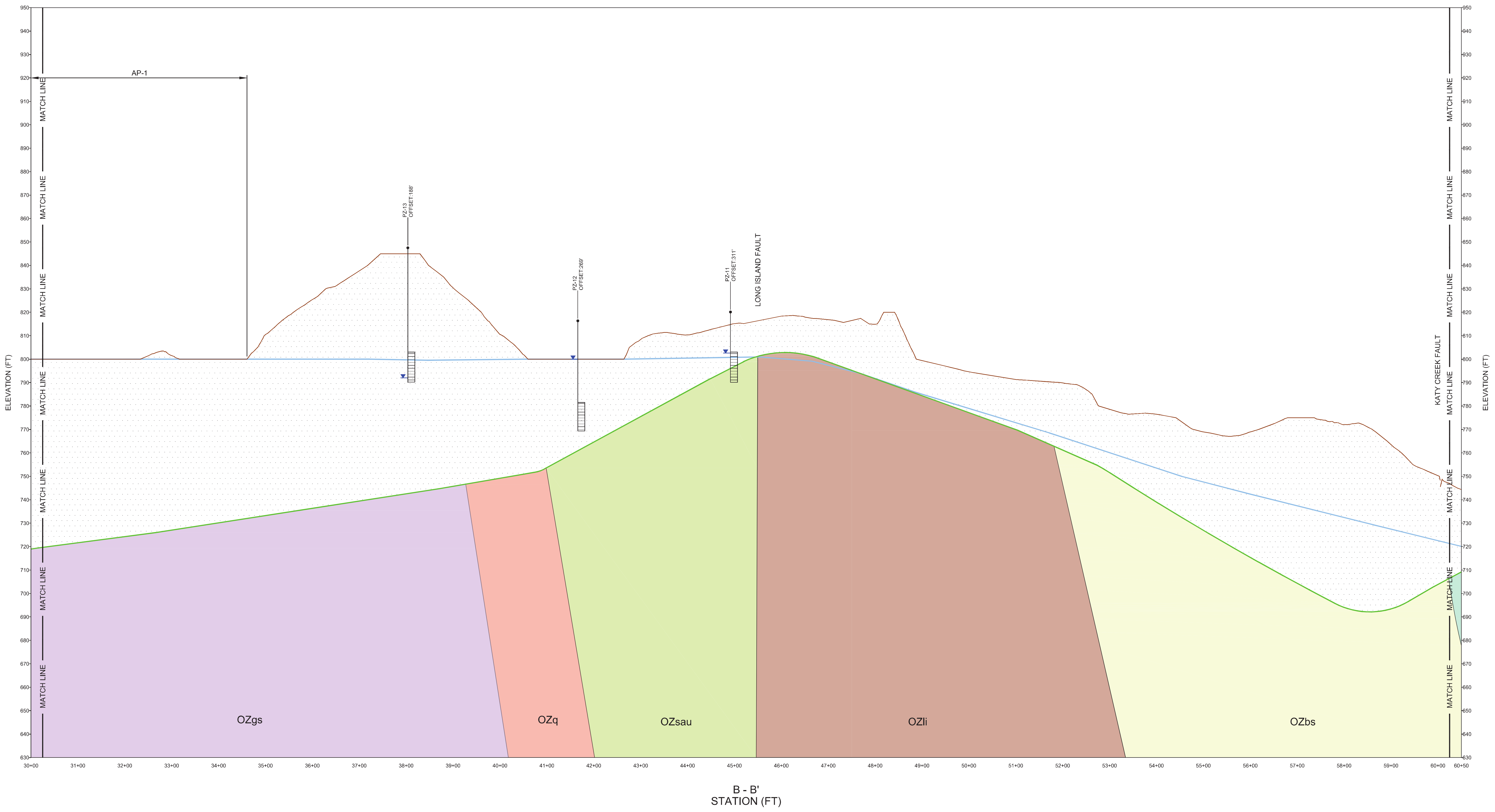


LEGEND

─	EXISTING GRADE
─	ESTIMATED GROUNDWATER SURFACE (2-13-15)
─	ESTIMATED TOP OF ROCK SURFACE
▭	OVERBURDEN/RESIDUUM

REFERENCES

1. EXISTING GRADE FROM USGS
7.5 MINUTE QUADRANGLE; LOWELL, 2011.

2. BORING/WELL/PIEZOMETER LOCATIONS AND ELEVATIONS PROVIDED BY SOUTHERN COMPANY SERVICES, INC.

3. GEOLOGIC UNITS TAKEN FROM MAPPING COMPLETED BY PETROLOGIC SOLUTIONS INC. IN 2015

0 100 200
1" = 100' FEET
5X VERTICAL EXAGGERATION

CLIENT
Georgia Power

CONSULTANT
GOLDER

YYYY-MM-DD	2018-11-07
DESIGNED	DLP
PREPARED	DJC
REVIEWED	DLP
APPROVED	RPK

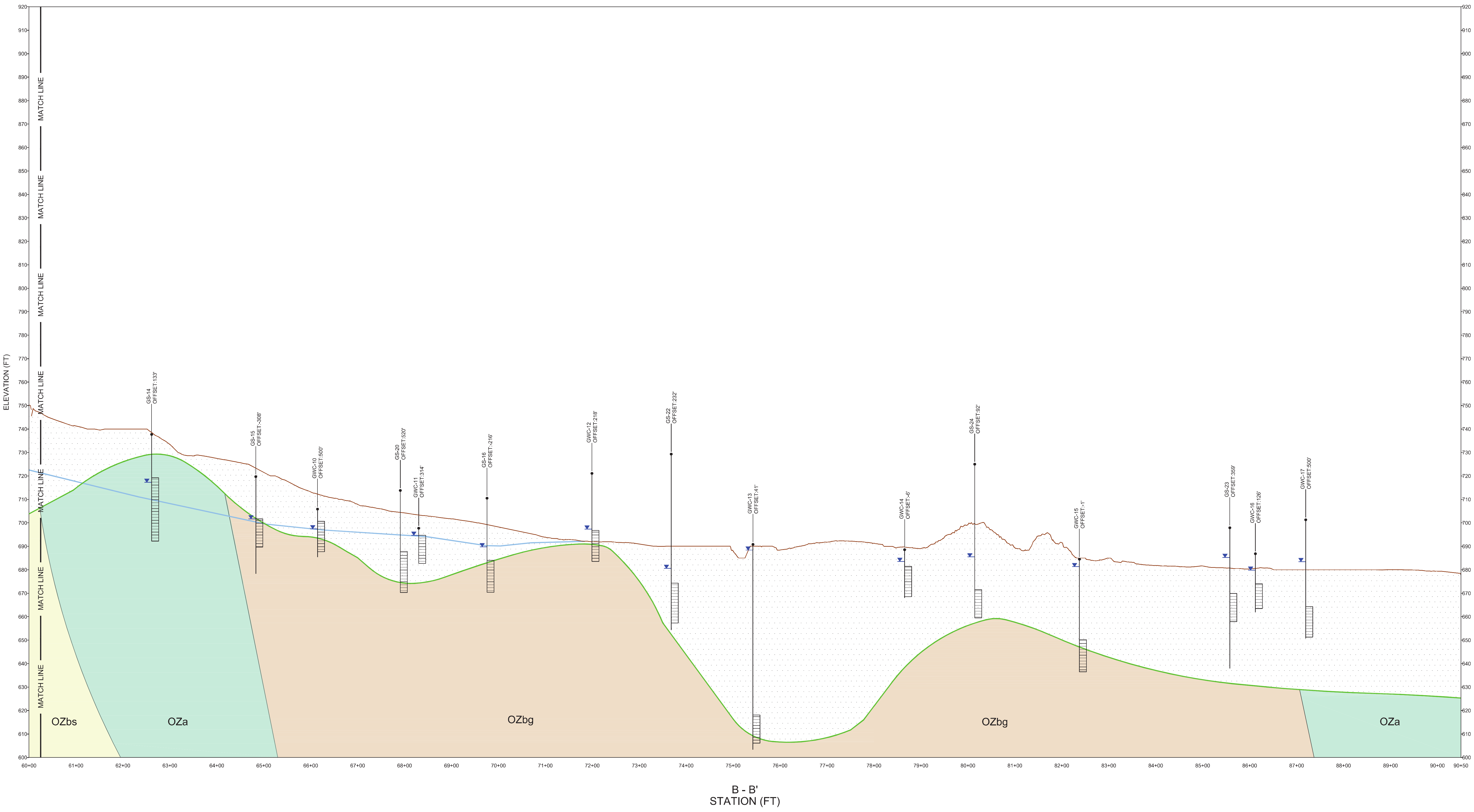
PROJECT
GEOLOGIC AND HYDROGEOLOGIC SUMMARY REPORT
PLANT WANSLEY

TITLE
GEOLOGIC CROSS SECTIONS SCHEMATIC
(FIGURE 5 OF 6)

PROJECT NO.	CONTROL	REV.	FIGURE
18111854	18111854A004.dwg	0	5-5

Path: C:\Users\dcoss\Documents\CAD Workspace\18111854-Georgia Power-Plant Wansley\PRODUCTION\A-GEOLOGIC AND HYDROGEOLOGIC SUMMARY REPORT\ | File Name: 18111854A004.dwg

0 1 in IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D



LEGEND

―	EXISTING GRADE
―	ESTIMATED GROUNDWATER SURFACE (2-13-15)
―	ESTIMATED TOP OF ROCK SURFACE
▭	OVERBURDEN/RESIDUUM

REFERENCES

1. EXISTING GRADE FROM USGS
7.5 MINUTE QUADRANGLE; LOWELL, 2011.

2. BORING/WELL/PIEZOMETER LOCATIONS AND ELEVATIONS PROVIDED BY SOUTHERN COMPANY SERVICES, INC.

3. GEOLOGIC UNITS TAKEN FROM MAPPING COMPLETED BY PETROLOGIC SOLUTIONS INC. IN 2015

0 100 200
1" = 100' FEET
5X VERTICAL EXAGGERATION

CLIENT
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GOLDER

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DESIGNED	DLP
PREPARED	DJC
REVIEWED	DLP
APPROVED	RPK

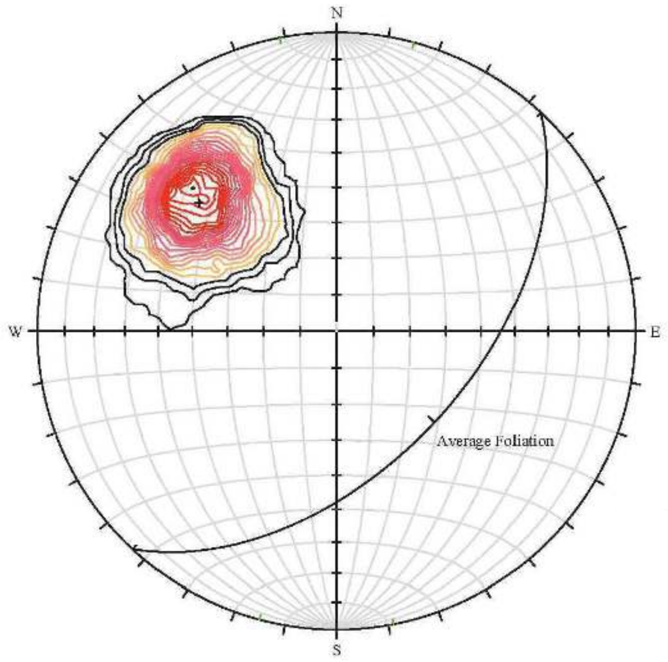
PROJECT
GEOLOGIC AND HYDROGEOLOGIC SUMMARY REPORT
PLANT WANSLEY

TITLE
GEOLOGIC CROSS SECTIONS SCHEMATIC
(FIGURE 6 OF 6)

PROJECT NO.	CONTROL	REV.	FIGURE
18111854	18111854A004.dwg	0	5-6

Path: C:\Users\dcoss\Documents\CAD Workspace\18111854-Georgia Power-Plant Wansley\PRODUCTION\A-GEOLOGIC AND HYDROGEOLOGIC SUMMARY REPORT\ | File Name: 18111854A004.dwg

0 1 in IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

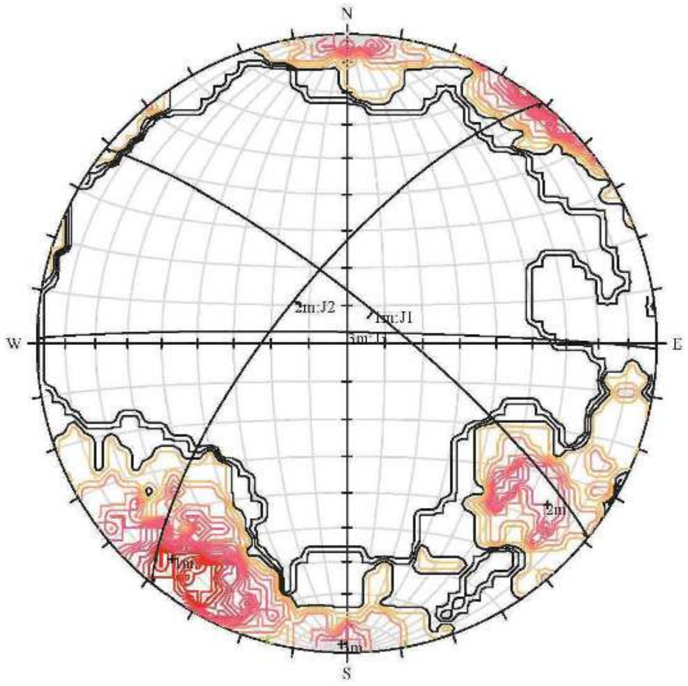


Equal-Area, Lower-Hemisphere, Stereonet of measured Foliation.

Orientations

ID	Strike Dip / AzimuthR
1m	N43E 53 SE / 043 / 53

Equal Area
Lower Hemisphere
44 Poles
44 Entries



Equal-Area, Lower-Hemisphere, Stereonet of measured Joints.

Orientations

ID	Strike Dip / AzimuthR
1m	N51W 79 NE / 309/79
2m	N39E 72NW / 219/72
3m	N89E 87 NE / 271/87

Equal Area
Lower Hemisphere
44 Poles
44 Entries

NOT TO SCALE

NOTE
1. DISCONTINUITY DATA COLLECTED AND ANALYZED BY PETROLOGIC SOLUTIONS, INC.

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PROJECT
GEOLOGIC AND HYDROGEOLOGIC SUMMARY REPORT
PLANT WANSLEY

TITLE
DISCONTINUITY DATA FROM GEOLOGIC MAPPING

PROJECT NO.	CONTROL	REV.	FIGURE
18111854	18111854A005.dwg	0	6

Path: C:\Users\dcoss\Documents\CAD Workspace\18111854-Georgia Power-Plant Wansley\PRODUCTION\A-GEOLOGIC AND HYDROGEOLOGIC SUMMARY REPORT\ | File Name: 18111854A005.dwg

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

NOT TO SCALE

LEGEND

┅ LINEAMENTS

━ PLANT WANSLEY BOUNDARY

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DESIGNED	DLP
PREPARED	DJC
REVIEWED	
APPROVED	

PROJECT

GEOLOGIC AND HYDROGEOLOGIC SUMMARY REPORT
PLANT WANSLEY

TITLE

REMOTE SENSING LINEAMENT MAP

PROJECT NO.	CONTROL	REV.	FIGURE
18111854	18111854A006.dwg	0	7

Path: C:\Users\dcoss\Documents\CAD Workspace\18111854-Georgia Power-Plant Wansley\PRODUCTION\A-GEOLOGIC AND HYDROGEOLOGIC SUMMARY REPORT\ | File Name: 18111854A006.dwg

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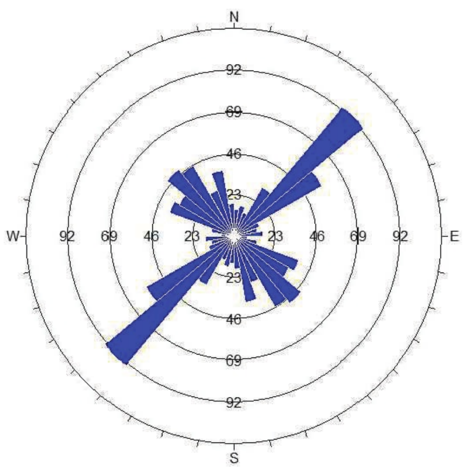


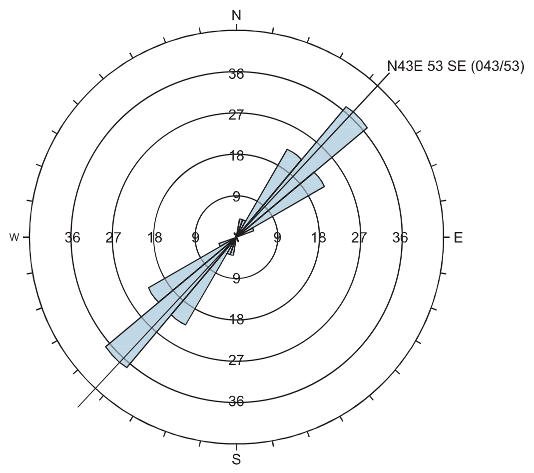
Rose Diagram of measured Lineaments.

Apparent Strike
115 max planes / arc
at outer circle

538 Planes Plotted
Within 45 and 90
Degrees of Viewing
Face

Trend / Plunge of
Face Normal = 0, 90
(directed away from viewer)

No Bias Correction



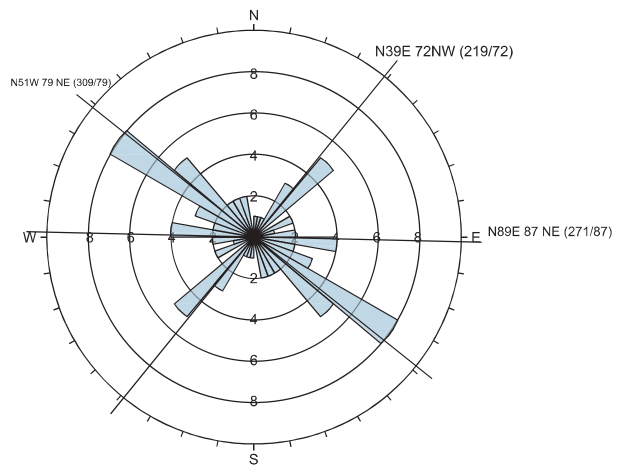
Rose Diagram of measured Foliation.

Apparent Strike
45 max planes / arc
at outer circle

94 Planes Plotted
Within 0 and 90
Degrees of Viewing
Face

Trend / Plunge of
Face Normal = 0, 90
(directed away from viewer)

No Bias Correction



Rose Diagram of measured Joints.

Apparent Strike
10 max planes / arc
at outer circle

44 Planes Plotted
Within 0 and 90
Degrees of Viewing
Face

Trend / Plunge of
Face Normal = 0, 90
(directed away from viewer)

No Bias Correction

NOT TO SCALE

NOTE
1. DISCONTINUITY DATA COLLECTED AND ANALYZED BY PETROLOGIC SOLUTIONS, INC.

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Georgia Power

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PREPARED	DJC
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PROJECT
GEOLOGIC AND HYDROGEOLOGIC SUMMARY REPORT
PLANT WANSLEY

TITLE
COMPARISON OF MEASURED DISCONTINUITIES AND LINEAMENTS

PROJECT NO.	CONTROL	REV.	FIGURE
18111854	18111854A007.dwg	0	8

Path: C:\Users\dcoss\Documents\CAD Workspace\18111854-Georgia Power-Plant Wansley\PRODUCTION\A-GEOLOGIC AND HYDROGEOLOGIC SUMMARY REPORT\ | File Name: 18111854A007.dwg

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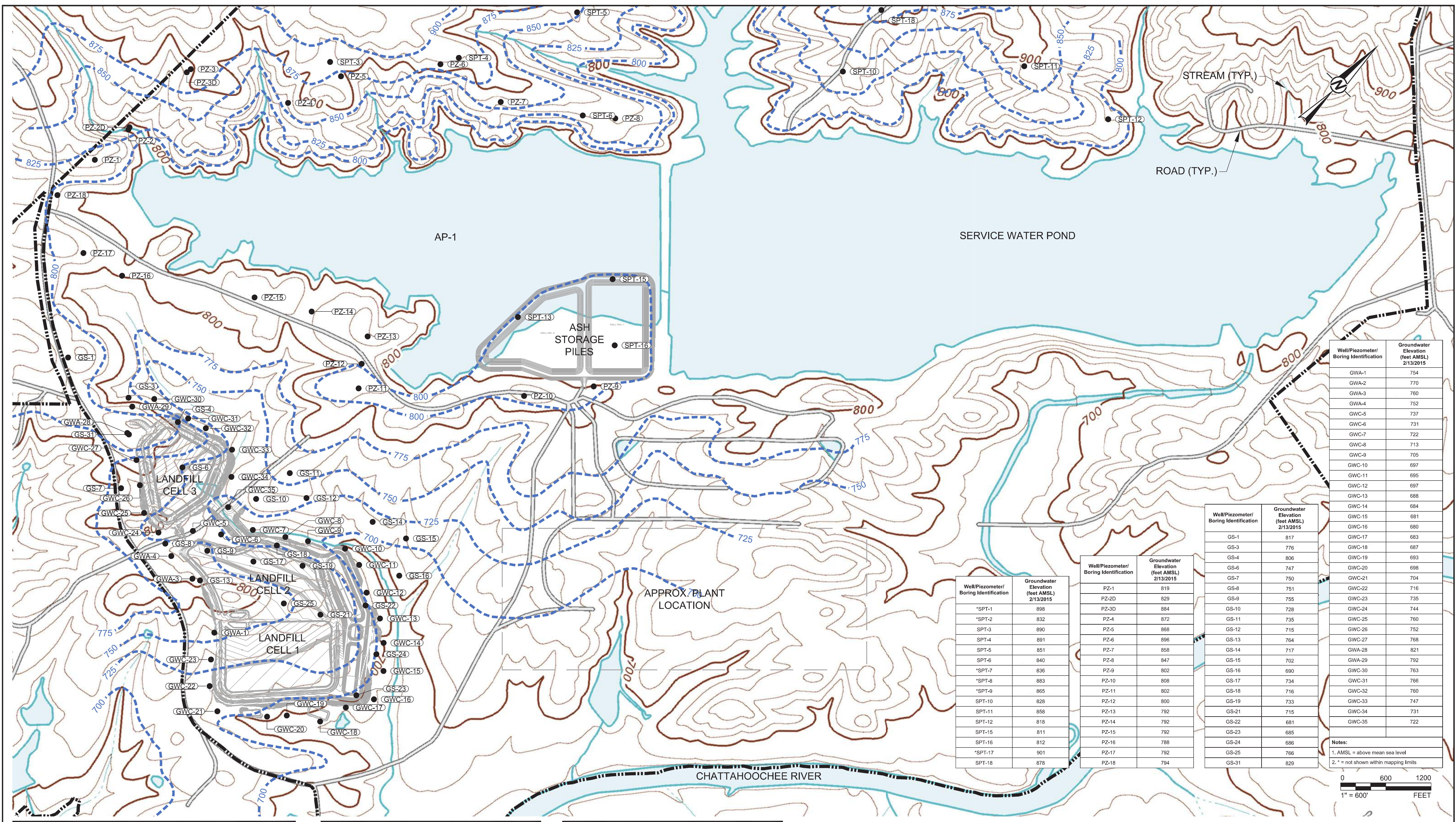

Well/Piezometer/ Boring Identification	Groundwater Elevation (feet AMSL) 2/13/2015
*SPT-1	898
*SPT-2	832
SPT-3	890
SPT-4	891
SPT-5	851
SPT-6	840
*SPT-7	836
*SPT-8	883
*SPT-9	865
SPT-10	828
SPT-11	858
SPT-12	818
SPT-15	811
SPT-16	812
*SPT-17	901
SPT-18	878

Well/Piezometer/ Boring Identification	Groundwater Elevation (feet AMSL) 2/13/2015
PZ-1	819
PZ-2D	829
PZ-3D	884
PZ-4	872
PZ-5	868
PZ-6	896
PZ-7	858
PZ-8	847
PZ-9	802
PZ-10	808
PZ-11	802
PZ-12	800
PZ-13	792
PZ-14	792
PZ-15	792
PZ-16	788
PZ-17	792
PZ-18	794

Well/Piezometer/ Boring Identification	Groundwater Elevation (feet AMSL) 2/13/2015
GS-1	817
GS-3	776
GS-4	806
GS-6	747
GS-7	750
GS-8	751
GS-9	755
GS-10	728
GS-11	735
GS-12	715
GS-13	764
GS-14	717
GS-15	702
GS-16	690
GS-17	734
GS-18	716
GS-19	733
GS-21	715
GS-22	681
GS-23	685
GS-24	686
GS-25	766
GS-31	829

Well/Piezometer/ Boring Identification	Groundwater Elevation (feet AMSL) 2/13/2015
GWA-1	754
GWA-2	770
GWA-3	760
GWA-4	752
GWC-5	737
GWC-6	731
GWC-7	722
GWC-8	713
GWC-9	705
GWC-10	697
GWC-11	695
GWC-12	697
GWC-13	688
GWC-14	684
GWC-15	681
GWC-16	680
GWC-17	683
GWC-18	687
GWC-19	693
GWC-20	698
GWC-21	704
GWC-22	716
GWC-23	735
GWC-24	744
GWC-25	760
GWC-26	752
GWC-27	768
GWA-28	821
GWA-29	792
GWC-30	763
GWC-31	766
GWC-32	760
GWC-33	747
GWC-34	731
GWC-35	722

Notes:
1. AMSL = above mean sea level
2. * = not shown within mapping limits

0 600 1200
1" = 600' FEET

LEGEND

▬ ▪▪ ▬ ▪▪ ▬	PROPERTY BOUNDARY
▪ ▪ ▪ ▪ ▪ ▪	ESTIMATED GROUNDWATER SURFACE CONTOUR (ft MSL)
●	EXISTING BORING/WELL/PIEZOMETER LOCATIONS

NOTES

1. TOPOGRAPHIC CONTOUR INTERVAL = 20 FEET
2. GROUNDWATER SURFACE CONTOUR INTERVAL = 25 FEET
3. GROUNDWATER ELEVATIONS MEASURED ON 02/13/2015.
4. GROUNDWATER CONTOURS BASED ON LINEAR INTERPOLATION BETWEEN AND EXTRAPOLATION FROM KNOWN DATA, TOPOGRAPHIC CONTOURS, AND KNOWN FIELD CONDITIONS, THEREFORE, GROUNDWATER CONTOURS MAY NOT REFLECT ACTUAL CONTOURS.

REFERENCES

1. USGS 7.5 MINUTE QUADRANGLE; LOWELL, 2011.
2. TOPOGRAPHIC CONTOURS FOR LANDFILL AND ASH STORAGE PILES PROVIDED BY SOUTHERN COMPANY SERVICES, INC.
3. BORING/WELL/PIEZOMETER LOCATIONS PROVIDED BY SOUTHERN COMPANY SERVICES, INC.

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Georgia Power

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YYYY-MM-DD	2018-11-07
DESIGNED	DLP
PREPARED	DJC
REVIEWED	DLP
APPROVED	RPK

PROJECT
GEOLOGIC AND HYDROGEOLOGIC SUMMARY REPORT
PLANT WANSLEY

TITLE
FEBRUARY 13, 2015, POTENTIOMETRIC SURFACE MAP

PROJECT NO.	CONTROL	REV.	FIGURE
18111854	18111854A002.dwg	0	9

Path: C:\Users\dcoss\Documents\CAD Workspace\18111854-Georgia Power-Plant Wansley\PRODUCTION\A-GEOLOGIC AND HYDROGEOLOGIC SUMMARY REPORT\ | File Name: 18111854A002.dwg

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