2.4 Hydrologic Engineering

Section 2.4 describes the hydrological characteristics of the VEGP site. The site location and description are provided in sufficient detail to support the safety analysis. This section addresses characteristics and natural phenomena that have the potential to affect the design basis for the proposed AP1000 units. The Section is divided into thirteen sections:

- Hydrologic Description (Section 2.4.1)
- Floods (Section 2.4.2)
- Probable Maximum Flood on Streams and Rivers (Section 2.4.3)
- Potential Dam Failures (Section 2.4.4)
- Probable Maximum Surge and Seiche Flooding (Section 2.4.5)
- Probable Maximum Tsunami Flooding (Section 2.4.6)
- Ice Effects (Section 2.4.7)
- Cooling Water Canals and Reservoirs (Section 2.4.8)
- Channel Diversions (Section 2.4.9)
- Flood Protection Requirements (Section 2.4.10)
- Low Water Considerations (Section 2.4.11)
- Ground Water (Section 2.4.12)
- Accidental Releases of Liquid Effluents in Ground and Surface Waters (Section 2.4.13)

2.4.1 Hydrologic Description

2.4.1.1 Site and Facilities

The 3,169-acre VEGP site is located on a coastal plain bluff on the southwest side of the Savannah River in eastern Burke County. The site is approximately 30 river miles above the U.S. Highway 301 bridge and directly across the river from the Department of Energy's Savannah River Site (Barnwell County, South Carolina). The VEGP site is approximately 15 miles east-northeast of Waynesboro, Georgia and 26 miles southeast of Augusta, Georgia, the nearest population center (i.e., having more than 25,000 residents). It is also about 100 miles north-northwest of Savannah, Georgia and 150 river miles from the mouth of the Savannah River. The contributing drainage area of the Savannah River at the site is 8,304 square miles, as estimated from digital mapping.

The Savannah River Basin and its subbasins, as delineated by the National Weather Service **(NWS 2005)**, and further subdivided into USGS Hydrologic Unit Code (HUC-12) subbasins

(USGS 2006f), are shown in Figure 2.4.1-1. The drainage areas of the NWS subbasins are given in Table 2.4.1-1

Two Westinghouse pressurized water reactors (PWRs), rated at 3,565 MWt each, are currently in operation at the VEGP site. Unit 1 began commercial operation in May 1987; Unit 2 began commercial operation in May 1989. All structures, including the containment structures, two natural draft cooling towers (one per unit), associated pumping and discharge structures, water treatment building, switchyard, and training center, are located at or above El. 220 ft mean sea level (msl).

SNC has selected the Westinghouse AP1000 certified plant design **(NRC 2006)** for the VEGP ESP application. The proposed AP1000 units, to be referred to as Units 3 and 4, will be located west of and adjacent to existing Units 1 and 2 as shown in SSAR Figure 1-4. The AP1000 is rated at 3,400 MWt, with a net electrical output of 1,117 megawatts electrical (MWe). The new units will use natural draft towers for circulating water system cooling, with make-up water coming from the Savannah River, and mechanical draft towers for service water system cooling, with make-up water coming from site wells. The Units 3 and 4 grade elevation will also be at or above 220 feet msl. An extensive site storm water drainage system was developed during construction of Units 1 and 2 and will be used for Units 3 and 4 with some modifications.

2.4.1.2 Hydrosphere

The Savannah River is the main hydrologic feature that may affect or be affected by power plants constructed at the VEGP site.

The watershed of the Savannah River extends into the mountains of North Carolina, South Carolina, and Georgia near Ellicott Rock, the point where the borders of those three states meet. The river system drains a basin of 10,577 sq mi, divided between the three states as follows **(SR 2006)**:

- 4,581 sq mi in South Carolina
- 5,821 sq mi in Georgia
- 175 sq mi in North Carolina

Within the three states, the basin includes portions of 44 counties and borders two major metropolitan centers, Augusta and Savannah. The lower 50 mi is tidally influenced **(USACE 1996)**.

The Savannah River basin, which is described as long and relatively narrow, crosses through three distinct physiographic provinces: Mountain, Piedmont, and Coastal Plain. The Mountain and Piedmont provinces are within the Appalachian Mountain range, with the border between them extending from northeast to southwest, crossing the Tallulah River at Tallulah Falls. The

Fall Line, or division between the Piedmont province and the Coastal Plain, also crosses the basin in a generally northeast to southwest direction, near Augusta, Georgia **(USACE 1996)**.

Watershed elevations range from 5,030 ft msl at Little Bald Peak in North Carolina to sea level at Savannah. The approximate range of elevations for each physiographic region is **(USACE 1996)**:

- 5,030 to 1,800 ft msl within the Mountain Province
- 1,800 to 500 ft msl within the Piedmont Province
- 500 to 0 ft msl within the Coastal Plain

The Savannah River, together with certain of its tributaries, forms the border between the states of Georgia and South Carolina. The confluence of the Seneca and Tugaloo Rivers, formerly known as "The Forks," but now inundated by Hartwell Lake, marks the upstream end of the Savannah River. The length of the Savannah River from “The Forks” to the mouth is approximately 312 mi **(USACE 1996)**.

The following principal streams make up the Savannah River stream system **(USACE 1996)**:

- The Tallulah and Chatooga rivers combine to form the Tugaloo River at River Mile 358.1.
- Twelve Mile Creek and the Keowee River join to form the Seneca River at River Mile 338.5.
- The Tugaloo and Seneca rivers join to form the Savannah River proper at River Mile 312.1, at the point known as “The Forks.”

The entire 312-mi length of the Savannah River is regulated by three adjoining US Army Corps of Engineers (USACE) multipurpose projects, forming a chain along the Georgia–South Carolina border 120 mi long. The three reservoirs, each with appreciable storage, are, from upstream to downstream:

- Hartwell Lake and Dam
- Richard B. Russell Lake and Dam
- J. Strom Thurmond Lake and Dam (also known as Clarks Hill Lake and Dam)

Of the 6,144 sq mi drainage basin above Thurmond Dam, 3,254 sq mi (53 percent) are between Thurmond and Russell Dams, 802 sq mi (13 percent) are between Russell and Hartwell Dams, and 2,088 sq mi (34 percent) are above the Hartwell Dam **(USACE 1996)**. Table 2.4.1-2 lists the River Miles of key landmarks along the Savannah River.

The climate in the upper Savannah River watershed is classified as temperate, with generally mild winters and long summers. The basin is protected from the extremes of winter continental weather experienced in the nearby Tennessee Valley by the Blue Ridge Mountains. The annual mean temperature for the basin is 60 ºF. January, which is usually the coldest month of the year, frequently has night temperatures of 20 ºF or lower. July and August, the hottest months of the year, have many days with temperatures over 90 ºF. In the lower section of the basin, the winters are milder and the summer temperatures higher **(USACE 1996)**.

There are generally two periods of maximum rainfall in the upper basin: February–March and July–August, although heavy rainfall has occurred in practically every calendar month. The mean annual precipitation decreases from 83.5 in. in Highlands, North Carolina, to 49.2 in. at Savannah, Georgia **(USACE 1996)**.

2.4.1.2.1 Hydrologic Characteristics

Average daily and annual peak flow series data have been tabulated by the USGS for nine stream gages that have been maintained along the Savannah River between River Miles 288.9 and 60.9. Table 2.4.1-3 identifies location, gage elevation, upstream drainage area, and start and stop date and number of records for the annual and daily time series for each gage. Annual peak discharge data for these gages are used in Section 2.4.2; daily discharge data for these gages are used in Section 2.4.11.3. Summary statistics characterizing the seasonal flow variability are discussed below.

As indicated in Table 2.4.1-2, the USGS gage at Jackson, South Carolina, is approximately 6 river miles upstream of the VEGP site. Based on the average daily flow series for this gage, presented in Table 2.4.1-6, the average daily discharge at the site is 8,913 cfs, calculated as the mean of the average daily flows for each day of the 31-year record. For this gage, the monthly average daily flow varies from a minimum of 7,216 cfs in September to a maximum of 11,347 cfs in March. A plot of the monthly variation in average daily flow on the Savannah River recorded at the Jackson, South Carolina stream gage (with plots for the Calhoun Falls, Augusta, and Clyo gages included for comparison) is provided in Figure 2.4.1-2, based on USGS records for the years of record of each gage, without accounting for the impact of changes in upstream regulation. Tables 2.4.1-4 through 2.4.1-7 show the average daily discharge for the years of record for each of the four gages presented in Figure 2.4.1-2.

2.4.1.2.2 Local Site Drainage

Local drainage is shown in Figure 2.4.1-3, which was developed from the Shell Bluff Landing, Girard NW, Alexander, and Girard USGS quadrangle sheets. The site is on a high, steep bluff on the west bank of the Savannah River, overlooking the extensive floodplain on the east bank. Georgia State Highway 23 runs roughly parallel to the river, about 4 mi from the VEGP site. It runs along the ridge line that separates local drainage running northeast to the river from runoff draining generally to the southwest.

An unnamed, highly incised creek drains the northern area of the site, including Mallard Pond, into the Savannah River just upstream of the site, near the point identified as Hancock Landing in Figure 2.4.1-3.

To the west, the site is drained by the Red Branch and Daniels Branch, which combine and drain along with Beaverdam Creek and High Head Branch into Telfair Pond, south of the site. A small, unnamed stream runs parallel to and about 2,000 ft to the west of River Road outfalls to Beaverdam Creek downstream of the pond.

The names, estimated channel lengths, and slopes of the natural channels draining the site area are provided in Table 2.4.1-8.

2.4.1.2.3 Dams and Reservoirs

There are a number of water control structures on the Savannah River and its major tributaries **(USGS 1990**, **USACE 1993**, and **USACE 1996)**. Table 2.4.1-9 presents a list of these structures with hydraulic design information for each project and identification of its location with respect to the VEGP site.

Three major projects run by the USACE upstream of the VEGP site have a significant influence on the discharge of the Savannah River due to their large storage volume. These are:

- Hartwell Lake and Dam,
- Richard Russell Lake and Dam, and
- J. Strom Thurmond Lake and Dam (also known as Clarks Hill Lake and Dam on the Georgia side)

The authorized water management goals of the three-dam multi-use project are specified for normal operation, flood operation, and drought condition operation as follows **(USACE 1996)**:

For normal conditions, the operation policy is designed to maximize the public benefits of hydroelectric power, flood damage reduction, recreation, fish and wildlife, water supply, and water quality.

Under flood conditions, the water management objective of the multipurpose projects is to operate the reservoir system to minimize flooding downstream by timing turbine discharges, gate openings, and spillway discharges as required.

For drought conditions, the water management objectives of the projects are:

- To prevent draw-down of lake levels below the bottom of the conservation pool,
- To make use of most of the available storage in the lake during the drought-of-record,
- To maintain hydroelectric plant capacity throughout the drought, and
- To minimize adverse impacts to recreation during the recreation season (generally considered to be from May 1 through Labor Day)

The USACE also operates the New Savannah Bluff Lock and Dam upstream of the VEGP site, but this project has very little impact on flows at the site, due to its small run-of-river storage volume **(USACE 1996)**.

Each project is described briefly in the following paragraphs **(USACE 1996)**.

The Hartwell Lake and Dam is at River Mile 288.9, 7 mi east of Hartwell, Georgia. The top of the conservation pool is set at El. 660 ft msl. At this level, the reservoir extends 49 mi up the Tugaloo River in Georgia and 45 mi up the Seneca and Keowee Rivers in South Carolina. The shoreline at El. 660 ft msl is approximately 962 mi long, excluding island areas. Operation of the project began in 1965.

The reservoir has a total storage capacity of 2,550,000 acre-feet below El. 660 ft msl. The dam consists of a concrete gravity section 1,900 ft in length and rising about 204 ft above the streambed, and two earth embankment sections extending to high ground on the Georgia and South Carolina shores of the river, for a total length of 17,880 ft.

The Richard B. Russell Lake and Dam is at River Mile 259.1 in Elbert County, Georgia, and Abbeville County, South Carolina. The dam is 18 mi southwest of Elberton, Georgia; 4 mi southwest of Calhoun Falls, South Carolina; and 40 mi northeast of Athens, Georgia. Operation of the project began in January 1985.

The top of the conservation pool is set at El. 475 ft msl. The reservoir has a total storage capacity of 1,026,200 acre-feet at this level, and 1,166,166 acre-feet of total storage at the top of the flood control pool (El. 480 ft msl).

The dam consists of a concrete gravity section 1,883.5 ft in length and two earth embankment sections, 2,180 ft in length in Georgia and 460 ft in length in South Carolina. A concrete overflow spillway section is located in what was formerly the stream channel. It has an ogee-shaped crest controlled by 10 tainter gates.

A flip bucket for dissipating the energy of spillway discharges is located at the bottom of the spillway. The spillway tainter gates are designed for a maximum discharge of 800,000 cfs at pool El. 490 ft msl.

The J. Strom Thurmond Lake and Dam is at River Mile 221.6 on the Savannah River, 22 mi upstream of Augusta, Georgia. The reservoir at the top of the flood control pool (El. 335 ft msl) has an area of 78,500 acres. At El. 330 ft msl, the top of the conservation pool, the reservoir extends about 40 mi up the Savannah River and about 30 mi up the Little River in Georgia and has approximately 1,050 mi of shoreline, excluding island areas. The reservoir has a total storage capacity of 2,510,000 acre-feet below El. 330 ft msl. Operation of the project began in 1952.

The dam consists of a concrete gravity section 2,282 ft in length and two earth embankment sections with a total length of 5,680 ft, extending to high ground on the Georgia and South Carolina shores.

The spillway is a concrete gravity ogee section extending across the west floodplain and river channel. A bucket anchored to solid rock and constructed at four levels ranging from

El. 163.0 ft msl to El. 179.0 ft msl, is provided at the toe of the spillway. The spillway discharges are controlled by 23 tainter gates separated by concrete piers 8 ft thick.

The embankments and earth dam are of rolled fill construction. An impervious core, graded from coarse and medium sand to fine silt and clay, extends to rock and is contained by a more pervious shell, consisting of well-graded coarse and medium sand to silt. The embankments are covered with rip-rap from the top down to El. 295 ft msl on the upstream side, and from the toe up to an elevation above maximum tailwater on the downstream side. U.S. Highway 221 crosses the dam.

<u>The New Savannah Bluff Lock and Dam</u> is located at River Mile 187.7. The function of the lock was originally to provide adequate draft depths for navigation, but there is currently very little commercial navigation above Savannah Harbor. Today the structure's main function is to maintain an adequate river stage for upstream water supply intake structures.

The structure crosses the Savannah River about 13 mi below Augusta. It is a concrete dam 360 ft long containing five vertical-lift crest control gates. The lock chamber, located on the Georgia side of the river, is 56 ft by 360 ft and is closed by mitering lock gates. The lift is 15 ft, the depth over the lower miter sill being about 10 ft at low water and over the upper miter sill being 14 ft at normal pool level. Elevation of the normal pool is about 115.0 ft msl, and low water at the downstream entrance to the lock is at El. 101.8 ft msl, based on a flow of 6,300 cfs.

2.4.1.2.4 Proposed Water Management Changes

The USACE, working in response to US Environmental Protection Agency (EPA) recommendations, is currently reviewing operating rules for the dams under its jurisdiction in the Savannah River watershed. The study goal is to determine if changes are warranted to meet current and future water resource management goals, including flood control, water supply, fish and wildlife enhancement, drought control, water quality, recreation, and aquatic plant control. The study is scheduled for completion in 2009 **(USACE 2004)**.

Pending the results of the watershed study, current USACE operations along the river are limited to the maintenance of existing structures and minor flood control improvements with no significant impact on the VEGP site.

It has been reported **(SR 2006)** that the Ports Authority of Georgia is considering deepening the harbor in Savannah to accommodate the new very large container ships that will be visiting ports on the East coast. The possibility that dredging would force the salinity gradient further upstream with possible adverse impact on the Savannah National Wildlife Refuge has been the subject of some study, but the possible change in policy would have no impact on safety issues at the VEGP site.

2.4.1.2.5 Surface Water Users

Historically, the Savannah River was an important transportation corridor, but today it serves primarily as a source of water for industry and municipalities, a receiving body for the subsequent discharge of effluent, and an avenue for power generation and recreational activities **(SR 2006)**.

Agencies with important roles in the watershed include the USACE, which is responsible for maintaining reservoirs on the main stem of the Savannah River, and the EPA in cooperation with the Georgia Environmental Protection Division and the South Carolina, which are responsible for maintaining water quality in the basin.

Current in-stream use of Savannah River water includes minimum stream flow requirements for navigation and environmental maintenance, and diversions for industrial use, including once-through cooling. Consumptive use of Savannah River water is predominantly for industrial withdrawals for cooling water towers and processing and diversions to water treatment plants for municipal water use.

Table 2.4.1-10 presents a summary of data on surface-water users adjacent to or downstream from VEGP whose intakes could be adversely impacted by an accidental release of contaminants from the site; the summary includes information on the owner, facility type, estimated distance from the VEGP site, and average daily withdrawal rate.

Information about groundwater users is presented in Section 2.4.12, while Section 2.4.13 discusses the consequences of liquid effluent releases to surface waters.

Table 2.4.1-1 Savannah River Subbasins and Drainage Areas above VEGP Site

NWS Subbasin		NWS Subbasin Name	Drainage Area, mi^2	
No.	I.D.		upstream of site (1)	downstream of site (2)
1	TIGG1	Burton Dam, GA	122.3	0.0
2	JCSS1	Jocassee Dam, SC	157.7	0.0
3	KEOS1	Keowee Dam, SC	288.0	0.0
4	HRTG1	Hartwell Dam, GA	1544.7	0.0
5	RBRS1	R.B. Russell Dam	738.2	0.0
6	CARG1	Carlton Bridge, GA	760.6	0.0
7	CHDS1UP	Clark Hill - Thurmon Dam (upstream)	665.9	0.0
8	CHDS1	Clark Hill Dam	1847.7	0.0
9	MODS1	Modoc, S.C.	539.9	0.0
10	AGTG1	Steven Creek Dam, GA	454.8	0.0
11	AGSG1	Augusta 5th Street	77.1	0.0
12	AUGG1	Augusta/Butler Creek	273.6	0.0
13	JACS1	Jackson, S.C.	651.2	0.0
14	BFYG1	Burton's Ferry, GA	182.5	293.4
15	BRIG1	Millhaven, GA	0.0	646.2
16	CLYG1	Clyo, GA	0.0	634.7
Estimated Savannah River drainage area at site			**8304.2**	

1) Based on data from Southeast River Flood Forecasting Center, Atlanta, GA. (NWS 2005)
2) As estimated from HUC-12 shapefiles

Table 2.4.1-2 River Miles for Key Landmarks Along the Savannah River

Land Mark	River Mile *
Confluence of White Water & Toxaway Rivers	368.6
Confluence of Tallulah & Chatooga (forming the Tugaloo)	358.1
Confluence of the Keowee & Twelve Mile Creek (forming Seneca River)	338.5
Confluence of the Senaca & Tugaloo Rivers (forming the Savannah)	312.1
Hartwell Dam (USGS gage 02187250)	288.9
Iva gage (USGS gage 02187500)	280.4
Confluence of Broad River	269.6
Calhoun Falls (USGS gage 02189000)	263.6
Richard B. Russell Dam (USGS gage 02189004)	259.1
Conflence of Little River	223.4
J. Strom Thurmond Dam (USGS gage 02194500)	221.6
Confluence of Stevens Creek	208.1
Augusta City Dam	207.0
Augusta, GA at Fifth Street gage site (02197000)	199.6
Horse Creek at mouth	197.4
New Savannah Bluff Lock and Dam	187.7
Shell Bluff Landing, Georgia	161.9
Jackson, SC gage (02197320)	156.8
Vogtle Electric Generating Plant	150.9
Burtons Ferry Gage (02197500)	118.7
Confluence of Brier Creek	102.5
Clyo gage (02198500)	60.9
Ebenezer Landing, Georgia	48.1
Houlihan Bridge (U.S. Highway 17)	21.6
City of Savannah, GA at Bull Street	14.4
Mouth of the Savannah River	0.0

* River miles measured from the mouth of Savannah Harbor, as reported by USACE 1996.

Table 2.4.1-3 USGS Gage Data for the Savannah River

USGS Gage ID	Location on Savannah River	River Mile *	Coordinates		Altitude, feet MSL **	Area drained, mi^2	Average daily flow series			Annual Peak flow series		
							Start	End	No.	Qp start	Qp end	No.
2187252	below Hartwell Lake nr Hartwell, GA	288.9	34°21'15" N,	82°48'55" W	470.00	2,090	10/1/1984	9/30/1999	4,502	1/21/1985	8/24/1999	15
2187500	near Iva, SC	280.4	34°15'20" N,	82°44'42" W	432.26	2,231	10/1/1950	9/30/1981	11,323	10/8/1949	7/24/1981	32
2189000	near Calhoun Falls, SC	263.6	34°04'15" N,	82°38'30" W	363.53	2,876	10/1/1896	9/30/1979	17,044	4/5/1897	3/28/1980	82
2195000	near Clarks Hill, SC	NR	33°38'40" N,	82°12'05" W	182.69	6,150	5/14/1940	6/30/1954	5,161	--	--	0
2196484	near North Augusta, SC	207.0	33°33'06" N,	82°02'19" W	150.00	7,150	10/1/1988	9/30/2002	5,113	9/21/1989	3/4/2002	13
2197000	at Augusta, GA	199.6	33°22'25" N,	81°56'35" W	96.58	7,508	10/1/1883	9/30/2003	35,793	1/17/1796	6/14/2004	133
2197320	near Jackson, SC	156.8	33°13'01" N,	81°46'04" W	77.00	8,110	10/1/1971	9/30/2002	10,733	1/21/1972	3/5/2002	30
2197500	at Burtons Ferry Bridge nr Millhaven, GA	118.7	32°56'20" N,	81°30'10" W	52.42	8,650	10/1/1939	9/30/2003	18,993	10/1/1929	3/21/2003	53
2198500	near Clyo, GA	60.9	32°31'41" N,	81°16'08" W	13.39	9,850	10/1/1929	9/30/2003	25,567	1/24/1925	3/3/2004	80

* River miles measured from the mouth of Savannah Harbor, as reported by USACE 1996.
** NGVD 1929

Source: Adapted from USGS 2006a

Table 2.4.1-4 Daily Average Flow Data for the Savannah River at Calhoun Falls, South Carolina (USGS Gage 2189000)

Day of month	Mean of daily mean values for this day for 49 years of record[1], in ft^3/s											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	5,364	5,898	6,560	8,923	6,925	5,443	4,455	3,872	4,237	3,286	3,630	4,632
2	5,084	6,221	6,427	8,229	6,832	5,161	4,482	4,081	3,904	3,078	3,827	4,534
3	5,719	5,796	6,734	7,558	6,824	4,698	4,020	4,167	3,718	2,960	3,821	4,435
4	5,632	6,219	7,497	7,158	6,529	5,023	3,008	4,237	3,547	3,205	4,180	5,338
5	5,596	5,686	6,972	8,424	5,786	5,796	3,114	4,531	3,558	3,488	4,082	6,139
6	6,324	5,925	6,452	8,819	5,454	5,555	3,935	4,285	3,642	3,323	4,048	5,638
7	7,437	7,683	7,408	8,529	5,380	5,587	4,638	4,310	4,473	3,224	3,810	5,778
8	6,593	6,761	7,349	8,164	5,243	6,334	4,592	4,356	4,503	3,887	3,820	5,563
9	5,991	6,038	6,340	8,194	5,215	5,651	4,681	4,450	4,410	3,780	3,864	4,983
10	6,304	6,226	5,744	6,916	5,039	4,783	4,567	4,226	3,976	3,412	3,780	5,151
11	6,274	6,374	6,054	6,539	5,265	4,809	4,260	3,953	3,885	3,451	3,932	4,961
12	5,577	6,749	6,824	7,098	5,606	4,912	4,617	3,676	3,593	3,463	3,866	5,437
13	5,061	8,015	7,053	7,949	5,521	5,155	5,113	5,354	3,819	3,246	4,227	5,333
14	5,664	8,108	7,193	8,068	5,405	5,225	4,718	5,460	3,958	3,128	3,872	5,486
15	5,451	6,564	6,791	7,346	5,621	4,838	4,503	4,829	4,023	3,178	4,062	6,332
16	5,840	6,167	7,183	7,791	5,561	4,552	4,880	4,299	3,899	3,248	4,064	5,910
17	6,253	6,370	6,959	7,460	5,493	4,819	4,899	4,407	3,956	3,186	4,004	5,658
18	6,401	6,974	6,071	6,864	5,345	5,148	4,658	4,863	3,937	3,299	4,532	5,487
19	6,468	6,621	6,076	6,996	5,339	4,973	5,127	4,654	3,711	3,282	4,809	5,520
20	7,141	6,584	6,982	7,193	5,422	5,021	4,759	4,114	3,667	3,340	4,662	5,688
21	7,074	7,106	7,352	6,842	5,789	5,171	4,663	4,012	3,741	3,639	4,303	6,548
22	6,061	7,211	8,108	6,423	5,717	5,128	4,353	4,114	3,478	3,333	4,507	6,862
23	5,743	6,675	8,035	6,193	5,491	4,999	4,414	4,290	3,301	3,131	4,308	6,130
24	5,919	6,069	8,340	6,133	5,611	5,239	4,326	4,160	3,375	3,287	4,284	5,631
25	6,107	5,968	7,747	6,176	5,157	5,323	4,268	4,246	3,428	3,189	4,317	4,358
26	5,687	6,205	7,591	6,311	4,968	5,114	4,391	3,963	3,705	3,524	4,400	4,748
27	5,432	6,620	7,547	6,261	4,722	4,701	4,367	3,760	3,852	3,427	4,870	6,071
28	5,945	6,525	7,624	6,064	4,845	4,901	4,231	4,016	3,731	3,201	5,000	5,934
29	5,903	5,381	7,737	6,111	5,369	5,269	4,003	4,081	3,386	3,481	5,503	6,425
30	5,555		8,100	6,932	5,325	4,942	4,129	4,709	3,125	3,492	5,053	6,429
31	6,005		8,063		5,419		4,098	5,175		3,446		5,769
Average:	5,987	6,508	7,126	7,255	5,555	5,142	4,396	4,344	3,785	3,342	4,248	5,578

1 -- Available period of record may be less than value shown for certain days of the year.

Source: Adapted from USGS 2006b

Table 2.4.1-5 Daily Average Flow Data for the Savannah River at Augusta, Georgia (USGS Gage 2197000)

Day of month	Mean of daily mean values for this day for 98 years of record[1], in ft^3/s											
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
1	10,790	11,320	17,390	16,289	10,680	8,129	7,708	8,359	8,281	7,717	5,987	8,172
2	11,380	11,860	15,900	16,230	10,950	8,078	8,381	8,139	8,205	10,460	6,316	7,694
3	11,360	11,960	14,110	17,210	10,570	8,107	7,871	8,541	7,546	10,080	6,574	7,651
4	12,460	12,860	13,420	15,820	10,130	7,917	7,126	8,446	7,586	8,478	6,847	8,232
5	13,170	13,380	14,440	14,099	9,711	7,943	7,085	7,901	7,451	7,249	6,990	8,680
6	12,130	13,339	14,920	15,170	9,621	8,233	7,356	8,065	7,634	7,143	6,782	8,617
7	11,860	13,850	15,029	15,920	9,875	8,760	7,357	8,125	7,709	6,793	6,303	8,444
8	12,600	15,250	15,910	15,740	10,160	8,985	7,993	7,921	7,986	6,526	6,310	8,281
9	12,650	15,590	16,410	15,490	10,140	8,532	8,653	8,440	7,689	6,696	6,763	8,289
10	12,080	15,459	16,070	15,120	10,110	8,316	8,541	8,329	8,819	7,243	6,846	8,670
11	11,550	15,330	14,549	14,560	9,318	8,103	7,732	7,352	9,687	7,243	6,650	8,512
12	11,790	15,190	13,940	13,650	8,830	8,026	7,387	7,287	7,867	7,047	6,635	8,372
13	12,240	14,620	14,520	12,780	8,648	8,111	7,342	7,680	6,671	7,058	6,901	8,580
14	11,610	14,330	14,940	12,730	8,600	8,570	7,788	8,807	6,223	6,582	7,357	8,793
15	11,200	14,090	14,690	13,110	8,388	8,829	7,669	9,442	6,372	6,121	7,344	9,559
16	10,860	13,469	15,490	13,619	8,393	9,036	7,872	9,381	6,331	5,916	7,227	10,260
17	11,570	13,880	15,880	13,450	8,369	8,825	7,699	9,570	6,543	6,188	7,475	9,995
18	12,350	15,020	14,779	12,270	7,988	8,540	7,635	9,034	7,583	6,975	7,398	9,486
19	13,900	15,020	13,869	11,650	7,629	8,056	7,612	8,447	7,598	6,931	7,311	9,025
20	15,450	14,170	14,490	11,670	8,318	7,589	7,735	8,776	6,913	6,854	7,297	8,854
21	14,820	14,130	15,780	11,620	9,137	7,369	7,393	8,078	6,540	7,215	6,879	9,797
22	12,730	15,110	16,450	11,370	9,283	7,657	7,171	7,790	6,591	7,233	6,834	9,845
23	11,580	14,790	16,189	10,830	9,216	7,228	6,961	7,473	6,438	7,373	6,792	9,854
24	11,800	14,010	16,550	10,380	8,788	7,318	6,879	7,321	6,270	7,584	7,131	9,289
25	11,990	13,780	15,960	10,060	8,499	8,373	7,196	7,213	6,418	7,035	7,296	9,232
26	12,190	13,880	15,079	10,500	7,805	8,399	7,623	7,367	6,989	6,491	7,352	9,595
27	11,760	14,160	15,370	10,500	7,795	7,699	7,499	7,301	8,905	6,709	7,551	10,100
28	11,260	16,089	15,380	10,190	7,904	7,406	7,428	7,615	8,902	6,778	7,584	10,090
29	11,310	11,980	15,300	9,767	7,866	7,209	7,655	8,207	7,516	6,342	7,950	10,160
30	11,450		16,800	10,480	7,794	7,598	8,445	8,447	7,140	6,319	8,448	11,020
31	11,250		16,920		7,823		8,962	8,352		6,173		11,100
Average:	12,101	14,066	15,372	13,076	8,979	8,098	7,669	8,168	7,413	7,115	7,038	9,169

1 -- Available period of record may be less than value shown for certain days of the year.

Source: Adapted from USGS 2006c

Table 2.4.1-6 Daily Average Flow Data for the Savannah River at Jackson, South Carolina (USGS Gage 2197320)

Day of month	Mean of daily mean values for this day for 31 years of record[1], in ft^3/s											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	8,843	10,990	10,650	11,520	9,351	8,778	8,337	7,511	7,725	7,052	7,188	8,115
2	9,091	11,140	11,050	10,540	8,757	8,383	7,974	7,581	7,334	7,079	7,167	8,850
3	9,807	11,920	11,320	10,560	8,860	7,941	7,691	7,778	7,141	7,541	7,088	8,730
4	9,931	11,990	11,470	10,660	8,858	8,393	7,922	7,877	7,433	7,708	7,193	8,524
5	9,759	11,430	12,559	10,900	9,146	8,316	7,743	7,420	7,791	7,885	7,261	8,674
6	9,677	11,560	12,140	11,150	8,650	8,323	8,097	7,441	7,891	7,779	7,233	8,840
7	9,407	11,650	12,040	10,630	8,578	8,328	8,102	7,409	7,778	7,589	7,218	8,908
8	9,032	11,730	12,160	10,290	7,630	8,169	7,924	7,463	7,395	7,581	7,141	9,053
9	9,086	11,620	12,240	10,180	7,377	8,247	7,316	7,566	7,322	7,791	7,225	9,121
10	9,402	11,830	12,020	10,470	8,088	7,944	7,700	7,752	7,428	7,937	7,354	8,978
11	9,922	11,430	11,100	10,920	7,937	8,374	7,524	7,465	7,247	7,994	7,435	9,219
12	10,540	11,980	11,480	10,510	8,381	8,175	7,107	7,766	7,042	7,991	7,510	9,271
13	10,800	12,060	11,790	10,360	8,695	8,682	7,079	7,695	7,059	7,850	7,542	9,356
14	10,870	11,850	11,920	9,937	8,551	8,554	7,042	7,798	7,047	7,693	7,745	9,084
15	10,640	11,930	11,740	9,614	8,096	8,441	7,183	7,859	7,299	7,367	8,222	9,007
16	10,430	11,840	11,510	10,490	8,221	8,061	7,270	7,835	7,208	7,330	8,354	9,235
17	10,510	10,920	11,570	10,510	8,368	7,730	7,478	7,945	7,015	7,739	7,940	9,326
18	10,770	10,540	11,340	10,150	8,784	7,774	7,583	8,110	6,855	7,308	7,681	9,248
19	11,290	11,110	10,750	9,529	9,375	7,715	7,551	8,038	6,841	7,717	7,734	9,064
20	11,480	10,840	10,560	9,320	8,814	7,670	7,688	7,437	6,826	7,695	7,644	9,841
21	11,260	10,200	10,800	9,484	8,461	8,276	7,558	7,482	6,702	7,905	7,584	9,628
22	11,430	10,260	10,990	9,388	8,173	8,800	7,393	7,431	7,010	7,758	7,739	9,536
23	11,580	10,760	10,220	9,379	8,739	8,878	7,469	7,361	7,161	7,848	8,381	9,469
24	11,300	11,080	9,758	9,780	9,255	8,404	7,360	7,312	7,366	8,257	8,387	9,350
25	11,240	11,250	10,010	9,456	9,503	8,230	7,209	7,335	7,141	8,340	8,529	9,362
26	10,980	11,090	11,160	9,380	9,236	8,154	7,234	7,284	7,216	8,108	8,117	9,653
27	10,900	11,380	11,150	9,780	9,021	8,113	7,057	7,332	7,115	7,974	7,992	9,524
28	11,230	10,990	10,860	9,542	8,956	8,240	6,866	7,430	6,977	8,022	7,863	9,155
29	10,720	10,540	11,550	9,237	9,177	8,481	6,835	8,035	7,106	7,759	8,077	8,781
30	10,850		11,950	9,728	9,396	8,469	7,195	7,984	7,017	7,360	8,527	8,777
31	10,870		11,900		9,236		7,465	7,957		7,160		8,816
Average:	10,440	11,307	11,347	10,113	8,699	8,268	7,482	7,635	7,216	7,713	7,702	9,113

1 -- Available period of record may be less than value shown for certain days of the year.

Source: Adapted from USGS 2006d

Table 2.4.1-7 Daily Average Flow Data for the Savannah River at Clyo, Georgia (USGS Gage 2198500)

Day of month	Mean of daily mean values for this day for 70 years of record[1], in ft^3/s											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	12,350	14,199	17,480	19,510	13,250	9,907	9,131	8,949	8,719	9,002	8,894	9,338
2	12,730	14,099	17,310	19,110	12,920	9,794	8,953	8,987	8,562	10,330	8,646	9,492
3	13,289	14,050	17,120	18,650	12,730	9,685	8,856	8,910	8,489	10,340	8,442	9,840
4	13,490	14,260	17,150	18,610	12,780	9,588	8,883	8,801	8,417	10,350	8,267	10,390
5	13,450	14,490	17,480	18,400	12,810	9,484	8,853	8,784	8,438	10,380	8,159	10,780
6	13,450	14,720	17,900	18,380	12,790	9,330	8,721	8,729	8,571	10,380	8,116	10,900
7	13,450	14,900	18,170	18,320	12,860	9,240	8,642	8,678	8,681	10,340	8,114	10,920
8	13,420	14,970	18,090	18,320	13,060	9,220	8,633	8,645	8,721	10,370	8,077	10,840
9	13,250	14,920	17,960	18,160	13,050	9,294	8,594	8,620	8,733	10,370	8,086	10,640
10	13,089	14,970	17,790	18,120	12,900	9,439	8,567	8,579	8,658	10,390	8,127	10,520
11	13,050	15,090	17,730	17,980	12,580	9,585	8,624	8,673	8,587	9,298	8,271	10,530
12	13,260	15,170	17,660	17,760	12,290	9,675	8,691	8,778	8,495	8,901	8,412	10,560
13	13,569	15,250	17,850	17,660	12,130	9,700	8,654	8,750	8,339	8,628	8,559	10,550
14	14,140	15,459	18,170	17,720	12,090	9,777	8,634	8,728	8,153	8,450	8,562	10,590
15	14,399	15,880	18,520	17,930	12,060	9,946	8,739	8,737	8,080	8,324	8,517	10,700
16	14,290	16,310	18,700	18,090	11,980	10,090	8,933	8,744	8,068	8,293	8,502	10,850
17	14,050	16,620	18,610	17,940	11,890	10,170	9,028	8,681	8,104	8,243	8,464	10,980
18	13,890	16,830	18,480	17,620	11,700	10,160	9,038	8,606	8,026	8,232	8,459	11,160
19	13,919	16,770	18,300	17,190	11,480	10,040	9,055	9,260	7,887	8,258	8,566	11,300
20	13,910	16,690	18,140	16,740	11,310	9,950	9,098	9,891	7,779	8,224	8,718	11,400
21	13,940	16,490	17,980	16,380	11,140	9,821	9,113	10,130	7,655	8,168	8,764	11,590
22	14,040	16,310	17,890	16,089	10,900	9,654	9,087	10,160	7,567	8,134	8,804	11,640
23	14,280	16,260	17,930	15,870	10,640	9,497	9,090	9,989	7,499	8,177	8,880	11,680
24	14,530	16,420	18,060	15,550	10,410	9,421	9,075	9,646	7,497	8,212	8,950	11,700
25	14,979	16,670	18,170	15,170	10,240	9,327	9,070	9,314	7,574	8,265	9,024	11,760
26	15,490	17,040	18,690	14,829	10,170	9,249	9,070	9,101	7,635	8,486	9,175	11,740
27	15,640	17,350	19,360	14,560	10,200	9,258	9,024	9,033	7,635	8,611	9,352	11,710
28	15,509	17,470	20,010	14,280	10,150	9,344	8,868	9,082	7,639	8,743	9,418	11,820
29	15,230	18,810	20,190	13,960	10,070	9,357	8,724	9,069	7,604	8,919	9,371	11,950
30	14,879		20,050	13,640	10,010	9,252	8,612	9,002	7,537	9,001	9,329	12,070
31	14,490		19,760		9,990		8,649	8,868		9,039		12,180
Average:	13,982	15,809	18,281	17,085	11,696	9,608	8,862	9,030	8,112	9,060	8,634	11,036

1 -- Available period of record may be less than value shown for certain days of the year.

Source: Adapted from USGS 2006e

Table 2.4.1-8 Approximate Lengths and Slopes of Local Streams

Map ID	Stream Identification	Approximate length, ft **	Upstream Elevation	Outfall Elevation	Approximate Slope
1	Unnamed creek at Hancock Landing to the Savannah River	7,000	163	85	0.0111
2	Unnamed tributary to Daniels Branch to Daniels Branch	6,000	190	105	0.0142
3	Red Branch to Daniels Branch	10,500	235	115	0.0114
4	Daniels Branch D/S of embankment dam to confluence with Red Br.	5,500	140	115	0.0045
5	Unnamed tributary to Beaverdam Creek	8,500	235	87	0.0174
6	Beaverdam Creek to Telfair Pond	13,500	100	85	0.0011
7	Beaverdam Creek, D/S of Telfair Pond to Savannah River	21,000	190	105	0.0040

* Identifier for streams shown in Figure 2.4-3

** from outfall to end of longest tributary

Table 2.4.1-9 Inventory of Savannah River Watershed Water Control Structures

Name of Dam or Reservoir	Owner or Operator	Stream	Savannah River Mile	Distance U/S of Vogtle Site	Drainage Area above dam (sq. mi.)	Total Storage, in 1000's of acre-feet	Normal Pool Elev, ft MSL	Spillway Crest Elevation, ft. MSL	Top of Dam Elevation, ft. MSL	Generator Capacity, MW
New Savannah Bluff Lock & Dam	USACE	Savannah River	187.7	36.8	7,508	RoR	115.0	n/a	n/a	n/a
Stevens Creek	SC Electric & Gas	Savannah River	208.1	57.2	7,173	11	n/a	n/a	n/a	19.2
J. Strom Thurmond Lake & Dam	USACE	Savannah River	221.6	70.7	6,144	2,510	335.0	300	351	280
Richard B. Russell Lake & Dam	USACE	Savannah River	259.1	108.2	2,900	1,026	475.0	436	495	300
Hartwell Lake & Dam	USACE	Savannah River	288.9	138.0	2,088	2,550	660.0	630	679	330
Yonah Dam	GA Power Company	Tugaloo-Chatooga	340.0	189.1	470	10.2	744.2	742	757	22.5
Keowee Lake & Dam	Duke Power Company	Senaca-Keowee	341.0	190.1	439	940	800.0	765	815	157.5
Tugaloo Lake & Dam	GA Power Company	Tugaloo	343.1	192.2	464	43.2	891.5	885	905	45
Tallulah Falls Dam	GA Power Company	Tallulah River	346.7	195.8	186	2.46	1,500.0	1493	1514	72
Mathis Lake & Dam	GA Power Company	Tallulah River	353.4	202.5	151	31.4	1,689.6	1681	1704	16
Jocassee Lake & Dam	Duke Power Company	Senaca-Keowee	357.0	206.1	148	1,100	1,110.0	1077	1125	612
Nacoochee Dam	GA Power Company	Tallulah River	362.1	211.2	136	8.2	1,752.5	1753	1765	4.8
Little River Lake & Dam	Duke Power Company	Senaca-Keowee	366.0	215.1	439	940	800.0	765	815	n/a
Burton Lake & Dam	GA Power Company	Tallulah River	366.4	215.5	118	108	1,866.6	1860	1873	6.1

Source: Compiled from USACE 1996

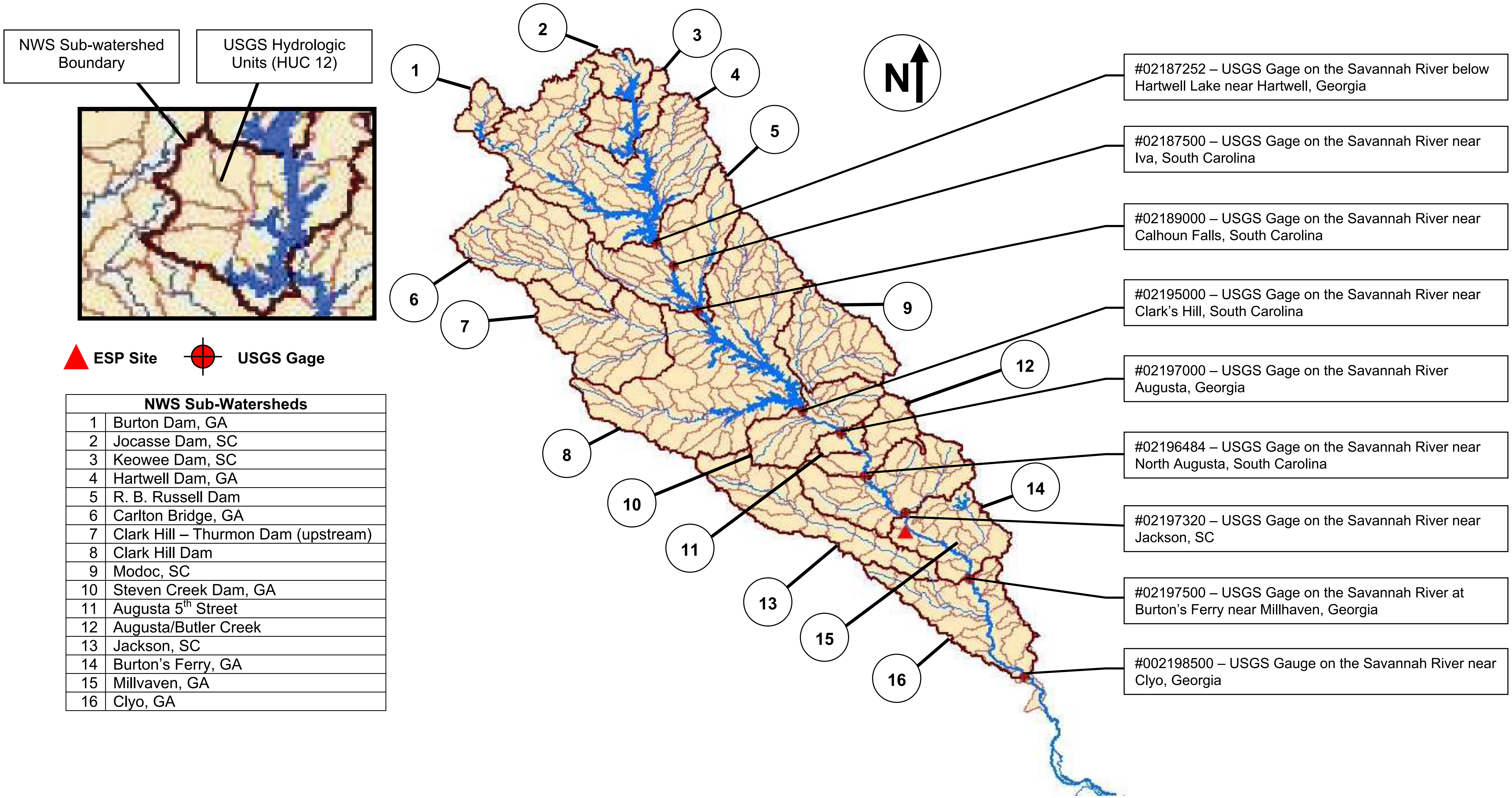
Table 2.4.1-10 Surface Water Users on the Savannah River Near or Downstream of Proposed Units

Owner	Facility type & Description	Source Water	River mile	Distance from VEGP	Average Daily Withdrawal	Reference
Savannah River Site, U.S.D.O.E.	Tritium Extraction Facility	Savannah River	151.0	-0.1	2.9 MGD (1)	DOE/EIS 1997
SCE & G	Vogtle Electric Generating Station	Savannah River	150.9	0.0	171.3 MGD (1)	DOE/EIS 1997
SCE & G	Coal-fired plant cooling water at SRS	Savannah River	151.0	-0.1	44.2 MGD (1)	DOE/EIS 1997
City of Savannah	Cherokee Hill Water Treatment Plant in Port Wentworth for treatment of industrial & domestic water	Savannah River	29.0	121.9	50.0 MGD	DOE/EIS 1997
Beaufort/Jaspar Water & Sewer Authority	W.T.P. Intake for WTP facility serving 75% of Beaufort Co. & 1% of Jasper Co.	Savannah River	39.2	111.7	16.0 MGD	DOE/EIS 1997
City of Waynesboro, Burke Co.	Water Treatment Plant intake for municipal water supply (12 miles overland from site)	Brier Creek	102.5	48.4	1.5 MGD (2)	Georgia DNR 2006
International Paper Corporation in Chatham Co., GA	Water treatment plant intake for industrial water supply (approximate river mile)	Savannah River	18.5 (3)	132.4	50.0 MGD (2)	Georgia DNR 2006
Kerr-McGee Chemical, LLC in Chatham Co., GA	Water treatment plant intake for industrial water supply (approximate river mile)	Savannah River	18.5 (3)	132.4	20.0 MGD (2)	Georgia DNR 2006
Georgia Power Company Riverside, GA	Water treatment plant intake for industrial water supply	Savannah River	18.5 (3)	132.4	174.0 MGD (2)	Georgia DNR 2006
Savannah Electric & Power Co-Pt Wentworth, GA	Water treatment plant intake for industrial water supply (approximate river mile)	Savannah River	18.5 (3)	132.4	267.0 MGD (2)	Georgia DNR 2006
Weyerheauser Company, Chatham Co., GA	Water treatment plant intake for industrial water supply (approximate river mile)	Savannah River	18.5 (3)	132.4	27.5 MGD (2)	Georgia DNR 2006
Weyerheauser Company, Chatham Co., GA	Water treatment plant intake for industrial water supply (approximate river mile)	Savannah River	18.5 (3)	132.4	30.0 MGD (2)	Georgia DNR 2006
Fort James Operating Company, Effingham, GA	Water Treatment Plant intake for municipal water supply	Savannah River	45	105.9	35.0 MGD (2)	Georgia DNR 2006
Savannah Electric & Power Co, McIntosh, GA	Water treatment plant intake for industrial water supply	Savannah River	45	105.9	130.0 MGD (2)	Georgia DNR 2006
Savannah Industrial & Domestic Water, Effingham Co., GA	Combined municipal and industrial water supply (near confluence with Savannah R.)	Abercorn Creek	29	121.9	55.0 MGD (2)	Georgia DNR 2006
J M Huber Corp -Brier Creek, in Warren Co., GA	Water treatment plant intake for industrial water supply (near confluence with Savannah R.)	Brier Creek	102.5	48.4	4.0 MGD (2)	Georgia DNR 2006

1) Average water use, 1998 interpolated to 2006 using 2010 projected value

2) Average water use, Georgia DNR 2006

3) Midpoint of the reach identified in Georgia DNR 2006



NWS Sub-Watersheds	
1	Burton Dam, GA
2	Jocasse Dam, SC
3	Keowee Dam, SC
4	Hartwell Dam, GA
5	R. B. Russell Dam
6	Carlton Bridge, GA
7	Clark Hill – Thurmon Dam (upstream)
8	Clark Hill Dam
9	Modoc, SC
10	Steven Creek Dam, GA
11	Augusta 5th Street
12	Augusta/Butler Creek
13	Jackson, SC
14	Burton's Ferry, GA
15	Millvaven, GA
16	Clyo, GA

Figure 2.4.1-1 Savannah River Watershed and HUCs (No Scale)

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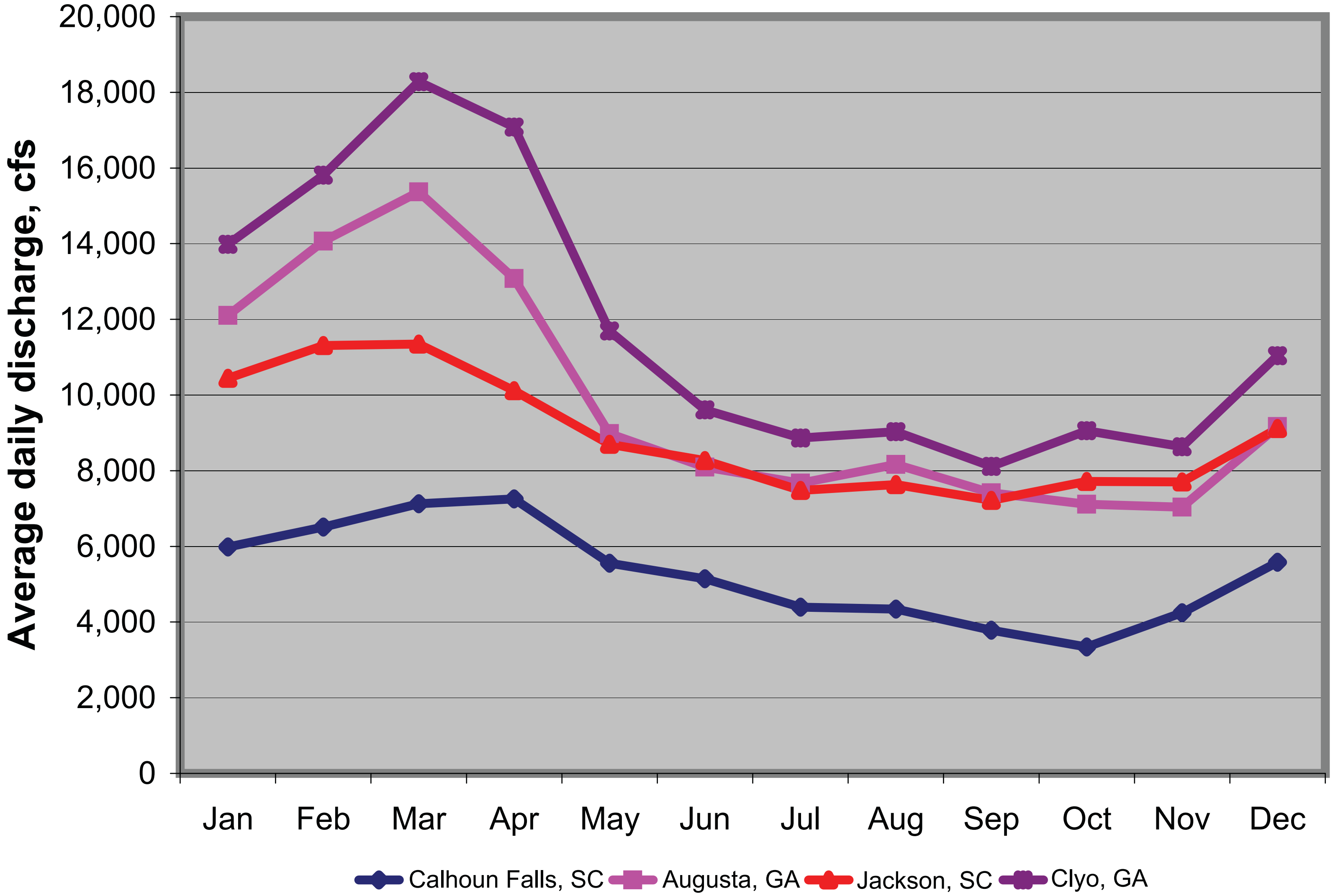

Figure 2.4.1-2 Average Daily Discharge for a Year – Selected Gages of the Savannah River

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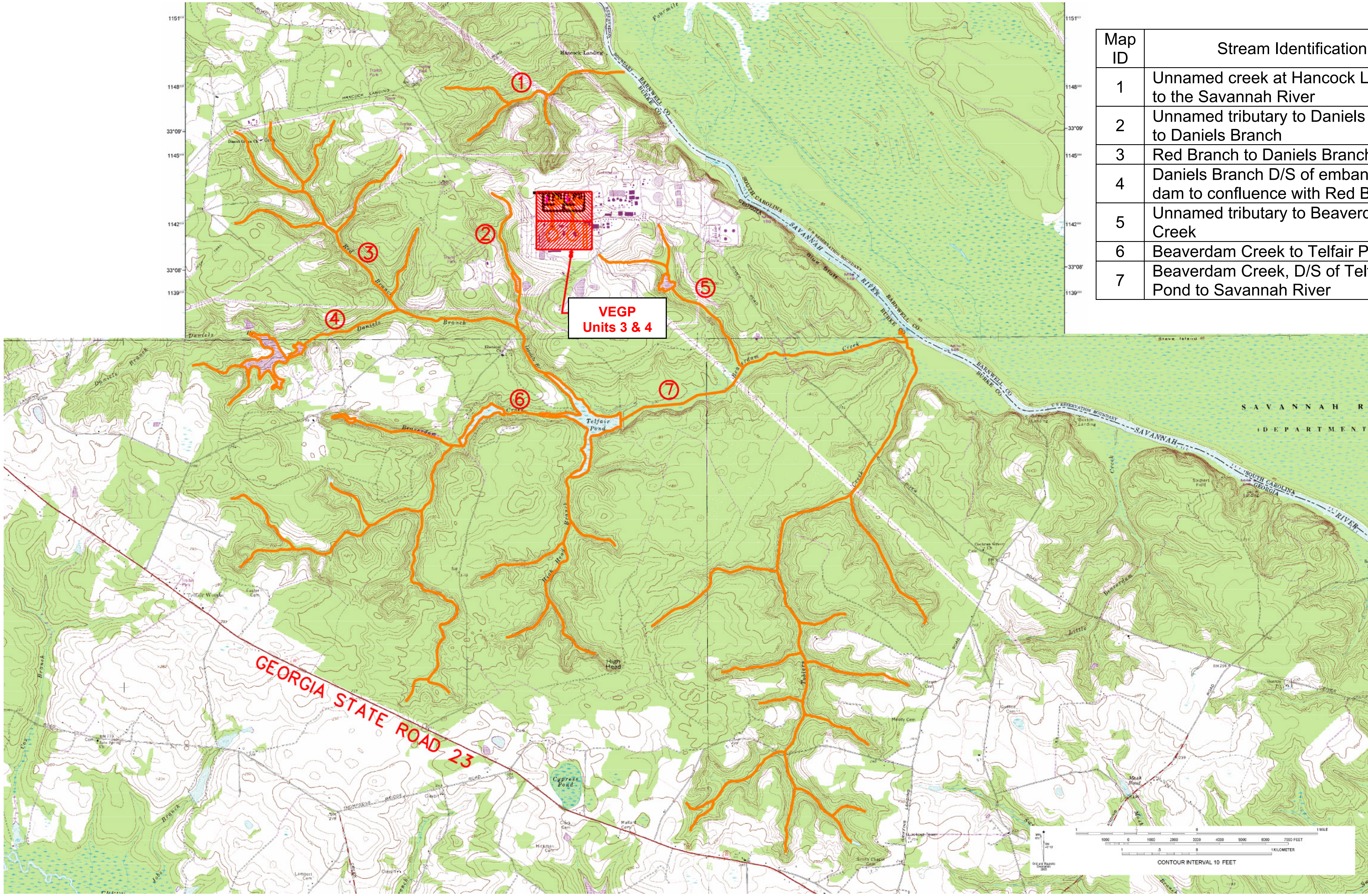

Map ID	Stream Identification
1	Unnamed creek at Hancock Landing to the Savannah River
2	Unnamed tributary to Daniels Branch to Daniels Branch
3	Red Branch to Daniels Branch
4	Daniels Branch D/S of embankment dam to confluence with Red Branch
5	Unnamed tributary to Beaverdam Creek
6	Beaverdam Creek to Telfair Pond
7	Beaverdam Creek, D/S of Telfair Pond to Savannah River

Figure 2.4.1-3 Site Drainage

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Section 2.4.1 References

(DOE/EIS 1997) US Department of Energy, Environmental Impact Statement Accelerator Production of Tritium at the Savannah River Site, DOE/EIS-027D, December 1997.

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2.4.2 Floods

2.4.2.1 Flood History

Potential causes of flooding at the site are limited to local runoff events due to intense point-rainfall near the site and flooding from the Savannah River. There is no historical record of flooding due to storm surges or tsunamis at the site, which is consistent with its location approximately 150 River Miles inland from the ocean. Because there are no large bodies of water near the site, flooding due to seiche motion was not considered (see Sections 2.4.5 and 2.4.6).

Table 2.4.2-1 **(USGS 2006a)** provides the date, stage elevation, and annual peak discharge for the entire period of record of USGS stream gage 02197000 on the Savannah River at Augusta, Georgia, approximately 48.7 River Miles upstream of the VEGP site. The annual peak floods include estimated values from historic floods reported in 1796, 1840, 1852, 1864, 1865, and 1876.

The maximum annual peak flood discharge for the period of record is 350,000 cfs from the storm of October 2, 1929. The storm of January 17, 1796, estimated from reported stages using slope-conveyance methods, is the oldest event used to extend the record length. The estimated value of the peak flow for this storm ranges from 280,000 cfs for a reported stage of 38 ft **(USGS 2006a)** to 360,000 cfs for a reported maximum flood stage of 40 ft **(USGS 1990)**. This puts the maximum flood elevation of the Savannah River at Augusta, Georgia, for the historic period between 134.6 and 136.6 ft msl, based on an elevation of 96.58 ft msl for the Augusta, Georgia, stream gage datum (see Table 2.4.2-1).

Since 1952, annual peaks on the Savannah River at Augusta, Georgia, have been impacted by regulation from upstream reservoirs: J. Strom Thurmond (also known as Clarks Hill) Lake and Dam in 1952, Hartwell Lake and Dam in 1961, and Richard B. Russell Lake and Dam in 1984 **(USACE 1996)**. In Figure 2.4.2-1 **(USGS 1990)**, which is based on the historical record from 1796 to 1985, this impact is shown by the pronounced reduction of peak flows after 1952. The addition of annual peak stream gage data from 1986 to 2002 would not significantly affect this graph, as indicated by the following averages:

Average annual peak discharge 1796 - 1950:	232,696 cfs
Average annual peak discharge 1876 - 1950:	113,086 cfs
Average annual peak discharge 1951 - 2004:	34,343 cfs
Average annual peak discharge 1951 - 1985:	37,569 cfs
Average annual peak discharge 1986 - 2004:	28,734 cfs

The USGS stream gage at Jackson, South Carolina, which is approximately 5.9 River Miles upstream of the VEGP site (see Table 2.4.1-2), has a record length significantly shorter than that of the Augusta gage and contains no observations before upstream dams were closed.

Table 2.4.2-2 compares the annual peak discharges on the Savannah River at Augusta, Georgia, and Jackson, South Carolina, for the 29 coincident years of record. During this period, the peak annual discharge at the two sites was not associated with the same storm event in seven instances. These cases are indicated by the grayed-out rows of Table 2.4.2-2, for which the dates of the peaks differ by a significant number of days. There is a 1-to-2-day lag in the occurrence of annual maximum peaks at the two gages derived from the same flood event. A very strong linear correlation exists between flood stages at the two sites for the annual peak floods derived from the same event, as shown in Figure 2.4.2-2, making it feasible to extend the historical record at Jackson, South Carolina. The annual peak flood stage at the VEGP site could then be estimated from the stages at Jackson, with a level of confidence dependent on the ability to establish a reliable estimate of the stage at the VEGP site from the river stage at Jackson, South Carolina, based on hydraulic considerations.

Annual peak flood frequency curves for regulated and unregulated conditions for the Savannah River at Augusta, Georgia, were developed for the period between 1796 and 1985 and are presented in Figure 2.4.2-3 **(USGS 1990)**. Unregulated annual peak discharge values for the period after 1952 and regulated annual peak discharge values for the years before 1952 were generated by modeling reservoir operation based on the stage-storage-discharge characteristics reported for the three projects, using the 1990 operating rule set for the entire period **(USGS 1990)**.

Figure 2.4.2-3 clearly shows the convergence of the regulated and unregulated annual flood frequency plots with increasing flood size. On the left side of the graph, for the 80 percent chance-of-exceedence event (a 1.25-year return period), the unregulated peak discharge exceeds the regulated peak by more than 100 percent; on the right side, for the 0.2 percent chance-of-exceedence event (500-year return period), the unregulated peak discharge exceeds the regulated peak by about 30 percent. Based on this trend, regulation would not be expected to significantly affect the probable maximum flood on the Savannah River downstream of Augusta, provided that the regulating structures do not fail. Flooding due to dam-breaks is discussed in Section 2.4.4.

2.4.2.2 Flood Design Considerations

The location of VEGP Units 3 and 4 would be adjacent to and generally to the west of existing VEGP Units 1 and 2, as illustrated in Figure 1-4. The site is located on a high bluff on the west bank of the Savannah River. The proposed site grade for the new units will be at or above El. 220 ft msl, similar to the existing VEGP units, well above the probable maximum flood stage of the Savannah River, as discussed in Section 2.4.3.

The annual maximum flood at the VEGP site can occur in any month of the year and is not associated specifically with icing, which does not normally occur to any significant degree, as indicated in Section 2.4.7). For this reason, the effect of ice accumulation on runoff was not taken into account in selecting the design flood.

The design basis flood for the VEGP site was determined by selecting the maximum flood elevation on the Savannah River obtained by considering all flooding scenarios applicable to the location, including an approximate estimate of the probable maximum flood (PMF), flooding due to probable maximum precipitation (PMP) over local drainage courses, and potential dam failures coincident with wind set-up and wave run-up. Flood surge from ocean storms and tsunami-caused flooding were not considered because the VEGP site is approximately 151 river miles inland.

Each applicable flooding scenario was evaluated following guidelines provided in Regulatory Guide 1.59, *Design Basis Floods for Nuclear Power Plants*, 1977 (RG 1.59) and ANSI/ANS-2.8, *Determining Design Basis Flooding at Power Reactor Sites* **(ANSI/ANS-2.8-1992)**, as detailed in Sections 2.4.3 through 2.4.7.

The controlling event for the VEGP site was determined to be from the breach of the upstream dams, estimated as described in Section 2.4.4, using the Standard Project Flood discharge as a starting condition, including wind set-up and wave run-up. The design basis flooding level derived from this event, including wave setup, is El. 178.10 ft msl, which is 41.9 ft below the proposed site grade elevation of 220.0 ft msl.

Elevations for safety-related components and structures are not yet established for the proposed units. However, the grade elevation in the power block area of the VEGP site would be approximately the same as the existing units, elevation 220 ft msl, providing over 41 ft of freeboard above the design basis flooding level. Freeboard for all above-grade, safety-related structures, systems, and components of the new units will be equal to or greater than this value.

2.4.2.3 Effects of Local Intense Precipitation

The design basis for local intense precipitation at the site is the PMP, which is defined as the "greatest depth of precipitation for a given duration that is physically possible over a given size storm area at a particular geographical location at a certain time of year" **(HMR-52 1982)**. Maps of the PMP are published for durations ranging from 6 to 72 hours and for watershed areas ranging from 10 to 20,000 sq mi **(HMR-51 1978)**.

As can be seen in Figure 2.4.1-3, the VEGP site is situated on high ground in such a manner that the areas to be drained by each conveyance system serving the site will be on the order of 1 sq mi, with times of concentration considerably less than 6 hours. The 1-sq-mi PMP for the VEGP site is calculated for a range of durations between 5 and 60 minutes from the 10-sq-mi, 6-hour, all-season average PMP depth, using multipliers following accepted engineering practice **(HMR-52, 1982)**. These values of depth are used to develop a relation between rainfall intensity and durations for the PMP, which will be used for storm drain designs at the VEGP site. The point values used for developing the relation are listed in Table 2.4.2-3 and the estimated curve is plotted in Figure 2.4.2-4.

The existing storm water system provides positive drainage away from the site for the runoff generated by the PMP: surface runoff flows away from the high ground on which the Unit 1 and 2 structures are located and is collected in four principal drainage channels aligned in concert with access roads and railroad facilities to outfall to the north, south, east, and west.

The locations and designs of storm water management systems for the new units at the VEGP site have not been determined for this ESP application. This will be done as part of detailed engineering and will be described in the COL application. In general, the storm water management system developed for Units 3 and 4 will be integrated with the existing facilities as possible; runoff from Units 3 and 4 will be directed away from Unit 1 and 2 structures, to outfall to the west and south of the VEGP site.

The storm drain system will be designed in accordance with good engineering practice, following all applicable federal, state, and local storm water management regulations. In addition, site grading will be sufficiently sloped to convey runoff overland from the PMP event, away from all buildings and safety-related equipment, without flooding, even if all catch basins and roof drains are plugged.

Table 2.4.2-1 Annual Peak Discharge for USGS Gage 2197000 on the Savannah River at Augusta, Georgia

Water Year	Date	Gage Height (feet)	Stream- flow (cfs)	Water Year	Date	Gage Height (feet)	Stream- flow (cfs)
1796	Jan. 17, 1796	38	280,000 (2)	1937	Jan. 04, 1937	30.1	91,400
1840	May 28, 1840	37.5	260,000 (2)	1938	Oct. 21, 1937	30.1	91,400
1852	Aug. 29, 1852	36.8	230,000 (2)	1939	Mar. 02, 1939	24.1	90,900
1864	Jan. 01, 1864	34	160,000 (2)	1940	Aug. 15, 1940	29.4	239,000
1865	Jan. 11, 1865	36.4	220,000 (2)	1941	Jul. 08, 1941	22.89	53,300
1876	Dec. 30, 1875	28.6	86,400	1942	Mar. 23, 1942	24.56	105,000
1877	Apr. 14, 1877	31.4	119,000	1943	Jan. 20, 1943	25.1	117,000
1878	Nov. 23, 1877	23.5	51,500	1944	Mar. 22, 1944	25.53	128,000
1879	Aug. 03, 1879	22	44,000	1945	Apr. 27, 1945	23.16	64,000
1880	Dec. 16, 1879	30.1	102,000	1946	Jan. 09, 1946	24.43	97,200
1881	Mar. 18, 1881	32.2	130,000	1947	Jan. 22, 1947	23.97	86,000
1882	Sep. 12, 1882	29.3	93,300	1948	Feb. 10, 1948	23.9	83,200
1883	Jan. 22, 1883	30.8	111,000	1949	Nov. 30, 1948	26.61	154,000
1884	Apr. 16, 1884	28	81,000	1950	Oct. 09, 1949	20.1	32,500
1885	Jan. 26, 1885	27.5	77,000	1951	Oct. 22, 1950	22.32	46,300
1886	May 21, 1886	32.5	135,000	1952	Mar. 06, 1952	21.53	39,300 (5)
1887	Jul. 31, 1887	34.5	173,000	1953	May 8, 1953	20.8	35,200 (6)
1888	Sep. 11, 1888	38.7	303,000	1954	Mar. 30, 1954	17.39	25,500 (6)
1889	Feb. 19, 1889	33.3	149,000	1955	Apr. 15, 1955	16.77	23,900 (6)
1890	Feb. 27, 1890	22.9	48,500	1956	Apr. 12, 1956	14.7	18,600 (6)
1891	Mar. 10, 1891	35.5	197,000	1957	May 7, 1957	14.08	18,000 (6)
1892	Jan. 20, 1892	32.8	140,000	1958	Apr. 18, 1958	22.91	66,300 (6)
1893	Feb. 14, 1893	25	60,000	1959	Jun. 08, 1959	18.65	28,500 (6)
1894	Aug. 07, 1894	24	54,000	1960	Feb. 14, 1960	20.58	34,900 (6)
1895	Jan. 11, 1895	30.4	106,000	1961	Apr. 02, 1961	20.56	34,800 (6)
1896	Jul. 10, 1896	30.5	107,000	1962	Jan. 09, 1962	20.09	32,500 (6)
1897	Apr. 06, 1897	29.3	93,300	1963	Mar. 23, 1963	19.52	31,300 (6)
1898	Sep. 02, 1898	31.3	117,000	1964	Apr. 09, 1964	24.16	87,100 (6)
1899	Feb. 08, 1899	31	113,000	1965	Dec. 27, 1964	20.62	34,600 (6)
1900	Feb. 15, 1900	32.7	138,000	1966	Mar. 06, 1966	21.5	39,300 (6)
1901	Apr. 04, 1901	31.8	124,000	1967	Aug. 25, 1967	18.1	26,500 (6)
1902	Mar. 01, 1902	34.6	175,000	1968	Jan. 12, 1968	20.94	35,900 (6)
1903	Feb. 09, 1903	33.2	147,000	1969	Apr. 21, 1969	22.24	45,600 (6)
1904	Aug. 10, 1904	25.5	63,000	1970	Apr. 01, 1970	17.68	25,200 (6)
1905	Feb. 14, 1905	25.8	64,800	1971	Mar. 05, 1971	23.3	63,900 (6)
1906	Jan. 05, 1906	29.6	96,600	1972	Jan. 20, 1972	20.36	33,700 (6)
1907	Oct. 05, 1906	23.6	52,000	1973	Apr. 08, 1973	21.63	40,200 (6)
1908	Aug. 27, 1908	38.8	307,000	1974	Feb. 23, 1974	20.13	32,900 (6)
1909	Jun. 05, 1909	28.7	87,300	1975	Mar. 25, 1975	22.24	45,600 (6)
1910	Mar. 02, 1910	26.4	69,800	1976	Jun. 05, 1976	20.27	33,300 (6)
1911	Apr. 14, 1911	19.1	32,800	1977	Apr. 07, 1977	20.5	34,200 (6)
1912	Mar. 17, 1912	36.8	234,000	1978	Jan. 26, 1978	21.98	43,100 (6)
1913	Mar. 16, 1913	35.1	156,000	1979	Feb. 27, 1979	21.13	37,300 (6)
1914	Dec. 31, 1913	24.3	48,000	1980	Mar. 31, 1980	22.33	47,200 (6)
1915	Jan. 20, 1915	28.2	61,000	1981	Feb. 12, 1981	14.7	17,700 (6)
1916	Feb. 03, 1916	31	82,400	1982	Jan. 02, 1982	19.39	30,700 (6)
1917	Mar. 06, 1917	29.2	68,000	1983	Apr. 10, 1983	23.21	66,100 (6)
1918	Jan. 30, 1918	25.5	45,500	1984	5-May-84	20.35	34,000 (6)
1919	Dec. 24, 1918	35	128,000	1985	Feb. 07, 1985	17.89	25,700 (6)
1920	Dec. 11, 1919	35.4	133,000	1986	Oct. 03, 1985	15.74	21,000 (6)
1921	Feb. 11, 1921	35.1	129,000	1987	Mar. 06, 1987	18.98	29,200 (6)
1922	Feb. 16, 1922	32	92,000	1988	Feb. 05, 1988	10.61	13,600 (6)
1923	Feb. 28, 1923	28	59,700	1989	Sep. 22, 1989	15.33	20,200 (6)
1924	Sep. 22, 1924	28	59,700	1990	Feb. 27, 1990	20.69	35,300 (6)
1925	Jan. 20, 1925	36.5	150,000	1991	Oct. 13, 1990	22.8	59,200 (6)
1926	Jan. 20, 1926	27.3	55,300	1992	Mar. 27, 1992	16.29	22,100 (6)
1927	Dec. 30, 1926	24	39,000	1993	Jan. 14, 1993	21.81	45,100 (6)
1928	Aug. 17, 1928	40.4	226,000	1994	Jul. 01, 1994	21.4	40,700 (6)
1929	Sep. 27, 1929	46.3	343,000	1995	Feb. 19, 1995	20.28	33,600 (6)
1930	Oct. 02, 1929	45.1	350,000	1996	Feb. 05, 1996	20.48	34,400 (6)
1931	Nov. 17, 1930	19.9	26,100	1997	Mar. 10, 1997	18.11	26,300 (6)
1932	Jan. 09, 1932	30.4	93,800	1998	Feb. 07, 1998	21.63	43,000 (6)
1933	Oct. 18, 1932	30.3	92,600	1999	Feb. 02, 1999	14.72	19,000 (6)
1934	Mar. 05, 1934	28.5	73,200	2000	Jan. 25, 2000	13.25	16,800 (6)
1935	Mar. 14, 1935	27.4	63,700	2002	Mar. 04, 2002	7.14	8,510 (6)
1936	Apr. 08, 1936	41.2	258,000	2003	24-May-03	20.42	31,600 (6)
				2004	Jun. 14, 2004	13.82	17,600 (6)

2 -- Discharge is an Estimate
5 -- Discharge affected to unknown degree by Regulation or Diversion
6 -- Discharge affected by Regulation or Diversion

Source: USGS 2006c

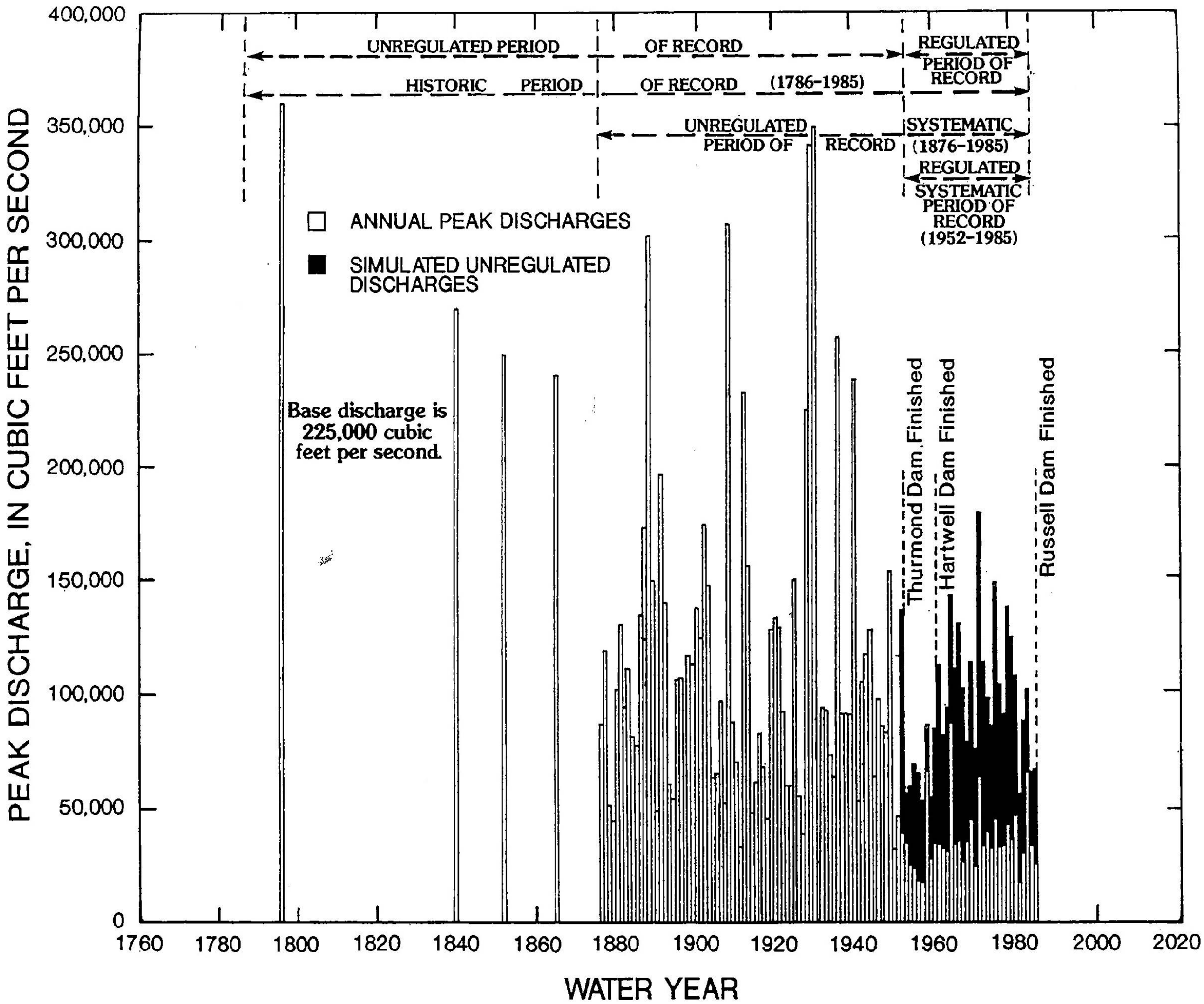
Table 2.4.2-2 Comparison of Annual Peak Discharges on the Savannah River at Augusta, Georgia and Jackson, South Carolina for 1972 to 2002

	Savannah River at Augusta, GA			Savannah River at Jackson, SC		
Water Year (Oct - Sept)	Date of annual peak discharge	Gage Height (feet)	Stream-flow (cfs)	Date of annual peak discharge	Gage Height (feet)	Stream-flow (cfs)
1972	Jan. 20, 1972	20.36	33,700	Jan. 21, 1972	19.02	n/r
1973	Apr. 08, 1973	21.63	40,200	Apr. 09, 1973	19.71	n/r
1974	Feb. 23, 1974	20.13	32,900	Feb. 24, 1974	18.64	n/r
1975	Mar. 25, 1975	22.24	45,600	Sep. 16, 1975	20.22	n/r
1976	Jun. 05, 1976	20.27	33,300	Jul. 06, 1976	18.84	n/r
1977	Apr. 07, 1977	20.5	34,200	Apr. 08, 1977	18.85	n/r
1978	Jan. 26, 1978	21.98	43,100	Jan. 28, 1978	19.65	n/r
1979	Feb. 27, 1979	21.13	37,300	Apr. 28, 1979	19.12	n/r
1980	Mar. 31, 1980	22.33	47,200	Apr. 01, 1980	20.72	n/r
1981	Feb. 12, 1981	14.7	17,700	Feb. 13, 1981	15.16	17300
1982	Jan. 02, 1982	19.39	30,700	Feb. 20, 1982	17.12	20500
1983	Apr. 10, 1983	23.21	66,100	Apr. 11, 1983	21.57	n/r
1984	May 5, 1984	20.35	34,000	Mar. 09, 1984	19.3	n/r
1985	Feb. 07, 1985	17.89	25,700	Feb. 08, 1985	17.21	20600
1986	Oct. 03, 1985	15.74	21,000	Nov. 24, 1985	14.29	15900
1987	Mar. 06, 1987	18.98	29,200	Mar. 07, 1987	18.35	n/r
1988	Feb. 05, 1988	10.61	13,600	Feb. 06, 1988	12.42	13200
1989	Sep. 22, 1989	15.33	20,200	Sep. 23, 1989	14.9	16800
1990	Feb. 27, 1990	20.69	35,300	Feb. 28, 1990	19.61	n/r
1991	Oct. 13, 1990	22.8	59,200	Oct. 14, 1990	20.05	n/r
1992	Mar. 27, 1992	16.29	22,100	Mar. 27, 1992	16.26	18800
1994	Jul. 01, 1994	21.4	40,700	Jul. 03, 1994	19.19	n/r
1995	Feb. 19, 1995	20.28	33,600	Feb. 20, 1995	18.91	n/r
1996	Feb. 05, 1996	20.48	34,400	Mar. 16, 1996	18.86	n/r
1997	Mar. 10, 1997	18.11	26,300	Mar. 11, 1997	18.41	n/r
1998	Feb. 07, 1998	21.63	43,000	Feb. 09, 1998	19.83	n/r
1999	Feb. 02, 1999	14.72	19,000	Oct. 28, 1998	15.23	17300
2000	Jan. 25, 2000	13.25	16,800	Jan. 26, 2000	14.86	16500
2002	Mar. 04, 2002	7.14	8,510	Mar. 05, 2002	8.77	8870

Source: Based on data from USGS 2006c and 2006d

Table 2.4.2-3 Probable Maximum Precipitation Values for Point Rainfall at VEGP Site

Duration	Watershed Area, mi^2	Multiplier	Applied to	Source	PMP depth (inches)
6-hour	10	n/a	n/a	HMR-51, Fig 18	31.0
1-hour	1	0.620	6-hr 10 mi^2 value	HMR-52, Fig 23	19.2
30-minutes	1	0.736	1-hr 1 mi^2 value	HMR-52, Fig 38	14.1
15-minutes	1	0.509	1-hr 1 mi^2 value	HMR-52, Fig 37	9.8
5-minutes	1	0.323	1-hr 1 mi^2 value	HMR-52, Fig 36	6.2



Source: Figure 2 from USGS 1990

Figure 2.4.2-1 Unregulated and Regulated Peak Discharge Frequency Curves for the Savannah River at Augusta, Georgia (02197000)

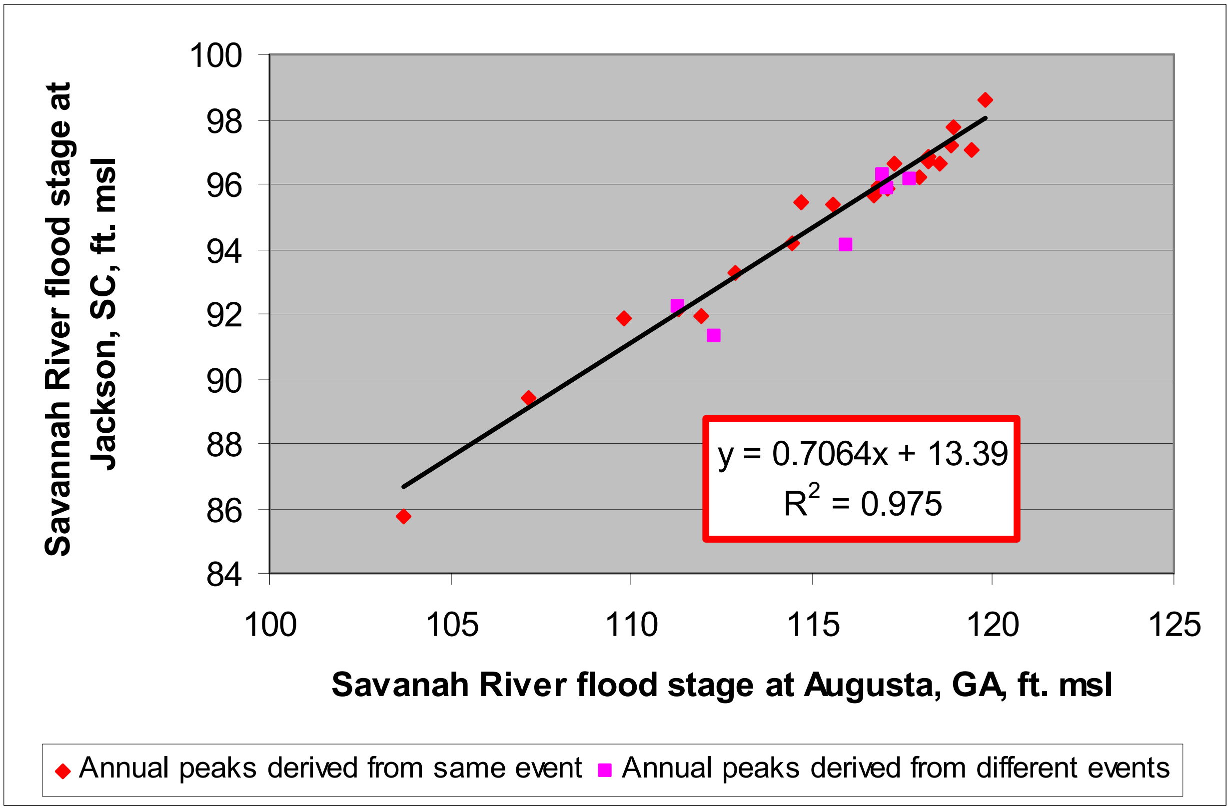
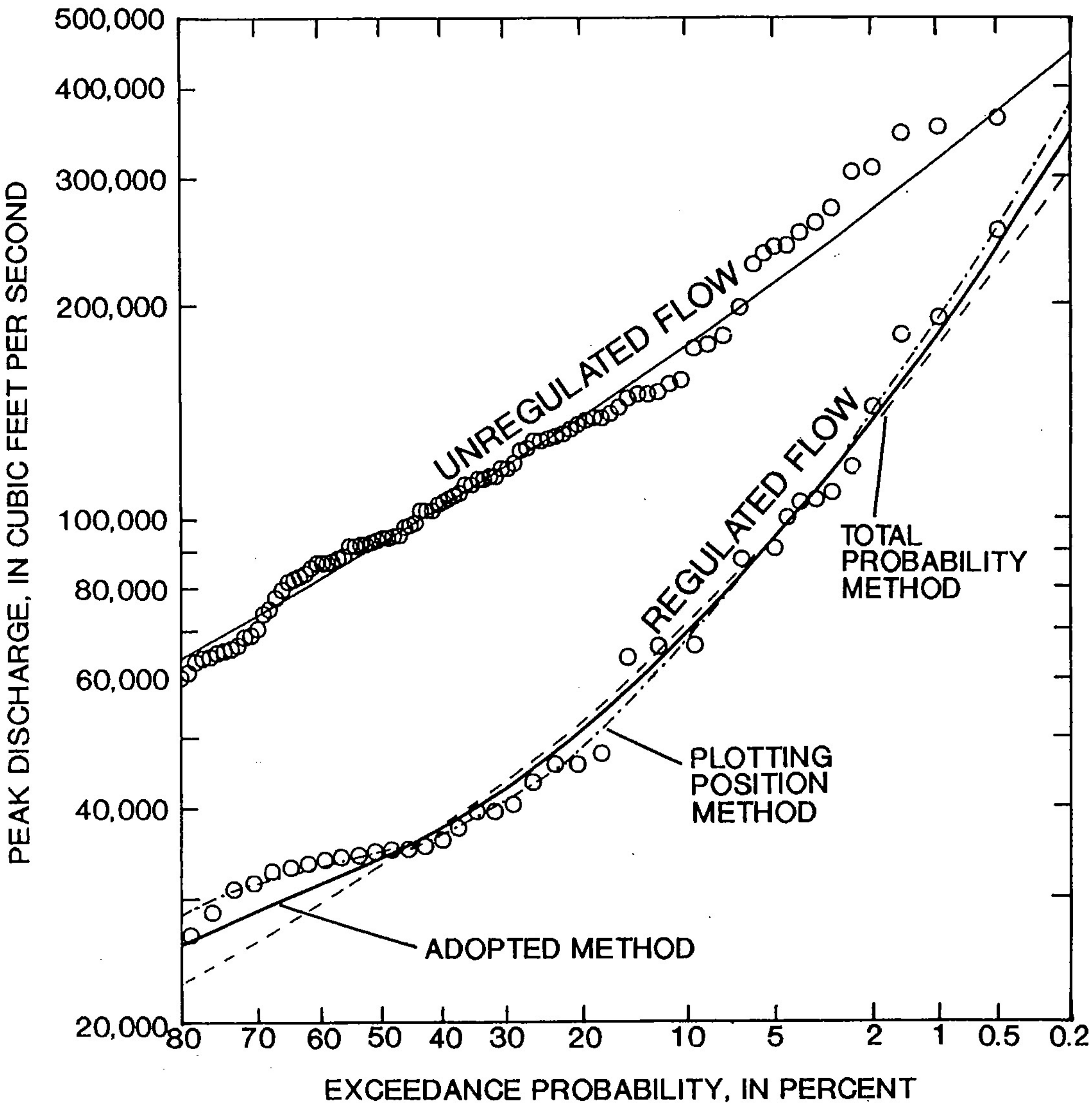


Figure 2.4.2-2 Correlation of Annual Peak Discharges on the Savannah River at Augusta, Georgia (02197000), and Jackson, South Carolina (2197320), for Years with Annual Peak Derived from Same Storm Event



Source: Figure 35 from USGS 1990

Figure 2.4.2-3 Unregulated and Regulated Annual Peak Discharge Frequency Curves for the Savannah River at Augusta, Georgia

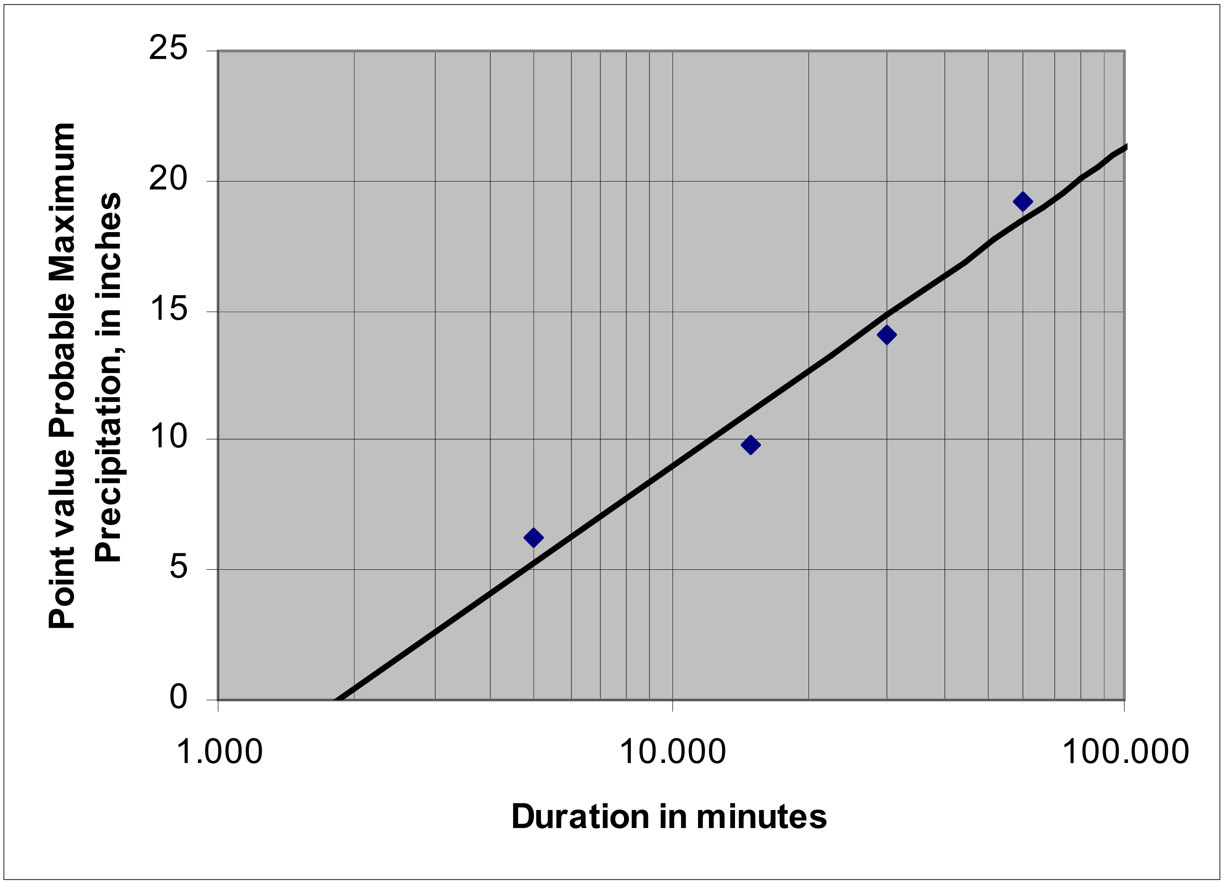


Figure 2.4.2-4 Probable Maximum Precipitation Values as a Function of Duration for Point Rainfall at VEGP Site

Section 2.4.2 References

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2.4.3 Probable Maximum Flood

In this section, the hydrometeorological design basis of any necessary flood protection measures is presented for those structures, systems, and components necessary to ensure the capability to shut down the proposed VEGP Units 3 and 4 and maintain them in a safe shutdown condition. One of the scenarios investigated to determine the design basis flood for ensuring the safety of nuclear power plants is the Probable Maximum Flood (PMF). PMF flows and stages at a site can be the result of local flooding, as discussed in Section 2.4.2, or riverine flooding, as described below.

The location of VEGP Units 3 and 4 would be adjacent to and generally to the west of the existing VEGP units, as illustrated in Figure 1-4. The site is located on a high bluff on the west bank of the Savannah River. The proposed site grade for the new units will be at or above Elevation 220 ft msl, similar to the existing VEGP units, which is well above the probable maximum flood stage of the Savannah River.

Based on calculations, site visits, an assessment of site conditions, and a review of previous studies, it was determined that the maximum water surface elevation resulting from the PMF on the Savannah River at the VEGP site and the additional combined action of wind setup and wave run-up would be substantially below El. 220 ft msl.

Considering this assessment, the VEGP site can be characterized as a “flood-dry site,” as described in Section 5.1.3 of the American National Standard Report, *Determining Design Basis Flooding at Power Reactor Sites*, because the safety-related structures of both the existing VEGP and proposed AP1000 units are or will be so high above the Savannah River that safety from flooding is “obvious or can be documented with minimum analysis” **(ANSI/ANS-2.8-1992)**.

A review of studies and analysis performed for the existing units was carried out to confirm that the conclusions continue to be valid for Units 3 and 4. This characterization of the VEGP site is reported in Section 2.4.3.1.

A calculation of the PMF discharge using approximate methods was developed for the ESP application from Regulatory Guide 1.59, *Design Basis Floods for Nuclear Power Plants*, Revision 2, August 1977, reported in Section 2.4.3.2, and the calculation of the associated flood stage using a steady-state hydraulic model and wave run-up, reported in Section 2.4.3.3. These calculations indicate that the maximum flood stage associated with Savannah River flooding is approximately 70 ft below the base slab elevation of the proposed units, confirming the assessment of the VEGP site as “flood dry.”

2.4.3.1 Review of Studies for Units 1 and 2

As part of the hydrologic study carried out for Units 1 and 2, the PMF values for the Savannah River at the site were first estimated using a hydrologic model of the entire upstream watershed and then were checked with a dynamic hydraulic model of the reach of the Savannah River between the last storage reservoir and the VEGP site, as summarized below:

1. The HEC-1 Flood Hydrograph Computer Program, developed by the USACE, was used to develop the PMF hydrograph of the Savannah River near the VEGP site, using the unit hydrographs of the 10 subbasins developed by the National Weather Service (NWS) together with Probable Maximum Precipitation (PMP) estimates derived from methodology outlined in National Weather Service Hydrometeorological Reports (NWS HMR 51 and HMR 52). Valley storage was accounted for by separately modeling the Strom Thurmond Dam HEC-1 outflow hydrograph with the NWS DAMBRK program.
2. The HEC-1 model was independently verified by routing the USACE-derived PMF outflow hydrograph from the Strom Thurmond Dam down to the VEGP site and combining it with the PMF hydrographs from the intervening drainage areas developed from HEC-1.

The results of these previous modeling efforts are summarized in Table 2.4.3-1 and are described in more detail below.

Table 2.4.3-1 Results of Previous PMF Modeling Efforts

Model	Description	PMF and Flood Elevation Results	PMF Stage Including Wave Action	Freeboard wrt El. 220 ft msl
HEC-1 Model with HMR 51 and 52 PMP	Ignoring Valley Storage	895,000 cfs, 136 ft msl	163 ft msl	57 ft
	Valley Storage Modeled in NWS DAMBRK	540,000 cfs, 126 ft msl	153 ft msl	67 ft
USACE PMF with NWS DAMBRK Model		710,000 cfs, 138 ft msl	165 ft msl	55 ft

2.4.3.1.1 Savannah River Watershed Hydrologic Model

In the HEC-1 hydrologic model, the watershed for the Savannah River at the VEGP site was subdivided into 10 subbasins with a total drainage area estimated at that time as 8,015 sq mi (the subwatershed areas used by the NWS for the current flood forecasting model of the Savannah River basin are different from the values used in previous modeling; the updated watershed areas are presented in Table 2.4.1-1 and are used for the PMF approximation described in Section 2.4.3.2). The PMF hydrograph for each subbasin was developed using the unit hydrograph obtained from NWS for the respective subbasins and the corresponding PMP estimates pertaining to the subbasin in question.

Starting from the most upstream subbasin, the PMF hydrograph was then routed and combined in succession in the downstream direction to the VEGP site, including reservoir routing through the upstream Burton, Hartwell, Strom Thurmond, and Stevens Creek dams.

Below Augusta, Georgia, significant floodplain storage exists that could significantly reduce the flood peak. Two PMF values at the VEGP site are presented in the study for licensing Units 1 and 2: a value of 540,000 cfs, with valley storage effects considered, and a value of 895,000 cfs without storage. Without the wind wave activities included, the maximum Savannah River PMF water levels at the VEGP site were estimated to be at El. 126 ft msl and 136 ft msl, respectively, for these two cases.

2.4.3.1.2 Dynamic Hydraulic Model Check on Hydrologic Model Results

An independent check of the reliability of the HEC-1-based estimate of the PMF at the VEGP site was carried out by routing the USACE-derived PMF outflow hydrograph from the Strom Thurmond Dam down to the VEGP site using the NWS dynamic hydraulic model DAMBRK and combining it with the HEC-1-derived PMF hydrographs from the intervening drainage areas between the Strom Thurmond Dam and the site.

The PMF outflow hydrograph at the Strom Thurmond Dam was obtained from the 1962 USACE *Reservoir Regulation Manual* (revised in 1968) developed by the Savannah District before the HMR 51 and 52 PMP guidelines were published and before the closure of the upstream dams.

The PMF peak discharge at the VEGP site was found to be 710,000 cfs, with a corresponding maximum water level at EL 138 ft msl.

It appears that a PMF value of 710,000 cfs was adopted in the study for Units 1 and 2 because it gave a higher water level than the 540,000 cfs value derived from the HEC-1/NWS modeling effort, when valley storage effects were considered.

2.4.3.2 Estimation of PMF by Approximate Methods

An alternative method for estimating the PMF is described in the NRC Regulatory Guide 1.59 for flood dry sites. The method consists of obtaining a relationship for the PMF discharge as a function of drainage area, based on PMF iso-line maps developed for regions of the United States east of the 105th Meridian, and utilizing the drainage area at a given site, obtain the PMF from the relation determined for that region. No PMP is required for this method. Calculations for the estimated PMF at the VEGP site are presented below.

The PMF values determined from the 100-, 500-, 1,000-, 5,000-, 10,000-, and 20,000 sq mi contributing area maps at the location of the Savannah River watershed upstream of the VEGP site are tabulated in Table 2.4.3-2.

Table 2.4.3-2 PMF Values for an Area-PMF Relationship at the VEGP Site

Watershed Area, sq. mi.	PMF in cfs from isolines	Supporting Figure (RG 1.59)
100	110,000	B-2
500	250,000	B-3
1,000	330,000	B-4
5,000	750,000	B-5
10,000	1,050,000	B-6
20,000	1,300,000	B-7

A logarithmic plot of the power curve fit to these values is presented in Figure 2.4.3-1. Based on the curve fit to the data and the currently estimated drainage area of 8,304 sq mi (as discussed in Section 2.4.1), the estimated PMF for the VEGP site is about 920,000 cfs. This point is located on the curve in Figure 2.4.3-1, along with a data point for VEGP (reported as Alvin W. Vogtle), presented on page 4 of 17 in Table B.1 of RG 1.59 as 1,001,000 cfs for a drainage area of 6,144 sq mi. Considering current and previously reported measurements, the drainage area reported for the VEGP site in Table B.1 appears to be incorrect and inconsistent with the RG 1.59 method, which was used to derive the value. However, it is presented as a published reference value.

2.4.3.3 Estimation of Flood Stage at VEGP Site for PMF

A stage-discharge relationship or “rating curve” is required to estimate the water surface elevation of the Savannah River near the VEGP site associated with the PMF discharge. This relationship was obtained from a steady-state hydraulic backwater analysis of the Savannah River run in HEC-RAS, a computer model developed by the USACE **(USACE 2005).**

The steady-state model was adapted from the dynamic model used for the analysis of the dam-break scenario described in Section 2.4.4, using the same channel roughness (Manning’s n) values as in that model. All bridges were removed from the dynamic model; they were not put back into the steady-state model, which is equivalent to assuming that any downstream bridges are either swept away or have a negligible impact on water surface elevations at the VEGP site during the PMF event.

Changes in the HEC-RAS model used to estimate stages at the VEGP site included:

- The reaches of the model upstream of the Augusta City Dam (River Mile 199.667) were removed.

- The model was converted from dynamic to steady-state mode with the downstream boundary condition at River Mile 99.406 determined by normal depth using an estimated energy slope of 0.0005 (the downstream water surface elevation will have a negligible impact on water surface elevations some 90 mi upstream near the VEGP site).
- The PMF and reference discharges were input for the entire model reach.
- The cross-section nearest the VEGP site (River Mile 150.906) was extended to the proposed top-of-slab elevation using 1:24,000-scale topography from 7.5-minute USGS quadrangles **(USGS MAPS 1989)**

The results for the cross-section nearest to the VEGP site (River Mile 150.906 in the model) are shown in Table 2.4.3-3.

Table 2.4.3-3 PMF Flood Stages for Cross-Section Nearest VEGP Site

Profile	Q Total, cfs	W.S. Elev, ft	E.G. Elev, ft	E.G. Slope	Vel Chnl, fps	Flow Area, sf	Top Width, ft	Froude # Chl
Avg Daily Max	13,669	88.22	88.25	0.000056	1.50	31,765	8,238	0.07
Avg Annual Peak	28,734	92.37	92.39	0.000056	1.64	66,743	8,551	0.07
Historic Max	360,000	118.55	118.63	0.000093	4.12	384,032	14,534	0.11
PMF	917,965	138.82	138.95	0.000102	5.66	680,627	14,681	0.13
2 x PMF	1,835,930	160.50	160.71	0.000120	7.50	999,754	14,784	0.14

The longitudinal profile output for the Savannah River for this model is reproduced as Figure 2.4.3-2. The cross section developed for the VEGP site is shown in Figure 2.4.3-3.

The estimated maximum stages at the VEGP site for the PMF estimated per the approximate method outlined in RG 1.59 are shown in Table 2.4.3-4.

Table 2.4.3-4 Estimated Probable Maximum Flood Stage at VEGP Site

PMF Stage:	138.82 ft msl –HEC-RAS WSL at River Mile 150.906
Wave run-up & wind set-up	11.31 ft – result for 2h:1v slope w/ 50 mph wind from NE over an 11-mile fetch resulting from dam-break
Total PMF Stage:	150.13 ft msl
Minimum Slab elevation	220.00 ft msl
Estimated Freeboard	69.87 feet

Based on the fact that the estimated maximum stage reached by the Savannah River at the site for the approximate PMF flood is over 69 feet below the minimum top-of-slab elevation of any safety-related systems, structures, or components at the VEGP site, the characterization of a flood-dry site should be established.

2.4.3.4 Conclusions

The PMF discharge on the Savannah River at the VEGP site estimated using the approximate methodology recommended for flood-dry sites is approximately 920,000 cfs, which corresponds to an approximate flood stage of about El. 139 ft msl. Accounting for wave run-up and wind set-up, the probable maximum water surface elevation on the Savannah River at the VEGP site would be less than elevation 151 ft msl.

The peak flood discharge associated with the dam-break analysis presented in Section 2.4.4 is about 2,332,000 cfs – significantly higher than the estimated PMF, which is consistent with the very significant volume of storage in the reservoirs upstream of the site. The maximum water surface elevation of the Savannah River at the VEGP site associated with the dam-break scenario is El. 166.79 ft msl at a discharge of 2,233,000 cfs (occurring several hours after the wave front associated with peak discharge, at which time the water surface is lower). Including 11.31 feet of wave run-up and wind set-up, the estimated maximum water stage at the VEGP site is El. 178.1 ft msl, significantly higher than the stage resulting from the PMF event with no dam failure.

In either case, the probable maximum flood stage is so far below the proposed grade elevation for the new units that the site can be classified as flood dry without reservation, and it can be concluded that the site is not susceptible to flooding from the Savannah River.

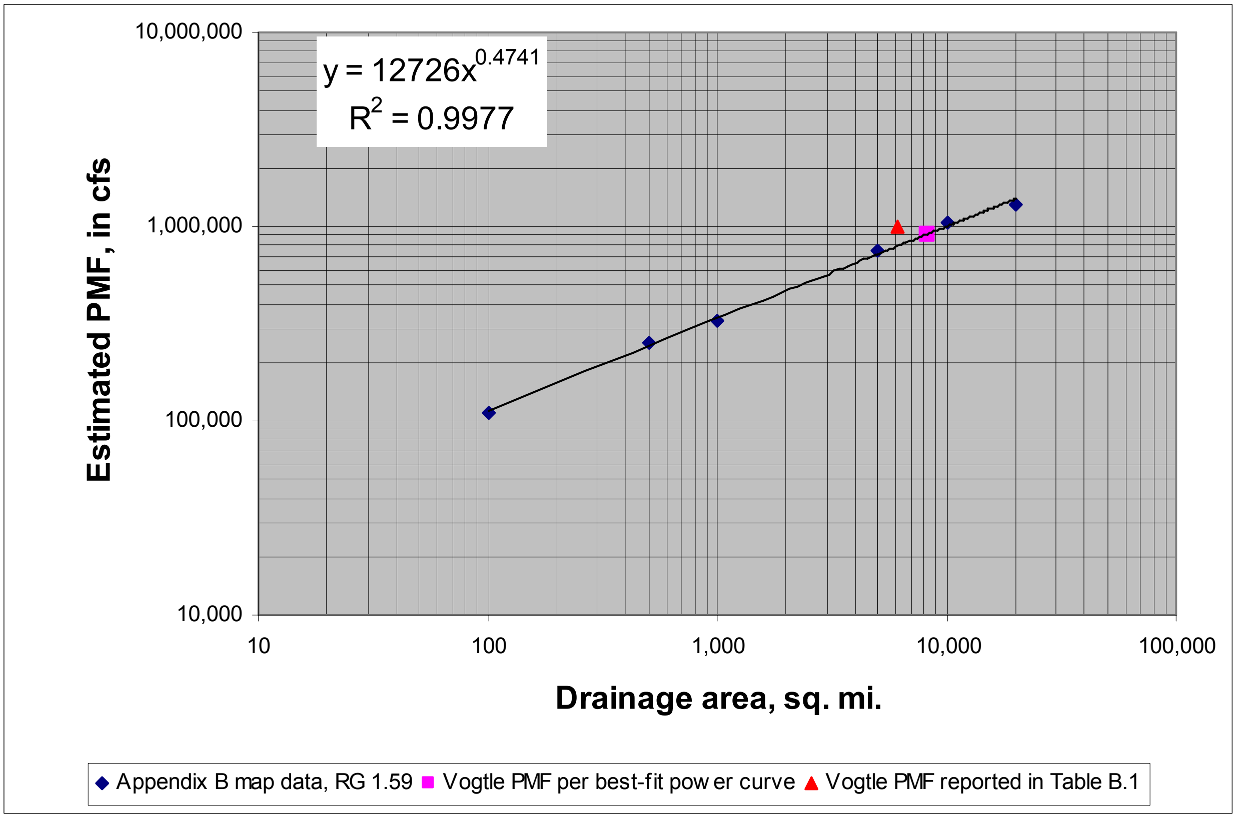


Figure 2.4.3-1 Area-PMF Plot for VEGP Site per Approximate Method from RG 1.59)

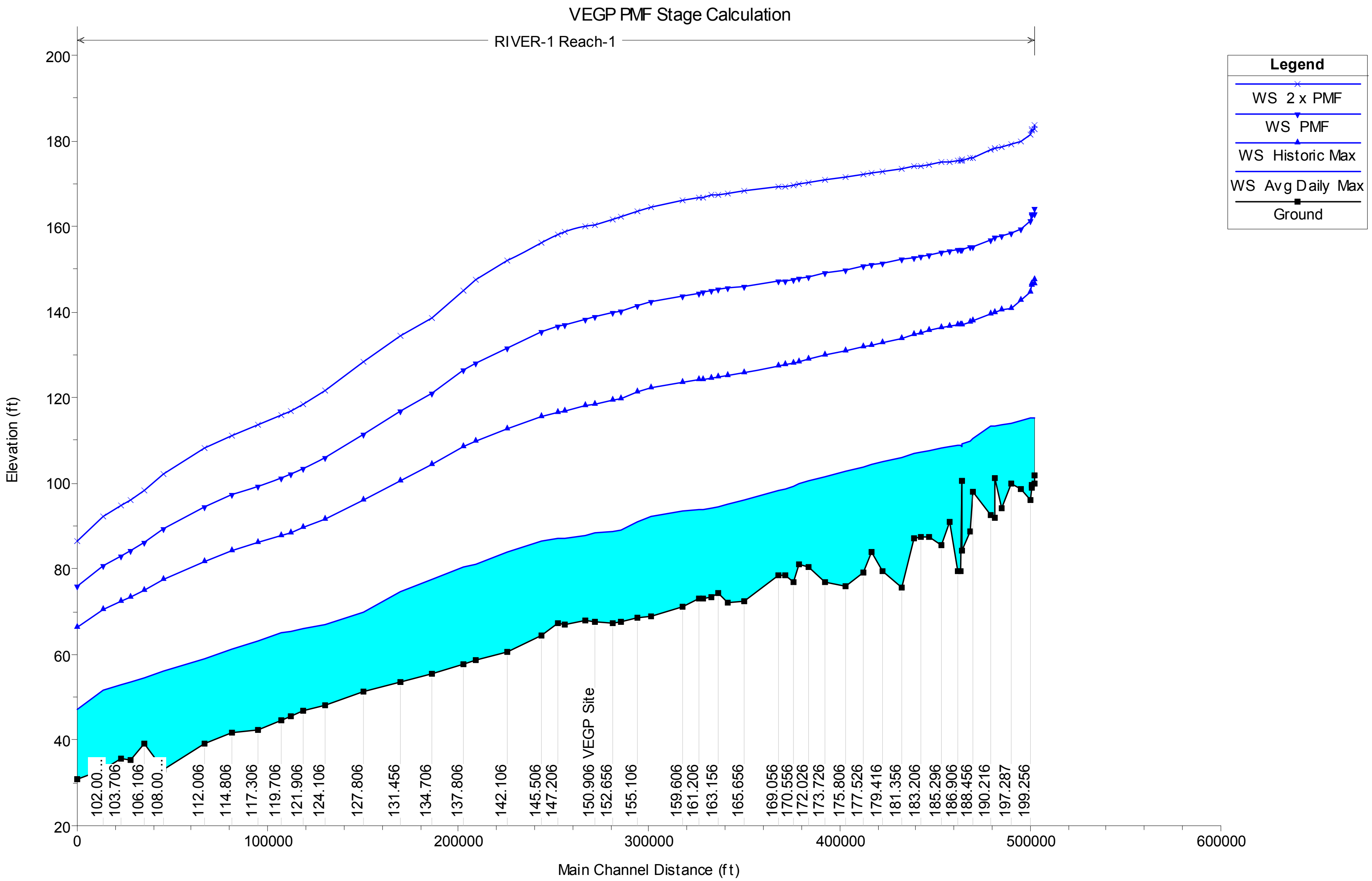


Figure 2.4.3-2 Longitudinal Profiles of the Savannah River from Steady-State HEC-RAS Model Run

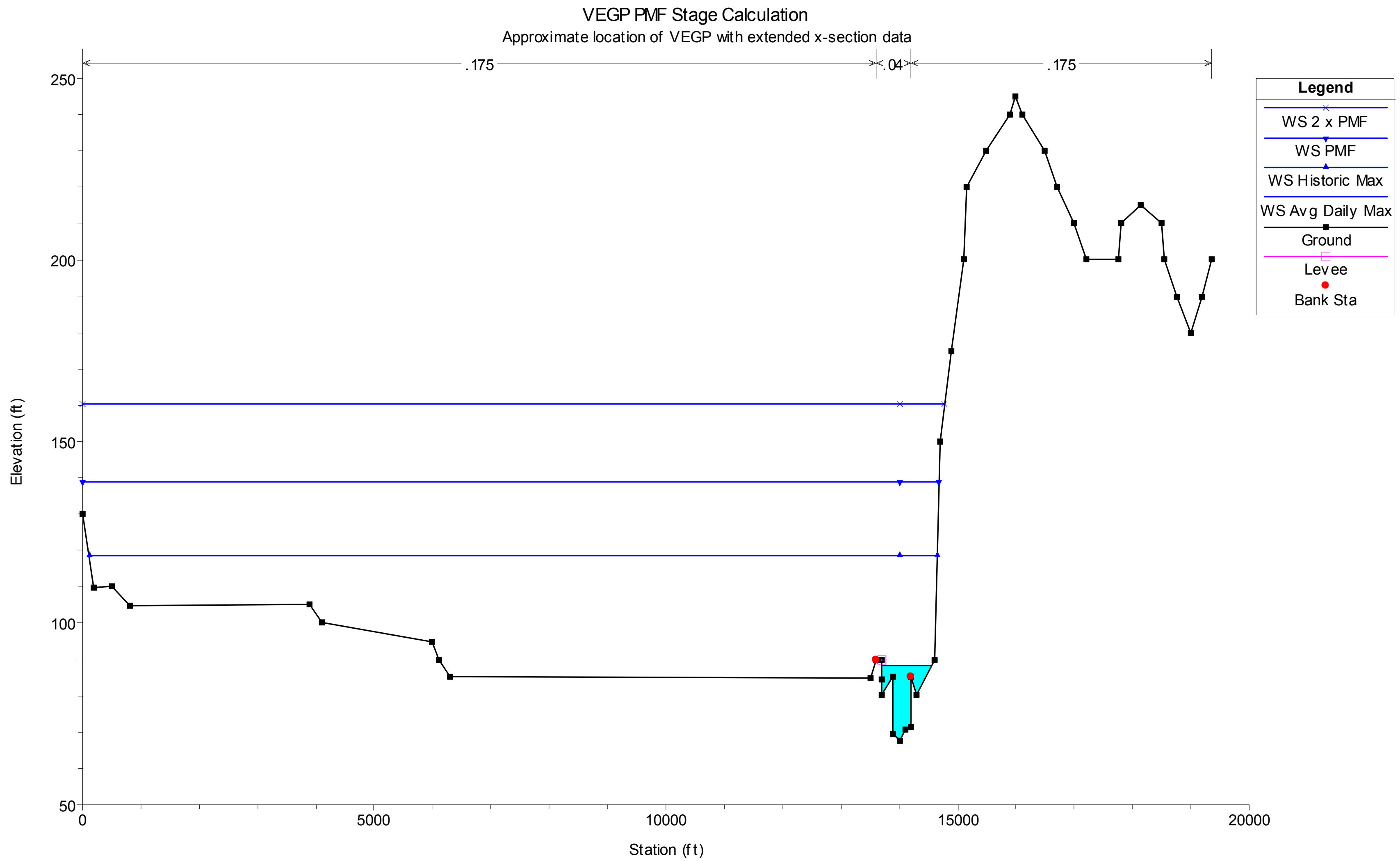


Figure 2.4.3-3 HEC-RAS Model Section at VEGP Site (Looking Downstream)

Section 2.4.3 References

(ANSI/ANS-2.8-1992) ANSI/ANS-2.8-1992, *Determining Design Basis Flooding at Power Reactor Sites*, American National Standards Institute/American Nuclear Society, 1992

(USACE 2005) HEC-RAS, River Analysis System, Version 3.1.3, Computer Program, Hydrologic Engineering Center, US Army Corps of Engineers, May 2005.

(USGS MAPS 1989) 7.5 Minute Series, Topographic Maps, US Geological Survey, Shell Bluff Landing, GA, 1989, Girard NW, GA-SC, 1989.

2.4.4 Potential Dam Failures

The VEGP site is located on the west bank of the Savannah River about 50 River Miles downstream of the City of Augusta, Georgia. There are 14 dams in the Savannah River Basin upstream of the VEGP site. These dams are owned and operated by either the U.S. Army Corps of Engineers (USACE) or one of several electric power generation companies located in Georgia and South Carolina. Table 2.4.1-9 lists the dams, their owners, and other pertinent data. The dams owned and operated by electric power generators fall under the jurisdiction of the Federal Energy Regulatory Commission (FERC); the other dams fall under the jurisdiction of the USACE.

Both FERC and USACE regulations require that dams for which failures pose a risk to human life be designed to survive very large earthquakes without risk of failure. Thus, it is unlikely that failure of any of the upstream dams would occur during a Safe Shutdown Earthquake (SSE). However, to demonstrate that the VEGP site will not be subject to flooding due to potential dam failures, a domino-type failure of the upstream dams is assumed, and this section analyzes the resulting flood wave and corresponding flood elevations at the VEGP site.

2.4.4.1 Dam Failure Permutations

Figure 2.4.4-1 shows the locations of the Savannah River Basin dams. Two of these dams, Stevens Creek Dam and New Savannah Bluff Lock and Dam, are relatively small weir structures used for flow diversion and small hydropower generation and do not have significant storage volumes. Both of these dams are located downstream of J. Strom Thurmond (also known as Clark's Hill) Dam and would be completely inundated by a breach of the upstream dams. Therefore, they are not included in the dam breach analysis presented in this subsection.

Table 2.4.1-9 lists each dam, its location, and size. Note that Little River Lake and Dam and Keowee Lake and Dam are hydraulically connected and share a common reservoir. All discharge from the common reservoir is through the Keowee Dam. Little River Dam has no outlet works.

Three large hydroelectric and storage dams on the Savannah River are operated by the USACE. They are J. Strom Thurmond Lake and Dam, Richard B. Russell Lake and Dam, and Hartwell Lake and Dam. Each dam comprises an earth embankment with a concrete gravity section in the center where the hydroelectric generation facilities and spillway gates are located. Upstream of Hartwell Dam, the remaining dams are located on tributaries to the Savannah River. Keowee/Little River Dam and Jocassee Dam are located on the Keowee River. Yonah Dam and Tugaloo Dam are located on the Tugaloo River. Tallulah Falls Dam, Mathis Dam, Nacoochee Dam, and Burton Dam are located on the Tallulah River, which is a tributary to the Tugaloo River.

For the dam breach analysis, conservatism of coincident flow rates in the Savannah River and water levels in the dams are assumed. The dam failure is assumed to be coincident with the standard project flood (SPF) water levels in the reservoirs behind the dams and the USACE-defined SPF discharge in the Savannah River.

Upstream of Thurmond Dam, there are essentially no free-flowing reaches of the Savannah River or the Keowee River. Each dam discharges into the reservoir pool of the next downstream dam. The failure mode that produces the largest flood wave and flood elevations at the VEGP site would produce the highest water level and largest volume of water at Thurmond Dam (the dam closest to the site) just before the assumed breach of Thurmond Dam. Based on the configuration of the dams upstream of Thurmond Dam, two breach scenarios are possible.

The first scenario consists of breaching all dams simultaneously. In this scenario, the water level at Thurmond Dam would be the SPF flood level in the lake, El. 342.1 ft msl **(USACE 1996)**. Initially, the stored water behind the reservoir would be the storage volume associated with the SPF water level. The inflow into Thurmond Lake would be equal to the flow through the breach at Russell Dam, which would be based on the SPF water level at Russell Dam, and so on upstream for all dams.

The second scenario consists of initially breaching only the most upstream dam in one of the stream reaches upstream of Hartwell Dam and allowing it to fill the next downstream reservoir, overtopping the downstream dam and breaching it. This scenario would continue breaching dams downstream by overtopping until Thurmond Dam is breached. In this scenario, when the breach occurs at Thurmond Dam, the water level would be at the top of the dam, El. 351.0 ft msl **(USACE 1996)**. Since the water level would be higher than the SPF level, the storage volume would also be larger. Additionally, the flow from Russell Dam into Thurmond Lake would have already started before Thurmond Dam was breached and would also be based on a higher water level in Russell Lake, resulting in a larger discharge into Thurmond Lake. Thus, with higher water levels and larger storage volumes and with the discharges from the upstream breaches already established before Thurmond Dam is breached, the second alternative would produce the higher flood wave downstream.

In the second scenario, there are two possible failure modes. The first mode (Mode 1) consists of Jocassee Dam breaching and progressing downstream through Keowee Dam to Lake Hartwell. The second mode (Mode 2) consists of Burton Dam breaching and progressing downstream through Nacoochee Dam, Mathis Dam, Tallulah Falls Dam, Tugaloo Dam, and Yonah Dam to Lake Hartwell. By comparing the normal pool storage volumes for the upstream dams listed in Table 2.4.1-9, the most severe failure mode is estimated. The combined normal pool storage volumes behind the dams in each mode are shown in Table 2.4.4-1.

Table 2.4.4-1 Normal Pool Storage Volumes

Dam	Mode 1 Reservior Storage Volume (1000 ac-ft)	Mode 2 Reservoir Storage Volume (1,000 ac-ft)
Jocassee	1,100	
Keowee	940	
Burton		108
Nacoochee		8.2
Mathis		31.4
Tallulah Falls		2.46
Tugalo		43.2
Yonah		10.2
Total	2,040	203

Table 2.4.4-1 indicates that the normal pool storage volume in Mode 1 is 10 times the volume in Mode 2. Thus, an assumed dam failure scenario following Mode 1 with the Jocassee Dam failing is analyzed.

2.4.4.2 Unsteady Flow Analysis of Potential Dam Failures

The dam breach option of the USACE River Analysis System computer program (HEC-RAS) **(USACE 2005a)** was used to develop the dam breach flood wave. The unsteady flow option of HEC-RAS was then used to route the flood wave downstream to the VEGP site. Multiple dams were breached in the analysis to determine the maximum flood elevation at the site. Although HEC-RAS is capable of routing several dam breaches in succession, this analysis used an alternative modeling approach for simplicity and conservatism. In this analysis, only two dams (Russell Dam and Thurmond Dam) were breached in succession. The storage volume behind the upstream dam (Russell Dam) was assumed to be equivalent to the SPF storage volume of all the upstream reservoirs (Lake Jocassee, Lake Keowee, Hartwell Lake, and Lake Russell). This approach conservatively models the successive failure of the three upstream dams and the simultaneous arrival of their combined storage volumes at Russell Dam. Russell Dam is breached by overtopping, which then causes the overtopping breach of Thurmond Dam and a subsequent flood wave down the Savannah River.

The *Savannah River Basin Water Control Manual* **(USACE 1996)** contains the SPF water levels, SPF discharges, and storage volumes from the Thurmond, Russell, and Hartwell dams, as well as storage data for the Jocassee and Keowee dams. Jocassee and Keowee dam SPF peak discharges and water levels are not available. However, probable maximum flood (PMF) water levels and discharges, which are greater than SPF values, are available and were used instead of the SPF values in the analysis. The PMF water levels and peak discharges for these two dams were obtained from LBC&W Associates of South Carolina **(LBC&W 1972)**. Area-capacity curves for each of the five reservoirs are shown on Figures 2.4.4-2 through 2.4.4-6, respectively.

For the purposes of this analysis, the Russell and Thurmond dams were assumed to fail by overtopping. The HEC-RAS dam breach option requires that breach parameters be established for each dam. The parameters define the breach dimensions and the time required to develop the breach. Several methodologies are available to estimate the required breach parameters. A report produced by the U.S. Bureau of Reclamation summarizes many of the methodologies for determining earth embankment breach parameters **(USBR 1998)**. This report is used to estimate the breach parameters for each dam. The estimated breach widths at the bottom of the breach are 750 and 755 ft for the Thurmond and Russell dams, respectively. The estimated breach side slope is 2H:1V for each breach, and the time to develop each breach is approximately 1 hour. For the dam breach analysis, it was conservatively assumed that each breach extends to the invert of the natural stream channel on the upstream side of the dam. For this to occur, it was assumed that some native material is eroded away along with the embankment material.

Once the dam breach occurred, the HEC-RAS computer program determined the flood wave discharge from the dam based on the breach dimensions, water level in the reservoir behind the dam, and the water level downstream of the dam. The program then used an unsteady flow option to model the progression of the flood wave downstream to the VEGP site. Additionally, HEC-RAS continued to model the flows through the dam breaches until the stored water in the reservoirs was evacuated. Since the combined volume of all five reservoirs is more than 10 million acre-feet, the flood wave from the dam breaches would last for several days at the VEGP site.

Cross-section data for the Savannah River used in the HEC-RAS computer model were obtained directly from the USACE, Savannah District **(USACE 2002)**. The data were supplied in HEC-RAS format and assembled from various floodplain studies on the Savannah River. To ensure that the cross-section data were accurate, several representative cross-sections near the site, in the City of Augusta, and near Thurmond Dam, were compared with cross-sections developed independently from USGS topographic maps **(USGS 1984–2000)**. In each instance, the cross-section data supplied provided a good match with those developed from USGS topographic maps.

The USACE elevation data for most of the cross-sections did not extend to the computed water surface elevation for the dam breach analysis. Therefore, HEC-RAS extended the left-most and right-most cross-section elevations vertically to meet the computed water surface. Usually, this approach is conservative in that it produces a cross-sectional area less than the actual cross-section. However, downstream of the breached dam, a constricted cross-section could produce water levels high enough to restrict the flow from the breach due to tail water submergence. Thus, four cross-sections downstream of the dam were sufficiently extended horizontally, based on USGS topographic information, to cover the range of the computed water levels.

A sensitivity analysis was performed to assess the effect of extending the remaining cross-sections to higher elevations. The results of this analysis indicated that extending the cross-sections lowered the water level and peak discharge at the VEGP site by less than 0.5 ft. Thus, for the most part, these cross-sections were not modified. However, the cross-section data through the City of Augusta extend only to the top of the levee on the right (west) bank of the Savannah River. Flood elevations for the dam breach event would overtop the levee and extend out into the City of Augusta. Thus, cross-section data through the City of Augusta were extended horizontally using topographic maps **(USGS 1984–2000)** to include additional area to these cross-sections and account for overtopping of the levee.

At least two sets of River Mile stationing have appeared in different USACE publications for the Savannah River. There is an approximately 16-mi discrepancy between the two stationing sets. The River Mile stationing set used in this analysis matches the stationing set used in the VEGP UFSAR and most of the *Savannah River Basin Water Control Manual* **(USACE 1996)**. The VEGP site is located at River Mile 150.9 in the HEC-RAS model. The other River Mile stationing reference would have the site at approximately River Mile 167.

Several bridges cross the Savannah River downstream of Thurmond Dam and through the City of Augusta. The last of these bridges is about 40 river miles upstream of the VEGP site. Modeling the dam breach flood wave through the City of Augusta with the bridges intact would produce results that impede the travel of the flood wave and reduce the computed flood levels at the VEGP site. However, during a dam breach event, all bridges would be significantly overtopped and it is likely that most, if not all, would be washed out. Thus, to provide more reasonable results, which allow the flood wave to progress unimpeded downstream (a conservative assumption for modeling the flood elevations at the VEGP site), the bridge structures were removed from the HEC-RAS model.

The Savannah River cross-section data supplied by the USACE stopped just downstream of Thurmond Dam. Cross-sections upstream and downstream of Thurmond and Russell dams were obtained from USGS topographic maps **(USGS 1984–2000)**. The below-water portions of the cross-section data were obtained from fishing maps with depth contours **(FHS L649; FHS L650)**.

Roughness coefficients (Manning’s n) were estimated using procedures developed by the US Geological Survey **(USGS 1989)**. Additionally, roughness coefficients were estimated for the flood studies performed for the existing VEGP Units 1 and 2 by calibrating water surface profile models with known flood elevations. The USGS estimation procedures produce roughness coefficients that are higher, and more conservative, than those presented in the UFSAR. Thus, the USGS-estimated roughness coefficients were used in the HEC-RAS dam breach model. The use of higher roughness coefficients is consistent with observations of dam-break floods that show that roughness coefficients for exceptionally high flow depths associated with dam-break floods are higher than those associated with lower flood flows in a river.

The starting water levels at three locations were required in the HEC-RAS dam breach model—in each of the two reservoirs and at the downstream end of the model. The cross-section farthest downstream in the HEC-RAS model is located at the River Mile 99.41, 51.5 mi downstream of the VEGP site. The normal depth option in HEC-RAS was used to determine the starting water surface elevation at this location. Given the distance from the site, any changes in the downstream boundary condition water level will not affect the computed flood elevations at the VEGP site.

The starting water level in Thurmond Lake was set at the SPF water level (i.e., El. 344.7 ft msl). Additionally, at this point an initial inflow was added equal to the SPF discharge of 560,000 cfs from Thurmond Dam. Once Russell Dam breaches, the overtopping breach of Thurmond Dam is triggered when the water level reaches El. 351.1 ft msl, 0.1 ft above the top of the dam (**USACE 1996)**, due to inflows from the breach of Russell dam.

The starting water level at Russell Dam was treated slightly differently. The model was set up as if the breaches of the Jocasse, Keowee, and Hartwell dams have already occurred and the combined SPF storage volume from these reservoirs is already at Russell Dam. Any upstream breaches would have already raised the water level to the top of Russell Dam. Therefore, the starting water level at Russell Dam was set at the top of the dam at El. 495.0 ft msl **(USACE 1996)**. The overtopping breach of Russell Dam was triggered 2 hours after the start of the HEC-RAS simulation. This 2-hour time delay allowed the SPF flood flow in the Savannah River downstream of Thurmond Dam to stabilize in the HEC-RAS model prior to initiating the Russell Dam breach.

2.4.4.3 Water Level at the Plant Site

The results of the HEC-RAS dam breach and unsteady flow routing analysis indicate that the peak water level at the VEGP site due to dam failure is El. 166.79 ft msl, which is 53.21 ft below the proposed site grade at El. 220.0 ft msl. The computed discharge at the time of the peak water level is 2,232,605 cfs.

The computed peak discharge rate, however, occurs 5 hours before the peak water level. The peak discharge is 2,331,582 cfs, with a corresponding water level at El. 164.71 ft msl. The delay in the peak water level at the site is due to backwater effects caused by the peak flood wave moving downstream of the site. The results are quoted to more significant figures than is physically possible to measure so that, if necessary, a direct correlation between the numerical results presented here and the computer output in supporting calculations can be obtained easily.

A plot of the Savannah River discharge and stage hydrograph at the VEGP site location is shown in Figure 2.4.4-7. Plots of the SPF water surface profile, maximum water surface profile, and water surface profile at the time of the maximum water level at the VEGP site are shown on Figures 2.4.4-8 through 2.4.4-10, respectively.

The flood elevations determined for this section have been determined to demonstrate that a postulated dam-break flood wave cannot adversely impact the VEGP site. The analysis to determine these elevations is based on very conservative assumptions, and the computed flood elevations should not be used for any other purposes or locations.

In accordance with ANSI/ANS-2.8 (1992), the maximum wave height and wave run-up at the shoreline generated by a 2-year wind speed must be estimated in conjunction with the dam breach flood level at the site. The fastest mile 2-year wind speed at the site is 50 mph **(ANSI/ANS-2.8 1992)**. The *Coastal Engineering Manual* **(USACE 2005b)** is used to estimate the wave height and run-up elevations at the VEGP site. The procedures outlined in the *Coastal Engineering Manual* use the wind speed, wind speed duration, water depth, and over-water fetch length to determine wave heights and run-up. The maximum fetch length during the dam breach flood is from the northeast and is about 11.14 miles long. The maximum fetch length is shown on Figure 2.4.4-11.

Various wind speed durations were analyzed to determine the maximum wave height and run-up elevation at the site. The wave run-up was determined based on the steep embankment condition that will exist during a dam breach flood event at the VEGP site. The estimated slope of the embankment is 2H:1V for the wave run-up determination.

The estimated wave height and run-up values at the VEGP site during the dam breach flooding event are as follows:

- Maximum Wave Height, HMAX = 7.46 ft
- Spectral Peak Period, TP(MAX) = 4.09 s
- Maximum Wave Length, L0 = 85.73 ft
- Maximum Wave Run-up, R = 11.31 ft

The calculated wave run-up also includes wave setup effects. To obtain the maximum flood elevation due to wind-induced waves at the VEGP site, the maximum wave run-up elevation was added to the still water elevation due to dam breach flooding. Adding these two numbers gives a maximum flood level of El. 178.10 ft msl, which is 41.9 ft below the proposed site grade of El. 220.0 ft msl. Therefore, the VEGP site is precluded from flooding due to potential dam failures and coincident wind-generated waves.

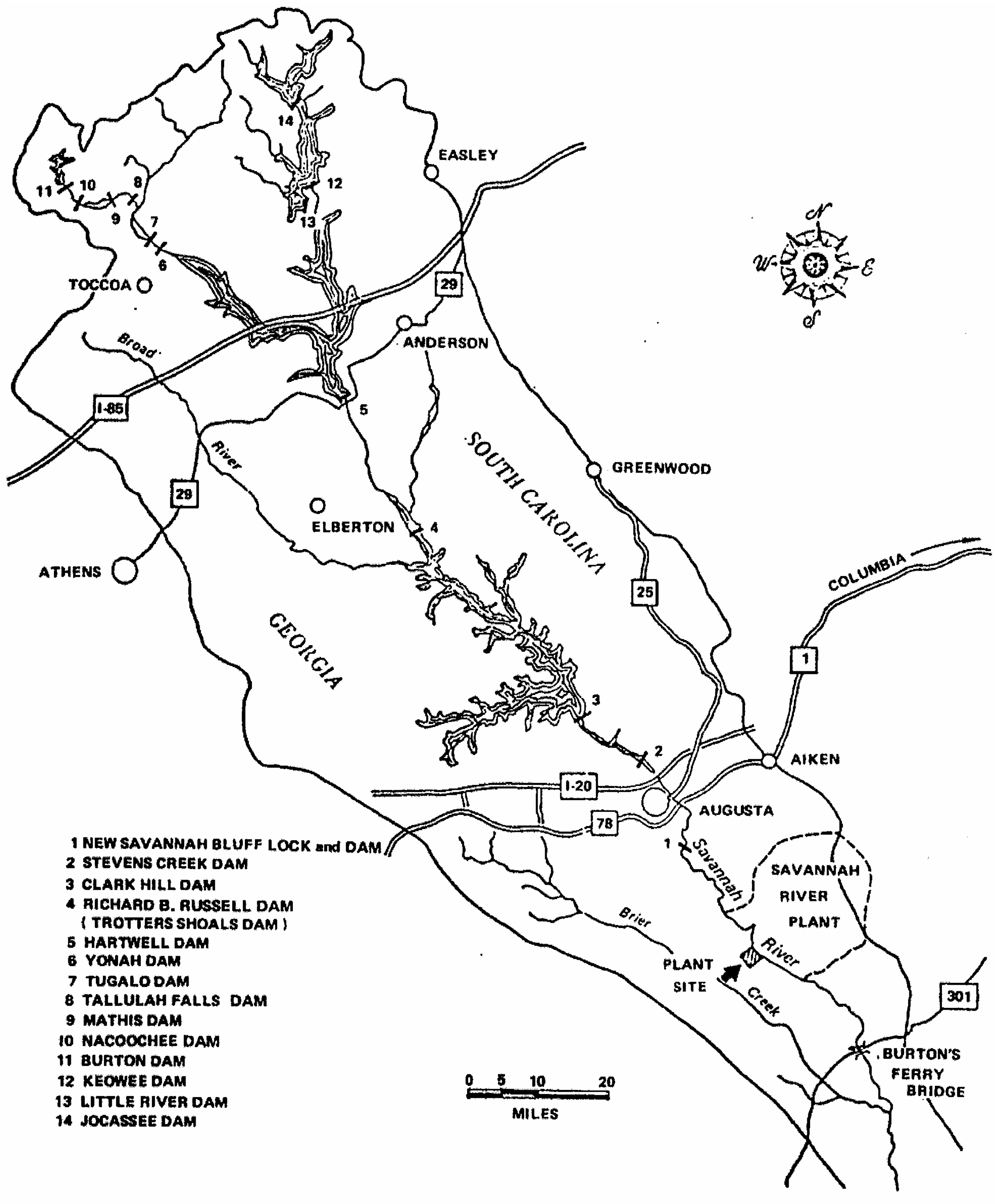
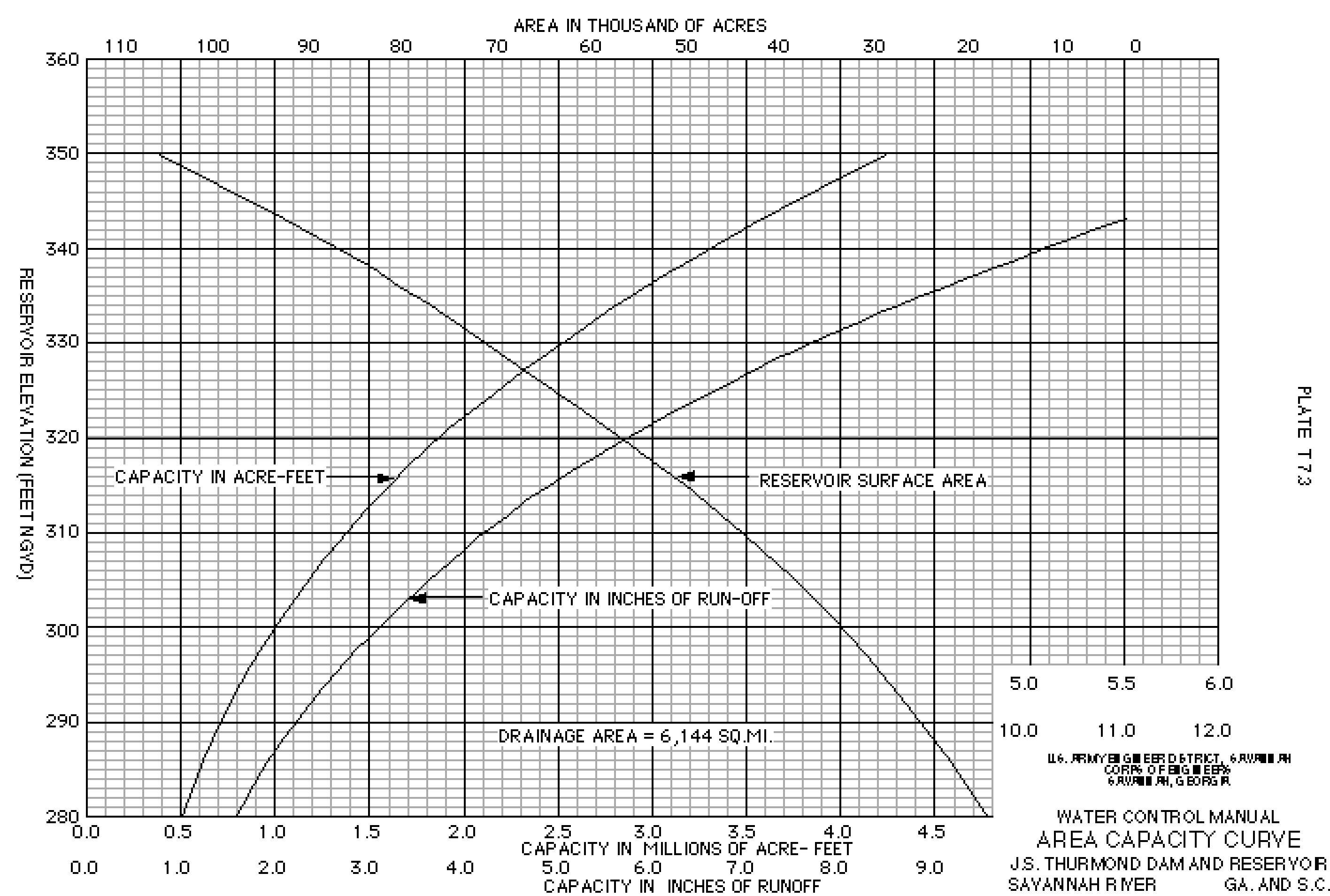
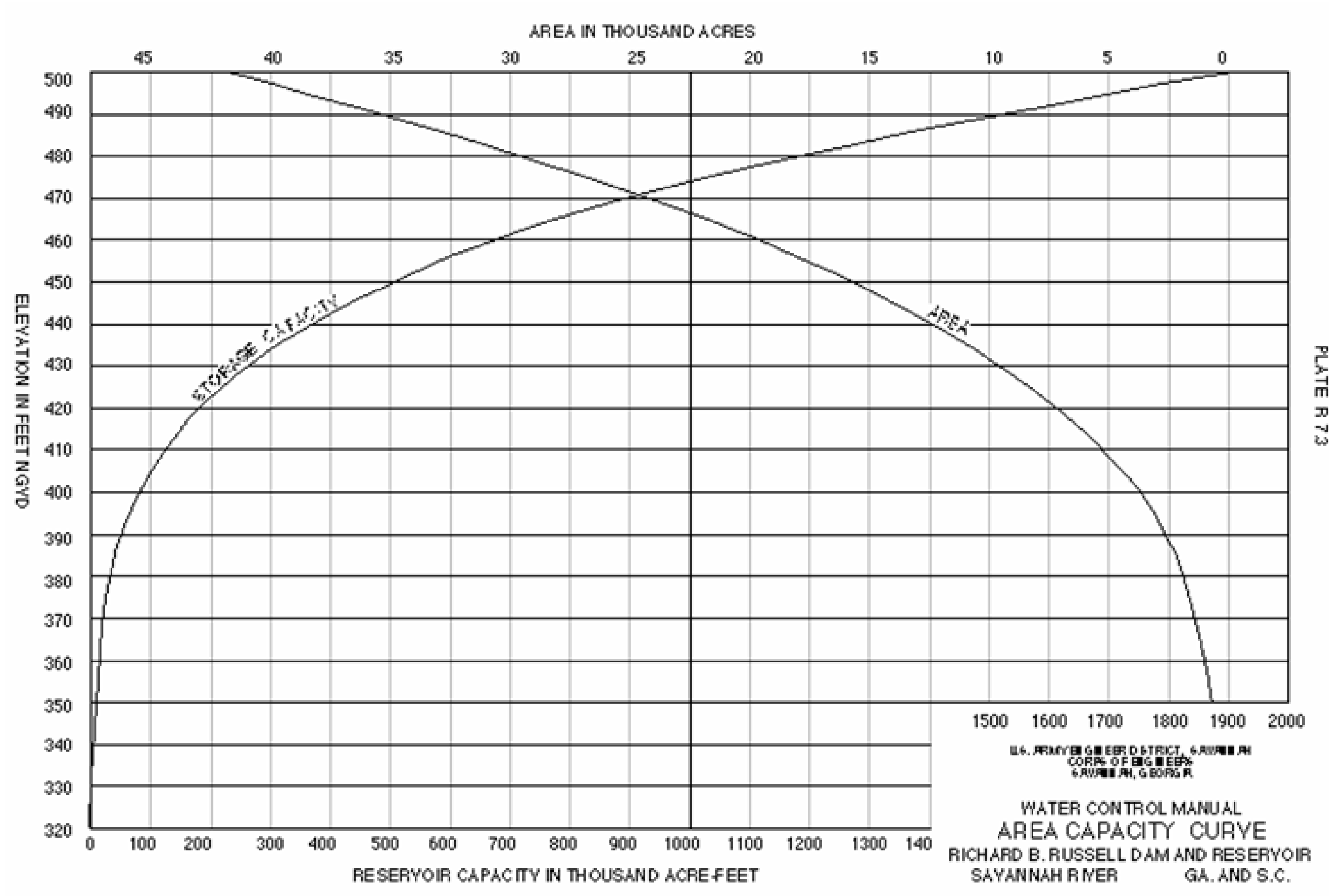


Figure 2.4.4-1 Savannah River Basin Dam Locations



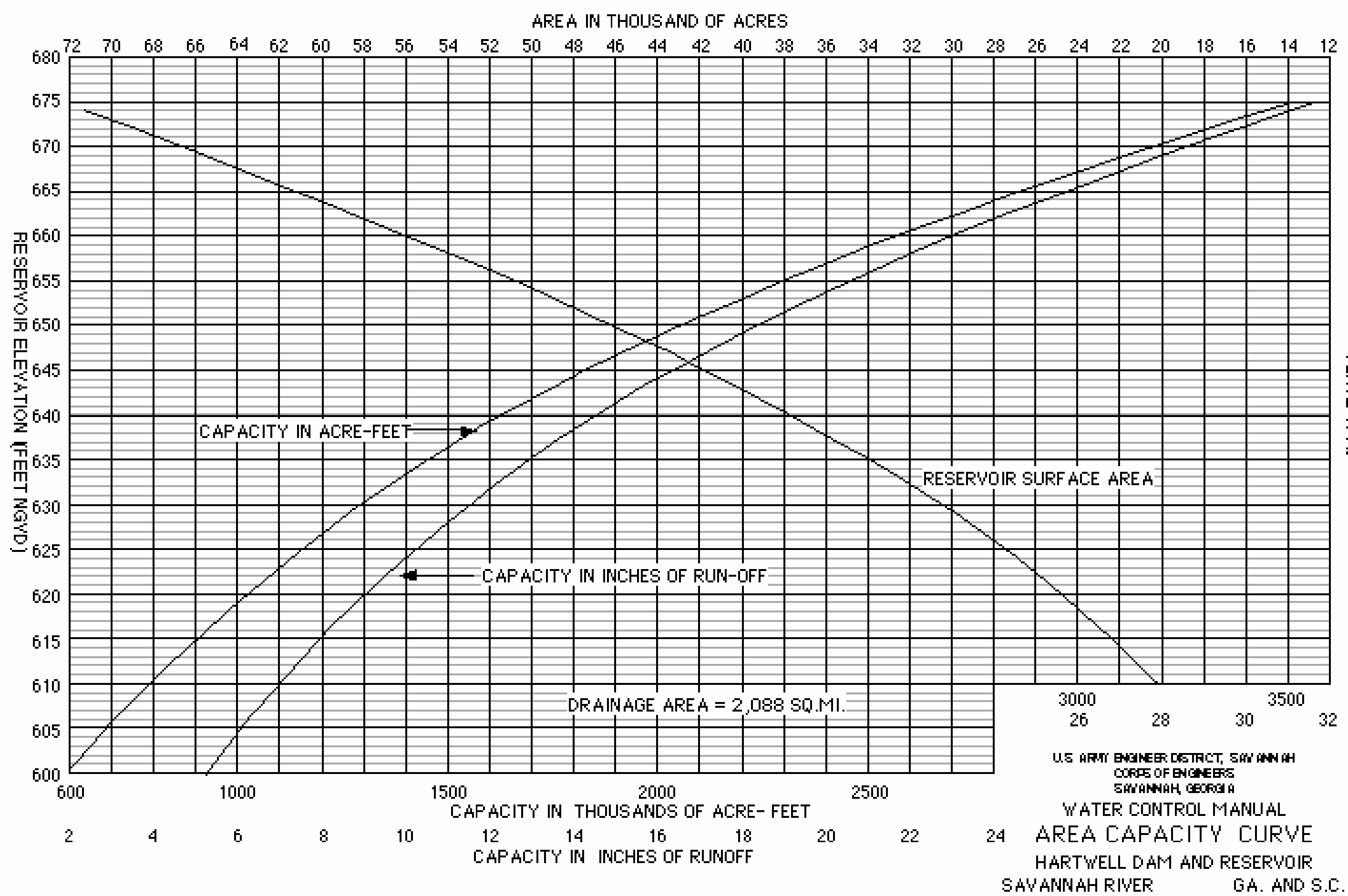
Source: USACE 1996

Figure 2.4.4-2 J. Strom Thurmond Area Capacity Curve



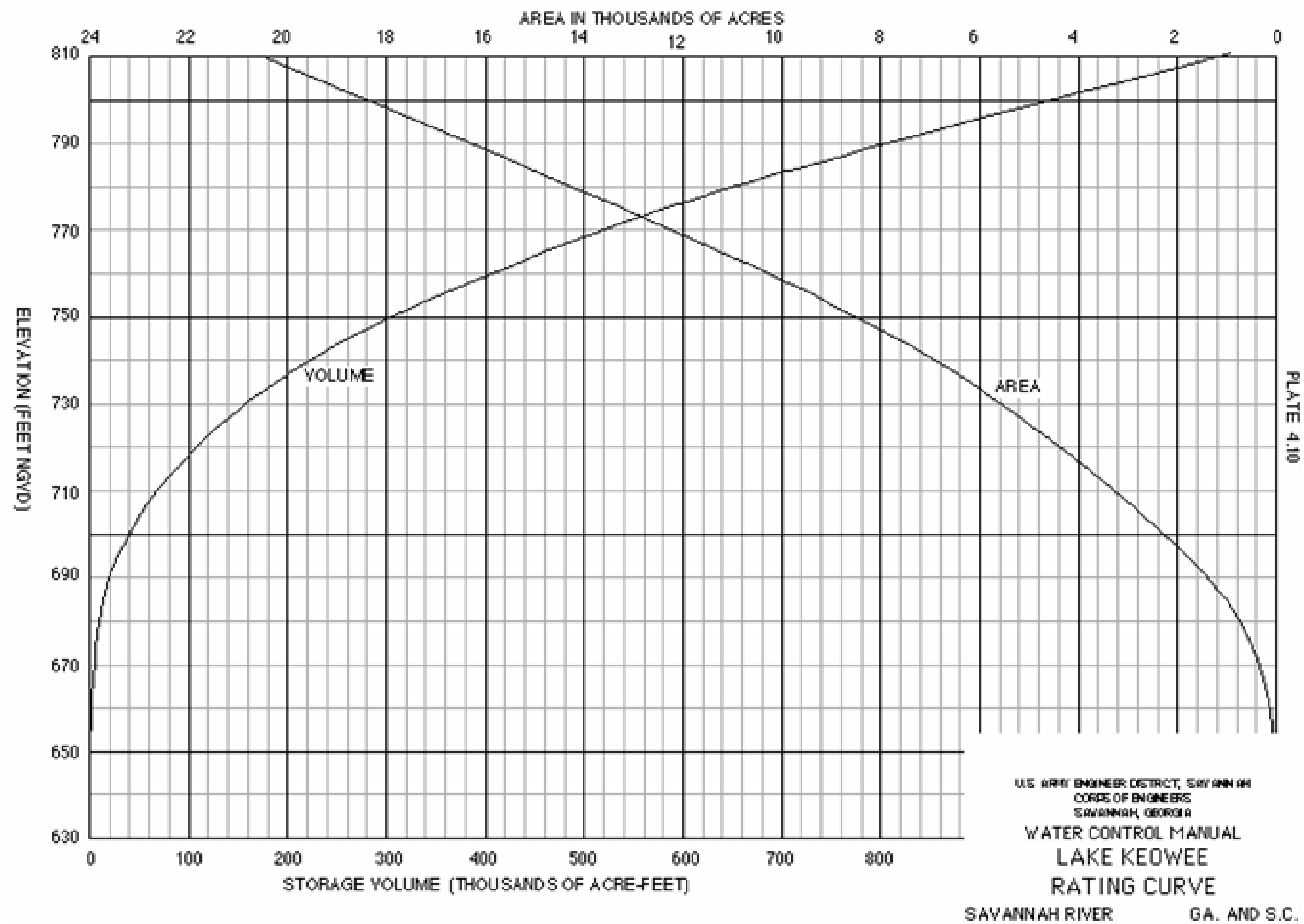
Source: USACE 1996

Figure 2.4.4-3 Richard B. Russell Area Capacity Curve



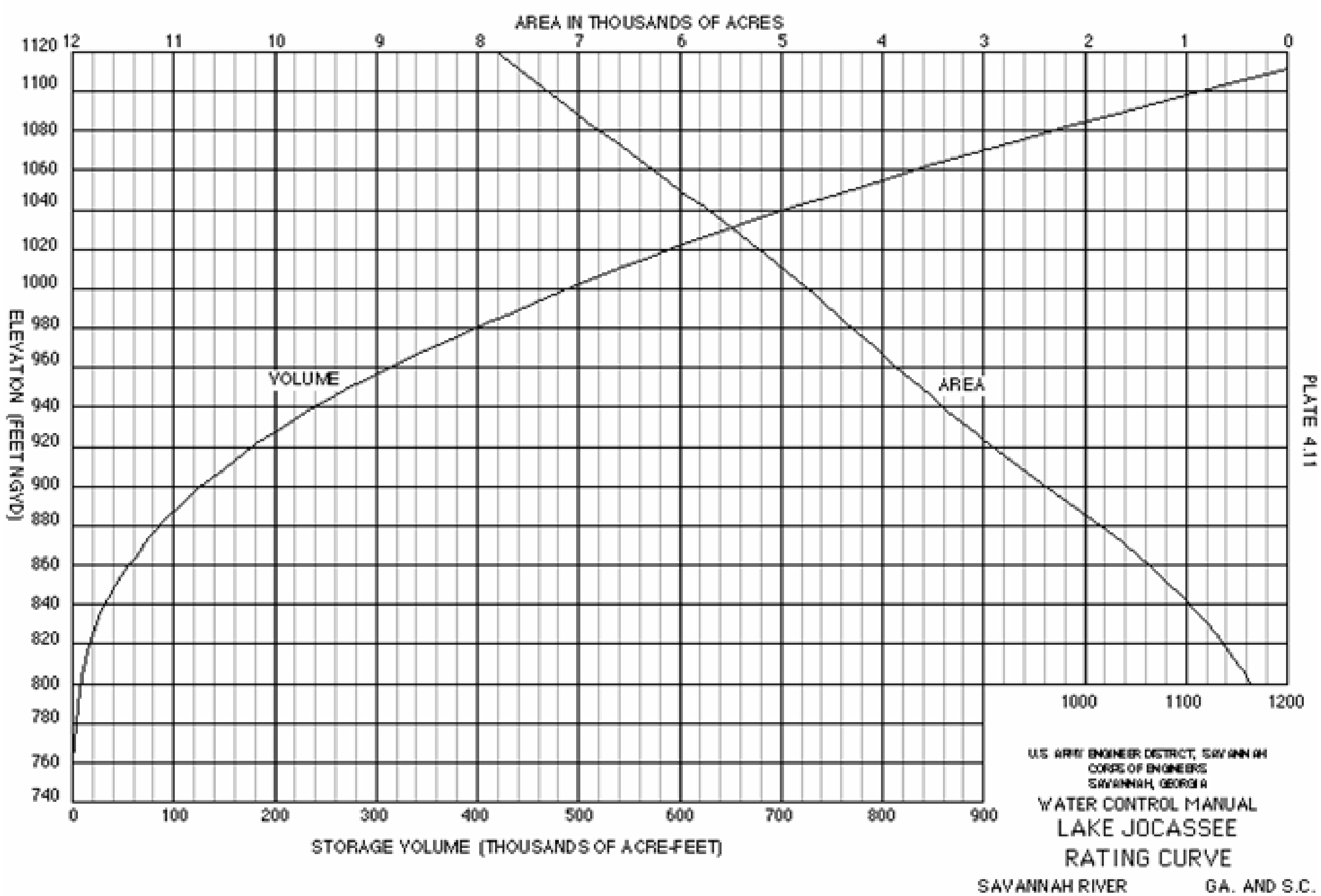
Source: USACE 1996

Figure 2.4.4-4 Hartwell Dam and Reservoir Area Capacity



Source: USACE 1996

Figure 2.4.4-5 Keowee Area Capacity Curve



Source: (USACE 1996)

Figure 2.4.4-6 Jocassee Area Capacity Curve

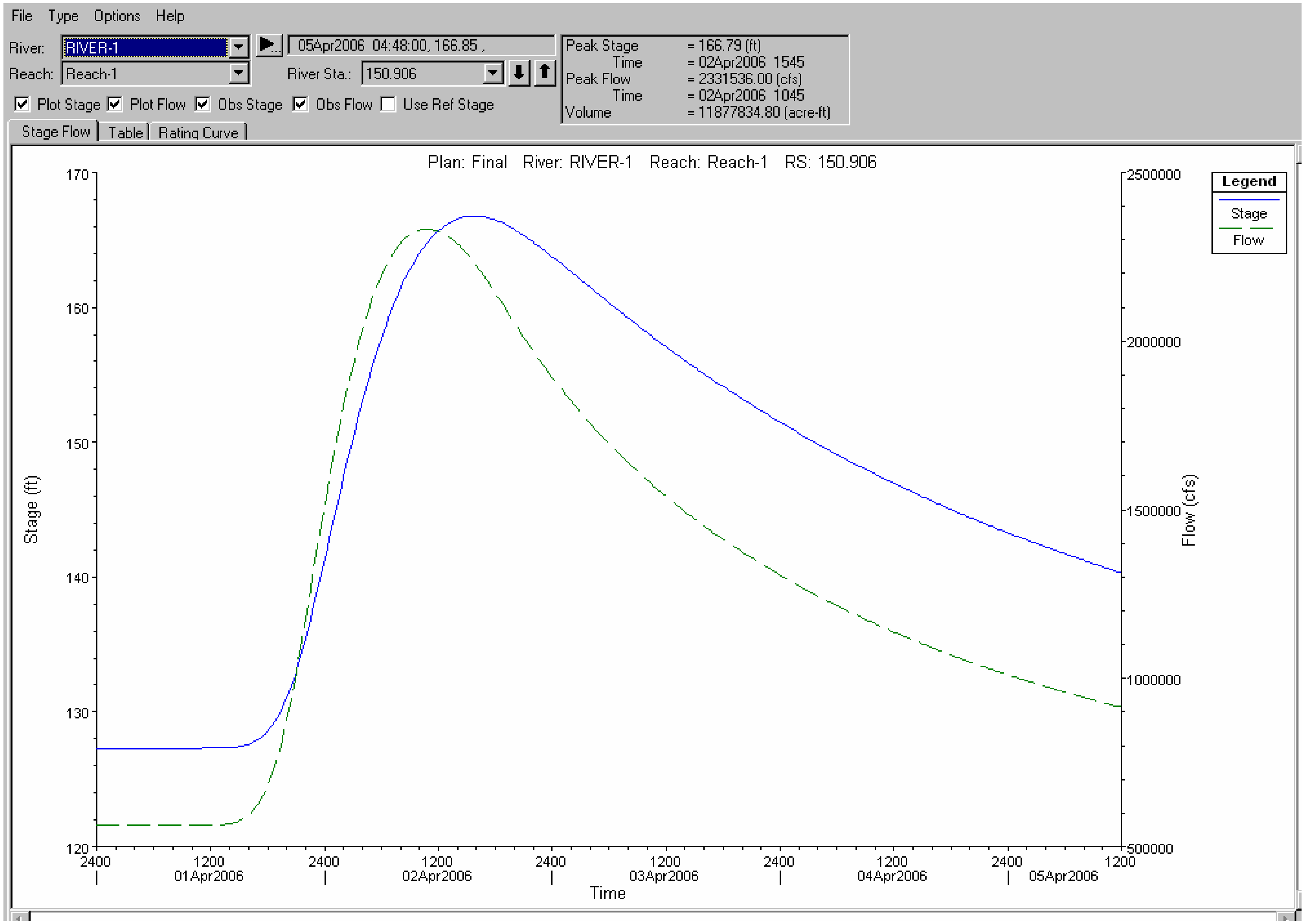


Figure 2.4.4-7 Dam Breach Flood Flow and Stage Hydrograph at the VEGP Site

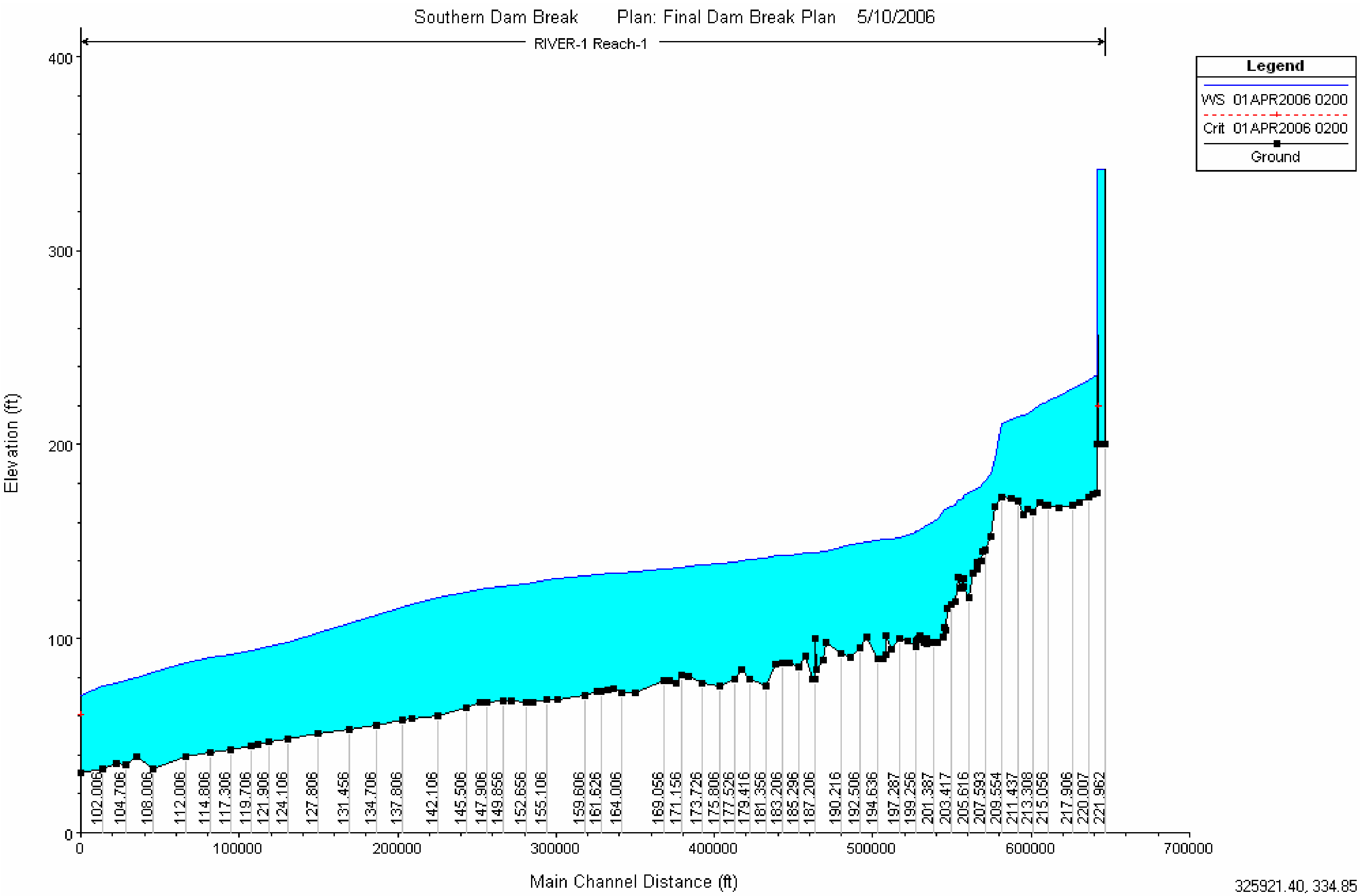


Figure 2.4.4-8 Savannah River SPF Water Surface Profile

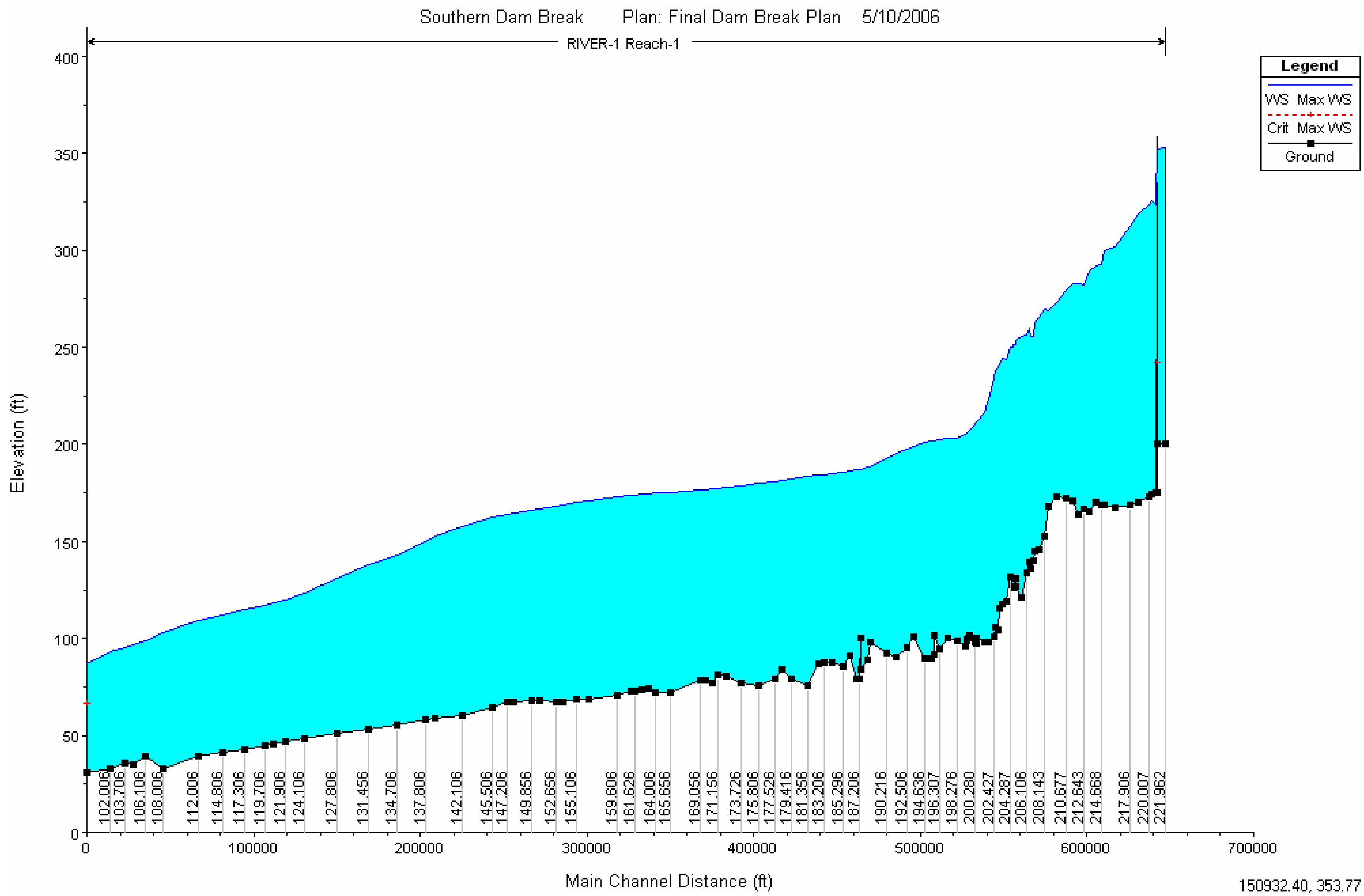


Figure 2.4.4-9 Savannah River Dam Breach Flood Maximum Water Surface Profile

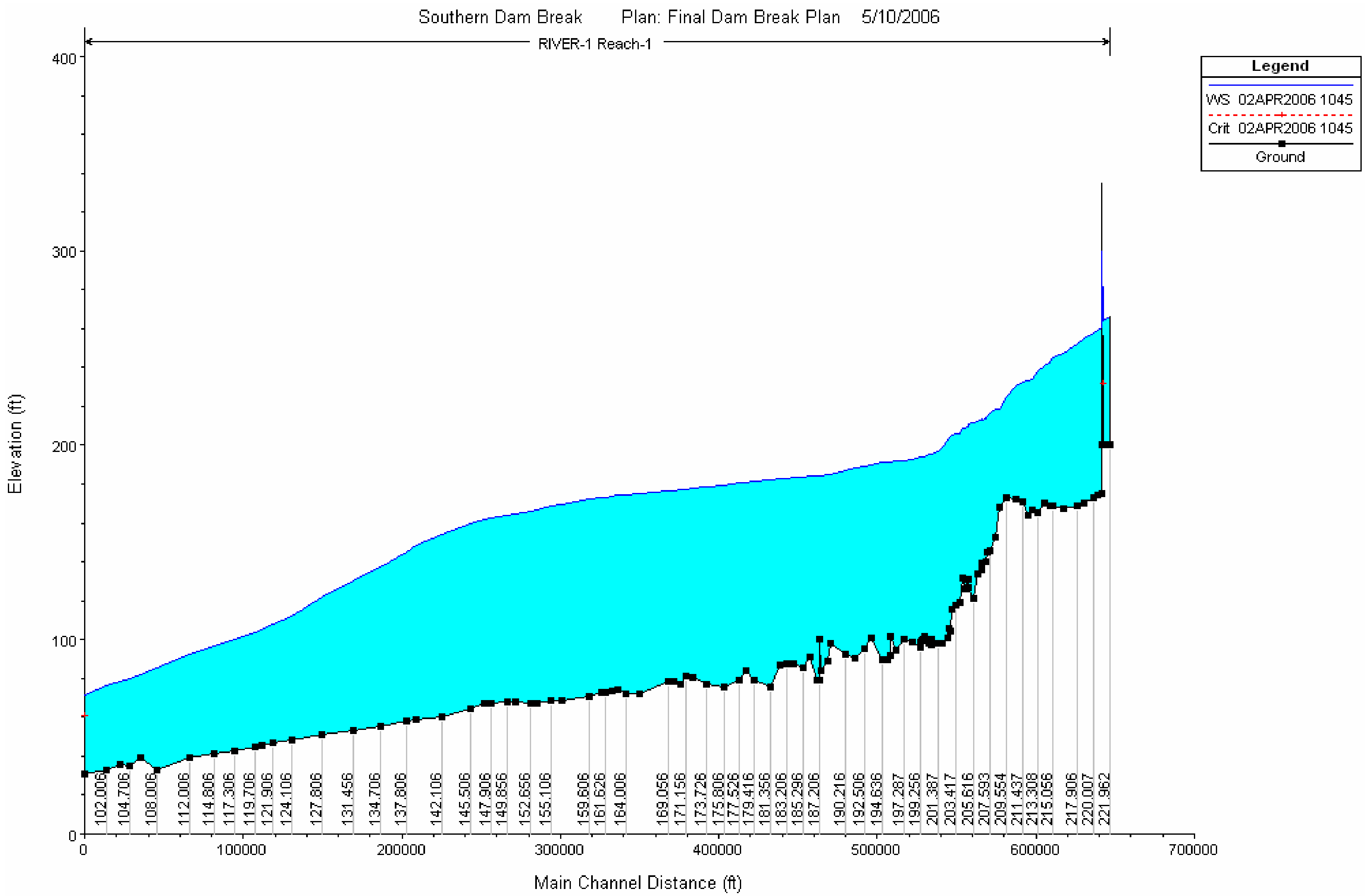


Figure 2.4.4-10 Savannah River Dam Breach Flood Water Surface Profile for Peak Discharge at VEGP Site

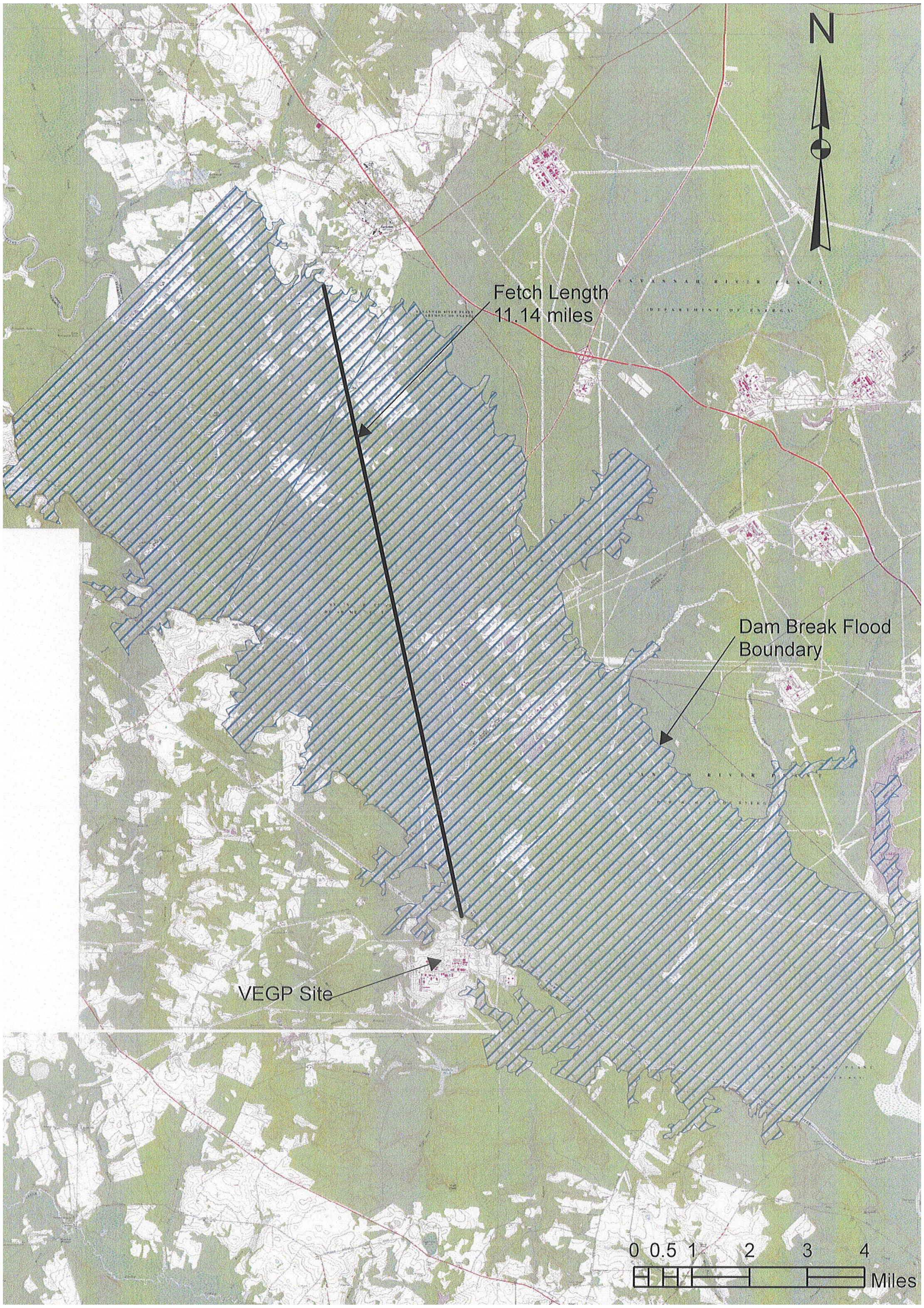


Figure 2.4.4-11 Maximum Fetch Length

Section 2.4.4 References

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(FHS L649) L649, Lake Russell, Georgia/South Carolina Series, Map, Fishing Hot Spots, Inc.

(FHS L650) L650, Clark's Hill Lake (J. Strom Thurmond Reservoir), Georgia/South Carolina Series, Map, Fishing Hot Spots, Inc.

(LBC&W 1972) NRC Accession Number 7912020110, Hydrologic Engineering Studies of Flood Potential for Keowee-Toxaway, Correspondence Letter; Lyles, Bissett, Carlisle, & Wolf Associates of South Carolina, 1972.

(USACE 1996) Water Control Manual, Savannah River Basin Multiple Purpose Projects: Hartwell Dam and Lake, Richard B. Russell Dam and Lake, J. Strom Thurmond Dam and Lake, Georgia and South Carolina, Water Control Manual, Savannah District, U.S. Army Corps of Engineers, 1996.

(USACE 2002) Savannah River HEC-2 Data File, Savannah District, U.S. Army Corps of Engineers, June 2002.

(USACE 2005a) HEC-RAS, River Analysis System, Version 3.1.3, Computer Program, Hydrologic Engineering Center, U.S. Army Corps of Engineers, May 2005.

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(USGS 1984–2000) 7.5 Minute Series, Topographic Maps, U.S. Geological Survey, Augusta East, GA, 2000; Augusta West, GA, 1984; Calhoun Falls, SC, 1986; Clarks Hill, SC, 1986; Heardmont, GA, 1986; Martinez, GA, 1981; North Augusta, GA, 2000.

(USGS 1989) WSP2339, Guide for Selecting Manning's Roughness Coefficients for Natural Channels and Floodplains, Water Supply Paper, U.S. Geological Survey, 1989.

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2.4.5 Probable Maximum Surge and Seiche Flooding

The VEGP site is located on a coastal plain bluff on the west bank of the Savannah River approximately 151 River Miles inland from the Atlantic Ocean at grade El. 220 ft msl. Since the site is not located on an open or large body of water, surge or seiche flooding will not produce the maximum water levels at the site.

The Savannah River estuary region is occasionally exposed to extreme mid-Atlantic hurricanes. Between 1841 and 2004, only three major hurricanes, Category 3 or over (measured using the Saffir/Simpson Hurricane Scale), hit the coast of Georgia **(Blake et al. 2005)**. The most devastating hurricane on record with a landfall within approximately 100 miles of the Savannah River estuary was Hurricane Hugo, which hit the coast of South Carolina near Charleston in 1989. This Category 4 hurricane produced a 20-foot-high storm surge in the Cape Romain-Bulls Bay area in South Carolina **(NHC 2006)**.

Regulatory Guide 1.59, *Design Basis Floods for Nuclear Power Plant*, Revision 2, August 1977 (RG 1.59), Appendix C provides the distribution of probable maximum surge levels from hurricanes along the Atlantic coast. It shows maximum surge heights of 28.2 ft mean low water (mlw) at Folly Island, South Carolina, and 33.9 ft mlw at Jekyll Island, Georgia, located northeast and southwest of the Savannah River estuary, respectively. The probable maximum storm surge height at the mouth of the Savannah River can be estimated from these values following the procedure described in RG 1.59 Appendix C, as shown in Table 2.4.5-1.

The high tide at the estuary with a 10 percent exceedance level is defined as 9.0 ft mlw, and the mlw at the entrance to Savannah River, Georgia is 1.2 ft below msl **(ANSI/ANS-2.8 1992)**. Considering the coincidence of the probable maximum surge with a 10-percent-exceedence high tide at the river mouth, a probable maximum surge height of 32.3 ft mlw or 31.1 ft msl may be obtained for the Savannah River estuary, as shown in Table 2.4.5-1.

If it is assumed that a storm surge of such a magnitude is generated in the Savannah River estuary moving inland, the surge height would dissipate before reaching the VEGP site (151 River Miles inland and at grade El. 220 ft msl), and the site would be free from any resultant flood. Also, because the VEGP site is not located on a large enclosed body of water, flooding due to seiche is precluded.

The probable maximum surge data from RG 1.59 have not included those from the hurricanes after 1975. The inclusion of the data from recent hurricanes, including Hurricane Hugo, may have changed the probable maximum surge data from RG 1.59 somewhat. However, because the VEGP site is 151 River Miles inland and at grade El. 220 ft msl, the effects of probable maximum surge at the estuary of Savannah River would be insignificant at the site, and would not cause flooding of the site.

Table 2.4.5-1 Estimated Probable Maximum Surge at the Savannah River Mouth

Components	Unit	Folly Island[a]	Jekyll Island[b]	Savannah Estuary[c]	Comments
Wind Setup	ft mlw[d]	17.15	20.63	18.89	Taken as average of wind set-up from Folly Island and Jekyll Island
Pressure Set-up	ft mlw	3.23	3.34	3.29	Taken as average of pressure set-up from Folly Island and Jekyll Island
Initial Water Level	ft mlw	1.00	1.20	1.10	Taken as average of initial water level from Folly Island and Jekyll Island
10 % Exceedence High Tide	ft mlw	6.80	8.70	9.00	Magnitude at the Savannah River estuary taken from ANSI/ANS-2.8-1992; others from NRC RG 1.59 1977
Total Surge Height	ft mlw	**28.2**	**33.9**	**32.3**	Sum of wind and pressure set-up, initial water level, and 10% exceedence high tide
mlw to msl conversion[e]	ft			-1.2	Magnitude at the Savannah estuary obtained from ANSI/ANS-2.8-1992
Sea Surface Anomaly	ft			0.0	Magnitude at the Savannah estuary obtained from ANSI/ANS-2.8-1992
Total Surge Height	ft msl			**31.1**	

[a] NRC RG 1.59 1977
[b] NRC RG 1.59 1977
[c] Wind and pressure set-up, and initial water level averaged from Folly Island and Jekyll Island, tidal data was obtained from ANSI/ANS-2.8-1992
[d] Mean low water (mlw)
[e] Mean sea level (msl) = (mlw +1.2) ft at the Savannah estuary **(ANSI/ANS-2.8 1992)**

Section 2.4.5 References

(ANSI/ANS-2.8 1992) Determining Design Basis Flooding at Power Reactor Sites, American National Standard/American Nuclear Society, July 1992.

(Blake et al. 2005) Blake, E.S., E.N. Rappaport, J.D. Jarrell, and C.W. Landsea, *The Deadliest, Costliest, and Most Intense United States Tropical Cyclones from 1851 to 2004 (and Other Frequently Requested Hurricane Facts)*, Tropical Prediction Center, National Hurricane Center, Miami, Florida, August 2005.

(NHC 2006) Hurricane History, National Hurricane Center, Web site address: http://www.nhc.noaa.gov/HAW2/english/history.shtml#hugo, accessed April 7, 2006.

2.4.6 Probable Maximum Tsunami Flooding

Since the VEGP site is not located on an open ocean coast or large body of water, tsunami-induced flooding will not produce the maximum water level at the site.

The Atlantic Ocean region is characterized by infrequent seismic and volcanic activities, resulting in few recorded tsunamis. The majority of tsunamis in the Atlantic Ocean and Caribbean Sea have been either triggered by seismic (earthquake) activity or the result of volcanic eruption. The most notable Atlantic tsunami was generated by the Great Lisbon Earthquake of 1755. The tsunami hit the coasts of Portugal, Spain, and northern Africa and traveled across the Atlantic Ocean with a 10-to-15-ft wave reportedly reaching the Caribbean coasts **(Maine DOC 2006)**. Computer models suggested a wave height of 10 ft along the east coast of the US **(NOAA 2006)** from this tsunami.

The effects of any tsunami with similar height approaching the Savannah River estuary would be dissipated before reaching the VEGP site (151 River Miles inland and at grade El. 220 ft msl), and the site would be free from any resultant flood.

Section 2.4.6 References

(Maine DOC 2006) *Tsunamis in the Atlantic Ocean*, Maine Geological Survey, Maine Department of Conservation, Web site address: http://www.maine.gov/doc/nrimc/mgs/explore/hazards/tsunami/jan05.htm, accessed April 10, 2006.

(NOAA 2006) *Tsunami, Tidal Waves and Other Extreme Waves*, National Weather Service Forecast Office, Philadelphia/Mount Holly, National Oceanic and Atmospheric Administration, Web site address: http://www.erh.noaa.gov/er/phi/reports/tsunami.htm, accessed April 10, 2006.

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2.4.7 Ice Effects

2.4.7.1 Ice Conditions and Historical Ice Formation

Long-term air temperature records available at the National Weather Service (NWS) weather station at Augusta, Georgia (Bush Field), and seven other cooperative observation stations around the VEGP site are used to analyze historical extreme air temperature variations at the VEGP site. The analysis was also supported by onsite temperature data measured at the VEGP site. A detailed description of station locations and data availability is presented in Section 2.3.2.

The climate at the VEGP site is characterized by short, mild winters and long, humid summers. Local climatology data at Augusta, Georgia, for a period of 129 years show an average annual air temperature of 64.2°F (17.9°C) **(NCDC 2003)**. January is the coldest month, with an average temperature of 46.8°F (8.2°C). July is the warmest, with an average temperature of 81.3°F (27.4°C). Based on temperature records at Augusta and seven surrounding stations, the lowest air temperature on record was observed to be -4.0°F (-20.0°C) at Aiken in January 1985 (Table 2.3-3). The January 1985 event produced a minimum air temperature of -0.1°F (-17.8°C) at the VEGP site, with the air temperature remaining below freezing (32°F [0°C]) for only about 50 hours (Figure 2.4.7-1). VEGP temperature data from 1984 through 2002 show that the average daily air temperature has remained below freezing for a maximum of 3 consecutive days (Table 2.4.7-1). In three instances, the average daily air temperature remained above freezing the entire year.

Historical water temperatures recorded at five USGS stations located on the Savannah River **(Dyar and Alhadeff 1997)** are presented in Table 2.4.7-2. These USGS stations include: No. 02187500 near Iva, South Carolina, at River Mile 280.4; No. 02189000 near Calhoun Falls, South Carolina, at River Mile 263.6; No. 02197000 at Augusta, Georgia, at River Mile 187.4; No. 02197500 at Burtons Ferry near Milhaven, Georgia, at River Mile 118.7; and No. 02198500 near Clyo, Georgia, at River Mile 60.9. The data cover a river reach that includes the VEGP site. Within this river reach, the minimum water temperature is observed in February, which shows a variation between 39.2°F (4.0°C) and 42.8°F (6.0°C).

Based on the record of air and water temperatures, it is very unlikely that surface or frazil ice formation would occur in the Savannah River in the vicinity of the proposed VEGP Units 3 and 4 river intake location.

2.4.7.2 Ice Jam Events

There are no recorded ice jam events in the lower reach of the Savannah River based on a search of the *Ice Jam Database* of the US Army Corps of Engineers **(USACE 2006)**.

The large dams and reservoirs on the Savannah River located upstream of the VEGP site reduce the possibility of any surface ice or ice floes moving downstream. Since the water temperatures in the lower reach of the Savannah River remain consistently above freezing, as seen in Table 2.4.7-2, the formation of frazil ice or ice jams would be very unlikely at the proposed VEGP Units 3 and 4 intake location.

2.4.7.3 Description of the Cooling Water System

The VEGP Units 3 and 4 will be Westinghouse AP1000 reactors and use a closed cycle cooling system with wet, natural-draft cooling towers for circulating water system cooling. The river intake system, comprising an intake canal and a pump intake structure, will be located upstream from the existing river intake structure for the VEGP Units 1 and 2. Makeup water from the Savannah River will be required to replace evaporative water losses, drift losses, and blowdown discharge from the circulating water system cooling towers.

For safety-related cooling, AP1000 reactors use passive ultimate heat sink (UHS) systems with in-plant storage water. These reactor plants do not require an external safety-related UHS system to reach safe shutdown. Also, the AP1000 design have a non-safety-related heat removal auxiliary heat sink–service water system (SWS) used for shutdown, normal operations, and anticipated operational events. Make-up water to the SWS will be supplied from site groundwater wells or a site water storage tank. Consequently, no water will be necessary from the Savannah River or from any other open surface water sources for the AP1000 UHS and SWS. Therefore, even a very unlikely ice event on the Savannah River will not have any impact on safety-related UHS or non-safety-related SWS of the proposed AP1000 units.

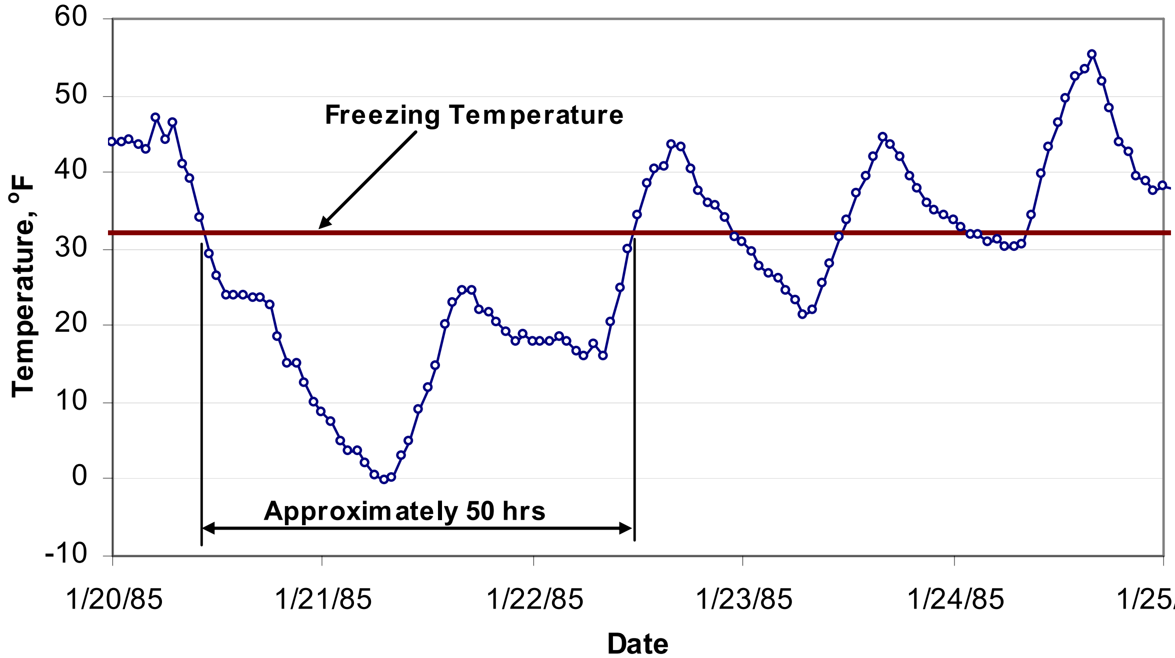
Table 2.4.7-1 Variation in Lowest Average Daily Temperatures and Number of Days with Average Daily Temperature Below Freezing

Year	Lowest Average Daily Temp ºF (ºC)		Date Lowest Average Daily Temp Occurred	No. of Consecutive Freezing Days	Total No. of Freezing Days
1984	25.7	-(3.5)	12/7/1984	1	3
1985	11.9	-(11.2)	1/21/1985	3	5
1986	20.7	-(6.3)	1/28/1986	2	3
1987	31.2	-(0.4)	1/27/1987	1	1
1988	25.2	-(3.8)	1/8/1988	3	6
1989	19.0	-(7.2)	12/23/1989	3	6
1990	37.3	(2.9)	12/25/1990	0	0
1991	26.0	-(3.3)	2/16/1991	1	1
1992	33.4	(0.8)	1/16/1992	0	0
1993	30.4	-(0.9)	3/14/1993	1	1
1994	21.3	-(5.9)	1/19/1994	2	4
1995	29.2	-(1.6)	2/9/1995	2	4
1996	20.8	-(6.2)	1/8/1996	3	8
1997	28.9	-(1.7)	1/18/1997	2	2
1998	34.8	(1.6)	12/26/1998	0	0
1999	25.2	-(3.8)	1/14/1999	3	3
2000	26.5	-(3.1)	12/20/2000	2	4
2001	30.9	-(0.6)	1/3/2001	2	2
2002	29.7	-(1.3)	1/4/2002	2	2
Average days				1.7	2.9

Table 2.4.7-2 Variation in the Minimum Water Temperatures at Five Locations on the Savannah River

USGS Station No.	Location	River Mile	Data Period	Observed Minimum Temperature, °F (°C)											
				Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.
02187500	Savannah River near Iva, SC	280.4	1958-1984	62.6 (17.0)	55.4 (13.0)	46.4 (8.0)	44.6 (7.0)	39.2 (4.0)	42.8 (6.0)	48.2 (9.0)	48.2 (9.0)	57.2 (14.0)	55.4 (13.0)	53.6 (12.0)	57.2 (14.0)
02189000	Savannah River near Calhoun Falls, SC	263.6	1957-1974	65.3 (18.5)	59 (15.0)	46.4 (8.0)	46.4 (8.0)	42.8 (6.0)	51.8 (11.0)	53.6 (12.0)	59.9 (15.5)	64.4 (18.0)	66.2 (19.0)	68 (20.0)	71.6 (22.0)
02197000	Savannah River at Augusta, GA	207.0	1958 - 1973	64.4 (18.0)	59 (15.0)	51.8 (11.0)	42.8 (6.0)	42.8 (6.0)	50 (10.0)	57.2 (14.0)	59.9 (15.5)	66.2 (19.0)	66.2 (19.0)	64.4 (18.0)	69.8 (21.0)
02197500	Savannah River at Burtons Ferry near Milhaven, GA	118.7	1957-1979	63.5 (17.5)	58.1 (14.5)	46.4 (8.0)	43.7 (6.5)	39.2 (4.0)	44.6 (7.0)	55.4 (13.0)	59 (15.0)	66.2 (19.0)	73.4 (23.0)	71.6 (22.0)	71.6 (22.0)
02198500	Savannah River near Clyo, GA	60.9	1938 - 1984	59.9 (15.5)	46.4 (8.0)	44.6 (7.0)	41 (5.0)	40.1 (4.5)	44.6 (7.0)	57.2 (14.0)	57.2 (14.0)	68 (20.0)	73.4 (23.0)	71.6 (22.0)	67.1 (19.5)

Source: Dyer and Alhadeff 1997



(The temperature remained below freezing for approximately 50 consecutive hours.)

Figure 2.4.7-1 Lowest Temperature Observed at the VEGP Site in 1985

Section 2.4.7 References

(Dyar and Alhadeff 1997) Dyar, T.R., and S.J. Alhadeff, *Stream-Temperature Characteristics in Georgia*, U.S. Geological Survey, Water Resources Report 96-4203, Atlanta, Georgia, 1997.

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(USACE 2006) *Ice Jam Database*, U.S. Army Corps of Engineers, Cold Region Research and Engineering Laboratory, Web site address: https://rsgis.crrel.usace.army.mil/icejam/index.html, accessed April 11, 2006.

2.4.8 Cooling Water Canals and Reservoirs

2.4.8.1 Cooling Water Canals

The proposed VEGP Units 3 and 4 will use a closed cycle cooling system for condenser heat rejection and will use wet, natural-draft, cooling towers for circulating water system cooling. Makeup water from the Savannah River will be required to replace evaporative water losses, drift losses, and blowdown discharge. The river intake for VEGP Units 3 and 4 will withdraw makeup water from the Savannah River at a maximum rate of approximately 57,784 gpm (128.7 cfs). The intake system will be located upstream of the river intake of the existing VEGP units. The makeup water will be pumped directly to the cooling tower basin.

For safety related cooling, AP1000 reactor plants use passive ultimate heat sink (UHS) systems with sufficient in-plant storage water for safety-related water cooling. These reactor plants do not require an external safety-related UHS system to reach safe shutdown. Therefore, the river intake system will not be part of the safety-related facilities for VEGP Units 3 and 4, and the river intake canal and structure will have no safety-related functions. These reactor plants also have a non-safety-related heat removal auxiliary heat sink–service water system (SWS) used for shutdown, normal operations, and anticipated operational events. Make-up water to the SWS will be supplied from site groundwater wells; therefore, the SWS will not depend on the river intake system.

The river intake system for VEGP Units 3 and 4 would consist of an intake canal and an intake structure. The design details of the river intake system will be established during the COL applications. An overview of the conceptual design is provided below.

The river intake canal will be approximately 200 ft long and 150 ft wide, with a bottom elevation of about El. 70 ft msl. The bottom of the canal would be unpaved and bordered by vertical sheet piles, the tops of which would be extended to about El. 98 ft msl. The river intake canal would also act as a siltation basin and will incorporate a sill to reduce sediment inflow into the canal. At the minimum river operating level (78 ft msl), the flow velocity in the new canal would be about 0.1 fps, calculated based on a maximum makeup water demand of 128.7 cfs. Because the river intake canal would also act as the siltation basin, maintenance dredging may be necessary to maintain the canal invert elevation. Also, the canal embankment slopes would be protected using rip-rap of appropriate design specifications.

The intake structure, located at the end of the river intake canal, would house multiple makeup water pumps, traveling band screens, and trash racks with raking mechanisms. For each of the two new units, three 50-percent-capacity, vertical wet-pit pumps would be installed in the intake structure, with one makeup water pump at each pump bay, along with one dedicated traveling band screen and a trash rack.

Because VEGP Units 3 and 4 will not rely on the Savannah River for safe shutdown, a minimum river water level will not be necessary for safety-related cooling water supply.

2.4.8.2 Reservoirs

VEGP Units 3 and 4 will not have any cooling water reservoirs.

2.4.9 Channel Diversions

The VEGP site area lies in the Upper Coastal Plain of the Atlantic Coastal Plain physiographic province and is bordered by the Savannah River to the east. The surrounding topography consists of gently rolling hills with surface topography elevation ranges from about 200 to nearly 300 ft msl. Local site drainage consists of a principally dendritic drainage pattern where all major streams are tributary to the Savannah River. The VEGP site and surrounding areas are shown in Figure 2.4.1-3.

Near the site area, incision of the Savannah River has produced a deep valley with topographic relief of nearly 150 ft from the river surface and a valley width of over 4 mi. The present-day river course is located at the western side of the valley, forming steep bluffs near the VEGP site. The river floodplain consists of a broad alluvial surface extended on the eastern side at heights of 5–10 ft above the riverbank.

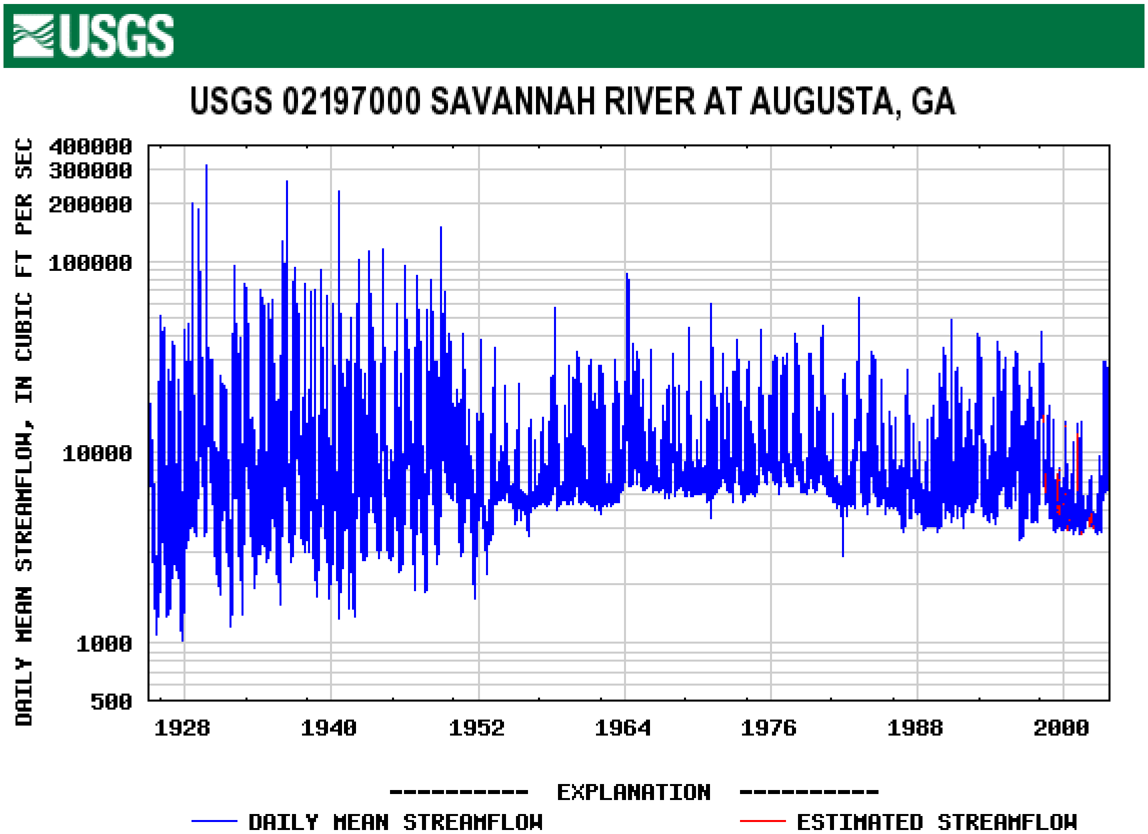
Rivers in the Upper Coastal Plain are typically underlain by sands, clays, limestones, and gravels and exhibit gentle to moderate bed slopes, wide floodplain development, and increased sinuosity. Consequently, diversion of the river channel in this region cannot be completely discounted.

Historical development of the river plan-form, which is the shape on map of river bank-line, near the VEGP site is well-represented in the USGS 7.5-minute series (topographic) maps. Oxbow lakes, meander cutoffs, abandoned meanders, low-lying swamps, and forested wetlands provide considerable evidence of historical channel plan-form development. Although meander river plan-form is present upstream and downstream of the site, the Savannah River near the site has a relatively straight and stable reach extending approximately from River Mile 143 to River Mile 152. A comparison of river bank-lines between 1965 and 1989, obtained from USGS topographic maps **(USGS 1989a**; **USGS 1989b**; **USGS 1989d)** and topographic maps used for VEGP Units 1 and 2, shows a nearly unchanged river plan-form within the reach during this period.

Since 1952, the Savannah River flow has been regulated by large federal multipurpose projects: Hartwell Dam, Richard B. Russell Dam, and J. Strom Thurmond (also known as Clarks Hill) Dam. A major impact of dam operation on river flow downstream of the J. Strom Thurmond Dam is the modulation of the outflow hydrograph, with reduced peaks and increased low-flow rates, as can be seen from Figure 2.4.9-1. Such flow modulation results in much-reduced river morphological activity, and a sudden river plan-form change is unlikely.

It is, therefore, unlikely that the river at the VEGP site will be diverted from the river intake by natural causes. Furthermore, analysis for existing VEGP Units 1 and 2 indicate that any possible effect on water supply to the intake from river channel diversion should come from extremely slow changes, which can be remedied as they occur.

While it is unlikely that a diversion of the main river channel will occur, such a diversion, either upstream or downstream of the proposed river intake, cannot be discounted. The river upstream and downstream from the proposed river intake has bluffs and steep slopes along the west bank. If it is assumed that a bluff slid into the river bed just upstream from the river intake structure, it may obstruct the flow of the main river channel, and river flow would divert over the floodplain on the eastern side of the river and away from the river intake. This could result in loss of the river intake due to river water starvation. Likewise, if a bluff slid into the river bed just downstream of the river intake structure, it again may obstruct the flow of the main river channel, but could possibly flood the river intake structure before diverting river water over the floodplain on the eastern side of the river. In this case, the river intake structure would be lost due to flooding. However, all the safety-related cooling water systems for the proposed AP1000 reactor plants would not use water from the river intake. Hence, the river intake would not be classified as a safety-related structure and loss of the river intake for either of these described scenarios would have no adverse affect on plant safety.



Source: USGS 2006b

Figure 2.4.9-1 Variation in Daily Mean Streamflow Rates at Augusta, Georgia, on the Savannah River (USGS Stream Gauging Station 02197000, Savannah River at Augusta, Georgia), Showing Streamflow Modulation After the Construction of the Dams

Section 2.4.9 References

(USGS 1989a) United States Geological Survey, Shell Bluff Landing Quadrangle, Georgia-South Carolina, 7.5 Minute Series (Topographic), DMA 4650 III NE – Series V845, 1965, Photorevised 1989.

(USGS 1989b) United States Geological Survey, Girard NW Quadrangle, Georgia-South Carolina, 7.5 Minute Series (Topographic), DMA 4650 III NW – Series V846, 1964, Photorevised 1989.

(USGS 1989d) United States Geological Survey, Girard Quadrangle, Georgia-South Carolina, 7.5 Minute Series (Topographic), DMA 4650 II SW – Series V845, 1964, Photorevised 1989.

(USGS 2006b) Daily Streamflow Data – Savannah River at Augusta, Website of the Unites States Geological Survey Surface Water for Georgia, http://nwis.waterdata.usgs.gov/ga/nwis/discharge?site_no=02197000&agency_cd=USGS&begin_date=1925-01-01&end_date=2003-09-30&format=gif&set_logscale_y=1&date_format=YYYY-MM-DD&rdb_compression=file&survey_email_address=&submitted_form=brief_list, accessed March 29, 2006.

2.4.10 Flood Protection Requirements

The maximum design basis flood elevation, including wind setup and wave run-up, at the VEGP site is El. 178.10 ft msl, as discussed in Section 2.4.4. This elevation is well below the VEGP site grade at El. 220.0 ft msl. Entrances and openings to all safety-related structures for the proposed VEGP Units 3 and 4 will be located at or above the site grade. Since the site grade is well above the maximum design basis flood elevation, the possibility is precluded of flooding VEGP Units 3 and 4 safety-related structures, systems, and components.

The effects of intense local precipitation on the safety-related structures, systems, and components of VEGP Units 3 and 4 will be considered in the design of site drainage facilities. The VEGP Units 3 and 4 site is on locally high ground, and natural drainage flow-paths slope away from the site, as shown in Figure 2.4.1-3. Thus, the topography of the proposed site facilitates drainage of intense rainfall events. Drainage facilities for the VEGP Units 3 and 4 site will be designed so that the peak discharge from the local probable maximum precipitation (PMP) do not produce flood elevations that could cause a flooding hazard to any safety-related structure, system, or component at the VEGP Units 3 and 4 site. The design will also assume that all drainage structures (e.g., culverts, storm drains, and bridges) are blocked during the PMP event. The safety-related structures, systems, and components would still be safe from resulting flood hazards.

Additionally, the design of the drainage facilities and the development of construction and operation plans will incorporate measures to ensure that existing VEGP Units 1 and 2 safety-related facilities are not subject to flooding during construction and operation of VEGP Units 3 and 4. Drainage from the VEGP Units 3 and 4 site during construction and operation of the new VEGP units will be directed away from the existing drainage facilities of VEGP Units 1 and 2. Hence, drainage from the VEGP Units 3 and 4 site will not interfere with the safety-related structures, systems, and components of VEGP Units 1 and 2.

The roofs of all safety-related structures will be designed to prevent flooding of, or leakage into, safety-related structures, systems, and components as a result of PMP on the roofs.

Although the river intake will not be a safety-related facility, rip-rap protection of embankment slopes will be provided at the river intake location on the west bank of the Savannah River to prevent intake canal bank erosion.

Applicable NRC, federal, state, and local stormwater management regulations will be followed in the design of the drainage facilities.

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2.4.11 Low Water Considerations

This section identifies the natural events that may reduce or limit the available cooling water supply and demonstrates that an adequate water supply will exist to operate or shut down the plant under normal operations, anticipated operations, and emergency conditions.

2.4.11.1 Low Flow in Streams

VEGP Units 3 and 4 will be Westinghouse AP1000 reactors that do not require a conventional ultimate heat sink to provide safety-related cooling during emergency shutdown. Consequently, river water will not be necessary to achieve safe shutdown of the units. The only use of water from the Savannah River for the reactor units will be for the circulating water system/turbine plant cooling water system makeup, where river water will be required to replace evaporative water losses, drift losses, and blowdown discharge.

2.4.11.1.1 Observed Low Flow Data

The Savannah River flow near the VEGP site is regulated by the operation of three large federal multipurpose projects located upstream: Hartwell Dam, Richard B. Russell Dam (Russell Dam), and J. Strom Thurmond (also known as Clarks Hill) Dam. The operation of the dams during low flow periods is controlled by the drought contingency plan for the Savannah River basin **(USACE 1989)**. The contingency plan was developed in 1989 during one of the most severe droughts in the region in recent history. The objectives **(USACE 1989)** of the plan are to:

- Maintain reservoir levels at or above the bottom of the conservation pools for the three reservoirs
- Maintain a minimum release no less than 3,600 cfs at J. Strom Thurmond Dam (Thurmond Dam) for downstream use
- Use most of the available storage in the reservoirs during the drought-of-record while maintaining reservoir levels above the bottom of the conservation pools as a contingency against a drought that exceeds the drought-of-record
- Maintain project capacity throughout the drought
- Maintain releases required to meet state water quality standards from J. Strom Thurmond Dam for as long as possible without jeopardizing water supplies
- Minimize impact to recreation during the recreational season, from the first of May through Labor Day

Depending on the pool elevations at Hartwell and Thurmond reservoirs, four levels of actions are defined in the drought contingency plan, as summarized in Table 2.4.11-1. Actions for Level 3, which corresponds to the severe drought of 1988–89 (drought-of-record), will maintain a minimum of 3,600 cfs of water released through Thurmond Dam. Thurmond Dam Level 4 actions require maintaining the minimum flow of 3,600 cfs for as long as possible and, thereafter, allow the same outflow as the reservoir inflow. Consequently, the drought contingency plan for the Savannah River basin will impact water availability at the VEGP site during low flow periods.

Low water conditions in the Savannah River in the vicinity of the VEGP site are analyzed using flow records at three USGS stream gage stations. These are USGS Station No. 02197000 at Augusta, Georgia, at River Mile 187.4; 02197320 at Jackson, South Carolina, at River Mile 156.8; and 02197500 at Burtons Ferry near Milhaven, Georgia, at River Mile 118.7. The VEGP site, located at River Mile 150.9, is nearest to the Jackson gage and nearly halfway between the gages at Augusta and Burtons Ferry.

Daily-mean stream flow data are available at these three stations from the USGS Web site **(USGS 2006g)**. USGS maintains stream flow records covering a water year, which starts on October 1 of the preceding year and ends on September 30 of the current year. The longest daily-mean flow record is available at Augusta, with a period of record from the water years 1884–1891, 1896–1906, and 1925–2003. At Burtons Ferry, the flow period of record is available between the water years 1940 and 2003, with missing data periods from 1971 to 1982. The Jackson gage presents the shortest period of record of daily stream flow data, with data available between the water years 1972 and 2002. Data from the Jackson gage also include numerous periods of missing flow values. However, these periods with missing data are generally during peak flow discharges with the low flow data remained mostly unaffected.

Streamflow gage and water level measurement data are also available near the VEGP site at USGS Station No. 021973269 – Savannah River near Waynesboro at approximate River Mile 150.6. However, flow records at this gage are only available since January 2005. The short duration of the record for this gage makes it unsuitable for the calculation of low flow statistics. These data are used instead for developing a stage-discharge relationship near the site as discussed in Section 2.4.11.4. Details of gage locations and data availability are shown in Table 2.4.11-2.

Annual minimum daily-mean stream flow data from the three gages are shown in Figure 2.4.11-1 and Table 2.4.11-3. The data show that the annual minimum daily-mean flow within the river reach between Augusta and Burtons Ferry increased considerably after the construction of the Thurmond and Hartwell dams. The annual minimum daily-mean flow decreased during the drought-of-record (1986–1989) and has remained lower, since the implementation of the drought contingency plan in 1989, than prior to the onset of the drought. Russell Dam, the last of the three major projects, was commissioned in 1985. Because of increased catchment area downstream from Augusta, the flow at Jackson and Burtons Ferry generally is higher than the flow at Augusta. However, occasionally, the annual minimum daily-mean flow at Augusta remains higher than that at Jackson or Burtons Ferry.

Figure 2.4.11-2 shows the variation of annual minimum daily-mean flow at Jackson and Burtons Ferry corresponding to that at Augusta for the period of available data. As indicated before, the annual minimum daily-mean flow at Jackson and Burtons Ferry remains higher than that at Augusta most of the time, except a few occasions when flow at Jackson or Burtons Ferry becomes similar to or less than that at Augusta. This may indicate that although the daily-mean flow generally increases at Jackson and Burtons Ferry compared to that at Augusta because of the increase in catchment area, during certain dry years the additional catchment area may not contribute additional flow to the low-flow available at Augusta.

Within the period from 1985 to 2003, after the completion of Richard B. Russell Dam and representing present-day river regulation, the lowest daily-mean flow at Augusta was observed as 3,460 cfs on May 16, 1996; at Jackson it was 3,940 cfs on September 13, 2002; and at Burtons Ferry a minimum flow of 3,920 cfs was observed on September 14, 2002 (Table 2.4.11-3). The low flow measured at Augusta is also the lowest observed after the completion of all three dams within the river reach that includes the VEGP site. This data period of record also includes two of the most severe droughts in recent history in the region, 1986–1989 **(USACE 1989)** and 1998–2003 **(USACE 2006c; USGS 2006h)**.

American National Standard ANSI/ANS-2.13-1979, *Evaluation of Surface-Water Supplies for Nuclear Power Sites* **(ANSI/ANS-2.13 1979)**, recommends that for ungaged sites that have gage stations located upstream and downstream, the flow at the site may be estimated by interpolation between the gaged records based on catchment areas at the site and at the gage stations. An analysis was performed following the procedure of ANSI/ANS-2.13 (1979), which showed that the data from the Augusta gage would be the most suitable for the analysis of low flow statistics at the VEGP site. Consequently, only data from the Augusta gage is used to obtain the low flow statistics at the VEGP site. Also, because the low flow data at Augusta are generally lower than the low flow data at Jackson or Burtons Ferry, it is more conservative to use the Augusta gage data to calculate low flow statistics at the VEGP site.

2.4.11.1.2 Low Flow Statistics

Analyses for low flow statistics were performed based on historical flow data at Augusta for daily-mean annual minimum flow conditions. Because of the regulation of the Savannah River due to the construction of the dams, the complete flow record at Augusta could not be used for the analyses. Instead, flow statistics were computed within discrete segments of homogenous data periods of record. Historical annual minimum daily-mean flow data from the water years 1884 to 1952 were first analyzed using six different probability density functions: normal, log-normal, exponential, generalized extreme value – type 1 (Gumbel), Pearson – type 3 (P3), and log-Pearson – type 3 (LP3) distributions. Goodness-of-fit of the distributions was evaluated using standard χ^2 – and Kolmogorov-Smirnov tests. A distribution is considered acceptable when the test value is lower than a standard test value for a certain confidence interval. The results of the analyses are summarized in Table 2.4.11-4. It shows that only three distributions, normal, P3, and LP3, are acceptable when both goodness-of-fit tests are considered for 95 percent confidence interval. The LP3 distribution, as indicated in Table 2.4.11-4, fits the observed data the best. This distribution is also presented in Figure 2.4.11-3. Weibull plotting position formula was used for observed data, and the frequencies of the distributions were modified to reflect low flow conditions following the methodology proposed by Riggs (1972). LP3 distribution was then used to obtain flow statistics for annual minimum daily-mean flow values for the water years 1985–2003, the period representative of present-day river regulation.

Figure 2.4.11-4 shows the LP3 distribution of the data for the water years 1953–2003. This period of record corresponds to the first regulation of the Savannah River by J. Strom Thurmond Dam. However, additional regulation of the river was added in 1965 and 1985 when Hartwell Dam and Richard B. Russell Dam, respectively—the last two of the three major projects—were constructed. The effect of this additional river regulation can be observed in the figure with a reduced fit of the distribution with observed data. The distribution is also found to be unacceptable according to the χ^2 goodness-of-fit test, with a test value of 23.6 for a 95 percent confidence interval (Table 2.4.11-5).

Table 2.4.11-5 also shows the summary of low flow statistics for water years 1985–2003 for annual minimum daily-mean flow at Augusta. Although the period of record for this data is small, it represents the present-day full regulation of the river flow and shows acceptable goodness-of-fit for annual minimum daily-mean flows. The low flow volume thus estimated for a 100-year return period is 3,298 cfs, as shown in Table 2.4.11-5. A 7-day average 10 year return period minimum discharge (7Q10) of 3,828 cfs is obtained in ER Section 2.3.1 for the flow at Augusta.

The corresponding low flow for a 100-year return period at Jackson (3,426 cfs) is also presented in Table 2.4.11-5 to facilitate a comparison. Figure 2.4.11-5 is a plot of the low flow frequency curve derived using the minimum daily-mean flow data observed at the Augusta gage for the period of 1985-2003. A similar frequency curve for the Jackson gage is presented in Figure 2.4.11-6.

2.4.11.1.3 Probable Minimum Flow

Because the river water will not be used for any safety-related activities for VEGP Units 3 and 4, probable minimum flow at the VEGP site has not been determined.

2.4.11.1.4 River Water Level for the 100-year Drought Condition

The flow rate for a 100-year drought event is estimated as 3,298 cfs in Table 2.4.11-5. The river stage corresponding to this flow rate was estimated from the stage-discharge relationship developed at USGS stream gage station 021973269 at Waynesboro, Georgia on the Savannah River near the VEGP site. Details of the stream measurements at this gaging location are presented in Table 2.4.11-2.

Streamflow measurements by the USGS at this gage were established very recently, and only eight records of measured data are available from the USGS Web site **(USGS 2006j)**. Details of these flow measurements and corresponding river stages are shown in Table 2.4.11-6. The data show five measurement events in 2005 and one each in 1986, 1987, and 1988. Flow measurements in 2005 were performed using an acoustic Doppler current profiler (ADCP). Measurements in the previous years were performed using current meters from boats.

The gage datum at this station is given on the USGS Web site as El. 90 ft above sea level NGVD29, which is equivalent to El. 90 ft msl. Using this datum, the converted water surface elevation for the measurements in 1988, 1987, and 1986 becomes close to El. 170 ft msl, which clearly is not correct. Based on the stage-discharge relationship presented in a VEGP Unit 1 and 2 analysis, it is assumed that these levels, which are shown as gage heights on the USGS Web site (also in Table 2.4.11-6), likely represent the river stage in feet msl after datum conversion.

Uncertainties also remain with the gage datum in converting the measured water surface gage heights from 2005, where the water levels become too high after conversion; for example, a flow of 8,120 cfs show a river stage of over El. 100 ft msl. This uncertainty in defining the gage datum for the Waynesboro gage was also identified at the site, where a gage datum of 70.75 ft msl was established based on a discussion with USGS and onsite geodetic marker of Georgia Power Company (GPC). Accordingly, a gage datum of 70.75 ft msl is used in this analysis.

The stage-discharge rating relationship at the site was developed using the measured flow discharges and river stages, as shown in Figure 2.4.11-7. The following approach was used to develop the rating relationship. First, the measured water levels for the years 1988, 1987, and 1986 were assumed to be the river stages in feet msl. Second, using data from all the measurement points, a best fit of the rating relation was investigated. A river stage corresponding to a no flow condition in the river at the station (H_0) was assumed, and all river stage data were converted to H-H_0 values. H-H_0 was then plotted against corresponding measured streamflow values. Last, an optimization of the best-fit rating relation was performed by modifying the assumed H_0 to maximize the root-mean-square value (R^2) of the best-fit equation. The final estimated relationship is shown in Figure 2.4.11-7. The optimization provided a zero flow level (H_0) of El. 67.56 ft msl, and an R^2 value of nearly 100 percent. The H_0 magnitude of El. 67.56 ft msl also lies within the range of river bottom elevations measured near the VEGP Units 3 and 4 river intake location during a bathymetric survey conducted in January 2006, as shown in Figure 2.4.11-8.

Using the stage-discharge relationship developed in Figure 2.4.11-7, a river stage of El. 76.26 ft msl was estimated at the VEGP site for the drought event with 100-year return period (3,298 cfs).

2.4.11.2 Low Water Resulting from Surges, Seiches, Tsunamis, or Ice Effects

Since the VEGP site is not located on a large body of water or in a coastal region, low water conditions resulting from storm surges, seiches, or tsunamis do not apply. Since there is no evidence of ice jam events near the VEGP site (see Section 2.4.7), low water conditions due to ice effects are also precluded. There are no dams downstream from the VEGP site; therefore, downstream dam failure is not a factor that could cause low flow condition at the site. Furthermore, no VEGP Unit 3 and 4 safety-related facilities will be dependent on water supply from the Savannah River.

2.4.11.3 Historical Low Water

Table 2.4.11-3 shows the annual minimum daily-mean flow recorded at the three USGS stations: Augusta, Jackson, and Burtons Ferry. Within the period of data availability, the lowest recorded daily-mean flow at Augusta was 1,040 cfs on October 2, 1927. At Jackson the record lowest flow of 3,220 cfs was observed on December 9, 1981, and at Burtons Ferry it was 2,120 cfs on September 9, 1951. The lowest flow on record at Augusta and Burtons Ferry occurred prior to construction of the dams on the Savannah River. However, because of the short length of flow records, the lowest flow at Jackson occurred after the J. Strom Thurmond and Hartwell dams were completed. The corresponding low flow at Augusta was 2,810 cfs, observed on December 7, 1981. Burtons Ferry data for this water year are not available.

Low water conditions in the river reach between Augusta and Burtons Ferry after completion of all three dams are discussed in Section 2.4.11.1.1. Since construction of the dams, the lowest flow measurement of 3,460 cfs was observed at Augusta on May 16, 1996. The corresponding flow at Jackson and Burtons Ferry, however, was considerably higher, with 5,730 cfs at Jackson on May 17, 1996, and 5,590 cfs at Burtons Ferry on May 18, 1996.

The lowest ever-recorded instantaneous flow at Augusta was 648 cfs on September 24, 1939, which was caused by the operation of the gates at the New Savannah Bluff Lock and Dam. The low flow stage-discharge rating curve at the Augusta gage was established based on the lowest measured flow magnitude of 1,400 cfs. The instantaneous low flow magnitude in 1939 was estimated by extrapolating the stage-discharge relationship at the gage station below the lowest measured discharge value of 1,400 cfs. The daily-mean flow for that day, however, was higher, at 2,940 cfs.

2.4.11.4 Future Controls

Present consumptive use of water from the Savannah River includes public supply, industrial and commercial use, power generation, and irrigation. A compilation of water use data for Georgia indicates that surface water use within the state remained nearly unchanged between 1980 and 2000 **(Fanning 2003)**. For South Carolina, while surface water use between 1990 and 2000 remained nearly the same, an increase of approximately 50 percent in surface water use is projected for the year 2045 **(SC DNR 2004)**. The projected increase also includes water demand for power generation.

The US Army Corps of Engineers, Savannah District, along with the states of Georgia and South Carolina, are developing an updated comprehensive water resources management plan for the Savannah River basin. As part of the comprehensive water management scenarios, a revised drought management plan is now being actively considered. Under the proposed plan and for proposed alternative (Alternative 2), flow through Thurmond Dam would be increased (from 3,600 cfs) to 3,800 cfs for a Level 3 drought **(USACE 2006c)**. This would also increase the low water flow available in the Savannah River near the VEGP site. The proposed drought triggers for this alternative are shown in Table 2.4.11-7.

2.4.11.5 Plant Requirements

VEGP Units 3 and 4 will be Westinghouse AP1000 reactor designs with a closed-cycle wet cooling system for condenser heat rejection. The only use of water from the Savannah River for the reactor units will be for the circulating water system/turbine plant cooling water system makeup, where river water will be required to replace evaporative water losses, drift losses, and blowdown discharge. Under normal operating conditions and design ambient conditions, river water demand for two-unit operation will be 82.9 cfs (37,212 gpm). The maximum water requirement for plant operation will be 128.7 cfs (57,784 gpm).

2.4.11.6 Heat Sink Dependability Requirements

The AP1000 reactor plants selected for VEGP Units 3 and 4 do not require a conventional ultimate heat sink to provide safety-related cooling during emergency shutdown. The AP1000 reactors make use of a passive cooling system and use water stored in onsite tanks. Consequently, river water will not be necessary to achieve safe shutdown of the units.

Table 2.4.11-1 Summary of Action Levels for Drought Management in the Savannah River Basin

Level	Reservoir Pool Levels				Action
	Hartwell Dam		J.S. Thurmond Dam[a]		
	Apr 18 – Oct 15 ft msl[b]	Dec 1 – Jan 1 ft msl	May 1 – Oct 15 ft msl	Dec 15 – Jan 1 ft msl	
1	656	655	326	325	Public Safety Information
2	654	652	324	322	Reduce Thurmond discharge to 4,500 cfs; reduce Hartwell discharge as appropriate to maintain balanced pool
3	646	646	316	316	Reduce Thurmond discharge to 3,600 cfs; reduce Hartwell discharge as appropriate to maintain balanced pool
4	625	625	312	312	Continue Level 3 discharge as long as possible; thereafter Inflow = Outflow

[a] J. Strom Thurmond Dam

[b] mean sea level

Source: USACE 1989

Table 2.4.11-2 Locations, Catchment Areas, and Data Availability of the USGS Gage Stations

Station Name	County/Town	USGS Station ID	Location			River Mile[a]	Catch-ment Area (mi²)	Daily Streamflow Data Availability		
			Latitude	Longitude	HU[b]			Start Date	End Date	Count
Savannah River at Augusta	Richmond, GA	02197000	33°22'25"	81°56'35"	03060106	187.4	7,508	10/1/1883	9/30/2003	35,793
Savannah River near Jackson	Aiken, SC	02197320	33°13'01"	81°46'04"	03060106	156.8	8,110	10/1/1971	9/30/2002	10,733
Savannah River at Burtons Ferry near Millhaven	Millhaven, GA	02197500	32°56'20"	81°30'10"	03060106	118.7	8,650	10/1/1939	9/30/2003	18,993
Savannah River near Waynesboro	Burke, GA	021973269	33°08'59"	81°45'18"	03060106	150.6[c]	8,300	1/22/2005	9/30/2005	252

[a] USACE 1996

[b] Hydrological Unit

[c] Approximate River Mile

Source: USGS 2006g

Table 2.4.11-3 Variation of Annual Minimum Daily-mean Flow in the Savannah River at Augusta, Jackson, and Burtons Ferry Gages

	Flow (ft^3/sec) at Locations			
	Augusta	**Jackson**	**Burtons Ferry**	
River Mile	**187.7**	**156.8**	**118.7**	**Comments**
1884	2,060			
1885	1,980			
1886	3,500			
1887	2,780			
1888	3,300			
1889	4,340			
1890	2,700			
1891	4,480			
1896	2,230			
1897	1,990			
1898	2,080			
1899	2,350			
1900	3,000			
1901	3,940			
1902	3,920			
1903	3,740			
1904	2,060			
1905	1,450			
1906	2,650			
1925	1,100			
1926	1,380			
1927	1,160			
1928	1,040			Historical low flow at Augusta on Oct. 2, 1927
1929	3,580			
1930	1,970			
1931	1,420			
1932	1,230			
1933	2,280			

Table 2.4.11-3 (cont.) Variation of Annual Minimum Daily-mean Flow in the Savannah River at Augusta, Jackson, and Burtons Ferry Gages

	Flow (ft^3/sec) at Locations			
	Augusta	Jackson	Burtons Ferry	
River Mile	187.7	156.8	118.7	Comments
1934	1,950			
1935	2,090			
1936	1,590			
1937	2,970			
1938	1,860			
1939	1,770			
1940	1,340		2,400	
1941	1,510		2,320	
1942	1,390		2,240	
1943	2,700		3,600	
1944	2,780		3,440	
1945	2,350		3,120	
1946	2,550		3,530	
1947	1,840		2,720	
1948	1,900		3,230	
1949	2,930		4,900	
1950	2,850		4,120	
1951	1,710		2,120	Lowest flow (within available data) at Burtons Ferry on Sep. 9, 1951
1952	1,770		2,550	J. Strom Thurmond Dam
1953	3,260		3,850	
1954	5,460		5,500	
1955	4,180		4,770	
1956	3,580		4,590	
1957	5,170		5,500	
1958	5,000		5,500	
1959	5,260		5,500	
1960	5,350		6,440	
1961	4,930		6,060	

Table 2.4.11-3 (cont.) Variation of Annual Minimum Daily-mean Flow in the Savannah River at Augusta, Jackson, and Burtons Ferry Gages

	Flow (ft^3/sec) at Locations			
	Augusta	Jackson	Burtons Ferry	
River Mile	187.7	156.8	118.7	Comments
1962	4,760		5,700	
1963	5,130		6,260	
1964	6,120		6,900	
1965	6,300		7,600	Hartwell Dam
1966	6,160		7,110	
1967	5,740		6,780	
1968	5,890		6,950	
1969	5,800		6,900	
1970	5,870		6,710	
1971	4,460			
1972	6,220	6,330		
1973	5,460	6,390		
1974	5,450	6,330		
1975	5,830	6,760		
1976	6,750	6,770		
1977	6,000	6,420		
1978	6,110	5,800		
1979	5,940	5,770		
1980	5,970	5,930		
1981	5,120	5,190		
1982	2,810	3,220		Lowest flow (within available data) at Jackson on Dec. 9, 1981
1983	5,080	5,050	5,870	
1984	4,740	4,900	5,210	
1985	4,750	4,760	4,830	Richard B. Russell Dam
1986	4,590	4,760	4,390	
1987	3,790	4,120	3,960	
1988	3,880	4,150	4,000	
1989	3,800	4,360	4,100	

Table 2.4.11-3 (cont.) Variation of Annual Minimum Daily-mean Flow in the Savannah River at Augusta, Jackson, and Burtons Ferry Gages

	Flow (ft^3/sec) at Locations			
	Augusta	Jackson	Burtons Ferry	
River Mile	**187.7**	**156.8**	**118.7**	**Comments**
1990	4,010	4,880	4,730	
1991	4,310	4,640	4,330	
1992	4,000	4,610	4,620	
1993	4,560	5,620	5,320	
1994	4,200	5,160	4,930	
1995	5,110	5,590	5,410	
1996	3,460	5,730	5,360	After 1985, lowest flow at Augusta on May 16, 1996
1997	4,230	4,790	4,480	
1998	4,300	5,310	5,370	
1999	3,800	4,710	4,490	
2000	3,880	4,300	4,160	
2001	3,670	4,380	4,550	
2002	3,730	3,960	3,920	After 1985, lowest flow at Jackson on Sep. 13, 2002; at Burtons Ferry on Sep. 14, 2002
2003	3,470		4,360	
Record Low Flow	1,040	3,220	2,120	
Low Flow between 1983–2002	3,460	3,960	3,920	Period of common data availability
Low Flow after 1985	3,460	3,960	3,920	Period after the completion of three major dams (present-day regulation of the Savannah River)

Source: USGS 2006g

Table 2.4.11-4 Summary of Statistical Parameters for Different Probability Density Functions Calculated with Annual Minimum Daily-mean Streamflow Values at Augusta for the Water Years 1884–1952

Distribution	Mean	SD[a]	Cs[b]	Goodness-of-Fit (95% confidence level)				Comments
				Standard Test Value		Present set of Data		
				χ^2	K-S[c]	χ^2	K-S	
Normal	2331.1	881.64	0.713	19.68	0.159	11.5	0.115	Acceptable
Exponential	2331.1	881.64	0.713			23.7	0.129	Not acceptable
Gumbel[d]	2331.1	881.64	0.713			24.7	0.216	Not acceptable
P3[e]	2331.1	881.64	0.713			8.4	0.074	Acceptable
Log-Normal	7.7	0.37	0.013			19.6	0.103	Marginal, not acceptable
LP3[f]	7.7	0.40	0.013			6.9	0.035	Acceptable with best value

a Standard Deviation

b Coefficient of Skewness

c Kolmogorov-Smirnov

d Extreme Value Type I

e Pearson Type 3

f Log-Pearson Type 3

Table 2.4.11-5 Summary of Low Flow Statistics for Log-Pearson Type 3 Distribution with Annual Minimum Daily-mean, 7-Day Moving-average, and 30-Day Moving-average Streamflow Values at Augusta and Jackson for the Water Years 1985–2003

Gage Station	Water Years	Data Type	Mean Ln (cfs)	SD[a]	Cs[b]	Goodness-of-Fit[c]		Low Flow Magnitudes (cfs) for Return Periods (years)				
						χ^2	K-S[d]	5	10	20	50	100
Augusta	1953-2003	Daily-mean	8.47	0.21	0.38	23.6	0.093	3,985	3,684	3,465	3,246	3,115
	1985-2003	Daily-mean	8.31	0.11	0.49	6.9	0.079	3,708	3,569	3,466	3,361	3,298
Jackson	1985-2002	Daily-mean	8.46	0.11	0.26	8.7	0.139	4,316	4,130	3,988	3,839	3,746

a Standard deviation

b Coefficient of Skewness

c For 95% confidence limit, standard χ^2 test value is 19.68; for Kolmogorov-Smirnov tests the standard values are 0.154 for water years 1953-2003, 0.231 for 1985-2003, and 0.236 for 1985-2002

d Kolmogorov-Smirnov

Table 2.4.11-6 Summary of Streamflow Measurement at USGS Station No. 021973269 Savannah River Near Waynesboro

Measurement No.	Date	Width ft	Area ft^2	Mean Velocity fps	Gage Height ft	Streamflow cfs	Measurement Type
8	10/14/2005	359	2740	1.89	7.81	5,180	ADCP
7	5/18/2005	369	4000	2.03	10.56	8,120	ADCP
6	3/31/2005	423	6740	3.22	19.28	21,700	ADCP
5	3/17/2005	371	5540	2.63	14.80	14,600	ADCP
4	1/19/2005				12.03	9,840	ADCP
3	8/29/1988	333	2270	1.96	77.56	4,450	Boat
2	2/4/1987	310	3300	2.32	80.60	7,640	Boat
1	9/24/1986	300	2300	1.98	77.84	4,570	Boat

Note: A detailed discussion on gage heights for different years is included in Section 2.4.11.1.4

Source: USGS 2006j

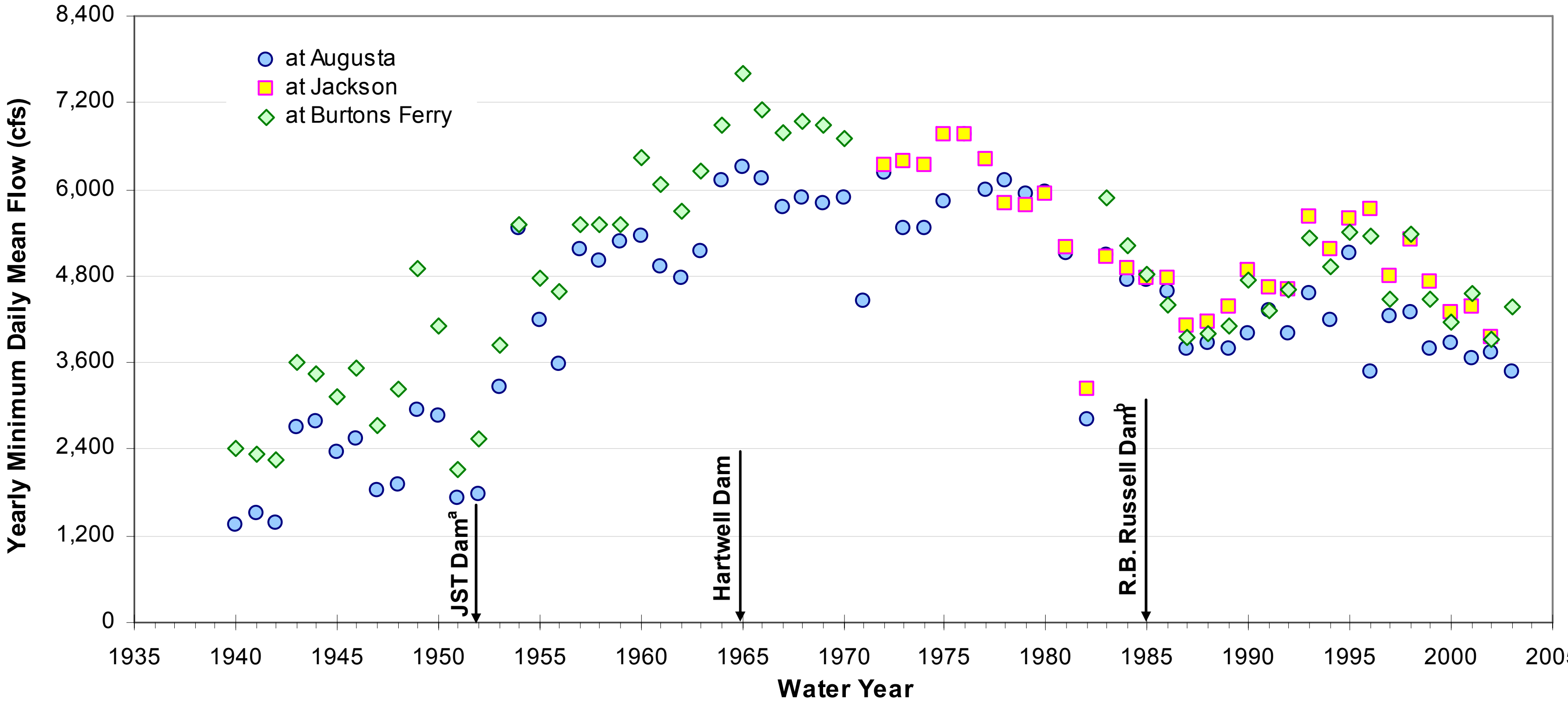
Table 2.4.11-7 Summary of Proposed Modifications in Action Levels for Drought Management in the Savannah River Basin

Level	Reservoir Pool Levels				Action
	Hartwell Dam		J.S. Thurmond Dam[a]		
	Apr 1 – Oct 15 ft msl[b]	Dec 15 – Jan 1 ft msl	Apr 1 – Oct 15 ft msl	Dec 15 – Jan 1 ft msl	
1	656	654	326	324	Reduce Thurmond discharge to 4,200 ft^3/sec
2	654	652	324	322	Reduce Thurmond discharge to 4,000 ft^3/sec
3	646	646	316	316	Reduce Thurmond discharge to 3,800 ft^3/sec
4	625	625	312	312	Inflow = Outflow

[a] J. Strom Thurmond reservoir

[b] mean sea level

Source: USACE 2006c

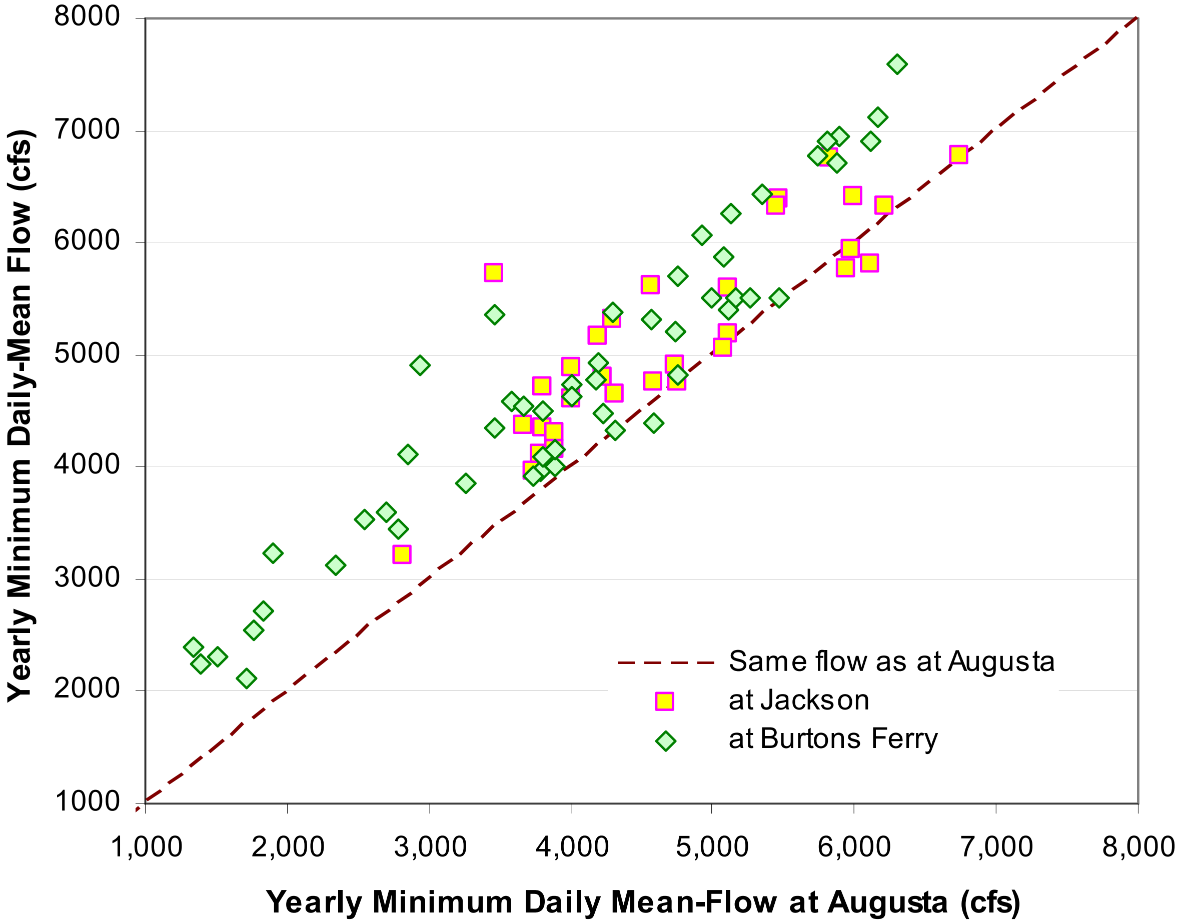


[a] J. Strom Thurmond Dam

[b] Richard B. Russell Dam

Source: USGS 2006g

Figure 2.4.11-1 Variation in Annual Minimum Daily-mean Stream Flow in the Savannah River at Augusta, Jackson, and Burtons Ferry Gages



Source: USGS 2006g

Figure 2.4.11-2 Change in Annual Minimum Daily-mean Flow at Jackson and Burtons Ferry Corresponding to that at Augusta for the Period of 1940-2003

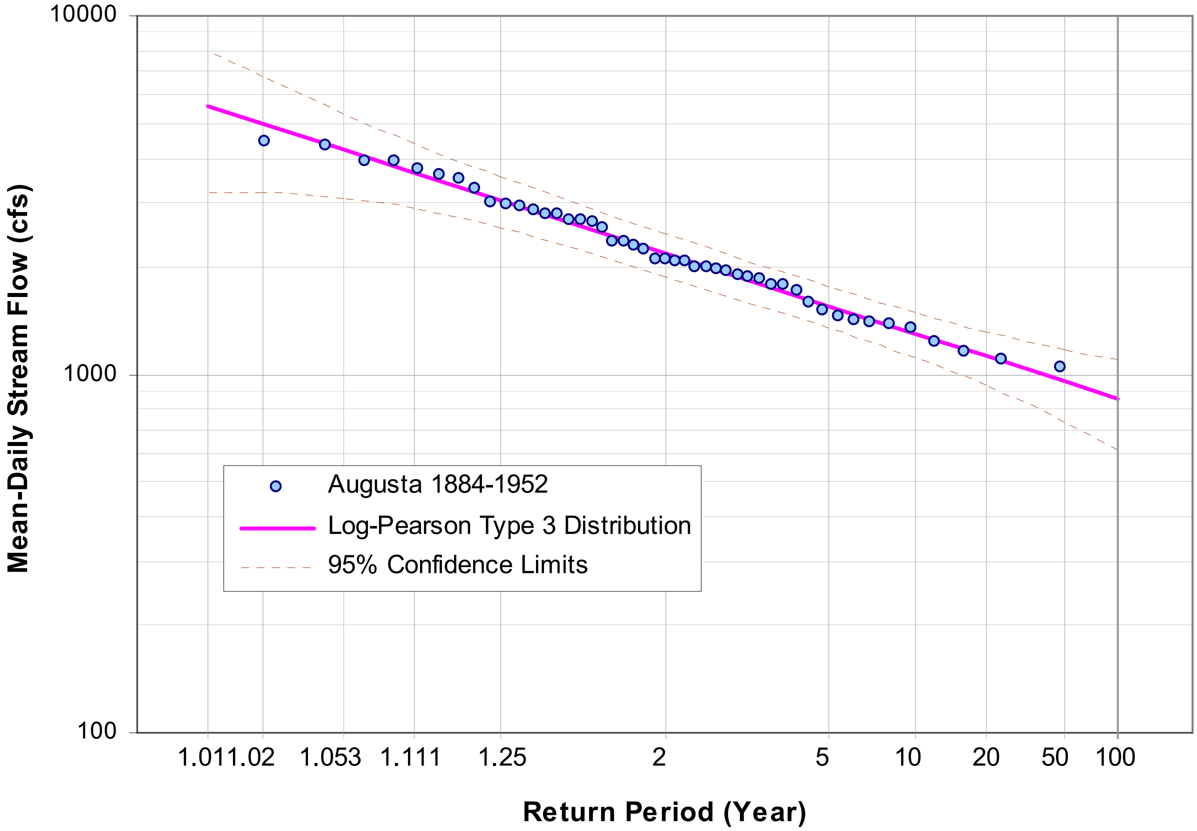


Figure 2.4.11-3 Log-Pearson Type 3 Distribution with Annual Minimum Daily-mean Flow Data from Augusta for the Water Years 1884–1952

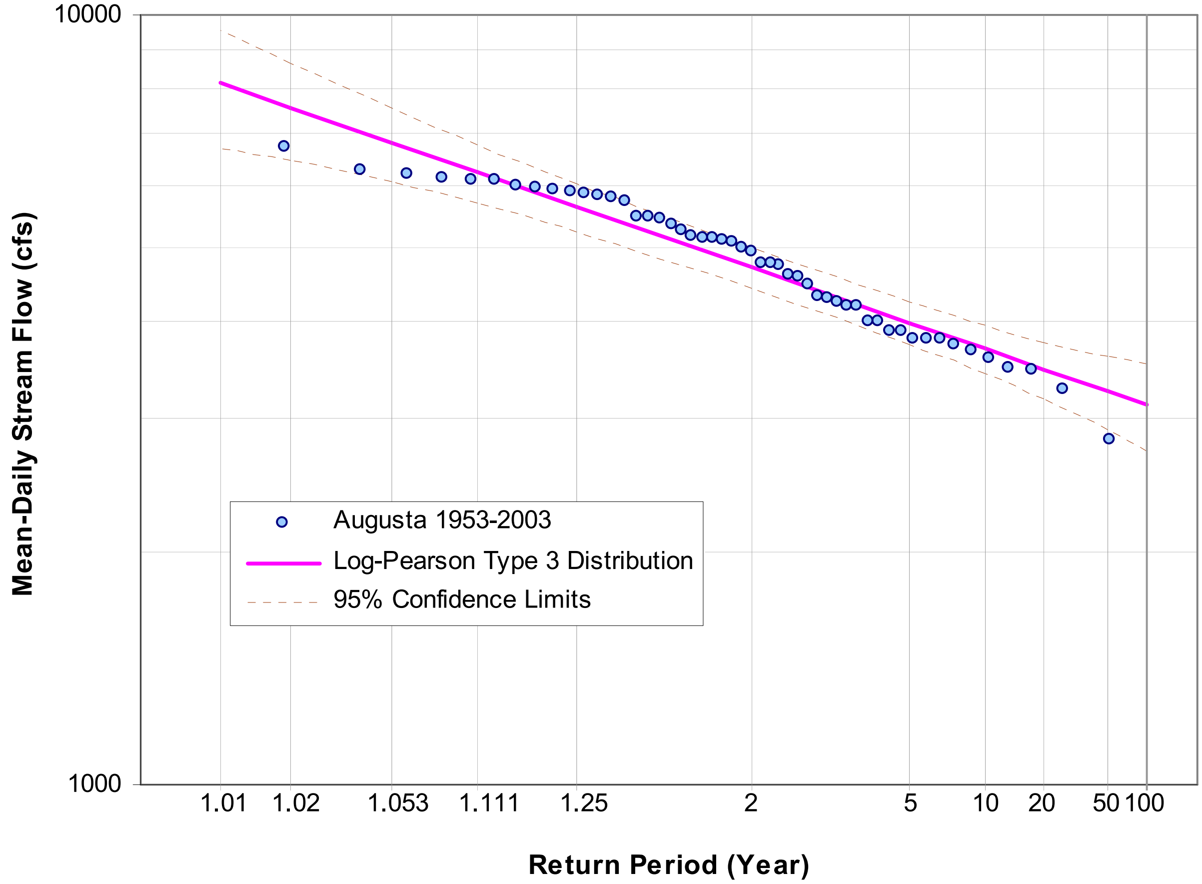


Figure 2.4.11-4 Log-Pearson Type 3 Distribution with Annual Minimum Daily-mean Flow Data from Augusta for the Water Years 1953–2003

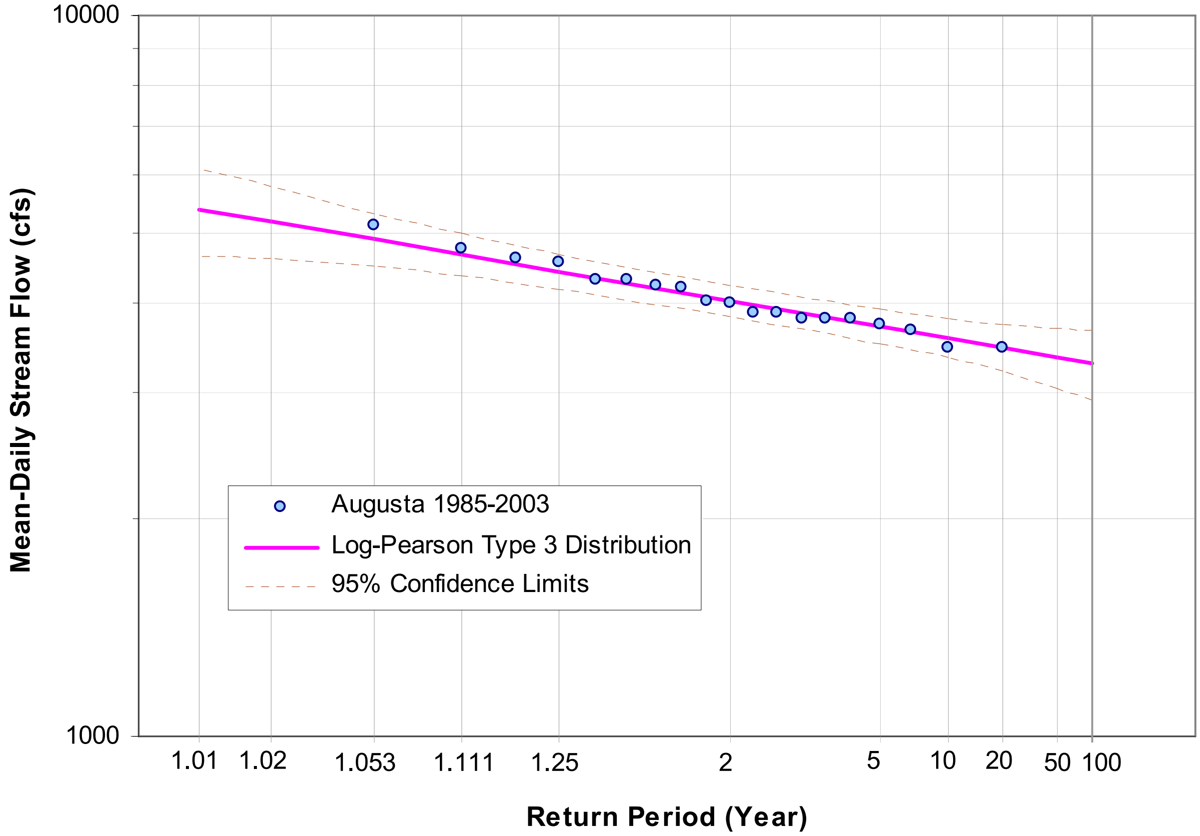


Figure 2.4.11-5 Log-Pearson Type 3 Distribution with Annual Minimum Daily-mean Flow Data from Augusta for the Water Years 1985–2003

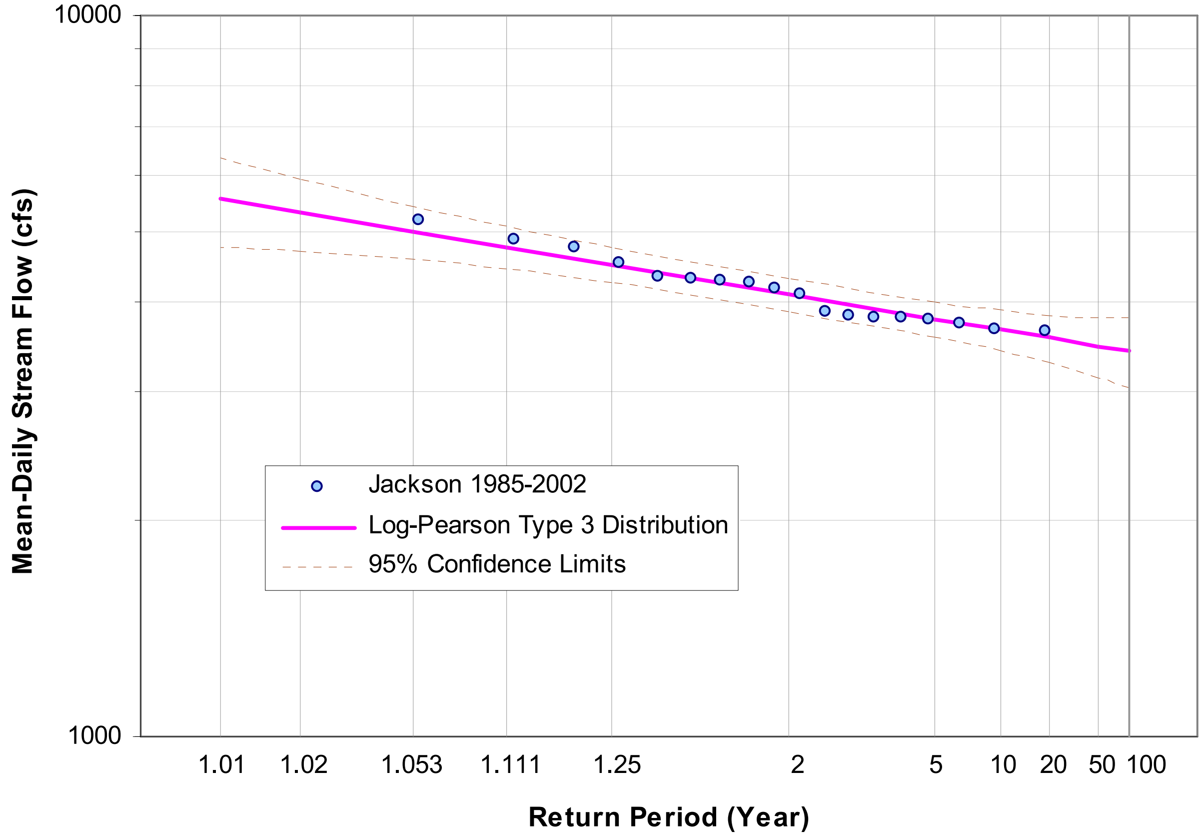
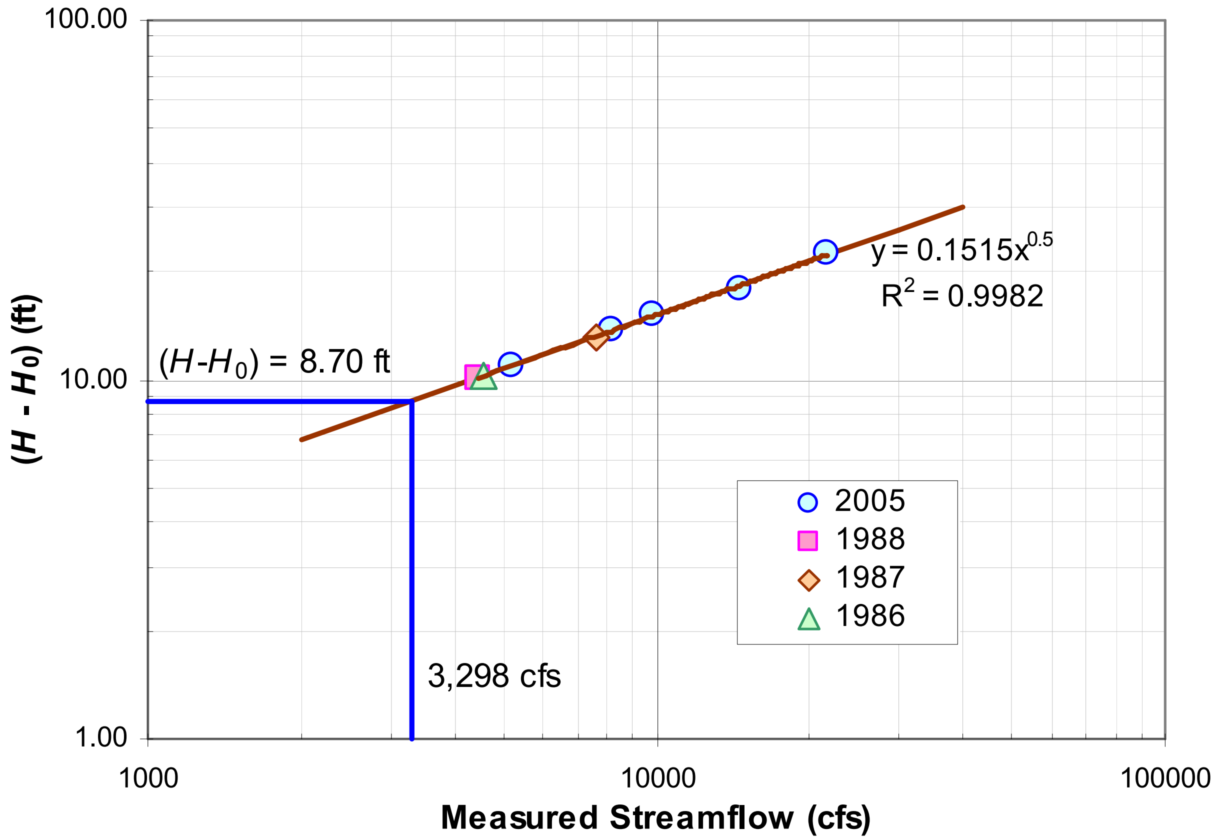


Figure 2.4.11-6 Log-Pearson Type 3 Distribution with Annual Minimum Daily-mean Streamflow from Jackson for the Water Years 1985–2002



H = Water surface elevation in El. ft msl
H_0 = Elevation corresponding to zero flow = El. 67.56 ft msl

Figure 2.4.11-7 River Stage-Discharge Rating Relationship at USGS Waynesboro Gage Station Near the VEGP Site Using Data for the Years 2005, 1988, 1987 and 1986

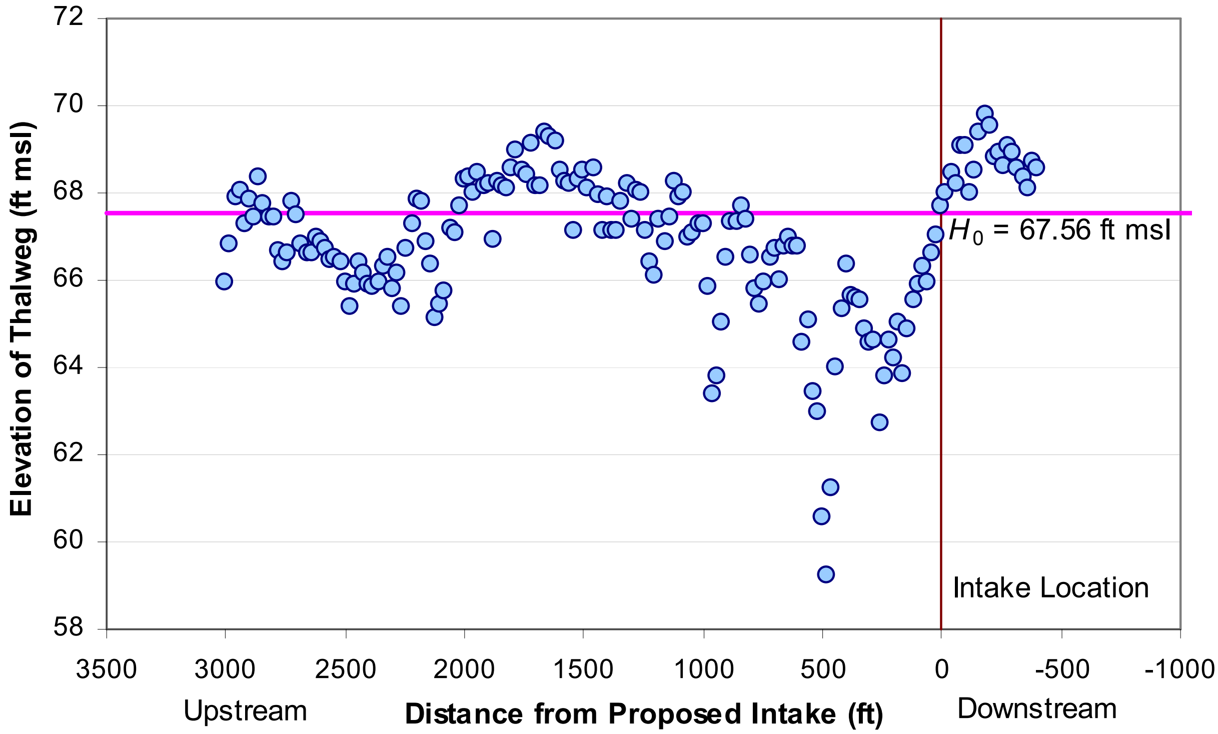


Figure 2.4.11-8 Comparison of Estimated River Stage Corresponding to Zero Discharge (H_0) with Measured River Thalweg Levels Near the Intake Location

Section 2.4.11 References

(ANSI/ANS-2.13 1979) American National Standards Institute/American Nuclear Society, American National Standard *Evaluation of Surface-Water Supplies for Nuclear Power Sites*, American Nuclear Society, November 5, 1979.

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(USGS 2006h) *Summary of Hydrologic Condition in Georgia*, U.S. Geological Survey, Web site: http://ga.water.usgs.gov/news/drought99/hydrsumm.html, accessed April 24, 2006.

(USGS 2006j) *Streamflow Measurements for Georgia*, Savannah River near Waynesboro, GA, U.S. Geological Survey, Web site: http://nwis.waterdata.usgs.gov/ga/nwis/measurements/?site_no=021973269&agency_cd=USGS, accessed May 12, 2006.

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2.4.12 Groundwater

This section describes the groundwater resources as it relates to the design bases for the Westinghouse AP1000 reactor design. The hydrogeology of the VEGP regional and local area including the site and the interface with the new AP1000 units are discussed in this section. Current and projected groundwater uses in the VEGP region are also discussed.

The 3,169 acre VEGP site is located on a coastal plain bluff on the southwest side of the Savannah River in eastern Burke County, Georgia. The proposed AP1000 units referred to as VEGP Units 3 and 4 will have a finished grade level elevation of approximately 220 ft msl. The below grade structural foundation for the safety related AP1000 containment structure will be 39.5 ft below grade level (180.5 ft msl). The Westinghouse AP1000 reactor design has no safety-related ultimate heat sink that relies on surface water or groundwater supplies. On-site wells will provide make-up water for the service water system (SWS). The wells will also supply water for power plant systems, including the fire protection system, the plant demineralized water supply system, and the potable water system. Groundwater withdrawn for the proposed 2 new units will be 752 gpm on average, with a maximum of 3,140 gpm. During normal operation, approximately 305 gpm of the withdrawn groundwater is returned as surface water to the Savannah River **(Westinghouse 2005)**.

In constructing the new units, the site will be excavated approximately 80 to 140 ft below existing grade to remove the in situ soil down to the principal bearing strata, the Blue Bluff Marl. The in situ soil will be replaced with seismically designed fill material. Foundations for the new units will be poured on this new backfill material and the fill material will be placed around the structures and continue up to the finished grade elevation of 220 ft msl. Seismic analysis of the geological formations under the proposed new units including the seismically designed backfill are discussed in Section 2.5.

2.4.12.1 Regional and Local Groundwater Aquifers, Sources, and Sinks

The following primary sources of information were used to develop the regional and local hydrogeological description in this section:

- Vogtle ALWR ESP Project Final Data Report, ES1374, Southern Company Services Inc., November 2005. (Appendix 2.4A)
- Data Report of Geotechnical Investigation and Laboratory Testing MACTEC Engineering and Consulting Inc., January 2005. (Appendix 2.5A)

- Groundwater Atlas of the United States, Segment 6, Alabama, Florida, Georgia, and South Carolina, U.S. Geological Survey, Hydrologic Investigations Atlas 730-G, J.A. Miller, 1990. **(Miller 1990)**
- Huddlestun, P.F., and J.H. Summerour, The Lithostratigraphic Framework of the Upper Cretaceous and Lower Tertiary of Eastern Burke County, Georgia, Bulletin 127, Georgia Department of Natural Resources, 1996. **(Huddlestun and Summerour 1996)**

2.4.12.1.1 Regional Hydrogeology

The region within a 200-mi radius around the VEGP site encompasses parts of four physiographic provinces. These include, from northwest to southeast, the Valley and Ridge, Blue Ridge, Piedmont, and Coastal Plain Physiographic Provinces. Figure 2.5.1-1 shows the physiographic provinces and indicates a 200-mi radius from the VEGP site. Several major aquifers or aquifer systems are present with these physiographic provinces. The VEGP site and associated groundwater are located within the Coastal Plain province **(Miller 1990)**. However, groundwater within the other provinces is discussed below to provide a complete picture of regional hydrogeologic conditions.

The Valley and Ridge Physiographic Province lies about 180 mi northwest of the VEGP site. Aquifers underlying the Valley and Ridge province occur within Paleozoic-age folded and faulted sedimentary rock. The sedimentary strata consist predominantly of sandstone, shale, and limestone, with minor amounts of dolomite, conglomerate, chert, and coal. The carbonate and sandstone layers form the principal aquifers in the province. Typical well yields are from 10 gpm in sandstone formations to 10 to 50 gpm within the limestone units. Locally high yields, equal to 100 gpm or greater, are possible within highly fractured strata or solution cavities. Localized weathered rock and alluvium can provide lesser, but adequate, groundwater yields for domestic use. **(Miller 1990)**

The Piedmont and Blue Ridge Physiographic Provinces are hydrologically similar in nature. The provinces are composed primarily of metamorphic rocks with igneous intrusions. Surface materials consist of overlying saprolite with alluvium. Groundwater occurs both in the fractured portions of bedrock and within the saprolite and alluvium material. Well yields generally depend on the local fracture density of the bedrock and range from a few to 30 gpm. Localized groundwater well yields of 100 gpm or greater are possible. **(Miller 1990)**

The majority of Georgia’s groundwater use occurs in the Coastal Plain Physiographic Province. The Coastal Plain sediments are thin, less than 200 ft thick, along the western boundary of the province (where they terminate at the contact with the Piedmont province) and thicken to over 4,000 ft in an eastern-to-southeastern direction. The sediments range in age from Holocene to Cretaceous and overlie crystalline igneous and metamorphic bedrock, which is an eastward extension of the Piedmont province **(Miller 1990)**.

Groundwater in the Coastal Plain is withdrawn from both unconfined, shallow aquifer systems and deeper, confined aquifer systems. These aquifers are recharged principally in their outcrop area along the western boundary of the province near the Fall Line and from localized infiltration of precipitation within the province. Precipitation migrates downward and laterally through the unconsolidated surficial materials for discharge to nearby streams and low areas or percolates downward into the deeper unconsolidated and consolidated material. The thickness and areal extent of the Coastal Plain sediments result in higher groundwater storage than for any other physiographic provinces in Georgia **(Miller 1990)**.

Three regional Coastal Plain aquifer systems are identified within a 50-mi radius of the VEGP site: Surficial aquifer system, Floridan aquifer system, and Southeastern Coastal Plain aquifer system **(Miller 1990)**. The Surficial aquifer system is described as localized water-bearing sediments of Miocene age or younger. Typical well depths range from 11 to 300 ft, with well yields of 2 to 25 gpm. Well depths are dependent on location and material thickness. The Floridan aquifer system has typical well depths of 40 to 900 ft, with average well yields of 1,000 to 5,000 gpm. Multiple unconsolidated and consolidated water-bearing sands exist within the aquifer system, separated by semi-confining to confining, fine-grained material. Typical well depths in the Southeastern Coastal Plain aquifer system are 30 to 800 ft, with well yields of 50 to 1,200 gpm. **(Leeth et al. 2005)**

The bedrock underlying the Coastal Plain sediments consists of crystalline rock and Paleozoic sedimentary rocks. Well yields for the rock units can range up to 50 gpm, correlating to saprolite, fractures, and solution features. Due to the sufficient amount of groundwater found in the overlying sediments, the bedrock is not typically used as a source of groundwater in the Coastal Plain Physiographic Province **(Miller 1990)**.

No sole-source aquifers have been designated within the VEGP site region **(EPA 2006c)**.

2.4.12.1.2 Local Hydrogeology

The VEGP site lies within the Coastal Plain Physiographic Province. The site is located approximately 40 mi southeast of the Fall Line, the northwestern boundary of the Coastal Plain physiographic province, and is adjacent to the Savannah River. Geologic conditions beneath the VEGP site generally consist of about 1000 ft of Coastal Plain sediments with underlying Triassic Basin rock and Paleozoic crystalline rock. The Savannah River lies along the northeast border of the VEGP site and influences the local hydrogeologic conditions within the site area. This local hydrogeology discussion is restricted to the VEGP site vicinity (approximate radius of 5 mi) south of the Savannah River.

Geotechnical and hydrogeological investigations performed for this ESP application provide information on the VEGP site from the Triassic Basin rock to the ground surface. The geotechnical logs are provided in Appendix 2.5A and further discussed in Section 2.5.4. The boring logs from the observation well installation are presented in Appendix 2.4A. In addition, reviews of the original site investigations, existing unit well monitoring programs, and published literature were included in the analysis. Results from these investigations indicate that there are three aquifers underlying the VEGP site, the Cretaceous, Tertiary, and Water Table (or Upper Three Runs), all being part of the Southeastern Coastal Plain aquifer system. Although present regionally, the Surficial aquifer system, consisting of Miocene (Hawthorne Formation) through Quaternary deposits, is not continuous over Burke County or the VEGP site **(Miller 1990)** and was not encountered in the investigations performed for this ESP application. The Floridan aquifer system, also present regionally, is absent from the VEGP site as well **(Huddlestun and Summerour 1996)**.

The lower aquifer at the VEGP site overlies the bedrock and is comprised of Cretaceous-age sediments. Locally, this aquifer system is known as the Cretaceous aquifer. The sediments include sands, gravels, and clays of the Cape Fear Formation, Pio-Nono Formation and associated unnamed sands, Gaillard Formation, Black Creek Formation, and Steel Creek Formation. The middle aquifer system is made up of Tertiary-age sediments occurring over the Cretaceous-age sediments described above. The middle aquifer is known locally as the Tertiary aquifer system. It consists primarily of the permeable sands of the Still Branch and Congaree Formations. The relatively impermeable clays and silts of the Snapp and Black Mingo Formations overlie and confine the Cretaceous aquifer, while the clays and clayey sands of the Lisbon Formation overlie and confine the Tertiary aquifer**.** The upper aquifer is unconfined and is comprised of Tertiary-age sands, clays, and silts of the Barnwell Formation, which overlie the relatively impermeable Lisbon Formation. This aquifer is known locally as the Water Table aquifer or Upper Three Runs aquifer. Figure 2.4.12-1 illustrates the hydrostratigraphic column for the VEGP site and surrounding area, identifying geologic units, confining units, and aquifers. Figures 2.4.12-2A and 2B present hydrogeologic cross sections for the VEGP site. Further discussion of the aquifers underlying the VEGP site and surrounding area is provided below.

Cretaceous Aquifer

The Cretaceous aquifer locally comprises the Cape Fear Formation, Pio-Nono Formation/unnamed sands, Gaillard Formation/Black Creek Formation, and Steel Creek Formation. These formations generally consist of fluvial and estuarine deposits of cross-bedded quartzitic sand and gravel interbedded with silt and clay. The coarse-grained sediments are mostly unconsolidated and are generally permeable, while the fine-grained sediments are partially consolidated and are generally impermeable. In addition to the varying lithology, the formation also exhibits lateral facies changes, on-lap and off-lap relationships, and discontinuous lenses **(Huddlestun and Summerour 1996)**. The elevations, thicknesses, and descriptions of these geologic formations, as determined from VEGP geotechnical boring B-1003, are summarized below:

- The basal Cape Fear Formation overlies the Triassic Basin bedrock, which is of Paleozoic age and consists of alternating mudstone, sandstone, and breccia. Boring B-1003 encountered top of bedrock at an elevation of approximately -826 ft msl. The Cape Fear Formation consists of interbedded sands, silts, clays, and gravels. The formation is approximately 191 ft thick, with the top of the formation being at El. -635 ft msl.

- The Pio-Nono Formation and other unnamed sands overlie the Cape Fear Formation. This formation consists of sand, silt, and clay. The formation is approximately 60 ft thick, while the top of the formation is at approximately El. -575 ft msl.

- The undifferentiated Gaillard Formation and Black Creek Formation overlie the Pio-Nono Formation and unnamed sands. Most of the formation consists of sand with silt and clay, and layers of gravel. The deposit is approximately 211 ft thick, with the top of the formation being at approximately El. -364 ft msl.

- The Steel Creek Formation overlies the undifferentiated Gaillard Formation and Black Creek Formation. It consists mainly of sand with clay and silt. The formation is approximately 110 ft thick; the top of the formation is at approximately El. -254 ft msl.

The Cretaceous aquifer system has not been extensively developed, primarily because the shallower Tertiary system is adequate for most groundwater needs and is available for use throughout the region. Quantitative data from the limited number of test and production wells in the Cretaceous strata, and inferred data from geologic and stratigraphic studies, indicate clearly that the Cretaceous aquifer system is highly transmissive and is capable of providing good quality groundwater.

Recharge to the Cretaceous aquifer system is primarily by direct infiltration of rainfall in its outcrop area, located north of the VEGP site in a 10- to 30-mile-wide belt extending from Augusta, Georgia, northeastward across South Carolina to near the state line separating North and South Carolina. In the outcrop areas, precipitation penetrates the Cretaceous sediments. Groundwater in the outcrop areas is under water table conditions, but as it moves progressively downdip, it becomes confined beneath the overlying Snapp and Black Mingo Formations in the vicinity of the VEGP site. Hence, the Cretaceous aquifer system is under confined conditions for most of its areal extent. Discharge of the Cretaceous aquifer system is primarily from subaqueous exposures of the aquifer that are presumed to occur along the Continental Shelf. Other discharge sources are to the Savannah River and by pumping.

Tertiary Aquifer

The most productive aquifer at the VEGP site consists of the Congaree and Still Branch Formations, which are hydraulically connected and are referred to as the Tertiary aquifer. The overlying Lisbon Formation, containing the Blue Bluff Marl, acts as a confining layer. The elevations, thicknesses, and descriptions of geologic formations comprising the Tertiary aquifer, as encountered in boring B-1003, are summarized below:

- The Black Mingo and Snapp Formations constitute a semi-confining hydrogeologic unit under the VEGP site that separates the underlying Cretaceous aquifer from the overlying Tertiary sand aquifer as they decline to the southeast. The Paleocene-age Black Mingo Formation is approximately 39 ft thick and consists of sand, clay, and silt. The top of the formation is at approximately El. -215 ft msl. The Snapp Formation overlies the Black Mingo Formation and consists of sand, clay and silt, and includes a basal gravel layer. The stratum is also Paleocene in age. The formation is approximately 107 ft thick. The top of the formation is at approximately El. -108 ft msl.

- Above the Snapp is the Eocene-age Congaree Formation. The Congaree Formation has a thickness of about 115 ft and consists primarily of sand with clay and silt, and a basal gravel layer. The top of the formation is at an elevation of approximately 7.3 ft msl. The overlying Still Branch and Bennock Millpond Sands Formation consist of sand, clay, and silt and has a weak carbonate component. The formation thickness is approximately 67 ft, with the top of the formation being approximately El. 74 ft msl.

- Overlying the Tertiary sediments is the Lisbon Formation. The Lisbon Formation is Eocene in age and is comprised of sand, clay, and silt with interbedded layers of fossiliferous limestone. The Lisbon Formation contains a marl known as the Blue Bluff Member (Blue Bluff Marl). The Lisbon Formation also contains the McBean Limestone Member, a fossiliferrous limestone layer. The formation has a thickness of approximately 63 ft, and the top of the formation is at approximately El. 137 feet msl. This formation separates the confined and unconfined aquifer systems beneath the VEGP site.

Recharge to the Tertiary aquifer is primarily by infiltration of rainfall in its outcrop area, which is a belt 20 to 60 miles wide extending northeastward across central Georgia and into portions of Alabama to the west and South Carolina to the east. Discharge from the Tertiary aquifer occurs from pumping, from natural springs in areas where topography is lower than the piezometric level of the aquifer, and from subaqueous outcrops that are presumed to occur offshore. Discharge also occurs to the Savannah River where the river has completed eroded the Blue Bluff Marl confining layer allowing discharge from the aquifer to the river bed.

Water Table Aquifer

The uppermost aquifer at the VEGP site is unconfined and consists of the Barnwell Group, including the discontinuous deposits of the Utley Limestone. The saturated interval within the Barnwell Group is commonly referred to as the Water Table aquifer (also known as the Upper Three Runs aquifer) and is the first water-bearing zone encountered beneath the VEGP site. The elevations, thicknesses, and descriptions of geologic formations comprising the Barnwell Group were determined from VEGP geotechnical and hydrogeological borings and are described as follows:

- The Utley Limestone Member of the Barnwell Group consists of sand, clay, and silt with carbonate-rich layers. The stratum is discontinuous across the VEGP site and was not encountered in several of the borings. When encountered, the thickness of the stratum ranges from approximately 22 to 104 ft, and the top of the formation ranges from approximately El. 151 to 199 ft msl. The Utley limestone was encountered at boring B-1003. The stratum is approximately 38 ft thick at this location with a top elevation of approximately El. 175 ft msl.
- Overlying the Utley Limestone are undifferentiated sands, clays, and silts. The thickness of the group is variable with a range of approximately 48 to 164 ft. The top of the group extends to the ground surface and ranges from approximately El. 205 to 264 ft msl. At boring B-1003, the formation is approximately 48 ft thick with the top of the formation being at an elevation of approximately 223 ft msl.

Recharge to the Water Table aquifer is almost exclusively by infiltration of direct precipitation. The presence of porous surface sands and the moderate topographic relief in the VEGP site area suggest that a significant fraction of the precipitation infiltrates the ground or is lost to the atmosphere by evapotranspiration. Discharge is to localized drainages and wells.

2.4.12.1.3 Observation Well Data

Data from a combination of new wells installed for the ESP application and existing VEGP site wells were used to develop groundwater elevation contour maps and present groundwater elevation trends. The new wells, designated OW-1001 through OW-1015, were installed in May and June 2005. (One of the wells, OW-1001, had very little change in groundwater levels and is not included in the analysis. A replacement well, OW-1001A, was installed in October 2005.) Ten of the new wells are screened in the Water Table aquifer. The remaining five new wells are screened in the confined Tertiary aquifer system below the Blue Bluff Marl. No wells were installed into the deeper Cretaceous aquifer. Existing wells 142 and 179, remaining from the pre-construction monitoring network for VEGP Units 1 and 2, are screened in the Water Table aquifer. Existing wells with identifications beginning with the number 8 were installed between 1979 and 1985 to monitor construction dewatering of VEGP Units 1 and 2. These wells are screened in either the Water Table or Tertiary aquifers. Existing wells with an LT designation were installed in 1985 as part of post-construction monitoring activities and are associated with the Water Table aquifer. The locations of observation wells presently being monitored at the VEGP site area are shown in Figure 2.4.12-3. Table 2.4.12-1 lists the observation wells currently being used to monitor the Water Table aquifer, while Table 2.4.12-2 lists the observation wells currently being used to monitor the Tertiary aquifer.

Monthly water levels in the observation wells were measured to characterize seasonal trends in groundwater levels and flow directions for VEGP site. Monthly monitoring of these wells began in June 2005 and is continuing. A 12-month data set representing June 2005 through June 2006 is utilized for this ESP application. In addition, longer-term data are available for some of the existing wells completed in the Water Table and Tertiary aquifers, which are used to characterize historical trends.

The following groundwater piezometric surface trend discussion is based on the information presented in Figures 2.4.12-4 through 2.4.12-18 and Tables 2.4.12-1 and 2.4.12-2.

Water Table Aquifer

Historical groundwater elevations for the 1971-1985 period for the Water Table aquifer are provided in Figure 2.4.12-4 for wells 142, 179, 803A, 804, and 805A. This monitoring occurred before construction, during construction dewatering, and after dewatering of VEGP Units 1 and 2. These data show the effect of construction dewatering and the recovery of groundwater levels after dewatering activities were completed. Historical groundwater elevation data for the 1995-2004 period are shown in Figure 2.4.12-5 for Water Table aquifer wells LT-1B, LT-7A, LT-12, LT-13, 802A, 805A, 806B, and 808. Groundwater elevations were relatively steady from 1995 to 1999; however, groundwater elevations decreased from 2000 through 2002, with 2002 having the lowest values. These decreases correlate to a drought that affected the region in the 1999-2002 period. Groundwater levels have partly recovered in the subsequent years.

Recent groundwater data from 2005 and 2006 for the Water Table aquifer are shown in Figure 2.4.12-6. These data exhibit little variability and do not show any significant seasonal influences during this monitoring period. Groundwater elevations range from approximately El. 132.5 to 165.5 ft msl across the area monitored.

The groundwater elevation data summarized in Table 2.4.12-1 were used to develop groundwater surface elevation contour maps for the Water Table aquifer on a quarterly basis. These maps are presented in Figures 2.4.12-7 through 2.4.12-11 for June 2005 through June 2006. Note that October 2005 data, as opposed to September 2005 data, were used to develop the contour map for the second quarter so that data from replacement well OW-1001A, installed in October 2005, could be incorporated. For each quarter, the spatial trend in the piezometric surface is similar, with elevations ranging from a high of approximately El. 165 ft msl in the vicinity of well OW-1013 to a low of less than El. 135 ft msl at well OW-1005. The groundwater surface contour maps indicate that horizontal groundwater flow across the VEGP site is in a north-northwest direction toward Mallard Pond (also known as Mathes Pond). This surface water feature is a local discharge point for the shallow groundwater flowing beneath the VEGP site. The horizontal hydraulic gradient across the site for the Water Table aquifer is relatively consistent between the five figures and is approximately 0.012 ft/ft.

Tertiary Aquifer

Historical groundwater elevations from 1971 through 1985 for Tertiary aquifer wells 27 and 29 are provided in Figure 2.4.12-12.

Recent groundwater elevation data from 2005 and 2006 for the Tertiary aquifer are shown in Figure 2.4.12-13. Elevations are relatively constant from June to August 2005. In most cases, the piezometric head of the aquifer declines from August 2005 through November 2005. The elevations begin to rebound in December 2006, continuing through February 2006. The lowering of the piezometric surface is likely in response to a decrease in precipitation. October and November are the months with the lowest precipitation during the year for this area. Well 27 shows a higher degree of variability than the others and is likely influenced by its proximity to the river.

The groundwater elevation data summarized in Table 2.4.12-2 were used to develop piezometric surface maps for the Tertiary aquifer. The Tertiary aquifer piezometric surface is presented in Figures 2.4.12-14 through 2.4.12-18 for June 2005 through June 2006. The piezometric surfaces for the Tertiary aquifer show a relatively consistent flow pattern. In general, the groundwater in this aquifer unit shows an east-to-northeast flow pattern, toward the Savannah River. Head elevations range from approximately El. 125 ft msl in the western portion of the VEGP site to less than El. 100 ft msl in the vicinity of the bluff next to the Savannah River flood plain. The elevation of the piezometric head at the bluff and that of the Savannah River flood plain suggest groundwater is discharging to the Savannah River. The piezometric elevations in the Tertiary aquifer decreased at least 1.5 ft across the VEGP site in December 2005, reflecting the seasonal decrease in precipitation.

The horizontal hydraulic gradient across the site for the Tertiary aquifer is relatively consistent among the five figures and is approximately 0.006 ft/ft. In the center of the VEGP site, there is a downward head difference of approximately 50 ft between the Water Table aquifer and the Tertiary aquifer, suggesting hydraulic separation of the two aquifers. The Blue Bluff Marl confining unit that separates the aquifer systems has an average thickness of about 70 ft at VEGP site.

Cretaceous Aquifer

At the VEGP site, both the Cretaceous and the Tertiary aquifers are considered confined beneath the Blue Bluff Marl but are in apparent hydraulic connection with each other. At some distance downdip of the VEGP site, the Cretaceous aquifer becomes hydraulically separated from the Tertiary aquifer. This separation is believed to be due to facies changes in the intervening clays and silts of the Snapp and Black Mingo formations becoming relatively impermeable. The point at which this occurs is not well defined but it is believed to be a few miles downdip (south) of the site.

The regional direction of the groundwater flow in the Cretaceous (and the Tertiary) aquifer system is south-by-southeast at a hydraulic gradient of approximately 6 to 20 ft/mi (0.001 to 0.004 ft/ft) **(Siple 1967)**. From the vicinity of the Fall Line to a point expected to be a few miles south of the site, the Savannah River has downcut through the Blue Bluff Marl confining layer and into the underlying strata. This cut allows both the Cretaceous and the Tertiary aquifers to discharge to the riverbed, resulting in a localized hydraulic (groundwater) sink. The aquifer flow directions in the vicinity of the river cut are affected by the hydraulic sink and do not follow regional trends.

2.4.12.1.4 Hydrogeologic Properties

The 15 new groundwater observation wells installed in connection with the ESP application were slug tested to determine in situ hydraulic conductivity values for the Water Table and Tertiary aquifers. Table 2.4.12-3 summarizes the test results. Soil samples collected from selected geotechnical and hydrogeological borings were submitted for laboratory tests to determine grain size, moisture content, and specific gravity, results from which are included in Tables 2.4.12-4 through 2.4.12-6. Similar data are available for the adjacent VEGP Units 1 and 2 site. The hydrogeological properties of the Water Table aquifer, Lisbon Formation (Blue Bluff Marl) confining unit, Tertiary aquifer, and Cretaceous aquifer at the VEGP site are discussed below.

Water Table Aquifer

In the vicinity of the VEGP site, the basal unit of the Barnwell Group, the Utley limestone member, is capable of transmitting groundwater but is of limited areal and vertical extent. In addition, the horizontal and vertical hydraulic conductivity of the saturated clays, silts, and sands within the Barnwell Group varies considerably, due to variable clay content.

The hydraulic conductivity of the Water Table aquifer within the vicinity of the VEGP site was previously measured by both in situ and laboratory testing methods during site characterization investigations for VEGP Units 1 and 2. In situ hydraulic conductivity values for the Barnwell Group sands, silts, and clays were found to range between 60 and 340 ft/yr (0.16 to 0.93 ft/day), with a geometric mean of 0.55 ft/day. Laboratory values varied considerably beyond the range of the in situ tests. Well pumping tests conducted in the Utley Limestone resulted in hydraulic conductivities ranging from 1,530 to 125,400 ft/yr (4.2 to 340 ft/day), while falling and constant head tests suggested lower values, ranging from 96 to 5,800 ft/yr (0.26 to 16 ft/day). Laboratory porosity values for the Barnwell Group sands, silts, and clays were found to range from 34 to 61 percent, with a mean value of 44 percent.

Hydraulic conductivities were determined for the VEGP site as part of the ESP investigation. Slug test results for the Water Table aquifer range from 0.074 to 2.7 ft/day, with a geometric mean of 0.41 ft/day (Table 2.4.12-3). Table 2.4.12-4 summarizes the laboratory test results for geotechnical samples of the Barnwell Formation, which were at depths ranging from El. 108 to 248 ft msl. Sand and clay make up the majority of samples, with some gravel present. Measured moisture contents, by weight, range from 4 to 93 percent. Specific gravity analysis was performed only for the samples collected from the observation well borings. Values range between 2.61 to 2.90 and have a median value of 2.66. Using the median moisture content of 25 percent and a value of 2.66 for the specific gravity, the void ratio is estimated to be about 0.67. A total porosity of 40 percent is calculated from this void ratio, and an effective porosity of about 32 percent is estimated based on 80 percent of the total porosity **(de Marsily 1986)**. The specific yield for the Water Table aquifer was not determined; however, an estimate of this value taken from published literature for similar aquifer materials indicates that it may be in the range of 0.20 to 0.33 **(McWhorter and Sunada 1977)**.

The groundwater travel time in the Water Table aquifer was calculated from the ESP site to the projected discharge point (Mallard Pond). A horizontal hydraulic gradient of 0.012 ft/ft between observation wells OW-1010 and OW-1005, a hydraulic conductivity of 0.41 ft/day, and the effective porosity of 32 percent were selected to calculate an average horizontal groundwater velocity of 0.015 ft/day. Using a distance of approximately 2,200 ft from center of the power block area for the new AP1000 units to the closest point of Mallard Pond, the groundwater travel time from the power block area to Mallard Pond is estimated to be about 400 years.

Lisbon Formation (Blue Bluff Marl) Confining Unit

The hydraulic conductivity of the marl layer is very low, and it effectively confines the aquifer underlying it. It is considered a vertical barrier to groundwater movement. In situ permeability tests (packer tests) were performed in the marl during site characterization investigations for VEGP Units 1 and 2. In 90 percent of the intervals tested, no measurable water inflow occurred. Laboratory permeability tests were also conducted on core samples collected from the marl. Laboratory measurements ranged from 0.0052 to 8.8 ft/yr (1.4×10^{-5} to 2.4×10^{-2} ft/day) with a geometric mean of 1.3×10^{-3} ft/day, indicating the marl is nearly impermeable. Porosity values ranged from 24 to 62 percent, with a mean value of 48 percent.

Geotechnical laboratory results for the Lisbon Formation (Blue Bluff Marl) confining unit are summarized in Table 2.4.12-5 for the VEGP site. Soil samples were collected between El. 51 and 135 ft msl. The samples consist of gravel, sand, and clay. Moisture contents range from 13.5 to 67 percent, with porosities of 25 to 59 percent. Using the median moisture content of 29 percent from geotechnical laboratory results and an assumed specific gravity of 2.65, the void ratio of the confining unit is estimated to be 77 percent. Based on the void ratio value, total porosity is calculated to be 44 percent. Assuming effective porosity is 80 percent of total porosity, the effective porosity for the confining unit is 35 percent **(de Marsily 1986)**.

Tertiary Aquifer

Hydraulic conductivities determined from Tertiary aquifer slug tests range from 0.35 to 2.1 ft/day, with a geometric mean of 0.83 ft/day (Table 2.4.12-3). These results are consistent with those for the VEGP Units 1 and 2 site for which the geometric mean was determined to be 0.51 ft/day. The laboratory results from the selected geotechnical samples collected in the Tertiary aquifer are presented in Table 2.4.12-6. Sample elevations range from El. -273 ft msl to 69 ft msl, with the samples consisting mainly of sand and fine particles, with some gravel. Moisture content ranges from 18 to 40 percent, with specific gravity values varying from 2.62 to 2.69. Using the median moisture content of 24 percent and a value of 2.67 for the specific gravity, the void ratio of the Tertiary aquifer is estimated to be about 0.64. A total porosity of 39 percent is calculated from this void ratio, and an effective porosity of about 31 percent is estimated based on 80 percent of the total porosity **(de Marsily 1986)**. The storage coefficient for the Tertiary aquifer alone has not been determined; however, previous tests of wells completed in the combined Cretaceous/Tertiary aquifers suggest that a value on the order of 10^{-4} would be a reasonable estimate (see below).

The horizontal hydraulic gradient of the Tertiary aquifer is approximately 0.0044 ft/ft, based on the average groundwater elevations between well OW-1011 and well 27. The average horizontal groundwater velocity was calculated at 0.012 ft/day using a hydraulic conductivity of 0.83 ft/day, a hydraulic gradient of 0.0044 ft/ft, and an effective porosity of 31 percent. Using a distance of 5,600 ft from center of the power block area for the new AP1000 units to the closest point of the Savannah River, the groundwater travel time from the power block area to the Savannah River in the Tertiary aquifer is estimated to be about 1300 years.

Cretaceous Aquifer

Two makeup water wells (designated as MU-1 and MU-2A) for VEGP Units 1 and 2 were reported to be capable of supplying water at 2,000 gal./min and 1,000 gal./min, respectively. The water is withdrawn from the combined Cretaceous/Tertiary aquifers. Pumping tests were conducted at these wells in 1977. Transmissivity values ranged between 110,400 to 130,900 gallons per day per foot (gpd/ft). A storage coefficient was calculated at 1.07×10^{-4}.

A pumping test was also conducted in a Cretaceous aquifer test well identified as TW-1 during site characterization activities for VEGP Units 1 and 2. A transmissivity value of 158,000 gpd/ft was calculated as an average value for the aquifer. The storage coefficient ranged between 3.3 x 10^{-4} and 2.1 x 10^{-4}, indicating the aquifer is effectively under confined conditions.

Vertical hydraulic conductivities were estimated assuming that the anisotropy ratio between the vertical and horizontal directions is 1:3, based on measured horizontal and vertical hydraulic conductivities for sandstone deposits **(Freeze and Cherry 1979)**. The vertical hydraulic conductivities for the Water Table aquifer, Lisbon Formation confining unit, and Tertiary aquifer are estimated to be 0.14, 0.00045, and 0.28 ft/day, respectively.

2.4.12.2 Regional and Local Groundwater Use

Present groundwater uses within 25 mi of the VEGP site are primarily municipal, industrial, and agricultural. Most of the groundwater wells withdraw water from the Cretaceous aquifer. Apart from water withdrawals for VEGP Units 1 and 2, the immediate area near the VEGP site has mainly domestic users, with no other large users nearby. The nearest domestic well is located west of the VEGP site across River Road.

The Georgia Environmental Protection Division (EPD) issues permits for wells having average daily withdrawals that exceed 100,000 gpd during any single month. Table 2.4.12-7 lists the permitted groundwater users, aquifer and withdrawal rates, and annual average withdrawal rates for municipal and industrial wells within 25 mi of the VEGP site and permitted by the Georgia EDP. Table 2.4.12-8 lists similar data for agricultural wells for the counties within 25 mi of the VEGP site and permitted by the Georgia EPD. The Safe Drinking Water Information System (SDWIS) maintained by the US EPA lists community, non-transient non-community, and transient non-community water systems serving the public. Community water systems are defined as those that serve the same people year-round (e.g., in homes or businesses). Non-transient non-community water systems are those that serve the same people, but not year-round (e.g., schools that have their own water system). Transient non-community water systems are those that do not consistently serve the same people (e.g., rest stops, campground, gas stations). Table 2.4.12-9 lists the community, non-transient non-community, and transient non-community water systems using groundwater as their primary water source within 25 mi of the VEGP site.

The locations of the agricultural, industrial, and municipal wells permitted by the Georgia EPD along with the public water system wells listed in the SDWIS database within 25 mi of the VEGP site are shown in Figure 2.4.12-19. These data indicate the nearest permitted agricultural well (William Hatcher, A-28) to be about 3.4 mi northwest of the VEGP site, while the nearest permitted industrial well (International Paper, I-1) is about 8.5 mi northwest of the site. The nearest municipal well (City of Waynesboro, M-1) is seen to be about 14.5 mi west-southwest of the VEGP site. The nearest SDWIS-listed well (Dealigle Mobile Home Park, C-6) is about 4.9 mi southwest of the VEGP site These wells are sufficiently distant from the VEGP site such that pumping these wells would have no effect on groundwater levels at the VEGP site. The recharge areas for the source aquifers for the nearest Georgia EPD-permitted wells are in their outcrop areas located up-gradient of the VEGP site and beyond the influence of the new units.

Regionally, projected overall water use is expected to increase through 2035 for Burke County. Surface water usage is increasing; however, it is increasing at a much slower rate than groundwater usage, approximately 5 percent versus 17 percent. Burke County's water usage, including both surface and groundwater, is projected as 100 to 120 mgpd for 2035 **(Fanning et al. 2003)**. Projections for Burke County total water use in 2050 are provided in the Comprehensive Water Supply Management Plan for Burke County and its Municipalities **(Rutherford 2000)**. Assuming the same water usage patterns, groundwater demand with the population increasing to 43,420 people is projected to be 10.94 mgpd for domestic use, 14.73 mgpd for industrial use, and 40.96 mgpd for agricultural use, which totals 66.63 mgpd **(Rutherford 2000)**.

Local groundwater use includes domestic wells and wells supplying water to existing VEGP Units 1 and 2. Uses include makeup process water, utility water, potable water, and supply for the fire protection system. Table 2.4.12-10 lists these wells, while Figure 2.4.12-20 identifies their location. Current permitted withdrawal rates are a monthly average of 6 mgpd and an annual average of 5.5 mgpd, as permitted by the Georgia EPD. Three of the wells are in the Cretaceous aquifer at depths varying from 851 to 884 ft, with design yields of 1,000 to 2,000 gpm. These wells provide makeup water for the plant processes. The remaining six wells extend into the Tertiary aquifer, range in depth from 200 to 370 ft, and have design yields of 20 to 150 gpm. Average annual usage levels for 1999 to 2004 from all wells excluding SEC are from 0.79 to 1.44 mgpd **(SNS 2005a)**. The SEC well was added in 2005 and will be included on water usage data from 2006. Recent groundwater usage from June 2005 to December 2005 is in Table 2.4.12-11.

Table 2.4.12-12 shows projected groundwater use for two AP1000 units with normal and maximum usage values. Service water system make-up, potable water system, demineralized water system, fire protection system, and miscellaneous users are the intended uses. Groundwater needed to supply VEGP Units 3 and 4 will be obtained from wells installed in the Tertiary and Cretaceous aquifers. The number and depths of the wells will be developed during the COL stage. SNC's groundwater use permit **(SNS 2005a)** will be modified accordingly.

2.4.12.3 Monitoring or Safeguard Requirements

Groundwater monitoring for the VEGP site takes place through programs implemented both for the existing units and as part of the ESP effort by SNC. Current groundwater monitoring programs for the existing units are addressed in VEGP Procedure Number 30140-C, Revision 22 **(VEGP 2006)**. The results of these programs are reported semiannually.

As part of detailed engineering, the existing SNC groundwater monitoring programs will be evaluated with respect to placement of the new units to determine if any additional monitoring of existing or construction of new observation wells will be required to adequately monitor impacts on groundwater. This evaluation will include a review of the observation wells installed for the ESP application to determine if they can be used as part of any longer-term groundwater monitoring program. The results will be described in the COL application.

Safeguards will be used to minimize the potential for adverse impacts to the groundwater by construction and operation of the new units. These safeguards could include the use of lined containment structures around storage tanks and hazardous materials storage areas, emergency cleanup procedures to capture and remove surface containments, and other measures deemed necessary to prevent or minimize adverse impacts to the groundwater beneath the VEGP site.

2.4.12.4 Design Basis for Subsurface Hydrostatic Loading

The design basis for subsurface hydrostatic loading for existing VEGP Units 1 and 2 is El. 165 ft msl. For new VEGP Units 3 and 4, the design basis for groundwater-induced loadings on subsurface portions of safety-related structures, systems, and components is also El. 165 ft msl as discussed in Section 2.5.4.6. Note that the lowest elevation of a safety-related structure, system, or component is El. 180.5 ft msl (bottom elevation of the auxiliary building slab). This elevation is about 20 ft above the highest water table elevation recorded in the power block area based on the contours plotted in Figures 2.4.12-7 through 2.4.12-11. Because the subsurface portions of all safety-related structures, systems, and components are well above the highest recorded water table elevations, there will be no groundwater-induced loadings. No permanent dewatering system will be employed to lower design basis groundwater levels. No wells will be used for safety-related purposes.

Table 2.4.12-1 Monthly Groundwater Level Elevations in the Water Table Aquifer

Well No.	Well Depth (ft)	Groundwater Level Elevations (ft msl)												
		Jun 2005	Jul 2005	Aug 2005	Sep 2005	Oct 2005	Nov 2005	Dec 2005	Jan 2006	Feb 2006	Mar 2006	Apr 2006	May 2006	Jun 2006
142	97	154.37	154.38	154.49	154.64	154.75	154.69	154.60	154.71	154.77	154.71	154.63	154.55	154.48
179	133	147.42	148.40	148.42	148.72	148.69	148.75	148.52	148.61	148.64	148.72	148.66	148.76	148.78
802A	91	157.90	157.86	158.07	158.23	158.29	158.34	158.28	158.28	158.39	158.23	158.17	158.09	157.99
803A	90	159.98	159.91	160.15	160.32	160.39	160.48	160.39	160.37	160.48	160.45	160.30	160.20	160.12
804	95	163.73	163.62	163.92	164.10	164.21	164.23	164.05	164.08	164.23	164.30	164.11	163.99	163.88
805A	129	158.53	158.57	158.84	158.98	159.09	159.09	159.05	158.94	158.92	158.98	158.82	158.82	158.63
806B	69	155.62	155.15	155.78	155.90	155.96	155.98	155.88	155.97	155.98	156.03	155.85	155.78	155.73
808	75	158.88	159.14	159.42	159.55	159.49	159.37	159.15	159.04	159.19	159.15	158.99	158.53	158.80
809	94	152.78	152.70	152.75	152.89	152.98	152.97	152.98	153.10	153.22	153.18	153.01	153.02	153.00
LT-1B	94	154.92	154.82	155.01	155.16	155.18	155.22	155.06	155.18	152.52	155.28	155.18	155.15	154.95
LT-7A	89	154.39	154.15	154.33	154.46	154.48	154.46	154.31	154.57	154.83	154.59	154.57	154.50	154.41
LT-12	88	158.21	157.90	158.07	158.22	158.31	158.28	158.21	158.53	158.66	158.48	158.54	158.48	158.23
LT-13	91	156.10	155.92	156.13	156.30	156.32	156.37	156.23	156.36	156.66	156.35	156.32	156.32	156.23
OW-1001	133	113.35	118.03	118.36	117.95	117.69	116.54	116.56	116.93	117.22	117.34	117.56	117.13	116.63
OW-1001A	93					135.95	135.91	135.97	135.99	135.98	135.96	135.97	135.96	135.96
OW-1003	91	155.94	155.89	156.06	156.29	156.24	156.36	156.26	156.34	156.37	156.43	156.32	157.24	156.16
OW-1005	177	132.95	132.73	132.88	133.01	132.67	132.65	132.53	132.74	133.04	133.12	133.14	133.20	133.12
OW-1006	135	147.66	147.48	147.57	147.60	147.49	147.20	147.18	147.41	147.40	147.37	147.35	147.21	147.05
OW-1007	120	151.82	151.72	151.78	151.63	151.45	151.15	151.05	151.41	151.49	151.45	151.22	151.11	150.99
OW-1009	98	162.38	162.40	162.71	162.90	163.01	163.03	162.87	162.93	163.01	163.01	162.89	162.79	162.65
OW-1010	95	163.10	163.26	163.59	163.77	163.81	163.78	163.62	163.60	163.63	163.57	163.44	163.29	163.09
OW-1012	94	161.83	161.93	162.07	162.06	161.98	161.80	161.71	161.82	161.86	161.80	161.68	161.53	161.37
OW-1013	104	164.95	165.00	165.29	165.47	165.48	165.42	165.21	165.29	165.46	165.31	165.23	165.11	164.96
OW-1015	120	159.63	159.58	159.78	159.90	159.96	159.96	159.82	159.81	159.79	159.89	159.75	159.66	159.58

Notes: Blank entries indicate data not available (OW-1001 had very little change in groundwater levels; a replacement well, OW-1001A, was installed in October 2005).
142- and 179-wells installed in 1971 for support of Units 1 and 2 pre-construction groundwater monitoring program.
800-series wells installed between 1979 and 1985 for support of Units 1 and 2 construction groundwater monitoring program.
LT-series wells installed in 1985 for support of the Units 1 and 2 post-construction groundwater monitoring program.
OW-wells installed in 2005 as part of the ESP subsurface investigation program (Appendix 2.4A).
Well depths are below ground surface at time of installation.

Table 2.4.12-2 Monthly Groundwater Level Elevations in the Tertiary Aquifer

Well No.	Well Depth (ft)	Groundwater Level Elevations (ft msl)												
		Jun 2005	Jul 2005	Aug 2005	Sep 2005	Oct 2005	Nov 2005	Dec 2005	Jan 2006	Feb 2006	Mar 2006	Apr 2006	May 2006	Jun 2006
27	190	91.50	89.96	91.63	83.96	82.13	88.24	82.57	84.62	85.77	84.49	83.42	83.08	83.03
29	212	98.88	97.80	98.33	93.17	91.86	91.89	92.59	93.97	94.19	93.63	93.05	92.16	91.76
850A	194	105.27	104.68	104.76	101.04	100.03	99.91	100.70	101.86	101.69	101.48	101.14	100.07	99.63
851A	285	114.54	114.40	114.02	111.59	111.38	110.60	112.34	112.32	112.43	112.42	112.23	111.08	110.36
852	223	114.71	114.49	114.00	111.88	111.09	111.21	111.88	113.06	113.51	113.14	112.82	111.74	110.38
853	221	108.60	108.17	107.98	104.53	103.64	103.45	104.18	105.32	105.14	104.97	104.65	103.58	103.15
854	222	107.06	106.88	106.65	103.37	102.38	102.23	103.03	104.13	103.85	103.73	103.45	102.31	101.86
855	225	102.63	101.74	102.00	97.22	96.08	96.21	96.85	98.43	98.49	98.15	97.53	96.75	95.93
856	182	114.07	113.94	113.49	111.37	110.57	110.63	111.31	112.52	112.46	112.39	112.07	111.21	109.94
OW-1002	237	120.13	120.61	120.04	118.65	117.81	117.71	118.44	119.36	119.63	119.64	119.43	118.37	117.65
OW-1004	187	108.27	108.14	108.01	105.06	104.05	103.75	104.51	105.56	105.83	105.28	105.12	103.88	103.54
OW-1008	247	126.06	127.99	125.09	124.24	123.49	123.51	124.19	125.10	125.46	125.54	125.21	124.33	123.42
OW-1011	218	122.50	122.38	121.49	120.37	119.59	119.73	120.46	121.41	121.64	121.70	121.48	120.47	119.37
OW-1014	197	111.18	111.00	110.74	108.34	107.34	107.11	107.81	108.87	108.73	108.75	108.66	107.41	106.94

Notes: Blank entries indicate data not available.
27- and 29-wells installed in 1971 for support of Units 1 and 2 pre-construction groundwater monitoring program.
800-series wells installed between 1979 and 1985 for support of Units 1 and 2 construction groundwater monitoring program.
LT-series wells installed in 1985 for support of the Units 1 and 2 post-construction groundwater monitoring program.
OW-wells installed in 2005 as part of the ESP subsurface investigation program (Appendix 2.4A).
Well depths are below ground surface at time of installation.

Table 2.4.12-3 Hydraulic Conductivity Values

Well No.	Depth Interval Tested (ft)	Elevation (ft msl)	Aquifer	Material	Hydraulic Conductivity	
					(cm/sec)	(ft/day)
OW-1001A	77 - 93	149.4 to 133.4	Water Table	Sandy Clay	2.6E-05	0.074
OW-1003	72 - 91	151.0 to 132.0	Water Table	Clayey Shell to Clayey Sand	4.4E-05	0.12
OW-1005	143 - 169	121.4 to 95.4	Water Table	Silty Sand	1.1E-04	0.32
OW-1006	113 - 134	114.1 to 93.1	Water Table	Fine Sand and Coarse Sand	4.8E-04	1.4
OW-1007	99 - 120	117.9 to 96.9	Water Table	Silty Sand	9.3E-04	2.7
OW-1009	81 - 98	139.9 to 122.9	Water Table	Silty Sand	4.0E-04	1.1
OW-1010	70 - 92	146.9 to 124.9	Water Table	Sand and Clayey Silty Sand	6.4E-05	0.18
OW-1012	71 - 94	134.4 to 111.4	Water Table	Sand and Silt	1.4E-04	0.39
OW-1013	81 - 104	135.9 to 112.9	Water Table	Sand	1.3E-04	0.38
OW-1015	90 - 120	130.4 to 100.4	Water Table	Clayey Sand and Sand	1.5E-04	0.44
OW-1002	216 - 237	11.4 to -9.6	Tertiary	Silty Sand and Fine to Medium Sand	3.2E-04	0.90
OW-1004	150 - 187	72.92 to 53.92	Tertiary	Sand to Silty Sand	1.3E-04	0.35
OW-1008	226 - 247	-9.4 to -28.4	Tertiary	Sand	7.5E-04	2.1
OW-1011	197 - 218	8.8 to -12.2	Tertiary	Silty Sand and Coarse Sand	3.8E-04	1.1
OW-1014	179 - 197	41.9 to 23.9	Tertiary	Silty Sand	1.9E-04	0.54
				Geometric Mean Water Table Aquifer	1.4E-04	0.41
				Geometric Mean Tertiary Aquifer	3.0E-04	0.83

Source: Appendix 2.5A

Table 2.4.12-4 Summary of Laboratory Test Results on Grain Size, Moisture Content and Specific Gravity for the Barnwell Formation

Borehole / Well No.	Sample Elevation (ft msl)	Grain Size Distribution			Moisture Content (%)	Specific Gravity
		Gravel (%)	Sand (%)	Clay/Silt (%)		
OW-1003	144.5	0.0	65.1	34.9	ND	2.69
OW-1003	139.5	31.1	50.0	18.4	ND	2.68
OW-1005	115.9	8.9	57.0	34.1	ND	2.63
OW-1005	110.9	18.2	47.6	34.3	ND	2.61
OW-1006	113.6	7.0	61.1	31.9	ND	2.67
OW-1006	108.6	3.6	74.4	22.0	ND	2.90
OW-1007	113.4	0.0	85.0	15.0	ND	2.65
OW-1007	108.4	0.0	85.0	18.1	ND	2.66
OW-1009	135.9	2.7	74.6	22.7	ND	2.61
OW-1009	130.9	34.7	45.9	19.2	ND	2.75
OW-1010	143.4	0.0	89.3	10.7	ND	2.67
OW-1010	138.4	0.0	63.5	36.5	ND	2.63
OW-1012	131.9	0.0	76.1	23.9	ND	2.66
OW-1012	126.9	0.0	14.1	85.9	ND	2.66
OW-1013	132.9	0.0	91.1	8.9	ND	2.65
OW-1013	122.9	0.0	91.1	8.9	ND	2.65
OW-1015	126.9	0.0	97.7	2.8	ND	2.63
OW-1015	125.4	0.0	93.2	6.8	ND	2.67
B-1002	214.3	6.2	79.1	14.7	6.2	ND
B-1002	203.5	0.0	50.5	49.7	24.4	ND
B-1002	193.5	0.0	57.0	43.0	31.8	ND
B-1002	188.5	0.0	43.1	56.9	58.8	ND
B-1002	168.5	0.0	62.7	37.3	42.9	ND
B-1002	158.5	0.0	71.8	28.2	29.3	ND
B-1002	148.5	0.3	72.0	27.7	24.5	ND
B-1002	138.5	0.0	73.6	26.4	27.6	ND
B-1003	208.2	0.0	79.1	20.9	13.4	ND
B-1003	185.2	0.0	70.2	29.8	42.1	ND
B-1003	168.2	0.0	34.4	13.4	17.5	ND
B-1003	148.2	0.0	91.8	8.2	32.3	ND
B-1004	240.8	0.0	66.4	33.6	13.8	ND
B-1004	237.8	0.6	66.6	32.8	14.5	ND
B-1004	226.3	0.2	71.6	28.2	18.5	ND
B-1004	206.3	0.0	27.4	72.6	46.2	ND
B-1004	196.3	0.0	36.2	63.8	62.9	ND
B-1004	181.3	8.5	56.1	35.4	24.1	ND
B-1004	166.3	0.0	68.7	31.3	28.8	ND
B-1004	126.3	40.6	27.0	32.4	19.7	ND
B-1006	248.5	0.0	89.4	10.6	3.8	ND
B-1006	222.5	0.1	61.6	38.3	19.7	ND
B-1006	197.5	0.0	21.6	78.4	92.8	ND
B-1006	187.5	0.1	77.2	22.7	25.4	ND
B-1006	167.5	0.0	55.5	44.5	51.9	ND

Table 2.4.12-4 (cont.) Summary of Laboratory Test Results on Grain Size, Moisture Content and Specific Gravity for the Barnwell Formation

Borehole / Well No.	Sample Elevation (ft msl)	Grain Size Distribution			Moisture Content (%)	Specific Gravity
		Gravel (%)	Sand (%)	Clay/Silt (%)		
B-1006	147.5	25.2	39.2	35.6	22.0	ND
B-1010	211.1	0.0	87.2	12.8	5.7	ND
B-1010	185.1	0.0	69.8	30.2	18.9	ND
B-1010	160.1	0.0	68.1	31.9	27.3	ND
				Median	25.0	2.66

Notes: ND - Not Determined.
OW-series data are provided in Appendix 2.4A.
B-series data are provided in Appendix 2.5A.
Moisture content is by weight percent.

Table 2.4.12-5 Summary of Laboratory Test Results on Grain Size, Moisture Content, and Porosity for the Lisbon Formation

Borehole / Well No.	Sample Elevation (ft msl)	Grain Size Distribution			Moisture Content (%)	Porosity
		Gravel (%)	Sand (%)	Clay/Silt (%)		
B-1002	123.0	49.4	21.7	28.9	52.1	0.59
B-1002	118.5	14.6	26.4	59.0	56.5	0.56
B-1002	108.5	12.8	53.4	33.8	25.5	0.36
B-1002	98.5	53.7	21.8	24.5	13.5	0.25
B-1002	88.5	26.3	49.4	27.3	28.6	0.45
B-1003	135.2	16.5	50.1	33.4	67.4	ND
B-1003	130.2	1.6	57.8	40.6	30.6	0.46
B-1003	118.5	1.2	67.1	31.7	40.6	0.52
B-1003	101.5	11.7	45.8	42.5	28.0	0.42
B-1003	81.5	7.3	58.5	34.2	25.9	0.39
B-1004	105.9	1.0	52.7	46.3	44.6	0.56
B-1004	96.3	0.7	57.6	41.7	30.1	0.45
B-1004	86.3	38.0	29.8	32.2	25.1	0.43
B-1004	72.8	20.9	37.4	41.7	20.8	0.38
B-1004	61.3	34.9	41.3	23.8	29.0	0.44
B-1004	51.3	5.2	60.3	34.5	26.2	0.39
B-1004	132.5	0.0	23.4	76.6	53.7	ND
				Median	29.0	0.44

Notes: ND - Not Determined.
B-series data are provided in Appendix 2.5A.
Moisture content is by weight percent.
Porosity calculated assuming a specific gravity of 2.65.

Table 2.4.12-6 Summary of Laboratory Test Results on Grain Size, Moisture Content, and Specific Gravity for the Still Branch And Congaree Formations

Borehole / Well No.	Sample Elevation (ft msl)	Grain Size Distribution			Moisture Content (%)	Specific Gravity
		Gravel (%)	Sand (%)	Clay/Silt (%)		
OW-1002	8.9	0.2	79.6	20.2	ND	2.65
OW-1002	-9.6	0.0	1.4	90.6	ND	2.62
OW-1004	69.4	0.1	89.7	10.2	ND	2.69
OW-1004	64.4	0.0	93.4	6.6	ND	2.67
OW-1008	-11.9	0.0	83.2	16.8	ND	2.69
OW-1008	-21.9	2.2	67.9	20.3	ND	2.68
OW-1011	12.3	0.0	88.9	10.8	ND	2.67
OW-1011	-2.7	4.5	89.6	5.9	ND	2.66
OW-1014	37.4	0.0	87.8	12.2	ND	2.69
OW-1014	32.4	0.0	89.6	10.4	ND	2.66
B-1002	68.5	16.2	32.9	50.9	23.3	ND
B-1002	33.5	0.0	66.4	33.6	40.7	ND
B-1002	16.5	2.6	71.4	26.0	18.5	ND
B-1003	57.5	0.0	94.6	5.4	23.6	ND
B-1003	37.5	0.9	82.7	16.4	32.3	ND
B-1003	17.5	1.4	77.2	21.4	39.3	ND
B-1003	-17.5	0.0	89.1	10.9	23.2	ND
B-1003	-57.5	0.3	85.5	14.2	23.2	ND
B-1003	-92.5	70.7	26.0	3.3	32.7	ND
B-1003	-127.5	0.0	21.5	78.5	21.3	ND
B-1003	-177.5	0.3	83.9	15.8	18.9	ND
B-1003	-227.5	0.0	84.1	15.9	28.6	ND
B-1003	-273.5	0.0	86.8	13.2	26.4	ND
				Median	24.0	2.67

Notes: ND - Not Determined.
OW-series data are provided in Appendix 2.4A.
B-series data are provided in Appendix 2.5A.
Moisture content is by weight percent.

Table 2.4.12-7 Georgia EPD Permitted Municipal and Industrial Groundwater Users within 25 miles of the VEGP Site

Well ID	Permit Holder	County	Aquifer	Year	Permitted Monthly Average, gpm (mgpd)	Permitted Annual Average, gpm (mgpd)	Average Annual Water Use, gpm (mgpd)
C-2	City of Sardis	Burke	Floridan	2004	278 (0.40)	278 (0.40)	63 (0.09)
				2005	278 (0.40)	278 (0.40)	NA
C-12	East Central Regional Hospital - Gracewood Campus	Richmond	Cretaceous Sand	2004	347 (0.50)	278 (0.40)	146 (0.21)
				2005	NA	NA	76 (0.11)
C-13	City of Hephzibah	Richmond	Cretaceous Sand	2004	833 (1.20)	833 (1.20)	160 (0.23)
				2005	NA	NA	236 (0.34)
C-19	Olin Corporation	Richmond	Cretaceous Sand	2004	847 (1.22)	847 (1.22)	514 (0.74)
				2005	NA	NA	486 (0.70)
C-19	Olin Corporation - Corrective Action Wells	Richmond	Cretaceous Sand	2004	632 (0.91)	632 (0.91)	229 (0.33)
				2005	NA	NA	250 (0.36)
I-1	International Paper	Burke	Cretaceous Sand	2004	660 (0.95)	660 (0.95)	181 (0.26)
				2005	660 (0.95)	660 (0.95)	35 (0.05)
I-2	Prayon, Inc	Richmond	Cretaceous Sand	2004	292 (0.42)	264 (0.38)	35 (0.05)
				2005	NA	NA	63 (0.09)
I-3	Thermal Ceramics, Inc.	Richmond	Cretaceous Sand	2004	625 (0.90)	625 (0.90)	313 (0.45)
				2005	NA	NA	208 (0.30)
I-4	Procter & Gamble Manufacturing Company	Richmond	Cretaceous Sand	2004	486 (0.70)	486 (0.70)	278 (0.40)
				2005	NA	NA	243 (0.35)
I-5	Southern Wood Piedmont Company	Richmond	Cretaceous Sand	2004	451 (0.65)	451 (0.65)	188 (0.27)
				2005	NA	NA	174 (0.25)
M-1	City of Waynesboro	Burke	Cretaceous Sand	2004	2778 (4.00)	2431 (3.50)	NA
				2005	2778 (4.00)	2431 (3.50)	NA
M-2	Augusta-Richmond Utilities Department	Richmond	Cretaceous Sand	2004	12778 (18.40)	12083 (17.40)	8285 (11.93)
				2005	NA	NA	8.40
	Southern Nuclear Operating Co.	Burke	Cretaceous Sand	2004	4167 (6.00)	3819 (5.50)	556 (0.80)
				2005	4167 (6.00)	3819 (5.50)	583 (0.84)

Notes: NA – not available
Groundwater permit and usage data **(Voudy 2006)**
Groundwater aquifer description **(Georgia DNR 2006)**
Well locations are labeled in Figure 2.4.12-19 using the listed Well IDs.
Southern Nuclear Operating Co. well locations are shown on Figure 2.4.12-20.

Table 2.4.12-8 Georgia EPD Permitted Agricultural Groundwater Users within 25 miles of the VEGP Site

Well ID	Permit Holder	County	Depth (ft)	Permit (gpm)
A-1	ANDERSON JOHN	Burke	363	1500
A-2	BLANCHARD HENRY	Burke	500	1200
A-3	BLANCHARD HENRY	Burke	450	1400
A-4	BOLLWEEVIL PLANATION	Burke	300	190
A-5	Chance Bill	Burke	500	450
A-6	CHANDLER FARM	Burke	580	1600
A-7	Chandler Michael	Burke	556	2400
A-8	Chandler Randall	Burke	579	2500
A-9	COCHRAN IRBY	Burke	420	1350
A-10	COLLINS ROBERT	Burke	430	1350
A-11	COLLINS ROBERT	Burke	530	1200
A-12	COLLINS ROBERT	Burke	480	1100
A-13	COLLINS ROBERT	Burke	440	1100
A-14	Collins Robert	Burke	490	1700
A-15	DIXON CARL	Burke	600	2000
A-16	DIXON JAMES	Burke	210	400
A-17	DIXON JAMES	Burke	200	200
A-18	DIXON JOANNE	Burke	640	1150
A-19	DIXON PERCY	Screven	560	2000
A-20	DIXON PERCY	Burke	560	2000
A-21	DIXON PERCY	Burke	350	115
A-22	DIXON PERCY	Burke	350	115
A-23	DIXON PERCY	Burke	550	3400
A-24	DIXON PERCY	Burke	350	200
A-25	DIXON PERCY	Burke	575	2500
A-26	DIXON PERCY	Burke	550	2500
A-27	GWR Partnership LLP	Burke	360	200
A-28	Hatcher William	Burke	300	500
A-29	HEATH CLAXTON	Burke	300	150
A-30	HEATH CLAXTON	Burke	400	250
A-31	HEATWOLE BYARD	Burke	325	200
A-32	HOPKINS HENRY	Burke	363	350
A-33	Horst Isaac	Burke	260	250
A-34	MALLARD CLYDE	Burke	320	400
A-35	MALLARD CLYDE MALLARD FARMS	Burke	210	250
A-36	MALLARD J.	Burke	200	150
A-37	McGregor Charles	Burke	430	350
A-38	MOBLEY DANNY	Burke	396	350
A-39	Mobley Danny	Burke	424	650
A-40	MOBLEY HERBERT	Burke	465	1100
A-41	MOBLEY HERBERT	Burke	500	1250
A-42	MOBLEY JAMES F.	Burke	572	2000
A-43	PENNINGTON FARMS- INC.	Burke	240	250
A-44	RAYMOND NEIL	Burke	430	1350

Table 2.4.12-8 (cont.) Georgia EPD Permitted Agricultural Groundwater Users within 25 miles of the VEGP Site

Well ID	Permit Holder	County	Depth (ft)	Permit (gpm)
A-45	Shepherd Joseph	Burke	421	1500
A-46	SMART DARRELL	Burke	300	350
A-47	SMART DARRELL	Burke	300	350
A-48	SMART DARRELL	Burke	300	350
A-49	SMART DARRELL	Burke	300	400
A-50	MIMS JOHN	Jenkins	445	1500
A-51	MIMS JOHN	Jenkins	460	1500
A-52	MULKEY A.	Jenkins	300	1000
A-53	MULKEY A.	Jenkins	400	500
A-54	PARKER GEORGE	Jenkins	450	700
A-55	PARKER GEORGE	Jenkins	300	450
A-56	PARKER GEORGE	Jenkins	300	450
A-57	Parker George	Jenkins	450	450
A-58	POINTE SOUTH GOLF CLUB- INC.	Richmond	311	400
A-59	BRAGG SOL	Screven	380	240
A-60	BRIAR CREEK COUNTRY CLUB	Screven	180	300
A-61	CAIN BRIAN	Screven	390	600
A-62	Cain Brian	Screven	493	1100
A-63	CLEMENT INVESTMENTS	Screven	282	1250
A-64	FOREHAND FARMS	Screven	160	250
A-65	Lee Mike	Screven	480	1800
A-66	Mill Haven Company Inc.	Screven	600	1200
A-67	MILLHAVEN CO.- INC.	Screven	553	1900
A-68	MILLHAVEN CO.- INC.	Screven	565	1400
A-69	NEWTON JAMES	Screven	350	400
A-70	SOWELL CAROLYN	Screven	275	300
A-71	STEPONGZI FRANK & PEARL	Screven	225	300
A-72	THOMPSON JAMES	Screven	475	750
A-73	THOMPSON ROGER	Screven	500	1000
A-74	WADE PLANTATION	Screven	215	200
A-75	WADE PLANTATION	Screven	250	190
A-76	WADE PLANTATION	Screven	460	1200
A-77	WADE PLANTATION	Screven	119	1000
A-78	WADE PLANTATION	Screven	750	1800
A-79	WADE PLANTATION	Screven	494	900
A-80	WADE PLANTATION	Screven	475	1200
A-81	WADE PLANTATION	Screven	672	1100
A-82	WADE PLANTATION	Screven	475	1100
A-83	WADE PLANTATION	Screven	525	1400
A-84	Wade Plantation	Screven	467	1100

Notes: Groundwater permit data **(Lewis 2006)**
Well locations are labeled in Figure 2.4.12-19 using the listed Well IDs.

Table 2.4.12-9 SDWIS Listed Public Water Systems Supplied From Groundwater Within 25 Miles of the VEGP Site in Georgia

Well ID	Water System ID	Water System Name	County Served	Type	System Status
C-1	GA0330000	Girard	Burke	Community	Active
C-2	GA0330002	Sardis	Burke	Community	Active
C-3	GA0330013	Mamie Joe Rhodes Harrison Subdivision	Burke	Community	Closed
C-4	GA0330006	Burke Academy	Burke	Non-Transient Non-Community	Active
C-5	GA0330022	Burke County Training Center	Burke	Non-Transient Non-Community	Active
C-6	GA0330020	Delaigle Mobile Home Park	Burke	Transient Non-Community	Closed
C-7	GA1650000	Millen	Jenkins	Community	Active
C-8	GA1650001	Perkins Water Authority	Jenkins	Community	Active
C-9	GA1650006	Jockey International, Inc.	Jenkins	Non-Transient Non-Community	Active
C-10	GA1650005	DNR - Magnolia Springs State Pk.	Jenkins	Transient Non-Community	Active
C-11	GA1650008	National Fish Hatchery	Jenkins	Transient Non-Community	Closed
C-12	GA2450023	East Central Regional Hospital	Richmond	Community	Active
C-13	GA2450002	Hephzibah	Richmond	Community	Active
C-14	GA2450017	Hephzibah - Oakridge	Richmond	Community	Active
C-15	GA2450014	Mars Trailer Park	Richmond	Community	Active
C-16	GA2450016	Mobile Home Country Club MHP	Richmond	Community	Active
C-17	GA2450004	Richmond County	Richmond	Community	Closed
C-18	GA2450159	Albion Kaolin Company	Richmond	Non-Transient Non-Community	Closed
C-19	GA2450152	Olin Chemicals	Richmond	Non-Transient Non-Community	Closed
C-20	GA2510000	Hiltonia	Screven	Community	Active
C-21	GA2510015	Buck Creek M.H.P.	Screven	Community	Closed
C-22	GA2510052	Millhaven Plantation	Screven	Community	Closed
C-23	GA2510011	DOT - Georgia Welcome Center	Screven	Transient Non-Community	Active
C-24	GA2510057	Savannah River Challenge Program	Screven	Transient Non-Community	Active
	GA0330035	Southern Nuclear - Simulator Bld	Burke	Non-Transient Non-Community	Active
	GA0330017	Southern Nuclear - Vogtle Makeup	Burke	Non-Transient Non-Community	Active
	GA0330036	Southern Nuclear - Vogtle Rec	Burke	Transient Non-Community	Active

Notes: US EPA SDWIS Database **(EPA 2006b)**
Well locations are labeled in Figure 2.4.12-19 using the listed Well IDs.
Southern Nuclear Operating Co. well locations are shown on Figure 2.4.12-20.

Table 2.4.12-10 Water-Supply Wells for the Existing VEGP Plant

Water Supply Well No.	Well Depth (ft)	Aquifer	Design Yield (gpm)	Water Use
MU-1	851	Cretaceous	2000	Make-up water for plant use (nuclear service water system; make-up to the water treatment plant demineralizer, and potable water source).
MU-2A	884	Cretaceous	1000	Make-up water for plant use (nuclear service water system; make-up to the water treatment plant demineralizer, and potable water source).
TW-1	860	Cretaceous	1000	Back-up water for the production make-up well system.
SW-5	200	Tertiary	20	Water supply for old security tactical training area.
IW-4	370	Tertiary	120	Irrigation water for ornamental vegetation.
CW-3	220	Tertiary	NA	Water supply for nuclear operations garage.
REC	265	Tertiary	150	Potable water supply for recreation area.
SB	340	Tertiary	50	Potable water supply for simulator training building.
SEC	320	Tertiary	10	Non-potable water for lavatory use at a new plant entrance security building

Notes: NA – not available
Water supply well data (excluding SEC well) **(SNS 2005b)**
SEC well data **(SNS 2005a)**
Well locations, excluding Well REC, are shown on Figure 2.4.12-20. Well REC is located approximately 9300 ft southwest from Well IW-4.

Table 2.4.12-11 Groundwater Use of the existing VEGP Plant from January 1, 2005 to December 31, 2005, gpm (Thousands of Gallons)

Month	Well MU-1	Well MU-2A	Well TW-1	Well SW-5	Well IW-4	Well CW-3	Well REC	Well SB
January	445 (19,209)	0	0	0	0	0.07 (3)	0.88 (38)	0.05 (2)
February	403 (17,416)	0	0	0	0	0.05 (2)	1.16 (50)	1.34 (58)
March	500 (21,601)	0	0	0	0	0.05 (2)	0.95 (41)	1.25 (54)
April	607 (26,211)	0	0	0	0	0.02 (1)	1.09 (47)	1.5 (65)
May	686 (29,648)	0	0	0	0	0.05 (2)	1.55 (67)	1.74 (75)
June	825 (35,625)	0	0	0	0.32 (14)	0.05 (2)	0.97 (42)	1.92 (83)
July	552 (23,846)	0	0	0	1.27 (55)	0.05 (2)	2.89 (125)	2.73 (118)
August	569 (24,560)	0	0	0	2.92 (126)	0.14 (6)	2.41 (104)	1.53 (66)
September	649 (28,020)	0	0	0	3.1 (134)	0.09 (4)	1.94 (84)	1.6 (69)
October	701 (30,290)	0	0	0	0	0.07 (3)	1.83 (79)	1.13 (49)
November	469 (20,282)	67 (2,880)	0	0	0	0.05 (2)	1.67 (72)	2.41 (104)
December	610 (26,363)	0	0	0	0	0.05 (2)	0.95 (41)	3.7 (160)
Total	7016 (303,071)	67 (2,880)	0	0	7.62 (329)	0.72 (31)	18.26 (789)	22.55 (974)
Monthly Average	585 (252,56)	6 (240)	0	0	0.625 (27)	0.07 (3)	1.53 (66)	1.88 (81)

Notes: Groundwater use data from Southern Nuclear Operating Company
SEC well is active in 2006

Table 2.4.12-12 Projected Groundwater Use for Two AP1000 Units

Water Use	Normal Case (gpm)	Maximum Case (gpm)
Service Water System Make-up	537	2353
Potable Water System	42	140
Demineralized Water System	150	600
Fire Protection System	10	12
Miscellaneous Users	13	35
Total	752	3140

GEOLOGIC TIME		SNC ESP NOMENCLATURE		
PERIOD	SERIES	GEOLOGIC UNIT	HYDROGEOLOGIC UNIT	REGIONAL HYDROGEOLOGIC UNIT
TERTIARY	Eocene	Barnwell Gr.	Water Table aquifer	Southeastern Coastal Plain Aquifer System
		Lisbon Fm. / Blue Bluff Mbr.	Confining unit	
		Still Branch Fm. Congaree Fm.	Tertiary sand aquifer	
	Paleocene	Snapp Fm. Black Mingo Fm.	Semi-confining unit	
Cretaceous		Steel Creek Fm.	Cretaceous aquifer	
		Gaillard Fm. / Black Creek Fm.		
		Pio-Nono Fm. / unnamed sands		
		Cape Fear Fm.		

Notes: Geologic unit naming convention **(Huddlestun and Summerour 1996; Falls and Prowell 2001)**
Regional hydrogeologic unit naming convention **(Miller 1990)**

Figure 2.4.12-1 Schematic Hydrostratigraphic Classification for VEGP Site

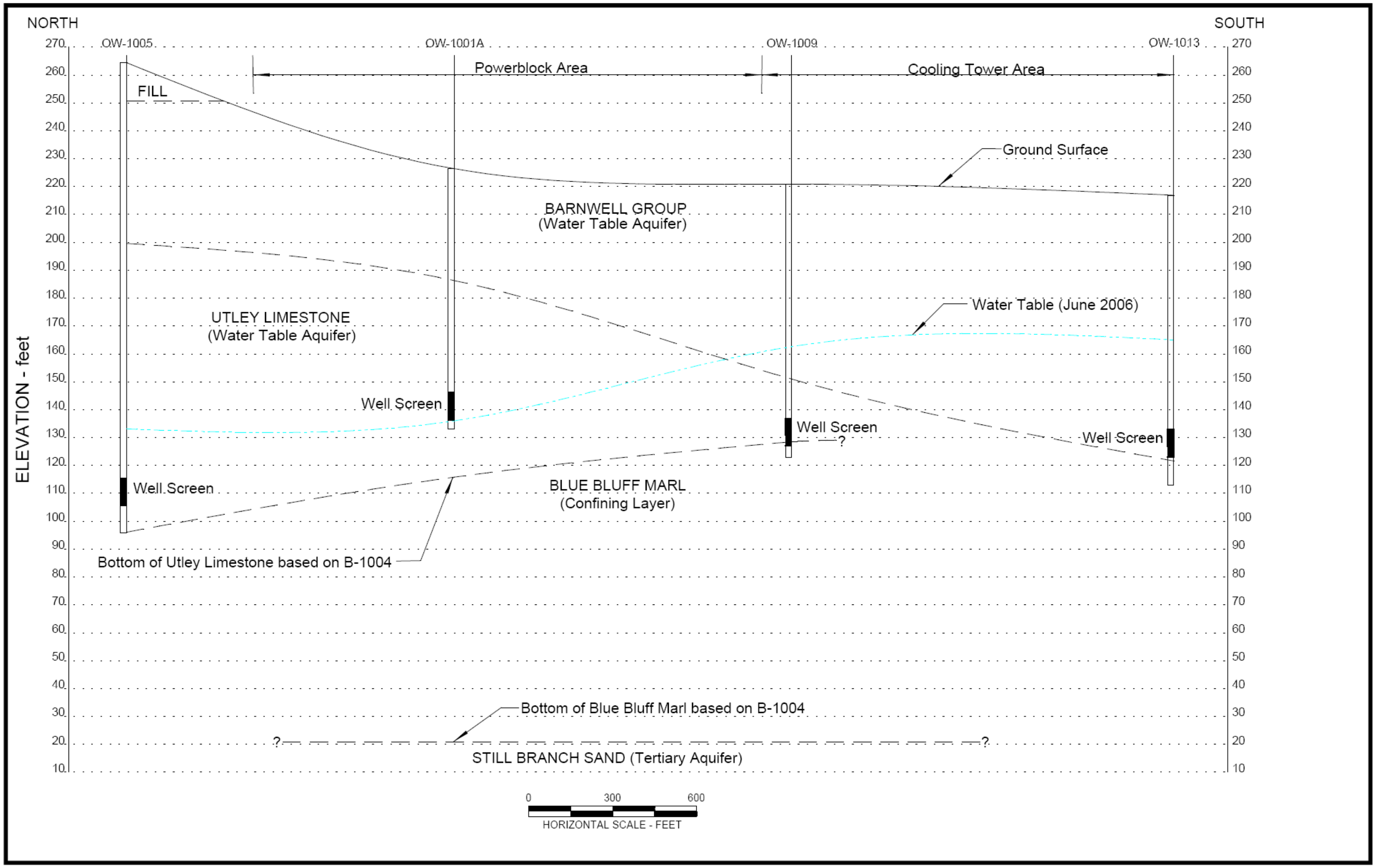

Figure 2.4.12-2A Hydrogeologic Cross-Section of the Water Table Aquifer at the VEGP Site

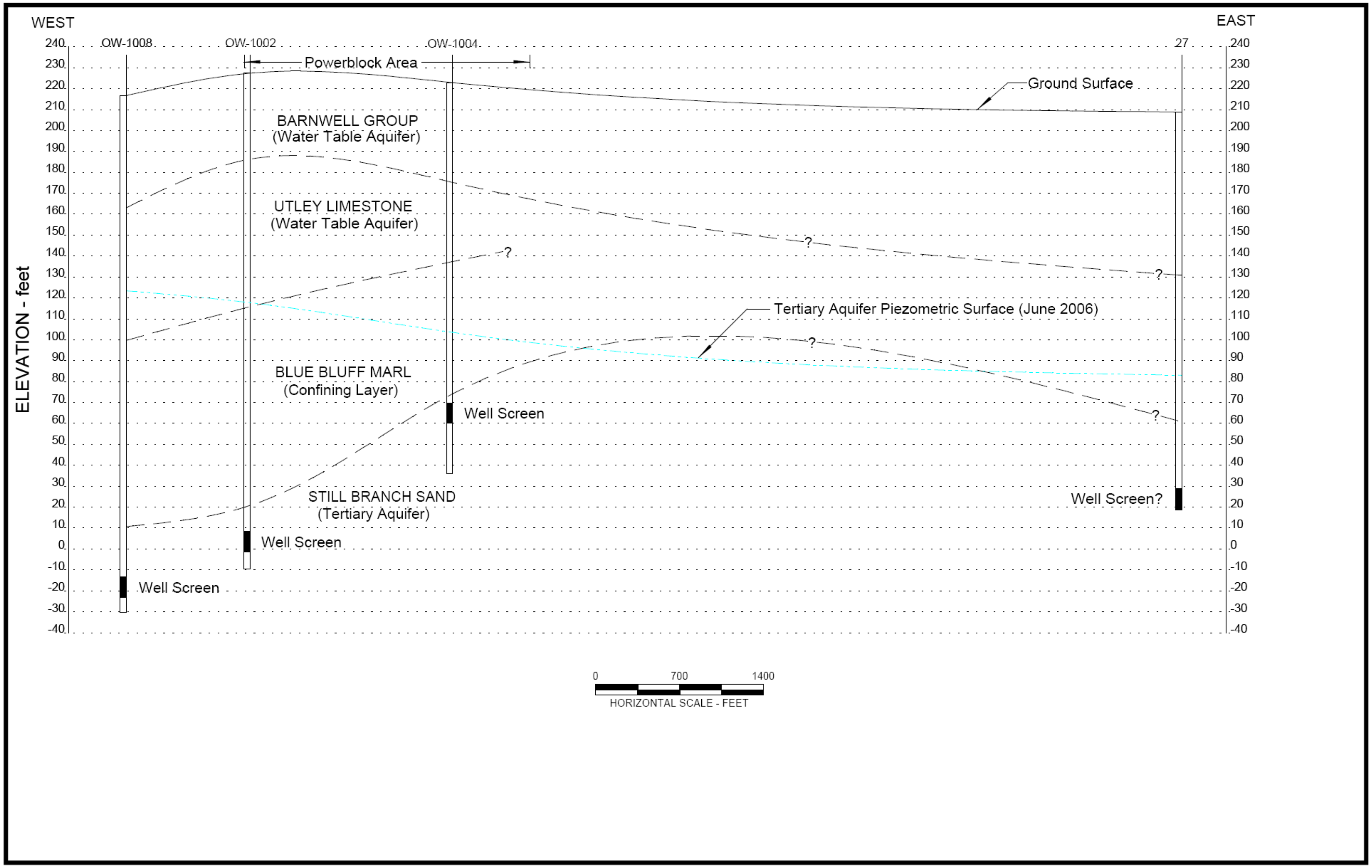

Figure 2.4.12-2B Hydrogeologic Cross-Section of the Tertiary Aquifer at the VEGP Site

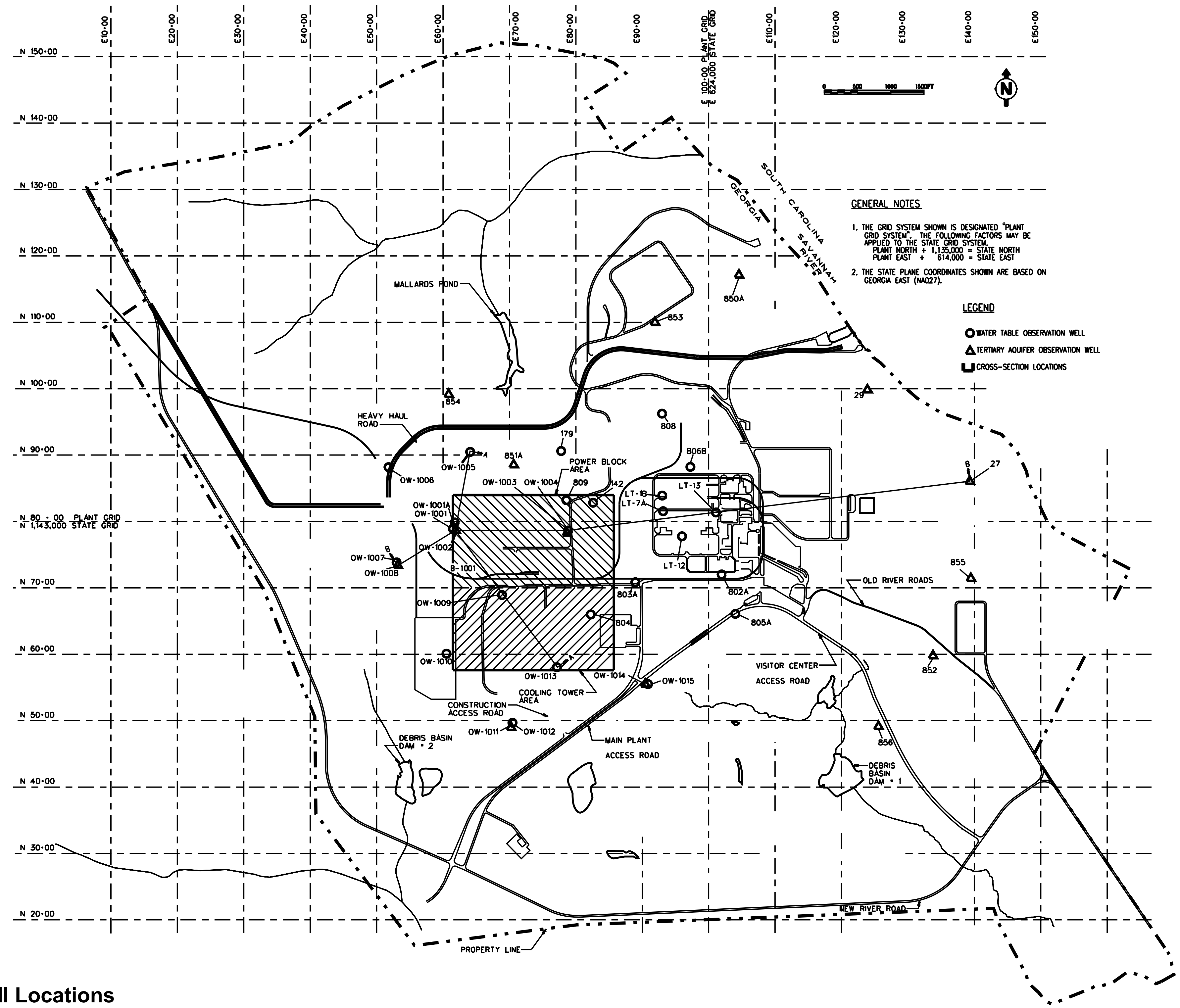

Figure 2.4.12-3 Observation Well Locations

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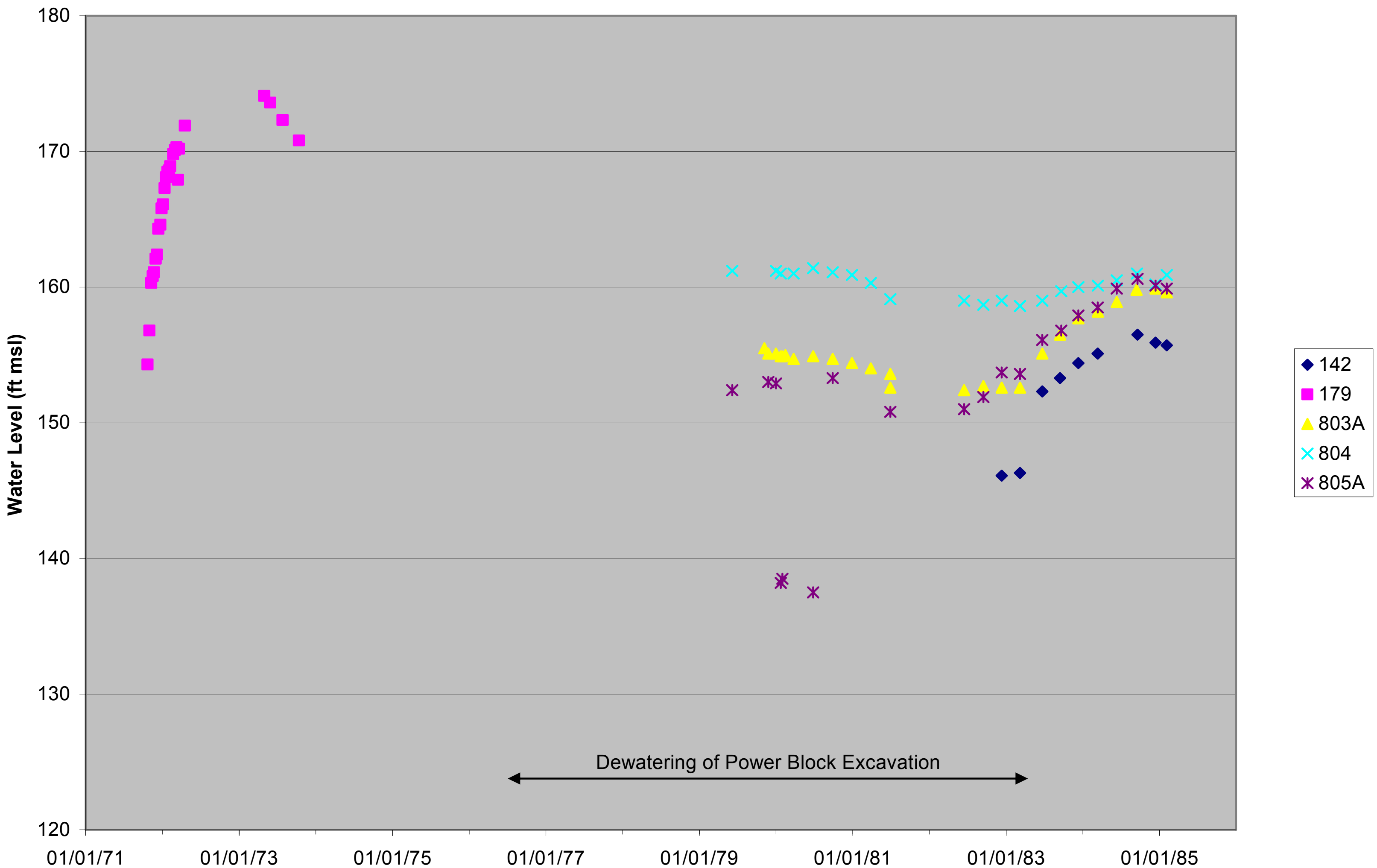

Figure 2.4.12-4 Water Table Aquifer: 1971–1985 Hydrographs

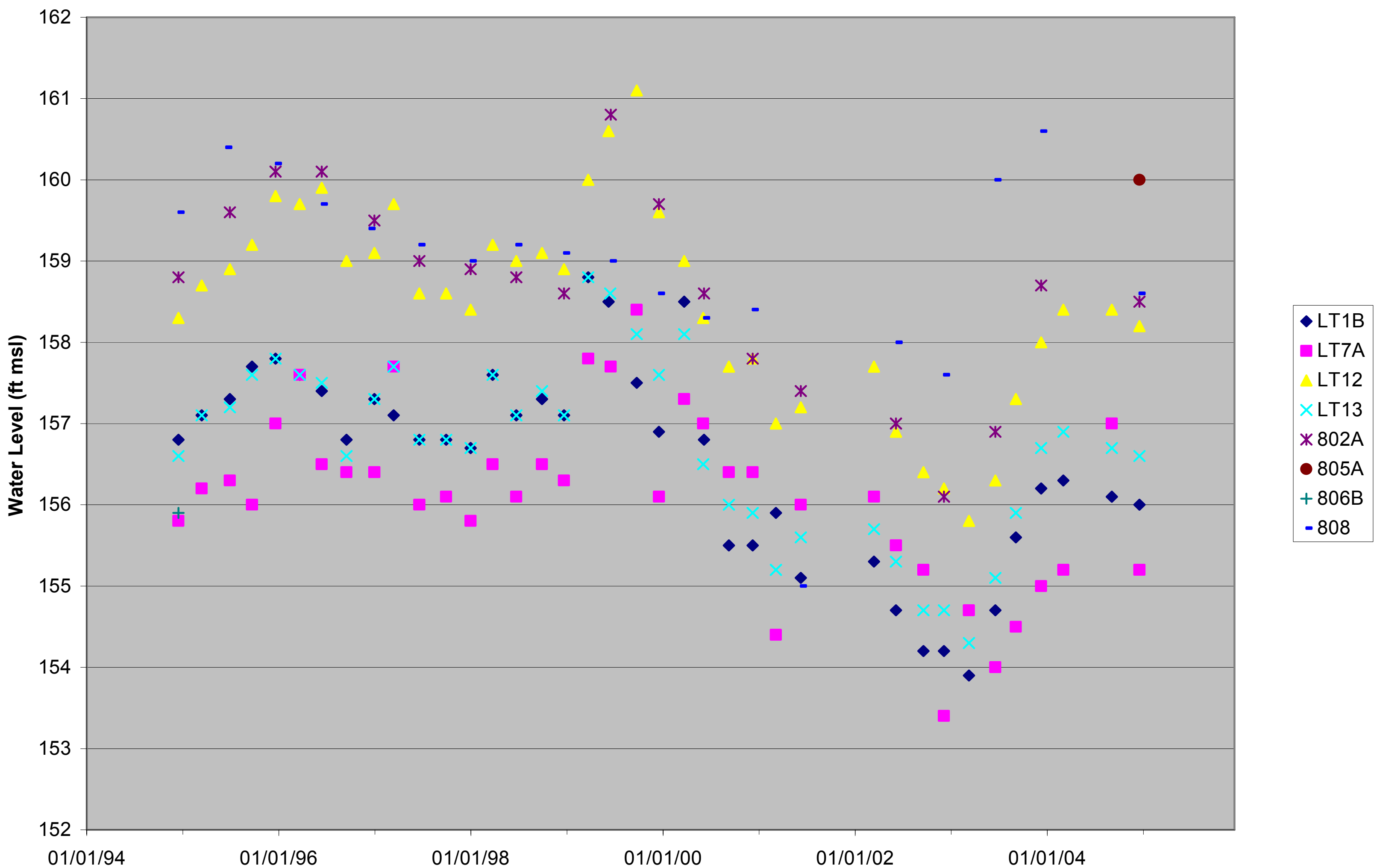

Figure 2.4.12-5 Water Table Aquifer: 1995–2004 Hydrographs

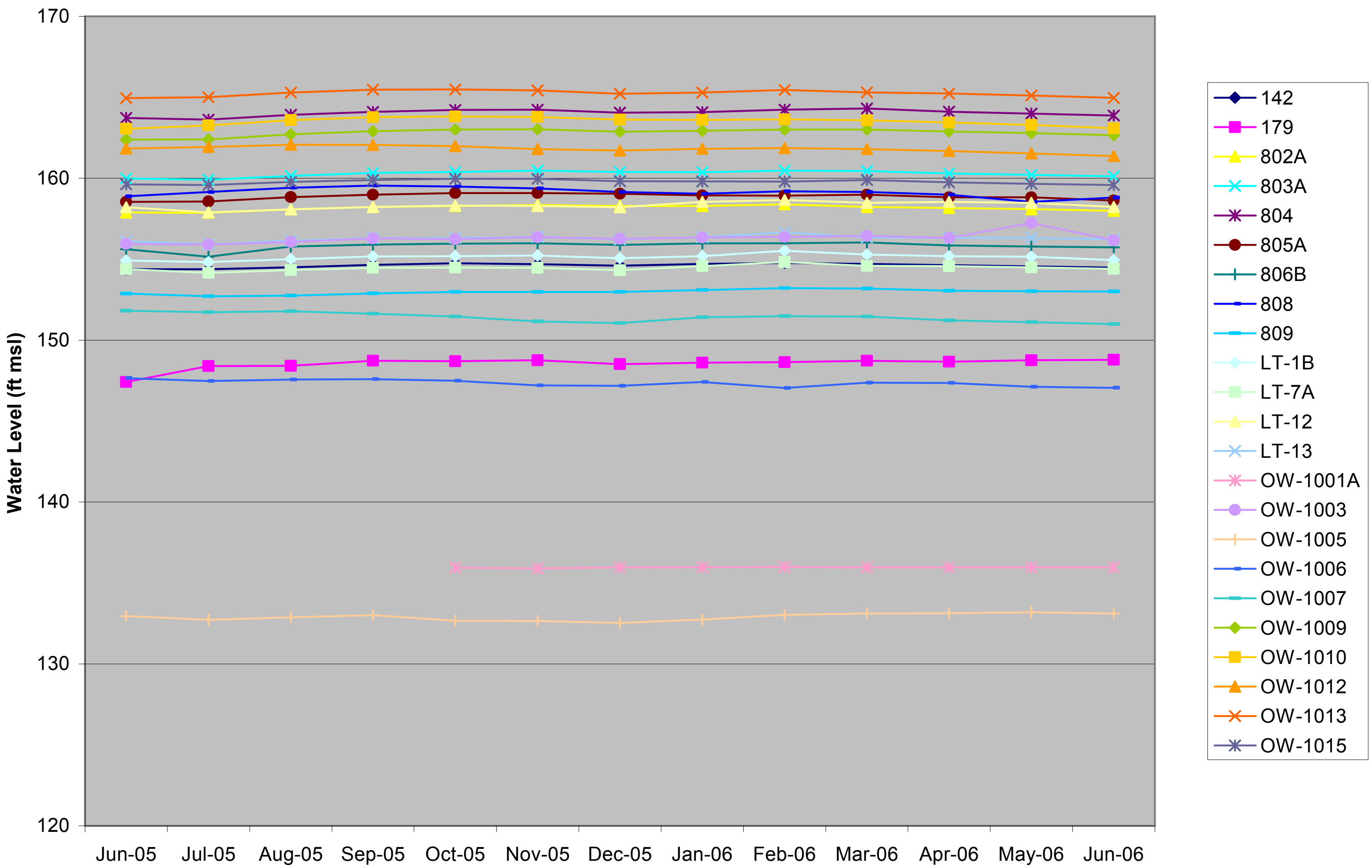

Figure 2.4.12-6 Water Table Aquifer: June 2005 – June 2006 Hydrographs

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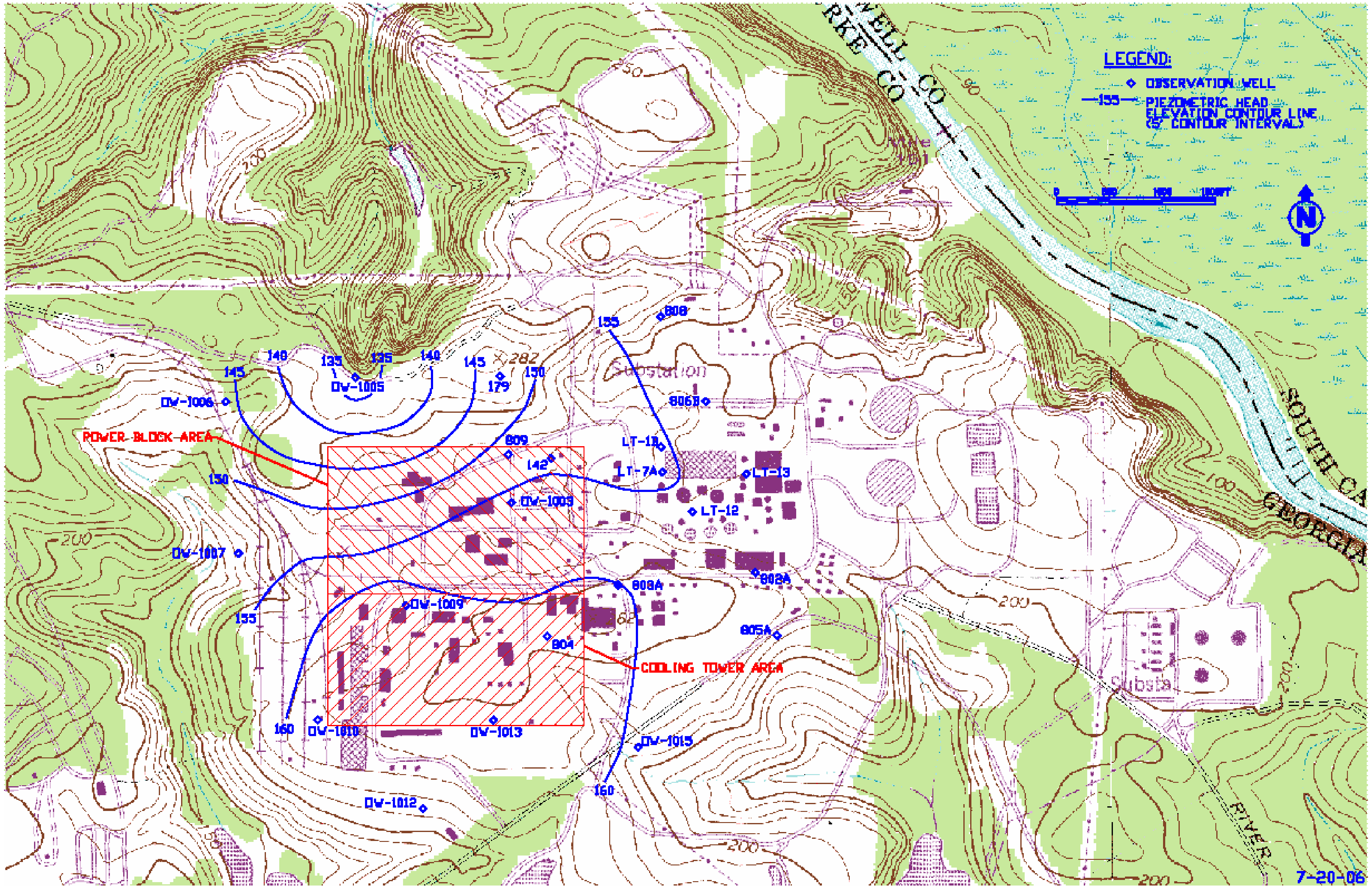

Figure 2.4.12-7 Water Table Aquifer: Piezometric Contour Map for June 2005

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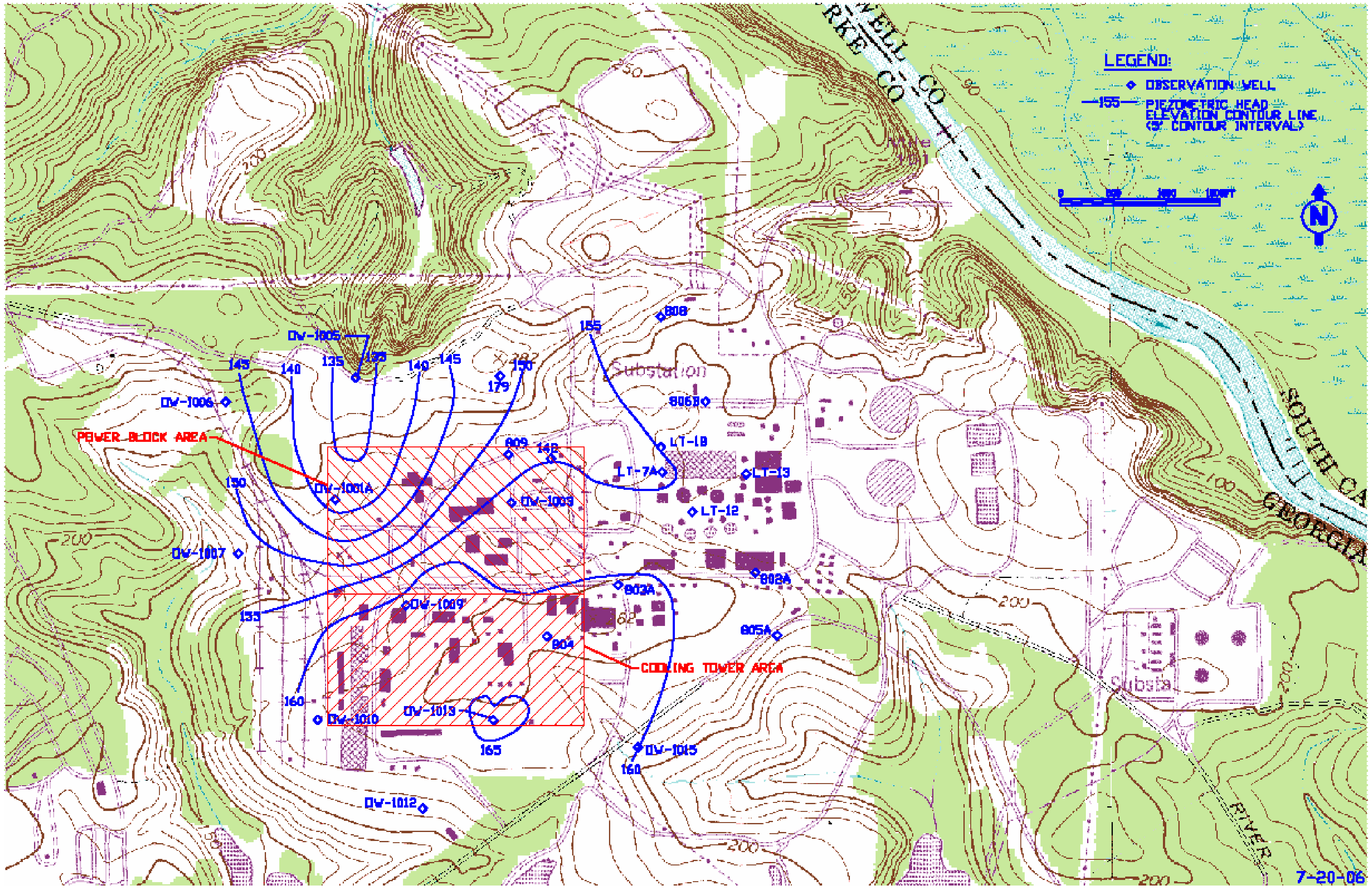

Figure 2.4.12-8 Water Table Aquifer: Piezometric Contour Map for October 2005

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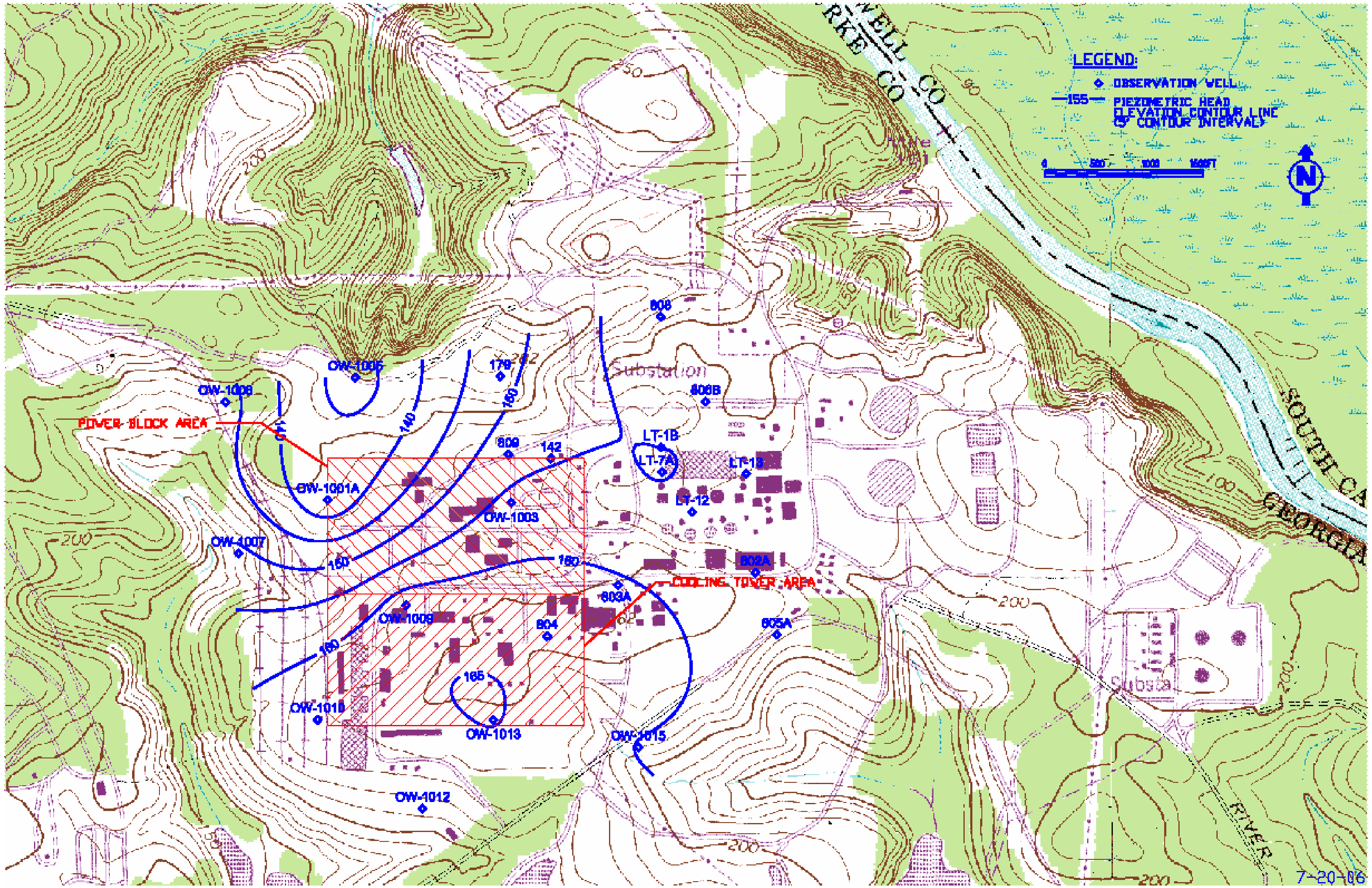

Figure 2.4.12-9 Water Table Aquifer: Piezometric Contour Map for December 2005

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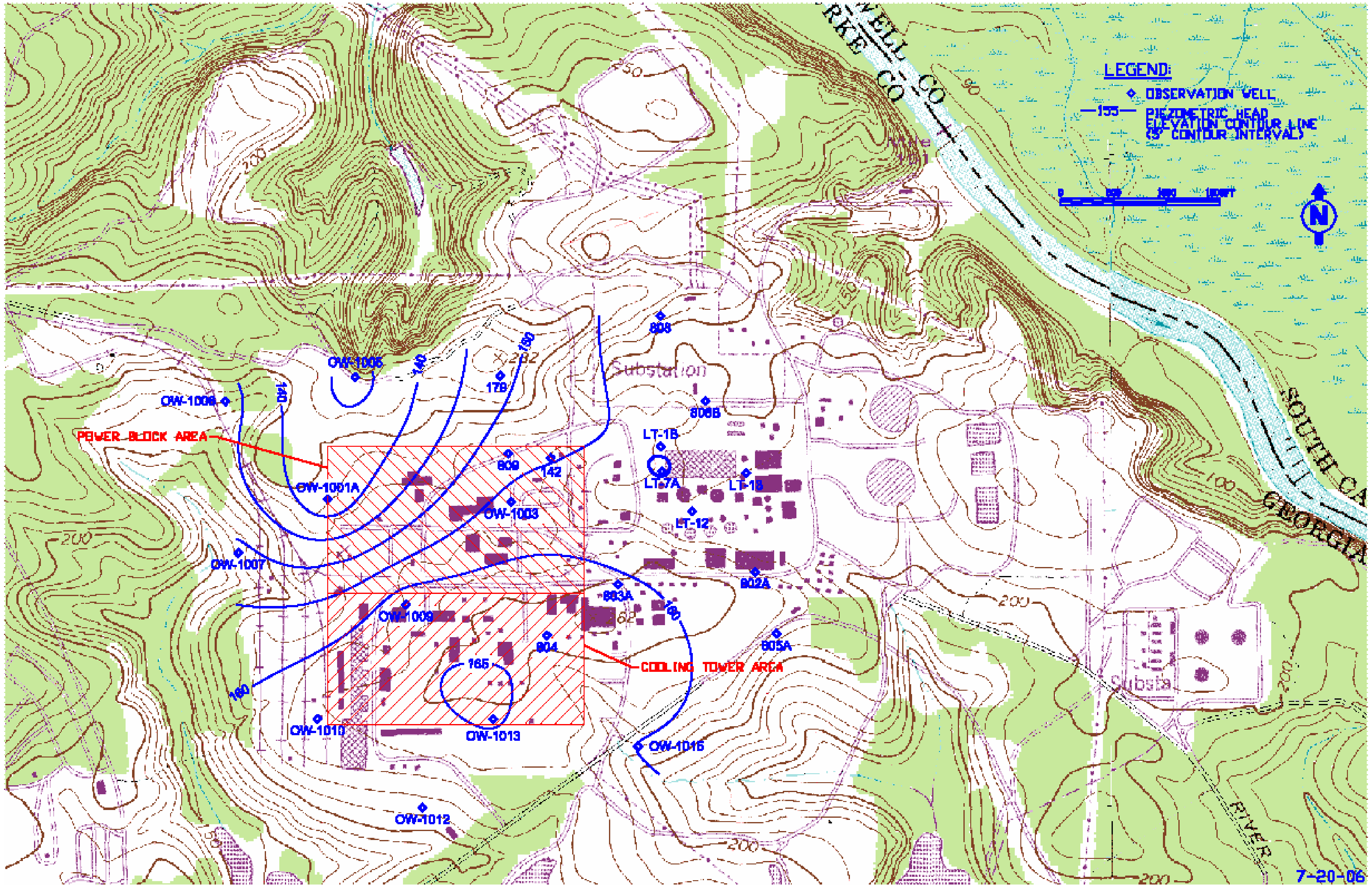

Figure 2.4.12-10 Water Table Aquifer: Piezometric Contour Map for March 2006

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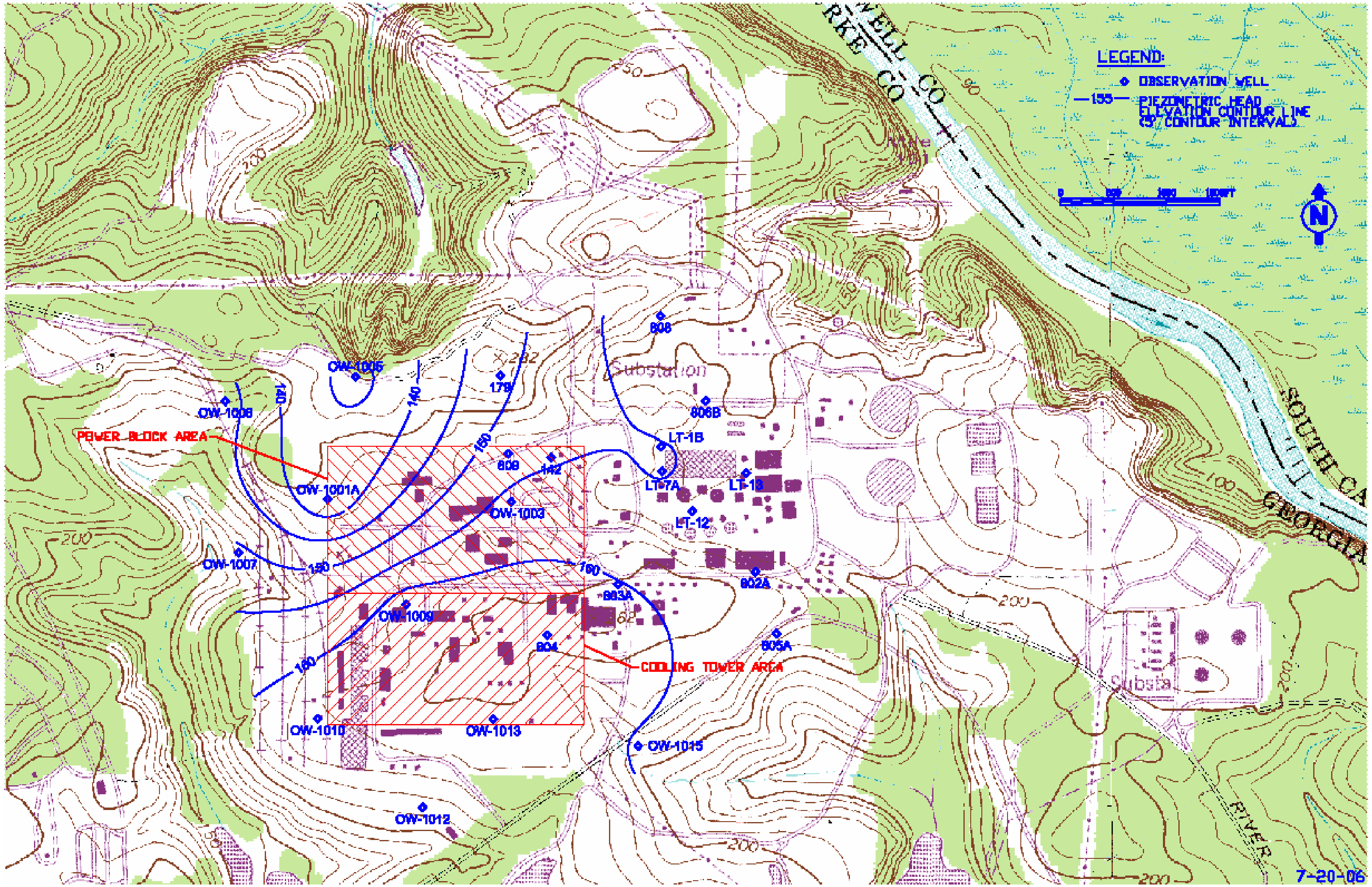

Figure 2.4.12-11 Water Table Aquifer: Piezometric Contour Map for June 2006

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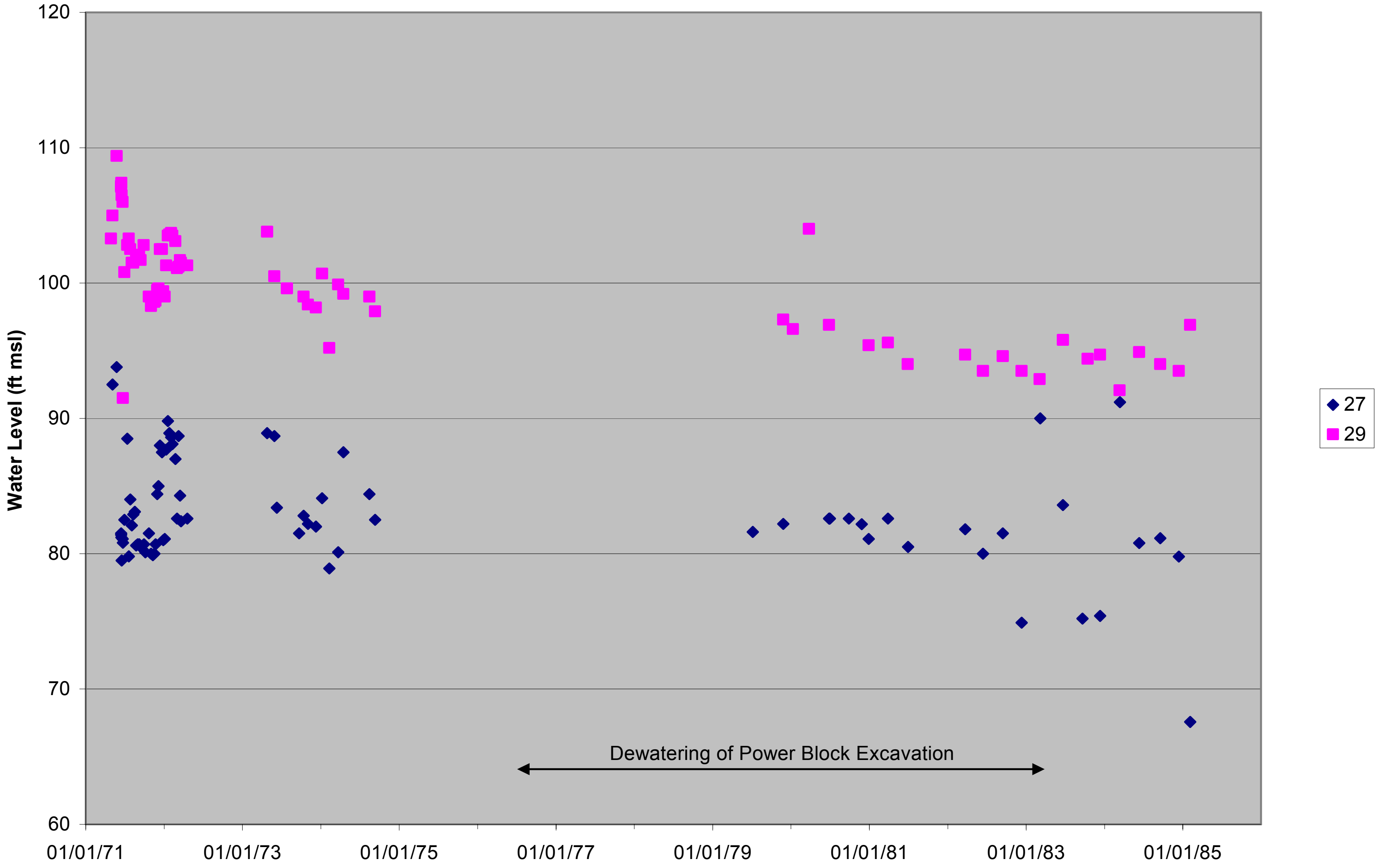

Figure 2.4.12-12 Tertiary Aquifer: 1971–1985 Hydrographs

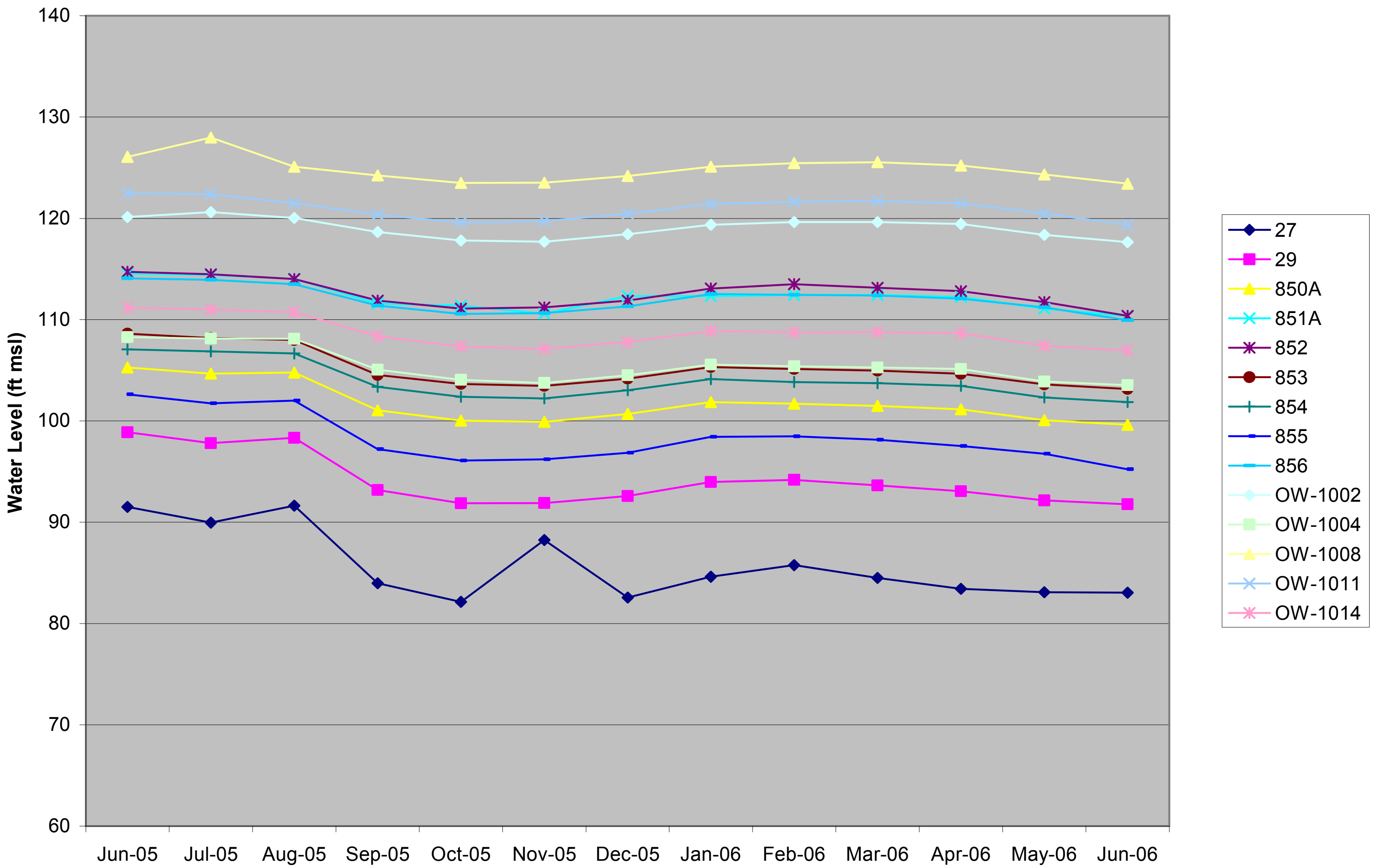

Figure 2.4.12-13 Tertiary Aquifer: June 2005 – June 2006 Hydrographs

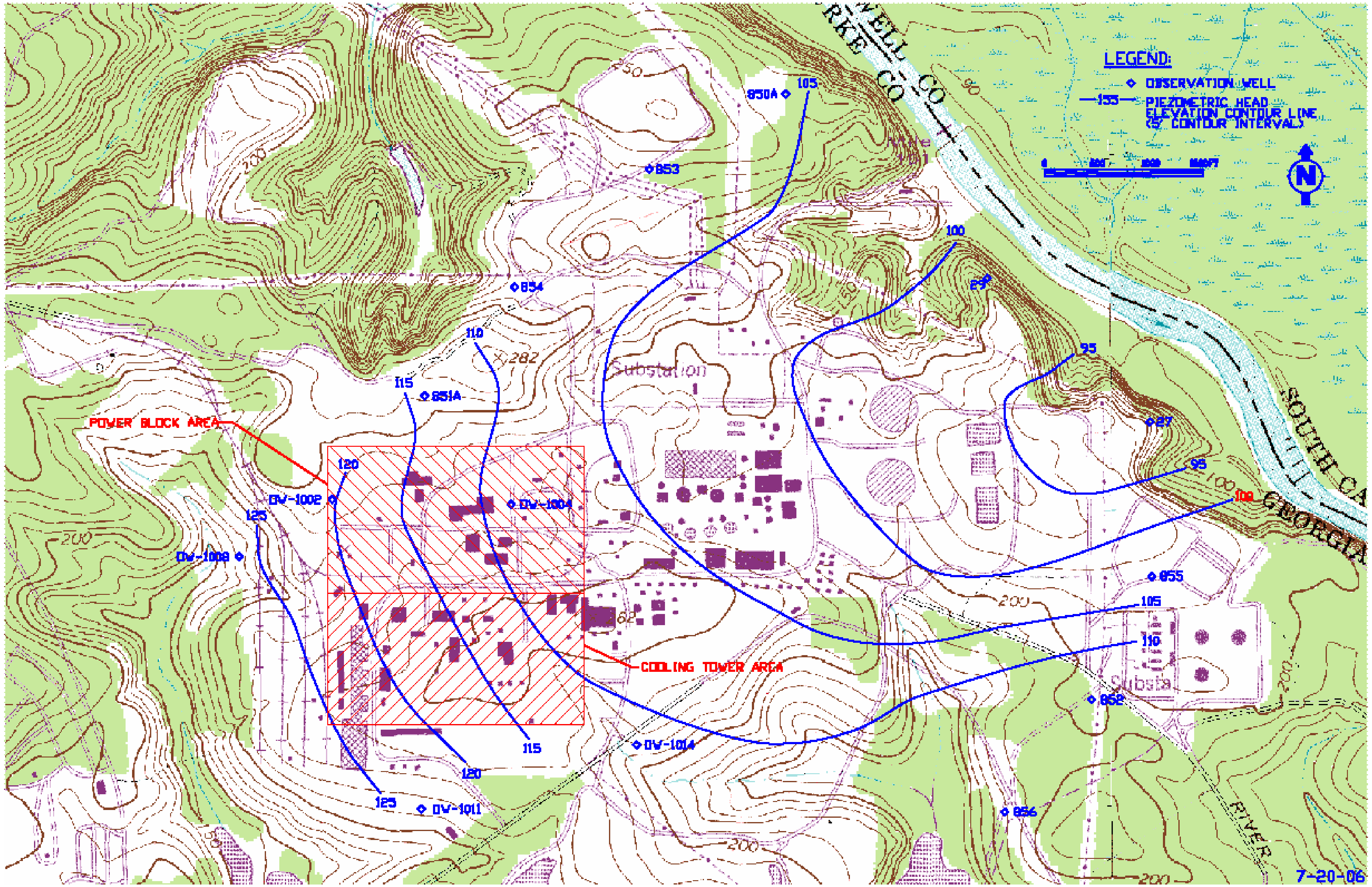

Figure 2.4.12-14 Tertiary Aquifer: Piezometric Contour Map for June 2005

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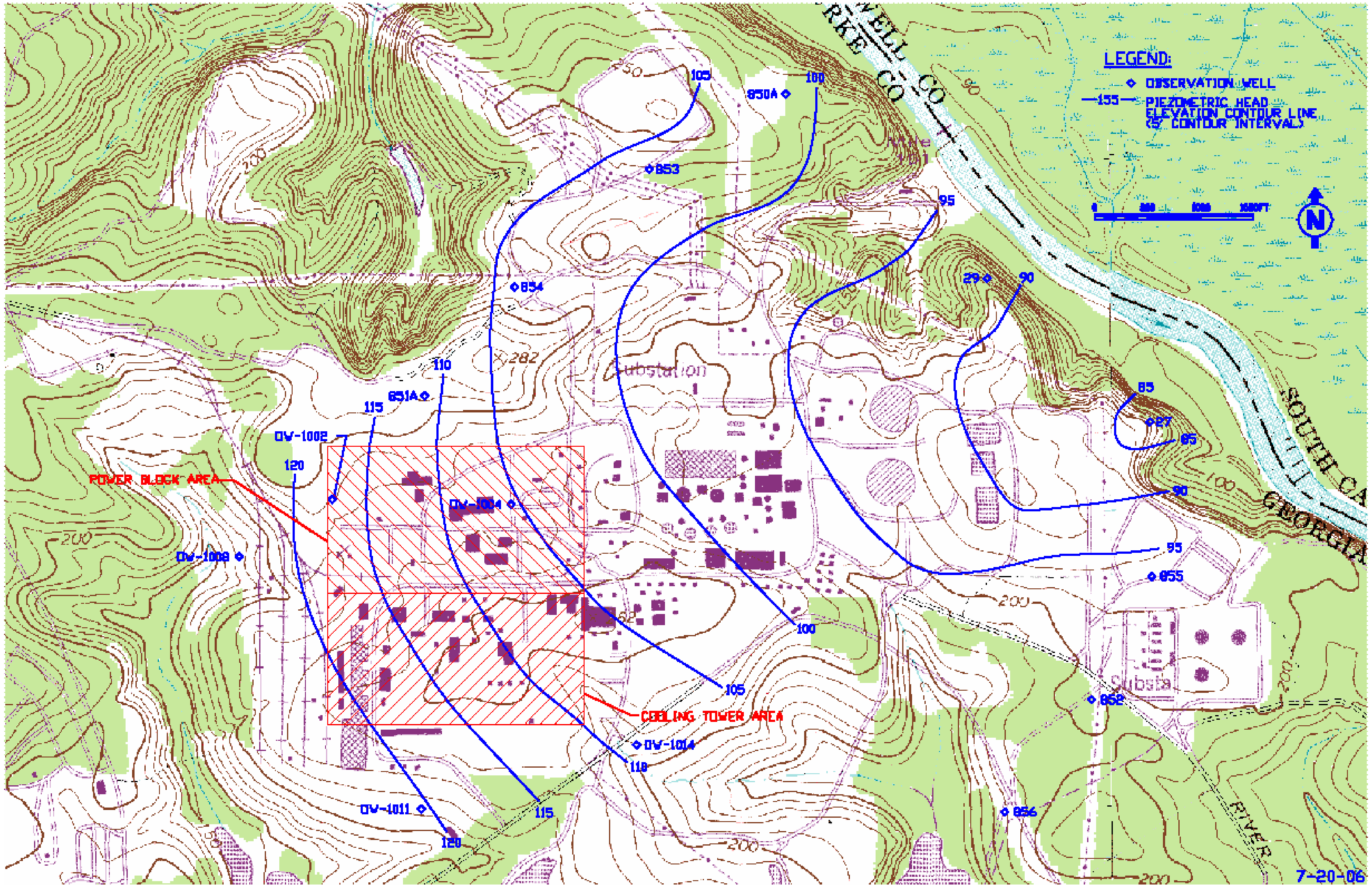

Figure 2.4.12-15 Tertiary Aquifer: Piezometric Contour Map for September 2005

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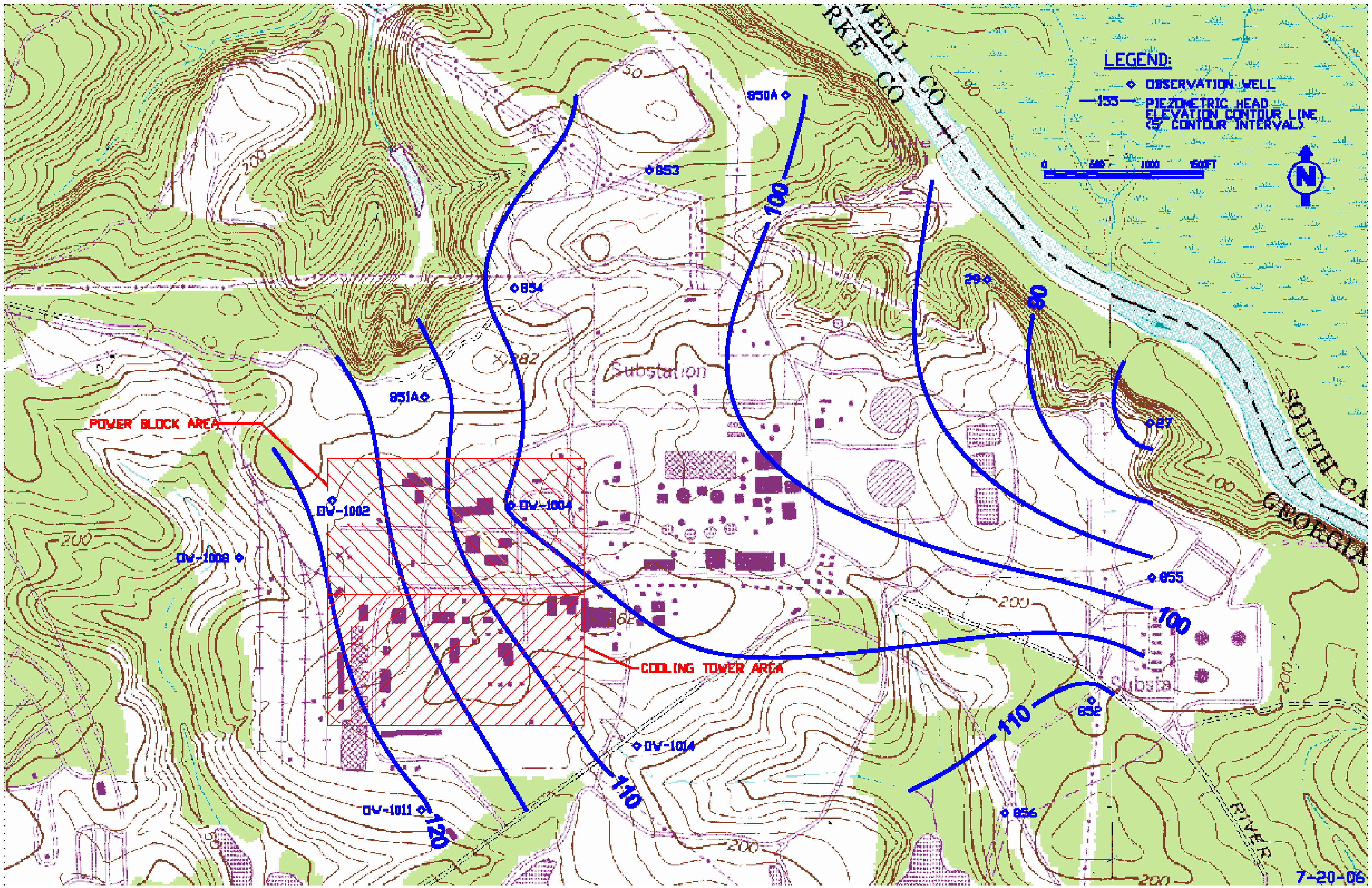

Figure 2.4.12-16 Tertiary Aquifer: Piezometric Contour Map for December 2005

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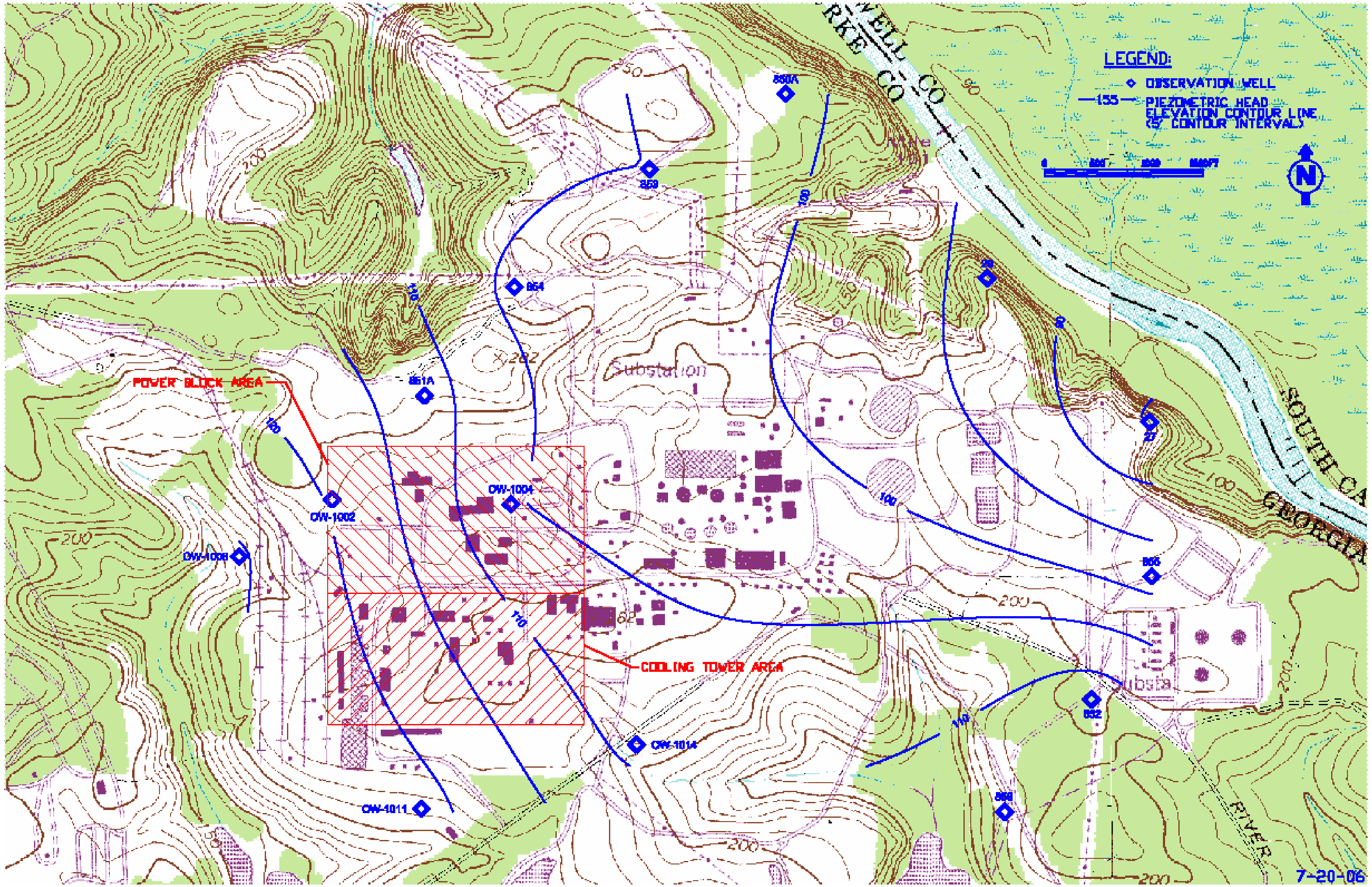

Figure 2.4.12-17 Tertiary Aquifer: Piezometric Contour Map for March 2006

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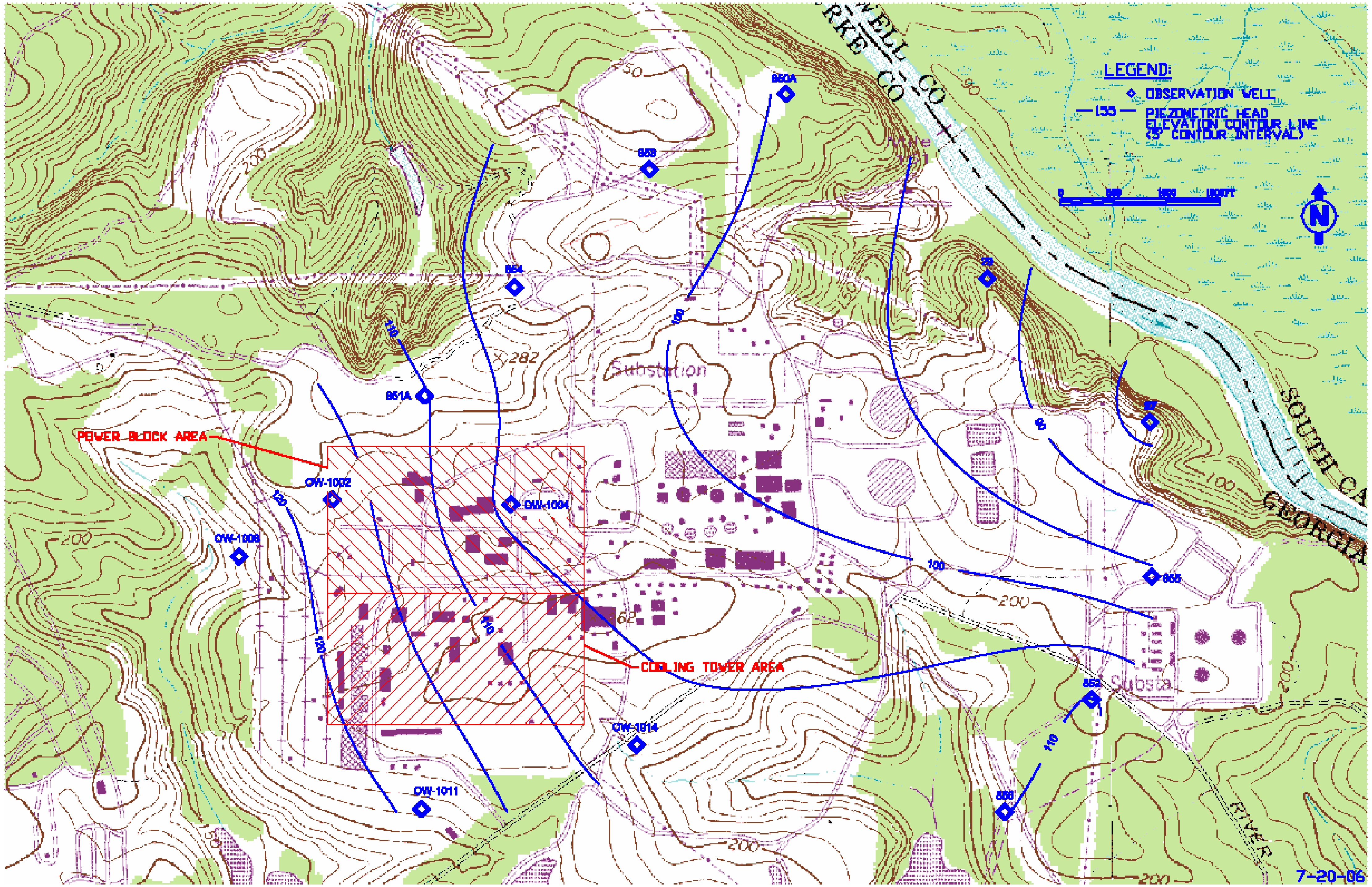

Figure 2.4.12-18 Tertiary Aquifer: Piezometric Contour Map for June 2006

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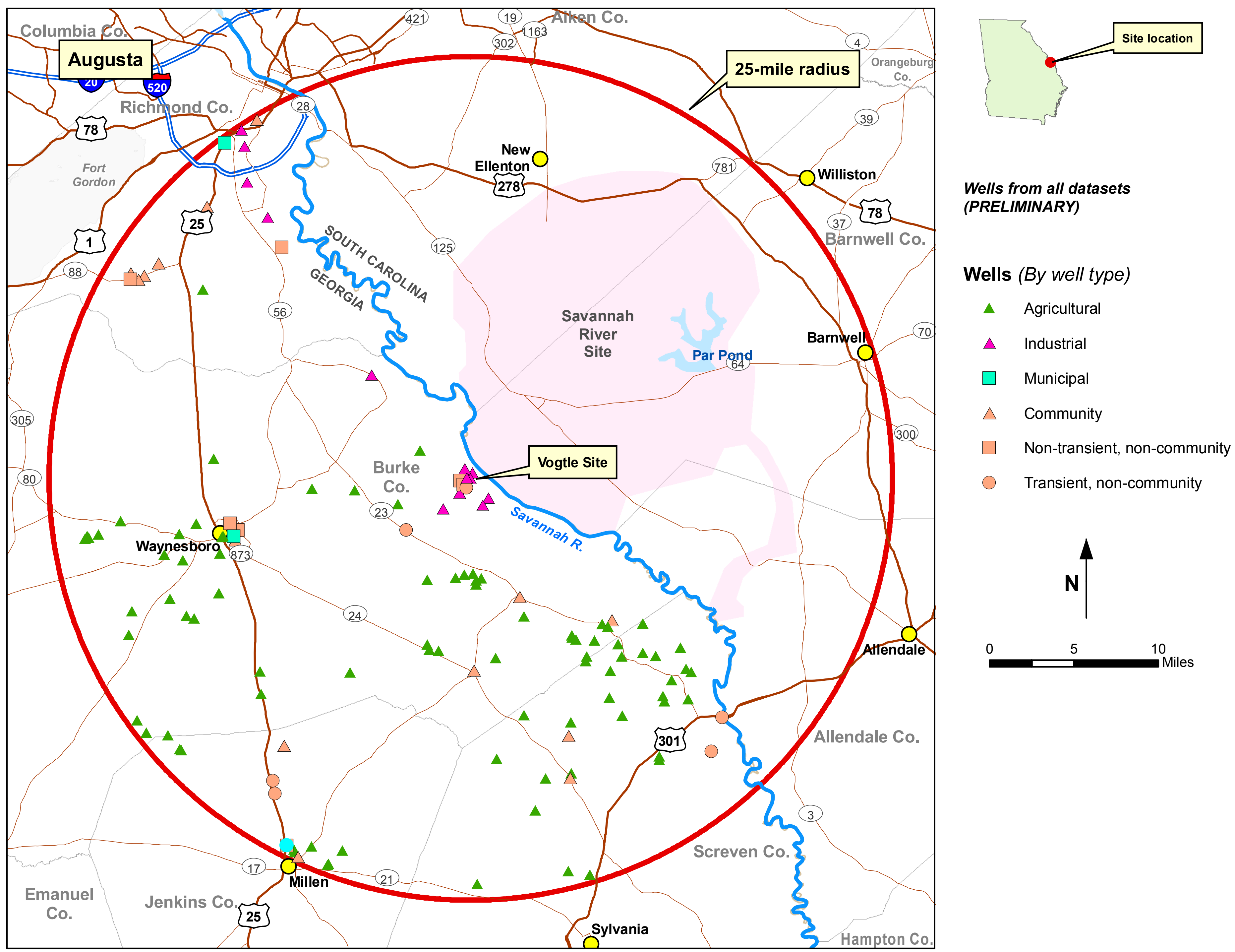

Figure 2.4.12-19 Locations of Agricultural, Industrial, Municipal, and Public Water Supply Wells Within 25 Miles of the VEGP Site

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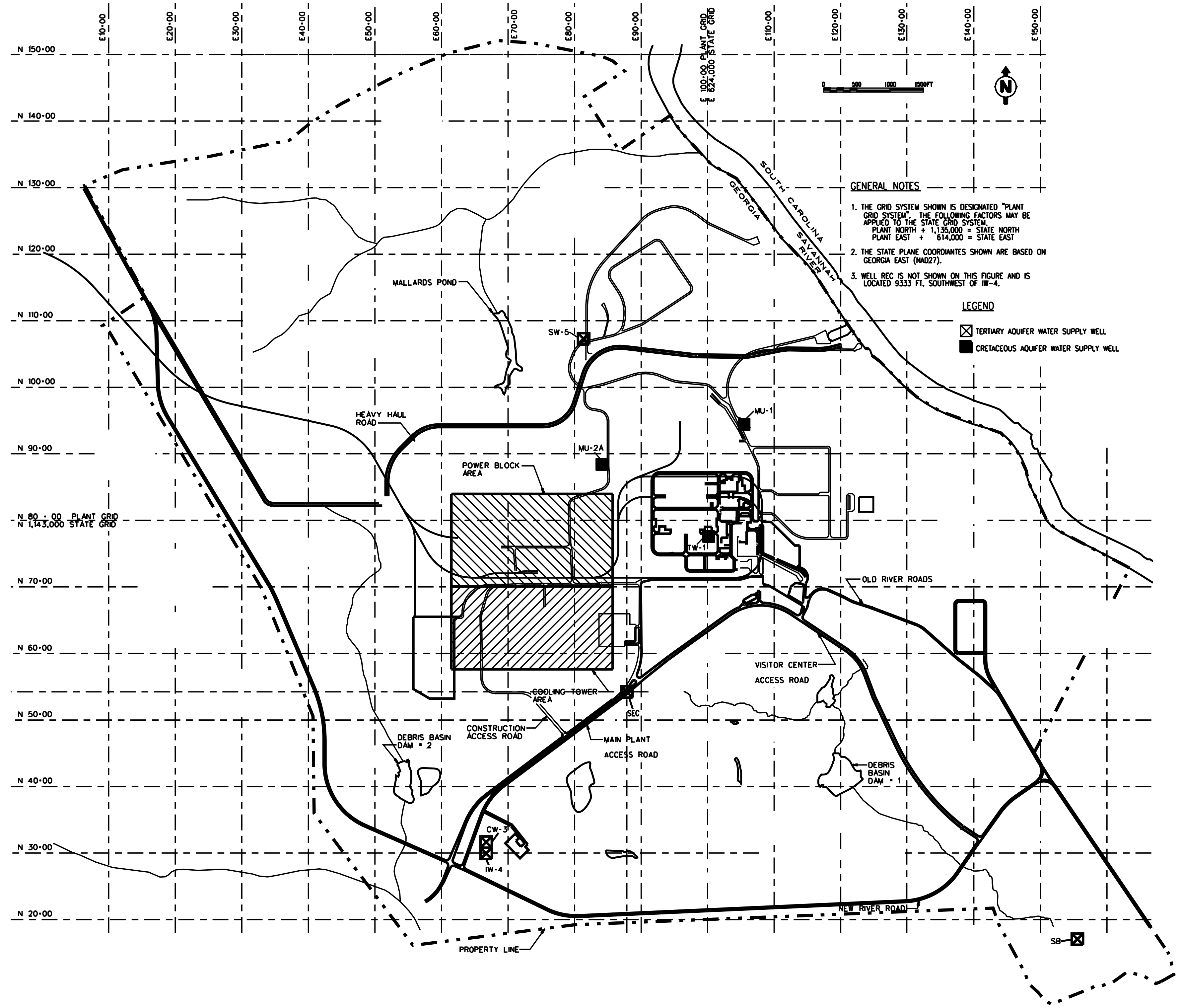

Figure 2.4.12-20 Locations of Existing Supply Wells at the VEGP Site

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2.4.13 Accidental Releases of Liquid Effluents in Ground and Surface Waters

2.4.13.1 Groundwater

This section provides a conservative analysis of a postulated, accidental liquid release of effluents to the groundwater at the VEGP site. The accident scenario is described. The conceptual model used to evaluate radionuclide transport is presented, along with potential pathways of contamination to water users. The radionuclide transport analysis is described, and the results are summarized. The radionuclide concentrations to which a water user might be exposed are compared against the regulatory limits.

2.4.13.1.1 Accident Scenario

The accident scenario has been selected based on information developed by Westinghouse to assist AP1000 COL applicants in evaluating the accidental liquid release of effluents **(Westinghouse 2006)**. The accident scenario assumes an instantaneous release from one of the two effluent holdup tanks located in the lowest level of the AP1000 auxiliary building.

There are two effluent holdup tanks, each with a capacity of 28,000 gal., for each AP1000 unit. These tanks have both the highest potential radionuclide concentrations and the largest volume. Therefore, they have been selected by Westinghouse as the limiting tanks for evaluating an accidental release of liquid effluents that could lead to the most adverse contamination of groundwater or surface water, via the groundwater pathway.

Westinghouse estimated the radionuclides concentrations of the effluent holdup tanks to be 101 percent of the reactor coolant. Westinghouse determined the radionuclide concentrations in reactor coolant itself to be as follows:

- For tritium (H-3), a coolant concentration of 1.0 µCi/g should be used.
- Corrosion products (Cr-51, Mn-54, Mn-56, Fe-55, Fe-59, Co-58 and Co-60) should be taken directly from the AP1000 DCD, Table 11.1-2, *Design Basis Reactor Coolant Activity*.
- Other radionuclides should be based on the AP1000 DCD, Table 11.1-2 multiplied by 0.12/0.25 to adjust the failed fuel rate from the design basis to a conservatively bounding value for this analysis.

Based on these recommendations, the expected radionuclide concentrations in the effluent holdup tanks have been calculated, and the results are summarized in Table 2.4.13-1.

2.4.13.1.2 Conceptual Model

Figure 2.4.13-1 illustrates the conceptual model used to evaluate an accidental liquid release of effluent to groundwater, or to surface water via the groundwater pathway. The key elements and assumptions embodied in the conceptual model are described and discussed below.

As indicated in Section 2.4.13.1.1, the effluent holdup tanks are assumed to be the source of the release, with each tank having a volume of 28,000 gal. and the radionuclide concentrations as summarized in Table 2.4.13-1. These tanks are located at the lowest level of the auxiliary building, which has a floor elevation of approximately 186.5 ft msl and is approximately 30 to 35 ft above the water table. One of these tanks is postulated to fail, and the entire contents of the tank are conservatively assumed to enter the groundwater (unconfined aquifer) instantaneously. This assumption is very conservative because it requires failure of the floor drain system, plus it ignores the barriers presented by the 6-ft-thick basemat and the sealed, 3-ft-thick exterior walls of the AP1000 auxiliary building.

With the postulated instantaneous release of the contents of an effluent holdup tank to groundwater, radionuclides would enter the unconfined aquifer and migrate with the groundwater in the direction of decreasing hydraulic head. Hydraulic head contour maps for the unconfined aquifer presented in Figures 2.4.12-7 through 2.4.12-9 indicate that the groundwater pathway from a point of release in either of the AP1000 auxiliary buildings would be northward to Mallard Pond, a groundwater discharge area. Because the underlying Blue Bluff Marl has a very low vertical permeability, as is described in Section 2.4.12, groundwater flow in the unconfined aquifer is predominantly horizontal. The flow path is assumed to be a straight line between the auxiliary buildings and the south side of Mallard Pond, a distance of approximately 2,200 ft based on Figure 1.2-4. During saturated zone transport, radionuclide concentrations of the liquid released to the water table would be reduced by the processes of adsorption, hydrodynamic dispersion, and radioactive decay. There are no existing water-supply wells between the postulated release points and Mallard Pond that withdraw water from the unconfined aquifer.

Mallard Pond serves as a groundwater discharge area for the unconfined aquifer. The radionuclides associated with a liquid release would enter the surface water system via Mallard Pond. Radionuclide concentrations would be diluted in the pond and in the stream running from the pond to the Savannah River. Groundwater flow into Mallard Pond is continuous, and the pond level is held constant by a spillway. The rate of spillway overflow discharging from Mallard Pond was determined to be at least 250 gpm in previous site investigations conducted for VEGP Units 1 and 2. Measurements of stream flow at points downstream indicate that flow increases progressively in magnitude before discharging to the Savannah River. Upon discharge to the Savannah River, the stream flow would mix with the Savannah River flow, resulting in significantly further dilution prior to withdrawal by the nearest surface water user. As noted in Section 2.4.1, the nearest downstream industrial surface water users include the Fort James Operating Company and the Georgia Power Company. Both companies operate river intakes that withdraw water from the Savannah River near River Mile 45, which is about 106 miles downstream of the VEGP site. The City of Savannah Municipal and Industrial Plant, and the Beaufort-Jasper County Water and Sewer Authority are the nearest downstream municipal water users. The City of Savannah obtains water from Abercorn Creek where it enters the Savannah River near River Mile 29, which is about 122 miles downstream from the VEGP site. Beaufort-Jasper County withdraws water from the Savannah River via an 18-mile canal.

2.4.13.1.3 Radionuclide Transport Analysis

A radionuclide transport analysis has been conducted to estimate the radionuclide concentrations that might expose existing and future water users based on an instantaneous release of the radioactive liquid of an AP1000 effluent holdup tank. Analysis of liquid effluent release commenced with the simplest of models, using demonstratively conservative assumptions and coefficients. Radionuclide concentrations resulting from the preliminary analysis were then compared against the maximum permissible concentrations (MPCs) identified in 10 CFR Part 20, Appendix B, Table 2, Column 2, to determine acceptability. Further analysis, using progressively more realistic and less conservative assumptions and modeling techniques, was conducted when the preliminary results were not acceptable.

Radionuclide transport along a groundwater pathline is governed by the advection-dispersion-reaction equation **(Javandel et al. 1984)**, which is given as

$$R\frac{\partial C}{\partial t} = D\frac{\partial^2 C}{\partial x^2} - v\frac{\partial C}{\partial x} - \lambda RC \qquad (2.4.13\text{-}1)$$

where: C = radionuclide concentration; R = retardation factor; D = coefficient of longitudinal hydrodynamic dispersion; v = average linear velocity; and λ = radioactive decay constant. The retardation factor is defined from the relationship

$$R = 1 + \frac{\rho_b K_d}{n} \qquad (2.4.13\text{-}2)$$

where: ρ_b = bulk density; K_d = distribution coefficient; and n = total porosity. The average linear velocity is determined using Darcy's law, which is

$$v = -\frac{K}{n_e}\frac{dh}{dx} \qquad (2.4.13\text{-}3)$$

where: K = hydraulic conductivity; n_e = effective porosity; and dh/dx = hydraulic gradient. The radioactive decay constant can be written as

$$\lambda = \frac{\ln 2}{t_{1/2}} \qquad (2.4.13\text{-}4)$$

where $t_{1/2}$ = radionuclide half-life. Conservatively neglecting hydrodynamic dispersion, Equation 2.4.13-1 can be integrated to yield

$$C = C_0 \exp(-\lambda t) \qquad (2.4.13\text{-}5)$$

where: C = radionuclide concentration; C_0 = initial radionuclide concentration; $t = LR/v$ = radionuclide travel time; and L = groundwater pathline length.

To estimate the radionuclide concentrations in groundwater discharging to Mallard Pond, Equation 2.4.13-5 was applied along the groundwater pathline that would originate at either of the liquid effluent release points beneath the AP1000 auxiliary buildings and terminate at Mallard Pond. The analysis was performed sequentially as described below.

2.4.13.1.3.1 Transport Considering Radioactive Decay Only

An initial screening analysis was performed considering radioactive decay only. This analysis assumed that all radionuclides migrate at the same rate as groundwater and considered no adsorption and retardation, which would otherwise result in a longer travel time and more radioactive decay. The concentrations of the radionuclides appearing in Table 2.4.13-1 were decayed for a period equal to the groundwater travel time from the point of release to Mallard Pond, using Equation 2.4.13-5 with R = 1. Radionuclides having concentrations less than 1 percent of their respective MPCs were eliminated from consideration because their concentrations would be well below their regulatory limits. Any radionuclides having a concentration greater than or equal to 1 percent of their MPC were retained for further evaluation.

Evaluating transport considering radioactive decay only requires an estimate of the groundwater travel time. The travel time in the unconfined aquifer between either of the AP1000 auxiliary buildings and Mallard Pond was conservatively determined based on site-specific data summarized in Section 2.4.12. The average linear velocity was calculated to be 0.1 ft/day, using Equation 2.4.13-3 with a maximum observed hydraulic conductivity of 2.65 ft/day, an effective porosity of 0.32, and a horizontal hydraulic gradient of 0.012 ft/ft. The straight-line distance from either AP1000 auxiliary building to Mallard Pond is approximately 2,200 ft, which would result in a conservatively estimated groundwater travel time of about 61 years (60.61 years). Using Equation 2.4.13-5, the initial concentrations given in Table 2.4.13-1 were decayed for a period of 60.61 years. Table 2.4.13-2 summarizes the results and identifies those radionuclides that would exceed their MPC by more than 1 percent. These include H-3, Co-60, Sr-90, Cs-137, and I-129.

2.4.13.1.3.2 Transport Considering Radioactive Decay and Adsorption

Radionuclides retained from the screening analysis (H-3, Co-60, Sr-90, Cs-137, and I-129) were further evaluated considering adsorption and retardation in addition to radioactive decay. The distribution coefficients for H-3 and I-129 were taken to be zero. The distribution coefficients for Co-60, Sr-90, and Cs-137 were based on the laboratory analysis of soil samples that were obtained from the VEGP site **(Kaplan 2006; MACTEC 2006)**. Soil samples were taken from 18 shallow test pits located in potential borrow source areas for the backfill that will be required for the new AP1000 units. Three additional soil samples were obtained from a boring located near B-1003. These samples were taken from below the water table and are representative of the sediments comprising the Barnwell Group and associated Water Table aquifer (see Section 2.4.12). The measured K_d values of these samples are summarized in Table 2.4.13-3.

Distribution coefficients for Co-60, Sr-90, and Cs-137 for transport analysis were selected considering the groundwater pathway for saturated zone transport in the Water Table aquifer. This pathway extends northward from the AP1000 auxiliary buildings, from where an accidental liquid release is postulated, and terminates at Mallard Pond, a total horizontal distance of about 2200 ft. The earth materials present along this pathway will include the material that will be used to backfill the power block excavation and the saturated sediments of the Barnwell Group. Of the total 2200 ft pathway length, about 140 ft of the pathway would be in backfill material with the remaining 2060 ft being in Water Table aquifer sediments. Because about 94% of the pathway occurs in Water Table aquifer sediments, it is appropriate to use distribution coefficients determined for these sediments (soil samples B-1003V-55-65, B-1003V-65-75, and B-1003V-75-82 in Table 2.3-3). These values range from 3.9 to 21.3 mL/g for Co, 14.4 to 17.4 mL/g for Sr, and 22.7 to greater than 30.1 mL/g for Cs. To ensure conservatism, K_d values representing the lower end of the each range were chosen for radionuclide transport analysis (i.e., 3.9 mL/g for Co, 14.4 mL/g for Sr, and 22.7 mL/g for Cs).

Retardation factors were then calculated using Equation 2.4.13-2 with a porosity of 0.40 and bulk density of 1.60 g/cm^3, based on information provided in Section 2.4.12. Concentrations were then determined at the point of discharge to Mallard Pond using Equation 2.4.13-5 with the appropriate retardation factors. Results are summarized in Table 2.4.13-4. The only radionuclides having concentrations greater than 1 percent of their respective MPCs would be H-3 and I-129. Note that the H-3 and I-129 concentrations would be about 3,400 percent and 3.6 percent of their MPCs, respectively.

2.4.13.1.3.3 Transport Considering Radioactive Decay, Adsorption, and Dilution

The H-3 and I-129 discharging with the groundwater to Mallard Pond would mix with other, uncontaminated groundwater discharging to Mallard Pond. A dilution factor was, therefore, applied to the H-3 and I-129 concentrations given in Table 2.4.13-4 to account for dilution in Mallard Pond. This dilution factor was previously estimated to be 2.8×10^{-4} based on the ratio of Mallard Pond stream flow (250 gpm) to the rate at which the postulated release would discharge into Mallard Pond (0.7 gpm). This value was confirmed to be applicable to the VEGP site using the postulated 28,000 gallon spill volume and hydrogeological properties of the unconfined aquifer as characterized for the ESP application. Accounting for this dilution (i.e., Table 2.4.13-4 Groundwater Concentration multiplied by dilution factor), the resulting H-3 concentration would be 9.4×10^{-6} μCi/cm^3 or 0.94 percent of its 1.0×10^{-3} μCi/cm^3 MPC value. The resulting I-129 concentration would be 2.0×10^{-12} μCi/cm^3, which is 0.001 percent of its

2.0×10^{-7} μCi/cm^3 MPC value. Note that the stream exiting Mallard Pond gains additional runoff water as it flows to the Savannah River, which would result in more dilution than was accounted for in this analysis. Significantly more dilution would occur as the stream discharges to, and mixes with, the Savannah River.

2.4.13.1.4 Compliance with 10 CFR Part 20

The radionuclide transport analysis presented in Section 2.4.13.1.3 demonstrates that each of the radionuclides that could be accidentally released to groundwater would be individually below its MPC. However, 10 CFR Part 20, Appendix B, Table 2, imposes additional requirements when the identity and concentration of each radionuclide in a mixture are known. In this case, the ratio present in the mixture and the concentration otherwise established in 10 CFR Part 20 Appendix B for the specific radionuclide not in a mixture must be determined. The sum of such ratios for all of the radionuclides in the mixture may not exceed “1” (i.e., “unity”).

This sum of fractions approach was applied to the radionuclide concentrations conservatively estimated in Section 2.4.13.1.3. Results are summarized in Table 2.4.13-5. The ratios for the mixture sum to 0.010, which is well below unity. Therefore, it is concluded that an accidental liquid release of effluents in groundwater would not exceed 10 CFR Part 20 limits.

2.4.13.2 Surface Water

No outdoor tanks contain radioactivity in the Westinghouse AP1000 design **(Westinghouse 2006)**. In particular, the AP1000 design does not require boron changes for load follow and does not recycle boric acid or reactor coolant water, so the boric acid tank is not radioactive. Because no outdoor tanks contain radioactivity, no accident scenario could result in the release of liquid effluent directly to the surface water.

Table 2.4.13-1 Radionuclide Concentrations in the AP1000 Effluent Holdup Tanks

Radionuclide	Design Basis Reactor Coolant Activity[1] (μCi/g)	Reactor Coolant Concentrations[2] (μCi/cm^3)	Effluent Holdup Tank Concentrations[3] (μCi/cm^3)
H-3	-	1.00E+00	1.01E+00
Cr-51	1.30E-03	1.30E-03	1.31E-03
Mn-54	6.70E-04	6.70E-04	6.77E-04
Mn-56	1.70E-01	1.70E-01	1.72E-01
Fe-55	5.00E-04	5.00E-04	5.05E-04
Fe-59	1.30E-04	1.30E-04	1.31E-04
Co-58	1.90E-03	1.90E-03	1.92E-03
Co-60	2.20E-04	2.20E-04	2.22E-04
Br-83	3.20E-02	1.54E-02	1.55E-02
Br-84	1.70E-02	8.16E-03	8.24E-03
Br-85	2.00E-03	9.60E-04	9.70E-04
Rb-88	1.50E+00	7.20E-01	7.27E-01
Rb-89	6.90E-02	3.31E-02	3.35E-02
Sr-89	1.10E-03	5.28E-04	5.33E-04
Sr-90	4.90E-05	2.35E-05	2.38E-05
Sr-91	1.70E-03	8.16E-04	8.24E-04
Sr-92	4.10E-04	1.97E-04	1.99E-04
Y-90	1.30E-05	6.24E-06	6.30E-06
Y-91m	9.20E-04	4.42E-04	4.46E-04
Y-91	1.40E-04	6.72E-05	6.79E-05
Y-92	3.40E-04	1.63E-04	1.65E-04
Y-93	1.10E-04	5.28E-05	5.33E-05
Nb-95	1.60E-04	7.68E-05	7.76E-05
Zr-95	1.60E-04	7.68E-05	7.76E-05
Mo-99	2.10E-01	1.01E-01	1.02E-01
Tc-99m	2.00E-01	9.60E-02	9.70E-02
Ru-103	1.40E-04	6.72E-05	6.79E-05
Rh-103m	1.40E-04	6.72E-05	6.79E-05
Rh-106	4.50E-05	2.16E-05	2.18E-05
Ag-110m	4.00E-04	1.92E-04	1.94E-04
Te-127m	7.60E-04	3.65E-04	3.68E-04
Te-129m	2.60E-03	1.25E-03	1.26E-03
Te-129	3.80E-03	1.82E-03	1.84E-03
Te-131m	6.70E-03	3.22E-03	3.25E-03
Te-131	4.30E-03	2.06E-03	2.08E-03
Te-132	7.90E-02	3.79E-02	3.83E-02
Te-134	1.10E-02	5.28E-03	5.33E-03
I-129	1.50E-08	7.20E-09	7.27E-09

Table 2.4.13-1 (cont.) Radionuclide Inventory of the AP1000 Effluent Holdup Tanks

Radionuclide	Design Basis Reactor Coolant Activity[1] (μCi/g)	Reactor Coolant Concentrations[2] (μCi/cm^3)	Effluent Holdup Tank Concentrations[3] (μCi/cm^3)
I-130	1.10E-02	5.28E-03	5.33E-03
I-131	7.10E-01	3.41E-01	3.44E-01
I-132	9.40E-01	4.51E-01	4.56E-01
I-133	1.30E+00	6.24E-01	6.30E-01
I-134	2.20E-01	1.06E-01	1.07E-01
I-135	7.80E-01	3.74E-01	3.78E-01
Cs-134	6.90E-01	3.31E-01	3.35E-01
Cs-136	1.00E+00	4.80E-01	4.85E-01
Cs-137	5.00E-01	2.40E-01	2.42E-01
Cs-138	3.70E-01	1.78E-01	1.79E-01
Ba-137m	4.70E-01	2.26E-01	2.28E-01
Ba-140	1.00E-03	4.80E-04	4.85E-04
La-140	3.10E-04	1.49E-04	1.50E-04
Ce-141	1.60E-04	7.68E-05	7.76E-05
Ce-143	1.40E-04	6.72E-05	6.79E-05
Pr-143	1.50E-04	7.20E-05	7.27E-05
Ce-144	1.20E-04	5.76E-05	5.82E-05
Pr-144	1.20E-04	5.76E-05	5.82E-05

[1] Values from AP1000 Table 11.1-2

[2] For tritium (H-3) a coolant concentration of 1.0 μCi/g is used; corrosion products (Cr-51, Mn-54, Mn-56, Fe-55, Fe-59, Co-58 and Co-60) are taken directly from the AP1000 DCD, Table 11.1-2; and other radionuclides are based on the AP1000 DCD, Table 11.1-2 multiplied by 0.12/0.25. The density of all liquids is assumed to be 1 g/cm^3.

[3] Values are 101% of the reactor coolant concentrations.

Table 2.4.13-2 Results of Transport Analysis Considering Radioactive Decay Only

Radionuclide	Effluent Holdup Tank Concentration[1] (μCi/cm³)	Half-life[2] (days)	Decay Rate[3] (days⁻¹)	MPC[4] (μCi/cm³)	Groundwater Concentration[5] (μCi/cm³)	Groundwater Concentration/ MPC
H-3	1.01E+00	4.51E+03	1.54E-04	1.00E-03	3.35E-02	3.35E+01
Cr-51	1.31E-03	2.77E+01	2.50E-02	5.00E-04	2.03E-244	4.05E-241
Mn-54	6.77E-04	3.13E+02	2.21E-03	3.00E-05	3.31E-25	1.10E-20
Mn-56	1.72E-01	1.07E-01	6.48E+00	7.00E-05	0.00E+00	0.00E+00
Fe-55	5.05E-04	9.86E+02	7.03E-04	1.00E-04	8.67E-11	8.67E-07
Fe-59	1.31E-04	4.45E+01	1.56E-02	1.00E-05	1.66E-154	1.66E-149
Co-58	1.92E-03	7.08E+01	9.79E-03	2.00E-05	1.17E-97	5.85E-93
Co-60	2.22E-04	1.93E+03	3.59E-04	3.00E-06	7.77E-08	2.59E-02
Br-83	1.55E-02	9.96E-02	6.96E+00	9.00E-04	0.00E+00	0.00E+00
Br-84	8.24E-03	2.21E-02	3.14E+01	4.00E-04	0.00E+00	0.00E+00
Br-85	9.70E-04	2.01E-03	3.44E+02	1.00E+00	0.00E+00	0.00E+00
Rb-88	7.27E-01	1.24E-02	5.59E+01	4.00E-04	0.00E+00	0.00E+00
Rb-89	3.35E-02	1.06E-02	6.54E+01	9.00E-04	0.00E+00	0.00E+00
Sr-89	5.33E-04	5.05E+01	1.37E-02	8.00E-06	4.35E-136	5.44E-131
Sr-90	2.38E-05	1.06E+04	6.54E-05	5.00E-07	5.59E-06	1.12E+01
Sr-91	8.24E-04	3.96E-01	1.75E+00	2.00E-05	0.00E+00	0.00E+00
Sr-92	1.99E-04	1.13E-01	6.16E+00	4.00E-05	0.00E+00	0.00E+00
Y-90	6.30E-06	2.67E+00	2.60E-01	7.00E-06	0.00E+00	0.00E+00
Y-91m	4.46E-04	3.45E-02	2.01E+01	2.00E-03	0.00E+00	0.00E+00
Y-91	6.79E-05	5.85E+01	1.18E-02	8.00E-06	6.41E-119	8.01E-114
Y-92	1.65E-04	1.48E-01	4.68E+00	4.00E-05	0.00E+00	0.00E+00
Y-93	5.33E-05	4.21E-01	1.65E+00	2.00E-05	0.00E+00	0.00E+00
Nb-95	7.76E-05	3.52E+01	1.97E-02	3.00E-05	2.44E-194	8.15E-190
Zr-95	7.76E-05	6.40E+01	1.08E-02	2.00E-05	4.61E-109	2.31E-104
Mo-99	1.02E-01	2.75E+00	2.52E-01	2.00E-05	0.00E+00	0.00E+00
Tc-99m	9.70E-02	2.51E-01	2.76E+00	1.00E-03	0.00E+00	0.00E+00
Ru-103	6.79E-05	3.93E+01	1.76E-02	3.00E-05	1.26E-174	4.20E-170
Rh-103m	6.79E-05	3.90E-02	1.78E+01	6.00E-03	0.00E+00	0.00E+00
Rh-106	2.18E-05	4.63E-04	1.50E+03	NA[6]	0.00E+00	
Ag-110m	1.94E-04	2.50E+02	2.77E-03	6.00E-06	4.04E-31	6.73E-26
Te-127m	3.68E-04	1.09E+02	6.36E-03	9.00E-06	2.34E-65	2.60E-60
Te-129m	1.26E-03	3.36E+01	2.06E-02	7.00E-06	3.76E-202	5.37E-197
Te-129	1.84E-03	4.83E-02	1.44E+01	4.00E-04	0.00E+00	0.00E+00
Te-131m	3.25E-03	1.25E+00	5.55E-01	8.00E-06	0.00E+00	0.00E+00
Te-131	2.08E-03	1.74E-02	3.98E+01	8.00E-05	0.00E+00	0.00E+00
Te-132	3.83E-02	3.26E+00	2.13E-01	9.00E-06	0.00E+00	0.00E+00
Te-134	5.33E-03	2.90E-02	2.39E+01	3.00E-04	0.00E+00	0.00E+00
I-129	7.27E-09	5.73E+09	1.21E-10	2.00E-07	7.27E-09	3.63E-02
I-130	5.33E-03	5.15E-01	1.35E+00	2.00E-05	0.00E+00	0.00E+00
I-131	3.44E-01	8.04E+00	8.62E-02	1.00E-06	0.00E+00	0.00E+00
I-132	4.56E-01	9.58E-02	7.24E+00	1.00E-04	0.00E+00	0.00E+00
I-133	6.30E-01	8.67E-01	7.99E-01	7.00E-06	0.00E+00	0.00E+00
I-134	1.07E-01	3.65E-02	1.90E+01	4.00E-04	0.00E+00	0.00E+00
I-135	3.78E-01	2.75E-01	2.52E+00	3.00E-05	0.00E+00	0.00E+00

Table 2.4.13-2 (cont.) Results of Transport Analysis Considering Radioactive Decay Only

Radionuclide	Effluent Holdup Tank Concentration[1] (μCi/cm³)	Half-life[2] (days)	Decay Rate[3] (days⁻¹)	MPC[4] (μCi/cm³)	Groundwater Concentration[5] (μCi/cm³)	Groundwater Concentration/ MPC
Cs-134	3.35E-01	7.53E+02	9.21E-04	9.00E-07	4.64E-10	5.16E-04
Cs-136	4.85E-01	1.31E+01	5.29E-02	6.00E-06	0.00E+00	0.00E+00
Cs-137	2.42E-01	1.10E+04	6.30E-05	1.00E-06	5.99E-02	5.99E+04
Cs-138	1.79E-01	2.24E-02	3.09E+01	4.00E-04	0.00E+00	0.00E+00
Ba-137m	2.28E-01	1.81E-03	3.84E+02	NA[6]	0.00E+00	
Ba-140	4.85E-04	1.27E+01	5.46E-02	8.00E-06	0.00E+00	0.00E+00
La-140	1.50E-04	1.68E+00	4.13E-01	9.00E-06	0.00E+00	0.00E+00
Ce-141	7.76E-05	3.25E+01	2.13E-02	3.00E-05	4.42E-210	1.47E-205
Ce-143	6.79E-05	1.38E+00	5.02E-01	2.00E-05	0.00E+00	0.00E+00
Pr-143	7.27E-05	1.36E+01	5.10E-02	2.00E-05	0.00E+00	0.00E+00
Ce-144	5.82E-05	2.84E+02	2.44E-03	3.00E-06	1.89E-28	6.31E-23
Pr-144	5.82E-05	1.20E-02	5.78E+01	6.00E-04	0.00E+00	0.00E+00

[1] Values from Table 2.4.13-1

[2] Values from NUREG/CR-5512, Table E.1 **(Kennedy and Strenge 1992)**; U. S. Department of Health Radiological Health Handbook **(USDOH 1970)** for Sr-92, Rh-106, and Ba-137m

[3] Values calculated from Equation 2.4.13-4

[4] Values from 10 CFR Part 20, Appendix B, Table 2, Column 2

[5] Values calculated from Equation 2.4.13-5

[6] MPC is not available.

Table 2.4.13-3 Results of k_d Analysis

Soil Sample	K_d Value (mL/g)		
	Co	Sr	Cs
A-10(a)	8.1	13.2	56.2
C-7	3.9	9.0	14.8
D-10	1.7	7.8	9.9
E-7	10.1	25.7	19.9
E-12	15.3	51.7	10.7
G-9	7.9	9.8	> 25.5
J-11	13.5	9.2	> 47.4
K-10	15.2	10.0	19.3
L-7	1.7	11.4	18.8
M-5	7.3	9.3	16.8
N-3	5.8	10.7	7.8
P-8	6.5	7.0	5.3
Q-7	3.2	9.3	14.6
H-6	1.4	6.0	3.5
S-9	3.0	8.6	19.3
R-8	2.1	10.5	13.5
B-1003V-55-65	10.9	17.4	> 30.1
B-1003V-65-75	3.9	15.0	22.7
B-1003V-75-82	21.3	14.4	33.2

Source: Kaplan 2006

Table 2.4.13-4 Results of Transport Analysis Considering Radioactive Decay and Adsorption

Radionuclide	Effluent Holdup Tank Conc.[1] (μCi/cm^3)	Distribution Coefficient (cm^3/g)	Retardation Factor[2]	Groundwater Concentration[3] (μCi/cm^3)	Groundwater Concentration/ MPC
H-3	1.01E+00	0.0	1.0	3.35E-02	3.35E+01
Co-60	2.22E-04	3.9	16.6	1.28E-61	4.28E-56
Sr-90	2.38E-05	14.4	58.5	3.90E-42	7.80E-36
I-129	7.27E-09	0.00	1.0	7.27E-09	3.63E-02
Cs-137	2.42E-01	22.7	91.6	7.14E-57	7.14E-51

[1] Values from Table 2.4.13-1

[2] Values calculated from Equation 2.4.13-2

[3] Values calculated from Equation 2.4.13-5

Table 2.4.13-5 Compliance with 10 CFR Part 20

Radionuclide	Concentration / MPC	Radionuclide	Concentration / MPC
H-3	9.39E-03	Rh-106	0.00E+00
Cr-51	4.05E-241	Ag-110m	6.73E-26
Mn-54	1.10E-20	Te-127m	2.60E-60
Mn-56	0.00E+00	Te-129m	5.37E-197
Fe-55	8.67E-07	Te-129	0.00E+00
Fe-59	1.66E-149	Te-131m	0.00E+00
Co-58	5.85E-93	Te-131	0.00E+00
Co-60	4.28E-56	Te-132	0.00E+00
Br-83	0.00E+00	Te-134	0.00E+00
Br-84	0.00E+00	I-129	1.02E-05
Br-85	0.00E+00	I-130	0.00E+00
Rb-88	0.00E+00	I-131	0.00E+00
Rb-89	0.00E+00	I-132	0.00E+00
Sr-89	5.44E-131	I-133	0.00E+00
Sr-90	7.80E-36	I-134	0.00E+00
Sr-91	0.00E+00	I-135	0.00E+00
Sr-92	0.00E+00	Cs-134	5.16E-04
Y-90	0.00E+00	Cs-136	0.00E+00
Y-91m	0.00E+00	Cs-137	7.14E-51
Y-91	8.01E-114	Cs-138	0.00E+00
Y-92	0.00E+00	Ba-137m	0.00E+00
Y-93	0.00E+00	Ba-140	0.00E+00
Nb-95	8.15E-190	La-140	0.00E+00
Zr-95	2.31E-104	Ce-141	1.47E-205
Mo-99	0.00E+00	Ce-143	0.00E+00
Tc-99m	0.00E+00	Pr-143	0.00E+00
Ru-103	4.20E-170	Ce-144	6.31E-23
Rh-103m	0.00E+00	Pr-144	0.00E+00
		Sum of Ratios =	0.010

Note: Ratios for H-3 and I-129 are from Section 2.4.13.1.4. Ratios for Co-60, Sr-90, and Cs-137 are from Table 2.4.13-4. Ratios for the remaining radionuclides are from Table 2.4.13-2.

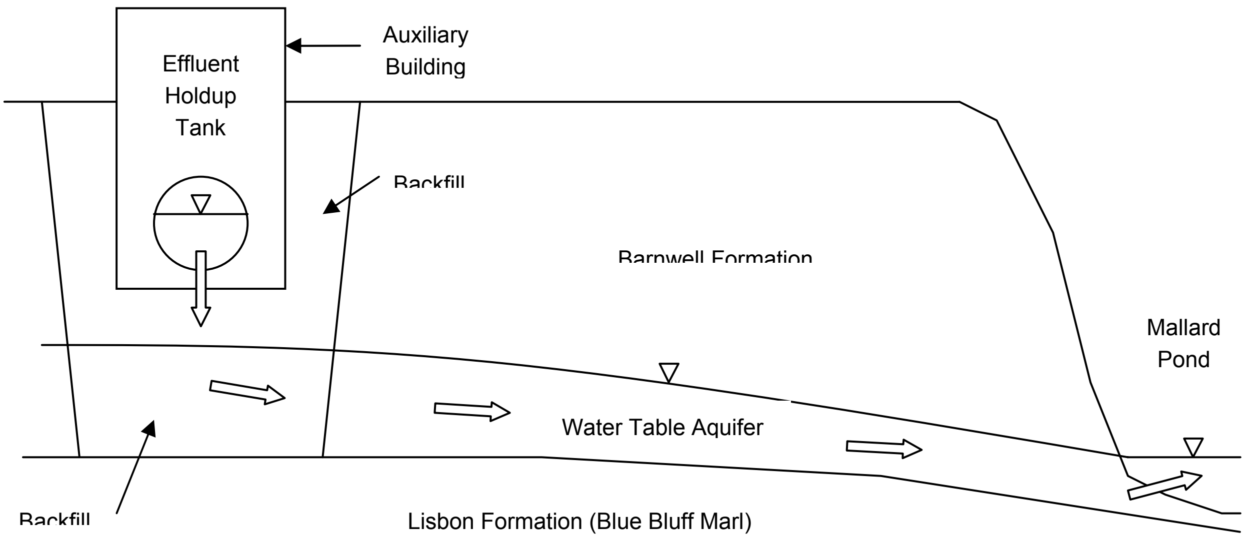

Figure 2.4.13-1 Conceptual Model for Evaluating Radionuclide Transport in Groundwater

Section 2.4.13 References

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(Kaplan 2006) Kaplan, D. I., Distribution Coefficients for the Vogtle Early Site Permit, WSRC-TR-2006-00246, Savannah River National Laboratory, Washington Savannah River Company, Aiken, South Carolina, July 2006.

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(Westinghouse 2006) AP1000 Calculation Note Number APP-WLS-M3C-021, Liquid Tank Rupture Evaluation (COL Item 15.7.6), Revision 0, Westinghouse Electric Company, LLC, 2006.

Appendix 2.4A—Observation Well Installation and Development Report

(Excludes contents of report Appendix J)

Prepared by
Earth Sciences and Environmental Engineering,
Technical Services,
Southern Company Generation

November 2005

VOGTLE ALWR ESP PROJECT FINAL DATA REPORT ES1374

Prepared By

Earth Science and Environmental Engineering
Technical Services
Southern Company Generation

November 2005

VOGTLE ALWR ESP PROJECT
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APPENDICES

1.0 INTRODUCTION

This report presents the information specified in the Bechtel Corporation (Bechtel) document titled *Technical Specification for Groundwater Well Installation for Southern ALWR ESP Project, Burke County, Georgia* (Bechtel Specification Number 25144-002-3PS-CY00-00002-000). This work occurred from May 24 through June 17, 2005. Southern Company Generation provided field supervision, technical consultation, and drilling subcontractors under the technical direction of Bechtel and SNC ESP Project.

Daily and weekly logs were developed during the project. These are respectively included in Appendices A and B.

2.0 SURVEYING SERVICES

The final well survey was provided by Georgia Power Land Engineering Group, Atlanta, Georgia, following the completion of the well installation program. A new survey was also performed for the existing wells to be used in the project. Qualified land surveyors performed the survey and met all survey requirements of the State of Georgia.

The horizontal survey was based on the plant grid system and converted to the State of Georgia coordinate system of northing and easting. The survey originated at a benchmark established for Plant Vogtle. Ground surface elevations were based on the 1927 National Geodetic Vertical Datum (NGVD). The horizontal survey meets the third-order accuracy (1:5000) and the elevation survey is accurate to at least the nearest one-tenth of a foot. This survey data is included in Appendix C.

The locations of the boreholes were determined by SCS and Bechtel using a hand held GPS unit. The proposed well layout coordinates are from existing distribution system layout drawings provided by Georgia Power.

3.0 UNDERGROUND UTILITY DETECTION

A survey to locate underground utilities was completed before the drilling work began at the site. The survey was completed by Mr. John Lattner, Vogtle Engineering, on May 23, 2005. All locations were clear of obstructions with the exception of OW-1009, which was offset to avoid fire protection water and electrical lines.

4.0 DRILLING AND SAMPLING

The drilling program began on May 24, 2005. Drilling was performed by: Kilman Brothers, Stone Mountain, Georgia; Greene's Water Wells, Inc., Gray, Georgia; S&ME, Inc., Blountville, Tennessee; and Prosonic Corporation, New Ellenton, S.C. A list of the equipment used on site during the investigation is included in Appendix D.

Drilling initially used both 3-1/4" ID and 4-1/4" ID hollow-stem augers (HSA) using Central Mine Equipment (CME) drill rigs. After discovering the 3-1/4" HSAs were too small to adequately set a well, all shallow aquifer wells were drilled, sampled, and set using 4-1/4" ID HSAs. In addition to conventional drilling procedures, rotosonic drilling was provided by Prosonic. This drilling technique uses high-frequency resonant energy. This resonant energy is transferred down the drill string at various sonic frequencies to provide a continuous relatively undisturbed core sample. SCG recommended this method due to the depths necessary for deep well installation, difficult drilling conditions for the conventional equipment as well as its increased speed of drilling.

Soil samples were collected through the hollow stem augers at 5 foot intervals using standard 2' split-spoon samplers, driven 18" by a standard 140 pound hammer or approved automatic hammer. Samples were logged on the site and representative portions were placed in 8-ounce glass sample jars labeled with the sample number, boring number, date, depth, and standard penetration test (SPT) data, including *n* the number of blows over a one-foot sample interval. Bag sampling of representative portions of the continuous 4" rotosonic core samples proceeded at the same 5-foot intervals as the spoon samples. The rotosonic, grab-sample intervals are correlative to the SPT sample intervals. The rotosonic samples were double-bagged and labeled with the same information as the SPT samples, except for *n*.

The complete soil boring logs are included in Appendix E. Due to the initial use of incorrect auger size (3-1/4" ID HSA) for some of the initial wells, some holes were cement-bentonite grout abandoned and new holes were drilled, generally adjacent to the original borehole. The abandoned holes are labeled as 'A' (for example, OW-1002A). The borehole abandonment forms and well construction details are included in Appendix F.

A brief description of the drilling and sampling for each location follows.

<u>OW-1001A</u>

Boring OW-1001A was started and completed on May 25, 2005. The borehole was drilled to a depth of 100' with 3-1/4" ID HSAs by Greene's. It was determined that the auger size was incorrect for the installation of the pre-pack well screen. No boring log was created for this hole since OW-1002A, located adjacent to the hole, was logged from the surface to 108.5 feet below ground surface. The hole was abandoned and grouted by S&ME on June 5, 2005.

<u>OW-1001</u>

Shallow well OW-1001 is installed approximately 10 feet from boring OW-1001A. Drilling on this hole continued from May 24 to May 29, 2005. No log was created for the upper portion of this hole since the adjacent boring OW-1002 was logged from the surface down. This boring was completed by Greene's to a depth of 140 feet and logged by an SCS geologist from split-spoon samples. Shallow well OW-1001 is installed in this boring.

OW-1002A

Boring OW-1002A was drilled on May 24 and 25, 2005. The borehole was drilled to a depth of 108.5' with 3-1/4" ID HSAs by Greene's. The hole was logged by an SCS geologist from split-spoon samples. It was determined that the auger size was incorrect for the installation of the pre-pack well screen. The hole was abandoned and grouted by S&ME on June 5, 2005.

OW-1002

Boring OW-1002 was started on June 2 and completed on June 6, 2005 by Prosonic. The borehole was drilled to a depth of 237 feet. The hole was logged by an SCS geologist from continuous 4" samples. Deep well OW-1002 is installed in this boring.

OW-1001 and OW-1002 are a well pair.

OW-1003A

Boring OW-1003A was started and completed on May 24, 2005. The borehole was drilled to a depth of 88.5 feet with 3-1/4" ID HSAs by S&ME, Inc. The hole was logged by an SCS geologist from split-spoon samples. It was determined that the auger size was incorrect for the installation of the pre-pack well screen. The hole was abandoned and grouted by S&ME on June 5, 2005.

OW-1003

Boring OW-1003 was started and completed on May 25, 2005. This boring was drilled approximately ten feet south of OW-1003A with 4-1/4" ID HSAs by S&ME. No log was prepared for this hole due to the proximity of OW-1003A. The hole was drilled down to 90.5' with no sampling and shallow observation well OW-1003 was installed.

OW-1004

Boring OW-1004 was started on June 3 and completed on June 11, 2005. The boring was drilled to a depth of 187 feet by Prosonic and logged by an SCS geologist from continuous 4" ID samples. Sampling in this boring began at 87' since OW-1003, the adjacent shallow well, was sampled to 88.5' feet. Prosonic had to shut down from June 4 to June 8 for training. Deep observation well OW-1004 was installed.

OW-1003 and OW-1004 are a well pair.

OW-1005A

Boring OW-1005A was started and completed on May 31, 2005. The auger boring was drilled to depth of 75 feet with 3-1/4" ID HSAs by Kilman. It was determined that the auger size was incorrect for the installation of the pre-pack well screen. This well was abandoned and grouted by S&ME on June 5, 2005. The hole was logged by an SCS geologist from samples collected in jars at the time of boring.

OW-1005

Boring OW-1005 was started on June 2 and completed on June 7, 2005. Due to the incorrect size of the augers used at OW-1005A, this new hole was offset approximately 10' from that boring. The boring was drilled to 170' with 4-1/4" ID HSAs by S&ME. No sampling was performed in the upper portion of the hole due to the proximity of OW-1005A. The hole was logged by an SCS geologist from split spoon samples from 68.5 feet to 170.0 below ground surface. OW-1005 is installed in this boring.

OW-1006A

Boring OW-1006A was started on June 3 and completed on June 4, 2005. This boring was drilled to 125' by S&ME with 4/1/4" ID HSAs. The hole was logged by an SCS geologist from split-spoon samples. This boring was abandoned due to a shortage of augers. Additional augers necessary to reach the marl unit could not be brought onsite quickly and the potential for HAS deviation in the existing hole warranted a decision to start in a new hole when sufficient augers were available. The hole was abandoned and grouted by S&ME on June 5, 2005.

OW-1006

Boring OW-1006 was started on June 9 and completed on June 14, 2005, by S&ME. No sampling was performed in the upper 118.5' feet due to the proximity of boring OW-1006A which was taken to 125'. No standard penetration tests were obtained from this hole due to drilling problems. The split-spoon sampler was pushed to collect samples. Shallow well OW-1006 is installed in this boring.

OW-1007

Boring OW-1007 was started on June 4 and completed on June 8, 2005. The boring was drilled to 122 feet by Greene's with 4-1/4" ID HSAs. No sampling was performed in the upper 98.5' due to the proximity of boring OW-1008 which was logged down to 105' by an SCS geologist from split-spoon samples. Shallow well OW-1007 is installed in this boring.

OW-1008

Boring OW-1008 was started on May 31 and completed on June 1, 2005. The upper portion of the hole was drilled by Kilman with 3-1/4" ID HSAs to 105 feet and logged by an SCS geologist from split-spoon samples. The remainder of the hole was drilled by PROSONIC to a depth of 247 feet. The lower portion of the hole was logged from continuous 4" ID samples. Deep well OW-1008 was installed in this boring.

OW-1007 and OW-1008 are a well pair.

OW-1009

Boring OW-1009 was started on May 24 and completed on May 25, 2005. The boring was drilled by S&ME with 4-1/4" ID HSAs to 100' and logged by an SCS geologist from split-spoon samples. Shallow well OW-1009 is installed in this hole.

OW-1010

Boring OW-1010 was started and completed on June 1, 2005. The boring was drilled by S&ME with 4-1/4" ID HSAs to 93.5 feet and logged by an SCS geologist from split-spoon samples taken to 95 feet. Shallow well OW-1010 is installed in this hole.

OW-1011

Boring OW-1011 was started on June 11 and completed on June 12, 2005. The boring was drilled by Prosonic to a depth of 217 feet and logged by an SCS geologist from continuous 4" ID samples taken from 87 feet to the bottom of the hole. Sampling of the upper 87 feet was not performed in this hole due to the proximity of OW-1012, which was sampled and logged from the surface to 93.6 feet. Deep well OW-1011 is installed in this boring.

OW-1012

Boring OW-1012 was started on May 31 and completed on June 1, 2005. The boring was drilled by S&ME with 4-1/4" ID HSAs to 93.6 feet and logged by an SCS geologist from split-spoon samples taken to 95 feet. Shallow well OW-1012 is installed in this hole.

OW-1011 and OW-1012 are a well pair.

OW-1013

Boring OW-1013 was started on June 9 and completed on June 10, 2005. The boring was drilled by S&ME with 4-1/4" ID HSAs to 103.5 feet and logged by an SCS geologist from split-spoon samples taken to 105 feet. Shallow well OW-10013 is installed in this hole.

OW-1014

Boring OW-1014 was started and finished June 11, 2005. The boring was drilled to a depth of 197.4 feet by Prosonic and logged by an SCS geologist from continuous 4" samples. Sampling in this boring began at 97 feet since OW-1015, the adjacent shallow well, was logged to 88.5 feet. Deep observation well OW-1014 was installed in this boring.

OW-1015

Boring OW-1015 was started May 30 and completed June 3, 2005. The boring was drilled to 120 feet by Greene's with 4-1/4" ID HSAs. The boring was logged by an SCS geologist from split-spoon samples. Shallow observation well OW-1015 was installed in this boring.

OW-1014 and OW-1015 are a well pair.

5.0 GROUNDWATER OBSERVATION WELLS

Fifteen wells were installed at the site between the dates of May 26 and June 15, 2005. Twenty-two observation wells were previously installed. Details of the new wells are provided in Appendix F. Table 5-1 summarizes this data.

Table 5-1 Observation well construction details

Well ID	Date Installed	Ground Elev.	Top of Casing Elev.	Well Dia. (in)	Screen Slot Size (in)	Total Well Depth (ft)	Screen Length (ft)	Screened Interval, Depth (ft)	Screened Interval, El. (ft)	Unit
OW-1001	5/29/05	230.854	233.494	2	0.01	133	10	121 - 130	109.724 – 100.224	shallow
OW-1002	6/6/05	227.442	230.502	2	0.01	237	10	219 – 229	7.812 – (-)2.188	deep
OW-1003	5/26/05	223.044	226.284	2	0.01	90.5	10	75.5 – 84.8	146.914 – 137.614	shallow
OW-1004	6/10/05	222.92	225.671	2	0.01	187	10	153.25 – 163.26	69.04 – 59.04	deep
OW-1005	6/7/05	264.389	267.289	2	0.01	176.8	10	157.3 – 167.3	106,459 – 96.459	shallow
OW-1006	6/14-15/05	223.044	226.284	2	0.01	135.5	10	116 - 126	110.491 – 100.491	shallow
OW-1007	6/7/05	216.91	219.96	2	0.01	120	10	102 – 111.5	114.28 – 104.28	shallow
OW-1008	6/1/05	216.65	219.71	2	0.01	247	10	230 – 240	(-)13.98 – (-)23.98	deep
OW-1009	5/27/05	220.887	223.647	2	0.01	97.9	10	84 – 94	136.257 – 126.257	shallow
OW-1010	6/1/05	216.895	219.905	2	0.01	94.8	10	73.3 – 83.3	142.965 – 132.965	shallow
OW-1011	6/13/05	205.785	209.043	2	0.01	217.6	10	200.6 – 210.6	4.555 – (-)5.445	deep
OW-1012	6/1/05	205.355	208.684	2	0.01	93.5	10	74.0 – 83.4	130.725 – 121.325	shallow
OW-1013	6/10/05	216.869	219.809	2	0.01	103.5	10	83.5 – 93.5	132.775 – 122.775	shallow
OW-1014	6/11/05	220.867	223.856	2	0.01	197	10	182 – 192	38.237 – 28.237	deep
OW-1015	6/3/05	220.427	223.157	2	0.01	120	10	93 - 103	126.797 – 116.797	shallow

All new wells and the inactive wells were developed by S&ME, Inc. Well development forms are included in Appendix G. The existing wells were also inspected by SCS and Bechtel. Well inspection forms are included in Appendix H. Water level measurements are being performed by the Plant under its existing Quality Assurance Program.

6.0 SAMPLE STORAGE

Soil samples collected from split-spoon and continuous sampling are stored onsite. Glass sample jars were used for split-spoon samples and zip-lock bags were labeled and double-bagged for the continuous 4" samples from the Prosonic rig. All samples, with the exception of those sent to the laboratory for analysis, are stored in a secure building within the plant site.

7.0 LABORATORY TESTING

Soil testing for selected samples was assigned by Bechtel. The samples were collected and delivered to the Southern Company Generation Construction Field Services soil laboratory in Alabaster, Alabama. Soil classification tests with hydrometer were performed. The laboratory results are presented in Appendix I.

8.0 SITE CLEAN UP

Site clean up to the plant's satisfaction was performed by the drillers.

9.0 SITE PHOTOGRAPHY

Digital photography of the site investigation is included as a courtesy, although the specifications did not require this work. The photographs (Appendix J) of the site investigation include selected soil samples, equipment, and site conditions.

APPENDIX A

DAILY FIELD LOGS

Daily Field Log

5/24/2005	• Started OW-1002A (Greene). • Started OW-1009 (S&ME) • Started OW-1003. Drilled to 88.5' with 3-1/4" ID HSAs.
5/25/2005	• Completed OW-1002A. This hole was abandoned due to incorrect auger size. • Drilled to 100' at OW-1001A. Abandoned this hole due to incorrect auger size. • Continuing at OW-1003 with 4/14" ID HSAs to bottom of yesterday's 3-1/4" ID HSA borehole. Restarted sampling at ~75'. Completed OW-1003. • Well at OW-1003 offset 10' due to 10' of cave-in in boring. Drilled down without sampling. OW-1003 well installation notes attempting to set pre-pack in open hole • S&ME development crew standing by for direction. • Kilman crew dropped supplies by OW-1003, OW-1002 and then heading to OW-1008. Had to standby till ~2 o'clock while well was relocated due to accessibility. Kilman did not bring enough HSA and rod to complete holes • Greene sampled OW-1002Ato 115'. Offset and drilled OW-1001A since no well materials were available to set well at the time. Wrong size augers were used. Had to pull out and re-drill with correct 4-1/4" ID HSAs. Greene not able to grout up hole since they did not have necessary equipment • Continue sampling on OW-1009 (S&ME). Equipment breakdown in coquina.
5/26/2005	• Started OW-1001 (Greene). Thin bed of hard crystalline limestone at 100' and again at 110'. • Completed OW-1003 (S&ME) • Development team completes 803A and 809
5/27/2005	• Completed OW-1009 (S&ME) • Development team pump burns out • Completed OW-1001 except grout installation
5/28/2005	OFF
5/29/2005	• Greene moves chemical grout pump to OW-1001. No grout delivered so grout taken from OW-1003 (6 bags). 2 additional bags brought in and 1 bag CETCO Super GeL X. Grouted hole up to 70'
5/30/2005	• Intermittent rain • Started OW-1015 (Greene)
5/31/2005 5/31/2005	• Kilman at OW-1005. Drilled to 78.5' and encountered flowing sand • Intermittent rain. Hard rain set in by 3:00 • Sand up in augers at OW-1015. Continuing on this hole • Prosonic onsite. Tom Moorer walked them through security. Brought only 150' drilling capability but sent helper to get additional tooling to reach 300'. • Discussed vibrations from Prosonic rig on plant equipment with Don Moore.. He did not see need for additional calcs to proceed • Green successfully cleans auger and took 98.5 to 100' sample. • Discuss number swap on well labeling with Louise Headland • Started lower portion OW-1008 (Prosonic) • Started OW-1012 (S&ME) • Showed location for OW-1006 to Kilman. They request road improvement
6/1/2005	• Started OW-1002B (Prosonic)

	• S&ME drilling OW-1012. Well completed • S&ME drilling OW-1010. • Development completed on 804, 805A, 853, 854, 856
6/2/2005	• Prosonic continues with OW-1002 • Completion of OW-1010. Well is accidentally lifted during grouting but returned to planned depth. Bechtel approves well as is. • S&ME moves to OW-1005. Kilman drilled original OW-1005 but pulled out. Well abandoned by S&ME. Cable broke and grazed S&ME Ted's shoulder. Ted declined emergency room visit • S&ME second rig moves to OW-1006 • Development completed on 27, 850A 852, 855
6/3/2005	• OW-1002B completed (Prosonic) • Started OW-1004 (Prosonic) • OW-1005B and OW-1006A started by S&ME rigs. Out of auger on OW-1005 at ~3 pm. • OW-1015 completed (Greene) • Development completed on OW-1003, OW-1009, OW-1010, OW-1012, OW-1015
6/4/2005	• Greene encounters difficult drilling at 105'. Had to retool for mud to stabilize borehole and clean flowing sand from HAS • Surface completion by S&ME at OW-1002` • Prosonic leaves site for training • OW-1015 surface completion by S&ME • Started OW-1007 (Greene)
6/5/2005	• OW-1001A abandoned by S&ME • OW-1001 and OW-1006 surface completion by S&ME • OW-1002A abandoned by S&ME • OW-1003A abandoned by S&ME • OW-1005A abandoned by S&ME • OW-1006A abandoned by S&ME
6/6/2005	• Started 1007 (Greene) • Development completed for OW-1001 • GPS locations taken for new wells • Drillers report using 32 bags of grout in OW-1001 on top of 70 feet of grout already in hole. This shrank to about 20' bgs and additional 10 bags were used to top it off. S&ME used a total of 120 bags to abandon OW-1001A, OW-1002A, and top off OW-1001 and OW-1002
6/7/2005	• OW-1005 completed (S&ME) • OW-1007 completed (Greene) • Conversation with Bechtel to confirm using Schedule 80 PVC in holes over 100', due to inability to insert well pumps. Southern Co expresses concerns about representativeness of water table conditions at OW-1001 and multiple saturated zones in OW-1005 and OW-1006. • Attempted to rig a 'stand off' on water level meter to aid in getting reliable water level measurement down PVC. Capillary attraction making reading difficult in 1008 and other deep wells. 'Stand-off' initially worked but then held water, which continuously trickled over GeoSlope probe thus negating its usefulness. • Bechtel calls to say OW-1001 appears to be OK because of recovery and another well and boring are not required there
6/8/2005	• OW-1006 assigned to Greene • OW-013 assigned to S&ME
6/9/2005	• OW-1006 started (Greene) • Started OW-1013 (S&ME)
6/10/2005	• OW-1006 continues

	• OW-1013 completed (S&ME)
6/11/2005	• OW-1014 started and completed (Prosonic) • OW-1011 started (Prosonic)
6/12/2005	• OW-1011 completed (Prosonic)
6/13/2005	• OW-1004 surface completion (S&ME development team) • OW-1011 surface completion (S&ME development team) • OW-1014 surface completion (S&ME development team) • OW-1006 continues
6/14/2005	• Development completed on OW-1002, OW-1004, OW-1007, OW-1008, OW-1011, OW-1014 • OW-1006 completed
6/15/2005	• Development completed on 142, 179, 27, OW-1005, OW-1013
6/16/2005	• OW-1006 surface completion and development (S&ME development team) • Inspected wells LT-1B, LT-12, and LT-7A. Made note of depth to water and bottom of wells. No redevelopment recommended

APPENDIX B

WEEKLY FIELD LOG

Vogtle ALWR ESP Project
Weekly Field Log

Well	Purpose	Status	Driller	Tuesday 24-May-05	Wednesday 25-May-05	Thursday 26-May-05	Friday 27-May-05	Saturday 28-May-05	Sunday 29-May-05	Monday 30-May-05	Tuesday 31-May-05	Wednesday 1-Jun-05	Thursday 2-Jun-05	Friday 3-Jun-05	Saturday 4-Jun-05
OW-1001	Shallow	Completed	Greene												
OW-1001A	Shallow	Abandoned	Kilman												
OW-1002A	Shallow	Abandoned	Greene												
OW-1002	Deep	Completed	Prosonic												
OW-1003A	Shallow	Abandoned	S&ME Tim												
OW-1003	Shallow	Completed	S&ME Tim												
OW-1004	Deep	Started	Prosonic												OFFSITE [illegible] Days
OW-1005A	Shallow	Abandoned	Kilman												
OW-1005	Shallow	Completed	S&ME Ted												
OW-1006A	Shallow	Abandoned	S&ME Tim												
OW-1006	Shallow	Located	Greene												
OW-1007	Shallow	Completed	Greene												
OW-1008	Deep	Completed	Kilman/Prosonic*												
OW-1009	Shallow	Completed	S&ME Ted												
OW-1010	Shallow	Completed	S&ME Tim												
OW-1011	Deep	Completed	Prosonic												
OW-1012	Shallow	Completed	S&ME Ted												
OW-1013	Shallow	Completed	S&ME Ted												
OW-1014	Deep	Completed	Prosonic												
OW-1015	Shallow	Completed	Greene												
Development Team						Developed 803a, 809	Surface Completion OW-1009				Helped gather supplies and assembled new pump	Developed 804, 805a, 853, 854, 856	Developed 850a, 852, 855 Surface Completion OW-1010	Surface completion OW-1003 Developed OW-1003, OW-1009, OW-1010, OW-1012, OW-1015	Surface completions OW-1002 OW-1015

Well	Sunday 5-Jun-05	Monday 6-Jun-05	Tuesday 7-Jun-05	Wednesday 8-Jun-05	Thursday 9-Jun-05	Friday 10-Jun-05	Saturday 11-Jun-05	Sunday 12-Jun-05	Monday 13-Jun-05	Tuesday 14-Jun-05	Wednesday 15-Jun-05	Thursday 16-Jun-05
OW-1001												
OW-1001A	Abandoned by S&ME											
OW-1002A	Abandoned by S&ME											
OW-1002												
OW-1003A	Abandoned by S&ME											
OW-1003												
OW-1004												
OW-1005A	Abandoned by S&ME											
OW-1005												
OW-1006A	Abandoned by S&ME											
OW-1006							OFFSITE					
OW-1007												
OW-1008												
OW-1009												
OW-1010												
OW-1011												
OW-1012												
OW-1013												
OW-1014												
OW-1015												
Development Team	Surface completions OW-1001 OW-1006			Surface completions OW-1005, OW-1007, OW-1012	OFFSITE	Surface completion OW-1013	OFFSITE			Developed and surface completion OW-1002, OW-1004, OW-1007, OW-1008, OW-1011, OW-1014	Developed 142, 179, 27, OW-1005, OW-1013	Surface Completion and development OW-1006

* Kilman 5/25 - 26. Prosonic 5/31-6/1

[ ] Drilling/well installation period - start to finish

[■] Time offsite, no drilling (Holiday, training, week-end)

APPENDIX C

SURVEY DATA

EXISTING WELL SURVEY
NEW WELL SURVEY

Vogtle Existing Well Survey (NAD27)

Well	Northing	Easting	El. Ground (ft.)	El. Top of Casing
				(TOC ft.)
	(NAD27)	(NAD27)		
142	1143282.409	622260.403	222.377	223.797
179	1144061.205	621778.747	274.668	275.068
802A	1142201.703	624195	215.558	218.258
803A	1142085.387	622896.031	218.394	219.574
804	1141599.597	622224.797	223.603	225.373
805A	1141616.153	624395.699	233.988	235.76
806B	1143821.568	623724.453	214.314	215.414
808	1144624.291	623297.746	214.871	215.771
809	1143320.36	621857.189	NA	223.671
LT-1B	1143390.484	623301.286	218.053	220.654
LT-7A	1143154.107	623314.265	217.813	218.563
LT-12	1142776.798	623597.644	218.274	219.024
LT-13	1143136.424	624108.674	218.273	220.073
27	1143622.414	627928.859	208.836	210.406
29	1144982.746	626389.789	190.83	192.61
850A	1146728.881	624482.466	225.225	227.025
851A	1143869.697	621064.25	261.685	263.325
852	1140993.937	627377.483	199.408	201.308
853	1146016.483	623191.496	226.599	229.969
854	1144900.49	621914.54	235.584	237.324
855	1142159.143	627948.361	216.767	218.668
856	1139928.479	626555.6	185.495	187.107

Vogtle New Well Survey (NAD27)

Location	Northing	Easting	El. Ground (ft.)	El. Top of Casing
				(TOC ft.)
1001	1142888.724	620148.556	230.224	232.864
1002	1142887.782	620189.341	226.812	229.872
1003	1142864.056	621884.337	222.414	225.654
1004	1142842.176	621880.794	222.29	225.041
1005	1144047.86	620408.765	263.759	266.659
1006	1143817.854	619179.749	226.491	229.971
1007	1142383.767	619301.009	216.28	219.33
1008	1142347.939	619306.686	216.02	219.08
1009	1141891.645	620888.608	220.257	223.017
1010	1140808.986	620051.708	216.265	219.275
1011	1139956.246	621033.045	205.155	208.413
1012	1139969.496	621045.924	204.725	208.054
1013	1140805.4	621715.032	216.239	219.179
1014	1140565.502	623070.234	220.237	223.226
1015	1140550.576	623086.318	219.797	222.527

APPENDIX D

FIELD INSTRUMENTS/EQUIPMENT

Contractor	Tools/Rig Description
Greene Water Well, Inc.	CME 75 Auger drill with water tank; manual hammer 1-ton crew truck Chevrolet Pickup HD 4-1/4" ID hollow stem auger – 125' 3-1/4" ID hollow stem auger 90' NWJ rod
Kilman Brothers	CME 45; 4X4; no water tank, auto hammer 125' of 3 1/4" ID hollow stem auger 110' N rod 2 cutter heads
S&ME (2 rigs)	3 F-Series, ¾-ton trucks 1 personal vehicle 2 CME 55 Auger/Wash drill rigs with SPT Autohammers Grundfos pump Static water level indicator Generator Steam Junny 2 grout plants with tremie pipe 3-1/4" ID hollow stem augers – 90' 4-1/4" ID hollow stem augers – 180' NWJ rods with 4" fishtail or 6" rollercone – 180' 6 2' split spoons
PROSONIC	SR-083 drill rig w/ 6" outer drive casing and 4" sampling tube Two 1-ton crew trucks Onboard grout machine Pressure washer
SCS	Provided 60' 4 1/4" ID hollow stem augers
	Extra – 1 bundle (19) 5' AWJ rods 9 loose 5' AWJ rods 14 loose 10' NWJ rods Chemical grouting machine

Contractor	Well Development Tools
S&ME	Grunfos Rediflo2 submersible pump 200' of hose and power lead 1 Generac 5000 Watt, 10 HP 110/240V AC generator

Well Supplies
Schedule 80 PVC slotted screens - 10' length Schedule 80 PVC risers - 10' length

Schedule 80 PVC riser - 2 1/2' length
Schedule 80 PVC riser - 5' length
Schedule 40 PVC slotted screens - 10' length
Schedule 40 PVC risers - 10' length
Schedule 40 PVC risers - 5' length
Schedule 40 PVC risers - 2 1/2' length

DSI 1A filter sand
JC50FS by Unimen filter sand
Foster Dixiana

CETCO Goldseal 3/8" bentonite chips
CETCO Puregold medium

APPENDIX E

BORING LOGS

OW-1001
OW-1002
OW-1002A
OW-1003
OW-1004
OW-1005
OW-1005A
OW-1006
OW-1006A
OW-1007
OW-1008
OW-1008A
OW-1009
OW-1010
0W-1011
OW-1012
OW-1013
OW-1014
OW-1015

LEGEND

N	**Standard Penetration Resistance. The sum of the number of blows from a 140 pound hammer needed to drive the sampler over the sampling depth of 6 to 18 inches.**
Bpf	**Blows per foot. Unit of measure for 'N'.**
WOR	**Split spoon sampler penetrates by weight of the sampling rods alone.**
WOH	**Split spoon sampler penetrates by the weight of 140 pound hammer alone, with no blows from the hammer.**

SOUTHERN COMPANY
Energy to Serve Your World

DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1001
Sheet 1 of 5

SITE Vogtle ALWR SSAR | HOLE DEPTH 140' | SURF.ELEV. 230.854
LOCATION Burke County, Georgia | COORDINATES N 1142888.724 | E 620148.556
ANGLE NA | BEARING NA | CONTRACTOR Greene | DRILL NO. CME 75
DRILLING METHOD 4 1/4" HSA | NO. SAMPLES 4 | NO. U.D. SAMPLES NA
WATER TABLE DEPTH 108.7' | ELEV. | TIME AFTER COMP. | DATE TAKEN 5/24/2005
TYPE GROUT NA | QUANTITY NA | MIX NA | DRILLING START DATE 5/24/2005
DRILLER Arthur | RECORDER S. Bearce | APPROVED NA | DRILLING COMP. DATE 5/29/2005

Depth Ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To Ft.	Blows	N BPF	Comments
0	230.85						
1	229.85	OW-1001 was installed in this borehole. OW-1001 is a well pair with OW-1002					
2	228.85	Soil sampling for the upper portion was completed in OW-1002A to the top of the MARL at 105'					
3	227.85	bgs. Sampling in this hole began at 113.5 feet bgs. (Sheet 4)					
4	226.85						
5	227.86	A previous borehole (OW-1001A) was made for this well but was abandoned. No log was prepared.					
6	224.85						
7	223.85						
	222.85						
9	221.85						
10	222.86						
11	219.85						
12	218.85						
13	217.85						
14	216.85						
15	217.86						
16	214.85						
17	213.85						
18	212.85						
19	211.85						
20	210.85						
21	209.85						
22	208.85						
23	207.85						
24	206.85						

Form GS9901 7-26-200

SOUTHERN COMPANY
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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1001

SITE Vogtle ALWR SSAR TOTAL DEPTH 140' SURF.ELEV. 230.854

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments
25	205.85	See Page 1					
26	204.85						
27	203.85						
28	202.85						
29	201.85						
30	200.85						
31	199.85						
32	198.85						
33	197.85						
34	196.85						
35	195.85						
36	194.85						
37	193.85						
38	192.85						
39	191.85						
40	190.85						
41	189.85						
42	188.85						
43	187.85						
44	186.85						
45	185.85						
46	184.85						
47	183.85						
48	182.85						
49	181.85						
50	180.85						
51	179.85						
52	178.85						
53	177.85						
54	178.86						
55	175.85						
56	174.85						

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SOUTHERN COMPANY
Energy to Serve Your World

DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1001

SITE Vogtle ALWR SSAR TAL DEPTH 140' ELEV. 230.854

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments
57	173.85	See Page 1					
58	172.85						
59	171.85						
60	170.85						
61	169.85						
62	168.85						
63	167.85						
64	166.85						
65	165.85						
66	164.85						
67	163.85						
68	162.85						
69	161.85						
70	160.85						
71	159.85						
72	158.85						
73	157.85						
74	156.85						
75	155.85						
76	154.85						
77	153.85						
78	152.85						
79	151.85						
80	150.85						
81	149.85						
82	148.85						
83	147.85						
84	146.85						
85	145.85						
86							
87	143.85						
88	142.85						

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1001

SITE Vogtle ALWR SSAR TOTAL DEPTH 140' SURF.ELEV. 230.854

Depth FT.	Elev. FT.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To FT.	Blows	N BPF	Comments
89	141.85						
90	140.85						
91	139.85						
92	138.85						
93	137.85						
94	136.85						
95	135.85						
96	134.85						
97	133.85						
98	132.85						
99	131.85						5/29/05
100	130.85						▼ 99' from ground surface
101	129.85						Difficult drilling at 100'
102	128.85						
103	127.85						
104	126.85						
105	125.85						
106	124.85						
107	123.85						5/24/05
108	122.85						▼ 108.7' from TOC
109	121.85						Difficult drilling at 110'
110	120.85						
111	119.85						
112	118.85						
113	117.85	Sampling begins at 113.5'					
114	116.85	Dark grey LIMESTONE bed, 0.2' thick with black macro fossils, thin laminae (~0.05')of CHALK on bottom	1	113.50-115	50/3"	50/3"	
115	115.85						
116	114.85						
117	113.85						
118			2	118.5-120	50/2"	50/2"	
119		Buff sandy COQUINA					
120	110.85						

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1001
Sheet 5 of 5

SITE Vogtle ALWR SSAR | TOTAL DEPTH 140' | SURF.ELEV. 230.854

Depth FT.	Elev. FT.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To Ft.	Blows	N BPF	Comments
121	109.85	Buff sandy COQUINA					
122	108.85						
123	107.85						
124	106.85	No recovery, auger used to grind through interval		123.5-125	50/0"	50/0"	
125	105.85						
126	104.85						
127	103.85						
128	102.85						
129	101.85	Dark grey LIMESTONE 2" layer	3	128.5-130	50/2"	50/2"	
130	100.85						
131	99.85						
132	98.85						
133	97.85						
134	96.85		4	133.5-135	18-19-25	44	
135	95.85	Approximately 3" of dark greenish grey MARL in spoon					
136	94.85						
137	93.85						
138	92.85	Greenish gray MARL		136.5-138	50/2"	50/2"	
139	91.85						
140	90.85			138.5-140	50/2"	50/2"	
141	89.85	Boring Terminated at 140'					
142	88.85						1500 gallons of water lost cleaning bottom of hole. Pumped at 60 gpm.
143	87.85						
144	86.85						
145	85.85						
146	84.85						
147	83.85						
148	82.85						
149	81.85						
150	82.86						
151	79.85						
152	78.85						

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SOUTHERN COMPANY
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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1002

SITE	Vogtle ALWR SSAR			HOLE DEPTH	237	SURF.ELEV.	227.442
LOCATION	Burke County, Georgia			COORDINATES N	1142887.782	E	620189.341
ANGLE	NA	BEARING	NA	CONTRACTOR	Prosonic	DRILL NO.	SR-083
DRILLING METHOD	Sonic			NO. SAMPLES	continuous	NO. U.D. SAMPLES	NA
WATER TABLE DEPTH	93.5'	ELEV.	133.312'	TIME AFTER COMP.	NA	DATE TAKEN	6/6/2005
TYPE GROUT	NA	QUANTITY	NA	MIX	NA	DRILLING START DATE	6/2/2005
DRILLER	Tony	RECORDER	Steve Bearce	APPROVED	NA	DRILLING COMP. DATE	6/6/2005

Depth Ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments
0	227.44						
1		Sampling not started until 87' below ground surface. Because drill technology changed, the hole had to be offset approximately 20' North of original borehole.					
2	226.44						
3	225.44	Well OW-1002 is installed in this borehole.					
4	224.44						
5	223.44						
6	222.44						
7	221.44						
8	220.44						
9	219.44						
10	218.44						
11	217.44						
12	216.44						
13	215.44						
14	214.44						
15	213.44						
16	212.44						
17	211.44						
18	210.44						
19	209.44						
20	208.44						
21	207.44						
22	206.44						
23	205.44						
24	204.44						

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1002

SITE Vogtle ALWR SSAR TOTAL DEPTH 237 SURF.ELEV. 227.442

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test: From To	Blows	N	Comments	% Rec	RQD
		See page 1							
25	202.44								
26	201.44								
27	200.44								
28	199.44								
29	198.44								
30	197.44								
31	196.44								
32	195.44								
33	194.44								
34	193.44								
35	192.44								
36	191.44								
37	190.44								
38	189.44								
39	188.44								
40	187.44								
41	186.44								
42	185.44								
43	184.44								
44	183.44								
45	182.44								
46	181.44								
47	180.44								
48	179.44								
49	178.44								
50	177.44								
51	176.44								
52	175.44								
53	174.44								
54									
55	172.44								
56	171.44								

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1002

SITE Vogtle ALWR SSAR TOTAL DEPTH 237 SURF.ELEV. 227.442

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments	% Rec	RQD
57	170.44	See page 1							
58	169.44								
59	168.44								
60	167.44								
61	166.44								
62	165.44								
63	164.44								
64	163.44								
65	162.44								
66	161.44								
67	160.44								
68	159.44								
69	158.44								
70	157.44								
71	156.44								
72	155.44								
73	154.44								
74	153.44								
75	152.44								
76	151.44								
77	150.44								
78	149.44								
79	148.44								
80	147.44								
81	146.44								
82	145.44								
83	144.44								
84	143.44								
85	142.44								
86	140.81								
87	140.44								
88	139.44	Sampling started with ProSonic drill rig							

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SOUTHERN COMPANY *Energy to Serve Your World*	DRILLING LOG GEOLOGICAL SERVICES	Hole No. OW-1002 Sheet 4 of 8

SITE: Vogtle ALWR SSAR | TOTAL DEPTH: 237 | SURF.ELEV. 227.442

Depth Ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments
89	138.44	Yellow tan, shelly, sandy CLAY (CH), interbedded w/ occasional fine-grained shelly SAND, (SW)	1	88.5 - 90	NA	NA	
90	137.44						
91	136.44						
92	135.44						
93	134.44						
94	133.44		2	93.5 - 95			
95	132.44						
96	131.44						
97	130.44						
98	129.44	Sharp contact into greenish grey MARL					
99	128.44		3	98.5 100	NA	NA	
100	127.44						
101	126.44						
102	125.44						
103	124.44						
104	123.44		4	103.5 - 105	NA	NA	
105	122.44						
106	121.44						
107	120.44						
108	119.44						
109	118.44		5	108. - 110	NS	NS	
110	117.44						
111	116.44						
112	115.44						
113	113.81						
114	113.44		6	113.5 - 115	NA	NA	
115	112.44						
116	111.44						
117	110.44						
118	108.81			118.5			
119	108.44		7	- 120	NA	NA	
120	107.44						

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1002

Sheet 5 of 8

SITE **Vogtle ALWR SSAR** TOTAL DEPTH **237** SURF.ELEV. 227.442

Depth Ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments	% Rec	RQD
121	106.44	Greenish grey MARL							
122	105.44								
123	104.44								
124	103.44		8	123.5 - 125	NA	NA			
125	102.44								
126	101.44								
127	100.44								
128	99.44								
129	98.44		9	128.5 - 130	NA	NA			
130	97.44								
131	96.44								
132	95.44								
133	94.44								
134	93.44	Thin bedded, light grey, "soft" or "friable" LIMESTONE occurs in this interval	10	133.5 - 135	NA	NA			
135	92.44								
136	91.44								
137	90.44								
138	89.44	Greenish grey MARL, becoming lighter in color							
139	88.44		11	138.5 - 140	NA	NA			
140	87.44								
141	86.44								
142	85.44								
143	84.44								
144	83.44		1`2	143.5 - 145	NA	NA			
145									
146	81.44								
147	80.44								
148	79.44								
149	78.44		13	148.5 - 150	NA	NA			
150		2 thin LIMESTONE beds between 147' and 157'							
151	76.44								
152	75.44								

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1002

SITE Vogtle ALWR SSAR | TOTAL DEPTH | SURF.ELEV. 227.442

Depth Ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments
153	73.44						
154	72.44		14	153.5 - 155	NA	NA	
155	71.44						
156	70.44						
157	69.44						
158	68.44	Greenish grey MARL					
159	67.44		15	158.5 - 160	NA	NA	
160	66.44						
161	65.44						
162	64.44						
163	63.44						
164	62.44		16	163.5 - 165	NA	NA	
165	61.44						
166	60.44						
167	59.44						
168	58.44						
169	57.44		17	168.5 - 170	NA	NA	
170	56.44						
171	55.44						
172	54.44						
173	53.44	Light olive grey sandy CLAY grading to -->					
174	52.44		18	173.5 - 175	NA	NA	
175	51.44						
176	50.44	Light olive grey fine- to coarse-grained SAND composed of shell fragments and CLAY					
177	49.44						
178	48.44	Greenish grey MARL					
179	47.44		19	178.5 - 180	NA	NA	
180	46.44						
181	45.44						
182	43.81						
183	43.44						
184	41.81		20	183.5 - 185	NA	NA	

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DRILLING LOG

GEOLOGICAL SERVICES

Hole No. OW-1002

Sheet 7 of 8

SITE Vogtle ALWR SSAR TOTAL DEPTH 237 SURF.ELEV. 227.442

Depth Ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments
185	42.44						
186	41.44						
187	40.44						
188	39.44	Greenish grey MARL					
189	38.44		21	188.5 - 190	NA	NA	
190	37.44						
191	36.44						
192	35.44						
193	34.44						
194	33.44		22	193.5 - 195	NA	NA	
195	32.44						
196	31.44						
197	30.44						
198	29.44						
199	28.44		23	198.5 - 200	NA	NA	
200	27.44						
201	26.44						
202	25.44						
203	24.44						
204	23.44		24	203.5 - 205	NA	NA	
205	22.44						
206	21.44						
207	20.44						
208	19.44						
209	18.44		25	208/5 - 210	NA	NA	
210	17.44						
211	16.44						
212	15.44						
213	14.44						
214		~ 1/2' gradation to dark grey fine- to medium-grained SAND (SP) with minor amounts of silt and organics and 3/4' thick lignite layer	26	213.5 -. 215	NA	NA	
215	12.44						
216	11.44						

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1002

SITE Vogtle ALWR SSAR TOTAL DEPTH 237 SURF.ELEV. 227.442

Depth Ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments
217	10.44						
218	9.44	6" grey CLAY layer					
219	8.44		27	218.5 - 220	NA	NA	
220	7.44						
221	6.44	Light greenish grey fine- to medium-grained, silty glauconitic SAND (SM)					
223	4.44						
224	3.44		28	223.5 - 225	NA	NA	
225	2.44						
226	1.44						
227	0.44						
228	-0.56				NA	NA	
229	-1.56		29	228.5 - 230			
230	-2.56						
231	-3.56						
232	-4.56						
233	-5.56						
234	-6.56		30	233.5 - 235	NA	NA	
235	-7.56						
236	-8.56						
237	-9.56						
238	-10.56	Boring terminated at 237'. Well OW-1002 installed in this borehole.					
239	-11.56						
240	-12.56						
241	-13.56						
242	-14.56						
243	-15.56						
244	-16.56						
245	-17.56						
246	-18.56						
247	-20.19						
248	-20.56						
249	-21.56						

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SOUTHERN COMPANY
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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1002A

SITE	Vogtle ALWR SSAR	HOLE DEPTH	108.5	SURF.ELEV.	NA
LOCATION	Burke County, Georgia	COORDINATES N	NA	E	NA
ANGLE	NA	BEARING	NA	CONTRACTOR	Greene
DRILL NO.	CME 75	DRILLING METHOD	HSA 3 1/4"	NO. SAMPLES	22
NO. U.D. SAMPLES	NA	WATER TABLE DEPTH	90'	ELEV.	NA
DATE TAKEN	5/25/2005	TYPE GROUT	NA	QUANTITY	NA
MIX	NA	DRILLING START DATE	5/24/2005	DRILLER	Greene/Arthur
RECORDER	Steve Bearce	APPROVED	NA	DRILLING COMP. DATE	5/25/2005

Depth FT.	Elev. FT.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To Ft.	Blows	N BPF	Comments
0							
1							
2							
3							
4		Red brown silty SAND (SM) to SAND (SW), fine- to coarse-grained	1A	3.5-5	11-13-15	28	
5							
6							
7							
8							
9		Yellow brown SAND (SW), fine- to medium-grained	2A	8.5-10	6-8-10	18	
10							
11							
12							
13							
14		Light brown clayey SAND (SC), fine- to medium-grained	3A	13.5-15	3-4-5	9	
15							
16							
17							
18							
19			4A	18.5-20	4-4-3	7	
20							
21							
22							
23							
24							

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SOUTHERN COMPANY
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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1002A

SITE Vogtle ALWR SSAR TOTAL DEPTH 108.5 SURF.ELEV.

Depth FT.	Elev. FT.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To FT.	Blows	N BPF	Comments
25		Light tan sandy Clay (CL)	5A	23.5-25	4-4-5	9	
26							
27							
28							
29							
30			6A	28.5 - 30	3-3-3	6	
31							
32							
33							
34		Buff COQUINA in layers ~=1/2 recovery of coquina	7A	33.5 - 35	50/3"	50/3"	
35							
36							
37							
38							
39		Buff colored, white shelly (<10%) clayey SAND (SC)	8A	38.5 - 40	10-9-8	17	
40							
41							
42							
43							
44		Same as above but no shells	9A	43.5 - 45	3-4-5	9	
45							
46							
47							
48							
49		Buff colored fine sandy CLAY (CL)	10A	48.5 - 50	7-2-9	11	
50							
51							
52							
53							
54		Grading to clayey fine SAND (SC)	11A	53.5 - 55	4-2-10	12	
55							
56							

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1002A

SITE Vogtle ALWR SSAR TOTAL DEPTH 108.5' SURF.ELEV.

Depth Ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To Ft.	Blows	N BPF	Comments
57							
58							
59		Buff colored, sandy shelly (15%) CLAY (CL)	12A	58.5-60	28-26-13	39	high N due to shells
60							
61							
62							
63							
64		Buff colored fine-grained clayey SAND (SC) moist	13A	63.5-65	11-13-19	32	
65							
66							
67							
68		Tan, slightly pink fine-grained sandy CLAY (CL), with fine-grained SAND, (SC) slightly moist					
69			14A	68.5-70	8-12-50	62	
70							
71							
72							
73							
74		Buff colored slightly green shelly, clayey, SAND (SC)	15A	73.5-75	8-12-27	39	
75							
76							
77							
78							
79		Light brown, silty, fine-grained SAND (SM), moist	16A	78.5-80	5-20-25	45	
80							
81							
82							
83							
84			17A	83.5-85	11-21-25	46	
85							
86							
87							
88							

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SOUTHERN COMPANY
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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1002A

SITE Vogtle ALWR SSAR TOTAL DEPTH 108.5 SURF.ELEV.

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments
89		Tan fine-grained SAND, (SP), wet	18A	88.5-90	12-25-31	56	
90							5/24/05 ▼ 90' from ground surface
91							
92							
93							
94		Buff silty, SAND, (SM), wet	19A	93.5-95	50/4"	50/4"	
95							
96							
97							
98							
99		Saturated with shell fragments (thin, 4mm, to thick, ~1cm)	20A	98.5-100	12-50/3"	12-50/3"	
100							
101							
102							
103							
104							
105		Greenish grey, MARL, damp	21A	103.5-105	3-1-50	51	
106							
107							
108							
109		Boring Terminated @ 108.5'. This borehole was abandoned due to use of 3 1/4" augers.	22A	108.5-110	11-50	61	
110							
111		Moved over approximately 20 feet north and drilled OW-1002 with ProSonic rig. Well was installed in borehole OW-1002.					
112							
113							
114							
115							
116							
117							
118							
119							
120							

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SOUTHERN COMPANY
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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1003

SITE	Vogtle ALWR SSAR	HOLE DEPTH	90	SURF.ELEV.	NA
LOCATION	Burke County, Georgia	COORDINATES N	NA	E	NA
ANGLE	NA	BEARING	NA	CONTRACTOR	S&ME
DRILL NO.	CME 550	DRILLING METHOD	31/4" HSA	NO. SAMPLES	18
NO. U.D. SAMPLES	NA	WATER TABLE DEPTH	63.6'	ELEV.	NA
TIME AFTER COMP.	NA	DATE TAKEN	5/25/2005	TYPE GROUT	NA
QUANTITY	NA	MIX	NA	DRILLING START DATE	5/24/2005
DRILLER	TIM	RECORDER	Steve Bearce	APPROVED	NA
DRILLING COMP. DATE	5/24/2005				

Depth Ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To Ft.	Blows	N BPF	Comments
0							
1							
2							
3		Red-brown silty-clayey SAND (SM-SC) fine- to medium-grained, moist					
4							
5			1	3.5-5	7-13-17	30	
6							
7							
8							
9		Light brown, silty SAND, (SM) to SAND (SW) fine- to medium-grained					
10			2	8.5-10	9-6-6	12	
11							
12							
13							
14		Red-brown silty-clayey SAND (SM-SC), fine-grained					
15			3	13.5-15	8-11-13	24	
16							
17							
18							
19		Red brown sandy SILT (ML) and Red-brown silty-clayey SAND, (SM-SC) fine-grained					
20			4	18.5-20	9-14-15	29	
21							
22							
23							
24		Yellow-brown SAND, (SW)					

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SOUTHERN COMPANY
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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1003

SITE Vogtle ALWR SSAR TOTAL DEPTH 90 SURF.ELEV. NA

Depth Ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To Ft.	Blows	N BPF	Comments
25		Fine- to medium-grained SAND, (SW) damp	5	23.5-25	8-11-17	28	
26							
27							
28							
29		Red-Brown silty SAND (SM) with laminations of clayey SAND (SM), clay and silt					
30			6	28.5-30	6-5-7	12	
31							
32							
33							
34		Yellow-brown with mottled grey clayey SAND (SC) and fine-grained SAND, damp	7	33.5-35	7-5-5	10	
35							
36							
37							
38							
39		Same as above with some sandy CLAY laminations, damp	8	38.5-40	4-4-4	8	
40							
41							
42							
43							
44		Yellow brown sandy CLAY (CL) fine-grained SAND, damp	9	43.5-45	3-3-4	7	
45							
46							
47							
48							
49		Layered yellow brown clayey SAND, (SC) and yellow brown sandy CLAY, moist					
50			10	48.5-50	3-3-4	7	
51							
52							
53							
54		very moist	11	53.5-55	2-2-5	7	
55							
56							

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1003

SITE Vogtle ALWR SSAR TOTAL DEPTH 90 SURF.ELEV. NA

Depth Ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test: From To FT.	Blows	N BPF	Comments
57							
58							
59		Light pinkish tan SAND (SW), fine- to medium-grained	12	58.5-60	2-7-9	16	
60							
61							
62							
63							
64		Light tan clayey SAND (SC)	13	63.5-65	WOR	WOR	5/25/05 ▼ 63.6' from ground surface
65							
66							
67							
68							
69		Buff colored clayey SAND, (SC) fine to medium grained SAND	14	68.5-70	WOR 18"	WOR 18"	Saturated
70							
71							
72							
73							
74		Same as above	15	73.5-75	WOR 12"	WOR 12"	
75							
76							
77							
78							
79		Reddish brown silty SAND (SM)	16	78.5-80	1-1-2	3	
80							
81							
82							
83							
84		Light tan silty SAND (SM)	17	83.5-85	1-1-2	3	
85		Tan and grey clayey COQUINA					
86							
87							
88							

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1003

SITE Vogtle ALWR SSAR TOTAL DEPTH 90 SURF.ELEV. NA

Depth Ft.	Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To Ft.	Blows	N BPF	Comments
89			18	88.5-90	13-21-23	44	
90		Greenish grey MARL					
91		BORING Terminated at 90.0'					
92		This borehole was abandoned due to the use of 3 1/4" augers.					
93							
94		Shallow well OW-1003 was installed approximately 10' south of this borehole. No boring log was prepared for the hole due to the proximity of this borehole.					
95							
96							
97							
98							
99							
100							
101							
102							
103							
104							
105							
106							
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118							
119							
120							

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1004

SIT	Vogtle ALWR SSAR			HOLE DEPTH	187	SURF.ELEV.	222.92
LOCATION	Burke County, Georgia			COORDINATES N	1142842.176	E	621880.794
AN	NA	BEARING	NA	CONTRACTOR	Prosonic	DRILL NO.	SR-083
DRILLING METHOD	Sonic			NO. SAMPLES	20	NO. U.D. SAMPLES	NA
WATER TABLE DEP		ELEV.	NA	TIME AFTER COMP.	NA	DATE TAKEN	
TYPE GROUT	NA	QUANTITY	NA	MIX		DRILLING START DATE	6/3/2005
DRILLER	Tony, Mike	RECORDER	S. Bearce	APPROVED	NA	DRILLING COMP. DATE	6/11/2005

epth	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To Ft.	Blows	N BPF	Comments
0	222.92						
1	221.92	This borehole was not sampled until 87'.					
2	220.92	OW-1004 is a well pair with OW-1003. The well is approximately ---feet --- of OW-1003.					
3	219.92	See boring log					
4	218.92	OW-1003 for description of upper sediments.					
5	217.92						
6	216.92						
7	215.92						
8	214.92						
9	213.92						
10	212.92						
11	211.92						
12	210.92						
13	209.92						
14	208.92						
15	207.92						
16	206.92						
17	205.92						
18	204.92						
19	203.92						
20	202.92						
21	201.92						
22	200.92						
23	199.92						
24	198.92						

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DRILLING LOG
GEOLOGICAL SERVICES

SITE Vogtle ALWR SSAR TOTAL DEPTH 187 SURF.ELEV. 222.92

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments	% Rec	RQD
25	196.92	See page 1							
26	195.92								
27	194.92								
28	193.92								
29	192.92								
30	191.92								
31	190.92								
32	189.92								
33	188.92								
34	187.92								
35	186.92								
36	185.92								
37	184.92								
38	183.92								
39	182.92								
40	181.92								
41	180.92								
42	179.92								
43	178.92								
44	177.92								
45	176.92								
46	175.92								
47	174.92								
48	173.92								
49	172.92								
50	171.92								
51	170.92								
52	169.92								
53	168.92								
54	163.39								
55	166.92								
56	161.39								

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SOUTHERN COMPANY
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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1004

SITE Vogtle ALWR SSAR | TOTAL DEPTH 187 | SURF.ELEV. 222.92

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments	% Rec	RQD
57	165.92	See page 1							
58	164.92								
59	163.92								
60	162.92								
61	161.92								
62	160.92								
63	159.92								
64	158.92								
65	157.92								
66	156.92								
67	155.92								
68	154.92								
69	153.92								
70	152.92								
71	151.92								
72	150.92								
73	149.92								
74	148.92								
75	147.92								
76	146.92								
77	145.92								
78	144.92								
79	143.92								
80	142.92								
81	141.92								
82	140.92								
83	139.92								
84	138.92								
85	137.92								
86	132.39								
87	135.92	Start sampling at 87'							
88	134.92	Olive-tan, wet CLAY (CL)							

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1004

SITE Vogtle ALWR SSAR TOTAL DEPTH 187 SURF.ELEV. 222.92

Depth Ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To Ft.	Blows	N BPF	Comments
89	133.92		1	88.5 - 90.0	NA	NA	
90	132.92						
91	131.92	Greenish grey MARL					
92	130.92						
93	129.92						
94	128.92		2	93.5 - 95	NA	NA	
95	127.92						
96	126.92						
97	125.92						
98	124.92						
99	123.92		3	98.5 - 100	NA	NA	
100	122.92						
101	121.92						
102	120.92						
103	119.92	Greenish grey shelly MARL with white fossils					
104	118.92		4	103.5 - 105	NA	NA	
105	117.92						
106	116.92						
107	115.92						
108	114.92						
109	113.92		5	108.5 - 110	NA	NA	
110	112.92						
111	111.92						
112	110.92						
113	109.92						
114	108.92						
115	107.92		6	113.5 - 115	NA	NA	
116	106.92						
117	105.92						
118	100.39						
119	103.92		7	118.5 - 120.	NA	NA	
120	102.92						

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1004

SITE Vogtle ALWR SSAR | TOTAL DEPTH 187 | SURF.ELEV. 222.92

Depth Ft.	Elev. FT.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To FT.	Blows	N BPF	Comments
121	101.92						
122	100.92	Shelly greenish grey MARL					
123	99.92						
124	98.92		8	123.5 - 125	NA	NA	
125	97.92						
126	96.92						
127	95.92						
128	94.92						
129	93.92	abundant (30%) gravel					
130	92.92		9	130 - 131.5	NA	NA	
131	91.92						
132	90.92						
133	89.92						
134	88.92						
135	87.92		10	133.5 - 135	NA	NA	
136	86.92						
137	85.92						
138	84.92						
139	83.92		11	138.5 - 140	NA	NA	
140	82.92						
141	81.92						
142	80.92						
143	79.92						
144	78.92		12	143.5 - 145	NA	NA	
145	77.92						
146	76.92						
147	75.92	6" gradational contact with abundant shells (white)					
148	74.92						
149	73.92	Dark grey, fine- to coarse-grained SAND, (SW) with green sand grains (glauconite or dolomite?)	13	148.5 - 150	NA	NA	
150	68.39						
151	71.92						
152	70.92						

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1004

SITE Vogtle ALWR SSAR TOTAL DEPTH 187 SURF.ELEV. 222.92

Depth Ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To Ft.	Blows	N BPF	Comments
153	69.92	grades to fine- to medium-grained dark grey SAND w/ organics, cohesive leaving core barrel, wet, poorly graded with silt (SP-SM)	14	153.5 - 155	NA	NA	
154	68.92						
155	67.92						
156	66.92						
157	65.92						
158	64.92		15	158.5 - 169	NA	NA	
159	63.92						
160	62.92						
161	61.92						
162	60.92						
163	59.92	Light grey, becomes loose coming out of core barrel fine-grained SAND (SP) with clay and silt	16	163.5 - 170	NA	NA	
164	58.92						
165	57.92						
166	56.92						
167	55.92						
168	54.92						
169	53.92		17	168.5 - 170	NA	NA	
170	52.92						
171	51.92						
172	50.92						
173	49.92						
174	48.92		18	173.5 - 175	NA	NA	
175	47.92	Dark grey organic, silty SAND (SM)					
176	46.92						
177	45.92						
178	44.92						
179	43.92		19	178.5 - 180	NA	NA	
180	42.92						
181	41.92						
182	36.39						
183	39.92						
184	34.39		20	183.5 - 185	NA	NA	

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1004

Sheet 7 of 7

SITE Vogtle ALWR SSAR | TOTAL DEPTH 187 | SURF.ELEV. 222.92

Depth Ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To Ft.	Blows	N BPF	Comments
185	37.92	Dark grey organic, silty SAND (SM)	20	188.5 - 190	NA	NA	
186	36.92						
187	35.92						
188	34.92	Boring teminated at 187'					
189	33.92	Well OW-1004 is installed in this borehole.					
190	32.92						
191	31.92						
192	30.92						
193	29.92						
194	28.92						
195	27.92						
196	26.92						
197	25.92						
198	24.92						
199	23.92						
200	22.92						
201	21.92						
202	20.92						
203	19.92						
204	18.92						
205	17.92						
206	16.92						
206	16.92						
208	14.92						
209	13.92						
210	12.92						
211	11.92						
212	10.92						
213	9.92						
214	4.39						
215	7.92						
216	6.92						

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SOUTHERN COMPANY
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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1005

SITE	Vogtle ALWR SSAR	HOLE DEPTH	170	SURF.ELEV.	264.389		
LOCATION	Burke County, Georgia	COORDINATES N	1144047.86	E	620408.765		
ANGLE	NA	BEARING	NA	CONTRACTOR	S&ME	DRILL NO.	CME B55
DRILLING METHOD	4/14" HSA	NO. SAMPLES	19	NO. U.D. SAMPLES	NA		
WATER TABLE DEPTH		ELEV.		TIME AFTER COMP.		DATE TAKEN	
TYPE GROUT	NA	QUANTITY	NA	MIX	NA	DRILLING START DATE	6/2/2005
DRILLER	Ted	RECORDER	R Tinsley/SCB	APPROVED	NA	DRILLING COMP. DATE	6/7/2005

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To ft.	Blows	N BPF	Comments
0	264.39						
1	263.39	Sampling in this borehole began at 68.5'. The adjacent borehole OW-1005A was drilled to 75'.					
2	262.39	The borehole was abandoned due to the use of 3 1/4" augers, which were incorrect size for well installation.					
3	261.39						
4	260.39	This borehole OW-1005 was located approximately 10' from feet from OW-1005A.					
5	259.39	Monitoring well OW-1005 is installed in this borehole.					
6	258.39						
7	257.39						
8	256.39						
9	255.39						
10	254.39						
11	253.39						
12	252.39						
13	251.39						
14	250.39						
15	249.39						
16	248.39						
17	247.39						
18	246.39						
19	245.39						
20	244.39						
21	243.39						
22	242.39						
23	241.39						
24	240.39						

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SOUTHERN COMPANY *Energy to Serve Your World*	DRILLING LOG GEOLOGICAL SERVICES	Hole No. OW-1005 Sheet 2 of 6

SITE Vogtle ALWR SSAR TOTAL DEPTH 170 SURF.ELEV. 264.389

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments
25	239.39	See page 1					
26	238.39						
27	237.39						
28	236.39						
29	235.39						
30	234.39						
31	233.39						
32	232.39						
33	231.39						
34	230.39						
35	229.39						
36	228.39						
37	227.39						
38	226.39						
39	225.39						
40	224.39						
41	223.39						
42	222.39						
43	221.39						
44	220.39						
45	219.39						
46	218.39						
47	217.39						
48	216.39						
49	215.39						
50	214.39						
51	213.39						
52	212.39						
53	211.39						
54							
55	209.39						
56	208.39						

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SOUTHERN COMPANY
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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1005

SITE Vogtle ALWR SSAR TOTAL DEPTH 170 SURF.ELEV. 264.389

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To ft.	Blows	N BPF	Comments
57	207.39	See page 1					
58	206.39						
59	205.39						
60	204.39						
61	203.39						
62	202.39						
63	201.39						
64	200.39						
65	199.39						
66	198.39						
67	197.39						
68	196.39	Sampling begins at 68.5'					
69	195.39		1B	68.5-70	2-36-50/1	36 50/1"	
70	194.39	Light grey to white sandy SILT (ML), calcareous with large and small shell fragments, very stiff					
71	193.39						
72	192.39						
73	191.39		2B	73.5-75	9-14-36	50	
74	190.39	fewer shells, less sand					
75	74.90	Greenish grey MARL					
76	188.39 76.20						
77	187.39	Light grey SILT, very stiff, calcareous with scattered shell fragments (ML)	3B	78.5-80	15-19-24	43	
78	186.39						
79	185.39						
80	184.39						
81	183.39						
82	182.39						
83	181.39		4B	83.5-85	50/2"	50/2"	
84	180.39						
85	179.39						
86							
87	177.39						
88	176.39						

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SOUTHERN COMPANY
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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1005

SITE Vogtle ALWR SSAR TOTAL DEPTH 170 SURF.ELEV. 264.389

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To ft.	Blows	N BPF	Comments
89	175.39		5B	88.5-90	7-17-30	47	
90	174.39	Light brownish grey SAND, fine to medium-grained, slightly silty (SW), calcareous					
91	173.39						
92	172.39	Mottled white to yellowish orange, silty SAND, with small to large shell fragments, Dense (SM)					
93	171.39						
94	170.39		6B	93.5-95	7-9-14	23	
95	169.39						
96	168.39	Light grey SILT, very stiff (ML)					
97	167.39	Pale yellow sandy SILT (ML) and silty SAND SM)					
98	166.39						
99	165.39		7B	98.5-100	7-17-34	51	
100	164.39						
101	163.39						
102	162.39						
103	161.39						
104	160.39	Greenish grey MARL	8B	103.5-105	18-34-29	63	
105	159.39	Pale yellow sandy SILT (ML) and silty SAND (SM)					
106	158.39						
107	157.39						
108	156.39						
109	155.39	White SHELL HASH with fine-coarse-grained SAND and large shell fragments	9B	108.5-110	8-18-39	57	
110	154.39						
111	153.39						
112	152.39						
113	151.39						
114	150.39		10B	113.5-115	12-30-30	60	
115	149.39						
116	148.39						
117	147.39						
118	145.76	Same as above with increase in fines					
119	145.39		11B	118.5-120	16-20-40	60	
120	144.39						

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1005

SITE Vogtle ALWR SSAR TOTAL DEPTH 170 SURF.ELEV. 264.389

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To ft.	Blows	N BPF	Comments
121	143.39						
122	142.39						
123	141.39	White SHELL HASH with fine-coarse-grained SAND (SW) and large shell fragments	12B	123.5-125	8-8-9	17	
124	140.39						
125	139.39						
126	138.39						
127	137.39						
128	136.39		13B	128.5-130	15-48-40	88	
129	135.39						
130	134.39						
131	133.39						
132	132.39						
133	131.39	Pale yellow SAND, fine to very fine- grained, clean (SP)	14B	133.5-135	7-9-21	30	
134	130.39						
135	129.39						
136	128.39						
137	127.39						
138	126.39						
139	125.39						
140	124.39	scattered shell pieces, dense	15B	138.5-140	10-13-30	43	
141	123.39						
142	122.39						
143	121.39						
144	120.39	increasing fines	16B	143.5-145	8-12-30	42	
145	119.39						
146	118.39						
147	117.39						
148	116.39	Pale yellow, silty SAND, calcareous (SM), fine-coarse-grained with shell pieces	17B	148.5-150	49/50/3"	49/ 50/3"	
149	115.39						
150							
151	113.39						
152	112.39						

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DRILLING LOG

GEOLOGICAL SERVICES

Hole No. OW-1005

SITE Vogtle ALWR SSAR | TOTAL DEPTH 170 | SURF.ELEV. 264.389

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments
153	111.39						
154	110.39	Pale yellow, silty SAND, calcareous (SM), fine- to coarse-grained with shell pieces	18B	153.5-155	12-33-50/2	33/ 50/2"	
155	109.39						
156	108.39						
157	107.39						
158	106.39						
159	105.39						
160	104.39	Same as above, slightly more consolidated	19B	158.5-160	25-22-44	66	Boring paused to procure more auger 6/04/05
161	103.39						
162	102.39						
163	101.39						
164	100.39			163.5-165	25-50/2"	25/ 50/2"	
165	99.39	Dark greenish grey MARL					
166	98.39						
167	97.39						
168	96.39						
169	95.39	Boring Terminated at 168.5		168.5 - 170	NA	NA	
170	94.39						
171	93.39						
172	92.39						
173	91.39						
174	90.39						
175	89.39						
176	88.39						
177	87.39						
178	86.39						
179	85.39						
180	84.39						
181	83.39						
182	81.76						
183	81.39						
184	80.39						

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1005A

SITE	Vogtle ALWR SSAR			HOLE DEPTH	75	SURF.ELEV.	263
LOCATION	Burke County, Georgia			COORDINATES N	NA	E	NA
ANGLE	NA	BEARING	NA	CONTRACTOR	Kilman	DRILL NO.	CME 45
DRILLING METHOD	3 1/4" HAS	NO. SAMPLES	15			NO. U.D. SAMPLES	NA
WATER TABLE DEPTH	NA	ELEV.	NA	TIME AFTER COMP.	NA	DATE TAKEN	NA
TYPE GROUT	NA	QUANTITY	NA	MIX	NA	DRILLING START DATE	5/31/2005
DRILLER	Kilman	RECORDER	Tinsley	APPROVED	NA	DRILLING COMP. DATE	5/31/2005

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To ft.	Blows	N BPF	Comments
0	263.00						
1							
2	262.00	Brown to reddish yellow SAND (SP), fine- to medium-grained, loose					
3	261.00		1A	3.5-5	4-12-11	23	
4	260.00						
5	259.00						
6	258.00						
7	257.00						
8	256.00	Mottled red and yellow silty SAND, fine- medium-grained (SW) to sandy silt (ML)	2A	8.5-10	2-10-14	24	
9	255.00						
10	254.00						
11	253.00						
12	252.00						
13	251.00	Red SAND, fine-grained, loose (SP)	3A	13.5-15	3-7-7	14	
14	250.00						
15	249.00						
16	248.00						
17	247.00						
18	246.00	Dark red, SAND, fine-grained (SP), loose	4A	18.5-20	7-6-6	12	
19	245.00						
20	244.00						
21	243.00						
22	242.00						
23	241.00						
24	240.00						

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SOUTHERN COMPANY
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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1005A

SITE Vogtle ALWR SSAR TOTAL DEPTH 75 SURF.ELEV. 263.759

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To ft.	Blows	N BPF	Comments	% Rec	RQD
25	238.76	Red and yellow SAND, fine-grained (SP), loose	5A	23.5-25	11-7-8	15			
26	237.76								
27	236.76								
28	235.76								
29	234.76	Yellow SAND, fine-grained (SP), loose	6A	28.5-30	6-7-8	15			
30	233.76								
31	232.76								
32	231.76								
33	230.76								
34	229.76		7A	33.5-35	7-10-11	21			
35	228.76								
36	227.76								
37	226.76								
38	225.76								
39	224.76	Red to light red, SAND, fine-grained, (SP), loose	8A	38.5-40	8-7-8	15			
40	223.76								
41	222.76								
42	221.76								
43	220.76								
44	219.76	Strong Brown, SAND, fine-coarse grained with some fines, (SW)	9A	43.5-45	13-8-8	16			
45	218.76								
46	217.76								
47	216.76								
48	215.76								
49	214.76	Brown to grey silty SAND, fine-coarse grained (SM)	10A	48.5-50	13-7-5	12			
50	213.76								
51	212.76								
52	211.76								
53	210.76								
54	209.76		11A	53.5-55	3-3-3	6			
55	208.76	Light grey CLAY (CL)							
56	207.76								

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GEOLOGICAL SERVICES

Hole No. OW-1005A

SITE Vogtle ALWR SSAR TOTAL DEPTH 75 SURF.ELEV.

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To ft.	Blows	N BPF	Comments
57	-57.00						
58	-58.00		12A	58.5-60	4-7-9	16	
59	-59.00	Light grey silty SAND very fine to fine grained, (SW)					
60	-60.00						
61	-61.00						
62	-62.00						
63	-63.00		13A	63.5-65	4-5-25	30	
64	-64.00	Light grey CLAY, (CL) stiff, calcareous					
65	-65.00						
66	-66.00						
67	-67.00						
68	-68.00		14A	68.5-70	8-12-23	35	
69	-69.00						
70	-70.00						
71	-71.00						
72	-72.00						
73	-73.00		15A	73.5-75	9-11-21	32	
74	-74.00						
75							
76	-76.00	Boring terminated at 75'.					
77	-77.00	This borehole was abandoned due to the use of 3 1/4" augers, which are incorrect size for well installation.					
78	-78.00						
79	-79.00	Borehole OW-1005 was completed approximately 10 ' from this hole using 4 1/4" augers. Well OW-1005 is installed in that hole.					
80	-80.00						
81	-81.00						
82	-82.00						
83	-83.00						
84	-84.00						
85	-85.00						
86	-86.00						
87	-87.00						
88	-88.00						

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1006

SITE	Vogtle ALWR SSAR	HOLE DEPTH	135	SURF.ELEV.	227.121
LOCATION	Burke County, Georgia	COORDINATES N	1143817.854	E	619179.749
ANGLE	NA	BEARING	NA	CONTRACTOR	Greene
DRILL NO.	CME 75	DRILLING METHOD	HSA	NO. SAMPLES	4
NO. U.D. SAMPLES	NA	WATER TABLE DEPTH		ELEV.	
TIME AFTER COMP.		DATE TAKEN		TYPE GROUT	NA
QUANTITY	NA	MIX	NA	DRILLING START DATE	6/9/2005
DRILLER	Arthur, Jarred	RECORDER	SC Bearce	APPROVED	NA
DRILLING COMP. DATE	6/14/2005				

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To ft.	Blows	N BPF	Comments
0	227.12						
1	226.12	No sampling prior to 118.5. See log for 1006A for soil descriptions through 120-130' depth. OW-1006A was abandoned. Drilling was terminated due to shortage of auger.					
2	225.12						
3	224.12						
4	223.12						
5	222.12						
6	221.12						
7	220.12						
8	219.12						
9	218.12						
10	217.12						
11	216.12						
12	215.12						
13	214.12						
14	213.12						
15	212.12						
16	211.12						
17	210.12						
18	209.12						
19	208.12						
20	207.12						
21	206.12						
22	205.12						
23	204.12						
24	203.12						

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1006

SITE Vogtle ALWR SSAR TOTAL DEPTH 135 SURF.ELEV. 227.121

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Standard Penetration Test Blows	Standard Penetration Test N	Comments
25	202.12	See page 1					
26	201.12						
27	200.12						
28	199.12						
29	198.12						
30	197.12						
31	196.12						
32	195.12						
33	194.12						
34	193.12						
35	192.12						
36	191.12						
37	190.12						
38	189.12						
39	188.12						
40	187.12						
41	186.12						
42	185.12						
43	184.12						
44	183.12						
45	182.12						
46	181.12						
47	180.12						
48	179.12						
49	178.12						
50	177.12						
51	176.12						
52	175.12						
53	174.12						
54	172.49						
55	172.12						
56	171.12						

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GEOLOGICAL SERVICES

Hole No. OW-1006

SITE Vogtle ALWR SSAR | TOTAL DEPTH 135 | SURF.ELEV. 227.121

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments
57	170.12						
58	169.12	See page 1					
59	168.12						
60	167.12						
61	166.12						
62	165.12						
63	164.12						
64	163.12						
65	162.12						
66	161.12						
67	160.12						
68	159.12						
69	158.12						
70	157.12						
71	156.12						
72	155.12						
73	154.12						
74	153.12						
75	152.12						
76	151.12						
77	150.12						
78	149.12						
79	148.12						
80	147.12						
81	146.12						
82	145.12						
83	144.12						
84	143.12						
85	142.12						
86	140.49						
87	140.12						
88	139.12						

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1006

SITE Vogtle ALWR SSAR TOTAL DEPTH 135 SURF.ELEV. 227.121

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To ft.	Blows	N BPF	Comments
89							
90							
91							
92							
93							
94							
95							
96							
97							
98							
99							
100							
101							
102							
103							
104							
105							
106							
107							
108							
109							
110							
111							
112							
113							
114							
115							
116							
117							
118		Sampling begins at 118.5'					
119			1	118.5-120	No SPTs		Pushed because of problems
120		Tan sandy and shelly CLAY (CH), saturated					

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1006

Sheet 5 of 5

SITE **Vogtle ALWR SSAR** TOTAL DEPTH **135** SURF.ELEV. 227.121

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To ft.	Blows	N	Comments
121	106.12						
122	105.12						
123	104.12	Tan sandy and shelly CLAY (CH), saturated					
124	103.12		2	123.5-125	NA	NA	No SPTs
125	102.12						Pushed because of drilling problems
126	101.12						
127	100.12						
128	99.12						
129	98.12	Light tan, fine-coarse grained SAND with shell (SW)	3	128.5-130	NA	NA	
130	97.12						
131	96.12						
132	95.12						
133	94.12		4	133.5-135	NA	NA	
134	93.12	Greenish grey MARL					
135	92.12						last sample at 135.0'
136	91.12	Boring terminated at 133.5					~six 150 gallon tubs of water used during drilling
137	90.12						
138	89.12						
139	88.12						
140	87.12						
141	86.12						
142	85.12						
143	84.12						
144	83.12						
145	82.12						
146	81.12						
147	80.12						
148	79.12						
149	78.12						
150	76.49						
151	76.12						
152	75.12						

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1006A
Sheet 1 of 5

SITE	Vogtle ALWR SSAR	HOLE DEPTH	125	SURF.ELEV.	226.491
LOCATION	Burke County, Georgia	COORDINATES N	1143910.384	E	775393.399
ANGLE	NA	BEARING	NA	CONTRACTOR	S&ME
DRILL NO.	CME 55	DRILLING METHOD	4-1/4" HAS	NO. SAMPLES	25
NO. U.D. SAMPLES	NA	WATER TABLE DEPTH	79'	ELEV.	
TIME AFTER COMP.		DATE TAKEN	6/3/2005	TYPE GROUT	NA
QUANTITY	NA	MIX	NA	DRILLING START DATE	6/3/2005
DRILLER	Tim Hall	RECORDER	Tinsley	APPROVED	NA
DRILLING COMP. DATE	6/4/2005				

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To ft.	Blows	N BPF	Comments
0	225.49						
1	224.49						
2	223.49						
3	222.49		1	3.5-5	5-5-7	12	
4	221.49	Yellowish brown SAND, fine-grained, loose (SP)					
5	220.49						
6	219.49						
7	218.49						
8	217.49						
9	216.49	Strong brown SAND, fine-grained, loose (SP)	2	8.5-10	3-3-3	6	
10	215.49						
11	214.49						
12	213.49						
13	212.49						
14	211.49	Reddish yellow SAND, fine-grained, loose (SP)	3	13.5-15	3-5-7	12	
15	210.49						
16	209.49						
17	208.49						
18	207.49						
19	206.49	Red and yellow SAND, fine-grained, loose (SP)	4	18.5-20	3-4-5	9	
20	205.49						
21	204.49						
22	203.49						
23	202.49						
24	201.49						

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1006A

SITE Vogtle ALWR SSAR TOTAL DEPTH 125 SURF.ELEV. 226.491

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To ft.	Blows	N BPF	Comments
25	201.49	Red and yellow SAND, fine-grained, loose (SP)	5	23.5-25	4-4-4	8	
26	200.49						
27	199.49						
28	198.49		6	28.5-30	3-4-6	10	
29	197.49						
30	196.49						
31	195.49						
32	194.49						
33	193.49						
34	192.49		7	33.5-35	3-5-5	10	
35	191.49						
36	190.49						
37	189.49						
38	188.49						
39	187.49	Yellowish red silty SAND, fine-grained (SM)	8	38.5-40	WOR/18"	WOR/ 18"	
40	186.49						
41	185.49						
42	184.49						
43	183.49						
44	182.49	White SAND, fine-grained, loose, with black minerals (SP)	9	43.5-45	WOR 1-1	2	
45	181.49						
46	180.49						
47	179.49						
48	178.49						
49	177.49						
50	176.49	light gray CLAY, slightly sandy, medium stiff (CL)	10	48.5-50	1-2-2	4	
51	175.49						
52	174.49						
53	173.49						
54	172.49	Reddish yellow clayey SAND (SC)	11	53.5-55	WOR/18	WOR/ 18"	
55	171.49						
56	170.49						

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1006A

SITE Vogtle ALWR SSAR TOTAL DEPTH 125 SURF.ELEV. 226.491

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To ft.	Blows	N BPF	Comments
57	169.49	Light gray and reddish yellow sandy CLAY (CL), soft					
58	168.49		12	58.5-60	1-1-1	2	
59	167.49						
60	166.49						
61	165.49						
62	164.49						
63	163.49						
64	162.49		13	63.5-65	WOH/18"	WHO/ 18"	
65	161.49	Yellow slightly sandy SILT (MH)					
66	160.49						
67	159.49						
68	158.49						
69	157.49	Mottled red to gray clayey SAND, fine- to medium-					
70	156.49	grained (SC)	14	68.5-70	WOH/12/5	17	
71	155.49						
72	154.49						
73	153.49						
74	152.49						
75	151.49		15	73.5-75	2-4-3	7	
76	150.49						
77	149.49						
78	148.49						
79	147.49						6/3/2005 ▼
80	146.49	Yellowish brown SAND, fine- to coarse-grained	16	78.5-80	3-2-2	4	79' from ground surface
81	145.49	slight fines (SW), loose					
82	144.49						
83	143.49						
84	142.49		17	83.5-85	12-16-17	33	
85	141.49	Pale yellow clayey SAND, to sandy CLAY with small to large shell fragments, stiff (SC-CL)					
86	140.49						
87	139.49						
88	138.49						

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SOUTHERN COMPANY *Energy to Serve Your World*	DRILLING LOG GEOLOGICAL SERVICES	Hole No. OW-1006A
		Sheet 4 of 5

SITE Vogtle ALWR SSAR TOTAL DEPTH 125 SURF.ELEV. 226.491

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To ft.	Blows	N BPF	Comments
89	137.49	Pale yellow sandy CLAY, stiff, calcareous (shell fragments) (CL)	18	88.5-90	7-7-9	16	
90	136.49						
91	135.49						
92	134.49						
93	133.49		19	93.5-95	8-8-9	17	
94	132.49	Pinkish white clayey SAND, fine - coarse-grained with shell fragments (SC)					
95	131.49						
96	130.49						
97	129.49						
98	128.49						
99	127.49	Light gray SAND, fine-grained (SP)	20	98.5-100	12-14-17	31	
100	126.49						
101	125.49						
102	124.49						
103	123.49						
104	122.49						
105	121.49		21	103.5-105	7-7-8	15	
106	120.49						
107	119.49						
108	118.49	Light gray SAND, fine-to medium grained, increase in fines (SW)					
109	117.49		22	108.5-110	10-10-10	20	
110	116.49						
111	115.49						
112	114.49						
113	113.49						
114	112.49	Very light tan silty SAND (SM)	23	113.5-115	10-11-14	25	
115	111.49						
116	110.49						
117	109.49						
118	108.49						
119	107.49	light gray COQUINA, unconsolidated	24	118.5-120	8-9-10	19	
120	106.49						

DRILLING LOG
GEOLOGICAL SERVICES

Hole No.	OW-1006A
Sheet 5 of 5	

SITE	Vogtle ALWR SSAR	TOTAL DEPTH	125	SURF.ELEV.	226.491

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To ft.	Blows	N BPF	Comments
121	105.49						
122	104.49						
123	103.49						
124	102.49						
125	101.49	light gray COQUINA, unconsolidated	25	23.5-12	9-16-16	32	
126	100.49	Boring terminated at 125' due to shortage of auger. This borehole was abandoned.					
127	99.49						
128	98.49						
129	97.49						
130	96.49						
131	95.49						
132	94.49						
133	93.49						
134	92.49						
135	91.49						
136	90.49						
137	89.49						
138	88.49						
139	87.49						
140	86.49						
141	85.49						
142	84.49						
143	83.49						
144	82.49						
145	81.49						
146	80.49						
147	79.49						
148	78.49						
149	77.49						
150	76.49						
151	75.49						
152	74.49						

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GEOLOGICAL SERVICES

Hole No. OW-1007

SITE	Vogtle ALWR SSAR	HOLE DEPTH	122	SURF.ELEV.	216.91
LOCATION	Burke County, Georgia	COORDINATES N	1142383.767	E	619301.009
ANGLE	NA	BEARING	NA	CONTRACTOR	Greene
DRILL NO.	CME 75 1993	DRILLING METHOD	4 1/4" HSA	NO. SAMPLES	6
NO. U.D. SAMPLES	NA	WATER TABLE DEPTH		ELEV.	
TIME AFTER COMP.		DATE TAKEN		TYPE GROUT	NA
QUANTITY	NA	MIX	NA	DRILLING START DATE	6/4/2005
DRILLER	Arthur/Jarrell	RECORDER	SC Bearce	APPROVED	NA
DRILLING COMP. DATE	6/7/2005				

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To ft.	Blows	N BPF	Comments
0	216.91						
1	215.91						
2	214.91	Sampling in this borehole began at 98.5' (Sheet 4).					
3	213.91	OW-1007 is a well pair with OW-1008. See boring log for OW-1008 for description of upper sediments.					
4	212.91						
5	211.91						
6	210.91						
7	209.91						
8	208.91						
9	207.91						
10	206.91						
11	205.91						
12	204.91						
13	203.91						
14	202.91						
15	201.91						
16	200.91						
17	199.91						
18	198.91						
19	197.91						
20	196.91						
21	195.91						
22	194.91						
23	193.91						
24	192.91						

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DRILLING LOG

GEOLOGICAL SERVICES

Hole No. OW-1007

SITE Vogtle ALWR SSAR TOTAL DEPTH 122 SURF.ELEV. 216.91

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments
25	191.91	See page 1					
26	190.91						
27	189.91						
28	188.91						
29	187.91						
30	186.91						
31	185.91						
32	184.91						
33	183.91						
34	182.91						
35	181.91						
36	180.91						
37	179.91						
38	178.91						
39	177.91						
40	176.91						
41	175.91						
42	174.91						
43	173.91						
44	172.91						
45	171.91						
46	170.91						
47	169.91						
48	168.91						
49	167.91						
50	166.91						
51	165.91						
52	164.91						
53	163.91						
54	162.28						
55	161.91						
56	160.91						

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216.28

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DRILLING LOG

GEOLOGICAL SERVICES

Hole No. OW-1007

SITE Vogtle ALWR SSAR | TOTAL DEPTH 122 | SURF.ELEV. 216.91

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments
57	159.91	See page 1					
58	158.91						
59	157.91						
60	156.91						
61	155.91						
62	154.91						
63	153.91						
64	152.91						
65	151.91						
66	150.91						
67	149.91						
68	148.91						
69	147.91						
70	146.91						
71	145.91						
72	144.91						
73	143.91						
74	142.91						
75	141.91						
76	140.91						
77	139.91						
78	138.91						
79	137.91						
80	136.91						
81	135.91						
82	134.91						
83	133.91						
84	132.91						
85	131.91						
86	130.28						
87	129.91						
88	128.91						

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GEOLOGICAL SERVICES

Hole No. OW-1007

SITE Vogtle ALWR SSAR TOTAL DEPTH 122 SURF.ELEV. 216.91

Depth Ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To Ft.	Blows	N BPF	Comments
89	127.91						
90	126.91						
91	125.91						
92	124.91						
93	123.91						
94	122.91						
95	121.91						
96	120.91						
97	119.91						
98	118.91	Drilling begins at 98.5'					
99	117.91		1	98.5-100	WOR		
100	116.91						
101	115.91						
102	114.91						
103	113.91						
104	112.91	Tan fine-grained silty SAND (SM), saturated					
105	111.91		2	103.5-105	2-4-6	10	
106	110.91						
107	109.91						
108	108.91						
109	107.91	Very light tan silty SAND (SM) becoming shelly	3	108.5-110	50/5"	50/5"	
110	106.91						
111	105.91						
112	104.91						
113	103.91						
114	102.91	light olive grey CLAY(CH)	4	113.5-115	80/3"	50/3"	
115	101.91						
116	100.91						
117	99.91						
118							
119	97.91	Greenish grey MARL					
120	96.91		5	118.5-120	NA	NA	

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1007

SITE **Vogtle ALWR SSAR** TOTAL DEPTH **122** SURF.ELEV. 216.91

Depth Ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To Ft.	Blows	N (BPF)	Comments
121	95.91	Greenish grey MARL	5	120-122	NA	NA	ss pushed with hydraulics because cat-head broke
122	94.91						
123	93.91	Boring terminated at 122'					
124	92.91						Estimated 3 auger volumes of light drilling fliud lost in this hole.
125	91.91						
126	90.91						
127	89.91						Approximately 100 gallons of water used in drilling and installation activities in addition to fluid.
128	88.91						
129	87.91						
130	86.91						
131	85.91						
132	84.91						
133	83.91						
134	82.91						
135	81.91						
136	80.91						
137	79.91						
138	78.91						
139	77.91						
140	76.91						
141	75.91						
142	74.91						
143	73.91						
144	72.91						
145	71.91						
146	70.91						
147	69.91						
148	68.91						
149	67.91						
150	66.28						
151	65.91						
152	64.91						

Form GS9901 7-26-2004

SOUTHERN COMPANY
Energy to Serve Your World™

DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1008

SITE Vogtle ALWR SSAR HOLE DEPTH 247 SURF.ELEV. 216.65

LOCATION Burke County, Georgia COORDINATES N 1142347.939 E 619306.686

ANGLE NA BEARING NA CONTRACTOR Kilman/Prosonic DRILL NO. CME 45/SR-083

DRILLING METHOD 3-1/4" HSA and Rotosonic NO. SAMPLES 47 NO. U.D. SAMPLES NA

WATER TABLE DEPTH 89.78' TOC ELEV. 128.24' TIME AFTER COMP. NA DATE TAKEN 6/7/2005

TYPE GROUT NA QUANTITY NA MIX NA DRILLING START DATE 5/25-26/2005 - Kilman

DRILLER Tony RECORDER S Bearce APPROVED NA DRILLING COMP. DATE 5/31-6/1/2005 - Prosonic

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments
				From To ft.	Blows	N (bpf)	
0	216.65						
1	215.65						
2	214.65						
3	213.65						
4	212.65						
5	211.02	Light red fine-gained silty SAND	1A	3.5-5	24-25-15	40	
6	210.65						
7	209.65						
8	208.65						
9	207.65						
10	206.65		2A	8.5-10	21-22-7	29	
11	205.65						
12	204.65						
13	203.65						
14	202.65						
15	201.65		3A	13.5-15	10-15-14	29	
16	200.65						
17	199.65						
18	198.65						
19	197.65						
20	196.65		4A	18.5-20	6-4-7	11	
21	195.65						
22	194.65						
23	193.65						
24	192.65						

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SOUTHERN COMPANY
Energy to Serve Your World

DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1008

SITE Vogtle ALWR SSAR   TOTAL DEPTH 247   SURF.ELEV. 216.65

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments	% Rec	RQD
25	191.65	Light yellow fine-grained SAND	5A	23.5-25	15-24-47	71			
26	190.65								
27	189.65								
28	188.65								
29	187.65								
30	186.65		6A	28.5-30	19-14-18	32			
31	185.65								
32	184.65								
33	183.65								
34	182.65								
35	181.65	Light yellow fine-grained silty SAND	7A	33.5-35	28-24-19	43			
36	180.65								
37	179.65								
38	178.65								
39	177.65								
40	176.65	Light red fine-grained silty SAND	8A	38.5-40	3-8-16	24			
41	175.65								
42	174.65								
43	173.65								
44	172.65								
45	171.65		9A	43.5-45	18-27-35	62			
46	170.65								
47	169.65								
48	168.65								
49	167.65								
50	166.65		10A	48.5-50	14-5-6	11			
51	165.65								
52	164.65								
53	163.65								
54	162.02								
55	161.65		11A	53.5-55	20-21-23	44			
56	160.65								

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SOUTHERN COMPANY
Energy to Serve Your World

DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1008

SITE Vogtle ALWR SSAR   TOTAL DEPTH 247   SURF.ELEV. 216.65

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments	% Rec	RQD
57	159.65								
58	158.65								
59	157.65								
60	156.65	Mottled reddish yellow brown fine-grained silty SAND	12A	58.5-60	4-6-6	12			
61	155.65								
62	154.65								
63	153.65								
64	152.65								
65	151.65	Mottled light-red fine-grained silty sand	13A	63.5-65	4-4-5	9			
66	150.65								
67	149.65								
68	148.65								
69	147.65								
70	146.65	Light red fine-grained silty SAND, moist	14A	68.5-70	3-2-3	5			
71	145.65								
72	144.65								
73	143.65								
74	142.65								
75	141.65	White medium grained silty SAND - moist	15A	73.5-75	2-2-2	4			
76	140.65								
77	139.65								
78	138.65								
79	137.65						5/25.2005 ▼ 80'		
80	136.65	White silty medium-grained SAND with shell fragments	16A	78.5-80	2-3-3	6			
81	135.65								
82	134.65								
83	133.65								
84	132.65								
85	131.65	White silty sandy SHELL HASH	17A	83.5-85	2-2-2	4			
86	130.02								
87	129.65								
88	128.65								

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SOUTHERN COMPANY
Energy to Serve Your World

DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1008

SITE Vogtle ALWR SSAR 247 SURF.ELEV. 216.65

Depth ft.	Elev.ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To ft.	Blows	N (bpf)	Comments
89	127.65						
90	126.65	White medium-grained silty SAND, moist	18A	88.5-90	3-4-4	8	6/7/05 ▼ 89.78' from TOC
91	125.65						
92	124.65						
93	123.65						
94	122.65						
95	121.65	White medium-grained silty SAND, with shell fragments and sharks teeth	19A	93.5-95	17-24-21	45	
96	120.65						
97	119.65						
98	118.65						
99	117.65						
100	116.65	White silty SHELL HASH, saturated	20A	98.5-100	50/2"	50.2"	
101	115.65						
102	114.65						
103	113.65						
104	112.65						
105	111.65	White medium-grained silty SAND, saturated	21A	102.5-105	18-20-22	44	
106	110.65						
107	109.65						Kilman drills to 105'
108	108.65						Prosonic completes hole from 107'
109	107.65	Yellowish tan, fine-medium and coarse grained SAND (SW) clay and silt present but generally less than 10% Coarse sand fraction composed of angular shell fragments ranging in size from 2mm to 1 cm. Occassional larger shell fragments. Abrupt change/ contact between sample intervals	1	108.5 - 110			
110	106.65						
111	105.65						
112	104.65						
113	103.65						
114	102.65		2	113.5-115	NA	NA	
115	101.65						
116	100.65						
117	99.65						
118	98.02	Medium greenish grey MARL with occassional fossils.	3	118.5-120	NA	NA	
119	97.65						
120	96.65						

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DRILLING LOG

GEOLOGICAL SERVICES

Hole No. OW-1008

Sheet 5 of 8

SITE **Vogtle ALWR SSAR** TOTAL DEPTH **247** SURF.ELEV. 216.65

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To ft.	Blows	N (bpf)	Comments
121	95.65						
122	94.65						
123	93.65						
124	92.65	Medium greenish grey MARL with occassional fossils.	4	123.5-125	NA	NA	
125	91.65						
126	90.65						
127	89.65						
128	88.65		5	128.5-130	NA	NA	
129	87.65						
130	86.65						
131	85.65						
132	84.65						
133	83.65						
134	82.65		6	133.5-135	NA	NA	
135	81.65						
136	80.65						
137	79.65	Greenish grey limestone, layer ~ 3" thick, fine-grained, heavier than MARL					
138	78.65						
139	77.65		7	138.5-140	NA	NA	
140	76.65						
141	75.65						
142	74.65						
143	73.65						
144	72.65						
145	71.65						
146	70.65						
147	69.65						
148	68.65	Medium greenish grey MARL with occassional fossils.	8	148.5-150	Na	NA	
149	67.65						
150							
151	65.65						
152	64.65						

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DRILLING LOG

GEOLOGICAL SERVICES

Hole No. OW-1008

SITE	Vogtle ALWR SSAR	TOTAL DEPTH 247	SURF.ELEV. 216.65

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To ft.	Blows	N (bpf)	Comments
153	63.65						
154	62.65						
155	61.65						
156	60.65						
157	59.65	Medium greenish grey MARL with occassional fossils.					
158	58.65		9	158.5-160	NA	NA	
159	57.65						
160	56.65						
161	55.65						
162	54.65						
163	53.65						
164	52.65		10	163.5-165	NA	NA	
165	51.65						
166	50.65						
167	49.65	Same MARL					
168	48.65						
169	47.65		11	168.5-170	NA	NA	
170	46.65						
171	45.65						
172	44.65						
173	43.65						
174	42.65		12	173.5-175	NA	NA	
175	41.65						
176	40.65	Grades to Shelly or fine to coarse grained SAND (SP) composed of whole and angular shell fragments in a MARL matrix (70%)					
177	39.65						
178	38.65						
179	37.65		13	178.5-180	NA	NA	
180	36.65						
181	35.65	"Sand" ranges from 10-30%					
182							
183	33.65						
184	32.65		14	183.5-185	NA	NA	

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1008

SITE **Vogtle ALWR SSAR** TAL DEPTH **247** SURF.ELEV. 216.65

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To ft.	Blows	N (bpf)	Comments
185	31.65						
186	30.65						
187	29.65	Same shelly MARL					
188	28.65						
189	27.65		15	188.5-190	NA	NA	
190	26.65						
191	25.65						
192	24.65						
193	23.65						
194	22.65		16	193.5-195	NA	NA	
195	21.65						
196	20.65						
197	19.65						
198	18.65	Same shelly MARL					
199	17.65		17	198.5-200	NA	NA	
200	16.65						
201	15.65						
202	14.65						
203	13.65						
204	12.65		18	203.5-205	NA	NA	
205	11.65						
206	10.65						
206	10.65	Dark grey silty SAND, (SM) fine grained SAND with some zones (1-2) feet of fine to coarse grained silty SAND (SM)					
208	8.65						
209	7.65		19	208.5-210	NA	NA	
210	6.65						
211	5.65						
212	4.65						
213	3.65						
214	2.02		20	213.5-215	NA	NA	
215	1.65						
216	0.65						

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1008

SITE **Vogtle ALWR SSAR** TAL DEPTH SURF.ELEV. 216.65

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To ft.	Blows	N (bpf)	Comments
217	-0.35						
218	-1.35	Dark grey silty SAND, (SM) fine-grained SAND with some zones (1-2) feet of fine- to coarse-grained silty SAND (SM)	21	218.5-220	NA	NA	
219	-2.35						
220	-3.35						
221	-4.35						
223	-6.35		22	223.5-225	NA	NA	
224	-7.35						
225	-8.35						
226	-9.35	Gradual change to grey fine SAND (SW)					
227	-10.35	Light grey fine SAND (SW)					
228	-11.35		23	228.5-230	NA	NA	
229	-12.35						
230	-13.35						
231	-14.35						
232	-15.35						
233	-16.35		24	233.5-235	NA	NA	
234	-17.35						
235	-18.35						
236	-19.35						
237	-20.35						
238	-21.35	Grey silty SAND (SM)	25	238.5-240	NA	NA	
239	-22.35						
240	-23.35						
241	-24.35						
242	-25.35						
243	-26.35	Abrupt change to light grey siliceous clay, (CL), to weak SHALE	26	243.5-245	NA	NA	
244	-27.35						
245	-28.35						
246	-29.35						
247	-30.98	Boring terminated at 247'. Well OW-1008 installed in this borehole.					
248	-31.35						
249	-32.35						

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SOUTHERN COMPANY
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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1008A

SITE	Vogtle ALWR SSAR - ESP	HOLE DEPTH	107.5	SURF.ELEV.	NA		
LOCATION	Burke County, GA	COORDINATES N		E			
ANGLE	NA	BEARING	NA	CONTRACTOR	Kilman Bro.	DRILL NO.	CME-55
DRILLING METHOD	3 1/4" HAS	NO. SAMPLES	21	NO. U.D. SAMPLES	0		
WATER TABLE DEPTH	80	ELEV.	136	TIME AFTER COMP.	NA	DATE TAKEN	5/26/2005
TYPE GROUT	NA	QUANTITY	NA	MIX	NA	DRILLING START DATE	5/26/2005
DRILLER	Kilman Bro.	RECORDER	RA Esposito	APPROVED	NA	DRILLING COMP. DATE	5/26/2005

Depth FT.	Elev. FT.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To FT.	Blows	N (bpf)	Comments
0							
1							
2							
3							
4							
5		Light red fine-gained silty SAND	1	3.5-5	24-25-15	40	
6							
7							
8							
9							
10			2	8.5-10	21-22-7	29	
11							
12							
13							
14							
15			S-3	13.5-15	10-15-14	29	
16							
17							
18							
19							
20			S-4	18.5-20	6-4-7	11	
21							
22							
23							
24							

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SOUTHERN COMPANY
Energy to Serve Your World

DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1008A

SITE Vogtle ALWR SSAR TOTAL DEPTH 107.5 SURF.ELEV. NA

Depth FT.	Elev. FT.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To FT.	Blows	N (bpf)	Comments
25		Light yellow fine-grained SAND	5	23.5-25	15-24-47	71	
26							
27							
28							
29							
30			6	28.5-30	19-14-18	32	
31							
32							
33							
34							
35		Light yellow fine-grained silty SAND	7	33.5-35	28-24-19	43	
36							
37							
38							
39							
40		Light red fine-grained silty SAND	8	38.5-40	3-8-16	24	
41							
42							
43							
44							
45			9	43.5-45	18-27-35	62	
46							
47							
48							
49							
50			10	48.5-50	14-5-6	11	
51							
52							
53							
54							
55			11	53.5-55	20-21-23	44	
56							

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SOUTHERN COMPANY
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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1008A

SITE Vogtle ALWR SSAR TOTAL DEPTH 107.5 SURF.ELEV. NA

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To ft.	Blows	N (bpf)	Comments
57							
58							
59							
60		Mottled reddish yellow brown fine-grained silty SAND	12	58.5-60	4-6-6	12	
61							
62							
63							
64							
65		Mottled light-red fine-grained silty sand	13	63.5-65	4-4-5	9	
66							
67							
68							
69							
70		Light red fine-grained silty SAND, moist	14	68.5-70	3-2-3	5	
71							
72							
73							
74							
75		White medium grained silty SAND - moist	15	73.5-75	2-2-2	4	
76							
77							
78							
79							
80		White silty medium-grained SAND with shell fragments	16	78.5-80	2-3-3	6	5/26/2005 ▼ 80' from ground surface
81							
82							
83							
84							
85		White silty sandy SHELL HASH	17	83.5-85	2-2-2	4	
86							
87							
88							

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1008A

SITE Vogtle ALWR SSAR TOTAL DEPTH 107.5 SURF.ELEV. NA

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To ft.	Blows	N (bpf)	Comments
89							
90		White medium-grained silty SAND, moist	18	88.5-90	3-4-4	8	
91							
92							
93							
94							
95		White medium-grained silty SAND, with shell fragments and sharks teeth	19	93.5-95	17-24-21	45	
96							
97							
98							
99							
100		White silty SHELL HASH, saturated	20	98.5-100	50/2"	100+	
101							
102							
103							
104							
105		White medium-grained silty SAND, saturated	21	102.5-105	18-20-22	44	
106							
107							
108		Boring terminated at 107.5' due to use of 3 1/4" augers.					
109		This borehole was abandoned.					
110		Well OW-1008 is installed in adjacent borehole OW-1008.					
111							
112							
113							
114							
115							
116							
117							
118							
119							
120							

SOUTHERN COMPANY
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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1009

SITE	Vogtle ALWR SSAR - ESP	HOLE DEPTH	100	SURF.ELEV.	220.887
LOCATION	Burke County, Georgia	COORDINATES N	1141891.645	E	620888.608
ANGLE	NA	BEARING	NA	CONTRACTOR	S&ME
DRILL NO.	CME 55	DRILLING METHOD	4-1/4" HAS	NO. SAMPLES	21
NO. U.D. SAMPLES	NA	WATER TABLE DEPTH	70'	ELEV.	150.257'
TIME AFTER COMP.	NA	DATE TAKEN	5/24/2005	TYPE GROUT	NA
QUANTITY	NA	MIX	NA	DRILLING START DATE	5/24/2005
DRILLER	Ted	RECORDER	RA Esposito	APPROVED	NA
DRILLING COMP. DATE	5/27/2005				

Depth Ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To Ft.	Blows	N BPF	Comments
0	220.89						
1	219.89						
2	218.89	White to red fine-grained SAND					
3	217.89						
			1	3.5-5	4-10-10	20	
4	216.89						
5	215.89	Dark red fine-grained silty SAND					
6	214.89						
7	213.89						
8	212.89						
9	211.89						
10	210.89		2	8.5-10	3-3-5	8	
11	209.89						
12	208.89						
13	207.89						
14	206.89						
15	205.89		3	13.5-15	2-4-4	8	
16	204.89						
17	203.89						
18	202.89						
19	201.89						
20	200.89		4	18.5-20	4-5-7	12	
		moist					
21	199.89						
22	198.89						
23	197.89						
24	196.89						

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SOUTHERN COMPANY *Energy to Serve Your World*	DRILLING LOG GEOLOGICAL SERVICES	Hole No. OW-1009 Sheet 2 of 2

SITE: Vogtle ALWR SSAR TOTAL DEPTH: 100 SURF.ELEV.: 220.887

Depth Ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test: From To Ft.	Blows	N BPF	Comments
25	195.89	Light yellow fine-grained SAND	5	23.5-25	5-5-6	11	
26	194.89						
27	193.89						
28	192.89						
29	191.89						
30	190.89	Light yellow fine-grained silty SAND	6	28.5-30	3-6-7	13	
31	189.89						
32	188.89						
33	187.89						
34	186.89						
35	185.89		7	33.5-35	3-4-5	9	
36	184.89						
37	183.89						
38	182.89						
39	181.89						
40	180.89	Light yellow fine-grained silty clayey SAND, moist	8	38.5-40	2-2-3	5	
41	179.89						
42	178.89						
43	177.89						
44	176.89						
45	175.89	Light yellow silty CLAY, moist-plastic	9	43.5-45	2-4-6	10	
46	174.89						
47	173.89						
48	172.89						
49	171.89						
50	170.89	Light yellow fine- to medium-grained silty SAND, moist	10	48.5-50	3-7-8	15	
51	169.89						
52	168.89						
53	167.89						
54	166.26						
55	165.89	Light yellow fine- to medium-grained silty SAND, moist	11	53.5-55	4-6-7	13	
56	164.89						

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SOUTHERN COMPANY
Energy to Serve Your World

DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1009

SITE Vogtle ALWR SSAR   TOTAL DEPTH 100   SURF.ELEV. 220.887

Depth Ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N BPF	Comments
57	163.89						
58	162.89						
59	161.89						
60	160.89	Light yellow silty fine grained SAND - moist	12	58.5-60	4-6-6	12	
61	159.89						
62	158.89						
63	157.89						
64	156.89						
65	155.89	Light yellow silty fine grained SAND - moist	13	63.5-65	0-1-2	3	
66	154.89						
67	153.89						
68	152.89						
69	151.89						
70	150.89	White silty fine-grained SAND - saturated	14	68.5-70	1-2-2	4	5/24/2005 ▼
71	149.89						70 feet from ground surface
72	148.89						
73	147.89						
74	146.89						
75	145.89	White medium-to coarse-grained SAND,saturated	15	73.5-75	0-0-1	1	
76	144.89						
77	143.89						
78	142.89						
79	141.89						
80	140.89		16	78.5-80	4-5-6	11	
81	139.89						
82	138.89						
83	137.89						
84	136.89						
85	135.89	Very light tan silty SAND (SM)	17	83.5-85	6-50/4"	100+	
86	134.26						
87	133.89						
88	132.89						

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SOUTHERN COMPANY
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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1009

SITE Vogtle ALWR SSAR | TOTAL DEPTH 100 | SURF.ELEV. 220.887

Depth Ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To Ft.	Blows	N BPF	Comments	% Rec	RQD
89	131.89								
90	130.89	Tan LIMESTONE shell hash, very light tan silty SAND (SM)	18	88.5-90	50/1"	100+			
91	129.89								
92	128.89								
93	127.89								
94	126.89								
95	125.89	Brown silty CLAY	19	93.5-95	6-18-3	21			
96	124.89								
97	123.89								
98	122.89								
99	121.89								
100	120.89	Green MARL	20	98.5-100	13 / 50/.2	100+			
101	119.89	Boring terminated at 100' OW-1009 installed in this borehole.							
102	118.89								
103	117.89								
104	116.89								
105	115.89								
106	114.89								
107	113.89								
108	112.89								
109	111.89								
110	110.89								
111	109.89								
112	108.89								
113	107.89								
114	106.89								
115	105.89								
116	104.89								
117	103.89								
118	102.26								
119	101.89								
120	100.89								

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SOUTHERN COMPANY
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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1010

Sheet 1 of 4

SITE	Vogtle ALWR SSAR	LE DEPTH	93.5	SURF.ELEV.	216.895
LOCATION	Burke County, Georgia	COORDINATES N	1140808.986	E	620051.708
ANGLE	NA	BEARING	NA	CONTRACTOR	S&ME
DRILL NO.	CME550	DRILLING METHOD	4 1/4" HAS	NO. SAMPLES	19
NO. U.D. SAMPLES	NA	WATER TABLE DEPTH	58.5'	ELEV.	157.765'
TIME AFTER COMP.	NA	DATE TAKEN	6/1/2005	TYPE GROUT	NA
QUANTITY	NA	MIX	NA	DRILLING START DATE	6/1/2005
DRILLER	Tim Hall	RECORDER	R. Tinsley	APPROVED	NA
DRILLING COMP. DATE	6/1/2005				

Depth Ft.	Elev.Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To Ft.	Blows	N BPF	Comments
0	216.90						
1	215.90						
2	214.90						
3	213.90						
4	212.90						
5	211.90	Reddish yellow SAND, fine- to medium-grained with coarse grains and hematite concretions, loose, (SW)	1	3.5-5	11-17-17	34	
6	210.90						
7	209.90						
8	208.90						
9	207.90						
10	206.90	Mottled weak red and brown SAND, fine-grained, Loose (SP)	2	8.5-10	7-8-11	19	
11	205.90						
12	204.90						
13	203.90						
14	202.90						
15	201.90		3	13.5-15	6-7-7	14	
16	200.90						
17	199.90						
18	198.90						
19	197.90						
20	196.90		4	18.5-20	7-7-8	15	
21	195.90						
22	194.90						
23	193.90						
24	192.90						

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SOUTHERN COMPANY
Energy to Serve Your World

DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1010

SITE Vogtle ALWR SSAR TOTAL DEPTH 93.5 SURF.ELEV. 216.895

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments
25	191.90	Mottled weak red and brown SAND, fine- to medium-grained with some coarse grains (SW)	5	23.5-25	9-9-6	15	
26	190.90						
27	189.90						
28	188.90						
29	187.90	Reddish yellow SAND fine- to medium-grained, loose (SW)					
30	186.90		6	28.5-30	9-31-42	73	
31	185.90						
32	184.90						
33	183.90						
34	182.90						
35	181.90		7	33.5-35	7-6-5	11	
36	180.90						
37	179.90						
38	178.90						
39	177.90						
40	176.90	Same as above with some coarse grains	8	38.5-40	5-5-5	10	
41	175.90						
42	174.90						
43	173.90						
44	172.90	Brownish yellow clayey SAND, soft, (SC)					
45	171.90		9	43.5-45	5-2-2	4	
46	170.90						
47	169.90						
48	168.90						
49	167.90	Mottled yellowish red clayey SAND, medium-grained (SC) with organics					
50	166.90		10	48.5-50	2-3-3	6	
51	165.90						
52	164.90						
53	163.90						
54	162.27						
55	161.90	Strong brown sand, medium-grained with slight fines (SP)	11	53.5-55	2-4-5	9	
56	160.90						

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SOUTHERN COMPANY
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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1010

SITE Vogtle ALWR SSAR | TOTAL DEPTH 93.5 | SURF.ELEV. 216.895

Depth Ft.	Elev.Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test: From To Ft	Blows	N BPF	Comments
57	159.90						
58	158.90						6/1/2005
59	157.90	Mottled white to brown clayey SAND, medium-grained (SP), medium dense	12	58.5-60	2-7-7	14	▼ 58.5' from ground surface
60	156.90						
61	155.90						
62	154.90						
63	153.90						
64	152.90	Strong brown clayey SAND, fine- to medium-grained (SC)	13	63.5-65	WOR-2-3	5	
65	151.90						
66	150.90						
67	149.90						
68	148.90						
69	147.90	Brownish yellow silty SAND, medium-grained, (SM)	14	68.5-70	WOH/18"	WHO/ 18"	
70	146.90						
71	145.90						
72	144.90						
73	143.90						
74	142.90	Tan poorly graded SAND with silt (SP-SM)	15	73.5-75	WOR 2'	WOR/ 2'	
75	141.90						
76	140.90						
77	139.90						
78	138.90						
79	137.90	Brownish yellow clayey, silty SAND (SC-SM), soft	16	78.5-80	WOR/18"	WOR/ 18"	
80	136.90						
81	135.90						
82	134.90						
83	133.90						
84	132.90	White SHELL HASH	17	83.5-85	50/3"	50/3"	
85	131.90						
86		Grayish green MARL					
87	129.90						
88	128.90						

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SOUTHERN COMPANY
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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1010

Sheet 4 of 4

SITE Vogtle ALWR SSAR DEPTH 93.5 SURF.ELEV. 216.895

Depth Ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To Ft.	Blows	N BPF	Comments
89	127.90						
90	126.90	Grayish green MARL, very stiff	18	88.5-90	18-9-12	21	
91	125.90						
92	124.90						
93	123.90	Boring terminated at 93.5'					
94	122.90	Well OW-1010 installed in this boring.					
95	121.90		19	93.5-95	21-50/4"	50/4"	
96	120.90						
97	119.90						
98	118.90						
99	117.90						
100	116.90						
101	115.90						
102	114.90						
103	113.90						
104	112.90						
105	111.90						
106	110.90						
107	109.90						
108	108.90						
109	107.90						
110	106.90						
111	105.90						
112	104.90						
113	103.90						
114	102.90						
115	101.90						
116	100.90						
117	99.90						
118							
119	97.90						
120	96.90						

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SOUTHERN COMPANY Energy to Serve Your World	**DRILLING LOG** GEOLOGICAL SERVICES	Hole No. OW-1011 Sheet 1 of 7

SITE	Vogtle ALWR SSAR			HOLE DEPTH	217	SURF.ELEV.	205.785
LOCATION	Burke County, Georgia			COORDINATES N	1139956.246	E	621033.045
ANGLE	NA	BEARING	NA	CONTRACTOR	Prosonic	DRILL NO.	SR-083
DRILLING METHOD	Sonic	NO. SAMPLES	continuous			NO. U.D. SAMPLES	NA
WATER TABLE DEPTH	NA	ELEV.	NA	TIME AFTER COMP.	NA	DATE TAKEN	NA
TYPE GROUT	NA	QUANTITY	NA	MIX	NA	DRILLING START DATE	6/11/2005
DRILLER	Tony	RECORDER	John Pugh	APPROVED	NA	DRILLING COMP. DATE	6/12/2005

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments	% Rec	RQD
0	205.79								
1	204.79	Sampling in this boring started at 87'. Borehole OW-1012 was sampled from the surface to 93.6'. These two are a well pair.							
2	203.79								
3	202.79								
4	201.79								
5	200.79								
6	199.79								
7	198.79								
8	197.79								
9	196.79								
10	195.79								
11	194.79								
12	193.79								
13	192.79								
14	191.79								
15	190.79								
16	189.79								
17	188.79								
18	187.79								
19	186.79								
20	185.79								
21	184.79								
22	183.79								
23	182.79								
24	181.79								

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SOUTHERN COMPANY
Energy to Serve Your World

DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1011

SITE Vogtle ALWR SSAR   TOTAL DEPTH 217   SURF.ELEV. 205.785

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To ft.	Blows	N BPF	Comments
25	180.79	See page one.					
26	179.79						
27	178.79						
28	177.79						
29	176.79						
30	175.79						
31	174.79						
32	173.79						
33	172.79						
34	171.79						
35	170.79						
36	169.79						
37	168.79						
38	167.79						
39	166.79						
40	165.79						
41	164.79						
42	163.79						
43	162.79						
44	161.79						
45	160.79						
46	159.79						
47	158.79						
48	157.79						
49	156.79						
50	155.79						
51	154.79						
52	153.79						
53	152.79						
54							
55	150.79						
56	149.79						

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SOUTHERN COMPANY
Energy to Serve Your World

DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1011

SITE Vogtle ALWR SSAR TOTAL DEPTH 217 SURF.ELEV. 205.785

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test: From To ft.	Standard Penetration Test: Blows	Standard Penetration Test: N BPF	Comments
57	148.79	See page one.					
58	147.79						
59	146.79						
60	145.79						
61	144.79						
62	143.79						
63	142.79						
64	141.79						
65	140.79						
66	139.79						
67	138.79						
68	137.79						
69	136.79						
70	135.79						
71	134.79						
72	133.79						
73	132.79						
74	131.79						
75	130.79						
76	129.79						
77	128.79						
78	127.79						
79	126.79						
80	125.79						
81	124.79						
82	123.79						
83	122.79						
84	121.79						
85	120.79						
86	119.16						
87	118.79	Begin sampling at 87' with ProSonic rig.					
88	117.79						

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SOUTHERN COMPANY
Energy to Serve Your World

DRILLING LOG
GEOLOGICAL SERVICES

SITE Vogtle ALWR SSAR TOTAL DEPTH 217 SURF.ELEV. 205.785

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments
89	116.79	Greenish grey CLAY, stiff					
90	115.79		1	88.5-90	NA	NA	
91	114.79						
92	113.79						
93	112.79						
94	111.79	Dark greenish to olive-grey CLAY, moist, stiff, light gray mottling					
95	110.79		2	93.5-95	NA	NA	
96	109.79						
97	108.79						
98	107.79						
99	106.79	Greenish grey CLAY, stiff, moist, small shell fragments					
100	105.79		3	98.5-100	NA	NA	
101	104.79						
102	103.79						
103	102.79						
104	101.79	Greenish grey CLAY, stiff, small shell fragments, not moist					
105	100.79		4	103.5-105	NA	NA	
106	99.79						
107	98.79						
108	97.16	LIMESTONE 2"					
109	96.79	Greenish grey CLAY, slightly moist, limestone fragments					
110	95.79		5	108.5-110	NA	NA	
111	94.79						
112	93.79						
113	92.79						
114	91.79	Greenish grey CLAY, not moist, larger shell fragments					
115	90.79		6	113.5-115	NA	NA	
116	89.79						
117	88.79						
118	87.16						
119	86.16	Light greenish grey CLAY, moist, w/ Limestone chunks					
120	85.79		7	118.5-120	NA	NA	

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1011

Sheet 5 of 7

SITE Vogtle ALWR SSAR TOTAL DEPTH 217 SURF.ELEV. 205.785

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To ft.	Blows	N BPF	Comments
121	84.79						
122	83.79						
123	82.79	Light grey LIMESTONE 4"					
124	81.79	Greenish grey CLAY, slightly moist					
125	80.79		8	123.5-125	NA	NA	
126	79.79						
127	78.79						
128	77.79						
129	76.79	Light-grey CLAY, stiff					
130	75.79		9	128.5-130	NA	NA	
131	74.79						
132	73.79						
133	72.79						
134	71.79						
135	70.79		10	133.5-135	NA	NA	
136	69.79						
137	68.79						
138	67.79						
139	66.79						
140	65.79	Greenish grey CLAY, stiff	11	138.5-140	NA	NA	
141	64.79						
142	63.79						
143	62.79						
144	61.79						
145	60.79		12	143.5-145	NA	NA	
146	59.79						
147	58.79						
148	57.79	_ _ _ potential void					
149	56.79						
150	55.16	Greenish grey CLAY, stiff	13	148.5-150	NA	NA	
151	54.79						
152	53.79						

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1011

SITE Vogtle ALWR SSAR | TOTAL DEPTH 217 | SURF.ELEV. 205.785

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N BPF	Comments
	152.50						
153	52.79						
154	51.79	Light bluish-grey, very fine sands to sandy CLAY, Loose, moist, clayey					
155	50.79		14	153.5-155	NA	NA	
156	49.79						
157	48.79						
158	47.79						
159	46.79	Light grey, slightly sandy CLAY, moist					
160	45.79		15	158.5-160	NA	NA	
161	44.79						
162	43.79						
163	42.79						
164	41.79	Light grey, silty, slightly sandy CLAY, moist					
165	40.79		16	163.5-165	NA	NA	
166	39.79						
167	38.79						
168	37.79						
169	36.79	Greenish grey sandy silty CLAY, bright green and tan nodules					
170	35.79		17	168.5-170	NA	NA	
171	34.79						
172	33.79						
173	32.79						
174	31.79						
175	30.79		18	173.5-175	NA	NA	
176	29.79						
177	28.79						
178	27.79	Dark olive grey CLAY, stiff					
179	26.79						
180	25.79		19	178.5-180	NA	NA	
181	24.79						
182							
183	22.79	Dark olive grey sandy CLAY					
184	21.79						

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1011
Sheet 7 of 7

SITE **Vogtle ALWR SSAR** TOTAL DEPTH **217** SURF.ELEV. 205.785

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To ft.	Blows	N BPF	Comments
185	20.79		20	183.5-185	NA	NA	
186	19.79						
187	18.79						
188	17.79						
189	16.79	Dark grey sandy CLAY					
190	15.79		21	188.5-190	NA	NA	
191	14.79						
192	13.79						
193	12.79						
194	11.79	Dark grey clayey fine SAND grading to					
195	10.79		22	193.5-195	NA	NA	
196	9.79	Clayey medium-grained SAND					
197	8.79						
198	7.79						
199	6.79	Dark bluish-gray silty fine- to medium-grained SAND very moist					
200	5.79		23	198.5-200	NA	NA	
201	4.79						
202	3.79						
203	2.79						
204	1.79						
205	0.78	Gray poorly graded sand with silt (SP-SM)	24	203.5-205	NA	NA	
206	-0.22						
206	-0.22						
208	-2.22						
209	-3.22						
210	-4.22	Gray poorly graded sand with silt (SP-SM)	25	208.5-210	NA	NA	
211	-5.22	Silty gravelly SAND with fossils, shark teeth					
212	-6.22						
213	-7.22						
214	-8.85	Dark bluish gray medium- to coarse-grained SAND					
215	-9.22		26	213.5	215	NA	
216	-10.22	Boring terminated at 217'					

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1012
Sheet 1 of 4

SITE	Vogtle ALWR SSAR	HOLE DEPTH	93.6	SURF.ELEV.	205.355
LOCATION	Burke County, Georgia	COORDINATES N	1139969.496	E	621045.924
ANGLE	NA	BEARING	NA	CONTRACTOR	S&ME
DRILL NO.	CME 55	DRILLING METHOD	HSA 4 1/4" ID	NO. SAMPLES	19
NO. U.D. SAMPLES	NA	WATER TABLE DEPTH	49.5'	ELEV.	155.225'
TIME AFTER COMP.	NA	DATE TAKEN	6/1/2005	TYPE GROUT	NA
QUANTITY	NA	MIX		DRILLING START DATE	5/31/2005
DRILLER	Ted/Rick	RECORDER	Tinsley	APPROVED	NA
DRILLING COMP. DATE	6/1/2005				

Depth Ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To Ft.	Blows	N BPF	Comments
0	205.36						
1	204.36						
2	203.36						
3	202.36						
4	201.36	Weak red SAND (SW), very fine - fine grained, loose, mottled					
5	200.36		1	3.5-5	2-2-3	5	
6	199.36						
7	198.36						
8	197.36						
9	196.36						
10	195.36		2	8.5-10	2-5-5	10	
11	194.36						
12	193.36						
13	192.36						
14	191.36						
15	190.36	Same as above with stronger mottling	3	13.5-15	3-5-5	10	
16	189.36						
17	188.36						
18	187.36	Brown SAND, fine to medium grained, loose, (SW)					
19	186.36						
20	185.36		4	18.5-20	5-15-26	41	
21	184.36						
22	183.36						
23	182.36						
24	181.36	Reddish yellow SAND					

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SOUTHERN COMPANY
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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1012

SITE Vogtle ALWR SSAR TOTAL DEPTH 93.6 SURF.ELEV. 205.355

Depth Ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N BPF	Comments
25	180.36	Reddish yellow SAND (SP), fine- to medium-grained with fines	5	23.5-25	6-16-17	33	
26	179.36						
27	178.36						
28	177.36						
29	176.36	Reddish yellow SAND (SP), fine-grained, loose					
30	175.36		6	28.5-30	3-7-7	14	
31	174.36						
32	173.36						
33	172.36						
34	171.36						
35	170.36		7	33.5-35	3-5-6	11	
36	169.36						
37	168.36						
38	167.36						
39	166.36						
40	165.36		8	38.5-40	2-5-6	11	
41	164.36						
42	163.36						
43	162.36						
44	161.36						
45	160.36		9	43.5-45	3-2-2	4	
46	159.36						
47	158.36	Reddish yellow SAND (SW), medium- to coarse-grained, loose, with fines					
48	157.36						
49	156.36						6/1/2005 ▼
50	155.36		10	48.5-50	1-1-2	3	49.5' from ground surface
51	154.36						
52	153.36	Pale yellow CLAY (CL), slightly sandy					
53	152.36						
54							
55	150.36		11	53.5-55	WHO/2/3	5	micas
56	149.36						

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GEOLOGICAL SERVICES

Hole No. OW-1012

SITE Vogtle ALWR SSAR 93.6 SURF.ELEV. 205.355

Depth Ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To Ft.	Blows	N BPF	Comments
57	148.36						
58	147.36						
59	146.36	Pale yellow CLAY (CL), slightly sandy					
60	145.36		12	58.5-60	1-1-2	3	
61	144.36						
62	143.36						
63	142.36						
64	141.36						
65	140.36		13	63.5-65	2-1-3	4	
66	139.36						
67	138.36						
68	137.36						
69	136.36	Pale yellow sandy CLAY, soft (CL)					
70	135.36		14	68.5-70	WOH/ WOH/ 1	WHO/1	
71	134.36						
72	133.36						
73	132.36	Brown SAND, fine- to medium-grained with pale yellow silt (SM)					
74	131.36						
75	130.36		15	73.5-75	WOH/ WOH/ 1		
76	129.36					WOH/ 1	
77	128.36						
78	127.36						
79	126.36	Pale olive SILT (ML)					
80	125.36		16	78.5-80	2-4-6	10	
81	124.36						
82	123.36						
83	122.36						
84	121.36	Pale yellow SILT, micaceous (ML)					
85	120.36		17	83.5-85	2-3-4	7	Black minerals
86							
87	118.36						
88	117.36						

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SOUTHERN COMPANY *Energy to Serve Your World*

DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1012

SITE Vogtle ALWR SSAR TOTAL DEPTH 93.6 SURF.ELEV. 205.355

Depth Ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To Ft.	Blows	N BPF	Comments
89	116.36	Grayish green MARL, very stiff					
90	115.36		18	88.5-90	18-25-50	75	
91	114.36						
92	113.36						
93	112.36						
94	111.36						
95	110.36	Boring Terminated at 93.6' Well OW-1012 installed in this borehole.	19	93.5-95	50/1"	50/1"	
96	109.36						
97	108.36						
98	107.36						
99	106.36						
100	105.36						
101	104.36						
102	103.36						
103	102.36						
104	101.36						
105	100.36						
106	99.36						
107	98.36						
108	97.36						
109	96.36						
110	95.36						
111	94.36						
112	93.36						
113	92.36						
114	91.36						
115	90.36						
116	89.36						
117	88.36						
118							
119	86.36						
120	85.36						

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SOUTHERN COMPANY
Energy to Serve Your World™

DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1013

SITE	Vogtle ALWR SSAR	HOLE DEPTH	103.5	SURF.ELEV.	216.869
LOCATION	Burke County, Georgia	COORDINATES N	1140805.4	E	621715.032
ANGLE	NA	BEARING	NA	CONTRACTOR	S&ME
DRILL NO.	CME 55	DRILLING METHOD	4 1/4" Hollow stem auger	NO. SAMPLES	20
NO. U.D. SAMPLES	NA	WATER TABLE DEPTH	49'	ELEV.	167.239'
TIME AFTER COMP.	NA	DATE TAKEN	6/9/2005	TYPE GROUT	NA
QUANTITY	NA	MIX	NA	DRILLING START DATE	6/9/2005
DRILLER	Ted Miller	RECORDER	S. Bearce	APPROVED	NA
DRILLING COMP. DATE	6/10/2005				

Depth Ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To Ft.	Blows	N BPF	Comments
0	216.87						
1	215.87						
2	214.87						
3	213.87						
4	212.87	Orange brown clayey SAND (SC)					
5	211.87		1	3.5-5	8-8-9	17	
6	210.87						
7	209.87						
8	208.87						
9	207.87						
10	206.87		2	8.5-10	5-10-9	19	
11	205.87						
12	204.87						
13	203.87						
14	202.87	Burgundy or hematitic clayey SAND (SC)					
15	201.87		3	13.5-15	2-2-3	5	
16	200.87						
17	199.87						
18	198.87						
19	197.87	Mottled orange, brown, and light gray sandy CLAY (CL)					
20	196.87		4	18.5-20	3-4-5	9	
21	195.87						
22	194.87						
23	193.87						
24	192.87	Burgundy hematite coated fine-grained to coarse-grained SAND (SW)					

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SOUTHERN COMPANY *Energy to Serve Your World*	**DRILLING LOG** GEOLOGICAL SERVICES	Hole No. OW-1013
		Sheet 2 of 4

SITE Vogtle ALWR SSAR TOTAL DEPTH 103.5 SURF.ELEV. 216.869

Depth Ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To Ft.	Blows	N BPF	Comments
25	191.87	Fine- to coarse-grsained SAND (SW) with minor amounts of clay, moist	5	23.5-25	4-5-6	11	
26	190.87						
27	189.87	Yellow brown fine SAND (SP) minor clay, moist					
28	188.87						
29	187.87						
30	186.87		6	28.5-30	2-3-5	8	
31	185.87						
32	184.87						
33	183.87						
34	182.87						
35	181.87		7	33.5-35	3-6-10	16	
36	180.87						
37	179.87						
38	178.87						
39	177.87						
40	176.87		8	38.5-40	3-6-9	15	
41	175.87						
42	174.87						
43	173.87						
44	172.87						
45	171.87	Same as above, wet	9	43.5-45	2-2-5	7	
46	170.87						
47	169.87						
48	168.87						
49	167.87						6/9/2005 ▼
50	166.87	Same as above - saturated	10	48.5-50	1-3-5	8	49 from ground surface
51	165.87						
52	164.87						
53	163.87	Yellow brown, wet, SAND (SC) clay content higher					
54	162.24						
55	161.87		11	53.5-55	3-2-5	7	
56	160.87						

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SOUTHERN COMPANY
Energy to Serve Your World

DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1013

SITE Vogtle ALWR SSAR   TOTAL DEPTH 103.5   SURF.ELEV. 216.869

Depth Ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To Ft.	Blows	N BPF	Comments
57	159.87						
58	158.87						
59	157.87	No recovery					
60	156.87		12	58.5-60	2-2-2	4	
61	155.87						
62	154.87						
63	153.87						
64	152.87	Same as above with clay blobs, saturated					
65	151.87		13	63.5-65	1-3-5	8	
66	150.87						
67	149.87						
68	148.87						
69	147.87						
70	146.87		14	68.5-70	2-3-4	7	
71	145.87						
72	144.87						
73	143.87						
74	142.87						
75	141.87		15	73.5-75	2-4-6	10	
76	140.87						
77	139.87						
78	138.87						
79	137.87						
80	136.87	Tan fine- to coarse-grained SAND (SW) with medium to coarse-grained black organic material	16	78.5-80	5-10-10	20	
81	135.87						
82	134.87						
83	133.87						
84	132.87						
85	131.87	Tan fine- to medium-grained SAND (SP-SM) with tan or gray clay "tubes" or bioturbation	17	83.5-85	3-2-4	6	
86	130.24						
87	129.87						
88	128.87						

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SOUTHERN COMPANY
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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1013

SITE Vogtle ALWR SSAR OTAL DEPTH 103.5 SURF.ELEV. 216.869

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To Ft.	Blows	N BPF	Comments
89	127.87	Light olive tan calcareous silty fine-grained SAND (SP - SM)					
90	126.87		18	88.5-90	6-7-9	16	
91	125.87						
92	124.87						
93	123.87						
94	122.87	light olive tan calcareous CLAY (CL), wet but not saturated					
95	121.87		19	93.5-95	4-19-15	24	
96	120.87						
97	119.87						
98	118.87						
99	117.87						
100	116.87	Greenish gray MARL	20	98.5-100	13-28-50/3	28/ 50/3"	
101	115.87						
102	114.87						
103	113.87						
104	112.87	Boring terminated at 103.5' Well OW-1013 installed in this borehole.					
105	111.87						
106	110.87						
107	109.87						
108	108.87						
109	107.87						
110	106.87						
111	105.87						
112	104.87						
113	103.87						
114	102.87						
115	101.87						
116	100.87						
117	99.87						
118							
119	97.87						
120	96.87						

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SOUTHERN COMPANY
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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1014

SITE Vogtle ALWR SSAR HOLE DEPTH 197.4 SURF.ELEV. 220.867

LOCATION Burke County, Georgia COORDINATES N 1140565.502 E 623070.234

ANGLE NA BEARING NA CONTRACTOR Prosonic DRILL NO. SR-083

DRILLING METHOD Sonic NO. SAMPLES continuous NO. U.D. SAMPLES NA

WATER TABLE DEPTH NA ELEV. NA TIME AFTER COMP. NA DATE TAKEN NA

TYPE GROUT NA QUANTITY NA MIX NA DRILLING START DATE 6/11/2005

DRILLER Michael RECORDER S Bearce APPROVED NA DRILLING COMP. DATE 6/11/2005

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments	% Rec	RQD
0	220.87								
1	219.87	This borehole was not sampled until 97'.							
2	218.87	OW-1014 is a well pair with OW-1015. See boring log OW-1015 fro description of the upper sediemnts.							
3	217.87								
4	216.87								
5	215.87								
6	214.87								
7	213.87								
8	212.87								
9	211.87								
10	210.87								
11	209.87								
12	208.87								
13	207.87								
14	206.87								
15	205.87								
16	204.87								
17	203.87								
18	202.87								
19	201.87								
20	200.87								
21	199.87								
22	198.87								
23	197.87								
24	196.87								

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DRILLING LOG
GEOLOGICAL SERVICES

SITE Vogtle ALWR SSAR TOTAL DEPTH 197.4 SURF.ELEV. 220.867

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments	% Rec	RQD
		See page 1							
25	195.87								
26	194.87								
27	193.87								
28	192.87								
29	191.87								
30	190.87								
31	189.87								
32	188.87								
33	187.87								
34	186.87								
35	185.87								
36	184.87								
37	183.87								
38	182.87								
39	181.87								
40	180.87								
41	179.87								
42	178.87								
43	177.87								
44	176.87								
45	175.87								
46	174.87								
47	173.87								
48	172.87								
49	171.87								
50	170.87								
51	169.87								
52	168.87								
53	167.87								
54									
55	165.87								
56	164.87								

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1014

SITE Vogtle ALWR SSAR TOTAL DEPTH 197.4 SURF.ELEV. 220.867

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To Ft.	Blows	N BPF	Comments
57	163.87	See Page 1					
58	162.87						
59	161.87						
60	160.87						
61	159.87						
62	158.87						
63	157.87						
64	156.87						
65	155.87						
66	154.87						
67	153.87						
68	152.87						
69	151.87						
70	150.87						
71	149.87						
72	148.87						
73	147.87						
74	146.87						
75	145.87						
76	144.87						
77	143.87						
78	142.87						
79	141.87						
80	140.87						
81	139.87						
82	138.87						
83	137.87						
84	136.87						
85	135.87						
86							
87	133.87						
88	132.87						

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SOUTHERN COMPANY
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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1014

SITE Vogtle ALWR SSAR TOTAL DEPTH 197.4 SURF.ELEV. 220.867

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To ft.	Blows	N BPF	Comments
89	131.87	See page 1					
90	130.87						
91	129.87						
92	128.87						
93	127.87						
94	126.87						
95	125.87						
96	124.87	Sampling begins at 97'					
97	123.87	Red orange silty clayey SAND					
98	122.87						
99	121.87						
100	120.87	White-tan fine- to medium-grained SAND	1	98.5-100	NA	NA	
101	119.87						
102	118.87	Brownish-yellow silty CLAY with shell fragments					
103	117.87						
104	116.87	Light greenish-brown carbonaceous stiff CLAY with Limestone pieces					
105	115.87		2	103.5-105	NA	NA	
106	114.87						
107	113.87						
108	112.87						
109	111.87	Moderately stiff greenish-grey carbonaceous clay with shell hash					
110	110.87		3	108.5-110	NA	NA	fizz
111	109.87						
112	108.87						
113	107.87						
114	106.87	Greenish grey stiff calcareous CLAY with small shell fragments					
115	105.87		4	113.5-115	NA	NA	
116	104.87						
117	103.87						
118							
119	101.87						
120	100.87		5	118.5-120	NA	NA	

DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1014

SITE: Vogtle ALWR SSAR | TOTAL DEPTH: 197.4 | SURF.ELEV. 220.867

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To ft.	Blows	N BPF	Comments
121	99.87						
122	98.87						
123	97.87						
124	96.87	Greenish grey stiff calcareous CLAY with small shell fragments					
125	95.87		6	123.5-125	NA	NA	
126	94.87						
127	93.87						
128	92.87						
129	91.87						
130	90.87		7	128.5-130	NA	NA	
131	89.87						
132	88.87						
133	87.87						
134	86.87						
135	85.87	Same as above with coarse shell fragments and limestone chunks	8	133.5-135	NA	NA	
136	84.87						
137	83.87						
138	82.87						
139	81.87						
140	80.87		9	138.5-140	NA	NA	
141	79.87						
142	78.87						
143	77.87						
144	76.87						
145	75.87		10	143.5-145	NA	NA	
146	74.87						
147	73.87						
148	72.87						
149	71.87						
150	70.24		11	148.5-150	NA	NA	
151	69.87						
152	68.87						

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DRILLING LOG

GEOLOGICAL SERVICES

Hole No. OW-1014

Sheet 6 of 7

SITE: Vogtle ALWR SSAR | TOTAL DEPTH: 197.4 | SURF.ELEV. 220.867

Depth FT.	Elev. FT.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To FT.	Blows	N Bbpf	Comments
153	67.87						
154	66.87						
155	65.87		12	153.5-155	NA	NA	
156	64.87	Greenish grey stiff calcareous CLAY with small shell fragments					
157	63.87						
158	62.87						
159	61.87						
160	60.87		13	158.5-160	NA	NA	
161	59.87						
162	58.87						
163	57.87						
164	56.87						
165	55.87		14	163.5-165	NA	NA	
166	54.87						
167	53.87						
168	52.87						
169	51.87	Light green slightly clayey SAND, turns light grey with brief (~1 hour) exposure to air, with bioturbation					
170	50.87	saturated	15	168.5-170	NA	NA	
171	49.87						
172	48.87						
173	47.87						
174	46.87		16	173.5-175	NA	NA	
175	45.87	Bottom of carbonate clay or confining layer					
176	44.87						
177	43.87	Dark grey silty SAND, (SM - SP), high organic content, saturated					
178	42.87						
179	41.87						
180	40.87		17	178.5-180	NA	NA	
181	39.87	Light grey, fine quartz SAND (SP), saturated					
182							
183	37.87						
184	36.87						

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1014
Sheet 7 of 7

SITE Vogtle ALWR SSAR TOTAL DEPTH 197.4 SURF.ELEV. 220.867

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To ft.	Blows	N BPF	Comments
185	35.87	Light grey, silty, fine-grained SAND (SM), saturated	18	183.5-185	NA	NA	
186	34.87	Dark grey fine sandy SILT (ML)					
187	33.87						
188	32.87						
189	31.87						
190	30.87	Grey poorly graded SAND with silt (SP-SM)	19	188.5-190	NA	NA	
191	29.87						
192	28.87						
193	27.87						
194	26.87						
195	25.87		20	193.5-195	NA	NA	
196	24.87						
197	23.87		21	195-197.4	NA	NA	
198	22.87	Boring terminated at 197.4' Well OW-1014 installed in this borehole.					
199	21.87						
200	20.87						
201	19.87						
202	18.87						
203	17.87						
204	16.87						
205	15.87						
206	14.87						
206	14.87						
208	12.87						
209	11.87						
210	10.87						
211	9.87						
212	8.87						
213	7.87						
214							
215	5.87						
216	4.87						

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SOUTHERN COMPANY
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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1015
Sheet 1 of 4

SITE	Vogtle ALWR SSAR	HOLE DEPTH	120	SURF.ELEV.	220.427
LOCATION	Burke County, Georgia	COORDINATES N	1140550.576	E	623086.318
ANGLE	NA	BEARING	NA	CONTRACTOR	Greene
DRILL NO.	CME 75	DRILLING METHOD	4 1/4" HSA	NO. SAMPLES	24
NO. U.D. SAMPLES	NA	WATER TABLE DEPTH	73'	ELEV.	
TIME AFTER COMP.		DATE TAKEN	5/30/2005	TYPE GROUT	NA
QUANTITY	NA	MIX	NA	DRILLING START DATE	5/30/2005
DRILLER	Greene , Dulong	RECORDER	S Bearce	APPROVED	NA
DRILLING COMP. DATE	6/3/2005				

Depth Ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To Ft.	Blows	N BPF	Comments
0	220.43						
1	219.43						
2	218.43						
3	217.43						
4	216.43	Brown, fine- to medium -grained SAND (SW) <5% silt					
5	215.43		1	3.5-5	3-9-8	17	
6	214.43						
7	213.43						
8	212.43						
9	211.43	Red-brown, hematitic clayey SAND (SC)					
10	210.43		2	8.5-10	8-10-13	23	
11	209.43						
12	208.43						
13	207.43						
14	206.43	Red and tan mottled fine- to medium-grained SAND (SP), traces of silt (<5%)					
15	205.43		3	13.5-15	9-9-13	22	
16	204.43						
17	203.43						
18	202.43						
19	201.43	Reddish-brown, sandy CLAY (CL) sand laminae are light tan					
20	200.43		4	18.5-20	10-11-14	25	
21	199.43						
22	198.43						
23	197.43						
24	196.43						

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SOUTHERN COMPANY
Energy to Serve Your World

DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1015

SITE Vogtle ALWR SSAR TOTAL DEPTH 120 SURF.ELEV. 220.427

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To ft.	Blows	N BPF	Comments
25	195.43	Reddish-brown, sandy CLAY (CL) sand laminae are light tan	5	23.5-25	8-11-14	25	
26	194.43						
27	193.43						
28	192.43						
29	191.43						
30	190.43	Orange-brown fine- to medium-grained SAND (SP) damp	6	28.5-30	6-7-8	15	
31	189.43						
32	188.43						
33	187.43						
34	186.43						
35	185.43		7	33.5-35	7-7-8	15	
36	184.43						
37	183.43						
38	182.43						
39	181.43						
40	180.43		8	38.5-40	6-8-14	22	
41	179.43						
42	178.43						
43	177.43						
44	176.43						
45	175.43		9	43.5-45	10-13-15	28	
46	174.43						
47	173.43						
48	172.43						
49	171.43	Yellowish brown sandy CLAY (CL-CH), moist					
50	170.43		10	48.5-50	6-7-9	16	
51	169.43						
52	168.43						
53	167.43						
54							
55	165.43		11	53.5-55	8-11-11	22	
56	164.43						

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SOUTHERN COMPANY
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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1015

SITE Vogtle ALWR SSAR TOTAL DEPTH 120 SURF.ELEV. 220.427

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To ft.	Blows	N BPF	Comments
57	163.43						
58	162.43						
59	161.43	Yellowish brown clayey SAND (SC) fine-grained, moist					6/2/2005 ▼
60	160.43		12	58.5-60	9-12-14	26	Water Table 59.5
61	159.43						
62	158.43	Tan fine- to coarse-grained SAND (SP) saturated					
63	157.43						
64	156.43	Yellow brown clayey SAND (SC) saturated					
65	155.43		13	63.5-65	1-3-5	8	
66	154.43						
67	153.43						
68	152.43						
69	151.43						
70	150.43		14	68.5-70	5-6-9	15	
71	149.43						
72	148.43						
73	147.43						▼
74	146.43						Water Table during drilling 5/30/2005
75	145.43		15	73.5-75	3-11-13	26	
76	144.43						
77	143.43						
78	142.43						
79	141.43						
80	140.43	Same as above, though orange in appearance	16	78.5-80	3-3-5	8	
81	139.43						
82	138.43						
83	137.43						
84	136.43	Yellow brown clayey SAND (SC) saturated					
85	135.43		17	83.5-85	2-3-3	6	
86							
87	133.43						
88	132.43						

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SOUTHERN COMPANY
Energy to Serve Your World

DRILLING LOG
GEOLOGICAL SERVICES

Hole No. OW-1015

SITE Vogtle ALWR SSAR TOTAL DEPTH 120 SURF.ELEV. 220.427

Depth ft.	Elev. Ft.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To ft.	Blows	N BPF	Comments
89	131.43						
90	130.43	Yellow brown clayey SAND (SC) saturated	18	88.5-90	4-9-6	15	
91	129.43						
92	128.43						
93	127.43	Greyish white, fine- to medium-grained SAND (SP) saturated					
94	126.43						sand flowed up into augers. used water and SuperGel X to attempt to flush.
95	125.43		19	93.5-95	13-26-39	65	
96	124.43						
97	123.43						
98	122.43						
99	121.43						
100	120.43	Very light tan poorly graded SAND with silt (SP-SM)	20	98.5-100	10-13-6	19	
101	119.43						
102	118.43						
103	117.43						
104	116.43	Tan shelly (coarse) fine to medium grained clayey SAND (SC)					
105	115.43		21	103.5-105	8-9-16	25	
106	114.43						
107	113.43						
108	112.43						
109	111.43	Greenish Gray MARL					
110	110.43		22	108.5-110	6-12-33	45	
111	109.43						
112	108.43						Boring Terminated at 120'. Mixed fluid to clean auger and stabilize hole. Bentonite was additive. Approx. the volume of the ID of 125' of 4 1/4" ID auger was allowed to sit overnight. Cleaned hole with fresh water to remove mud. Volume of water used in hole was 200 gallons.
113	107.43						
114	106.43						
115	105.43		23	113.5-115	NA	NA	
116	104.43						
117	103.43						
118							
119	101.43						
120	100.43	Boring terminated at 120'	24	118.5-120	20-30-50/3"	30/ 50/3"	

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APPENDIX F

ABANDONMENT FORMS

AND

AS BUILT
WELL CONSTRUCTION LOGS

WELL ABANDONMENT DATA

PROJECT: SOUTHERN ALWR ESP PROJECT	**WELL/HOLE NO:** OW-1001A **DEPTH:** 100' **HOLE DIAMETER:** ~7 5/8"
ABANDONMENT BY: S&ME, Inc.	**DATE ABANDONED:** 6/5/2005
REASON FOR ABANDONMENT: This hole was drilled with incorrect size augers.	**VOLUME USED:** 32 cubic feet
REMARKS: 32 bags of grout were used to abandon this hole.	

PROJECT: SOUTHERN ALWR ESP PROJECT	**WELL/HOLE NO:** OW-1002A **DEPTH:** 108.5' **HOLE DIAMETER:** ~7 5/8"
ABANDONMENT BY: S&ME, Inc.	**DATE ABANDONED:** 6/5/2005
REASON FOR ABANDONMENT: This hole was drilled with incorrect size augers.	**VOLUME USED:** 35 cubic feet
REMARKS: 35 bags of grout were used to abandon this hole.	

PROJECT:	WELL/HOLE NO:	OW-1003A
SOUTHERN ALWR ESP PROJECT	DEPTH:	90.00'
	HOLE DIAMETER:	~7 5/8"
ABANDONMENT BY:	DATE ABANDONED:	
S&ME, Inc.		5/25/2005
REASON FOR ABANDONMENT:	VOLUME USED:	
This hole was drilled with incorrect size augers.		25 cubic feet
REMARKS:		
25 bags of grout were used to abandon this hole.		

PROJECT:	WELL/HOLE NO:	OW-1006A
SOUTHERN ALWR ESP PROJECT	DEPTH:	125'
	HOLE DIAMETER:	~7 5/8"
ABANDONMENT BY: S&ME, Inc.	DATE ABANDONED:	6/5/2005
REASON FOR ABANDONMENT: This hole was drilled with incorrect size augers.	VOLUME USED:	40 cubic feet
REMARKS: 40 bags of grout were used to abandon this hole.		

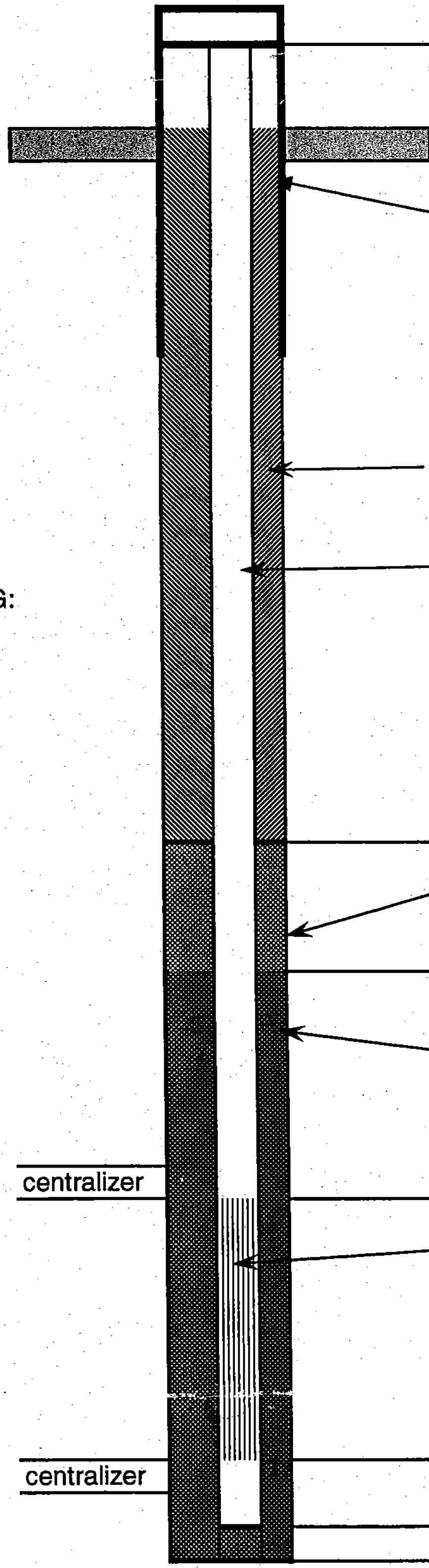
PROJECT: SOUTHERN ALWR ESP PROJECT	**WELL/HOLE NO:** OW-1005A **DEPTH:** 75' **HOLE DIAMETER:** ~7 5/8"
ABANDONMENT BY: S&ME, Inc.	**DATE ABANDONED:** 6/5/2005
REASON FOR ABANDONMENT: This hole was drilled with incorrect size augers.	**VOLUME USED:** 25 cubic feet
REMARKS: 25 bags of grout were used to abandon this hole.	

SOUTHERN COMPANY GENERATION

WELL CONSTRUCTION LOG

Coords	N 1142888.724 E 620148.556	PROJECT	Vogtle ALWR SSAR
		LOCATION	Burke County, Georgia
DATE INSTALLED	5/29/2005	PREPARED	7/18/2005

WELL NO. **OW-1001**



	DEPTH (ft.)	ELEVATION (ft.)
Top of 2" PVC Casing		233.494
3' X 3' CONCRETE PAD 4-6" THICK GROUND SURFACE	0	230.854
TOP OF SEAL	113	117.854
TOP Of FILTER PACK	116	114.854
BOTTOM OF RISER/ TOP OF SCREEN	121	109.854
BOTTOM OF SCREEN	130	100.854
BOTTOM OF CASING	133	97.854
BOTTOM OF HOLE	133	97.854

PROTECTIVE CASING
DIA 4" x 4" x 4"
TYPE Plated steel

BACKFILL MATERIAL
TYPE Cement/bentonite grout

RISER CASING
DIA 2"
TYPE Sch 40 PVC

STANDUP CASING:
hinge lid, welded

ANNULAR SEAL
TYPE Cetco Goldseal 3/8" chips

FILTER PACK
TYPE: JC50FS by Unimen

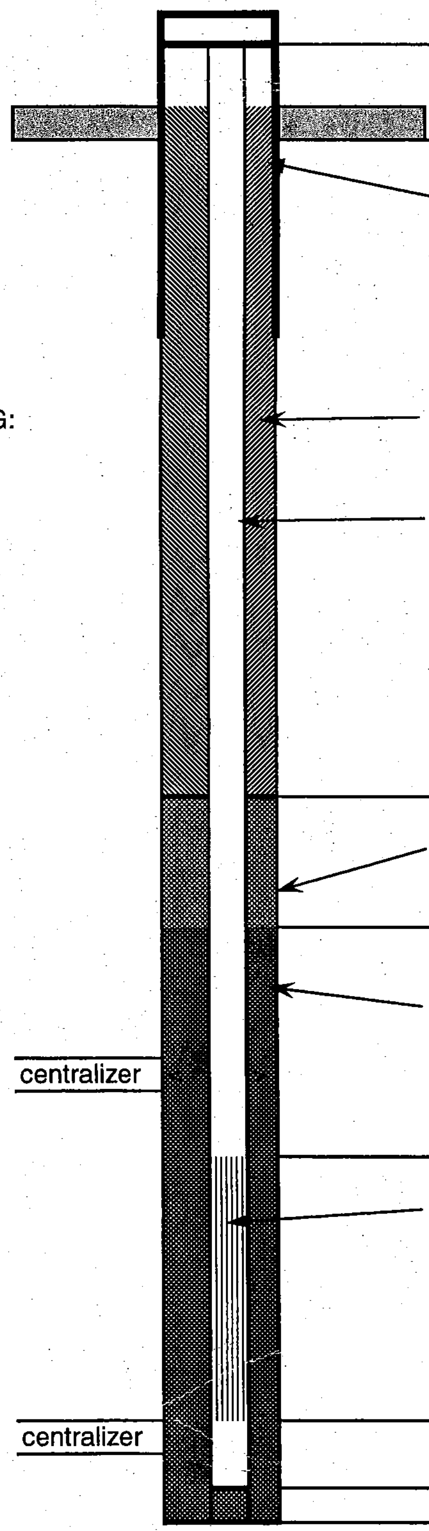
SCREEN
DIA 2"
TYPE Sch 40 PVC
OPENING WIDTH 0.01" spaced 0.125"
OPENING TYPE machine slotted

HOLE DIA: 9"

SOUTHERN COMPANY GENERATION

WELL CONSTRUCTION LOG

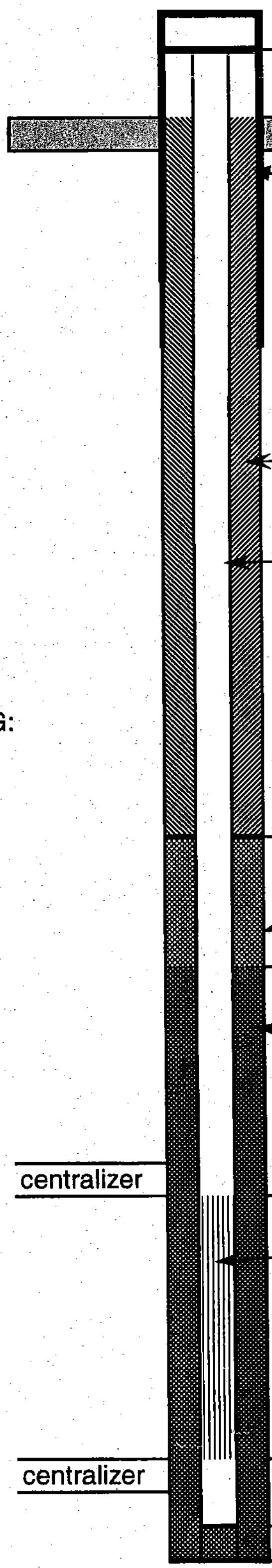
Coords	N 1142887.782 E 620189.341	PROJECT	Vogtle ALWR SSAR	WELL NO.
DATE INSTALLED	6/6/2005	LOCATION	Burke County, Georgia	OW-1002
		PREPARED	7/18/2005	



	DEPTH	ELEVATION
Top of 2" PVC casing		230.502
3' X 3' CONCRETE PAD 4-6" THICK GROUND SURFACE	0	227.442
PROTECTIVE CASING DIA 4"x4"x4' TYPE Plated steel **BACKFILL MATERIAL** TYPE Cement/bentonite grout **RISER CASING** DIA 2" TYPE Sch 80 PVC		
TOP OF SEAL	212	15.442
ANNULAR SEAL TYPE Cetco Goldseal 3/8" chips TOP Of FILTER PACK	216	11.442
FILTER PACK TYPE: 1A by DSI BOTTOM OF RISER/ TOP OF SCREEN	219	8.442
SCREEN DIA 2" TYPE Sch 80 PVC OPENING WIDTH 0.01" spaced 0.125" OPENING TYPE machine slotted BOTTOM OF SCREEN	229	-1.558
BOTTOM OF CASING	237	-9.558
BOTTOM OF HOLE	237	-9.558

SOUTHERN COMPANY GENERATION

WELL CONSTRUCTION LOG		PROJECT	Vogtle ALWR SSAR	WELL NO.
Coords	N 1142864.05 E 621884.337	LOCATION	Burke County, Georgia	
DATE INSTALLED	5/26/2005		PREPARED 7/16/2005	OW-1003



STANDUP CASING: hinge lid, welded

centralizer

centralizer

HOLE DIA: 9"

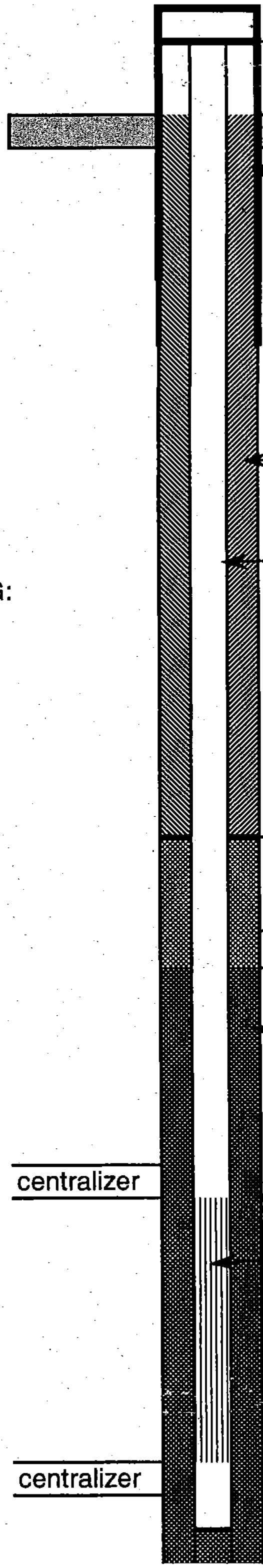
	DEPTH (ft.)	ELEVATION (ft.)
Top of 2" PVC casing		226.284
3' X 3' CONCRETE PAD 4-6" THICK GROUND SURFACE	0	223.044
PROTECTIVE CASING DIA 4"x4"x4" TYPE Plated steel		
BACKFILL MATERIAL TYPE Cement/bentonite grout		
RISER CASING DIA 2" TYPE Sch 40 PVC		
TOP OF SEAL	68.5	154.544
ANNULAR SEAL TYPE Cetco Goldseal 3/8" chips		
TOP OF FILTER PACK	72	151.044
FILTER PACK TYPE: 1A by DSI		
BOTTOM OF RISER/ TOP OF SCREEN	75.5	147.544
SCREEN DIA 2" TYPE Sch 40 PVC OPENING WITH 0.01" spaced 0.125" OPENTING TYPE machine slotted		
BOTTOM OF SCREEN	84.8	138.244
BOTTOM OF CASING	90.5	132.544
BOTTOM OF HOLE	90.5	132.544

SOUTHERN COMPANY GENERATION

WELL CONSTRUCTION LOG

Coords	N 1142842.17 E 621880.794	PROJECT	Vogtle ALWR SSAR
		LOCATION	Burke County, Georgia
DATE INSTALLED	6/10/2005	PREPARED	7/18/2005

WELL NO. **OW-1004**



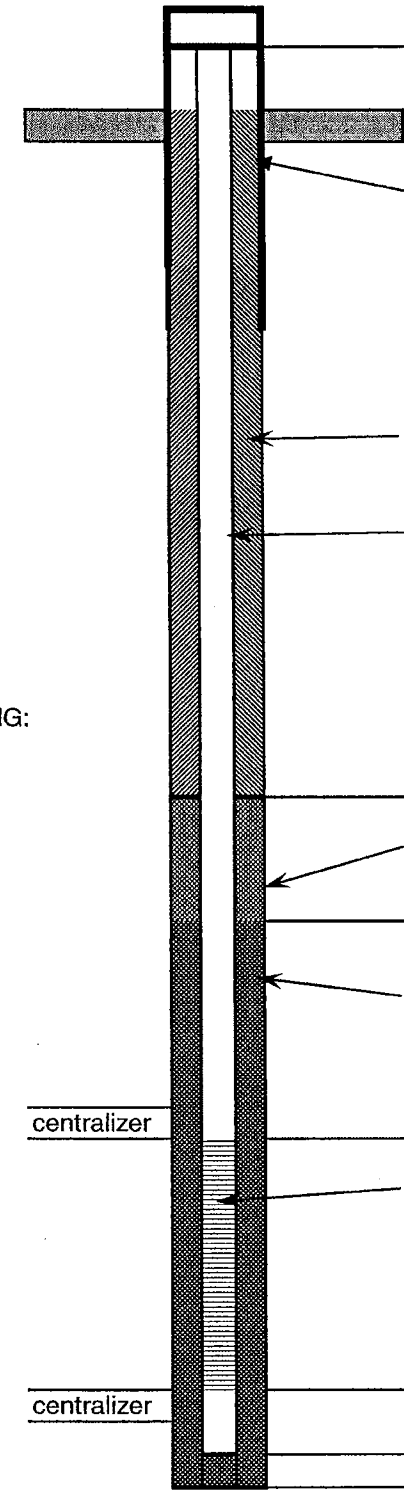
	DEPTH (ft.)	ELEVATION (ft.)
Top of 2" PVC CASING		225.671
3' X 3' CONCRETE PAD 4-6" THICK GROUND SURFACE	0	222.92
PROTECTIVE CASING DIA 4"X4"X4' TYPE Plated steel		
BACKFILL MATERIAL TYPE Cement/bentonite grout		
RISER CASING DIA 2" TYPE Sch 80 PVC		
TOP OF SEAL	147	75.92
ANNULAR SEAL TYPE Cetco Goldseal 3/8" chips		
TOP OF FILTER PACK	150	72.92
FILTER PACK TYPE: 1A by DSI		
BOTTOM OF RISER/ TOP OF SCREEN	153	69.92
SCREEN DIA 2" TYPE Sch 80 PVC OPENING WIDTH 0.01" spaced 0.125" OPENING TYPE Machine slotted		
BOTTOM OF SCREEN	163	59.92
BOTTOM OF CASING	169	53.92
BOTTOM OF HOLE	187	35.92

STANDUP CASING:
hinge lid, welded

HOLE DIA 6"

SOUTHERN COMPANY GENERATION

WELL CONSTRUCTION LOG		PROJECT	Vogtle ALWR SSAR	WELL NO.
Coords	N 1144047.86 E 620408.765	LOCATION	Burke County, Georgia	
DATE INSTALLED	6/7/2005		PREPARED 7/18/2005	OW-1005



STANDUP CASING:
hinge lid, welded

HOLE DIA: 9"

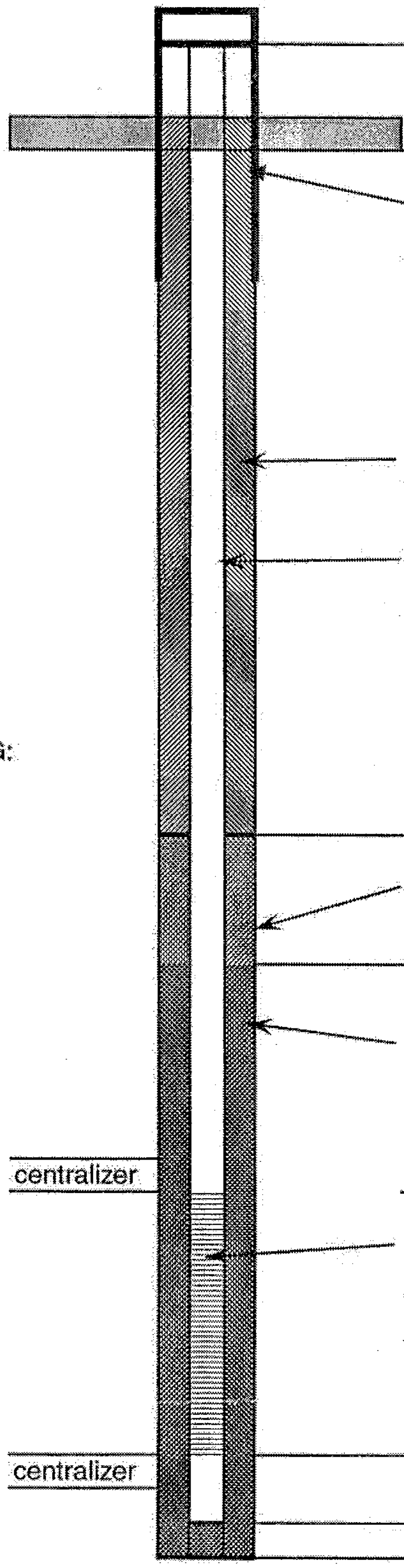
	DEPTH (ft.)	ELEVATION (ft.)
TOP OF 2" PVC CASING		267.289
3' X 3' CONCRETE PAD 4-6" THICK GROUND SURFACE	0	264.389
PROTECTIVE CASING DIA 4"X4"X4" TYPE Plated steel		
BACKFILL MATERIAL TYPE Cement/bentonite grout		
RISER CASING DIA 2" TYPE Sch 80 PVC		
TOP OF SEAL	140	124.389
ANNULAR SEAL TYPE Cetco Goldseal 3/8" chips		
TOP OF FILTER PACK	143	121.389
FILTER PACK TYPE: 1A by DSI		
BOTTOM OF RISER/ TOP OF SCREEN	149	115.389
SCREEN DIA 2" TYPE Sch 80 PVC OPENING WIDTH 0.01" spaced 0.125" OPENING TYPE Machine slotted		
BOTTOM OF SCREEN	159	105.389
BOTTOM OF CASING	168.5	95.889
BOTTOM OF HOLE	168.5	95.889

SOUTHERN COMPANY GENERATION

WELL CONSTRUCTION LOG

Coords	N 1143817.85 E 619179.749	PROJECT	Vogtle ALWR SSAR
		LOCATION	Burke County, Georgia
DATE INSTALLED	6/14-15/2005	PREPARED	7/18/2005

WELL NO. **OW-1006**



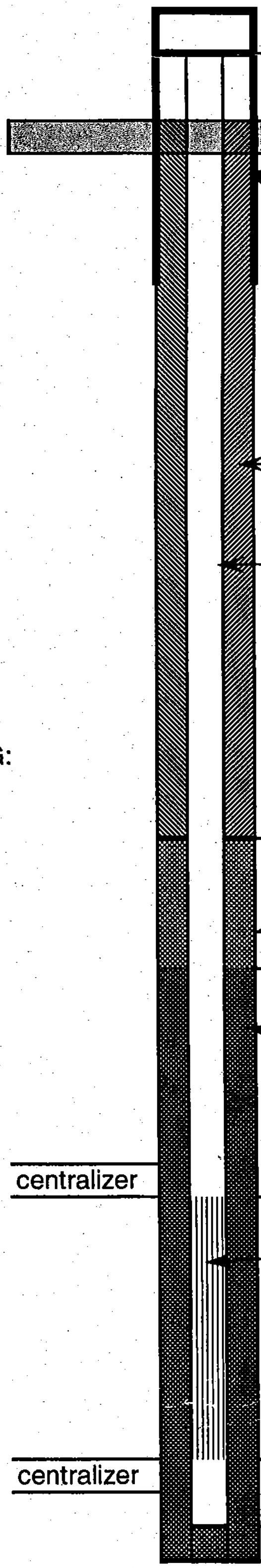
STANDUP CASING:
hinge lid, welded

HOLE DIA: 9"

	DEPTH (ft.)	ELEVATION (ft.)
TOP OF 2" PVC CASING		230.601
3' X 3' CONCRETE PAD 4-6" THICK GROUND SURFACE	0	227.121
PROTECTIVE CASING DIA 4"X4"X4" TYPE Plated steel		
BACKFILL MATERIAL TYPE Cement/bentonite grout		
RISER CASING DIA 2" TYPE Sch 80 PVC		
TOP OF SEAL	110	117.121
ANNULAR SEAL TYPE Cetco Goldseal 3/8" chips		
TOP OF FILTER PACK	113	114.121
FILTER PACK TYPE: 1A by DSI		
BOTTOM OF RISER/ TOP OF SCREEN	116	111.121
SCREEN DIA 2" TYPE Sch 80 PVC OPENING WIDTH 0.01" spaced 0.125" OPENING TYPE Machine slotted		
BOTTOM OF SCREEN	126	101.121
BOTTOM OF CASING	136	91.121
BOTTOM OF HOLE	136	91.121

SOUTHERN COMPANY GENERATION

WELL CONSTRUCTION LOG		PROJECT	Vogtle ALWR SSAR	WELL NO.
Coords	N 1142383.76 E 619301.009	LOCATION	Burke County, Georgia	
DATE INSTALLED	6/7/2005		PREPARED 7/18/2005	OW-1007



	DEPTH (Ft.)	ELEVATION (ft.)
TOP OF 2" PVC CASING		219.96
3' X 3' CONCRETE PAD 4-6" THICK GROUND SURFACE	0	216.91
PROTECTIVE CASING DIA 4"X4"X4" TYPE Plated steel		
BACKFILL MATERIAL TYPE Cement/bentonite grout		
RISER CASING DIA 2" TYPE Sch 40 PVC		
TOP OF SEAL	96	120.91
ANNULAR SEAL TYPE Cetco Goldseal 3/8" chips		
TOP OF FILTER PACK	99	117.91
FILTER PACK TYPE: 1A by DSI		
BOTTOM OF RISER/ TOP OF SCREEN	102	114.91
SCREEN DIA 2" TYPE Sch 40 PVC OPENING WIDTH 0.01" spaced 0.125" OPENING TYPE Machine slotted		
BOTTOM OF SCREEN	112	104.91
BOTTOM OF CASING	120	96.91
BOTTOM OF HOLE	120	96.91

STANDUP CASING:
hinge lid, welded

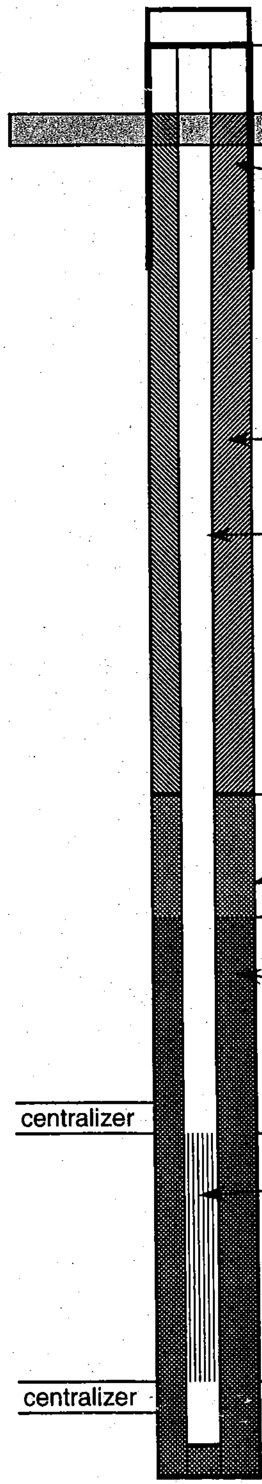
centralizer

centralizer

HOLE DIA: 9"

SOUTHERN COMPANY GENERATION

WELL CONSTRUCTION LOG		PROJECT	Vogtle ALWR SSAR	WELL NO.
Coords	N 1142347.93 E 619306.686	LOCATION	Burke County, Georgia	
DATE STARTED	6/1/2005		PREPARED 7/18/2005	OW-1008



	DEPTH (ft.)	ELEVATION (ft.)
TOP OF 2" PVC CASING		219.71
3' X 3' CONCRETE PAD 4-6" THICK GROUND SURFACE	0	216.65
PROTECTIVE CASING DIA 4"X4"X4" TYPE Plated steel		
BACKFILL MATERIAL TYPE Cement/bentonite grout		
RISER CASING DIA 2" TYPE Sch 80 PVC		
TOP OF SEAL	224	-7.35
ANNULAR SEAL TYPE Cetco Goldseal 3/8" chips		
TOP OF FILTER PACK	226	-9.35
FILTER PACK TYPE: 1A by DSI		
BOTTOM OF RISER/ TOP OF SCREEN	230	-13.35
SCREEN DIA 2" TYPE Sch 80 PVC OPENING WIDTH 0.01" spaced 0.125" OPENING TYPE Machine slotted		
BOTTOM OF SCREEN	240	-23.35
BOTTOM OF CASING	245	-28.35
BOTTOM OF HOLE	247	-30.35

STANDUP CASING:
hinge lid, welded

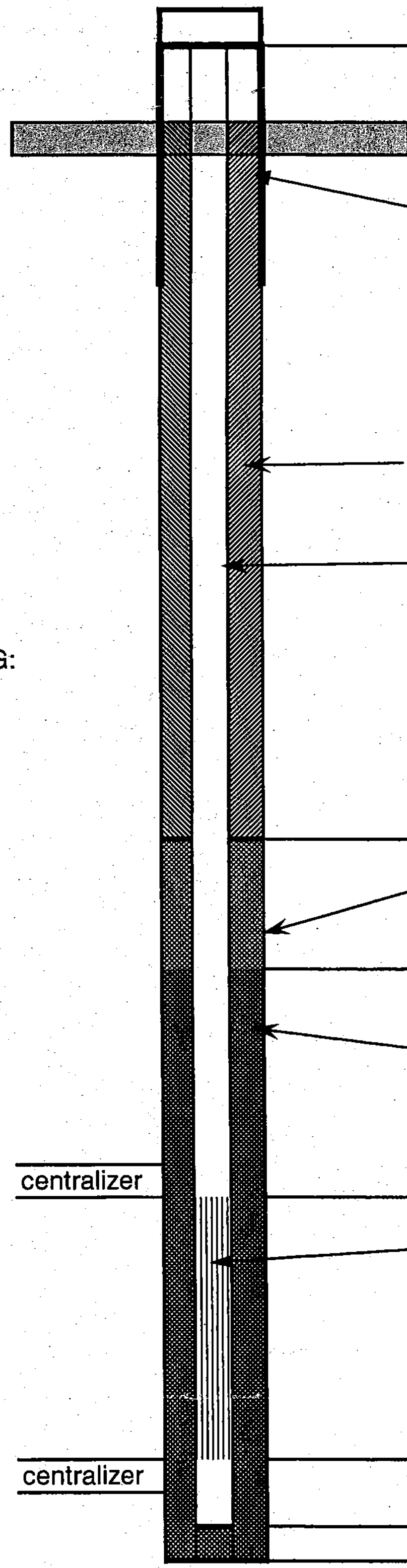
HOLE DIA: 6"

SOUTHERN COMPANY GENERATION

WELL CONSTRUCTION LOG

Coords	N 1141891.64 E 620888.608	PROJECT	Vogtle ALWR SSAR
		LOCATION	Burke County, Georgia
DATE INSTALLED	5/27/2005	PREPARED	7/18/2005

WELL NO. **OW-1009**



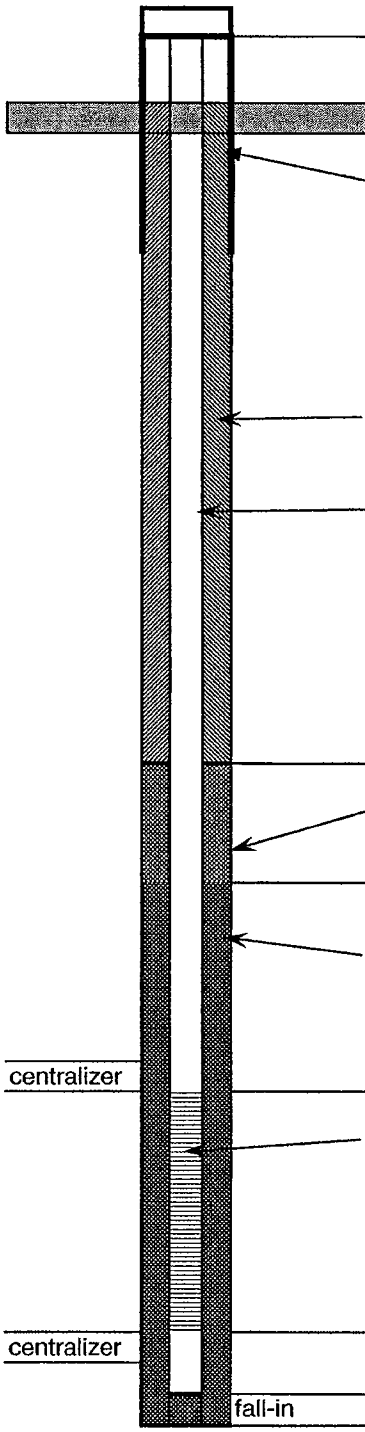
STANDUP CASING:
hinge lid, welded

HOLE DIA: 9"

	DEPTH (ft.)	ELEVATION (ft.)
TOP OF 2" PVC CASING		223.647
3' X 3' CONCRETE PAD 4-6" THICK GROUND SURFACE	0	220.887
PROTECTIVE CASING DIA 4"X4"X4" TYPE Plated steel		
BACKFILL MATERIAL TYPE Cement/bentonite grout		
RISER CASING DIA 2" TYPE Sch 40 PVC		
TOP OF SEAL	78	142.887
ANNULAR SEAL TYPE Cetco Goldseal 3/8" chips		
TOP OF FILTER PACK	81	139.887
FILTER PACK TYPE: 1A by DSI		
BOTTOM OF RISER/ TOP OF SCREEN	84	136.887
SCREEN DIA 2" TYPE Sch 40 PVC OPENING WIDTH 0.01" spaced 0.125" OPENING TYPE Machine slotted		
BOTTOM OF SCREEN	94	126.887
BOTTOM OF CASING	98	122.887
BOTTOM OF HOLE	98	122.887

SOUTHERN COMPANY GENERATION

WELL CONSTRUCTION LOG		PROJECT	Vogtle ALWR SSAR	WELL NO.
Coords	N 1140808.98 E 620051.708	LOCATION	Burke County, Georgia	
DATE INSTALLED	6/1/2005	PREPARED	7/18/2005	**OW-1010**



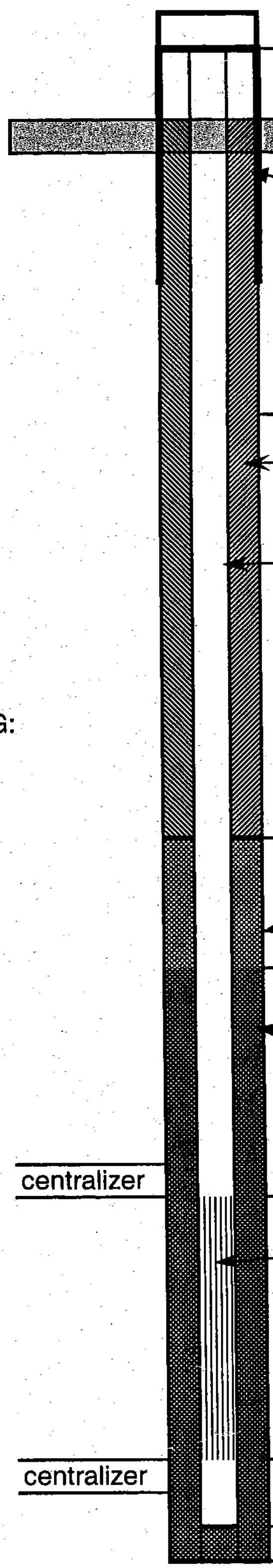
STANDUP CASING:
hinge lid, welded

HOLE DIA: 9"

	DEPTH (ft.)	ELEVATION (ft.)
TOP OF 2" PVC CASING		219.905
3' X 3' CONCRETE PAD 4-6" THICK		
GROUND SURFACE	0	216.895
PROTECTIVE CASING DIA 4"X4"X4" TYPE Plated steel		
BACKFILL MATERIAL TYPE Cement/bentonite grout		
RISER CASING DIA 2" TYPE Sch 40 PVC		
TOP OF SEAL	67.0	149.895
ANNULAR SEAL TYPE Cetco Goldseal 3/8" chips		
TOP OF FILTER PACK	70.1	146.795
FILTER PACK TYPE: 1A by DSI		
BOTTOM OF RISER/ TOP OF SCREEN	73	143.895
SCREEN DIA 2" TYPE Sch 40 PVC OPENING WIDTH 0.01" spaced 0.125" OPENING TYPE Machine slotted		
BOTTOM OF SCREEN	83	133.895
BOTTOM OF CASING	92	124.895
BOTTOM OF HOLE	94	122.895

SOUTHERN COMPANY GENERATION

WELL CONSTRUCTION LOG	PROJECT Vogtle ALWR SSAR	WELL NO.
Coords N 1139956.24 E 621033.045	LOCATION Burke County, Georgia	
DATE INSTALLED 6/13/2005	PREPARED 7/18/2005	OW-1011



	DEPTH (ft.)	ELEVATION (ft.)
TOP OF 2" PVC CASING		209.043
3' X 3' CONCRETE PAD 4-6" THICK GROUND SURFACE	0	205.785
PROTECTIVE CASING DIA 4"X4"X4" TYPE Plated steel		
BACKFILL MATERIAL TYPE Cement/bentonite grout **RISER CASING** DIA 2" TYPE Sch 80 PVC		
TOP OF SEAL	193	12.785
ANNULAR SEAL TYPE Cetco Puregold med chips		
TOP Of FILTER PACK	197	8.785
FILTER PACK TYPE: Foster Dixiana		
BOTTOM OF RISER/ TOP OF SCREEN	200	5.785
SCREEN DIA 2" TYPE Sch 80 PVC OPENING WIDTH 0.01" spaced 0.125" OPENING TYPE Machine slotted		
BOTTOM OF SCREEN	210	-4.215
BOTTOM OF CASING	218	-12.215
BOTTOM OF HOLE	218	-12.215

STANDUP CASING:
hinge lid, welded

centralizer

centralizer

HOLE DIA: 6"

SOUTHERN COMPANY GENERATION

WELL CONSTRUCTION LOG

Coords	N 1139969.49 E 621045.924	PROJECT	Vogtle ALWR SSAR
		LOCATION	Burke County, Georgia
DATE INSTALLED	6/1/2005	PREPARED 7/18/2005	

WELL NO. **OW-1012**

	DEPTH (ft.)	ELEVATION (ft.)
TOP OF 2" PVC CASING		208.684
3' x 3' CONCRETE PAD 4 - 6" THICK GROUND SURFACE	0	205.355
PROTECTIVE CASING DIA 4"X4"X4" TYPE Plated steel		
BACKFILL MATERIAL TYPE Cement/bentonite grout		
RISER CASING DIA 2" TYPE Sch 40 PVC		
TOP OF SEAL	67.0	138.355
ANNULAR SEAL TYPE Cetco Goldseal 3/8" chips		
TOP OF FILTER PACK	71	134.355
FILTER PACK TYPE: 1A BY DSI		
BOTTOM OF RISER/ TOP OF SCREEN	74.0	131.355
SCREEN DIA TYPE 2" TYPE Sch 40 PVC OPENING WIDTH 0.01" spaced 0.125" OPENING TYPE Machine slotted		
BOTTOM OF SCREEN	83	122.355
BOTTOM OF CASING	94	111.355
BOTTOM OF HOLE	94	111.355

STANDUP CASING
hinge lid, welded

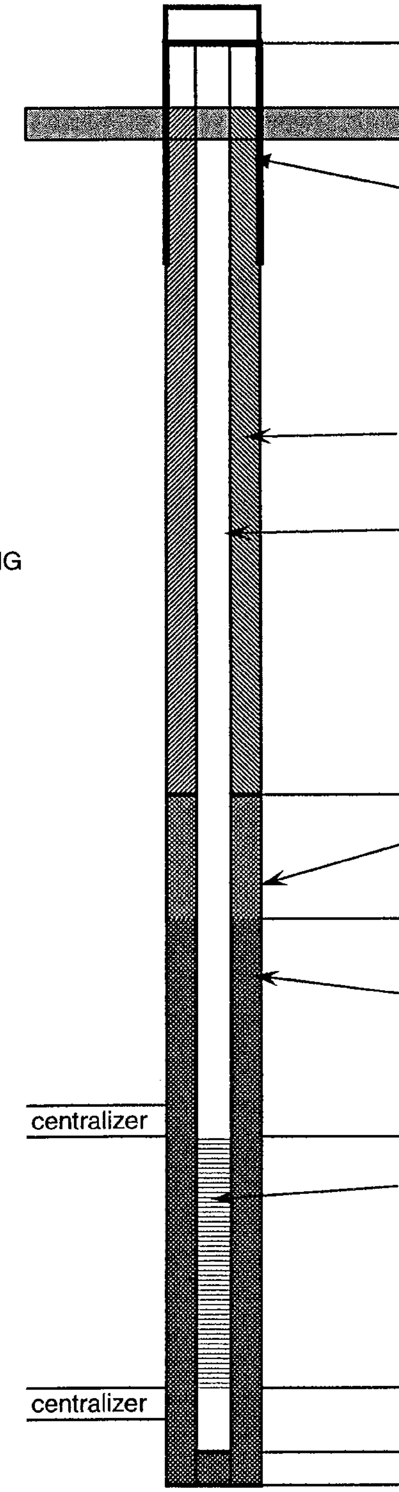
centralizer

centralizer

HOLE DIA: 9"

SOUTHERN COMPANY GENERATION

WELL CONSTRUCTION LOG	PROJECT	Vogtle ALWR SSAR	WELL NO.
Coords N 1140805.4 E 621715.032	LOCATION	Burke County, Georgia	
DATE INSTALLED 6/10/2005		PREPARED 7/18/2005	OW-1013



STANDUP CASING
hinge lid, welded

centralizer

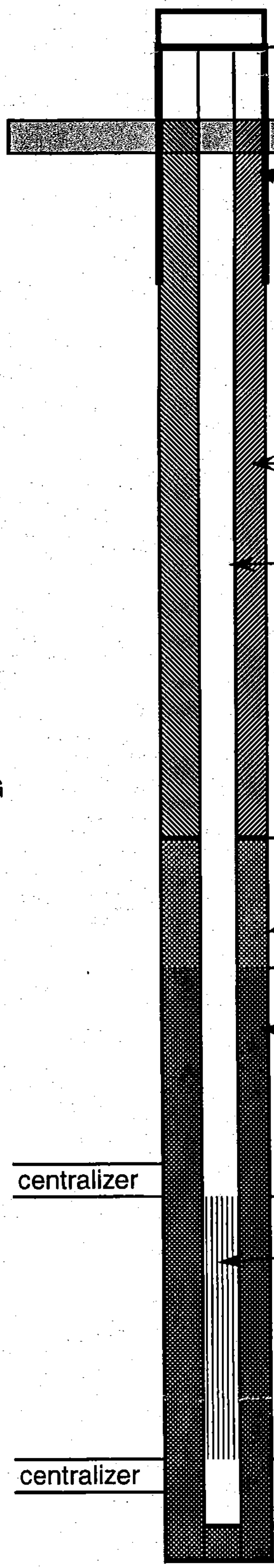
centralizer

HOLE DIA: 9"

	DEPTH (ft.)	ELEVATION (ft.)
TOP OF 2" PVC CASING		219.809
3' x 3' CONCRETE PAD 4 - 6" THICK GROUND SURFACE	0	216.869
PROTECTIVE CASING DIA 4"X4"X4" TYPE Plated steel **BACKFILL MATERIAL** TYPE Cement/bentonite grout **RISER CASING** DIA 2" TYPE Sch 40		
TOP OF SEAL	78	138.369
ANNULAR SEAL TYPE Cetco Goldseal 3/8" chips		
TOP OF FILTER PACK	81.0	135.869
FILTER PACK TYPE: 1A by DSI		
BOTTOM OF RISER/ TOP OF SCREEN	84	132.369
SCREEN DIA 2" TYPE Sch 40 PVC OPENING WIDTH 0.01" spaced 0.125" OPENING TYPE Machine slotted		
BOTTOM OF SCREEN	94	122.869
BOTTOM OF CASING	104	112.869
BOTTOM OF HOLE	104	112.869

SOUTHERN COMPANY GENERATION

WELL CONSTRUCTION LOG		PROJECT	Vogtle ALWR SSAR	WELL NO.
Coords	N 1140565.502 E 623070.234	LOCATION	Burke County, Georgia	
DATE INSTALLED	6/11/2005		PREPARED 7/18/2005	OW-1014



STANDUP CASING
hinge lid, welded

centralizer

centralizer

HOLE DIA: 6"

	DEPTH (ft.)	ELEVATION (ft.)
TOP OF 2" PVC CASING		223.856
3' x 3' CONCRETE PAD 4 - 6" THICK GROUND SURFACE	0	220.867
TOP OF SEAL	176	44.867
TOP Of FILTER PACK	179	41.867
BOTTOM OF RISER/ TOP OF SCREEN	182	38.867
BOTTOM OF SCREEN	192	28.867
BOTTOM OF CASING	197	23.867
BOTTOM OF HOLE	197	23.867

PROTECTIVE CASING

DIA	4"X4"X4"
TYPE	Plated steel

BACKFILL MATERIAL

TYPE	Cement/bentonite grout

RISER CASING

DIA	2"
TYPE	Sch 80 PVC

ANNULAR SEAL

TYPE	Cetco Puregold 3/8" chips

FILTER PACK

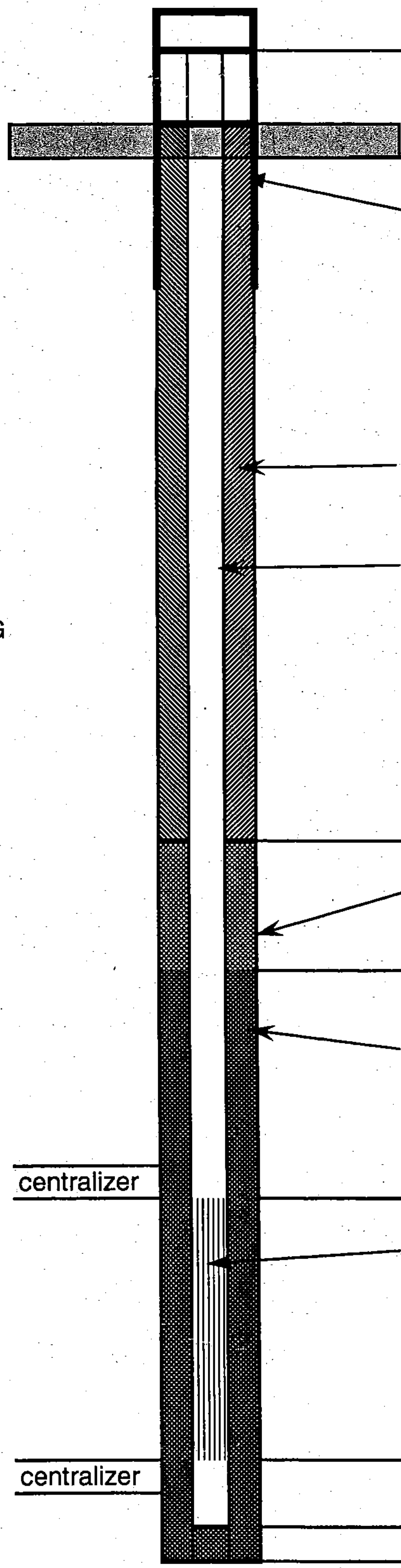
TYPE:	Foster Dixiana Filter Sand

SCREEN

DIA	2"
TYPE	Sch 80 PVC
OPENING WIDTH	0.01" spaced 0.125"
OPENING TYPE	Machine slotted

SOUTHERN COMPANY GENERATION

WELL CONSTRUCTION LOG		PROJECT	Vogtle ALWR SSAR	WELL NO.
Coords	N 1140550.57 E 623086.318	LOCATION	Burke County, Georgia	
DATE INSTALLED	6/3/2005		PREPARED 7/18/2005	OW-1015



HOLE DIA: 9"

Description	DEPTH (ft.)	ELEVATION (ft.)
TOP OF 2" PVC CASING		223.157
3' x 3' CONCRETE PAD 4 - 6" THICK		
GROUND SURFACE	0	220.427
PROTECTIVE CASING DIA 4"X4"X4" TYPE Plated steel		
BACKFILL MATERIAL TYPE Cement/bentonite grout		
RISER CASING DIA 2" TYPE Sch 40 PVC		
TOP OF SEAL	86	134.427
ANNULAR SEAL TYPE Cetco Goldseal 3/8" chips		
TOP OF FILTER PACK	89.6	130.827
FILTER PACK TYPE: 1A BY DSI		
BOTTOM OF RISER/ TOP OF SCREEN	93	127.427
SCREEN DIA 2" TYPE Sch 40 PVC OPENING WIDTH 0.01" spaced 0.125" OPENING TYPE Machine slotted		
BOTTOM OF SCREEN	103	117.427
BOTTOM OF CASING	120	100.427
BOTTOM OF HOLE	120	100.427

APPENDIX G

WELL DEVELOPMENT FORMS

MONITORING WELL DEVELOPMENT

Facility/Project Name	County	Well Name
Vogtle SSAR	Burke	27
Facility License, Permit or Monitoring Number		

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:
   - surged with bailer and bailed ☐ 41
   - surged with bailer and pumped ☐ 61
   - surged with block and bailed ☐ 42
   - surged with block and pumped ☐ 62
   - surged with block, bailed, and pumped ☐ 70
   - compressed air ☐ 20
   - bailed only ☐ 10
   - pumped only ☒ 51
   - pumped slowly ☐ 50
   - other ______ ☒ [redacted]

3. Time spent developing well ______ min.

4. Depth of well (from top of well casing) 190.55' ft.

5. Inside diameter of well 1¾" or 1½" in.

6. Volume of water in filter pack and well casing ______ gal.

7. Volume of water removed from well ______ gal.

8. Volume of water added (if any) None gal.

9. Source of water added None

10. Analysis performed on water added? ☐ Yes ☒ No
    (If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	124.85' ft.	ft.
Date	b.	6-2-05	
Time	c.		
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 Turbid ☐ 15 (Describe)	Clear ☐ 20 Turbid ☐ 25 (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

	Before Development	After Development
14. Total suspended solids	— mg/l	— mg/l
15. COD	— mg/l	— mg/l

16. Well developed by: Person's Name and Firm
Tim Kelly
Rick Fredrick } S&ME

17. Additional comments on development:
WELL COULD NOT BE PURGED DUE TO DIAMETER SIZE OF PVC CASING.
PUMP WOULD NOT FIT INTO CASING.

Facility Address or Owner/Responsible Party Address

Name:

Firm:

Street:

City/State/Zip:

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature:

Print Name:

Firm:

MONITORING WELL DEVELOPMENT

Facility/Project Name	County	Well Name
Vogtle SSAR	Burke	142
Facility License, Permit or Monitoring Number		

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:
   - surged with bailer and bailed ☐ 41
   - surged with bailer and pumped ☐ 61
   - surged with block and bailed ☐ 42
   - surged with block and pumped ☐ 62
   - surged with block, bailed, and pumped ☐ 70
   - compressed air ☒ 20
   - bailed only ☐ 10
   - pumped only 51
   - pumped slowly ☐ 50
   - other ______ ☒ [redacted]

3. Time spent developing well: 15 min.

4. Depth of well (from top of well casing): 97.0' ft.

5. Inside diameter of well: 2" in.

6. Volume of water in ~~filter pack and~~ well casing: 4.4 gal.

7. Volume of water removed from well: Approx 13.0 gal.

8. Volume of water added (if any): None gal.

9. Source of water added: None

10. Analysis performed on water added? ☐ Yes ☒ No (If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	70.10' ft.	Dry ft.
Date	b.	6-15-05	6-15-05
Time	c.	9:30 Am	9:45 Am
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☒ 10 Turbid ☐ 15	Clear ☒ 20 Turbid ☐ 25
		(Describe) WATER WAS CLEAR DURING DEVELOPMENT & WHEN DRY AFTER APPROX 1 WELL VOLUME REMOVED.	(Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	— mg/l	— mg/l
15. COD	— mg/l	— mg/l

16. Well developed by: Person's Name and Firm
Tim Kelly, Rick Fredrick — S&ME

17. Additional comments on development:
WELL DEVELOPED USING AIR COMPRESSOR
≈ 50 PSI OF PRESSURE AT BOTTOM OF WELL

Facility Address or Owner/Responsible Party Address

Name: ______

Firm: ______

Street: ______

City/State/Zip: ______

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: ______

Print Name: ______

Firm: ______

MONITORING WELL DEVELOPMENT

Facility/Project Name	County	Well Name
Vogtle SSAR	Burke	179
Facility License, Permit or Monitoring Number		

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:
   - surged with bailer and bailed ☐ 41
   - surged with bailer and pumped ☐ 61
   - surged with block and bailed ☐ 42
   - surged with block and pumped ☐ 62
   - surged with block, bailed, and pumped ☐ 70
   - compressed air ☒ 20
   - bailed only ☐ 10
   - pumped only ☐ 51
   - pumped slowly ☐ 50
   - other ______ ☒

3. Time spent developing well: 20 min.

4. Depth of well (from top of well casing): 133.62' ft.

5. Inside diameter of well: 2" in.

6. Volume of water in ~~filter pack and~~ well casing: 1.0 gal.

7. Volume of water removed from well: Approx 3.0 gal.

8. Volume of water added (if any): None gal.

9. Source of water added: None

10. Analysis performed on water added? ☐ Yes ☒ No (If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	127.17 ft.	Dry ft.
Date	b.	6-15-05	6-15-05
Time	c.	11:40 Am	11:55 Am
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 / Turbid ☒ 15	Clear ☒ 20 / Turbid ☐ 25
(Describe)		Slightly turbid	WATER BECAME MORE CLEAR AFTER 3 WELL VOLUMES REMOVED

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	— mg/l	— mg/l
15. COD	— mg/l	— mg/l

16. Well developed by: Person's Name and Firm

Tim Kelly
Rick Fredrick } S&ME

17. Additional comments on development:

WELL DEVELOPED USING AIR COMPRESSOR ≈ 50 PSI OF PRESSURE AT BOTTOM OF WELL

Facility Address or Owner/Responsible Party Address

Name: ______

Firm: ______

Street: ______ ~~2.4A-146~~

City/State/Zip: ______

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: ______

Print Name: ______

Firm: ______

MONITORING WELL DEVELOPMENT

Facility/Project Name	County	Well Name
Vogtle SSAR	Burke	179
Facility License, Permit or Monitoring Number		

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:
   - surged with bailer and bailed ☐ 41
   - surged with bailer and pumped ☐ 61
   - surged with block and bailed ☐ 42
   - surged with block and pumped ☐ 62
   - surged with block, bailed, and pumped ☐ 70
   - compressed air ☐ 20
   - bailed only ☐ 10
   - pumped only ☒ 51
   - pumped slowly ☐ 50
   - other ☒ ______

3. Time spent developing well ______ min.

4. Depth of well (from top of well casing) 133.62' ft.

5. Inside diameter of well 1 3/4" or 1 1/2" in.

6. Volume of water in filter pack and well casing ______ gal.

7. Volume of water removed from well ______ gal.

8. Volume of water added (if any) NONE gal.

9. Source of water added None

10. Analysis performed on water added? ☐ Yes ☒ No
    (If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	127.26' ft.	ft.
Date	b.	6-1-05	
Time	c.		
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 / Turbid ☐ 15 (Describe)	Clear ☐ 20 / Turbid ☐ 25 (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

	Before	After
14. Total suspended solids	— mg/l	— mg/l
15. COD	— mg/l	— mg/l

16. Well developed by: Person's Name and Firm
Tim Kelly, Rick Fredrick } S&ME

17. Additional comments on development:

WELL COULD NOT BE PURGED DUE TO DIAMETER SIZE OF PVC CASING PUMP WOULD NOT FIT INTO CASING.

Facility Address or Owner/Responsible Party Address

Name: ______

Firm: ______

Street: ______

City/State/Zip: ______

I hereby certify that the above information is true and correct to the best of knowledge.

Signature: ______

Print Name: ______

Firm: ______

MONITORING WELL DEVELOPMENT

Facility/Project Name	County	Well Name
Vogtle SSAR	Burke	803 A
Facility License, Permit or Monitoring Number		

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:
   - surged with bailer and bailed ☐ 41
   - surged with bailer and pumped ☐ 61
   - surged with block and bailed ☐ 42
   - surged with block and pumped ☐ 62
   - surged with block, bailed, and pumped ☐ 70
   - compressed air ☐ 20
   - bailed only ☐ 10
   - pumped only ☒ 51
   - pumped slowly ☐ 50
   - other ______ ☒ ■

3. Time spent developing well: 30 min.

4. Depth of well (from top of well casing): 89.20' ft.

5. Inside diameter of well: 2" in.

6. Volume of water in ~~filter pack and~~ well casing: 4.7 gal.

7. Volume of water removed from well: 21 gal.

8. Volume of water added (if any): NONE gal.

9. Source of water added: None

10. Analysis performed on water added? ☐ Yes ☒ No (If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	60.23 ft.	Dry ft.
Date	b.	5/26/05	5/26/05
Time	c.	2:30 pm	3:00 pm
12. Sediment in well bottom		89.20' inches	89.20' inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15	Clear ☐ 20 Turbid ☐ 25
(Describe)		TURBID (CLOUDY)	TURBID (CLOUDY)

Fill in if drilling fluids were used and well is at solid waste facility:

	Before	After
14. Total suspended solids	— mg/l	— mg/l
15. COD	— mg/l	— mg/l

16. Well developed by: Person's Name and Firm
TIM KELLY - S&ME
RICK FREDRICK - S&ME

17. Additional comments on development:
Min 3 Well Volumes Required
Max 4 Well Volumes Removed (Dry) 1st DEVELOPMENT
Noted: Pump Rate ≈ 2.0 gallon per min
Allowed well to recharge from 3:00 pm to 4:30 pm Pg 1 of 2

Facility Address or Owner/Responsible Party Address

Name: ______

Firm: ______

Street: ______ ~~2.4A 148~~

City/State/Zip: ______

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: ______

Print Name: ______

Firm: ______

MONITORING WELL DEVELOPMENT

Facility/Project Name	County	Well Name
Vogtle SSAR	Burke	803 A
Facility License, Permit or Monitoring Number		

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:

surged with bailer and bailed	☐	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed, and pumped	☐	70
compressed air	☐	20
bailed only	☐	10
pumped only	☒	51
pumped slowly	☐	50
other ______	☒	[redacted]

3. Time spent developing well: 20 min.

4. Depth of well (from top of well casing): 89.20' ft.

5. Inside diameter of well: 2" in.

6. Volume of water in ~~filter pack and~~ well casing: 4.7 gal.

7. Volume of water removed from well: 20 gal.

8. Volume of water added (if any): None gal.

9. Source of water added: None

10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	60.30' ft.	Dry ft.
Date	b.	5/26/05	5/26/05
Time	c.	4:30	4:50
12. Sediment in well bottom		89.20' inches	89.20 inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15	Clear ☐ 20 Turbid ☒ 25
(Describe)		Turbid (cloudy)	Turbid (cloudy)

Fill in if drilling fluids were used and well is at solid waste facility:

	Before Development	After Development
14. Total suspended solids	— mg/l	— mg/l
15. COD	— mg/l	— mg/l

16. Well developed by: Person's Name and Firm

17. Additional comments on development:

Min of 3 well Volumes Required
Max of 4 removed (Dry), 2nd DEVELOPMENT
Note! Pump Rate ≈ 2.0 gallon per min.

Pg 2 of 2

Facility Address or Owner/Responsible Party Address

Name: ______

Firm: ______

Street: ______

City/State/Zip: ______

I hereby certify that the above information is true and correct to the best of knowledge.

Signature: ______

Print Name: ______

Firm: ______

MONITORING WELL DEVELOPMENT

Facility/Project Name	County	Well Name
Vogtle SSAR	Burke	804
Facility License, Permit or Monitoring Number		

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method:
   - surged with bailer and bailed ☐ 41
   - surged with bailer and pumped ☐ 61
   - surged with block and bailed ☐ 42
   - surged with block and pumped ☐ 62
   - surged with block, bailed, and pumped ☐ 70
   - compressed air ☐ 20
   - bailed only ☐ 10
   - pumped only ☒ 51
   - pumped slowly ☐ 50
   - other ________ ☒ [redacted]

3. Time spent developing well: 20 min.

4. Depth of well (from top of well casing): 95.09' ft.

5. Inside diameter of well: 2" in.

6. Volume of water in [redacted] well casing: 5.3 gal.

7. Volume of water removed from well: 16.0 gal.

8. Volume of water added (if any): NONE gal.

9. Source of water added: None

10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	62.31' ft.	63.10' ft.
Date	b.	6-1-05	6-1-05
Time	c.	4:45 pm	5:05 pm
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 / Turbid ☒ 15	Clear ☒ 20 / Turbid ☐ 25
		(Describe) VERY CLOUDY	(Describe) WATER CLEARED AFTER APPROX 1 WELL VOLUME REMOVED.

Fill in if drilling fluids were used and well is at solid waste facility:

	Before	After
14. Total suspended solids	— mg/l	— mg/l
15. COD	— mg/l	— mg/l

16. Well developed by: Person's Name and Firm
TIM KELLY, RICK FREDRICK } SAME

17. Additional comments on development:
3 WELL VOLUMES REMOVED
PUMP RATE ≈ 1.0 gal per min.

Facility Address or Owner/Responsible Party Address

Name:

Firm:

Street:

City/State/Zip:

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature:

Print Name:

Firm:

MONITORING WELL DEVELOPMENT

Facility/Project Name	County	Well Name
Vogtle SSAR	Burke	805A
Facility License, Permit or Monitoring Number		

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method:
   - surged with bailer and bailed ☐ 41
   - surged with bailer and pumped ☐ 61
   - surged with block and bailed ☐ 42
   - surged with block and pumped ☐ 62
   - surged with block, bailed, and pumped ☐ 70
   - compressed air ☐ 20
   - bailed only ☐ 10
   - pumped only ☒ 51
   - pumped slowly ☐ 50
   - other ________ ☒

3. Time spent developing well: 55 min.

4. Depth of well (from top of well casing): 127.0' ft.

5. Inside diameter of well: 2" in.

6. Volume of water in ~~filter pack and~~ well casing: 8.0 gal.

7. Volume of water removed from well: 24.0 gal.

8. Volume of water added (if any): None gal.

9. Source of water added: None

10. Analysis performed on water added? ☐ Yes ☒ No
    (If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	77.69' ft.	78.20' ft.
Date	b.	6-1-05	6-1-05
Time	c.	6:20 pm	7:15 pm
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 / Turbid ☒ 15	Clear ☒ 20 / Turbid ☐ 25
(Describe)		Gray Color Very Turbid	Clear after 1 well volume removed.

Fill in if drilling fluids were used and well is at solid waste facility:

	Before	After
14. Total suspended solids	— mg/l	— mg/l
15. COD	— mg/l	— mg/l

16. Well developed by: Person's Name and Firm
Tim Kelly
Rick Fredrick } S&ME

17. Additional comments on development:
3 Well Volumes Removed
Pump Rate ≈ 1.0 gal per min.

Facility Address or Owner/Responsible Party Address

Name:

Firm:

Street:

City/State/Zip:

I hereby certify that the above information is true and correct to the best of knowledge.

Signature:

Print Name:

Firm:

SCS Field Form

MONITORING WELL DEVELOPMENT

Gallons per foot 0.163

Facility/Project Name: Vogtle SSAR	County: Burke	Well Name: 809
Facility License, Permit or Monitoring Number		

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method:
   - surged with bailer and bailed ☐ 41
   - surged with bailer and pumped ☐ 61
   - surged with block and bailed ☐ 42
   - surged with block and pumped ☐ 62
   - surged with block, bailed, and pumped ☐ 70
   - compressed air ☐ 20
   - bailed only ☐ 10
   - pumped only ☒ 51
   - pumped slowly ☐ 50
   - other ______ ☒

3. Time spent developing well: 20 min.

4. Depth of well (from top of well casing): 93.00' ft.

5. Inside diameter of well: 2'' in.

6. Volume of water in ~~filter pack~~ and well casing: 3.5 gal.

7. Volume of water removed from well: 20 gal.

8. Volume of water added (if any): None gal.

9. Source of water added: ~~None~~

10. Analysis performed on water added? ☐ Yes ☒ No
    (If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	71.50' ft.	71.66' ft.
Date	b.	5/26/05	5/26/05
Time	c.	1:45 pm	2:00 pm
12. Sediment in well bottom		94.35' − 93.00 = 1.35 inches (SEE INSP REPORT)	inches
13. Water clarity		Clear ☐ 10 / Turbid ☒ 15	Clear ☒ 20 / Turbid ☐ 25
(Describe)		SLIGHTLY TURBID	CLEAR

Fill in if drilling fluids were used and well is at solid waste facility:

	Before Development	After Development
14. Total suspended solids	— mg/l	— mg/l
15. COD	— mg/l	— mg/l

16. Well developed by: Person's Name and Firm
Tim Kelly } S&ME, INC
Rick Fredrick }

17. Additional comments on development:
MIN. 3 Well Volumes Required
MAX. 6 Well Volumes Removed
NOTED: Pump Rate ≈ 2.0 gallon per min.

Facility Address or Owner/Responsible Party Address

Name: ______

Firm: ______

Street: ______

City/State/Zip: ______

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: ______

Print Name: ______

Firm: ______

MONITORING WELL DEVELOPMENT

Facility/Project Name	County	Well Name
Vogtle SSAR	Burke	850 A
Facility License, Permit or Monitoring Number		

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method:

surged with bailer and bailed	☐	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed, and pumped	☐	70
compressed air	☐	20
bailed only	☐	10
pumped only	☒	51
pumped slowly	☐	50
other ____	☒	[redacted]

3. Time spent developing well: 55 min.

4. Depth of well (from top of well casing): 193.21' ft.

5. Inside diameter of well: 2" in.

6. Volume of water in ~~filter pack and~~ well casing: 11.1 gal.

7. Volume of water removed from well: 33.4 gal.

8. Volume of water added (if any): NONE gal.

9. Source of water added: None

10. Analysis performed on water added? ☐ Yes ☒ No (If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	124.90 ft.	125.26' ft.
Date	b.	6-2-05	6-2-05
Time	c.	3:15 pm	4:10 pm
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 / Turbid ☒ 15	Clear ☒ 20 / Turbid ☐ 25
(Describe)		SLIGHTLY TURBID	CLEAR AFTER 2 gallons REMOVED.

Fill in if drilling fluids were used and well is at solid waste facility:

	Before	After
14. Total suspended solids	— mg/l	— mg/l
15. COD	— mg/l	— mg/l

16. Well developed by: Person's Name and Firm

TIM KELLY
RICK FREDRICK } S&ME

17. Additional comments on development:

3 WELL VOLUMES REMOVED
Pump RATE ≈ 1.0 gal Per min.

Facility Address or Owner/Responsible Party Address	I hereby certify that the above information is true and correct to the best of my knowledge.
Name:	
Firm:	Signature:
Street:	Print Name:
City/State/Zip:	Firm:

MONITORING WELL DEVELOPMENT

Facility/Project Name	County	Well Name
Vogtle SSAR	Burke	852
Facility License, Permit or Monitoring Number		

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method:
   - surged with bailer and bailed ☐ 41
   - surged with bailer and pumped ☐ 61
   - surged with block and bailed ☐ 42
   - surged with block and pumped ☐ 62
   - surged with block, bailed, and pumped ☐ 70
   - compressed air ☐ 20
   - bailed only ☐ 10
   - pumped only ☒ 51
   - pumped slowly ☐ 50
   - other ______ ☒

3. Time spent developing well 90 min.

4. Depth of well (from top of well casing) 221.63' ft.

5. Inside diameter of well 2" in.

6. Volume of water in ~~filter pack and~~ well casing 21.7 gal.

7. Volume of water removed from well 65 gal.

8. Volume of water added (if any) NONE gal.

9. Source of water added None

10. Analysis performed on water added? ☐ Yes ☒ No
    (If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	88.62' ft.	96.13' ft.
Date	b.	6-2-05	6-2-05
Time	c.	10:10 AM	11:40 AM
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☒ 10 Turbid ☐ 15 (Describe)	Clear ☒ 20 Turbid ☐ 25 (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	— mg/l	— mg/l
15. COD	— mg/l	— mg/l

16. Well developed by: Person's Name and Firm
Tim Kelly
RICK FREDRICK } S&ME

17. Additional comments on development:
3 WELL VOLUMES REMOVED
PUMP RATE ≈ 1.0 gal per min.

Facility Address or Owner/Responsible Party Address

Name:

Firm:

Street:

City/State/Zip:

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature:

Print Name:

Firm:

MONITORING WELL DEVELOPMENT

Facility/Project Name	County	Well Name
Vogtle SSAR	Burke	853
Facility License, Permit or Monitoring Number		

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method:
   - surged with bailer and bailed ☐ 41
   - surged with bailer and pumped ☐ 61
   - surged with block and bailed ☐ 42
   - surged with block and pumped ☐ 62
   - surged with block, bailed, and pumped ☐ 70
   - compressed air ☐ 20
   - bailed only ☐ 10
   - pumped only ☒ 51
   - pumped slowly ☐ 50
   - other ______ ☒ [redacted]

3. Time spent developing well: 55 min.

4. Depth of well (from top of well casing): 224.0' ft.

5. Inside diameter of well: 2" in.

6. Volume of water in filter pack and well casing: 16.2 gal.

7. Volume of water removed from well: 55 gal.

8. Volume of water added (if any): NONE gal.

9. Source of water added: None

10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	124.50' ft.	124.62' ft.
Date	b.	6-1-05	6-1-05
Time	c.	12:30 pm	1:25 pm
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 / Turbid ☒ 15	Clear ☒ 20 / Turbid ☐ 25
		(Describe) SLIGHTLY TURBID	(Describe) CLEAR AFTER ≈2 gallons Removed

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	—	mg/l	— mg/l
15. COD	—	mg/l	— mg/l

16. Well developed by: Person's Name and Firm
TIM KELLY
RICK FREDRICK } S&ME

17. Additional comments on development:

3 WELL VOLUMES REMOVED
PUMP RATE 1.0 gal per min.

Facility Address or Owner/Responsible Party Address

Name:

Firm:

Street:

City/State/Zip:

I hereby certify that the above information is true and correct to the best of knowledge.

Signature:

Print Name:

Firm:

MONITORING WELL DEVELOPMENT

Facility/Project Name	County	Well Name
Vogtle SSAR	Burke	854
Facility License, Permit or Monitoring Number		

1. Can this well be purged dry? (SEE COMMENTS) ? ☒ Yes ☐ No

2. Well development method:

surged with bailer and bailed	☐	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed, and pumped	☐	70
compressed air	☐	20
bailed only	☐	10
pumped only	☒	51
pumped slowly	☐	50
other ______	☒	

3. Time spent developing well: 10 min.

4. Depth of well (from top of well casing): 221.31' ft.

5. Inside diameter of well: 2" in.

6. Volume of water in ~~filter pack and~~ well casing: 14.4 gal.

7. Volume of water removed from well: 10.0 gal.

8. Volume of water added (if any): NONE gal.

9. Source of water added: None

10. Analysis performed on water added? ☐ Yes ☒ No (If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	132.99' ft.	140.0' ft.
Date	b.	6-1-05	6-1-05
Time	c.	3:00 pm	3:10 pm
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 / Turbid ☒ 15	Clear ☒ 20 / Turbid ☐ 25
		(Describe) SLIGHTLY TURBID	(Describe) AFTER 10 gals REMOVED.

Fill in if drilling fluids were used and well is at solid waste facility:

	Before	After
14. Total suspended solids	— mg/l	— mg/l
15. COD	— mg/l	— mg/l

16. Well developed by: Person's Name and Firm
TIM KELLY, RICK FREDRICK } S&ME

17. Additional comments on development:
THE PUMP WOULD NOT GO DEEPER THAN APPROX 140.0' SOME TYPE OF OBSTRUCTION IN WELL.
APPROX 10.0 gallons REMOVED AND THEN WENT DRY.
PUMP RATE 1.0 gal per min.

Facility Address or Owner/Responsible Party Address

Name: ______

Firm: ______

Street: ______

City/State/Zip: ______

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: ______

Print Name: ______

Firm: ______

MONITORING WELL DEVELOPMENT

Facility/Project Name	County	Well Name
Vogtle SSAR	Burke	B55
Facility License, Permit or Monitoring Number		

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method:

surged with bailer and bailed	☐	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed, and pumped	☐	70
compressed air	☐	20
bailed only	☐	10
pumped only	☒	51
pumped slowly	☐	50
other ______	☐	

3. Time spent developing well 65 min.

4. Depth of well (from top of well casing) 225.50' ft.

5. Inside diameter of well 2" in.

6. Volume of water in ~~filter pack and~~ well casing 17.2 gal.

7. Volume of water removed from well 51.6 gal.

8. Volume of water added (if any) NONE gal.

9. Source of water added None

10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	120.04' ft.	120.64' ft.
Date	b.	6-2-05	6-2-05
Time	c.	8:45 AM	9:50 AM
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☒ 10 Turbid ☐ 15 (Describe)	Clear ☒ 20 Turbid ☐ 25 (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	— mg/l	— mg/l
15. COD	— mg/l	— mg/l

16. Well developed by: Person's Name and Firm
TIM KELLY
RICK FREDRICK } S&ME

17. Additional comments on development:

3 WELL VOLUMES REMOVED
PUMP RATE ≈ 1.0 gal per min.

Facility Address or Owner/Responsible Party Address

Name: ______

Firm: ______

Street: ______

City/State/Zip: ______

I hereby certify that the above information is true and correct to the best of m[y] knowledge.

Signature: ______

Print Name: ______

Firm: ______

MONITORING WELL DEVELOPMENT

Facility/Project Name	County	Well Name
Vogtle 55AR	Burke	856
Facility License, Permit or Monitoring Number		

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:

surged with bailer and bailed	☐	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed, and pumped	☐	70
compressed air	☐	20
bailed only	☐	10
pumped only	☒	51
pumped slowly	☐	50
other ______	☒	

3. Time spent developing well: 25 min.

4. Depth of well (from top of well casing): 120.45' ft.

5. Inside diameter of well: 2" in.

6. Volume of water in [redacted] well casing: 7.4 gal.

7. Volume of water removed from well: 22.2 gal.

8. Volume of water added (if any): NONE gal.

9. Source of water added: None

10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	75.11' ft.	DRY ft.
Date	b.	6-1-05	6-1-05
Time	c.	5:35 pm	6:00 pm
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☒ 10 / Turbid ☐ 15 (Describe)	Clear ☒ 20 / Turbid ☐ 25 (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

	Before	After
14. Total suspended solids	— mg/l	— mg/l
15. COD	— mg/l	— mg/l

16. Well developed by: Person's Name and Firm
TIM KELLY
RICK FREDRICK } S&ME

17. Additional comments on development:
APPROX 2 WELL VOLUMES REMOVED BEFORE GOING DRY
PUMP RATE ≈ 1.0 gal per min.

Facility Address or Owner/Responsible Party Address	I hereby certify that the above information is true and correct to the best of my knowledge.
Name:	Signature:
Firm:	Print Name:
Street:	Firm:
City/State/Zip:	

MONITORING WELL DEVELOPMENT

Facility/Project Name	County	Well Name
Vogtle SSAR	Burke	1001
Facility License, Permit or Monitoring Number		

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:

surged with bailer and bailed	☐	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed, and pumped	☐	70
compressed air	☐	20
bailed only	☐	10
pumped only	☒	51
pumped slowly	☐	50
other	☒	

3. Time spent developing well: 15 min.

4. Depth of well (from top of well casing): 137.15' ft.

5. Inside diameter of well: 2" in.

6. Volume of water in ~~filter pack and~~ well casing: 4.44 gal.

7. Volume of water removed from well: 8.0 gal.

8. Volume of water added (if any): None gal.

9. Source of water added: None

10. Analysis performed on water added? ☐ Yes ☒ No (If yes, attach results)

	Before Development	After Development
11. Depth to Water (from top of well casing)	a. 109.93 ft.	Dry ft.
Date	b. 6-6-05	
Time	c. 2:30pm	
12. Sediment in well bottom	inches	inches
13. Water clarity	Clear ☐ 10 / Turbid ☒ 15	Clear ☐ 20 / Turbid ☐ 25
(Describe)	Gray in Color	

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	— mg/l	— mg/l
15. COD	— mg/l	— mg/l

16. Well developed by: Person's Name and Firm

Tim Kelly
Rick Fredrick } S&ME

17. Additional comments on development:

Well when dry after only 8 gallons removed.
Water level @ 125.49' @ 5:10pm (6-6-05) Water level @ 124.62 (6-7-05)
Water level @ 125.39' @ 5:50pm (6-6-05)

Facility Address or Owner/Responsible Party Address

Name:

Firm:

Street:

City/State/Zip:

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature:

Print Name:

Firm:

~~24A 150~~

MONITORING WELL DEVELOPMENT

Facility/Project Name	County	Well Name
Vogtle SSAR	Burke	1002
Facility License, Permit or Monitoring Number		

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method:
   - surged with bailer and bailed ☐ 41
   - surged with bailer and pumped ☐ 61
   - surged with block and bailed ☐ 42
   - surged with block and pumped ☐ 62
   - surged with block, bailed, and pumped ☐ 70
   - compressed air ☒ 20
   - bailed only ☐ 10
   - pumped only ☐ 51
   - pumped slowly ☐ 50
   - other ________ ☐ [redacted]

3. Time spent developing well: 25 min.

4. Depth of well (from top of well casing): 245.60' ft.

5. Inside diameter of well: 2" in.

6. Volume of water in ~~filter pack and~~ well casing: 22.3 gal.

7. Volume of water removed from well: Apprx. 70 gal.

8. Volume of water added (if any): None gal.

9. Source of water added: None

10. Analysis performed on water added? ☐ Yes ☒ No (If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	109.05' ft.	112.68' ft.
Date	b.	6-14-05	6-14-05
Time	c.	3:35	4:00
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 / Turbid ☒ 15	Clear ☒ 20 / Turbid ☐ 25
(Describe)		TURBID UNTIL 1 WELL VOLUME REMOVED	WATER CLEAR WHEN DEVELOPMENT COMPLETED

Fill in if drilling fluids were used and well is at solid waste facility:

	Before		After	
14. Total suspended solids	—	mg/l	—	mg/l
15. COD	—	mg/l	—	mg/l

16. Well developed by: Person's Name and Firm

TIM KELLY
RICK FREDRICK } S&ME

17. Additional comments on development:

WELL WAS DEVELOPED USING AIR COMPRESSOR
≈ 50 PSI OF PRESSURE AT BOTTOM OF WELL

Facility Address or Owner/Responsible Party Address

Name: ____________

Firm: ____________

Street: ____________

City/State/Zip: ____________

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: ____________

Print Name: ____________

Firm: ____________

MONITORING WELL DEVELOPMENT

Facility/Project Name	County	Well Name
Vogtle SSAR	Burke	1003
Facility License, Permit or Monitoring Number		

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:
   - surged with bailer and bailed ☐ 41
   - surged with bailer and pumped ☐ 61
   - surged with block and bailed ☐ 42
   - surged with block and pumped ☐ 62
   - surged with block, bailed, and pumped ☐ 70
   - compressed air ☐ 20
   - bailed only ☐ 10
   - pumped only ☒ 51
   - pumped slowly ☐ 50
   - other ______ ☒

3. Time spent developing well: 65 min.

4. Depth of well (from top of well casing): 97.0' ft.

5. Inside diameter of well: 2" in.

6. Volume of water in filter pack and well casing: 4.2 gal.

7. Volume of water removed from well: 13.0 gal.

8. Volume of water added (if any): None gal.

9. Source of water added: None

10. Analysis performed on water added? ☐ Yes ☒ No
    (If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	71.06' ft.	Dry ft.
Date	b.	6-3-05	6-3-05
Time	c.	8:35 Am	9:40 Am
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 / Turbid ☒ 15	Clear ☒ 20 / Turbid ☐ 25
(Describe)		SLIGHTLY TURBID	CLEAR AFTER 2ND WELL VOLUME REMOVED

Fill in if drilling fluids were used and well is at solid waste facility:

	Before		After	
14. Total suspended solids	—	mg/l	—	mg/l
15. COD	—	mg/l	—	mg/l

16. Well developed by: Person's Name and Firm
TIM KELLY, RICK FREDRICK — S&ME

17. Additional comments on development:
3 WELL VOLUMES REMOVED. THE WELL WENT DRY AFTER EACH VOLUME REMOVED. ALLOWED THE WELL TO RECHARGE & PURGE 3 TIMES.
PUMP RATE ≈ 1.0 gallon PER MIN.

Facility Address or Owner/Responsible Party Address

Name: ______

Firm: ______

Street: ______

City/State/Zip: ______

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: ______

Print Name: ______

Firm: ______

MONITORING WELL DEVELOPMENT

Facility/Project Name	County	Well Name
Vogtle SSAR	Burke	1004
Facility License, Permit or Monitoring Number		

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:
   - surged with bailer and bailed ☐ 41
   - surged with bailer and pumped ☐ 61
   - surged with block and bailed ☐ 42
   - surged with block and pumped ☐ 62
   - surged with block, bailed, and pumped ☐ 70
   - compressed air ☒ 20
   - bailed only ☐ 10
   - pumped only ☐ 51
   - pumped slowly ☐ 50
   - other ______ ☒

3. Time spent developing well: 15 min.

4. Depth of well (from top of well casing): 175.0' ft.

5. Inside diameter of well: 2" in.

6. Volume of water in ~~filter pack and~~ well casing: 9.3 gal.

7. Volume of water removed from well: Approx 20 gal.

8. Volume of water added (if any): None gal.

9. Source of water added: None

10. Analysis performed on water added? ☐ Yes ☒ No
    (If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	117.80' ft.	Dry ft.
Date	b.	6-14-05	
Time	c.	1:00	1:15
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☒ 10 / Turbid ☐ 15	Clear ☒ 20 / Turbid ☐ 25
		(Describe) Water was clear at time of develop.	(Describe) Water was clear when well went dry.

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	— mg/l	— mg/l
15. COD	— mg/l	— mg/l

16. Well developed by: Person's Name and Firm
Tim Kelly
Rick Fredrick } Same

17. Additional comments on development:
Well was developed using air compressor
≈ 50 psi of pressure used at bottom of well

Facility Address or Owner/Responsible Party Address

Name: ______

Firm: ______

Street: ______

City/State/Zip: ______

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: ______

Print Name: ______

Firm: ______

MONITORING WELL DEVELOPMENT

Facility/Project Name	County	Well Name
Vogtle SSAR	Burke	1005
Facility License, Permit or Monitoring Number		

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:
   - surged with bailer and bailed ☐ 41
   - surged with bailer and pumped ☐ 61
   - surged with block and bailed ☐ 42
   - surged with block and pumped ☐ 62
   - surged with block, bailed, and pumped ☐ 70
   - compressed air ☒ 20
   - bailed only ☐ 10
   - pumped only 51
   - pumped slowly ☐ 50
   - other ________ ☒

3. Time spent developing well: 20 min.

4. Depth of well (from top of well casing): 173.05' ft.

5. Inside diameter of well: 2" in.

6. Volume of water in ~~filter pack and~~ well casing: 7.0 gal.

7. Volume of water removed from well: 25 gal.

8. Volume of water added (if any): None gal.

9. Source of water added: None

10. Analysis performed on water added? ☐ Yes ☒ No (If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	130.07' ~~173.05~~ ft.	171.33' ft.
Date	b.	6-15-05	6-15-05
Time	c.	8:55 Am	9:15 Am
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 / Turbid ☒ 15	Clear ☒ 20 / Turbid ☐ 25
(Describe)		SLIGHTLY TURBID	CLEAR AFTER 3 WELL VOLUMES REMOVED.

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	/ mg/l	/ mg/l
15. COD	/ mg/l	/ mg/l

16. Well developed by: Person's Name and Firm
TIM KELLY
RICK FREDRICK } S&ME

17. Additional comments on development:
WELL DEVELOPED USING AIR COMPRESSOR
≈ 50 PSI OF PRESSURE AT BOTTOM OF WELL

Facility Address or Owner/Responsible Party Address

Name: ________

Firm: ________

Street: ________

City/State/Zip: ________

I hereby certify that the above information is true and correct to the best of m[y] knowledge.

Signature: ________

Print Name: ________

Firm: ________

MONITORING WELL DEVELOPMENT

Facility/Project Name	County	Well Name
Vogtle SSAR	Burke	1006
Facility License, Permit or Monitoring Number		

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:

surged with bailer and bailed	☐	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed, and pumped	☐	70
compressed air	☒	20
bailed only	☐	10
pumped only	☒	51
pumped slowly	☐	50
other	☒	[redacted]

3. Time spent developing well: 25 min.

4. Depth of well (from top of well casing): 139.00' ft.

5. Inside diameter of well: 2" in.

6. Volume of water in ~~filter pack and~~ well casing: 9.7 gal.

7. Volume of water removed from well: 30.0 gal.

8. Volume of water added (if any): gal.

9. Source of water added: None

10. Analysis performed on water added? ☐ Yes ☒ No (If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	79.81' ft.	85.14 ft.
Date	b.	6-16-05	6-16-05
Time	c.	7:50 Am	8:15 Am
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15	Clear ☒ 20 Turbid ☐ 25
(Describe)		Slightly TURBID CLEARED AFTER 1 VOLUME REMOVED	CLEAR AT COMPLETION

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	— mg/l	— mg/l
15. COD	— mg/l	— mg/l

16. Well developed by: Person's Name and Firm
TIM. KELLY
RICK FREDRICK } S&ME

17. Additional comments on development:

WELL DEVELOPED USING AIR COMPRESSOR
≈ 50PSI OF PRESSURE AT BOTTOM OF WELL

Facility Address or Owner/Responsible Party Address

Name:

Firm:

Street:

City/State/Zip:

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature:

Print Name:

Firm:

MONITORING WELL DEVELOPMENT

Facility/Project Name	County	Well Name
Vogtle SSAR	Burke	1007
Facility License, Permit or Monitoring Number		

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method:

surged with bailer and bailed	☐	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed, and pumped	☐	70
compressed air	☒	20
bailed only	☐	10
pumped only		51
pumped slowly	☐	50
other	☒	

3. Time spent developing well: 15 min.

4. Depth of well (from top of well casing): 115.0' ft.

5. Inside diameter of well: 2" in.

6. Volume of water in ~~filterpack and~~ well casing: 7.6 gal.

7. Volume of water removed from well: APPROX 30 gal.

8. Volume of water added (if any): None gal.

9. Source of water added: None

10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	68.09 ft.	68.47' ft.
Date	b.	6-14-05	6-14-05
Time	c.	5:40	5:55
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 / Turbid ☒ 15	Clear ☒ 20 / Turbid ☐ 25
(Describe)		SLIGHTLY TURBID	WATER CLEAR AFTER DEVELOPMENT COMPLETED.

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	— mg/l	— mg/l
15. COD	— mg/l	— mg/l

16. Well developed by: Person's Name and Firm
TIM KELLY
RICK FREDRICK
} S&ME

17. Additional comments on development:
WELL DEVELOPED USING AIR COMPRESSOR
≈ 50 PSI OF PRESSURE AT BOTTOM OF WELL

Facility Address or Owner/Responsible Party Address

Name:

Firm:

Street:

City/State/Zip:

I hereby certify that the above information is true and correct to the best of m[y] knowledge.

Signature:

Print Name:

Firm:

MONITORING WELL DEVELOPMENT

Facility/Project Name	County	Well Name
Vogtle SSAR	Burke	1008
Facility License, Permit or Monitoring Number		

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method:
   - surged with bailer and bailed ☐ 41
   - surged with bailer and pumped ☐ 61
   - surged with block and bailed ☐ 42
   - surged with block and pumped ☐ 62
   - surged with block, bailed, and pumped ☐ 70
   - compressed air ☒ 20
   - bailed only ☐ 10
   - pumped only 51
   - pumped slowly ☐ 50
   - other ______ ☒

3. Time spent developing well 25 min.

4. Depth of well (from top of well casing) 252.8 ft.

5. Inside diameter of well 2" in.

6. Volume of water in ~~filter pack and~~ well casing 26.0 gal.

7. Volume of water removed from well APPROX 80 gal.

8. Volume of water added (if any) None gal.

9. Source of water added None

10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	93.52 ft.	94.85 ft.
Date	b.	6-14-05	6-14-05
Time	c.	5:00 pm	5:25 pm
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15 (Describe) SLIGHTLY TURBID	Clear ☒ 20 Turbid ☐ 25 (Describe) CLEAR WATER WHEN DEVELOPMENT COMPLETED.

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	— mg/l	— mg/l
15. COD	— mg/l	— mg/l

16. Well developed by: Person's Name and Firm

TIM KELLY
RICK FREDRICK } S&ME

17. Additional comments on development:

WELL DEVELOPED USING AIR COMPRESSOR
≈ 50 PSI OF PRESSURE AT BOTTOM OF WELL

Facility Address or Owner/Responsible Party Address

Name: ______

Firm: ______

Street: ______

City/State/Zip: ______

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: ______

Print Name: ______

Firm: ______

MONITORING WELL DEVELOPMENT

Facility/Project Name	County	Well Name
Vogtle SSAR	Burke	1009
Facility License, Permit or Monitoring Number		

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method:

surged with bailer and bailed	☐	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed, and pumped	☐	70
compressed air	☐	20
bailed only	☐	10
pumped only	☒	51
pumped slowly	☐	50
other ______	☐	

3. Time spent developing well: 48 min.

4. Depth of well (from top of well casing): 97.0' ft.

5. Inside diameter of well: 2" in.

6. Volume of water in ~~filter pack and~~ well casing: 5.9 gal.

7. Volume of water removed from well: 35.4 gal.

8. Volume of water added (if any): None gal.

9. Source of water added: None

10. Analysis performed on water added? ☐ Yes ☒ No (If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	60.78' ft.	69.93' ft.
Date	b.	6-3-05	6-3-05
Time	c.	7:35 am	8:23 am
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 / Turbid ☒ 15	Clear ☒ 20 / Turbid ☐ 25
(Describe)		TAN IN COLOR	CLEAR AFTER 6 WELL VOLUMES REMOVED.

Fill in if drilling fluids were used and well is at solid waste facility:

	Before	After
14. Total suspended solids	— mg/l	— mg/l
15. COD	— mg/l	— mg/l

16. Well developed by: Person's Name and Firm

TIM KELLY
RICK FREDRICK } SSIME

17. Additional comments on development:

6-WELL VOLUMES REMOVED
PUMP RATE ≈ 1.0 gallon PER MIN.

Facility Address or Owner/Responsible Party Address	I hereby certify that the above information is true and correct to the best of my knowledge.
Name:	
Firm:	Signature:
Street:	Print Name:
City/State/Zip:	Firm:

MONITORING WELL DEVELOPMENT

Facility/Project Name	County	Well Name
Vogtle SSAR	Burke	1010
Facility License, Permit or Monitoring Number		

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method:
   - surged with bailer and bailed ☐ 41
   - surged with bailer and pumped ☐ 61
   - surged with block and bailed ☐ 42
   - surged with block and pumped ☐ 62
   - surged with block, bailed, and pumped ☐ 70
   - compressed air ☐ 20
   - bailed only ☐ 10
   - pumped only ☒ 51
   - pumped slowly ☐ 50
   - other ________ ☒ [redacted]

3. Time spent developing well: 80 min.

4. Depth of well (from top of well casing): 92.0' ft.

5. Inside diameter of well: 2" in.

6. Volume of water in [redacted] well casing: 6.0 gal.

7. Volume of water removed from well: 36.0 gal.

8. Volume of water added (if any): None gal.

9. Source of water added: None

10. Analysis performed on water added? ☐ Yes ☒ No
    (If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	55.41' ft.	90.52' ft.
Date	b.	6-3-05	6-3-05
Time	c.	11:30 am	12:40 pm
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15 (Describe) VERY TURBID	Clear ☐ 20 Turbid ☒ 25 (Describe) SLIGHTLY TURBID AFTER 6 WELL VOLUMES REMOVED

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	— mg/l	— mg/l
15. COD	— mg/l	— mg/l

16. Well developed by: Person's Name and Firm
TIM KELLY
RICK FREDRICK } S&ME

17. Additional comments on development:

6 WELL VOLUMES REMOVED – THE WELL WAS STILL SLIGHTLY TURBID AFTER 6-WELL VOLUMES REMOVED.

PUMP RATE ≈ 1.0 gallon PER MIN.

Facility Address or Owner/Responsible Party Address

Name: ______

Firm: ______

Street: ______

City/State/Zip: ______

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: ______

Print Name: ______

Firm: ______

MONITORING WELL DEVELOPMENT

Facility/Project Name	County	Well Name
Vogtle SSAR	Burke	1011
Facility License, Permit or Monitoring Number		

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method:

surged with bailer and bailed	☐	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed, and pumped	☐	70
compressed air	☒	20
bailed only	☐	10
pumped only		51
pumped slowly	☐	50
other ______	☒	

3. Time spent developing well: 25 min.

4. Depth of well (from top of well casing): 225.0' ft.

5. Inside diameter of well: 2" in.

6. Volume of water in ~~filter pack and~~ well casing: 22.7 gal.

7. Volume of water removed from well: Approx 70 gal.

8. Volume of water added (if any): gal.

9. Source of water added: None

10. Analysis performed on water added? ☐ Yes ☒ No (If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	86.12 ft.	90.10' ft.
Date	b.	6-14-05	6-14-05
Time	c.	2:40 pm	3:05 pm
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 / Turbid ☒ 15	Clear ☒ 20 / Turbid ☐ 25
		(Describe) TURBID UNTIL APPROX 1 WELL VOLUME REMOVED	(Describe) WATER CLEAR WHEN DEVELOPMENT COMPLETE

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	— mg/l	— mg/l
15. COD	— mg/l	— mg/l

16. Well developed by: Person's Name and Firm

Tim Kelly
Rick Fredrick } S&ME

17. Additional comments on development:

WELL WAS DEVELOPED USING AIR COMPRESSOR
≈ 50 PSI OF PRESSURE USED AT BOTTOM OF WELL

Facility Address or Owner/Responsible Party Address

Name: ______

Firm: ______

Street: ______

City/State/Zip: ______

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: ______

Print Name: ______

Firm: ______

MONITORING WELL DEVELOPMENT

Facility/Project Name	County	Well Name
Vogtle SSAR	Burke	1012
Facility License, Permit or Monitoring Number		

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method:
   - surged with bailer and bailed ☐ 41
   - surged with bailer and pumped ☐ 61
   - surged with block and bailed ☐ 42
   - surged with block and pumped ☐ 62
   - surged with block, bailed, and pumped ☐ 70
   - compressed air ☐ 20
   - bailed only ☐ 10
   - pumped only ☒ 51
   - pumped slowly ☐ 50
   - other ______ ☒ [redacted]

3. Time spent developing well: 40 min.

4. Depth of well (from top of well casing): 98.0' ft.

5. Inside diameter of well: 2" in.

6. Volume of water in ~~filter pack and~~ well casing: 8.5 gal.

7. Volume of water removed from well: 26.0 gal.

8. Volume of water added (if any): None gal.

9. Source of water added: None

10. Analysis performed on water added? ☐ Yes ☒ No
    (If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	45.85' ft.	52.78' ft.
Date	b.	6-3-05	6-3-05
Time	c.	9:55 am	10:35 am
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15 (Describe) Very Turbid Tan Color	Clear ☒ 20 Turbid ☐ 25 (Describe) Clear after 1 well volume removed.

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	— mg/l	— mg/l
15. COD	— mg/l	— mg/l

16. Well developed by: Person's Name and Firm
Tim Kelly
Rick Fredrick } S&ME

17. Additional comments on development:

3 well volumes removed
Pump rate ≈ 1.0 gallon per min.

Facility Address or Owner/Responsible Party Address

Name: ______

Firm: ______

Street: ______

City/State/Zip: ______

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: ______

Print Name: ______

Firm: ______

MONITORING WELL DEVELOPMENT

Facility/Project Name	County	Well Name
Voqtle SSAR	Burke	1013
Facility License, Permit or Monitoring Number		

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method:
   - surged with bailer and bailed ☐ 41
   - surged with bailer and pumped ☐ 61
   - surged with block and bailed ☐ 42
   - surged with block and pumped ☐ 62
   - surged with block, bailed, and pumped ☐ 70
   - compressed air ☐ 20
   - bailed only ☐ 10
   - pumped only ☒ 51
   - pumped slowly ☐ 50
   - other ______ ☒

3. Time spent developing well: 50 min.

4. Depth of well (from top of well casing): 108.25 ft.

5. Inside diameter of well: 2" in.

6. Volume of water in ~~filter pack and~~ well casing: 8.7 gal.

7. Volume of water removed from well: 28 gal.

8. Volume of water added (if any): None gal.

9. Source of water added: None

10. Analysis performed on water added? ☐ Yes ☒ No
    (If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	54.86' ft.	69.96' ft.
Date	b.	6-15-05	6-15-05
Time	c.	7:40 am	8:30
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 / Turbid ☒ 15	Clear ☒ 20 / Turbid ☐ 25
(Describe)		SLIGHTLY TURBID	CLEAR AFTER 3 WELL VOLUMES REMOVED.

Fill in if drilling fluids were used and well is at solid waste facility:

	Before	After
14. Total suspended solids	— mg/l	— mg/l
15. COD	— mg/l	— mg/l

16. Well developed by: Person's Name and Firm
    TIM KELLY
    RICK FREDRICK } SAME

17. Additional comments on development:
    APPROX 3 WELL VOLUMES REMOVED
    PUMP RATE AT 1.0 gallon PER MIN.

Facility Address or Owner/Responsible Party Address

Name: ______

Firm: ______

Street: ______

City/State/Zip: ______

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: ______

Print Name: ______

Firm: ______

MONITORING WELL DEVELOPMENT

Facility/Project Name	County	Well Name
Vogtle SSAR	Burke	1014
Facility License, Permit or Monitoring Number		

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method:
   - surged with bailer and bailed ☐ 41
   - surged with bailer and pumped ☐ 61
   - surged with block and bailed ☐ 42
   - surged with block and pumped ☐ 62
   - surged with block, bailed, and pumped ☐ 70
   - compressed air ☒ 20
   - bailed only ☐ 10
   - pumped only ☐ 51
   - pumped slowly ☐ 50
   - other ______ ☐ [redacted]

3. Time spent developing well: 25 min.

4. Depth of well (from top of well casing): 205' ft.

5. Inside diameter of well: 2" in.

6. Volume of water in ~~filter pack and~~ well casing: 15.0 gal.

7. Volume of water removed from well: APPROX 45 gal.

8. Volume of water added (if any): None gal.

9. Source of water added: None

10. Analysis performed on water added? ☐ Yes ☒ No
    (If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	113.0' ft.	119.51' ft.
Date	b.	6-14-05	6-14-05
Time	c.	1:50 pm	2:15 pm
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 / Turbid ☒ 15	Clear ☒ 20 / Turbid ☐ 25
		(Describe) WATER CLEAR AFTER 10 MIN. OF DEVELOPMENT	(Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	— mg/l	— mg/l
15. COD	— mg/l	— mg/l

16. Well developed by: Person's Name and Firm
TIM KELLY
RICK FREDRICK
} S&ME

17. Additional comments on development:
WELL WAS DEVELOPED USING AIR COMPRESSOR
≈ 50 PSI OF PRESSURE USED AT BOTTOM OF WELL

Facility Address or Owner/Responsible Party Address

Name: ______

Firm: ______

Street: ______

City/State/Zip: ______

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: ______

Print Name: ______

Firm: ______

MONITORING WELL DEVELOPMENT

Facility/Project Name	County	Well Name
Vogtle SSAR	Burke	1015
Facility License, Permit or Monitoring Number		

1. Can this well be purged dry? ☐ Yes ☒ No

2. Well development method:

surged with bailer and bailed	☐	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed, and pumped	☐	70
compressed air	☐	20
bailed only	☐	10
pumped only	☒	51
pumped slowly	☐	50
other ______	☒	

3. Time spent developing well: 60 min.

4. Depth of well (from top of well casing): 122.40' ft.

5. Inside diameter of well: 2" in.

6. Volume of water in [redacted] well casing: 9.6 gal.

7. Volume of water removed from well: 30.0 gal.

8. Volume of water added (if any): None gal.

9. Source of water added: None

10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	63.47' ft.	70.97' ft.
Date	b.	6-3-05	6-3-05
Time	c.	1:30 pm	2:30 pm
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ 10 / Turbid ☒ 15	Clear ☒ 20 / Turbid ☐ 25
		(Describe) Very muddy thick, brown in color	(Describe) Water became clear after ≈ 3 well volumes removed.

Fill in if drilling fluids were used and well is at solid waste facility:

	Before Development	After Development
14. Total suspended solids	— mg/l	— mg/l
15. COD	— mg/l	— mg/l

16. Well developed by: Person's Name and Firm
Tim Kelly
Rick Fredrick } S&ME

17. Additional comments on development:

3 well volumes removed
Pump rate ≈ 1.0 gallon per min.

Facility Address or Owner/Responsible Party Address

Name: ______

Firm: ______

Street: ______

City/State/Zip: ______

I hereby certify that the above information is true and correct to the best of m[y] knowledge.

Signature: ______

Print Name: ______

Firm: ______

APPENDIX H

WELL INSPECTION FORMS

SNC ALWR ESP PROJECT
EXISTING OBSERVATION WELL INSPECTION REPORT

Well Number LT-1B

Well Status active

Inspected by S.C. Bearce

Date 6/16/05

Company SCS

Well Surface Description:

Stickup (ground surface to top of riser casing): 2.61'

Riser casing diameter: 2"

Steel surface protective casing: ✓ Yes ______ No

Protective casing diameter: 0.55'

Cap: ✓ Yes ______ No   Locked: ✓ Yes ______ No

Concrete surface seal: ______ Yes ✓ No

Surface seal condition/integrity: ______

Remarks: ______

Well Description:

Depth to water (measured from top of riser casing): 66.36'

Well depth (measured from top of riser casing to bottom of well): 93.48'

Evidence of sediment in bottom of well: ✓ Yes ______ No ______ Maybe

Remarks: ~ 0.2' red mud on bottom

Recommended for Development: ______ Yes ✓ No

Notes:

SNC ALWR ESP PROJECT
EXISTING OBSERVATION WELL INSPECTION REPORT

Well Number LT-7A Well Status active

Inspected by S.C. Baarcq Date 6/16/05

Company SCS

Well Surface Description:

Stickup (ground surface to top of riser casing): 1.74'

Riser casing diameter: 2"

Steel surface protective casing: ✓ Yes ____ No

Protective casing diameter: 0.55

Cap: ✓ Yes ____ No Locked: ✓ Yes ____ No

Concrete surface seal: ____ Yes ✓ No

Surface seal condition/integrity:

Remarks: no concrete surround

Well Description:

Depth to water (measured from top of riser casing): 64.80'

Well depth (measured from top of riser casing to bottom of well): 89.02

Evidence of sediment in bottom of well: ____ Yes ✓ No ____ Maybe

Remarks:

Recommended for Development: ____ Yes ✓ No

Notes:

SNC ALWR ESP PROJECT
EXISTING OBSERVATION WELL INSPECTION REPORT

Well Number LT-12 Well Status active

Inspected by S.C. Bearce Date 6/16/05

Company SCS

Well Surface Description:

Stickup (ground surface to top of riser casing): 0.18'

Riser casing diameter: 2" ID

Steel surface protective casing: ✓ Yes ___ No

Protective casing diameter: 0.55

Cap: ✓ Yes ___ No Locked: ✓ Yes ___ No

Concrete surface seal: ___ Yes ✓ No

Surface seal condition/integrity:

Remarks: no concrete surround

Well Description:

Depth to water (measured from top of riser casing): 61.44'

Well depth (measured from top of riser casing to bottom of well): 88.35'

Evidence of sediment in bottom of well: ✓ Yes ___ No ___ Maybe

Remarks: little sediment on end of probe after recording water level

Recommended for Development: ___ Yes ✓ No

Notes:

SNC ALWR ESP PROJECT
EXISTING OBSERVATION WELL INSPECTION REPORT

Well Number LT-13 Well Status active

Inspected by SC Bearce / L. Haidland Date 6/16/05

Company SCS / Bechtel

Well Surface Description:

Stickup (ground surface to top of riser casing): 2.26 – 0.52

Riser casing diameter: 4" ND sch 40 4" ND sched 40 PVC

Steel surface protective casing: ✓ Yes ___ No

Protective casing diameter: .55 0.55

Cap: – Yes ✓ No Locked: ✓ Yes — No

Concrete surface seal: ✓ Yes ___ No

Surface seal condition/integrity:

Remarks: difficult positioning because of stevens level recorder. In small steel building

Well Description:

Depth to water (measured from top of riser casing): 64.60

Well depth (measured from top of riser casing to bottom of well): 90.65

Evidence of sediment in bottom of well: ✓ Yes ___ No ___ Maybe

Remarks:

Recommended for Development: ___ Yes ✓ No

Notes:

SNC ALWR ESP PROJECT
EXISTING OBSERVATION WELL INSPECTION REPORT

Well Number 27

Well Status Inactive

Inspected by John Pugh

Date 5-18-05 12:38 EDT

Company Southern Company Services

Well Surface Description:

Stickup (ground surface to top of riser casing): 1.4 ft

Riser casing diameter: 2"

Steel surface protective casing: ✓ Yes ___ No

Protective casing diameter: 0.7 FT

Cap: ✓ Yes ___ No Locked: ✓ Yes ___ No

Concrete surface seal: ___ Yes ✓ No

Surface seal condition/integrity: N/A

Remarks: ___

Well Description:

Depth to water (measured from top of riser casing): 126.40FT

Well depth (measured from top of riser casing to bottom of well): 190.40FT

Evidence of sediment in bottom of well: ___ Yes ✓ No ___ Maybe

Remarks: NO EVIDENCE OF SEDIMENT OBSERVED

Recommended for Development: ✓ Yes ___ No

Notes:

SNC ALWR ESP PROJECT
EXISTING OBSERVATION WELL INSPECTION REPORT

Well Number 29 Well Status Inactive

Inspected by John Pugh / L. Headland Date 5/19/05

Company SCS / Bechtel

Well Surface Description:

Stickup (ground surface to top of riser casing): 1.9' − 0.12' = 1.78'

Riser casing diameter: 2"

Steel surface protective casing: ✓ Yes ___ No

Protective casing diameter: 0.66'

Cap: ✓ Yes ___ No Locked: ___ Yes ✓ No (lock on top of well)

Concrete surface seal: ___ Yes ✓ No

Surface seal condition/integrity: N/A

Remarks:

Well Description:

Depth to water (measured from top of riser casing): 211.94'

Well depth (measured from top of riser casing to bottom of well): 99.6'

Evidence of sediment in bottom of well: ___ Yes ✓ No ___ Maybe

Remarks: tip clean.

Recommended for Development: ✓ Yes ___ No

Notes:

SNC ALWR ESP PROJECT
EXISTING OBSERVATION WELL INSPECTION REPORT

Well Number 142   Well Status Inactive

Inspected by J. Pugh / L. Headland   Date 5/19/05

Company SCS \ Bechtel   11:55 AM

Well Surface Description:

Stickup (ground surface to top of riser casing): 1.94' − 0.58' = 1.36'

Riser casing diameter: 2"

Steel surface protective casing: ✓ Yes ___ No

Protective casing diameter: 0.66'

Cap: ✓ Yes ___ No   Locked: ✓ Yes ___ No (lock cut)

Concrete surface seal: ___ Yes ✓ No

Surface seal condition/integrity: N/A

Remarks: Borehole casing diameter (steel) = 0.33'
well consists of :- protective casing, borehole casing + riser casing.

Well Description:

Depth to water (measured from top of riser casing): 70.5'

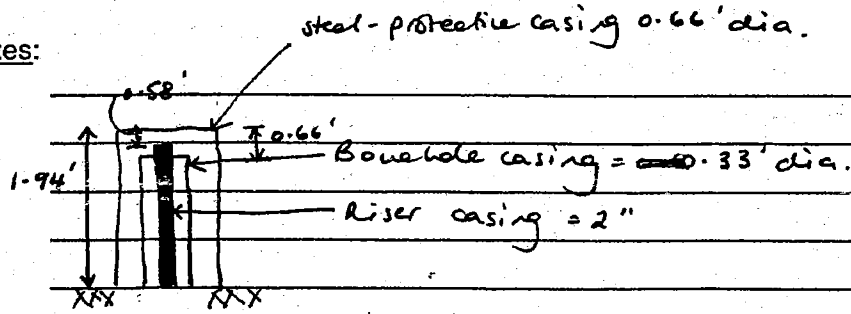
Well depth (measured from top of riser casing to bottom of well): 97.37'

Evidence of sediment in bottom of well: ___ Yes ✓ No ___ Maybe

Remarks: clean tip

Recommended for Development: ✓ Yes ___ No

Notes:



SNC ALWR ESP PROJECT
EXISTING OBSERVATION WELL INSPECTION REPORT

Well Number 179 Well Status inactive

Inspected by JOHN PUGH Date 05/18/05 16:44

Company SOUTHERN COMPANY SERVICES

Well Surface Description:

Stickup (ground surface to top of riser casing): 0.25 FT

Riser casing diameter: 2 IN.

Steel surface protective casing: ✓ Yes ____ No

Protective casing diameter: 0.71 FT

Cap: ✓ Yes ____ No Locked: ✓ Yes ____ No

Concrete surface seal: ____ Yes ✓ No

Surface seal condition/integrity: N/A

Remarks: ____

Well Description:

Depth to water (measured from top of riser casing): 127.23 FT

Well depth (measured from top of riser casing to bottom of well): 132.62 FT

Evidence of sediment in bottom of well: ✓ Yes ____ No ____ Maybe

Remarks: PROBE STAINED W/ VERY FINE SILT

Recommended for Development: ✓ Yes ____ No

Notes:

SNC ALWR ESP PROJECT
EXISTING OBSERVATION WELL INSPECTION REPORT

Well Number 802 A   Well Status active

Inspected by SBearce / L Headland   Date 6/16/05

Company SCS / Bechtel

Well Surface Description:

Stickup (ground surface to top of riser casing): 3.27 - 0.49 = 2.78'

Riser casing diameter: 4" ND sch 40 PVC

Steel surface protective casing: ✓ Yes ___ No

Protective casing diameter: 0.55'

Cap: ___ Yes X No   Locked: X Yes ___ No

Concrete surface seal: ___ Yes X No

Surface seal condition/integrity:

cover in good shape

Remarks: needs casing cap

Well Description:

Depth to water (measured from top of riser casing): 61.01

Well depth (measured from top of riser casing to bottom of well): 90.50

Evidence of sediment in bottom of well: X Yes ___ No ___ Maybe

Remarks: no sediment on probe

Recommended for Development: ___ Yes ___ No

Notes:

SNC ALWR ESP PROJECT
EXISTING OBSERVATION WELL INSPECTION REPORT

Well Number: 803 A — Well Status: Inactive

Inspected by: John Pugh + Laiselkadlaal — Date: 5-19-05

Company: Southern Company — 9:30 AM EST

Well Surface Description:

Stickup (ground surface to top of riser casing): 1.53' - 0.42' = 1.11'

Riser casing diameter: 2"

Steel surface protective casing: ✓ Yes ___ No

Protective casing diameter: 0.83'

Cap: ✓ Yes ___ No Locked: ✓ Yes ___ No (combination)

Concrete surface seal: ___ Yes ✓ No

Surface seal condition/integrity: N/A Four surrounding posts

Remarks: ______

Well Description:

Depth to water (measured from top of riser casing): 60.25'

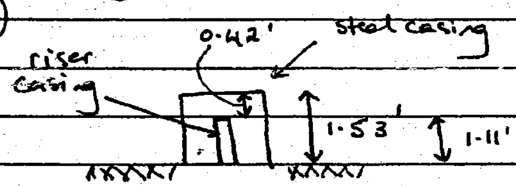
Well depth (measured from top of riser casing to bottom of well): 89.51'

Evidence of sediment in bottom of well: ___ Yes ___ No ✓ Maybe

Remarks: Soft @ bottom, silt on tip of dipmeter

Recommended for Development: ✓ Yes ___ No

Notes: Current riser casing / protective casing measurements (5-1905 - 5/18/05)



SNC ALWR ESP PROJECT
EXISTING OBSERVATION WELL INSPECTION REPORT

Well Number 804 Well Status Inactive

Inspected by John Pugh / L. Headlcol Date 5/19/05

Company SCS 9.55 AM

Well Surface Description:

Stickup (ground surface to top of riser casing): 2.11' − 0.39' = 1.72'

Riser casing diameter: 2"

Steel surface protective casing: ✓ Yes ___ No

Protective casing diameter: 0.83'

Cap: ✓ Yes ___ No Locked: ✓ Yes ___ No

Concrete surface seal: ___ Yes ✓ No

Surface seal condition/integrity: N/A Four concrete posts surrounding well.

Remarks: ___

Well Description:

Depth to water (measured from top of riser casing): 62.13'

Well depth (measured from top of riser casing to bottom of well): 95.2'

Evidence of sediment in bottom of well: ✓ Yes ___ No ___ Maybe

Remarks: silt on tip of dipmeter

Recommended for Development: ✓ Yes ___ No

Notes:

SNC ALWR ESP PROJECT
EXISTING OBSERVATION WELL INSPECTION REPORT

Well Number: 805A — Well Status: Inactive

Inspected by: J. Pugh | L. Headland — Date: 5/19/05

Company: SCS | Bechtel

Well Surface Description:

Stickup (ground surface to top of riser casing): 2.0 − 0.42 = 1.58'

Riser casing diameter: 2"

Steel surface protective casing: ✓ Yes ___ No

Protective casing diameter: 0.83'

Cap: ✓ Yes ___ No Locked: ✓ Yes ___ No

Concrete surface seal: ___ Yes ✓ No

Surface seal condition/integrity: N/A

Remarks: ___

Well Description:

Depth to water (measured from top of riser casing): 77.72'

Well depth (measured from top of riser casing to bottom of well): 128.55'

Evidence of sediment in bottom of well: ✓ Yes ___ No ___ Maybe

Remarks: soft ~silt on tip.

Recommended for Development: ✓ Yes ___ No

Notes:

SNC ALWR ESP PROJECT
EXISTING OBSERVATION WELL INSPECTION REPORT

Well Number 806B Well Status active

Inspected by S. Bearce Date ______

Company SCS

Well Surface Description:

Stickup (ground surface to top of riser casing): 1.8-0.65 = 1.15

Riser casing diameter: 2" ND Sch 40 PVC

Steel surface protective casing: ✓ Yes — No

Protective casing diameter: 0.95'

Cap: — Yes ✓ No Locked: ✓ Yes — No

Concrete surface seal: — Yes ✓ No

Surface seal condition/integrity: NA

Remarks: ______

Well Description:

Depth to water (measured from top of riser casing): 60.42

Well depth (measured from top of riser casing to bottom of well): 69.35

Evidence of sediment in bottom of well: — Yes ✓ No — Maybe

Remarks: hard bottom touch

Recommended for Development: ______ Yes ✓ No

Notes:

SNC ALWR ESP PROJECT
EXISTING OBSERVATION WELL INSPECTION REPORT

Well Number 808 Well Status active

Inspected by S Beare / L Headlund Date 6/16/05

Company SCS

Well Surface Description:

0.98 -0.12

Stickup (ground surface to top of riser casing): .98+.98-.12= 0.98

Riser casing diameter: 4" ND Sch 40 PVC

Steel surface protective casing: ✓ Yes — No

Protective casing diameter: 0.55

Cap: — Yes ✓ No Locked: ~~✓~~ Yes ✓ No (SCB.)

Concrete surface seal: ✓ Yes — No

Surface seal condition/integrity: good

Remarks: In Steel building

Well Description:

Depth to water (measured from top of riser casing): 57.52

Well depth (measured from top of riser casing to bottom of well): ~75.40

Evidence of sediment in bottom of well: ✓ Yes ____ No ____ Maybe

Remarks: soft bottom

Recommended for Development: ____ Yes ✓ No

Notes:

SNC ALWR ESP PROJECT
EXISTING OBSERVATION WELL INSPECTION REPORT

Well Number 809   Well Status inactive

Inspected by John Pugh   Date 5-18-05

Company Southern Company Services

Well Surface Description:

Stickup (ground surface to top of riser casing): 1.23 ft

Riser casing diameter: 2"

Steel surface protective casing: ✓ Yes ____ No

Protective casing diameter: 0.56 ft

Cap: ✓ Yes ____ No   Locked: ✓ Yes ____ No

Concrete surface seal: ____ Yes ✓ No

Surface seal condition/integrity: ____

Remarks: ____

Well Description:

Depth to water (measured from top of riser casing): 71.41 ft

Well depth (measured from top of riser casing to bottom of well): 94.35 ft

Evidence of sediment in bottom of well: X Yes ____ No ____ Maybe

Remarks: brown substance on point of water level indicator when bottom was measured

Recommended for Development: ✓ Yes ____ No

Notes:

SNC ALWR ESP PROJECT
EXISTING OBSERVATION WELL INSPECTION REPORT

Well Number 850 A — Well Status inactive

Inspected by John Pugh — Date 5-18-05 15:30 EDT

Company Southern Company Services

Well Surface Description:

Stickup (ground surface to top of riser casing): 1.96 ft

Riser casing diameter: 2"

Steel surface protective casing: ✓ Yes ____ No

Protective casing diameter: 0.56 ft

Cap: ✓ Yes ____ No Locked: ✓ Yes ____ No

Concrete surface seal: ____ Yes ✓ No

Surface seal condition/integrity: ____________________

Remarks: ____________________

Well Description:

Depth to water (measured from top of riser casing): 126.12 ft

Well depth (measured from top of riser casing to bottom of well): 193.68

Evidence of sediment in bottom of well: ____ Yes X No ____ Maybe

Remarks: ____________________

Recommended for Development: ✓ Yes ____ No

Notes:

SNC ALWR ESP PROJECT
EXISTING OBSERVATION WELL INSPECTION REPORT

Well Number 851 A

Well Status inactive

Inspected by John Pugh

Date 05/18/05 17:00 EDT

Company Southern Company Services

Well Surface Description:

Stickup (ground surface to top of riser casing): 2.0 FT

Riser casing diameter: 2 IN.

Steel surface protective casing: ✓ Yes ___ No

Protective casing diameter: 0.56 FT

Cap: ✓ Yes ___ No Locked: ✓ Yes ___ No

Concrete surface seal: ___ Yes ✓ No

Surface seal condition/integrity: N/A

Remarks: ______

Well Description:

Depth to water (measured from top of riser casing): 149.65 FT

Well depth (measured from top of riser casing to bottom of well): 285.18 FT

Evidence of sediment in bottom of well: ___ Yes ✓ No ___ Maybe

Remarks: ______

Recommended for Development: ✓ Yes ___ No

Notes:

SNC ALWR ESP PROJECT
EXISTING OBSERVATION WELL INSPECTION REPORT

Well Number 852 Well Status inactive

Inspected by John Pugh Date 5-18-05 13:19 EDT

Company SOUTHERN COMPANY SERVICES

Well Surface Description:

Stickup (ground surface to top of riser casing): 2.0 FT

Riser casing diameter: 2"

Steel surface protective casing: ✓ Yes ___ No

Protective casing diameter: 0.52 FT

Cap: ✓ Yes ___ No Locked: ✓ Yes ___ No

Concrete surface seal: ___ Yes ✓ No

Surface seal condition/integrity: N/A

Remarks:

Well Description:

Depth to water (measured from top of riser casing): 89.27 FT

Well depth (measured from top of riser casing to bottom of well): 222.90 FT

Evidence of sediment in bottom of well: ___ Yes ✓ No ___ Maybe

Remarks: NO EVIDENCE OF SEDIMENT OBSERVED

Recommended for Development: ✓ Yes ___ No

Notes:

SNC ALWR ESP PROJECT
EXISTING OBSERVATION WELL INSPECTION REPORT

Well Number 853 — Well Status inactive

Inspected by John Pugh — Date 05/18/05 16:10 EDT

Company Southern Company Services

Well Surface Description:

Stickup (ground surface to top of riser casing): 1.86 FT

Riser casing diameter: 2 IN.

Steel surface protective casing: ✓ Yes ___ No

Protective casing diameter: 0.56 FT

Cap: ✓ Yes ___ No Locked: ✓ Yes ___ No

Concrete surface seal: ___ Yes ✓ No

Surface seal condition/integrity: N/A

Remarks: ______

Well Description:

Depth to water (measured from top of riser casing): 125.69 FT

Well depth (measured from top of riser casing to bottom of well): 220.86 FT

Evidence of sediment in bottom of well: ✓ Yes ___ No ___ Maybe

Remarks: FINE SAND & ORGANIC MTL. ON PROBE

Recommended for Development: ✓ Yes ___ No

Notes:

SNC ALWR ESP PROJECT
EXISTING OBSERVATION WELL INSPECTION REPORT

Well Number 854 Well Status inactive

Inspected by JOHN PUGH Date 05/18/05

Company SOUTHERN COMPANY SERVICES ~~16:24~~ EDT 16:24

Well Surface Description:

Stickup (ground surface to top of riser casing): 1.85 FT

Riser casing diameter: 2 IN.

Steel surface protective casing: ✓ Yes ___ No

Protective casing diameter: 0.56 FT

Cap: ✓ Yes ___ No Locked: ✓ Yes ___ No

Concrete surface seal: ___ Yes ✓ No

Surface seal condition/integrity: N/A

Remarks: ___

Well Description:

Depth to water (measured from top of riser casing): 134.24 FT

Well depth (measured from top of riser casing to bottom of well): 222.33

Evidence of sediment in bottom of well: ✓ Yes ___ No ___ Maybe

Remarks: SOFT BOTTOM BELOW SCREENED INTERVAL PROBE CONTAINS ORGANIC & SILT MATERIAL TRACES

Recommended for Development: ✓ Yes ___ No

Notes:

SNC ALWR ESP PROJECT
EXISTING OBSERVATION WELL INSPECTION REPORT

Well Number 855

Well Status inactive

Inspected by John Pugh

Date 5-18-05
12:58 EDT

Company SOUTHERN Co. SERVICES

Well Surface Description:

Stickup (ground surface to top of riser casing): 2.0 FT.

Riser casing diameter: 2"

Steel surface protective casing: ✓ Yes ___ No

Protective casing diameter: 0.52 FT

Cap: ✓ Yes ___ No Locked: ✓ Yes ___ No

Concrete surface seal: ___ Yes ✓ No

Surface seal condition/integrity: N/A

Remarks: ______

Well Description:

Depth to water (measured from top of riser casing): 120.40FT

Well depth (measured from top of riser casing to bottom of well): 224.50FT

Evidence of sediment in bottom of well: ___ Yes ___ No ___ Maybe

Remarks: NO EVIDENCE OF SEDIMENT OBSERVED --- HOWEVER, MEASURED DEPTH OF 224.50FT IS LESS THAN DOCUMENTED BOTTOM OF SCREENED INTERVAL.

Recommended for Development: ✓ Yes ___ No

Notes:

SNC ALWR ESP PROJECT
EXISTING OBSERVATION WELL INSPECTION REPORT

Well Number 856 — Well Status inactive

Inspected by JOHN PUGH — Date 05/18/05 13:47 EDT

Company SOUTHERN COMPANY SERVICES

Well Surface Description:

Stickup (ground surface to top of riser casing): 2.0 FT

Riser casing diameter: ~~0.52 FT~~ 2"

Steel surface protective casing: ✓ Yes ___ No

Protective casing diameter: 0.52 FT

Cap: ✓ Yes ___ No Locked: ✓ Yes ___ No

Concrete surface seal: ___ Yes ✓ No

Surface seal condition/integrity: N/A

Remarks:

Well Description:

Depth to water (measured from top of riser casing): 75.70 FT

Well depth (measured from top of riser casing to bottom of well): 182.14 FT

Evidence of sediment in bottom of well: ___ Yes ___ No ___ Maybe

Remarks: MEASURED DEPTH LESS THAN ORIGINAL BOTTOM OF SCREENED INTERVAL. NO EVIDENCE OF SEDIMENT OBSERVED ON PROBE

Recommended for Development: ✓ Yes ___ No

Notes:

APPENDIX I

LABORATORY DATA

Intracompany Correspondence

SOUTHERN COMPANY
Energy to Serve Your World®

Date: August 24, 2005

To: Ms. Rhonda Tinsley

From: Mr. Bobby Williams

Subject: Plant Vogtle ESP

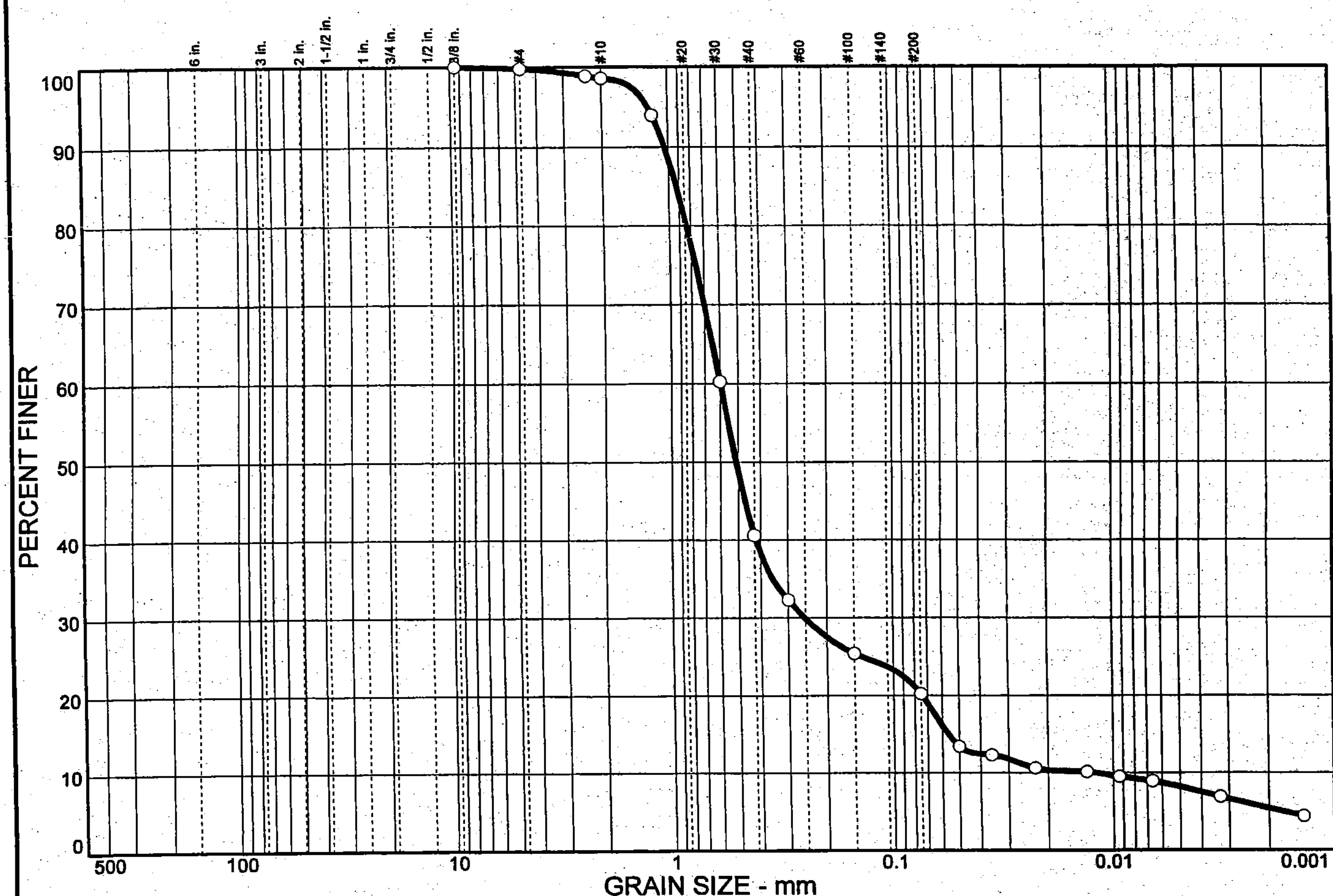
Enclosed are the test results for the Plant Vogtle ESP Project soil samples delivered to the Southern Company Central Laboratory on July 28, 2005. Tests performed include, Soil Particle Size Analysis with Hydrometer (ASTM D-422), and Specific Gravity of Soil (ASTM D-854).

We appreciate the opportunity to assist you on this project. If there are any questions, or if we can be of any further assistance, please call me at 8-255-6508 or Sam Moore at 8-255-6061.

Sincerely,

Bobby Williams, PE
Geostructural Services

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.2	79.6	12.0	8.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	99.8		
#8	98.9		
#10	98.6		
#16	94.0		
#30	60.2		
#40	40.6		
#50	32.3		
#100	25.4		
#200	20.2		

* (no specification provided)

Soil Description

Light Gray Silty sand

Atterberg Limits

PL= NA LL= NA PI= NA

Coefficients

D_{85}= 0.925 D_{60}= 0.598 D_{50}= 0.510
D_{30}= 0.252 D_{15}= 0.0564 D_{10}= 0.0122
C_u= 49.11 C_c= 8.71

Classification

USCS= SM AASHTO=

Remarks

Bag Sample
Specific Gravity - 2.65

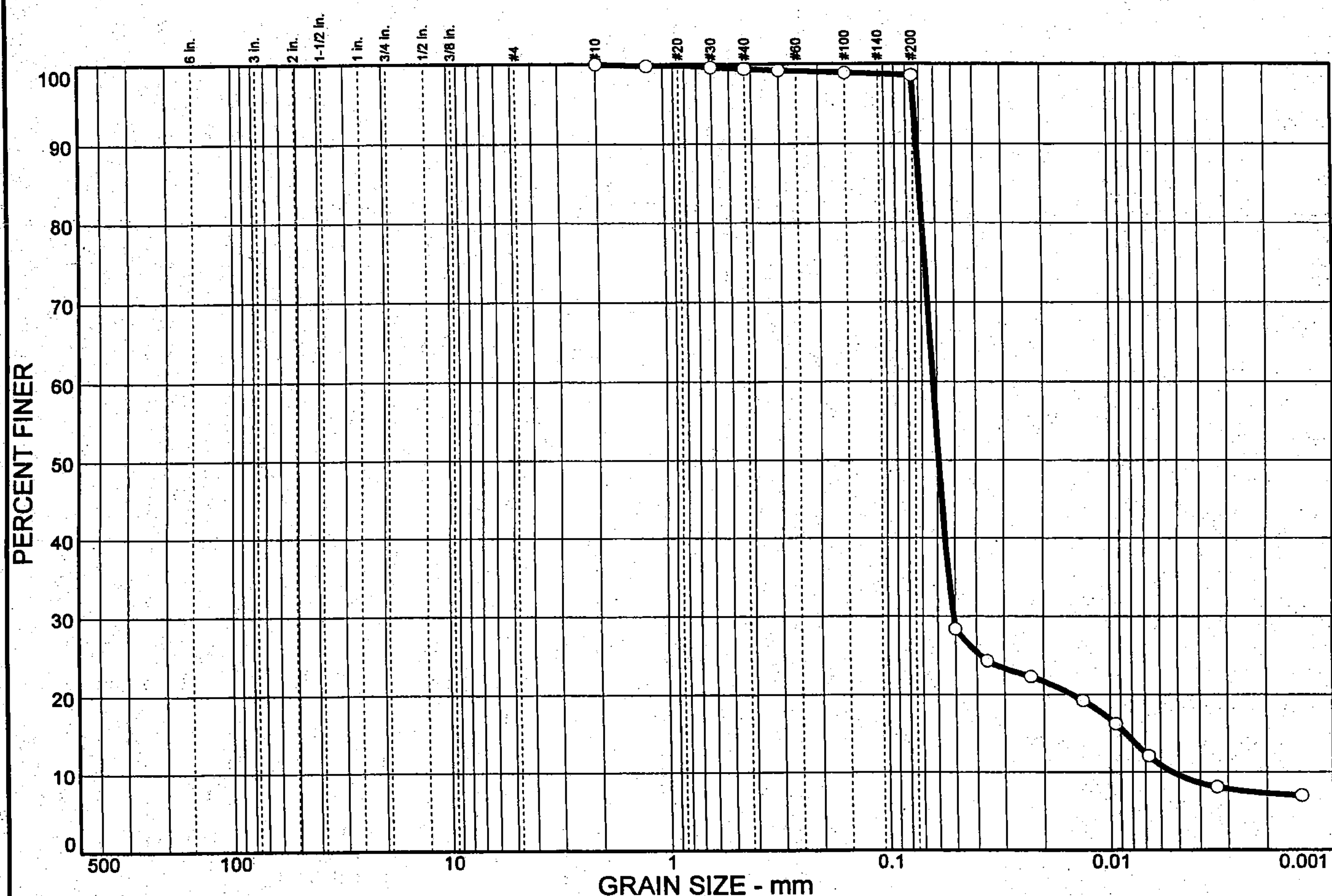
Sample No.: #27 **Source of Sample:** **Date:** 08/22/05
Location: Boring #1002 **Elev./Depth:** 218.5'-220.0'

SOUTHERN COMPANY

Client: SCS-Rhonda Tinsley and Steve Bearce
Project: Southern Nuclear/Plant Vogtle ESP

Project No: V003-DE **Lab#** 1

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	1.4	89.0	9.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#16	99.8		
#30	99.6		
#40	99.4		
#50	99.2		
#100	98.9		
#200	98.6		

* (no specification provided)

Soil Description

Dark Gray Silt

Atterberg Limits

PL= NA LL= NA PI= NA

Coefficients

D_{85}= 0.0705 D_{60}= 0.0624 D_{50}= 0.0590
D_{30}= 0.0509 D_{15}= 0.0086 D_{10}= 0.0053
C_u= 11.73 C_c= 7.81

Classification

USCS= ML AASHTO=

Remarks

Bag Sample
Specific Gravity - 2.62

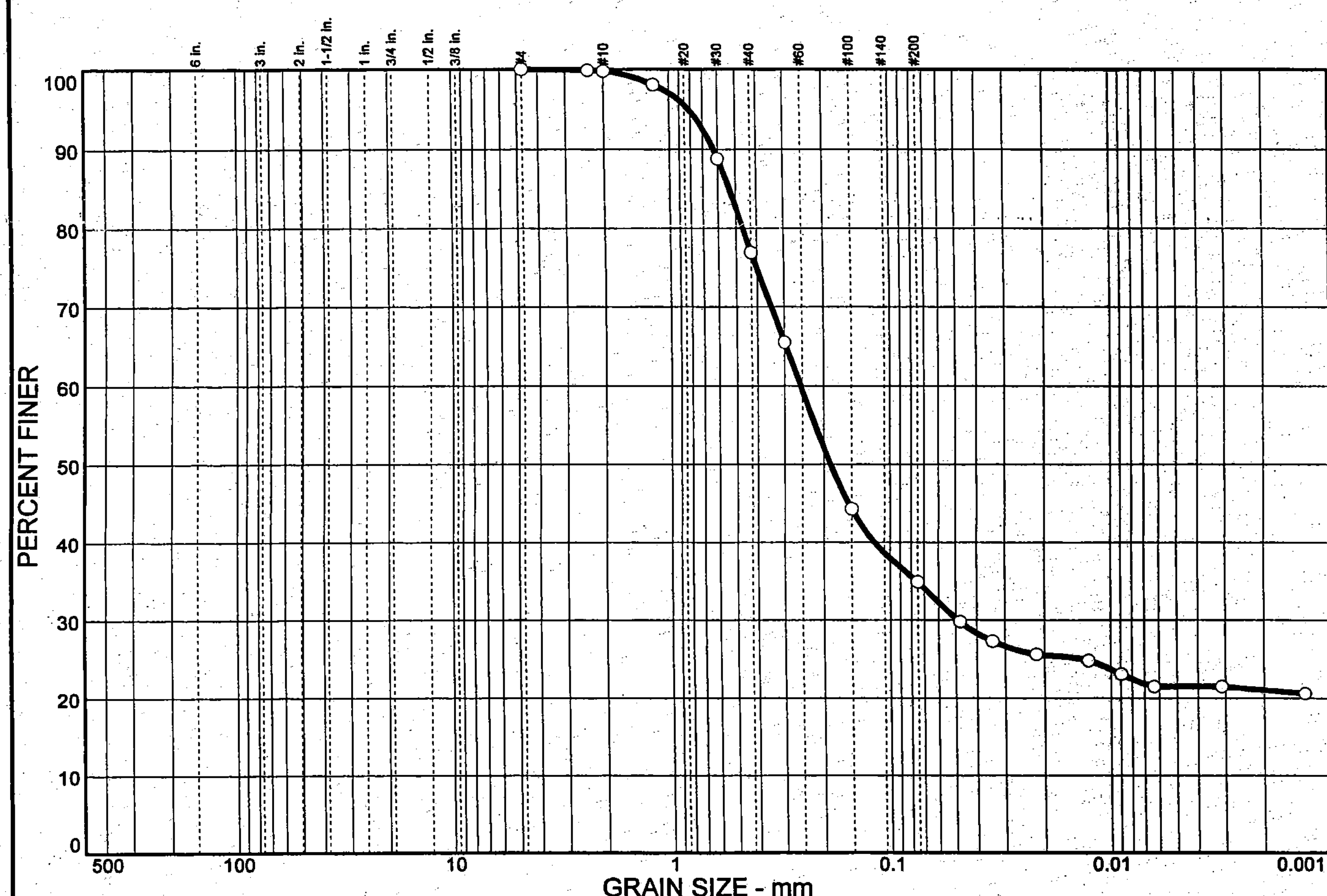
Sample No.: #29 **Source of Sample:** **Date:** 08/22/05
Location: Boring #1002 **Elev./Depth:** 237'

SOUTHERN COMPANY

Client: SCS-Rhonda Tinsley and Steve Bearce
Project: Southern Nuclear/Plant Vogtle ESP

Project No: 2-AA-1200 V003-DE **Lab#** 2

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	65.1	13.4	21.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	99.9		
#10	99.8		
#16	98.1		
#30	88.8		
#40	76.9		
#50	65.5		
#100	44.3		
#200	34.9		

* (no specification provided)

Soil Description

Reddish Brown Silty sand

Atterberg Limits

PL= NA LL= NA PI= NA

Coefficients

D_{85}= 0.533 D_{60}= 0.254 D_{50}= 0.186
D_{30}= 0.0487 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

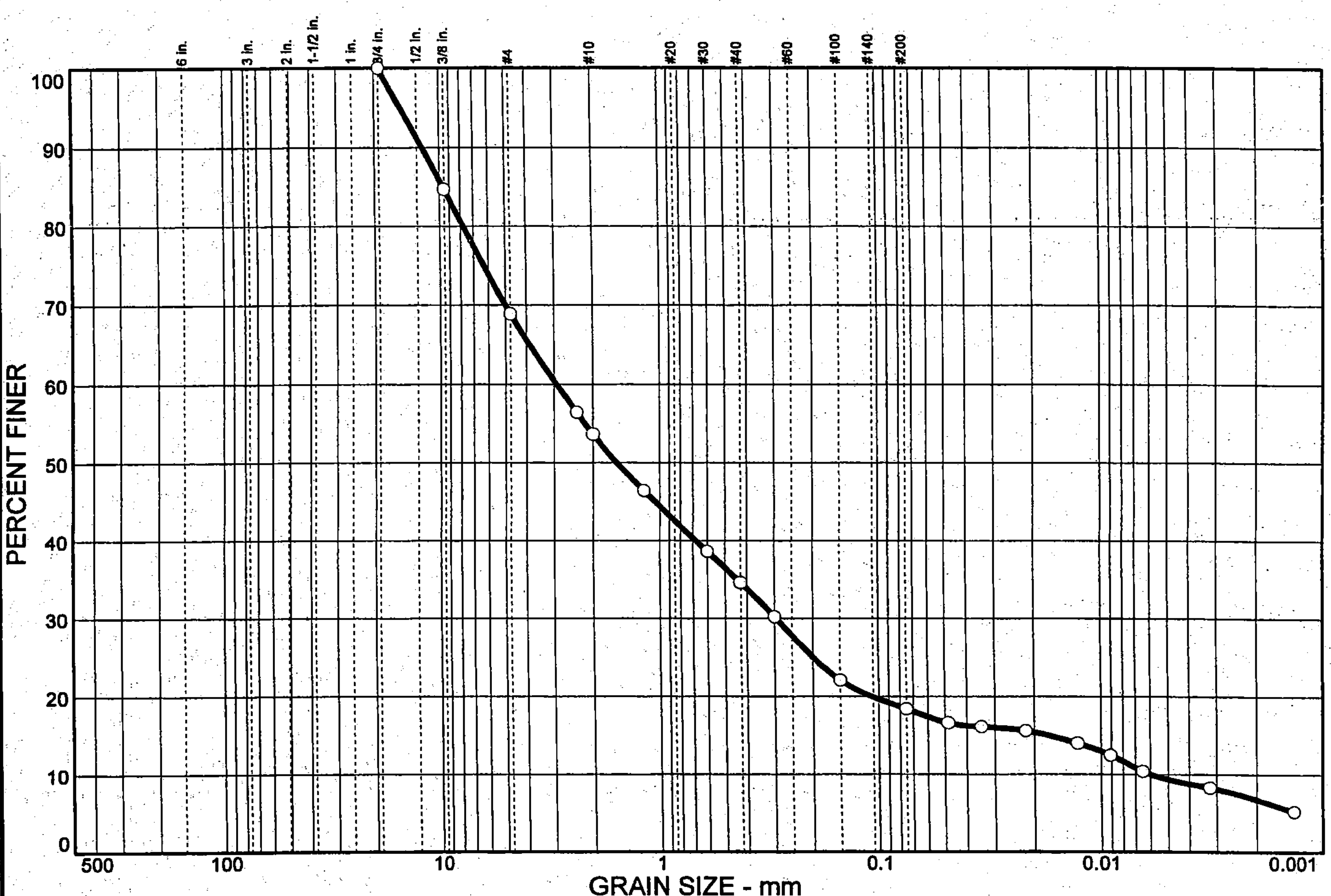
Jar Sample
Specific Gravity - 2.69

Sample No.: #16 **Source of Sample:** **Date:** 08/23/05
Location: Boring #1003 **Elev./Depth:** 78.5'

SOUTHERN COMPANY

Client: SCS-Rhonda Tinsley and Steve Bearce
Project: Southern Nuclear/Plant Vogtle ESP
Project No: V003-DE **Lab#** 3

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	31.1	50.5	9.1	9.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
.375 in.	84.7		
#4	68.9		
#8	56.4		
#10	53.6		
#16	46.4		
#30	38.6		
#40	34.6		
#50	30.2		
#100	22.1		
#200	18.4		

* (no specification provided)

Soil Description

Light Tan Silty sand with gravel

Atterberg Limits

PL= NA LL= NA PI= NA

Coefficients

D_{85}= 9.65 D_{60}= 2.92 D_{50}= 1.57
D_{30}= 0.295 D_{15}= 0.0171 D_{10}= 0.0060
C_u= 486.69 C_c= 4.99

Classification

USCS= SM AASHTO=

Remarks

Jar Sample
Spicific Gravity - 2.68

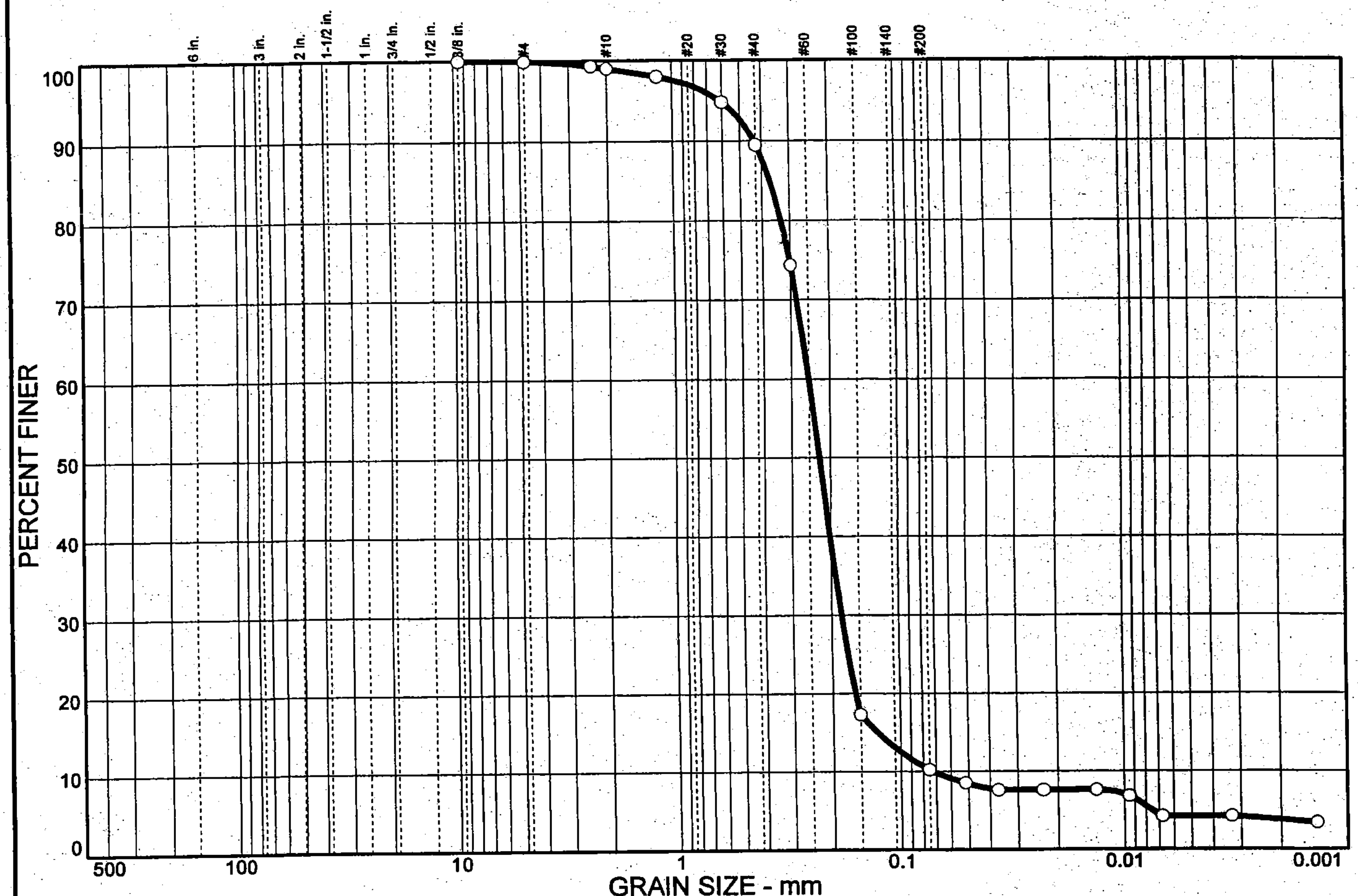
Sample No.: #17 **Source of Sample:** **Date:** 08/23/05
Location: Boring #1003 **Elev./Depth:** 83.5'

SOUTHERN COMPANY

Client: SCS-Rhonda Tinsley and Steve Bearce
Project: Southern Nuclear/Plant Vogtle ESP

Project No: 2441-202 V003-DE **Lab#** 4

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.1	89.7	6.0	4.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	99.9		
#8	99.3		
#10	99.0		
#16	98.0		
#30	94.8		
#40	89.5		
#50	74.4		
#100	17.3		
#200	10.2		

* (no specification provided)

Soil Description

Gray Poorly graded sand with silt

Atterberg Limits

PL= NA LL= NA PI= NA

Coefficients

D_{85}= 0.368 D_{60}= 0.251 D_{50}= 0.225
D_{30}= 0.180 D_{15}= 0.126 D_{10}= 0.0725
C_u= 3.46 C_c= 1.79

Classification

USCS= SP-SM AASHTO=

Remarks

Bag Sample
Specific Gravity - 2.69

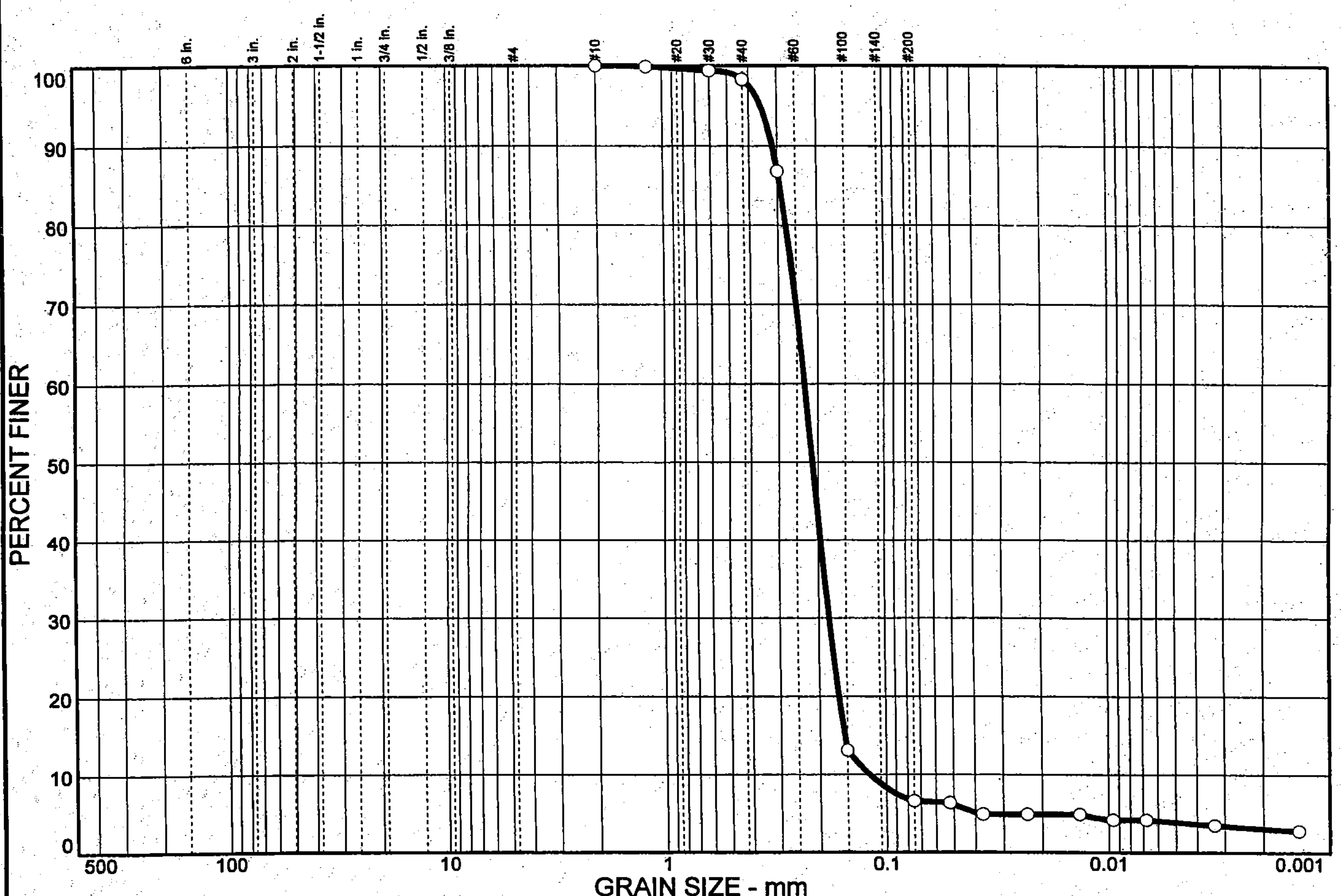
Sample No.: #14 **Source of Sample:** **Date:** 08/23/05
Location: Boring #1004 **Elev./Depth:** 153.5'- 155.0'

SOUTHERN COMPANY

Client: SCS-Rhonda Tinsley and Steve Bearce
Project: Southern Nuclear/Plant Vogtle ESP
Project No: V003-DE **Lab#** 5

2.4A-203

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	93.4	2.7	3.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#16	99.9		
#30	99.4		
#40	98.3		
#50	86.8		
#100	13.1		
#200	6.6		

* (no specification provided)

Soil Description

Gray Poorly graded sand with silt

Atterberg Limits

PL= NA LL= NA PI= NA

Coefficients

D_{85}= 0.293 D_{60}= 0.230 D_{50}= 0.212
D_{30}= 0.180 D_{15}= 0.154 D_{10}= 0.119
C_u= 1.94 C_c= 1.18

Classification

USCS= SP-SM AASHTO=

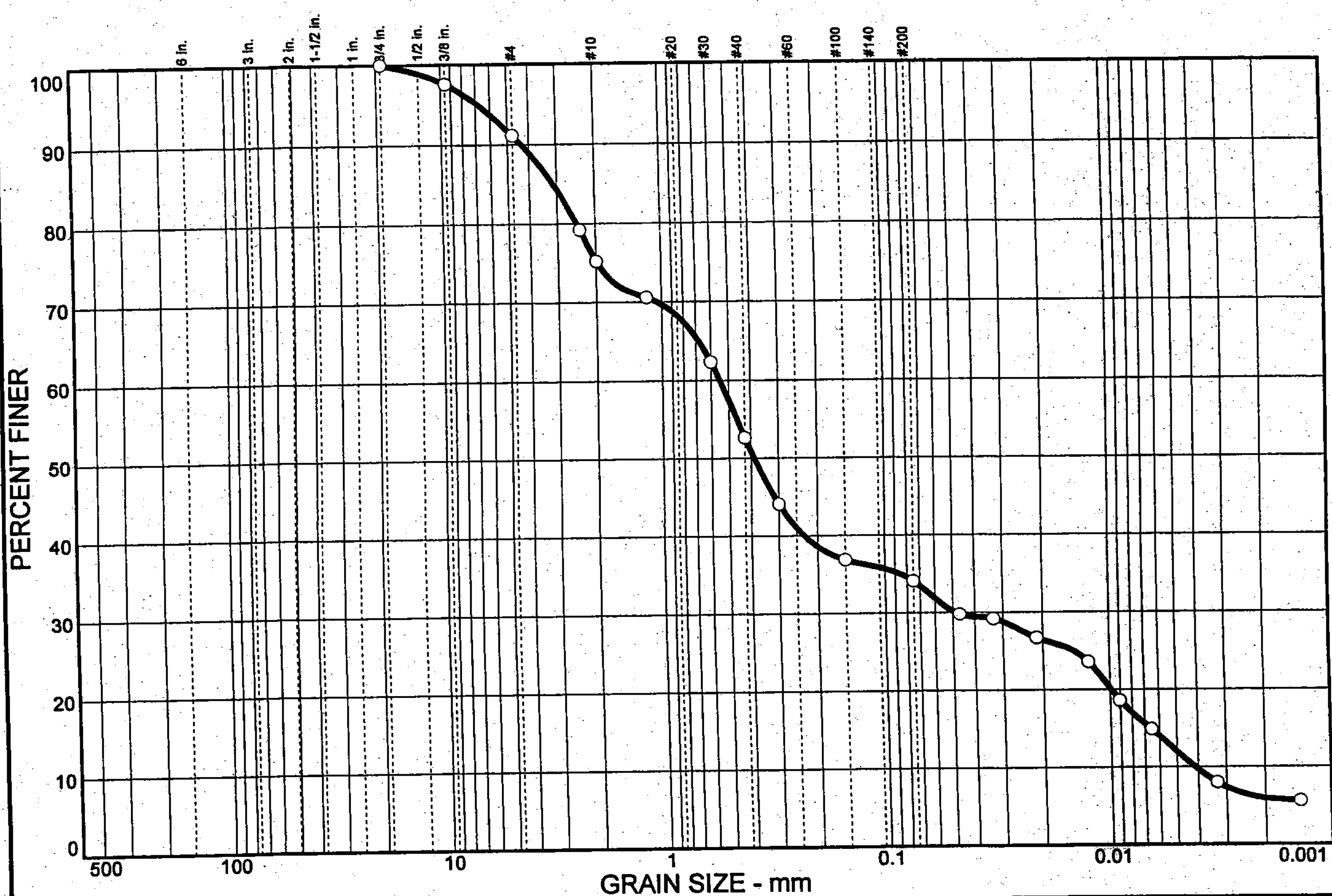
Remarks

Bag Sample
Specific Gravity - 2.67

Sample No.: #15 **Source of Sample:** **Date:** 08/23/05
Location: Boring #1004 **Elev./Depth:** 158.5'-160.0'

SOUTHERN COMPANY	**Client:** SCS-Rhonda Tinsley and Steve Bearce **Project:** Southern Nuclear/Plant Vogtle ESP **Project No:** 2004 V003-DE **Lab#** 6

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	8.9	57.0	22.1	12.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
.375 in.	97.6		
#4	91.1		
#8	79.2		
#10	75.2		
#16	70.6		
#30	62.3		
#40	52.6		
#50	44.1		
#100	36.9		
#200	34.1		

* (no specification provided)

Soil Description

Very Light Tan Silty sand

Atterberg Limits

PL= NA LL= NA PI= NA

Coefficients

D_{85}= 3.11 D_{60}= 0.549 D_{50}= 0.387
D_{30}= 0.0484 D_{15}= 0.0066 D_{10}= 0.0041
C_u= 132.85 C_c= 1.03

Classification

USCS= SM AASHTO=

Remarks

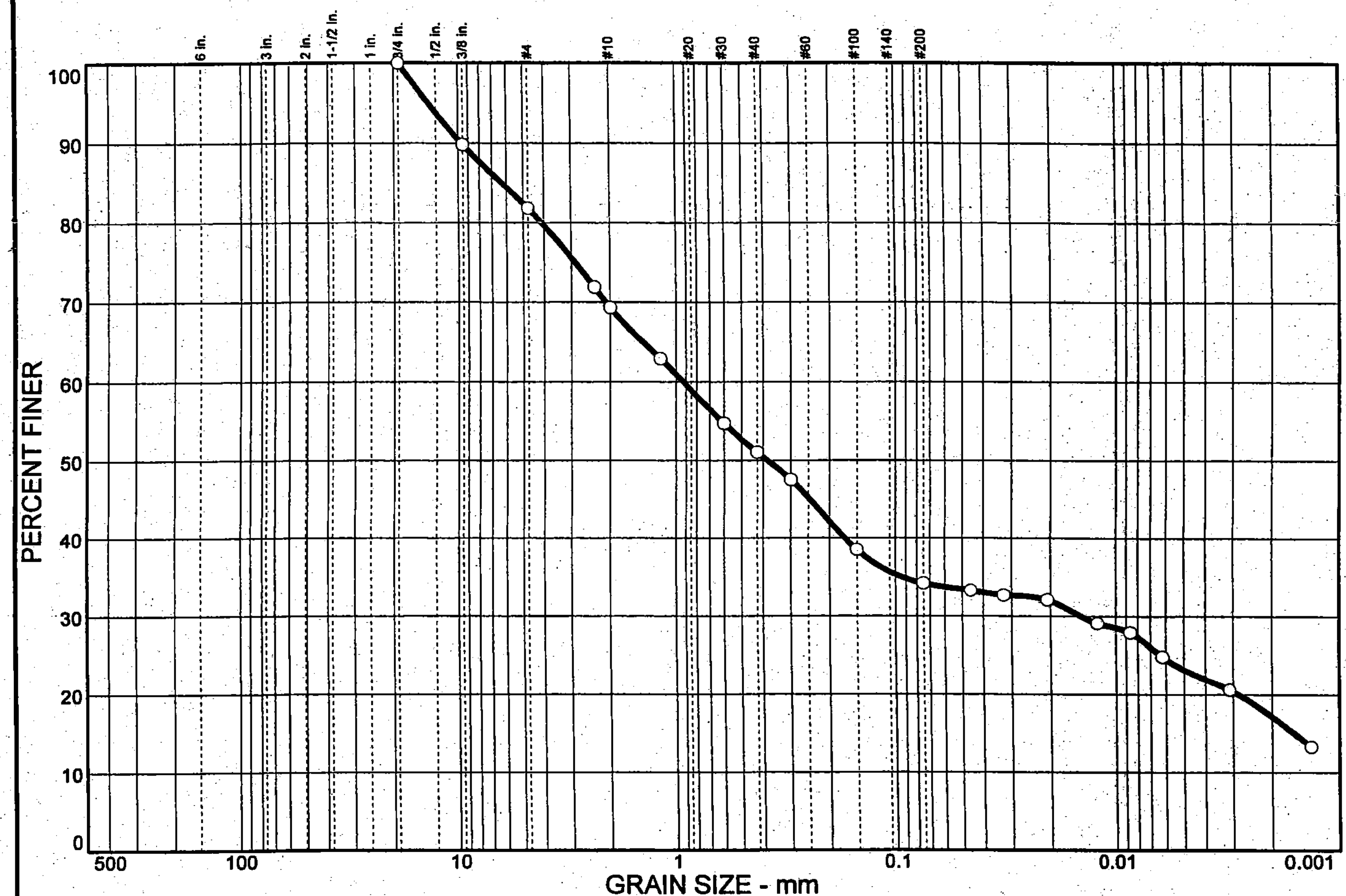
Jar Sample
Specific Gravity - 2.63

Sample No.: #17B
Location: Boring #1005
Source of Sample:
Date: 08/23/05
Elev./Depth: 148.5'-150.0'

SOUTHERN COMPANY

Client: SCS-Rhonda Tinsley and Steve Bearce
Project: Southern Nuclear/Plant Vogtle ESP
Project No: V003-DE **Lab#** 7

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	18.2	47.6	11.0	23.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
.375 in.	89.8		
#4	81.8		
#8	71.9		
#10	69.3		
#16	62.9		
#30	54.7		
#40	51.0		
#50	47.5		
#100	38.5		
#200	34.2		

* (no specification provided)

Soil Description

Very Light Tan Silty sand with gravel

Atterberg Limits

PL= NA LL= NA PI= NA

Coefficients

D_{85}= 6.29 D_{60}= 0.926 D_{50}= 0.383
D_{30}= 0.0144 D_{15}= 0.0016 D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Jar Sample
Specific Gravity - 2.61

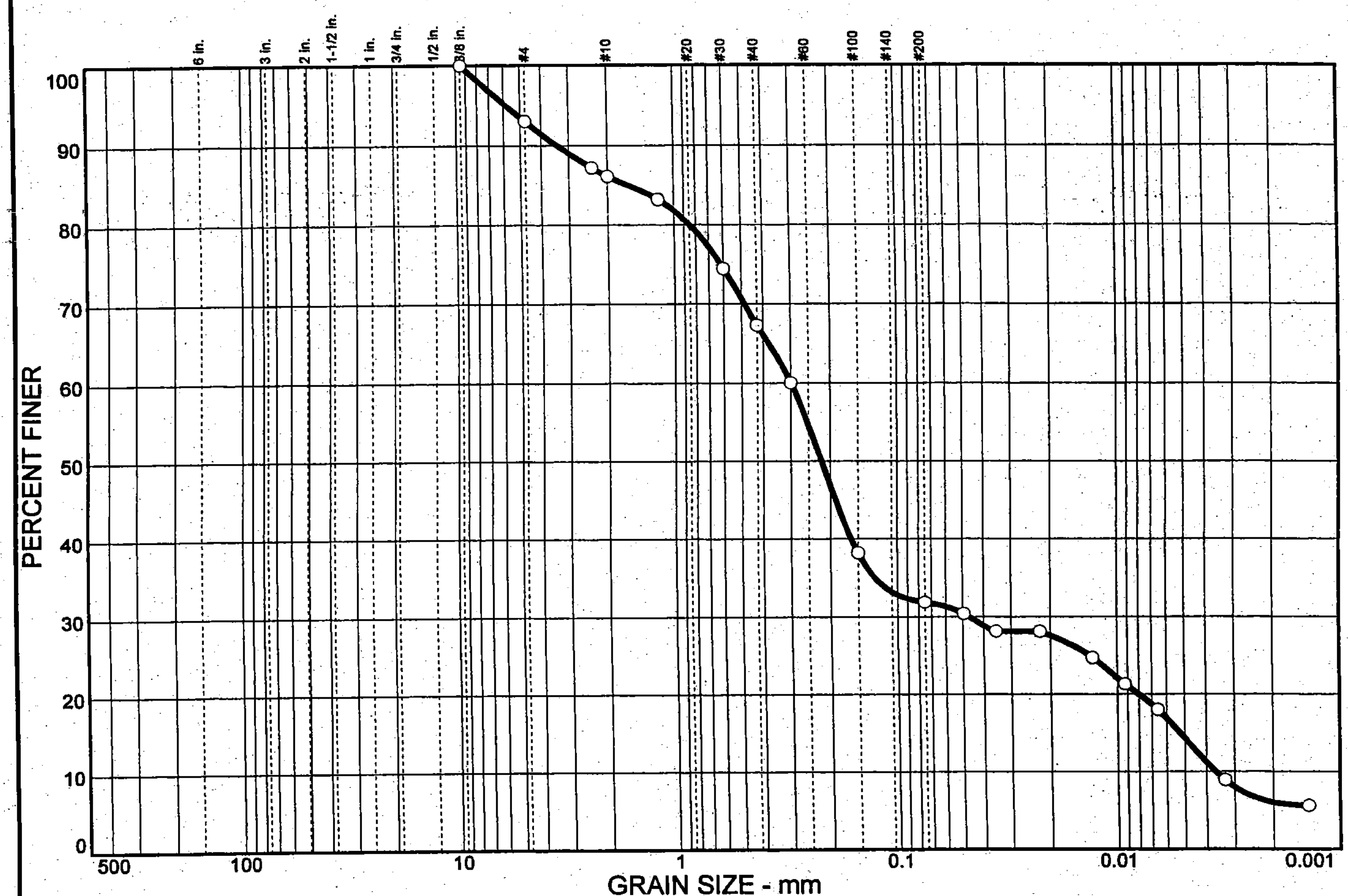
Sample No.: #18B **Source of Sample:** **Date:** 08/23/05
Location: Boring #1005 **Elev./Depth:** 153.5-155.0

SOUTHERN COMPANY

Client: SCS-Rhonda Tinsley and Steve Bearce
Project: Southern Nuclear/Plant Vogtle ESP

Project No: V003-DE **Lab#** 8

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	7.0	61.1	17.6	14.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	93.0		
#8	87.2		
#10	86.1		
#16	83.2		
#30	74.5		
#40	67.3		
#50	60.0		
#100	38.2		
#200	31.9		

* (no specification provided)

Soil Description

Very Light Tan Silty sand

Atterberg Limits

PL= NA LL= NA PI= NA

Coefficients

D_{85}= 1.62 D_{60}= 0.300 D_{50}= 0.219
D_{30}= 0.0467 D_{15}= 0.0052 D_{10}= 0.0036
C_u= 82.37 C_c= 1.99

Classification

USCS= SM AASHTO=

Remarks

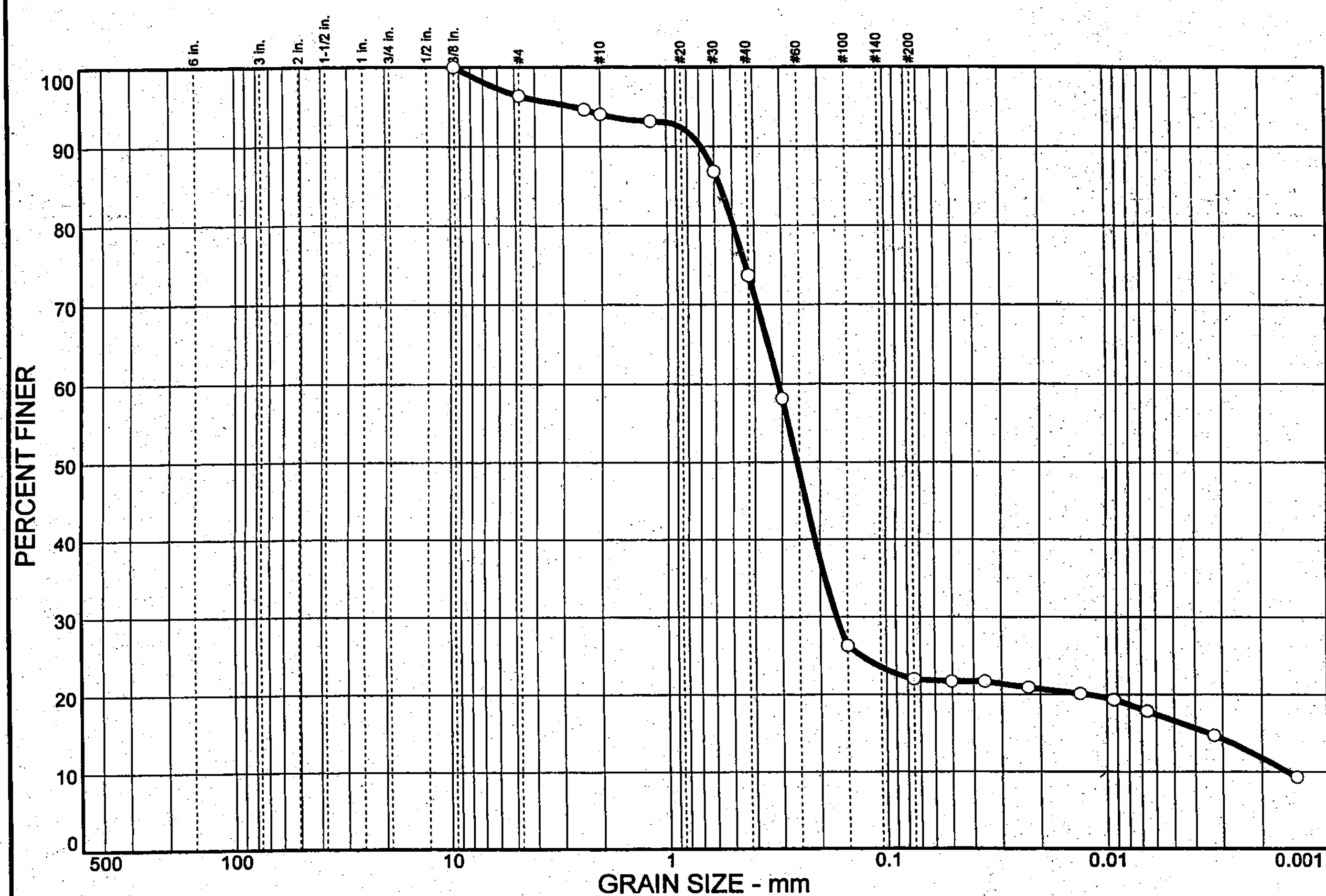
Jar Sample
Specific Gravity - 2.67

Sample No.: #23 **Source of Sample:** **Date:** 08/23/05
Location: Boring #1006 **Elev./Depth:** 113.5'-115.0'

SOUTHERN COMPANY

Client: SCS-Rhonda Tinsley and Steve Bearce
Project: Southern Nuclear/Plant Vogtle ESP
Project No: V003-DE **Lab#** 9

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	3.6	74.4	5.4	16.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	96.4		
#8	94.7		
#10	94.1		
#16	93.2		
#30	86.8		
#40	73.7		
#50	58.1		
#100	26.3		
#200	22.0		

* (no specification provided)

Soil Description

Very Light Tan Silty sand

Atterberg Limits

PL= NA LL= NA PI= NA

Coefficients

D_{85}= 0.566 D_{60}= 0.312 D_{50}= 0.256
D_{30}= 0.168 D_{15}= 0.0035 D_{10}= 0.0015
C_u= 202.26 C_c= 58.75

Classification

USCS= SM AASHTO=

Remarks

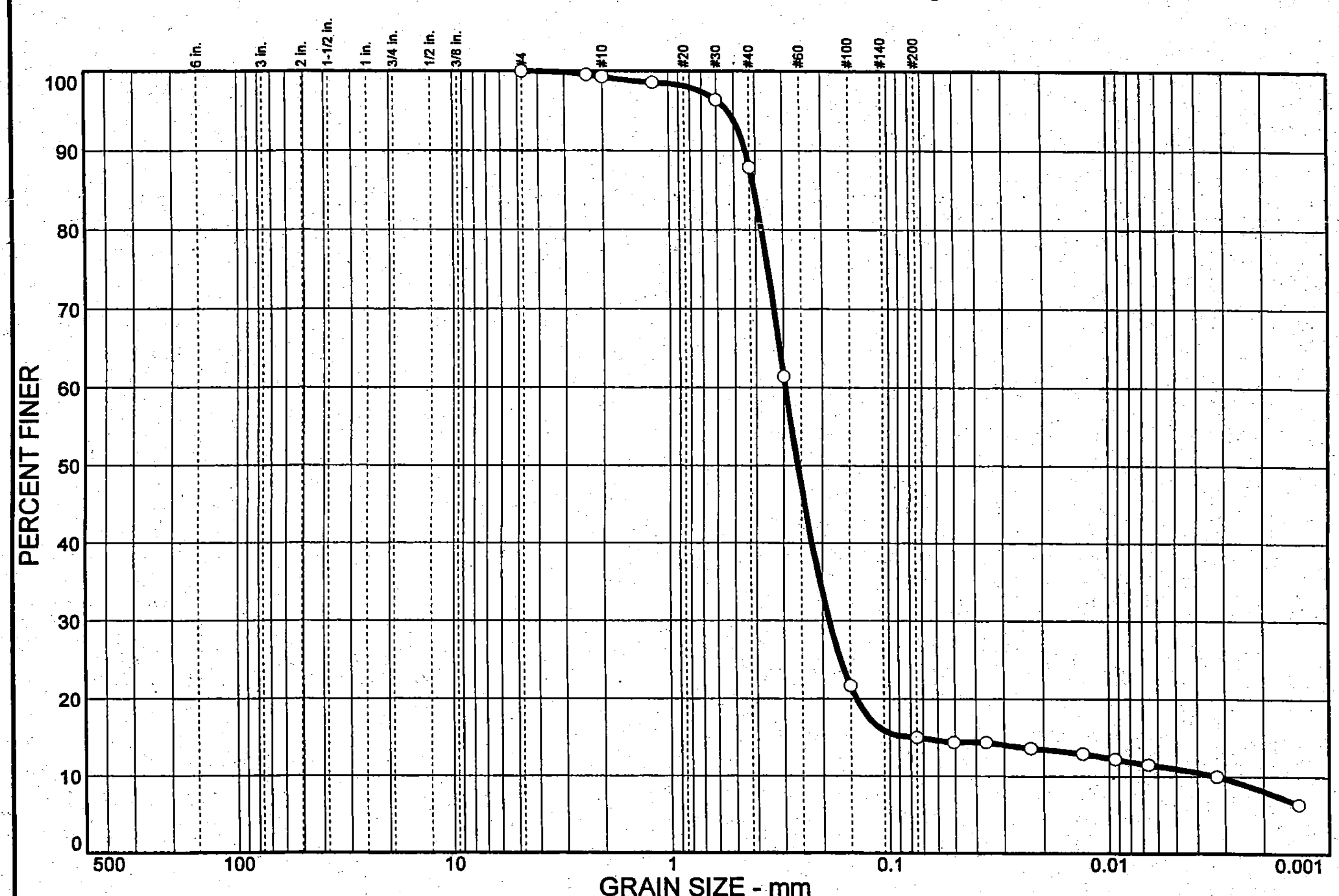
Jar Sample
Specific Gravity - 2.59

Sample No.: #24 **Source of Sample:** **Date:** 08/23/05
Location: Boring #1006 **Elev./Depth:** 118.5'-120.0'

SOUTHERN COMPANY

Client: SCS-Rhonda Tinsley and Steve Bearce
Project: Southern Nuclear/Plant Vogtle ESP
Project No: V003-DE **Lab#** 10

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	85.0	4.0	11.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	99.6		
#10	99.3		
#16	98.6		
#30	96.4		
#40	87.9		
#50	61.4		
#100	21.7		
#200	15.0		

* (no specification provided)

Soil Description

Very Light Tan Silty sand

Atterberg Limits

PL= NA LL= NA PI= NA

Coefficients

D_{85}= 0.404 D_{60}= 0.295 D_{50}= 0.259
D_{30}= 0.186 D_{15}= 0.0750 D_{10}= 0.0033
C_u= 90.28 C_c= 35.89

Classification

USCS= SM AASHTO=

Remarks

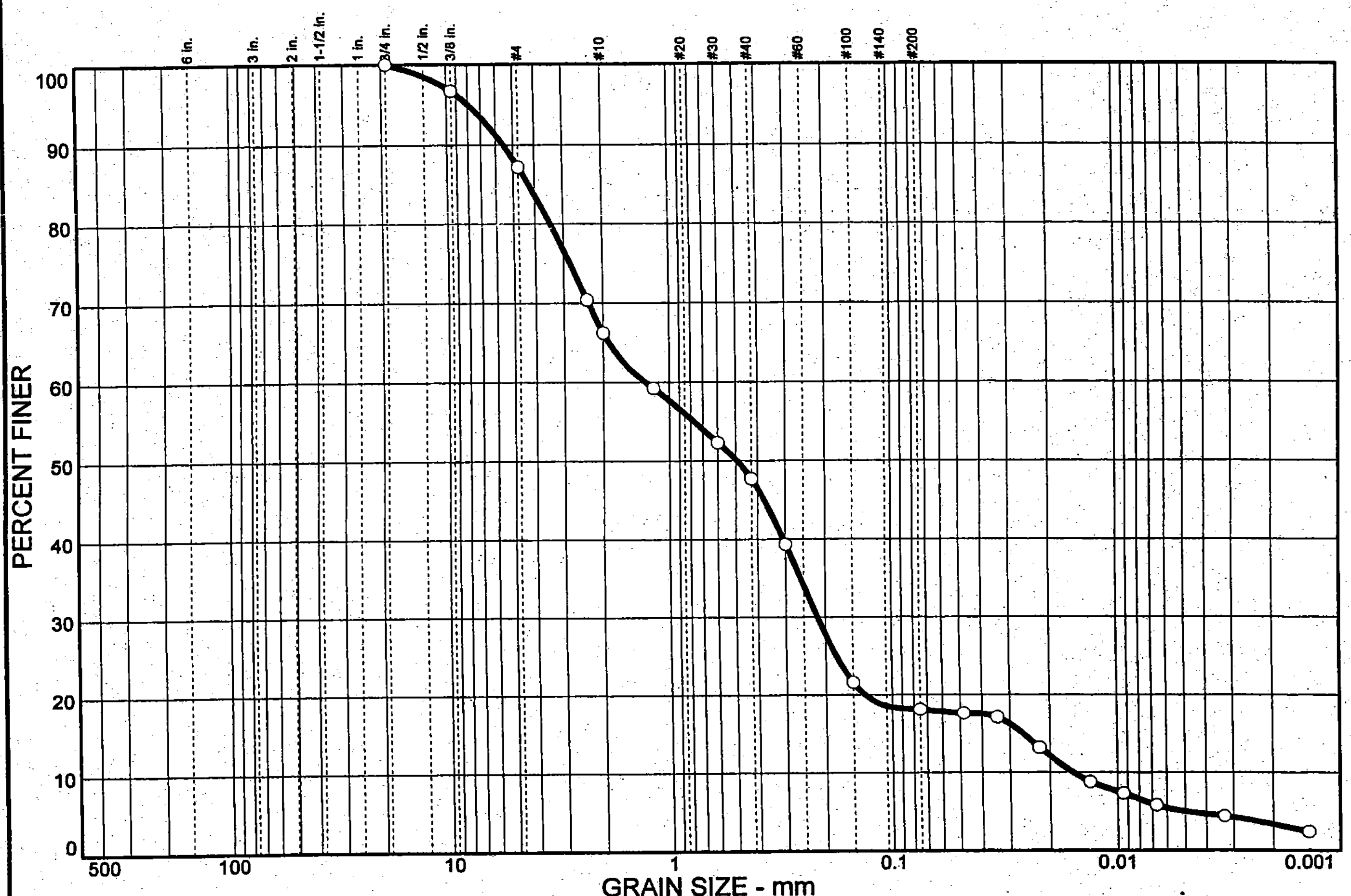
Jar Sample
Specific Gravity - 2.65

Sample No.: #2 **Source of Sample:** **Date:** 08/23/05
Location: Boring #1007 **Elev./Depth:** 103.5'-105.0

SOUTHERN COMPANY

Client: SCS-Rhonda Tinsley and Steve Bearce
Project: Southern Nuclear/Plant Vogtle ESP
Project No: 2.4A-209 V003-DE **Lab#** 11

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	12.8	69.1	13.1	5.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
.375 in.	96.7		
#4	87.2		
#8	70.4		
#10	66.2		
#16	59.2		
#30	52.3		
#40	47.7		
#50	39.3		
#100	21.6		
#200	18.1		

* (no specification provided)

Soil Description

Very Light Tan Silty sand

Atterberg Limits

PL= NA LL= NA PI= NA

Coefficients

D_{85}= 4.27 D_{60}= 1.29 D_{50}= 0.493
D_{30}= 0.217 D_{15}= 0.0263 D_{10}= 0.0157
C_u= 81.97 C_c= 2.33

Classification

USCS= SM AASHTO=

Remarks

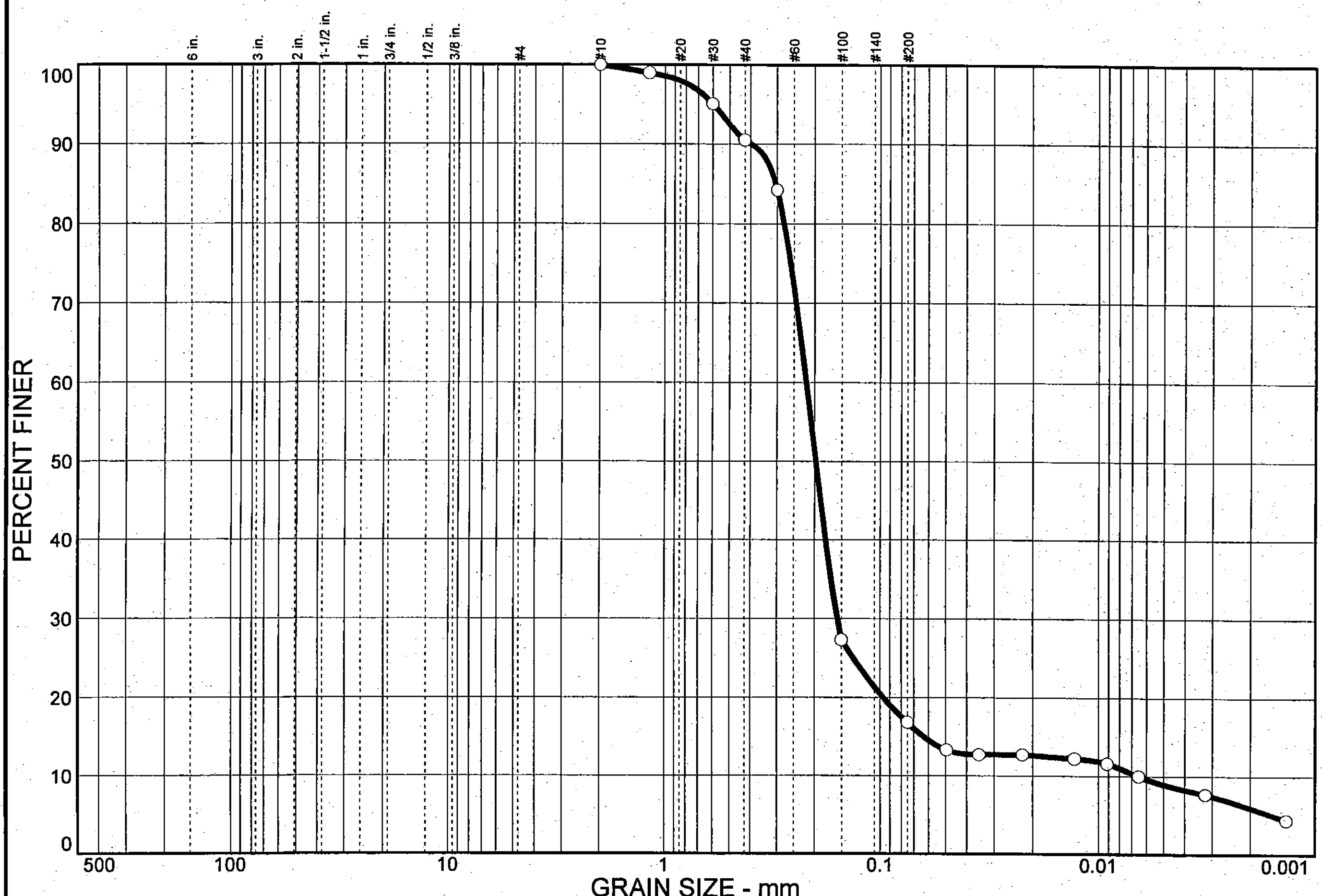
Jar Sample
Specific Gravity - 2.66

Sample No.: #3 **Source of Sample:** **Date:** 08/23/05
Location: Boring #1007 **Elev./Depth:** 108.5'-110.0'

SOUTHERN COMPANY

Client: SCS-Rhonda Tinsley and Steve Bearce
Project: Southern Nuclear/Plant Vogtle ESP
Project No.: V003-DE **Lab#** 12

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	83.2	7.8	9.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#16	99.0		
#30	95.1		
#40	90.5		
#50	84.2		
#100	27.3		
#200	16.8		

* (no specification provided)

Soil Description

Light Tan Silty sand

Atterberg Limits

PL= NA LL= NA PI= NA

Coefficients

D_{85}= 0.306 D_{60}= 0.219 D_{50}= 0.197
D_{30}= 0.156 D_{15}= 0.0632 D_{10}= 0.0065
C_u= 33.60 C_c= 17.15

Classification

USCS= SM AASHTO=

Remarks

Bag Sample
Specific Gravity - 2.69

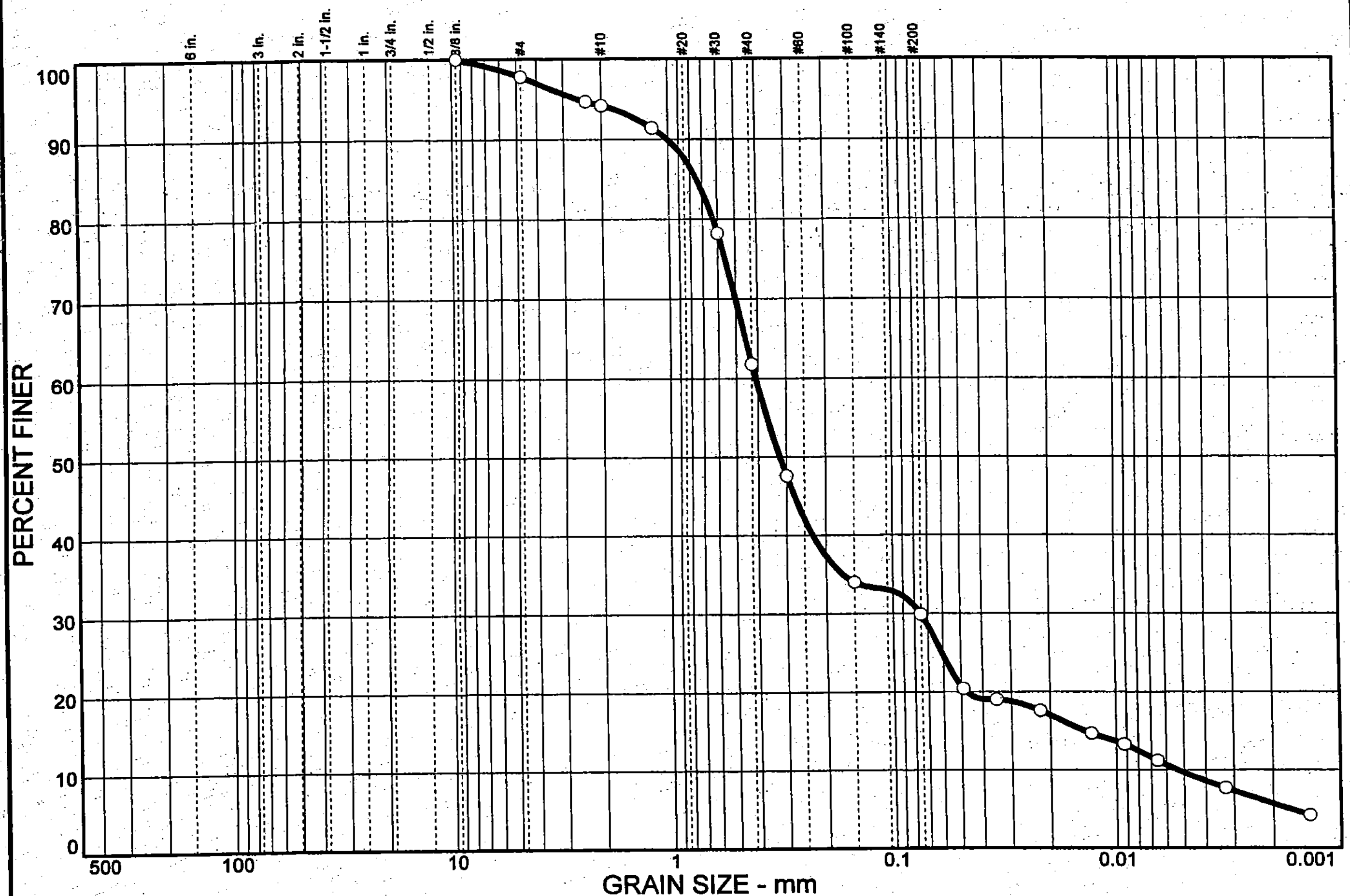
Sample No.: #24 **Source of Sample:** **Date:** 08/23/05
Location: Boring #1008 **Elev./Depth:** 228.5'-230.0'

SOUTHERN COMPANY

Client: SCS-Rhonda Tinsley and Steve Bearce
Project: Southern Nuclear/Plant Vogtle ESP

Project No: 2.4A-21 V003-DE **Lab#** 13

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	2.2	67.9	20.3	9.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	97.8		
#8	94.7		
#10	94.2		
#16	91.4		
#30	78.2		
#40	61.8		
#50	47.6		
#100	34.0		
#200	29.9		

* (no specification provided)

Soil Description

Gray Silty sand

Atterberg Limits

PL= NA LL= NA PI= NA

Coefficients

D_{85}= 0.744 D_{60}= 0.409 D_{50}= 0.321
D_{30}= 0.0754 D_{15}= 0.0138 D_{10}= 0.0053
C_u= 76.50 C_c= 2.60

Classification

USCS= SM AASHTO=

Remarks

Bag Sample

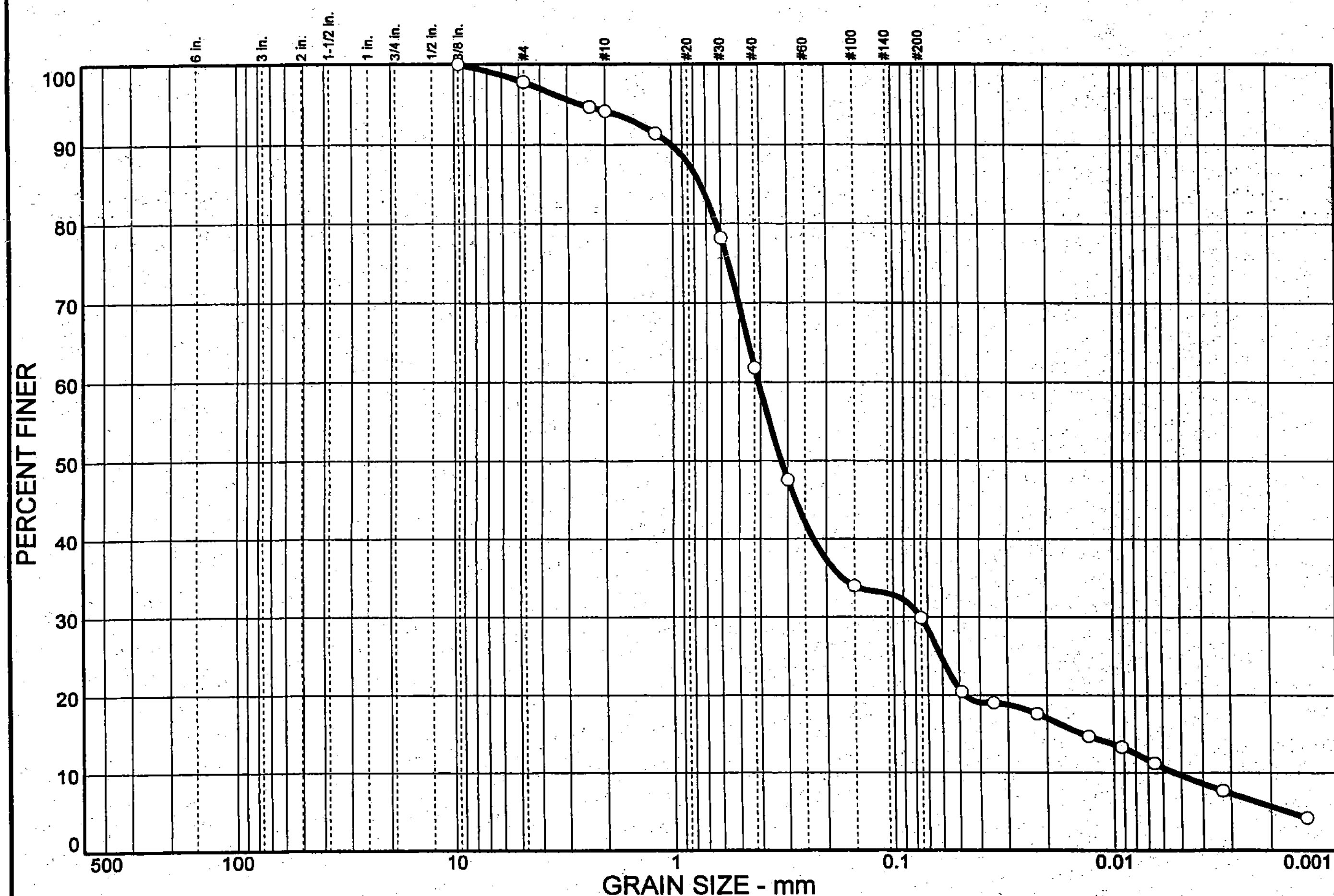
Sample No.: #25 **Source of Sample:** **Date:** 08/23/05
Location: Boring #1008 **Elev./Depth:** 238.5'-240.0'

SOUTHERN COMPANY

Client: SCS-Rhonda Tinsley and Steve Bearce
Project: Southern Nuclear/Plant Vogtle ESP

Project No: 2 V003-DE **Lab#** 13

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	2.2	67.9	20.3	9.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	97.8		
#8	94.7		
#10	94.2		
#16	91.4		
#30	78.2		
#40	61.8		
#50	47.6		
#100	34.0		
#200	29.9		

* (no specification provided)

Soil Description

Gray Silty sand

Atterberg Limits

PL= NA LL= NA PI= NA

Coefficients

D_{85}= 0.744 D_{60}= 0.409 D_{50}= 0.321
D_{30}= 0.0754 D_{15}= 0.0138 D_{10}= 0.0053
C_u= 76.50 C_c= 2.60

Classification

USCS= SM AASHTO=

Remarks

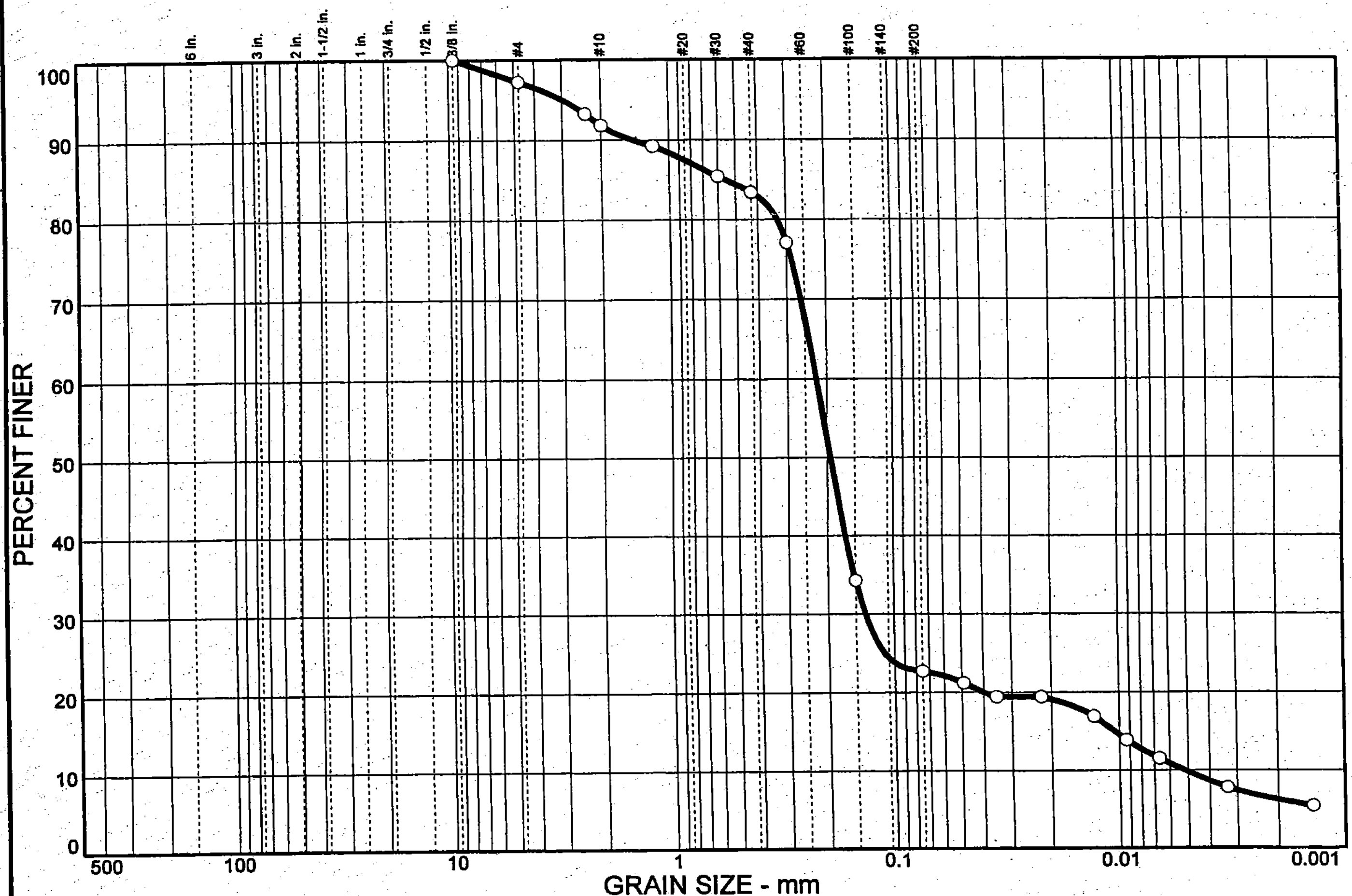
Bag Sample
Specific Gravity - 2.68

Sample No.: #25
Location: Boring #1008
Source of Sample:
Date: 08/23/05
Elev./Depth: 238.5'-240.0'

SOUTHERN COMPANY

Client: SCS-Rhonda Tinsley and Steve Bearce
Project: Southern Nuclear/Plant Vogtle ESP
Project No.: 3 V003-DE
Lab# 14

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	2.7	74.6	12.9	9.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	100.0		
#4	97.3		
#8	93.3		
#10	91.8		
#16	89.2		
#30	85.4		
#40	83.4		
#50	77.1		
#100	34.3		
#200	22.7		

* (no specification provided)

Soil Description

Very Light Tan Silty sand

Atterberg Limits

PL= NA LL= NA PI= NA

Coefficients

D_{85}= 0.558 D_{60}= 0.223 D_{50}= 0.193
D_{30}= 0.135 D_{15}= 0.0105 D_{10}= 0.0052
C_u= 42.99 C_c= 15.88

Classification

USCS= SM AASHTO=

Remarks

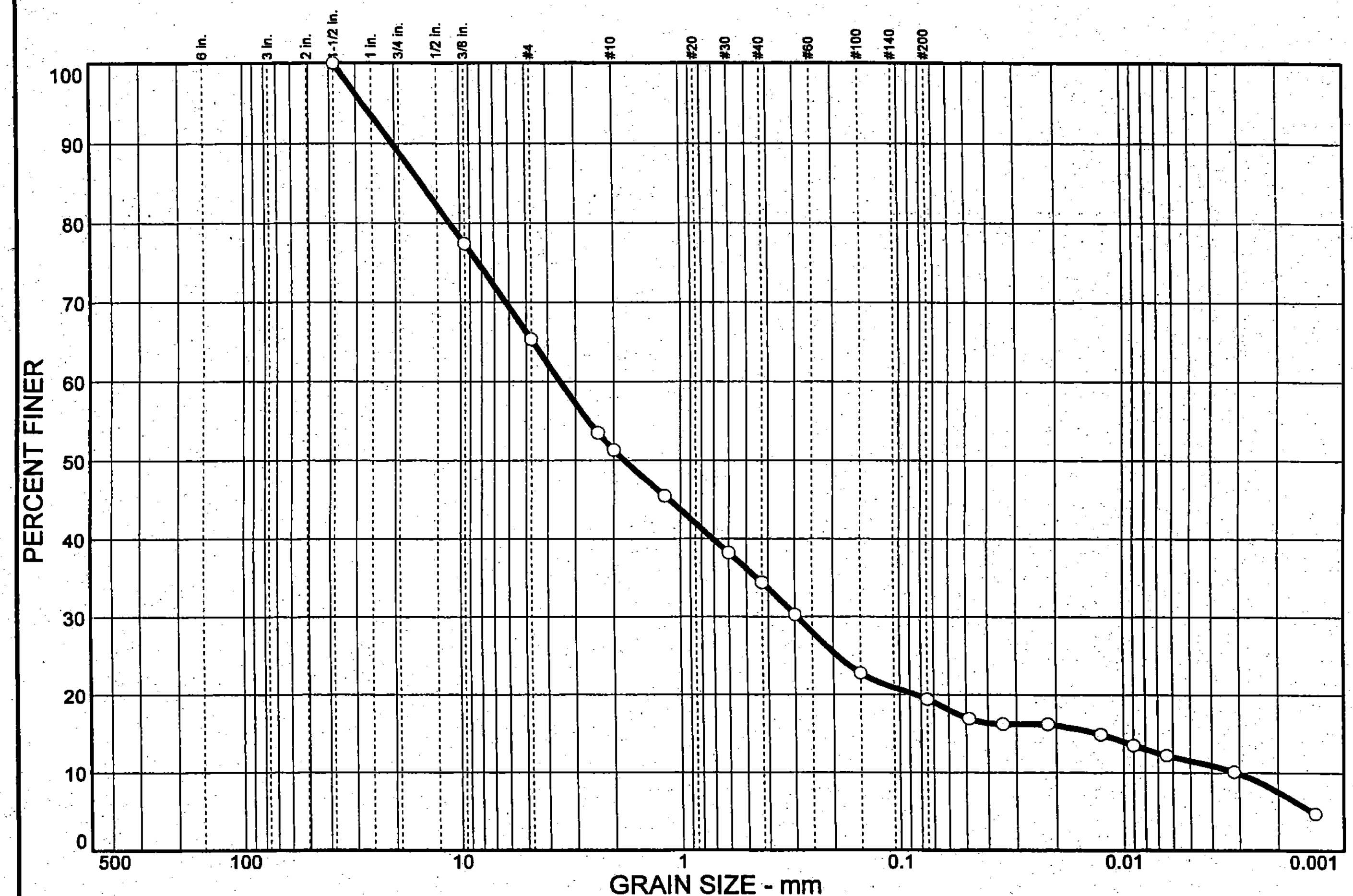
Jar Sample
Spicific Gravity - 2.61

Sample No.: #17 **Source of Sample:** **Date:** 08/24/05
Location: Boring #1009 **Elev./Depth:** 85'

SOUTHERN COMPANY

Client: SCS-Rhonda Tinsley and Steve Bearce
Project: Southern Nuclear/Plant Vogtle ESP
Project No: V003-DE **Lab#** 15

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	34.7	45.9	7.9	11.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.50 in.	100.0		
.375 in.	77.4		
#4	65.3		
#8	53.5		
#10	51.3		
#16	45.5		
#30	38.2		
#40	34.4		
#50	30.3		
#100	22.8		
#200	19.4		

* (no specification provided)

Soil Description

Very Light Tan Silty sand with gravel

Atterberg Limits

PL= NA LL= NA PI= NA

Coefficients

D_{85}= 15.0 D_{60}= 3.53 D_{50}= 1.79
D_{30}= 0.293 D_{15}= 0.0130 D_{10}= 0.0031
C_u= 1142.64 C_c= 7.85

Classification

USCS= SM AASHTO=

Remarks

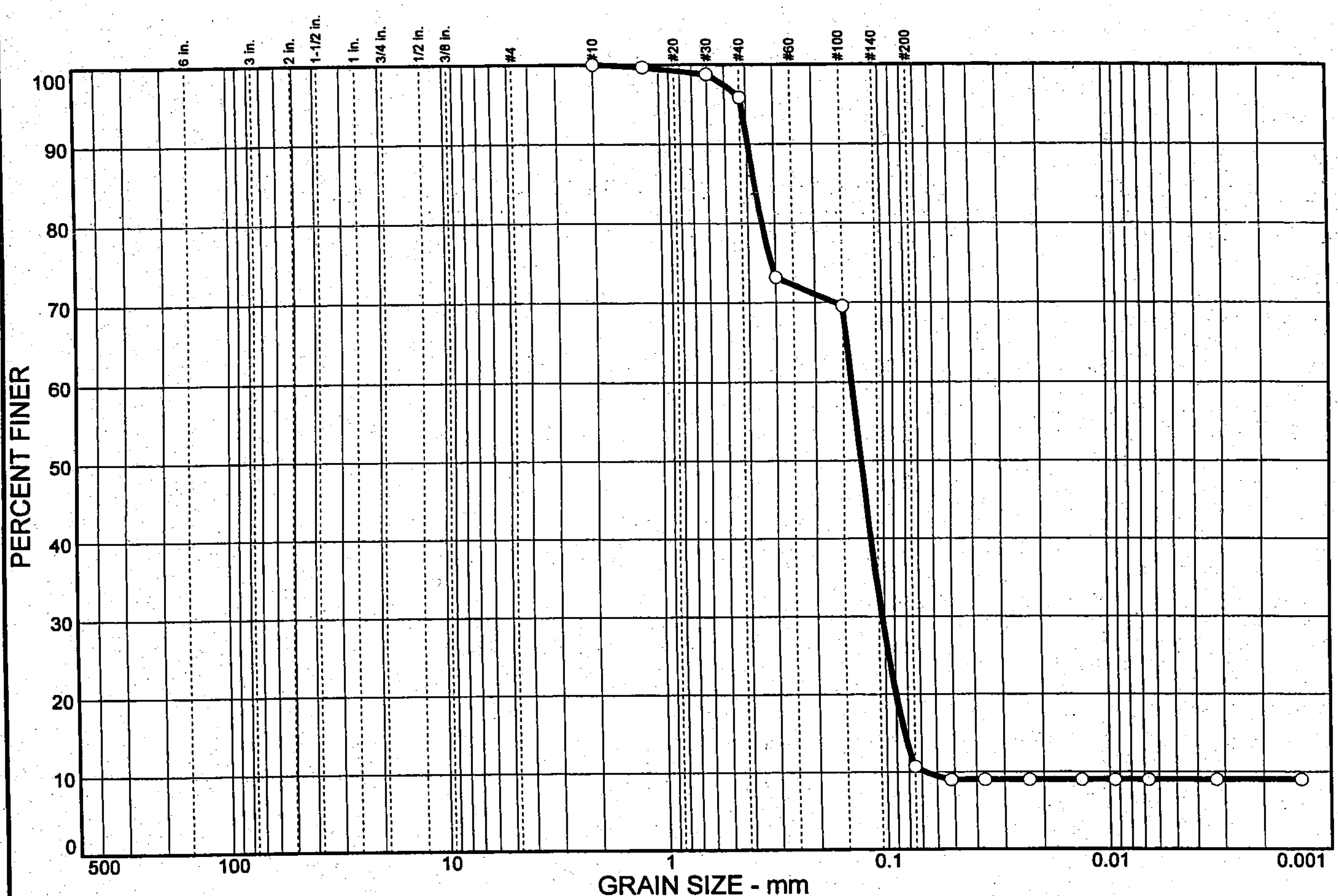
Jar Sample
Specific Gravity 2.75

Sample No.: #18 **Source of Sample:** **Date:** 08/24/05
Location: Boring #1009 **Elev./Depth:** 90'

SOUTHERN COMPANY

Client: SCS-Rhonda Tinsley and Steve Bearce
Project: Southern Nuclear/Plant Vogtle ESP
Project No: V003-DE **Lab#** 16

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	89.3	1.7	9.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#16	99.7		
#30	98.8		
#40	95.9		
#50	73.2		
#100	69.6		
#200	10.7		

* (no specification provided)

Soil Description

Tan Poorly graded sand with silt

Atterberg Limits

PL= NA LL= NA PI= NA

Coefficients

D_{85}= 0.370 D_{60}= 0.138 D_{50}= 0.126
D_{30}= 0.102 D_{15}= 0.0830 D_{10}= 0.0670
C_u= 2.05 C_c= 1.14

Classification

USCS= SP-SM AASHTO=

Remarks

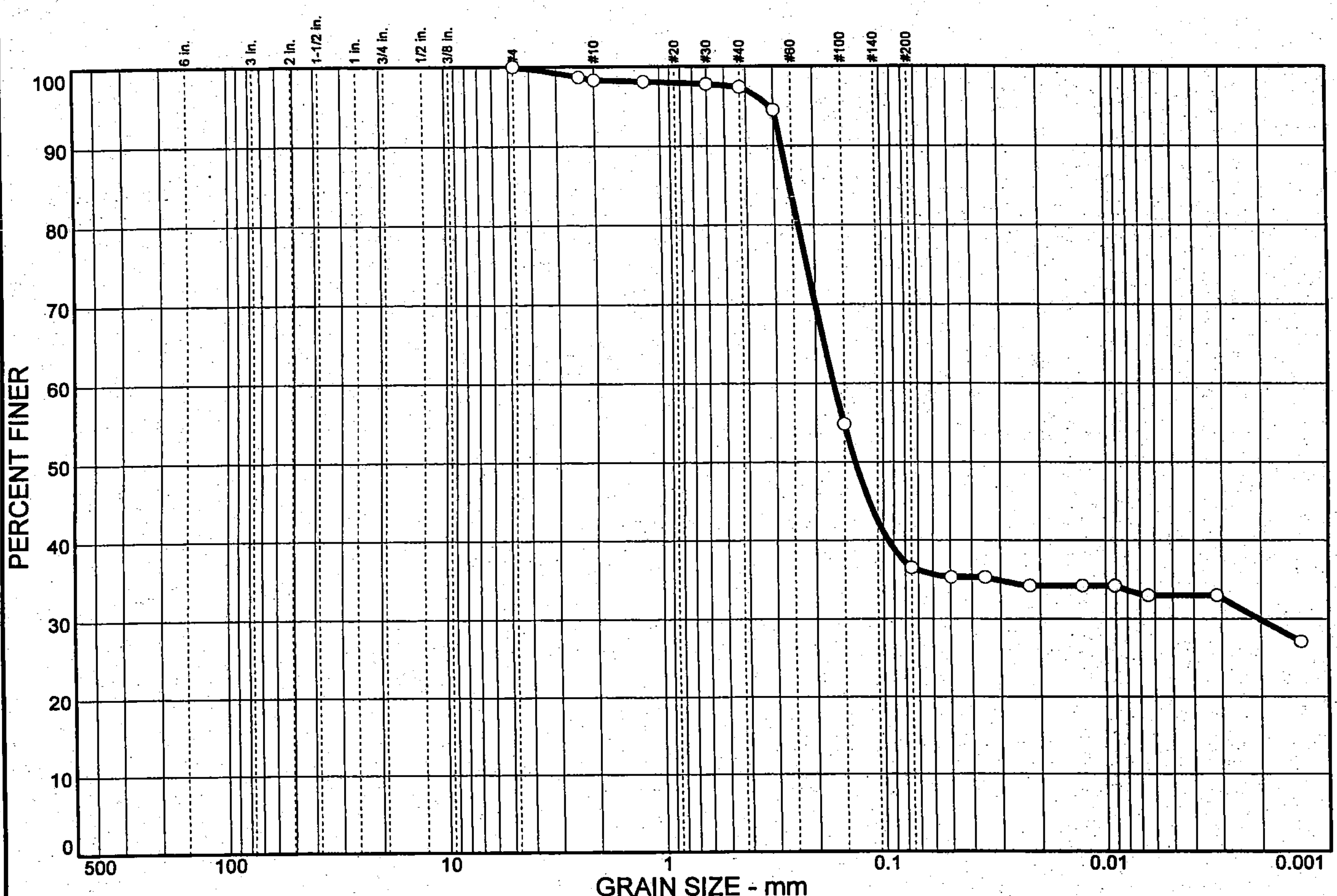
Jar Sample
Specific Gravity - 2.67

Sample No.: #15 **Source of Sample:** **Date:** 08/24/05
Location: Boring #1010 **Elev./Depth:** 73.5'-75.0'

SOUTHERN COMPANY

Client: SCS-Rhonda Tinsley and Steve Bearce
Project: Southern Nuclear/Plant Vogtle ESP
Project No: V003-DE **Lab#** 17

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	63.5	3.5	33.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	98.7		
#10	98.3		
#16	98.1		
#30	97.8		
#40	97.4		
#50	94.5		
#100	54.8		
#200	36.5		

* (no specification provided)

Soil Description

Tan Silty sand

Atterberg Limits

PL= NA LL= NA PI= NA

Coefficients

D_{85}= 0.257 D_{60}= 0.167 D_{50}= 0.134
D_{30}= 0.0020 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

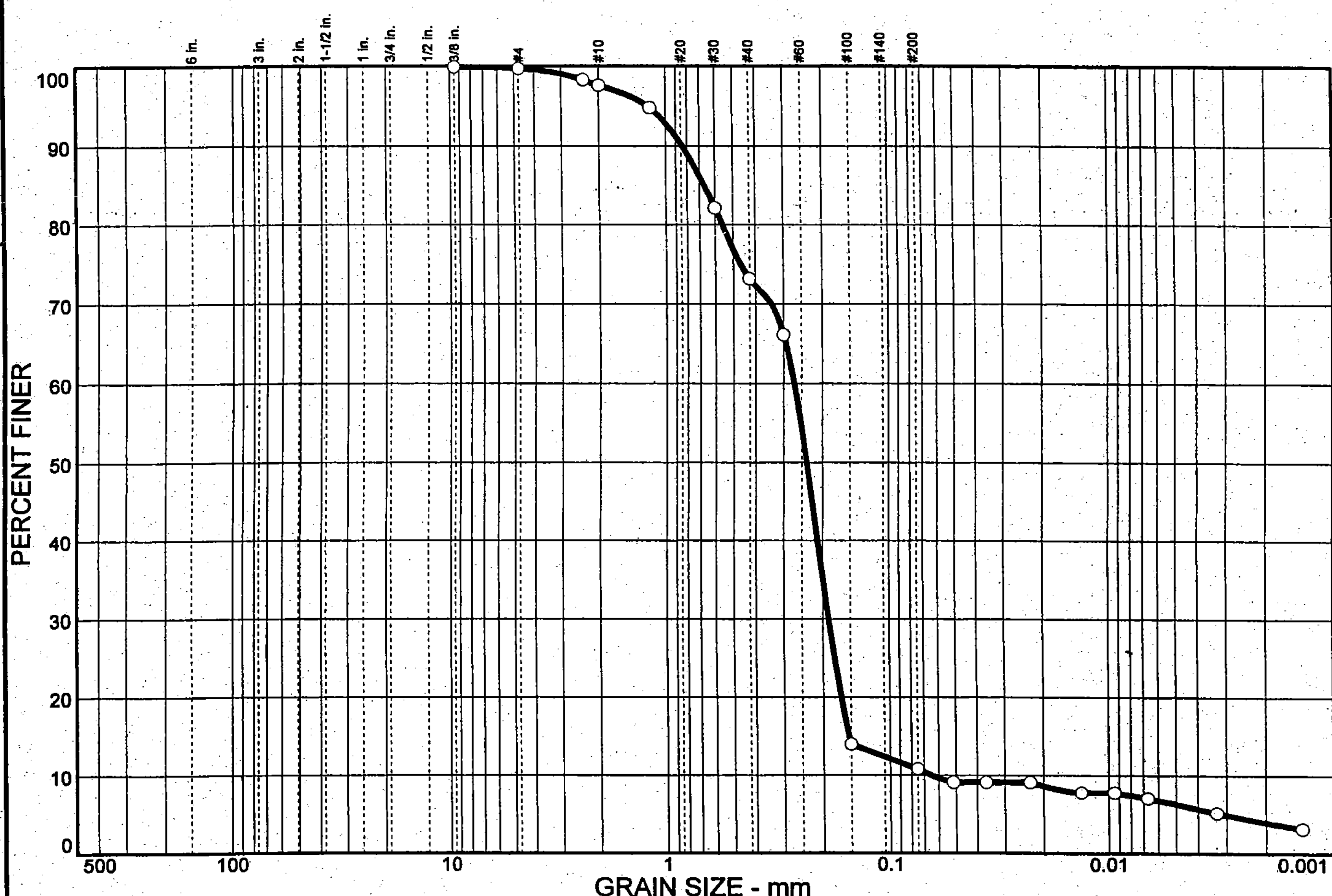
Jar Sample
Specific Gravity - 2.63

Sample No.: #16 **Source of Sample:** **Date:** 08/24/05
Location: Boring #1010 **Elev./Depth:** 78.5'-80.0'

SOUTHERN COMPANY

Client: SCS-Rhonda Tinsley and Steve Bearce
Project: Southern Nuclear/Plant Vogtle ESP
Project No: V003-DE **Lab#** 18

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
		88.9	4.4	6.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375 in.	99.9		
#4	99.7		
#8	98.3		
#10	97.6		
#16	94.8		
#30	82.1		
#40	73.2		
#50	66.1		
#100	14.0		
#200	10.8		

* (no specification provided)

Soil Description

Gray Poorly graded sand with silt

Atterberg Limits

PL= NA LL= NA PI= NA

Coefficients

D_{85}= 0.669 D_{60}= 0.269 D_{50}= 0.236
D_{30}= 0.188 D_{15}= 0.153 D_{10}= 0.0649
C_u= 4.15 C_c= 2.03

Classification

USCS= SP-SM AASHTO=

Remarks

Bag Sample
Specific Gravity - 2.67

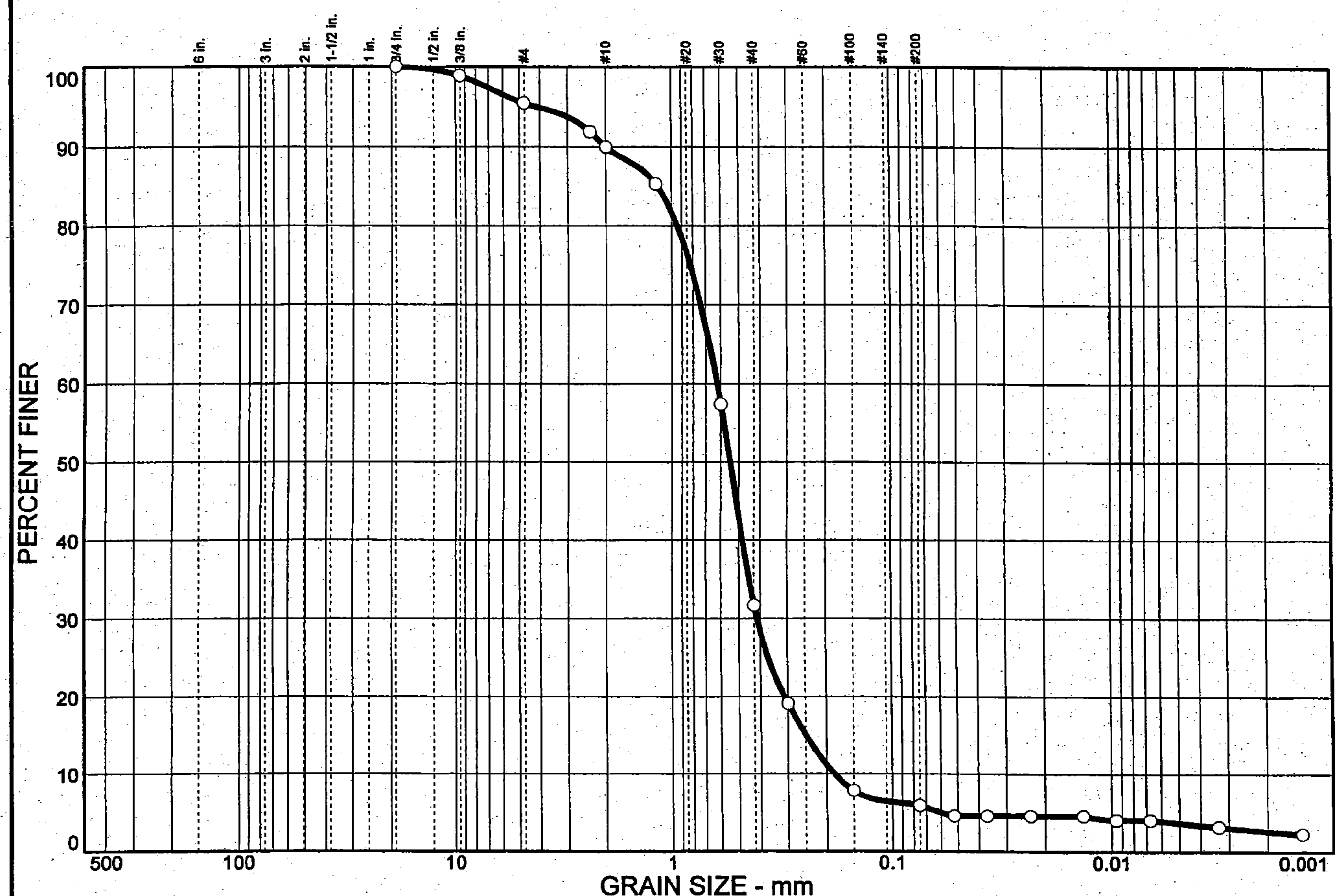
Sample No.: #24 **Source of Sample:** **Date:** 08/24/05
Location: Boring #1011 **Elev./Depth:** 193.5'-195.0'

SOUTHERN COMPANY

Client: SCS-Rhonda Tinsley and Steve Bearce
Project: Southern Nuclear/Plant Vogtle ESP
Project No.: V003-DE **Lab#** 19

2.4A-318

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	4.5	89.6	2.2	3.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
.375 in.	98.9		
#4	95.5		
#8	91.9		
#10	90.0		
#16	85.3		
#30	57.3		
#40	31.7		
#50	19.1		
#100	7.8		
#200	5.9		

* (no specification provided)

Soil Description

Gray Poorly graded sand with silt

Atterberg Limits

PL= NA LL= NA PI= NA

Coefficients

D_{85}= 1.16 D_{60}= 0.623 D_{50}= 0.545
D_{30}= 0.412 D_{15}= 0.249 D_{10}= 0.185
C_u= 3.38 C_c= 1.48

Classification

USCS= SP-SM AASHTO=

Remarks

Bag Sample
Specifiv Gravity - 2.66

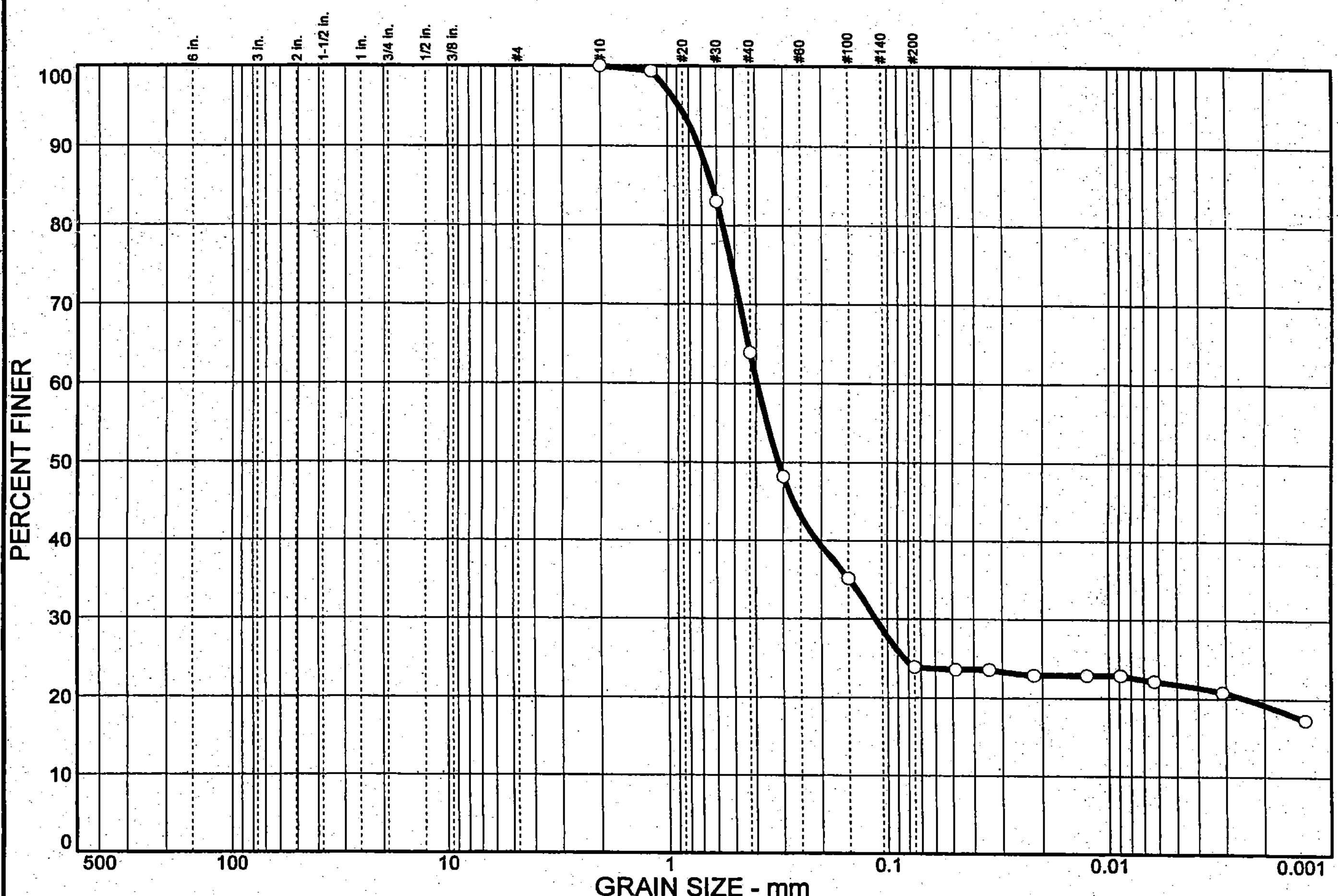
Sample No.: #25 **Source of Sample:** **Date:** 08/24/05
Location: Boring #1011 **Elev./Depth:** 208.5'-210.0'

SOUTHERN COMPANY

Client: SCS-Rhonda Tinsley and Steve Bearce
Project: Southern Nuclear/Plant Vogtle ESP
Project No.: V003-DE **Lab#** 20

2.4A-219

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	76.1	2.1	21.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#16	99.4		
#30	83.0		
#40	63.9		
#50	48.2		
#100	35.2		
#200	23.9		

* (no specification provided)

Soil Description

Tan Silty sand

Atterberg Limits

PL= NA LL= NA PI= NA

Coefficients

D_{85}= 0.628 D_{60}= 0.395 D_{50}= 0.316
D_{30}= 0.113 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO=

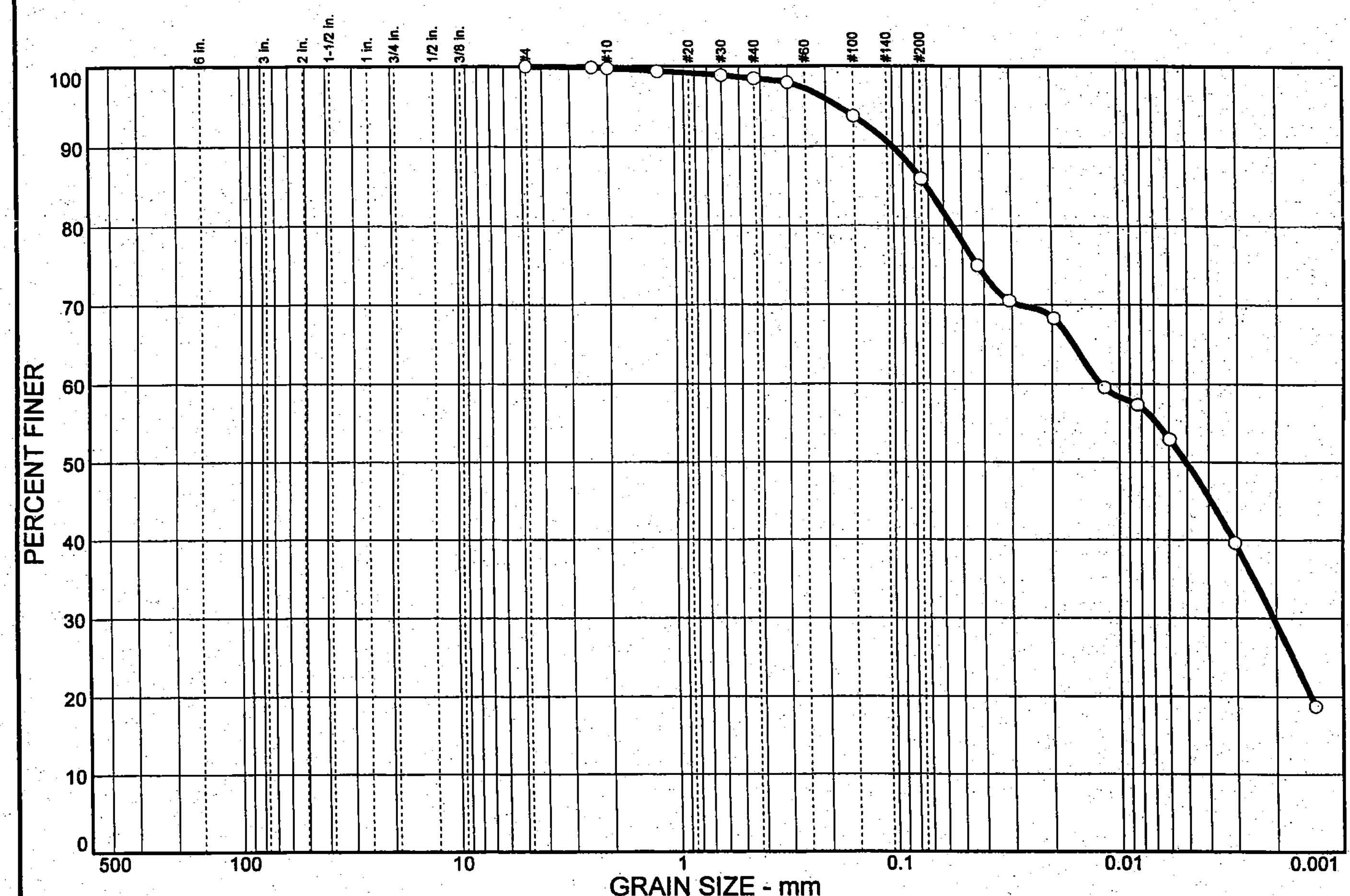
Remarks

Jar Sample
Specific Gravity - 2.66

Sample No.: #15 **Source of Sample:** **Date:** 08/24/05
Location: Boring #1012 **Elev./Depth:** 73.5'-75.0'

SOUTHERN COMPANY	**Client:** SCS-Rhonda Tinsley and Steve Bearce **Project:** Southern Nuclear/Plant Vogtle ESP **Project No:** 2-4A-220 V003-DE **Lab#** 21

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	14.1	36.1	49.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	99.9		
#10	99.8		
#16	99.4		
#30	98.9		
#40	98.5		
#50	98.0		
#100	93.8		
#200	85.9		

* (no specification provided)

Soil Description

Light Tan Silt

Atterberg Limits

PL= NA LL= NA PI= NA

Coefficients

D_{85}= 0.0712 D_{60}= 0.0121 D_{50}= 0.0051
D_{30}= 0.0021 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

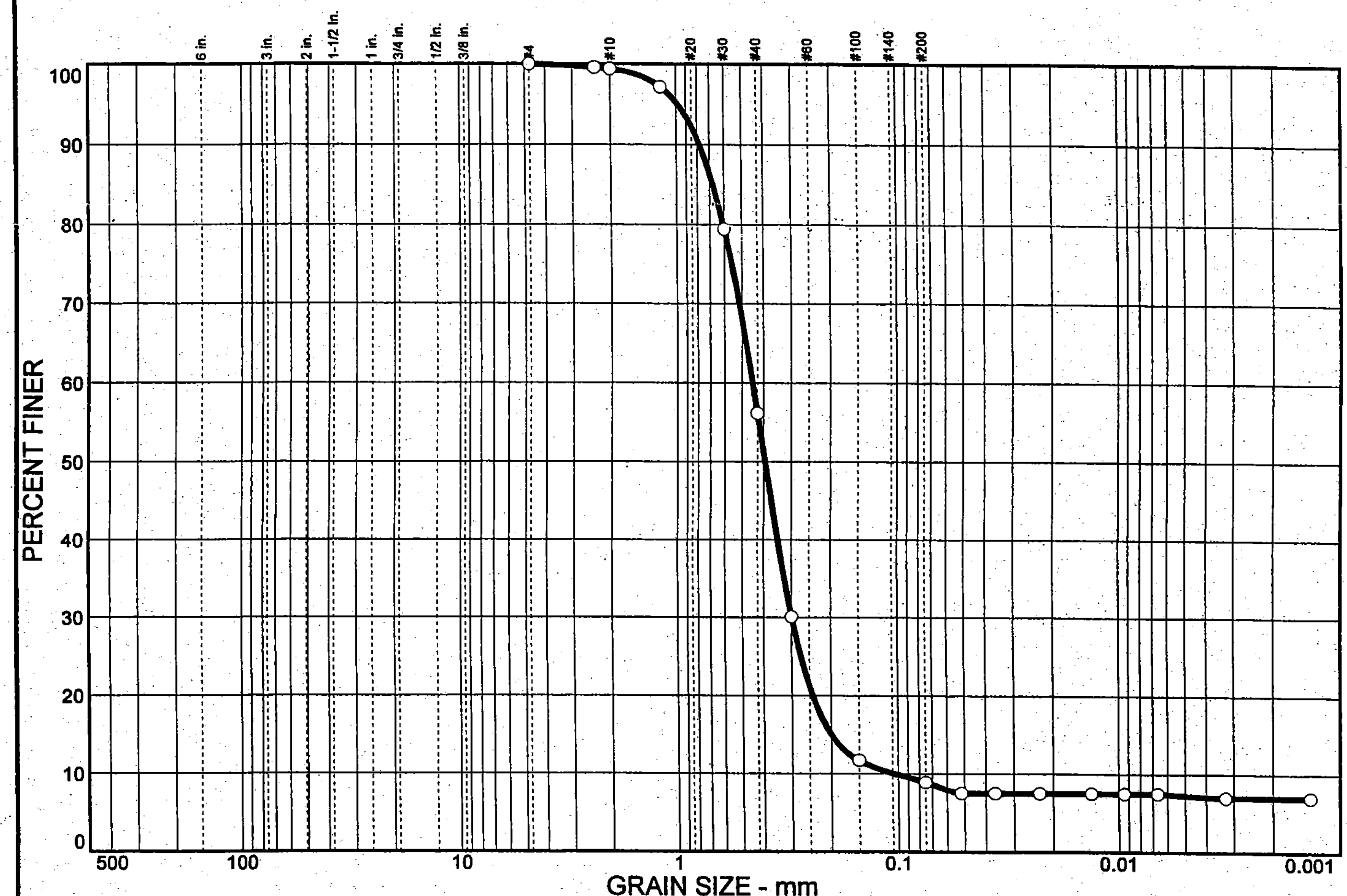
Jar Sample
Specific Gravity - 2.66

Sample No.: #16 **Source of Sample:** **Date:** 08/24/05
Location: Boring #1012 **Elev./Depth:** 78.5'-80.0'

SOUTHERN COMPANY

Client: SCS-Rhonda Tinsley and Steve Bearce
Project: Southern Nuclear/Plant Vogtle ESP
Project No: V003-DE **Lab#** 22

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	91.1	1.6	7.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	99.6		
#10	99.4		
#16	97.2		
#30	79.4		
#40	56.1		
#50	30.1		
#100	11.7		
#200	8.9		

* (no specification provided)

Soil Description

Tan Poorly graded sand with silt

Atterberg Limits

PL= NA LL= NA PI= NA

Coefficients

D_{85}= 0.676 D_{60}= 0.447 D_{50}= 0.393
D_{30}= 0.300 D_{15}= 0.200 D_{10}= 0.104
C_u= 4.28 C_c= 1.92

Classification

USCS= SP-SM AASHTO=

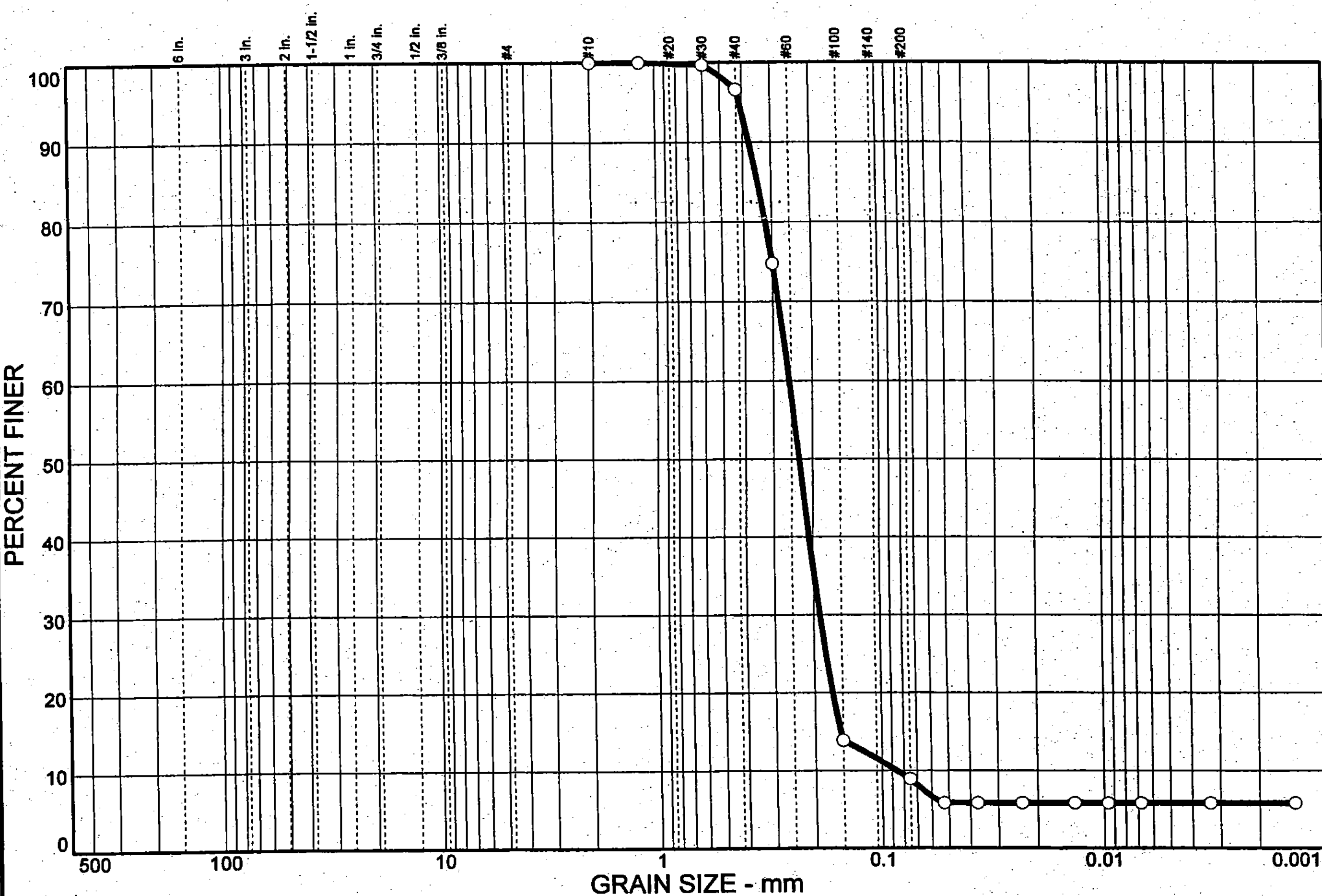
Remarks

Jar Sample
Specific Gravity - 2.65

Sample No.: #17 **Source of Sample:** **Date:** 08/24/05
Location: Boring #1013 **Elev./Depth:** 84.0'

SOUTHERN COMPANY	**Client:** SCS-Rhonda Tinsley and Steve Bearce **Project:** Southern Nuclear/Plant Vogtle ESP **Project No:** V003-DE **Lab#** 23

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	91.1	3.1	5.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#16	100.0		
#30	99.7		
#40	96.6		
#50	74.8		
#100	13.9		
#200	8.9		

* (no specification provided)

Soil Description

Light Tan Poorly graded sand with silt

Atterberg Limits

PL= NA LL= NA PI= NA

Coefficients

D_{85}= 0.346 D_{60}= 0.255 D_{50}= 0.230
D_{30}= 0.187 D_{15}= 0.153 D_{10}= 0.0861
C_u= 2.96 C_c= 1.60

Classification

USCS= SP-SM AASHTO=

Remarks

Jar Sample
Specific Gravity - 2.65

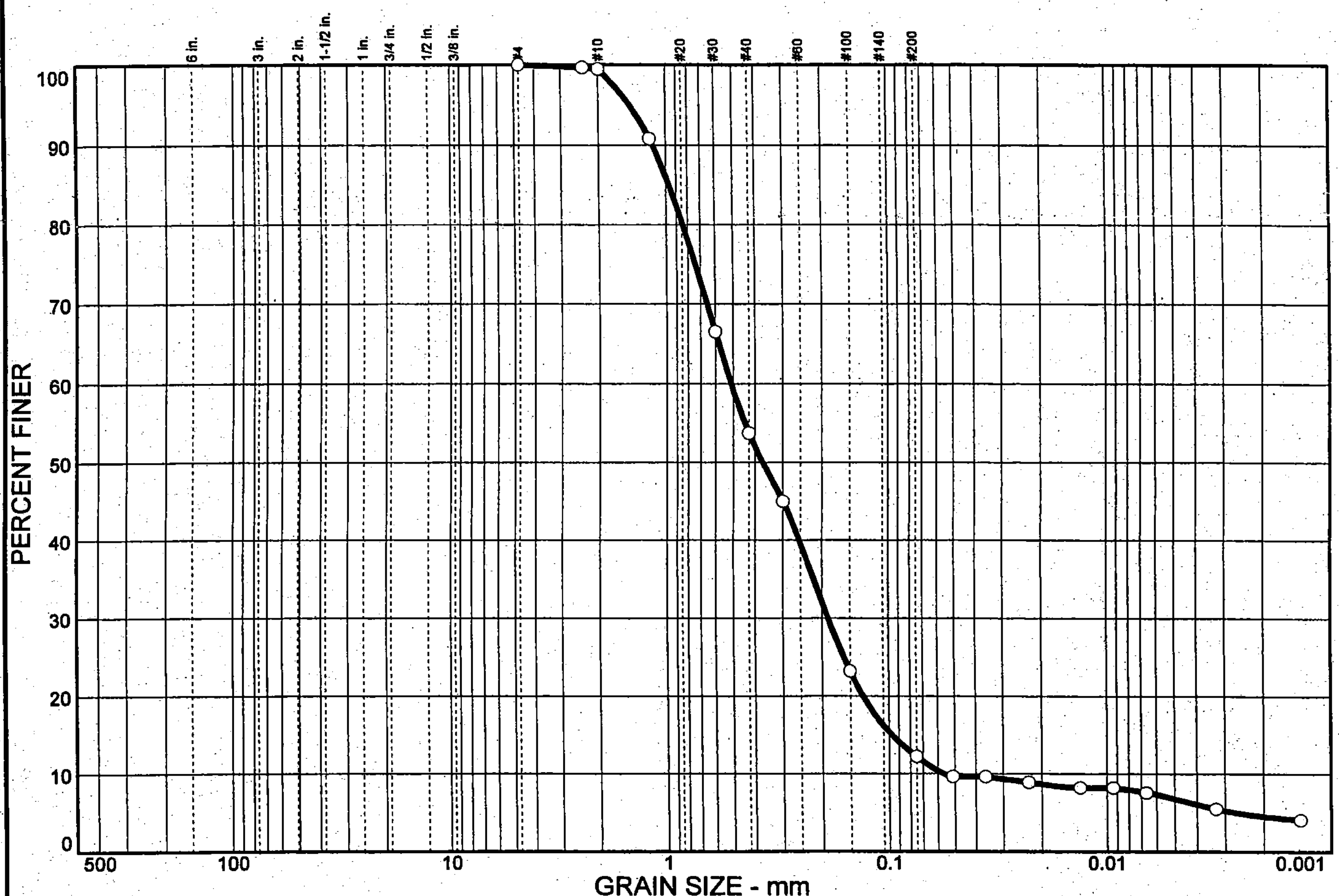
Sample No.: #18 **Source of Sample:** **Date:** 08/24/05
Location: Boring #1013 **Elev./Depth:** 94.0'

SOUTHERN COMPANY

Client: SCS-Rhonda Tinsley and Steve Bearce
Project: Southern Nuclear/Plant Vogtle ESP

Project No: 23 V003-DE **Lab#** 24

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	87.8	5.4	6.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	99.7		
#10	99.5		
#16	90.8		
#30	66.5		
#40	53.7		
#50	45.0		
#100	23.2		
#200	12.2		

* (no specification provided)

Soil Description

Gray Silty sand

Atterberg Limits

PL= NA LL= NA PI= NA

Coefficients

D_{85}= 0.969 D_{60}= 0.510 D_{50}= 0.369
D_{30}= 0.188 D_{15}= 0.0971 D_{10}= 0.0564
C_u= 9.04 C_c= 1.22

Classification

USCS= SM AASHTO=

Remarks

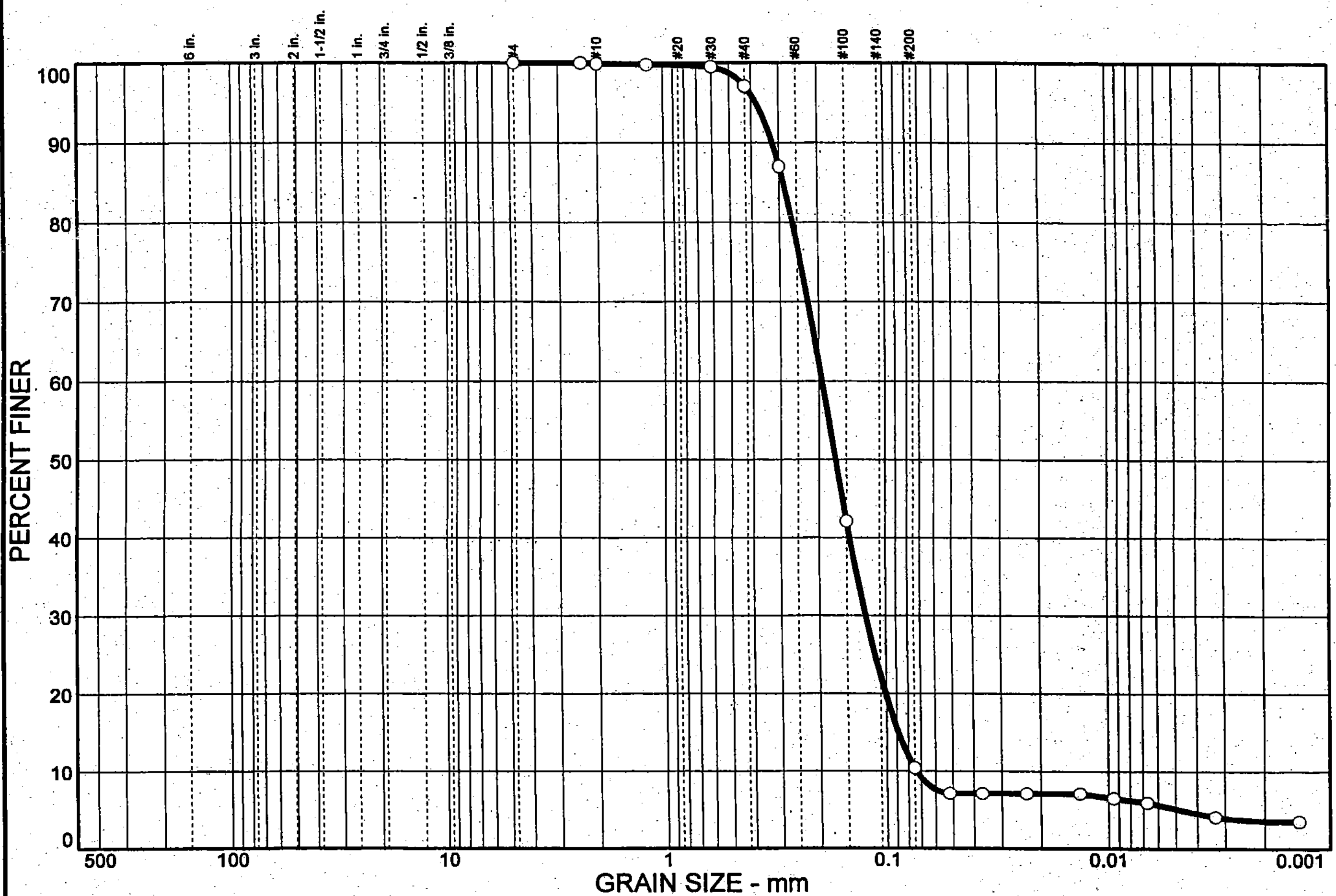
Bag Sample
Specific Gravity - 2.69

Sample No.: #18 **Source of Sample:** **Date:** 09/24/05
Location: Boring #1014 **Elev./Depth:** 183.5'-185.0'

SOUTHERN COMPANY

Client: SCS-Rhonda Tinsley and Steve Bearce
Project: Southern Nuclear/Plant Vogtle ESP
Project No.: V003-DE **Lab#** 25

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	89.6	5.3	5.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	100.0		
#10	99.9		
#16	99.8		
#30	99.5		
#40	97.1		
#50	87.0		
#100	42.1		
#200	10.4		

* (no specification provided)

Soil Description

Gray Poorly graded sand with silt

Atterberg Limits

PL= NA LL= NA PI= NA

Coefficients

D_{85}= 0.288 D_{60}= 0.194 D_{50}= 0.168
D_{30}= 0.123 D_{15}= 0.0887 D_{10}= 0.0735
C_u= 2.64 C_c= 1.07

Classification

USCS= SP-SM AASHTO=

Remarks

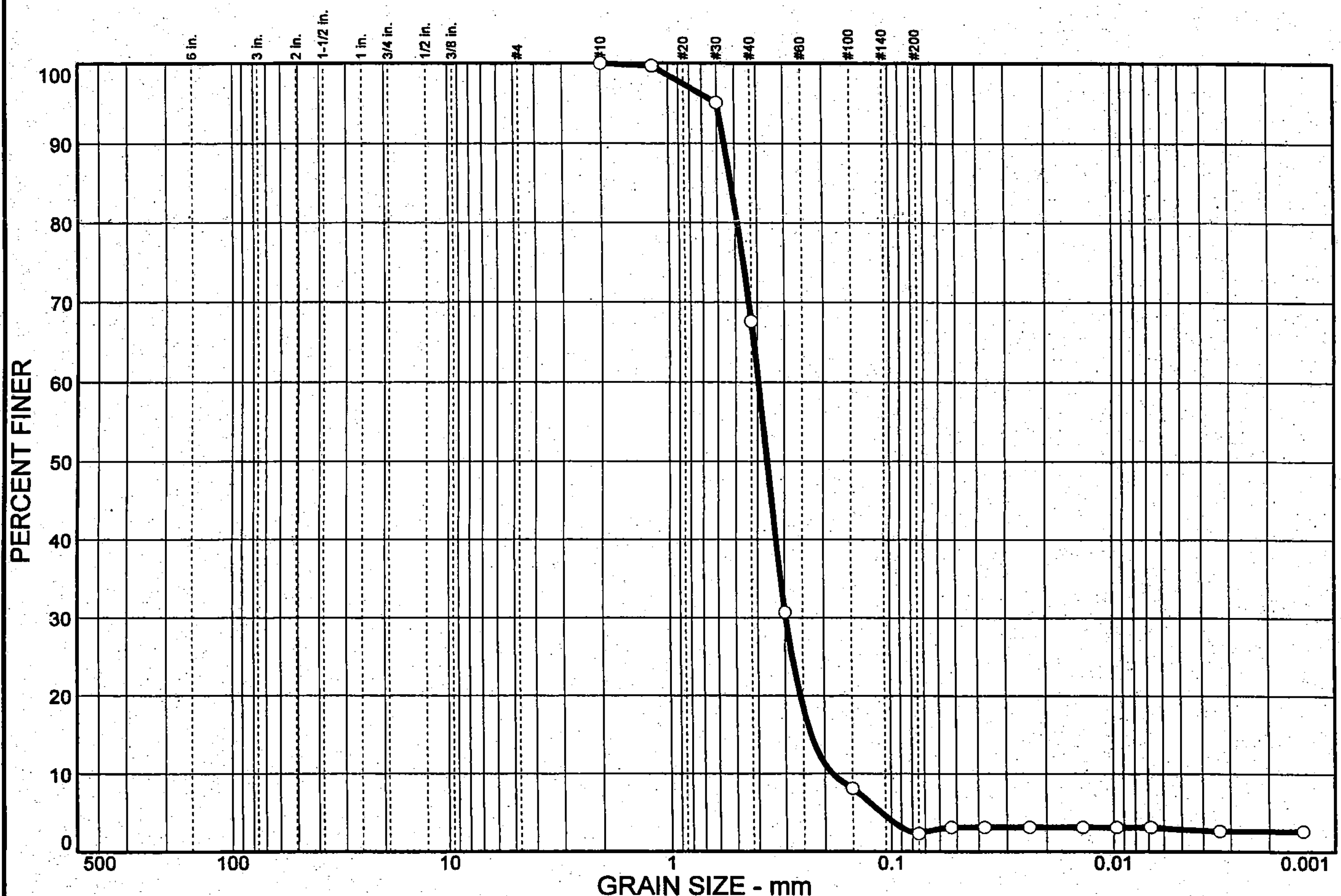
Bag Sample
Specific Gravity - 2.66

Sample No.: #19 **Source of Sample:** **Date:** 08/24/09
Location: Boring #1014 **Elev./Depth:** 188.5'-190.0'

SOUTHERN COMPANY

Client: SCS-Rhonda Tinsley and Steve Bearce
Project: Southern Nuclear/Plant Vogtle ESP
Project No: V003-DE **Lab#** 26

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	97.7		2.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#16	99.7		
#30	95.1		
#40	67.6		
#50	30.7		
#100	8.1		
#200	2.3		

* (no specification provided)

Soil Description

Very Light Tan Poorly graded sand

Atterberg Limits

PL= NA LL= NA PI= NA

Coefficients

D_{85}= 0.521 D_{60}= 0.395 D_{50}= 0.362
D_{30}= 0.298 D_{15}= 0.230 D_{10}= 0.184
C_u= 2.15 C_c= 1.22

Classification

USCS= SP AASHTO=

Remarks

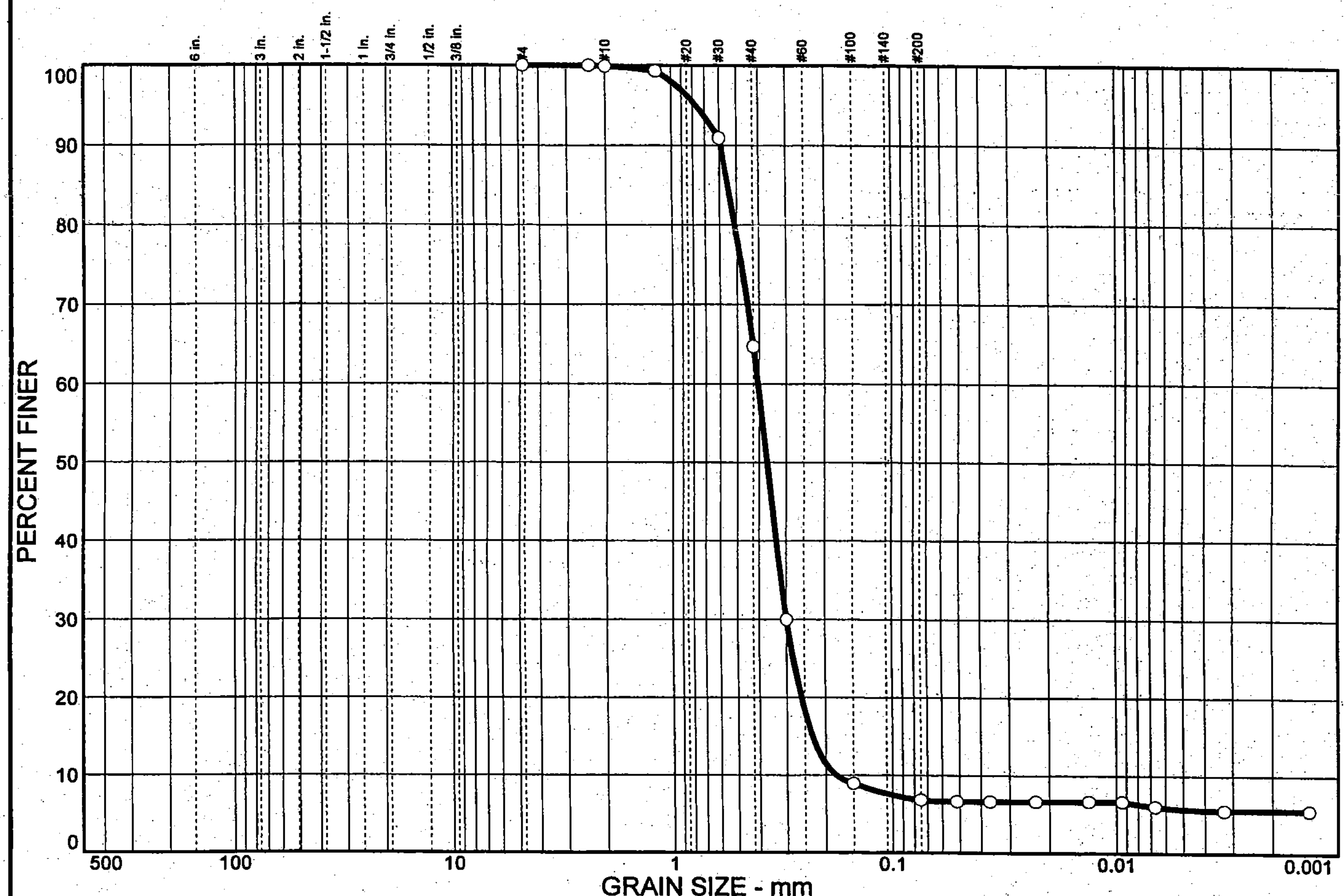
Jar Sample
Specific Gravity - 2.63

Sample No.: #19 **Source of Sample:** **Date:** 08/24/05
Location: Boring #1015 **Elev./Depth:** 93.5'-95.0'

SOUTHERN COMPANY

Client: SCS-Rhonda Tinsley and Steve Bearce
Project: Southern Nuclear/Plant Vogtle ESP
Project No: [illegible]26 V003-DE **Lab#** 27

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	93.2	1.1	5.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	100.0		
#10	99.9		
#16	99.3		
#30	90.9		
#40	64.7		
#50	30.0		
#100	8.9		
#200	6.8		

* (no specification provided)

Soil Description

Very Light Tan Poorly graded sand with silt

Atterberg Limits

PL= NA LL= NA PI= NA

Coefficients

D_{85}= 0.549 D_{60}= 0.405 D_{50}= 0.368
D_{30}= 0.300 D_{15}= 0.230 D_{10}= 0.180
C_u= 2.25 C_c= 1.23

Classification

USCS= SP-SM AASHTO=

Remarks

Jar Sample
Specific Gravity - 2.67

Sample No.: #20 **Source of Sample:** **Date:** 08/24/05
Location: Boring #1015 **Elev./Depth:** 93.5'-100.0'

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APPENDIX J

SITE PHOTOS