

Tennessee Valley Authority  
Regulatory Submittal for Kingston Fossil Plant

Documents submitted:

Dike C Risk Mitigation Work Plan  
Quality Control Plan Dike C Buttress  
Stantec Technical Specifications Dike C Buttress Stage 1 Construction  
Response to Bureau of Reclamation Comments

Date submitted  
12/01/2009

Submitted to whom  
Leo Francendese

Concurrence

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Approvals

TVA Michael T. Scott Date 12/2/09  
EPA Leo Francendese Date 12/2/09

*consulted w/ TDEC*

## **Dike C Risk Mitigation Work Plan Section D**

### **1.0 Purpose of Work**

The scope of this work plan is to describe the construction activities for the first portion of the Dike C Risk Mitigation Plan. Stantec Consulting Services is the engineer of record for the dikes and has designed the buttress system to increase the stability of the dike system at the Kingston Ash Recovery Site. Work will be completed per Specifications, the Quality Plan and Design Drawings (Appendix A) provided by Stantec and included as attachments to this work plan. The main component of the plan is the construction of a buttress system around the outside of Dike C. The buttress will extend from Dike D, in the north, to the Red Water Wetlands, along the plant intake channel in the south. The buttress will consist of a sand filter overlain by gravel and riprap. The design and construction of the buttress system is broken into four sections labeled A thru D. This work plan is for Section D; the first section to be completed. Work to be performed includes the removal of ash, removal of trees and placement of a graded filter system.

Placement of the buttress system includes the following:

- Removal of ash using the best technically available equipment without cutting into the dike.
- Control ash and water infiltration using berms and pumps.
- Place filter material according to the Stantec Design.
- Remove trees and their root balls. Trees greater than three inches in circumference will be surveyed in case seeps develop.

### **2.0 Design Components**

Stantec Consulting Services has provided the construction drawings, technical specifications and Quality Control Plan for the Dike C Buttress Stage 1 construction. The design provides an Alternative 2 for geotextile use. Alternative 2 will not be used. Alternative 1, incorporating a 6 - inch minimum manufactured sand filter, will be used. In addition, the design package references other sections; This Work Plan is solely for Section D. Work Plans for other sections will be issued at a later date. Stantec's Designs, Specifications and Quality Control Plan will be the guideline for all Dike C Buttress Construction work and are provided as Appendix A of this Work Plan.

### **3.0 Ash Removal Guidelines**

A key step in the construction of the dike buttress is the removal of ash from below the footprint of the buttress. The ash does not present a design issue, but may present site close out concerns if it cannot be determined that adequate ash has been removed from below the footprint. The QC Manager shall set the limits of excavation to protect the stability and integrity of Dike C. The QA Manager will monitor excavation activities to prevent excavation from exceeding these limits. Grade stakes and spotters will be used, as needed, to aid the operator in maintaining proper elevation.

## Dike C Risk Mitigation Work Plan –Section D

### 3.1 Ash Removal from above water areas.

The Jacobs QA Manager and the EPA on site representative will visually examine the exposed areas and agree on what is clean. Once the area has been deemed clean, the area will be photo documented according to the Photo Documentation SOP (TVA-KIF-SOP-026). Once the EPA is comfortable with the established field procedure, the EPA may allow TVA to proceed without direct oversight.

### 3.2 Ash Removal from below water areas.

The Dike C Sampling and Analysis Plan documents the process of using a Vibracore to collect samples for visual ash determination and is used to identify areas where ash is present (Figure 2). When ash is present, mechanical dredging will be used to remove the ash. The cleaned areas will be re-sampled using a box corer or similar device. Sampling will be completed from a small john boat every day ash is removed. GPS locations will be noted and the core photographed. The box core or similar sampling device will allow for visual determination on appropriate ash removal levels. If sampling reveals that ash is still present in unacceptable levels, dredging will continue and the sampling event repeated until the ash is removed to acceptable levels. Documentation procedures will follow the Sampling Plan. The EPA onsite representative must agree that an adequate amount of ash has been removed and the buttress construction may precede with confidence that future investigation and remediation below the buttress will not be required. Once a routine has been established, the EPA may allow TVA to proceed without direct EPA oversight.

## **4.0 Construction Management**

The construction process will incorporate ash removal and Dike Construction. Construction will begin at the toe of the dike prior to working up the slope of the dike. An access road may be constructed to reach the ash and install the materials along the toe. TVA surveying will provide exposed slope points, as well as as-built points. Survey points will be gathered daily, or as needed, to establish and maintain construction control points. Construction progress will be monitored by the quality team, in accordance with the attached Stantec Quality Control Plan. The quality manager will have discretion to stop work if construction activities reveal an adverse affect on dike stability.

### **4.1 Geotechnical Analysis**

Geotechnical samples will be collected on site and documented. Results will be retained in project records. The Stantec Quality Plan provides sampling requirements. Request for deviation from this plan must be submitted on an RFI for approval by Stantec.

## Dike C Risk Mitigation Work Plan –Section D

### 4.2 Material Delivery

Materials will be brought to the MAP area for staging. Approximately 50 loads per day will be required to maintain an adequate stockpile. Increase in the number of loads will require coordination with the Community Involvement Group to allow proper notification to the public. Material staged on site will be kept separate from other materials. Material stock pile areas will be maintained in a clean and orderly manner.

### 4.3 Ash Removal

Ash removal along the dike, where the buttress is to be constructed, will occur in a manner similar to current operations for removing ash from the east side of Dike 2. Ash will be removed to the best technical capabilities of the equipment. Prior to placement of buttress material, the area will be approved and photographed.

Once ash is removed from the toe of the dike, the excavated area shall not be left open for more than 24 hours before granular material (sand, #57, #2 aggregate and riprap) is put in place.

### 4.4 Construction – Dry Area

The majority of work for Section D will be completed in an area where the Emory River can be held back by existing berms. Work in this area is being considered to be done in Dry Conditions. An access road will be constructed along the toe of buttress and will be constructed of materials identified in the buttress design. A geo-grid may be placed within the No. 57 or No. 2 stone for better vehicle support. A passable road surface may be constructed by placing a geotextile fabric along the top of the buttress material and covering the fabric with a stone material to allow passage. Material placed atop the buttress filter material will be removed and the remainder of the buttress material installed, once the access road is no longer needed.

Access roads constructed outside the Dike Buttress may be constructed using non-graded material, if approved by the QC manager.

Work along the existing bench will be completed in parallel with the construction of the toe road. Equipment will work from both areas to place material along the slope of the dike, in accordance with the Stantec specifications and design drawings. Grade stakes will be used to ensure that a minimum of 6 inches of sand is placed. Small tracked vehicles, such as a skid steer, will be utilized to evenly spread material. Grade shots of the slope elevations will be obtained prior to material placement and as needed to document that proper depth of material has been placed. The surveys will be used as as-builts for the final construction report.

Quality control samples will be collected at intervals specified in the attached Quality Control Plan. In-place sand filter samples will be analyzed on site to provide quick turnaround. Construction will be allowed to continue on a draft

## Dike C Risk Mitigation Work Plan –Section D

result as long as the fines in the sample remain within specifications. Sample results will be forwarded to the QA Manager.

Material that comes in contact with ash will be removed.

### **4.5 Construction – Wet Area**

A smaller portion of Section D will be build within the Emory River. Construction techniques will vary slightly from those for working in dry areas. To ensure that a minimum of 6 inches of sand is placed within the water, an amount equal to two feet will be placed using excavator buckets. The sand will have a slight sinuous level to it, but will be at least 6 inches thick. Survey points will be collected at intervals identified in the QA Plan and, as need to maintain control and documentation. Sequential rock layers will be placed in a similar manner to ensure minimum amounts of each are obtained. A turbidity curtain will be installed to reduce migration of fines out into the Emory River.

### **4.6 Tree Removal**

Trees will be removed from the dike area in accordance with Stantec’s specifications and designs. Remaining roots will be excavated in a manner that causes the least amount of disturbance to the existing dike fill. Trees will not be pulled. Alternative methods will require approval of the Stantec QC Manager. Roots greater than 2 inches in circumference will be removed from the ground. Trees with a base greater than 3 inches in circumference shall be photographed and surveyed for future reference.

## **5.0 Schedule**

The Dike C Buttress Construction is anticipated to start once the work plan is approved. The total time required to complete Section D is estimated at three and half months. Completion of the entire lower dike is currently estimated at eight months. Work is estimated to progress at about 20 feet per day for one crew. Once designs and work plans are approved for the remaining three sections, a second shift may be added to reduce the overall duration for completion.

## **6.0 Quality**

Stantec will maintain the role of Quality Control Manager and the onsite daily Quality Assurance. The QA Manager will document that construction is compliant with Stantec’s designs and specifications. The QA Manager and the QC Manager will work together to resolve design/constructability issues. Any changes will require QC Manager approval.

Request for Information (RFI) will be documented in writing and provided to Stantec for approval and tracking. If a change or modification is required to a specification or design, the Stantec QC Manager will need to sign off on the RFI.

As part of the quality control program, photographs will be taken daily.

## Dike C Risk Mitigation Work Plan –Section D

### **7.0 Daily Documentation**

A daily report will document the labor force, equipment used, materials delivered to the site, materials used in construction, distance of dike buttress constructed, safety concerns, problems encountered and resolutions. Reports will be maintained in the project files.

Photographs of work activities will be taken daily. Photographs will include both the approved foundation prior to sand placement and after the sand has been placed. Photographs will be documented according to Photo Documentation SOP (TVA-KIF-SOP-026) and stored accordingly in the project files.

### **8.0 Waste Management**

Waste and materials to be disposed of from the project include the following: ash, vegetation, soil, rock, and equipment fluids.

Ash will be removed from the work area to a level approved by the EPA Oversight. The removed ash will be taken to the processing area and combined with all the ash for removal from the site. Ash will be handled in accordance with established ash disposal procedures.

Vegetation will be chipped and left onsite. Rock and soil will be reused within ash work areas as needed. Equipment fluids will be contained and disposed of in accordance with existing site waste handling procedures. Spills or unintended release of waste shall be reported immediately to the Jacobs Construction Manager.

### **9.0 Permitting**

No permitting is required for this work.

### **10.0 Health and Safety**

Work will comply with the established site wide Health and Safety Plan. Unique safety concerns for this project will focus on working at the water's edge. Forecasts from TVA River Operations for water levels at Watts Bar will be provided daily. Information is also provided on the TVA web site listed below:

<http://lakeinfo.tva.gov/htbin/lakeinfo?site=WBH&DataType=All&submit=View+info>

Dust control is required. The current dust control measures will be used to control dust emissions. If dust plumes are visible, operations will be suspended until control measures are applied.

Additional filter material will be staged on site for response to identified adverse conditions, such as large seeps or soil movements. Response to such events will be directed by the Construction or QC Manager, or assigned designees. Prior to repair work, the area must be inspected by the QC Manager to determine stability issues. Repairs will be made according to the work specific Emergency Action plan or as directed by Stantec's QC Manager.

### Dike C Buttress Sections



Figure 1

Dike C Risk Mitigation Work Plan –Section D

Dike C Vibracore Sampling Locations



Figure 2

**RFI FORM**

**RFI No:** \_\_\_\_\_ **Program: Kingston Recovery Project**  
**Date Submitted:** \_\_\_\_\_ **Location: TVA – Kingston Fossil Plant**  
**Project and Number:** \_\_\_\_\_

<b>Originator:</b> _____		Sheet <u>1</u> of <u>1</u>	
<b>Equipment/Drawings/Specification Reference/Document:</b>			
<b>Request:</b>			
<b>Response:</b>			
<b>Signature:</b> _____		<b>Date:</b> _____	
<b>CONCURRENCE/APPROVAL</b>			
<b>JACOBS</b>			
<b>Concur/Approve</b>	<b>Date</b>		<b>Date</b>
_____		_____	
Construction Manager/Representative		_____	
_____		_____	
Quality Control		_____	
_____		_____	
Engineering Manager/Representative		_____	
<b>Action Taken/Results:</b>			
<b>Signature:</b> _____		<b>Date:</b> _____	

Figure 3

**Quality Control Plan**  
**Dike C Buttress**  
**Stage 1 Construction**  
**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 Dike C buttress 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). Designated EPA 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 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. At this time, the QC Manager is Don Fuller II, PE of Stantec Consulting Services Inc. or his duly appointed successor.

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 buttress components. The QC Team is Jacobs Engineering or their duly appointed successor.

**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 construction activities to include but not be limited to the character and sequence of work, coordination and scheduling.

The Owner's Civil Projects (CP) shall serve as the prime contractor for the Dike C buttress project. Any portion(s) of the work designated to others shall be conducted under the direct supervision of CP.

The Owner shall be responsible for providing qualified professionals to establish and enforce safety protocols related to the project.

### **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 prepared by the QC Team and distributed to all parties prior to the next meeting. These minutes 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 and other parties that will actively participate in the construction activities shall attend these meetings. Minutes shall be prepared and distributed as noted above.

#### **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 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 by additional 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 (with the Owner copied) on a daily basis.

## **4. Ash Removal (within project limits)**

Ash removal within the project limits shall be conducted under separate authority. Prior to construction of Dike C buttress components within subject areas, the Owner and/or their Designee shall obtain written approval from the regulatory contact and/or other appropriate parties that ash has been removed consistent with established guidelines and that construction may proceed.

## **5. Embankment**

### **5.1. General**

Embankment materials shall conform to the requirements established in Section 02150 of the technical specifications. Embankment shall be placed to the lines and grades shown in the drawings in a manner that conforms to the technical specifications.

### **5.2. Quality Control Requirements**

QC requirements are as follows:

- a. Prior to placement, laboratory testing data 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. The exposed surface was inspected to:
  - i. confirm embankment layers are properly compacted and uniform;
  - ii. confirm that elevations are consistent with the project design;
  - iii. confirm that foundation benching has been provided which is conducive to horizontal lift construction in areas with slopes of 20 percent or greater.

- c. Laboratory conformance testing for soil embankment shall consist of one natural moisture content test, standard engineering classification (i.e. sieve and hydrometer, Atterberg Limits and specific gravity) and standard Proctor test per source. This testing is in association with embankment placed on the starter bench road to promote positive drainage.
- d. Field conformance testing shall include in-place density testing to provide documentation of the compaction operations at a minimum one test per two hundred linear feet of starter dike bench length or one test per day whichever is greater or at prescribed intervals established by the QC Manager.
- e. Construction monitoring and field acceptance of embankment placement shall be documented by the QC Team

## **6. Manufactured Sand Product**

### **6.1. General**

Manufactured sand product materials shall conform to the requirements established in Section 02150 of the technical specifications. Manufactured sand product shall be placed as directed by the QC Manager.

### **6.2. QC Requirements**

QC requirements are as follows:

- a. Prior to delivery, 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 shall consist of one gradation for every 10,000 tons delivered to the site. Conformance testing shall also be performed of placed material with gradation performed for every 500 tons placed.
- c. Construction monitoring and field acceptance of manufactured sand product placement shall be documented by the QC Team.

## **7. Geotextile Filter**

### **7.1. General**

Geotextile materials shall conform to the requirements established in Section 02373 of the technical specifications. Geotextile shall be placed to the lines and grades shown in the drawings in a manner that conforms to the technical specifications.

Geotextile 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 project site.

## **7.2. 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 schedule and procedures shall be performed as established in the technical specifications.
- c. Construction monitoring and field acceptance of geotextile installation shall be documented by the QC Team.

## **8. Aggregate**

### **8.1. General**

Aggregate materials shall conform to the requirements established in Section 02410 of the technical specifications. Aggregate shall be placed to the lines and grades shown in the drawings in a manner that conforms to the technical specifications.

### **8.2. QC Requirements**

QC requirements are as follows:

- a. Prior to delivery, 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 shall consist of one gradation at every 30,000 tons delivered to the site. Gradation tests shall be performed on placed materials at the rate of one test per 1,000 tons placed.
- c. Construction monitoring and field acceptance of aggregate placement shall be documented by the QC Team.

## **9. Tennessee Department of Transportation Class B Machined Riprap**

### **9.1. General**

Riprap materials shall conform to the requirements established in Section 02410 of the technical specifications. Riprap shall be placed to the lines and grades shown in the drawings in a manner that conforms to the technical specifications.

## **9.2. QC Requirements**

QC requirements are as follows:

- a. Prior to delivery, 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 shall consist of one gradation at every 30,000 tons delivered to the site or at any visual change in gradation as determined by the QC Team.
- c. Construction monitoring and field acceptance of riprap placement shall be documented by the QC Team.

## **10. Revegetation**

### **10.1. General**

Revegetation activities shall conform to the requirements established in Section 02936 of the technical specifications.

### **10.2. QC Requirements**

QC requirements are as follows:

- a. Prior to delivery, 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. The QC Team shall observe seedbed preparation, fertilizer and lime application, seeding and mulching activities to confirm appropriate revegetation procedures per the project requirements. Construction monitoring and field acceptance shall be documented by the QC Team.

## **11. Project Documentation**

Documentation shall be collected and maintained by the QC Manager (copied to the Owner) during the Dike C buttress project. Survey and generation of as-built drawings shall be performed by TVA. The QC Manager shall review as-built Drawings for completeness. 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 and as-built data;
- Construction issue and solution reports;
- Plan modifications; and
- Meeting minutes.



**Stantec**

**ISSUED FOR CONSTRUCTION**

**Stantec Consulting Services Inc.  
One Team. Infinite Solutions**

Technical Specifications

Dike C Buttress  
Stage 1 Construction  
Kingston Fossil Plant  
Harriman, Roane County,  
Tennessee

Prepared for

Tennessee Valley Authority  
Kingston, Tennessee

November 18, 2009

**TECHNICAL SPECIFICATIONS**  
**DIVISION 2 – SITE WORK**  
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Section 02150	Site Preparation
Section 02373	Geotextile Filter
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Section 02936	Revegetation

**TECHNICAL SPECIFICATIONS**  
**SECTION 02100 – EROSION CONTROL AND STABILIZATION**

**PART 1 - GENERAL**

**1.1. DESCRIPTIONS**

1.1.1. This Section includes provisions for erosion control and stabilization. All construction activities shall be conducted in accordance with applicable environmental requirements. Install sediment and erosion control measures prior to disturbance where applicable.

1.1.2. CIVIL PROJECTS (CP) shall become familiar with the Final Grading Plan, Erosion and Sediment Control Details and Best Management Practices (BMP) Plan, and shall anticipate, and therefore plan in advance for each construction activity.

**1.2. RELATED DOCUMENTS**

1.2.1. The Quality Control Plan and Engineering Drawings apply to the work of this section.

**PART 2 - MATERIALS**

2.1. Refer to the BMP Plan at the end of this Specification, the Sediment and Erosion Control Plan, the Details, and Section 02936 – Revegetation for products and materials to be employed in erosion control and stabilization efforts.

2.2. This Section provides material requirements for silt fence, and fiber rolls.

**PART 3 - EXECUTION**

**3.1. CONSTRUCTION PHASE OPERATIONS**

3.1.1. CP shall evaluate the work of the project and plan to minimize the surface area disturbed at any one time. Excavation shall be limited to the area that can be buttressed in accordance with these Specifications and Drawings within 24 hours.

3.1.1.1. Perform clearing and grubbing, excavation or grading, fabric installation, rock cover and riprap buttress construction at the site in stages to avoid exposing large areas of bare soil. Excavate and place earth fill material during dry weather, when possible.

3.1.1.2. Establish final grade as quickly as possible.

3.1.1.3. Seed and mulch disturbed areas of soil adjacent to work areas as soon as possible.

3.1.2. CP shall control fugitive dust emissions.

3.1.2.1. Control dust generation by covering disturbed areas promptly with the geotextile fabric and by wetting haul roads or applying approved (by TVA) chemical soil binders, as needed.

3.1.3. CP shall not discharge raw silt and sediment laden water from the site without providing for removal of soil particles.

3.1.3.1. Use rock filters or sediment filter bags, fiber rolls and/or use silt fence enclosures or de-silting basins.

3.1.3.2. Use rock silt checks and rip-rap or channel lining when dewatering through ditches and swales.

3.1.3.3. TVA shall provide inspection and maintenance of best management practices at minimum on a weekly basis.

3.1.3.4. In addition, inspect all best management practices after each rainfall of 0.5 inches or more.

3.1.3.5. Maintain all best management devices by removing accumulated silt, repairing or replacing damaged devices and by cleaning up any excess discharges, or mud on gravel roads.

## 3.2. SEDIMENT BARRIERS

3.2.1. CP shall install silt fences, and/or fiber rolls or other suitable measures as practicable along the contour adjacent to Watts Barr Lake prior to any disturbance above the area. Silt fence may also be required at other locations based upon field conditions. The silt fence shall be removed segmentally as an area is ready for geotextile fabric overlay. Floating turbidity curtains shall be installed as needed to protect intake locations. If an area is completed in terms of armoring within one day of initial disturbance and no rain is forecast, then sediment barriers may not be required.

### 3.2.2. Silt Fences

Silt fences shall conform to the material requirements shown on the Drawings. Install below proposed disturbed areas in accordance with the plans and details and as needed in other areas. Embed silt fence as shown on the Drawings. Turn ends of silt fence slightly toward the uphill side to mitigate against bypassing.

### 3.2.3. Fiber Rolls

Fiber rolls and other commercial products made from coconut fiber, rice straw, plastic, wood shavings, or other material can also be used as sediment barriers along streams. Follow manufacturers' installation instructions and ensure that sediment filter spacing on slopes is correct. Make sure runoff does not bypass barriers, coconut rolls, or other barriers underneath or around the ends.

#### 3.2.4. Maintenance

Inspect silt fences and other installed manmade barriers once a week and after rainfalls of 0.5 inch or more. Remove sediment before it reaches six inches in depth. Traps and basins are to be cleaned out when half full. Reinstall sections of fence which have washed out underneath the fence. Replace broken, torn or worn fences. Rebuild or replace damaged brush barriers and fiber rolls. Make repairs within three days of discovering.

#### 3.2.5. Turbidity Curtains

Turbidity curtains may be needed in the intake channel to control sediment advance towards plant intake points.

### 3.3. SLOPE PROTECTION

3.3.1. The CP shall take measures as necessary to minimize sheet, rill and gully erosion prior to placing geotextile fabric. Slopes shall be stabilized immediately after tree removal and grubbing with measures as described below.

- A. Divert Upland Runoff – Use diversion berms as practicable to control flow and route around work areas.
- B. Tracking– Track a dozer up and down the slopes to create horizontal breaks which will slow the overland flow of water.
- C. Sediment Barriers – See paragraph 3.2.

### 3.4. SEDIMENT TRAPS AND BASINS

TVA shall observe effluent leaving the site during rainfall events. If water appears to be excessively muddy or silt-laden, TVA shall review the BMP Plan and insure that all structures are properly installed and functioning, and that all prescribed measures have been taken to minimize erosion. If they appear to be functioning properly upon inspection or after necessary repairs and the effluent is still not acceptable, then TVA shall take immediate action to have CP construct sediment traps as indicated herein. TVA will support CP in the design and location of such traps.

#### 3.4.1. Sediment Traps

Any depression, swale or low-lying place that receives muddy flows from exposed soil areas can serve as a sediment trap. Installing several small traps at strategic locations is often better than building one large basin. The simplest approach is to dig a hole or build a dike (berm) of earth or stone where concentrated flows are present. This will help to detain runoff so sediment can settle out. The outlet can be a rock-lined depression in the containment berm.

### **3.4.2. Sizing and Design Considerations**

**3.4.2.1.** A minimum storage of 134 cubic yards per acre of exposed soil drained is required for basins and traps. Traps and basins are designed so that flow paths through the trap or basin are as long as possible, to promote greater settling of soil particles. Sediment basin length must be twice the width or more if possible – the longer the flow path through the basin, the better. Side slopes for the excavation or earthen containment berms are 2:1 or flatter. Berms are made of well compacted clayey soil, with a height of 5 feet or less. Well mixed rock can also be used as a containment berm for traps. Place soil fill for the berm or dam in 6" layers and compact. The entire trap or basin, including the ponding area, berms, outlet, and discharge area, must be seeded and mulched immediately after construction.

**3.4.2.2.** An overflow outlet can be made by making an notch in the containment berm and lining it with rock. Rock in the notch must be large enough to handle overflows, and the downhill outlet should be stabilized with rock or other flow dissipaters similar to a culvert outlet. The overflow should be at an elevation so the dam will not overtop. Allow at least one foot of freeboard. Outlets must be designed to promote sheet flow of discharges onto vegetated areas if possible. If the discharge will enter a ditch or channel, make sure it is stabilized with vegetation or lined.

### **3.4.3. Inspection and Maintenance**

Inspect inlets, berms, spillways, and outlet areas for erosion after each rain exceeding 0.5 inch and every seven days. Repair gullied areas and any upslope areas contributing large volumes of sediment. Repair and reseed bare areas. Ensure that downstream receiving area is stable. Remove sediment before it fills half the trap or basin volume.

## **3.5. INSPECTION AND MAINTENANCE**

**3.5.1.** CP is responsible for inspection and maintenance of the construction site and all best management practices.

### **3.5.2. Inspection**

Erosion and sediment controls must be inspected weekly and after each rain exceeding 0.5 inch. Keep records of inspection observations and actions taken, and file with other erosion and sediment control plan paperwork.

### **3.5.3. Maintenance**

Daily inspect equipment and hydraulic oil systems at the beginning of the day. Repair or replace frayed or damaged lines or hoses before use in or near water and provide containment measures if required.

**3.5.3.1** Keep erosion and sediment controls in good working order until the project is completed. Brush and other debris should be removed from work areas. Sediment accumulating behind silt fences or other sediment filters should be removed regularly. All structures that have become dislodged or damaged (such as silt fences, etc.) should be repaired within three days of discovery.

**3.5.3.2** Make sure that waste materials, building materials, and supplies are properly tied down or contained so that wind and storm water runoff cannot carry the materials away. Fuel, lubricants, and hazardous waste products should be stored in an approved tank or other structure to avoid spills and runoff. Provide spill kits and containment material on-site, especially near fueling or equipment service areas. Maintain vehicles and equipment away from the site if possible. If maintenance must occur on-site, ensure that spills are cleaned up quickly.

## **Best Management Practices Plan Dike C Buttress Construction – Stage 1**

### **Purpose of the Best Management Practices Plan**

The purpose of the Best Management Practices (BMP) plan is to evaluate potential sources of sediment and other pollutants at the project site and put controls in place that will effectively prevent pollutant discharges to surface and ground waters. Construction activities shall be performed in accordance with the Kingston site wide Stormwater Pollution Prevention Plan. This BMP is a guideline for the Dike C work activities. The following general pollution control requirements have been addressed in the BMP Plan, as applicable:

1. Control limited threat discharges to minimize impacts to water quality;
2. Prevent the discharge of pollutants associated with construction activities to surface waters;
3. Retain soil and sediment on site;
4. Permanently stabilize disturbed soils.

This plan has been developed based on an understanding of the current conditions of the watershed, a general knowledge of the previous activities at the site, and an anticipation of the proposed remediation activities scheduled for the site. This plan is intended to be a "living" document, in that as the Work at the site progresses, this plan must be periodically reviewed and adjusted to suit the actual conditions and situations as they develop. CIVIL PROJECTS and all SUBCONTRACTORS shall become familiar with this plan, and shall constantly monitor the site conditions, making appropriate modifications as needed.

### **Site Description:**

The Kingston Fossil Plant Dike C is located along the Emory River / Watts Bar Lake in Roane County, Tennessee. Dike C is the containment embankment for the Kingston Fossil Plant ash pond and stilling basin. The toe of the embankment extends into Watts Bar Lake and is being armored with riprap and other materials to improve the stability of the containment structure.

### **Construction Activities Proposed:**

This work involves buttressing Dike C of the ash pond/ stilling basin at the Kingston Fossil Plant. Work measures required to stabilize the site include:

- A. Installation of sediment and erosion control measures for the site
- B. Shaping of starter dike bench to improve drainage including the removal of existing pipes and placement of embankment
- C. Documentation of location and removal of trees and rootwads on the embankment

- D. Surface preparation to allow filter placement.
- E. Placement of sand filter on designated areas of slope above and below the water surface.
- F. Placement of stone cover on the sand and construction of riprap buttress.
- G. Revegetation of disturbed areas outside limits of riprap placement.
- H. Removal of temporary sediment control measures.

**Work Sequence:**

1. Installation of perimeter sediment and erosion control measures in accordance with the Drawings, Section 02100 of the Specifications and the Sediment and Erosion Control Measures Section below.
2. Protection of existing geotechnical instrumentation as described in Section 02150 of these Specifications.
3. Surveying and photographing trees to be removed as described in Section 02150 of these Specifications.
4. Excavation and stockpiling of gravel from starter dike bench road as described in Section 02150 of these Specifications.
5. Shaping the starter dike bench to drain towards Watts Bar Lake. as described in Section 02150 of these Specifications.
6. Removing drain pipes from starter dike bench and backfilling as described in Section 02150 of these Specifications.
7. Removing trees and other vegetation as described in Section 02150 of these Specifications.
8. Grubbing of rootwads as described in Section 02150 of these Specifications.
9. Removal of organic materials and topsoil as described in Section 02150 of these Specifications.
10. Placing manufactured sand product in tree rootwad removal areas as described in Section 02150 of these Specifications.
11. Excavation and stockpiling of previously placed riprap as described in Section 02150 of these Specifications.
12. Grading surface to allow placement of geotextile or granular filter as described in Sections 02373 and 02410 of these Specifications.
13. Construction of access roads or temporary access ramps as described in Section 02410 of these Specifications.
14. Construction of riprap buttress as described in Section 02410 of these Specifications.

15. Removal of temporary sediment control measures in a segmental manner. Protection of existing site improvements or utilities from damage.

**Sediment and Erosion Control Measures:**

Due to the lack of available area downstream of the limits of disturbance caused by the presence of work extending into Watts Bar Lake there is inadequate area for a sediment pond. Alternative measures have been analyzed and will be employed to reduce total suspended solids (TSS) during construction. Measures to reduce TSS for the remainder of the site are described below:

1. Use of geotextile filter on the slopes, roads and other disturbed areas.
2. Placement of aggregate and riprap armor on slopes along the Lake.
3. Installation of silt fence and fiber logs around the perimeter of the disturbed areas.
4. Seeding of areas disturbed by Construction activity outside of buttress placement.
5. The installation of rock check dams in temporary diversion ditches.
6. The use of booms or berms to contain sediment from affecting other portions of the Lake.

**Other Control Measures:**

Dust generation shall be minimized by spraying with water.

**Other State or Local Plans:**

Work on-site shall adhere to all applicable state and local laws.

**Maintenance:**

All silt fences, fiber coils, booms and other sediment control devices shall be inspected as described below. Tears in the fence shall be repaired or portions of the fence replaced within 3 days of discovery. Sumps shall be cleaned of accumulated sediment when sediment depths exceed six inches. CP shall likewise ensure that all roads maintain adequate gravel cover and replace same to maintain the design template.

**Inspections:**

Qualified personnel shall inspect storm water control measures, discharge locations, vehicle exits, disturbed areas of the site and material storage areas at a minimum of every 7 calendar days and within 24 hours of every 0.5 inch precipitation event. Areas that have been temporarily stabilized shall be inspected at least once per month. Revisions to the BMP Plan based on the results of these inspections shall be implemented within seven days.

A report summarizing the scope of the inspection, names and qualifications of the inspecting personnel, the date of the inspection, observations as they relate to the BMP Plan and corrective actions shall be noted in the report. All reports shall be kept for at least three years after the date of the inspection or for one year after coverage under the site specific stormwater prevention plan. Each report shall be signed, and shall be available at the site for review.

**Non-Storm Water Discharges:**

All on-site vehicles will be monitored for leaks and receive regular preventive maintenance to reduce the chance of leakage. Preventive maintenance such as changing oil shall be performed off-site. Any spills of hydraulic fluid or oil from machinery shall be immediately cleaned up using rags, mops, kitty litter, sand, sawdust and placed in plastic cans before being disposed off in a legal manner. Containment of any spill using dikes, plastic liners or other methods will be used as necessary. Manufacturer's methods for spill cleanup will be posted on-site and site personnel will be made aware of the location of the procedural information and cleanup supplies. Any spill of toxic or hazardous substances will be immediately reported to the EPA. The site superintendent will be the spill prevention and cleanup coordinator.

Materials expected to be on-site include: Petroleum based products, fertilizer, grass seed, mulch, geotextiles, geomembranes, steel, stone, coal combustion products and agricultural lime.

**CP, Subcontractors and Owner:**

The CP and each subcontractor shall implement the appropriate control measures outlined in this BMP plan. The project OWNER for the purpose of this submittal is the Tennessee Valley Authority.

**Certification:**

I certify under penalty of the law that I understand the terms and conditions of the general National Pollutant Discharge Elimination System (NPDES) permit that authorizes the storm water discharges associated with industrial activity from the construction site identified as part of this Certification”

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Printed or Typed Name and Title

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Signature

Representing:

Phone: Office:

Date: \_\_\_\_\_

**END OF SECTION 02100**

## TECHNICAL SPECIFICATIONS SECTION 02150 – SITE PREPARATION

### PART 1 - GENERAL

#### 1.1. RELATED DOCUMENTS

The conditions and description of work shown in other sections of these Specifications as well as the Engineering Drawings and Quality Control Plan apply to this Section.

#### 1.2. SUMMARY

1.2.1. This section includes the following:

- Surveying and photographing trees to be removed.
- Excavation and stockpiling of gravel from starter dike bench road
- Shaping the starter dike bench to drain towards Watts Bar Lake.
- Removing drain pipes from starter dike bench and backfilling
- Removing trees and other vegetation.
- Grubbing of rootwads.
- Removal of organic materials and topsoil
- Placing manufactured sand product in tree rootwad removal areas
- Excavation and stockpiling of previously placed riprap
- Grading or smoothing of surface to allow placement of filter
- Removal of temporary sediment control measures in a segmental manner. Protection of existing site improvements or utilities from damage.

1.2.2. Related Sections include the following:

- Section 02100 – Erosion Control and Stabilization
- Section 02373 – Geotextile Placement
- Section 02410 – Rock Buttress and Granular Filter Components

#### 1.3. DEFINITIONS

##### 1.3.1. Starter Dike

The starter dike is the lower in elevation portion of Dike C at approximate elevation 748 feet and below immediately adjacent to Watts Bar Lake.

### 1.3.2. Dike Bench

The dike bench is the relatively flat area at the top of the starter bench upon which the raised dike was constructed at approximate elevation 748 feet. A portion of this area remains and is currently covered with gravel and being used as a road.

### 1.3.3. Rootwads

Rootwads consist of the tree stump as well as roots greater than 2 inches in mean diameter.

### 1.3.4. Topsoil

Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than two inches in diameter; and free of weeds, roots and other deleterious materials.

### 1.3.5. Drain Pipes

Steel or plastic piping previously installed to drain the dike bench.

## PART 2 - PRODUCTS

2.1. Remove cleared topsoil for use elsewhere or dispose of as it is not required in the landfill area but is required in borrow areas for use in re-vegetation.

2.2. Manufactured Sand Product is a durable quarry produced material free of deleterious amounts of shale conforming to Rogers Group Inc. Roane County Quarry Manufactured Sand Product Tennessee Department of Transportation Concrete Sand or QC Manager approved equal. The gradation shall conform to the following:

Sieve/Screen Size	Percent Passing
3/8	100
No. 4	95-100
No. 8	80-100
No. 16	50-85
No. 30	25-60
No. 50	10-30
No. 100	2-10
No. 200	0-5

2.3. There are no requirements for the cutting or stacking of trees or timber.

2.4. Embankment soils used for promoting positive drainage on the dike bench shall consist of clean soils that classify as CL or CH according to the Unified Soil Classification System. These soils shall not contain organic debris, ash or contain rock exceeding two inches in diameter

### **PART 3 - EXECUTION**

#### **3.1. PREPARATION**

3.1.1. Protect and maintain geotechnical instrumentation from disturbance during construction. Install silt fencing along furthest downstream point practicable.

3.1.2. Locate and survey trees to be removed to document their position in case seeps occur. Photograph trees and relate them to the survey positions.

3.1.3. Remove gravel from the starter dike bench road and stockpile for later use. Install temporary silt fence just below starter dike bench.

3.1.4. Through the placement of embankment shape the starter dike bench to slope towards Watts Bar Lake at 2% minimum slope. Prior to placement of embankment materials, exposed surfaces shall be stripped of all vegetation, organic soils and vegetative cover soils as well as any other deleterious materials. Exposed surfaces shall be scarified to promote lift bonding. The sequence of filling shall commence at the lowest section (in elevation) of the subject footprint and proceed upward in maximum eight-inch loose lifts in a manner to maintain positive drainage at all times. Positive drainage through minimum two percent cross slopes 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. For areas with slopes greater than 20 percent, embankment benches shall be provided which are conducive to horizontal lift construction. These embankment benches shall be constructed on 10 foot vertical increments during Stage 2 construction and are not required for Stage 1.

Each lift of soil embankment shall be compacted with a tamping foot or sheep foot roller, or equivalent approved by the QC MANAGER, to a minimum of 95 percent of standard Proctor maximum dry density. 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 scarified to promote lift bonding.

3.1.5. Remove piping below starter dike bench and compact embankment into excavated areas. Compact embankment using manual tampers or other means to achieve 95% of standard Proctor maximum dry density.

#### **3.2. CLEARING AND GRUBBING**

Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots. Completely remove stumps, roots, obstructions, and debris extending to a depth of 18 inches below exposed subgrade. In general, all trees and brush with a mean diameter of 2-inches or greater at ground level shall be grubbed out. Where it is not reasonable to remove trees by a mowing with a bush hog or with similar mowing equipment the following guidelines apply:

- 3.2.1. All trees shall be cut using a handsaw or chainsaw and the cut tree and branches discarded.
- 3.2.2. Remove the remaining tree trunk, stump, and rootwad
- 3.2.3. Grub any remaining roots of the tree so that only 2 inches or smaller roots are left in place
- 3.2.4. The resulting cavity from removal of the rootwad shall be cleaned of loose soil and debris
- 3.2.5. The cavity shall then be backfilled with manufactured sand product and graded to blend and match adjacent slopes.

### 3.3. TOPSOIL STRIPPING

- 3.3.1. Remove sod and grass before stripping topsoil.
- 3.3.2. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other materials. Strip surface soil of unsuitable topsoil, including trash, debris, weeds, roots, and other waste materials.
- 3.3.3. Dispose of excess topsoil as specified for materials disposal.
- 3.3.4. Employ perimeter Best Management Practices, such as silt fences or berms, to minimize runoff of silt and sediment laden waters from the stockpiled topsoil and waste materials.

### 3.4. RIPRAP EXCAVATION

Relocate or remove silt fence as needed. Excavate previously placed riprap after clearing activities are completed. Excavate riprap as practicable and limit sediment production by dip excavation using buckets. Only loose riprap shall be removed. Riprap embedded into the slope shall remain. In areas under water the excavator bucket shall be used to probe loose riprap, snags or trees and remove same. Embedded items shall remain in place. Stockpile riprap for re-use as practicable. Reinstall silt fence at completion of riprap removal.

### 3.5. PREPARE SURFACE FOR GRANULAR FILTER OR GEOTEXTILE PLACEMENT

3.5.1. CP shall prepare the exposed surface to receive granular filter or geotextile fabric placement by grading, blading, tamping or use of backhoe bucket to provide a relatively even, smooth surface free of protrusions, rocks, roots and other items that would keep the filter from making contact with the soil. This may also be achieved using an excavator with no teeth and a welded plate. Surfaces not immediately receiving filter shall be tracked as practicable with equipment moving up and down slopes. If tracking results in an irregular surface, utilize a plate tamper mounted on the excavator or the back of the bucket to "iron" or smooth the area. Tamp soft areas as practicable to obtain a smooth surface.

3.5.2. Work shall be performed in segments and disturbance shall be limited as practicable to limit exposure of exposed soils to rainfall events and subsequent erosion. This time limit is set at 24 hours. Silt fencing or other sediment control devices shall be removed immediately before granular filter or geotextile placement.

**3.5.3** TVA shall survey prepared areas of slope after approval of the subgrade and prior to placement of granular filter. This surveying is anticipated to be performed on a daily basis and be associated with grade staking activities. The as-built data shall be provided to the QC Manager daily for review. Staking/survey shots are anticipated at 25' increments and at slope breaks.

**END OF SECTION 02150**

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## TECHNICAL SPECIFICATIONS

### SECTION 02373 – GEOTEXTILE FILTER (ALTERNATIVE 2)

#### PART 1 - GENERAL

##### 1.1. RELATED DOCUMENTS

The Engineering Drawings, Quality Control Plan and other Sections of the Project specifications apply to the Work specified in this Section. Geotextile shall not be utilized as filter unless approved in writing by TVA. It may be used as a temporary measure and removed.

##### 1.2. DESCRIPTION OF WORK

This work shall consist of furnishing and placing a minimum 15 ounce per square yard weight non-woven filter geotextile on the starter dike extending underwater to the limits shown on the Drawings. Work above water shall consist of placing the fabric in firm contact with soils as specified. Work for placement of the geotextile filter underwater consists of sinking the geotextile in a controlled manner, with appropriate overlap where not pre-seamed. The role of the filter geotextile is as an underlayment for riprap buttress.

Prior to installation, the geotextile manufacturer shall provide the QC MANAGER with certification signed by an authorized employee of the manufacturer. The certification shall indicate that the geotextile material meets or exceeds the specified minimum average roll values provided in Table 1. The manufacturer shall also provide certified laboratory test data for unit weight, tensile strength, puncture strength, mullen burst strength, permittivity, apparent opening size and trapezoidal tear strength measured in accordance with the procedures listed in Table 1 at a minimum frequency of 1 test per 100,000 ft<sup>2</sup> of geotextile produced, with exception to U.V. resistance which shall be provided a minimum frequency of twice per year.

#### PART 2 - MATERIAL

##### 2.1. GENERAL

The geotextile materials supplied under these specifications shall be first quality products specifically manufactured for cushion applications and shall have demonstrated by prior use their suitability for such applications. The geotextile manufacturer shall provide at least three references encompassing at least 10,000,000 ft<sup>2</sup> of geotextile used in similar projects.

##### 2.2. GEOTEXTILE FABRIC

The geotextile shall meet the physical requirements of Table 1. Acceptable geotextile fabrics include Mirafi 1160N, DaITex 1160, Geosynthetic Inc. NW16 and Geotex 1701 or equivalent products. The geotextile shall be free of holes, tears, defects, and patch-repairs of defects. The geotextile shall be composed of nonwoven needle-punched, discontinuous (staple) fibers. Fibers used in manufacture of the geotextile shall consist of a material composed of at least 85 percent by weight polyolefins, polyesters, or polyamides.

Table 1. Geotextile Filter Properties

Property	Test Method	English	Metric
Unit Weight	ASTM D 3776	15 oz/yd <sup>2</sup>	542 g/m <sup>2</sup>
Tensile Strength	ASTM D 4632	380 lbs	1.69 kN
Puncture Strength	ASTM D 4833	235 lbs	1.04 kN
Mullen Burst Strength	ASTM D 3787	740 psi	5,098 kPa
Trapezoidal Tear Strength	ASTM D 4533	140 lbs	0.623 kN
Grab Tensile Elongation	ASTM D 4632	50%	50%
AOS	ASTM D 4751	100 sieve	0.15 mm
Permittivity	ASTM D 4491	0.5 sec <sup>-1</sup>	-
U.V. Resistance	ASTM D 4355	70%	70%

**Note:**

All numerical values represent minimum average roll values (i.e., average of test results from any sampled roll in a lot shall meet or exceed the minimum average roll values in the table) in weaker principle direction. Lot sampled according to ASTM D 4354, "Practice for Sampling Geosynthetics for Testing."

**PART 3 - EXECUTION**

**3.1. SHIPMENT AND STORAGE**

The geotextile shall be labeled, stored, and handled in accordance with ASTM D-4873, "Guide for Identification, Storage, and Handling of Geosynthetics." The geotextile shall be kept dry and wrapped in a waterproof wrapping such that it is protected from UV light and the elements during shipping and storage. Geotextile rolls shall be stored in a manner which protects them from the elements. If stored outdoors, they shall be elevated and protected with a waterproof, opaque cover.

**3.2. INSTALLATION**

**3.2.1. General**

The geotextile shall not be installed until conformance test results are reviewed and the geotextile is accepted by the QC MANAGER. CP shall handle all geotextiles in such a manner as to ensure the geotextile is not damaged. The above water surface base on which the geotextile is to be placed shall be prepared to a smooth condition free of debris or obstructions which may damage the geotextile. The surface base shall be approved by the QC MANAGER prior to geotextile placement. Care shall be taken not to entrap stone, excessive dust, or moisture in the geotextile. The CONTRACTOR shall not operate heavy equipment on the geotextile without a minimum 36 inch cover of approved material.

Geotextile shall not be placed underwater until the area is approved by the regulatory authority noted in the Quality Control Plan

### 3.2.2. Deployment

- Geotextiles placed above water level shall be deployed free of wrinkles and folds. On slopes, the geotextiles shall be anchored at the top and unrolled down the slope. In the presence of wind, all geotextiles shall be weighted with sandbags or other material which will not damage the geotextile. Geotextile uplifted by wind may be reused upon approval by the QC MANAGER.
- Geotextiles placed in water require ballast to promote sinking. There are a number of methods to place geotextile in water. One method employed by Contractors involves using a long reach excavator to reach the full length of placement. The geotextile is rolled onto a steel pole with a buoy attached at one of the pole. The lead edge of the geotextile is anchored under the excavator and the roll lowered/pushed into place. Aggregate is then placed on the fabric and the pole retrieved for re-use. In areas inaccessible to equipment a steel wire net of sufficient weight to sink the geotextile fabric may be used. This net can be attached to the geotextile using ties and rolled up and transported to the installation area. A barge may be used to pull the steel net/fabric out to final position. Small floats or paint marks that can be observed from the surface or by divers can be used to mark the edge of the fabric to provide for proper overlaps. Ballast smaller than the net apertures can be used to weigh down the geotextile and the steel net retrieved for re-use.
- CP shall develop a plan for geotextile deployment for review and approval by the QC MANAGER. Geotextile shall not be deployed until the deployment plan is approved

### 3.2.3. Geotextile Placed Above Water

Adjacent geotextile panels shall be heat bonded or sewn. Minimum two foot overlaps are required. All seams shall be oriented parallel to (in the direction of) the slope. Seams constructed perpendicular or transverse to the direction of the slope will not be accepted. The geotextile shall be examined over the entire surface after installation to ensure that no potentially harmful objects are present.

### 3.2.4. Geotextile Placed Under Water

Adjacent geotextiles panels may be pre-sewn or heat bonded prior to placement in water up to the width that can be practicably placed. Otherwise, overlaps shall not be less than five feet.

## 3.3. HEAT-BONDED SEAMS

Seams may be heat bonded using hot plate, hot knife, or ultrasonic devices. Manual or automatic machine driven seaming devices may be used; however, machine driven seaming equipment is preferred. Continuous or spot seams may be used as required by the contract documents. For spot seams, a minimum 6-inch long heat-bonded seam shall be manufactured for each 3-feet of geotextile length. All locations where heat bonding has melted through either geotextile panel shall be repaired. Adjacent geotextile panels shall be overlapped 24-inches prior to seaming. The geotextile panels shall be completely clean dry prior to seaming. The geotextile panel edges shall lay flat against each other prior to seaming such that no gaps are formed in the seam. Heat seaming shall not be

performed during rain or snow. Ambient temperatures for seaming should be above freezing, i.e. 32°F, unless test strips indicate satisfactory seams can be fabricated at lower temperatures. The use of a seaming board or slip sheet is recommended for some seaming operations. A seaming board or slip sheet may be a wood board or piece of geomembrane which is placed below the geotextile panels at the location of seaming. The board or sheet may be pulled with a rope or strap as seaming progresses. The purpose of the seaming board or slip sheet are to provide a firm, clean surface for seaming and to reduce condensation onto the geotextile from an underlying soil layer as a result of seaming.

### **3.4. REPAIRS**

Damaged geotextiles and geotextiles contaminated with dirt shall be repaired immediately. Repairs shall be made with the same geotextile product style as the original material. All repairs shall meet the approval of the QC MANAGER, prior to cover placement.

Geotextile panels which require repair shall be removed and replaced with new material. Replacement material shall be sewn or heat bonded as previously described in this specification. All seams shall be oriented parallel to (in the direction of) the slope. Seams constructed perpendicular or transverse to the slope will not be accepted.

### **3.5. COVER PLACEMENT**

#### **3.5.1. General**

Placement of cover (No. 2 aggregate) on the geotextile shall be accomplished in a manner as to ensure that the geotextile is not damaged. Cover material shall be placed within 14 days of deployment for geotextile above water and immediately below water. Geotextile exposure periods may exceed 14 days when approved by the QC MANAGER based on evaluation of geotextile resistance to UV degradation and on local environmental conditions

#### **3.5.2. Placement**

The cover shall meet the material requirements of the engineering documents and shall be approved by the QC MANAGER, or other TVA representative prior to placement. Cover material shall be placed such that excess tensile stress is not mobilized in the geotextile. Cover placement operations shall comply with the requirements and limitations of the contract documents and project design documents.

#### **3.5.3. Protection**

Low ground pressure (< 5 lb/in<sup>2</sup>) equipment shall be used to place No. 2 aggregate cover and build access ways. Cover thickness on the geotextile shall be greater than or equal to 1.0 ft prior to operation of low ground pressure equipment and 36 inches or more prior to operation of heavy equipment. When approved by the QC MANAGER, higher ground pressure (>5 lb/in<sup>2</sup>) equipment may be operated on the cover in accordance with the cover thickness requirements provided in Table 2. On slopes cover shall be placed beginning at the bottom of the slope and extending upward. Any damaged areas of geotextile shall be repaired or replaced as noted in Paragraph 3.4 of this section.

Table 2. Geotextile or Sand Filter Cover Lift Thickness Requirements for Equipment Operation

Maximum Allowable Equipment Ground Pressure (psi)	Lift Thickness of Overlying Cover Material (ft)
<5	1.0
5-10	1.5
10-20	2.0
>20	3.0

Note: Cover lift thickness to be approved by the QC MANAGER.

### 3.6. CONFORMANCE SAMPLING AND TESTING

#### 3.6.1. Sampling Frequency

The geotextile shipment shall be divided into lots to facilitate conformance sampling. A lot is to be considered as any separate portion of the shipment that differs from other portions in specification, style, or origin of manufacture. Roll(s) shall be selected at random from each lot for conformance testing. These roll(s) are herein referred to as conformance sampling units. One conformance sampling unit shall be selected for every 100,000 square feet of geotextile included in the lot. All rolls sampled for conformance testing shall be securely re-covered with an opaque, waterproof cover and shall remain covered until time of installation.

#### 3.6.2. Sample Identification

The QC MANAGER shall be responsible for collection of conformance samples from the selected sampling units. Samples shall be 3 feet long and taken across the entire width of the roll and shall not include the first complete revolution of fabric on the roll. Each conformance sample shall be clearly identified with the style number, roll number, and manufacturer's name. The QC MANAGER shall be responsible for conformance testing of unit weight, tensile strength, puncture strength, mullen burst strength, trapezoidal tear strength, apparent opening size, and permittivity in accordance with the procedures listed in Table 1.

#### 3.6.3. Testing Methods

Compliance of geotextile materials to this project specification shall be determined in accordance with ASTM D 4759 "Standard Practice for Determining the Specification Conformance of Geosynthetics." The lot shall be considered in compliance with this specification and accepted for construction if the average test values of lot sampling units meet or exceed specification values provided in Table 1. The QC MANAGER shall examine all conformance test results and approve the geotextile prior to deployment.

#### **3.6.4. Retesting**

If the average test value for any individual lot sampling unit fails to meet one or more of the specification values, the lot shall be resampled and retested. This testing shall be done at the expense of the manufacturer. Any individual lot sampling unit which fails initial testing shall not be included in the lot for resampling. The geotextile manufacturer may request retesting be performed with a technical representative of the manufacturer present. The lot shall be considered in compliance with this specification and accepted for construction if the average test values for all resampled lot sampling units meet the specification values. The lot shall be rejected if an average test value for any resampled lot sampling unit fails to meet one or more of the specification values.

#### **3.6.5. Independent Retesting**

Alternatively, the manufacturer may elect retesting be performed by two independent third party testing laboratories. The lot shall be considered in compliance with this specification and accepted for construction if both laboratories report average test values which meet the specification values. The lot shall be rejected if either laboratory reports average test values which do not meet one or more of the specification values.

#### **3.6.6. Isolation Testing**

The QC MANAGER may permit additional testing to isolate the portion of a rejected lot which is in noncompliance provided rolls within the lot are numbered consecutively. This testing shall be performed at the expense of the manufacturer. To isolate the portion of the lot which is in noncompliance, two additional samples shall be taken from the two rolls having roll numbers immediately higher and lower than the failing roll. If both additional tests meet or exceed specification values, the roll that represents the initial failing sample and the roll manufactured immediately after that roll shall be considered out of specification and rejected. The procedure may be repeated with additional tests to bracket noncompliant rolls within the lot. The remainder of the lot shall be considered within specification and accepted.

**END OF SECTION 02373**

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## TECHNICAL SPECIFICATIONS

### SECTION 02410 – ROCK BUTTRESS AND GRANULAR FILTER COMPONENTS

#### PART 1 - GENERAL

##### 1.1. DESCRIPTION OF WORK

This Specification covers placement of manufactured sand, No. 57 aggregate, No. 2 aggregate and riprap to construct the granular filter and rock buttress for Dike C of the Ash Pond and Stilling Pool for the Kingston Fossil plant. A geotextile filter is shown in the Drawings as Alternate 2 but shall not be utilized unless approved in writing by TVA. Geotextile filter shall conform to the requirements of Section 02373 – Geotextile Filter. Erosion and sediment control measures shall conform to Section 02100– Erosion Control and Stabilization of these Specifications.

##### 1.2. SUBMITTALS

Certification statements shall be provided by each supplier that the product conforms to these specifications. In addition all materials shall meet the testing schedules noted in the QC Plan.

#### PART 2 - MATERIALS

##### 2.1. AGGREGATE

No. 2 aggregate and No. 57 aggregate shall consist of quarried stone meeting the requirements of Section 903 of the Tennessee Department of Transportation (TDOT) "Standard Specifications for Road and Bridge Construction" (Standard Specifications) latest edition. The gradation shall conform to Table 1 (AASHTO M43) in Section 903.22 of the Standard Specifications

##### 2.2. GEOTEXTILE FILTER

Geotextile filter if approved by TVA for filter use beneath the rock buttress materials shall conform to Section 02373 – Geotextile Filter of these Specifications.

##### 2.3. TDOT CLASS B MACHINED RIPRAP

Riprap buttress stone shall consist of quarry stone meeting the requirements of Section 709 of the Tennessee Department of Transportation "Standard Specifications for Road and Bridge Construction" latest edition. Machined Riprap (Class B) shall vary in size from 3 inches to 2.25 feet (from 75 to 675 mm) with no more than 20% by weight being less than 6 inches in size (150 mm).

##### 2.4. MANUFACTURED SAND PRODUCT

This product shall conform to Section 02150, Part 2, Paragraph 2.2 of these specifications.

Other sources of sand product may be approved by QC MANAGER subject to filter analysis based on gradation and the quality of the sand.

## **PART 3 - EXECUTION**

### **3.1. GRANULAR FILTER**

Granular filter shall consist of a minimum of six inches manufactured sand product placed on soil subgrade with the sand then overlain by six inches TDOT No. 57 aggregate which is in turn overlain by six inches TDOT No. 2 aggregate. Surfaces to receive granular filter shall be prepared to a condition free of large protrusions as directed by the QC MANAGER. No filter shall be placed until the subgrade is approved by the QC Manager or the designated representative on the QC Team.

#### **3.1.1. Sand Placement**

The sand component of the graded filter shall be placed to a minimum thickness of six inches. This measurement shall be made perpendicular to the surface of the dike.

#### **3.1.2. Underwater Placement**

The sand component of the filter placed under water shall be performed in such a manner as to provide a minimum thickness of six inches. One such method involves placement by excavator of overlapping buckets of sand. In some areas the sand thickness will likely exceed six inches and form a sinusoidal wave pattern of placement.

#### **3.1.3. Stone Placement**

Stone and riprap shall be placed to the minimum thickness indicated on the Drawings. Measurement shall be made perpendicular to the slope.

#### **3.1.4. Contamination Issues**

Placed sand shall be covered with No. 57 stone as quickly as practicable. In no event shall sand remain exposed for more than 24 hours. Any contamination of sand from soil or ash shall be cause to remove and replace the sand. The action of covering of sand by No. 57 stone and No. 2 stone shall be performed in such a manner that stone cover will lag sand placement by five feet to reduce contamination risk. This lag may be adjusted based on field operations and conditions as deemed necessary by the QC Manager.

#### **3.1.5. Riprap Placement**

Riprap may be placed by mechanical means using an excavator or loader. The maximum allowable drop height for riprap placement is two feet. The rock shall be placed to the depths, extents and template shown in the drawings. The surface of the lining, upon completion, shall be graded as practicable into final position to ensure proper thickness and a uniform surface. Larger rocks shall be uniformly distributed with the small rocks and spalls filling the voids between the larger rocks.

### **3.2. CUSHION GEOTEXTILE FILTER**

Surfaces to receive cushion geotextile shall be prepared to a relatively smooth condition, free of jagged rocks, depressions and debris. Any soft areas shall be excavated and backfilled. Geotextile

shall be placed in accordance with the requirements of Section 02373 – Geotextile Filter of these Specifications. Note that geotextile filter shall not be used without written authorization by TVA

### **3.3. ACCESS TO CONSTRUCTION**

#### **3.3.1. Access to Work – Areas of Granular Filter**

Riprap shall not be placed until the granular filter has been approved by the QC MANAGER or the designated representative on the QC Team. In order to access locations of riprap placement, temporary access ramps or roads may be needed. Where operating heavy equipment or trucks over the filter, additional cover shall be placed to a minimum total depth of 36 inches over the sand component of the filter. This cover shall consist of an additional 18 inches of No. 2 aggregate spread on access areas and covered on the surface with 6 inches of No. 57 aggregate. The No. 2 aggregate shall be spread in a single lift utilizing low ground pressure equipment conforming to Table 2 of Section 02373 of these Specifications or by using excavator buckets. The No. 57 aggregate shall be spread in a single lift. The temporary road surface can be reclaimed and re-used as needed. If aggregate is left in place a minimum cover of 3 feet of riprap is required. Where the No. 57 aggregate surface has been contaminated with ash, it shall be removed and wasted as directed by the QC MANAGER.

#### **3.3.2. Access to Work – Geotextile Filter (where approved by TVA)**

Riprap shall not be placed until the protective cover of No. 2 aggregate has been approved by the QC MANAGER. In order to access locations of riprap placement, temporary access ramps or roads may be needed. Where operating heavy equipment or trucks over the geotextile filter and No. 2 aggregate cover, additional cover shall be placed to a minimum total depth of 36 inches. This cover shall consist of an additional 18 inches of No. 2 aggregate spread on access areas and covered on the surface with 6 inches of No. 57 aggregate. The No. 2 aggregate shall be spread in a single lift utilizing ground pressure equipment conforming to Table 2 of Section 02373 of these Specifications or by using excavator buckets. The No. 57 aggregate shall be spread in a single lift. The temporary road surface can be reclaimed and re-used as needed. If aggregate is left in place a minimum cover of 3 feet of riprap is required. Where the No. 57 aggregate surface has been contaminated with ash, it shall be removed and wasted as directed by the QC MANAGER.

**END OF SECTION 02410**

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**TECHNICAL SPECIFICATIONS**  
**SECTION 02936 – REVEGETATION**

**PART 1 - GENERAL**

**1.1. DESCRIPTION**

This Work consists of furnishing all labor, equipment and materials for preparing the seedbed, adding soil amendments, and seeding disturbed areas both in borrow areas and adjacent to work zones.

**1.2. RELATED WORK**

- A. Quality Control Plan
- B. Section 02100 – Erosion Control and Stabilization
- C. Section 02150 – Site Preparation
- D. Section 02370 – Geotextile Filter
- E. Section 02410 – Rock Buttress and Granular Filter Components

**1.3. SUBMITTALS**

- A. Agronomic soil test results shall be submitted to the QC MANAGER.
- B. Seed tickets, fertilizer certification and CaCO<sub>3</sub> equivalency certification shall be submitted to the QC MANAGER.
- C. A sample of the netting proposed by CP shall be submitted to the QC MANAGER.
- D. A sample of the Erosion Control Blanket shall be submitted to the QC MANAGER.

**1.4. QUALITY CONTROL**

**1.4.1.** Agricultural limestone shall be purchased from quarries approved by the Tennessee Department of Agriculture.

**1.4.2.** Fertilizer (bagged or bulk) either dry or liquid, must be manufactured and sold under the jurisdiction of the Tennessee Department of Agriculture, Ag Inputs Section.

**1.4.3.** All seed shall be certified by an Official Seed Certifying Agency. Seeds shall have been tested within nine months prior to use. Each kind of seed shall be separately packed and delivered to the project in a seed-tight bag. Each bag shall bear a tag or label bearing the seal of the Official Seed Certifying Agency. The analysis of the seed (% pure seed, % germination, date tested, etc.) shall be attached to the bag.

## **PART 2 - PRODUCTS**

### **2.1. LIME**

Agricultural ground limestone or its equivalent shall be used. The ground limestone must meet the following requirements: contain sufficient calcium and magnesium carbonate and be equivalent to not less than 80 percent calcium carbonate and must be fine enough so that not less than 90 percent shall pass through a US Standard No. 10 sieve and not less than 35 percent shall pass through a US Standard No. 50 sieve. Lime shall be applied at the rate specified in Paragraph 3.1. Agricultural ground limestone shall be purchased from quarries approved by the Tennessee Department of Agriculture.

### **2.2. FERTILIZER**

The fertilizer shall be a commercial fertilizer containing the plant nutrients of nitrogen (N), available phosphoric acid (P<sub>2</sub>O<sub>5</sub>) and soluble potash (K<sub>2</sub>O) and shall be applied at the rate specified in Section 3.1. Bagged fertilizer shall display the following information on the bag or on a sticker or tag attached to the bag: net weight, brand and grade, guaranteed analysis, and name and address of manufacturer. Bulk fertilizer (dry or liquid) shall be accompanied by a statement from the manufacturer which contains the same information required for the bagged fertilizer.

### **2.3. SEED**

**2.3.1.** Seed shall be applied to all disturbed areas, in accordance with Table 1 with no alterations except with the written consent of the QC MANAGER. The seed mixture shall be totally free of any wild onion, giant foxtail, nodding thistle, Johnsongrass, and Canada thistle seed and contain less than two percent other crop seed. The seed shall also comply with all Tennessee seed laws and regulations.

**2.3.2.** Seed shall be furnished fully tagged and labeled in accordance with the state laws and the US Department of Agriculture Rules and Regulations under the Federal Seed Act in effect on the date of invitations for bid. All seed must be from the latest crop available. No seed will be accepted with a date of test of more than nine (9) months prior to the date of delivery to the site. Any seed which has become wet, moldy or otherwise damaged in transit or storage will not be accepted.

**2.3.3.** All seed shall be delivered in separate bags or packages according to species or be a certified seed mixture. The tags from each seed bag shall be given to the QC MANAGER at the site. These tags will be required for final payment.

**2.3.4.** All legume seed shall be treated with inoculant prior to seeding in accordance with Paragraph 2.6 (Inoculants).

Table 1

Seed Mixtures	Hydroseed Rate (pounds/acre PLS*)
Application Period: February 1 to May 15	
Endophyte Free Kentucky 31 Tall Fescue	40
Potomac or Boone Orchard Grass	20
Korean Lespedeza	10
White Sweet Clover	10
Plus:	
Perennial or Annual Rye (2/15 to 4/15)	15
or	
Weeping Lovegrass (4/15 to 5/15)	3
Application Period: May 15 to August 1	
Endophyte Free Kentucky 31 Tall Fescue	40
Potomac or Boone Orchard Grass	20
Birdsfoot Trefoil	3
Weeping Lovegrass	3
Application Period: August 1 to November 15	
Endophyte Free Kentucky 31 Tall Fescue	40
Potomac or Boone Orchard Grass	20
White Sweet Clover	12
Birdsfoot Trefoil	8
Perennial Rye	15

\*PLS Pure Live Seed is determined by multiplying the percent germination of the seed times the percent purity  
Note: Any lawn areas disturbed shall be seeded with an approved lawn seed mixture. Mulch areas and plant 60 lbs. per acre winter wheat between November 15<sup>th</sup> and February 1<sup>st</sup>.

**2.4. MULCH**

The mulch shall consist of wheat straw, hay or rye straw. The mulch material shall be air dry, reasonably light in color and shall not be musty, moldy, caked or otherwise of low quality. The use of mulch that contains noxious weeds will not be permitted. Mulch shall be applied at the rate specified in Paragraph 3.3.

**2.5. NETTING**

Plastic netting manufactured from extruded rectangular mesh plastic, a minimum of 45-inches wide with approximately ¾-inch by 1-inch mesh openings, weighing not less than 2.6 pounds per 1,000 square feet (± ½ pound) shall be used. Other netting may be used if approved by the QC MANAGER. Staples will be U-shaped and made from steel wire of No. W1-W1.5 or W2 or adequate polymaterial fasteners as needed for installation conditions. The staples shall have a minimum length of six (6) inches. Staples shall be driven flush with the soil surface. Netting shall be installed per the specifications in Paragraph 3.3.

## 2.6. INOCULANTS

The inoculant for treating legume seeds shall be a pure culture of nitrogen-fixing bacteria prepared specifically for the species and shall not be used later than the date indicated on the container or otherwise specified. A mixing medium, as recommended by the manufacturer, shall be used to bond the inoculant to the seed. Four times the amount of the inoculant recommended by the manufacturer shall be used. Seed shall be sown within 24 hours of treatment and shall not remain in a hydroseeder longer than four (4) hours.

## 2.7. EROSION CONTROL BLANKET

Erosion control blanket shall be a manufactured product consisting of plastic netting on both sides with excelsior or coconut in between.

## PART 3 - EXECUTION

### 3.1. SEEDBED PREPARATION

3.1.1. Immediately following final grading, the areas to be seeded shall be dressed to a reasonably smooth, firm surface, as determined by the QC MANAGER. Sludge shall be placed to a depth of two inches and incorporated into the top six inches of soil by disking or tilling. Lime shall be applied uniformly at the rate of seven (7) tons per acre. Fertilizer shall be applied at a rate sufficient to supply a minimum of 70 pounds of nitrogen (N), 145 pounds of phosphorus (P<sub>2</sub>O<sub>5</sub>) and 70 pounds of potash (K<sub>2</sub>O) per acre. These rates are subject to change depending on results of soil tests to be performed immediately prior to seeding. These soil tests shall be the responsibility of TVA.

3.1.2. The surface shall be tilled to a minimum depth of six (6) inches with either a tandem or offset disk meeting the following specifications:

- A. Disk Size: 22 inches minimum
- B. Disk Spacing: 13 inches maximum
- C. Weight: 400 pounds per foot of cut minimum
- D. Equipped with a drag of sufficient weight to remove any furrows left by the disk.

3.1.3. Seedbed preparation shall be suspended when soil conditions are not suitable for the preparation of a satisfactory seedbed. The QC MANAGER shall make this determination.

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### 3.2. SEEDING

3.2.1. The specified mixtures of pure live seed (PLS) will be used on all disturbed areas using the seasonal variations shown.

3.2.2. All areas shall be seeded immediately following seedbed preparation. In the event the date does not concur with the seeding schedules specified, seeding shall be accomplished using any one of the specified rates or an equivalent rate designed to fit the site and weather conditions, as directed by the QC MANAGER.

3.2.3. All seed shall be broadcast evenly over the area immediately following tilling using a hydroseeder. The slurry PH shall not be allowed to drop below a pH of 5.0. In addition, the CP shall provide an accurate pH meter to monitor the slurry at all times.

### 3.3. MULCHING

3.3.1. Mulch materials shall be spread uniformly over all seeded areas. The mulch shall be applied uniformly over all seeded areas of less than 33% slope at the rate of two (2) tons per acre immediately following seeding.

3.3.2. Mulch netting meeting the requirements of Paragraph 2.5 shall be installed on all disturbed areas with slopes less than 33%. The netting shall be installed with a minimum six-inch overlap with adjacent rows. Staples shall be installed at four-foot maximum spacing on all edges and laps. Interior rows of staples shall be at four-foot maximum spacing with staples spaced at eight-foot maximum spacing along each row. Staples in interior row shall alternate in spacing with staples in an adjacent rows.

3.3.3. Erosion control blankets shall be employed to protect slopes 3H:1V or steeper unless otherwise shown on the Drawings. Install up and down the hill (vertical) for long slopes. Walk blankets down to ensure good contact with the soil. Use plenty of staples to keep blankets flat. Overlap blankets at 6 to 8 inches on sides, tops and bottoms. Do not stretch blankets, and do not exceed manufacturer's directions on maximum slope angle for the product. Refer to the Manufacturer's recommendations for installation patterns and stapling.

### 3.4. MEASUREMENT OF PERFORMANCE

3.4.1. TVA shall achieve 90 percent vegetative cover at the end of the second growing season. Such vegetative cover shall be measured using a transects method along the project baseline or other convenient baseline in borrow areas. This method shall involve taping along chosen transects and observing vegetation at each one-foot interval. At each observation point it will be noted whether vegetation is in contact with the transect. The sum of positive observations divided by total observations will determine compliance. Noticeably bare or eroded areas along or between transects shall be repaired even if the overall vegetative cover exceeds 90 percent.

### 3.5. EQUIVALENCY

3.5.1. These seeding specifications are intended to stabilize the project area through establishment of an adequate vegetative cover to provide interim protection and to enhance the wildlife utilization and development of the project area and the surrounding environment. The CP may be permitted to

incorporate alternate seeding, fertilization and/or protection techniques which produce the intended results. The CP is encouraged to consider such applications. However, the CP is cautioned that if an alternate technique is utilized, the CP must assume the responsibility for the deviation from this specification and shall still meet the requirements of Paragraph 3.4.

**3.5.2.** Use of alternative techniques or other deviations from the standards and instructions provided herein must be approved by the QC MANAGER prior to implementation. The QC MANAGER will partially base his assessment on the purity of the constituents proposed, as well as the potential for interference of the proposed alternate techniques with other elements of the project and the overall design intent.

**END OF SECTION 02936**

## **Appendix A**

### **Stantec Design Drawings**

Bureau of Reclamation Comments  
 Review of Dike C Buttress Work Plan November 30, 2009

Reviewed by: Michael J. Gobla, P.E.  
 Peer Reviewed by: David B. Paul, P.E.

A review was performed of the following document:

Dike C Risk Mitigation Work Plan Section D dated 11/19/09

Responses provided by Jacobs December 2, 2009.

<b>Comment</b>	<b>Source</b>	<b>Response</b>
<p>1. Section 3.0 Ash Removal Guidelines – The text states that the extent of excavation of ash will be based on agreement between the Jacobs QA manager and the EPA on site representative to determine what is clean. Statements need to be added that the QC manager (STANTEC) shall have the authority to limit excavation depths if necessary to protect the stability and integrity of Dike C.</p>	<p>BoR</p>	<p>The following sentences were added to Section 3.0:          “The QC Manager shall set the limits of excavation to protect the stability and integrity of Dike C. The QA Manager will monitor excavation activities to prevent excavation from exceeding these limits. Grade stakes and spotters will be used, as needed, to aid the operator in maintaining proper elevation.”</p>
<p>2. Section 4.3 Ash Removal – The last sentence “Once the ash is removed from the toe of the dike, the excavated area shall not be left open for more the 24 hours before filter material is put in place.” Should be modified to read as: “Once the ash is removed from the toe of the dike, the excavated area shall not be left open for more than 24 hours before granular filter material is put in place.” By changing the definition to “granular filter material” it will match the wording in the specifications and be clear that not only sand but also the No. 57 and No. 2 aggregate layers are required to be in place in this time frame. Having only the sand installed will not be sufficiently protective against a seepage or slope failure; there needs to be weight over the sand filter hence the specifications define “granular filter” as a 6” layer of sand covered by 6” of No. 57 aggregate, covered by 6” of No. 2 aggregate.</p>	<p>BoR</p>	<p>The sentence now reads:          “Once ash is removed from the toe of the dike, the excavated area shall not be left open for more the 24 hours before granular material (sand, #57, #2 aggregate and riprap) is put in place.”</p>

<p>3. Section 4.4 Construction – Dry Area – The sentences “An access road may be constructed along the toe of buttress. The access road shall be constructed of materials identified in the buttress design.” Imply that only graded materials can be used for this haul road. It is suggested that shot rock is an economical alternative for the bulk of the fill for this toe road and should be considered.</p>	<p>BoR</p>	<p>As responded to similar comment from the specifications – “For quality control purposes the shot rock will not be utilized. The TDOT Class B machined riprap is a more consistent product. However, the following sentence was added to Section 4.4 to give some flexibility: “Access roads constructed outside the Dike Buttress may be constructed using non-graded material, if approved by the QC manager.”</p>
<p>4. Section 4.6 Tree Removal – The sentence “In addition to cutting trees, trees may be removed by pulling.” is not acceptable and may damage the dike fill. Only small trees, less than 2 inches in diameter, would be acceptable for pulling, the Work Plan needs to be revised to be clear on this aspect. The specifications do not include pulling of trees, if it is to be performed the specifications should be revised to be consistent with the work plan.</p>	<p>BoR</p>	<p>Section 4.6 has been modified as follows: “Trees will be removed from the dike area in accordance with Stantec’s specifications and designs. Remaining roots will be excavated in a manner the causes the least amount of disturbance to the existing dike fill. Trees will not be pulled. Alternative methods will require approval of the Stantec QC Manager. Roots greater than 2 inches in circumference will be removed from the ground. Trees with a base greater than 3 inches in circumference shall be photographed and surveyed for future reference.</p>
<p>5. Section 7.0 Daily Documentation - Photographs of the approved foundation before and after sand placement should be taken and included in the project records to document the quality of the buttress construction.</p>	<p>BoR</p>	<p>Section 7.0 has been expanded to include the following: “Photographs of work activities will be taken daily. Photographs will include both the approved foundation prior to sand placement and after the sand has been placed. Photographs will be documented according to Photo Documentation SOP (TVA-KIF-SOP-026) and stored accordingly in the project files.</p>

A  
B  
C  
D  
E  
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H

# PLANS FOR CONSTRUCTION

## DIKE C BUTTRESS

### STAGE 1 - SEGMENT 'D'

# KINGSTON FOSSIL PLANT

## HARRIMAN, ROANE COUNTY, TENNESSEE

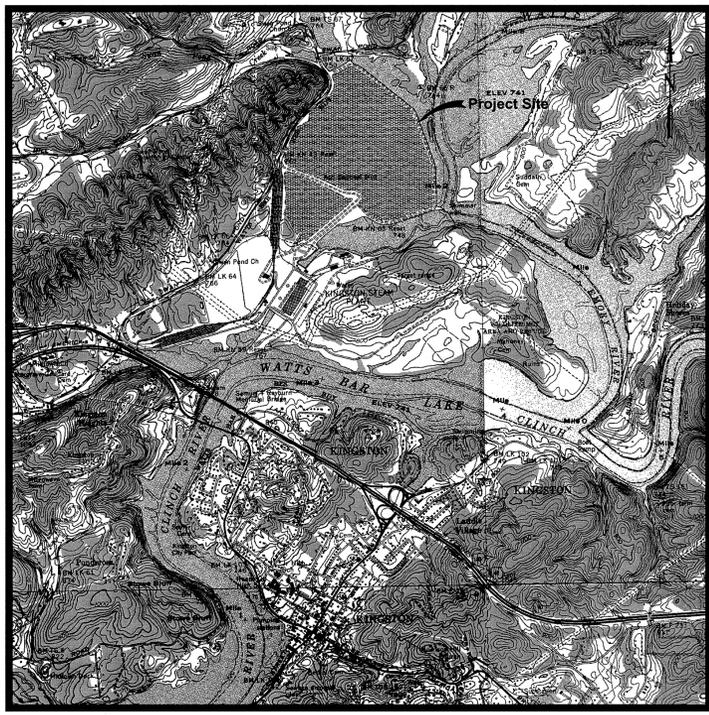
PREPARED FOR

# TENNESSEE VALLEY AUTHORITY

PREPARED FOR

# TENNESSEE VALLEY AUTHORITY

PREPARED BY



Stantec Consulting Services Inc.  
1409 N. Forbes Rd.  
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Fax 859.422.3100  
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**INDEX OF SHEETS**

10W229-40	COVER SHEET
10W229-41	GENERAL NOTES
10W229-42	EXISTING CONDITIONS
10W229-43	PROJECT SETTING
10W229-44	SEGMENT 'D' - GRADING PLAN
10W229-45 - 10W229-52	SEGMENT 'D' - CROSS SECTIONS
10W229-53	TYPICAL SECTIONS AND DETAILS
10W229-54	DETAILS

**ISSUED FOR CONSTRUCTION**

For Supporting Design Calculations see FPGKIFFESCDX00000020090020		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>R</td><td>0</td><td>11/18/09</td><td>DEH</td><td>DMG</td><td>DEH</td><td>DWF</td><td>DWF</td><td>DWF</td><td>TJ</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr> <tr><td>REV. NO.</td><td>DATE</td><td>DSGN</td><td>DRWN</td><td>CHKD</td><td>SUPV</td><td>RVSD</td><td>APPD</td><td>ISSD</td><td>PROJECT</td><td>AS CONST</td><td>ISS</td><td>DATE</td><td>BY</td><td>CHKD</td><td>SUPV</td><td>RVSD</td><td>APPD</td><td>ISSD</td><td>PROJECT</td></tr> </table>		R	0	11/18/09	DEH	DMG	DEH	DWF	DWF	DWF	TJ	-	-	-	-	-	-	-	-	-	-	REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVSD	APPD	ISSD	PROJECT	AS CONST	ISS	DATE	BY	CHKD	SUPV	RVSD	APPD	ISSD	PROJECT
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# GENERAL NOTES

- Definitions:** Whenever the following terms are used in these Drawings, it is understood that they represent the following:

**CP:** The Tennessee Valley Authority (TVA) Civil Projects which is responsible for construction for this project (or their designee).

**EPA:** The United States Environmental Protection Agency which is the regulatory authority for the site.

**Engineer:** Stantec Consulting Services Inc.

**Owner:** Tennessee Valley Authority (TVA) – Kingston Fossil Plant

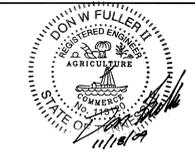
**TDOT:** This means the Tennessee Department of Transportation and specifically references the "Standard Specifications for Road and Bridge Construction", current edition. Any material designated as "TDOT" is to conform to the material standards noted and placement/installation methodology specified in the current edition of the "Standard Specifications for Road and Bridge Construction".

**Quality Control (QC) Plan:** Refers to a document that establishes minimum quality control requirements, testing frequency and quality oversight responsibility.

**Quality Control (QC) Manager:** A professional engineer licensed in the State of Tennessee that is responsible for the Quality of the constructed project as defined in the QC Plan. The QC Team consists of qualified personnel that work under the direct supervision of the QC Manager. QC Team personnel are individuals that are familiar with the materials utilized and the buttress construction components.

**Construction Manager:** Responsible for construction activity to include but not be limited to the character and sequence of work, coordination and scheduling.
- The project will be constructed in two stages. The first stage shown on these Drawings involves the buttress construction for the starter dike. The second stage, not shown on these Drawings will be performed later and involves buttressing of the raised dike. In addition, the work is divided into linear segments noted as A, B, C and D respectively.
- These Drawings are presented as an aid in project construction but should not be construed as the only reference needed. CP shall become familiar with and adhere to the Technical Specifications, the QC Plan and applicable environmental and safety regulations. No materials shall be placed in Watts Bar Lake until approved by the regulatory authority and the Owner.
- Topographic information shown in the Drawings is dated and does not reflect changes since the time of aerial photography. Areas of hydrographic surveying may not reflect current conditions as the underwater surface constantly changes.
- It shall be the CP's responsibility to verify that all underground utilities discovered during the underground locating sweeps are relocated or otherwise protected in full compliance with any requirements of the plant-issued Excavation Permit to the satisfaction of the Owner and in accordance with TVA processes and procedures prior to the ground disturbing activities, including the borrow areas. Where utilities are shown or indicated on the drawings, the information given is in accordance with the best available information in the Engineer's possession, but is approximate in nature. The data is not warranted to be either complete or correct.
- The CP shall make a concerted effort to prevent any disruption of utility services, and if any unintended disruption occurs, the CP shall coordinate the safe and immediate restoration of the service. If disruption of any utility services is unavoidable, it shall be the responsibility of CP to notify affected utility users and utility owners 48 hours in advance. The CP shall also make every effort to restore said services before quitting work for the day. In the event this cannot be done, the CP shall provide temporary service to the property owners until permanent service can be restored.
- The CP shall protect all work and staging areas from intrusion by unauthorized personnel.
- Existing geotechnical instrumentation is shown on the Drawings. The CP shall protect this instrumentation from damage. This instrumentation shall be extended upward during the course of the work.
- The CP shall be responsible for health and safety of its personnel and shall meet industry standard requirements. The CP shall adhere to TVA requirements for safety and construction.
- The CP shall be responsible for the maintenance of all access roads, staging areas and storage areas used during construction, and shall restore said areas to their original condition, or better once construction is complete unless the Owner gives written permission to the CP to retain the area "as is".
- The CP shall conduct all operations in accordance with applicable environmental permits, rules, laws and regulations included but not limited to those set forth in CEC 19966, 20065 or other environmental review documents for this project.
- The CP is responsible for site drainage throughout construction and shall install temporary drainage structures or pump water as necessary to prevent interference with the work. Such temporary drainage features shall be performed in accordance with the requirements of environmental permits and the Kingston Storm Water Pollution Prevention Plan (SWPPP).
- The CP shall note sequencing of operations identified in the Drawings.
- Vegetative and organic materials shall be removed as described in the Specifications.
- Drainage conditions surrounding existing facilities outside the project limits are not addressed by the Drawings. Grading, shaping and installation of drainage structures may be required to promote positive drainage. Such work shall be directed by others.
- Materials delivered for incorporation into the work shall be temporarily stored in areas selected by the CP and approved by the Owner. Materials shall be stored in accordance with the manufacturer's recommendations.
- The erosion and sediment control measures shown shall be considered the minimum; supplemental measures shall be provided by the CP as field conditions dictate or as directed by the regulatory authority.
- Borrow areas shall be graded and vegetated in conformance with project requirements, subject to environmental regulations from other agencies, and shall be permitted if required by regulation. It should be noted that there may be regulatory restrictions associated with clearing a site.
- During construction, the CP shall inspect, clean, and maintain all sediment control devices as shown on the Drawings and provide reporting as required by the Specifications and regulations on said items.
- The CP shall control fugitive dust emissions during construction in such a manner as to comply with applicable regulations. Dust control measures shall be subject to approval of the QC Manager and the Owner.
- Borrow areas shall be maintained in such a manner as to promote positive drainage, reduce erosion of soils and provide stable excavations. Final grade slopes shall be no steeper than 3H:1V and interim slope conditions shall not abruptly terminate or impound water.
- During borrow excavation, satisfactory materials shall be segregated for use as starter dike bench embankment. Satisfactory materials are soils that classify as CL or CH according to the Unified Soils Classification System. Satisfactory materials which contain excessive moisture shall be stockpiled, bladed, disked, or chemically treated as necessary to permit adequate drying. Classification of soil as satisfactory or unsatisfactory shall be determined by the QC Manager.
- Unsatisfactory materials shall remain at the borrow site. No satisfactory material shall be wasted without authorization by the Owner. Moisture content shall not be deemed an appropriate cause to have a material defined as unsatisfactory.
- Stockpiles shall be graded to maintain positive drainage at all times. The side slopes shall have maximum 3H:1V slope. The top of the stockpile shall have a minimum two percent slope. Materials shall be segregated as directed by the QC Manager.
- Soil stockpiles that will not be disturbed for 21 days or more shall be temporarily seeded with wheat or rye at a rate of 60 lbs/acre and shall be covered with mulch.
- This work covers Stage 1 of two stages of construction. The design therefore depicts intermediate conditions between the completion of Stage 1 and prior to Stage 2 with the assumption that Stage 2 proceeds immediately upon completion of Stage 1.
- All pipe removal and trenching shall be conducted in strict accordance with applicable TVA process and procedure requirements.
- Pipe removal at the locations noted on the Drawings shall require backfill. Soil backfill and embankment shall be placed to a minimum density of 95% of the Standard Proctor maximum dry density.
- Geotextiles used for construction shall be certified by the manufacturer as conforming to the project requirements. Geotextiles shall not be utilized as filter unless approved by TVA. It may be used as a temporary measure and removed.
- Certifications of material quality and conformance to project requirements shall be submitted to the QC Manager for approval prior to installation.
- All surfaces shall be approved by the QC Manager prior to embankment or buttress construction.
- The CP shall develop a haul road plan prior to initiation of construction and submit it to the QC Manager for approval.
- The CP shall be responsible for construction surveyor selection and coordination of all construction related surveying. All established TVA bench marks or other monuments shall be preserved and protected. Any established marker or benchmark that is damaged by construction activities shall be replaced by TVA Surveying Services.
- The Construction Manager shall communicate construction issues, problems or discrepancies in the Drawings to the QC Manager and Owner immediately upon becoming aware of such problems.
- Additional geotechnical instrumentation beyond that currently depicted may be installed during construction.

**ISSUED FOR CONSTRUCTION**

<p>For Supporting Design Calculations see FPGKIFFESCDX00000020090020</p>		<table border="1"> <tr> <td>R</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td> </tr> <tr> <td>REV. NO.</td><td>DATE</td><td>DSGN</td><td>DRWN</td><td>CHKD</td><td>SUPV</td><td>RWND</td><td>APPD</td><td>ISSD</td><td>PROJECT BY</td><td>AS CONST</td><td>ISSD BY</td> </tr> </table>										R	-	-	-	-	-	-	-	-	-	-	-	REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RWND	APPD	ISSD	PROJECT BY	AS CONST	ISSD BY
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REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RWND	APPD	ISSD	PROJECT BY	AS CONST	ISSD BY																								
		<p>SCALE: NONE EXCEPT AS NOTED</p>																																	
 <p>Stantec Consulting Services Inc. 1409 N. Forbes Rd. Lexington, Kentucky 40511-2950 Tel: 859.422.3000 Fax: 859.422.3100 www.stantec.com</p>		<p>DESIGNED BY: D. HERRON DRAWN BY: D. GRAHAM CHECKED BY: D. HERRON SUPERVISED BY: D. FULLER REVIEWED BY: D. FULLER APPROVED BY: T. JOHNSON ISSUED BY:</p>																																	
<p>KINGSTON FOSSIL PLANT TENNESSEE VALLEY AUTHORITY FOSSIL AND HYDRO ENGINEERING</p>		<p>AUTOCAD R 2000 DATE 11/18/09 36 C 10W229-41 R 0</p>																																	

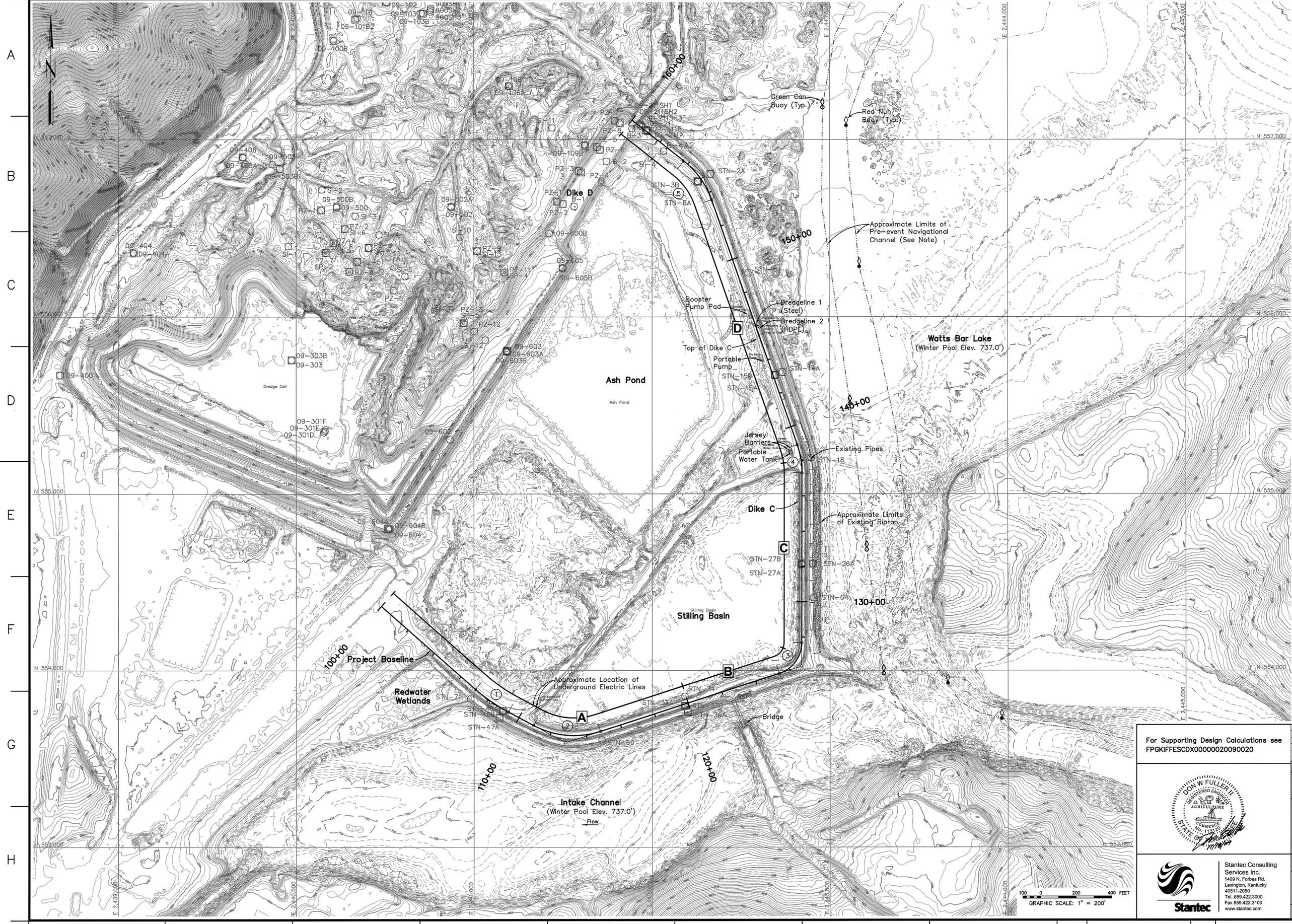


TABLE OF BASELINE COORDINATES			
STATION	BASELINE	NORTHING	EASTING
100+00.00	Begin Project Baseline	554,363.86	2,440,477.77
160+00.00	End Project Baseline	557,109.43	2,441,888.38

BASELINE CURVE DATA			
①		②	
P.I. Sta. = 108+20.74	P.I. Sta. = 112+99.93		
Northing = 553,819.18	Northing = 553,591.92		
Easting = 2,441,091.71	Easting = 2,441,514.77		
$\Delta = 132^{\circ}06'$	$\Delta = 46^{\circ}19'10''$		
R = 974.68'	R = 479.84'		
T = 113.94'	T = 205.26'		
L = 226.85'	L = 387.92'		
E = 6.64'	E = 42.06'		
P.C. Sta. = 107+06.80	P.C. Sta. = 110+94.67		
P.T. Sta. = 109+33.65	P.T. Sta. = 114+82.59		
③		④	
P.I. Sta. = 126+71.85	P.I. Sta. = 138+12.12		
Northing = 554,024.61	Northing = 555,200.41		
Easting = 2,442,840.47	Easting = 2,442,843.77		
$\Delta = 71^{\circ}45'50''$	$\Delta = 19^{\circ}21'32''$		
R = 182.94'	R = 479.84'		
T = 132.33'	T = 81.64'		
L = 229.13'	L = 162.13'		
E = 42.85'	E = 6.93'		
P.C. Sta. = 125+39.52	P.C. Sta. = 137+30.28		
P.T. Sta. = 127+68.65	P.T. Sta. = 138+92.41		
⑤			
P.I. Sta. = 154+96.30			
Northing = 556,792.40			
Easting = 2,442,289.43			
$\Delta = 32^{\circ}28'34''$			
R = 479.84'			
T = 139.75'			
L = 271.98'			
E = 19.94'			
P.C. Sta. = 153+56.55			
P.T. Sta. = 156+28.53			

**SEGMENT STATIONS**  
 Segment 'A' - Sta. 100+00.0 to Sta. 120+00.0  
 Segment 'B' - Sta. 120+00.0 to Sta. 127+00.0  
 Segment 'C' - Sta. 127+00.0 to Sta. 138+00.0  
 Segment 'D' - Sta. 138+00.0 to Sta. 160+00.0

**INSTRUMENTATION LEGEND**  
 STN-1 Slope Inclinometer (SI)  
 STN-2 Piezometer (PZ)  
 STN-3 Settlement Platform (SP)

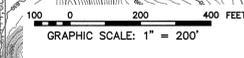
**NOTES**  
 1. Topographic mapping was generated from a LIDAR survey performed on April, 2009 by Tuck Mapping Solutions, Inc.  
 2. The hydrographic contours shown here were provided by TVA.  
 3. The navigational channel limits shown were provided by TVA using U.S. Army Corps of Engineers Nashville District data and was reviewed by the U.S. Coast Guard for its approximate location. The location shown is pre-event and is subject to change when clean-up operations are completed.

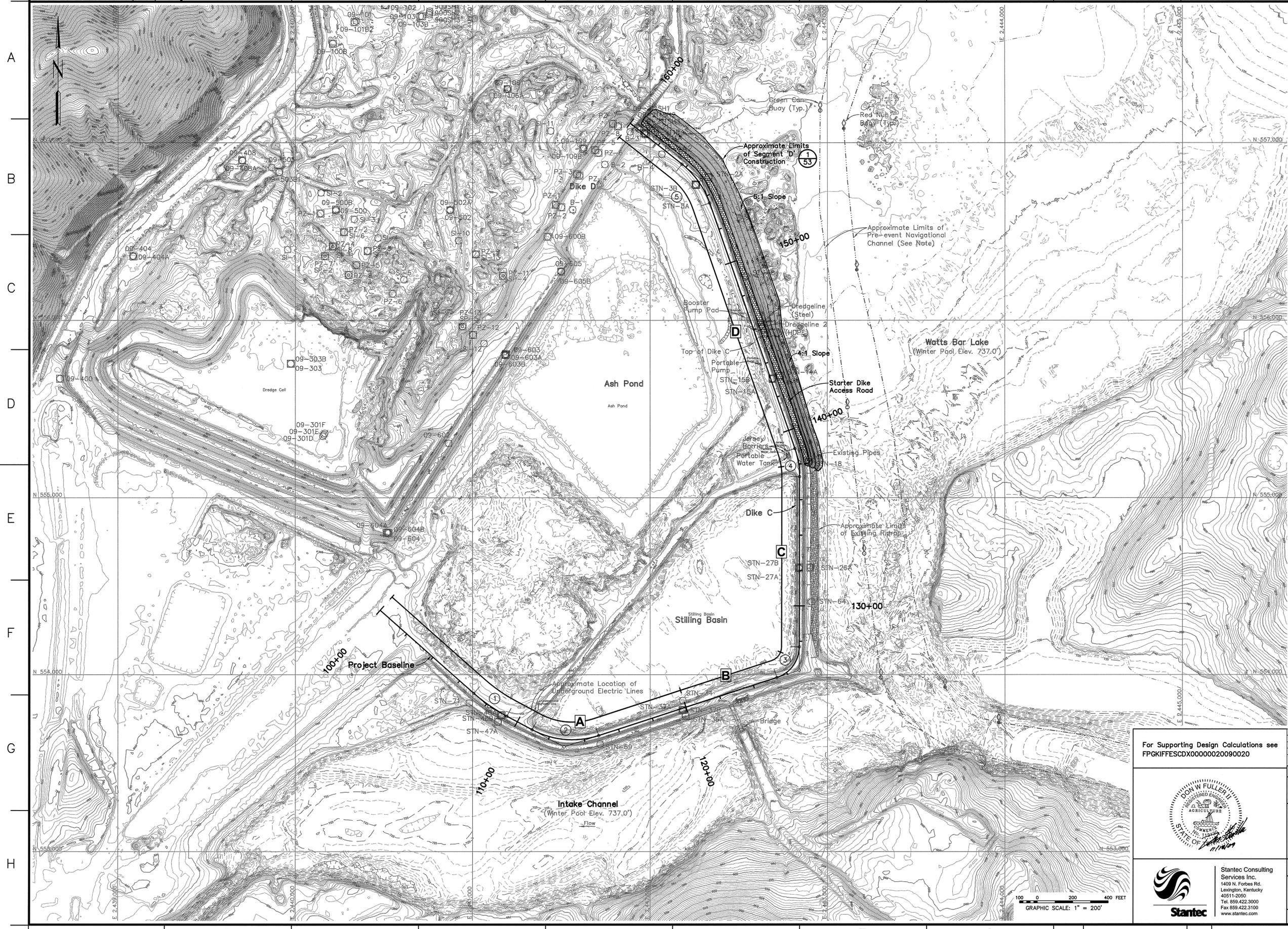
**ISSUED FOR CONSTRUCTION**

For Supporting Design Calculations see  
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REV	NO.	DATE	DOGN	DRWN	CHKD	SUPV	RVID	APPD	ISSD	PROJECT	AS CONST	DISCIPLINE	
SCALE: 1" = 200'											EXCEPT AS NOTED		
YARD													
DIKE C BUTTRESS													
STAGE 1 CONSTRUCTION													
EXISTING CONDITIONS													
DESIGNED BY:	D. HERRON	DRAWN BY:	D. GRAHAM	CHECKED BY:	D. HERRON	SUPERVISED BY:	D. FULLER	REVIEWED BY:	D. FULLER	APPROVED BY:	D. FULLER	ISSUED BY:	T. JOHNSON
KINGSTON FOSSIL PLANT													
TENNESSEE VALLEY AUTHORITY													
FOSSIL AND HYDRO ENGINEERING													
AUTOCAD R 2000	DATE	11/18/09	36	C	10W229-42	R 0							





**SEGMENT STATIONS**  
 Segment 'A' - Sta. 100+00.0 to Sta. 120+00.0  
 Segment 'B' - Sta. 120+00.0 to Sta. 127+00.0  
 Segment 'C' - Sta. 127+00.0 to Sta. 138+00.0  
 Segment 'D' - Sta. 138+00.0 to Sta. 160+00.0

**INSTRUMENTATION LEGEND**  
 STN-1 Slope Inclinometer (SI)  
 STN-2 Piezometer (PZ)  
 STN-3 Settlement Platform (SP)

**NOTES**  
 1. Topographic mapping was generated from a LIDAR survey performed on April, 2009 by Tuck Mapping Solutions, Inc.  
 2. The hydrographic contours shown here were provided by TVA.  
 3. See Sheet 42 for Project Baseline coordinates and curve data.  
 4. The navigational channel limits shown were provided by TVA using U.S. Army Corps of Engineers Nashville District data and was reviewed by the U.S. Coast Guard for its approximate location. The location shown is pre-event and is subject to change when clean-up operations are completed.

Section or Detail No.  
 Sheet Where Shown  
**REFERENCE KEY**

**ISSUED FOR CONSTRUCTION**

For Supporting Design Calculations see  
 FPGKIFFSCDX00000020090020

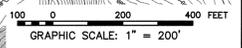


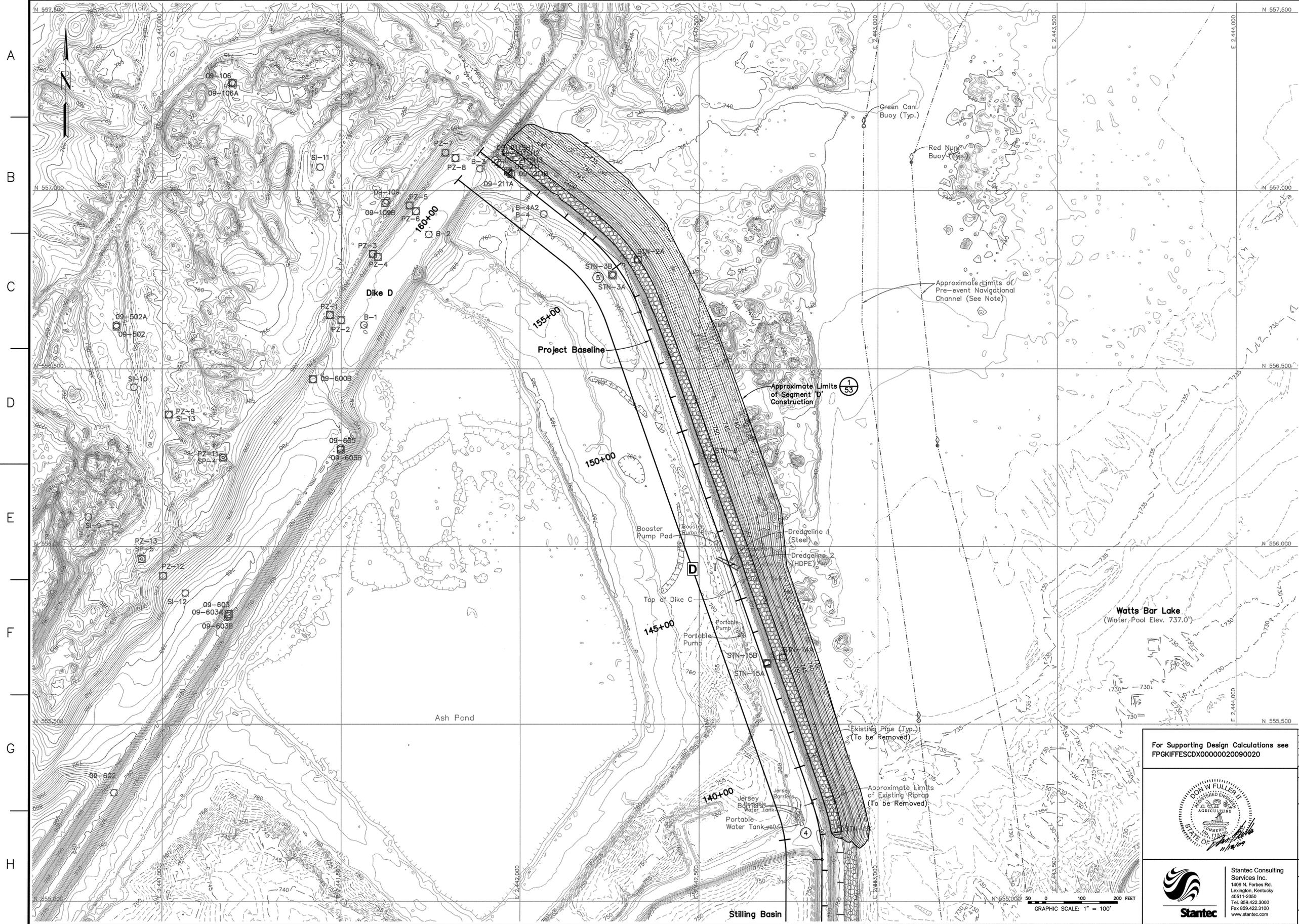
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 Fax. 859.422.3100  
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REV	NO.	DATE	DRN	CHKD	SUPV	RVWD	APPR	ISSD	PROJECT	AS CONST	DISCIPLINE
1	1	11/18/09	DEH	DMG	DEH	DWF	DWF	DWF	TJ		INTERFACE
ISSUED FOR CONSTRUCTION											
SCALE: 1"=200'											
EXCEPT AS NOTED											

**YARD**  
**DIKE C BUTTRESS**  
**STAGE 1 CONSTRUCTION**  
**PROJECT SETTING**

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
D. HERRON	D. GRAHAM	D. HERRON	D. FULLER	D. FULLER	D. FULLER	T. JOHNSON
<b>KINGSTON FOSSIL PLANT</b>						
<b>TENNESSEE VALLEY AUTHORITY</b>						
FOSSIL AND HYDRO ENGINEERING						





**SEGMENT STATIONS**  
 Segment 'A' - Sta. 100+00.0 to Sta. 120+00.0  
 Segment 'B' - Sta. 120+00.0 to Sta. 127+00.0  
 Segment 'C' - Sta. 127+00.0 to Sta. 138+00.0  
 Segment 'D' - Sta. 138+00.0 to Sta. 160+00.0

**INSTRUMENTATION LEGEND**  
 STN-1 Slope Inclinator (SI)  
 STN-2 Piezometer (PZ)  
 STN-3 Settlement Platform (SP)

**NOTES**  
 1. Topographic mapping was generated from a LIDAR survey performed on April, 2009 by Tuck Mapping Solutions, Inc.  
 2. The hydrographic contours shown here were provided by TVA.  
 3. See Sheet 42 for Project Baseline coordinates and curve data.  
 4. The navigational channel limits shown were provided by TVA using U.S. Army Corps of Engineers Nashville District data and was reviewed by the U.S. Coast Guard for its approximate location. The location shown is pre-event and is subject to change when clean-up operations are completed.

Section or Detail No.   
 Sheet Where Shown   
**REFERENCE KEY**

**ISSUED FOR CONSTRUCTION**

For Supporting Design Calculations see  
 FPGKIFFESCDX00000020090020



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REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RWVD	APPD	ISSD	PROJECT	AS CONST	ISSUED BY	DISCIPLINE
0	11/18/09											INTERFACE

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DIKE C BUTTRESS												
STAGE 1 CONSTRUCTION												
SEGMENT 'D' - GRADING PLAN												
DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:						
D. HERRON	D. GRAHAM	D. HERRON	D. FULLER	D. FULLER	D. FULLER	T. JOHNSON						
KINGSTON FOSSIL PLANT												
TENNESSEE VALLEY AUTHORITY												
FOSSIL AND HYDRO ENGINEERING												
AUTOCAD R 2000	DATE	36	C	10W229-44				R 0				
SCALE: 1"=100'												
EXCEPT AS NOTED												

GRAPHIC SCALE: 1" = 100'

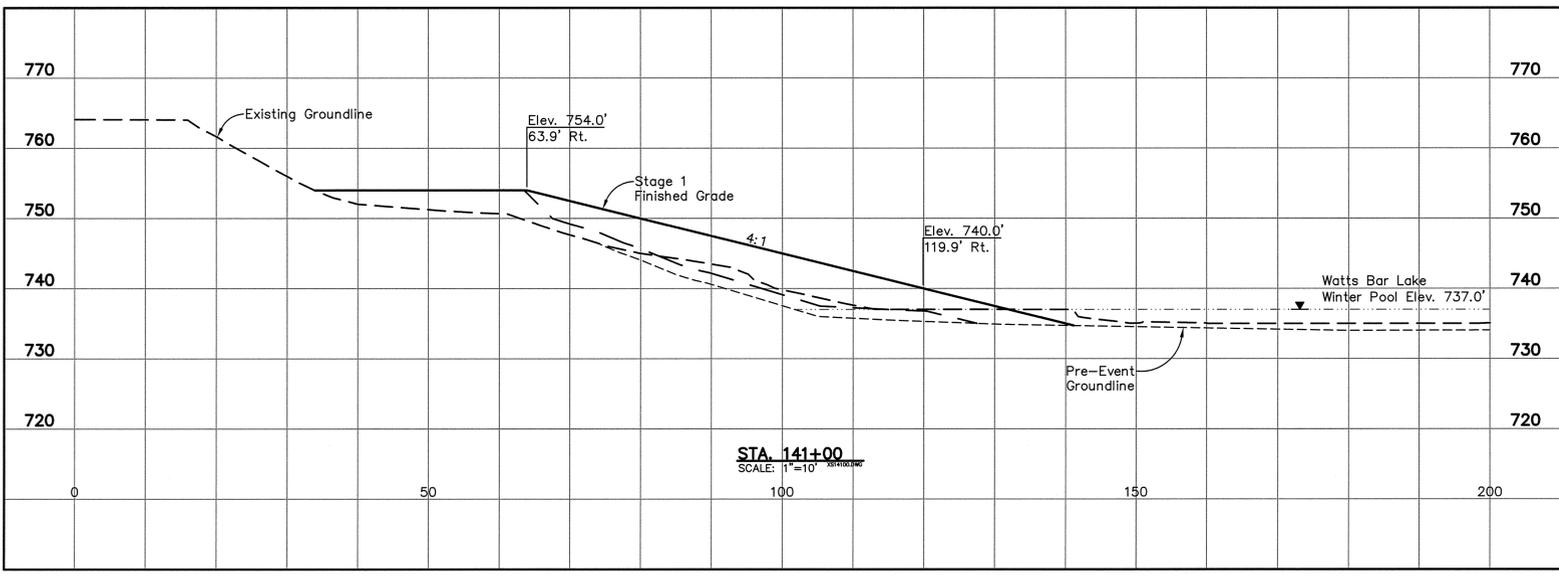
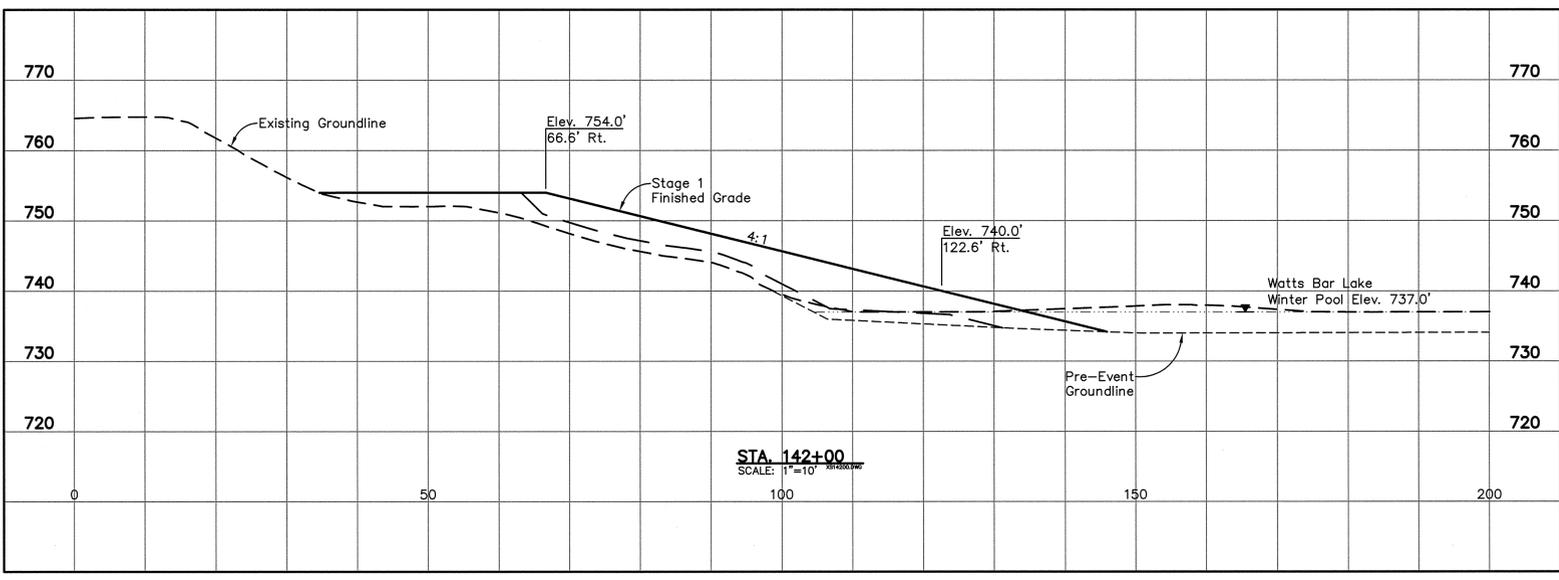
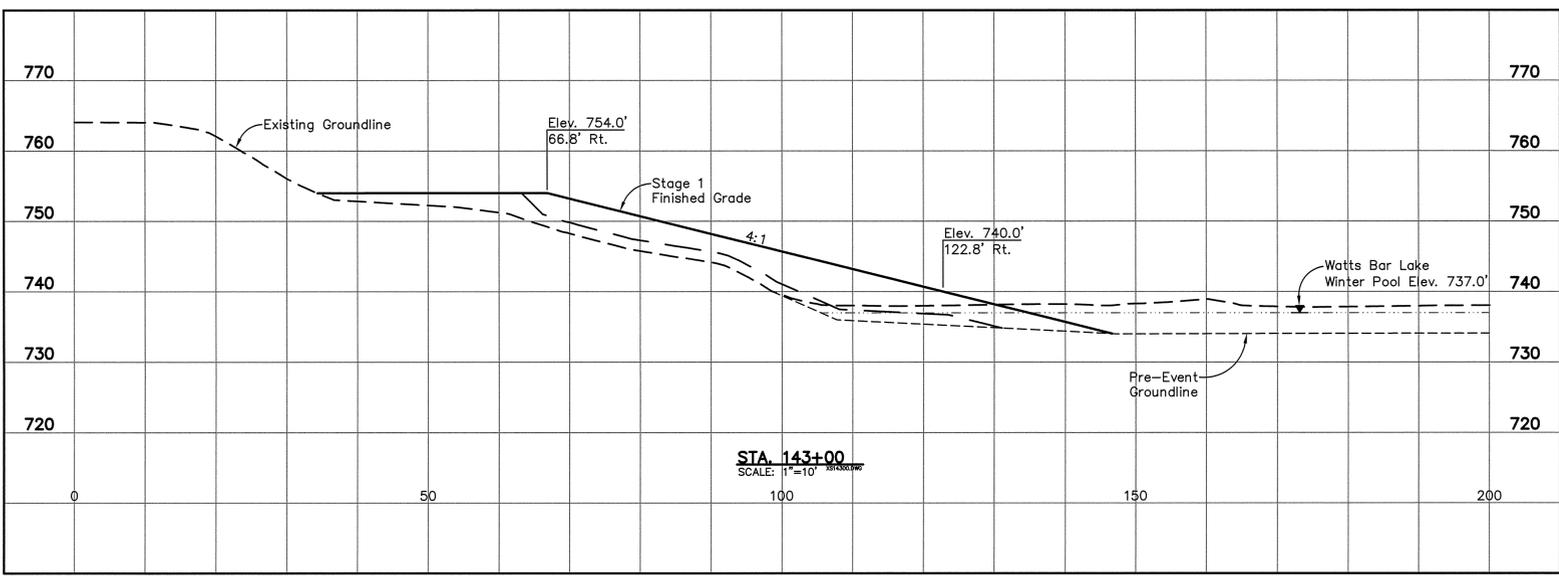
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PLOT FACTOR: XX  
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 DO NOT ALTER MANUALLY

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**NOTE:**  
For Filter configurations see Typical Sections - Alternative 1 (Sheet 53).

**ISSUED FOR CONSTRUCTION**

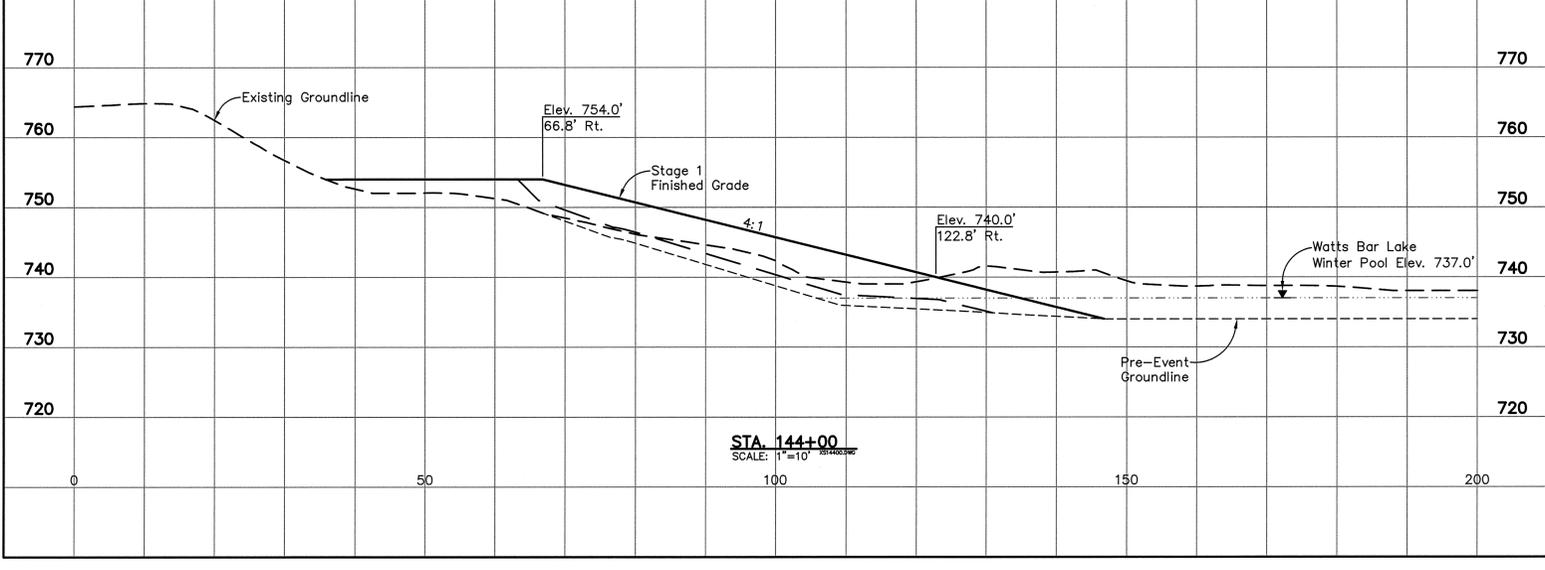
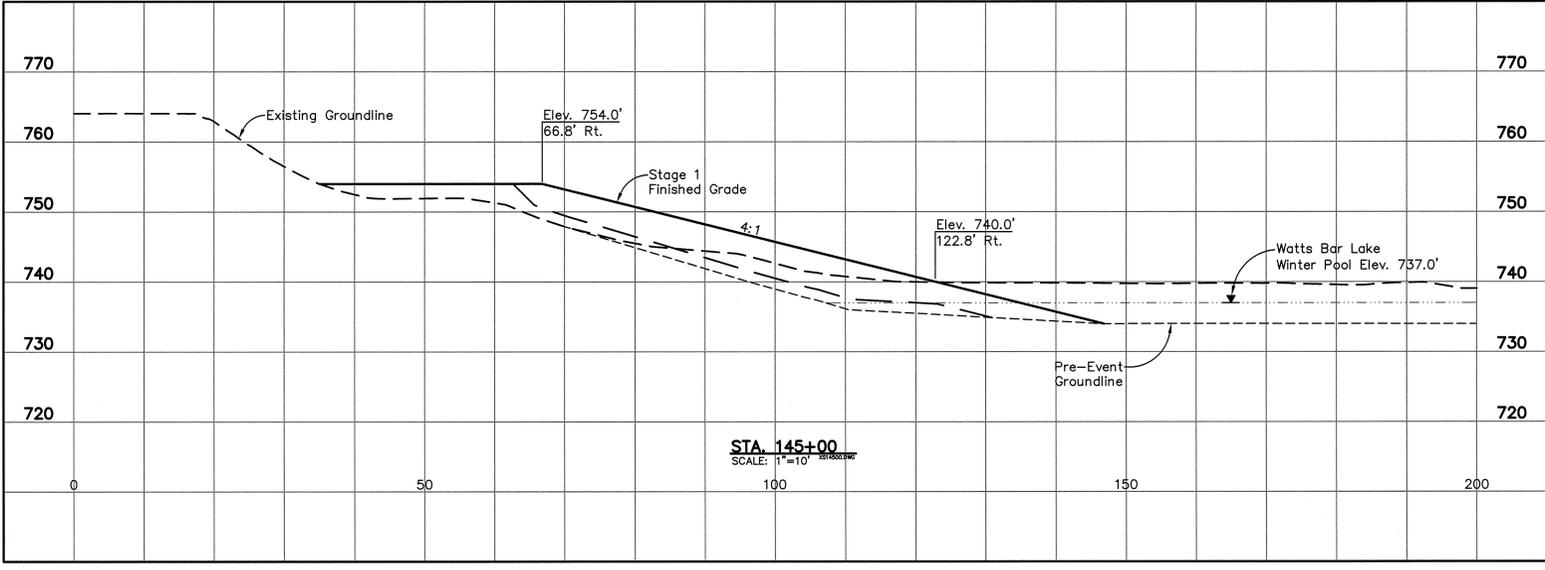
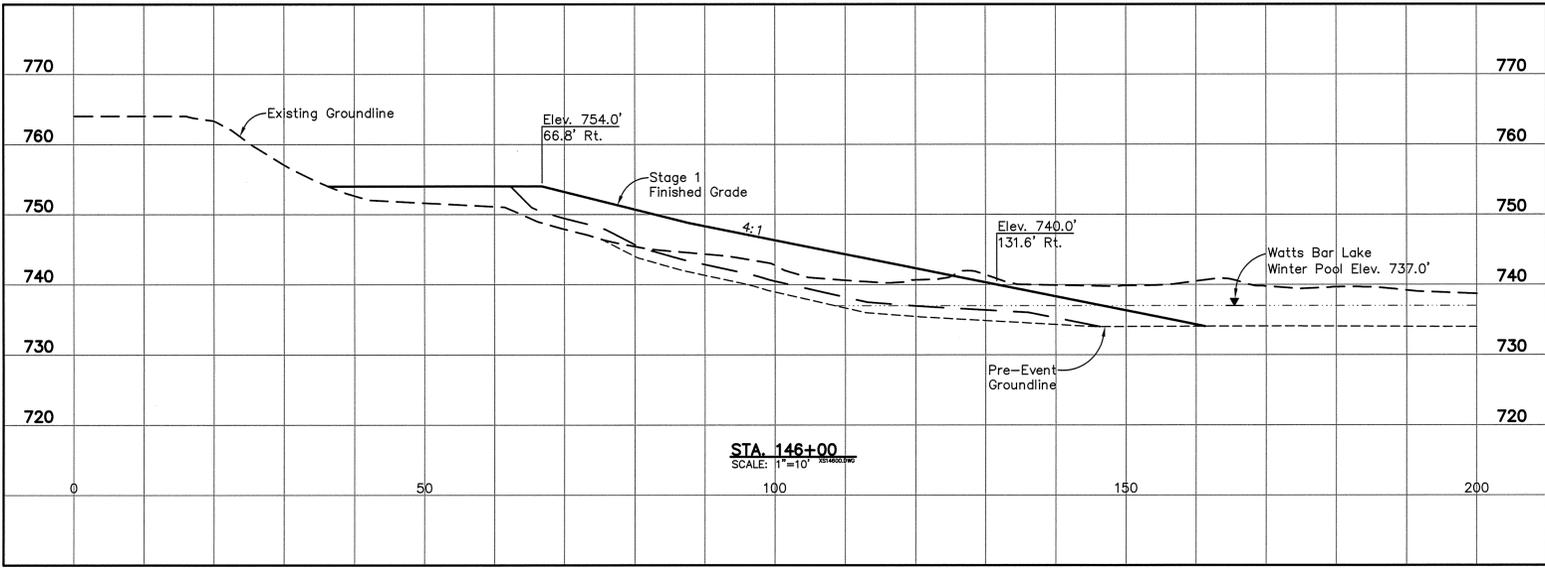
For Supporting Design Calculations see FPGKIFFESCDX00000020090020

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REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVND	APPD	ISSD	PROJECT	AS CONST	BY	DISCIPLINE
0	11/18/09	DEH	DMG	DEH	DWF	DWF	DWF	TJ				
ISSUED FOR CONSTRUCTION												
SCALE: 1"=10' EXCEPT AS NOTED												
YARD												
DIKE C BUTTRESS												
STAGE 1 CONSTRUCTION												
SEGMENT 'D' - CROSS SECTIONS												
DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:						
D. HERRON	D. GRAHAM	D. HERRON	D. FULLER	D. FULLER	D. FULLER	T. JOHNSON						
KINGSTON FOSSIL PLANT												
TENNESSEE VALLEY AUTHORITY												
FOSSIL AND HYDRO ENGINEERING												
AUTOCAD R 2000	DATE	36	C	10W229-46	R 0							
	11/18/09											

PLOT DATE: 11/17/2009 USER: GRAHAM, DAVE  
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**NOTE:**  
For Filter configurations see Typical Sections - Alternative 1 (Sheet 53).

**ISSUED FOR CONSTRUCTION**

For Supporting Design Calculations see  
FPGKIFFESCDX00000020090020



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REV. NO.	DATE	DESIGN	DRAWN	CHECKED	SUPV	REVISED	APPROVED	ISSUED	PROJECT	AS CONST.
0	11/18/09	DEH	DMG	DEH	DWF	DWF	DWF	TJ		

SCALE: 1"=10'  
EXCEPT AS NOTED

**YARD**

**DIKE C BUTTRESS  
STAGE 1 CONSTRUCTION  
SEGMENT 'D' - CROSS SECTIONS**

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
D. HERRON	D. GRAHAM	D. HERRON	D. FULLER	D. FULLER	D. FULLER	T. JOHNSON

**KINGSTON FOSSIL PLANT  
TENNESSEE VALLEY AUTHORITY  
FOSSIL AND HYDRO ENGINEERING**

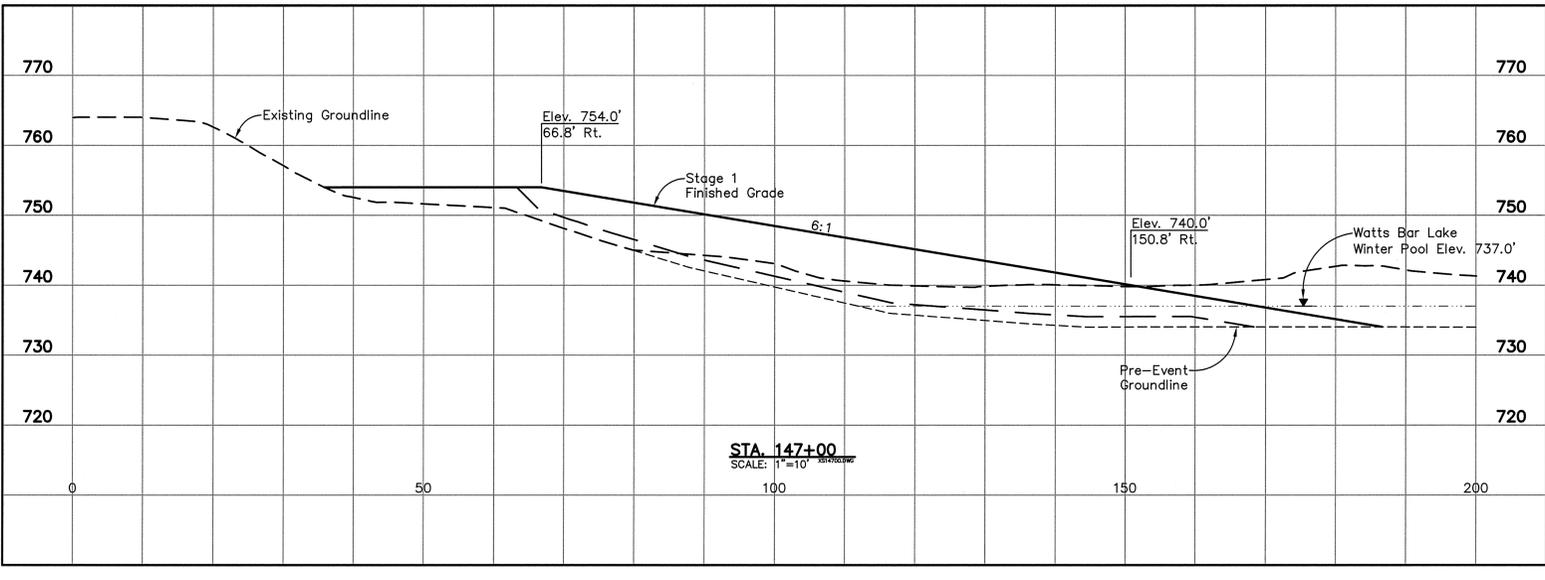
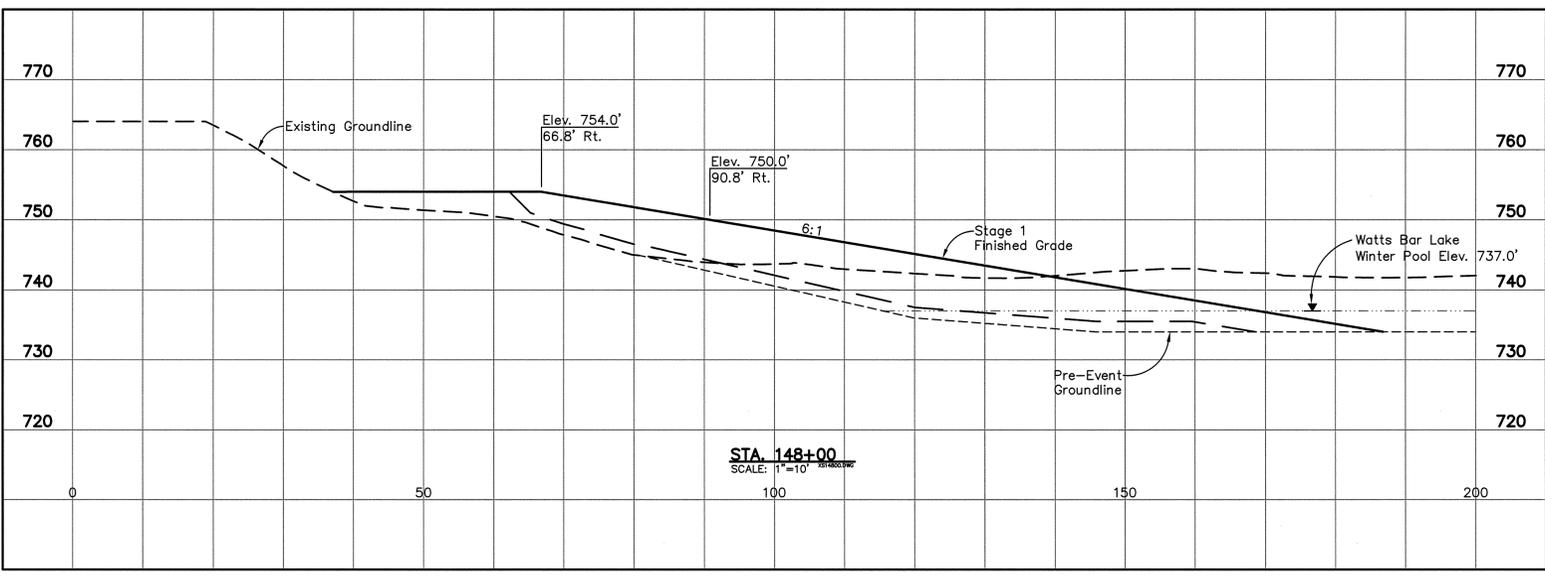
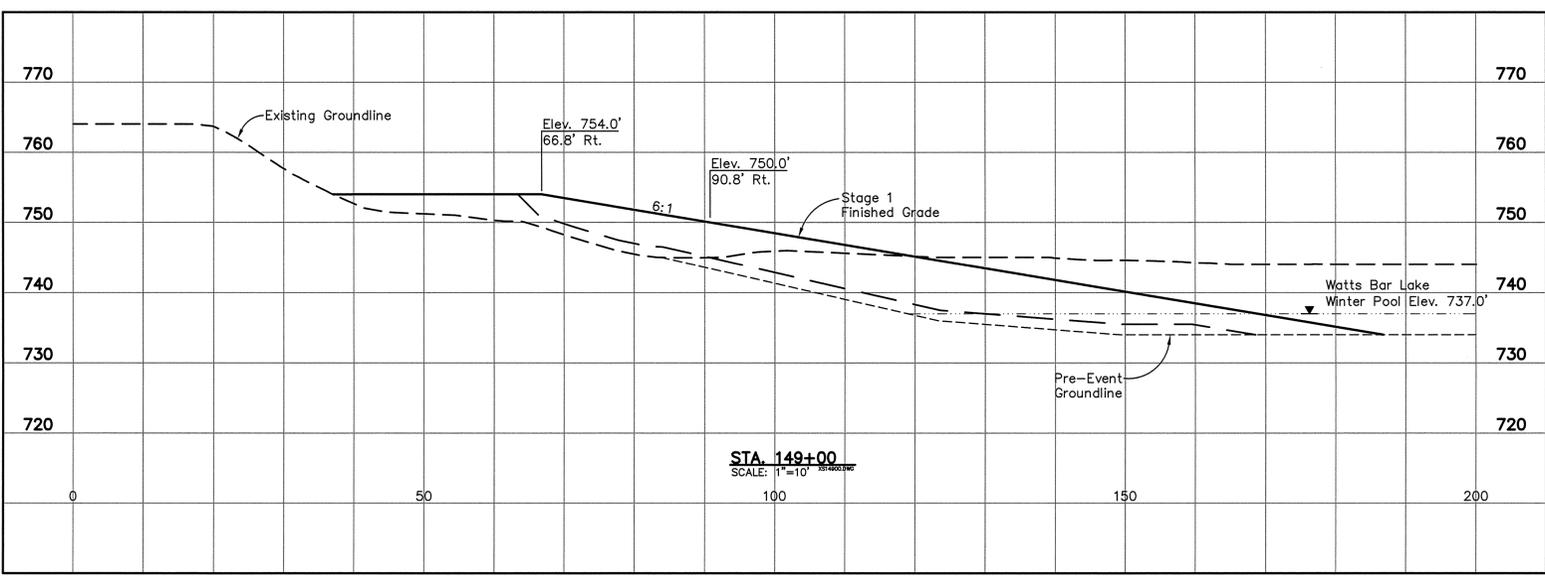
AUTOCAD R 2000 DATE 11/18/09 36 C 10W229-47 R 0

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W\_TVA  
C.A.D. DRAWING  
DO NOT ALTER MANUALLY

PLOT DATE: 11/17/2009 USER: GRAHAM, DAVE PLOT PATH: \\P:\Projects\10W229\10W229-47\SEGMENTS\10W229-47-RO.DWG

A  
B  
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**NOTE:**  
For Filter configurations see Typical Sections - Alternative 1 (Sheet 53).

**ISSUED FOR CONSTRUCTION**

For Supporting Design Calculations see  
FPGKIFFESCDX00000020090020



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1409 N. Forbes Rd.  
Lexington, Kentucky  
40511-0250  
Tel. 859.422.3000  
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REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVSD	APPR	ISSD	PROJECT	AS CONST
0	11/18/09	DEH	DMG	DEH	DWF	DWF	DWF	TJ		

SCALE: 1"=10'  
EXCEPT AS NOTED

YARD  
DIKE C BUTTRESS  
STAGE 1 CONSTRUCTION  
SEGMENT 'D' - CROSS SECTIONS

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
D. HERRON	D. GRAHAM	D. HERRON	D. FULLER	D. FULLER	D. FULLER	T. JOHNSON

KINGSTON FOSSIL PLANT  
TENNESSEE VALLEY AUTHORITY  
FOSSIL AND HYDRO ENGINEERING

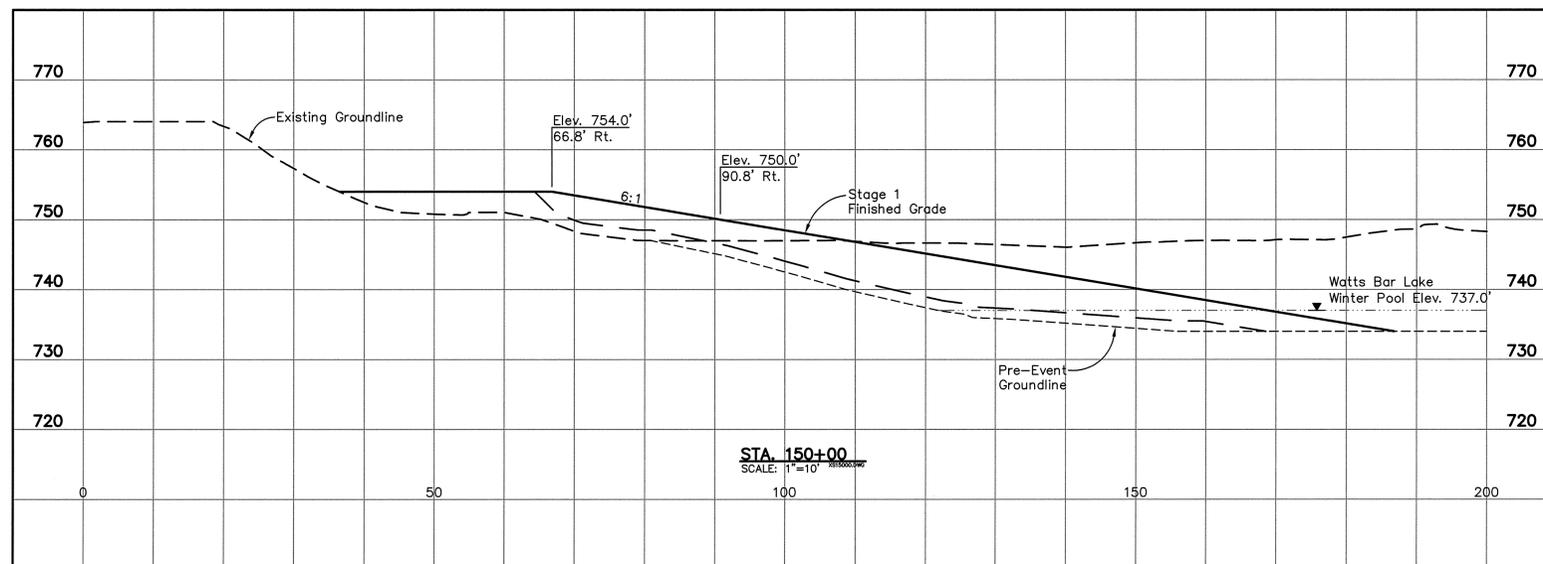
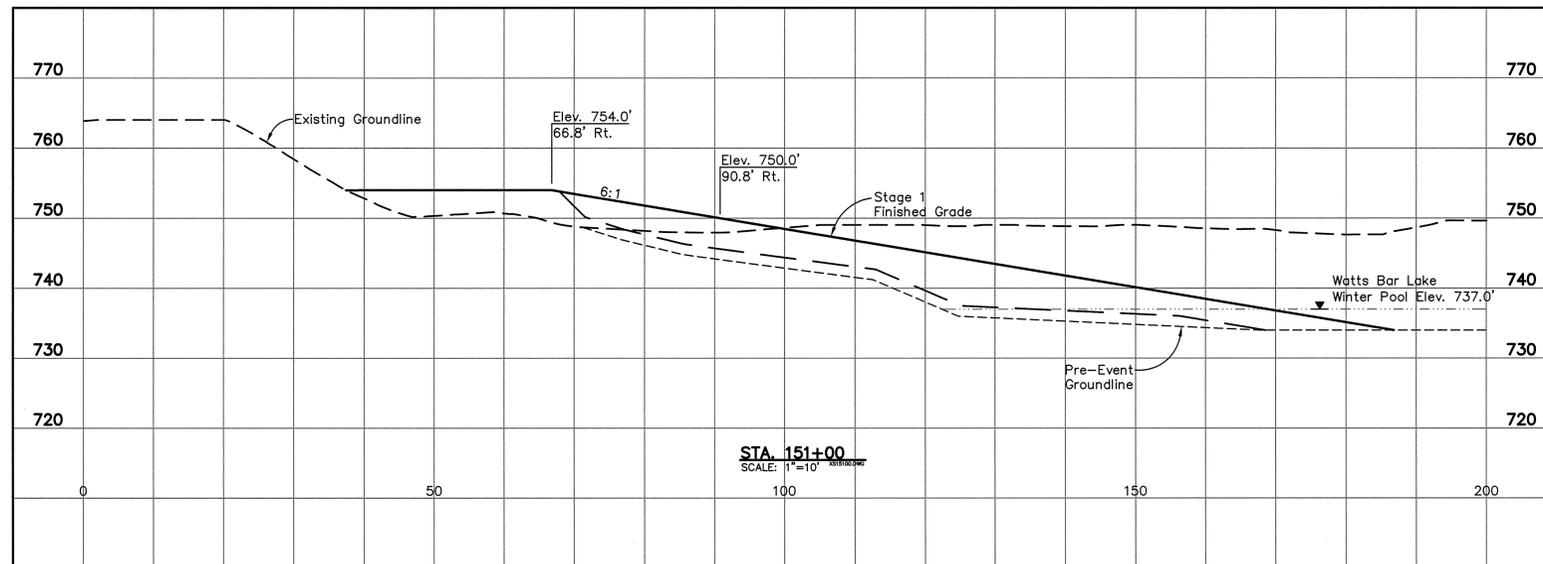
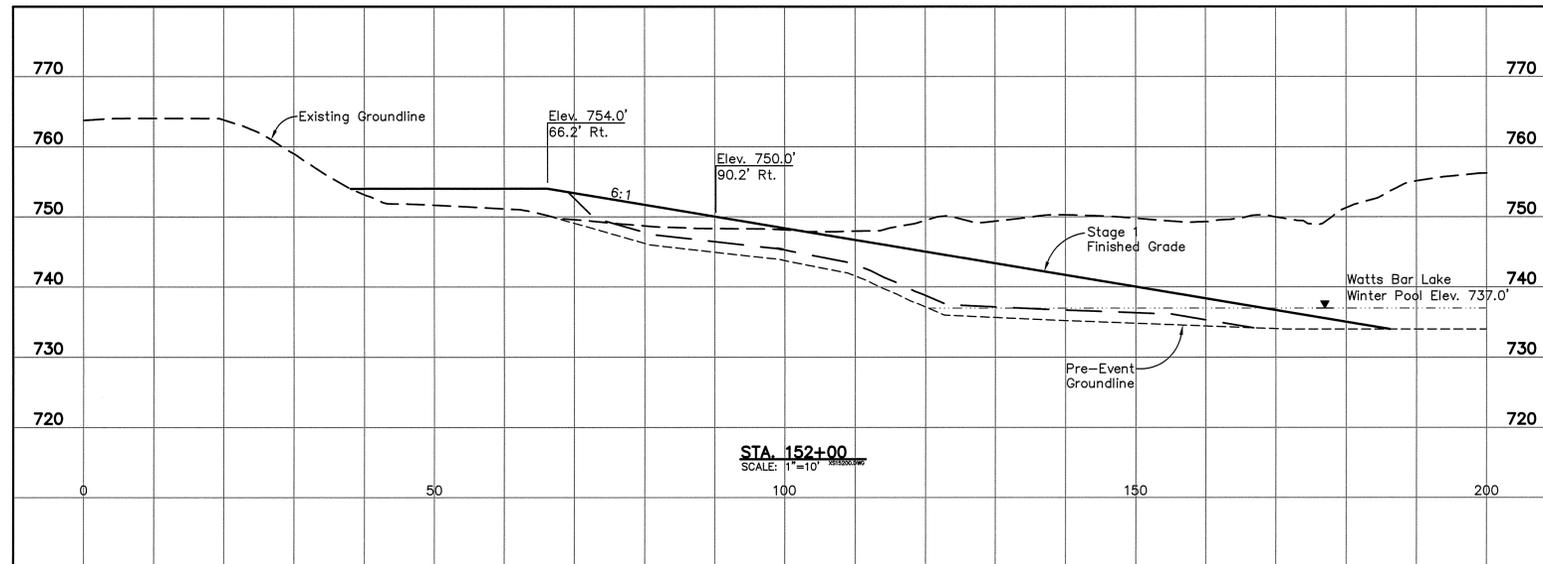
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PLOT FACTOR:XX  
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C.A.D. DRAWING  
DO NOT ALTER MANUALLY

REV. DATE: 11/18/09 BY: D. GRAHAM, DWF  
PROJECT: DIKE C BUTTRESS STAGE 1 CONSTRUCTION SEGMENT 'D' - CROSS SECTIONS

A  
B  
C  
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**NOTE:**  
For Filter configurations see Typical Sections - Alternative 1 (Sheet 53).

**ISSUED FOR CONSTRUCTION**

For Supporting Design Calculations see FPGKIFESCDX00000020090020		R 0		11/18/09		DEH	DMG	DEH	DWF	DWF	DWF	TJ			DISCIPLINE
ISSUED FOR CONSTRUCTION															INTERFACE
SCALE: 1"=10'															EXCEPT AS NOTED
YARD															
DIKE C BUTTRESS															
STAGE 1 CONSTRUCTION															
SEGMENT 'D' - CROSS SECTIONS															
DESIGNED BY:	D. HERRON	DRAWN BY:	D. GRAHAM	CHECKED BY:	D. HERRON	SUPERVISED BY:	D. FULLER	REVIEWED BY:	D. FULLER	APPROVED BY:	D. FULLER	ISSUED BY:	T. JOHNSON		
KINGSTON FOSSIL PLANT															
TENNESSEE VALLEY AUTHORITY															
FOSSIL AND HYDRO ENGINEERING															
AUTOCAD R 2000	DATE	11/18/09	36	C	10W229-49	R 0									



PLOT DATE: 11/17/2009 USER: GRAHAM.DAVE  
 PLOT PATH: \\STANTEC\Projects\10W229\10W229-49-00.DWG

A

B

C

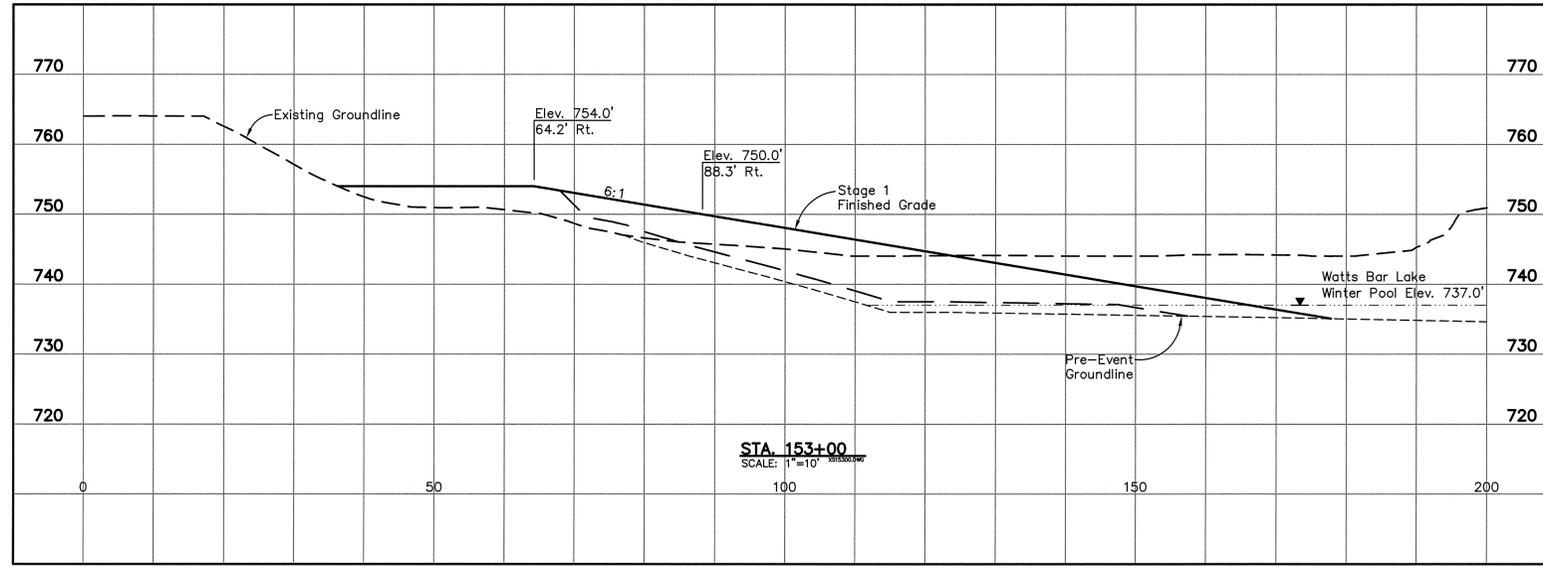
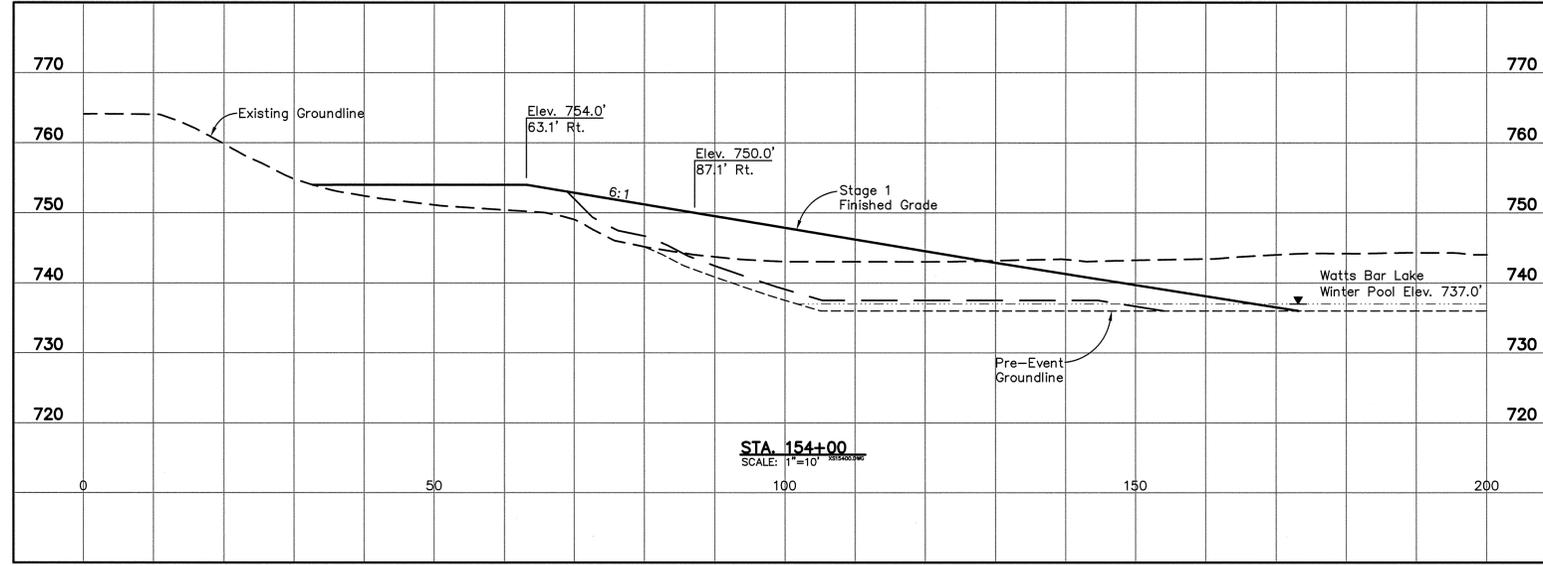
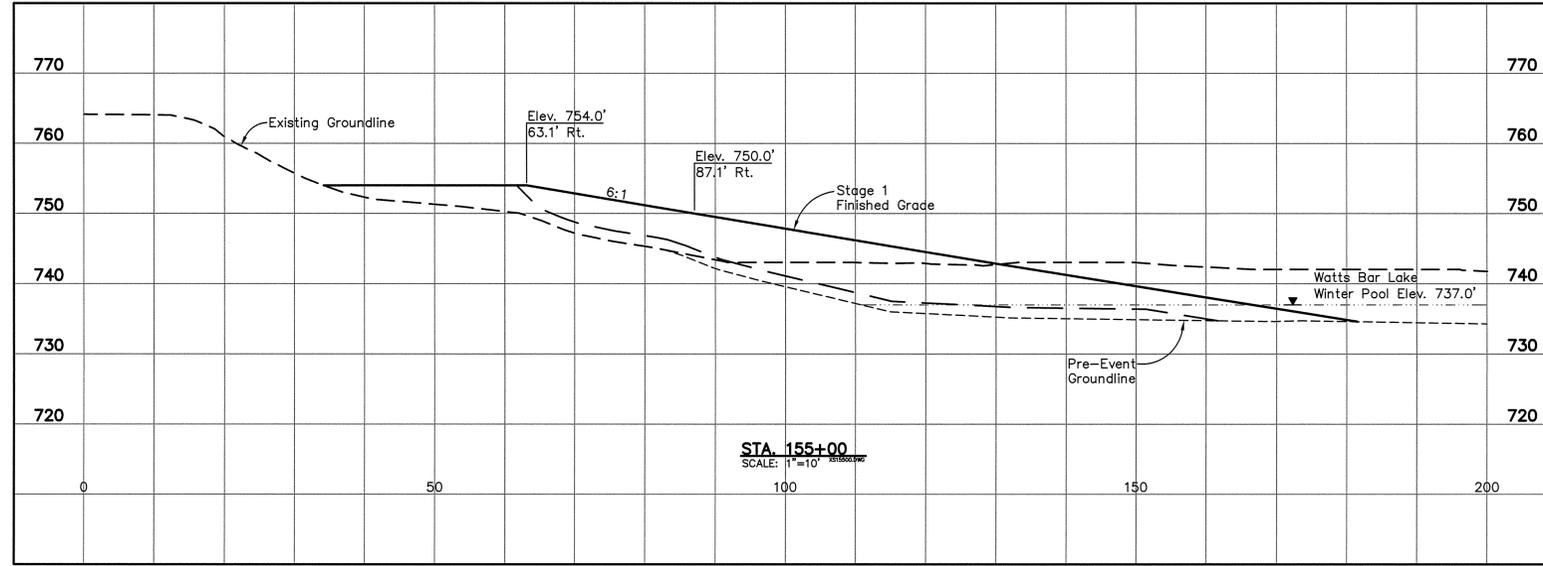
D

E

F

G

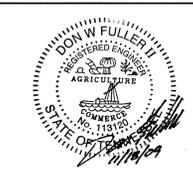
H



**NOTE:**  
For Filter configurations see Typical Sections - Alternative 1 (Sheet 53).

**ISSUED FOR CONSTRUCTION**

For Supporting Design Calculations see FPGKIFESCDX00000020090020



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

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RWVD	APPD	ISSD	PROJECT	AS CONST	REV
0	11/18/09	DEH	DMG	DEH	DWF	DWF	DWF	TJ			

YARD											
DIKE C BUTTRESS STAGE 1 CONSTRUCTION SEGMENT 'D' - CROSS SECTIONS											
DESIGNED BY:	DRWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:					
D. HERRON	D. GRAHAM	D. HERRON	D. FULLER	D. FULLER	D. FULLER	T. JOHNSON					
KINGSTON FOSSIL PLANT TENNESSEE VALLEY AUTHORITY FOSSIL AND HYDRO ENGINEERING											
AUTOCAD R 2000	DATE	36	C	10W229-50	R 0						
	11/18/09										

STANTEC 0  
TASK COMPLETED BY: REV NO.

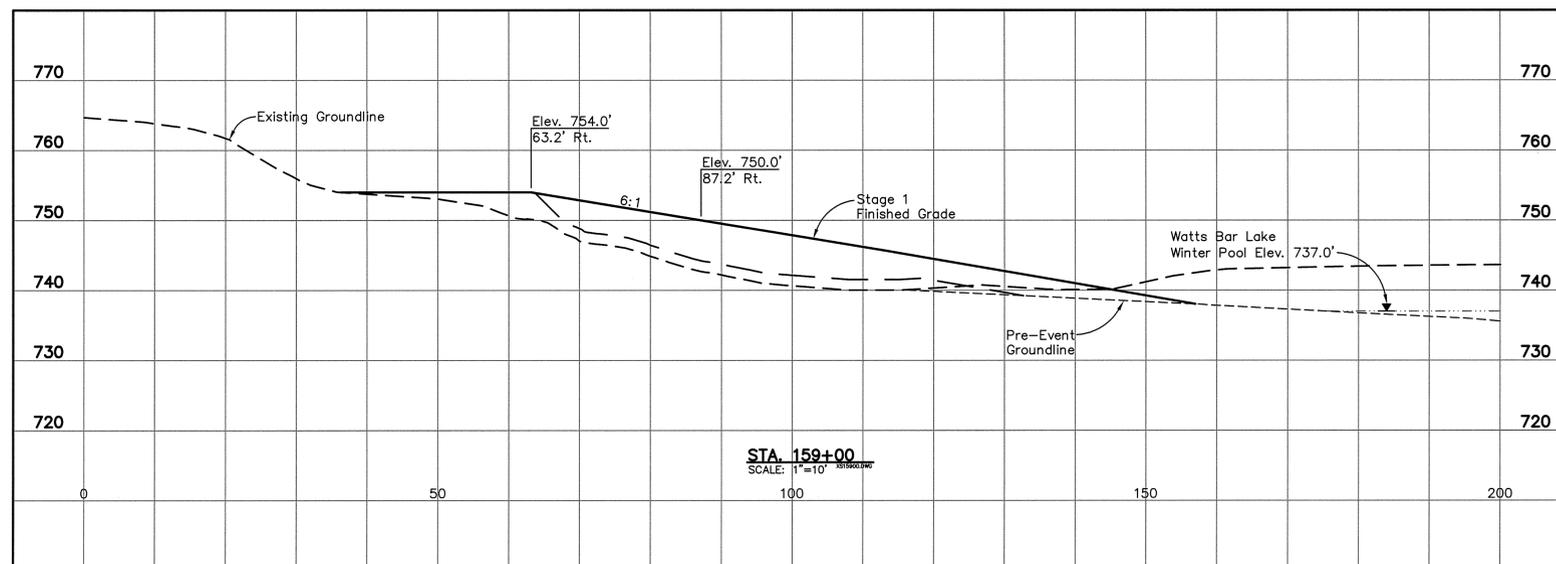
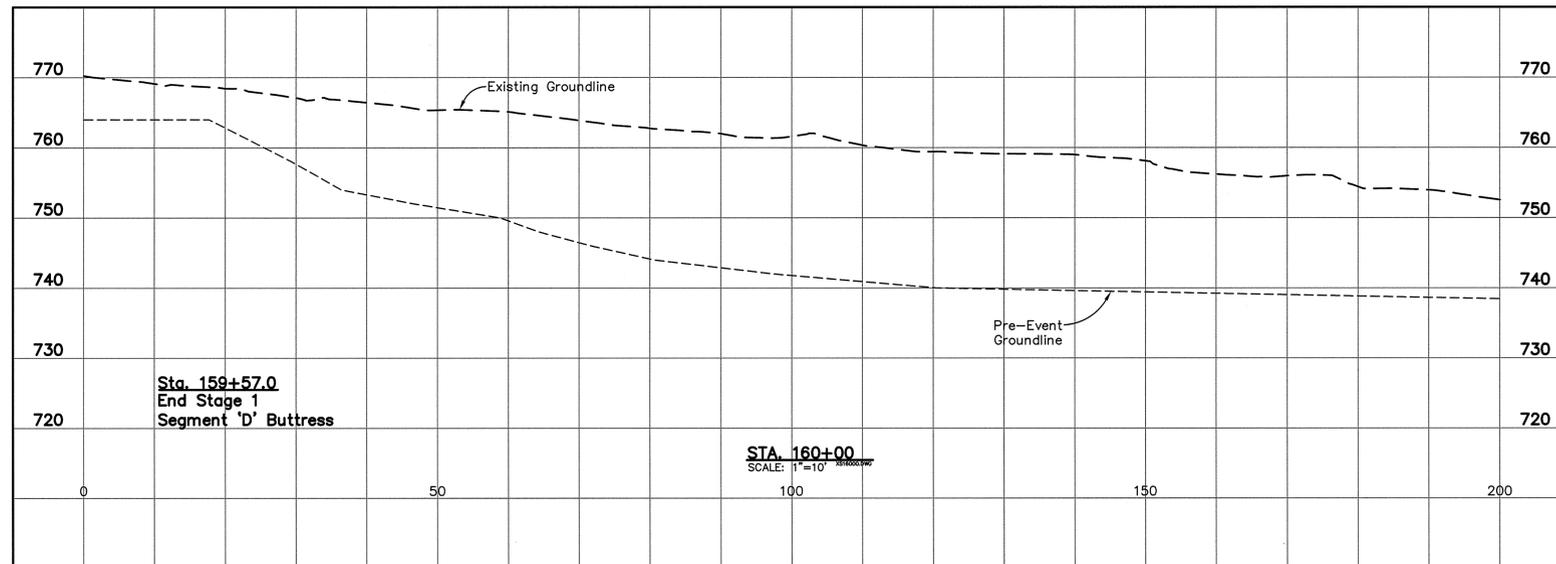
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W\_TVA  
C.A.D. DRAWING  
DO NOT ALTER MANUALLY

PLOT DATE: 11/17/2009 USER: GRAHAM.DWG... 09-6ZZM01 C 92



A  
B  
C  
D  
E  
F  
G  
H

A  
B  
C  
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G  
H



**NOTE:**  
For Filter configurations see Typical Sections - Alternative 1 (Sheet 53).

**ISSUED FOR CONSTRUCTION**

For Supporting Design Calculations see FPGKIFFESCDX00000020090020		<table border="1"> <tr> <td>REV. NO.</td> <td>DATE</td> <td>DSGN</td> <td>DRWN</td> <td>CHKD</td> <td>SUPV</td> <td>RVMD</td> <td>APPR</td> <td>ISSD</td> <td>PROJECT</td> <td>AS CONST</td> <td>BY</td> </tr> <tr> <td>0</td> <td>11/18/09</td> <td>DEH</td> <td>DMG</td> <td>DEH</td> <td>DWF</td> <td>DWF</td> <td>DWF</td> <td>TJ</td> <td></td> <td></td> <td></td> </tr> </table>										REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVMD	APPR	ISSD	PROJECT	AS CONST	BY	0	11/18/09	DEH	DMG	DEH	DWF	DWF	DWF	TJ			
REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVMD	APPR	ISSD	PROJECT	AS CONST	BY																								
0	11/18/09	DEH	DMG	DEH	DWF	DWF	DWF	TJ																											
		SCALE: 1"=10' YARD <b>DIKE C BUTTRASS</b> <b>STAGE 1 CONSTRUCTION</b> <b>SEGMENT 'D' - CROSS SECTIONS</b>																																	
 Stantec Consulting Services Inc. 1409 N. Forbes Rd. Lexington, Kentucky 40511-2050 Tel. 859.422.3000 Fax 859.422.3100 www.stantec.com		<table border="1"> <tr> <td>DESIGNED BY:</td> <td>DRAWN BY:</td> <td>CHECKED BY:</td> <td>SUPERVISED BY:</td> <td>REVIEWED BY:</td> <td>APPROVED BY:</td> <td>ISSUED BY:</td> </tr> <tr> <td>D. HERRON</td> <td>D. GRAHAM</td> <td>D. HERRON</td> <td>D. FULLER</td> <td>D. FULLER</td> <td>D. FULLER</td> <td>T. JOHNSON</td> </tr> </table> <p align="center"><b>KINGSTON FOSSIL PLANT</b> <b>TENNESSEE VALLEY AUTHORITY</b> FOSSIL AND HYDRO ENGINEERING</p>										DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:	D. HERRON	D. GRAHAM	D. HERRON	D. FULLER	D. FULLER	D. FULLER	T. JOHNSON										
DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:																													
D. HERRON	D. GRAHAM	D. HERRON	D. FULLER	D. FULLER	D. FULLER	T. JOHNSON																													
AUTOCAD R 2000		DATE: 11/18/09		36 C		10W229-52		R 0																											

PLOT DATE: 11/17/2009 USER: GRAHAM, DAW  
 PLOT PATH: \\V:\Projects\10W229-52\Drawings\DIKE\_C\_BUTTRASS\STAGE1\REV0\_FIL\_SEGMENTS\10W229-52-R0.DWG