Tennessee Valley Authority
Regulatory Submittal for Kingston Fossil Plant

Documents submitted:
Interim Dredge Cell Ash Staking and Instrumentation Design Package

Date Submitted:
08/24/2010

Submitted to whom
Craig Zeller

Concurrence

Received	Not Applicable	TVA
☒	☐	Steve McCracken
☒	☐	Michelle Cagley
☒	☐	Kathryn Nash
☒	☐	Steve Cherry
☐	☐	

Received	Not Applicable	Jacobs
☒	☐	Steve Richardson
☒	☐	Butch Parton
☐	☐	
☐	☐	
☐	☐	
☐	☐	

Approvals

TVA _____ Date 8/24/010

EPA _____ Date 9/02/10

CONSULTED W/ TDEC

cc:

- ☒ Anda Ray, TVA
- ☒ Barbara Scott, TDEC
- ☒ Leo Francendese, EPA
- ☒ Craig Zeller, EPA
- ☒ Dennis Yankee, TVA
- ☒ Kathryn Nash, TVA
- ☒ Cynthia Anderson, TVA
- ☒ Steve McCracken, TVA
- ☒ EDM
- ☒ Julie Pfeffer, Jacobs
- ☒ Steve Richardson, Jacobs
- ☒ Michelle Cagley, TVA
- ☒ Greg Signer, TVA
- ☒ KIF Incident Document Control
- ☒ Katie Kline, TVA
- ☒ Dannena Bowman, EPA
- ☒ Jeff Gary, Jacobs
- ☒ Robert Pullen, Jacobs
- ☒ Brenda Brickhouse, TVA
- ☒ John Dizer, TVA

Response to Comments
IFC 100% Submittal
Interim Dredge Cell Ash Stacking and Instrumentation Plan

Comment	Source	Response
Quality Control Plan		
General comment: The Quality Control Plan, as presented on 8/23/2010 is fairly generic in nature. This is understandable insofar as the Plan as submitted allows TVA and its contractors a great deal of flexibility in execution. It is expected that the plan will become more explicit as the project unfolds.	**TDEC**	Noted.
Section 2.2, page 1 – The specification for the QC manager does not state that the position will be held by an *independent* (i.e., not a direct employee of TVA) Tennessee licensed professional engineer.	**TDEC**	For this project, Stantec has been designated as the QC Manager. As noted in Section 2.2 of the QC plan and the Quality Control Task Summary, the QC Manager shall be a professional engineer licensed in Tennessee.
Section 3.2, page 2 – discusses the use of alternative construction and QC methods, but does not discuss performance equivalency or TDEC approval for substitution. A field change order process should be established for the entire project. Any proposed construction or QC method changes submitted to the owner shall also be submitted to the TDEC On-site Manager for TDEC review and approval prior to implementation.	**TDEC**	Field modifications will be based on geotechnical data/analyses along with visual observations made by the QC Team during the work. Modifications to established criteria will be documented/submitted to the regulatory contact through weekly summary reports. TVA is preparing a field change order process for the entire project. This will be submitted under separate cover.
Section 4.3, page 3 – This document needs to include the optimum percent moisture content (~25%). Strike "..or as established by the QC manager based on field observations and testing" from the last sentence.	**TDEC**	Retrieved ash is anticipated to have varying optimum moisture content and maximum dry density parameters. The optimum moisture content will be established by standard Proctor testing for representative samples of predominant fill

Comment	Source	Response
		materials used in embankment construction. The minimum testing frequency is established at 10,000 cubic yards as outlined in the testing schedule. The QC Manager may need to use alternative methods to assess moisture due to variances in material type/consistency recognized between established testing intervals. These methods, if employed, will be communicated to the regulatory contact through weekly summary reports. The QC Plan will be amended to say "Materials shall be compacted to a minimum of 90 percent of the standard Proctor maximum dry density at a moisture content within minus four percent and plus two percent of optimum. The QC Manager may make adjustments to this moisture range based on field observations and testing." Requested laboratory testing of ash materials that have been used in dredge cell construction are attached. Proctor data accompanied by gradations represent initial characterization testing. Additional proctor data represents conformance testing performed during construction.
Section 5.1.d., page 4 – states that surfaces destined to receive geotextile should be prepared to a "relatively" smooth surface. Although it is likely that this material will be free of rocks, sticks, hard clods etc, it is not impossible that they could be present. "Relatively" is an objective term, and I would suggest that language to the effect of those surfaces being smooth-rolled and visually inspected (walked-down) to verify	**TDEC**	The QC Team will visually observe the existing surfaces prior to geotextile installation to confirm that surfaces meet the QC objectives outlined in Section 5.1 of the QC Plan.

Comment	Source	Response
the absence of protrusions at the surface prior to laying the geotextile be used instead.		
Section 5.1.g., page 5 – Change "displacement" to read "displacement/damage".	**TDEC**	Concur.
Section 6, page 5, second paragraph – states that the erosion control structures will be monitored "periodically". I recommend that a routine frequency be established, plus a visual inspection after each significant rainfall event. Also, should include submission of "adjustments" (changes) to TDEC for notification purposes (no approval required).	**TDEC**	The inspections will be conducted in accordance with the current Storm Water Management Plan (SWMP). The SWMP outlines these minimum inspection frequencies and notification requirements. The site SWMP inspector is tasked with managing this program and has the responsibility to ensure that applicable regulatory requirements are met.
Section 9.2, page 6, – This part should include the units of measure and the detection limit for measuring changes in readings for the piezometers, inclinometers and settlement plates.	**TDEC**	The units of measure for piezometer readings are in millivolts that are converted to feet of head and psf. The vibrating wire piezometers being installed have a range of 3.45 bars (50 psi). The resolution is 0.025% of Full Scale (FS), which is .0125 psi. Manufacturer's specifications are attached. Inclinometer readings are made digitally and are reported in inches. Readings are made to the nearest one hundred thousandths of a foot (0.00012 inches) based on the attached calibration report. Manufacturer's specifications are attached Settlement plates are surveyed to the nearest one-hundredth of a foot.
Section 9.4, page 7, Thresholds – Need to provide formulae for determining initial pore pressure and percent difference in pore	**TDEC**	The baseline data referenced in Section 9.3 includes the initial piezometer readings. Pressure

Comment	Source	Response
pressure. Should also include a description of how the crew will collect and review data and make the determination of the need to inform the QC Manager of the need to stop work.		ratios during embankment constructed are calculated by: [(current piezometer reading – initial piezometer reading) divided by (the fill height times 110 pcf)]. Readings of geotechnical Instrumentation are performed daily in active work areas and weekly elsewhere as noted in the Material Testing and Product Certification Schedule attached to the QC Plan. As the team collects piezometer data, current readings are compared to previous readings. Significant differences in readings are reviewed by the QC Manager. Data used to calculate the displacement ratio is processed in a timely fashion with the results compared to thresholds. Results of these reviews are compared to established thresholds and decisions are made relative to restrictions to filling activities, additional stability analyses, etc.
Section 4.1, General Strike the first sentence – maximum to allow pore pressure dissipation would be very thin and this is not the intent. (4.2 says 12 – inch loose maximum)	**BoR**	The current grading plan provides for individual lifts of material to be spread across relatively large areas (or maximum horizontal extent possible). This provides an opportunity for excess pore pressures to dissipate prior to subsequent lifts.
Second sentence - Strike “unless otherwise approved ” There should be no reason for construction greater than 2 feet per day.	**BoR**	Results from the geotechnical instrumentation monitoring program along with additional stability analyses will be used in combination to assess whether this maximum daily filling limit (within discrete footprints) will be adjusted. Any adjustments will be consistent with documented stability objectives for the project.

Comment	Source	Response
After Section 4.1 and before Section 4.2 there should be written specifications regarding “Excavation”	**BoR**	The excavation of materials to achieve the lines and grades shown are left as a means and methods issue for the Contractor for this project.
Section 4.3 Compaction - First paragraph - strike “or as established by the QC Manager based on field observations and testing.” There should be no reason to vary from this specification.	**BoR**	The maximum dry density will be established by standard Proctor testing for representative samples of predominant fill materials used in embankment construction. The minimum testing frequency is established at 10,000 cubic yards as outlined in the testing schedule. The QC Manager may need to use alternative methods to assess compaction due to variances in material type/consistency recognized between established testing intervals. These methods, if employed, will be communicated to the regulatory contact through weekly summary reports. The QC Plan will be amended to say “Materials shall be compacted to a minimum of 90 percent of the standard Proctor maximum dry density at a moisture content within minus four percent and plus two percent of optimum. The QC Manager may make adjustments to this moisture range based on field observations and testing.”
4.4 QC Requirements - ·Specify the testing frequency – minimum of one in place proctor density and one laboratory moisture per day.	**BoR**	The testing schedule calls for a minimum of five nuclear density tests per acre per lift. Device calibration (or assessment of laboratory moistures vs. field moistures) will be conducted as needed.

Comment	Source	Response
After Section 4 and before Section 5 there should be an entire section on drainage ditch construction.	**BoR**	These are temporary ditches that will be removed in two to three years. The ditch materials, which include geotextile fabric and riprap, have established material and placement objectives to be met. The drawings establish the layout (and minimum slope) along with a typical construction detail.
In the ditch construction specification there needs to be explanation of the note on the drawing which states “Temporary crossings of the Perimeter Ditch shall be developed by the Contractor subject to approval by the QC Manager”	**BoR**	The Contractor may need to cross the perimeter ditch for access. If so, a means and method such as a culvert crossing or low water crossing will be developed by the Contractor. The QC Manager will check the proposed crossing for hydraulic capacity as part of TVA’s approval process.
Specification regarding the ditch protection needs to be defined. There are specifications for riprap which must be for the ditch construction?	**BoR**	These are temporary ditches that will be removed in two to three years. The ditch shall be protected in accordance with the current SWMP. The site SWMP inspector is tasked with managing this program and has the responsibility to ensure that applicable regulatory requirements are met. Riprap is intended for ditch construction or check dams, if needed.
There should be means for measuring the flow in the ditch in the QC requirements	**BoR**	We do not believe this is necessary as the data will not be used for design purposes; however, if this changes, flow rates may be estimated by measuring the depth of flow.
Section 5.1f should read “deployment to prevent ultraviolet light degradation”	**BoR**	Concur. The section will be revised to read “to protect the geotextile from ultraviolet light

Comment	Source	Response
		degradation”.
General Comments - There is general concern that the existing working pad under the formerly constructed “test cell” could be walled off with relatively impermeable material under the revised cell design. Therefore we offer two recommendations: If the elevation of the “rock” working pad is similar to the to-be-constructed capillary break, then the use of this pad as a draining feature should be tied into the capillary break. If the elevation of the “rock” working pad is lower and cannot be connected to the to-be-constructed capillary break, then the use of this pad as a draining feature should be tied into a rock “finger” or “road” of rock from the test cell working pad all the way into the drainage ditch of this project.	**BoR**	Portions of the working platform constructed at the base of the test embankment will be below the projected long-term groundwater elevation (based on current groundwater study). The capillary break is not a drainage layer and is intended to mitigate the potential for capillary rise within the constructed embankment. The capillary break, where constructed, will be established within critical areas (to meet stability objectives) above the projected long term groundwater elevation. Pore pressures (during filling activities) will be controlled through stacking rates based on the results from the geotechnical instrumentation monitoring program.

Stantec

Summary of Soil Tests

Project Name	TVA Kingston Plant Dike Failure	Project Number	171468117
Source	Kingston Fly Ash	Lab ID	30
County	N/A	Date Received	3-5-09
Sample Type	Bag	Date Reported	3-18-09

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 24.5

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
3"	75	
2"	50	
1 1/2"	37.5	
1"	25	100.0
3/4"	19	99.2
3/8"	9.5	96.5
No. 4	4.75	93.7
No. 10	2	88.3
No. 40	0.425	81.8
No. 200	0.075	59.1
	0.02	29.6
	0.005	7.6
	0.002	3.0
estimated	0.001	1.0

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	6.3	11.7
Coarse Sand	5.4	6.5
Medium Sand	6.5	---
Fine Sand	22.7	22.7
Silt	51.5	56.1
Clay	7.6	3.0

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: ---

Plastic Limit: Non Plastic

Plasticity Index: ---

Activity Index: N/A

NOTE: Assumed

Moisture-Density Relationship

Test Method: ASTM D 698 Method B

Maximum Dry Density (lb/ft^3): 82.8

Maximum Dry Density (kg/m^3): 1326

Optimum Moisture Content (%): 24.9

Over Size Correction %: N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854

Prepared: Dry

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.31

Classification

Unified Group Symbol: ML

Group Name: Sandy silt

AASHTO Classification: A-4 (0)

Comments: Atterberg Limit Test not performed.

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: TVA Kingston Plant Dike Failure
Source: Kingston Fly Ash

Project Number: 171468117
Lab ID: 30

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Weathered and Friable

Tested By: CM
Test Date: 03-10-2009
Date Received: 03-05-2009

Maximum Particle size: 1" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	100.0
3/4"	99.2
3/8"	96.5
No. 4	93.7
No. 10	88.3

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

Specific Gravity: 2.31

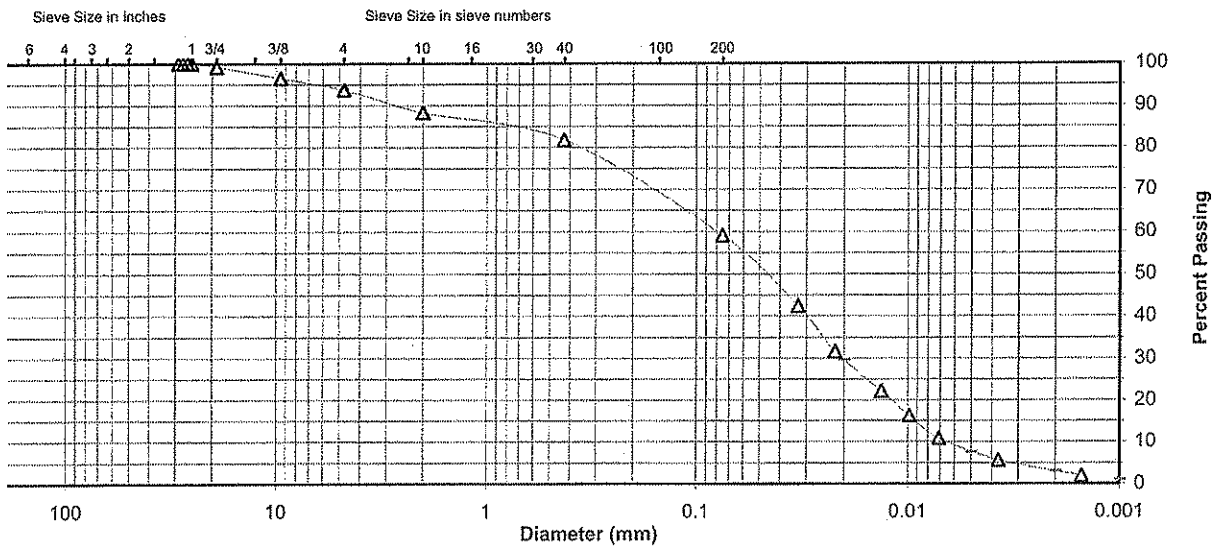
Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	81.8
No. 200	59.1
0.02 mm	29.6
0.005 mm	7.6
0.002 mm	3.0
0.001 mm	1.0

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.8	5.5	5.4	6.5	22.7	51.5	7.6

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	11.7	6.5	22.7	56.1	3.0



Comments

Reviewed By

File: frm_171468117_sum_30 Sheet: Hydro-Report
Preparation Date: 1998
Revision Date: 1-2008

Stantec Consulting Services Inc.

Laboratory Document
Prepared By: MW
Approved BY: TLK

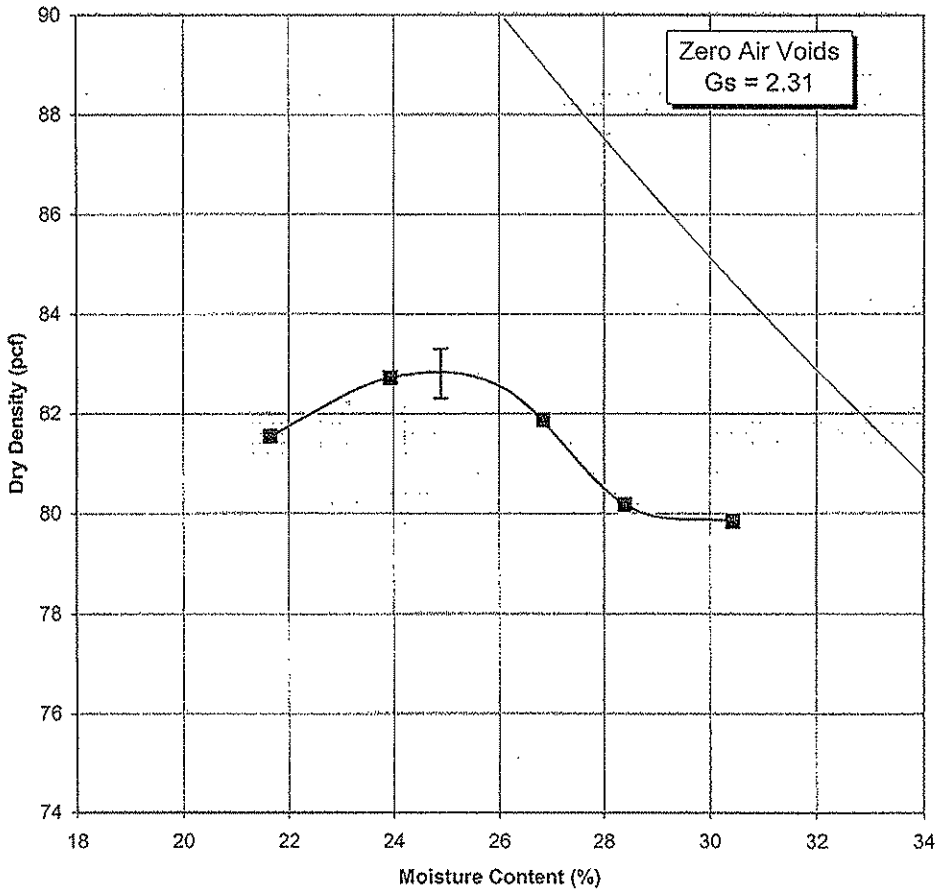
Stantec

Moisture-Density Data Sheet

Project: TVA Kingston Plant Dike Failure
Source: Kingston Fly Ash
Sample Description: Sandy Silt (ML), dark gray
Visual Notes: Bottom Ash
Prepared: Moist Oversized Fraction: 4 % Rammer: Mechanical

Project No.: 171468117
Sample No.: 30
Nmc: 19.2 %
Test Method: ASTM D 698 - Method B
Gs - Fines: ASTM D 854

Mold Weight 4215 grams		Moisture Determination				
Wet Weight plus Mold (grams)	Wet Weight minus Mold (grams)	Wet Soil and Can Weight (grams)	Dry Soil and Can Weight (grams)	Can Weight (grams)	Water Content (%)	Dry Density (pcf)
5783	1568	577.31	469.82	69.32	26.8	81.9
5770	1555	657.65	527.47	69.14	28.4	80.2
5788	1573	713.81	563.33	68.95	30.4	79.8
5764	1549	490.94	410.58	74.94	23.9	82.7
5714	1499	492.63	418.60	76.86	21.7	81.5



Maximum Dry Density 82.8 PCF
Optimum Moisture Content 24.9 %

Stantec

Summary of Soil Tests

Project Name	TVA: KIF Test Embankment	Project Number	175669015
Source	Bulk FA Sample from Stockpile	Lab ID	2
County	Roane, TN	Date Received	8-31-09
Sample Type	Bag Composite	Date Reported	10-2-09

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 25.7

Particle Size Analysis

Preparation Method: ASTM D 421

Gradation Method: ASTM D 422

Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
3"	75	
2"	50	
1 1/2"	37.5	
1"	25	
3/4"	19	100.0
3/8"	9.5	99.7
No. 4	4.75	98.9
No. 10	2	97.9
No. 40	0.425	96.3
No. 200	0.075	85.1
	0.02	53.4
	0.005	15.9
	0.002	5.2
estimated	0.001	1.0

Plus 3 in. material, not included: 0 (%)

Range	ASTM (%)	AASHTO (%)
Gravel	1.1	2.1
Coarse Sand	1.0	1.6
Medium Sand	1.6	---
Fine Sand	11.2	11.2
Silt	69.2	79.9
Clay	15.9	5.2

Atterberg Limits

Test Method: ASTM D 4318 Method A

Prepared: Dry

Liquid Limit: ---

Plastic Limit: Non Plastic

Plasticity Index: ---

Activity Index: N/A

Moisture-Density Relationship

ASTM D 698 - Method A

Maximum Dry Density (lb/ft^3): 87.6

Maximum Dry Density (kg/m^3): 1403

Optimum Moisture Content (%): 22.9

Over Size Correction %: 0

California Bearing Ratio

Test Not Performed

Bearing Ratio (%): N/A

Compacted Dry Density (lb/ft^3): N/A

Compacted Moisture Content (%): N/A

Specific Gravity

Test Method: ASTM D 854

Prepared: Dry

Particle Size: No. 10

Specific Gravity at 20° Celsius: 2.35

Classification

Unified Group Symbol: ML

Group Name: Silt

AASHTO Classification: A-4 (0)

Comments:

Reviewed by:

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name: TVA: KIF Test Embankment
Source: Bulk FA Sample from Stockpile

Project Number: 175669015
Lab ID: 2

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method: ASTM D 422
Prepared using: ASTM D 421

Particle Shape: Angular
Particle Hardness: Hard and Durable

Tested By: JF
Test Date: 09-25-2009
Date Received: 08-31-2009

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3"	
2"	
1 1/2"	
1"	
3/4"	100.0
3/8"	99.7
No. 4	98.9
No. 10	97.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on: Total Sample

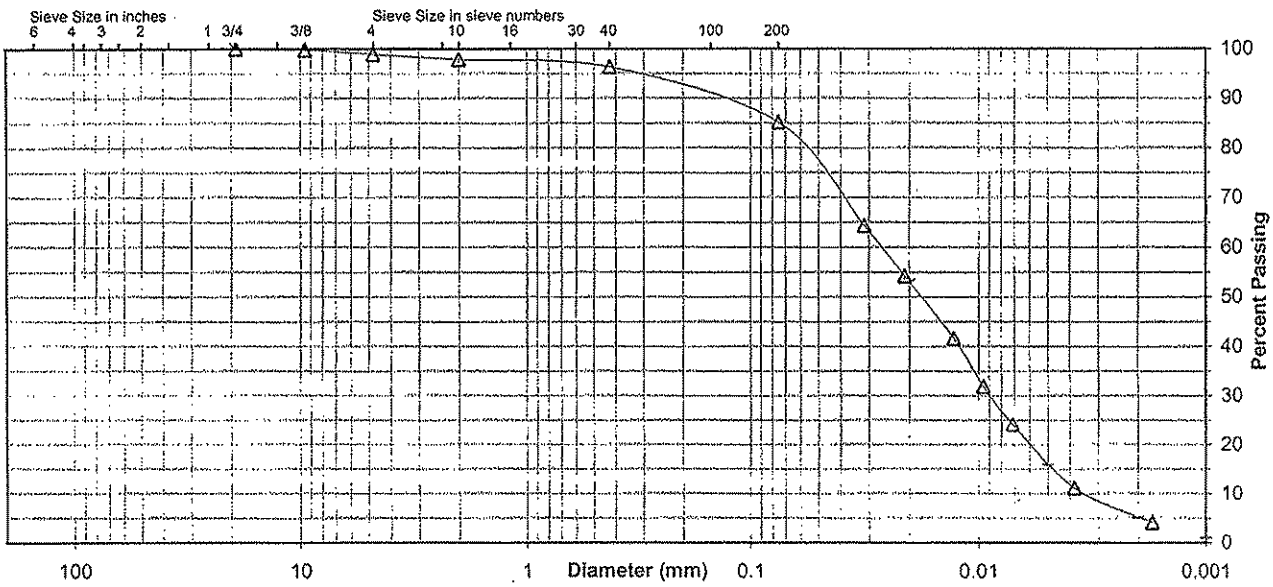
Specific Gravity: 2.35

Dispersed using: Apparatus A - Mechanical, for 1 minute

No. 40	96.3
No. 200	85.1
0.02 mm	53.4
0.005 mm	15.9
0.002 mm	5.2
0.001 mm	1.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	1.1	1.0	1.6	11.2	69.2	15.9
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	2.1			1.6	11.2	79.9	5.2



Comments

Reviewed By

File: frm_175669015_sum_2 Sheet: Hydro-Report
Preparation Date: 1998
Revision Date: 1-2008

Stantec Consulting Services Inc.

Laboratory Document
Prepared By: MW
Approved BY: TLK

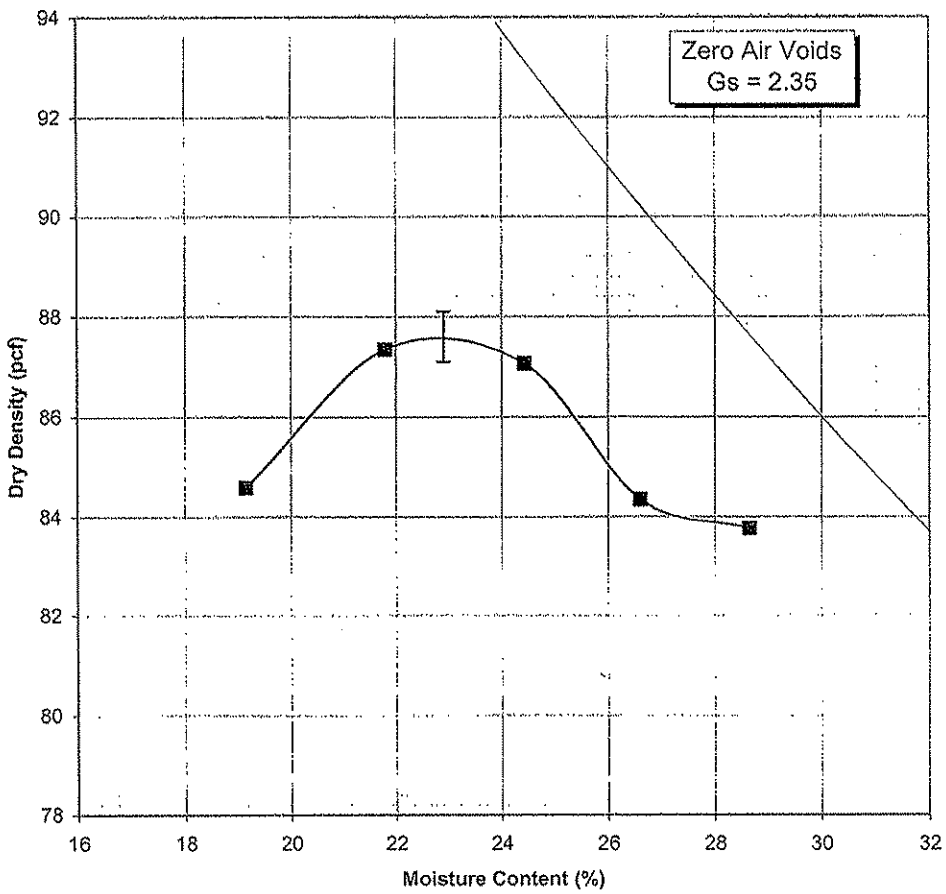
Stantec

Moisture-Density Data Sheet

Project: TVA: KIF Test Embankment
Source: Bulk FA Sample from Stockpile
Sample Description: Silt (ML), dark gray, fly ash
Visual Notes: Fly ash
Prepared: Moist Oversized Fraction: < 5 % Rammer: Mechanical

Project No.: 175669015
Sample No.: 2
Test Method: ASTM D 698 - Method A
Gs - Fines: Assumed

Mold Weight 4213.6 grams		Moisture Determination				
Wet Weight plus Mold (grams)	Wet Weight minus Mold (grams)	Wet Soil and Can Weight (grams)	Dry Soil and Can Weight (grams)	Can Weight (grams)	Water Content (%)	Dry Density (pcf)
5850	1636	399.61	334.81	69.61	24.4	87.1
5827	1613	382.65	316.76	69.13	26.6	84.3
5841	1628	496.71	401.98	71.32	28.6	83.8
5821	1607	436.15	370.96	72.01	21.8	87.3
5736	1522	475.68	410.56	70.59	19.2	84.6



Maximum Dry Density 87.6 PCF
Optimum Moisture Content 22.9 %

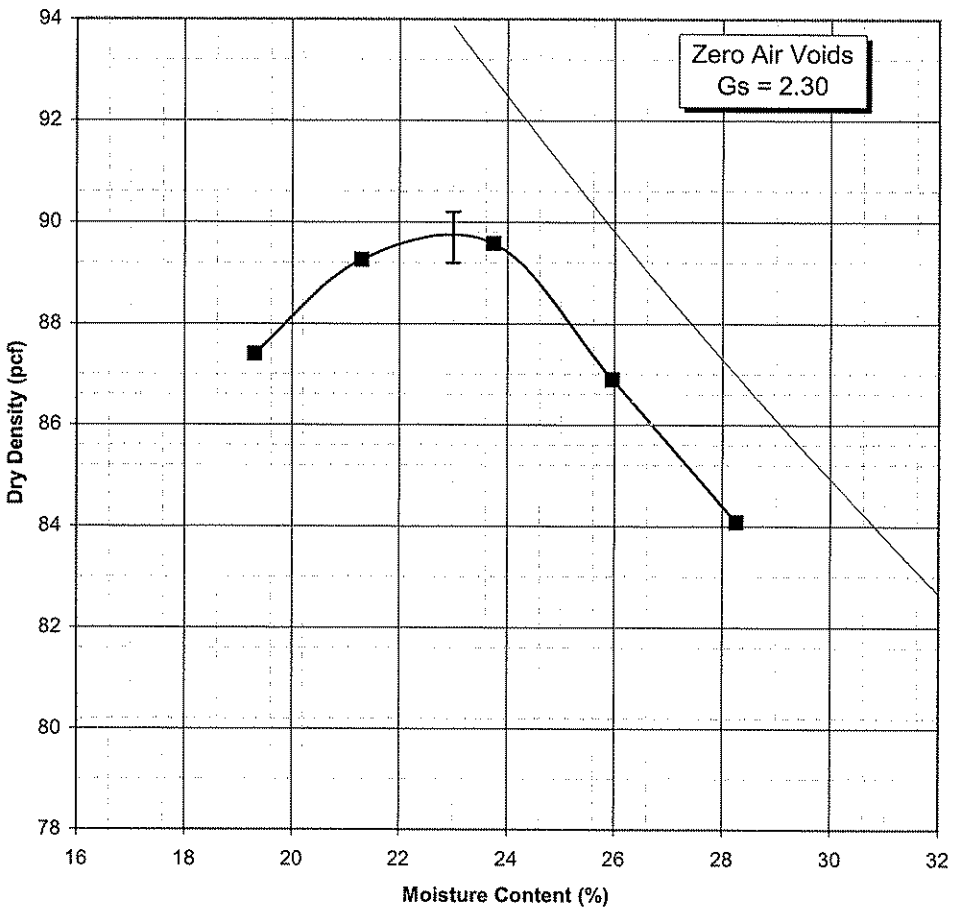
Stantec

Moisture-Density Data Sheet

Project: TVA: KIF Test Embankment
Source: Test Embankment, Bulk Sample
Sample Description: Silt (ML), dark gray
Visual Notes: fly ash
Prepared: Moist Oversized Fraction: < 5 % Rammer: Mechanical

Project No.: 175669015
Sample No.: 1
Test Method: ASTM D 698 - Method A
Gs - Fines: Assumed

Mold Weight 4215 grams		Moisture Determination				
Wet Weight plus Mold (grams)	Wet Weight minus Mold (grams)	Wet Soil and Can Weight (grams)	Dry Soil and Can Weight (grams)	Can Weight (grams)	Water Content (%)	Dry Density (pcf)
5868	1653	619.64	506.48	70.65	26.0	86.9
5844	1629	646.68	519.47	69.22	28.3	84.1
5889	1674	546.04	455.01	71.60	23.7	89.6
5850	1635	584.73	494.63	71.57	21.3	89.3
5790	1575	594.32	509.65	70.95	19.3	87.4



Maximum Dry Density 89.7 PCF
Optimum Moisture Content 23.0 %

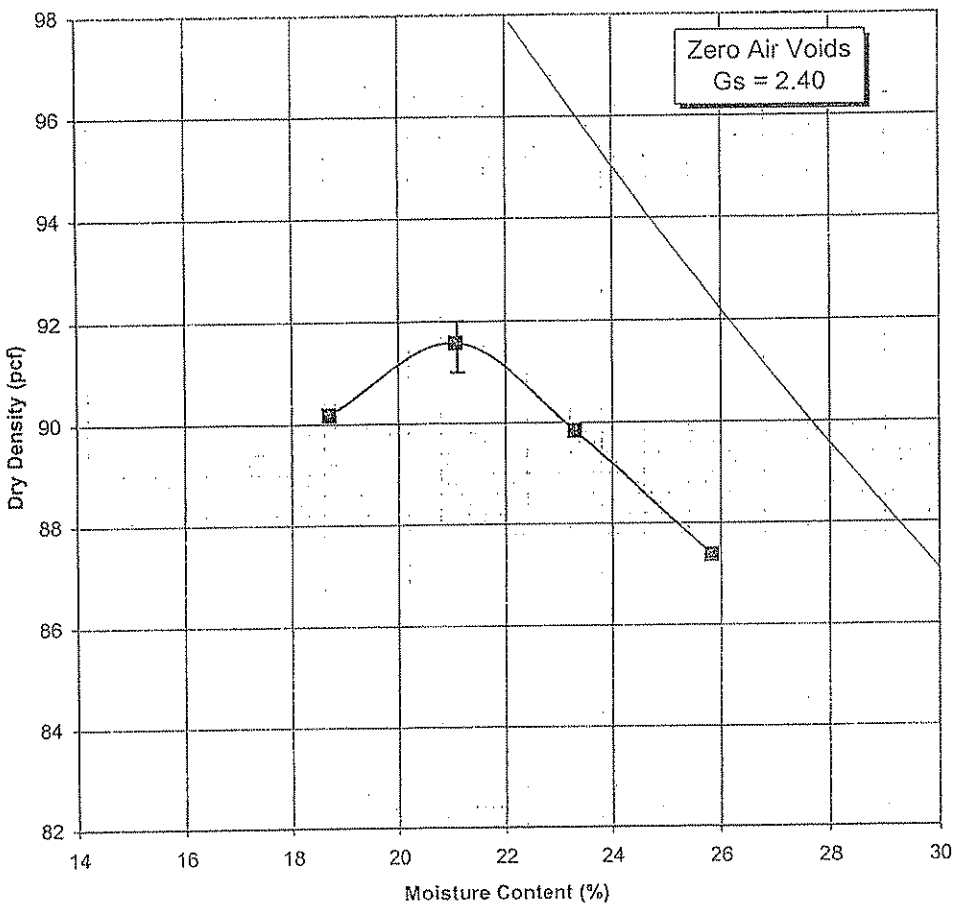
Stantec

Moisture-Density Data Sheet

Project: TVA: KIF Test Embankment
Source: BF & Relic
Sample Description: Silt (ML), gray
Visual Notes:
Prepared: Moist Oversized Fraction: < 5 % Rammer: Mechanical

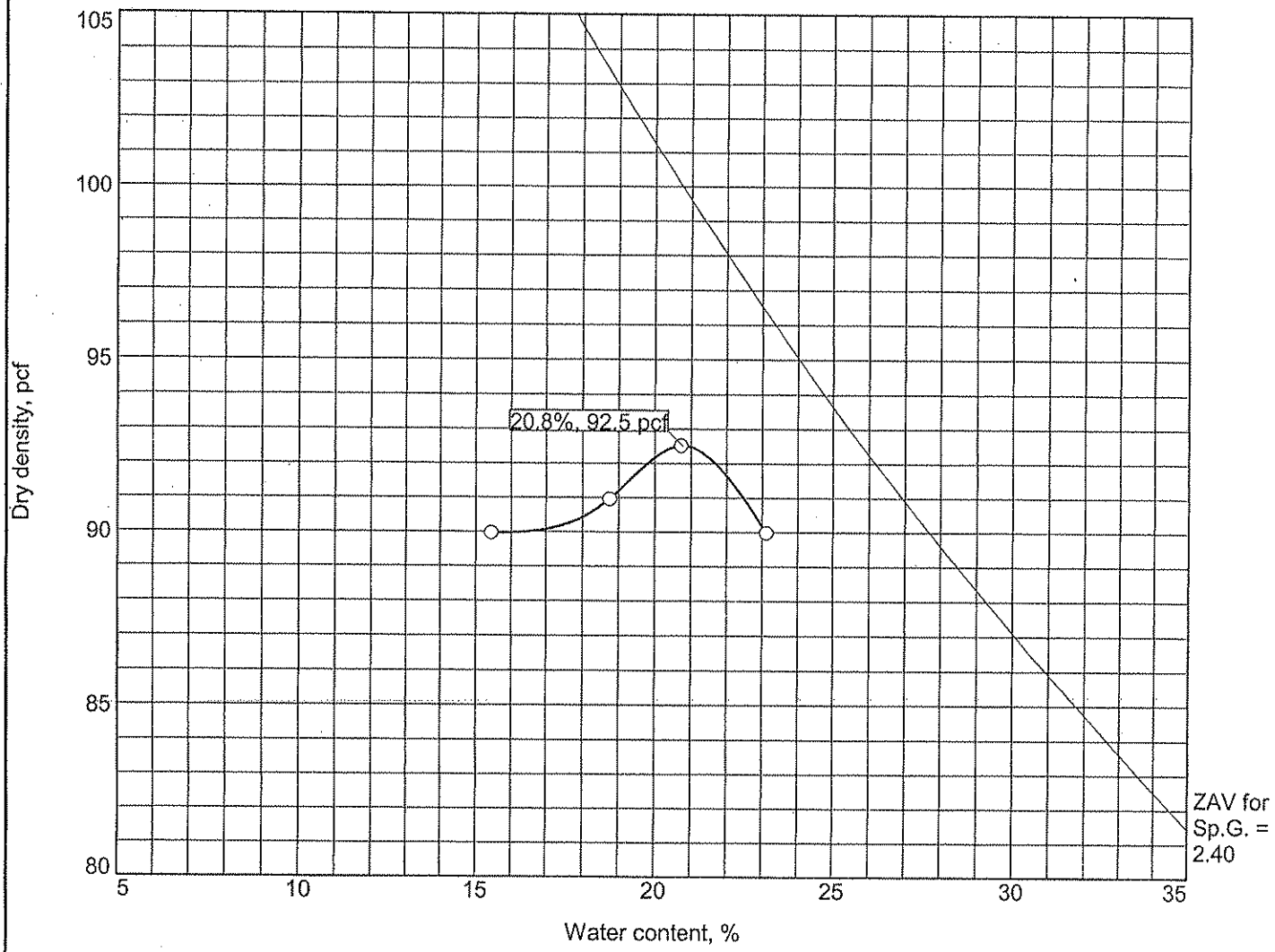
Project No.: 175669015
Sample No.: 3
Test Method: ASTM D 698 - Method B
Gs - Fines: Assumed

Mold Weight 4213.3 grams		Moisture Determination				
Wet Weight plus Mold (grams)	Wet Weight minus Mold (grams)	Wet Soil and Can Weight (grams)	Dry Soil and Can Weight (grams)	Can Weight (grams)	Water Content (%)	Dry Density (pcf)
5888	1675	305.58	260.28	45.30	21.1	91.6
5886	1673	586.44	489.48	73.46	23.3	89.8
5874	1661	591.88	485.60	74.26	25.8	87.4
5830	1617	628.98	541.78	75.48	18.7	90.2



Maximum Dry Density 91.5 PCF
Optimum Moisture Content 21.1 %

COMPACTION TEST REPORT



Test specification: ASTM D 698-07e1 Method B Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
	NT	NT	NT	NT	NT	NT	5.6	NT

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 92.5 pcf Optimum moisture = 20.8 %	Bottom and fly ash with coal cinders, limetone gravel
Project No. 3043101035 **Client:** TVA **Project:** TVA Kingston-Dredge Cell Stacking ○ **Source of Sample:** TVA Kingston Ash **Sample Number:** 4211	**Remarks:** DNS - Data Not Submitted; NT - No Test. Date: 8/17/2010
MACTEC Engineering and Consulting, Inc. **Knoxville, TN**	**Figure** 4211

Tested By: REF 8/17/2010 **Checked By:** REF comp.calc./JL/TL T. Lawrence 8/20/2010

MOISTURE DENSITY TEST DATA

8/17/2010

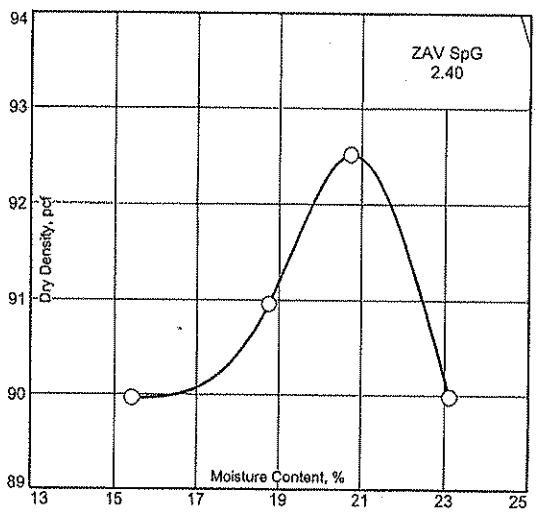
Client: TVA
Project: TVA Kingston-Dredge Cell Stacking
Project Number: 3043101035
Location: TVA Kingston Ash
Sample Number: 4211
Description: Bottom and fly ash with coal cinders, limetone gravel
USCS Classification: NT **AASHTO Classification:** NT
Natural Moisture: NT **Liquid Limit:** NT **Plasticity Index:** NT
Testing Remarks: DNS - Data Not Submitted; NT - No Test.
Date: 8/17/2010
Tested by: REF **Checked by:** REF comp.calc./JL/TL
Percent passing 3/8 in. sieve: 94.4

Test Data and Results For Curve 4211

Test Specification:

Type of Test: ASTM D 698-07e1 Method B Standard

Mold Dia: 3.99 **Hammer Wt.:** 5.5 **Drop:** 12 **Layers:** 3 **Blows per Layer:** 25



Point No.	1	2	3	4
Wt. M+S	13.12	13.15	13.03	12.89
Wt. M	9.44	9.44	9.44	9.44
Wt. W+T	1105.7	1020.4	1325.9	1098.7
Wt. D+T	937.7	879.5	1149.7	978.3
Tare	211.0	199.6	210.1	198.5
Moist.	23.1	20.7	18.8	15.4
Dry Den.	90.0	92.5	91.0	90.0

Test Results: Max. Dry Den.= 92.5 pcf Opt. Moist.= 20.8%

CES 8/17/2010

Reviewed: T. Lawrence 8/20/2010

MACTEC Engineering and Consulting, Inc.

Calibration Record

200 - 2050 Hartley Ave., Coquitlam, British Columbia, Canada V3K 6W5
Tel: 604.540.1100 • Fax: 604.540.1005 • Toll Free: 1.800.665.5599 (North America only)
e-mail: info@rstinstruments.com • Website: www.rstinstruments.com

DIGITAL INCLINOMETER PROBE

Customer: STANTEC - LEXINGTON
Work Order: Q017424
Model: IC32202 2 feet
Probe S/N: DP04630000
Date: 25-Aug-10 9:51
References: Inclinometer Frame 20111402
Referenced to National Standards Annually

Face Frame Angle	A+/-	Cross Axis Average Left/Right B feet	Deviation Face Right feet	Deviation Face Left feet	Face Error feet	Mean Deviation feet	True Deviation feet	Error feet
30	L	-0.00048	1.00004	-1.00002	0.00002	1.00004	1.00000	-0.00004
15	L	-0.00028	0.51768	-0.51764	0.00004	0.51766	0.51764	-0.00002
0		0.00012	0.00014	0.00000	0.00014	0.00006	0.00000	-0.00006
15	R	0.00052	-0.51758	0.51756	-0.00002	-0.51758	-0.51764	-0.00006
30	R	0.00078	-0.99996	0.99998	0.00002	-0.99998	-1.00000	-0.00002

Face Frame Angle	B+/-	Cross Axis Average Left/Right A feet	Deviation Face Right feet	Deviation Face Left feet	Face Error feet	Mean Deviation feet	True Deviation feet	Error feet
30	L	0.00056	1.00004	-1.00002	0.00002	1.00004	1.00000	-0.00004
15	L	0.00050	0.51772	-0.51766	0.00006	0.51770	0.51764	-0.00006
0		0.00018	0.00012	-0.00010	0.00002	0.00012	0.00000	-0.00012
15	R	-0.00024	-0.51740	0.51750	0.00010	-0.51744	-0.51764	-0.00020
30	R	-0.00018	-0.99994	0.99998	0.00004	-0.99996	-1.00000	-0.00004

Calibrated By: KAA

Applied Science Technologists and Technicians of British Columbia
22724
A.C.
AL CULLEY
AScT

Document Number: ICL0025D

MIG0106A

Vented VW Pressure Transducer

Vented VW Pressure Transducer

Applications

The vented pressure transducer is designed specifically for monitoring changes in water level. Typical applications include:

- Monitoring water levels in wells and standpipes.
- Monitoring water levels in stilling basins installed in reservoirs and streams.

Operation Overview

The VW pressure transducer converts water pressure to a frequency signal via a patented* arrangement of diaphragm, a tensioned steel wire, and an electromagnetic coil.

The pressure transducer is designed so that a change in pressure on the diaphragm causes a change in tension of the wire. An electromagnetic coil is used to excite the wire, which then vibrates at its natural frequency. The vibration of the wire in the proximity of the coil generates a frequency signal that is transmitted to the readout device.

The readout or data logger stores the reading in Hz. Calibration factors are then applied to the reading to arrive at a pressure in engineering units.

Advantages

Designed for Wells & Standpipes: Pressure transducers placed in wells and standpipes sense barometric pressure as well as water pressure. This leads to measurement uncertainty (error) since barometric pressure changes independently of water pressure. The vented design of this pressure transducer eliminates the barometric component, which results in more reliable readings.

Special Vent Tube: The extra large diameter vent tube provides quick response to changes in atmospheric pressure and cannot be blocked by condensation.

Oversize Desiccant Chamber: The large capacity, low maintenance desiccant chamber keeps vent tube dry for 3 to 6 months.

US Patent #4,938,068

VENTED PRESSURE TRANSDUCER

22 PSI Vented Transducer 52612402
50 PSI Vented Transducer 52612405

Sensor Type: Pluck-type vibrating wire sensor with built-in thermistor or RTD.

Range: 1.5 bar (22 psi) or 3.45 bar (50 psi).

Resolution: 0.025%FS with VW Data Recorder.

Calibration Accuracy: ±0.1% FS.

Maximum Pressure: 2 x rated range.

Filter: 50-micron sintered stainless steel.

Calibration: Eleven-point calibration.

Temperature Coefficient: < 0.02% FS per °C).

Materials: Stainless steel.

Dimensions: 29 x 191 mm (1.125 x 7.5").

Weight: 0.45 kg (1 lb).

VENTED SIGNAL CABLE

Vented Cable. 50614410

Shielded cable with four 22-gauge tinned- copper conductors, 0.25" vent tube, and polyurethane jacket. For use between transducer and desiccant chamber. Specify feet or meters.

Splice Kit for Vented Cable 50614415

Contains components required to splice 5 conductors and vent tube.

Non-Vented Signal Cable 50613524

Shielded cable with four 22-gauge tinned- copper conductors for use between dessicant chamber and readout station or data logger. Specify feet or meters.

DESICCANT CHAMBER

Desiccant Chamber 52612495

Prevents moisture from entering cable and vent tubing. Desiccant can be renewed in an oven. Protects one transducer. 108 x 108 x 64 mm deep (4.25 x 4.25 x 2.5").

Extra Desiccant Pack 02540003

Anhydrous calcium sulfate in moisture proof container. Sufficient to replace desiccant in one chamber.

READOUTS

VW Data Recorder. 52613500

This easy to use readout displays and records VW sensor data in Hz or Hz^2, and thermistor or RTD data in degrees C. See separate data sheet for details.

DATA LOGGERS

VW MiniLogger 52613310

The VW MiniLogger is a reliable, low-cost data logger designed to monitor a single vibrating wire sensor. See separate dataset for details.

CR10X Data Logger

Compatible data loggers include the Campbell Scientific CR10X with VW interface. AM16/32 multiplexer can accommodate 16 pressure transducers with temperature readings or 32 pressure transducers without temperature readings. See separate dataset for details.

Slope Indicator Head Office 12123 Harbour Reach Drive, Mukilteo, WA, 98275 USA
Tel: 425-493-6200 Tel: 866-916-0541 Fax: 425-493-6250 Email: solutions@slope.com

SLOPE INDICATOR
WWW.SLOPEINDICATOR.COM

Copyright 11/2007 by Slope Indicator, a division of Durham Geo-Enterprises. Products and specifications are subject to review and change without notice.

Stantec

Stantec Consulting Services Inc.
1409 North Forbes Road
Lexington, KY 40511-2050
Tel: (859) 422-3000
Fax: (859) 422-3100

August 24, 2010 let_003_175669014

Ms. Kathryn Nash
General Manager
TVA Kingston Fossil Ash Recovery Operations
1134 Swan Pond Road, KFP 1T-KST
Harriman, Tennessee 37748

Re: Interim Dredge Cell Ash Stacking and Instrumentation Plan
Kingston Fossil Plant
Harriman, Roane County, Tennessee
Document Control Number RDP-0113C-R0

Dear Ms. Nash:

Stantec Consulting Services Inc. (Stantec) has developed requested construction plans for interim ash stacking across designated portions of the North/Central Dredge Cell located at the above referenced site. These Issued for Construction (IFC) plans provide for ash stacking to designate grades and elevations along with proposed instrumentation details/locations and monitoring criteria. The IFC version addresses comments received during a regulatory meeting conducted at Tennessee Department of Environmental Conservation facilities located in Nashville, Tennessee on August 23, 2010.

Stantec appreciates the opportunity to provide these services and we look forward to continue working with you toward successful completion of the project. If you have any questions or need additional information, please call.

Sincerely,

STANTEC CONSULTING SERVICES INC.

MICHAEL J. STEELE
REGISTERED ENGINEER
AGRICULTURE
COMMERCE
No. 113118
STATE OF TENNESSEE

Michael J. Steele, PE
Associate

/rdr

Don W. Fuller II, PE
Principal

Enclosures: Plans for Construction (5 drawings)
Quality Control Plan

PLANS FOR CONSTRUCTION

INTERIM DREDGE CELL
ASH STACKING AND INSTRUMENTATION PLAN
KINGSTON FOSSIL PLANT

HARRIMAN, ROANE COUNTY, TENNESSEE

PREPARED FOR

TENNESSEE VALLEY AUTHORITY

VICINITY MAP

1000 0 2000 4000 FEET
GRAPHIC SCALE

PREPARED BY

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

INDEX OF SHEETS

10W216-01	COVER SHEET
10W216-02	ASH STACKING PLAN
10W216-03	INSTRUMENTATION PLAN
10W216-04	TYPICAL CROSS SECTIONS
10W216-05	DETAILS

ISSUED FOR CONSTRUCTION

For Supporting Design Calculations see FPGKIFFESCDX00000020100001

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	DISCIPLINE INTERFACE
R --	--	--	--	--	--	--	--	--	--	--	--
R 0	08/24/10	KDL	PJB	DEH	MJS	DEH	MJS	TJ	--	--	--

ISSUED FOR CONSTRUCTION

SCALE: AS NOTED EXCEPT AS NOTED

MICHAEL J. STEELE, REGISTERED ENGINEER, COMMONWEALTH OF KENTUCKY, 19511, STATE OF TENNESSEE, 8/24/2010

YARD
INTERIM DREDGE CELL

ASH STACKING & INSTRUMENTATION
COVER SHEET
RDP-0113C-R0

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
K. LINDQUIST	P. BOND	D. HERRON	M. STEELE	D. HERRON	M. STEELE	T. JOHNSON

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

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 | DATE 08/24/10 | 36 | C | 10W216-01 | R 0

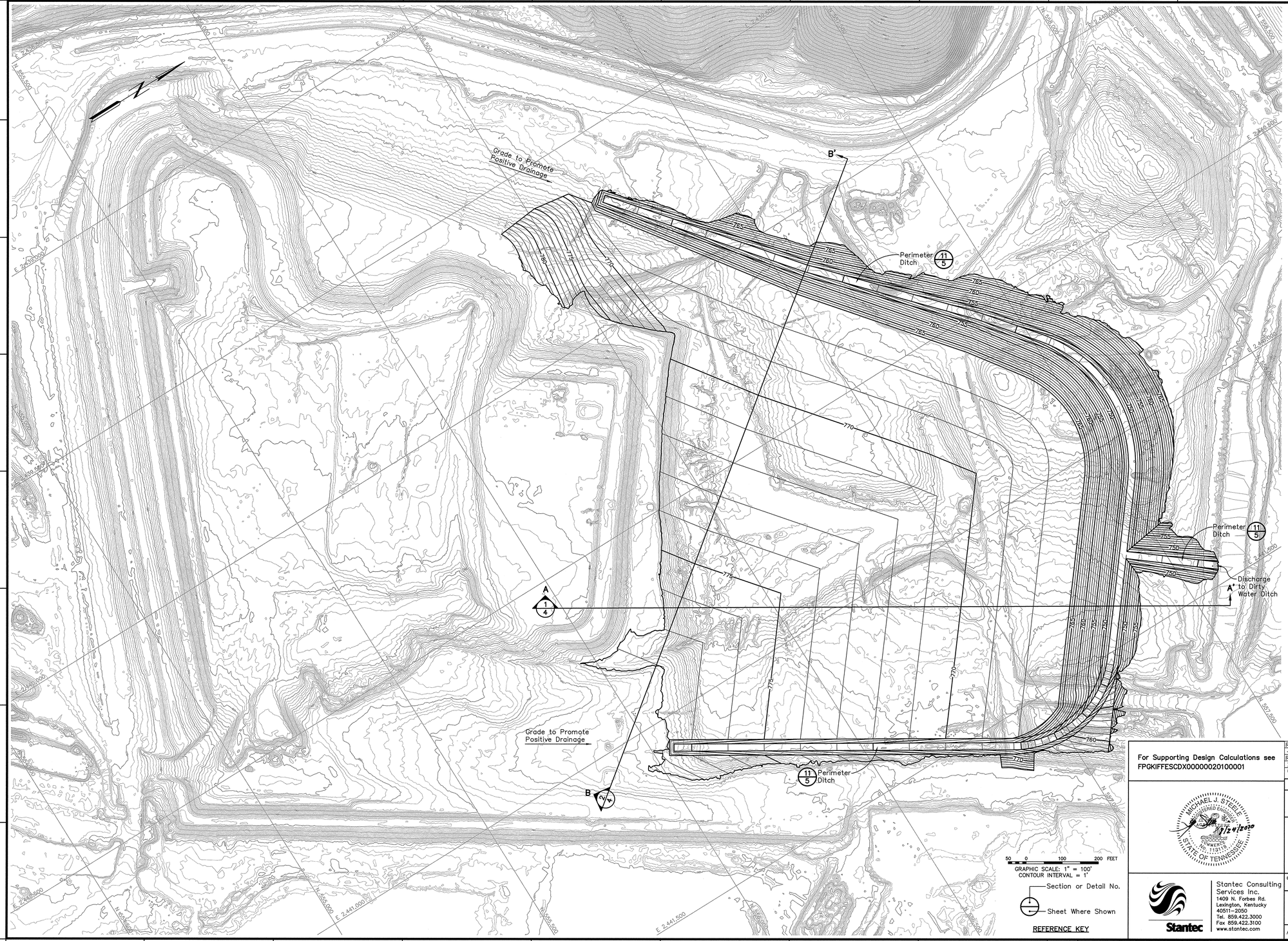
PLOT DATE: 08/24/2010, USER: JOHNSON, TINACY
N:\TVA-WATTS BAR\CAD\KINGSTON\Harriman\INTERIM_DREDGE_CELL\DEVAL_IFC\10W216-01-R0.DWG

STANTEC | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

36 C 10W216-01



NOTES:

1. Topographic mapping was generated from a LiDAR survey performed on July 23, 2010 by Tuck Mapping Solutions, Inc.
2. Extend instrumentation as directed by the QC Manager and referenced in the QC Plan.
3. The Interim Dredge Cell Ash Stacking Plan has an area of 45.9 acres, cut volume of 140,000 cubic yards and a fil volume of 510,000 cubic yards.
4. The Contractor will be responsible for developing any modifications to the East–West haul road horizontal and vertical alignments for continued use during construction operations.
5. Temporary crossings of the Perimeter Ditch shall be developed by the Contractor subject to approval by the QC Manager.
6. This plan represents the top of Interim Ash Stacking. The Capillary Break will be located above (in elevation) these contours.

ISSUED FOR CONSTRUCTION

PLOT DATE: 08/24/2010 USER: JOHNSON, TRACY
N:\DRAWINGS\10W216\10W216-02-R0.DWG
N:\DRAWINGS\10W216\INTERIM_DREDGE_CELL\REV0_IFC\10W216-02-R0.DWG

For Supporting Design Calculations see FPGKIFFESCDX000000020100001

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV CD
R –	–	–	–	–	–	–	–	–	–	–	–
–											
R 0	08/24/10	KDL	PJB	DEH	MJS	DEH	MJS	TJ	–	–	–
ISSUED FOR CONSTRUCTION											DISCIPLINE INTERFACE

SCALE: 1"=100' EXCEPT AS NOTED

MICHAEL J. STEELE — REGISTERED ENGINEER — 8/24/2010 — CERTIFICATE NO. 113115 — STATE OF TENNESSEE

YARD
INTERIM DREDGE CELL

ASH STACKING & INSTRUMENTATION
ASH STACKING PLAN
RDP–0113C–R0

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
K. LINDQUIST	P. BOND	D. HERRON	M. STEELE	D. HERRON	M. STEELE	T. JOHNSON

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

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 | DATE: 08/24/10 | 36 | C | 10W216–02 | R 0

STANTEC	0
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

LEGEND

- Proposed Slope Inclinometer
- Proposed Piezometer
- Proposed Settlement Platform
- Existing Slope Inclinometer
- Existing Piezometer
- Existing Settlement Platform

NOTES:

1. Topographic mapping was generated from a LiDAR survey performed on July 23, 2010 by Tuck Mapping Solutions, Inc. and merged with the Interim Dredge Cell Ash Stacking Plan.
2. Extend instrumentation as directed by the QC Manager and referenced in the QC Plan.

ISSUED FOR CONSTRUCTION

PLOT DATE: 09/24/2010 USER: JOHNSON, TIMOTHY
C:\APPLICATION DATA\ADOBE\ACROBAT\8.0\ACROBAT\WORKING\WORKING\INTERIM_DREDGE_CELL\REV0_IFC\10W216-03-R0.DWG

For Supporting Design Calculations see FPGKIFFESCDX00000020100001

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV SYM
R –	–	–	–	–	–	–	–	–	–	–	–
R 0	08/24/10	KDL	BFS	DEH	MJS	DEH	MJS	TJ	–	–	–

ISSUED FOR CONSTRUCTION

DISCIPLINE INTERFACE

SCALE: AS NOTED EXCEPT AS NOTED

YARD
INTERIM DREDGE CELL

ASH STACKING & INSTRUMENTATION
ASH STACKING PLAN
RDP-0113C-R0

MICHAEL J. STEELE — REGISTERED ENGINEER — AGRICULTURE — COMMERCE — NO. 113191 — STATE OF TENNESSEE — 9/24/2010

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:
K. LINDQUIST	P. BOND	D. HERRON	M. STEELE	D. HERRON	M. STEELE	T. JOHNSON

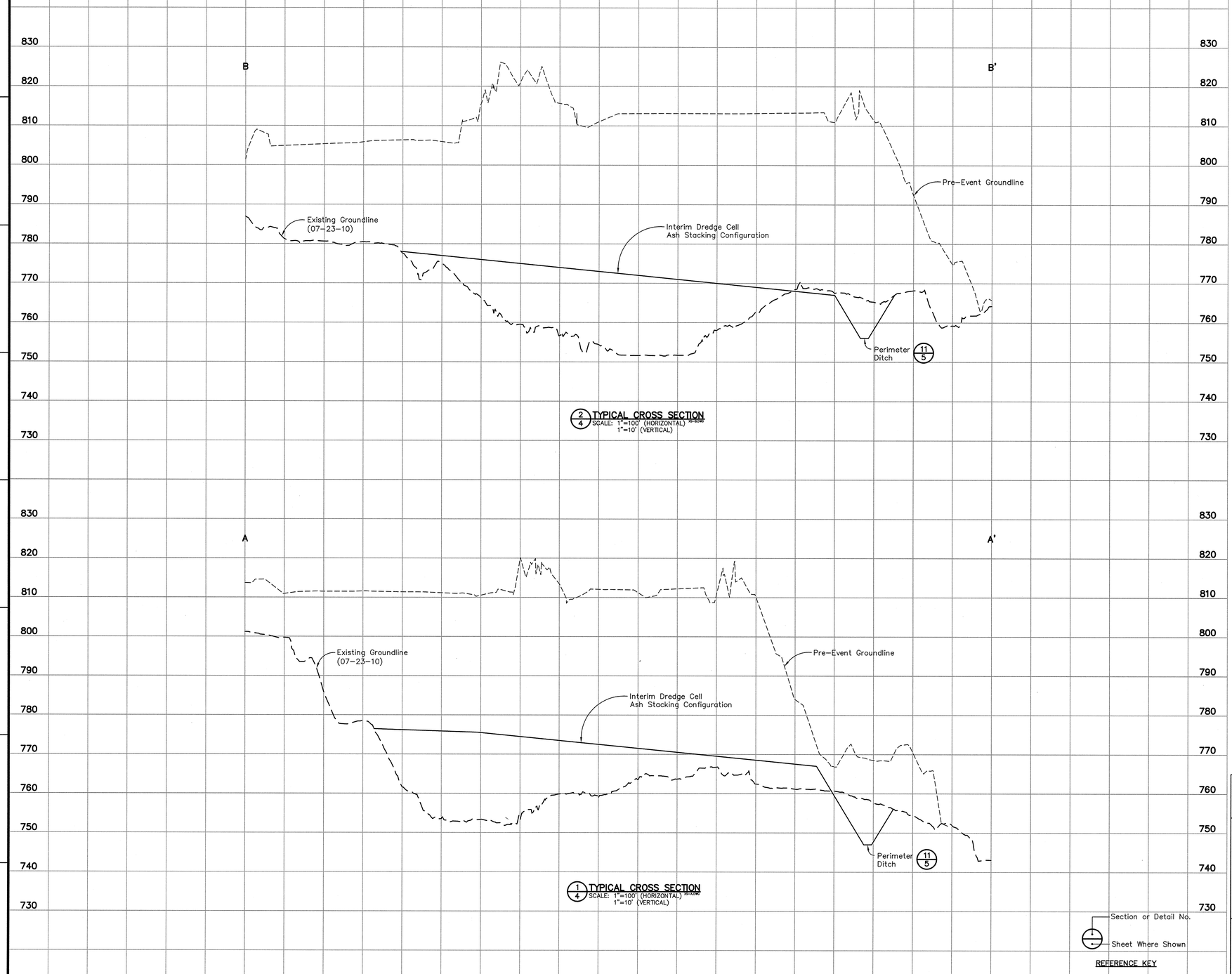
KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000	DATE 08/24/10	36	C	10W216-03	R 0

STANTEC	0
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING DO NOT ALTER MANUALLY



ISSUED FOR CONSTRUCTION

For Supporting Design Calculations see FPGKIFFESCDX00000020100001

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV GR
R –	–	–	–	–	–	–	–	–	–	–	–
R 0	08/24/10	KDL	PJB	DEH	MJS	DEH	MJS	TJ	–	–	–

ISSUED FOR CONSTRUCTION

DISCIPLINE INTERFACE

SCALE: AS NOTED — EXCEPT AS NOTED

YARD
INTERIM DREDGE CELL

ASH STACKING & INSTRUMENTATION TYPICAL CROSS SECTIONS RDP-0113C-R0

MICHAEL J. STEELE — REGISTERED ENGINEER — AGRICULTURE & COMMERCE — NO. 119115 — STATE OF TENNESSEE — 8/24/2010

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:
K. LINDQUIST	P. BOND	D. HERRON	M. STEELE	D. HERRON	M. STEELE	T. JOHNSON

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

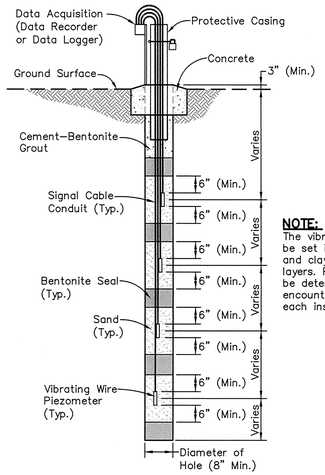
AUTOCAD R 2000 | DATE 08/24/10 | 36 | C | 10W216-04 | R 0

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

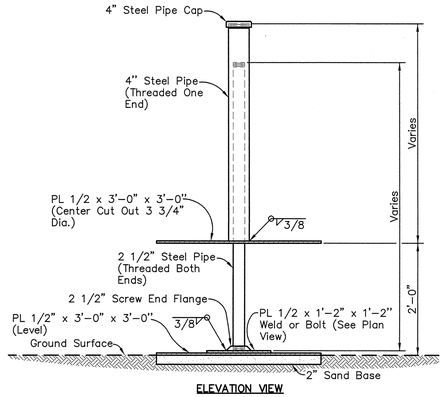
STANTEC	0
TASK COMPLETED BY:	REV NO.

PLOT DATE: 08/24/2010 USER: JOHNSON, TRACY
V:\CIVIL\KINGSTON\ASH&GYPSUM\DRAWING\INTERIM_DREDGE_CELL\REV0_JF\10W216-04-R0.DWG

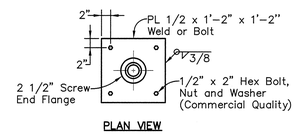


NOTE:
The vibrating wire piezometers shall be set in the ash materials, silty clay and clayey to silty sand with gravel layers. Piezometer tip elevations shall be determined in the field based on encountered subsurface conditions at each instrument location.

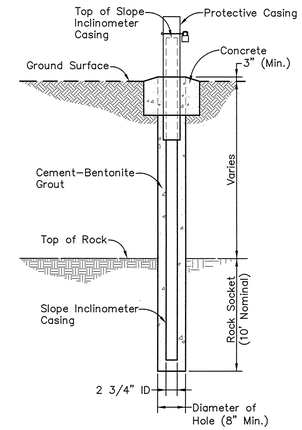
1/5 **DETAIL – VIBRATING WIRE PIEZOMETER INSTALLATION**
NOT TO SCALE



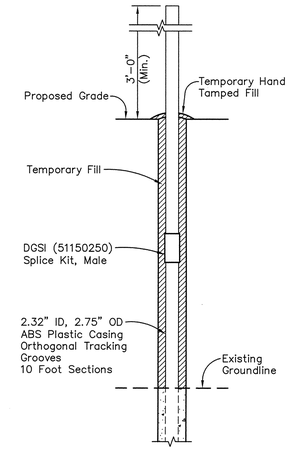
NOTES:
1. Additional pipe shall be furnished in 5'–3" sections (due to commercial pipe lengths of 21'–0") threaded on both ends.
2. Pipe sizes are given in nominal diameters.



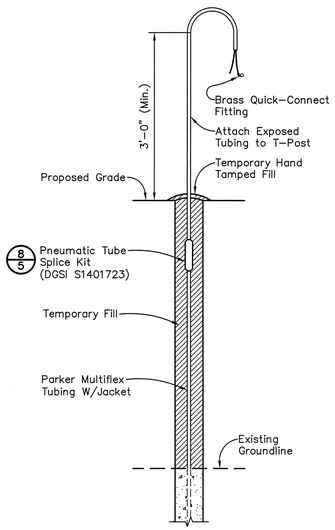
2/5 **DETAIL – SETTLEMENT PLATFORM INSTALLATION**
NOT TO SCALE



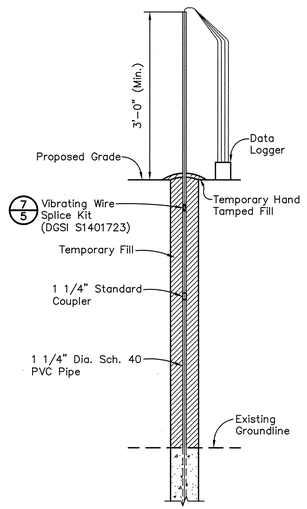
3/5 **DETAIL – SLOPE INCLINOMETER INSTALLATION**
NOT TO SCALE



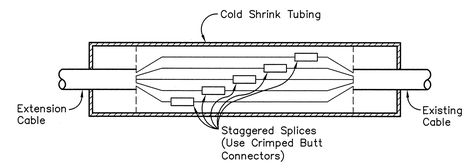
4/5 **DETAIL – SLOPE INCLINOMETER EXTENSION**
SCALE: 1"=1'–0"



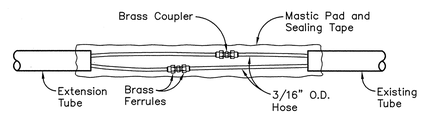
5/5 **DETAIL – PNEUMATIC PIEZOMETER EXTENSION**
SCALE: 1"=1'–0"



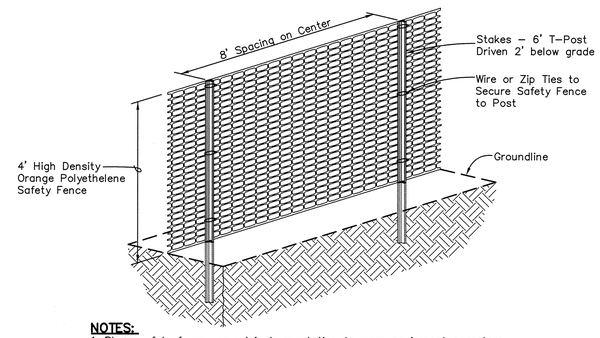
6/5 **DETAIL – VIBRATING WIRE PIEZOMETER EXTENSION**
SCALE: 1"=1'–0"



7/5 **DETAIL – VIBRATING WIRE SPLICE KIT**
NOT TO SCALE



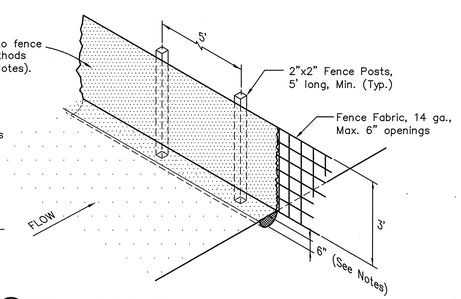
8/5 **DETAIL – PNEUMATIC TUBE SPLICE KIT**
NOT TO SCALE



NOTES:
1. Place safety fence around instrumentation to warn equipment operators. Move fence as instruments are extended.
2. Attach safety fence to T–Posts in accordance with the manufacturer's recommendations.
3. Use warning signs as appropriate.
4. Remove fence at project completion and dispose of in a legal manner.

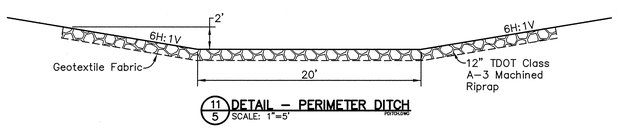
9/5 **DETAIL – SAFETY FENCE**
NOT TO SCALE

ISSUED FOR CONSTRUCTION



NOTES:
1. The bottom 12 inches of the fabric shall be buried in a 6–inch trench cut into the ground or covered by 6 inches of fill material to prevent sediment from escaping under the fence. All earthwork shall be on the upstream side of the fence.
2. Geotextile fabric shall meet the following specifications: Grab strength (ASTM D 4632) – 90 lbs. Min., Width – 4' Min., Apparent opening size (ASTM D4751) No. 20. Ultraviolet degradation (ASTM D 4355) 70% strength retained. Elongation at 45lb (ASTM D 4632).

10/5 **DETAIL – SILT FENCE**
NOT TO SCALE



11/5 **DETAIL – PERIMETER DITCH**
SCALE: 1"=5'

INSTRUMENTATION AFFECTED BY STACKING PLAN

Piezometers	Vibrating Wire Piezometers	Pneumatic Piezometers	Inclinometers
PZ–1 (Dike D)	PZ–9 PZ–11	09–500B 09–502B 09–503B1 09–106A 09–109B	SI–2 SI–3 SI–4 SI–10 09–500 09–502A 09–503 SI–11 09–106 09–109

Section or Detail No.
Sheet Where Shown
REFERENCE KEY

For Supporting Design Calculations see FPGKIFFESCDX00000020100001

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV ST
R –	–	–	–	–	–	–	–	–	–	–	–
R 0	08/24/10	KDL	PJB	DEH	MJS	DEH	MJS	TJ	–	–	–

ISSUED FOR CONSTRUCTION

SCALE: AS NOTED — EXCEPT AS NOTED

DISCIPLINE INTERFACE

YARD
INTERIM DREDGE CELL

ASH STACKING & INSTRUMENTATION DETAILS
RDP–0113C–R0

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
K. LINDQUIST	P. BOND	D. HERRON	M. STEELE	D. HERRON	M. STEELE	T. JOHNSON

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

KINGSTON FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 | DATE 08/24/10 | 36 | C | 10W216–05 | R 0

PLOT FACTOR:XX
W_TVA

C.A.D. DRAWING DO NOT ALTER MANUALLY

STANTEC | 0
TASK COMPLETED BY: | REV NO.

PLOT DATE: 08/24/2010 USER: JOHNSON, TRACY
S:\APPLICATIONS\AUTOCAD\WORKING\INTERIM_DREDGE_CELL\REVD_JF(1)\10W216-05-R0.DWG

Quality Control Plan

Interim Dredge Cell Ash Stacking & Instrumentation Plan
Kingston Fossil Plant
Harriman, Roane County, Tennessee

1. Purpose and Scope

This document is a site specific Quality Control (QC) plan that addresses construction and monitoring in association with the Interim Dredge Cell Ash Stacking & Instrumentation Plan project. The QC plan is intended to present minimum project requirements and shall serve as an outline for use in developing site specific protocols based on conditions encountered during the work.

2. Responsibility and Authority

A summary of QC personnel and associated responsibilities is presented below.

2.1. Regulatory Agency

Work conducted under this project shall be coordinated with, the U.S. Environmental Protection Agency (EPA) and the Tennessee Department of Environment and Conservation (TDEC). Designated EPA and TDEC personnel shall serve as the regulatory contact.

2.2. Quality Control Manager and Team

A professional engineer licensed in the state of Tennessee shall be designated as the QC Manager and shall be responsible for overall management of construction monitoring, testing and related documentation as outlined herein. The QC Manager shall be the Engineer of Record for project construction. The QC Manager shall determine appropriate test standards and methods for designated field observations and/or laboratory testing and shall be responsible for review of QC data to assess conformance with project requirements.

The QC Team shall consist of qualified personnel working under the direct supervision of the QC Manager. The QC Team shall be familiar with the materials used and the functional intent of the respective Plan components.

2.3. Owner

The plant and its ancillary functions are owned by the Tennessee Valley Authority (Owner). The Owner shall be responsible for overall management of construction activities to include but not be limited to contracting, administration and retaining the services of qualified consultants as required during the project.

The Owner and/or their Designee shall appoint one representative to serve as the Construction Manager. The Construction Manager shall be responsible for the overall planning, coordination and control of project construction. This includes but is not limited to

the character and sequence of work, coordination, scheduling, and management of cost, time and contract administration as related to the execution of the project. The Owner shall be responsible for providing qualified professionals to establish and enforce safety protocols related to the project.

2.4. Contractor

The CONTRACTOR will be the entity with which the TVA has entered into an agreement to construct the Interim Dredge Cell Ash Stacking & Instrumentation Plan project. The CONTRACTOR shall designate a Site Superintendent responsible for construction activity and communication with the QC Manager and Construction Manager. Any portion(s) of the work designated to others shall be conducted under the direct supervision of the CONTRACTOR.

3. Quality Control Activities

3.1. Meetings

Meetings shall be coordinated and conducted by the QC Manager and/or the Construction Manager on a weekly basis. The primary purpose of these meetings shall be to confirm that all parties involved are familiar with the project, required procedures and associated QC objectives along with any safety issues related to construction. Specific safety issues shall be the responsibility of designated safety professionals. Minutes of each meeting shall be documented for inclusion with the project records.

Pre-construction meetings shall be held prior to initiating individual phases of construction. The QC Manager, Construction Manager, Site Superintendent, and other parties that will actively participate in the construction activities shall attend these meetings.

3.2. Alternative Methods

Consistent with the overall objectives of the project, alternative construction and QC methods may be used during the course of the work. Proposed modifications shall be developed by the QC Manager and submitted to the Owner for review prior to incorporation into the project. Documentation of these alternative methods shall be prepared with copies retained for inclusion with the project records.

3.3. Contractor Submittals

CONTRACTOR submittals shall be submitted to TVA procurement and distributed to the QC Manager and Construction Manager. These submittals shall be reviewed and approved by the QC Manager prior to delivery and/or use of the respective construction materials. Copies of all submittals shall be included with the project records.

3.4. Conformance Testing

Conformance testing consists of periodic testing of materials and/or constructed products. Conformance testing shall be conducted by the QC Team as required by this plan and additional testing may be added at the discretion of the QC Manager. Results of

conformance testing shall be reviewed by the QC Manager to assess conformance with project requirements. Copies of all conformance testing results shall be included with the project records.

3.5. Field Observations

The QC Team shall observe and document (as outlined herein) all construction activities associated with the project. Results shall be reported to the QC Manager and Construction Manager (with the Owner copied) on a daily basis.

4. Ash Stacking

4.1. General

Lifts shall be placed to the maximum horizontal extent practicable to allow pore water dissipation. The daily rate of placement within discrete (or localized) areas shall not exceed two feet per day unless otherwise approved by the QC Manager based on response of the material and monitoring of geotechnical instrumentation. No slopes shall be constructed at greater than 10H:1V until the instrumentation is in place. Once instrumentation is installed within a given area, then design slopes may be constructed. Grading shall conform to the lines and grades shown in the accompanying Drawings.

4.2. Placement

The sequence of filling shall commence at the lowest section (in elevation) of the subject footprint and proceed upward in maximum 12 inch loose lifts in a manner to maintain positive drainage at all times. Positive drainage shall be maintained on all fill surfaces. The fill sequence shall also be performed in a manner that reduces the potential for uncontrolled sediment runoff and adequately controls runoff from the embankment area. Ash placement shall be performed uniformly across the cell and result in slopes no steeper than outlined in Section 4.1 above.

4.3. Compaction

Each embankment lift shall be compacted with a appropriate roller or rubber tired equipment as approved by the QC Manager for the subject material. Materials shall be compacted to a minimum of 90 percent of standard proctor maximum dry density at a moisture content within minus four percent and plus two percent of optimum or as established by the QC Manager based on field observations and testing.

Following initial compaction, the surface shall be sealed with a smooth drum roller to reduce the potential for surface water infiltration. Prior to placement of subsequent lifts the surface shall be lightly scarified to promote lift bonding.

Although compaction will be confirmed visually by the QC Team based on the response of materials to loaded equipment, field conformance testing shall also be performed and include periodic in-place density and device calibration testing to provide documentation of the compaction operations at the prescribed intervals indicated in the attached testing schedule or as established by the QC Manager. Device calibration/confirmation testing shall consist of in-situ density tests performed at intervals as established by the QC Manager.

4.4. QC Requirements

Embankment placement and compaction methods shall be monitored by the QC Team to assess conformance with program requirements.

Evaluation criteria shall include overall compaction results. Appropriate modifications to embankment placement and compaction methodology shall be developed by the QC Manager if compacted materials do not meet program requirements.

The rate of embankment construction shall be measured by the QC Team every 24-hour period in which work has been performed as well as for a weekly total. Measurement methods shall be as approved by the QC Manager.

Field conformance testing shall include periodic in-place density and device calibration testing to provide documentation of the compaction operations at prescribed intervals as directed by the QC Manager. Moisture testing will include both nuclear density readings and laboratory moistures.

5. Non-Woven Geotextile Filter Fabric

5.1. General

Geotextile materials shall be unloaded and stored in accordance with manufacturer recommendations. The contractor shall generate a material inventory log during unloading of material shipments to the program site.

Requirements for geotextile are as follows:

a. Geotextile shall be a 16-ounce weight, non-woven, polyester or polypropylene fabric. Acceptable geotextile fabrics include:

   - Skaps Industries GE 116;
   - Propex Geosynthetics Geotex 1701;
   - Agru American Agrutex 1161;
   - Dalco Nonwovens Dultex 11610;
   - GSE Lining Technology NW 16;
   - Tencate Geosynthetics Mirafi S1600; and
   - US Fabrics, Inc. US380 NW

b. Geotextile shall be protected from direct sunlight, ultraviolet rays, temperature greater that 140 degrees Fahrenheit, mud, dirt, dust and debris. During storage, geotextile filter fabric shall be wrapped in a heavy duty protective covering.

c. Installation shall be in accordance with manufacturer recommendations.

d. Surfaces to receive geotextile shall be prepared to a relatively smooth condition, free of obstructions, depressions and debris.

e. Geotextile shall be placed with the long dimension parallel with the centerline of ditches and roads, and/or parallel to embankment slopes, as applicable. Geotextile shall be laid smooth, and free of tension, stress, folds, wrinkles or creases. Perpendicular seams shall be avoided.

f. Geotextile shall be covered with designated materials within 15 days of deployment for ultraviolet light protection.

g. Geotextile shall be overlapped one foot. Care shall be taken during riprap placement to avoid displacement of geotextile.

5.2. QC Requirements

QC requirements are as follows:

a. Prior to delivery, manufacturer and supplier certifications shall be submitted to the QC Manager indicating that all materials meet, or exceed, the minimum established properties. Certifications shall be accompanied by supporting QC testing.

b. Conformance testing and procedures shall be performed as shown in the testing schedule.

c. Construction monitoring and field acceptance of geotextile installation shall be documented by the QC Team. Laps shall be visually inspected for conformance.

6. Erosion Control

Erosion Control shall conform to the site wide Storm Water Management Plan (SWMP). Erosion and sediment control measures shall be provided as field conditions dictate and approved by the Construction Manager, or as directed by the appropriate Regulatory Agency.

The Construction Manager shall periodically monitor these structures as well as overall site drainage conditions. Appropriate adjustments to site drainage and related sediment control structures shall be made as necessary based on current site conditions during the project.

7. As-built Documentation

7.1. General

The CONTRACTOR will grade stake the existing configuration and provide cut/fill stakes on an appropriate interval as needed for construction. The location (northing and easting) and elevation of the existing surface shall be recorded and provided to the QC Manager. Other surveys shall include:

- Monthly progress survey of stacking;
- As-needed to provide support to QC activities;

- Location of ditches and drainage structures; and
- Cross sections on 100 foot centers on the project baseline of each work item noted above with maximum survey point incremental distance of 50 feet.

7.2. Quality Control Requirements

a. All survey activities shall be performed under the direction of a Tennessee licensed Land Surveyor or Professional Engineer.

b. Survey data shall be provided to the QC Manager within 10 days of survey completion in survey point files with a description for each of the points. Survey shots shall be performed along cross sections and along breaks in slopes.

c. The QC Manager will develop as-built Drawings from the provided data.

8. TDOT Class A-3 Machined Riprap

Riprap materials are utilized for rock check dam construction and ditches, and shall conform to the requirements in Section 709.03 of the TDOT "Standard Specifications for Road and Bridge Construction." Prior to delivery, supplier certification shall be submitted to the QC Manager that all materials meet or exceed the minimum established properties.

9. Instrumentation

9.1. General

Instrumentation monitoring has been established for the Interim Dredge Cell Ash Stacking & Instrumentation Plan project embankment area to monitor the embankment slopes and the underlying foundation materials. Instrumentation for geotechnical monitoring shall be installed or extended according to the attached Plan and Detail Sheets. The instrumentation program includes the prescribed use of the instrumentation and the specific monitoring of these devices as further detailed. T-posts and orange safety fence shall be installed around instrumentation by the CONTRACTOR.

9.2. Types

a. Piezometers shall be installed and monitored to characterize the increase and dissipation of pore pressures within the existing ash and native foundation soils-layers due to embankment loading.

b. Slope inclinometers shall be used to measure lateral displacements within the embankment and foundation materials due to loading. The inclinometers shall be anchored a minimum of 10 feet into bedrock.

c. Settlement plates shall be utilized to measure the vertical deformation of the foundation soils due to embankment loading.

If any instruments are damaged during construction, they shall be repaired/replaced as directed by the QC Manager.

9.3. Measurements

Baseline data shall be confirmed prior to embankment loading. Piezometers, inclinometers and settlement plates shall be measured once a day, unless directed otherwise by the QC Manager. The rate of embankment construction shall be varied by the QC Manager as part of the overall program objectives. Measured instrumentation responses shall be reviewed and evaluated by the QC Manager.

9.4. Thresholds

Embankment loading models have been analyzed which take into account the existing subsurface conditions and the proposed embankment heights. The following threshold limits shall be used for the stacking embankment.

a. Piezometers – Embankment filling may continue, with regular monitoring frequency, as long as the ratio of excess pore pressure to the applied embankment load is 10 percent or below. When the excess pore pressure ratio within **native foundation soil layers** ranges from 10 to 15 percent, embankment filling may continue, but with an increase in instrumentation monitoring specified by the QC Manager. All fill placements shall stop immediately when the excess pore pressure ratio is above the 15 percent level within **native foundation soil layers**. Embankment filling shall stop immediately when the excess pore pressure ratio is above the 10 percent level within **wet (foundation) ash layers**. All excess pore pressure measurements shall be evaluated from baseline data values.

b. Slope Inclinometers and Settlement Plates – Embankment filling may continue with regular monitoring frequency, as long as the displacement ratio of lateral inclinometer movement to vertical settlement plate movement is 20 percent or below. When the displacement ratio ranges from 20 to 30 percent, embankment filling may continue, but with an increase in instrumentation monitoring specified by the QC Manager. All fill placements shall stop immediately when the displacement ratio is above the 30 percent level.

Following a stoppage, embankment filling in affected areas may resume based on the discretion of the QC Manager and engineering considerations on embankment stability. It should be noted that embankment loading may be restricted and/or modified at the discretion of the QC Manager based on other potentially unstable conditions not outlined herein.

10. Project Documentation

Documentation shall be collected and maintained by the QC Manager (copied to the Owner) during the Interim Dredge Cell Ash Stacking & Instrumentation Plan project. This documentation shall include but not be limited to the following:

- Daily construction field reports;
- Observation reports;
- CONTRACTOR submittals;

- Material conformance data;
- Photographic documentation;
- Survey data;
- As-Built Drawings;
- Construction issue and solution reports;
- Weekly summary reports (for regulatory submittal);
- Plan modifications; and
- Meeting minutes.

Interim Dredge Cell Ash Stacking & Instrumentation Plan
Quality Control Task Summary[1]

A. General Site and Construction Tasks

Task	Responsible Personnel[4]	Task Description/Itemization
QC Testing	QC Manager	-Designate appropriate test standards and methods to maintain quality standards outlined in the project requirements -Review all QC data for conformance with project standards and requirements -Collection and maintenance of all QC documentation -Generation of all QC related reports
Project Meetings	QC Manager / Construction Manager	-Organize meetings as necessary to ensure construction related personnel are familiar with design, construction procedures, and QA/QC requirements.
Contractor Submittals	QC Manager (QC Team)	-Approval of contractor submittals a minimum of 10 days before materials arrive on site -Verify materials utilized in site construction meet or exceed project requirements
Scheduling	Construction Manager	-Develop and maintain construction schedule and verify construction progress
Site Inspections	Construction Manager	-Site observations for indications of slope failure and/or instability
Surveying	Construction Manager	-Schedule surveying

B. Embankment

Task	Responsible Personnel	Task Description/Itemization
Ash Fill Placement and Compaction	QC Manager	-Verify and document ash fill placement and compaction per project requirements -Verify ash fill meets or exceeds project requirements -Confirm proper lift thickness -Verify proper lift surface preparation and scarification techniques -Establish and record elevations

C. Non-Woven Geotextile Filter Fabric

Task	Responsible Personnel	Task Description/Itemization
Submittals	QC Manager	-Approval of material samples and certified material specifications a minimum of 10 days prior to product arrival on site
Conformance Testing	QC Manager	-Collection, organization and maintenance of delivery tickets and all available documentation that supplied materials meet or exceed project requirements -Verification of minimum conformance tests
Installation	QC Team	-Monitor geotextile deployment and covering operations -Documentation that operations performed per project requirements, manufacturer recommendations, and industry practice

D. TDOT Class A-3 Machined Riprap

Task	Responsible Personnel	Task Description/Itemization
Submittals	QC Manager	-Approval of documentation regarding conformance and TDOT[3] acceptance of proposed riprap supplier and riprap materials for TDOT projects a minimum of 10 days prior to material arrival on site
Conformance Testing	QC Manager	-Verify minimum conformance testing per current QC Plan

E. Instrumentation

Task	Responsible Personnel	Task Description/Itemization
Extensions	QC Manager	-Extend existing instrumentation
New Installations	QC Manager	-Install new geotechnical instrumentation
Readings	QC Manager	-QC Team takes readings for threshold analyses
Protection	Construction Manager	-Arrange and coordinate installation of t-posts and safety fence around instrumentation

F. Erosion and Sediment Control

Task	Responsible Personnel	Task Description/Itemization
Site Inspections and Evaluations	Construction Manager	-Periodic erosion and sediment control structure inspections and overall site drainage evaluations -Adjustments to site drainage and structures as necessary, based upon prevalent site conditions -Documentation of sediment control observations and modifications

G. QA/QC Documentation

Task	Responsible Personnel	Task Description/Itemization
Documentation	QC Manager AND Construction Manager	-Overall organization and maintenance of QA/QC documentation of items outlined above as well as those designated in the QA/QC Plan

Notes:

1) The task summary is an itemized list of the general responsibilities to be administrated by the Construction Manger and the QC Manger/QC Team per the current Quality Control Plan and the associated testing schedule.

2) All materials testing and site observations are to be conducted in accordance with the current Quality Control Plan and the associated testing schedule to assure that minimum project requirements are maintained on the site during the construction of the special waste disposal facility. Frequency stated when applicable. Many manager or team tasks, such as subgrade inspection, have no quantifiable testing frequency but are required during work progress.

3) TDOT- "Tennessee Department of Transportation"

4) Responsible Personnel Definitions:

Construction Manager - A TVA employee or consultant designated to be the Owner representative on the construction site. Responsibilities involve overall management of site operations including construction administration tasks, waste disposal, contracting and retaining the services of all necessary personnel (including a qualified engineer) for the life of the facility. The Construction Manager is also a liaison for the Owner to the QC Manager and Contractors.

QC Manager - Registered Professional Engineer in the State of Tennessee that becomes the Engineer of Record for construction. Responsibilities generally include the management of all specific construction and operational tasks as well as the construction monitoring and/or testing, and construction document preparation.

QC Team - Personnel qualified in construction quality assurance/quality control (QA/QC) testing procedures pertinent to the Kingston Fossil Plant facility working under the direct supervision of the QC Manager.

Interim Dredge Cell Ash Stacking & Instrumentation Plan
Kingston Fossil Plant
Harriman, Roane County, Tennessee

Quality Control Plan - Material Testing and Product Certification Schedule

Material	Property	Test Method	Value	Minimum Conformance Test Frequency
Ash Fill Stacking Operations				
Ash Fill	Nuclear Density and Moisture	ASTM	Minimum 90% standard Proctor and -4% to +2% optimum moisture	5 tests / acre / lift
	Classification and Proctor	ASTM	Varies to be approved by QC Manager	1 / 10,000 CY
Erosion Control and Stabilization				
Site Inspections and Evaluations	Project Requirements		Site Wide SWPPP	Bi-Weekly inspections
TDOT Class A-3 Riprap	Gradations	ASTM	Project Requirements	1 / 30,000 tons delivered
Rate of Embankment Construction	Height in Feet		Measured	Daily/Weekly/Monthly
Non-Woven Geotextile Filter Fabric	Project Requirements	ASTM	Project Requirements	1/ manufacturer / year visual

Material	Property	Test Method	Value	Minimum Conformance Test Frequency
Instrumentation				
Extensions	TVA Protocols		Manufacturer's Recommendations	
Thresholds				
	Pore Pressure Ratios	Measurement	Project Requirements	Daily in active areas/Weekly elsewhere
	Displacement Ratio	Measurement	Project Requirements	Daily in active areas/Weekly elsewhere
QA/QC Documentation	Project Requirements		Project Requirements	