

# GROUNDWATER MONITORING PLAN (rev. 1)

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PLANT YATES  
INACTIVE CCR LANDFILL – GYPSUM STACK

COWETA COUNTY, GEORGIA

FOR



Georgia  
Power

May 2021



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## I. CERTIFICATION

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I hereby certify that this Groundwater Monitoring Plan was prepared by, or under the direct supervision of, a “Qualified Groundwater Scientist,” in accordance with the Georgia Environmental Protection Division (EPD) Rules of Solid Waste Management, Chapter 391-3-3.10(6). According to 391-3-4-.01(57), a Qualified Groundwater Scientist is “a professional engineer or geologist registered to practice in Georgia who has received a baccalaureate or post-graduate degree in the natural sciences or engineering and has sufficient training and experience in groundwater hydrology and related fields that enable individuals to make sound professional judgments regarding groundwater monitoring, contaminant fate and transport, and corrective action.” The design of the groundwater monitoring system was developed in compliance with the Georgia Environmental Protection Division (GA EPD) Rules of Solid Waste Management, Chapter 391-3-4.10(6).

Signature: \_\_\_\_\_

Date: 2021-05-07



## 1. INTRODUCTION

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Groundwater monitoring is required by the Georgia Environmental Protection Division (EPD) to detect and quantify potential changes in groundwater chemistry. This Groundwater Monitoring Plan (plan) describes the groundwater monitoring program for the site. This plan meets the requirements of EPD rules and uses EPD's Manual for Ground Water Monitoring dated September 1991 as a guide. Groundwater monitoring well locations are presented on Figure 1 of Appendix A and monitoring well construction details presented in Appendix A, Table 1.

Monitoring will occur in accordance with 391-3-4-.10 of the Georgia Solid Waste Management Rules. If the monitoring requirements specified in this plan conflict with EPD rules (391-3-4), the EPD rules will take precedent.

The Gypsum Stack Landfill (Gypsum Stack) was permitted by Georgia EPD on February 14, 1992. The facility-initiated closure activities in 2015 that included removal of all coal combustion residuals (CCR). In accordance with the United States Environmental Protection Agency (USEPA) Coal Combustion Rule (§257.90), which is incorporated in the Georgia State CCR Rule by reference, a detection monitoring well network for Gypsum Stack has been installed. The existing monitoring wells were installed following the guidelines presented herein. Additionally, this plan documents the methods for future monitoring well installation and/or replacement, and procedures for well abandonment. As required by 391-3-4.10(6)(g), a minor modification will be submitted to the EPD prior to the unscheduled installation or abandonment of monitoring wells. Well installation and/or abandonment must be directed by a qualified groundwater scientist. Currently, routine assessment monitoring is completed as required by 391-3-4.10(6)(a) and §257.95.

## 2. GEOLOGIC AND HYDROGEOLOGIC CONDITIONS

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A detailed overview of site geology and hydrogeology was provided in *The Geology and Hydrogeology of the Plant Yates CT-121 Project Stacking Area*. This document was prepared by Southern Company Services, Inc. during permitting of the former gypsum landfill in the early 1990s. The former landfill was located within Plant Yates property approximately 0.5 miles north of the CCR pond area. The Hydrogeological Assessment report provides a comprehensive review of the site's geology and hydrogeology.

Plant Yates lies within the Inner Piedmont of western Georgia, immediately southeast of the Brevard Fault Zone, an inactive fault which forms the northern boundary of the Inner Piedmont and the Dadeville Complex lithologies. The rocks in the area have been subjected to several episodes of metamorphism and intrusion by igneous bodies, creating a complex geologic picture. Surface expressions of the joints are observed on topographic maps and aerial photos of the Plant Yates area.

Granitic gneiss and schist units have been identified in the Plant Yates area. Both units are covered by a thick layer of saprolite. The schist unit is a sequence of amphibolites interlayered with chlorite schists and other metasedimentary rocks. Amphibolites are well foliated and may be retrograded to chlorite. The granitic gneiss is metamorphosed light-gray granitic pluton of medium- to coarse-grained texture. The unit is exposed in outcrops that trend northeast.

A thin layer soil from one to two feet thick overlies a thick layer of saprolite. The saprolite, which extends to typical depths of 20-40 feet below ground surface, was formed from the weathering of the underlying metamorphic rocks. There is typically a zone of variable thickness (approximately 5-20 feet) of weathered rock between the saprolite and competent bedrock.

Shallow groundwater is typically encountered near the saprolite/weathered rock interface. Bedrock becomes increasing competent with depth and movement of groundwater occurs only in fractures (i.e., secondary porosity). Recharge to the water-bearing zones in fractured bedrock takes place by seepage through the overlying mantle of soil/saprolite, or by direct entrance through openings in outcrops. A recent water table elevation contour map showing overall flow directions is provided in Appendix A, Figure 2. Average depth of the water table at Plant Yates varies with topography (range of approximately 5 to 50 feet below ground surface).

At the site, groundwater in the saturated overburden represents the uppermost aquifer. This uppermost aquifer is comprised of both residual soils, saprolite, and partially weathered rock, and is generally unconfined. It is recharged by precipitation stored in residual soils and typically discharges to streams. Groundwater stored in the overburden also recharges the underlying bedrock through preferentially weathered discontinuities in the bedrock and discharges to streams through inter-connected bedrock fractures. Hydraulic conductivity (K) is defined as the rate at which water can move through a permeable medium. In situ rising head and falling slug tests were performed at multiple locations at the Gypsum Stack to determine horizontal K values. Vertical K values for locations throughout Plant Yates were determined by laboratory testing of undisturbed overburden samples (Shelby Tubes) collected at multiple Plant Yates locations. The range in K values at these locations was small, indicating a fairly uniform hydrogeologic layers across the saprolite and weathered rock horizon (typically range from  $10^{-3}$  cm/sec to  $10^{-4}$  cm/sec). Tables 1A and 1B, Horizontal and Vertical Hydraulic Conductivity Data Summary, present summaries of the K testing values from Plant Yates monitoring wells and piezometers laboratory test results for locations throughout Plant Yates. The values from the field and laboratory tests fall within the

standard range of hydraulic conductivity values associated with a silty sand. Supporting data for Table 1 are provided in Appendix B, Hydraulic Conductivity Testing Results.

The horizontal hydraulic gradient across the former Gypsum Stack was measured during the August and September 2020 groundwater monitoring events from GWA-2 to GWC-4R resulting with an average estimated horizontal gradient of 0.033 ft/ft.

Average groundwater flow velocity in the Gypsum Stack area is based on hydraulic conductivity (K), lateral gradient (i) and effective porosity ( $P_e$ ). The average K for the site is 1054 feet/year, and the gradient across Gypsum Stack (September 2020) was 0.033 ft/ft, and the effective porosity ( $n_e$ ) was estimated at 0.20. The average groundwater velocity is calculated as:

$$V_{gw} = (K)(i)/n_e = ((1054 \text{ ft/year}) (0.033 \text{ ft/ft})/0.20 \text{ ft/ft}) = 174 \text{ feet/year.}$$

**TABLE 1A**  
**HORIZONTAL HYDRAULIC CONDUCTIVITY DATA**

Location	Test	Hydraulic Conductivity (cm/sec)	Hydraulic Conductivity (ft/day)	Hydraulic Conductivity (ft/yr)
GWA-2	Slug-In Test	1.10E-03	3.12	1136
	Slug-Out Test	1.82E-03	5.16	1880
GWC-1R	Slug-In Test	8.41E-04	2.39	871
	Slug-Out Test	7.79E-04	2.22	806
GWC-2R	Slug-In Test	2.21E-03	6.29	2289
	Slug-Out Test	2.14E-03	6.08	2213
GWC-3R	Slug-In Test	1.19E-03	3.37	1226
	Slug-Out Test	9.30E-04	2.65	963
GWC-4R	Slug-In Test	1.66E-03	4.72	1718
	Slug-Out Test	1.67E-03	4.75	1728
GWC-5R	Slug-In Test	4.17E-04	1.19	432
	Slug-Out Test	4.58E-04	1.30	474
GWC-6R	Slug-In Test	5.77E-04	1.64	597
	Slug-Out Test	6.14E-04	1.75	635
Slug-In Test Geometric Mean		9.95E-04	2.83	1030
Slug-out Test Geometric Mean		1.04E-03	2.96	1077

Notes:

1. Slug Tests performed by ACC, Inc. personnel 4/5-6, 2021.
2. Slug constructed of sand filled 1" x 5' PVC pipe sealed with threaded end caps.
3. Testing performed in general accordance with ASTM D4044.
4. Water level changes measured using a level Troll 700 transducer (30 psi).
5. Data analysis performed using AQTESOLV software by the Bouwer-Rice method for an unconfined aquifer.

**TABLE 1B**  
**SITEWIDE VERTICAL HYDRAULIC CONDUCTIVITY**

Location	Depth (ft bgs)	Hydraulic Conductivity (cm/sec)	Hydraulic Conductivity (ft/day)	Hydraulic Conductivity (ft/yr)
YGWA-17S	17 - 19	6.91E-04	1.96	715
YGWC-19S	17 - 19	1.78E-04	0.50	184
YGWA-20S	17 - 19	9.72E-05	0.28	101
YGWC-22S	7 – 9	1.63E-03	4.62	1688
YGWC-22S	17 - 19	4.66E-04	1.32	485
YGWC-24S	17 - 19	2.51E-03	7.11	2599
YGWC-24S	37 - 39	2.50E-05	0.07	26
PZ-25S	33 - 35	4.13E-05	0.12	43
PZ-25S	44 - 46	2.00E-04	0.57	207
YGWC-26S	17 - 19	1.79E-06	0.01	1.9
YGWC-26S	27 - 29	3.36E-05	0.10	35
YGWC-27S	17 - 19	4.58E-07	0.00	0.5
YGWC-27S	27 – 29	3.56E-06	0.01	3.7
YGWC-28S	17 - 19	2.08E-07	0.00	0.2
PZ-30S	27 – 29	1.38E-05	0.04	14
PZ-31S	44 – 46	7.85E-04	2.23	813
Geometric Mean		4.88E-05	0.14	51

Notes:

1. Data from Shelby Tube sample analysis completed by Cardno ATC, 2015.
2. All locations original IDs were originally pre-fixed with “PZ”; pre-fixes of locations incorporated into a groundwater monitoring network were changed to “YGWA” or “YGWC” as appropriate.
3. ft bgs = feet below ground surface
4. cm/sec = centimeters per second; ft/day = feet per day; ft/yr = feet per year

### 3. WELL LOCATIONS

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Groundwater monitoring wells are installed to monitor the uppermost occurrence of groundwater beneath the site. Locations were selected based on the former waste unit layout and site geologic and hydrogeologic considerations. Locations were chosen to serve as upgradient (GWA designation) or downgradient (GWC designation) based on groundwater flow direction determined by potentiometric evaluation. The well naming nomenclature is based on Georgia EPD's Industrial Waste Disposal Site Design and Operations Plan – Supplemental Data for Solid Waste Handling Permit (undated).

A map depicting monitoring well locations is included in Appendix A (Figure 1, Groundwater Monitoring Plan). A tabulated list of individual monitoring wells with well construction details such as location coordinates, top-of-casing elevation, well depths and screened intervals is included in Appendix A, Table 1. A September potentiometric map was prepared for the uppermost aquifer in the area of the Gypsum Stack and is illustrated on Figure 2, Appendix A. Any change to the groundwater monitoring network must be made by a minor modification to the permit pursuant to 391-3-4.10(6)(g)7.

Upgradient monitoring well GWA-2 is utilized as part of the monitoring network system. This monitoring well is located to the east of the former Gypsum Stack.

The following six downgradient monitoring wells are utilized as part of the monitoring network system; GWC-1R, GWC-2R, GWC-3R, GWC-4R, GWC-5R and GWC-6R. The monitoring well locations are shown in Appendix A, Figure 1. Boring logs and well construction diagrams for the existing monitoring wells are provided In Appendix C, Boring Logs and Well Construction Diagrams.



## **4. MONITORING WELL DRILLING, CONSTRUCTION, ABANDONMENT & REPORTING**

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The existing monitoring well network at the Gypsum Stack is in place. Existing monitoring wells were installed following the latest version of the Region 4 USEPA Science and Ecosystem Support Division Operating Procedure for Design and Installation of Monitoring Wells as a general guide for best practices. Monitoring well construction data are provided on Table 1, Appendix A.

### **4.1 DRILLING**

A variety of well drilling methods are available for the purpose of installing groundwater wells. Drilling methodology options include, but are not limited to hollow stem augers, direct push, air rotary, mud rotary, and rotosonic techniques. The drilling method shall minimize the disturbance of subsurface materials and shall not cause impact to the groundwater. Borings will be advanced using an appropriate drilling technology capable of drilling and installing a well in the site-specific geology. Monitoring wells will be installed using the most current version of the USEPA SED SEDGUID-101-R1 as a general guide for best practices. Drilling equipment shall be decontaminated before use and between borehole locations using the procedures described in the latest version of the Region 4 U.S. Environmental Protection Agency Science and Ecosystem Support Division Operating Procedure for Field Equipment Cleaning and Decontamination as a guide.

Sampling and/or coring may be used to help determine the stratigraphy and geology. Samples will be logged by trained personnel working under the direction of a Professional Geologist/Engineer registered in the State of Georgia. Screen depths will be chosen based on the depth of the uppermost aquifer.

All drilling for any subsurface hydrologic investigation, installation, or abandonment of groundwater monitoring wells must be performed by a driller that has, at the time of installation, a performance bond on file with the Water Well Standards Advisory Council.

### **4.2 DESIGN AND CONSTRUCTION**

Well construction materials will be sufficiently durable to resist chemical and physical degradation and will not interfere with the quality of groundwater samples.

#### WELL CASINGS AND SCREENS

American Society for Testing and Materials International (ASTM), National Science Foundation (NSF) rated, Schedule 40, 2-inch diameter polyvinyl chloride (PVC) pipe with flush threaded connections will be used for the well riser and screens. Compounds that can cause PVC to deteriorate (e.g., organic compounds) are not expected at this facility. If conditions warrant, other appropriate materials may be used for construction with prior written approval from the EPD.

#### WELL INTAKE DESIGN

The design and construction of the intake of the groundwater wells shall: (1) allow sufficient groundwater flow to the well for sampling; (2) minimize the passage of formation materials (turbidity) into the well; and (3) ensure sufficient structural integrity to prevent the collapse of the intake structure.

Each groundwater monitoring well will include a well screen designed to limit the amount of formation material passing into the well when it is purged and sampled. Screens with 0.010-inch slots have proven effective for the earth materials at the site and will be used unless geologic conditions discovered at the time of installation dictate a different size. Screen length shall not exceed 10 feet without justification as to why a longer screen is necessary (e.g., significant variation in groundwater level). If the above prove ineffective for developing a well with sufficient yield or acceptable turbidity, further steps will be taken to ensure that the well screen is appropriately sized for the formation material. This may include performing sieve analysis of the formation material and determining well screen slot size based on the grain size distribution.

Pre-packed dual-wall well screens may be used for well construction. Pre-packed well screens combine a centralized inner well screen, a developed filter sand pack, and an outer conductor screen in one integrated unit composed of inert materials. Pre-packed well screens will be installed following general industry standards and using the latest version of the Region 4 U.S. Environmental Protection Agency Science and Ecosystem Support Division Operating Procedure for Design and Installation of Monitoring Wells as a general guide.

#### FILTER PACK AND ANNULAR SEAL

The materials used to construct the filter pack were clean quartz sand of a size that is appropriate for the screened formation. Fabric filters were not used as filter pack material. Sufficient filter material will be placed in the hole and measurements taken to ensure that no bridging occurs. Upon placement of the filter pack, the well may be pumped to assure settlement of the pack. If pumping is performed, the top of filter pack depth will be measured, and additional sand added if necessary. The filter pack will extend approximately one to two feet above the top of the well screen.

The materials used to seal the annular space must prevent hydraulic communication between strata and prevent migration from overlying areas into the well screen interval. A minimum of two feet of bentonite (chips, pellets, or slurry) will be placed immediately above the filter pack. The bentonite seal will extend up to the base of any overlying confining zone or the top of the water-bearing zone to prevent cementitious grout from entering the water-bearing or screened zone. If dry bentonite is used, the bentonite must be hydrated with potable water prior to grouting the remaining annulus.

The annulus above the bentonite seal will be grouted with a cement and bentonite mixture (approximately 94 pounds cement / 3 to 5 pounds bentonite / 6.5 gallons of potable water) placed via tremie pipe from the top of the bentonite seal. During grouting, care will be taken to assure that the bentonite seal is not disturbed by locating the base of the tremie pipe approximately 2 feet above the bentonite seal and injecting grout at low pressure/velocity.

#### PROTECTIVE CASING AND WELL COMPLETION

After allowing the grout to settle, the well will be finished by installing a flush-mount or above-ground protective casing as appropriate, and building a surface cap. The use of flush-mount wells will generally be limited to paved surfaces unless site operations warrant otherwise. The surface cap will extend from the top of the cementitious grout to ground surface, where it will become a concrete apron extending

outward with a radius of at least 2 feet from the edge of the well casing and sloped to drain water away from the well.

Each well will be fitted with a cap that contains a hole or opening to allow the pressure in the well to equalize with atmospheric pressure. In wells with above-ground protection, the space between the well casing and the protective casing will be filled with coarse sand or pea-gravel to within approximately 6 inches of the top of the well casing. A small weep hole will be drilled at the base of the metal casing for the drainage of moisture from the casing. Above ground protective covers will be locked.

Protective bollards will be installed around each above-grade groundwater monitoring well. Well construction in high traffic areas will generally be limited unless site conditions warrant otherwise.

The groundwater monitoring well detail attached in Appendix D, Groundwater Monitoring Well Detail, illustrates the general design and construction details for a monitoring well.

#### WELL DEVELOPMENT

Well development will be conducted under supervision of a certified groundwater professional. After well construction is completed, wells will be developed by alternately purging and surging until relatively clear discharge water with little turbidity is observed. The goal will be to achieve a turbidity of less than 5 nephelometric turbidity units (NTUs); however, formation-specific conditions may not allow this target to be accomplished. Development can be discontinued once a minimum turbidity of 10 NTU is achieved. Additionally, the stabilization criteria contained in Appendix E, Groundwater Sampling Procedures should be met. A variety of techniques may be used to develop site groundwater monitoring wells. The method used must create reversals or surges in flow to eliminate bridging by particles around the well screen. These reversals or surges can be created by using surge blocks, bailers, or pumps. The wells will be developed using a pump capable of inducing the stress necessary to achieve the development goals. All development equipment will be decontaminated prior to first use and between wells. Well development data will be included in installation documentation reports.

In low yielding wells, potable water may be added to the well to facilitate surging of the well screen interval and removal of fine-grained sediment. If water is added, the volume will be documented and at a minimum, an equal volume purged from the well.

Many geologic formations contain clay and silt particles that are small enough to work their way through the wells' filter packs over time. Therefore, the turbidity of the groundwater from the monitoring wells may gradually increase over time after initial well development. As a result, the monitoring wells may have to be redeveloped periodically to remove the silt and clay that has worked its way into the filter pack of the monitoring wells. Each monitoring well should be redeveloped when sample turbidity values have significantly increased since initial development or since prior redevelopment. The redevelopment should be performed as described above.

#### **4.3 ABANDONMENT**

Per Georgia Rule 391-3-4-.10(6)(g): Monitoring wells require abandonment and replacement after two consecutive dry sampling events, unless an alternate schedule is approved by the GA EPD. Well abandonment will be directed by a qualified groundwater scientist.

#### 4.4 DOCUMENTATION

The following information documenting the construction and development of each well will be submitted to EPD by a qualified groundwater scientist within 60 days after completing all planned well installations.

- Well identification,
- Name of drilling contractor and type of drill rig,
- Documentation stating that a Georgia-registered professional surveyor shall certify that the horizontal accuracy for the installed monitoring wells is 0.5 feet, and vertical accuracy for top of casing elevations to 0.01 feet using a known datum,
- Documentation that the driller, at the time the monitoring wells were installed, had a bond on file with the Water Well Standards Advisory Council,
- Type of protective well cap and sump dimensions for each well,
- Dates of drilling and initial well emplacement,
- Drilling method and drilling fluid if used,
- Borehole diameter and well casing diameter,
- Well depth ( $\pm 0.1$  ft.),
- Lithologic logs,
- Well casing materials,
- Screen materials and design (i.e., interval in feet below ground surface and elevation),
- Screen length,
- Screen slot size,
- Filter pack material/size and volume (placement narrative),
- Seal emplacement method and type/volume of sealant,
- Surface seal and volumes/mix of annular seal material,
- Well development date,
- Sealant materials and volume,
- Well turbidity following development,
- Narrative of well development method - specific well development,
- Documentation of ground surface elevation ( $\pm 0.01$  ft.),
- Documentation of top of casing elevation ( $\pm 0.01$  ft.), and
- Schematic of the well with dimensions

## 5. GROUNDWATER MONITORING PARAMETERS AND FREQUENCY

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The following describes groundwater sampling requirements with respect to parameters for analysis, sampling frequency, sample preservation and shipment, and analytical methods. Groundwater samples used to provide compliance monitoring data will not be filtered prior to collection.

Table 2, Groundwater Monitoring Parameters and Frequency, presents the groundwater monitoring parameters and sampling frequency. A minimum of eight independent samples from each groundwater are collected and analyzed for 40 CFR 257, Subpart D, Appendix III and Appendix IV test parameters to establish a background statistical dataset. Subsequently, in accordance with 391-3-4-.10(6), the monitoring frequency for the Appendix III parameters is at least semi-annual during the post-CCR removal monitoring period. Assessment monitoring is performed per Chapter 391-3-4-.10, Georgia Rules for Solid Waste Management.

When referenced throughout this plan, Appendix III and Appendix IV parameters refer to the parameters contained in Appendix III and Appendix IV of 40 CFR 257, Subpart D, 80 Fed. Reg. 21468 (April 17, 2015).

If any parameters contained in Appendix I or II of 40 CFR 258, Subpart E, as amended, 56 Fed. Reg. 51032 - 51039 (October 9, 1991) are detected at statistically significant levels above background concentrations, these parameters will continue to be monitored. Appendix I or II analytes for the approved monitoring wells have been historically monitored in accordance with the requirements of Chapter 391-3-4-.14, Rules for Solid Waste Management.

As shown on Table 3, Analytical Methods, groundwater samples will be analyzed using methods specified in USEPA Manual SW-846, EPA 600/4-79-020, Standard Methods for the Examination of Water and Wastewater (SM18-20), USEPA Methods for the Chemical Analysis of Water and Wastes (MCAWW), ASTM, or other suitable analytical methods approved by the Georgia EPD. The method used will be able to reach a suitable practical quantification limit to detect natural background conditions at the facility. The groundwater samples will be analyzed by licensed and accredited laboratories through the National Environmental Laboratory Accreditation Program (NELAP). Field instruments used to measure pH must be accurate and reproducible to within 0.2 Standard Units (S.U.).

**TABLE 2**  
**GROUNDWATER MONITORING PARAMETERS & FREQUENCY**

MONITORING PARAMETER		GROUNDWATER MONITORING	
		Background	Semi-Annual Events
<b>Field Parameters</b>	Temperature	X	X
	pH	X	X
	Specific Conductance	X	X
	Turbidity	X	X
	Dissolved Oxygen	X	X
<b>Appendix I and II Metals (State Permit)</b>	Antimony	X	X
	Arsenic	X	X
	Barium	X	X
	Beryllium	X	X
	Cadmium	X	X
	Chromium	X	X
	Cobalt	X	X
	Copper	X	X
	Lead	X	X
	Mercury	X	X
	Nickel	X	X
	Selenium	X	X
	Silver	X	X
	Thallium	X	X
	Vanadium	X	X
	Zinc	X	X
<b>Appendix III (40 CFR 257)</b>	Boron	X	X
	Calcium	X	X
	Chloride	X	X
	Fluoride	X	X
	pH	X	X
	Sulfate	X	X
	Total Dissolved Solids	X	X

**TABLE 2**  
**GROUNDWATER MONITORING PARAMETERS & FREQUENCY**

MONITORING PARAMETER		GROUNDWATER MONITORING	
		Background	Semi-Annual Events
<b>Appendix IV (40CFR 257)</b>	Antimony	X	Assessment sampling frequency and parameter list determined in accordance with Georgia Chapter 391-3-4.10(6).
	Arsenic	X	
	Barium	X	
	Beryllium	X	
	Cadmium	X	
	Chromium	X	
	Cobalt	X	
	Fluoride	X	
	Lead	X	
	Lithium	X	
	Mercury	X	
	Molybdenum	X	
	Selenium	X	
	Thallium	X	
	Radium 226 & 228	X	

**TABLE 3**  
**ANALYTICAL METHODS**

Parameters	EPA Method Number
Boron	6010B/6020B
Calcium	7140/6010B/6020B
Chloride	300.0/300.1/9250/9251/9253/9056A
Fluoride	300.0/300.1/9214/9056A
pH	150.1field/90405C
Sulfate	9035/9036/9038300.0/300.1/9056A
Total Dissolved Solids (TDS)	160/2540C
Antimony	7040/7041/6010B/6020B
Arsenic	7060A/7061A/6010B/6020B
Barium	7080A/7081/6010B/6020B
Beryllium	7090/7091/6010B/6020B

**TABLE 3**  
**ANALYTICAL METHODS**

Parameters	EPA Method Number
Cadmium	7130/7131A/6020B
Chromium	7190/7191/6010B/6020B
Cobalt	7200/7201/6010B/6020B
Copper	7210/7211/6010B/6020B
Fluoride	300.0/300.1/9214/9056A
Lead	7420/7421/6010B/6020B
Lithium	6010B/6020B
Mercury	7470A/7471B
Molybdenum	6010B/6020B
Nickel	7520/7521/6010B/6020B
Selenium	7740/7741A/6010B/6020B
Silver	7760A/7761/6010B/6020B
Thallium	7840/7841/6010B/6020B
Vanadium	7910/7911/6010B/6020B
Zinc	7950/7951/6010B/6020B
Radium 226 and 228 combined	903/9320/9315



## 6. SAMPLE COLLECTION

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During each sampling event, samples will be collected and handled in accordance with the procedures specified in Appendix E, Groundwater Sampling Procedures. Sampling procedures were developed using standard industry practice and USEPA Region 4 Field Branches Quality System and Technical Procedures as a guide. Low-flow sampling methodology will be utilized for sample collection. Alternative industry accepted sampling techniques may be used when appropriate with prior EPD approval.

For groundwater sampling, positive gas displacement PVC, Teflon™ or stainless steel bladder pumps will be used for purging. If dedicated bladder pumps are not used, portable bladder pumps or peristaltic pumps (with dedicated or disposable tubing) may be used. When non-dedicated equipment is used, it will be decontaminated prior to use and between wells. The applied groundwater purging, and sampling methodologies are discussed in the groundwater semi-annual monitoring reports submitted to EPD.

Per Georgia Rule 391-3-4-.10(6)(g) monitoring wells require replacement after two consecutive dry sampling events. Well installation must be directed by a qualified groundwater scientist. A minor modification shall be submitted in accordance with Rule 391-3-4-.02(3)(b)(6) prior to the installation or decommissioning of monitoring wells.

## 7. CHAIN-OF-CUSTODY

---

All samples will be handled under chain-of-custody (COC) procedures beginning in the field. The COC record will contain the following information:

- Sample identification numbers
- Signature of collector
- Date and time of collection
- Sample type
- Sample point identification
- Number of sample containers
- Notated date(s) and time(s) of sample transfer between individuals
- Signature of person(s) involved in the chain of possession
- Dates of possession by each individual

The samples will remain in the custody of assigned personnel, an assigned agent, or the laboratory. If the samples are transferred to other employees for delivery or transport, the sampler or possessor must relinquish possession and the samples must be received by the new owner.

If the samples are being shipped, a hard copy COC will be signed and enclosed within the shipping container.

Samplers must use COC forms provided by the analytical laboratory or use a COC form similarly formatted and containing the information listed above.

## 8. FIELD AND LABORATORY QUALITY ASSURANCE / QUALITY CONTROL

---

All field quality control samples will be prepared the same as compliance samples with regard to sample volume, containers, and preservation. The following quality control samples will be collected during each sampling event:

Field Equipment Rinsate Blanks - Where sampling equipment is not new or dedicated, an equipment rinsate blank will be collected at a rate of one blank per 10 samples using non-dedicated equipment.

Field Duplicates - Field duplicates will be collected by filling additional containers at the same location, and the field duplicate is assigned a unique sample identification number. One blind field duplicate will be collected for every 20 samples.

Field Blanks - Field blanks will be collected in the field using the same water source that is used for decontamination. The water will be poured directly into the supplied sample containers in the field and submitted to the laboratory for analysis of target constituents. One field blank will be collected for every 20 samples.

Calibration of field instruments occurs daily and follows the recommended (specific) instrument calibration procedures provided by the manufacturer and/or equipment manual specific to each instrument. Daily calibration is documented on field forms and these field forms are included in all groundwater monitoring reports. Instruments are recalibrated as necessary (e.g., when calibration checks indicate significant variability), and all checks and recalibration steps are documented on field calibration forms. Calibration of the instruments is also checked if any readings during sampling activities are suspect. Replacement probes and meters are obtained as a corrective action in the event that recalibration does not improve instrument function. Calibration field forms are provided as part of each groundwater report's quality control documentation.

The groundwater samples will be analyzed by licensed and accredited laboratories through the NELAP.

## 9. REPORTING RESULTS

---

A semi-annual groundwater report that documents the results of sampling and analysis will be submitted to EPD. Semi-annual groundwater monitoring reports will be submitted to the EPD within 90 days of receipt of the groundwater analytical data from the laboratory. At a minimum, semi-annual reports will include:

1. A narrative describing sampling activities and findings including a summary of the number of samples collected, the dates the samples were collected and whether the samples were required by the detection or assessment monitoring programs.
2. A brief overview of purging/sampling methodologies.
3. Discussion of results.
4. Recommendations for the future monitoring consistent with the Rules.
5. Potentiometric surface contour map for the aquifer(s) being monitored, signed and sealed by a Georgia-registered P.G. or P.E.
6. Table of as-built information for groundwater monitoring wells including top of casing elevations, ground elevations, screened elevations, current groundwater elevations and depth to water measurements.
7. Groundwater flow rate and direction calculations.
8. Identification of any groundwater wells that were installed or decommissioned during the preceding year, along with a narrative description of why these actions were taken.
9. A narrative discussion of any transition between monitoring programs (e.g., the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase over background levels.
10. If applicable, semi-annual assessment monitoring results.
11. Any alternate source demonstration completed during the previous monitoring period, if applicable.
12. Laboratory Reports.
13. COC documentation.
14. Field sampling logs including field instrument calibration, indicator parameters and parameter stabilization data.

15. Field logs and forms for each sampling event to include, but not limited to, well signage, well access, sampling and purging equipment condition, and any site conditions that may affect sampling.
16. Documentation of non-functioning wells.
17. Table of current analytical results for each well, highlighting statistically significant increases and concentrations above maximum contaminant level (MCL).
18. Statistical analyses.
19. Certification by a qualified groundwater scientist.

## 10. STATISTICAL ANALYSIS

---

Groundwater quality data from each sampling event will be statistically evaluated to determine if there has been a statistically significant change in groundwater chemistry. Historical background data will be used to determine statistical limits.

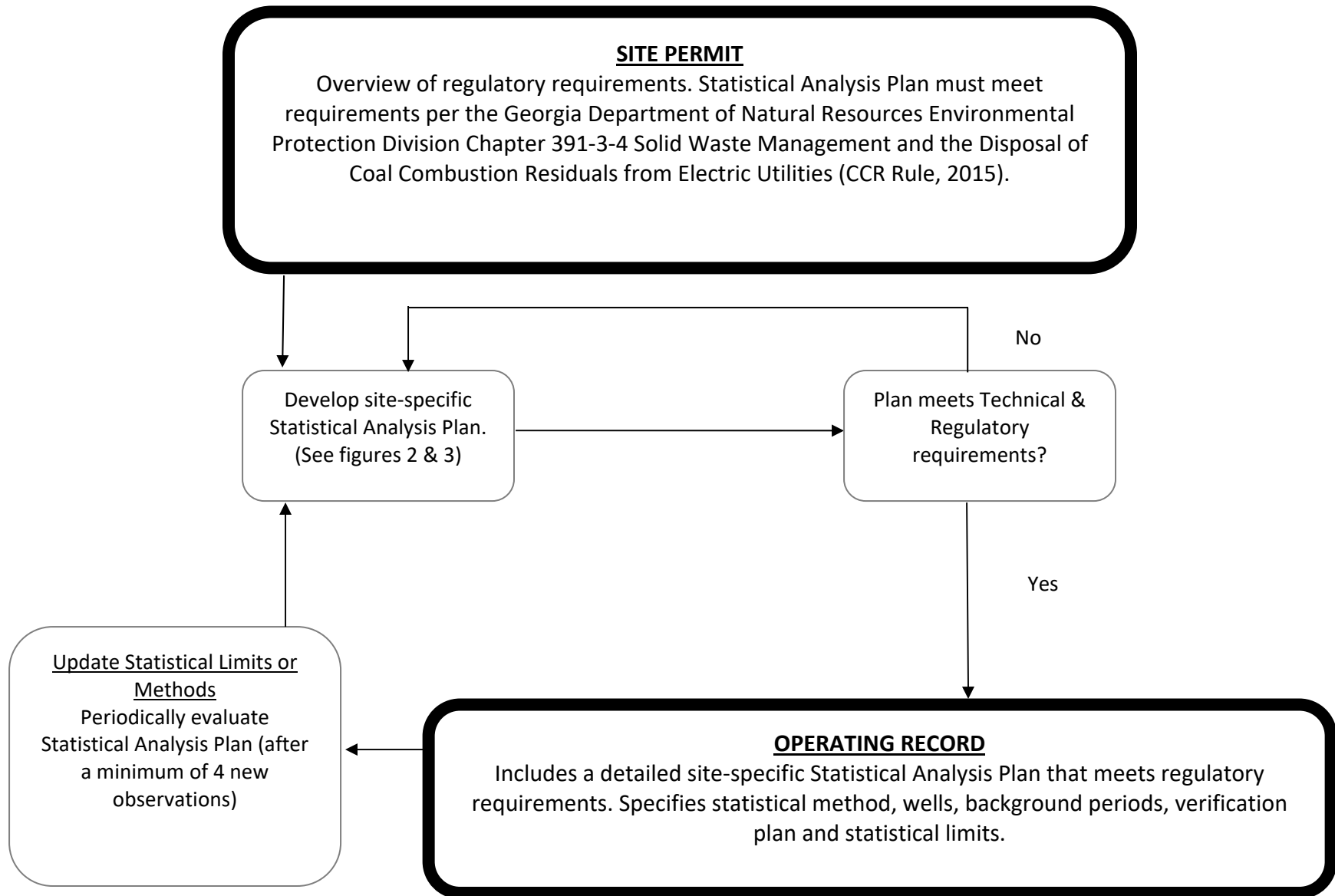
According to EPD rules (391-3-4-.10(6)(a)) the site must specify in the operating record the statistical methods to be used in evaluating groundwater monitoring data for each hazardous constituent. The statistical test chosen shall be conducted separately for each hazardous constituent in each well. As authorized by the rule, statistical tests that will be used include:

1. A prediction interval procedure in which an interval for each constituent is established from the distribution of the background data, and the level of each constituent in each compliance well is compared to the upper prediction limit. (391-3-4-.14(18)(c)).
2. A control chart approach that gives control limits for each constituent. (391-3-4-.14(18)(d)).
3. Another statistical test method (such as prediction limits or control charts) that meets the performance standards of paragraph 391-3-4-.14(19) of the rule (391-3-4-.14(18)(e)). A justification for an alternative method will be placed in the operating record and the Director notified of the use of an alternative test. The justification will demonstrate that the alternative method meets the performance standards of 391-3-4-.14(19).

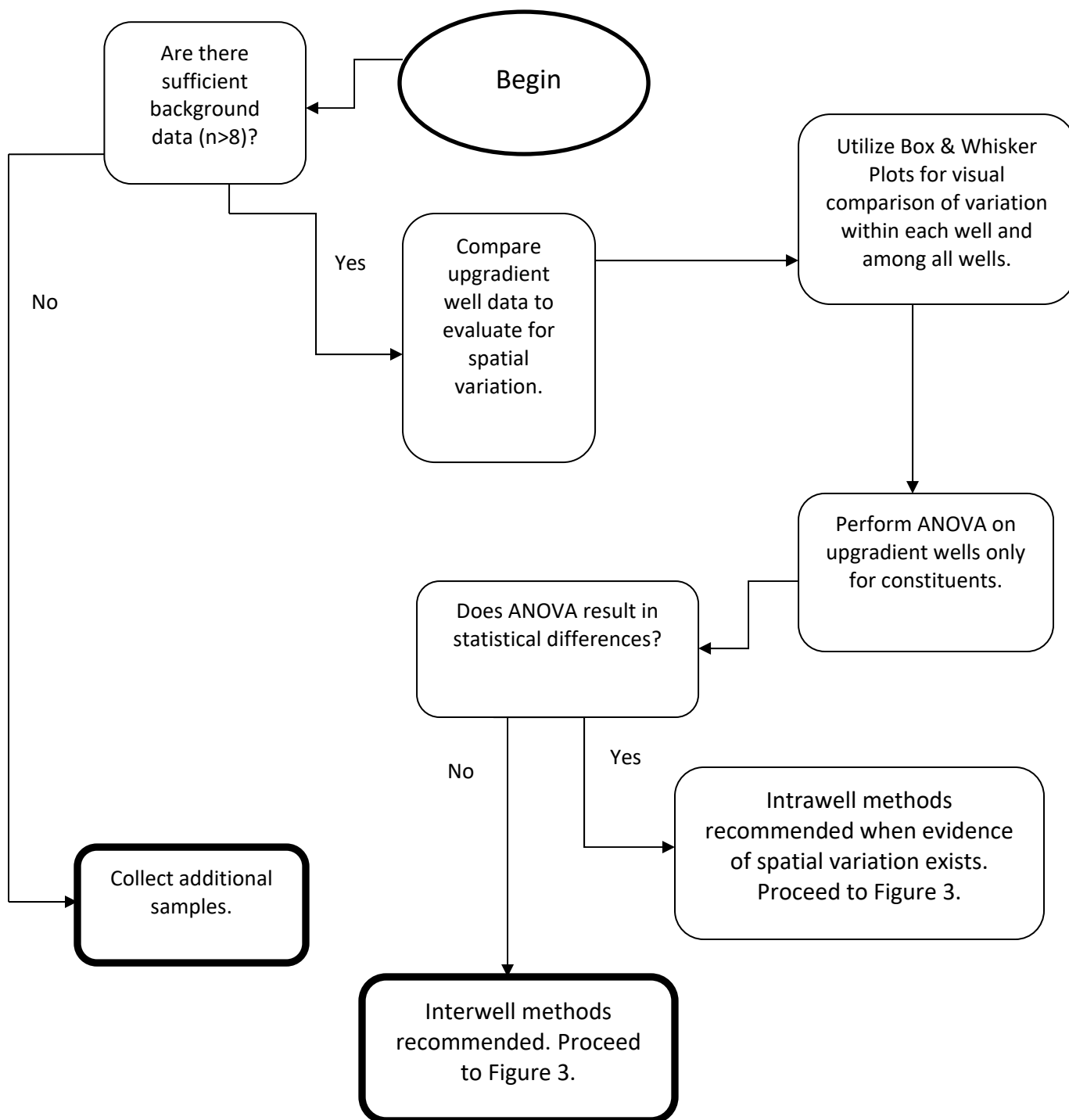
Based on site-specific conditions, statistical methods may be intra-well, inter-well, or combination of both.

A site-specific statistical analysis plan that provides details regarding the statistical methods to be used will be placed in the site's operating record pursuant to 391-3-4-.10(6). Figure 1, Statistical Analysis Plan Overview, includes a flowchart that depicts the process that will be followed to develop the site-specific plan. Figure 2, Decision Logic for Determining Appropriate Statistical Methods, depicts the decision logic that will be used to determine the appropriate method as required by 391-3-4-.10(6). Figure 3, Decision Logic For Computing Prediction Limits, presents the logic that will be used to calculate site-specific statistical limits and test compliance results against those limits.

**FIGURE 1. STATISTICAL ANALYSIS PLAN OVERVIEW**

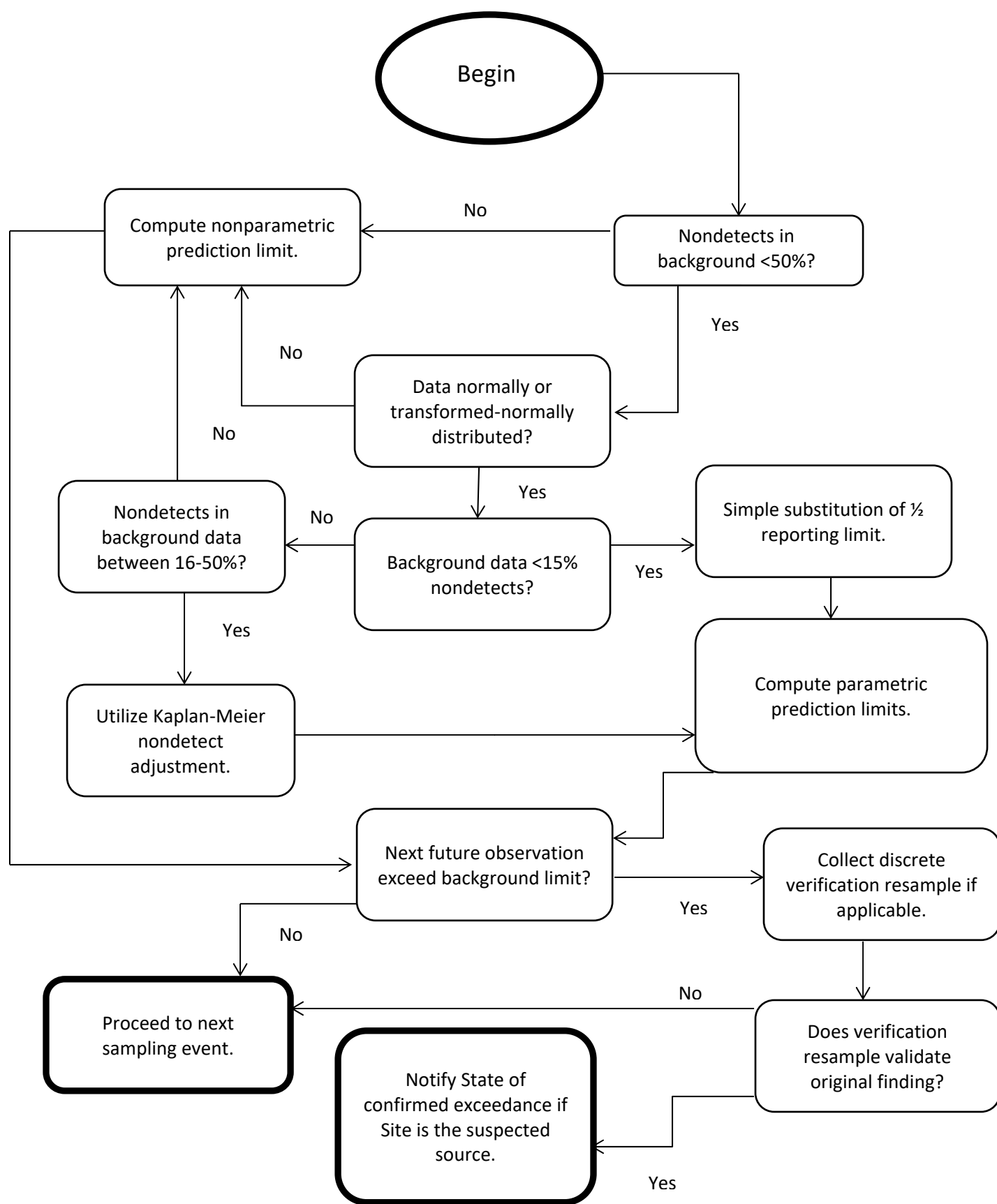


**FIGURE 2. DECISION LOGIC FOR DETERMINING APPROPRIATE STATISTICAL METHOD**





**FIGURE 3. DECISION LOGIC FOR COMPUTING PREDICTION LIMITS**



## **APPENDICES**

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**APPENDIX A. MONITORING SYSTEM DETAILS**

**APPENDIX B. HYDRAULIC CONDUCTIVITY TESTING RESULTS**

**APPENDIX C. BORING LOGS AND WELL CONSTRUCTION DIAGRAMS**

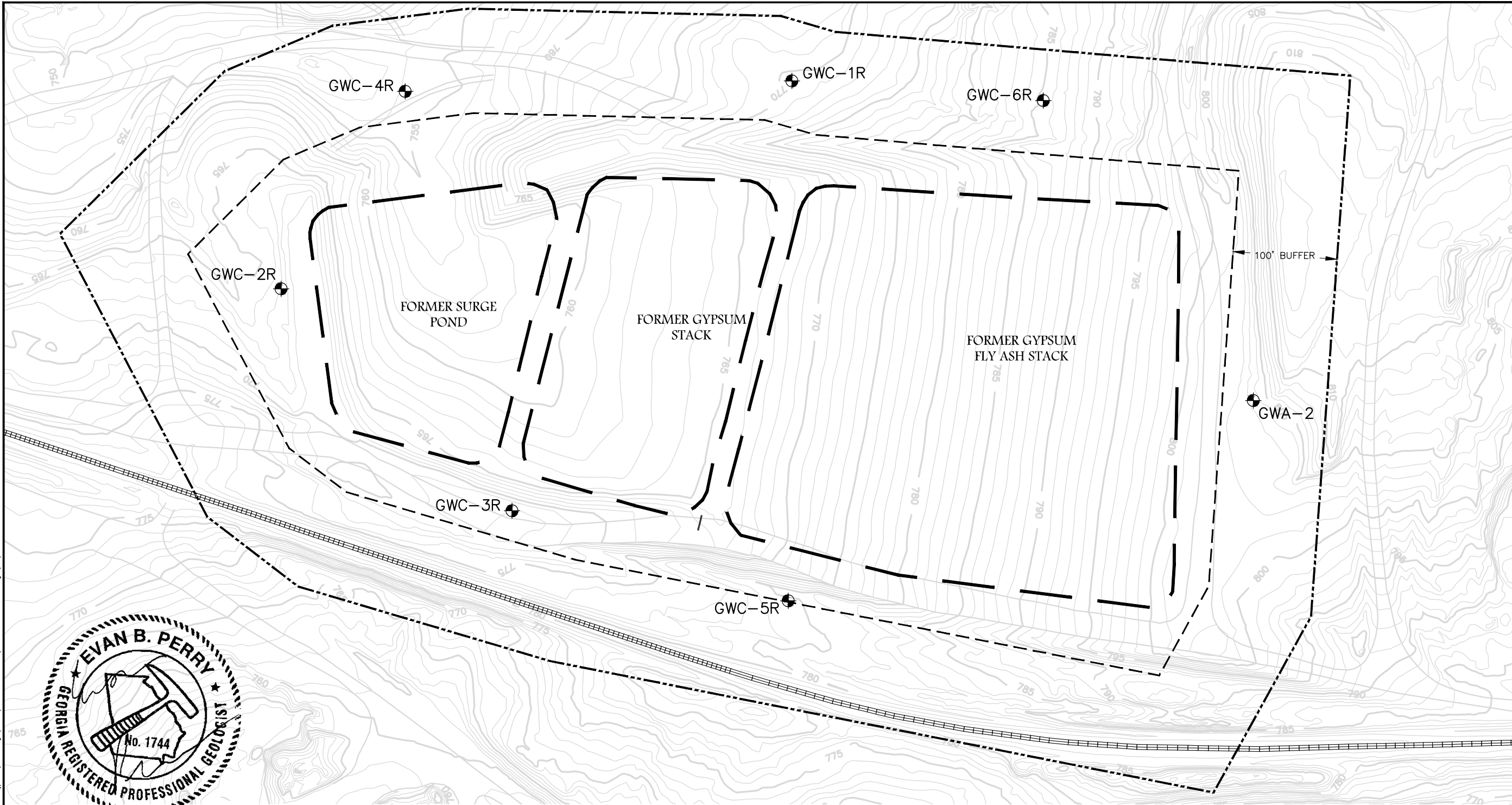
**APPENDIX D. GROUNDWATER MONITORING WELL DETAIL**

**APPENDIX E. GROUNDWATER SAMPLING PROCEDURE**

**APPENDIX A. MONITORING SYSTEM DETAILS**

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P:\Industrial\1054- Southern Company\107- Plant Yates CDR Permitting\1 - CDR Permit Gypsum\Drawings\Bones\2021-03 Revisions\1054-107-GYP-GWMP.dwg 2/26/21 MATT MALONE



GROUNDWATER MONITORING WELLS						
WELL NAME	NORTHING	EASTING	WELL DEPTH (FT BTOC)	TOP OF CASING ELEVATION	WELL SCREEN ELEVATION	DEPTH TO GROUND-WATER (FT BTOC)
GWA-2	1261383.11	2073509.98	52.02	805.62	763.80 - 753.80	34.98
GWC-1R	1261869.77	2073279.85	36.37	773.27	747.20 - 737.20	21.91
GWC-2R	1261942.15	2072755.92	44.00	769.76	736.06 - 726.06	27.96
GWC-3R	1261647.10	2072841.28	38.35	775.25	747.10 - 737.10	27.04
GWC-4R	1262046.56	2072953.68	30.20	757.48	737.58 - 727.58	15.56
GWC-5R	1261439.91	2073027.56	42.35	782.45	750.40 - 740.40	28.25
GWC-6R	1261732.91	2073479.40	55.25	788.98	747.04 - 737.04	34.04
FT BTOC = FEET BELOW TOP OF CASING. ELEVATION DATA ARE RELATIVE TO NAVD88. NORTHINGS AND EASTINGS ARE GEORGIA STATE PLANE WEST (NAD83). DEPTHS TO GROUNDWATER MEASURED SEPTEMBER 2020.						

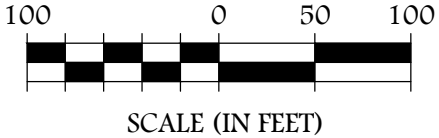
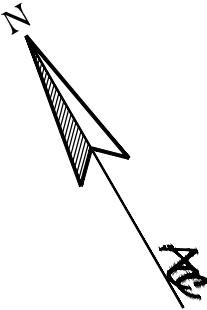
NOTES:

1. TOPOGRAPHIC SURVEY DATED MAY 26, 2017.  
2. REMOVAL OF WASTE MATERIAL AND LINER COMPLETED IN SEPTEMBER 2016.  
3. FINAL COVER SYSTEM AND SITE RESTORATION COMPLETED IN LATE 2016.

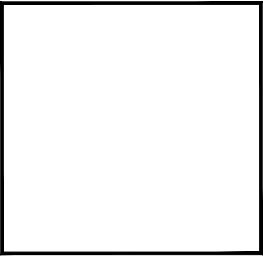
LEGEND:

10 PROMINENT CONTOUR  
2 INTERMEDIATE CONTOUR  
RAILROAD TRACK  
ROAD

GWC-5R GROUNDWATER WELL  
100' BUFFER BOUNDARY  
FORMER LIMITS OF WASTE DISPOSAL  
FORMER WASTE DISPOSAL UNITS



ATLANTIC COAST CONSULTING, INC.  
1150 Northmeadow Pkwy,  
Suite 100  
Roswell, Ga 30076  
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PROJECT:

PLANT YATES GYPSUM STACK

708 Dyer Road  
Newnan, Georgia

Georgia Power

REVISIONS		

Drawn by:	Checked by:	QC by:
MM	EP	MJ

PROJECT NUMBER:

1054-107

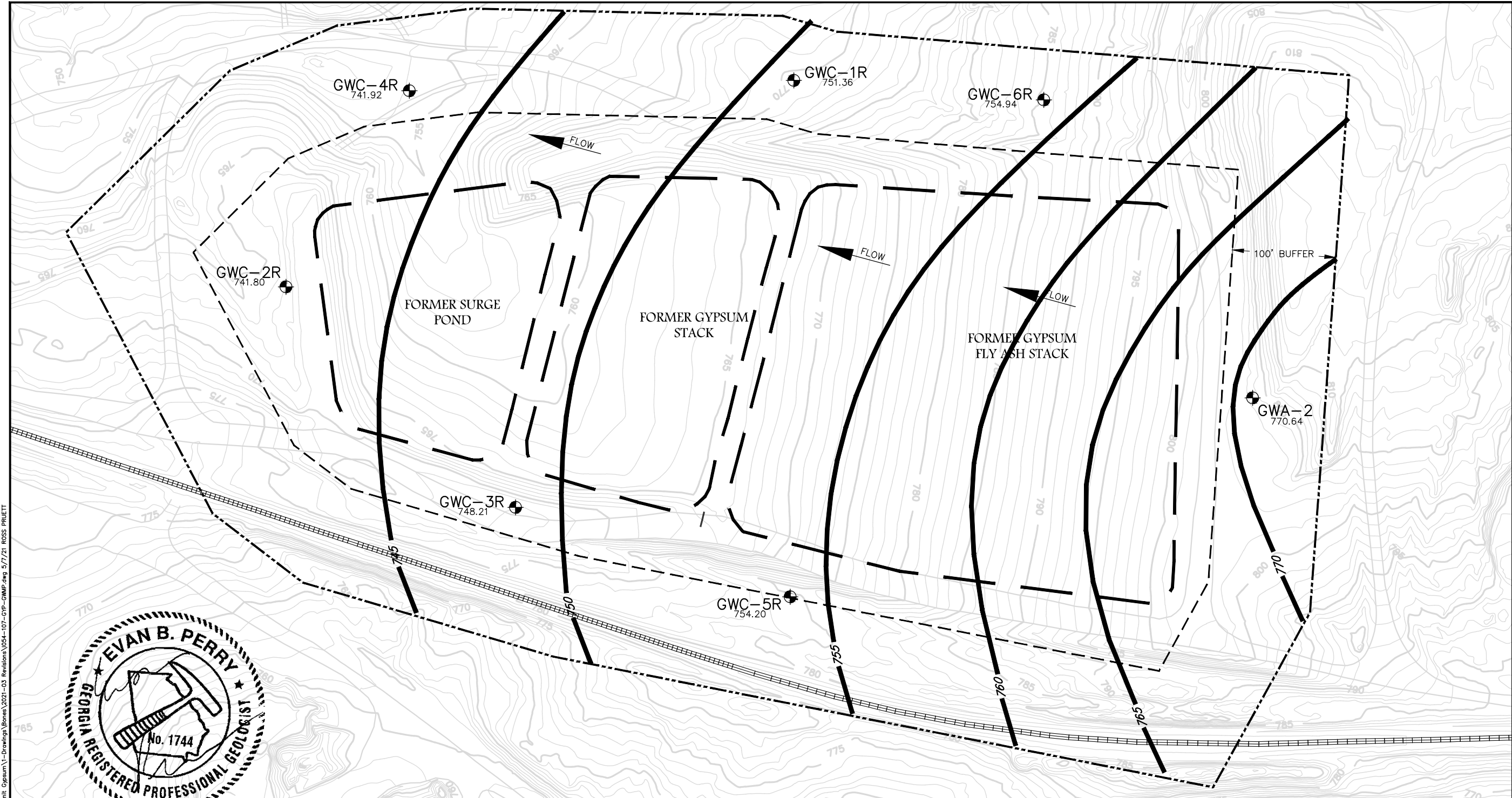
May 2021

MONITORING WELL NETWORK

Figure 1



P:\Industrial\1054- Southern Company\107- Plant Yates CDR Permitting\1 - CDR Permit Gypsum\Drawings\Bones\2021-03 Revisions\1054-107-GYP-GWMP.dwg 5/7/21 RDS PR/ET



GROUNDWATER MONITORING WELLS						
WELL NAME	NORTHING	EASTING	WELL DEPTH (FT BTOC)	TOP OF CASING ELEVATION	WELL SCREEN ELEVATION	GROUND-WATER ELEVATION
GWA-2	1261383.11	2073509.98	52.02	805.62	763.80 - 753.80	770.64
GWC-1R	1261869.77	2073279.85	36.37	773.27	747.20 - 737.20	751.36
GWC-2R	1261942.15	2072755.92	44.00	769.76	736.06 - 726.06	741.80
GWC-3R	1261647.10	2072841.28	38.35	775.25	747.10 - 737.10	748.21
GWC-4R	1262046.56	2072953.68	30.20	757.48	737.58 - 727.58	741.92
GWC-5R	1261439.91	2073027.56	42.35	782.45	750.40 - 740.40	754.20
GWC-6R	1261732.91	2073479.40	55.25	788.98	747.04 - 737.04	754.94

FT BTOC = FEET BELOW TOP OF CASING. ELEVATION DATA ARE RELATIVE TO NAVD88. NORTHINGS AND EASTINGS ARE GEORGIA STATE PLANE WEST (NAD83). DEPTHS TO GROUNDWATER MEASURED SEPTEMBER 2020.

**NOTES:**

1. TOPOGRAPHIC SURVEY DATED MAY 26, 2017.  
2. REMOVAL OF WASTE MATERIAL AND LINER COMPLETED IN SEPTEMBER 2016.  
3. FINAL COVER SYSTEM AND SITE RESTORATION COMPLETED IN LATE 2016.

**LEGEND:**

10

PROMINENT CONTOUR

2

INTERMEDIATE CONTOUR

750

GROUNDWATER CONTOUR

RAILROAD TRACK

ROAD

100' BUFFER BOUNDARY

FORMER LIMITS OF WASTE DISPOSAL

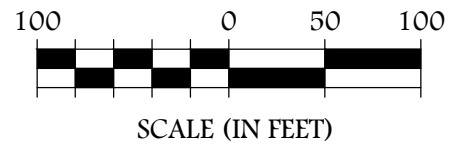
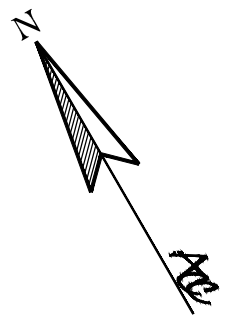
FORMER WASTE DISPOSAL UNITS

GWC-5R

748.90

GROUNDWATER WELL

GROUNDWATER ELEVATION



**ACC**  
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PROJECT:  
**PLANT YATES  
GYPSUM STACK**  
  
708 Dyer Road  
Newnan, Georgia



REVISIONS		

Drawn by:	Checked by:	QC by:
MM	EP	MJ

PROJECT NUMBER:  
  
1054-107  
  
May 2021

SEPTEMBER 2020  
POTENTIOMETRIC  
SURFACE CONTOUR  
MAP

**TABLE 1**  
**GROUNDWATER MONITORING WELL CONSTRUCTION DETAILS**

<b>Upgradient Monitoring Well ID</b>	<b>Total Depth (ft BTOC)</b>	<b>Top of Casing (ft)</b>	<b>Screened Interval Elev. (ft)</b>	<b>Depth to Groundwater (ft BTOC)</b>	<b>September 2020 Groundwater Elevation (ft)</b>	<b>Screened Lithology</b>
GWA-2	52.02	805.62	763.80 – 753.80	34.98	770.64	PWR
YGWA-1I	53.60	836.60	793.3 - 783.3	36.71	799.89	PWR
YGWA-1D	128.85	837.25	759.2 - 709.2	48.22	789.03	Bedrock
YGWA-2I	63.75	866.25	812.8 - 802.8	44.18	822.07	PWR
YGWA-3I	59.05	796.55	747.7 - 737.7	53.32	743.23	PWR
YGWA-3D	134.18	796.78	712.9 - 662.9	23.41	773.37	Bedrock
YGWA-4I	48.81	784.21	745.7 - 735.7	23.45	760.76	PWR
YGWA-5I	58.94	784.54	735.9 - 725.9	19.82	764.72	PWR
YGWA-5D	129.13	784.53	706.0 – 656.0	22.51	762.02	Bedrock
YGWA-14S	34.96	748.76	724.1 - 714.1	17.37	731.39	Saprolite
YGWA-17S	39.85	783.05	753.2 - 743.2	12.62	770.43	Saprolite
YGWA-18S	39.97	790.57	760.9 - 750.9	20.39	770.18	Saprolite
YGWA-18I	79.97	790.57	720.9 - 710.9	23.59	766.98	PWR
YGWA-20S	29.52	767.12	747.9 - 737.9	11.44	755.68	Saprolite
YGWA-21I	79.90	783.70	714.1 - 704.1	31.29	752.41	PWR
YGWA-30I	59.48	762.58	713.4 - 703.4	48.47	714.11	PWR
YGWA-39	68.59	818.19	760.1 - 750.1	21.81	796.38	PWR
YGWA-40	48.23	815.73	778.0 – 768.0	25.44	790.29	PWR
YGWA-47	59.19	758.22	709.6 - 699.6	33.38	724.84	PWR
<b>Downgradient Monitoring Well ID</b>	<b>Total Depth (ft BTOC)</b>	<b>Top of Casing (ft)</b>	<b>Screen Interval Elev. (ft)</b>	<b>Depth to Groundwater (ft BTOC)</b>	<b>September 2020 Groundwater Elevation (ft)</b>	<b>Screened Lithology</b>
GWC-1R	36.37	773.27	747.20 – 737.20	21.91	751.36	Saprolite
GWC-2R	44.00	769.76	736.06 – 726.06	27.96	741.80	Saprolite
GWC-3R	38.45	775.25	747.10 – 737.10	27.04	748.21	Saprolite
GWC-4R	30.20	757.48	737.58 – 727.58	15.56	741.92	Saprolite
GWC-5R	42.35	782.45	750.40 – 740.40	28.25	754.20	Saprolite
GWC-6R	55.25	788.98	747.04 – 737.40	34.04	754.94	PWR

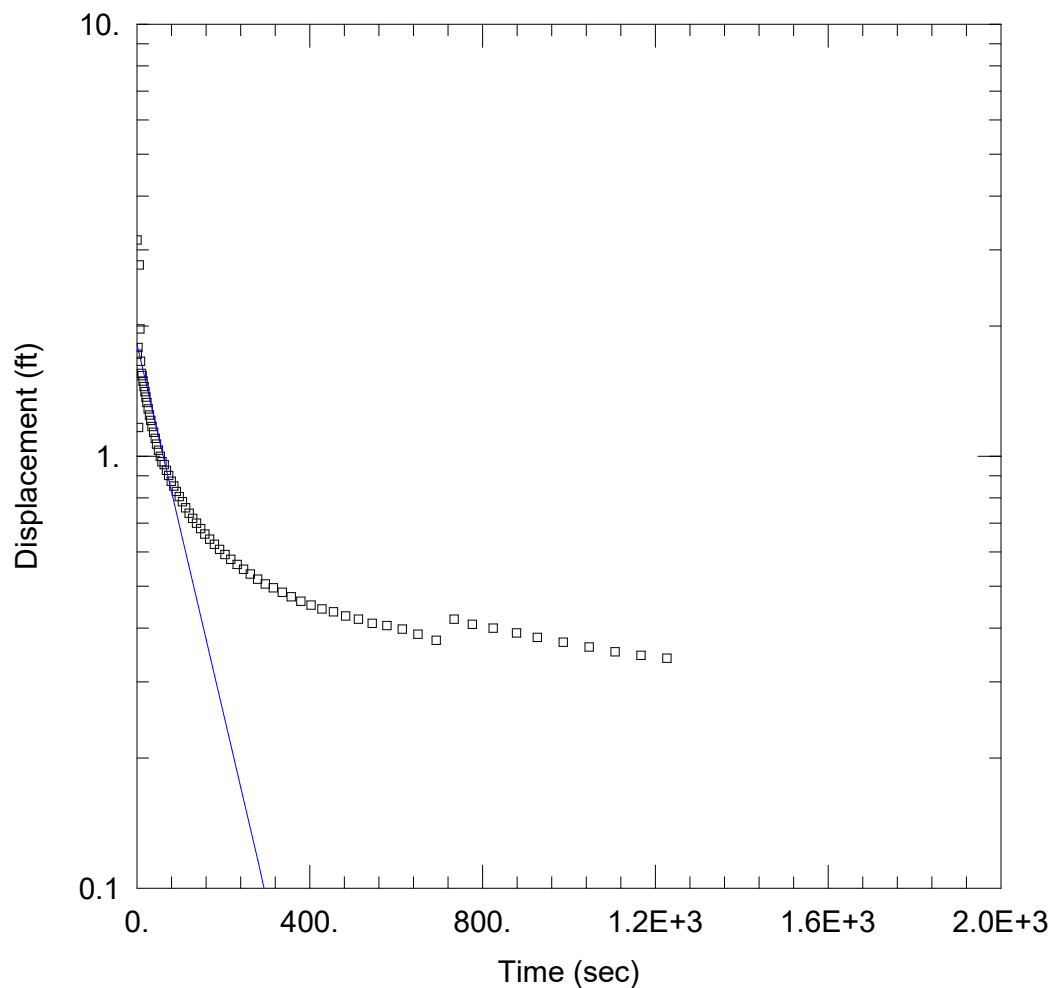
Notes:

ft BTOC = feet below top of casing

Elevation in U.S. Survey Feet (NAVD88) based on June 2020 survey

PWR = Partially Weathered Rock

## **APPENDIX B. HYDRAULIC CONDUCTIVITY TESTING RESULTS**



### WELL TEST ANALYSIS

Data Set: C:\...\GWA-2 IN.aqt

Date: 04/09/21

Time: 13:31:09

### PROJECT INFORMATION

Company: Atlantic Coast Consulting

Project: 1054-107

Location: Plant Yates Gypsum Landfill

Test Well: GWA-2 IN

Test Date: 4/6/2021

### AQUIFER DATA

Saturated Thickness: 16.34 ft

Anisotropy Ratio ( $K_z/K_r$ ): 1.

### WELL DATA (GWA-2)

Initial Displacement: 3.162 ft

Total Well Penetration Depth: 16.34 ft

Casing Radius: 0.0833 ft

Static Water Column Height: 16.34 ft

Screen Length: 10. ft

Well Radius: 0.25 ft

Gravel Pack Porosity: 0.3

### SOLUTION

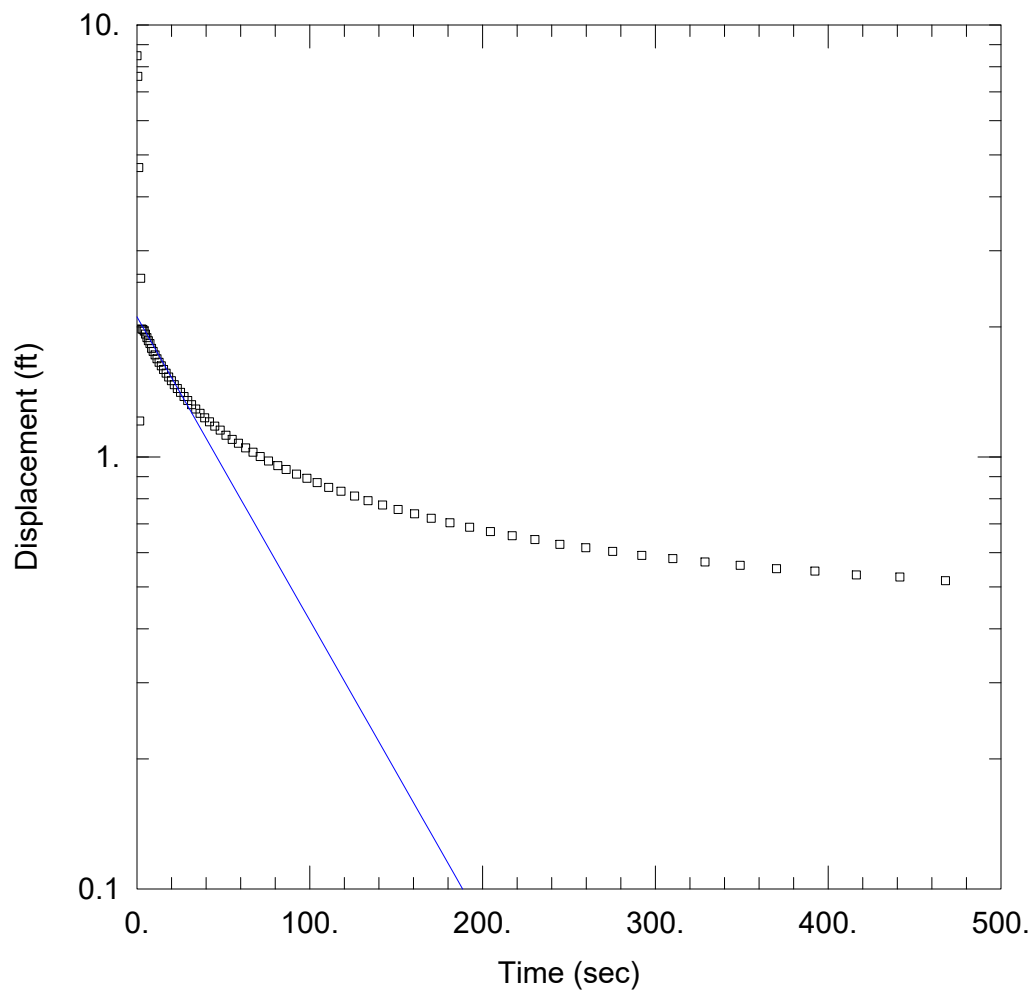
Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.001098$  cm/sec

$y_0 = 1.815$  ft





### WELL TEST ANALYSIS

Data Set: \...\GWA-2 OUT.aqt

Date: 04/14/21

Time: 09:17:30

### PROJECT INFORMATION

Company: Atlantic Coast Consulting

Client: Plant Yates

Project: I054-107

Location: Plant Yates Gypsum Landfill

Test Well: GWA-2 OUT

Test Date: 4/6/2021

### AQUIFER DATA

Saturated Thickness: 16.74 ft

Anisotropy Ratio ( $K_z/K_r$ ): 1.

### WELL DATA (GWA-2)

Initial Displacement: 8.487 ft

Total Well Penetration Depth: 16.74 ft

Casing Radius: 0.0833 ft

Static Water Column Height: 16.74 ft

Screen Length: 10. ft

Well Radius: 0.25 ft

Gravel Pack Porosity: 0.3

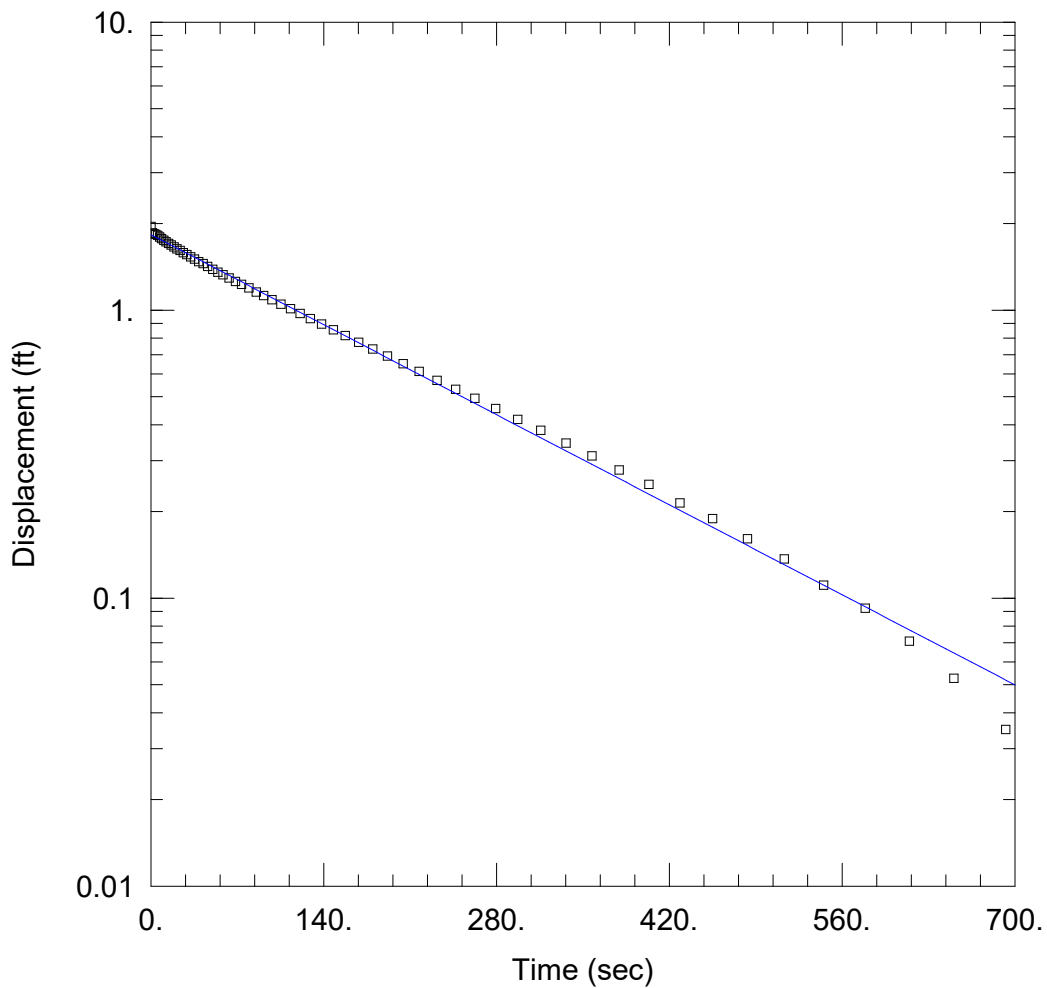
### SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.001816$  cm/sec

$y_0 = 2.109$  ft



### WELL TEST ANALYSIS

Data Set: C:\...\GWC-1R IN.aqt

Date: 04/09/21

Time: 13:32:54

### PROJECT INFORMATION

Company: Atlantic Coast Consulting

Project: 1054-107

Location: Plant Yates Gypsum Landfill

Test Well: GWC-1R IN

Test Date: 4/6/2021

### AQUIFER DATA

Saturated Thickness: 16.04 ft

Anisotropy Ratio ( $K_z/K_r$ ): 1.

### WELL DATA (GWC-1R)

Initial Displacement: 1.95 ft

Total Well Penetration Depth: 16.04 ft

Casing Radius: 0.0833 ft

Static Water Column Height: 16.04 ft

Screen Length: 10. ft

Well Radius: 0.33 ft

Gravel Pack Porosity: 0.3

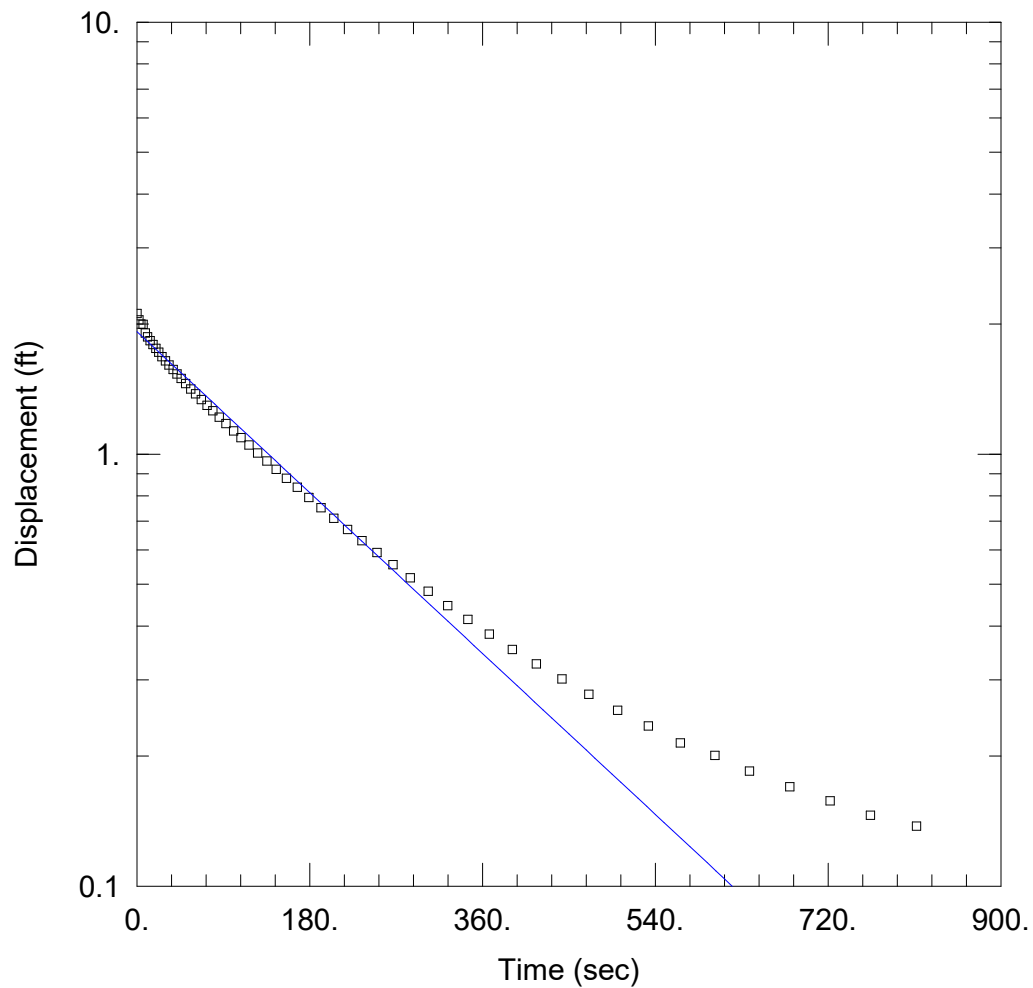
### SOLUTION

Aquifer Model: Unconfined

$K = 0.0008413$  cm/sec

Solution Method: Bouwer-Rice

$y_0 = 1.828$  ft



### WELL TEST ANALYSIS

Data Set: C:\...\GWC-1R OUT.aqt

Date: 04/09/21

Time: 13:34:44

### PROJECT INFORMATION

Company: Atlantic Coast Consulting

Project: 1054-107

Location: Plant Yates Gypsum Landfill

Test Well: GWC-1R OUT

Test Date: 4/6/2021

### AQUIFER DATA

Saturated Thickness: 16. ft

Anisotropy Ratio ( $K_z/K_r$ ): 1.

### WELL DATA (GWC-1R)

Initial Displacement: 2.117 ft

Total Well Penetration Depth: 16. ft

Casing Radius: 0.0833 ft

Static Water Column Height: 16. ft

Screen Length: 10. ft

Well Radius: 0.33 ft

Gravel Pack Porosity: 0.3

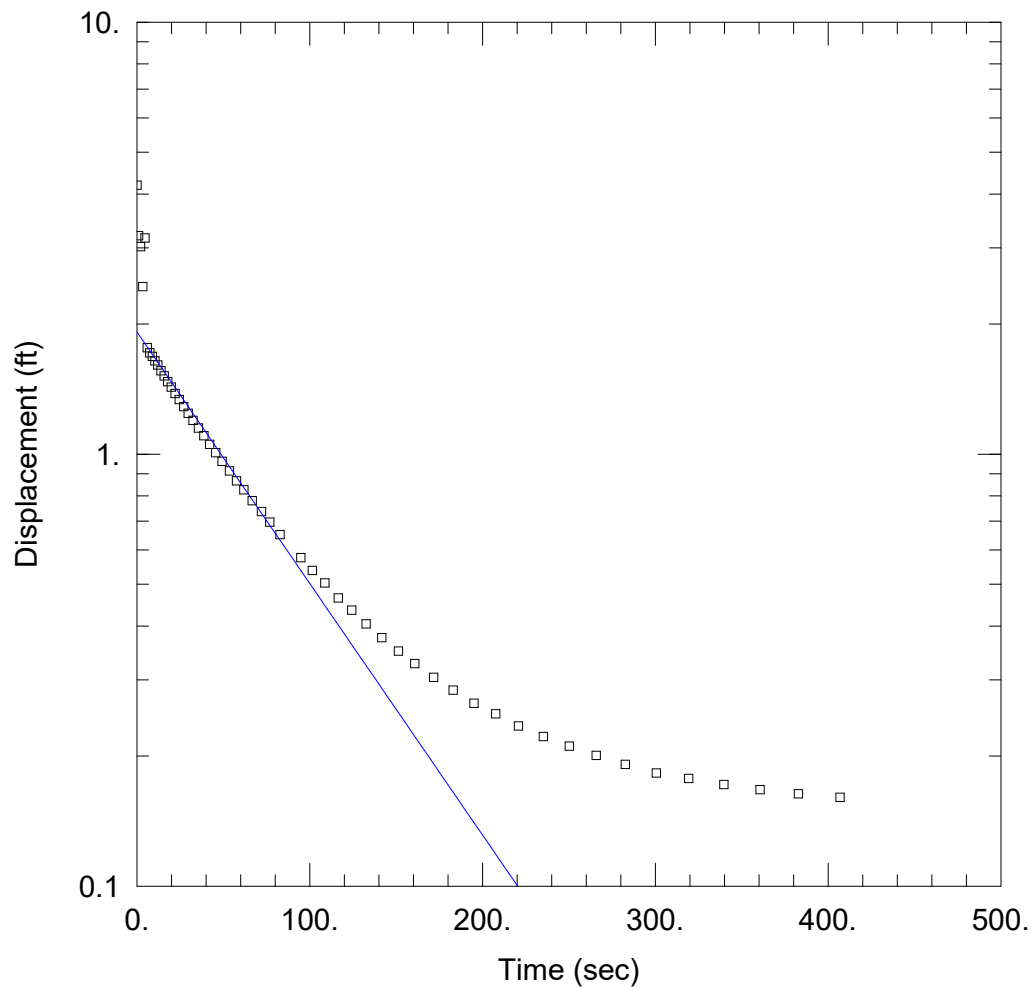
### SOLUTION

Aquifer Model: Unconfined

$K = 0.0007792$  cm/sec

Solution Method: Bouwer-Rice

$y_0 = 1.92$  ft



### WELL TEST ANALYSIS

Data Set: C:\...\GWC-2R IN.aqt

Date: 04/09/21

Time: 13:34:28

### PROJECT INFORMATION

Company: Atlantic Coast Consulting

Project: 1054-107

Location: Plant Yates Gypsum Landfill

Test Well: GWC-2R IN

Test Date: 4/6/2021

### AQUIFER DATA

Saturated Thickness: 16.7 ft

Anisotropy Ratio ( $K_z/K_r$ ): 1.

### WELL DATA (GWC-2R)

Initial Displacement: 4.195 ft

Total Well Penetration Depth: 16.7 ft

Casing Radius: 0.0833 ft

Static Water Column Height: 16.7 ft

Screen Length: 10. ft

Well Radius: 0.33 ft

Gravel Pack Porosity: 0.3

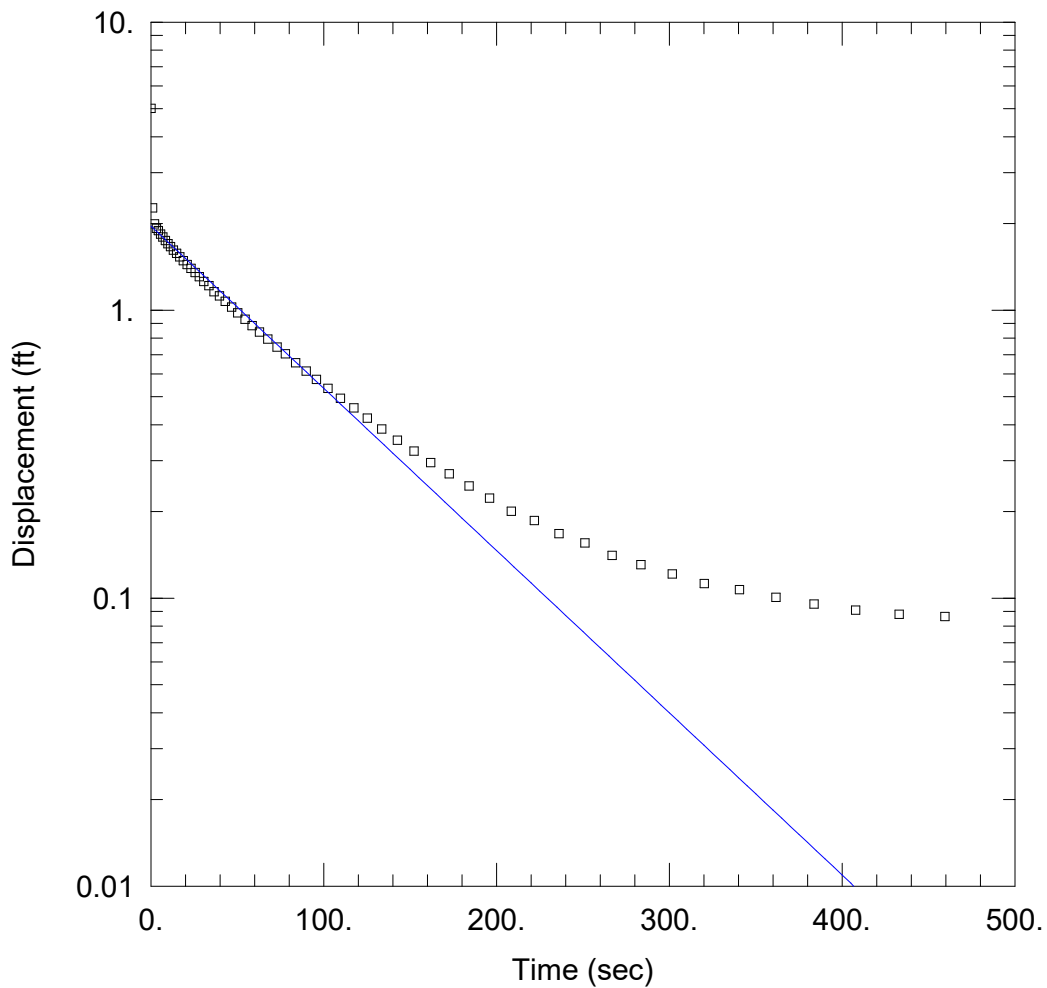
### SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.002212$  cm/sec

$y_0 = 1.917$  ft



### WELL TEST ANALYSIS

Data Set: C:\...\GWC-2R OUT.aqt

Date: 04/09/21

Time: 13:34:09

### PROJECT INFORMATION

Company: Atlantic Coast Consulting

Project: 1054-107

Location: Plant Yates Gypsum Landfill

Test Well: GWC-2R OUT

Test Date: 4/6/2021

### AQUIFER DATA

Saturated Thickness: 16.62 ft

Anisotropy Ratio ( $K_z/K_r$ ): 1.

### WELL DATA (GWC-2R)

Initial Displacement: 5.02 ft

Total Well Penetration Depth: 16.62 ft

Casing Radius: 0.0833 ft

Static Water Column Height: 16.62 ft

Screen Length: 10. ft

Well Radius: 0.33 ft

Gravel Pack Porosity: 0.3

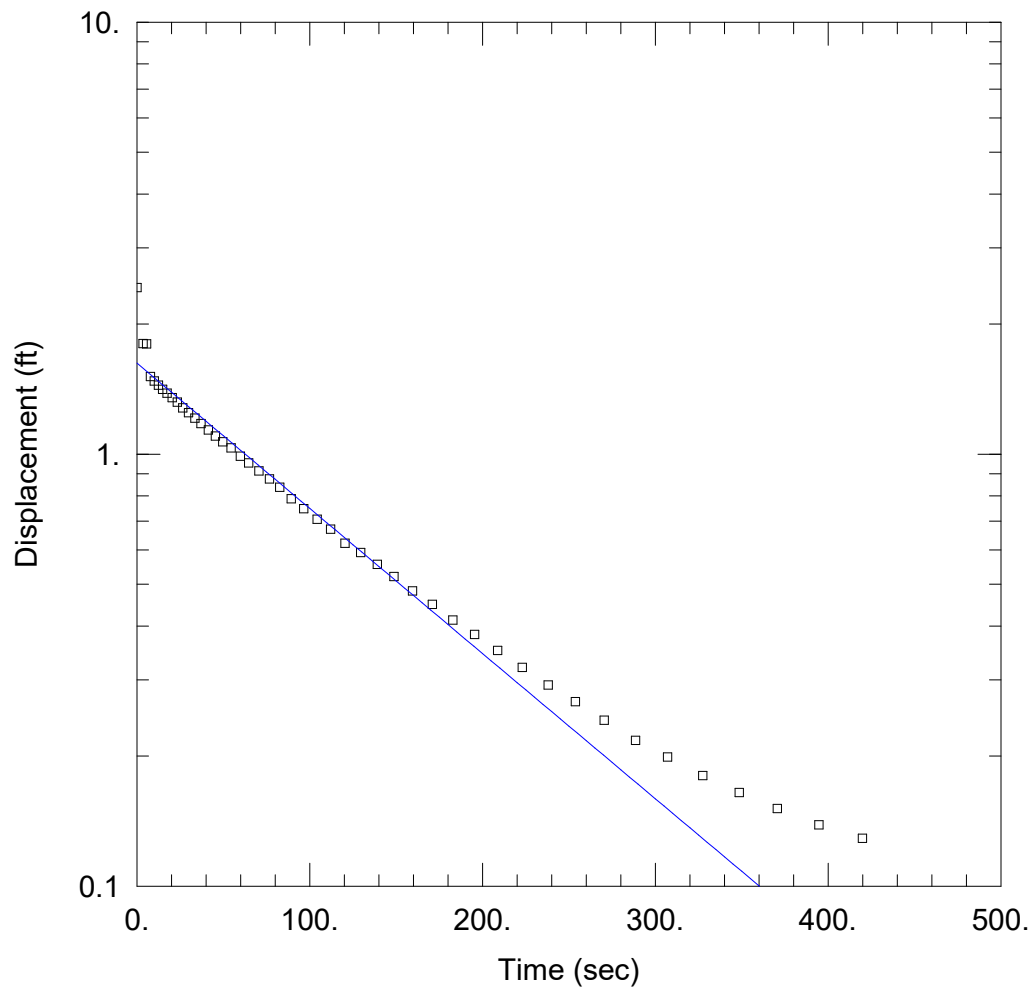
### SOLUTION

Aquifer Model: Unconfined

$K = 0.002138$  cm/sec

Solution Method: Bouwer-Rice

$y_0 = 1.957$  ft



### WELL TEST ANALYSIS

Data Set: C:\...\GWC-3R IN.aqt

Date: 04/09/21

Time: 13:35:12

### PROJECT INFORMATION

Company: Atlantic Coast Consulting

Project: 1054-107

Location: Plant Yates Gypsum Landfill

Test Well: GWC-3R IN

Test Date: 4/5/2021

### AQUIFER DATA

Saturated Thickness: 11.86 ft

Anisotropy Ratio ( $K_z/K_r$ ): 1.

### WELL DATA (GWC-3R)

Initial Displacement: 2.43 ft

Total Well Penetration Depth: 11.86 ft

Casing Radius: 0.0833 ft

Static Water Column Height: 11.86 ft

Screen Length: 10. ft

Well Radius: 0.33 ft

Gravel Pack Porosity: 0.3

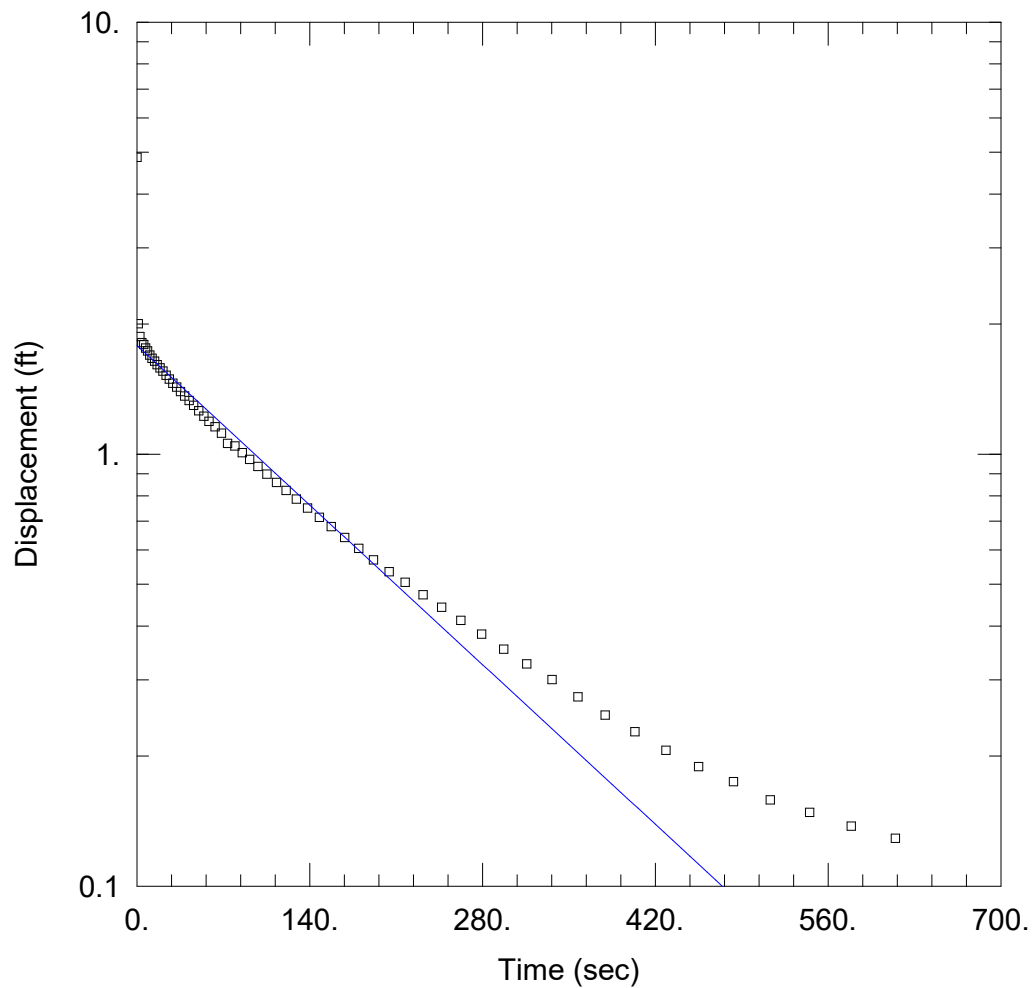
### SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.001185$  cm/sec

$y_0 = 1.623$  ft



### WELL TEST ANALYSIS

Data Set: C:\...\GWC-3R OUT.aqt

Date: 04/09/21

Time: 13:35:42

### PROJECT INFORMATION

Company: Atlantic Coast Consulting

Project: 1054-107

Location: Plant Yates Gypsum Landfill

Test Well: GWC-3R OUT

Test Date: 4/5/2021

### AQUIFER DATA

Saturated Thickness: 11.85 ft

Anisotropy Ratio ( $K_z/K_r$ ): 1.

### WELL DATA (GWC-3R)

Initial Displacement: 4.86 ft

Total Well Penetration Depth: 11.85 ft

Casing Radius: 0.0833 ft

Static Water Column Height: 11.85 ft

Screen Length: 10. ft

Well Radius: 0.33 ft

Gravel Pack Porosity: 0.3

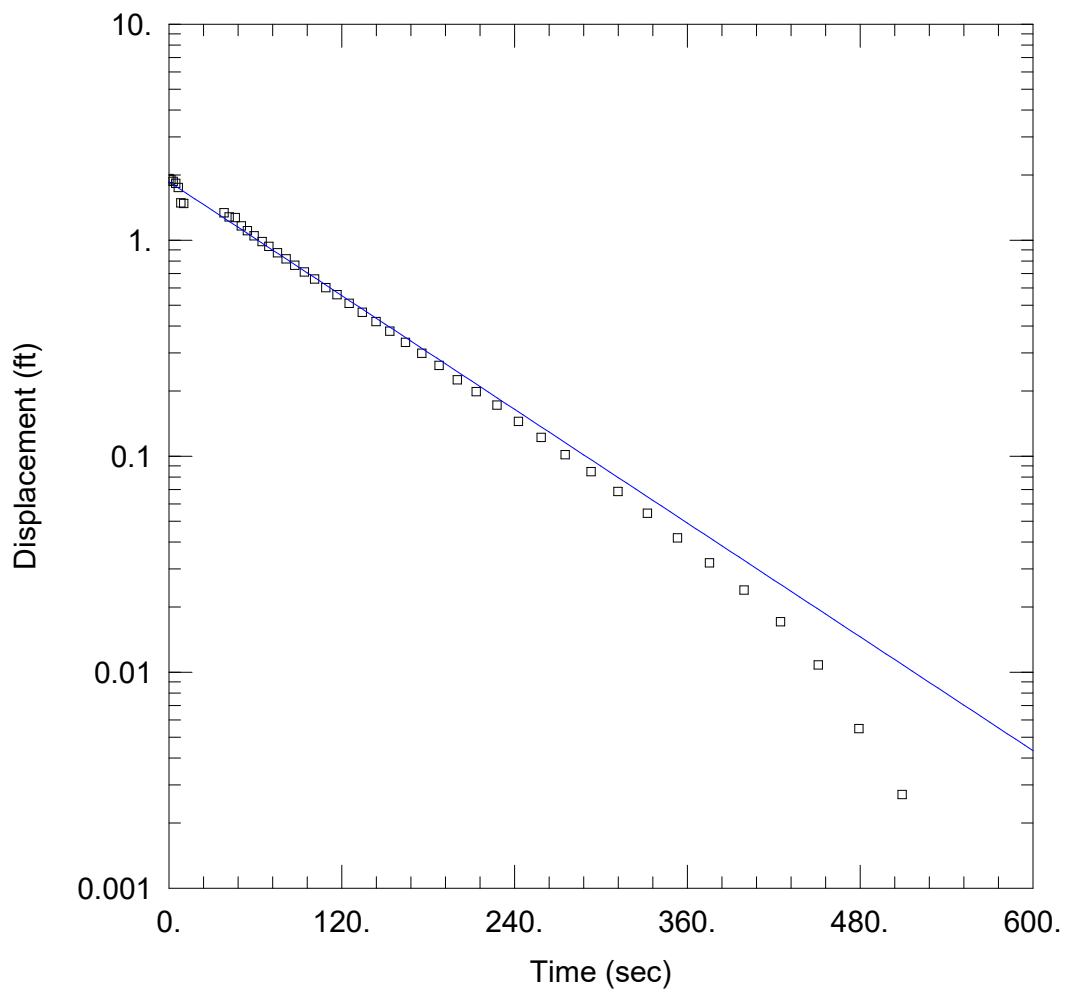
### SOLUTION

Aquifer Model: Unconfined

$K = 0.0009304$  cm/sec

Solution Method: Bouwer-Rice

$y_0 = 1.785$  ft



### WELL TEST ANALYSIS

Data Set: C:\...\GWC-4R IN.aqt

Date: 04/09/21

Time: 13:36:25

### PROJECT INFORMATION

Company: Atlantic Coast Consulting

Project: 1054-107

Location: Plant Yates Gypsum Landfill

Test Well: GWC-4R IN

Test Date: 4/6/2021

### AQUIFER DATA

Saturated Thickness: 16.33 ft

Anisotropy Ratio ( $K_z/K_r$ ): 1.

### WELL DATA (GWC-4R)

Initial Displacement: 1.928 ft

Total Well Penetration Depth: 16.33 ft

Casing Radius: 0.0833 ft

Static Water Column Height: 16.33 ft

Screen Length: 10. ft

Well Radius: 0.33 ft

Gravel Pack Porosity: 0.3

### SOLUTION

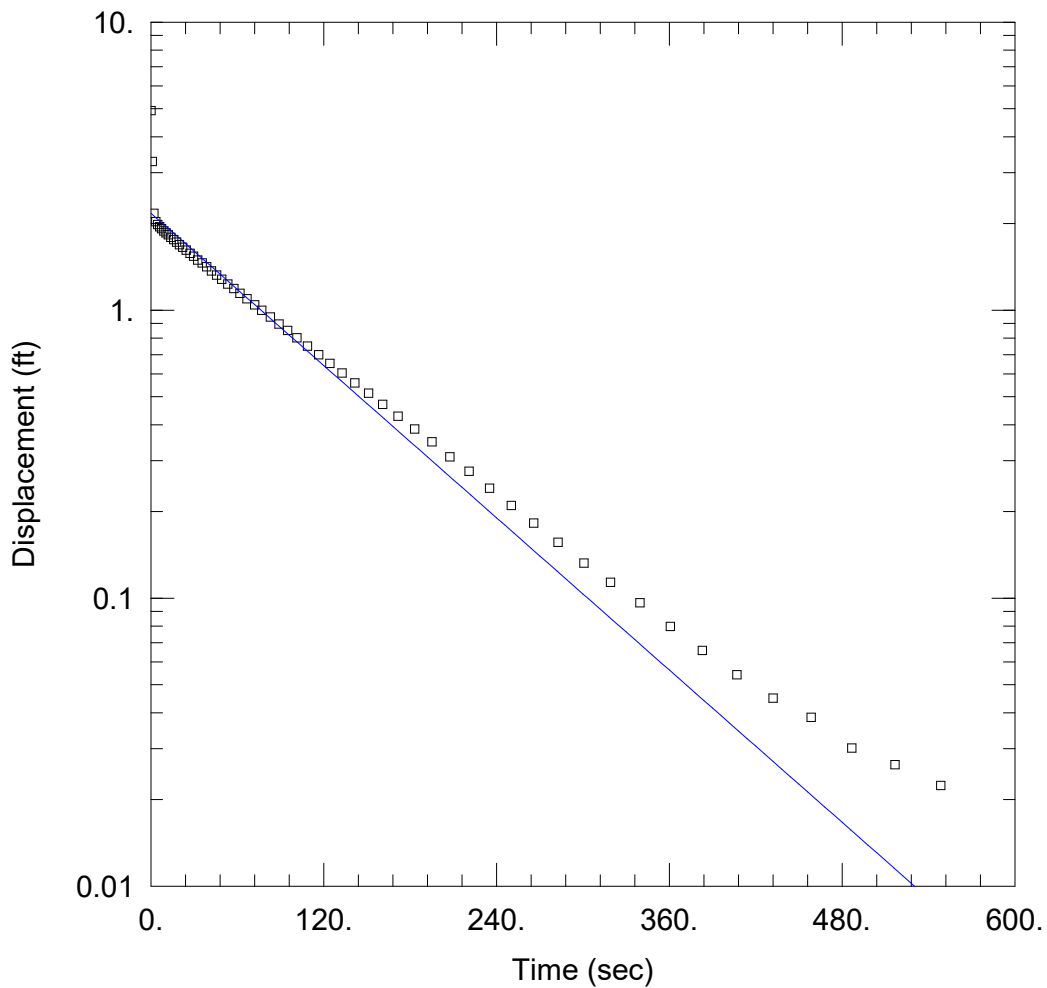
Aquifer Model: Unconfined

$K = 0.00166$  cm/sec

Solution Method: Bouwer-Rice

$y_0 = 1.862$  ft





### WELL TEST ANALYSIS

Data Set: C:\...\GWC-4R OUT.aqt

Date: 04/09/21

Time: 13:37:02

### PROJECT INFORMATION

Company: Atlantic Coast Consulting

Project: 1054-107

Location: Plant Yates Gypsum Landfill

Test Well: GWC-4R OUT

Test Date: 4/6/2021

### AQUIFER DATA

Saturated Thickness: 16.46 ft

Anisotropy Ratio ( $K_z/K_r$ ): 1.

### WELL DATA (GWC-4R)

Initial Displacement: 4.927 ft

Total Well Penetration Depth: 16.49 ft

Casing Radius: 0.0833 ft

Static Water Column Height: 16.49 ft

Screen Length: 10. ft

Well Radius: 0.33 ft

Gravel Pack Porosity: 0.3

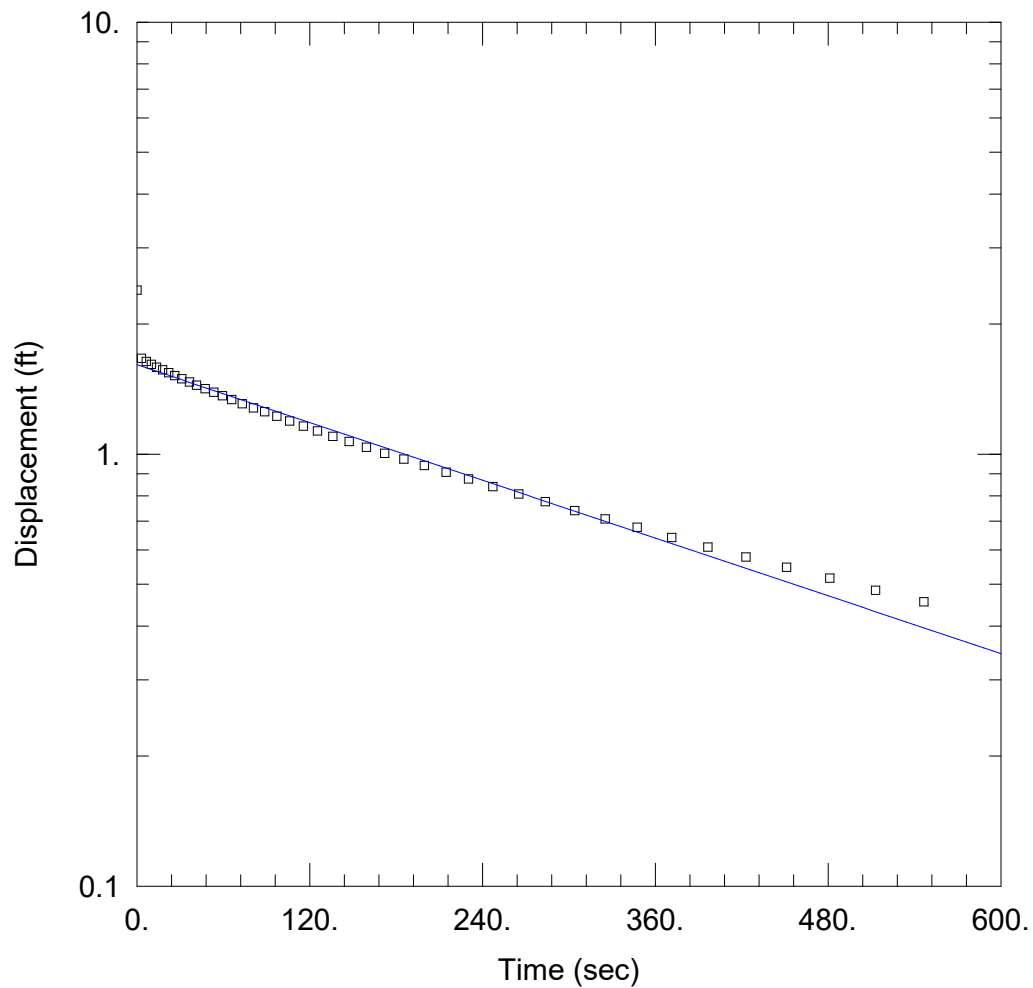
### SOLUTION

Aquifer Model: Unconfined

$K = 0.00167$  cm/sec

Solution Method: Bouwer-Rice

$y_0 = 2.169$  ft



### WELL TEST ANALYSIS

Data Set: C:\...\GWC-5R IN.aqt

Date: 04/09/21

Time: 13:37:31

### PROJECT INFORMATION

Company: Atlantic Coast Consulting

Project: 1054-107

Location: Plant Yates Gypsum Landfill

Test Well: GWC-5R IN

Test Date: 4/5/2021

### AQUIFER DATA

Saturated Thickness: 15.6 ft

Anisotropy Ratio ( $K_z/K_r$ ): 1.

### WELL DATA (GWC-5R)

Initial Displacement: 2.397 ft

Total Well Penetration Depth: 15.6 ft

Casing Radius: 0.0833 ft

Static Water Column Height: 15.6 ft

Screen Length: 10. ft

Well Radius: 0.33 ft

Gravel Pack Porosity: 0.3

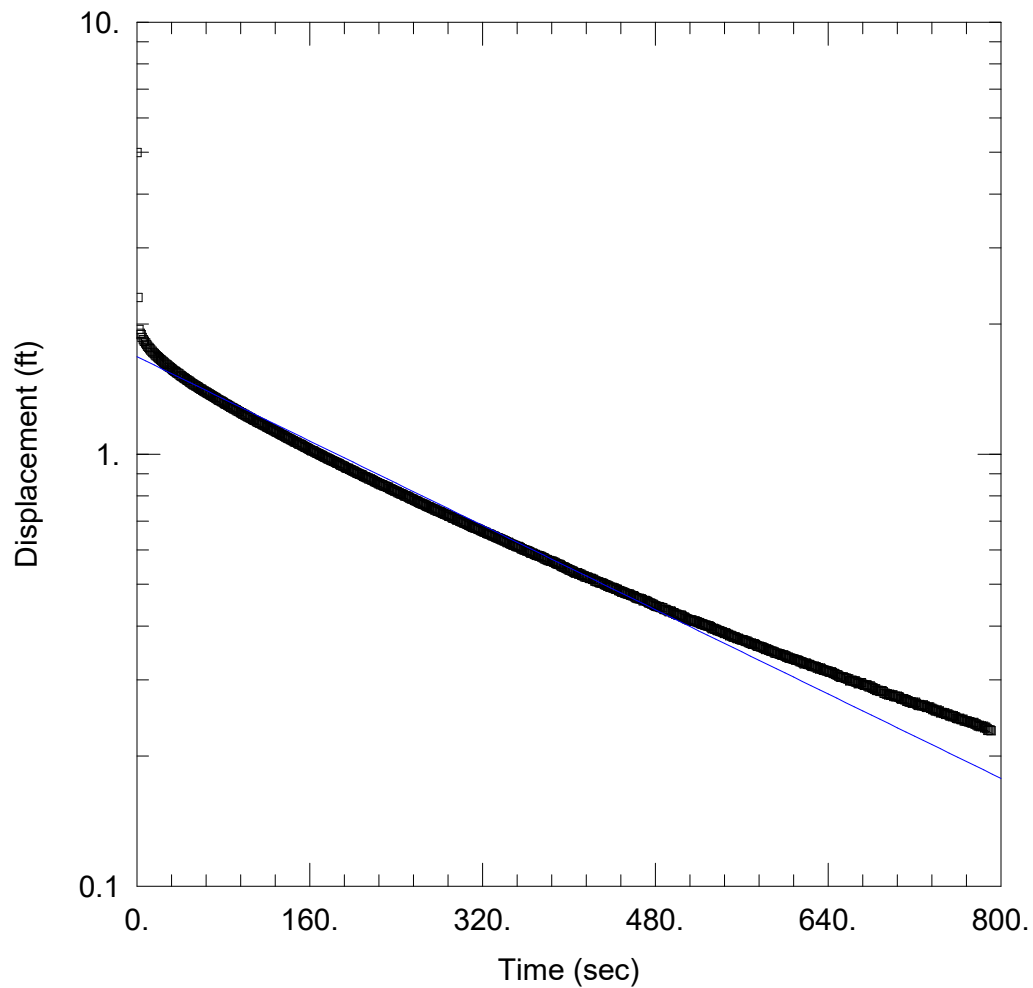
### SOLUTION

Aquifer Model: Unconfined

$K = 0.0004174$  cm/sec

Solution Method: Bouwer-Rice

$y_0 = 1.61$  ft



### WELL TEST ANALYSIS

Data Set: C:\...\GWC-5R OUT.aqt

Date: 04/09/21

Time: 13:38:22

### PROJECT INFORMATION

Company: Atlantic Coast Consulting

Project: 1054-107

Location: Plant Yates Gypsum Landfill

Test Well: GWC-5R OUT

Test Date: 4/5/2021

### AQUIFER DATA

Saturated Thickness: 15.71 ft

Anisotropy Ratio ( $K_z/K_r$ ): 1

### WELL DATA (GWC-5R)

Initial Displacement: 4.994 ft

Total Well Penetration Depth: 15.71 ft

Casing Radius: 0.0833 ft

Static Water Column Height: 15.71 ft

Screen Length: 10. ft

Well Radius: 0.33 ft

Gravel Pack Porosity: 0.3

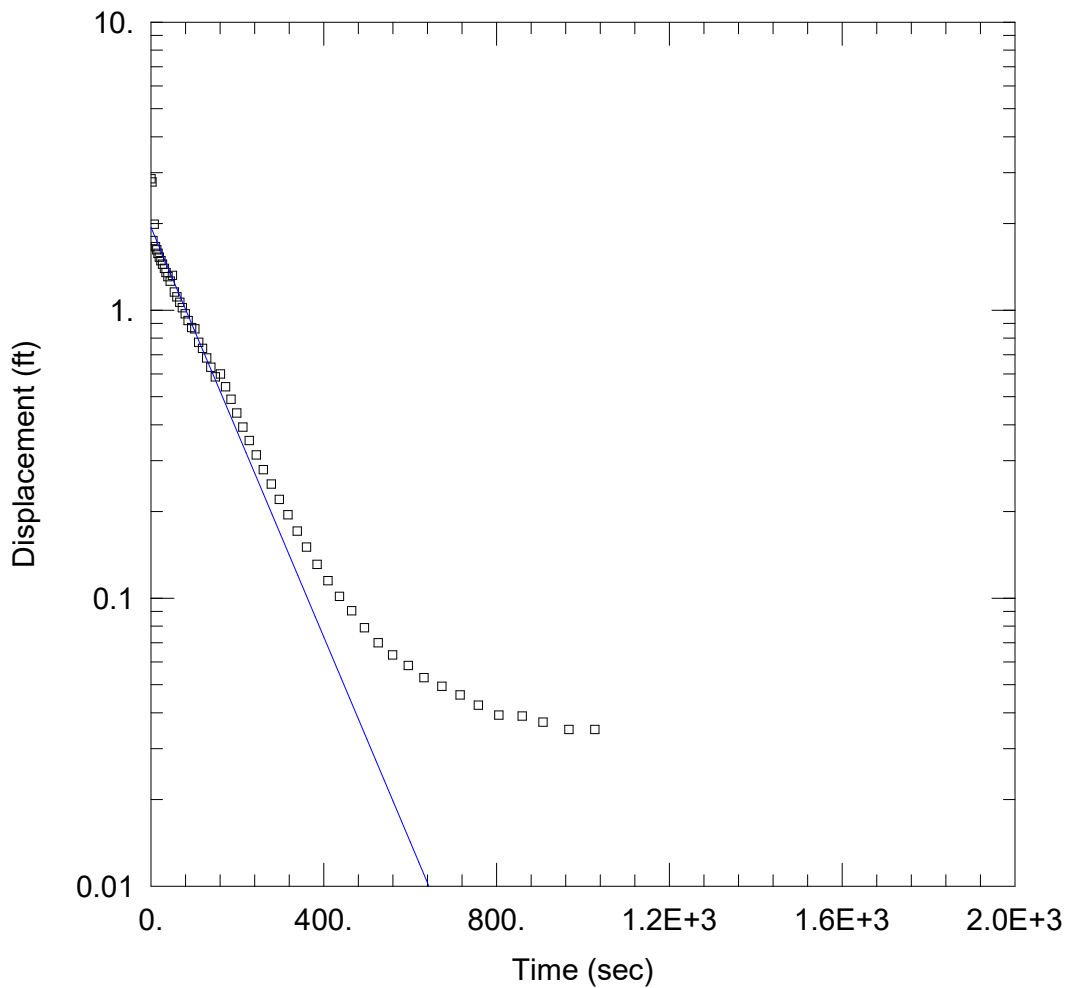
### SOLUTION

Aquifer Model: Unconfined

$K = 0.0004577$  cm/sec

Solution Method: Bouwer-Rice

$y_0 = 1.681$  ft



### WELL TEST ANALYSIS

Data Set: C:\...\GWC-6R IN.aqt

Date: 04/09/21

Time: 13:38:53

### PROJECT INFORMATION

Company: Atlantic Coast Consulting

Project: 1054-107

Location: Plant Yates Gypsum Landfill

Test Well: GWC-6R IN

Test Date: 4/6/2021

### AQUIFER DATA

Saturated Thickness: 18.66 ft

Anisotropy Ratio ( $K_z/K_r$ ): 1.

### WELL DATA (GWC-6R)

Initial Displacement: 2.861 ft

Total Well Penetration Depth: 18.66 ft

Casing Radius: 0.0833 ft

Static Water Column Height: 18.66 ft

Screen Length: 10. ft

Well Radius: 0.1667 ft

Gravel Pack Porosity: 0.3

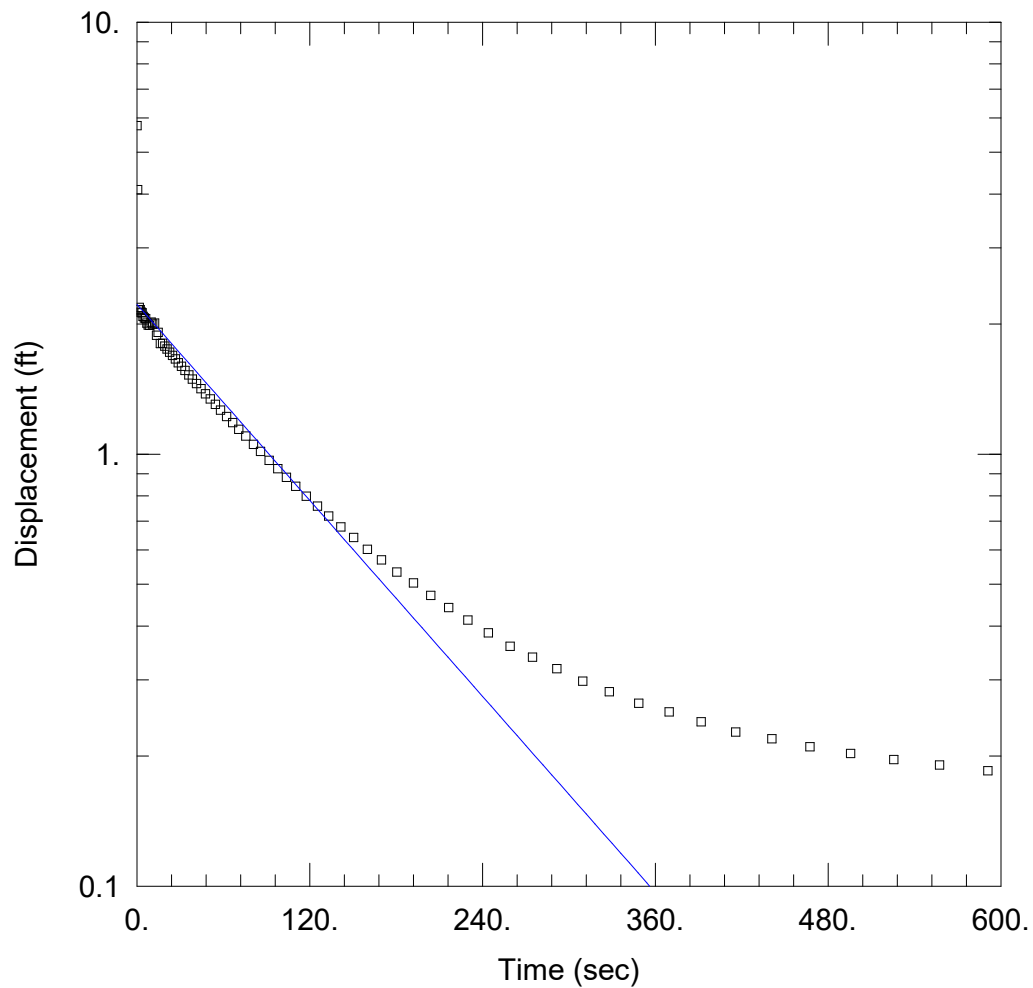
### SOLUTION

Aquifer Model: Unconfined

$K = 0.0005771$  cm/sec

Solution Method: Bouwer-Rice

$y_0 = 1.938$  ft



### WELL TEST ANALYSIS

Data Set: C:\...\GWC-6R OUT.aqt

Date: 04/09/21

Time: 13:39:22

### PROJECT INFORMATION

Company: Atlantic Coast Consulting

Project: 1054-107

Location: Plant Yates Gypsum Landfill

Test Well: GWC-6R OUT

Test Date: 4/6/2021

### AQUIFER DATA

Saturated Thickness: 18.68 ft

Anisotropy Ratio ( $K_z/K_r$ ): 1.

### WELL DATA (GWC-6R)

Initial Displacement: 5.761 ft

Total Well Penetration Depth: 18.68 ft

Casing Radius: 0.0833 ft

Static Water Column Height: 18.68 ft

Screen Length: 10. ft

Well Radius: 0.1667 ft

Gravel Pack Porosity: 0.3

### SOLUTION

Aquifer Model: Unconfined

$K = 0.0006137$  cm/sec

Solution Method: Bouwer-Rice

$y_0 = 2.221$  ft

October 27, 2015

Bart Smelser  
**Southern Company Services, Inc.**  
299 Logan Martin Village Road  
Vincent, AL 35178  
205-438-5893 direct

**Subject: Laboratory Testing Results**  
*Plant Yates Piezometers Geotechnical Investigation*  
*Cardno Project Number Z003000203*

Cardno ATC

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Mr. Smelser:

Cardno ATC has completed the soils testing for the Shelby Tube samples collected from the Plant Yates Piezometers location. These samples were collected by Southern Company Services, Inc. and delivered to the Cardno ATC laboratory in Alabaster, AL by members of Cardno staff. This work was conducted in accordance with the master agreement between Cardno ATC and Southern Company Affiliates, dated February 28, 2014, and detailed in the Work Authorization dated September 23, 2015.

The purpose of this letter is to report the results of the laboratory testing which are detailed in the following pages.

Cardno ATC sincerely appreciates the opportunity to work with you on this project. If you have any questions or if we may be of further service to you, please contact us.

Respectfully Submitted,

**Cardno ATC**



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Enclosures: laboratory report

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200 Wellington Court, Suite 100  
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# SUMMARY OF LABORATORY RESULTS

PAGE 1 OF 1

**CLIENT** Southern Company Services

**PROJECT NAME** Plant Yates Piezometers

**PROJECT NUMBER** Z003000203

**PROJECT LOCATION** Newnan, GA

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	Classification	Water Content (%)	Dry Density (pcf)	Specific Gravity	Void Ratio
PZ-17s	17.0	NP	NP	NP	4.75	21.2	SM-SC			2.665	
PZ-19s	17.0	NP	NP	NP	9.5	42.0	SM-SC			2.681	
PZ-20s	17.0	NP	NP	NP	4.75	28.9	SM-SC			2.665	
PZ-22s	7.0	NP	NP	NP	9.5	20.3	SM-SC			2.731	
PZ-22s	17.0	NP	NP	NP	9.5	28.0	SM-SC			2.717	
PZ-24s	17.0	NP	NP	NP	19	15.3	SM-SC			2.693	
PZ-24s	37.0	NP	NP	NP	4.75	22.0	SM-SC			2.701	
PZ-25s	33.0	NP	NP	NP	9.5	23.4	SM-SC			2.678	
PZ-25s	44.0	NP	NP	NP	19	22.3	SM-SC			2.682	
PZ-26s	17.0	37	27	10	4.75	57.9	ML			2.741	
PZ-26s	27.0	NP	NP	NP	4.75	33.7	SM-SC			2.720	
PZ-27s	17.0	39	30	9	4.75	73.5	ML			2.661	
PZ-27s	27.0	NP	NP	NP	2	45.0	SM-SC			2.673	
PZ-28s	17.0	NP	NP	NP	19	18.9	SM-SC			2.578	
PZ-30s	27.0	NP	NP	NP	4.75	16.6	SM-SC			2.710	
PZ-31s	7.0	NP	NP	NP	4.75	16.7	SM-SC			2.653	

LAB SUMMARY - GINT STD US LAB.GDT - 10/27/15 11:25 - S:\TRADITIONAL\BIRMINGHAM LAB\SOUTHERN COMPANY\PLANT YATES PIEZOMETERS\GINT\PLANT YATES PIEZOMETERS.GPJ

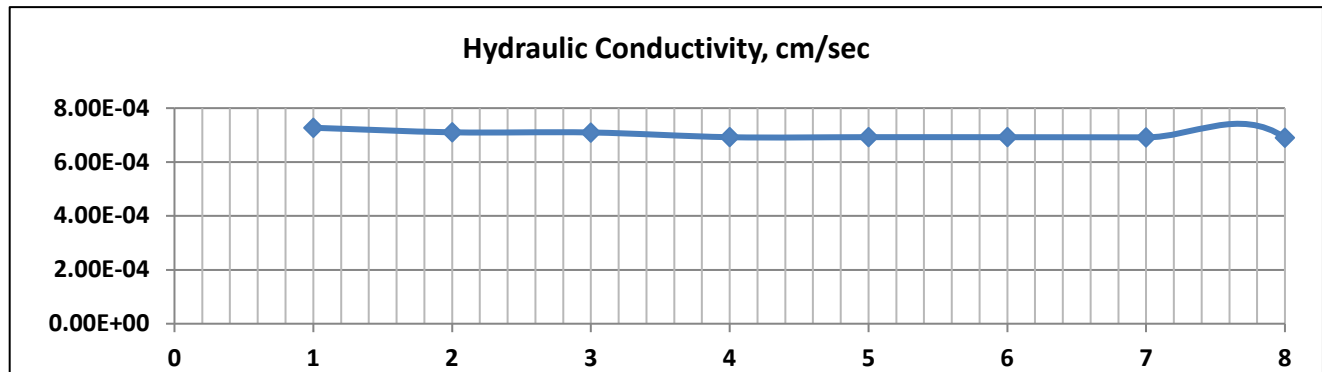


# Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084-10

Project :	Plant Yates Piezometers	Project Number:	Z003000203
Client :	Southern Company Services, INC	Sample Number :	PZ-17s (17'-19')
Sample Location :	PZ-17S (17'-19') UD-01	Date Sampled:	09/10/15
Northing:	--	Easting:	--
Sample Preparation:	Shelby Tube Pushed	Elevation:	--
		Permeant Liquid :	De-Aired Tap Water

Initial Sample Conditions		Initial Working Pressures, psi		Final Sample Conditions	
Wet Density, pcf	119.8	Chamber	92	Wet Density, pcf	119.6
Dry Density, pcf	98.0	Head	79	Dry Density, pcf	98.1
Moisture Content, %	22.2	Tail	77	Moisture Content, %	22.0
Void ratio, e	0.697	Conso.	14	Void ratio, e	0.695
Porosity, n	0.411	Soil Specific Gravity		Porosity, n	0.410
Saturation, Percent	84.9	Gs	2.665	Saturation, Percent	84.2
Hydraulic Gradient, i	9.8	Proctor Referenced		Hydraulic Gradient, i	7.1
Sample Length, Inches	5.668	--		Sample Length, Inches	5.650
Sample Volume, cc	584.4856			Sample Volume, cc	583.5545
B-value :	97.0%	Sample Consolidated During Saturation, %			0.32%



Start Test @ t=0	Cum. Time Δ t, min.	Head Loss, Δh2, psi	Hydraulic Conductivity, k (Permeability)	
0	0.00	2.0000	cm/sec	°C
1	0.08	1.9180	7.27E-04	20
2	0.17	1.8429	7.10E-04	20
3	0.25	1.7692	7.10E-04	20
4	0.33	1.7053	6.92E-04	20
5	0.42	1.6385	6.92E-04	20
6	0.50	1.5746	6.92E-04	20
7	0.58	1.5134	6.92E-04	20
8	0.67	1.4550	6.91E-04	20
9	0.00			20

**Hydraulic Conductivity, cm/sec**

**6.91E-04**



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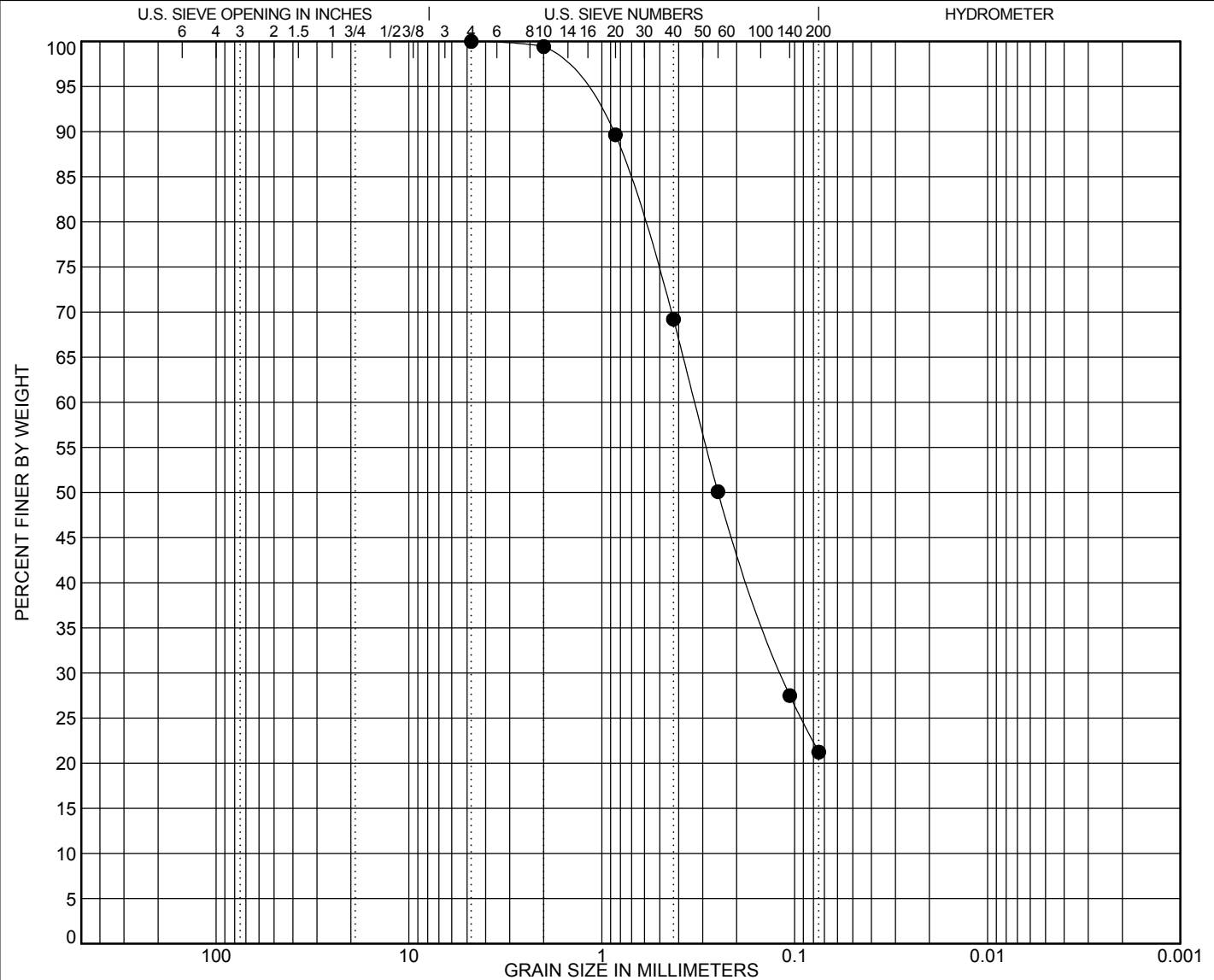
# GRAIN SIZE DISTRIBUTION

CLIENT Southern Company Services

PROJECT NAME Plant Yates Piezometers

PROJECT NUMBER Z003000203

PROJECT LOCATION Newnan, GA

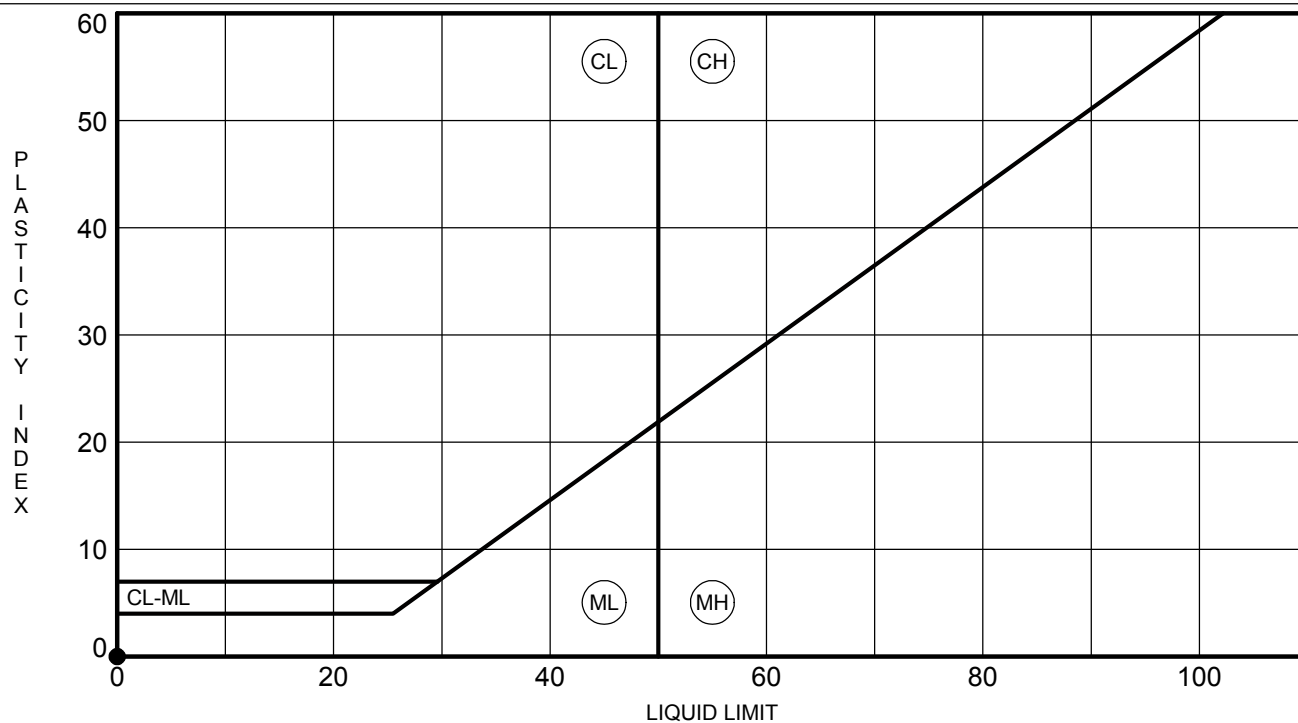


**CLIENT** Southern Company Services

**PROJECT NAME** Plant Yates Piezometers

PROJECT NUMBER Z003000203

**PROJECT LOCATION** Newnan, GA

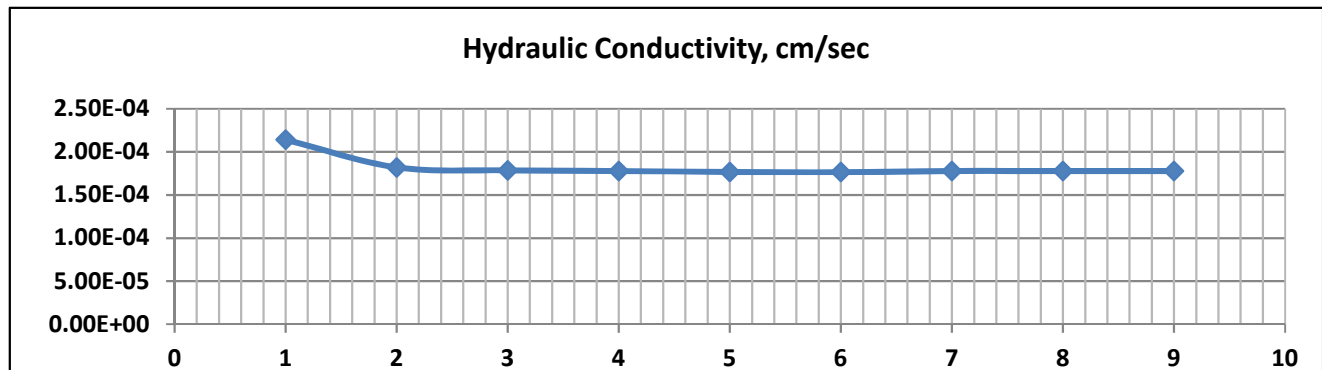
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# Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084-10

Project :	Plant Yates Piezometers	Project Number:	Z003000203
Client :	Southern Company Services, INC	Sample Number :	PZ-19S (17'-19')
Sample Location :	PZ-19S (17'-19') UD-01	Date Sampled:	09/21/15
Northing: --	Easting: --	Elevation:	--
Sample Preparation:	Shelby Tube Pushed	Permeant Liquid :	De-Aired Tap Water

Initial Sample Conditions		Initial Working Pressures, psi		Final Sample Conditions	
Wet Density, pcf	112.9	Chamber	87	Wet Density, pcf	110.9
Dry Density, pcf	85.5	Head	78	Dry Density, pcf	85.5
Moisture Content, %	32.1	Tail	76	Moisture Content, %	29.7
Void ratio, e	0.956	Conso.	10	Void ratio, e	0.956
Porosity, n	0.489	Soil Specific Gravity		Porosity, n	0.489
Saturation, Percent	89.9	Gs	2.681	Saturation, Percent	83.3
Hydraulic Gradient, i	9.9	Proctor Referenced		Hydraulic Gradient, i	8.4
Sample Length, Inches	5.613	--		Sample Length, Inches	5.613
Sample Volume, cc	582.1245	--		Sample Volume, cc	582.1245
B-value :	98.0%	Sample Consolidated During Saturation, %			0.00%



Start Test @ t=0	Cum. Time Δ t, min.	Head Loss, Δh <sub>2</sub> , psi	Hydraulic Conductivity, k (Permeability)	
0	0.00	2.0000	cm/sec	°C
1	0.17	1.9513	2.14E-04	20
2	0.33	1.9180	1.82E-04	20
3	0.50	1.8804	1.79E-04	20
4	0.67	1.8429	1.78E-04	20
5	0.83	1.8068	1.77E-04	20
6	1.00	1.7706	1.77E-04	20
7	1.00	1.7692	1.78E-04	20
8	1.17	1.7331	1.78E-04	20
9	1.33	1.6983	1.78E-04	20

**Hydraulic Conductivity, cm/sec**

**1.78E-04**

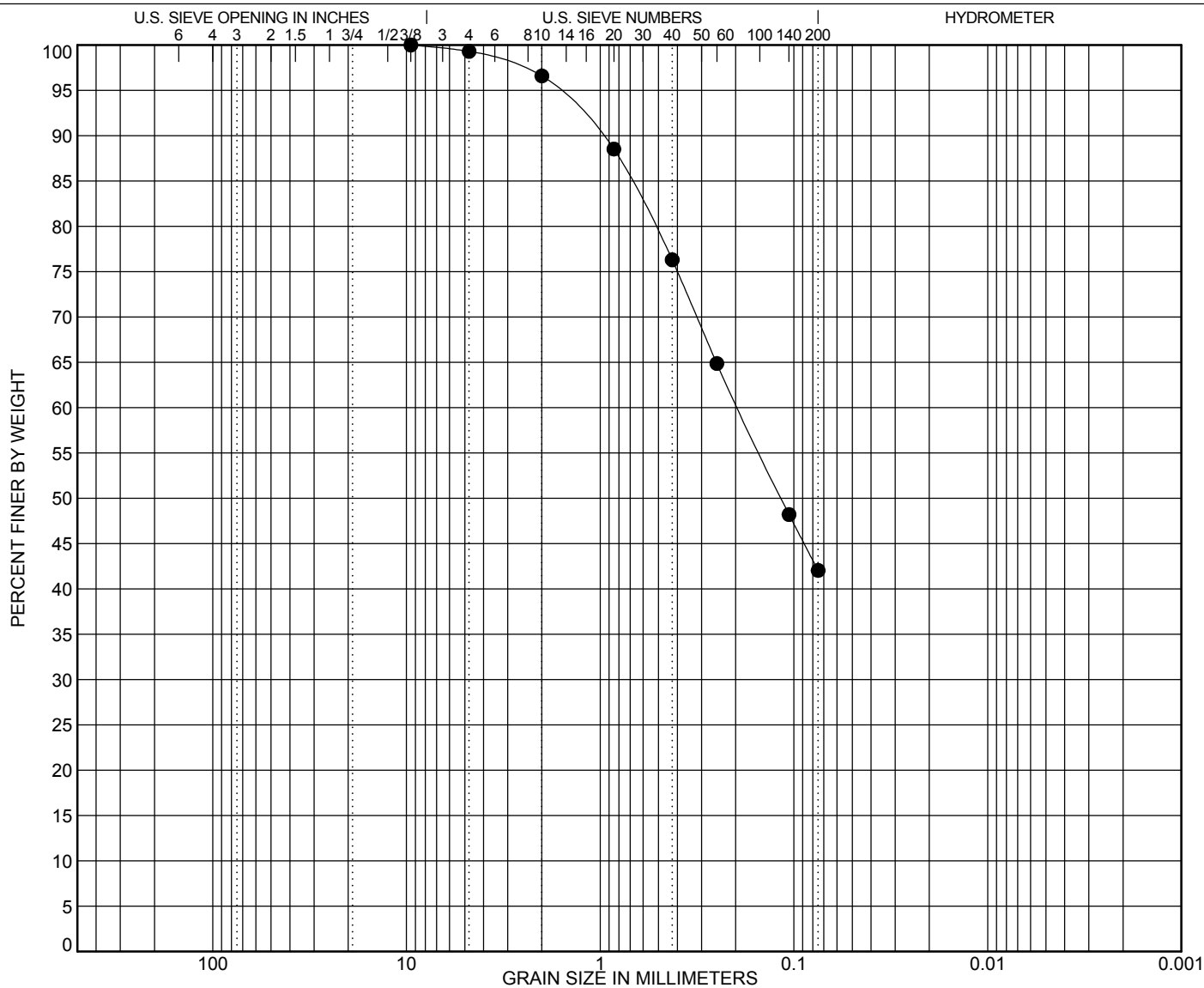
## GRAIN SIZE DISTRIBUTION

**CLIENT** Southern Company Services

**PROJECT NAME** Plant Yates Piezometers

PROJECT NUMBER Z003000203

**PROJECT LOCATION** Newnan, GA



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

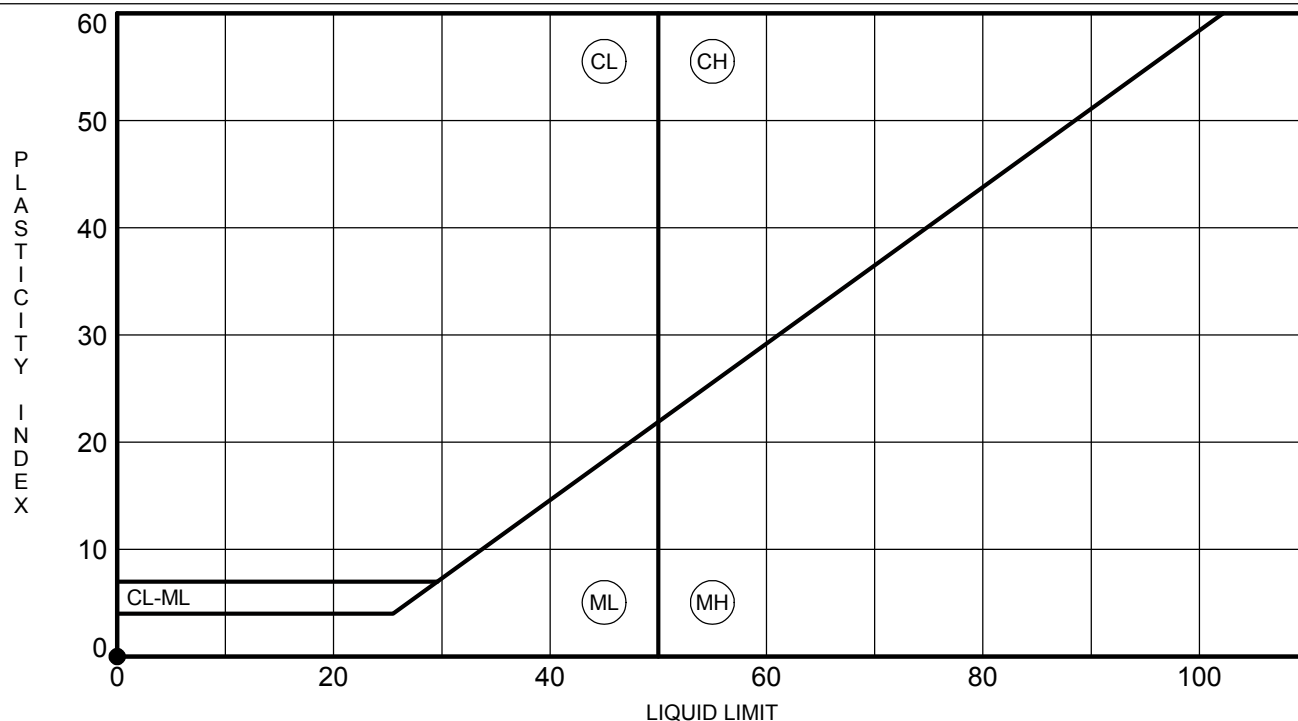
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**CLIENT** Southern Company Services

**PROJECT NAME** Plant Yates Piezometers

**PROJECT NUMBER** Z003000203

**PROJECT LOCATION** Newnan, GA

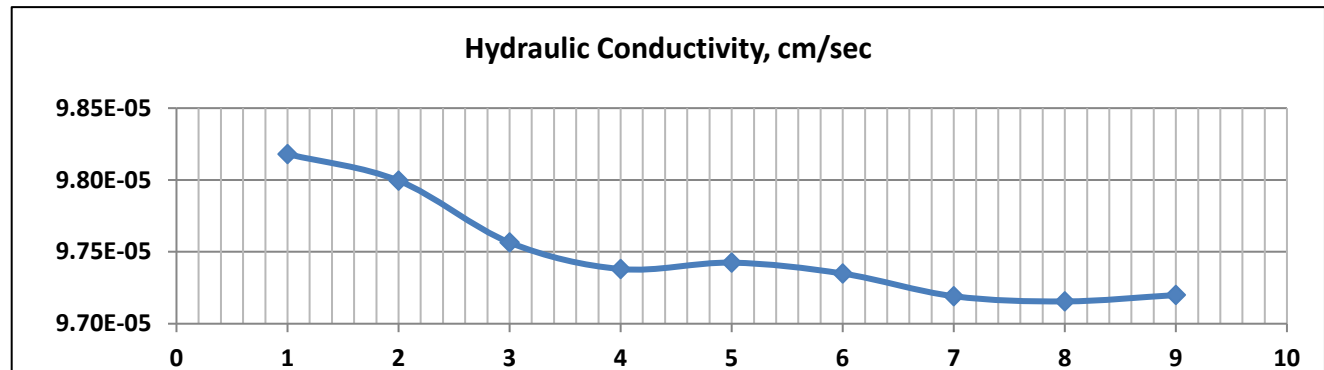
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# Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084-10

Project :	Plant Yates Piezometers	Project Number:	Z003000203
Client :	Southern Company Services, INC	Sample Number :	PZ-20s (17'-19')
Sample Location :	PZ-20s (17'-19') UD-01	Date Sampled:	09/03/15
Northing: --	Easting: --	Elevation:	--
Sample Preparation:	Shelby Tube Pushed	Permeant Liquid :	De-Aired Tap Water

Initial Sample Conditions		Initial Working Pressures, psi		Final Sample Conditions	
Wet Density, pcf	126.8	Chamber	93	Wet Density, pcf	120.2
Dry Density, pcf	98.4	Head	79	Dry Density, pcf	98.8
Moisture Content, %	28.9	Tail	77	Moisture Content, %	21.7
Void ratio, e	0.690	Conso.	15	Void ratio, e	0.683
Porosity, n	0.408	<b>Soil Specific Gravity</b>		Porosity, n	0.406
Saturation, Percent	111.5	Gs	2.665	Saturation, Percent	84.5
Hydraulic Gradient, i	9.9	<b>Proctor Referenced</b>		Hydraulic Gradient, i	8.2
Sample Length, Inches	5.585	--		Sample Length, Inches	5.535
Sample Volume, cc	569.1641			Sample Volume, cc	566.5934
B-value :	100.0%	Sample Consolidated During Saturation, %			0.90%



Start Test @ t=0	Cum. Time Δ t, min.	Head Loss, Δh2 psi	Hydraulic Conductivity, k (Permeability)	
0	0.00	2.0000	cm/sec	°C
1	0.33	1.9563	9.82E-05	20
2	0.67	1.9138	9.80E-05	20
3	1.00	1.8727	9.76E-05	20
4	1.33	1.8323	9.74E-05	20
5	1.67	1.7926	9.74E-05	20
6	2.00	1.7539	9.73E-05	20
7	2.33	1.7164	9.72E-05	20
8	2.67	1.6794	9.72E-05	20
9	3.00	1.6430	9.72E-05	20

**Hydraulic Conductivity, cm/sec**

**9.72E-05**



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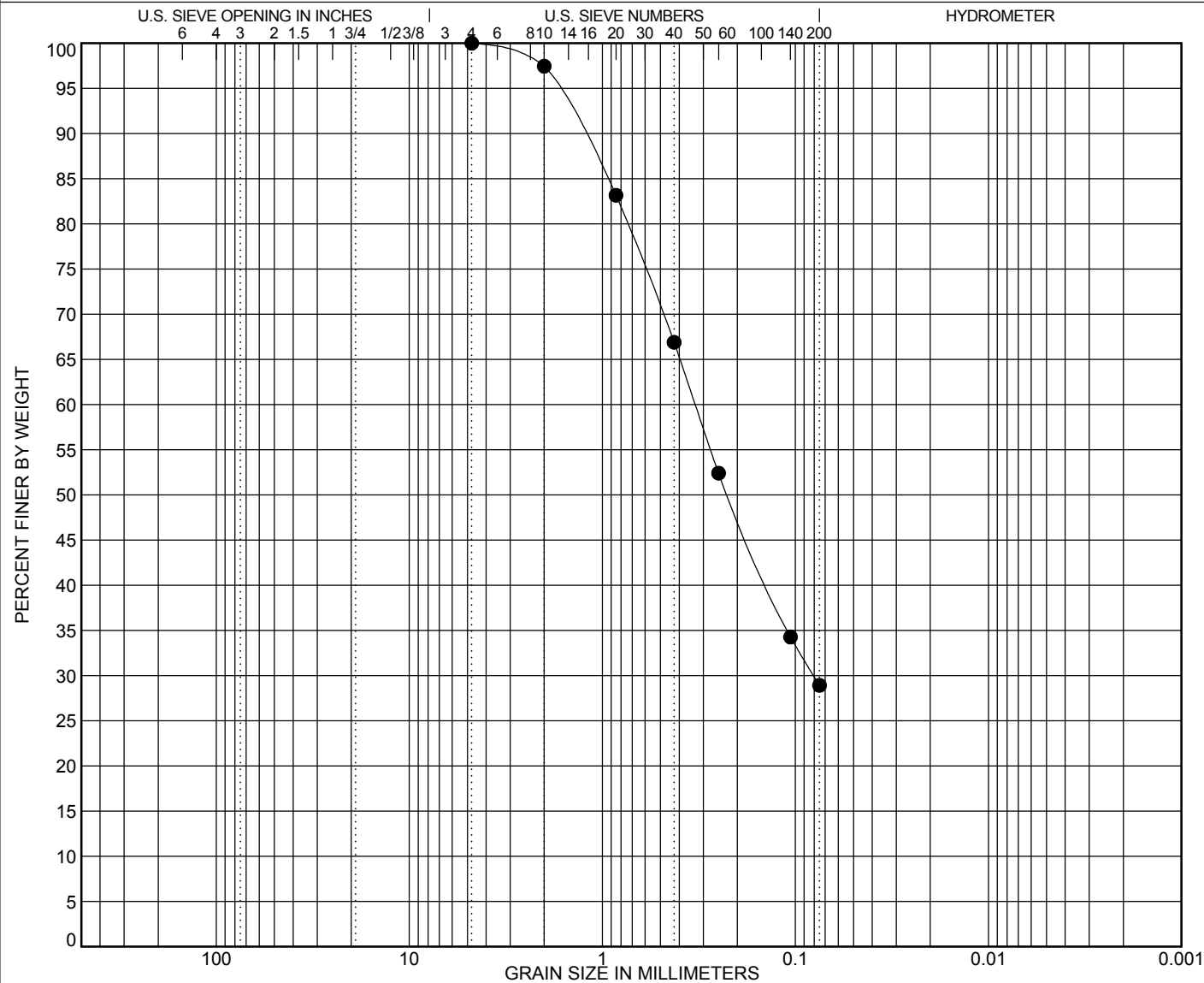
# GRAIN SIZE DISTRIBUTION

CLIENT Southern Company Services

PROJECT NAME Plant Yates Piezometers

PROJECT NUMBER Z003000203

PROJECT LOCATION Newnan, GA



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification					LL	PL	PI	Cc	Cu
● PZ-20s	17	SILTY SAND (SM-SC)					NP	NP	NP		
BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt		%Clay	
● PZ-20s	17	4.75	0.33	0.08		0.0	71.1	28.9			

GRAIN SIZE - GINT STD US LAB.GDT - 10/27/15 11:27 - S:\TRADITIONAL\BIRMINGHAM LAB\SOUTHERN COMPANY\PLANT YATES PIEZOMETERS\GINT\PLANT YATES PIEZOMETERS.GPJ

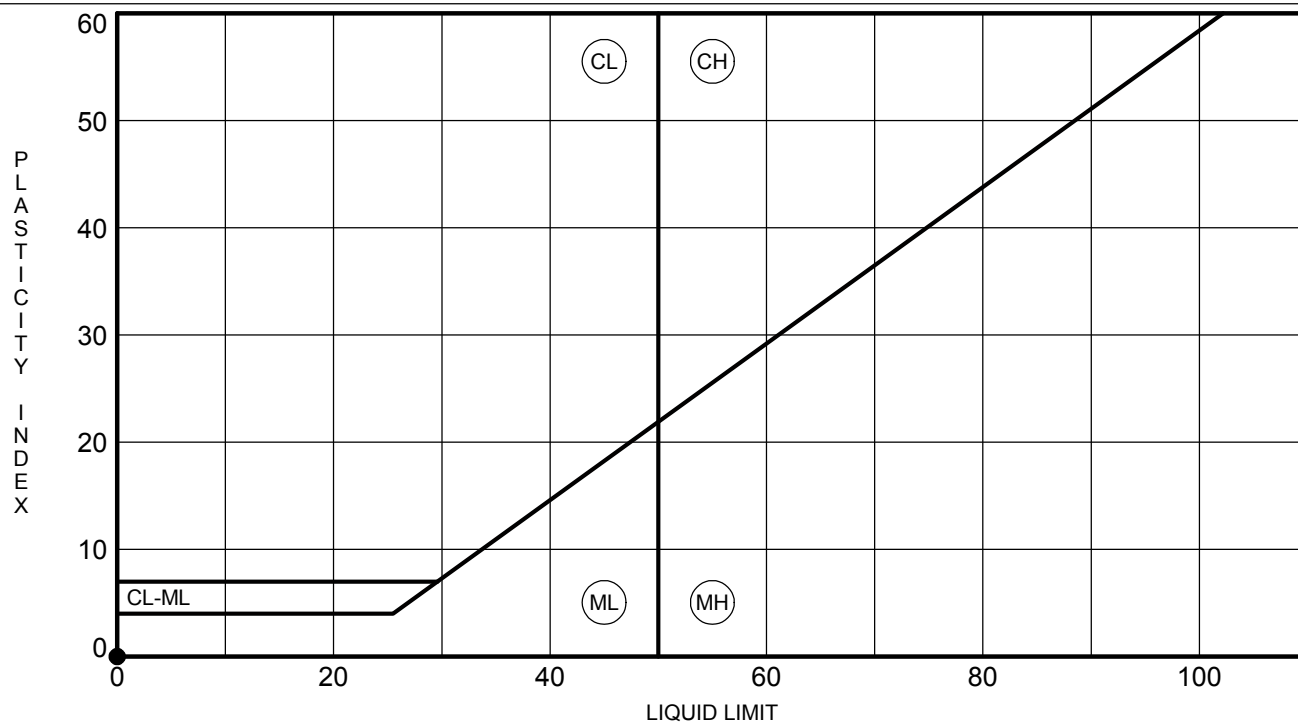


**CLIENT** Southern Company Services

**PROJECT NAME** Plant Yates Piezometers

PROJECT NUMBER Z003000203

**PROJECT LOCATION** Newnan, GA

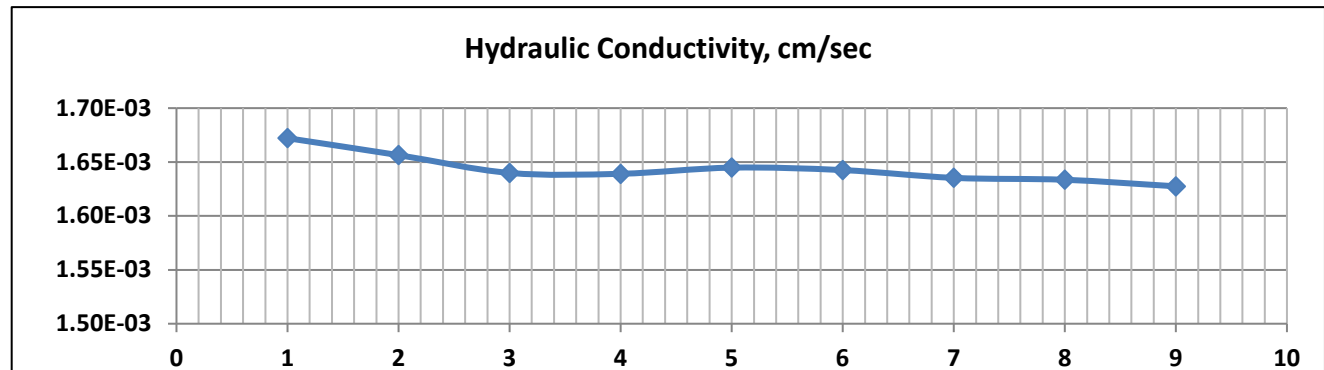
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# Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084-10

Project :	Plant Yates Piezometers	Project Number:	Z003000203
Client :	Southern Company Services, INC	Sample Number :	PZ-22S (7'-9')
Sample Location :	PZ-22S (7'-9') UD-01	Date Sampled:	09/17/15
Northing:	--	Easting:	--
Sample Preparation:	Shelby Tube Pushed	Elevation:	--
		Permeant Liquid :	De-Aired Tap Water

Initial Sample Conditions		Initial Working Pressures, psi		Final Sample Conditions	
Wet Density, pcf	110.9	Chamber	83	Wet Density, pcf	110.3
Dry Density, pcf	83.5	Head	78	Dry Density, pcf	83.6
Moisture Content, %	32.8	Tail	76	Moisture Content, %	31.9
Void ratio, e	1.040	Conso.	6	Void ratio, e	1.038
Porosity, n	0.510	Soil Specific Gravity		Porosity, n	0.509
Saturation, Percent	86.2	Gs	2.731	Saturation, Percent	84.0
Hydraulic Gradient, i	9.9	Proctor Referenced		Hydraulic Gradient, i	8.4
Sample Length, Inches	5.618	--		Sample Length, Inches	5.600
Sample Volume, cc	571.7477			Sample Volume, cc	570.8288
B-value :	96.0%	Sample Consolidated During Saturation, %			0.32%



Start Test @ t=0	Cum. Time Δ t, min.	Head Loss, Δh2, psi	Hydraulic Conductivity, k (Permeability)	
0	0.00	2.0000	cm/sec	°C
1	0.02	1.9625	1.67E-03	20
2	0.03	1.9263	1.66E-03	20
3	0.05	1.8916	1.64E-03	20
4	0.07	1.8568	1.64E-03	20
5	0.08	1.8220	1.64E-03	20
6	0.10	1.7887	1.64E-03	20
7	0.12	1.7567	1.64E-03	20
8	0.13	1.7247	1.63E-03	20
9	0.15	1.6941	1.63E-03	20

**Hydraulic Conductivity, cm/sec**

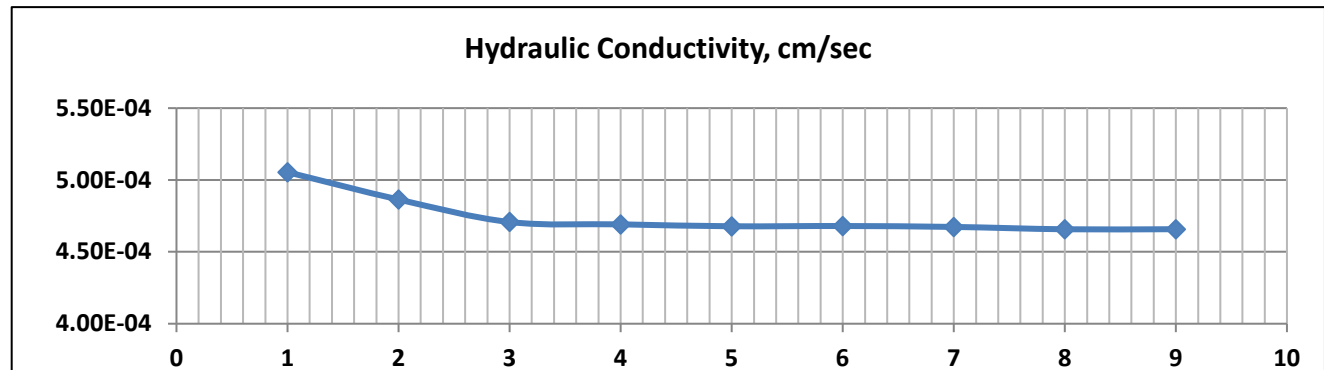
**1.63E-03**

# Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084-10

Project :	Plant Yates Piezometers	Project Number:	Z003000203
Client :	Southern Company Services, INC	Sample Number :	PZ-22s (17'-19')
Sample Location :	PZ-22s (17'-19') UD-02	Date Sampled:	09/17/15
Northing: --	Easting: --	Elevation:	--
Sample Preparation:	Shelby Tube Pushed	Permeant Liquid :	De-Aired Tap Water

Initial Sample Conditions		Initial Working Pressures, psi		Final Sample Conditions	
Wet Density, pcf	111.1	Chamber	88	Wet Density, pcf	110.3
Dry Density, pcf	82.5	Head	78	Dry Density, pcf	82.4
Moisture Content, %	34.7	Tail	76	Moisture Content, %	33.8
Void ratio, e	1.056	Conso.	11	Void ratio, e	1.057
Porosity, n	0.514	Soil Specific Gravity		Porosity, n	0.514
Saturation, Percent	89.4	Gs	2.717	Saturation, Percent	86.9
Hydraulic Gradient, i	9.8	Proctor Referenced		Hydraulic Gradient, i	7.8
Sample Length, Inches	5.645	--		Sample Length, Inches	5.648
Sample Volume, cc	572.9644			Sample Volume, cc	573.1166
B-value :	99.0%	Sample Swelled During Saturation, %			0.05%



Start Test @ t=0	Cum. Time Δ t, min.	Head Loss, Δh2 psi	Hydraulic Conductivity, k (Permeability)	
0	0.00	2.0000	cm/sec	°C
1	0.08	1.9444	5.05E-04	20
2	0.17	1.8943	4.86E-04	20
3	0.25	1.8485	4.71E-04	20
4	0.33	1.8012	4.69E-04	20
5	0.42	1.7553	4.68E-04	20
6	0.50	1.7100	4.68E-04	20
7	0.58	1.6663	4.67E-04	20
8	0.67	1.6246	4.66E-04	20
9	0.75	1.5829	4.66E-04	20

**Hydraulic Conductivity, cm/sec**

**4.66E-04**



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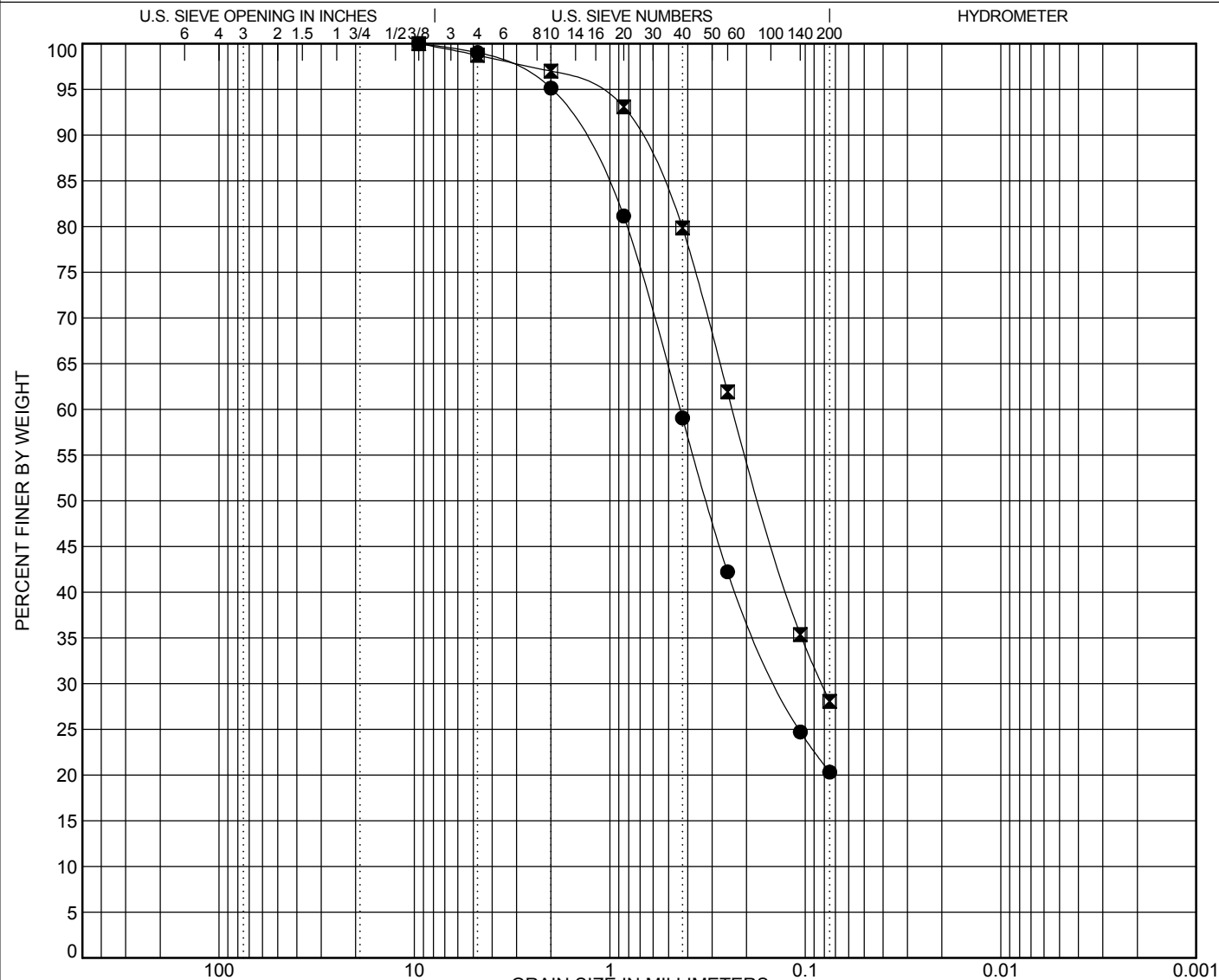
# GRAIN SIZE DISTRIBUTION

CLIENT Southern Company Services

PROJECT NAME Plant Yates Piezometers

PROJECT NUMBER Z003000203

PROJECT LOCATION Newnan, GA



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification					LL	PL	PI	Cc	Cu
● PZ-22S	7	SILTY SAND (SM-SC)					NP	NP	NP		
☒ PZ-22S	17	SILTY SAND (SM-SC)					NP	NP	NP		
BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt		%Clay	
● PZ-22S	7	9.5	0.438	0.137		1.0	78.7	20.3			
☒ PZ-22S	17	9.5	0.235	0.082		1.3	70.7	28.0			

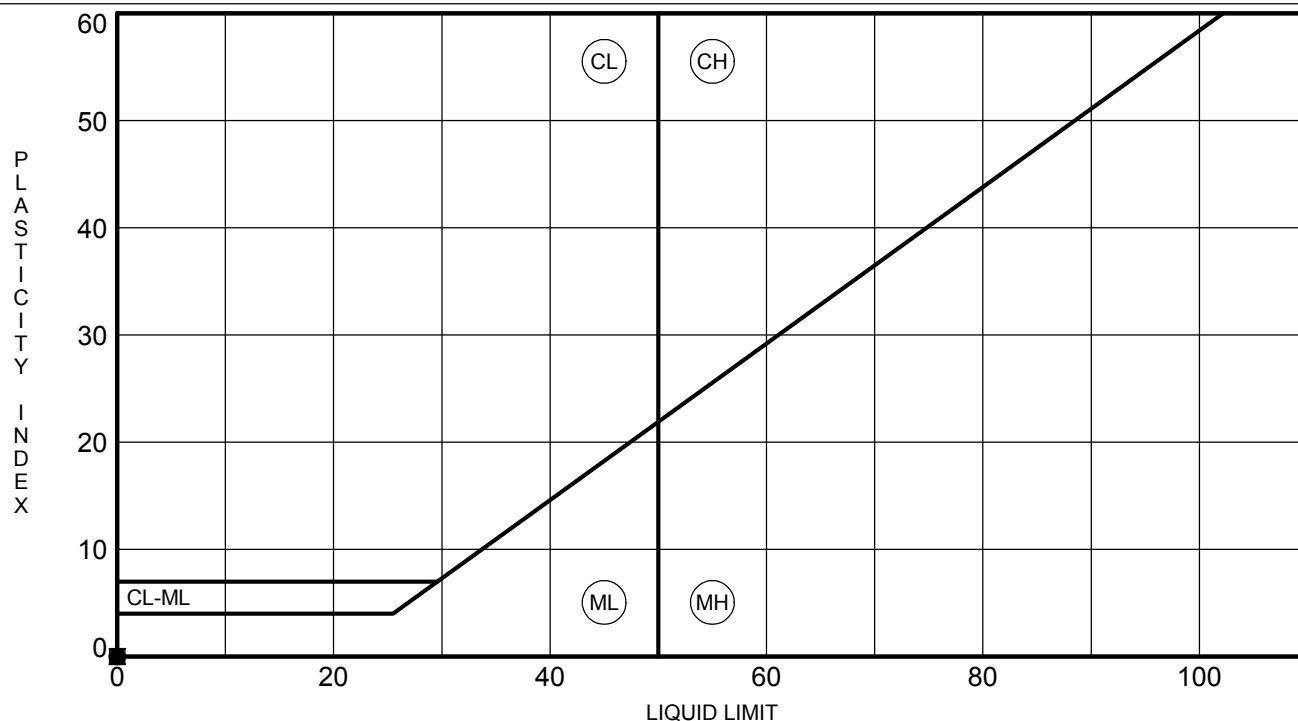
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**CLIENT** Southern Company Services

**PROJECT NAME** Plant Yates Piezometers

PROJECT NUMBER Z003000203

**PROJECT LOCATION** Newnan, GA

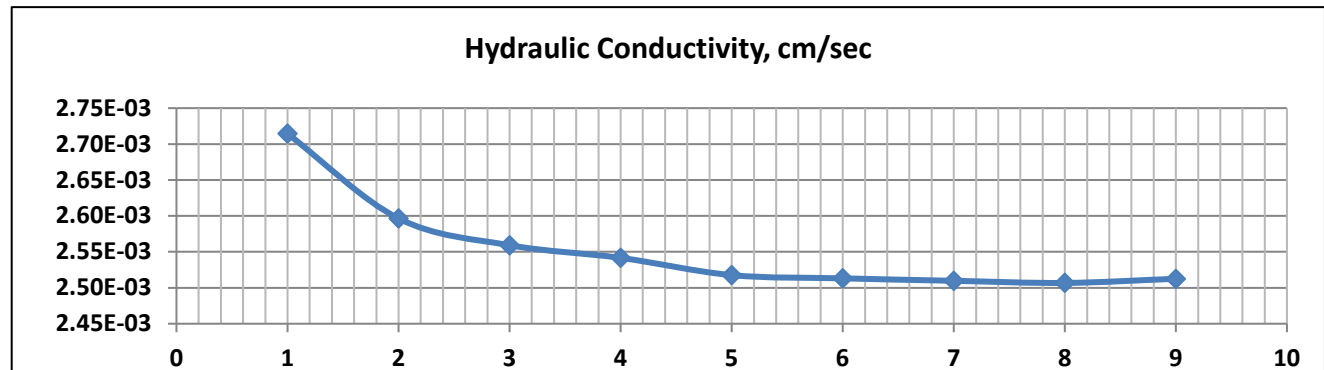
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# Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084-10

Project :	Plant Yates Piezometers	Project Number:	Z003000203
Client :	Southern Company Services, INC	Sample Number :	PZ-24S (17'-19')
Sample Location :	PZ-24S (17'-19') UD-01	Date Sampled:	09/17/15
Northing:	--	Easting:	--
Sample Preparation:	Shelby Tube Pushed	Elevation:	--
		Permeant Liquid :	De-Aired Tap Water

Initial Sample Conditions		Initial Working Pressures, psi		Final Sample Conditions	
Wet Density, pcf	103.0	Chamber	90	Wet Density, pcf	111.1
Dry Density, pcf	83.4	Head	79	Dry Density, pcf	83.4
Moisture Content, %	23.5	Tail	77	Moisture Content, %	33.3
Void ratio, e	1.015	Conso.	12	Void ratio, e	1.015
Porosity, n	0.504	Soil Specific Gravity		Porosity, n	0.504
Saturation, Percent	62.2	Gs	2.693	Saturation, Percent	88.2
Hydraulic Gradient, i	9.9	Proctor Referenced		Hydraulic Gradient, i	7.7
Sample Length, Inches	5.587	--		Sample Length, Inches	5.583
Sample Volume, cc	566.4718			Sample Volume, cc	566.2689
B-value :	96.0%	Sample Consolidated During Saturation, %			0.07%



Start Test @ t=0	Cum. Time Δ t, min.	Head Loss, Δh2, psi	Hydraulic Conductivity, k (Permeability)	
0	0.00	2.0000	cm/sec	°C
1	0.02	1.9388	2.71E-03	20
2	0.03	1.8846	2.60E-03	20
3	0.05	1.8318	2.56E-03	20
4	0.07	1.7803	2.54E-03	20
5	0.08	1.7317	2.52E-03	20
6	0.10	1.6830	2.51E-03	20
7	0.12	1.6357	2.51E-03	20
8	0.13	1.5899	2.51E-03	20
9	0.15	1.5440	2.51E-03	20

**Hydraulic Conductivity, cm/sec**

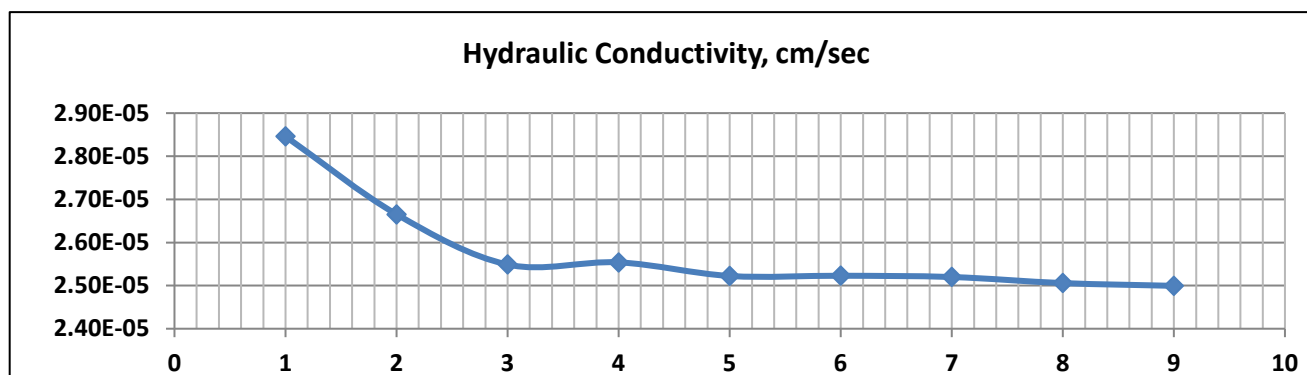
**2.51E-03**

# Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084-10

Project :	Plant Yates Piezometers	Project Number:	Z003000203
Client :	Southern Company Services, INC	Sample Number :	PZ-24S (37'-39')
Sample Location :	PZ-24S (37'-39') UD-02	Date Sampled:	09/16/15
Northing: --	Easting: --	Elevation:	--
Sample Preparation:	Shelby Tube Pushed	Permeant Liquid :	De-Aired Tap Water

Initial Sample Conditions		Initial Working Pressures, psi		Final Sample Conditions	
Wet Density, pcf	109.6	Chamber	101	Wet Density, pcf	112.3
Dry Density, pcf	90.6	Head	79	Dry Density, pcf	91.0
Moisture Content, %	21.0	Tail	77	Moisture Content, %	23.3
Void ratio, e	0.860	Conso.	23	Void ratio, e	0.851
Porosity, n	0.462	Soil Specific Gravity		Porosity, n	0.460
Saturation, Percent	66.0	Gs	2.701	Saturation, Percent	74.0
Hydraulic Gradient, i	9.6	Proctor Referenced		Hydraulic Gradient, i	8.3
Sample Length, Inches	5.745	--		Sample Length, Inches	5.687
Sample Volume, cc	594.031			Sample Volume, cc	591.0023
B-value :	100.0%	Sample Consolidated During Saturation, %			1.01%



Start Test @ t=0	Cum. Time Δ t, min.	Head Loss, Δh2 psi	Hydraulic Conductivity, k (Permeability)	
0	0.00	2.0000	cm/sec	°C
1	1.00	1.9611	2.85E-05	20
2	2.00	1.9277	2.67E-05	20
3	3.00	1.8971	2.55E-05	20
4	4.00	1.8638	2.55E-05	20
5	5.00	1.8332	2.52E-05	20
6	6.00	1.8015	2.52E-05	20
7	7.00	1.7706	2.52E-05	20
8	8.00	1.7414	2.51E-05	20
9	9.00	1.7122	2.50E-05	20

**Hydraulic Conductivity, cm/sec**

**2.50E-05**



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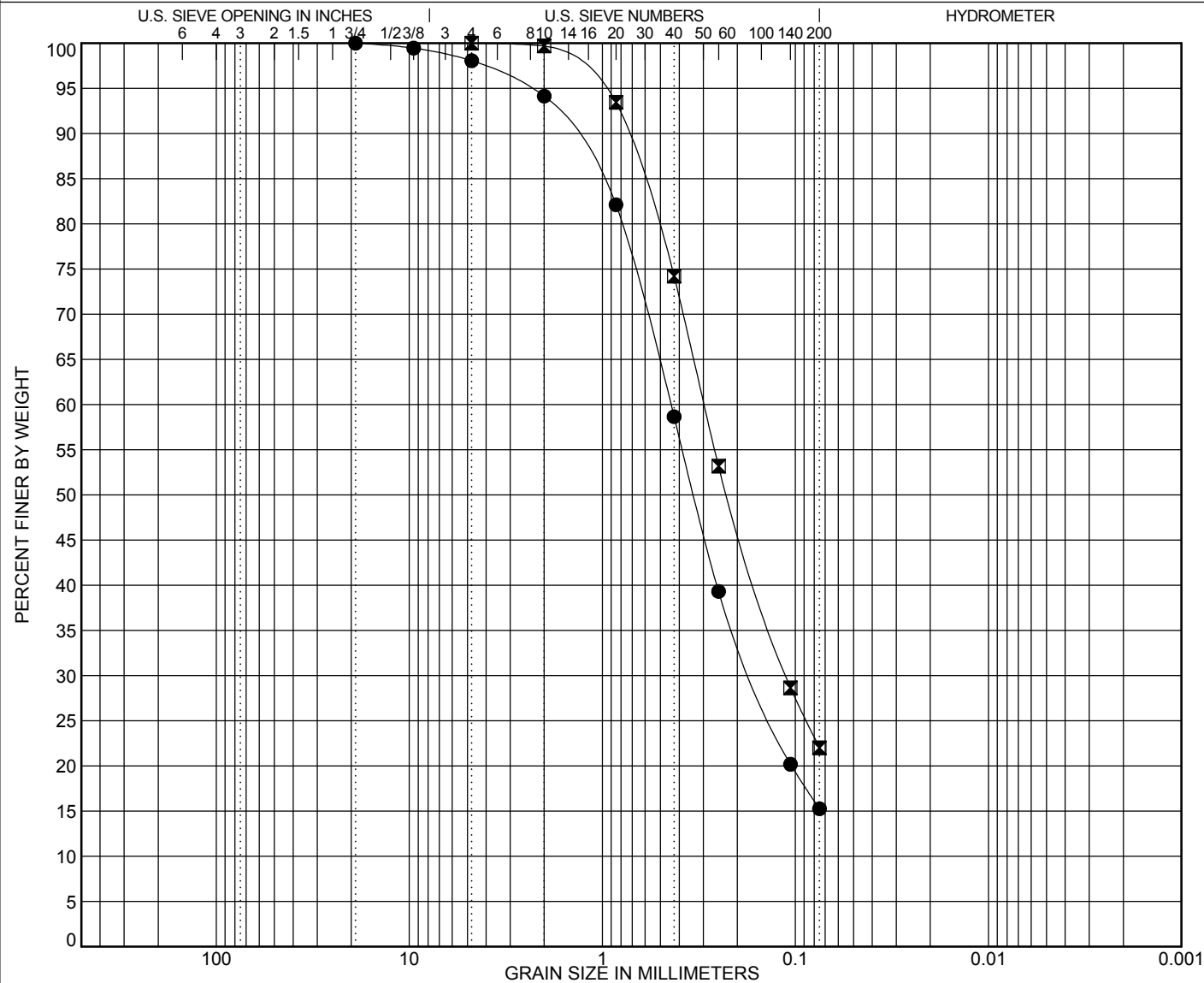
# GRAIN SIZE DISTRIBUTION

CLIENT Southern Company Services

PROJECT NAME Plant Yates Piezometers

PROJECT NUMBER Z003000203

PROJECT LOCATION Newnan, GA



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification					LL	PL	PI	Cc	Cu
● PZ-24S	17	SILTY SAND (SM-SC)					NP	NP	NP		
☒ PZ-24S	37	SILTY SAND (SM-SC)					NP	NP	NP		
BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt		%Clay	
● PZ-24S	17	19	0.442	0.165		1.9	82.8	15.3			
☒ PZ-24S	37	4.75	0.297	0.111		0.0	78.0	22.0			

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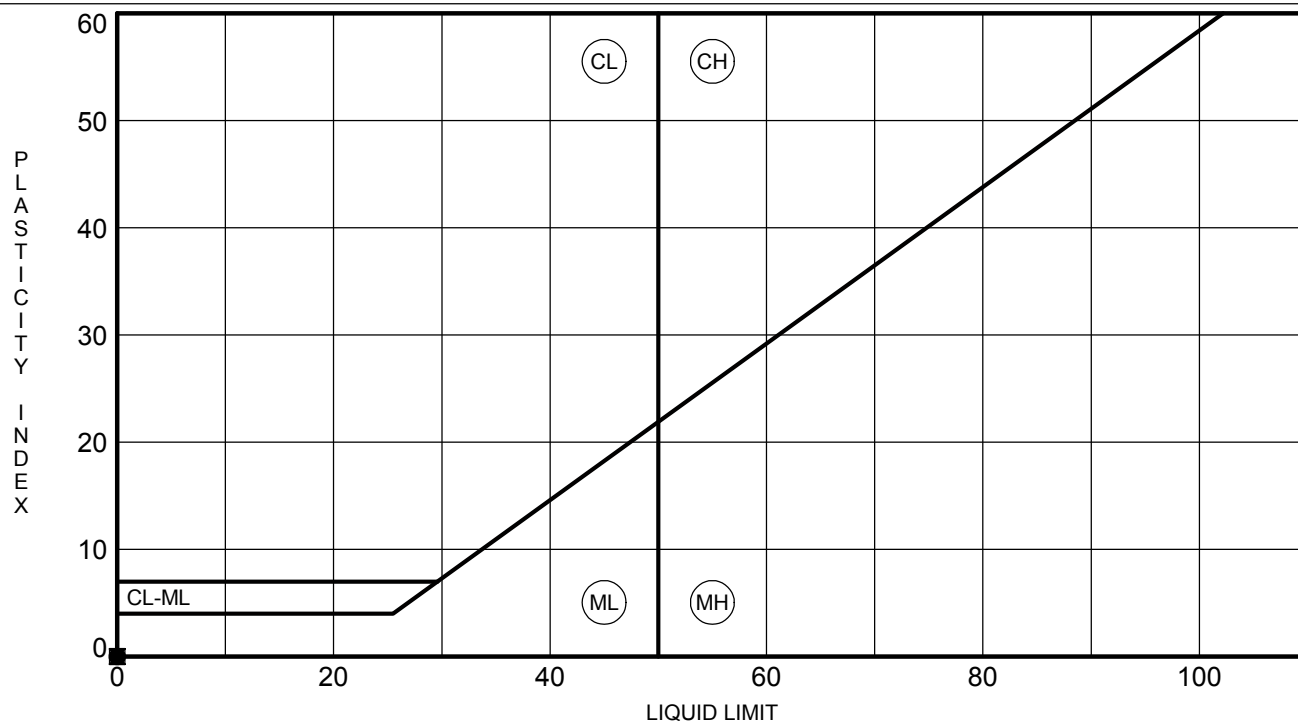


**CLIENT** Southern Company Services

**PROJECT NAME** Plant Yates Piezometers

PROJECT NUMBER Z003000203

**PROJECT LOCATION** Newnan, GA

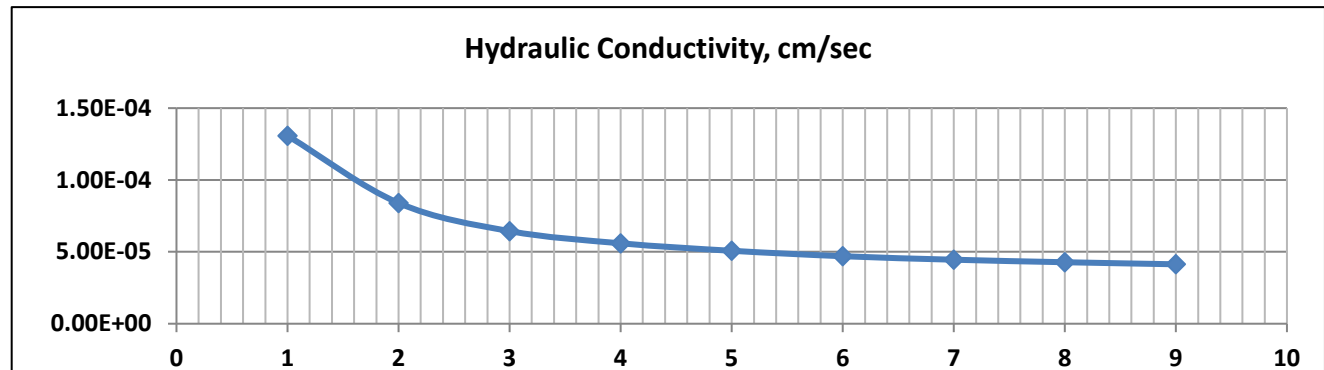
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# Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084-10

Project :	Plant Yates Piezometers	Project Number:	Z003000203
Client :	Southern Company Services, INC	Sample Number :	PZ-25S (33'-35')
Sample Location :	PZ-25S (33'-35') UD-01	Date Sampled:	09/03/15
Northing: --	Easting: --	Elevation:	--
Sample Preparation:	Shelby Tube Pushed	Permeant Liquid :	De-Aired Tap Water

Initial Sample Conditions		Initial Working Pressures, psi		Final Sample Conditions	
Wet Density, pcf	110.9	Chamber	98	Wet Density, pcf	112.1
Dry Density, pcf	85.8	Head	79	Dry Density, pcf	86.1
Moisture Content, %	29.2	Tail	77	Moisture Content, %	30.3
Void ratio, e	0.947	Conso.	20	Void ratio, e	0.942
Porosity, n	0.486	Soil Specific Gravity		Porosity, n	0.485
Saturation, Percent	82.7	Gs	2.678	Saturation, Percent	86.1
Hydraulic Gradient, i	9.8	Proctor Referenced		Hydraulic Gradient, i	7.7
Sample Length, Inches	5.635	--		Sample Length, Inches	5.600
Sample Volume, cc	575.4849	--		Sample Volume, cc	573.6865
B-value :	97.0%	Sample Consolidated During Saturation, %			0.62%



Start Test @ t=0	Cum. Time Δ t, min.	Head Loss, Δh2 psi	Hydraulic Conductivity, k (Permeability)	
0	0.00	2.0000	cm/sec	°C
1	1.00	1.8290	1.31E-04	20
2	2.00	1.7831	8.40E-05	20
3	3.00	1.7525	6.44E-05	20
4	4.00	1.7164	5.59E-05	20
5	5.00	1.6816	5.07E-05	20
6	6.00	1.6497	4.70E-05	20
7	7.00	1.6163	4.45E-05	20
8	8.00	1.5829	4.28E-05	20
9	9.00	1.5509	4.13E-05	20

**Hydraulic Conductivity, cm/sec**

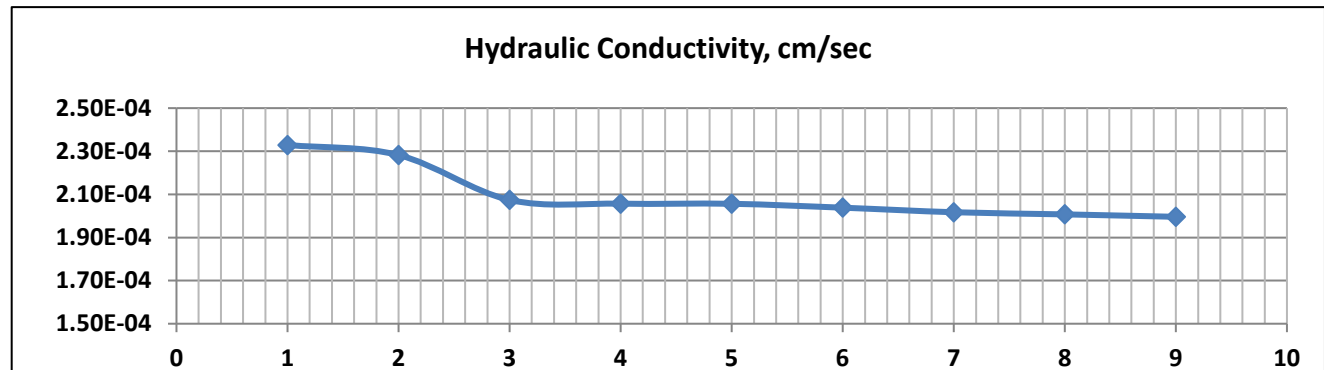
**4.13E-05**

# Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084-10

Project :	Plant Yates Piezometers	Project Number:	Z003000203
Client :	Southern Company Services, INC	Sample Number :	PZ-25S (44'-46')
Sample Location :	PZ-25S (44'-46') UD-02	Date Sampled:	09/03/15
Northing: --	Easting: --	Elevation:	--
Sample Preparation:	Shelby Tube Pushed	Permeant Liquid :	De-Aired Tap Water

Initial Sample Conditions		Initial Working Pressures, psi		Final Sample Conditions	
Wet Density, pcf	118.4	Chamber	104	Wet Density, pcf	119.4
Dry Density, pcf	97.9	Head	78	Dry Density, pcf	98.1
Moisture Content, %	21.0	Tail	76	Moisture Content, %	21.7
Void ratio, e	0.710	Conso.	27	Void ratio, e	0.706
Porosity, n	0.415	Soil Specific Gravity		Porosity, n	0.414
Saturation, Percent	79.2	Gs	2.682	Saturation, Percent	82.4
Hydraulic Gradient, i	9.9	Proctor Referenced		Hydraulic Gradient, i	9.0
Sample Length, Inches	5.610	--		Sample Length, Inches	5.577
Sample Volume, cc	572.1864	--		Sample Volume, cc	570.4937
B-value :	97.0%	Sample Consolidated During Saturation, %			0.59%



Start Test @ t=0	Cum. Time Δ t, min.	Head Loss, Δh2, psi	Hydraulic Conductivity, k (Permeability)	
0	0.00	2.0000	cm/sec	°C
1	0.08	1.9736	2.33E-04	20
2	0.17	1.9486	2.28E-04	20
3	0.25	1.9302	2.07E-04	20
4	0.33	1.9082	2.06E-04	20
5	0.42	1.8860	2.06E-04	20
6	0.50	1.8651	2.04E-04	20
7	0.58	1.8451	2.02E-04	20
8	0.67	1.8248	2.01E-04	20
9	0.75	1.8051	2.00E-04	20

**Hydraulic Conductivity, cm/sec**

**2.00E-04**



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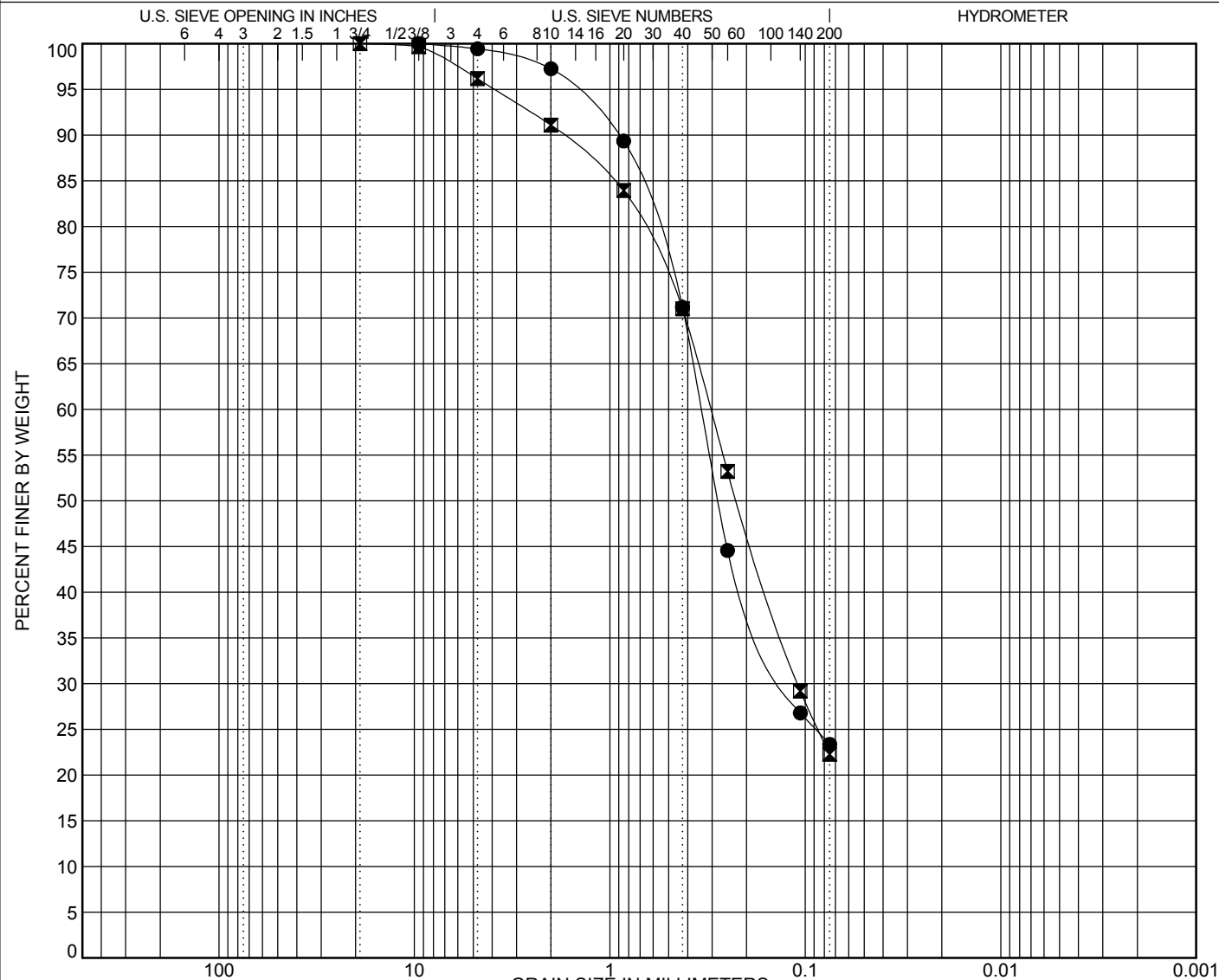
# GRAIN SIZE DISTRIBUTION

CLIENT Southern Company Services

PROJECT NAME Plant Yates Piezometers

PROJECT NUMBER Z003000203

PROJECT LOCATION Newnan, GA



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification					LL	PL	PI	Cc	Cu
● PZ-25S	33	SILTY SAND (SM-SC)					NP	NP	NP		
☒ PZ-25S	44	SILTY SAND (SM-SC)					NP	NP	NP		
BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt		%Clay	
● PZ-25S	33	9.5	0.34	0.124		0.6	76.1	23.4			
☒ PZ-25S	44	19	0.306	0.109		3.8	73.9	22.3			

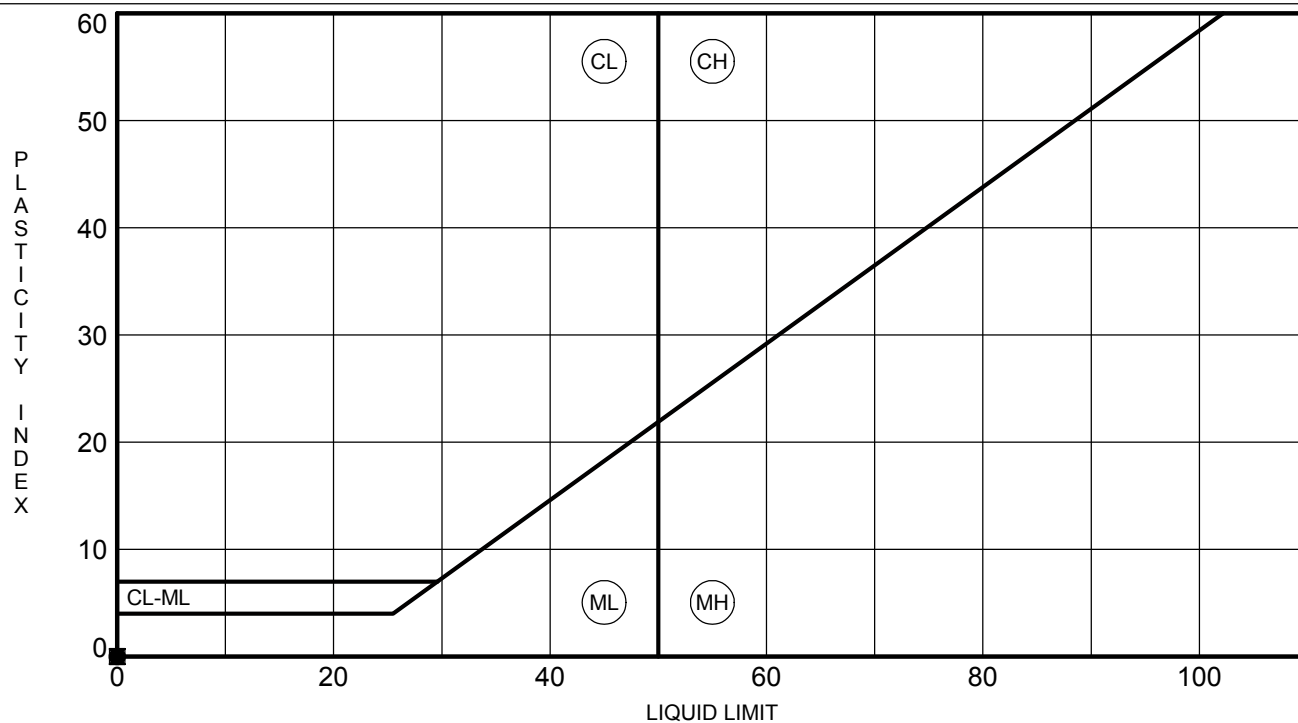
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**CLIENT** Southern Company Services

**PROJECT NAME** Plant Yates Piezometers

PROJECT NUMBER Z003000203

**PROJECT LOCATION** Newnan, GA

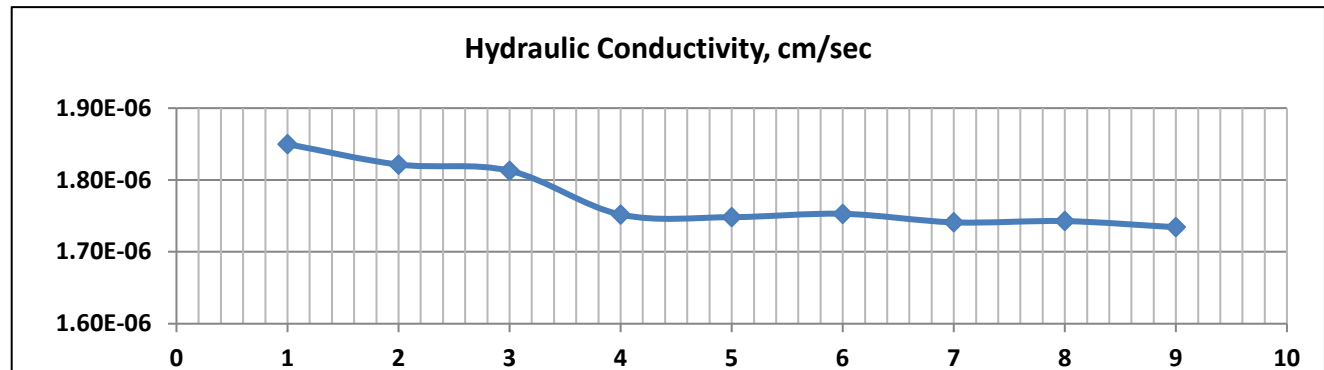
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# Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084-10

Project :	Plant Yates Piezometers	Project Number:	Z003000203
Client :	Southern Company Services, INC	Sample Number :	PZ-26S (17'-19')
Sample Location :	PZ-26S (17'-19') UD-01	Date Sampled:	9/31/2015
Northing: --	Easting: --	Elevation:	--
Sample Preparation:	Shelby Tube Pushed	Permeant Liquid :	De-Aired Tap Water

Initial Sample Conditions		Initial Working Pressures, psi		Final Sample Conditions	
Wet Density, pcf	122.6	Chamber	92	Wet Density, pcf	115.8
Dry Density, pcf	94.9	Head	79	Dry Density, pcf	95.2
Moisture Content, %	29.3	Tail	77	Moisture Content, %	21.7
Void ratio, e	0.803	Conso.	14	Void ratio, e	0.797
Porosity, n	0.445	Soil Specific Gravity		Porosity, n	0.443
Saturation, Percent	99.9	Gs	2.741	Saturation, Percent	74.5
Hydraulic Gradient, i	9.8	Proctor Referenced		Hydraulic Gradient, i	8.9
Sample Length, Inches	5.645	--		Sample Length, Inches	5.601
Sample Volume, cc	590.4383	--		Sample Volume, cc	588.1194
B-value :	100.0%	Sample Consolidated During Saturation, %			0.78%



Start Test @ t=0	Cum. Time Δ t, min.	Head Loss, Δh2 psi	Hydraulic Conductivity, k (Permeability)	
0	0.00	2.0000	cm/sec	°C
1	10.00	1.9741	1.85E-06	20
2	20.00	1.9494	1.82E-06	20
3	30.00	1.9249	1.81E-06	20
4	40.00	1.9038	1.75E-06	20
5	50.00	1.8807	1.75E-06	20
6	60.00	1.8574	1.75E-06	20
7	70.00	1.8357	1.74E-06	20
8	80.00	1.8131	1.74E-06	20
9	90.00	1.7920	1.73E-06	20

**Hydraulic Conductivity, cm/sec**

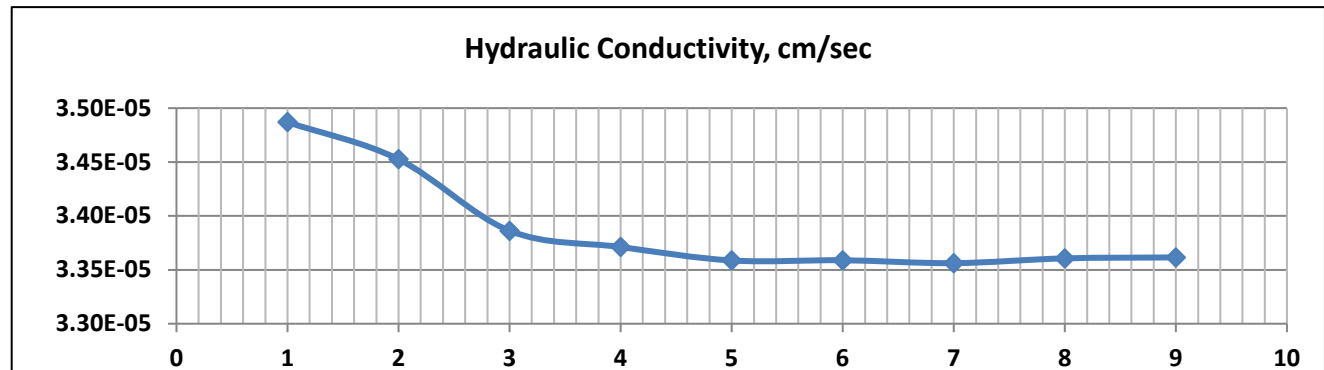
**1.73E-06**

# Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084-10

Project :	Plant Yates Piezometers	Project Number:	Z003000203
Client :	Southern Company Services, INC	Sample Number :	PZ-26S (27'-29')
Sample Location :	PZ-26S (27'-29') UD-02	Date Sampled:	9/31/15
Northing: --	Easting: --	Elevation:	--
Sample Preparation:	Shelby Tube Pushed	Permeant Liquid :	De-Aired Tap Water

Initial Sample Conditions		Initial Working Pressures, psi		Final Sample Conditions	
Wet Density, pcf	120.1	Chamber	101	Wet Density, pcf	119.2
Dry Density, pcf	92.5	Head	79	Dry Density, pcf	92.5
Moisture Content, %	29.8	Tail	77	Moisture Content, %	28.8
Void ratio, e	0.834	Conso.	23	Void ratio, e	0.834
Porosity, n	0.455	Soil Specific Gravity		Porosity, n	0.455
Saturation, Percent	97.1	Gs	2.720	Saturation, Percent	94.1
Hydraulic Gradient, i	9.8	Proctor Referenced		Hydraulic Gradient, i	8.0
Sample Length, Inches	5.623	--		Sample Length, Inches	5.619
Sample Volume, cc	570.3925			Sample Volume, cc	570.1895
B-value :	100.0%	Sample Consolidated During Saturation, %			0.07%



Start Test @ t=0	Cum. Time Δ t, min.	Head Loss, Δh2 psi	Hydraulic Conductivity, k (Permeability)	
0	0.00	2.0000	cm/sec	°C
1	1.00	1.9538	3.49E-05	20
2	2.00	1.9096	3.45E-05	20
3	3.00	1.8685	3.39E-05	20
4	4.00	1.8273	3.37E-05	20
5	5.00	1.7873	3.36E-05	20
6	6.00	1.7475	3.36E-05	20
7	7.00	1.7089	3.36E-05	20
8	8.00	1.6705	3.36E-05	20
9	9.00	1.6332	3.36E-05	20

**Hydraulic Conductivity, cm/sec**

**3.36E-05**



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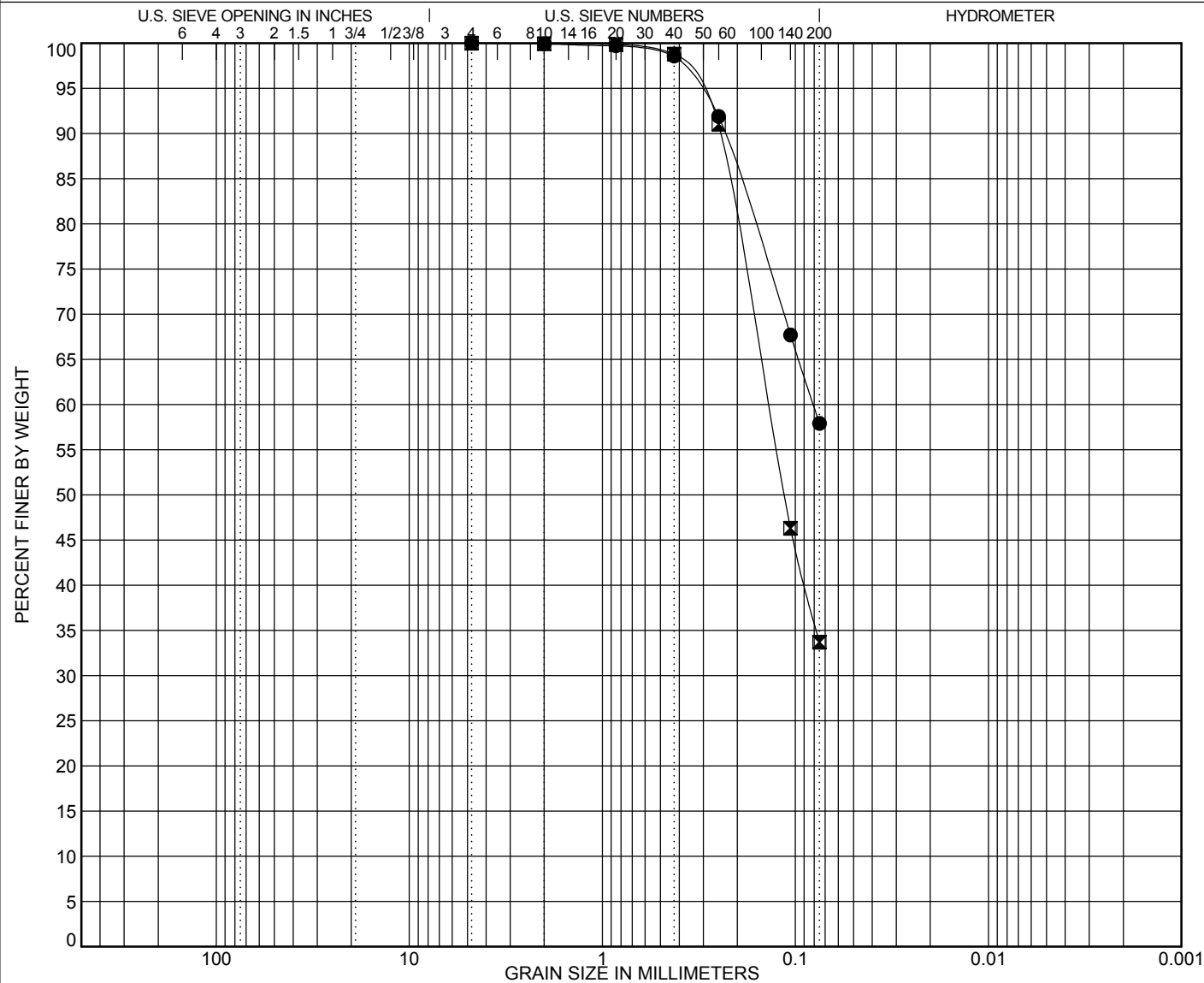
# GRAIN SIZE DISTRIBUTION

CLIENT Southern Company Services

PROJECT NAME Plant Yates Piezometers

PROJECT NUMBER Z003000203

PROJECT LOCATION Newnan, GA



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification					LL	PL	PI	Cc	Cu
● PZ-26s	17	SANDY SILT (ML)					37	27	10		
☒ PZ-26s	27	SILTY SAND (SM-SC)					NP	NP	NP		
BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt		%Clay	
● PZ-26s	17	4.75	0.081			0.0	42.1	57.9			
☒ PZ-26s	27	4.75	0.138			0.0	66.3	33.7			

GRAIN SIZE - GINT STD US LAB GDT - 10/27/15 11:29 - S:\TRADITIONAL\BIRMINGHAM LAB\SOUTHERN COMPANY\PLANT YATES PIEZOMETERS\GINT\PLANT YATES PIEZOMETERS.GPJ

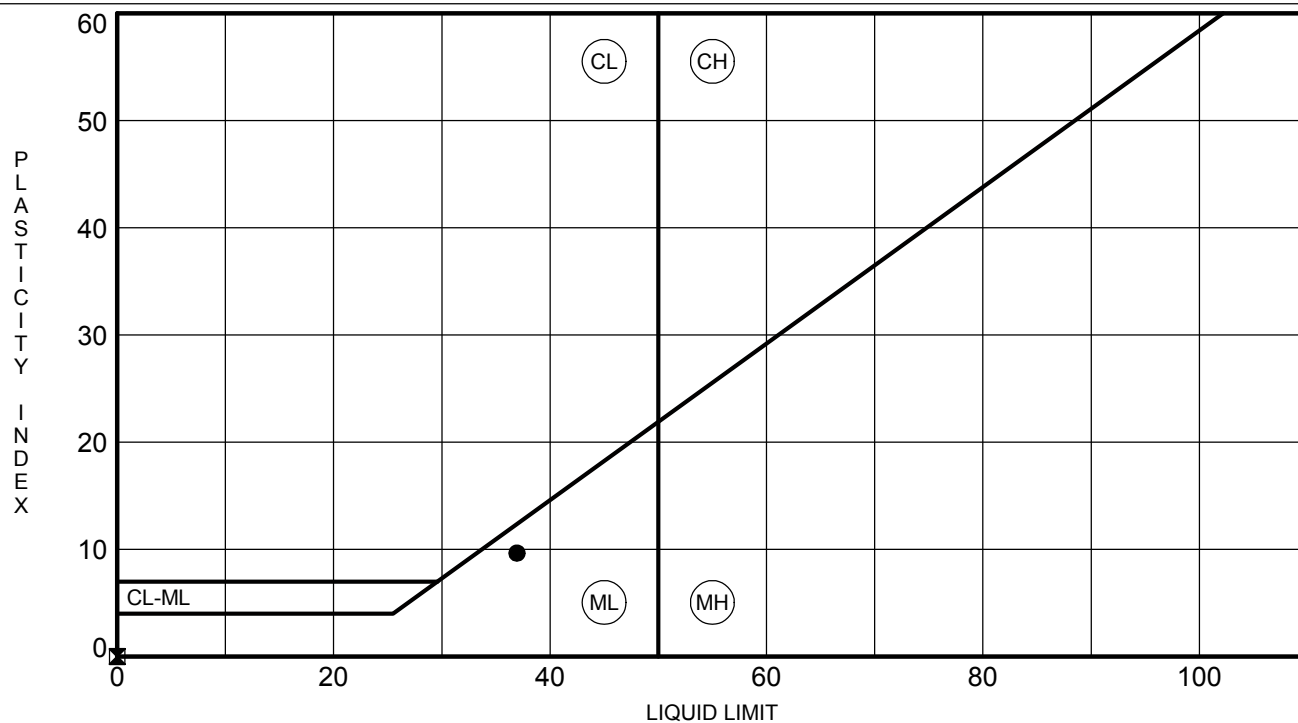


**CLIENT** Southern Company Services

**PROJECT NAME** Plant Yates Piezometers

PROJECT NUMBER Z003000203

**PROJECT LOCATION** Newnan, GA

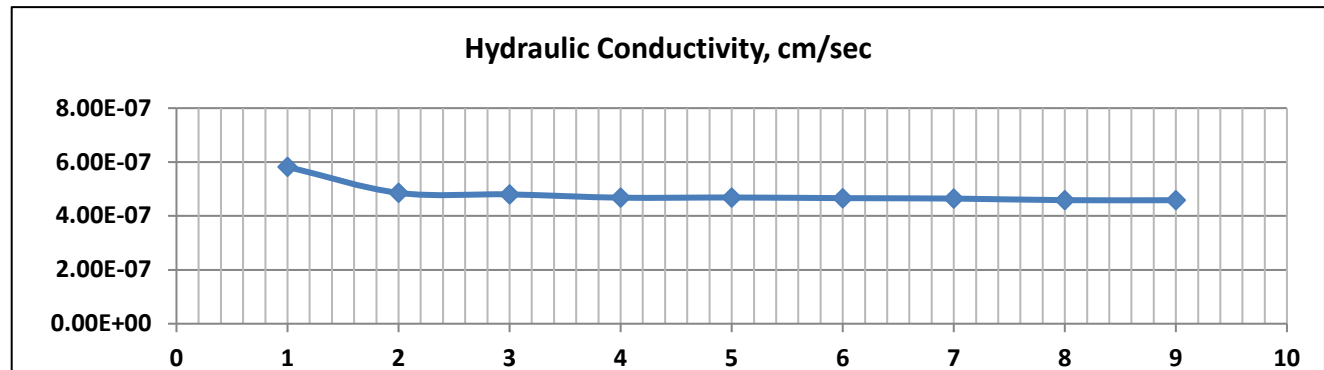
[illegible]

# Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084-10

Project :	Plant Yates Piezometers	Project Number:	Z003000203
Client :	Southern Company Services, INC	Sample Number :	PZ-27S (17'-19')
Sample Location :	PZ-27S (17'-19') UD-01	Date Sampled:	10/07/15
Northing: --	Easting: --	Elevation:	--
Sample Preparation:	Shelby Tube Pushed	Permeant Liquid :	De-Aired Tap Water

Initial Sample Conditions		Initial Working Pressures, psi		Final Sample Conditions	
Wet Density, pcf	126.5	Chamber	93	Wet Density, pcf	126.1
Dry Density, pcf	99.6	Head	79	Dry Density, pcf	99.8
Moisture Content, %	27.0	Tail	77	Moisture Content, %	26.3
Void ratio, e	0.667	Conso.	15	Void ratio, e	0.663
Porosity, n	0.400	Soil Specific Gravity		Porosity, n	0.399
Saturation, Percent	107.7	Gs	2.661	Saturation, Percent	105.7
Hydraulic Gradient, i	9.8	Proctor Referenced		Hydraulic Gradient, i	9.6
Sample Length, Inches	5.635	--		Sample Length, Inches	5.603
Sample Volume, cc	578.7582			Sample Volume, cc	577.1055
B-value :	97.0%	Sample Consolidated During Saturation, %			0.57%



Start Test @ t=0	Cum. Time $\Delta t$ , min.	Head Loss, $\Delta h_2$ psi	Hydraulic Conductivity, k (Permeability)	
0	0.00	2.0000	cm/sec	°C
1	10.00	1.9917	5.82E-07	20
2	20.00	1.9861	4.86E-07	20
3	30.00	1.9794	4.80E-07	20
4	40.00	1.9733	4.68E-07	20
5	50.00	1.9666	4.68E-07	20
6	60.00	1.9602	4.66E-07	20
7	70.00	1.9538	4.64E-07	20
8	80.00	1.9480	4.58E-07	20
9	90.00	1.9416	4.58E-07	20

**Hydraulic Conductivity, cm/sec**

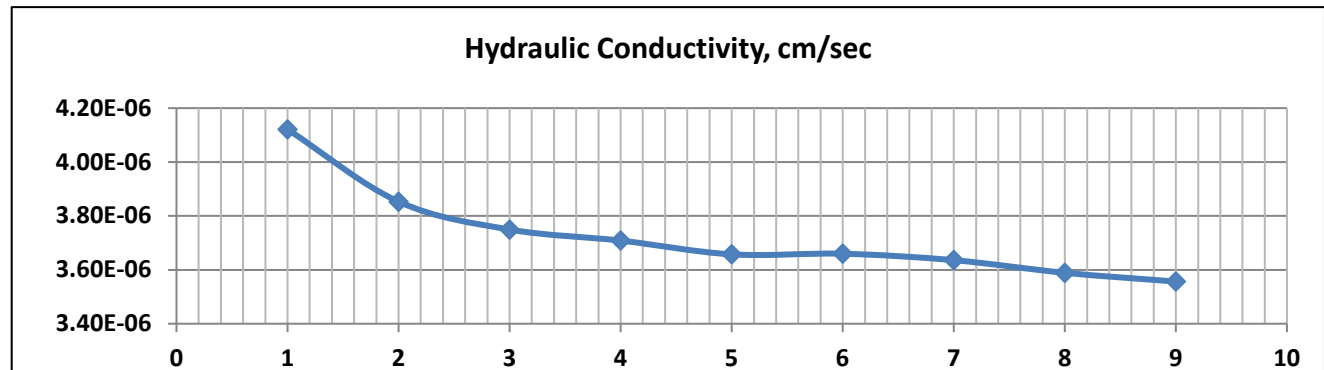
**4.58E-07**

# Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084-10

Project :	Plant Yates Piezometers	Project Number:	Z003000203
Client :	Southern Company Services, INC	Sample Number :	PZ-27S (27'-29')
Sample Location :	PZ-27S (27'-29') UD-02	Date Sampled:	10/07/15
Northing: --	Easting: --	Elevation:	--
Sample Preparation:	Shelby Tube Pushed	Permeant Liquid :	De-Aired Tap Water

Initial Sample Conditions		Initial Working Pressures, psi		Final Sample Conditions	
Wet Density, pcf	120.0	Chamber	98	Wet Density, pcf	119.6
Dry Density, pcf	91.1	Head	79	Dry Density, pcf	91.3
Moisture Content, %	31.7	Tail	77	Moisture Content, %	31.0
Void ratio, e	0.831	Conso.	20	Void ratio, e	0.827
Porosity, n	0.454	Soil Specific Gravity		Porosity, n	0.453
Saturation, Percent	101.9	Gs	2.673	Saturation, Percent	100.2
Hydraulic Gradient, i	9.8	Proctor Referenced		Hydraulic Gradient, i	8.8
Sample Length, Inches	5.657	--		Sample Length, Inches	5.629
Sample Volume, cc	576.1263			Sample Volume, cc	574.6934
B-value :	99.0%	Sample Consolidated During Saturation, %			0.49%



Start Test @ t=0	Cum. Time Δ t, min.	Head Loss, Δh2, psi	Hydraulic Conductivity, k (Permeability)	
0	0.00	2.0000	cm/sec	°C
1	5.00	1.9725	4.12E-06	20
2	10.00	1.9488	3.85E-06	20
3	15.00	1.9258	3.75E-06	20
4	20.00	1.9027	3.71E-06	20
5	25.00	1.8807	3.66E-06	20
6	30.00	1.8576	3.66E-06	20
7	35.00	1.8359	3.64E-06	20
8	40.00	1.8159	3.59E-06	20
9	45.00	1.7959	3.56E-06	20

**Hydraulic Conductivity, cm/sec**

**3.56E-06**



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 Fax: 205-733-8954

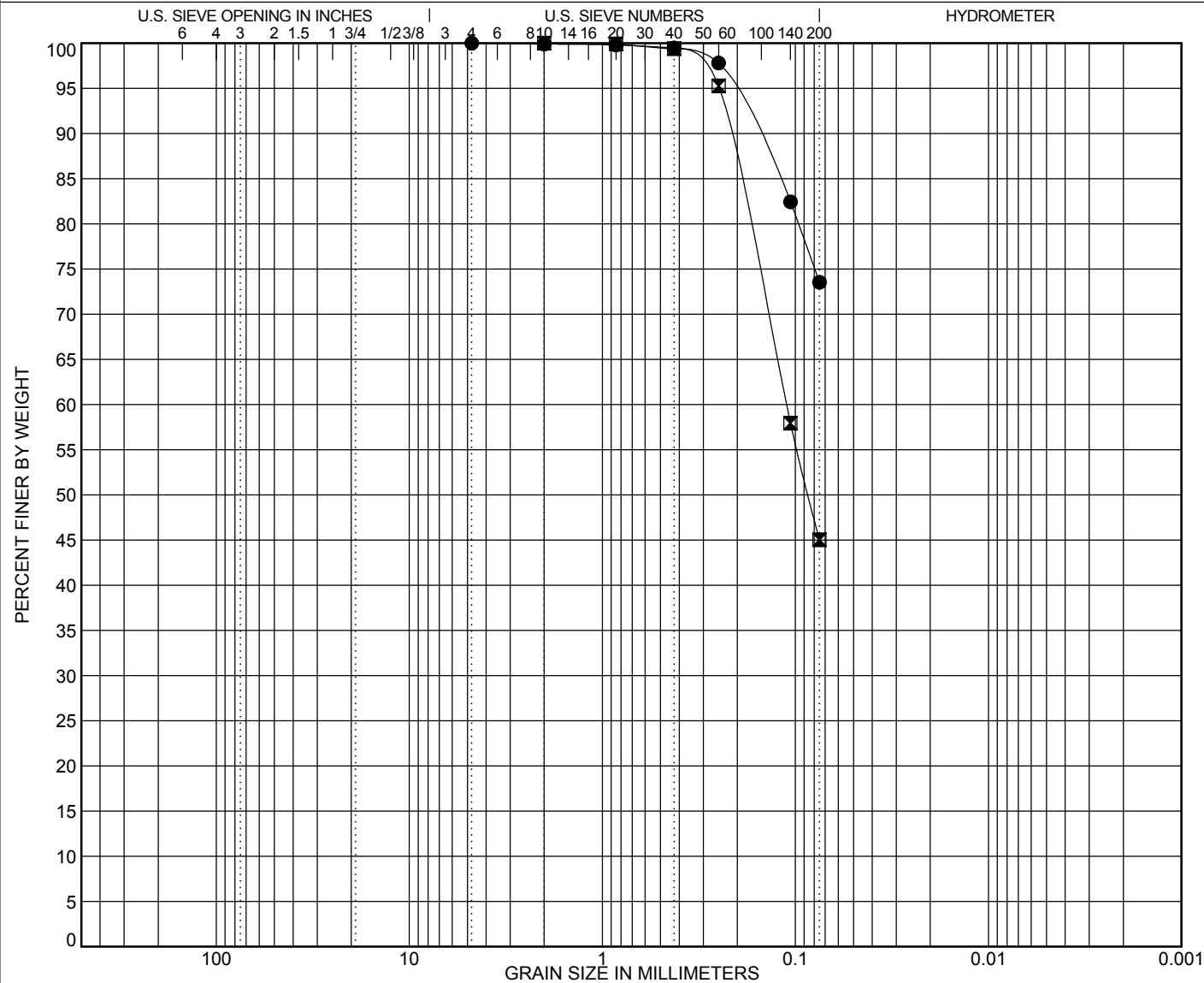
# GRAIN SIZE DISTRIBUTION

CLIENT Southern Company Services

PROJECT NAME Plant Yates Piezometers

PROJECT NUMBER Z003000203

PROJECT LOCATION Newnan, GA



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification					LL	PL	PI	Cc	Cu
● PZ-27s	17	SILT with SAND (ML)					39	30	9		
☒ PZ-27s	27	SILTY SAND(SM-SC)					NP	NP	NP		
BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt		%Clay	
● PZ-27s	17	4.75				0.0	26.5	73.5			
☒ PZ-27s	27	2	0.111			0.0	55.0	45.0			

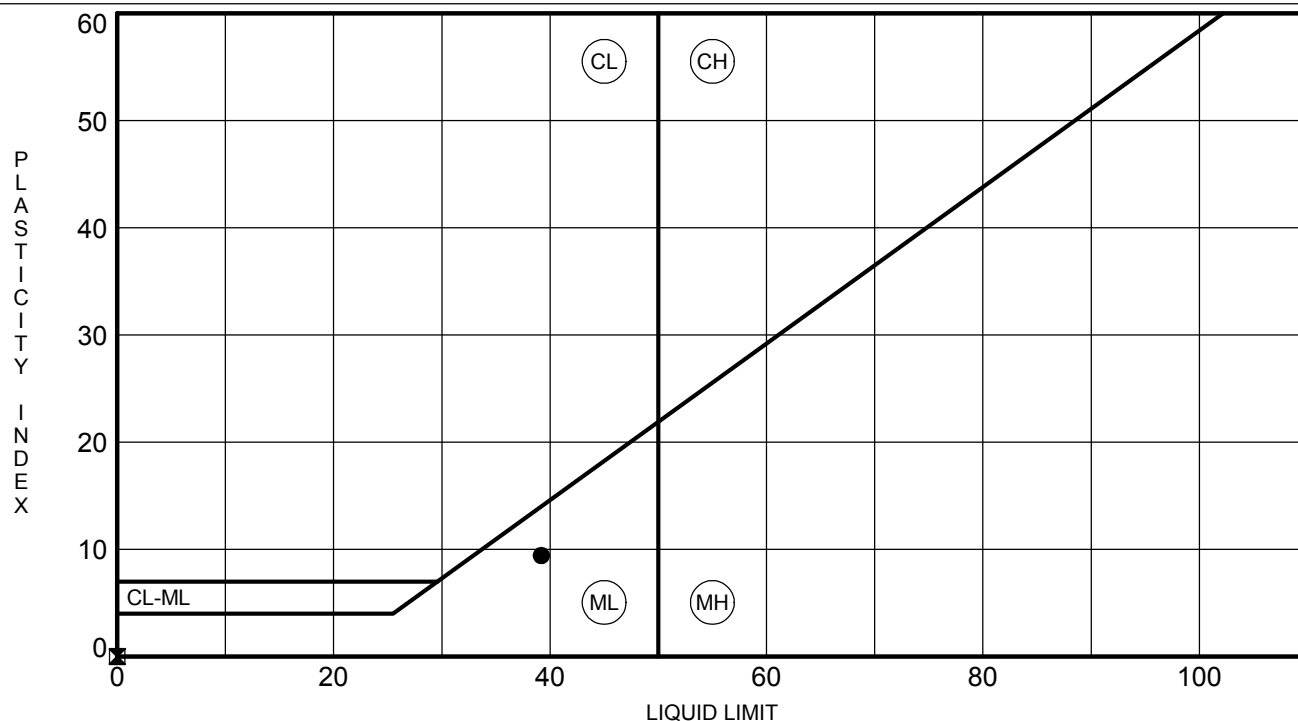
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**CLIENT** Southern Company Services

**PROJECT NAME** Plant Yates Piezometers

**PROJECT NUMBER** Z003000203

**PROJECT LOCATION** Newnan, GA

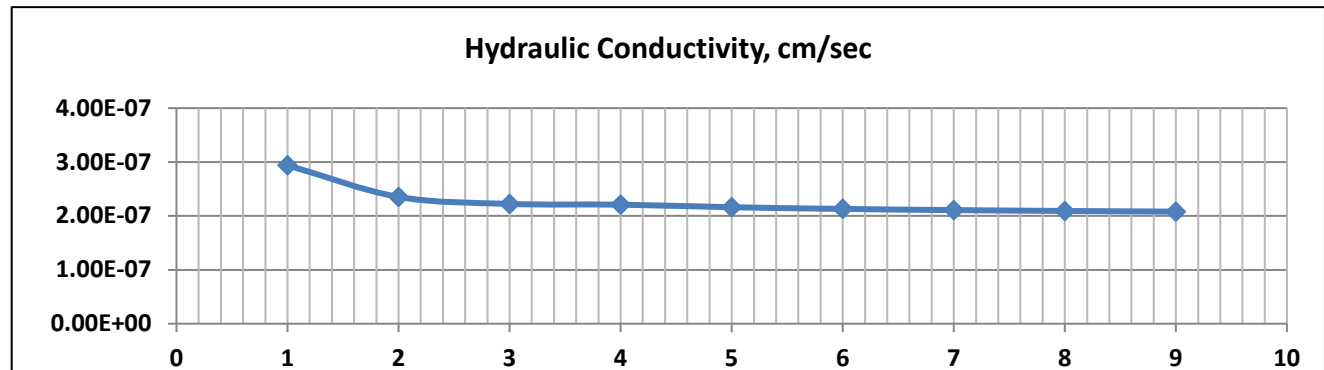
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# Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084-10

Project :	Plant Yates Piezometers	Project Number:	Z003000203
Client :	Southern Company Services, INC	Sample Number :	PZ-28S (17'-19')
Sample Location :	PZ-28S (17'-19') UD-01	Date Sampled:	No Date
Northing: --	Easting: --	Elevation:	--
Sample Preparation:	Shelby Tube Pushed	Permeant Liquid :	De-Aired Tap Water

Initial Sample Conditions		Initial Working Pressures, psi		Final Sample Conditions	
Wet Density, pcf	124.6	Chamber	93	Wet Density, pcf	126.0
Dry Density, pcf	100.8	Head	79	Dry Density, pcf	100.9
Moisture Content, %	23.6	Tail	77	Moisture Content, %	24.9
Void ratio, e	0.597	Conso.	15	Void ratio, e	0.594
Porosity, n	0.374	Soil Specific Gravity		Porosity, n	0.373
Saturation, Percent	102.2	Gs	2.578	Saturation, Percent	108.0
Hydraulic Gradient, i	9.9	Proctor Referenced		Hydraulic Gradient, i	9.8
Sample Length, Inches	5.606	--		Sample Length, Inches	5.584
Sample Volume, cc	568.1281			Sample Volume, cc	567.0091
B-value :	99.0%	Sample Consolidated During Saturation, %			0.39%



Start Test @ t=0	Cum. Time Δ t, min.	Head Loss, Δh2, psi	Hydraulic Conductivity, k (Permeability)	
0	0.00	2.0000	cm/sec	°C
1	10.00	1.9958	2.94E-07	20
2	20.00	1.9933	2.35E-07	20
3	30.00	1.9905	2.22E-07	20
4	40.00	1.9875	2.21E-07	20
5	50.00	1.9847	2.16E-07	20
6	60.00	1.9819	2.13E-07	20
7	70.00	1.9791	2.11E-07	20
8	80.00	1.9764	2.09E-07	20
9	90.00	1.9736	2.08E-07	20

**Hydraulic Conductivity, cm/sec**

**2.08E-07**



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Fax: 205-733-8954

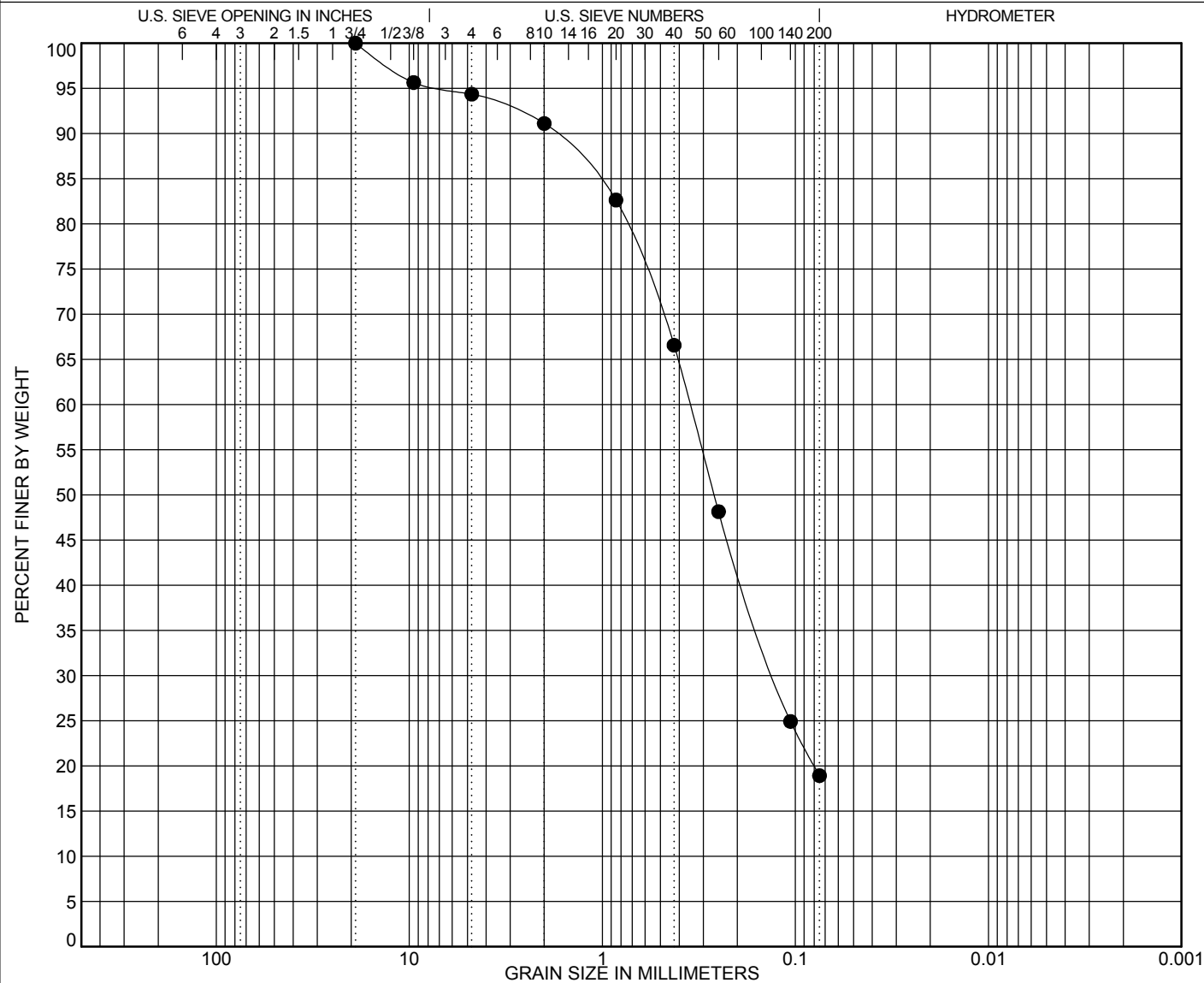
# GRAIN SIZE DISTRIBUTION

CLIENT Southern Company Services

PROJECT NAME Plant Yates Piezometers

PROJECT NUMBER Z003000203

PROJECT LOCATION Newnan, GA



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification					LL	PL	PI	Cc	Cu
● PZ-28s	17	SILTY SAND (SM-SC)					NP	NP	NP		
BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt		%Clay	
● PZ-28s	17	19	0.352	0.128		5.7	75.4	18.9			

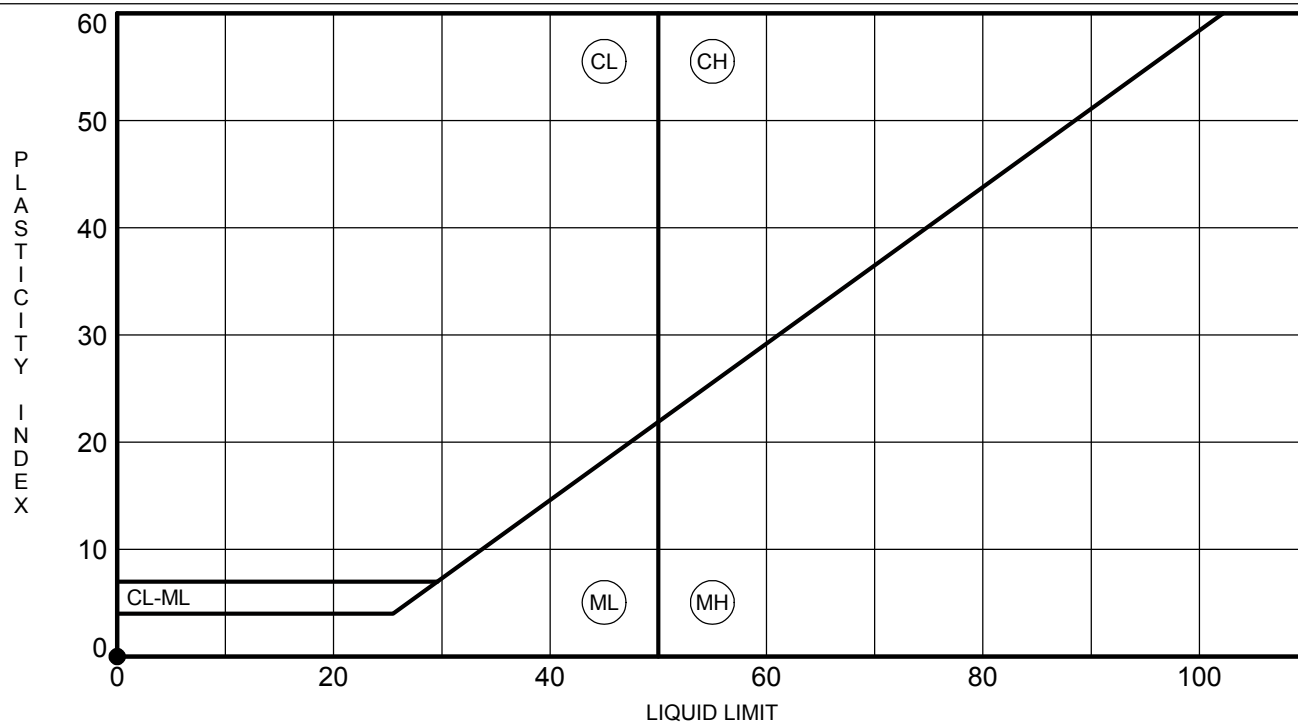
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**CLIENT** Southern Company Services

**PROJECT NAME** Plant Yates Piezometers

PROJECT NUMBER Z003000203

**PROJECT LOCATION** Newnan, GA

[illegible]

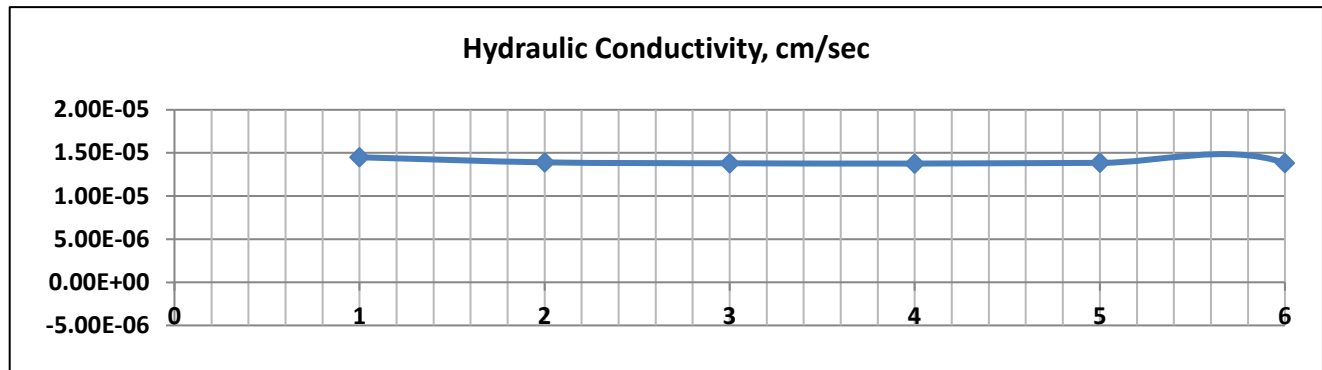


# Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084-10

Project :	Plant Yates Piezometers	Project Number:	Z003000203
Client :	Southern Company Services, INC	Sample Number :	PZ-30S (27'-29')
Sample Location :	PZ-30S (27'-29') UD-01	Date Sampled:	09/23/15
Northing:	--	Easting:	--
Sample Preparation:	Shelby Tube Pushed	Elevation:	--
		Permeant Liquid :	De-Aired Tap Water

Initial Sample Conditions		Initial Working Pressures, psi		Final Sample Conditions	
Wet Density, pcf	122.4	Chamber	101	Wet Density, pcf	124.0
Dry Density, pcf	99.7	Head	79	Dry Density, pcf	100.5
Moisture Content, %	22.7	Tail	77	Moisture Content, %	23.5
Void ratio, e	0.696	Conso.	23	Void ratio, e	0.683
Porosity, n	0.410	Soil Specific Gravity		Porosity, n	0.406
Saturation, Percent	88.5	Gs	2.710	Saturation, Percent	93.1
Hydraulic Gradient, i	10.0	Proctor Referenced		Hydraulic Gradient, i	7.5
Sample Length, Inches	5.538	--		Sample Length, Inches	5.450
Sample Volume, cc	580.1959			Sample Volume, cc	575.5133
B-value :	100.0%	Sample Consolidated During Saturation, %			1.59%



Start Test @ t=0	Cum. Time Δ t, min.	Head Loss, Δh2, psi	Hydraulic Conductivity, k (Permeability)	
0	0.00	2.0000	cm/sec	°C
1	5.00	1.8985	1.45E-05	20
2	10.00	1.8098	1.39E-05	20
3	15.00	1.7236	1.38E-05	20
4	20.00	1.6410	1.38E-05	20
5	25.00	1.5596	1.38E-05	20
6	30.00	1.4842	1.38E-05	20
7	0.00			20
8	0.00			20
9	0.00			20

**Hydraulic Conductivity, cm/sec**

**1.38E-05**



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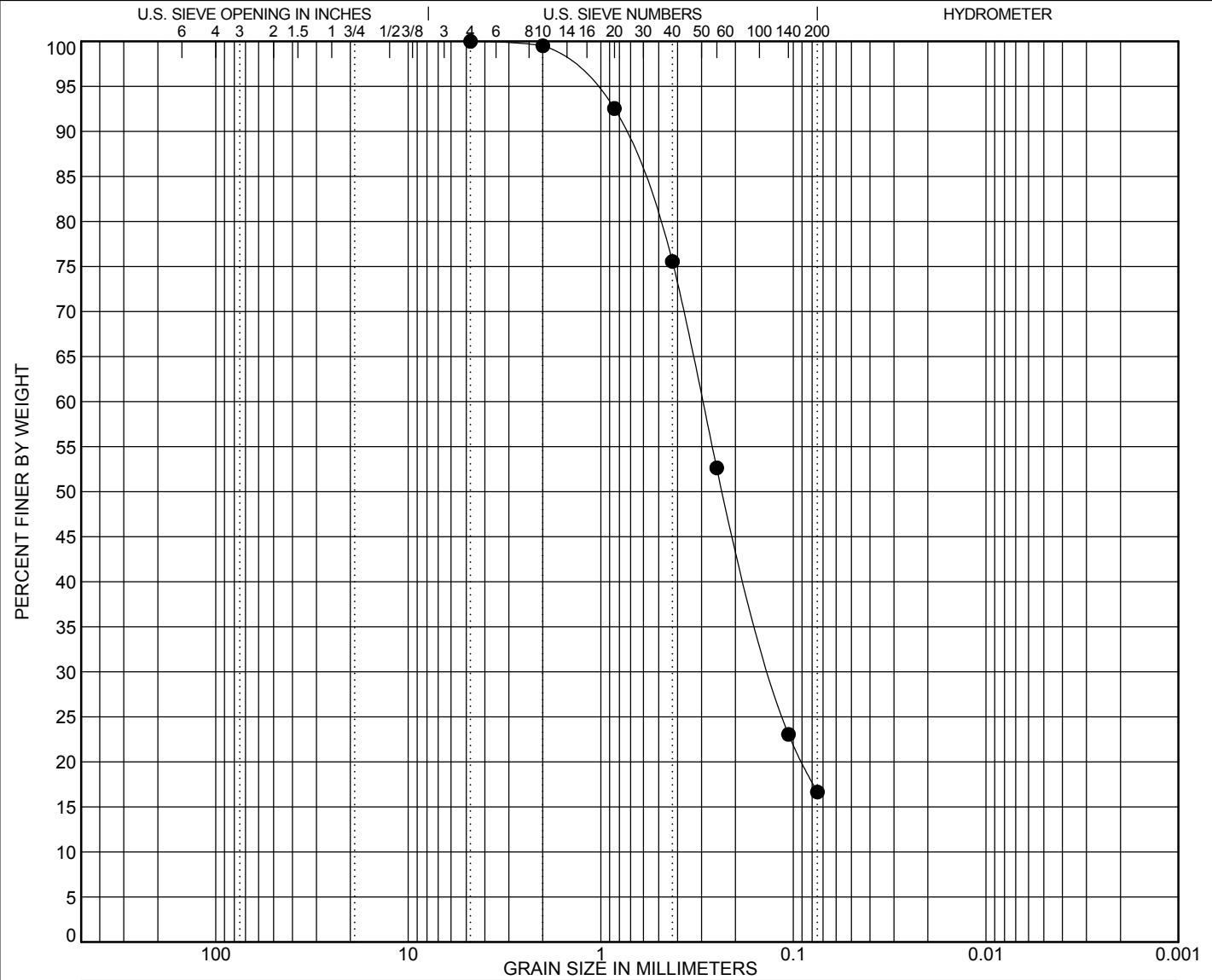
# GRAIN SIZE DISTRIBUTION

CLIENT Southern Company Services

PROJECT NAME Plant Yates Piezometers

PROJECT NUMBER Z003000203

PROJECT LOCATION Newnan, GA



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification					LL	PL	PI	Cc	Cu
● PZ-30s	27	SILTY SAND (SM-SC)					NP	NP	NP		
BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt		%Clay	
● PZ-30s	27	4.75	0.296	0.13		0.0	83.4	16.6			

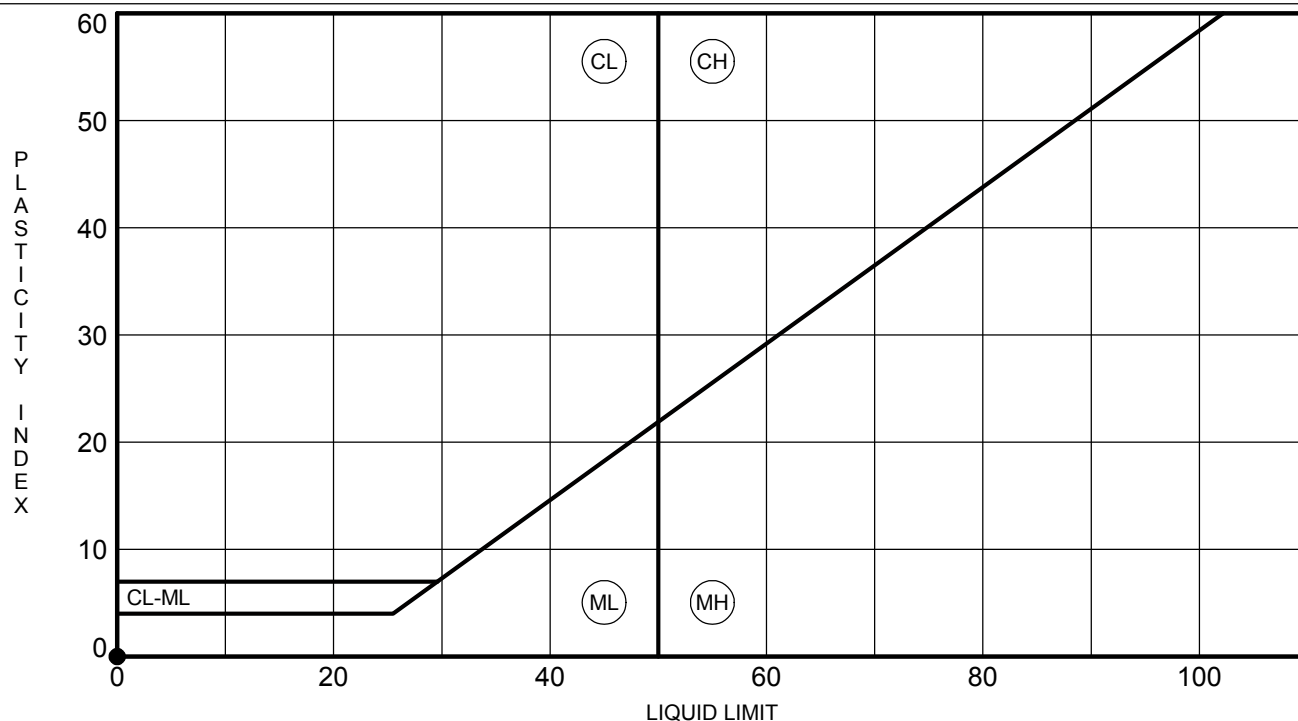
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**CLIENT** Southern Company Services

**PROJECT NAME** Plant Yates Piezometers

PROJECT NUMBER Z003000203

**PROJECT LOCATION** Newnan, GA

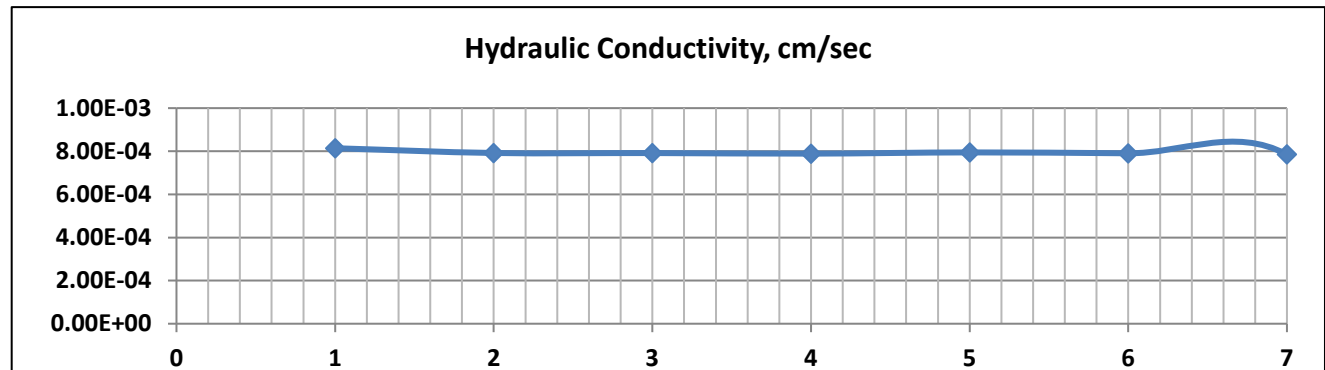
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# Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D 5084-10

Project :	Plant Yates Piezometers	Project Number:	Z003000203
Client :	Southern Company Services, INC	Sample Number :	PZ-31S (44'-46')
Sample Location :	PZ-31S (44'-46')	Date Sampled:	09/03/15
Northing:	--	Easting:	--
Sample Preparation:	Shelby Tube Pushed	Elevation:	--
		Permeant Liquid :	De-Aired Tap Water

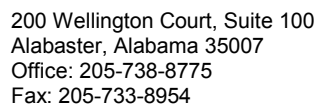
Initial Sample Conditions		Initial Working Pressures, psi		Final Sample Conditions	
Wet Density, pcf	99.9	Chamber	83	Wet Density, pcf	108.3
Dry Density, pcf	79.1	Head	79	Dry Density, pcf	79.2
Moisture Content, %	26.3	Tail	77	Moisture Content, %	36.7
Void ratio, e	1.092	Conso.	5	Void ratio, e	1.089
Porosity, n	0.522	Soil Specific Gravity		Porosity, n	0.521
Saturation, Percent	63.8	Gs	2.653	Saturation, Percent	89.3
Hydraulic Gradient, i	9.9	Proctor Referenced		Hydraulic Gradient, i	7.2
Sample Length, Inches	5.617	--		Sample Length, Inches	5.598
Sample Volume, cc	583.669			Sample Volume, cc	582.6785
B-value :	98.0%	Sample Consolidated During Saturation, %			0.34%



Start Test @ t=0	Cum. Time Δ t, min.	Head Loss, Δh2, psi	Hydraulic Conductivity, k (Permeability)	
0	0.00	2.0000	cm/sec	°C
1	0.08	1.9099	8.14E-04	20
2	0.17	1.8284	7.92E-04	20
3	0.25	1.7484	7.92E-04	20
4	0.33	1.6727	7.89E-04	20
5	0.42	1.5971	7.95E-04	20
6	0.50	1.5290	7.90E-04	20
7	0.58	1.4653	7.85E-04	20
8	0.67			20
9	0.75			20

**Hydraulic Conductivity, cm/sec**

**7.85E-04**

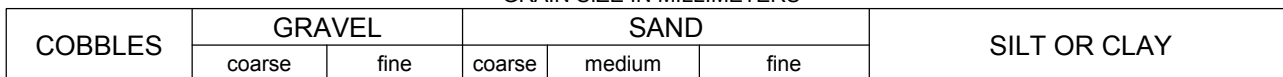


**CLIENT** Southern Company Services

**PROJECT NAME** Plant Yates Piezometers

PROJECT NUMBER Z003000203

**PROJECT LOCATION** Newnan, GA

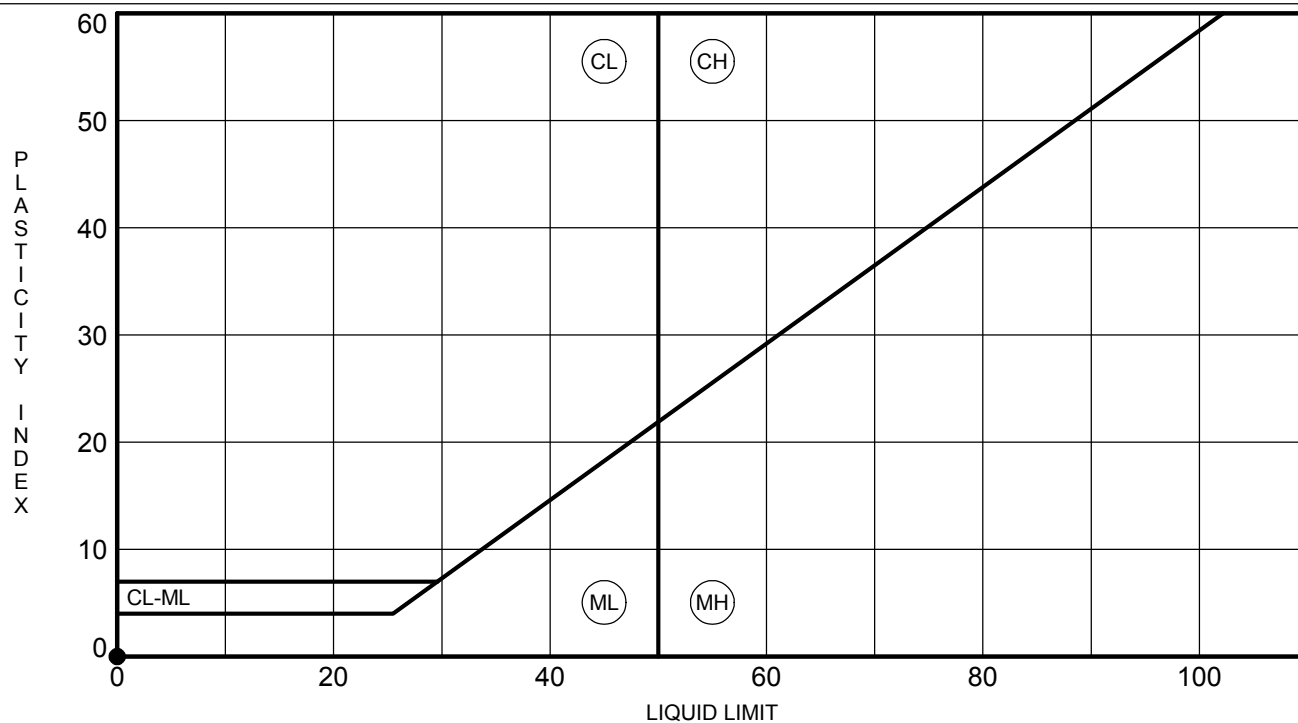


**CLIENT** Southern Company Services

**PROJECT NAME** Plant Yates Piezometers


PROJECT NUMBER Z003000203

**PROJECT LOCATION** Newnan, GA

[illegible]

## **APPENDIX C. BORING LOGS AND WELL CONSTRUCTION DIAGRAMS**

The well coordinates and elevation data were revised  
based on a June 2020 survey (Arcadis, June 29, 2020).

 <b>DRILLING LOG</b> <b>GEOLOGICAL SERVICE!</b>						Hole No. <b>GWA-2</b>	
Sheet 1 of 2							
SITE <b>Plant Yates</b>				HOLE DEPTH <b>49.5</b>		SURF.ELEV. <b>803.1</b>	
LOCATION <b>Gypsum Stacking Area</b>				COORDINATES N <b>1,261,383.11</b> E <b>2,073,509.98</b>			
ANGLE <b>0</b>		BEARING <b>0</b>		CONTRACTOR <b>SCS, Inc.</b>		DRILL NO. <b></b>	
DRILLING METHOD <b>HAS/SS -31' Rock core-49.5'</b>				NO. SAMPLES <b>6</b>		NO. U.D. SAMPLES <b>0</b>	
CASING SIZE <b>6"</b>		LENGTH <b></b>		CORE SIZE <b>2"</b>		TOTAL % REC. <b></b>	
WATER TABLE DEPTH <b>37.6</b>		ELEV. <b>767.71</b>		TIME AFTER COMP. <b>0</b>		DATE TAKEN <b>4/17/2007</b>	
TYPE GROUT <b>Portland Type I/II</b>		QUANTITY <b>18 gallons</b>		MIX <b>6 gal:94 lbs</b>		DRILLING START DATE <b>4/16/2007</b>	
DRILLER <b>Shawn Milan</b>		RECORDER <b>Lea Millet</b>		APPROVED <b></b>		DRILLING COMP. DATE <b>4/17/2007</b>	

Graphic Log	Depth	Elev.	Material Description, Classification and Remarks	Standard Penetration Test			Sample No.	Comments
				From To	Blows	N		
	0	803.1						
	1	802.1						
	2	801.1						
	3	800.1						
	4	799.1						
	5	798.1	Orange and tan silty CLAY, dry, black mottling, high mica content	4.5-6.0	2/5/6	11		50%
	6	797.1						
	7	796.1						
	8	795.1						
	9	794.1						
	10	793.1	As above	9.5-11.0	4/4/5	9		40%
	11	792.1						
	12	791.1						
	13	790.1						
	14	789.1						
	15	788.1	As above - last 3" starting into saprolite	14.5-16.0	3/5/7	12		50%
	16	787.1						
	17	786.1						
	18	785.1						
	19	784.1						
	20	783.1	Orange gneissic saprolite with mica, dry, weathered feldspar pebbles	19.5-21.0	4/3/8	11		50%
	21	782.1						
	22	781.1						
	23	780.1						
	24	779.1						



**DRILLING LOG**  
**GEOLOGICAL SERVICE**

Hole No. GWA-2

Sheet 2 of 2

SITE			Plant Yates	OTAL DEPTH	49.5	SURF.ELEV.	805.31	
Graphic Log	Depth	Elev.	Material Description, Classification and Remarks	Standard Penetration Test			Sample No.	Comments
				From To	Blows	N		
	25	778.1	As above, no pebbles	24.5-26.0	4/4/50-3	R		
	26	777.1						
	27	776.1						
	28	775.1						
	29	774.1						
	30	773.1	Granular gneissic saprolite	29.5-31.0	50-3	R		20
	31	772.1	32' - Top of Rock					
	32	771.1	Black & white schist, verging on gneiss - chlorite, biotite, white minerals	32-40				
	33	770.1	Fracture with iron staining, chlorite/biotite schist	7.9/8				
	34	769.1	33.7-Fracture with iron staining					
	35	768.1	Fracture with pyrite					
	36	767.1	Schist verging on gneiss, iron staining, small amount pyrite					
	37	766.1	Chlorite/biotite schist, iron staining, light clay rind					
	38	765.1	36.9-Iron staining in fracture					
	39	764.1	Fracture with clay rind					
	40	763.1	37.1-Clay rind with minimal pyrite					
	41	762.1	Visible amphibole					
	42	761.1	Pyrite crystal, high chlorite content					
	43	760.1	Abundant pyrite	40-45				
	44	759.1	Thin clay rind	4.8/5				
	45	758.1	42.7-High chlorite content, heavier clay rind					
	46	757.1	Gneissic with visible biotite books, chlorite, pyrite, thin clay rind					
	47	756.1						
	48	755.1	Chlorite/biotite schist, pyrite, thin clay rind	45-50				
	49	754.1	Visible amphibole	4/5				
	50	753.1	Gneissic, visible biotite, pyrite					
	51		Schistic, visible amphibole, clay rind					
	52		48.1-Heavy clay rind					
	53		49.5- Bottom of Boring					
	54							
	55							
	56							

SOUTHERN COMPANY SERVICES, INC.

# WELL CONSTRUCTION LOG

SITE Plant Yates

PROJECT Background well installation

WELL NO.

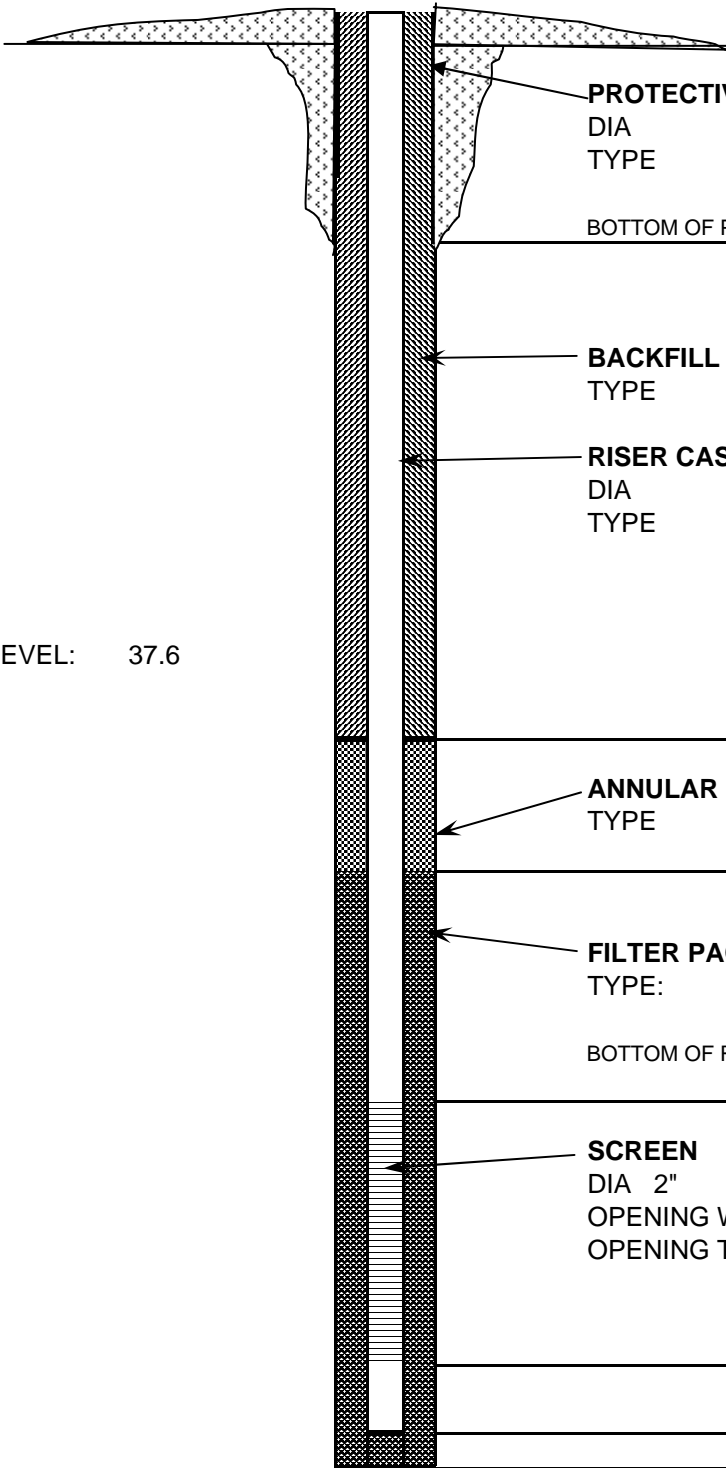
LOCATION Gypsum Stacking Area

DATE STARTED 4/17/2007


ENDED 4/17/2007

PREPARED L. Millet

GWA-2

	DEPTH	ELEVATION
 <p>GROUND SURFACE</p> <p><b>PROTECTIVE CASING</b> DIA 4" TYPE Sch 40 PVC</p> <p>BOTTOM OF PROTECTIVE CASING</p> <p><b>BACKFILL MATERIAL</b> TYPE Portland Type I/II</p> <p><b>RISER CASING</b> DIA 2" TYPE Sch 40 PVC</p> <p>TOP OF SEAL</p> <p><b>ANNULAR SEAL</b> TYPE Bentonite</p> <p>TOP OF FILTER PACK</p> <p><b>FILTER PACK</b> TYPE: Grade 1A Filter Sand</p> <p>BOTTOM OF RISER/ TOP OF SCREEN</p> <p><b>SCREEN</b> DIA 2" TYPE Sch 40 PVC OPENING WIDTH 0.01 OPENING TYPE Slot</p> <p>BOTTOM OF SCREEN</p> <p>BOTTOM OF CASING</p> <p>BOTTOM OF HOLE</p>	0	803.1
	2	801.1
	35.3	767.8
	37.3	765.8
	39.3	763.8
	49.3	753.8
	49.3	753.8
	49.5	753.6
<p>WATER LEVEL: 37.6</p> <p>HOLE DIA: 6"</p>		

The well coordinates and elevation data were revised  
based on a June 2020 survey (Arcadis, June 29, 2020).

		<b>DRILLING LOG</b>				Hole No. <b>GWC-1R</b>	
		<b>GEOLOGICAL SERVICES</b>				Sheet <b>1</b> of <b>2</b>	
SITE <b>Georgia Power Company Plant Yates</b>		HOLE DEPTH <b>33.6</b>		SURF.ELEV. <b>770.50</b>			
LOCATION <b>Gypsum Facility</b>		COORDINATES <b>N 1261869.77</b>		E <b>2073279.85</b>			
ANGLE <b>0</b>	BEARING <b>0</b>	CONTRACTOR <b>SCS, Inc.</b>		DRILL NO. <b>CME 550</b>			
DRILLING METHOD <b>HSA</b>		NO. SAMPLES <b>6</b>		NO. U.D. SAMPLES <b>0</b>			
WATER TABLE DEPTH <b>24' bgs</b>		ELEV. <b>746.47</b>	TIME AFTER COMP. <b>1 hour</b>		DATE TAKEN <b>5/12/2011</b>		
TYPE GROUT <b>NA</b>		QUANTITY <b>NA</b>	MIX <b>NA</b>		DRILLING START DATE <b>5/12/2011</b>		
DRILLER <b>S. Milam</b>		RECORDER <b>C. Sellars</b>	APPROVED <b>D. Brooks</b>		DRILLING COMP. DATE <b>5/12/2011</b>		

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From To	Blows	N			
0	770.50								
1	769.50								
2	768.50								
3	767.50								
4	766.50								
5	765.50	SILT, Clayey; reddish brown; dry	1	4.5-6	4-7-6	13			
6	764.50								
7	763.50								
8	762.50								
9	761.50								
10	760.50	CLAY, Silty; red; micaceous; damp	2	9.5-11	3-3-3	6			
11	759.50								
12	758.50								
13	757.50								
14	756.50								
15	755.50	SAA	3	14.5-16	2-3-4	7			
16	754.50								
17	753.50								
18	752.50								
19	751.50								
20	750.50	SAND, Clayey; light brown; moist; micaceous; medium grained sand with feldspar and quartz pebbles	4	19.5-21	15-39-50/3	50+			
21	749.50								
22	748.50								
23	747.50								
24	746.50								

**DRILLING LOG**  
**GEOLOGICAL SERVICES**

Hole No. GWC-1R

Sheet 2 of 2

SITE **Georgia Power Company Plant Yates** TOTAL DEPTH **33.6** SURF.ELEV. **770.5**

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From To	Blows	N			
25	745.50	SAND, Clayey; light brown; wet; micaceous; medium grained sand with feldspar and quartz pebbles	5	24.5-26	25-50/3	50+			
26	744.50								
27	743.50								
28	742.50								
29	741.50								
30	740.50	SAA	6	29.5-31	16-50/4	50+			
31	739.50								
32	738.50								
33	737.50								
34	736.50								
35	735.50	BOH @ 33.6' bgs							
36	734.50								
37	733.50								
38	732.50								
39	731.50								
40	730.50								
41	729.50								
42	728.50								
43	727.50								
44	726.50								
45	725.50								
46	724.50								
47	723.50								
48	722.50								
49	721.50								
50	720.50								
51	719.50								
52	718.50								
53	717.50								
54	716.50								
55	715.50								


## WELL CONSTRUCTION LOG

Southern Company Generation

PROJECT: Plant Yates		DRILLING CO.: SCS, Inc.		WELL NAME		
		DRILLER: S. Milam				
LOCATION: Gypsum Stack		RIG TYPE: CME550				
LOGGER: C. Sellers		DRILLING METHODS: HSA		GWC-1R		
DATE CONSTRUCTED: 5/12/2011						
<p>Locking Hinged Top</p> <p>1/4-inch Vent</p> <p>1/4-inch Weep Hole</p> <p>4-ft x 4-ft x 4" concrete pad</p> <p>2" Threaded Riser Cap</p> <p>Pea Gravel in annular space</p> <p>GROUND SURFACE</p> <p><b>PROTECTIVE CASING</b> SIZE: 4-inch round TYPE: PVC</p> <p>BOTTOM OF PROTECTIVE CASING</p> <p><b>BACKFILL MATERIAL</b> TYPE: Portland Cement Grout AMOUNT: 50 gal</p> <p><b>RISER CASING</b> DIA: 2-inch TYPE: Schedule 40 PVC JOINT TYPE: Flush Threaded</p> <p>▼ El. 746.47 5/12/2011 at time of completion</p> <p><b>ANNULAR SEAL</b> TYPE: 3/8-inch bentonite pellets Sur-plug 5 gal buckets AMOUNT: 1 bucket PLACEMENT: Tremie</p> <p><b>FILTER PACK</b> TYPE: DSI Sand - #1A Drillers Services, Inc. 0.5 cubic foot bags AMOUNT: 8.5 bags PLACEMENT: Tremie; wash with water</p> <p><b>SCREEN</b> DIA: 3.75" outer, 2" inner TYPE: ASTM-NSF Schedule 40 PVC Pre-Pac OPENING WIDTH: 0.01-inch OPENING TYPE: Slotted SLOT SPACING: 0.25-inch SLOT LENGTH: 1.5-inch</p> <p>HOLE DIA: 8"</p>				DEPTH FEET	ELEVATION FT, MSL	
				TOP OF RISER	2.77	773.27

HOLE DIA: 8"

The well coordinates and elevation data were revised  
based on a June 2020 survey (Arcadis, June 29, 2020).

		<b>DRILLING LOG</b>				Hole No. <b>GWC-2R</b>	
		<b>GEOLOGICAL SERVICES</b>				Sheet <b>1</b> of <b>2</b>	
SITE <b>Georgia Power Company Plant Yates</b>		HOLE DEPTH <b>42.2</b>		SURF.ELEV. <b>766.80</b>			
LOCATION <b>Gypsum Facility</b>		COORDINATES <b>N 1261942.15 E 2072755.92</b>					
ANGLE <b>0</b> BEARING <b>0</b>		CONTRACTOR <b>SCS, Inc.</b>		DRILL NO. <b>CME500</b>			
DRILLING METHOD <b>HSA</b>		NO. SAMPLES <b>4</b>		NO. U.D. SAMPLES <b>0</b>			
WATER TABLE DEPTH _____ ELEV. _____		TIME AFTER COMP. _____		DATE TAKEN _____			
TYPE GROUT _____ QUANTITY _____ MIX _____		DRILLING START DATE <b>10/19/2010</b>					
DRILLER <b>S. Milam</b> RECORDER <b>L. Millet</b> APPROVED _____		DRILLING COMP. DATE <b>10/19/2010</b>					

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From To	Blows	N			
0	766.80	Reddish orange silty SAND, dry, loose, very fine grained					Logged from auger cuttings to 25' bgs		
1	765.80								
2	764.80								
3	763.80								
4	762.80								
5	761.80								
6	760.80								
7	759.80								
8	758.80								
9	757.80								
10	756.80	Light orange clayey SILT, dry, loose, white nodules							
11	755.80								
12	754.80								
13	753.80								
14	752.80								
15	751.80	Light brown clayey SILT, dry, loose, with pebbles							
16	750.80								
17	749.80								
18	748.80								
19	747.80								
20	746.80	As above, with trace mica							
21	745.80								
22	744.80								
23	743.80								
24	742.80								

**DRILLING LOG  
GEOLOGICAL SERVICES**

Hole No. GWC-2R

Sheet 2 of 2

SITE		Georgia Power Company Plant Yates				TOTAL DEPTH	42.2	SURF.ELEV.	766.8
Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From To	Blows	N			
25	741.80	Light tan silty SAND, moist, occasional black speckling, trace mica		25-26.5					
26	740.80								
27	739.80								
28	738.80								
29	737.80								
30	736.80	Tan and white silty SAND, as above		30-31.5					
31	735.80								
32	734.80								
33	733.80								
34	732.80								
35	731.80	Brown and white silty SAND, moist, occasional dark brown mottling		35-36.5					
36	730.80								
37	729.80								
38	728.80								
39	727.80								
40	726.80	Light tan SAND, moist, occasional brown mottling, pieces of heavily weathered schist		40-41.5					
41	725.80								
42	724.80								
43	723.80								
44	722.80								
45	721.80	Top of rock 42.2' - bottom of boring							
46	720.80								
47	719.80								
48	718.80								
49	717.80								
50	716.80								
51	715.80								
52	714.80								
53	713.80								
54	712.80								
55	711.80								

# WELL CONSTRUCTION LOG

Southern Company Generation

PROJECT: Plant Yates		DRILLING CO.: SCS, Inc.		WELL		
		DRILLER: S. Milam		NAME		
LOCATION: Gypsum Stack		RIG TYPE: CME550				
LOGGER: L. Millet		DRILLING METHODS: HSA		GWC-2R		
DATE CONSTRUCTED: 10/19/2010						
				DEPTH		
				FEET		
				ELEVATION		
				FT, MSL		
Locking Hinged Top				TOP OF RISER	-2.96	769.76
1/4-inch Vent						
1/4-inch Weep Hole						
2" Threaded Riser Cap						
Pea Gravel in annular space						
6-ft x 6-ft x 4" concrete pad				GROUND SURFACE	0.00	766.80
PROTECTIVE CASING						
SIZE: 4-inch round						
TYPE: PVC						
BOTTOM OF PROTECTIVE CASING						
BACKFILL MATERIAL						
TYPE: Portland Cement Grout						
AMOUNT: 30 gal						
RISER CASING						
DIA: 2-inch						
TYPE: Schedule 40 PVC						
JOINT TYPE: Flush Threaded						
TOP OF SEAL				26.74		740.06
ANNULAR SEAL						
TYPE: 3/8-inch bentonite pellets						
Sur-plug 5 gal buckets						
AMOUNT: 3/4 bucket						
PLACEMENT: Tremie						
TOP OF FILTER PACK				28.74		738.06
FILTER PACK						
TYPE: DSI Sand - #1A						
Drillers Services, Inc. 0.5 cubic foot bags						
AMOUNT: 8 bags						
PLACEMENT: Tremie; wash with water						
BOTTOM OF RISER / TOP OF SCREEN				30.74		736.06
SCREEN						
DIA: 2-inch						
TYPE: ASTM-NSF Schedule 40 PVC						
OPENING WIDTH: 0.01-inch						
OPENING TYPE: Slotted						
SLOT SPACING: 0.25-inch						
SLOT LENGTH: 1.5-inch						
BOTTOM OF SCREEN				40.74		726.06
BOTTOM OF CASING				41.04		725.76
HOLE DIA: 8"						

▼ El. 740.31  
10/29/2010



The well coordinates and elevation data were revised  
based on a June 2020 survey (Arcadis, June 29, 2020).

SOUTHERN COMPANY Energy to Serve Your World™		DRILLING LOG GEOLOGICAL SERVICES				Hole No. GWC-3R			
						Sheet 1 of 2			
SITE Georgia Power Company Plant Yates		HOLE DEPTH 35.4		SURF.ELEV. 772.20					
LOCATION Gypsum Facility		COORDINATES N 1261647.1 E 2072841.28							
ANGLE 0 BEARING 0		CONTRACTOR SCS, Inc.		DRILL NO. CME 550					
DRILLING METHOD HSA		NO. SAMPLES 7		NO. U.D. SAMPLES 0					
WATER TABLE DEPTH 26.45' bgs		ELEV. 745.88		TIME AFTER COMP. 24 hours		DATE TAKEN 5/12/2011			
TYPE GROUT NA		QUANTITY NA		MIX NA		DRILLING START DATE 5/11/2011			
DRILLER S. Milam		RECORDER C. Sellars		APPROVED D. Brooks		DRILLING COMP. DATE 5/11/2011			
Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From To	Blows	N			
0	772.20	SAND, Clayey; red; dry; micaceous; fine to medium grained	1	4.5-6	2-3-2	5			
1	771.20								
2	770.20								
3	769.20								
4	768.20								
5	767.20	CLAY, Sandy; yellowish red; micaceous; damp	2	9.5-11	3-3-4	7			
6	766.20								
7	765.20								
8	764.20								
9	763.20								
10	762.20	SAA	3	14.5-16	5-4-4	8			
11	761.20								
12	760.20								
13	759.20								
14	758.20								
15	757.20	SAND, Silty; tan; moist; micaceous; fine grained sand with feldspar and quartz pebbles	4	19.5-21	3-3-5	8			
16	756.20								
17	755.20								
18	754.20								
19	753.20								
20	752.20								
21	751.20								
22	750.20								
23	749.20								
24	748.20								

**DRILLING LOG  
GEOLOGICAL SERVICES**

Hole No. GWC-3R

Sheet 2 of 2

SITE **Georgia Power Company Plant Yates** TOTAL DEPTH **35.4** SURF.ELEV. **772.2**

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From To	Blows	N			
25	747.20	SAND, Clayey; light brown; wet; micaceous; medium grained sand with feldspar and quartz pebbles	5	24.5-26	4-5-7	12			
26	746.20								
27	745.20								
28	744.20								
29	743.20								
30	742.20	SAA	6	29.5-31	21-50/4	50+			
31	741.20								
32	740.20								
33	739.20								
34	738.20								
35	737.20	SAA	7	34.5-36	50/2	50+			
36	736.20								
BOH at 35.40' bgs									
37	735.20								
38	734.20								
39	733.20								
40	732.20								
41	731.20								
42	730.20								
43	729.20								
44	728.20								
45	727.20								
46	726.20								
47	725.20								
48	724.20								
49	723.20								
50	722.20								
51	721.20								
52	720.20								
53	719.20								
54	718.20								
55	717.20								

## WELL CONSTRUCTION LOG

Southern Company Generation

PROJECT: Plant Yates		DRILLING CO.: SCS, Inc.		WELL NAME		
		DRILLER: S. Milam				
LOCATION: Gypsum Stack		RIG TYPE: CME550				
LOGGER: C. Sellers		DRILLING METHODS: HSA		GWC-3R		
DATE CONSTRUCTED: 5/11/2011						
				DEPTH FEET		
				ELEVATION FT, MSL		
				TOP OF RISER	2.95	775.25
GROUND SURFACE				0.00	772.2	
BOTTOM OF PROTECTIVE CASING						
BACKFILL MATERIAL TYPE: Portland Cement Grout AMOUNT: 50 gal						
RISER CASING DIA: 2-inch TYPE: Schedule 40 PVC JOINT TYPE: Flush Threaded						
TOP OF SEAL				20.00	752.20	
ANNULAR SEAL TYPE: 3/8-inch bentonite pellets Sur-plug 5 gal buckets AMOUNT: 1 bucket PLACEMENT: Tremie						
TOP OF FILTER PACK				23.20	749.0	
FILTER PACK TYPE: DSI Sand - #1A Drillers Services, Inc. 0.5 cubic foot bags AMOUNT: 8 bags PLACEMENT: Tremie; wash with water						
BOTTOM OF RISER / TOP OF SCREEN				25.10	747.10	
SCREEN DIA: 3.75" outer, 2" inner TYPE: ASTM-NSF Schedule 40 PVC Pre-Pac OPENING WIDTH: 0.01-inch OPENING TYPE: Slotted SLOT SPACING: 0.25-inch SLOT LENGTH: 1.5-inch						
BOTTOM OF SCREEN				35.10	737.10	
BOTTOM OF CASING				35.40	736.80	
HOLE DIA: 8"						

▼ El. 745.88  
5/12/2011 24 hours after construction

The well coordinates and elevation data were revised  
based on a June 2020 survey (Arcadis, June 29, 2020).

<b>SOUTHERN COMPANY</b> <i>Energy to Serve Your World™</i>		<b>DRILLING LOG</b> <b>GEOLOGICAL SERVICES</b>				Hole No. <b>GWC-4R</b>			
		Sheet <b>1</b> of <b>2</b>							
SITE <b>Georgia Power Company Plant Yates</b>						HOLE DEPTH <b>29</b>		SURF.ELEV. <b>754.6</b>	
LOCATION <b>Gypsum Facility</b>				COORDINATES <b>N 1262046.56</b>		<b>E 2072841.28</b>			
ANGLE <b>0</b>		BEARING <b>0</b>		CONTRACTOR <b>SCS, Inc.</b>		DRILL NO. <b>CME500</b>			
DRILLING METHOD <b>HSA</b>		NO. SAMPLES <b>3</b>		NO. U.D. SAMPLES <b>0</b>					
WATER TABLE DEPTH _____		ELEV. _____		TIME AFTER COMP. _____		DATE TAKEN _____			
TYPE GROUT _____		QUANTITY _____		MIX _____		DRILLING START DATE <b>10/20/2010</b>			
DRILLER <b>S. Milam</b>		RECORDER <b>L. Millet</b>		APPROVED _____		DRILLING COMP. DATE <b>10/20/2010</b>			

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From To	Blows	N			
0	754.6	Dark brown silty CLAY, moist, plastic, trace mica					Logged from auger cuttings to 15' bgs		
1	753.6								
2	752.6								
3	751.6								
4	750.6								
5	749.6								
6	748.6								
7	747.6								
8	746.6								
9	745.6								
10	744.6	As above							
11	743.6								
12	742.46								
13	741.6								
14	740.6								
15	739.6	Orange and white clayey SILT, moist, black mottling, with mica, trace sand		15-16.5					
16	738.6								
17	737.6								
18	736.6								
19	735.6								
20	734.6	As above		20-21.5					
21	733.6								
22	732.6								
23	731.6								
24	730.6								

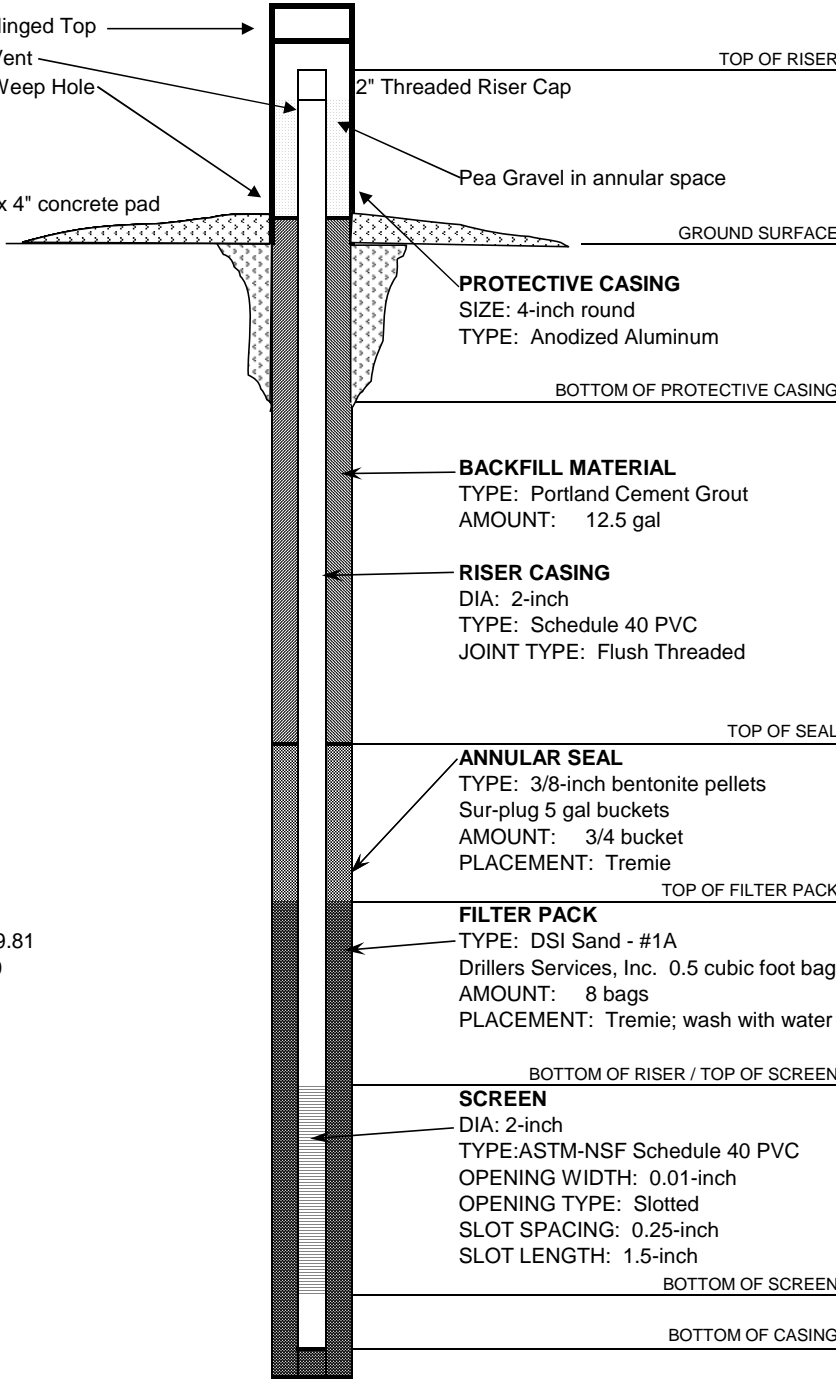
**DRILLING LOG  
GEOLOGICAL SERVICES**

Hole No. GWC-4R  
Sheet 2 of 2

SITE		Georgia Power Company Plant Yates		TOTAL DEPTH		29		SURF.ELEV.		754.6		
Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD			
				From To	Blows	N						
25	729.6	Light brown and white silty SAND, moist, very fine to fine grained, with mica, brown mottling		25-26.5								
26	728.6											
27	727.6											
28	726.6											
29	725.6											
29	725.6	Top of rock										
30	724.6	29' - Bottom of boring										
31	723.6											
32	722.6											
33	721.6											
34	720.6											
35	719.6											
36	718.6											
37	717.6											
38	716.6											
39	715.6											
40	714.6											
41	713.6											
42	712.6											
43	711.6											
44	710.6											
45	709.6											
46	708.6											
47	707.6											
48	706.6											
49	705.6											
50	704.6											
51	703.6											
52	702.6											
53	701.6											
54	700.6											
55	699.6											


## WELL CONSTRUCTION LOG

Southern Company Generation

PROJECT: Plant Yates		DRILLING CO.: SCS, Inc.	WELL NAME
		DRILLER: S. Milam	
LOCATION: Gypsum Stack		RIG TYPE: CME550	GWC-4R
LOGGER: L. Millet		DRILLING METHODS: HSA	
DATE CONSTRUCTED: 10/20/2010			
		DEPTH FEET	ELEVATION FT, MSL
		TOP OF RISER	-2.88 757.48
GROUND SURFACE		0.00	754.60
<b>PROTECTIVE CASING</b> SIZE: 4-inch round TYPE: Anodized Aluminum BOTTOM OF PROTECTIVE CASING			
<b>BACKFILL MATERIAL</b> TYPE: Portland Cement Grout AMOUNT: 12.5 gal <b>RISER CASING</b> DIA: 2-inch TYPE: Schedule 40 PVC JOINT TYPE: Flush Threaded TOP OF SEAL		13.02	741.58
<b>ANNULAR SEAL</b> TYPE: 3/8-inch bentonite pellets Sur-plug 5 gal buckets AMOUNT: 3/4 bucket PLACEMENT: Tremie TOP OF FILTER PACK		15.02	739.58
<b>FILTER PACK</b> TYPE: DSI Sand - #1A Drillers Services, Inc. 0.5 cubic foot bags AMOUNT: 8 bags PLACEMENT: Tremie; wash with water BOTTOM OF RISER / TOP OF SCREEN		17.02	737.58
<b>SCREEN</b> DIA: 2-inch TYPE: ASTM-NSF Schedule 40 PVC OPENING WIDTH: 0.01-inch OPENING TYPE: Slotted SLOT SPACING: 0.25-inch SLOT LENGTH: 1.5-inch BOTTOM OF SCREEN		27.02	727.58
BOTTOM OF CASING		27.32	727.28
HOLE DIA: 8"			

▼ El. 739.81  
7/16/2010

The well coordinates and elevation data were revised  
based on a June 2020 survey (Arcadis, June 29, 2020).

		<b>DRILLING LOG</b>				Hole No. GWC-5R	
		<b>GEOLOGICAL SERVICES</b>				Sheet 1 of 2	
SITE <b>Georgia Power Company Plant Yates</b>		HOLE DEPTH <b>39.9</b>		SURF.ELEV. <b>780.00</b>			
LOCATION <b>Gypsum Facility</b>		COORDINATES <b>N 1261439.91 E 2073027.56</b>					
ANGLE <b>0</b>	BEARING <b>0</b>	CONTRACTOR <b>SCS, Inc.</b>		DRILL NO. <b>CME 550</b>			
DRILLING METHOD <b>HSA</b>		NO. SAMPLES <b>7</b>		NO. U.D. SAMPLES <b>0</b>			
WATER TABLE DEPTH <b>29.2' bgs</b>		ELEV. <b>750.47</b>	TIME AFTER COMP. <b>24 hours</b>		DATE TAKEN <b>5/12/2011</b>		
TYPE GROUT <b>NA</b>		QUANTITY <b>NA</b>	MIX <b>NA</b>	DRILLING START DATE <b>5/11/2011</b>			
DRILLER <b>S. Milam</b>		RECORDER <b>C. Sellars</b>	APPROVED <b>D. Brooks</b>	DRILLING COMP. DATE <b>5/11/2011</b>			

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From To	Blows	N			
0	780.00								
1	779.00								
2	778.00								
3	777.00								
4	776.00								
5	775.00	SAND, Clayey; red; dry; micaceous; fine to medium grained	1	4.5-6	2-2-3	5			
6	774.00								
7	773.00								
8	772.00								
9	771.00								
10	770.00	SAND, Silty; tan; damp; micaceous; fine grained	2	9.5-11	6-12-10	22			
11	769.00								
12	768.00								
13	767.00								
14	766.00								
15	765.00	SAA	3	14.5-16	7-22-25	47			
16	764.00								
17	763.00								
18	762.00								
19	761.00								
20	760.00	SAA	4	19.5-21	6-9-11	20			
21	759.00								
22	758.00								
23	757.00								
24	756.00								

**DRILLING LOG**  
**GEOLOGICAL SERVICES**

Hole No. GWC-5R

Sheet 2 of 2

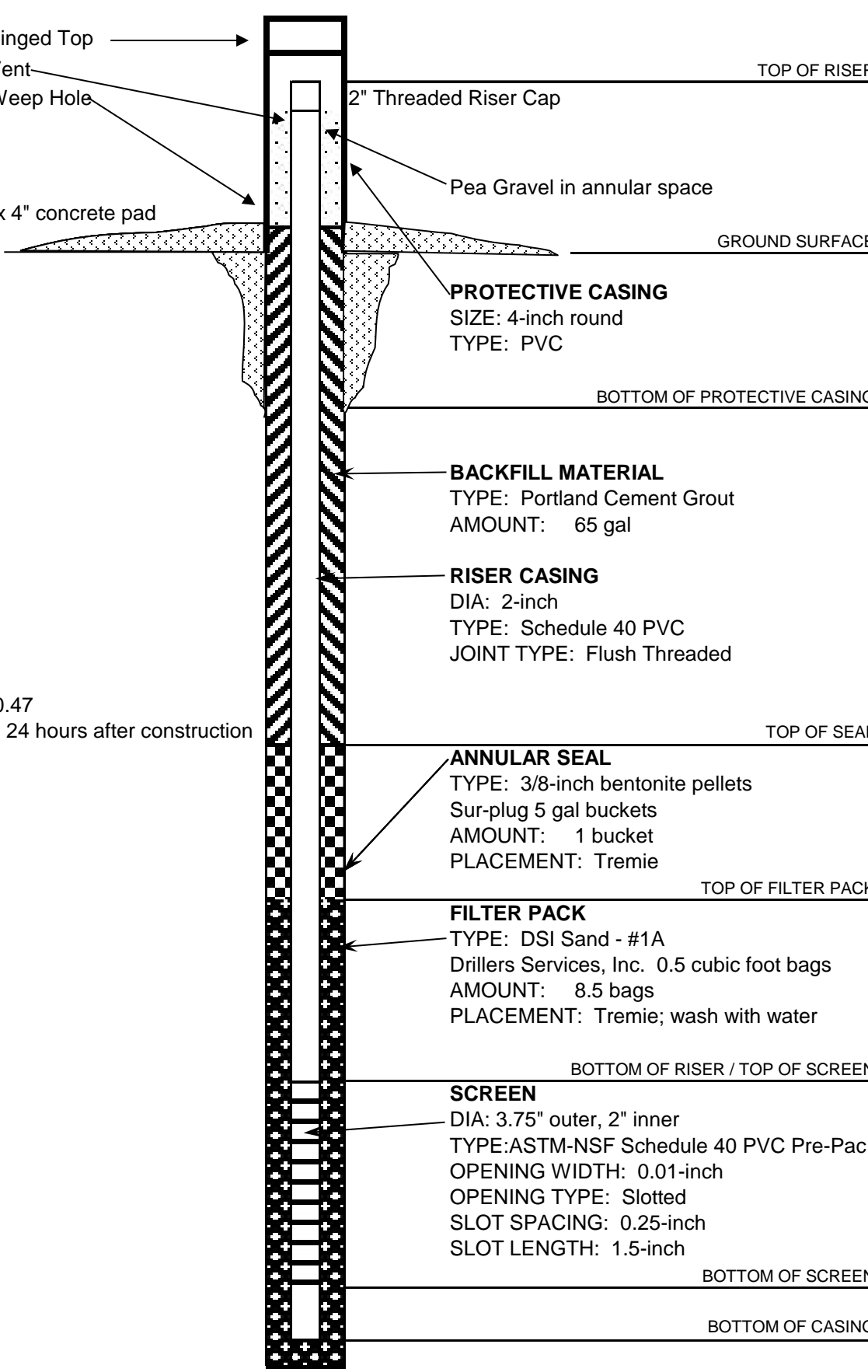
SITE **Georgia Power Company Plant Yates** TOTAL DEPTH **39.9** SURF.ELEV. **780**

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From To	Blows	N			
25	755.00	SAND, Clayey; tan; moist; micaceous; medium grained sand with feldspar and quartz pebbles	5	24.5-26	7-8-9	17			
26	754.00								
27	753.00								
28	752.00								
29	751.00								
30	750.00	SAA except wet	6	29.5-31	8-12-24	36			
31	749.00								
32	748.00								
33	747.00								
34	746.00								
35	745.00	SAA	7	34.5-36	22-34-50/2	50+			
36	744.00								
37	743.00								
38	742.00								
39	741.00								
40	740.00	BOH at 39.90' bgs							
41	739.00								
42	738.00								
43	737.00								
44	736.00								
45	735.00								
46	734.00								
47	733.00								
48	732.00								
49	731.00								
50	730.00								
51	729.00								
52	728.00								
53	727.00								
54	726.00								
55	725.00								



## WELL CONSTRUCTION LOG

Southern Company Generation

PROJECT: Plant Yates		DRILLING CO.: SCS, Inc.		WELL NAME	
		DRILLER: S. Milam			
LOCATION: Gypsum Stack		RIG TYPE: CME550			
LOGGER: C. Sellers		DRILLING METHODS: HSA		GWC-5R	
DATE CONSTRUCTED: 5/11/2011					
				DEPTH FEET	ELEVATION FT, MSL
				2.87	782.45
TOP OF RISER					
2" Threaded Riser Cap					
Pea Gravel in annular space					
4-ft x 4-ft x 4" concrete pad					
GROUND SURFACE				0.00	778.0
PROTECTIVE CASING SIZE: 4-inch round TYPE: PVC					
BOTTOM OF PROTECTIVE CASING					
BACKFILL MATERIAL TYPE: Portland Cement Grout AMOUNT: 65 gal					
RISER CASING DIA: 2-inch TYPE: Schedule 40 PVC JOINT TYPE: Flush Threaded					
TOP OF SEAL				24.20	755.50
ANNULAR SEAL TYPE: 3/8-inch bentonite pellets Sur-plug 5 gal buckets AMOUNT: 1 bucket PLACEMENT: Tremie					
TOP OF FILTER PACK				28.00	751.70
FILTER PACK TYPE: DSI Sand - #1A Drillers Services, Inc. 0.5 cubic foot bags AMOUNT: 8.5 bags PLACEMENT: Tremie; wash with water					
BOTTOM OF RISER / TOP OF SCREEN				29.60	750.40
SCREEN DIA: 3.75" outer, 2" inner TYPE: ASTM-NSF Schedule 40 PVC Pre-Pac OPENING WIDTH: 0.01-inch OPENING TYPE: Slotted SLOT SPACING: 0.25-inch SLOT LENGTH: 1.5-inch					
BOTTOM OF SCREEN				39.60	740.40
BOTTOM OF CASING				39.90	740.10
HOLE DIA: 8"					

The well coordinates and elevation data were revised  
based on a June 2020 survey (Arcadis, June 29, 2020).

SOUTHERN COMPANY <i>Energy to Serve Your World™</i>		DRILLING LOG GEOLOGICAL SERVICES				Hole No. GWC-6R	
						Sheet 1 of 2	
SITE <b>Plant Yates</b>		HOLE DEPTH <b>48.1</b>		SURF.ELEV. <b>785.60</b>			
LOCATION <b>Gypsum Stacking Area</b>		COORDINATES N <b>1261732.91</b>		E <b>2073479.40</b>			
ANGLE <b>0</b>	BEARING <b>0</b>	CONTRACTOR <b>SCS, Inc.</b>		DRILL NO. <b>CME550</b>			
DRILLING METHOD <b>HSA/HQ Rock core with water</b>		NO. SAMPLES <b>7</b>		NO. U.D. SAMPLES <b>0</b>			
CASING SIZE		LENGTH		CORE SIZE		TOTAL % REC.	
WATER TABLE DEPTH <b>31.50</b>		ELEV. <b>754.10</b>		TIME AFTER COMP. <b>15 hours</b>		DATE TAKEN <b>8/12/2009</b>	
TYPE GROUT		QUANTITY		MIX		DRILLING START DATE <b>8/11/2009</b>	
DRILLER <b>S. Milam</b>		RECORDER <b>L. Millet</b>		APPROVED		DRILLING COMP. DATE <b>8/11/2009</b>	

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From To	Blows	N			
0	785.60								
1	784.60								
2	783.60								
3	782.60								
4	781.60								
5	780.60	Red clayey SILT, dry, soft, with mica, black mottling, relict schist	1	4.5-6	5-3-4	7		100	
6	779.60								
7	778.60								
8	777.60								
9	776.60								
10	775.60	Red and white silty SAND, dry, soft, with mica, black mottling, relict gneiss	2	9.5-11	10-12-8	20		100	
11	774.60								
12	773.60								
13	772.60								
14	771.60								
15	770.60	Red, black and white granular saprolite, dry, firm, trace mica, relict gneiss	3	14.5-16	9-8-10	18		100	
16	769.60								
17	768.60								
18	767.60								
19	766.60								
20	765.60	Orange, black, and white saprolitic gneiss, dry, soft, with amphibolite and mica	4	19.5-21	6-8-9	17		100	
21	764.60								
22	763.60								
23	762.60								
24	761.60								

**DRILLING LOG  
GEOLOGICAL SERVICES**

Hole No. GWC-6R

Sheet 2 of 2

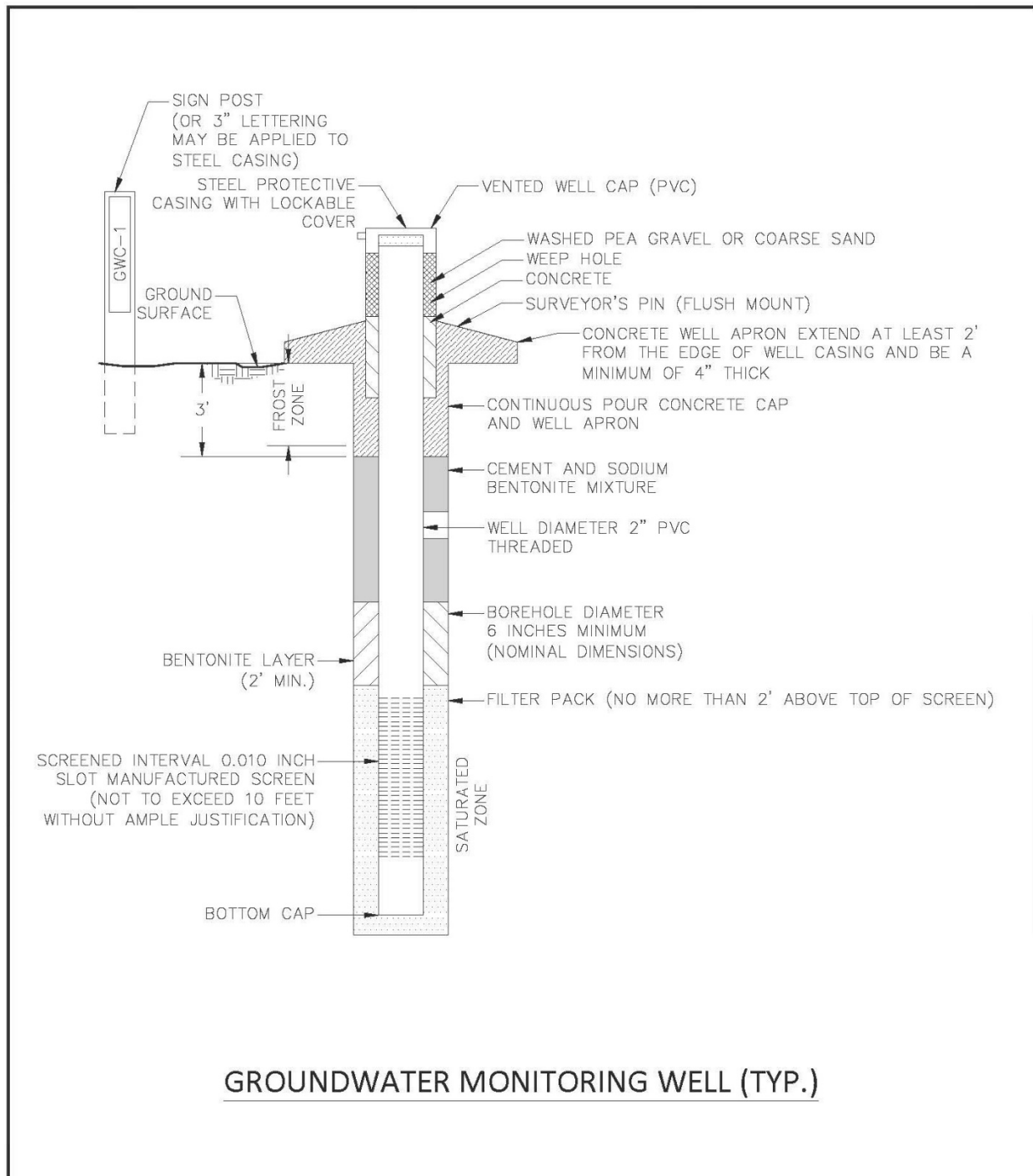
SITE **Plant Yates** TOTAL DEPTH **48.1** SURF.ELEV. **785.6**

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From To	Blows	N			
25	760.60	Orange, black, and white saprolitic gneiss, dry, soft	5	24.5-26	6-8-10	18		100	
26	759.60								
27	758.60								
28	757.60								
29	756.60								
30	755.60	Orange and white clayey SILT, dry, soft, with mica, black mottling, relict schist	6	29.5-31	5-4-4	8		100	
31	754.60								
32	753.60								
33	752.60								
34	751.60								
35	750.60	Black, white, and orange weathered gneiss, moist, firm	7	34.5-39	10-19-50/3	R		100	
36	749.60								
37	748.60								
38	747.60								
39	746.60	38.1- Auger refusal		38.1-43.1			5.0/4.15	83	
40	745.60	38'-39' - Black and white GNEISS 39'-39.5' - weathered black and white GNEISS							
41	744.60	41' - Light gray GNEISS with multiple iron-stained fractures and pyrite							
42	743.60	41'-43' - highly weathered as above							
43	742.60								
44	741.60	Light gray chlorite and muscovite SCHIST, with pyrite 44'-44.5' - Iron-stained fractures		43.1-48.1			5.0/5.0	100	
45	740.60								
46	739.60	46' - Fracture							
47	738.60								
48	737.60								
49	736.60	48.1' - Bottom of boring							
50	735.60								
51	734.60								
52	733.60								
53	732.60								
54	731.60								
55	730.60								
56	729.60								

## Southern Company Generation

PROJECT: Plant Yates		DRILLING CO.: SCS, Inc.	WELL NAME
LOCATION: Gypsum Stacking Area		RIG TYPE: CME 550	
LOGGER: L. Millet		DRILLING METHODS: HSA, HQ Rock Core	GWC-6R
DATE CONSTRUCTED: 8/11/2009			
		DEPTH FEET	ELEVATION FT, MSL
TOP OF RISER			788.98
GROUND SURFACE		0.00	785.60
BOTTOM OF PROTECTIVE CASING			
TOP OF SEAL		34.56	751.04
TOP OF FILTER PACK		36.56	749.04
BOTTOM OF RISER / TOP OF SCREEN		38.56	747.04
BOTTOM OF SCREEN		48.56	737.04
BOTTOM OF CASING		51.87	733.73
<p>HOLE DIA: 8" in soil 4" in rock</p>			

## APPENDIX D. GROUNDWATER MONITORING WELL DETAIL



## **APPENDIX E. GROUNDWATER SAMPLING PROCEDURE**

Groundwater sampling will be conducted using most current USEPA Region 4 Field Quality and Technical Procedures as a guide. The following procedures describe the general methods associated with groundwater sampling at the site. Prior to sampling, the well must be evacuated (purged) to ensure that representative groundwater is obtained. Any item coming in contact with the inside of the well casing, or the well water will be kept in a clean container and handled only with gloved hands.

Sample personnel will follow the procedures below at each well to ensure that a representative sample is collected:

1. Check the well, the lock, and the locking cap for damage or evidence of tampering. Record observations and notify Georgia Power if it appears that the well has been compromised.
2. Measure and record the depth to water in all wells to be sampled prior to purging using a water measuring device consisting of probe and measuring tape capable of measuring water levels with accuracy to 0.1 foot. Static water levels will be measured from each well, within a 24-hour period. The water level measuring device will be decontaminated prior to lowering in each well.
3. Install Pump: If a dedicated pump is not present, slowly lower the pump into the well to the midpoint of the well screen or a depth otherwise approved by the hydrogeologist or project scientist. The pump intake must be kept at least two (2) feet above the bottom of the well to prevent disturbance and suspension of any sediment present in the bottom of the well. Record the depth to which the pump is lowered. All non-dedicated pumps and wiring will be decontaminated before use and between well locations using procedures described in the latest version of the Region 4 U.S. Environmental Protection Agency Science and Ecosystem Support Division (SESD) Operating Procedure for Field Equipment Cleaning and Decontamination as a guide.
4. Measure Water Level: Immediately prior to purging, measure the water level again with the pump in the well. Leave the water level measuring device in the well.
5. Purge Well: Begin pumping the well at approximately 100 to 500 milliliters per minute (ml/min). Monitor the water level continually. Maintain a steady flow rate that results in a stabilized water level with 0.3 ft. or less of variability. Avoid entraining air in the tubing. Record each adjustment made to the pumping rate and the water level measured immediately after each adjustment.
6. Monitor Indicator Parameters: Monitor and record the field indicator parameters (turbidity, temperature, specific conductance, pH, oxidation reduction potential (ORP), and DO) approximately every three to five minutes. The well is considered stabilized and ready for sample collection when the indicator parameters have stabilized for three consecutive readings at a minimum:

±0.1 for pH

±10% for specific conductance (conductivity)

±10% for DO where DO>0.5mg/L. If DO<0.5mg/L no stabilization criteria apply

≤10 for turbidity

Temperature – Record only, not used for stabilization criteria

ORP – Record only, not used for stabilization criteria.

7. Collect samples at a flow rate between 50 and 250 ml/min and such that drawdown of the water level within the well is stable. Flow rate must be reduced if excessive drawdown is observed during sampling. All sample containers should be filled with minimal turbulence by allowing the groundwater to flow from the tubing gently down the inside of the container.
8. Compliance samples will be unfiltered; however, to determine if turbidity is affecting sample results, duplicate samples may be filtered in the field prior to being placed in a sample container, clearly marked as filtered and preserved. Filtering will be accomplished by the use of 0.45 micron filters on the sampling line. At least two filter volumes of sample will pass through before filling sample containers. Filtered samples are not considered compliance samples and are only used to evaluate the effects of turbidity.
9. All sample bottles will be filled, capped, and placed in an ice containing cooler immediately after sampling where temperature control is required. Samples that do not require temperature control will be placed in a clean and secure container.
10. Sample containers and preservative will be appropriate for the analytical method being used.
11. Information contained on sample container labels will include:
  - a. Name of facility
  - b. Date and time of sampling
  - c. Sample description (well number)
  - d. Sampler's initials
  - e. Preservatives
  - f. Analytical method(s)
12. After samples are collected, samplers will remove all non-dedicated equipment. Upon completion of all activity the well will be closed and locked.
13. Samples will be delivered to the laboratory following appropriate COC and temperature control requirements. The goal for sample delivery will be within 48 hours of collection; however, at no time will samples be analyzed after the method-prescribed hold time.

Throughout the sampling process new latex or nitrile gloves will be worn by the sampling personnel. A clean pair of new, disposable gloves will be worn each time a different location is sampled and new gloves donned prior to filling sample bottles. Gloves will be discarded after sampling each well and before sampling the next well.

The goal when sampling is to attain a turbidity of less than 5 NTU; however, samples may be collected where turbidity is less than 10 NTU and the stabilization criteria described above are met.

If sample turbidity is greater than 5 NTU and all other stabilization criteria have been met, samplers will continue purging for 3 additional hours in order to reduce the turbidity to 5 NTU or less.

- If turbidity remains above 5 NTU but is less than 10 NTU, and all other parameters are stabilized, the well can be sampled.
- Where turbidity remains above 10 NTU, an unfiltered sample will be collected followed by a filtered sample that has passed through an in-line 0.45-micron filter attached to the discharge (sample collection) tube. Data from filtered samples will only be used to quantify the effects of turbidity on sample results.

Samplers will identify the sample bottle as containing a filtered sample on the sample bottle label and on the COC form.