



Stantec



Final Report

Dike D Interim Stability and
Maintenance Plan
TVA Kingston Fossil Plant
Harriman, Roane County,
Tennessee

Stantec Consulting Services Inc.
One Team. Infinite Solutions

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Prepared for:
Jacobs-Kingston Team
Harriman, Tennessee

August 7, 2009



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August 7, 2009

rpt_003_171468117

Mr. Tod Woodson
Jacobs Project Manager
Kingston Fossil Plant
1134 Swan Pond Road
Harriman, Tennessee 37748

Re: Final Report
Dike D Interim Stability and Maintenance Plan
TVA Kingston Fossil Plant
Harriman, Roane County, Tennessee

Dear Mr. Woodson:

As requested, Stantec Consulting Services Inc. (Stantec) has completed our Report of Interim Stability and Maintenance Plan for Dike D at the Kingston Fossil Plant. The report documents the subsurface conditions, results of laboratory testing, findings from the historical document reviews and emergency buttress operations, results of our analyses and evaluation, and recommendations for the structure. These services were performed under TVA's Engineering Service Request ESR/TAO 621, in accordance with the terms and provisions established in our System-Wide Services Agreement dated December 22, 2008.

Stantec appreciates the opportunity to provide engineering services for this project. If you have any questions, or if we may be of further assistance, feel free to contact our office.

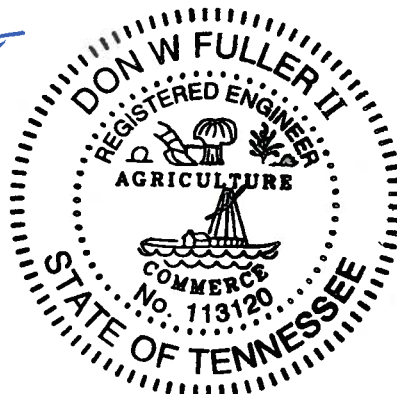
Sincerely,

STANTEC CONSULTING SERVICES INC.

Don W. Fuller III, PE
Principal

/rdr

Enclosures: 0



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Final Report
Dike D Interim Stability and Maintenance Plan
TVA Kingston Fossil Plant
Harriman, Roane County, Tennessee

1. Introduction and Background

The following report documents an interim assessment and maintenance plan associated with the Dike D structure in response to a specific request by the Environmental Protection Agency (EPA). The EPA request was for the Tennessee Valley Authority (TVA) to provide a short term evaluation of the stability of Dike D as well as recommendations relative to development of an engineering monitoring and maintenance plan to be executed during the recovery phase of the December 2008 Kingston dredge cell failure. As designated by TVA this analysis assumes the short term recovery period extends two years. This report evaluates the current facility geometry including the initial emergency mitigation buttress and provides recommendations relative to short term facility monitoring, maintenance and reporting.

The December 22, 2008 dredge cell incident resulted in collateral impacts to the adjacent Dike D embankment structure which forms the western limits of the remaining facility ash pond. Observations by Stantec Consulting Services Inc. (Stantec) personnel beginning on December 22nd indicated that the northernmost portion of the Dike D structure exhibited numerous longitudinal and transverse cracks at the ground surface and the western slopes along nearly the entire length were left in a near vertical scarp configuration. The reference scarps delineated the eastern limits of the dredge cell mass failure. As part of TVA's emergency response team, Stantec was directed to oversee Dike D damage mitigation engineering. These efforts included short term monitoring, geotechnical evaluation, short term mitigation engineering and oversight of associated buttress construction. Documentation of the initial mitigation engineering program is presented in the Stantec report titled: "Dike D Buttress Construction and Slope Inclinometers" dated June 23, 2009. A general Kingston facility layout is illustrated in Figure 1.

2. Design and Construction

The Dike D design knowledgebase has been formed from available information which consists of historical TVA design drawings, operations manuals, Quality Control (QC) plans, related aerial photographs, topographic mapping, annual TVA inspection reports and direct conversations with TVA personnel. The northern limits of the dike for a distance of roughly 800 feet extending south from the Dike C intersection was formed in the early 1980s as part of the initial dredge cell operations. Available information indicates this segment was part of a series of transitional deflector dikes and divider dikes which eventually formed the eastern limits of the dredge cell in this area. The original dike structure which was predominantly west of the current alignment failed in 1984 as a result of foundation undermining associated with dredging and was later reconstructed. The remaining structure alignment which extends to the south side of the ash pond was completed in 2004 to form the intermediate or emergency dredge cell as shown in TVA's 10W425 series of design drawings. These drawings indicate the dike was to be constructed with an initial 30-foot wide crest and 3:1 (Horizontal: Vertical) outslopes. In association with dredge cell development the original starter dike was overlain by a series of incremental dikes. These overlying dikes were predominantly lost during the 2008 dredge cell failure.



**Dike D Interim Stability and
Maintenance Plan
TVA Kingston Fossil Plant**

**Figure 1. Kingston Fossil
Plant Dredge Cell
Failure (photo from
TVA)**



Dike D Photos.ppt

JSD

Historical construction records associated with Dike D are primarily limited to general information presented in TVA annual inspection reports. No formal as-built drawings for the dike have been identified to date. Operational plan narratives related to development of the dredge cell dike system indicate that the dikes were to be constructed from compacted bottom ash and fly ash.

Emergency buttress construction is documented within the June, 2009 Stantec report previously referenced. Dike D western slope grading operations south of the emergency buttress was performed independently by TVA in association with the recovery efforts. It is understood that the overlying incremental dike relics left in place following the dredge cell failure were removed and used as fill for these grading operations.

Dike D geometry currently consists of an approximate 2,800 foot long structure with an elevation profile along the dike crest ranging from 774 feet along the northernmost 800 foot long segment to elevation 780 feet to the south. Crest width ranges from roughly 20 to 80 feet and outslopes range from roughly 2:1 (Horizontal: Vertical) to 4:1.

Engineering observations, monitoring and mitigation construction immediately following the dredge cell failure began with periodic monitoring, construction of a clay soil surface veneer to reduce precipitation infiltration and installation of slope inclinometers along the crest of the dike. Following these initial actions, a western outslope buttress was constructed along the northern limits of the dike. Buttress construction included strategic use of limestone aggregates and geotextiles to form a base stabilization zone. Geotechnical instrumentation was then installed to monitor the foundation materials and embankment performance during construction. The main buttress embankment was constructed through controlled placement of bottom ash materials. The completed bottom ash grade was then covered with clay soils to reduce the potential for surface water infiltration and erosion. Two relic drainage pipes oriented roughly perpendicular to the dike within the buttress construction zone were also abandoned in place through grouting. Detailed information regarding buttress construction documentation and as-built data is presented in the previously referenced report.

3. Stability Assessment

The short term assessment of Dike D stability includes a seepage analysis, slope stability analysis and consideration of key site observations made in association with the work to date. Information available for use in this evaluation includes pertinent exploratory boring logs, laboratory testing and geotechnical instrumentation data from the published AECOM report titled "Root Cause Analysis of TVA Kingston Dredge Pond Failure from December 22, 2008" dated June 25, 2009, recent Stantec geotechnical exploration and testing results as well as historical studies present in the facility records.

3.1. Slope Stability Analysis

The analysis presented herein consists of an assessment of the global slope stability for the existing Dike D configuration under temporary (less than two years), drained, static loading conditions. Slope stability analyses were performed at Dike D baseline Stations 6+50 and 21+50. The locations of these cross sections are illustrated on the drawing titled "Interim Dike D Assessment – Existing Conditions and Baseline Layout" presented in Appendix A. The purpose of the slope stability analysis is to determine if the existing Dike D geometry and foundation conditions provide adequate factors of safety under the prescribed interim conditions.

For this analysis, the Dike D components are as follows:

- Shale Bedrock
- Fine Grained Sand to Sand with Silt
- Sandy Silt to Silty Sand
- Lean Clay Foundation Soil
- Sensitive Silt/Clay
- Hydraulically and Mechanically Placed Ash
- Constructed Ash
- Stone Base Layer
- Cover Soil

A summary of the general engineering classification and assigned slope stability shear strength parameters associated with these materials are outlined below. Note the materials are listed in order from the base of the stability section to the ground surface.

Shale Bedrock. Available information indicates bedrock immediately underlying the structure consists of the Conasauga Shale formation. This shale has a relatively high strength consistency in relation to the overlying native soils and forms the lower boundary of the stability model.

Fine Grained Sand to Sand with Silt. Located above the shale bedrock is a layer of relatively dense, fine to medium grained sand that is predominately classified as SP-SM and SP according to the Unified Soil Classification System (USCS). Based on a correlation of site specific Standard Penetration Test (SPT) data to shear strengths, this material was modeled with a friction angle of 31 degrees and zero cohesion.

Sandy Silt to Silty Sand. The sandy silt to silty sand layer consists of loose materials that are predominately classified as ML and SM according to the USCS. Based on a correlation of site specific Standard Penetration Test (SPT) data to shear strengths, this material was modeled with a friction angle of 27 degrees and zero cohesion.

Lean Clay Foundation Soil. The lean clay foundation soil layer consists of materials that are predominately classified as CL and CL-ML according to the USCS. Based on the results of site specific direct shear and triaxial testing, this material was modeled with a friction angle of 30 degrees and zero cohesion (conservatively neglecting the measured cohesion).

Sensitive Silt/Clay. The sensitive silt/clay layer consists of a relatively thin (~0.5 to ~2.0 foot) zone of silts and clays or in some cases a reported combination of clayey silts thinly interbedded with very fine flyash potentially located at the base of the ash pond materials. Based on the results of recent site specific testing this material was conservatively modeled with a friction angle of 28 degrees and zero cohesion (neglecting measured cohesion).

It should be noted that the currently limited subsurface data along the Dike D corridor does not fully verify the presence of this material. Varying forms of this material have been recently noted by AECOM in association with the dredge cell root cause analysis study and by Stantec in association with the ongoing Dike C stability evaluation. It is anticipated that operational variables such as the limits of historical pond dredging and physical location

within the ash pond in relation to the sluice discharge points will limit the presence of the material to specific pond zones. It is anticipated that future confirmation borings performed in association with the dredge cell closure design will define the aerial extent of the material as necessary. For the purpose of this evaluation, the sensitive silt/clay layer was included within the stability model as a contingency to provide conservative results without requiring additional intrusive sampling and analysis at this time.

Hydraulically and Mechanically Placed Ash. The hydraulically and mechanically placed ash layer consists of bottom ash and fly ash materials that were placed using hydraulic or mechanical methods. The sluiced and mechanically placed ash layer was conservatively modeled as one material with a friction angle of 25 degrees and zero cohesion based on available test data and Stantec's experience with similar materials and placement conditions.

Constructed Ash. The constructed ash layer consists of bottom ash materials placed within the dredge cell using mechanical methods. The constructed ash layer was modeled with a friction angle of 30 degrees and zero cohesion based on available test data and Stantec's experience with similar materials and placement conditions.

Stone Base Layer. The stone base layer consists of materials placed during recent Dike D buttress construction activities. These materials were placed as a drainage layer below the constructed bottom ash buttress against the Dike D embankment between approximate baseline Stations 1+00 and 8+00. The stone base layer was modeled with a friction angle of 38 degrees and zero cohesion.

Cover Soil. The cover soil layer consists of materials placed over the bottom ash buttress constructed against the Dike D embankment. The cover soil layer was modeled with a friction angle of 24 degrees and zero cohesion based on information presented in Foundations and Earth Structures, Naval Facilities Engineering Command (NavFac), Design Manual 7.1, Department of the Navy, May 1982.

A summary of the shear strength parameters used in the global slope stability analysis is presented in the table below. As discussed above, these values are based on site-specific testing, published information and Stantec's experience with similar materials.

Table 1. Summary of Effective Stress Shear Strength Parameters Used in the Global Slope Stability Analysis

Component	Unit Weight γ (pcf)	Cohesion/Adhesion \bar{c} (psf)	Internal Friction Angle (°)
Fine Grained Sand to Sand with Silt	118	0	31
Sandy Silt to Silty Sand	105	0	27
Lean Clay Foundation Soil	129	0	30
Sensitive Silt/Clay	127	0	28
Hydraulically and Mechanically Placed Ash	96	0	25
Constructed Ash	93	0	30
Stone Base Layer	105	0	38
Cover Soil	120	0	24

Modeling Methodology

Slope stability calculations were performed using SLOPE/W[®] 2007, a slope stability program developed by GEO-SLOPE International, Ltd. The Spencer Method was used to compute the factor of safety for the considered failure surfaces. An optimization process was then conducted to obtain the critical failure surface. The phreatic surface was positioned based on a review of Dike D piezometer readings, boring logs and seepage analysis results.

Slope Stability Analysis Results

The results of the static slope stability analyses under drained conditions for sections located at Dike D baseline Stations 6+50 and 21+50 indicate factors of safety of 1.9 and 1.5, respectively. Graphical plots of these results are provided in Figures 2 and 3 below.

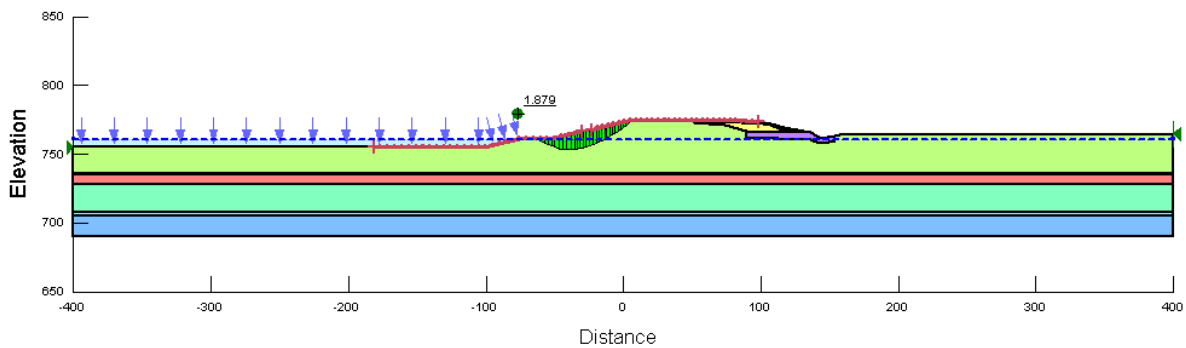


Figure 2. Stability Section – Station 6+50

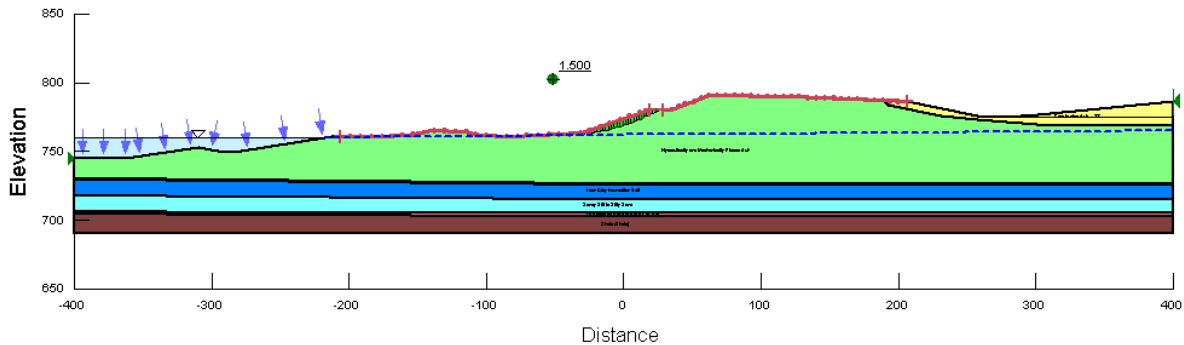


Figure 3. Stability Section – Station 21+50

3.2. Seepage Analysis

Presented herein are the results of the seepage analysis performed for the controlling conditions anticipated at Station 21+50. The objective is to provide an evaluation of anticipated seepage conditions as it relates to the short term stability of the Dike D structure.

The steady state analysis was performed using the computer program SEEP/W (GEO-SLOPE International Ltd). The tailwater (main ash pond side) elevation was assumed at El. 760 feet. The headwater (dredge cell side) elevation was conservatively assumed at El. 765 feet.

Since the phreatic surface will be calculated from the analysis based on the applied boundary conditions, the saturated/unsaturated SEEP/W model was selected for all soils. Both volumetric water content function and hydraulic conductivity function were projected for each material.

The volumetric water content function of each soil was estimated using the SEEP/W built-in sample functions. Soil type and the saturated water content along with the minimum and maximum suctions were the input parameters. The saturated water content, as summarized in Table 1, was determined based on the soil void ratios. The default suctions (max. = 1,000 pounds per square foot (psf) and min. = 0.01 psf) were used in the analysis. The defined volumetric water content functions are shown in Figure 4.

The volumetric water content functions were then used in conjunction with the saturated hydraulic conductivities (k_{sat}) to define the hydraulic conductivity functions. The k_{sat} values used in the analysis are also presented in Table 2. A typical k_{sat} value was assumed for a soil based on the soil type per the guidelines presented by Milton E. Harr, Groundwater and Seepage, McGraw-Hill Book Company, 1962.

The critical vertical hydraulic gradient (i_c) of a soil can be computed from the following equation:

$$i_c = \frac{G_s - 1}{1 + e}$$

Where,

G_s = Specific Gravity of Solids

e = Void Ratio

The critical hydraulic gradient for each soil is presented in the last column of Table 2.

Table 2. Summary of Soil Parameters

Soil Horizon	Saturated k_v (cm/s)	Ratio k_h / k_v	Specific Gravity G_s	Void Ratio e	Critical Gradient i_{cr}	Volumetric Water Content		Basis
						Saturated (%)	Residual (%)	
Sluiced and Mechanically Placed Ash	3.0e-5	50	2.31	0.85	0.71	46	0.04	Available Laboratory Data (Test Trench #3)
Silts and Sands	1.0e-5	50	2.70	0.65	1.03	39	0.01	Based on Typical Values
Silty Clay	1.0e-5	50	2.70	0.65	1.03	39	0.01	Based on Typical Values
Sensitive Silt/Ash	3.0e-5	50	2.31	0.85	0.71	46	0.04	Available Laboratory Data (Test Trench #3)
Shale	1.0e-7	10	2.60	0.25	1.28	20	0.01	Available Laboratory Data (Test Trench #3)

Constant pressure (head) boundary conditions were applied to the model. On the main ash pond side (tailwater), the head was assumed at El. 760 feet; on the dredge cell side (headwater), the head was assumed at El. 765 feet.

The finite element mesh was composed of quad and triangle elements with an approximate global element size of 5 feet. The mesh and the applied boundary conditions are shown in Figure 4.

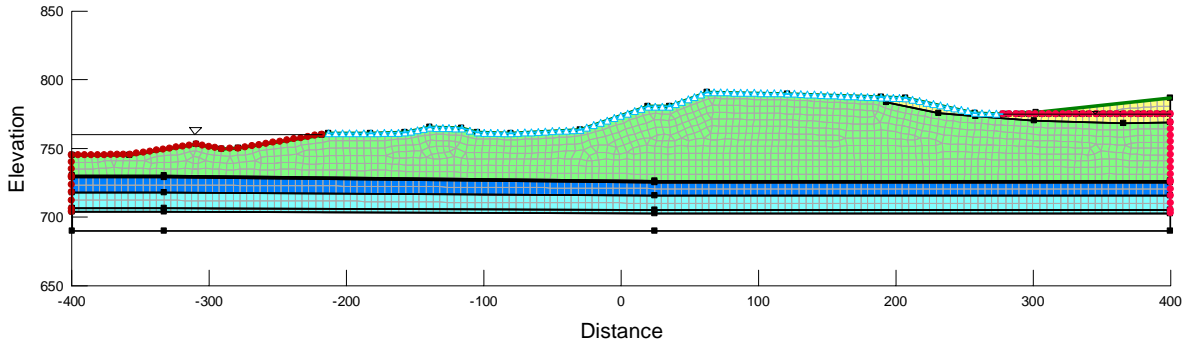


Figure 4. Finite Element Mesh and Boundary Conditions

Seepage Analysis Results

Current standard engineering practice is to design embankment systems to provide a minimum factor of safety of 3 for exit gradient as computed from the following equation:

$$FS_{eg} = \frac{i_c}{i_e} \geq 3$$

Where,

FS_{eg} = Factor of safety for exit gradient.

i_c = Critical vertical gradient causing flotation of the embankment material

i_e = Maximum exit gradient computed from seepage modeling

Review of the seepage analysis results indicates that a maximum projected vertical exit gradient of 0.07 occurs on the tailwater side of the dike. This results in a factor of safety of 10.1 against seepage piping or heave failure for Sluiced and Mechanically Placed Ash which is the material with critical gradient of 0.71 presented in Table 2.

4. Conclusions and Recommendations

Visual observations and instrumentation data reviewed to date indicate that the emergency buttress system and TVA grading related to Dike D have met the objectives of short term stabilization of the structure and eliminating the physical hazards associated with the near vertical western slope scarps that resulted from the adjacent dredge cell failure.

The results of this analysis indicate that the existing Dike D configuration does provide adequate factors of safety for both global stability and steady state seepage under the designated short term two-year period for drained, steady state seepage and static loading conditions. In consideration of initial observations relative to dike strain as evidenced by the surface cracks noted immediately following the dredge cell failure it is recommended that the current facility monitoring activities be formalized into a structured program for the duration of the anticipated two-year facility recovery period. For continuity in the engineering interpretation of site conditions it is recommended that Stantec review and approve the written monitoring and maintenance program.

It is recommended that the Dike D monitoring program include monthly visual inspections and documentation as well geotechnical instrumentation monitoring, engineering review and reporting. It is anticipated that the existing geotechnical instrumentation network consisting of both slope inclinometers and piezometers will be adequate for use in this program. Pertinent geotechnical instrumentation locations, boring logs and installation details are presented in Appendix B. A draft Dike Inspection form is presented in Appendix C. The interim instrumentation monitoring and dike inspection program should be developed and supervised by a qualified professional engineer. The inspection program should include provisions for supplemental inspections to be performed at the discretion of the engineer in response to extraneous conditions such as site operations, construction activities and precipitation events.

Facility maintenance should include maintaining the dike surface to promote positive, controlled drainage and control erosion. It is recommended that sufficient roadway aggregate base designs be implemented to prevent rutting of the dike surface. Specific consideration should be given to developing and maintaining roadway surfaces that are adequate for truck traffic associated with the ash recovery operations. In addition, it is recommended that appropriate roadway side barriers be constructed to reduce the potential for vehicles to leave the roadway and overturn on dike side slopes.

It is recommended that emergency action plans be developed for use in response to potential dike failures. The emergency action plans should include stockpiling of materials and maintaining appropriate equipment and operators at the site for dike repair wherein rapid response may reduce the overall severity, risk and recovery cost. It is recommended that emergency action plans include provisions to reduce the ash pond pool in the event of a dike emergency.

It is understood that the pending dredge cell closure plan will integrate full long term evaluation and mitigation design of Dike D as part of those design and permitting efforts.

The conclusions and recommendations presented herein were developed with the degree of care and skill normally exercised by competent members of the engineering profession. Due to the nature of the project, no warranties can be provided regarding the conditions between boring locations or the actual performance of the dike.

Appendix A

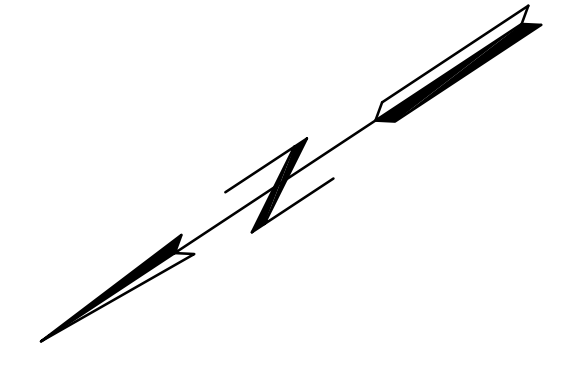
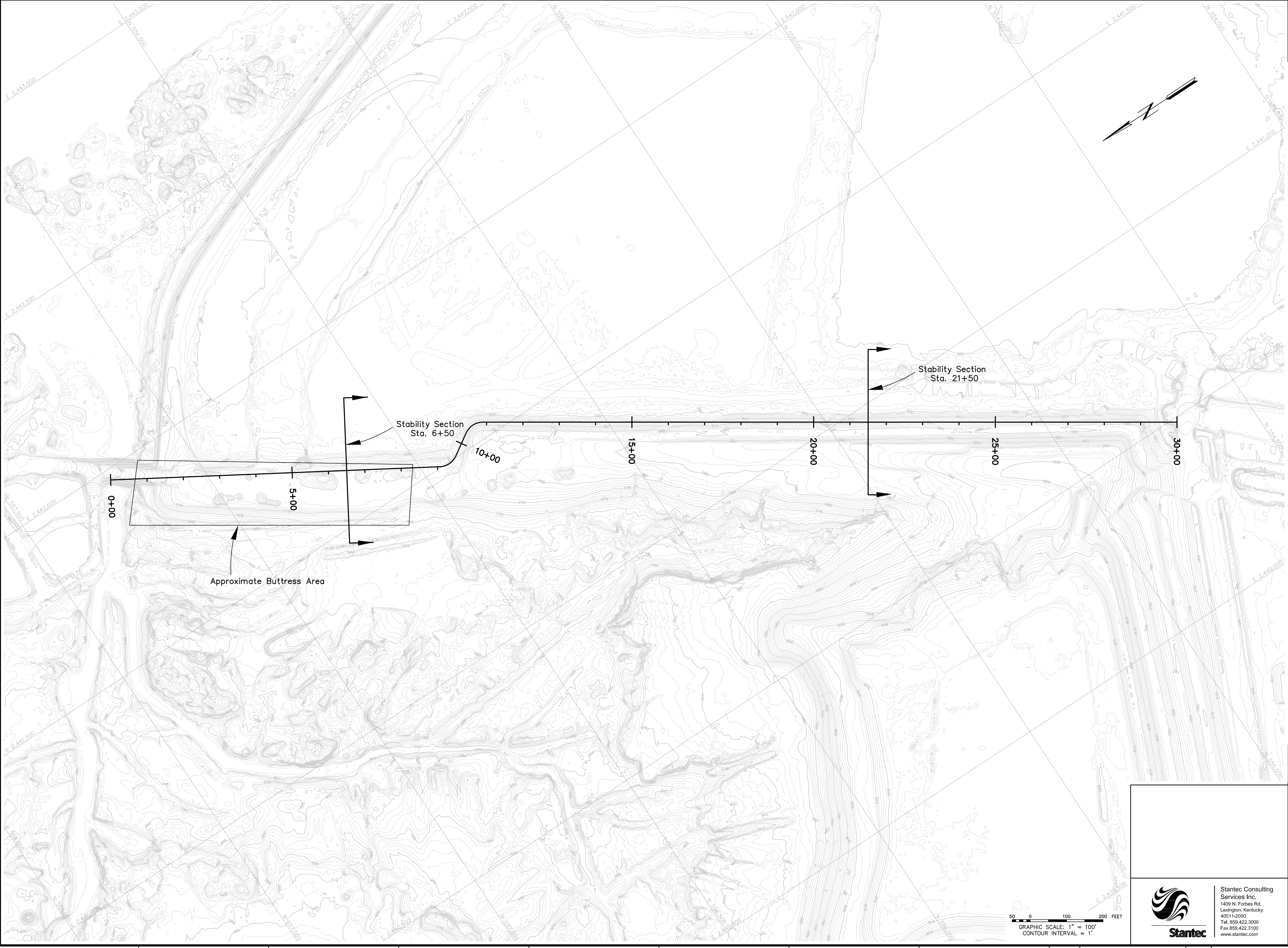
Interim Dike D Assessment – Exiting Conditions and Baseline Layout Drawing

10-XXXXXX C 17 2 3 4 5 6 7 8 9 10 11 12

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 The Copyrights to all designs and drawings are the property of Stantec. Reproduction or use for any purpose other than that authorized by Stantec is forbidden.

NOTES:
 1. Topographic mapping was provided by Tennessee Valley Authority on June 8, 2009 and was generated from a LIDAR survey performed on May 12, 2009 by Tuck Mapping Solutions, Inc. This plan was developed for discussion purposes only and is not to be used for construction.
 2. The baseline shown for Dike D was provided to Stantec by Worley Parsons on a drawing dated January 2, 2009. Baseline reference stakes were set in the field by Tennessee Valley Authority (TVA) surveyors.

**ISSUED FOR REVIEW
 NOT FOR CONSTRUCTION**



GRAPHIC SCALE: 1" = 100'
 CONTOUR INTERVAL = 1'



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REV. NO.	DATE	ISSN	DRWN	CHKD	SUPV	RVND	APPR	ISSD	PROJECT ID	AS CONST	REV. BY
01	06/09		T. JOHNSON	M. STEELE	DON FULLER	J. MONTGOMERY					

SCALE: 1"=100'
 YARD
**INTERIM DIKE D ASSESSMENT
 EXISTING CONDITIONS
 AND BASELINE LAYOUT**

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
K. LINDQUIST	T. JOHNSON	M. STEELE	DON FULLER	J. MONTGOMERY		
KINGSTON FOSSIL PLANT TENNESSEE VALLEY AUTHORITY FOSSIL AND HYDRO ENGINEERING						
AUTOCAD R 2008	DATE 06/09	41	C	XXWXXX-01	R 0	

TASK COMPLETED BY: _____
 REV. NO. _____

PLOT FACTOR: XX
 W_TVA
 C.A.D. DRAWING
 DO NOT ALTER MANUALLY

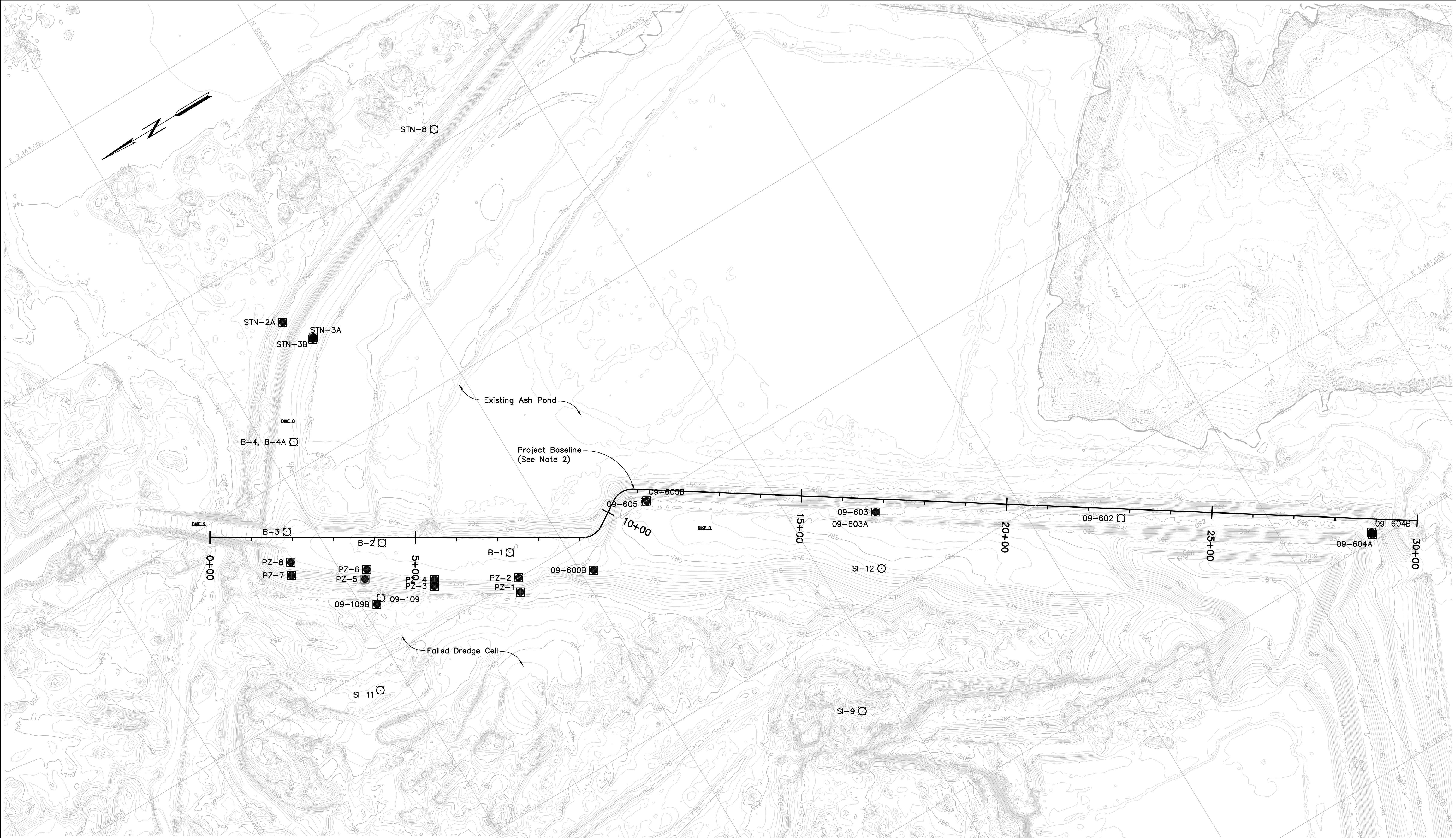
PLOT DATE: 07/22/2009 USER: VEMAR, SHARAH
 C:\V\F\PROJECTS\10-XXXXXX\10-XXXXXX-01.dwg P-000001.DWG 2:08

Appendix B

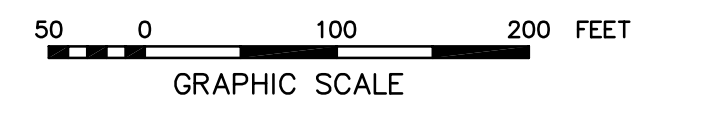
Geotechnical
Instrumentation Location
Plan, Boring Logs and
Installation Details

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NOTES:
1. The baseline shown for Dike D was provided to Stantec by Worley Parsons on a drawing dated January 2, 2009. Baseline reference stakes were set in the field by Tennessee Valley Authority (TVA) surveyors.
2. Boring numbers designated as "09-XXX" were drilled by AECOM. This information was provided to Stantec on June 26, 2009 along with the Root Cause Analysis Report.



LEGEND
PZ-1 Existing Piezometer
B-1 Existing Slope Inclinator



PIEZOMETER INSTALLATIONS			
PIEZOMETER ID	NORTHING ¹	EASTING ¹	GROUND ELEV. (FT.) ²
STN-2A	556,806.57	2,442,329.32	751.20
STN-3A	556,761.59	2,442,259.75	763.90
STN-3B	556,765.05	2,442,256.36	763.90
09-109B	556,955.50	2,441,523.30	763.41
09-600B	556,470.71	2,441,421.34	776.66
09-603	556,806.89	2,441,187.46	760.61
09-603A	556,805.42	2,441,185.06	760.55
09-604A	554,803.16	2,440,515.37	762.39
09-604B	554,801.55	2,440,521.03	762.36
09-605B	556,273.05	2,441,498.96	761.64
PZ-1	556,850.76	2,441,488.15	765.3
PZ-2	556,836.44	2,441,500.11	766.9
PZ-3	556,822.55	2,441,588.54	766.3
PZ-4	556,814.34	2,441,602.15	766
PZ-5	556,856.55	2,441,690.87	763.7
PZ-6	556,842.41	2,441,706.59	763.7
PZ-7	557,105.65	2,441,791.01	759
PZ-8	557,091.52	2,441,816.11	760.1

SLOPE INCLINOMETER INSTALLATIONS			
SLOPE INCLINOMETER ID	NORTHING ¹	EASTING ¹	GROUND ELEV. (FT.) ²
STN-8	556,248.52	2,442,540.30	752.20
SI-9	556,068.48	2,440,789.54	777.94
SI-11	567,068.19	2,441,439.93	757.97
SI-12	555,968.89	2,441,062.49	763.81
09-602	555,356.82	2,440,655.75	761.50
09-603	555,509.39	2,441,137.48	760.61
09-605	556,277.45	2,441,498.35	761.74
09-109	556,971.55	2,441,627.44	763.59
B-1	556,823.08	2,441,553.81	774.16
B-2	556,877.44	2,441,744.70	774.06
B-3	557,061.67	2,441,687.56	770.9
B-4	556,934.61	2,442,066.28	764.21
B-4A	556,954.37	2,442,065.82	765.17

¹ Northing and Easting are top of concrete pad. Elevation is ground surface. Locations provided by TVA, Power Systems Operations, Surveying and Project Services.
² Horizontal Datum: NAD 27 (Tennessee Lambert); Vertical Datum: NAVD83.
³ Surface protection for B-4 was damaged. After repair, installation was re-named B-4A.

REV. NO.	DATE	DSN	DRW	CHKD	SUPV	RVID	APPR	ISSD	PROJECT ID	AS CONST	REV
0	07/09										

SCALE: 1" = 100'
EXCEPT AS NOTED

YARD KINGSTON FOSSIL PLANT DIKE D INSTRUMENTATION

Stantec Consulting Services Inc.
1409 N. Forbes Rd.
Lexington, Kentucky 40511-2050
Tel: 859.422.3000
Fax: 859.422.3100
www.stantec.com

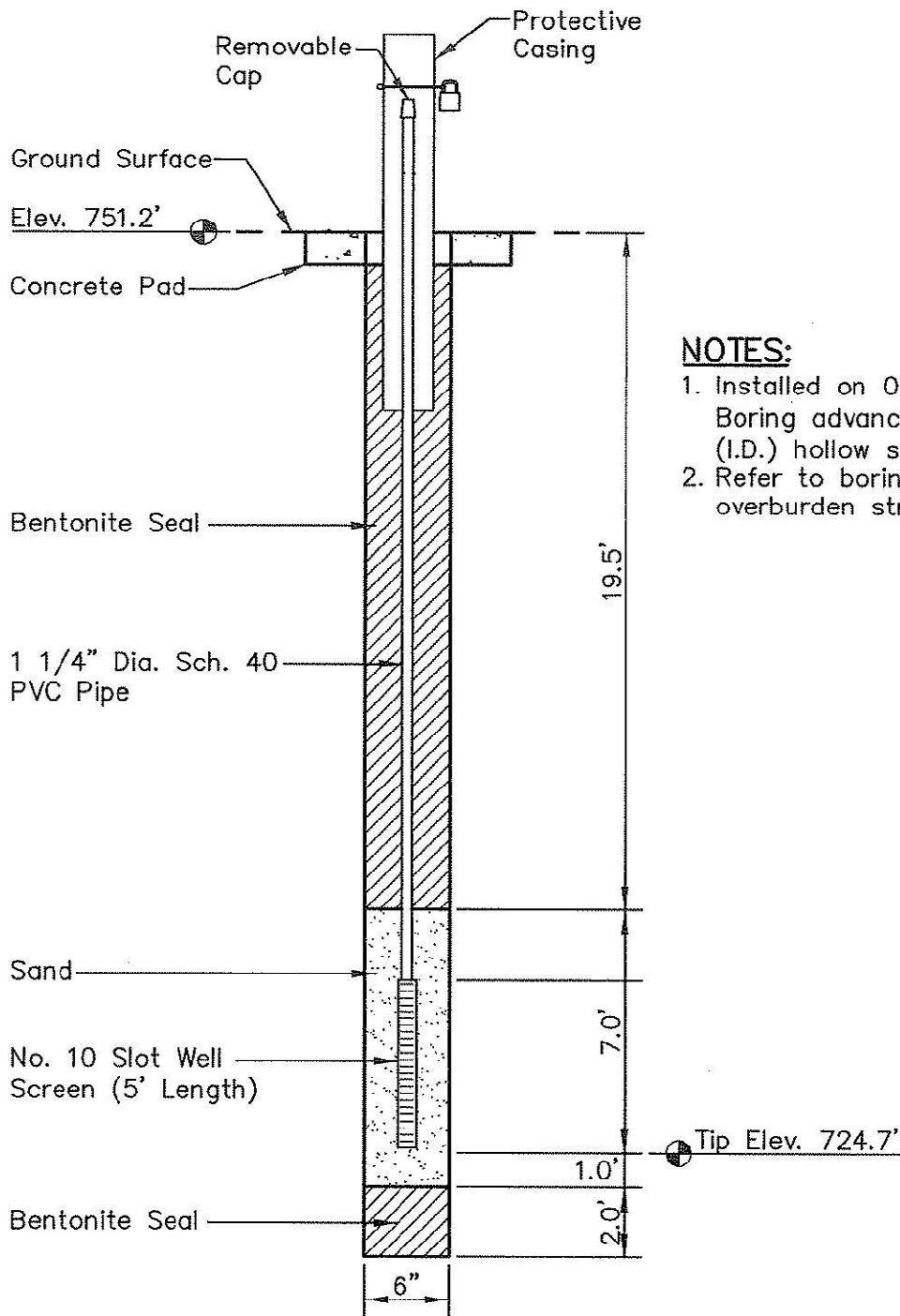
DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
	R. FLINN	R. NANDURI	J. DINGRANDO	J. ANDREW		

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

NOT FOR CONSTRUCTION

AUTOCAD R 2008	DATE	41	C	10W427-01	R 0
TASK COMPLETED BY:			REV NO.		

PLOT FACTOR: XX
W_TVA
C.A.D. DRAWING
DO NOT ALTER MANUALLY



NOTES:

1. Installed on 04/16/2009. Boring advanced with 3.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.

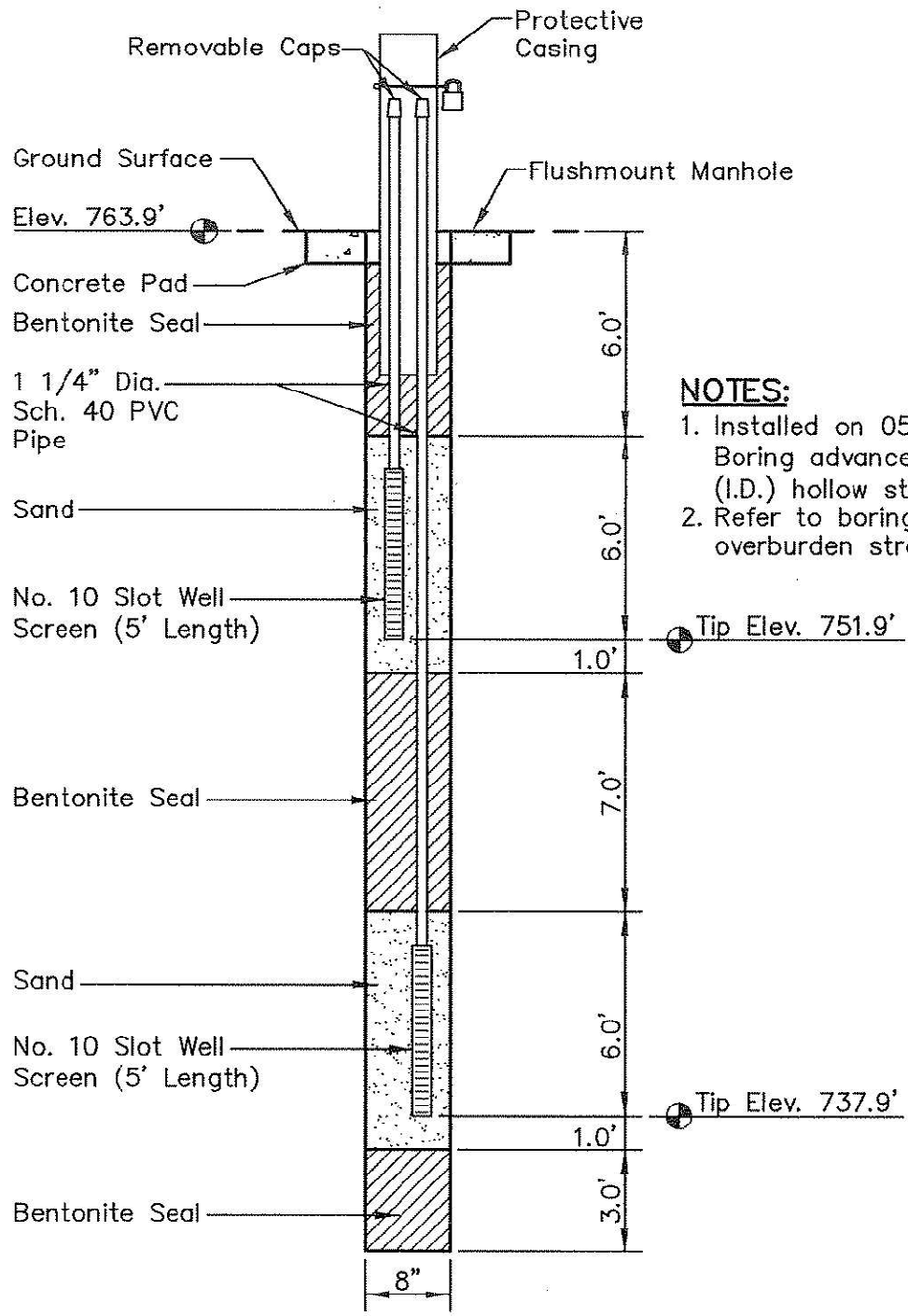
LOCATION:

Northing: 556,806.57
 Easting: 2,442,329.32
 Ground Elevation: 751.2 feet

Locations to be provided by
 TVA, Power Systems
 Operations, Surveying and
 Project Services.
 Horizontal Datum: NAD 27
 Vertical Datum: NGVD29

PIEZOMETER STN-2A ASH POND STABILITY KINGSTON FOSSIL PLANT			
Stantec		Stantec Consulting Services Inc. 1409 N. Forbes Rd. Lexington, Kentucky 40511-2050 859-422-3000 www.stantec.com	
DRAWN BY	TJ	DATE	JUNE, 2009
CHECKED BY	ZCM	PROJ. NO.	175569042
CHECKED BY	AAC	SCALE	NTS
		REVISED	SHEET
		1.	3.
		2.	4.
			1 OF 1

PLOT DATE: 07/15/2009 USER: FLYNN, RENEE
 V: 175569042\SEOTECHNICAL\DRAWING\INSTRUMENTS\690-2C-KIF-301-FZ2A.DWG



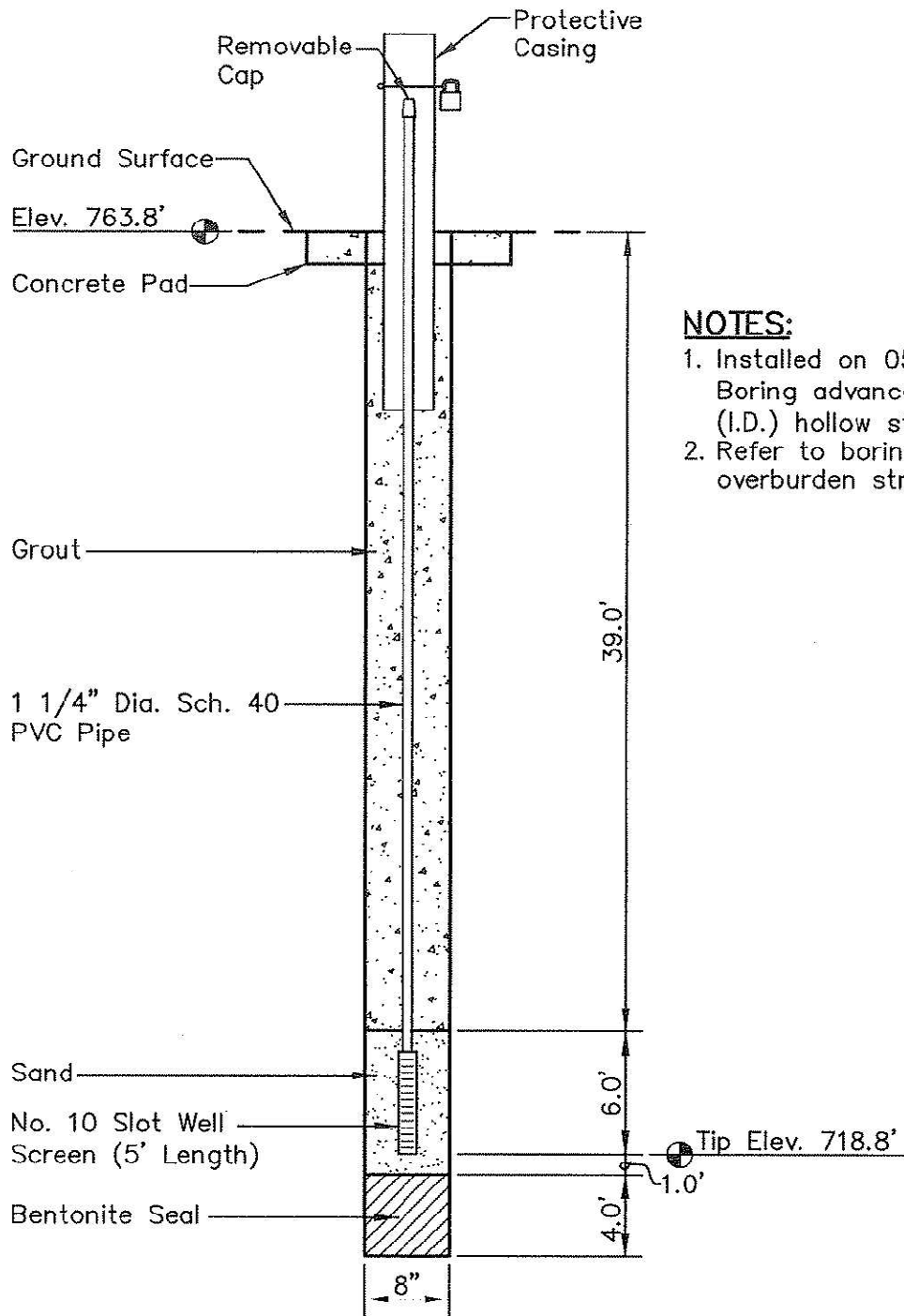
- NOTES:**
1. Installed on 05/01/2009. Boring advanced with 4.25" (I.D.) hollow stem augers.
 2. Refer to boring log for overburden stratigraphy.

LOCATION:
 Northing: 556,761.99
 Easting: 2,442,259.75
 Ground Elevation: 763.9 feet

Locations to be provided by TVA, Power Systems Operations, Surveying and Project Services.
 Horizontal Datum: NAD 27
 Vertical Datum: NGVD29

PIEZOMETER STN-3A ASH POND STABILITY KINGSTON FOSSIL PLANT			
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DRAWN BY	TJ	DATE	JUNE, 2009
CHECKED BY	ZCM	PROJ. NO.	175569042
CHECKED BY	AAC	SCALE	NTS
		REVISED	SHEET
		1.	3.
		2.	4.
			1 OF 1

PLOT DATE: 06/30/2009 USER: FL\NPR, RENEE V:\1755\ACTIVE\175569042\GEOTECHNICAL\GRA\WING\INSTRUMENTS\69042C--KF--301--P23A.DWG



NOTES:

1. Installed on 05/01/2009. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.

LOCATION:

Northing: 556,765.05
 Easting: 2,442,256.36
 Ground Elevation: 763.8 feet

Locations to be provided by TVA, Power Systems Operations, Surveying and Project Services.
 Horizontal Datum: NAD 27
 Vertical Datum: NGVD29

**PIEZOMETER STN-3B
 ASH POND STABILITY
 KINGSTON FOSSIL PLANT**

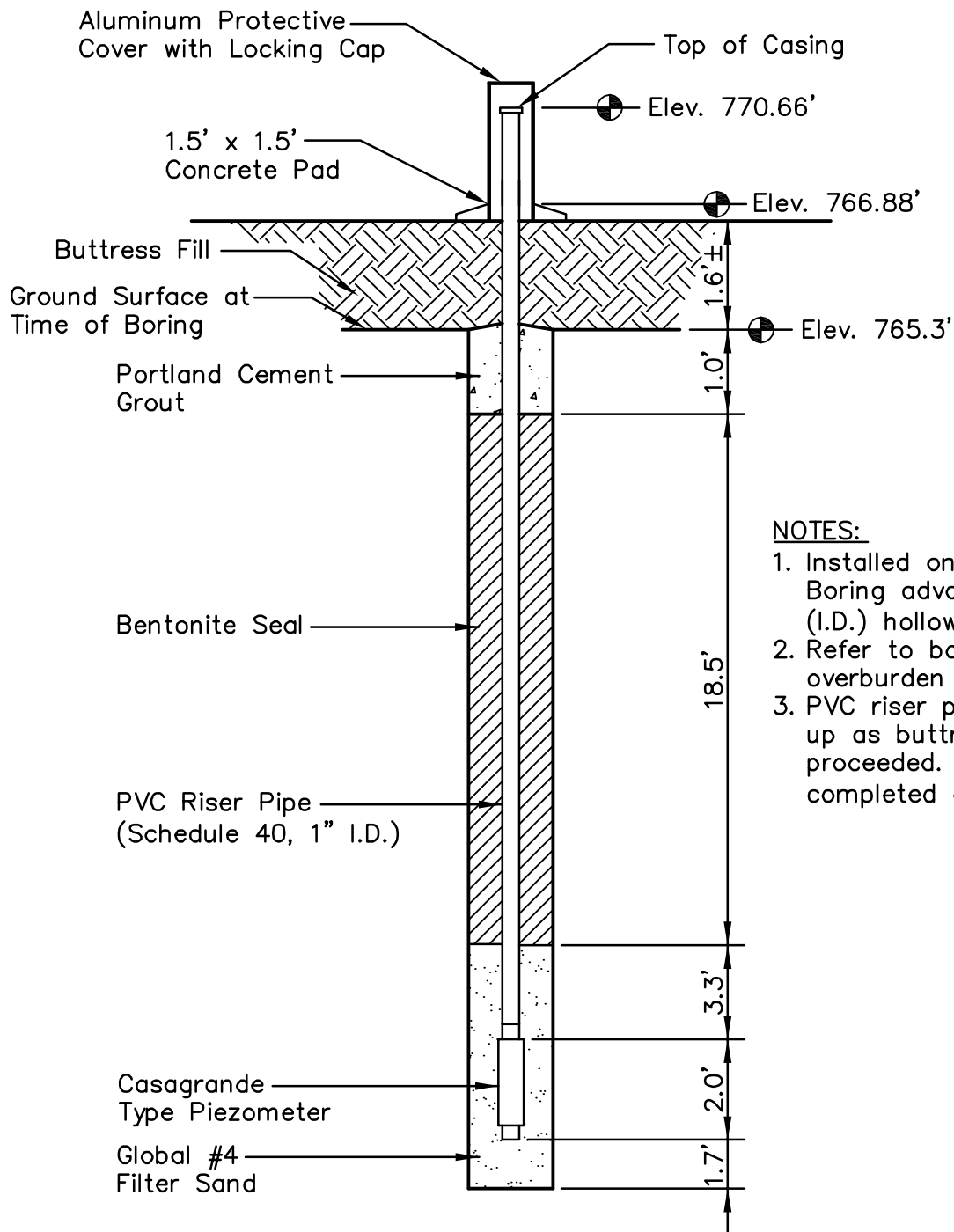


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CHECKED BY	ZCM	PROJ. NO.	175569042	1.	3.
CHECKED BY	AAC	SCALE	NTS	2.	4.

SHEET
1 OF 1

PLOT DATE: 06/30/2009 USER: FL'NN, REVEE
 V:\1755\ACTIVE\175569042\GEOTECHNICAL\DRAWING\INSTRUMENTS\6904-2C-KIF-301-PZ3B.DWG



NOTES:

1. Installed on 01/14/2009. Boring advanced with 3.25-inch (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.
3. PVC riser pipe was extended up as butress fill placement proceeded. Surface protection completed on 02/24/2009.

DATE: 05/14/2009 USER: SAMS, BRIAN V:\1714\ACTIVE\171468117\ENVIRONMENTAL_DRAWINGS\KIF\DIKE_D\68117C-KIF-301-PZ1.DWG

LOCATION (TOP OF CASING)

Northing: 556,650.76
 Easting: 2,441,468.15
 Elevation: 770.66'
 Locations provided by TVA,
 Power Systems Operations,
 Surveying and Project Services.
 Horizontal Datum: NAD 27
 (Tennessee Lambert)
 Vertical Datum: NGVD29

**PIEZOMETER PZ-1
KINGSTON FOSSIL PLANT DIKE D BUTRESS**

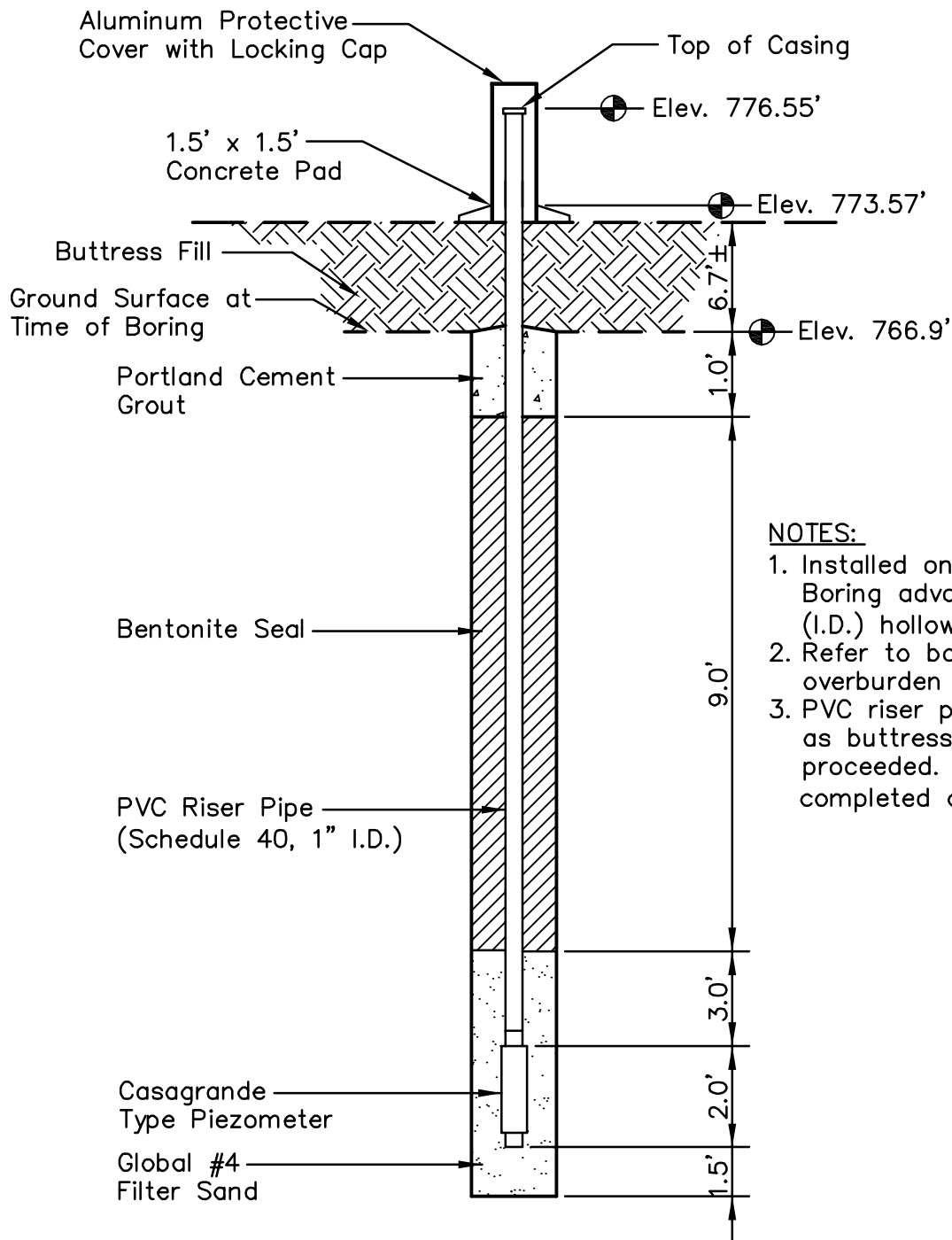


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CHECKED BY	<i>JDE</i>	PROJ. NO.	<i>171468117</i>	1.	3.	1 OF 8
CHECKED BY	<i>JSD</i>	SCALE	<i>NTS</i>	2.	4.	



NOTES:

1. Installed on 01/14/2009. Boring advanced with 3.25-inch (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.
3. PVC riser pipe was extended up as butress fill placement proceeded. Surface protection completed on 2/24/2009.

DATE: 05/14/2009 USER: SAMS, BRIAN V:\1714\ACTIVE\171468117\ENVIRONMENTAL_DRAWINGS\KIF\DIKE_D\68117C-KIF-302-PZ2.DWG

LOCATION (TOP OF CASING)

Northing: 556,636.44
 Easting: 2,441,500.11
 Elevation: 776.55'
 Locations provided by TVA,
 Power Systems Operations,
 Surveying and Project Services.
 Horizontal Datum: NAD 27
 (Tennessee Lambert)
 Vertical Datum: NGVD29

**PIEZOMETER PZ-2
KINGSTON FOSSIL PLANT DIKE D BUTRESS**

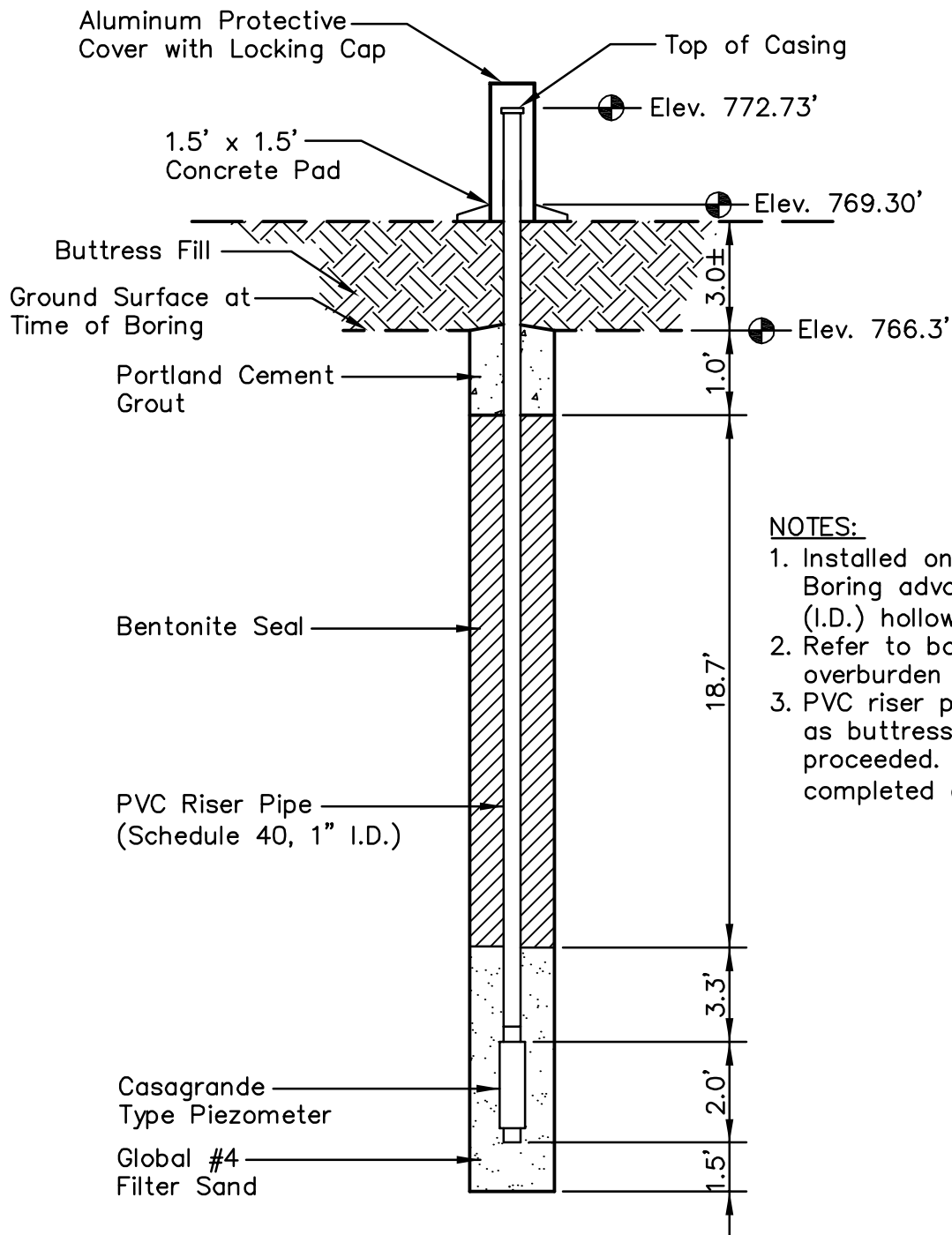


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CHECKED BY	<i>JDE</i>	PROJ. NO.	<i>171468117</i>	1.	3.	2 OF 8
CHECKED BY	<i>JSD</i>	SCALE	<i>NTS</i>	2.	4.	



- NOTES:**
1. Installed on 01/15/2009. Boring advanced with 3.25-inch (I.D.) hollow stem augers.
 2. Refer to boring log for overburden stratigraphy.
 3. PVC riser pipe was extended up as butress fill placement proceeded. Surface protection completed on 02/25/2009.

DATE: 05/14/2009 USER: SAMS, BRIAN V:\1714\ACTIVE\171468117\ENVIRONMENTAL_DRAWINGS\KIF\DIKE_D\68117C-KIF-303-PZ3.DWG

LOCATION (TOP OF CASING)
 Northing: 556,822.95
 Easting: 2,441,588.54
 Elevation: 772.73'
 Locations provided by TVA,
 Power Systems Operations,
 Surveying and Project Services.
 Horizontal Datum: NAD 27
 (Tennessee Lambert)
 Vertical Datum: NGVD29

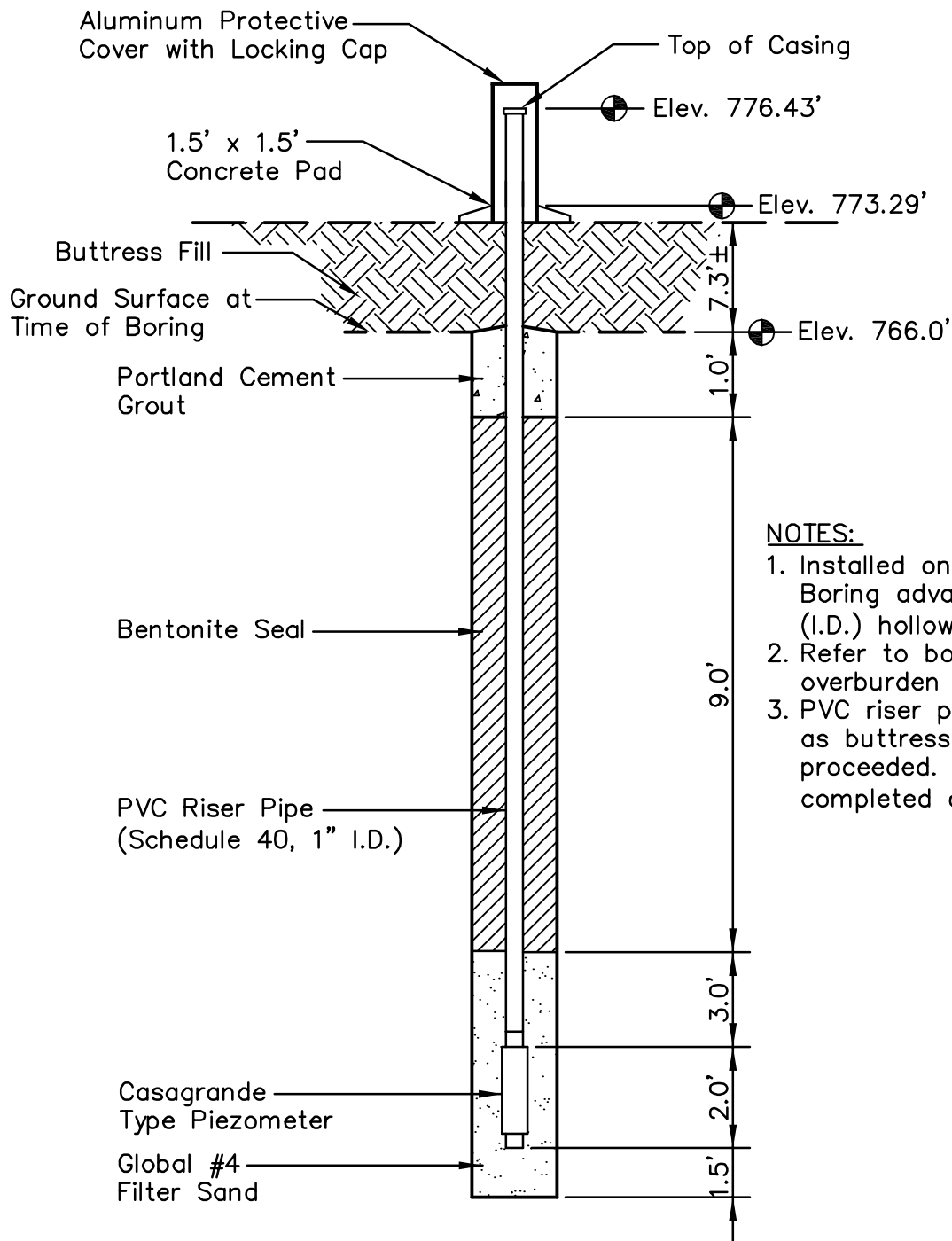
**PIEZOMETER PZ-3
 KINGSTON FOSSIL PLANT DIKE D BUTRESS**



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CHECKED BY	<i>JDE</i>	PROJ. NO.	<i>171468117</i>	1.	3.	3 OF 8
CHECKED BY	<i>JSD</i>	SCALE	<i>NTS</i>	2.	4.	



NOTES:

1. Installed on 01/14/2009. Boring advanced with 3.25-inch (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.
3. PVC riser pipe was extended up as butress fill placement proceeded. Surface protection completed on 02/25/2009.

DATE: 05/14/2009 USER: SAMS, BRIAN V:\1714\ACTIVE\171468117\ENVIRONMENTAL_DRAWINGS\KIF\DIKE_D\68117C-KIF-304-PZ4.DWG

LOCATION (TOP OF CASING)

Northing: 556,814.34
 Easting: 2,441,602.15
 Elevation: 776.43'
 Locations provided by TVA,
 Power Systems Operations,
 Surveying and Project Services.
 Horizontal Datum: NAD 27
 (Tennessee Lambert)
 Vertical Datum: NGVD29

**PIEZOMETER PZ-4
KINGSTON FOSSIL PLANT DIKE D BUTRESS**

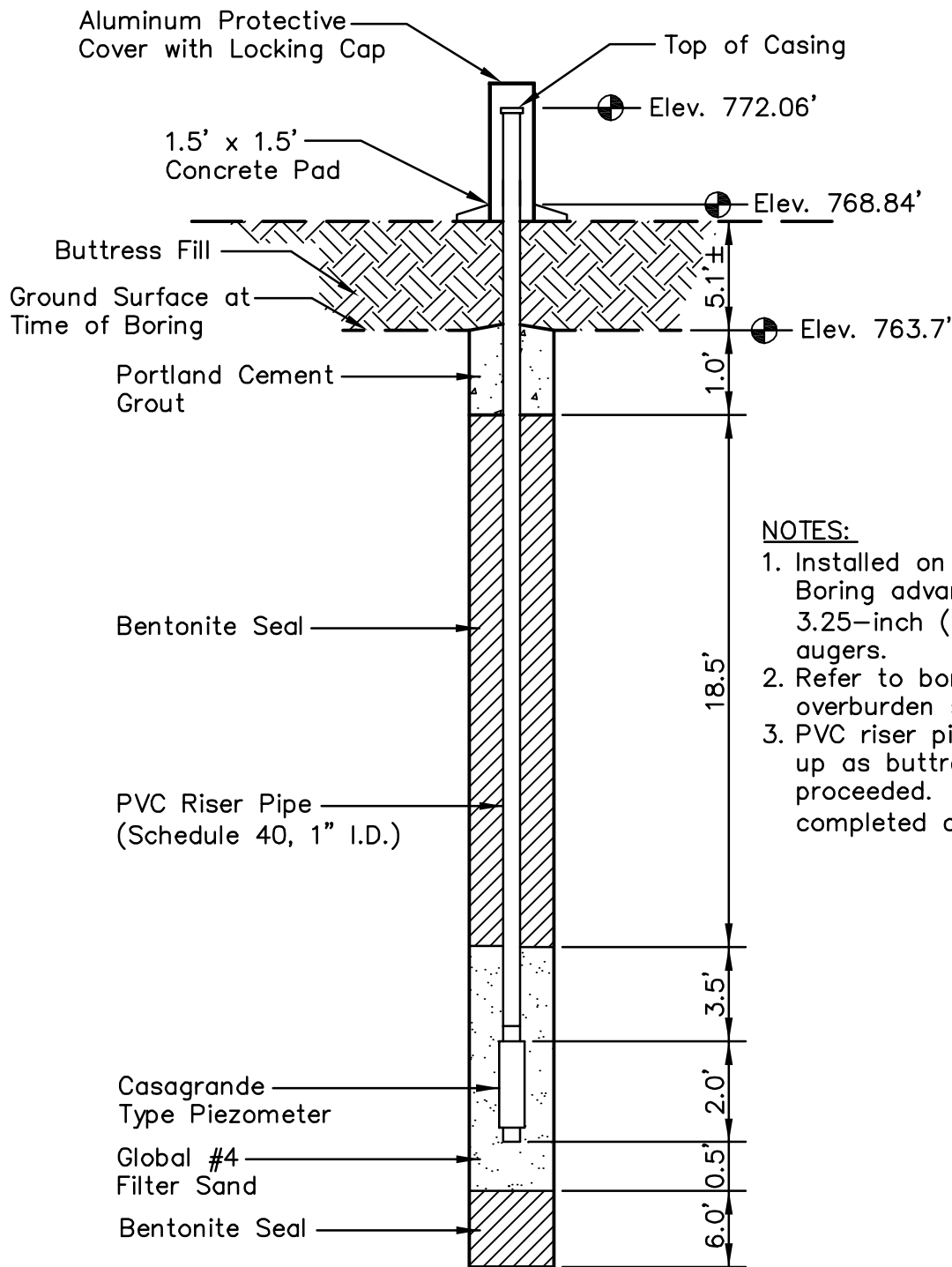


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CHECKED BY	JDE	PROJ. NO.	171468117	1.	3.	4 OF 8
CHECKED BY	JSD	SCALE	NTS	2.	4.	



NOTES:

1. Installed on 01/15/2009. Boring advanced with 3.25-inch (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.
3. PVC riser pipe was extended up as buttress fill placement proceeded. Surface protection completed on 02/25/2009.

DATE: 05/14/2009 USER: SAMS, BRIAN V:\1714\ACTIVE\171468117\ENVIRONMENTAL_DRAWINGS\KIF\DIKE_D\68117C-KIF-305-PZ5.DWG

LOCATION (TOP OF CASING)

Northing: 556,958.55
 Easting: 2,441,690.87
 Elevation: 772.06'
 Locations provided by TVA,
 Power Systems Operations,
 Surveying and Project Services.
 Horizontal Datum: NAD 27
 (Tennessee Lambert)
 Vertical Datum: NGVD29

**PIEZOMETER PZ-5
KINGSTON FOSSIL PLANT DIKE D BUTTRESS**

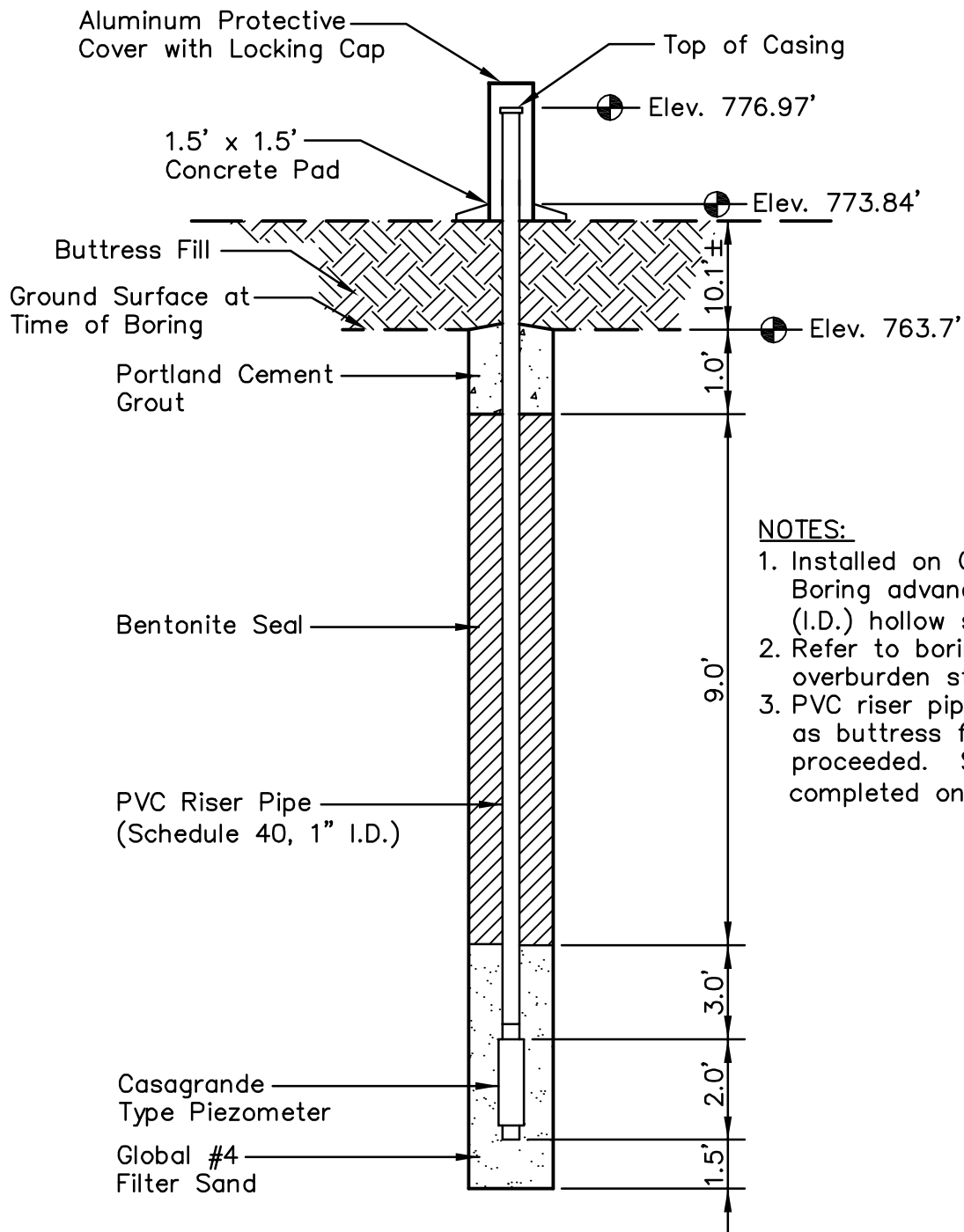


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CHECKED BY	JDE	PROJ. NO.	171468117	1.	3.	5 OF 8
CHECKED BY	JSD	SCALE	NTS	2.	4.	



NOTES:

1. Installed on 01/15/2009. Boring advanced with 3.25-inch (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.
3. PVC riser pipe was extended up as buttress fill placement proceeded. Surface protection completed on 2/26/2009.

DATE: 05/14/2009 USER: SAMS, BRIAN V:\1714\ACTIVE\171468117\ENVIRONMENTAL_DRAWINGS\KIF\DIKE_D\68117C-KIF-306-PZ6.DWG

LOCATION (TOP OF CASING)

Northing: 556,942.41
 Easting: 2,441,708.59
 Elevation: 776.97'
 Locations provided by TVA,
 Power Systems Operations,
 Surveying and Project Services.
 Horizontal Datum: NAD 27
 (Tennessee Lambert)
 Vertical Datum: NGVD29

**PIEZOMETER PZ-6
KINGSTON FOSSIL PLANT DIKE D BUTTRESS**

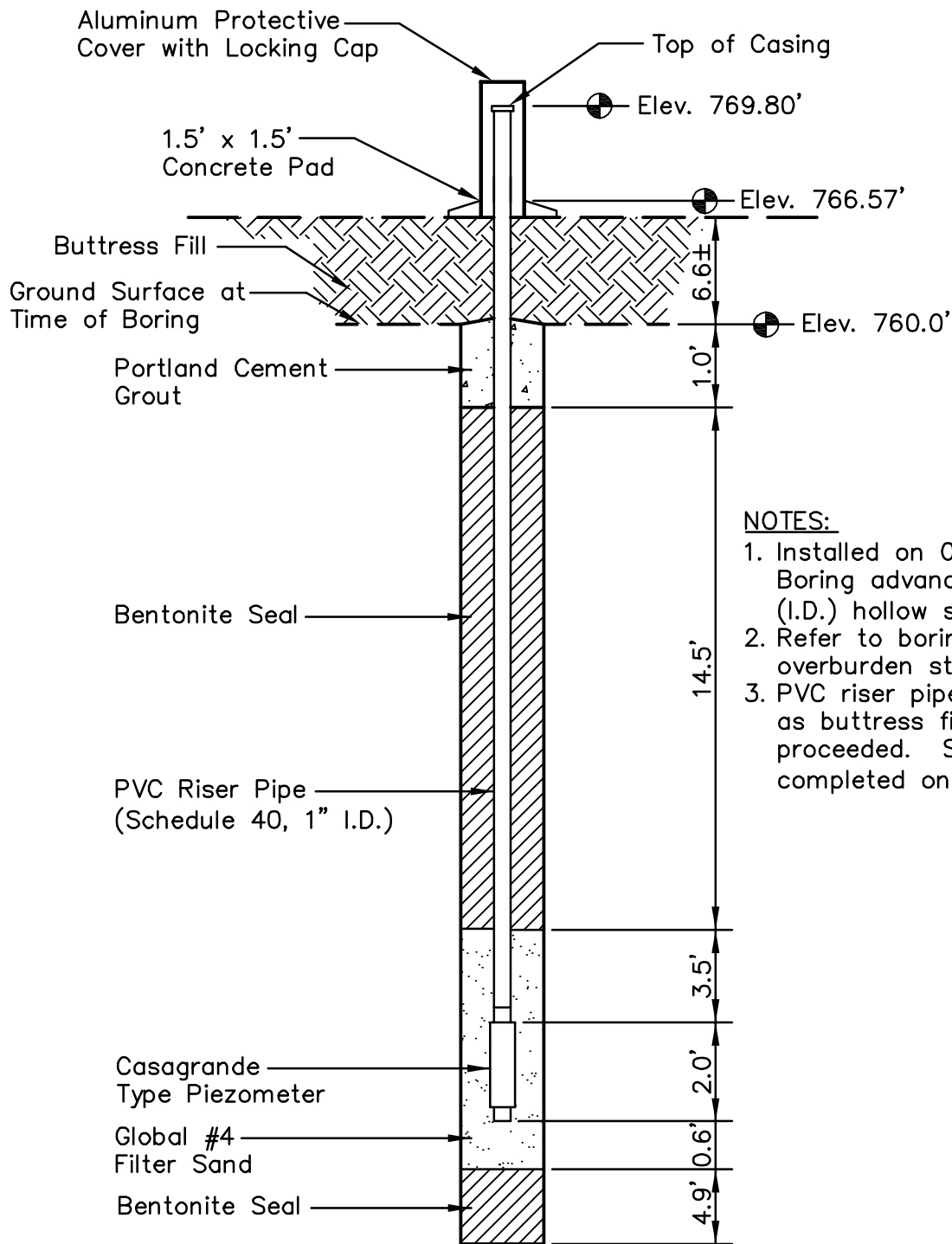


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CHECKED BY	JDE	PROJ. NO.	171468117	1.	3.	6 OF 8
CHECKED BY	JSD	SCALE	NTS	2.	4.	



NOTES:

1. Installed on 01/15/2009. Boring advanced with 3.25-inch (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.
3. PVC riser pipe was extended up as butress fill placement proceeded. Surface protection completed on 2/26/2009.

DATE: 05/14/2009 USER: SAMS, BRIAN V:\1714\ACTIVE\171468117\ENVIRONMENTAL_DRAWINGS\KIF\DIKE_D\68117C-KIF-307-PZ7.DWG

LOCATION (TOP OF CASING)

Northing: 557,106.66
 Easting: 2,441,791.01
 Elevation: 769.80'
 Locations provided by TVA,
 Power Systems Operations,
 Surveying and Project Services.
 Horizontal Datum: NAD 27
 (Tennessee Lambert)
 Vertical Datum: NGVD29

**PIEZOMETER PZ-7
KINGSTON FOSSIL PLANT DIKE D BUTRESS**

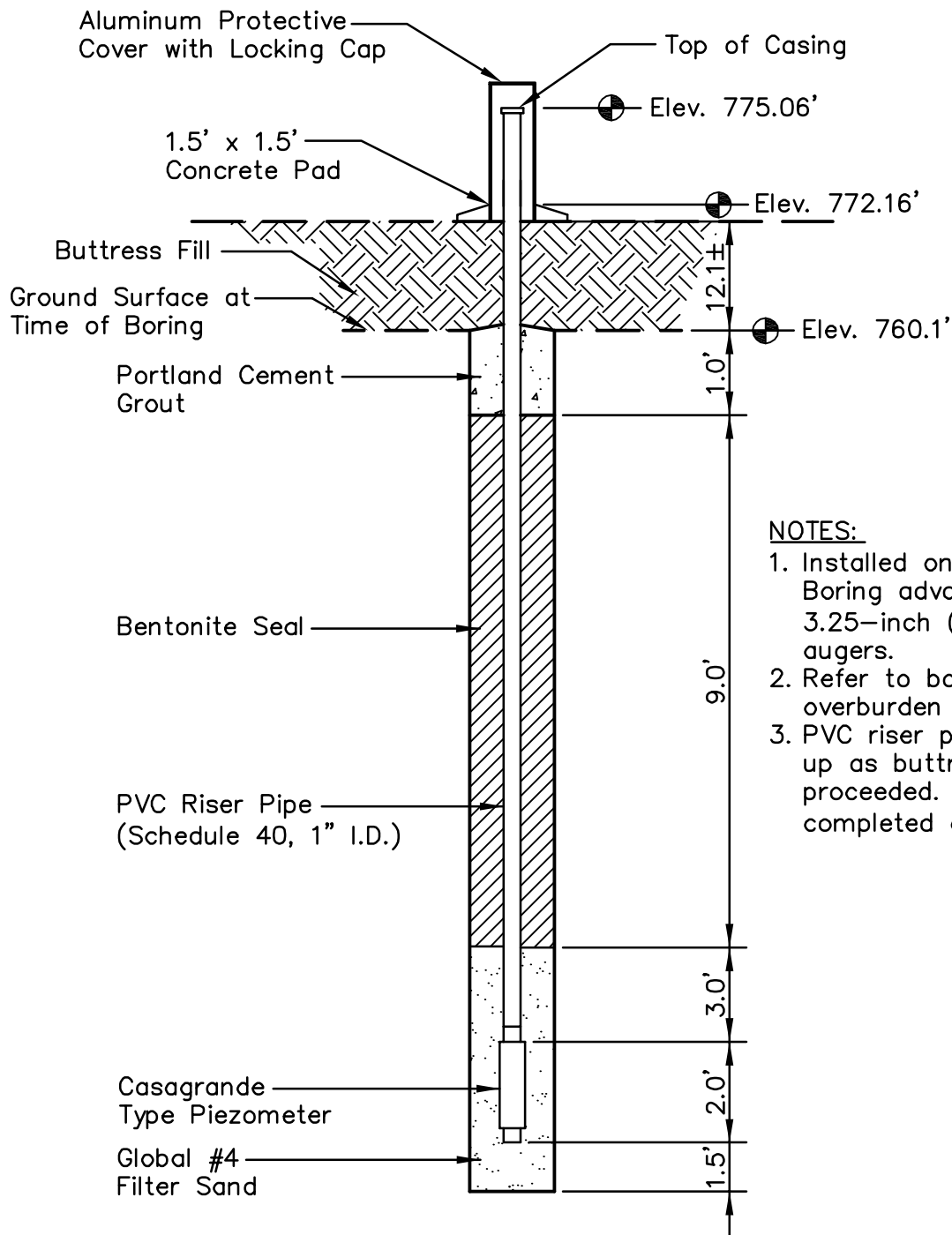


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CHECKED BY	JDE	PROJ. NO.	171468117	1.	3.	7 OF 8
CHECKED BY	JSD	SCALE	NTS	2.	4.	



NOTES:

1. Installed on 01/15/2009. Boring advanced with 3.25-inch (I.D.) hollow stem augers.
2. Refer to boring log for overburden stratigraphy.
3. PVC riser pipe was extended up as butress fill placement proceeded. Surface protection completed on 2/26/2009.

DATE: 05/14/2009 USER: SAMS, BRIAN V:\1714\ACTIVE\171468117\ENVIRONMENTAL_DRAWINGS\KIF\DIKE_D\68117C-KIF-308-PZ8.DWG

LOCATION (TOP OF CASING)

Northing: 557,091.55
 Easting: 2,441,819.11
 Elevation: 775.06'
 Locations provided by TVA,
 Power Systems Operations,
 Surveying and Project Services.
 Horizontal Datum: NAD 27
 (Tennessee Lambert)
 Vertical Datum: NGVD29

**PIEZOMETER PZ-8
KINGSTON FOSSIL PLANT DIKE D BUTRESS**

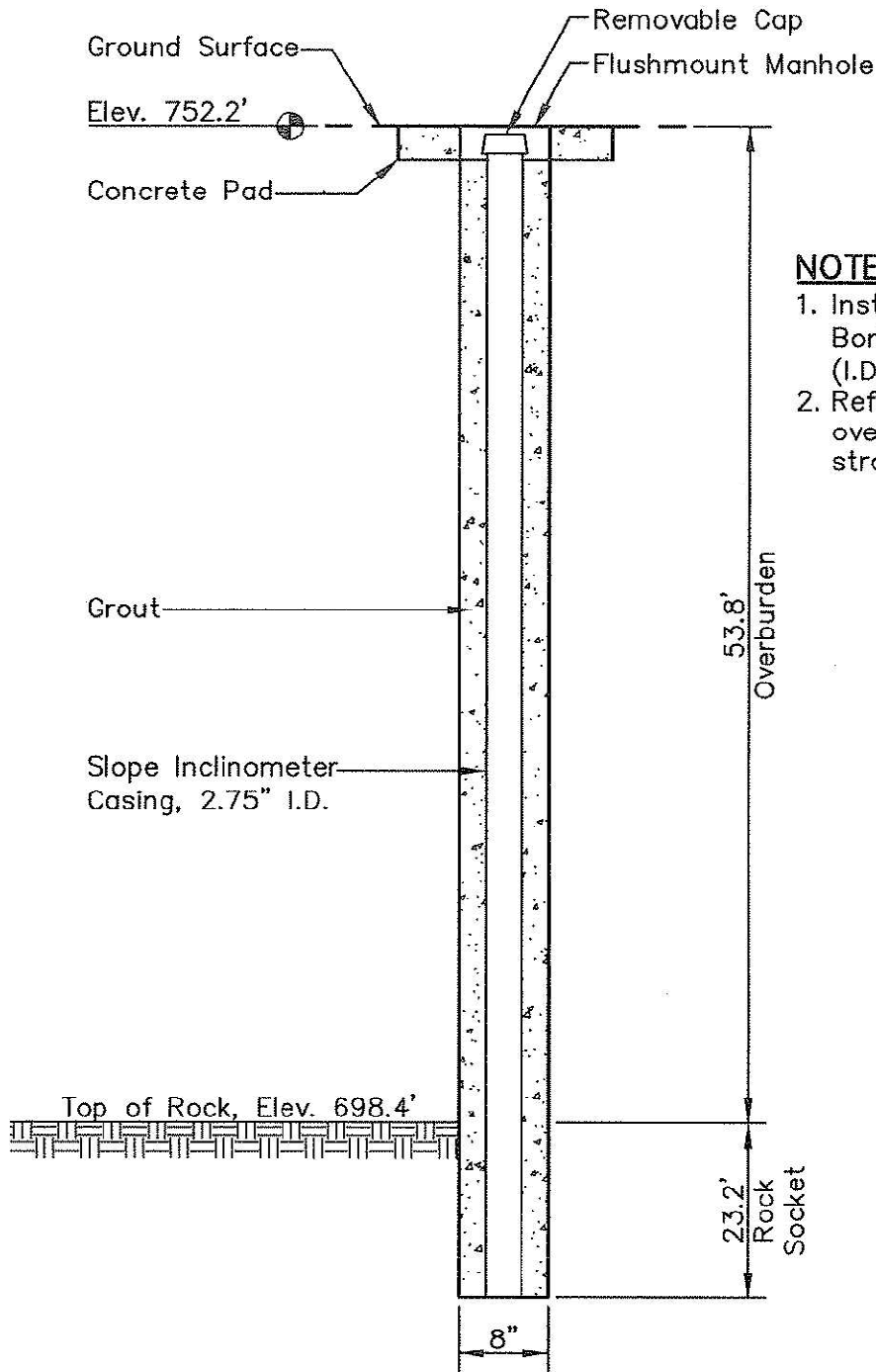


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CHECKED BY	JSD	SCALE	NTS	2.	4.	



NOTES:

1. Installed on 04/13/2009. Boring advanced with 4.25" (I.D.) hollow stem augers.
2. Refer to boring log for overburden and rock stratigraphy.

PLOT DATE: 05/30/2009 USER: FLMM, RENE
 V:\1755\ACTIVE\175569042\GEO\TECHNICAL\DRAWING\INSTRUMENTS\69042C-4F-301-STN8.DWG

LOCATION:

Northing: 556,298.52
 Easting: 2,442,540.30
 Ground Elevation: 752.2 feet

Locations to be provided by
 TVA, Power Systems
 Operations, Surveying and
 Project Services.
 Horizontal Datum: NAD 27
 Vertical Datum: NGVD29

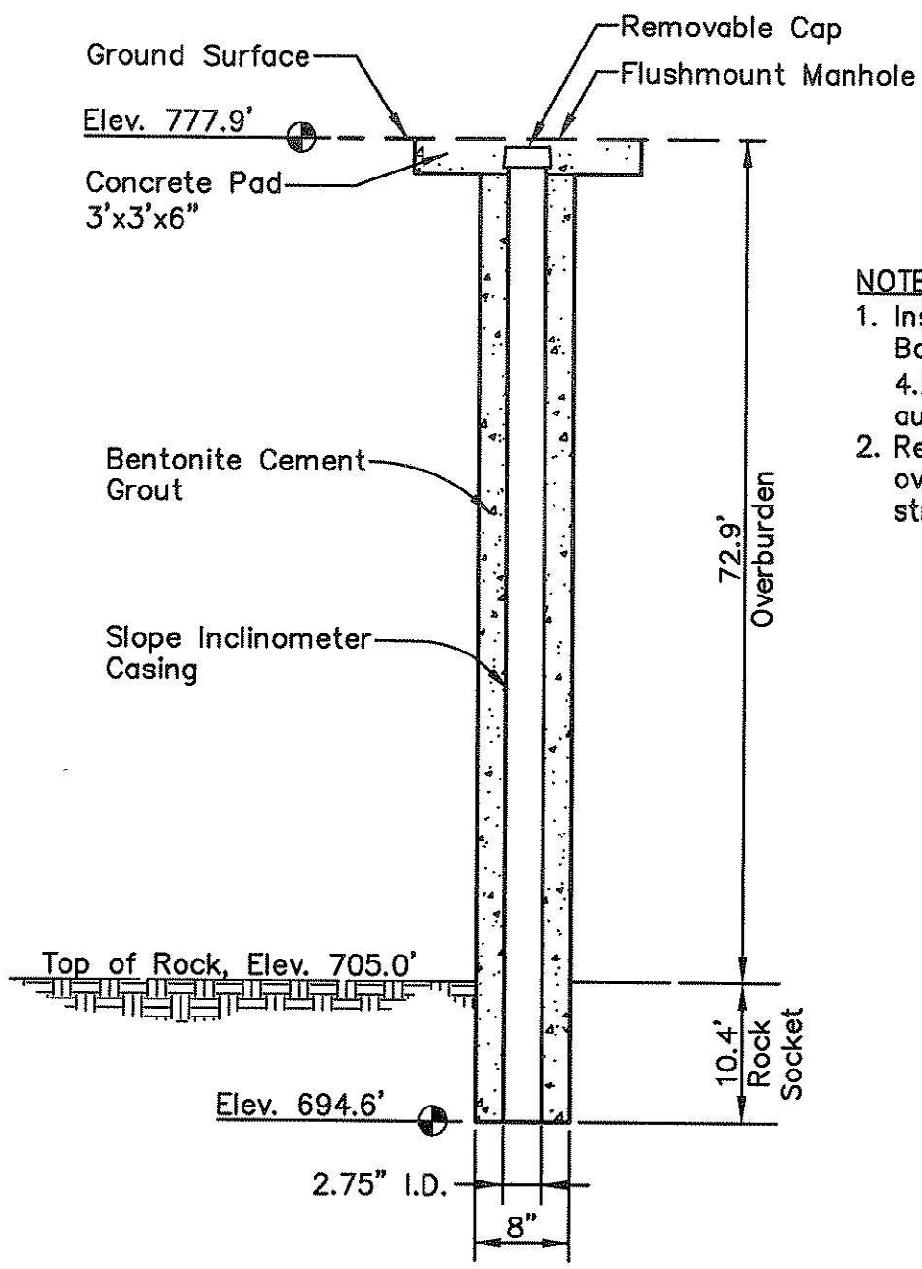
**SLOPE INCLINOMETER STN-8
 ASH POND STABILITY
 KINGSTON FOSSIL PLANT**



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CHECKED BY	ZCM	PROJ. NO.	175569042	1.	3.	1 OF 1
CHECKED BY	AAC	SCALE	NTS	2.	4.	



- NOTES:**
1. Installed on 05/11/2009. Boring advanced with 4.25-inch (I.D.) hollow stem augers.
 2. Refer to boring log for overburden and rock stratigraphy.

DATE: 05/28/2009 USER: CLINKENBEARD, ADAM V: \1758 \ACTIVE\175866015 \ENVIRONMENTAL\DRAWING\INSTRUMENTS\G9015C-KIF-301-S19.DWG

LOCATION
 Northing: 556,088.48
 Easting: 2,440,789.54
 Ground Elevation: 777.9 feet

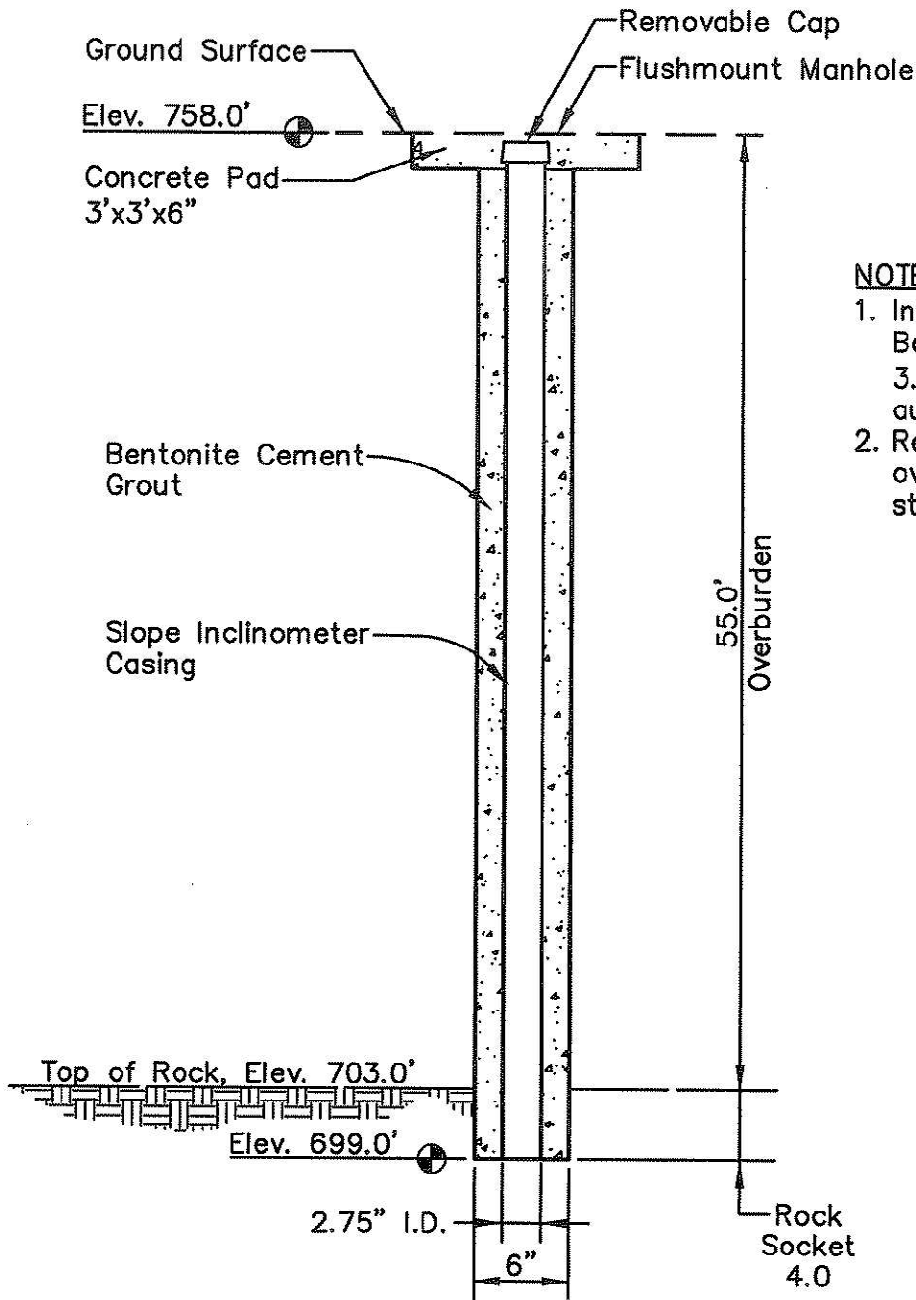
Locations provided by TVA,
 Power Systems Operations,
 Surveying and Project Services.
 Horizontal Datum: NAD 27
 (Tennessee Lambert)
 Vertical Datum: NGVD29

**SLOPE INCLINOMETER SI-9
 KINGSTON FOSSIL PLANT
 TEST EMBANKMENT AREA B**

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CHECKED BY	ZCM	PROJ. NO.	175669015	1.	3.
CHECKED BY	AAC	SCALE	NTS	2.	4.

SHEET
 1 OF 1



NOTES:

1. Installed on 04/20/2009. Boring advanced with 3.25-inch (I.D.) hollow stem augers.
2. Refer to boring log for overburden and rock stratigraphy.

DATE: 05/28/2009 USER: CLINKENBEARD, ADAM V:\17566\ACTIVE\175669015\ENVIRONMENTAL\DRAWING\INSTRUMENTS\G9015C-KIF-301-9111.DWG

LOCATION

Northing: 557,066.19
 Easting: 2,441,439.93
 Ground Elevation: 758.0 feet

Locations provided by TVA,
 Power Systems Operations,
 Surveying and Project Services.
 Horizontal Datum: NAD 27
 (Tennessee Lambert)
 Vertical Datum: NGVD29

SLOPE INCLINOMETER SI-11
KINGSTON FOSSIL PLANT
TEST EMBANKMENT AREA B



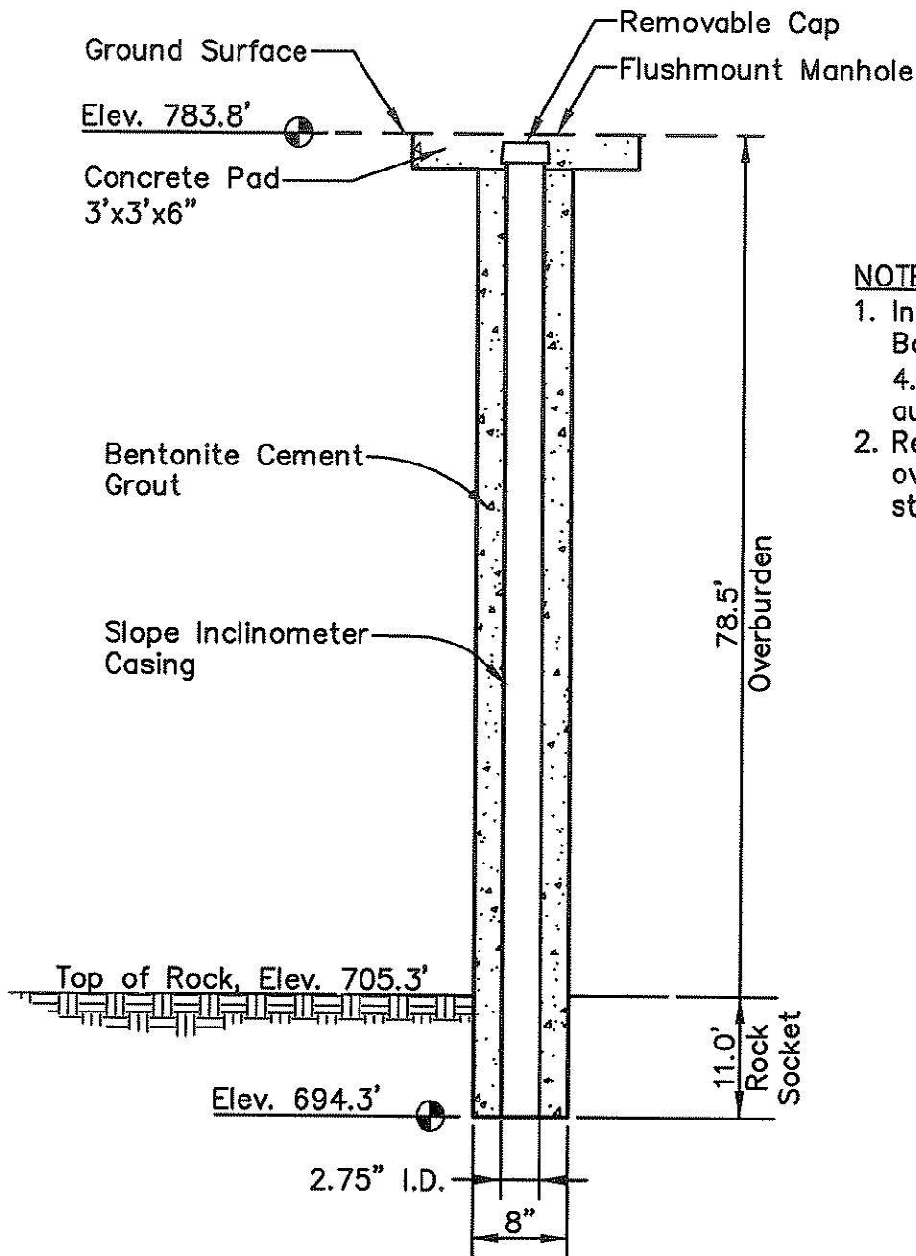
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CHECKED BY	AAC	SCALE	NTS	2.	4.

SHEET
1 OF 1



NOTES:

1. Installed on 04/21/2009. Boring advanced with 4.25-inch (I.D.) hollow stem augers.
2. Refer to boring log for overburden and rock stratigraphy.

DATE: 05/28/2009 USER: CLINKENBEARD, ADAM V:\1756\ACTIVE\175669015\ENVIRONMENTAL_DRAWING_INSTRUMENTS\09015C-RIF-30-1-SI12.DWG

LOCATION

Northing: 555,868.69
 Easting: 2,441,062.49
 Ground Elevation: 783.8 feet

Locations provided by TVA,
 Power Systems Operations,
 Surveying and Project Services.
 Horizontal Datum: NAD 27
 (Tennessee Lambert)
 Vertical Datum: NGVD29

SLOPE INCLINOMETER SI-12
KINGSTON FOSSIL PLANT
TEST EMBANKMENT AREA B



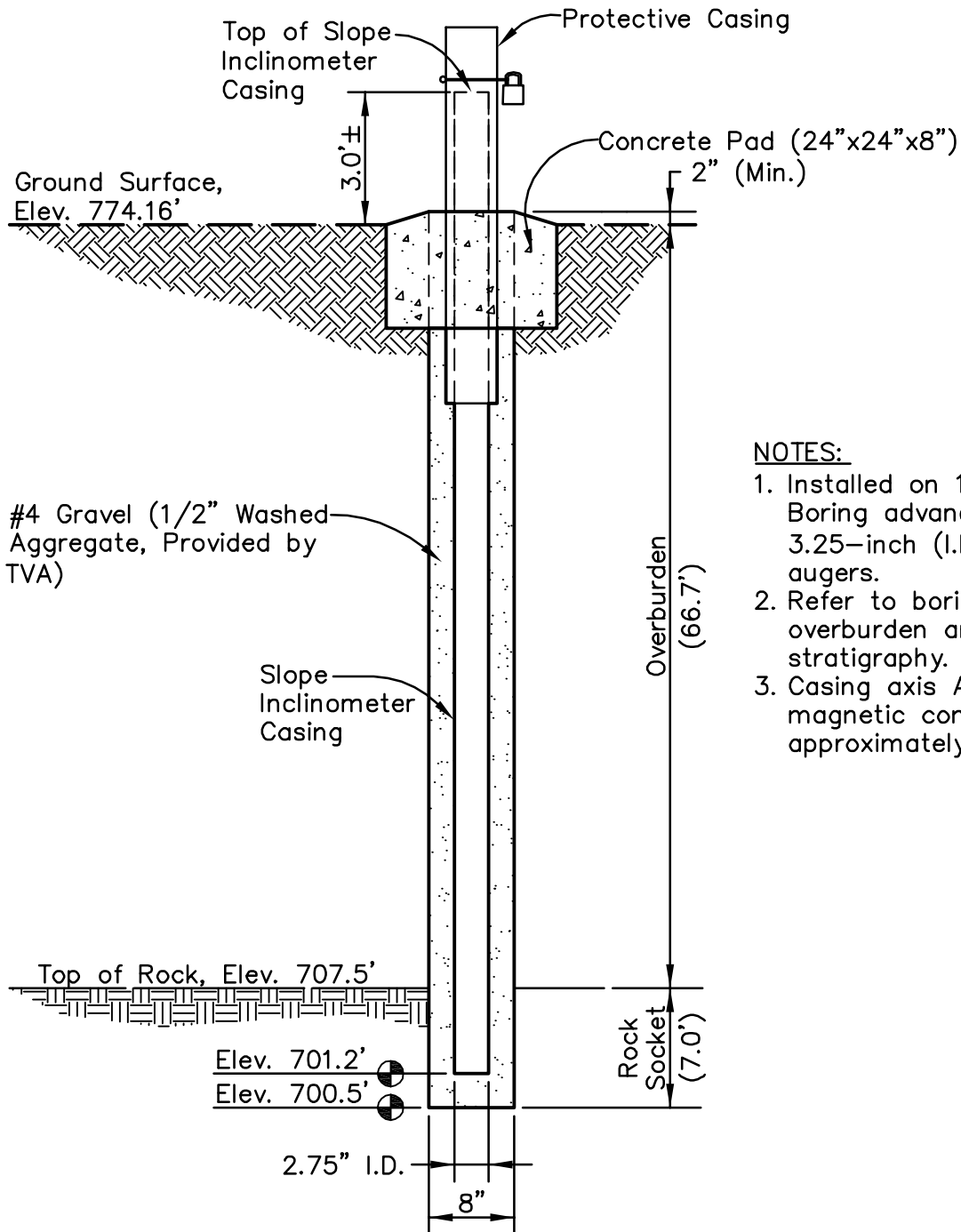
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CHECKED BY	AAC	SCALE	NTS	2.	4.

SHEET
1 OF 1



NOTES:

1. Installed on 12/28/2008. Boring advanced with 3.25-inch (I.D.) hollow stem augers.
2. Refer to boring log for overburden and rock stratigraphy.
3. Casing axis A0 oriented to magnetic axis bearing of approximately 308 degrees.

DATE: 05/05/2009 USER: JOHNSON, TRACY V:\1714\ACTIVE\171468117\ENVIRONMENTAL_DRAWINGS\KIF\DIKE_D\68117C-KIF-301-S11.DWG

LOCATION

Northing: 556,623.08 feet
 Easting: 2,441,563.81 feet
 Ground Elevation: 774.16 feet

Locations provided by TVA, Power Systems Operations, Surveying and Project Services.
 Horizontal Datum: NAD 27 (Tennessee Lambert)
 Vertical Datum: NGVD29

**SLOPE INCLINOMETER B-1
 KINGSTON FOSSIL PLANT DIKE D BUTTRESS**

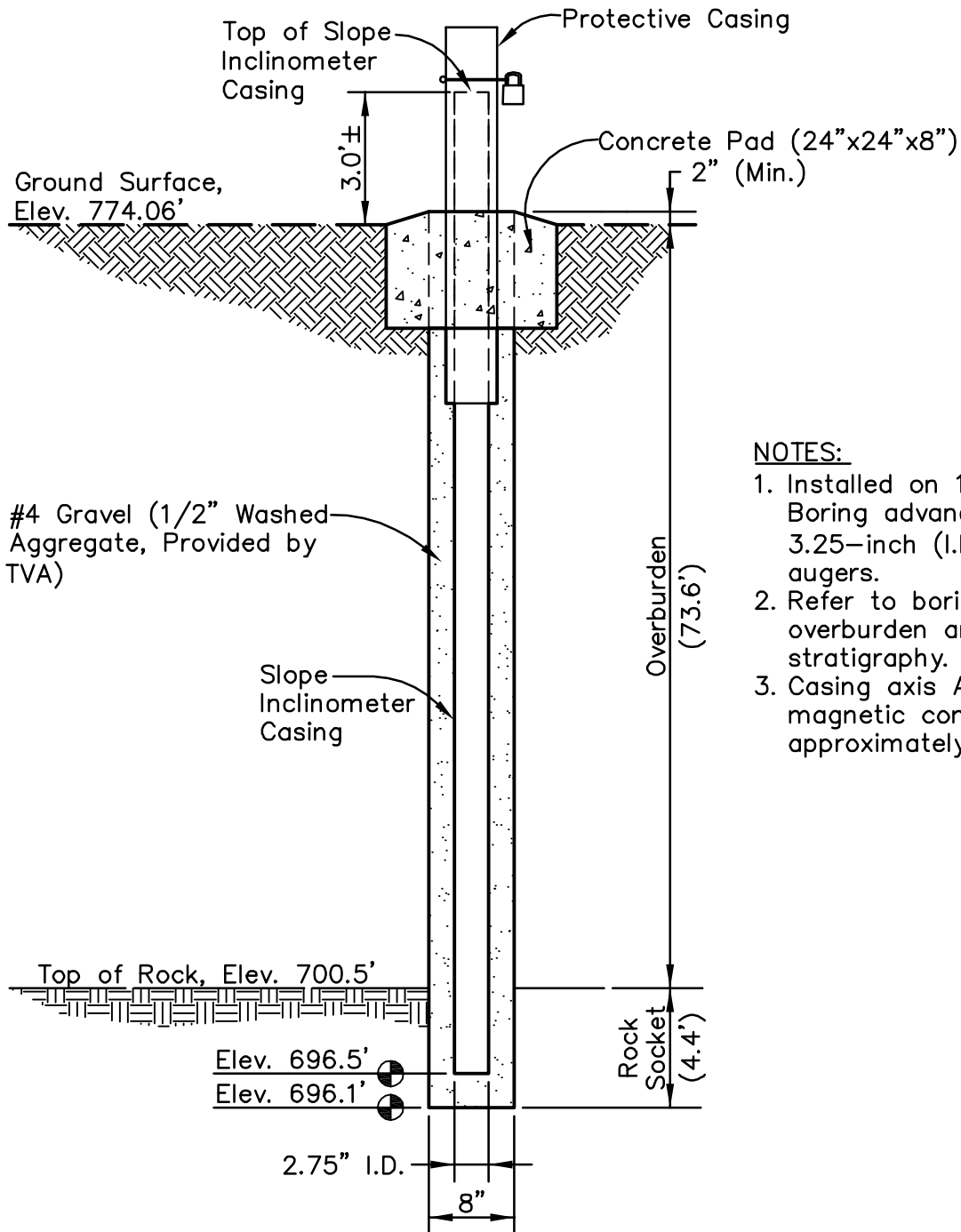


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CHECKED BY	JSD	SCALE	NTS	2.	4.	



NOTES:

1. Installed on 12/27/2008. Boring advanced with 3.25-inch (I.D.) hollow stem augers.
2. Refer to boring log for overburden and rock stratigraphy.
3. Casing axis A0 oriented to magnetic axis bearing of approximately 292 degrees.

LOCATION

Northing: 556,877.44 feet
 Easting: 2,441,744.70 feet
 Ground Elevation: 774.06 feet

Locations provided by TVA, Power Systems Operations, Surveying and Project Services.
 Horizontal Datum: NAD 27 (Tennessee Lambert)
 Vertical Datum: NGVD29

**SLOPE INCLINOMETER B-2
 KINGSTON FOSSIL PLANT DIKE D BUTTRESS**



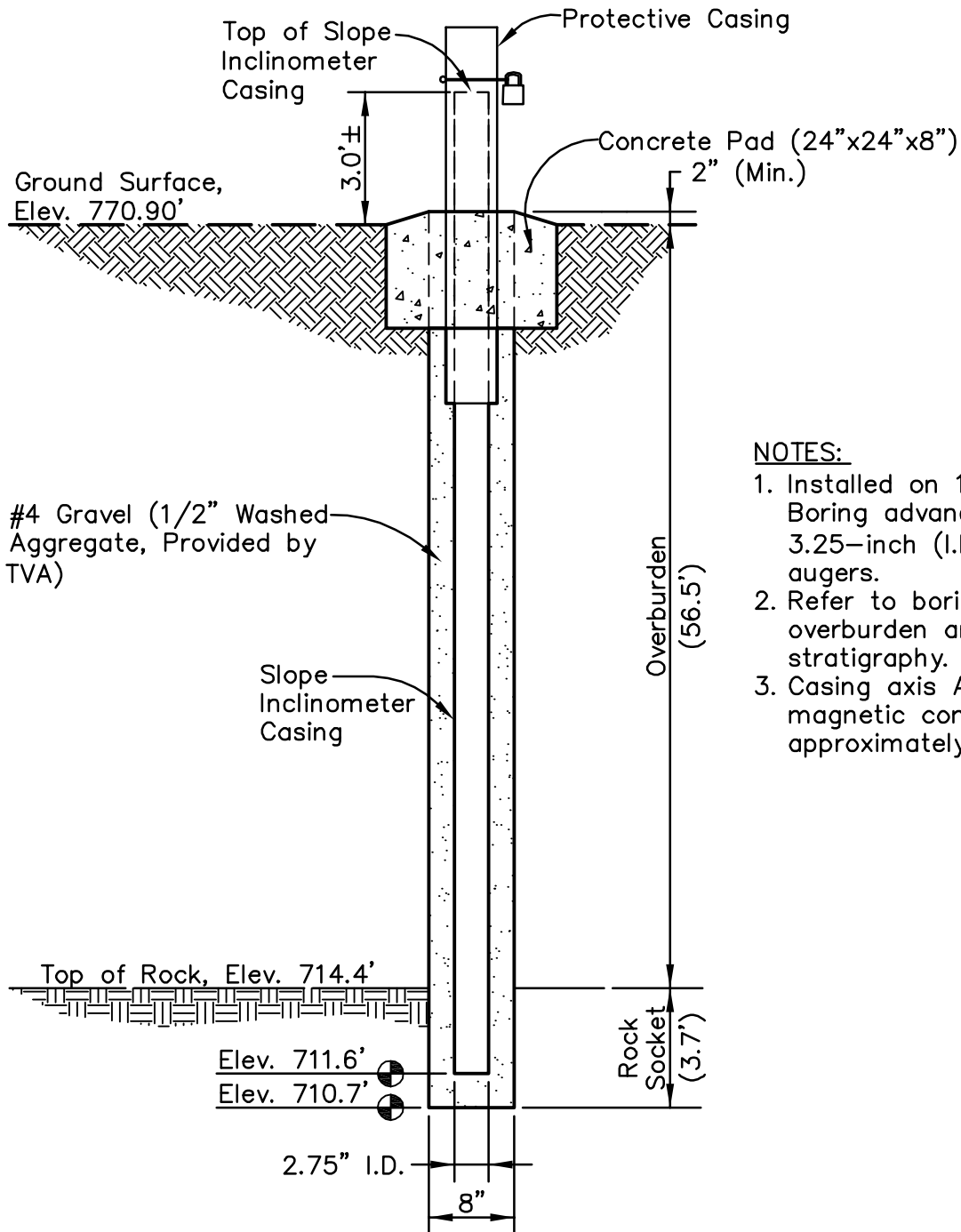
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DRAWN BY	RWE	DATE	MAY, 2009	REVISED		SHEET
CHECKED BY	JDE	PROJ. NO.	171468117	1.	3.	2 OF 5
CHECKED BY	JSD	SCALE	NTS	2.	4.	

DATE: 05/05/2009 USER: JOHNSON, TRACY V:\1714\ACTIVE\171468117\ENVIRONMENTAL_DRAWINGS\KIF\DIKE_D\68117C-KIF-302-SI2.DWG



NOTES:

1. Installed on 12/29/2008. Boring advanced with 3.25-inch (I.D.) hollow stem augers.
2. Refer to boring log for overburden and rock stratigraphy.
3. Casing axis A0 oriented to magnetic axis bearing of approximately 36 degrees.

DATE: 05/05/2009 USER: JOHNSON, TRACY V:\1714\ACTIVE\171468117\ENVIRONMENTAL_DRAWINGS\KIF\DIKE_D\68117C-KIF-303-SI3.DWG

LOCATION

Northing: 557,061.67 feet
 Easting: 2,441,887.56 feet
 Ground Elevation: 770.90 feet

Locations provided by TVA, Power Systems Operations, Surveying and Project Services.
 Horizontal Datum: NAD 27 (Tennessee Lambert)
 Vertical Datum: NGVD29

**SLOPE INCLINOMETER B-3
 KINGSTON FOSSIL PLANT DIKE D BUTTRESS**

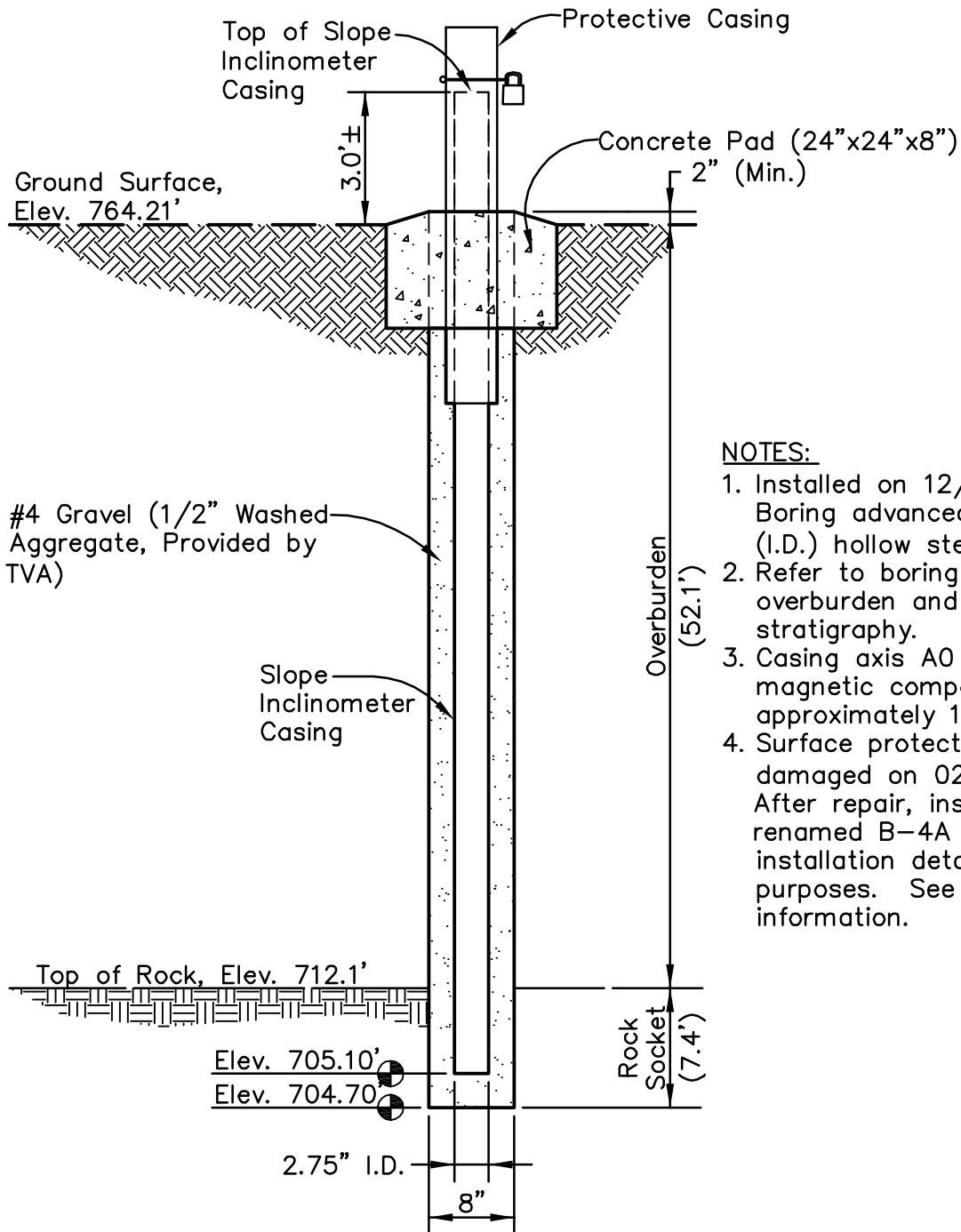


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 Lexington, Kentucky
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 859-422-3000

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DRAWN BY	RWE	DATE	MAY, 2009	REVISED		SHEET
CHECKED BY	JDE	PROJ. NO.	171468117	1.	3.	3 OF 5
CHECKED BY	JSD	SCALE	NTS	2.	4.	



NOTES:

1. Installed on 12/28/2008. Boring advanced with 3.25-inch (I.D.) hollow stem augers.
2. Refer to boring log for overburden and rock stratigraphy.
3. Casing axis A0 oriented to magnetic axis compass bearing of approximately 18 degrees.
4. Surface protection was damaged on 02/05/2009. After repair, installation was renamed B-4A for data installation detail reporting purposes. See B-4A for more information.

DATE: 05/05/2009 USER: JOHNSON, TRACY V:\1714\ACTIVE\171468117\ENVIRONMENTAL_DRAWINGS\KIF\DIKE_D\68117C-KIF-304-S14.DWG

LOCATION

Northing: 556,934.61 feet
 Easting: 2,442,066.28 feet
 Ground Elevation: 764.21 feet

Locations provided by TVA, Power Systems Operations, Surveying and Project Services.
 Horizontal Datum: NAD 27 (Tennessee Lambert)
 Vertical Datum: NGVD29

**SLOPE INCLINOMETER B-4
 KINGSTON FOSSIL PLANT DIKE D BUTTRESS**

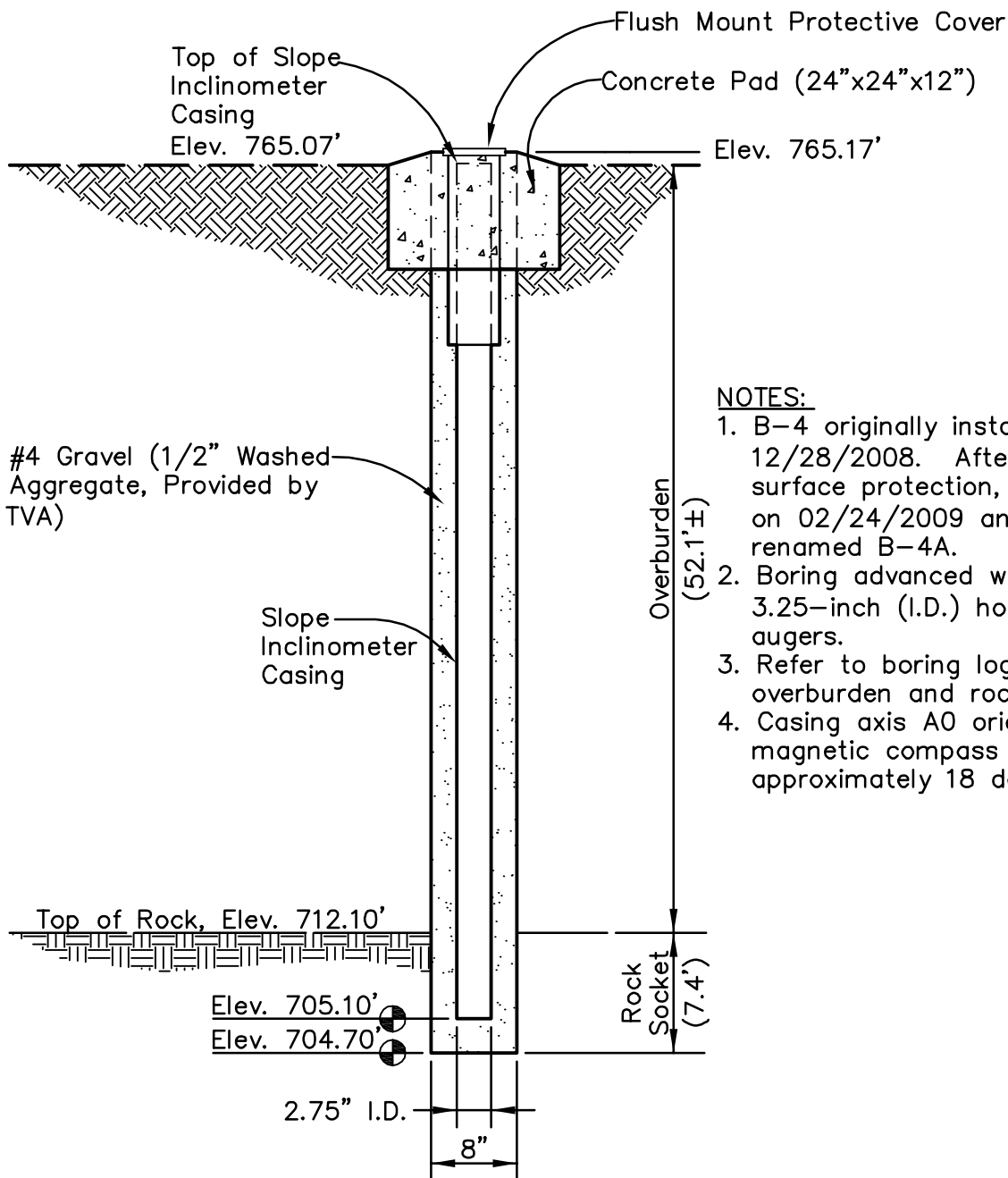


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DRAWN BY	<i>RWE</i>	DATE	<i>MAY, 2009</i>	REVISED		SHEET
CHECKED BY	<i>JDE</i>	PROJ. NO.	<i>171468117</i>	1.	3.	4 OF 5
CHECKED BY	<i>JSD</i>	SCALE	<i>NTS</i>	2.	4.	



NOTES:

1. B-4 originally installed on 12/28/2008. After damage to surface protection, repairs made on 02/24/2009 and installation renamed B-4A.
2. Boring advanced with 3.25-inch (I.D.) hollow stem augers.
3. Refer to boring log for overburden and rock stratigraphy.
4. Casing axis A0 oriented to magnetic compass bearing of approximately 18 degrees.

DATE: 05/05/2009 USER: JOHNSON, TRACY V:\1714\ACTIVE\171468117\ENVIRONMENTAL_DRAWINGS\KIF\DIKE_D\68117C-KIF-305-S15.DWG

LOCATION (TOP OF CONCRETE)

Northing: 556,934.37 feet
 Easting: 2,442,065.92 feet
 Top of Concrete Elevation: 765.17 feet
 Locations provided by TVA, Power Systems Operations, Surveying and Project Services.
 Horizontal Datum: NAD 27 (Tennessee Lambert)
 Vertical Datum: NGVD29

**SLOPE INCLINOMETER B-4A
KINGSTON FOSSIL PLANT DIKE D BUTTRESS**



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DRAWN BY	<i>RWE</i>	DATE	<i>MAY, 2009</i>	REVISED		SHEET
CHECKED BY	<i>JDE</i>	PROJ. NO.	<i>171468117</i>	1.	3.	5 OF 5
CHECKED BY	<i>JSD</i>	SCALE	<i>NTS</i>	2.	4.	

Project No. <u>175569042</u>	Location <u>N 556761.99, E 2442259.75 (NAD27)</u>
Project Name <u>Kingston Ash Pond</u>	Boring No. STN-3A Total Depth <u>30.0 ft</u>
Location <u>Kingston, Tennessee</u>	Surface Elevation <u>763.9 ft. (NGVD29)</u>
Project Type <u>Geotechnical Exploration</u>	Date Started <u>4/27/09</u> Completed <u>5/1/09</u>
Supervisor <u>Ben Halada</u> Driller <u>Steve Bradford</u>	Depth to Water <u>N/A</u> Date/Time <u>N/A</u>
Logged By <u>Adam Smith</u>	Automatic Hammer <input checked="" type="checkbox"/> Safety Hammer <input type="checkbox"/> Other <input type="checkbox"/>

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
763.9'	0.0'	Top of Hole							
		OVERBURDEN, (Augered without sampling) See Log for STN-3							Boring advanced using 4 1/4 " Hollow Stem Augers
733.9'	30.0'								

No Refusal /
Bottom of Hole

F:\MSM_LEGACY_171485117_KINGSTON ASH POND.GPJ_F:\MSM.GDT_7/21/09

Project No.	175569042	Location	N 556765.05, E 2442256.36 (NAD27)	
Project Name	Kingston Ash Pond	Boring No.	STN-3B	Total Depth 50.0 ft

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
713.8'	50.0'	OVERBURDEN, (Augered without sampling) See Log for STN-3 (Continued)							

		No Refusal / Bottom of Hole							
		PZ Installed, tip at elevation 718.8' Flushmount well cover and concrete pad installed.							

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AECOM	CLIENT Tennessee Valley Authority	LOG OF BORING NUMBER 09-109B
	PROJECT NAME Kingston Dredge Cell Failure RCA	ARCHITECT-ENGINEER OGC

SITE LOCATION
714 Swan Pond Road; Harriman, Tennessee

DEPTH(FT) ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. ³	UNCONFINED COMPRESSIVE STRENGTH TONS/FT. ² 1 2 3 4 5 PLASTIC LIMIT % WATER CONTENT % LIQUID LIMIT % X-----●-----△ 10 20 30 40 50 STANDARD PENETRATION BLOWS/(FT) ⊗ 10 20 30 40 50
SURFACE ELEVATION +763.41							

5.0		PA					
10.0							
15.0		RB			Following retrieval of 3 in. tube sample, cuttings were taken from top and bottom for water content testing. Samples designated with an "A" were taken from bottom of sample; the others were taken from top.		
20.0					20.5 Pneumatic Piezometer Installed at 20.0 ft.		
25.0	1	OST		25.5	Fill: Silt-sized ash, trace fine sand, trace clay - gray - saturated (ML) (FA) Failed Sample 2: Poor recovery. Sample placed into jars.		●
30.0	3	OST		28.0	See UMass Direct Shear Test results (DeGroot, 2009) for Sample 3 description.		●
30.0	3A	OST		28.0	Clayey silt, some fine to coarse sand - brown and gray - saturated (CL-ML)		●
30.0	4	OST		33.0	Pneumatic Piezometer Installed at 31.0 ft.		X △ ●
35.0	5	OST		33.0	Pneumatic Piezometer Installed at 31.0 ft.		X △ ●
35.0	6	OST		35.5	Silty fine to medium sand, trace clay - light brown - saturated (SM)		●
40.0		RB					

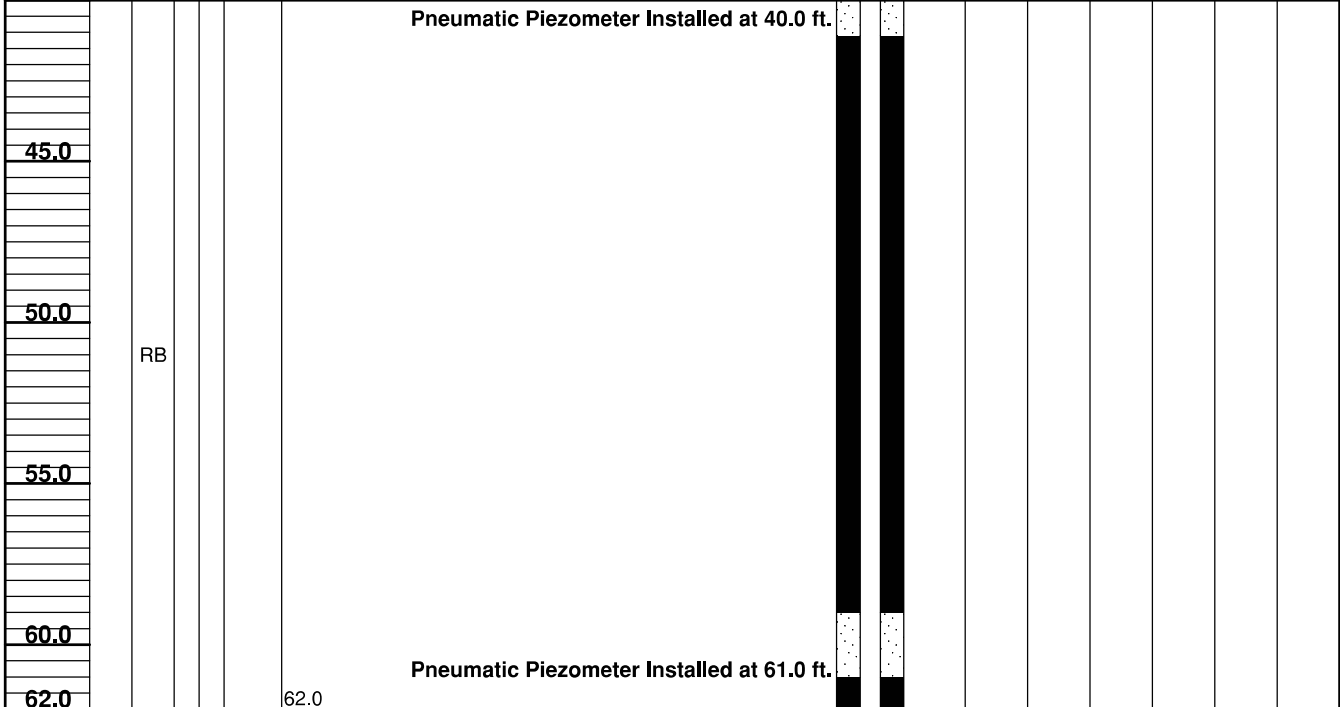
... continued

WORK IN PROGRESS WITH DATE 6/9/09 BORINGS.GPJ FS_DATATEMPLATE.GDT 6/9/09

AECOM	CLIENT Tennessee Valley Authority	LOG OF BORING NUMBER 09-109B
	PROJECT NAME Kingston Dredge Cell Failure RCA	ARCHITECT-ENGINEER OGC

SITE LOCATION
714 Swan Pond Road; Harriman, Tennessee

DEPTH(F) ELEVATION(F)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. ³	UNCONFINED COMPRESSIVE STRENGTH TONS/FT. ²	1	2	3	4	5	
							PLASTIC LIMIT %	WATER CONTENT %					LIQUID LIMIT %
							10	20	30	40	50		
SURFACE ELEVATION +763.41 (Continued)						STANDARD PENETRATION BLOWS/(FT)	10	20	30	40	50		



End of Boring
 Borehole advanced to 8.0 with power auger.
 Borehole advanced from 8.0 ft. to 62.0 ft. with rock bit and drilling fluid.
 Casing used: 23 ft. of 4 in.
 OST = Osterberg sampler
 Pneumatic Piezometers installed at 20.0, 31.0, 40.0, and 61.0 ft.

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

WL Not Observed	BORING STARTED 2/14/09	AECOM OFFICE Chicago Area - 01
NORTHING 556965.5	BORING COMPLETED 2/16/09	ENTERED BY KKB
EASTING 2441623.3	RIG/FOREMAN D-50/JHC	APP'D BY RCR
		SHEET NO. 2 OF 2
		AECOM JOB NO. 60095742

WORK IN PROGRESS WITH DATE 60095742-2009 BORINGS.GPJ FS_DATATEMPLATE.GDT 6/9/09

AECOM	CLIENT Tennessee Valley Authority	LOG OF BORING NUMBER 09-600B
	PROJECT NAME Kingston Dredge Cell Failure RCA	ARCHITECT-ENGINEER OGC

SITE LOCATION
714 Swan Pond Road; Harriman, Tennessee

DEPTH(FT) ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. ³	UNCONFINED COMPRESSIVE STRENGTH TONS/FT. ²	PLASTIC LIMIT % X	WATER CONTENT % ●	LIQUID LIMIT % △	STANDARD PENETRATION BLOWS/(FT)
X					SURFACE ELEVATION +776.66						

5.0		PA									
10.0											
15.0											
20.0		RB									
25.0											
30.0											
32.0					32.0						
34.5	1	OST			34.5	Silt-sized ash, little fine sand - gray - saturated (ML) (FA) Unfailed		●			
35.0											
40.0		RB									
					... continued						

WORK IN PROGRESS WITH DATE 6/8/09 BORINGS.GPJ FS_DATATEMPLATE.GDT 6/8/09

AECOM	CLIENT Tennessee Valley Authority	LOG OF BORING NUMBER 09-600B
	PROJECT NAME Kingston Dredge Cell Failure RCA	ARCHITECT-ENGINEER OGC

SITE LOCATION
714 Swan Pond Road; Harriman, Tennessee

DEPTH(FT) ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. ³	UNCONFINED COMPRESSIVE STRENGTH TONS/FT. ²				
						1	2	3	4	5
						PLASTIC LIMIT % X		WATER CONTENT % ●		LIQUID LIMIT % △
						10	20	30	40	50
						STANDARD PENETRATION BLOWS/(FT)				
						10	20	30	40	50
		RB		SURFACE ELEVATION +776.66 (Continued)						
45.0	2	OST		44.0 See UMass Direct Shear Test results (DeGroot, 2009) for Sample 2 description. Piezometer Installed at 46.0 ft.						
	3	OST		46.5 Sample 3: No recovery of sample. Sample lost in borehole during retrieval.						
50.0	4	OST		49.0 Clayey silt, little fine to medium sand - brown and gray - saturated (CL-ML)						
55.0		RB		51.5						
57.5	5	OST		55.0 Silt, trace clay and sand - brown - saturated (ML) Piezometer Installed at 56.0 ft.						
				57.5						
End of Boring Boring advanced to 8.0 ft. with power auger. Boring advanced from 8.0 to 57.5 ft. with rock bit and drilling fluid. Borehole grouted upon completion. Casing used: 10 ft. of 4 in. Piezometers installed at 46.0 and 56.0 ft. (FA) = Fly Ash (BA) = Bottom Ash										

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

WL Not Observed	BORING STARTED 1/19/09	AECOM OFFICE Chicago Area - 01
NORTHING 556470.71	BORING COMPLETED 1/19/09	ENTERED BY KKB
EASTING 2441421.34	RIG/FOREMAN D-50/RT	APP'D BY RCR
		SHEET NO. 2 OF 2
		AECOM JOB NO. 60095742

WORK IN PROGRESS WITH DATE 60095742-2009 BORINGS.GPJ FS_DATATEMPLATE.GDT 6/8/09



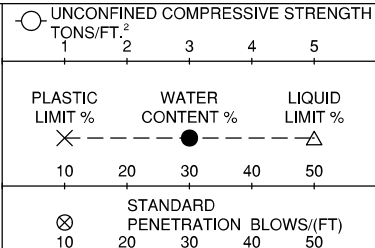
CLIENT
Tennessee Valley Authority

PROJECT NAME
Kingston Dredge Cell Failure RCA

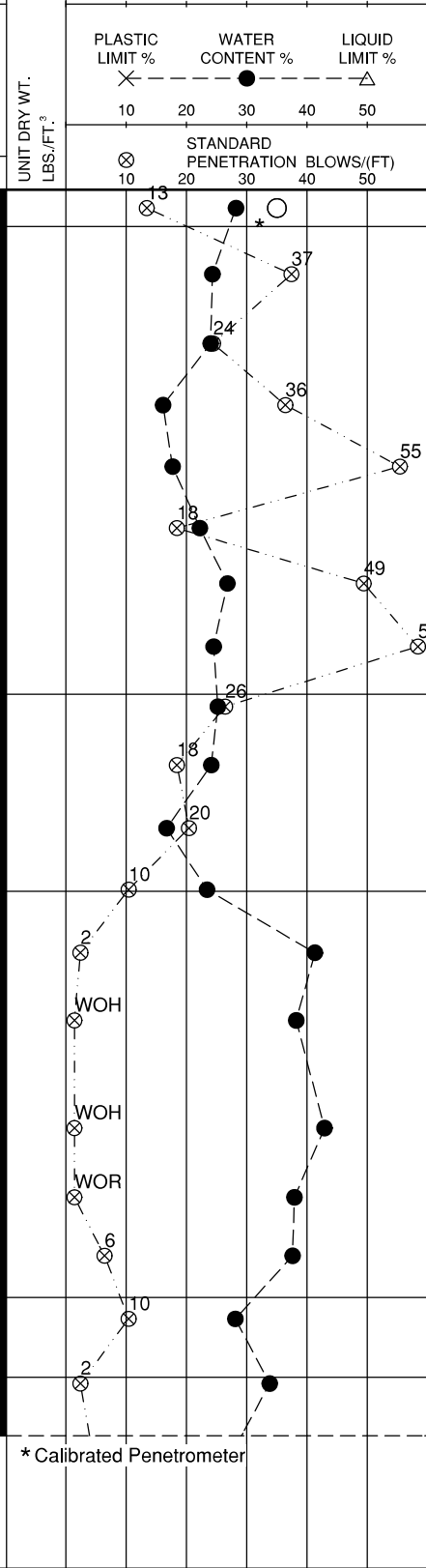
LOG OF BORING NUMBER **09-603**

ARCHITECT-ENGINEER
OGC

SITE LOCATION
714 Swan Pond Road; Harriman, Tennessee



DEPTH(FT) ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE RECOVERY	DESCRIPTION OF MATERIAL
				SURFACE ELEVATION +780.61
	1	SS		1.2 Fill: Silty clay, little fine to coarse sand, trace fine to coarse gravel - reddish brown - very stiff (CL) Bottom ash seam noted from 0.4 to 0.8 ft.
	2	SS		Fill: Silt-sized ash, little fine sand - gray - dense to medium dense - moist to saturated (ML) (FA) Unfailed
5.0	3	SS		
	4	SS		
10.0	5	SS		
	6	SS		
15.0	7	SS		
	8	SS		
	9	SS		16.4 Fill: Silty fine to coarse sand-sized ash, little fine to medium gravel - gray - medium dense - saturated (SM) (BA) Unfailed
20.0	10	SS		
	11	SS		
	12	SS		22.8 Fill: Silt-sized ash, little fine sand - gray - medium dense to very loose - saturated (ML) (FA) Unfailed
25.0	13	SS		
	14	SS		Sample 14: WOR and one blow advanced sampler 3.5 ft.
30.0	15	SS		Sample 15: One blow advanced sampler 2.5 ft.
	16	SS		
35.0	17	SS		
	18	SS		36.0 Fill: Silty fine to medium sand-sized ash - gray - medium dense - saturated (SM) (FA & BA) Unfailed
	19	SS		38.6 Fill: Silt-sized ash, little fine sand - gray - very loose to loose - saturated (ML) (FA) Unfailed
40.0				... continued



WORK IN PROGRESS WITH DATE 60095742-2009 BORINGS.GPJ FS_DATATEMPLATE.GDT 6/8/09

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM	CLIENT Tennessee Valley Authority	LOG OF BORING NUMBER 09-603
	PROJECT NAME Kingston Dredge Cell Failure RCA	ARCHITECT-ENGINEER OGC

SITE LOCATION
714 Swan Pond Road; Harriman, Tennessee

DEPTH(FT) ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. ³	UNCONFINED COMPRESSIVE STRENGTH TONS/FT. ²	PLASTIC LIMIT %	WATER CONTENT %	LIQUID LIMIT %	STANDARD PENETRATION BLOWS/(FT)
SURFACE ELEVATION +780.61 (Continued)										
	20	SS		Fill: Silt-sized ash, little fine sand - gray - very loose to loose - saturated (ML) (FA) Unfailed						
45.0	21	SS								
	22	SS								
50.0	23	SS								
	24	SS								
	25	SS		50.5 Silty clay, trace fine sand - gray - soft (CL)						
	26	SS		52.5 Silty fine to medium sand, little to some clay - brown with gray - loose to medium dense - moist (SM)						
55.0	27	SS								
	28	SS								
60.0	29	SS								
	30	SS								
	31	SS		62.5 Silty fine to medium sand, some clay - gray - very loose - wet (SM)						
65.0	32	SS		64.5 Silty fine to medium sand, little to trace clay - gray - very loose to loose - saturated (SM)						
	33	SS								
70.0	34	SS		69.0 Silty fine to medium sand, trace clay - gray - medium dense - saturated (SM)						
	35	SS								
75.0	36	SS								
76.0	37	SS		75.0 76.0 Weathered shale - gray Pneumatic Piezometer installed at 76.0 ft.						
End of Boring Boring advanced to 10.0 ft. with power auger. Boring advanced from 10.0 to 76.0 ft. with rock bit and drilling fluid. Pneumatic piezometer installed at 76 ft. Borehole backfilled upon completion.										
... continued										

WORK IN PROGRESS WITH DATE 60095742-2009 BORINGS.GPJ FS_DATATEMPLATE.GDT 6/8/09

AECOM	CLIENT Tennessee Valley Authority	LOG OF BORING NUMBER 09-603
	PROJECT NAME Kingston Dredge Cell Failure RCA	ARCHITECT-ENGINEER OGC

SITE LOCATION
714 Swan Pond Road; Harriman, Tennessee

DEPTH(FT)	ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. ³	UNCONFINED COMPRESSIVE STRENGTH TONS/FT. ²	PLASTIC LIMIT %	WATER CONTENT %	LIQUID LIMIT %
X						SURFACE ELEVATION +780.61 (Continued)		⊗	X	●	△
								⊗			⊗

Casing used: 10 ft. of 4 in. Automatic-Mobile hammer used for Standard Penetration Tests.
 SS* = SPT value based on first 6 in.
 WOH = Weight of Hammer
 WOR = Weight of Rod
 (FA) = Fly Ash
 (BA) = Bottom Ash

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

WL 12.0 ft. WS; 10.0 ft. BCR; 8.0 ft. ACR	BORING STARTED 3/9/09	AECOM OFFICE Chicago Area - 01
NORTHING 555809.89	BORING COMPLETED 3/10/09	ENTERED BY KKB
EASTING 2441187.46	RIG/FOREMAN Mobile B-57 (V.H.)/MB	APP'D BY RCR
		SHEET NO. 3 OF 3
		AECOM JOB NO. 60095742

WORK IN PROGRESS WITH DATE 60095742-2009 BORINGS.GPJ FS_DATATEMPLATE.GDT 6/8/09

AECOM	CLIENT Tennessee Valley Authority	LOG OF BORING NUMBER 09-603A
	PROJECT NAME Kingston Dredge Cell Failure RCA	ARCHITECT-ENGINEER OGC

SITE LOCATION
714 Swan Pond Road; Harriman, Tennessee

DEPTH(FT) ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. ³	UNCONFINED COMPRESSIVE STRENGTH TONS/FT. ²	2	3	4	5
X					SURFACE ELEVATION +780.55		○				
							X	-	●	-	△
							⊗	STANDARD PENETRATION BLOWS/(FT)			
							10	20	30	40	50

5.0											
10.0											
15.0											
20.0	RB										
25.0											
30.0											
35.0											
40.0											

... continued

WORK IN PROGRESS WITH DATE 6/8/09 60095742-2009 BORINGS.GPJ FS_DATATEMPLATE.GDT

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO.
60095742

SHEET NO. **1** OF **2**

AECOM	CLIENT Tennessee Valley Authority	LOG OF BORING NUMBER 09-603A
	PROJECT NAME Kingston Dredge Cell Failure RCA	ARCHITECT-ENGINEER OGC

SITE LOCATION
714 Swan Pond Road; Harriman, Tennessee

DEPTH(FT) ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE RECOVERY	DESCRIPTION OF MATERIAL	UNCONFINED COMPRESSIVE STRENGTH TONS/FT. ²	PLASTIC LIMIT %	WATER CONTENT %	LIQUID LIMIT %	UNIT DRY WT. LBS./FT. ³	STANDARD PENETRATION BLOWS/(FT)
⊗				SURFACE ELEVATION +780.55 (Continued)		⊗	●	△		⊗

45.0				Pneumatic Piezometer installed at 48.0 ft. Vane Shear Test #1 at 51.5 ft. Peak Su >1900 psf							
50.0		RB									
55.0											
56.0			56.0		Pneumatic piezometer installed at 56.0 ft.						

End of Boring
Borehole advanced to 56.0 ft. with rock bit and drilling fluid.
Pneumatic piezometers installed at 48.0 and 56.0 ft.
Casing used: 10 ft. of 4 in.

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.										
WL	Not Observed			BORING STARTED	3/10/09		AECOM OFFICE	Chicago Area - 01		
NORTHING	555805.42			BORING COMPLETED	3/10/09		ENTERED BY	KKB		SHEET NO. 2 OF 2
EASTING	2441185.06			RIG/FOREMAN	Mobile B-57 (V.H.)/MB		APP'D BY	RCR		AECOM JOB NO. 60095742

WORK IN PROGRESS WITH DATE 6/8/09 60095742-2009 BORINGS.GPJ FS_DATATEMPLATE.GDT 6/8/09

AECOM	CLIENT Tennessee Valley Authority	LOG OF BORING NUMBER 09-604A
	PROJECT NAME Kingston Dredge Cell Failure RCA	ARCHITECT-ENGINEER OGC

SITE LOCATION
714 Swan Pond Road; Harriman, Tennessee

DEPTH(FT) ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. ³	UNCONFINED COMPRESSIVE STRENGTH TONS/FT. ²				
							PLASTIC LIMIT %	WATER CONTENT %	LIQUID LIMIT %		
							10	20	30	40	50
SURFACE ELEVATION +782.39							STANDARD PENETRATION BLOWS/(FT)				
							10	20	30	40	50

5.0	PA																		
10.0																			
15.0																			
20.0																			
25.0	RB																		
30.0																			
35.0																			
40.0																			

... continued

* Calibrated Penetrometer

WORK IN PROGRESS WITH DATE 6/8/09 60095742-2009 BORINGS.GPJ FS_DATATEMPLATE.GDT

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. **60095742**

SHEET NO. **1** OF **2**

AECOM	CLIENT Tennessee Valley Authority	LOG OF BORING NUMBER 09-604A
	PROJECT NAME Kingston Dredge Cell Failure RCA	ARCHITECT-ENGINEER OGC

SITE LOCATION
714 Swan Pond Road; Harriman, Tennessee

DEPTH(FT) ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE RECOVERY	DESCRIPTION OF MATERIAL	UNCONFINED COMPRESSIVE STRENGTH TONS/FT. ²	PLASTIC LIMIT %	WATER CONTENT %	LIQUID LIMIT %	UNIT DRY WT. LBS./FT. ³	STANDARD PENETRATION BLOWS/(FT)
				SURFACE ELEVATION +782.39 (Continued)						

45.0										
50.0										
55.0		RB		Disturbed samples retrieved following completion of vane shear testing.						
60.0				Vane Shear Test #1 at 62.5 ft. Peak Su = 2025 psf, Remolded Su = 850 psf Pneumatic Piezometer installed at 63.0 ft. Vane Shear Test #2 at 64.5 ft. Peak Su = 3575 psf, Remolded Su = 1400 psf						
65.0	1	ST		64.0 Silty clay, little to some fine to medium sand - gray - very stiff (CL) Vane Shear Test #3 at 66.5 ft. Peak Su = 3550 psf, Remolded Su = 1350 psf						
	2	ST		68.0 Vane Shear Test #4 at 68.5 ft. Peak Su = 2750 psf, Remolded Su = 850 psf No recovery from 68 to 70 ft.						
70.0		ST		70.0 Silty fine sand, little clay - gray (SM) Vane Shear Test #5 at 70.5 ft. Peak Su = 2350 psf, Remolded Su = 550 psf						
	3	ST		72.0 Clayey silt, little fine to medium sand - gray - saturated (CL-ML) Vane Shear Test #6 at 72.0 ft. Peak Su = 2175 psf, Remolded Su = 500 psf Vane Shear Test #7 at 74.0 ft. Peak Su = 3450 psf, Remolded Su = 825 psf						
74.0	4	ST		74.0 End of Boring Boring advanced to 8 ft. with power auger. Borehole advanced from 8 ft to 74 ft. with rock bit and drilling fluid. Borehole backfilled upon completion. Pneumatic Piezometer installed at 63 ft.						

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

WL Not Observed	BORING STARTED 3/2/09	AECOM OFFICE Chicago Area - 01
NORTHING 554803.16	BORING COMPLETED 3/2/09	ENTERED BY KKB
EASTING 2440515.37	RIG/FOREMAN Mobile B-57 (V.H.)/MB	APP'D BY RCR
		SHEET NO. 2 OF 2
		AECOM JOB NO. 60095742

WORK IN PROGRESS WITH DATE 60095742-2009 BORINGS.GPJ FS_DATATEMPLATE.GDT 6/8/09

AECOM	CLIENT Tennessee Valley Authority	LOG OF BORING NUMBER 09-604B
	PROJECT NAME Kingston Dredge Cell Failure RCA	ARCHITECT-ENGINEER OGC

SITE LOCATION
714 Swan Pond Road; Harriman, Tennessee

DEPTH(FT) ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. ³	UNCONFINED COMPRESSIVE STRENGTH TONS/FT. ²	1	2	3	4	5
⊗					SURFACE ELEVATION +782.36		⊗					
							PLASTIC LIMIT %			WATER CONTENT %		LIQUID LIMIT %
							⊗		●		△	
							10	20	30	40	50	
							⊗			STANDARD PENETRATION BLOWS/(FT)		
							10	20	30	40	50	

5.0		PA										
10.0												
15.0												
20.0					Following retrieval of 3 in. tube sample, cuttings were taken from top and bottom for water content testing. Samples designated with an "A" were taken from bottom of sample; the others were taken from top.							
25.0												
30.0		RB										
35.0												
40.0												

... continued

WORK IN PROGRESS WITH DATE 6/8/09 60095742-2009 BORINGS.GPJ FS_DATATEMPLATE.GDT

AECOM	CLIENT Tennessee Valley Authority	LOG OF BORING NUMBER 09-604B
	PROJECT NAME Kingston Dredge Cell Failure RCA	ARCHITECT-ENGINEER OGC

SITE LOCATION
714 Swan Pond Road; Harriman, Tennessee

DEPTH(FT) ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. ³	UNCONFINED COMPRESSIVE STRENGTH TONS/FT. ²											
							1	2	3	4	5							
					SURFACE ELEVATION +782.4													

					(Continued)													
45.0	1	OST			45.0 Fill: Silt-sized ash, trace fine sand, trace clay - gray - saturated (ML) (FA) Unfailed													
50.0		RB			47.5													
55.0	2	OST			56.0 Sample 2: No recovery Pneumatic piezometer installed at 56.0 ft.													
60.0	3	OST			61.4 Fill: Silt-sized ash, trace fine sand, trace clay - gray - saturated (ML) (FA) Unfailed Sample OST-3: Organic Content = 0.60%													
	3A	OST																
	4	OST			61.4 Sample OST-4: Organic Content = 2.77%													
	4A	OST																
	5	OST			61.4 Silty clay, little fine to medium sand - brown and gray (CL)													
	5A	OST																
65.0	6	OST																
	6A	OST																
	7	OST																
	7A	OST																
70.0	8	OST																
	9	OST																
73.5	9A	OST			73.5 End of Boring Boring advanced to 10.0 ft. with power auger. Boring advanced from 10.0 to 71.0 ft. with rock bit and drilling fluid. Pneumatic piezometer installed at 56 ft. Casing used: 40.0 ft. of 4 in.													

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

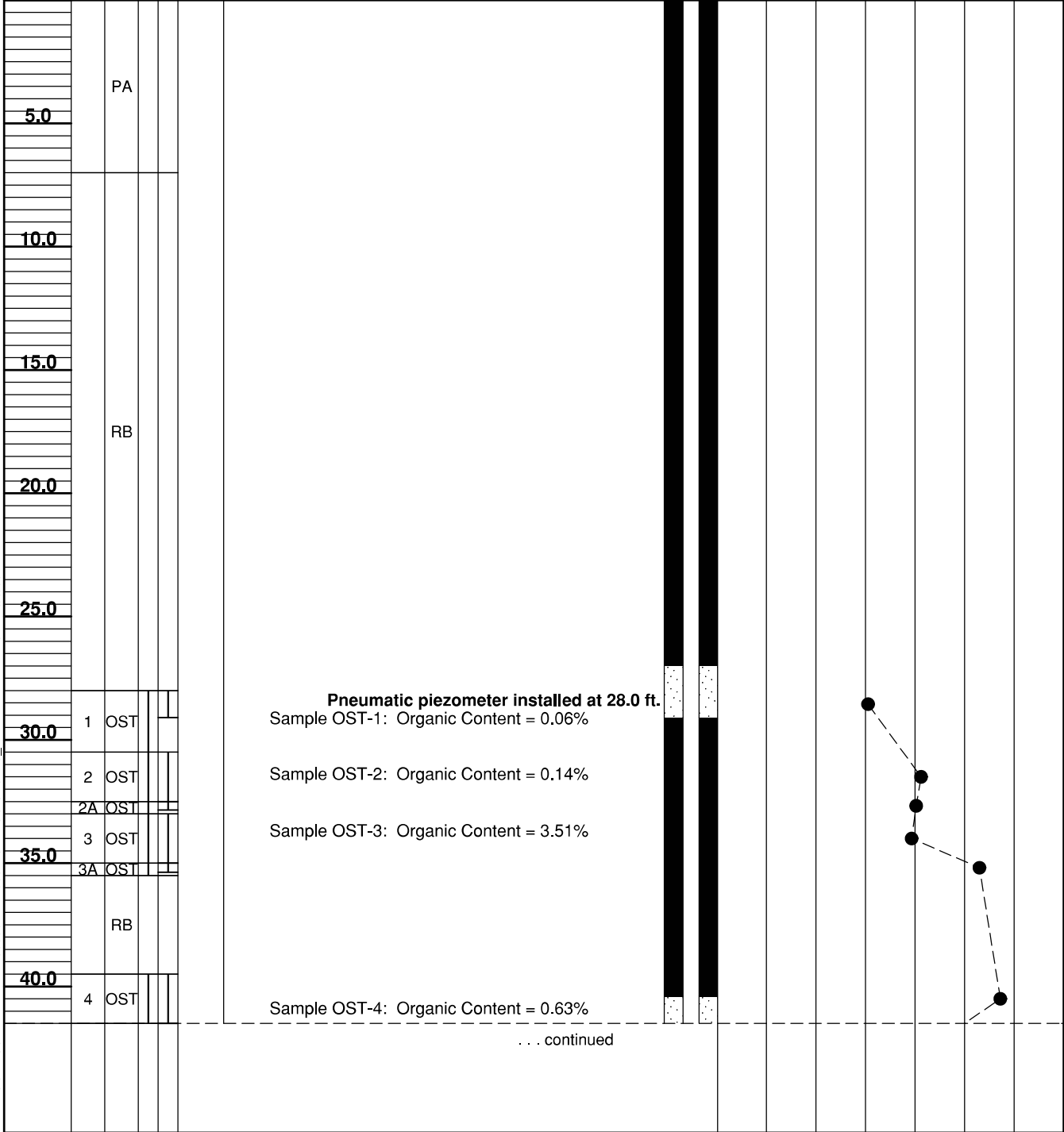
WL Not Observed	BORING STARTED 3/1/09	AECOM OFFICE Chicago Area - 01
WL	BORING COMPLETED 3/2/09	ENTERED BY KKB
WL	RIG/FOREMAN Mobile B-57 (V.H.)/MB	APP'D BY RCR
		SHEET NO. 2 OF 2
		AECOM JOB NO. 60095742

AECOM LOG 60095742-2009 BORINGS.GPJ FS_DATA\TEMPLATE.GDT 6/22/09

AECOM	CLIENT Tennessee Valley Authority	LOG OF BORING NUMBER 09-605B
	PROJECT NAME Kingston Dredge Cell Failure RCA	ARCHITECT-ENGINEER OGC

SITE LOCATION
714 Swan Pond Road; Harriman, Tennessee

DEPTH(FT) ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. ³	UNCONFINED COMPRESSIVE STRENGTH TONS/FT. ² 1 2 3 4 5 PLASTIC LIMIT % WATER CONTENT % LIQUID LIMIT % X-----●-----△ 10 20 30 40 50 STANDARD PENETRATION BLOWS/(FT) ⊗ 10 20 30 40 50
SURFACE ELEVATION +781.64							



WORK IN PROGRESS WITH DATE 6/8/09 BORINGS.GPJ FS_DATA\TEMPLATE.GDT

AECOM	CLIENT Tennessee Valley Authority	LOG OF BORING NUMBER 09-605B
	PROJECT NAME Kingston Dredge Cell Failure RCA	ARCHITECT-ENGINEER OGC

SITE LOCATION
714 Swan Pond Road; Harriman, Tennessee

DEPTH(FT) ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE RECOVERY	DESCRIPTION OF MATERIAL	UNCONFINED COMPRESSIVE STRENGTH TONS/FT. ²	PLASTIC LIMIT %	WATER CONTENT %	LIQUID LIMIT %	STANDARD PENETRATION BLOWS/(FT)	UNIT DRY WT. LBS./FT. ³
				SURFACE ELEVATION +781.64 (Continued)						
	4A	OST		Pneumatic piezometer installed at 42.0 ft.						
	5	OST		Sample OST-5: Organic Content = 0.26%						
45.0	5A	OST		Sample OST-6: Organic Content = 0.20%						
	6	OST								
	6A	OST		47.0						
	7	OST		See UMass Direct Shear Test results (DeGroot, 2009) for Sample 7 description.						
50.0	8	OST		49.5 Pneumatic piezometer installed at 49.0 ft.						
	8A	OST		See UMass Direct Shear Test results (DeGroot, 2009) for Sample 8 description.						
	9	OST		52.0 Silty clay, little fine to medium sand - brown and gray (CL)						
55.0	9A	OST								
	10	OST		57.0						
	11	ST3		Clayey silt, little fine to medium sand - brown and gray - saturated (CL-ML)						
60.0	11A	ST3		59.5						
65.0										
70.0										
75.0										
77.0				77.0 Pneumatic piezometer installed at 76.0 ft.						
				End of Boring Borehole advanced from 7.0 ft. with power auger. Borehole advanced from 7.0 to 77.0 ft. with rock bit and drilling fluid. Casing used: 27 ft. of 4 in. Pneumatic piezometers installed at 28.0, 42.0, 49.0, and 76.0 ft.						

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

WL Not Observed	BORING STARTED 2/25/09	AECOM OFFICE Chicago Area - 01
NORTHING 556273.05	BORING COMPLETED 2/27/09	ENTERED BY KKB
EASTING 2441498.96	RIG/FOREMAN D-50/JC	APP'D BY RCR
		SHEET NO. 2 OF 2
		AECOM JOB NO. 60095742

WORK IN PROGRESS WITH DATE 6/8/09 60095742-2009 BORINGS.GPJ FS_DATATEMPLATE.GDT

Project No.	171468117	Location	N 556650.99, E 2441468.02 (NAD27)	
Project Name	Kingston Fossil Plant Dike D Buttress	Boring No.	PZ-1	Total Depth 26.5 ft
Location	Kingston, Tennessee	Surface Elevation	765.3 ft. (NGVD29)	
Project Type	Geotechnical Exploration	Date Started	1/14/09	Completed 1/14/09
Supervisor	Jim Andrew	Driller	G. Thompson	Depth to Water 3.6 ft
Logged By	Jim Andrew	Depth to Water	5.4 ft	Date/Time 1/16/09

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
765.3'	0.0'	Top of Hole							
		Bottom Ash, dark gray, dry to wet, very loose to loose, fine to coarse grained sand-sized particles, non-plastic		SPT-1	0.0 - 1.5	0.5	5-3-2	--	SPTs driven with 140-lb auto hammer
				SPT-2	5.0 - 6.5	1.0	4-3-2	--	Boring performed prior to completion of buttress
				SPT-3	10.0 - 11.5	1.5	1-1-1	25	
				SPT-4	15.0 - 16.5	1.0	1-1-1	23	
744.8'	20.5'	Fly Ash, dark gray, wet, soft to very soft, non-plastic		SPT-5	20.0 - 21.5	1.5	2-1-2	--	wh = weight of hammer
738.8'	26.5'			SPT-6	25.0 - 26.5	0.5	wh-wh-2	28	Piezometer installed

No Refusal /
Bottom of Hole

FMSM_LEGACY_171468117_PZ BORINGS.GPJ FMSM.GDT 4/20/09

Project No.	171468117	Location	N 556636.98, E 2441500.52 (NAD27)	
Project Name	Kingston Fossil Plant Dike D Buttress	Boring No.	PZ-2	Total Depth 16.5 ft
Location	Kingston, Tennessee	Surface Elevation	766.9 ft. (NGVD29)	
Project Type	Geotechnical Exploration	Date Started	1/14/09	Completed 1/14/09
Supervisor	Jim Andrew	Driller	G. Thompson	Depth to Water 3.8 ft
Logged By	Jim Andrew	Depth to Water	4.7 ft	Date/Time 1/16/09

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
766.9'	0.0'	Top of Hole							
		Buttress Aggregate (Not Sampled)							SPTs driven with 140-lb auto hammer
762.4'	4.5'	Bottom Ash, dark gray, moist to wet, very loose to loose, fine to coarse grained sand-sized particles, non-plastic		SPT-1	5.0 - 6.5	1.0	5-3-5	--	Boring performed prior to completion of buttress
				SPT-2	10.0 - 11.5	1.5	3-2-3	--	wh = weight of hammer
750.4'	16.5'			SPT-3	15.0 - 16.5	1.0	wh-wh-wh	--	Piezometer installed

No Refusal /
Bottom of Hole

Project No.	171468117	Location	N 556822.89, E 2441588.49 (NAD27)		
Project Name	Kingston Fossil Plant Dike D Buttress	Boring No.	PZ-3	Total Depth	26.5 ft
Location	Kingston, Tennessee	Surface Elevation	766.3 ft. (NGVD29)		
Project Type	Geotechnical Exploration	Date Started	1/14/09	Completed	1/15/09
Supervisor	Jim Andrew	Driller	G. Thompson	Depth to Water	4.0 ft
Logged By	Jim Andrew	Depth to Water	5.9 ft	Date/Time	1/16/09

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
766.3'	0.0'	Top of Hole							
763.3'	3.0'	Buttress Aggregate (Not Sampled)							SPTs driven with 140-lb auto hammer
756.3'	10.0'	Bottom Ash, dark gray, moist, loose, fine to coarse grained sand-sized particles, non-plastic, some fly ash		SPT-1	5.0 - 6.5	1.5	3-4-4	31	Boring performed prior to completion of buttress
751.3'	15.0'	Bottom Ash (50%), dark gray, moist, very loose, fine to coarse grained sand-sized particles, non-plastic, mixed with fly ash (50%)		SPT-2	10.0 - 11.5	1.5	2-2-2	--	
		Fly Ash, dark gray, moist to wet, very soft, non-plastic		SPT-3	15.0 - 16.5	1.5	2-2-3	--	
				SPT-4	20.0 - 21.5	1.5	1-1-1	--	
739.8'	26.5'			SPT-5	25.0 - 26.5	1.0	1-1-1	--	Piezometer installed

No Refusal /
Bottom of Hole

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Project No.	171468117	Location	N 556814.11, E 2441602.33 (NAD27)		
Project Name	Kingston Fossil Plant Dike D Buttress	Boring No.	PZ-4	Total Depth	16.5 ft
Location	Kingston, Tennessee	Surface Elevation	766.0 ft. (NGVD29)		
Project Type	Geotechnical Exploration	Date Started	1/14/09	Completed	1/14/09
Supervisor	Jim Andrew	Driller	G. Thompson	Depth to Water	3.5 ft
Logged By	Jim Andrew	Depth to Water	5.0 ft	Date/Time	1/16/09

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
766.0'	0.0'	Top of Hole							
762.0'	4.0'	Buttress Aggregate (Not Sampled)							SPTs driven with 140-lb auto hammer
		Bottom Ash, dark gray, dry to moist, loose to medium dense, fine to coarse grained sand-sized particles, non-plastic, some fly ash		SPT-1	5.0 - 6.5	1.0	9-5-5	--	Boring performed prior to completion of buttress
754.5'	11.5'			SPT-2	10.0 - 11.5	1.5	2-5-5	--	10.0 - 11.5, bulk sample taken
		Fly Ash, dark gray, wet, very soft, non-plastic		SPT-3	15.0 - 16.5	1.0	wh-wh-wh	35	wh = weight of hammer Piezometer installed
749.5'	16.5'								

No Refusal /
Bottom of Hole

Project No.	171468117	Location	N 556958.41, E 2441690.90 (NAD27)	
Project Name	Kingston Fossil Plant Dike D Buttress	Boring No.	PZ-5	Total Depth 31.5 ft
Location	Kingston, Tennessee	Surface Elevation	763.7 ft. (NGVD29)	
Project Type	Geotechnical Exploration	Date Started	1/15/09	Completed 1/15/09
Supervisor	Jim Andrew	Driller	G. Thompson	Depth to Water 5.7 ft
Logged By	Jim Andrew	Depth to Water	N/A	Date/Time 1/16/09
		Depth to Water	N/A	Date/Time N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
763.7'	0.0'	Top of Hole							
		Buttress Aggregate (Not Sampled)							SPTs driven with 140-lb auto hammer
									Boring performed prior to completion of buttress
750.7'	13.0'								
		Bottom Ash, dark gray, moist, loose to medium dense, fine to coarse grained sand-sized particles, non-plastic		SPT-1	15.0 - 16.5	0.5	4-5-5	16	
742.7'	21.0'								
		Fly Ash, dark gray, moist to wet, medium stiff, non-plastic		SPT-2	20.0 - 21.5	1.5	2-2-3	--	
				SPT-3	25.0 - 26.5	1.0	2-2-2	17	
733.2'	30.5'								
732.2'	31.5'	Sandy Clay, red - brown, moist, soft		SPT-4	30.0 - 31.5	1.5	2-2-3	--	Piezometer installed

No Refusal /
Bottom of Hole

FMSM_LEGACY_171468117_PZ BORINGS.GPJ_FMSM.GDT_4/20/09

Project No.	171468117	Location	N 556944.60, E 2441707.83 (NAD27)		
Project Name	Kingston Fossil Plant Dike D Buttress	Boring No.	PZ-6	Total Depth	16.5 ft
Location	Kingston, Tennessee	Surface Elevation	763.7 ft. (NGVD29)		
Project Type	Geotechnical Exploration	Date Started	1/15/09	Completed	1/15/09
Supervisor	Jim Andrew	Driller	G. Thompson	Depth to Water	4.3 ft
Logged By	Jim Andrew	Depth to Water	N/A	Date/Time	1/16/09
				Date/Time	N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
763.7'	0.0'	Top of Hole							
		Buttress Aggregate (Not Sampled)							SPTs driven with 140-lb auto hammer
759.2'	4.5'								
		Bottom Ash, dark gray, dry, medium dense, fine to coarse grained sand-sized particles, non-plastic		SPT-1	5.0 - 6.5	0.5	8-6-9	--	Boring performed prior to completion of buttress
753.2'	10.5'								
752.2'	11.5'	Clay, red - brown, moist, very stiff		SPT-2	10.0 - 11.5	0.5	8-11-13	--	
		Fly Ash, dark gray, wet, soft, non-plastic							
747.2'	16.5'			SPT-3	15.0 - 16.5	1.0	1-2-2	--	Piezometer installed

No Refusal /
Bottom of Hole

Project No.	171468117	Location	N 557105.47, E 2441791.06 (NAD27)		
Project Name	Kingston Fossil Plant Dike D Buttress	Boring No.	PZ-7	Total Depth	26.5 ft
Location	Kingston, Tennessee	Surface Elevation	760.0 ft. (NGVD29)		
Project Type	Geotechnical Exploration	Date Started	1/15/09	Completed	1/15/09
Supervisor	Jim Andrew	Driller	G. Thompson	Depth to Water	5.4 ft
Logged By	Jim Andrew	Depth to Water	N/A	Date/Time	N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
760.0'	0.0'	Top of Hole							
		Buttress Aggregate (Not Sampled)							SPTs driven with 140-lb auto hammer
755.0'	5.0'								
		Bottom Ash, dark gray, moist, medium dense, fine to coarse grained sand-sized particles, non-plastic		SPT-1	5.0 - 6.5	0.0	4-8-7	--	Boring performed prior to completion of buttress
750.0'	10.0'								
		Fly Ash, dark gray, moist to wet, very soft, non-plastic		SPT-2	10.0 - 11.5	0.5	2-1-1	20	
				SPT-3	15.0 - 16.5	0.5	wh-wh-wh	9	wh = weight of hammer
				SPT-4	20.0 - 21.5	0.5	1-1-1	--	
736.8'	23.2'								
		Sandy Clay, red - brown, moist, soft		SPT-5	25.0 - 26.5	1.0	1-2-2	--	Piezometer installed
733.5'	26.5'								

No Refusal /
Bottom of Hole

Project No.	171468117	Location	N 557088.57, E 2441818.68 (NAD27)		
Project Name	Kingston Fossil Plant Dike D Buttress	Boring No.	PZ-8	Total Depth	16.5 ft
Location	Kingston, Tennessee	Surface Elevation	760.1 ft. (NGVD29)		
Project Type	Geotechnical Exploration	Date Started	1/15/09	Completed	1/15/09
Supervisor	Jim Andrew	Driller	G. Thompson	Depth to Water	5.0 ft
Logged By	Jim Andrew	Depth to Water	N/A	Date/Time	N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
760.1'	0.0'	Top of Hole							
		Buttress Aggregate (Not Sampled)							SPTs driven with 140-lb auto hammer Boring performed prior to completion of buttress
752.8'	7.3'								
		Ash, dark gray, wet, very soft, non-plastic		SPT-1	10.0 - 11.5	0.0	1-2-2	--	
743.6'	16.5'			SPT-2	15.0 - 16.5	0.0	2-1-1	--	Piezometer installed

No Refusal /
Bottom of Hole

Project No.	175569042	Location	N 556248.52, E 2442540.30 (NAD27)		
Project Name	Kingston Ash Pond	Boring No.	STN-8	Total Depth	76.7 ft
Location	Kingston, Tennessee	Surface Elevation	752.2 ft. (NGVD29)		
Project Type	Geotechnical Exploration	Date Started	4/13/09	Completed	4/13/09
Supervisor	Ben Halada	Driller	Kent Clements	Depth to Water	17.5 ft
Logged By	Ben Halada	Automatic Hammer	<input checked="" type="checkbox"/>	Safety Hammer	<input type="checkbox"/>
		Other	<input type="checkbox"/>		

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks	
Elevation	Depth		Rock Core							RQD
752.2'	0.0'	Top of Hole								
749.7'	2.5'	LEAN CLAY (Fill), red brown, moist, stiff		SPT-1	0.0 - 1.5	1.0	4-6-5	18	Boring advanced using 3 1/4 " Hollow Stem Augers	
749.2'	3.0'			SPT-2	1.5 - 3.0	0.7	4-8-10	16		
748.2'	4.0'	BOTTOM ASH (Fill), black, moist, medium dense		SPT-3	3.0 - 4.5	1.5	9-16-22	17	Piston sampler and sucker rods were utilized to obtain recovery during Shelby Tube sampling	
746.7'	5.5'	LEAN CLAY (Fill), red brown, moist, very stiff		SPT-4	4.5 - 6.0	1.3	6-11-13	13		
		BOTTOM ASH (Fill), black, moist, medium dense		SPT-5	6.0 - 7.5	1.0	11-13-14	14		
		LEAN CLAY (Fill), brown, moist, very stiff, some fine grained sand, some gravel		SPT-6	7.5 - 9.0	1.0	11-15-14	16		
741.2'	11.0'			ST-1	9.0 - 11.0	1.2		--		ST-1: sandy clay in bottom of tube
		SAND, light brown, dry, very loose, fine to medium grained, some silt		SPT-7	11.0 - 12.5	1.2	WOR-WOH-WOH	20		
738.2'	14.0'			SPT-8	12.5 - 14.0	1.1	2-3-2	17		
		LEAN CLAY, light red brown, moist, very soft, some fine grained sand		SPT-9	14.0 - 15.5	1.1	1-1-2	21		
734.7'	17.5'			ST-2	15.5 - 17.5	2.0		--		
		SAND, light brown, saturated, very loose, fine grained, trace clayey silt		SPT-10	17.5 - 19.0	1.3	WOR-1-1	20		
				SPT-11	19.0 - 20.5	1.1	WOR-WOH-1	18		
				SPT-12	20.5 - 22.0	1.3	WOH-1-1	21		
				SPT-13	22.0 - 23.5	1.1	1-WOH-WOH	17		
				SPT-14	23.5 - 25.0	1.4	1-WOH-WOH	21		
				SPT-15	25.0 - 26.5	1.3	1-1-WOH	22		
				SPT-16	26.5 - 28.0	1.1	WOH-WOH-1	24		
				SPT-17	28.0 - 29.5	1.3	1-1-1	20		
				SPT-18	29.5 - 31.0	1.2	1-WOH-1	19		
				SPT-19	31.0 - 32.5	1.1	WOH-WOH-WOH	17		
				SPT-20	32.5 - 34.0	1.0	WOH-1-1	21		
				SPT-21	34.0 - 35.5	1.3	1-2-3	24		
			SPT-22	35.5 - 37.0	1.0	1-2-1	21			

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Project No. <u>175569042</u>		Location <u>N 556248.52, E 2442540.30 (NAD27)</u>	
Project Name <u>Kingston Ash Pond</u>		Boring No. <u>STN-8</u> Total Depth <u>76.7 ft</u>	

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core						
711.2'	41.0'	SAND, light brown, saturated, very loose, fine grained, trace clayey silt <i>(Continued)</i>		SPT-23	37.0 - 38.5	1.3	1-1-1	18	Began Core
				SPT-24	38.5 - 40.0	1.3	WOR-WOH-WOH	19	
				SPT-25	40.0 - 41.5	1.2	WOR-WOH-2	19	
703.2'	49.0'	SAND, light gray, saturated, medium dense, fine grained		SPT-26	41.5 - 43.0	1.4	4-3-4	17	
				SPT-27	43.0 - 44.5	1.1	WOR-WOH-3	19	
				SPT-28	44.5 - 46.0	1.2	2-3-5	16	
				SPT-29	46.0 - 47.5	1.1	4-3-2	19	
				SPT-30	47.5 - 49.0	1.3	2-3-6	21	
				SPT-31	49.0 - 50.5	1.3	6-11-22	21	
698.7'	53.5'	SAND, light brown to brown, moist, very dense, fine to medium grained, some medium to coarse gravel		SPT-32	50.5 - 52.0	1.0	18-17-12	21	
				SPT-33	52.0 - 53.5	1.1	6-7-13	22	
				SPT-34	53.5 - 53.9	0.4	50/0.4	--	
696.4'	55.8'	Shale, (Augered)		SPT-35	55.0 - 55.3	0.3	50/0.3	--	
675.5'	76.7'	Shale, gray, fine grained, very thin bedded, 45° bedding angle		0%	5.9	0.5	8	61.7	
				0%	5.0	2.0	40	66.7	
				0%	4.5	1.8	40	71.2	
				0%	5.5	2.3	42	76.7	
			Bottom of Hole						

Boring backfilled with bentonite cement grout from 0.0 ft to 76.7 ft

FMSM_LEGACY_17148517_KINGSTON_ASH_POND.GPJ_FMSM.GDT_7/21/09

Project No.	175569042	Location	N 556248.52, E 2442540.30 (NAD27)	
Project Name	Kingston Ash Pond	Boring No.	STN-8	Total Depth 76.7 ft

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
		Top of Rock = 53.5' Elevation (698.7')							
		WOH = Weight of Hammer WOR = Weight of Rods							
		Split Samples: SPT-2, 3, 4 and 25							
		Slope Indicator (76.7 ft of pipe) installed with a concrete pad and flushmount cover							

F:\MSM_LEGACY\17148517_KINGSTON ASH POND.GPJ_F:\MSM.GDT_7/21/09



SUBSURFACE LOG (DRAFT)

Project No.	171468117	Location	N 557065.24, E 2441439.30 (NAD27)		
Project Name	Kingston Ash Pond	Boring No.	SI-11	Total Depth	59.0 ft
Location	Kingston, Tennessee	Surface Elevation	757.8 ft. (NGVD29)		
Project Type	Geotechnical Exploration	Date Started	4/20/09	Completed	4/20/09
Supervisor	Ben Halada	Driller	Kent Clements	Depth to Water	N/A
Logged By	Ben Halada	Automatic Hammer	<input type="checkbox"/>	Safety Hammer	<input type="checkbox"/>
		Other	<input type="checkbox"/>		

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
757.8'	0.0'	Top of Hole							
		OVERBURDEN, (Augered, no sampling)							Boring advanced using 3 1/4 " Hollow Stem Augers

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Project No.	171468117	Location	N 557065.24, E 2441439.30 (NAD27)	
Project Name	Kingston Ash Pond	Boring No.	SI-11	Total Depth 59.0 ft

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
702.8'	55.0'	OVERBURDEN, (Augered, no sampling) <i>(Continued)</i>							
698.8'	59.0'	No Core, Rock like resistance (Augered)							

Auger Refusal /
Bottom of Hole

Slope Indicator (59.0 ft of pipe) installed with a concrete pad and flushmount cover

Boring backfilled with bentonite cement grout from 0.0 ft to 74.0 ft



SUBSURFACE LOG (DRAFT)

Project No.	171468117	Location	N 555869.23, E 2441063.93 (NAD27)		
Project Name	Kingston Ash Pond	Boring No.	SI-12	Total Depth	89.5 ft
Location	Kingston, Tennessee	Surface Elevation	784.1 ft. (NGVD29)		
Project Type	Geotechnical Exploration	Date Started	4/30/09	Completed	5/1/09
Supervisor	Ben Halada	Driller	Kent Clements	Depth to Water	N/A
Logged By	Ben Halada	Automatic Hammer	<input type="checkbox"/>	Safety Hammer	<input type="checkbox"/>
		Other	<input type="checkbox"/>		

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
784.1'	0.0'	Top of Hole							
		OVERBURDEN, Ash (Augered without sampling)							Boring advanced using 4 1/4 " Hollow Stem Augers

FMSM_LEGACY_171468117_KINGSTON_INSTRUMENTATION.GPJ_FMSM.GDT_7/21/09

Project No.		171468117			Location		N 555869.23, E 2441063.93 (NAD27)		
Project Name		Kingston Ash Pond			Boring No.		SI-12	Total Depth 89.5 ft	
Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
		OVERBURDEN, Ash (Augered without sampling) (Continued)							
705.6'	78.5'								
		No Core, Rock like resistance (Augered)							
694.6'	89.5'								Boring backfilled with bentonite cement grout from 0.0 ft to 89.5 ft
		Auger Refusal / Bottom of Hole							

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Project No.	171468117	Location	N 555869.23, E 2441063.93 (NAD27)		
Project Name	Kingston Ash Pond	Boring No.	SI-12	Total Depth	89.5 ft

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	

Slope Indicator (100 ft of pipe) installed with a concrete pad and protective cover

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Project No. <u>171468117</u>		Location <u>Not Yet Surveyed</u>							
Project Name <u>Kingston Ash Pond</u>		Boring No. <u>SI-9</u> Total Depth <u>83.3 ft</u>							
Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
		OVERBURDEN, (Augered, no sampling) (Continued)							
705.0'	72.9'								
		No Core, Rock like resistance (Augered)							Boring backfilled with bentonite cement grout from 0.0 ft to 83.3 ft
694.6'	83.3'								
		No Refusal / Bottom of Hole							

F:\MSM_LEGACY_171468117_KINGSTON_INSTRUMENTATION\GPI_FMSM.GDT_7/21/09

Project No.	171468117	Location	Not Yet Surveyed	
Project Name	Kingston Ash Pond	Boring No.	SI-9	Total Depth 83.3 ft

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
Slope Indicator (83.3 ft of pipe) installed with a concrete pad and flushmount cover									

F:\MSM_LEGACY_171468117_KINGSTON_INSTRUMENTATION\GPI_FMSM.GDT_7/21/09

SITE LOCATION
714 Swan Pond Road; Harriman, Tennessee

DEPTH(FT)	ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. ³	UNCONFINED COMPRESSIVE STRENGTH TONS/FT. ²	PLASTIC LIMIT %	WATER CONTENT %	LIQUID LIMIT %
						SURFACE ELEVATION +781.50					
		1	SS			Fill: Silty clay, little fine gravel and fine to coarse sand - reddish brown - hard (CL)		14			*
		2	SS			Fill: Silty fine to medium sand-sized ash, little clay - gray - dense - moist (SM) (BA) Unfailed					47
5.0		3	SS			Fill: Silt-sized ash, little fine sand - gray - dense - moist (ML) (FA) Unfailed					45
		4	SS			Fill: Silty fine to medium sand-sized ash, little clay - gray - dense - moist (SM) (FA) Unfailed					39
10.0		5	SS			Fill: Sandy silt-sized ash - gray - dense to medium dense - moist (ML) (FA) Unfailed					35
		6	SS								32
		7	SS								17
15.0		8	SS			Fill: Silty fine to coarse sand-sized ash, little clay and fine to medium gravel - gray - extremely dense - moist (SM) (BA) Unfailed					106
		9	SS								86
20.0		10	SS			Fill: Sandy silt-sized ash, little fine gravel - gray - extremely dense to dense - moist (ML) (FA) Unfailed					77
		11	SS								33
25.0		12	SS			Fill: Silty fine to coarse sand-sized ash, little fine to medium gravel - gray - medium dense to dense - saturated (SM) (BA) Unfailed					29
		13	SS								37
		14	SS								21
30.0		15	SS			Fill: Silt-sized ash, little fine sand - gray - very loose to medium dense - saturated (ML) (FA) Unfailed					5
		16	SS								1
		17	SS								WOH
35.0		18	SS								6
		19	SS								4
40.0		20	SS								15
						... continued					

WORK IN PROGRESS WITH DATE 6/8/09 60095742-2009 BORINGS.GPJ FS_DATATEMPLATE.GDT 6/8/09



CLIENT
Tennessee Valley Authority

PROJECT NAME
Kingston Dredge Cell Failure RCA

LOG OF BORING NUMBER **09-602**

ARCHITECT-ENGINEER
OGC

SITE LOCATION
714 Swan Pond Road; Harriman, Tennessee

DEPTH(FT) ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. ³	UNCONFINED COMPRESSIVE STRENGTH TONS/FT. ²			PLASTIC LIMIT % WATER CONTENT % LIQUID LIMIT %			STANDARD PENETRATION BLOWS/(FT)				
						1	2	3	10	20	30	40	50	10	20	30
SURFACE ELEVATION +781.50 (Continued)																
	21	SS		Fill: Silt-sized ash, little fine sand - gray - very loose to medium dense - saturated (ML) (FA) Unfailed Sample 21: Final blow advanced sampler 2 ft.												
	22	SS		44.5												
45.0	22A	SS		45.0	Fill: Medium to coarse sand-sized ash, trace silt - gray - loose - saturated (SP) (BA) Unfailed											
	23	SS		45.8												
	23A	SS		46.1	Fill: Sandy silt-sized ash - gray - very loose - saturated (ML) (FA) Unfailed											
	23B	SS			Fill: Medium to coarse sand-sized ash, trace fine gravel - gray - loose - saturated (SP) (BA) Unfailed											
50.0	24	SS			Fill: Silt-sized ash, little fine sand, trace clay - gray - very loose - saturated (ML) (FA) Unfailed Sample 23B: Final blow advanced sampler 1 ft. No recovery from 51 to 53 ft.											
		SS														
55.0	25	SS		55.0												
	26	SS			Silty clay, little fine to medium sand - brown - stiff (CL)											
	27	SS			Sample 27: Gray fine sand inclusions noted.											
60.0	28	SS		61.0												
	29	SS			Clayey silt, little to some fine to medium sand - brown - medium to stiff (CL-ML)											
	30	SS		64.0												
65.0	30A	SS		64.0	Sandy clay, some silt - stiff to soft (CL)											
	31	SS		66.0												
	31A	SS			Silty fine to medium sand, little to some clay - gray - very loose - saturated (SM)											
70.0	32	SS														
	33	SS			Sample 33: WOH advanced sampler 3 ft.											
	34	SS		73.0												
75.0	34A	SS		73.0	Clayey silt, little to some fine to medium sand, trace organics - gray - very loose - moist (CL-ML)											
	35	SS		76.5												
	36	SS*		77.0	Fine to medium sand, little silt - gray - medium dense - moist (SP-SM)											
	36A	SS		78.5	Silty fine to coarse sand, little fine gravel - brown and gray - extremely dense - saturated (SM) Weathered shale noted.											
80.0		RB			Apparent bedrock											
... continued																

WORK IN PROGRESS WITH DATE 60095742-2009 BORINGS.GPJ FS_DATATEMPLATE.GDT 6/8/09

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

* Calibrated Penetrometer

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AECOM	CLIENT Tennessee Valley Authority	LOG OF BORING NUMBER 09-602
	PROJECT NAME Kingston Dredge Cell Failure RCA	ARCHITECT-ENGINEER OGC

SITE LOCATION
714 Swan Pond Road; Harriman, Tennessee

DEPTH(FT) ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. ³	UNCONFINED COMPRESSIVE STRENGTH TONS/FT. ²	1	2	3	4	5	
X					SURFACE ELEVATION +781.50 (Continued)		X						
							PLASTIC LIMIT %			WATER CONTENT %		LIQUID LIMIT %	
							X		●	---		△	
							10	20	30	40	50		
							X	STANDARD PENETRATION BLOWS/(FT)					
							10	20	30	40	50		

		RB			Apparent bedrock							
85.0				85.0								

End of Boring
 Boring advanced to 10.0 ft. with power auger.
 Boring advanced from 10.0 to 85 ft. with rock bit and drilling fluid.
 Borehole grouted and inclinometer installed to 85 ft.
 Casing used: 10 ft. of 4 in.
 Automatic-Mobile hammer used for Standard Penetration Tests.
 SS* = SPT value based on first 6 in.
 WOH = Weight of Hammer
 WOR = Weight of Rod
 (FA) = Fly Ash
 (BA) = Bottom Ash

* Calibrated Penetrometer

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

WL 14.0 ft. WD	BORING STARTED 3/11/09	AECOM OFFICE Chicago Area - 01	
NORTHING 555306.82	BORING COMPLETED 3/12/09	ENTERED BY KKB	SHEET NO. 3 OF 3
EASTING 2440865.75	RIG/FOREMAN Mobile B-57 (V.H.)/MB	APP'D BY RCR	AECOM JOB NO. 60095742

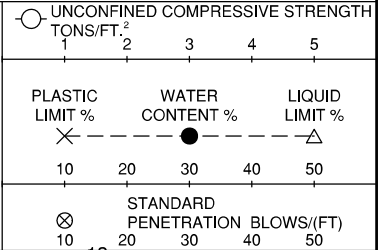
WORK IN PROGRESS WITH DATE 6/8/09 60095742-2009 BORINGS.GPJ FS_DATATEMPLATE.GDT 6/8/09

AECOM

CLIENT
Tennessee Valley Authority
PROJECT NAME
Kingston Dredge Cell Failure RCA

LOG OF BORING NUMBER **09-603**
ARCHITECT-ENGINEER
OGC

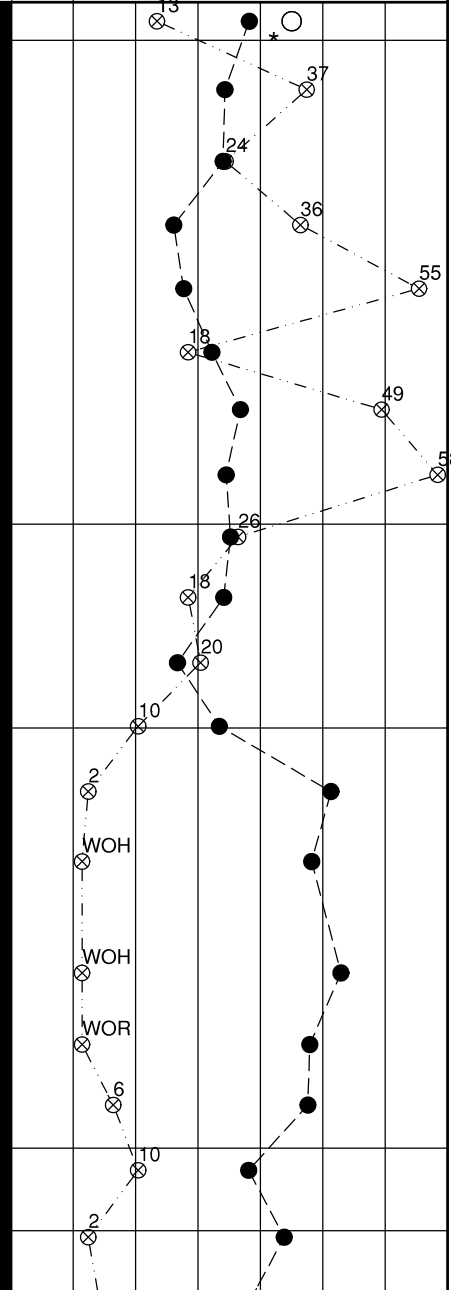
SITE LOCATION
714 Swan Pond Road; Harriman, Tennessee



DEPTH(FT)	ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL
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UNIT DRY WT.
LBS./FT.³

DEPTH(FT)	ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL
						SURFACE ELEVATION +780.61
		1	SS			1.2 Fill: Silty clay, little fine to coarse sand, trace fine to coarse gravel - reddish brown - very stiff (CL) Bottom ash seam noted from 0.4 to 0.8 ft.
		2	SS			Fill: Silt-sized ash, little fine sand - gray - dense to medium dense - moist to saturated (ML) (FA) Unfailed
5.0		3	SS			
		4	SS			
10.0		5	SS			
		6	SS			
15.0		7	SS			
		8	SS			
		9	SS			16.4 Fill: Silty fine to coarse sand-sized ash, little fine to medium gravel - gray - medium dense - saturated (SM) (BA) Unfailed
20.0		10	SS			
		11	SS			
		12	SS			22.8 Fill: Silt-sized ash, little fine sand - gray - medium dense to very loose - saturated (ML) (FA) Unfailed
25.0		13	SS			
		14	SS			Sample 14: WOR and one blow advanced sampler 3.5 ft.
30.0		15	SS			Sample 15: One blow advanced sampler 2.5 ft.
		16	SS			
35.0		17	SS			
		18	SS			36.0 Fill: Silty fine to medium sand-sized ash - gray - medium dense - saturated (SM) (FA & BA) Unfailed
40.0		19	SS			38.6 Fill: Silt-sized ash, little fine sand - gray - very loose to loose - saturated (ML) (FA) Unfailed



... continued

* Calibrated Penetrometer

WORK IN PROGRESS WITH DATE 60095742-2009 BORINGS.GPJ FS_DATATEMPLATE.GDT 6/8/09

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. **60095742**

SHEET NO. **1** OF **3**

AECOM	CLIENT Tennessee Valley Authority	LOG OF BORING NUMBER 09-603
	PROJECT NAME Kingston Dredge Cell Failure RCA	ARCHITECT-ENGINEER OGC

SITE LOCATION
714 Swan Pond Road; Harriman, Tennessee

DEPTH(FT) ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. ³	UNCONFINED COMPRESSIVE STRENGTH TONS/FT. ²	PLASTIC LIMIT %	WATER CONTENT %	LIQUID LIMIT %	STANDARD PENETRATION BLOWS/(FT)
				SURFACE ELEVATION +780.61 (Continued)						
20	SS			Fill: Silt-sized ash, little fine sand - gray - very loose to loose - saturated (ML) (FA) Unfailed						
45.0	21	SS								
	22	SS								
50.0	24	SS								
	23	SS								
	25	SS		50.5 Silty clay, trace fine sand - gray - soft (CL)						
	26	SS		52.5 Silty fine to medium sand, little to some clay - brown with gray - loose to medium dense - moist (SM)						
55.0	27	SS								
	28	SS								
60.0	29	SS								
	30	SS								
	31	SS		62.5 Silty fine to medium sand, some clay - gray - very loose - wet (SM)						
65.0	32	SS		64.5 Silty fine to medium sand, little to trace clay - gray - very loose to loose - saturated (SM)						
	33	SS								
70.0	34	SS		69.0 Silty fine to medium sand, trace clay - gray - medium dense - saturated (SM)						
	35	SS								
75.0	36	SS								
76.0	37	SS		75.0 Weathered shale - gray 76.0 Pneumatic Piezometer installed at 76.0 ft.						
				End of Boring Boring advanced to 10.0 ft. with power auger. Boring advanced from 10.0 to 76.0 ft. with rock bit and drilling fluid. Pneumatic piezometer installed at 76 ft. Borehole backfilled upon completion.						
				... continued						

WORK IN PROGRESS WITH DATE 60095742-2009 BORINGS.GPJ FS_DATATEMPLATE.GDT 6/8/09

AECOM	CLIENT Tennessee Valley Authority	LOG OF BORING NUMBER 09-603
	PROJECT NAME Kingston Dredge Cell Failure RCA	ARCHITECT-ENGINEER OGC

SITE LOCATION
714 Swan Pond Road; Harriman, Tennessee

DEPTH(FT)	ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. ³	UNCONFINED COMPRESSIVE STRENGTH TONS/FT. ²	PLASTIC LIMIT %	WATER CONTENT %	LIQUID LIMIT %	STANDARD PENETRATION BLOWS/(FT)
⊗						SURFACE ELEVATION +780.61 (Continued)		○	⊗	●	△	⊗

Casing used: 10 ft. of 4 in. Automatic-Mobile hammer used for Standard Penetration Tests.
 SS* = SPT value based on first 6 in.
 WOH = Weight of Hammer
 WOR = Weight of Rod
 (FA) = Fly Ash
 (BA) = Bottom Ash

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

WL 12.0 ft. WS; 10.0 ft. BCR; 8.0 ft. ACR	BORING STARTED 3/9/09	AECOM OFFICE Chicago Area - 01
NORTHING 555809.89	BORING COMPLETED 3/10/09	ENTERED BY KKB
EASTING 2441187.46	RIG/FOREMAN Mobile B-57 (V.H.)/MB	APP'D BY RCR
		SHEET NO. 3 OF 3
		AECOM JOB NO. 60095742

WORK IN PROGRESS WITH DATE 6/09/09 60095742-2009 BORINGS.GPJ FS_DATATEMPLATE.GDT 6/8/09



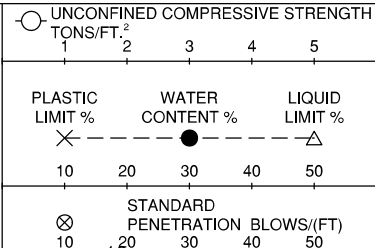
CLIENT
Tennessee Valley Authority

PROJECT NAME
Kingston Dredge Cell Failure RCA

LOG OF BORING NUMBER **09-605**

ARCHITECT-ENGINEER
OGC

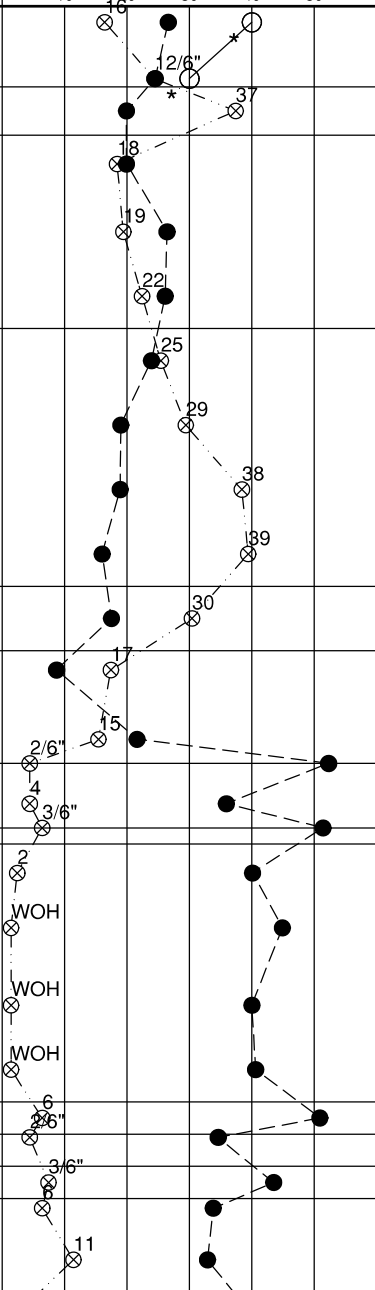
SITE LOCATION
714 Swan Pond Road; Harriman, Tennessee



DEPTH(FT)	ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL
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UNIT DRY WT.
LBS./FT.³

DEPTH(FT)	ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL
						SURFACE ELEVATION +781.74
		1	SS			Fill: Silty clay, little fine to coarse sand, trace fine to coarse gravel - reddish brown - hard to very stiff (CL)
		2	SS			2.5
		2A	SS			Fill: Silty fine to coarse sand-sized ash, trace clay and fine gravel - gray - dense - moist (SM) (FA & BA) Unfailed
5.0		3	SS			4.0
		4	SS			Fill: Sandy silt-sized ash, trace gravel - gray - medium dense - moist (ML) (FA) Unfailed
10.0		5	SS			10.0
		6	SS			Fill: Silty fine to medium sand-sized ash - gray - medium dense - moist (SM) (FA & BA) Unfailed
15.0		7	SS			15.0
		8	SS			18.0
		9	SS			18.0
20.0		10	SS			Fill: Sandy silt-sized ash, trace clay - gray - medium dense to dense - moist (ML) (FA) Unfailed
		11	SS			20.0
		12	SS			Fill: Silty fine to coarse sand-sized ash, trace clay - gray - medium dense - moist to wet (SM) (BA) Unfailed
25.0		12A	SS			23.5
		13	SS			Fill: Silt-sized ash, little fine sand, trace clay - gray - loose - saturated (ML) (FA) Unfailed
		13A	SS			25.5
		14	SS			26.0
		15	SS			Fill: Medium to coarse sand-sized ash, little silt - gray - loose - saturated (SP-SM) (BA) Unfailed
30.0		16	SS			Fill: Silt-sized ash, little fine sand and trace clay - gray - very loose - saturated (ML) (FA) Unfailed
		17	SS			30.0
35.0		18	SS			34.0
		18A	SS			Fill: Sandy silt-sized ash - gray - loose - saturated (ML) (FA & BA) Unfailed
		19	SS			35.0
		19A	SS			36.0
		20	SS			37.0
40.0						Fill: Fine to coarse sand-sized ash, little silt - gray - loose - saturated (SP-SM) (BA) Unfailed



... continued

* Calibrated Penetrometer

WORK IN PROGRESS WITH DATE 60095742-2009 BORINGS.GPJ FS_DATATEMPLATE.GDT 6/8/09

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.



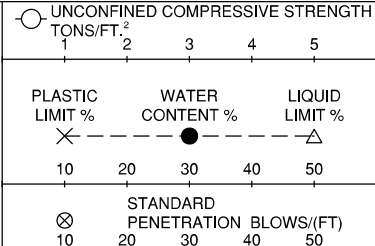
CLIENT
Tennessee Valley Authority

PROJECT NAME
Kingston Dredge Cell Failure RCA

LOG OF BORING NUMBER **09-605**

ARCHITECT-ENGINEER
OGC

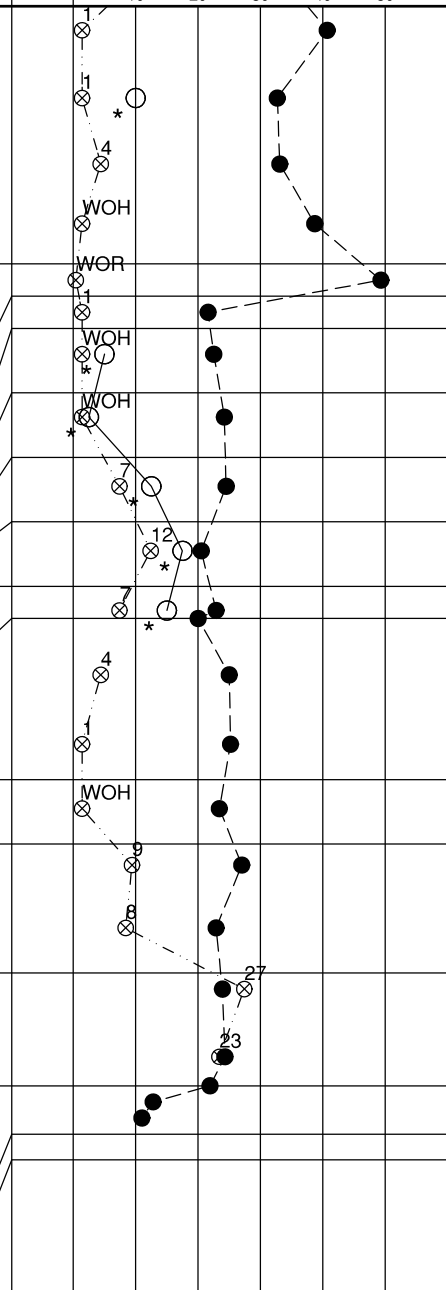
SITE LOCATION
714 Swan Pond Road; Harriman, Tennessee



DEPTH(FT)	ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL
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UNIT DRY WT.
LBS./FT.³

DEPTH(FT)	ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL
						SURFACE ELEVATION +781.74 (Continued)
		21	SS			Fill: Silt-sized ash, little clay, trace fine sand - gray - medium dense to very loose - saturated (ML) (FA) Unfailed
		22	SS			
45.0		23	SS			
		24	SS			
	48.0	25	SS			Silt, little clay interbedded with silt-sized ash slimes, trace fine to medium sand - dark gray to black - very loose - saturated (ML) & (FA)
50.0		25A	SS			Clayey silt, little fine to medium sand - gray - very loose - wet (CL-ML)
	49.0	26	SS			Silty clay, little fine to medium sand - brown and gray - medium (CL)
	52.0	27	SS			Clayey silt, little fine to medium sand - brown and gray - soft (CL-ML)
55.0		28	SS			Sandy silt, little to some clay - brown to gray - loose - moist (ML)
	56.0	29	SS			Silty clay, little fine to coarse sand - brown and gray - stiff (CL)
	58.0	30	SS			Clayey silt, little to some fine to coarse sand - brown and gray - stiff - moist (CL-ML)
60.0		30A	SS			Silty fine to medium sand, little to trace clay - gray - loose to very loose - wet - saturated (SM)
	59.0	31	SS			
	64.0	32	SS			
65.0		33	SS			Silty fine to medium sand, trace clay - orangish brown - very loose - saturated (SM)
	66.0	34	SS			Silty fine to medium sand - orangish brown - loose - saturated (SM)
	70.0	35	SS			
70.0		36	SS			Fine to coarse sand, little silt - orangish brown - medium dense - saturated (SP-SM)
	73.5	37	SS			
75.0		37A	SS			Silty fine to medium sand, little gravel, trace fine to medium clay - brown - extremely dense - saturated (SM)
	75.0	38	RB			Borehole caved in at 37 ft. after sampling to 74.5 ft. and remaining open over night. Drilled to 75.0 ft.
	75.8	39	SS			Weathered shale - dark brown and gray
80.0			RB			Driller's Note: Apparent shale bedrock



... continued

* Calibrated Penetrometer

WORK IN PROGRESS WITH DATE 6/8/09 60095742-2009 BORINGS.GPJ FS_DATATEMPLATE.GDT 6/8/09


The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM	CLIENT Tennessee Valley Authority	LOG OF BORING NUMBER 09-605
	PROJECT NAME Kingston Dredge Cell Failure RCA	ARCHITECT-ENGINEER OGC

SITE LOCATION
714 Swan Pond Road; Harriman, Tennessee

DEPTH(FT) ELEVATION(FT) SAMPLE NO. SAMPLE TYPE SAMPLE DISTANCE RECOVERY	DESCRIPTION OF MATERIAL	UNCONFINED COMPRESSIVE STRENGTH TONS/FT. ²	1	2	3	4	5
		PLASTIC LIMIT %	10	20	30	40	50
		WATER CONTENT %	10	20	30	40	50
		LIQUID LIMIT %	10	20	30	40	50
		STANDARD PENETRATION BLOWS/(FT)	10	20	30	40	50

SURFACE ELEVATION +781.74 (Continued)

82.0	 Driller's Note: Apparent shale bedrock						
	End of Boring Boring advanced to 18.0 ft. with power auger. Boring advanced from 18.0 to 82.0 ft. with rock bit and drilling fluid. Borehole grouted upon completion. Installed inclinometer to 82 ft. Casing used: 18 ft. of 4 in. Automatic-Diedrich hammer used for Standard Penetration Tests. SS* = SPT value based on first 6 in. WOH = Weight of Hammer WOR = Weight of Rod (FA) = Fly Ash (BA) = Bottom Ash	* Calibrated Penetrometer					

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

WL Dry to 20.0 ft. WD	BORING STARTED 2/23/09	AECOM OFFICE Chicago Area - 01
NORTHING 556277.45	BORING COMPLETED 2/25/09	ENTERED BY KKB
EASTING 2441498.35	RIG/FOREMAN D-50/JC	SHEET NO. 3 OF 3 AECOM JOB NO. 60095742

WORK IN PROGRESS WITH DATE 60095742-2009 BORINGS.GPJ FS_DATATEMPLATE.GDT 6/8/09



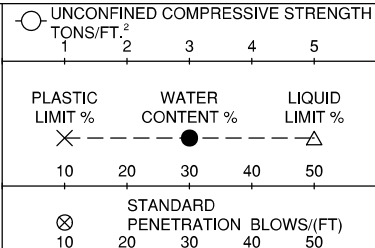
CLIENT
Tennessee Valley Authority

PROJECT NAME
Kingston Dredge Cell Failure RCA

LOG OF BORING NUMBER **09-109**

ARCHITECT-ENGINEER
OGC

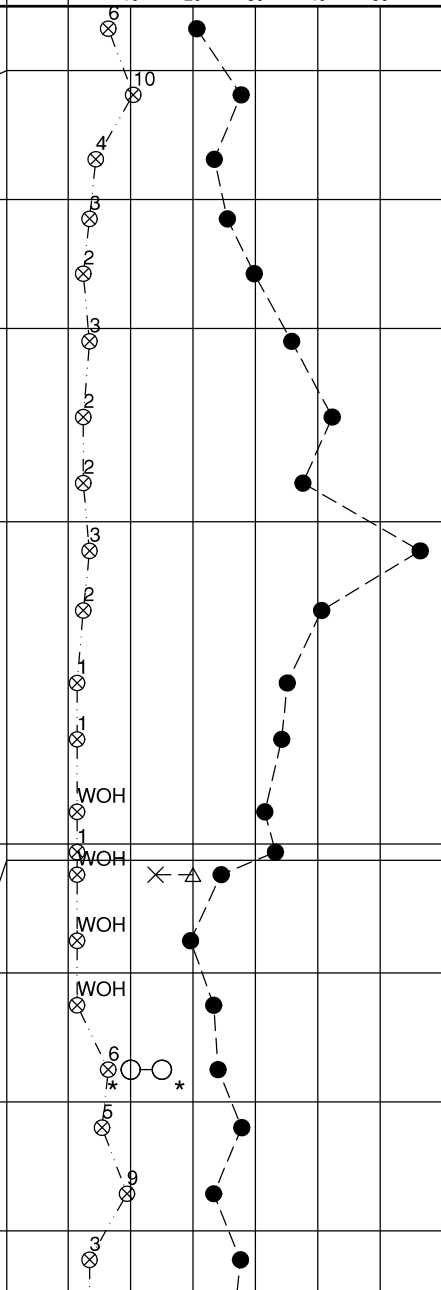
SITE LOCATION
714 Swan Pond Road; Harriman, Tennessee



DEPTH(FT)	ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL
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UNIT DRY WT. LBS./FT.³

DEPTH(FT)	ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL
						SURFACE ELEVATION +763.59
		1	SS			Fill: Silty fine to medium sand-sized ash, trace clay - gray - loose - moist (SM) (FA) Failed
		2	SS			Fill: Silt-sized ash, little fine sand - gray - medium dense to loose - moist (ML) Sample 3: 2 in. seam of reddish brown silty clay noted. (FA) Failed
5.0		3	SS			
		4	SS			Fill: Silty sand-sized ash - gray - very loose - wet (SM) (FA & BA) Failed
10.0		5	SS			
		6	SS			Fill: Sandy silt-sized ash, little clay - gray - very loose - saturated (ML) (FA) Failed
15.0		7	SS			
		8	SS			
		9	SS			Fill: Silt-sized ash, little clay, trace fine sand - gray - very loose - saturated (ML) (FA) Failed
20.0		10	SS			
		11	SS			
25.0		12	SS			
		13	SS			
		14	SS*			Silt, little clay and trace fine sand interbedded with silt-sized ash slimes - dark gray and black - wet (ML) & (FA)
		14A	SS			
30.0		15	SS			Clayey silt, some fine to medium sand - brownish gray to grayish brown - very loose (CL-ML)
		16	SS			Clayey silt, little fine to medium sand - brown and gray - stiff (CL-ML)
35.0		17	SS			
		18	SS			Silty fine to medium sand, little clay - light brown - loose - saturated (SM)
		19	SS			
40.0		20	SS			Silty fine to medium sand, little clay - reddish brown - very loose to loose - saturated (SM)



... continued

* Calibrated Penetrometer

WORK IN PROGRESS WITH DATE 6/9/09 BORINGS.GPJ FS_DATATEMPLATE.GDT 6/9/09

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

AECOM JOB NO. **60095742**

SHEET NO. **1** OF **2**

AECOM	CLIENT Tennessee Valley Authority	LOG OF BORING NUMBER 09-109
	PROJECT NAME Kingston Dredge Cell Failure RCA	ARCHITECT-ENGINEER OGC

SITE LOCATION
714 Swan Pond Road; Harriman, Tennessee

DEPTH(FT) ELEVATION(FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT. ³	UNCONFINED COMPRESSIVE STRENGTH TONS/FT. ²						
							1	2	3	4	5		
SURFACE ELEVATION +763.59 (Continued)							PLASTIC LIMIT %			WATER CONTENT %		LIQUID LIMIT %	
							10	20	30	40	50		
							STANDARD PENETRATION BLOWS/(FT)						
							10	20	30	40	50		
	21	SS			Silty fine to medium sand, little clay - reddish brown - very loose to loose - saturated (SM)								
	22	SS											
45.0	23	SS											
	24	SS											
					48.0								
	25	SS			Silty fine to medium sand, little clay - reddish brown to brown - medium dense - saturated (SM)								
50.0	26	SS											
	27	SS											
					54.0								
55.0	28	SS			Fine to medium sand, little silt, trace clay - brown - medium dense - saturated (SM)								
	29	SS											
	30	SS											
60.0	30A	SS			Gravelly fine to coarse sand, little silt, trace clay - brown and black - dense to extremely dense - saturated (SM) Weathered shale noted.								
	31	SS											
	32	SS*											
	32A	SS											
65.0					62.4 Weathered shale - gray Drilled without sampling Driller's Note: Apparent bedrock								
		RB											
68.0					62.7 End of Boring Borehole advanced to 8.0 ft. with power auger. Borehole advanced from 8.0 to 68 feet with rock bit and drilling fluid. Borehole grouted upon completion and inclinometer installed to 68 ft. Casing used: 8 ft. of 4 in. Automatic-Diedrich Hammer used for Standard Penetration Tests. SS* = SPT value based on first 6 in. WOH = Weight of Hammer (FA) = Fly Ash (BA) = Bottom Ash								

The stratification lines represent the approximate boundary lines between soil types: in situ, the transition may be gradual.

WL 7.3 ft. WD	BORING STARTED 2/12/09	AECOM OFFICE Chicago Area - 01
NORTHING 556971.56	BORING COMPLETED 2/12/09	ENTERED BY KKB
EASTING 2441627.44	RIG/FOREMAN D-50/JD	SHEET NO. 2 OF 2
		APP'D BY RCR
		AECOM JOB NO. 60095742

WORK IN PROGRESS WITH DATE 60095742-2009 BORINGS.GPJ FS_DATA\TEMPLATE.GDT 6/9/09

Project No.	171468117	Location	N 556623.08, E 2441563.81 (NAD27)	
Project Name	Kingston Fossil Plant Dike D Buttress	Boring No.	B-1	Total Depth 73.7 ft

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
707.5'	66.7'	Silty Sand (alluvium), orange to brown, wet, fine grained, poorly graded (Continued)							decreasing fines content with depth
700.5'	73.7'	Shale, (augered)							Slope Inclinerometer B-1 installed

No Refusal /
Bottom of Hole

Top of Rock = 66.7'
Elevation (707.5')

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Project No.	171468117	Location	N 556877.44, E 2441744.70 (NAD27)		
Project Name	Kingston Fossil Plant Dike D Buttress	Boring No.	B-2	Total Depth	78.0 ft
Location	Kingston, Tennessee	Surface Elevation	774.1 ft. (NGVD29)		
Project Type	Geotechnical Exploration	Date Started	12/26/08	Completed	12/27/08
Supervisor	Jim Andrew	Driller	G. Thompson	Depth to Water	N/A
Logged By	Jim Andrew	Depth to Water	N/A	Date/Time	N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
774.1'	0.0'	Top of Hole							
		Bottom Ash, gray to dark gray, dry to wet, very loose to dense, fine to coarse grained, sand-sized particles, non-plastic							Boring location surveyed by TVA SPTs driven with 140-lb auto hammer
				SPT-1	5.0 - 6.5		5-6-15	--	
				SPT-2	10.0 - 11.5		8-14-11	15	material is dry from 5.0 feet to 12.5 feet
				SPT-3	12.5 - 14.0		19-24-24	--	
				SPT-4	15.0 - 16.5		8-13-14	--	
				SPT-5	17.5 - 19.0		5-5-6	--	material becomes wet at 17.5 feet
				SPT-6	20.0 - 21.5		3-2-2	--	
				SPT-7	22.5 - 24.0		wh-wh-wh	24	
				SPT-8	25.0 - 26.5		wh-wh-wh	--	wh = weight of hammer
				SPT-9	27.5 - 29.0		wh-wh-wh	--	
				SPT-10	30.0 - 31.5		wh-wh-wh	--	
				SPT-11	32.5 - 34.0		wh-wh-wh	--	
				SPT-12	35.0 - 36.5		1-1-3	--	
				SPT-13	37.5 - 39.0		2-2-1	26	
				SPT-14	40.0 - 41.5		wh-wh-wh	46	
730.6'	43.5'			SPT-15	42.5 - 44.0		wh-wh-3	--	

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Project No.	171468117	Location	N 556877.44, E 2441744.70 (NAD27)		
Project Name	Kingston Fossil Plant Dike D Buttress	Boring No.	B-2	Total Depth	78.0 ft

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
		Silty Sand (alluvium), orange to brown, wet, very loose to medium dense, fine grained, poorly graded <i>(Continued)</i>		SPT-16	45.0 - 46.5		2-3-2	--	
			SPT-17	47.5 - 49.0		1-wh-wh	21		
			SPT-18	50.0 - 51.5		wh-wh-wh	--		
			SPT-19	52.5 - 54.0		2-1-3	--		
			SPT-20	55.0 - 56.5		2-4-5	--		decreasing fines content with depth
			SPT-21	57.5 - 59.0		2-2-2	24		
			SPT-22	60.0 - 61.5		5-5-6	--		
			SPT-23	62.5 - 64.0		6-9-8	--		
			SPT-24	65.0 - 66.5		3-2-1	--		
			SPT-25	67.5 - 69.0		9-10-10	--		
			SPT-26	70.0 - 71.5		9-7-10	23		
700.5'	73.6'								
696.1'	78.0'	Shale, (augered)							Slope Inclinator B-2 installed
		No Refusal / Bottom of Hole							
		Top of Rock = 73.6' Elevation (700.5')							

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Project No.	171468117	Location	N 557061.67, E 2441887.56 (NAD27)		
Project Name	Kingston Fossil Plant Dike D Buttress	Boring No.	B-3	Total Depth	60.2 ft
Location	Kingston, Tennessee	Surface Elevation	770.9 ft. (NGVD29)		
Project Type	Geotechnical Exploration	Date Started	12/29/08	Completed	12/29/08
Supervisor	Patrick Kiser	Driller	G. Thompson	Depth to Water	N/A
Logged By	Patrick Kiser	Depth to Water	N/A	Date/Time	N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
770.9'	0.0'	Top of Hole							
		Bottom Ash, dark gray to gray, damp to wet, fine to coarse grained sand-sized particles, non-plastic							Boring location surveyed by TVA
									Boring logged by auger cuttings; no sampling performed
									material becomes wet at 18.0 feet
									Zone of coarse gravel 25.0 feet - 30.0 feet
728.9'	42.0'								

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Project No.	171468117	Location	N 557061.67, E 2441887.56 (NAD27)		
Project Name	Kingston Fossil Plant Dike D Buttress	Boring No.	B-3	Total Depth	60.2 ft

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
714.4'	56.5'	Silty Sand (alluvium), orange to brown, wet, fine grained, poorly graded (Continued)							
710.7'	60.2'	Shale, (augered)							Slope Inclinerometer B-3 installed
No Refusal / Bottom of Hole Top of Rock = 56.5' Elevation (714.4')									

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Project No.	171468117	Location	N 556934.61, E 2442066.28 (NAD27)		
Project Name	Kingston Fossil Plant Dike D Buttress	Boring No.	B-4	Total Depth	59.5 ft
Location	Kingston, Tennessee	Surface Elevation	764.2 ft. (NGVD29)		
Project Type	Geotechnical Exploration	Date Started	12/28/08	Completed	12/29/08
Supervisor	Patrick Kiser	Driller	G. Thompson	Depth to Water	N/A
Logged By	Patrick Kiser	Depth to Water	N/A	Date/Time	N/A

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
764.2'	0.0'	Top of Hole							
759.7'	4.5'	Bottom Ash, gray to dark gray, dry to damp, very dense, fine to coarse grained sand-sized particles, non-plastic		SPT-1	2.0 - 3.5	1.5	8-24-35	--	Boring location surveyed by TVA SPTs driven with 140-lb auto hammer material becomes wet at 12.0 feet
756.4'	7.8'	Sandy Lean Clay, red - brown, moist, medium stiff to stiff, with sand sized chert particles		SPT-2	5.0 - 6.5	1.4	5-5-7	24	
		Bottom Ash, gray to dark gray, dry to wet, loose to medium dense, fine to coarse grained sand-sized particles, non-plastic		SPT-3	7.5 - 9.0	1.2	5-14-16	17	
			SPT-4	10.0 - 11.5	0.6	3-7-5	17		
748.3'	15.9'	Sandy Lean Clay, red - brown, moist, medium stiff to stiff, with sand layers and lenses		SPT-5	15.0 - 16.5	0.6	2-3-1	--	
			SPT-6	20.0 - 21.5	0.9	1-1-3	29		
741.6'	22.6'	Bottom Ash, gray to dark gray, dry to wet, loose to medium dense, fine to coarse grained sand-sized particles, non-plastic		SPT-7	22.5 - 24.0	1.5	4-10-9	--	
			SPT-8	25.0 - 26.5	1.0	3-4-5	--		
			SPT-9	27.5 - 29.0	1.5	4-5-3	20		
			SPT-10	30.0 - 31.5	1.5	2-2-4	--		
			SPT-11	32.5 - 34.0	1.5	3-3-1	--		
728.8'	35.4'		Silty Sand (alluvium), orange to brown, wet, very loose to loose, fine grained, poorly graded		SPT-12	35.0 - 36.5	1.5	2-1-3	
		SPT-13		37.5 - 39.0	0.6	1-2-3	--		
		SPT-14		40.0 - 41.5	1.2	1-1-1	19		

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Project No.	171468117	Location	N 556934.61, E 2442066.28 (NAD27)		
Project Name	Kingston Fossil Plant Dike D Buttress	Boring No.	B-4	Total Depth	59.5 ft

Lithology		Description	Overburden	Sample #	Depth	Rec. Ft.	Blows	Mois.Cont. %	Remarks
Elevation	Depth		Rock Core	RQD	Run	Rec. Ft.	Rec. %	Run Depth	
712.1'	52.1'	Silty Sand (alluvium), orange to brown, wet, very loose to loose, fine grained, poorly graded <i>(Continued)</i>							
704.7'	59.5'	Shale, (augered)							Slope Inclinometer B-4 installed

No Refusal /
Bottom of Hole

Top of Rock = 52.1'
Elevation (712.1')

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Appendix C

Draft Dike Inspection Reporting Form



TVA Fossil Power Group Monthly CCP Impoundment Safety Inspection Checklist

1. General Information

Monthly safety inspections of CCP disposal impoundments / facilities shall be performed by plant personnel and documented using this form. Forms shall be filed on site. Any serious findings shall be immediately reported to appropriate TVA personnel. Particular attention should be given to evidence of (or changes in) seepage, slope instabilities, sinkholes, boils, crest settlement, cracking, and improper functioning of spillways and outlet structures.

Plant:

Inspection Date:

CCP Facility:

Inspection Personnel:

Weather Conditions:

2. Observations and Notes

2.1 Dike Crest:

Settlement/Cracking: Yes () No () New () Existing ()

Location/Description/Observations:

Rutting: Yes () No () New () Existing ()

Location/Description/Observations:

Erosion: Yes () No () New () Existing ()

Location/Description/Observations:

2.2 Interior and Exterior Dike Slopes:

Freeboard: _____ feet (estimated)

Changes from Last Inspection/Observations:

Steep Slopes: Yes () No () New () Existing ()

Location/Description/Observations:



**Instabilities (slides,
sloughs, or scarps):**

Yes () No () New () Existing ()

Location/Description/Observations:

Erosion:

Yes () No () New () Existing ()

Location/Description/Observations:

Vegetation/Brush:

Bare () Sparse () Adequate () Dense ()

Change from Last Inspection/Description /Observations:

Trees:

Yes () No () New () Existing ()

Location/Size/Observations:

Animal Burrows:

Yes () No () New () Existing ()

Location/Description/Observations:

Sinkholes:

Yes () No () New () Existing ()

Location/Description/Size/Observations:

Seepage:

Yes () No () New () Existing ()

Location/Description/Size:

Increase in flow from last inspection? Yes () No () NA ()

Estimated Flow Rate: _____ gallons per minute

Clear () or Dirty () water emitting

Growing in Size? Yes () No ()

Other Observations:



2.3 Dike Toe Areas:

Seepage:

Yes () No () New () Existing ()

Location/Description/Size:

Increase in flow from last inspection? Yes () No () NA ()

Estimated flow rate: _____ gallons per minute

Clear () or Dirty () water emitting

Growing in Size? Yes () No ()

Other Observations:

Boils:

Yes () No () New () Existing ()

Location/Description/Size:

Increase in flow from last inspection? Yes () No () NA ()

Estimated flow rate: _____ gallons per minute

Clear () or Dirty () water emitting.

Growing in Size? Yes () No ()

Other Observations:

2.4 Seepage Collection System:

Is there a seepage collection system for this impoundment? Yes () No ()

If yes, provide the following information:

Location of System:

Increase in flow from last inspection? Yes () No ()

Estimated flow rate: _____ gallons per minute

Clear () or dirty () water emitting.

Other Observations/Changes from Last Inspection:



2.5 Spillway Weirs and Outlet System:

Outlet System Type: Spillway Weir/Risers () Pumps () Other () _____

Riser or Outlet Pipe Joint Leakage/Separation: Yes () No () New () Existing () Not able to inspect ()

Description/Observations:

Riser or Outlet Pipe Misalignment: Yes () No () New () Existing () Not able to Inspect ()

Description/Observations:

Headwall Condition At Outlet: Good () Poor w/ Cracking () No Headwall ()

Description/Observations:

Working Order of Pump Outlets (if applicable): Good () Need Maintenance () NA ()

Description/Observations:

Discharge Channel Condition: Good () Erosion () Sloughing () Blockage ()

Description/Observations:

Other Observations:

3. Closure

Recommended Maintenance (as a result of this inspection):

Items for Follow-up Next Inspection:

List of Attachments (Photos, Sketches, Drawings or Illustrations):