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March 19, 2012 rpt_001_175561087

Shannon Bennett
Tennessee Valley Authority
1101 Market Street, LP 5G-C
Chattanooga, Tennessee 37402

Re: Project Planning Document (Revision 0)
Bottom Ash Pond Closure
TVA Project No. 203536
John Sevier Fossil Plant
Hawkins County, Tennessee

Dear Ms. Bennett:

As requested, Stantec Consulting Services (Stantec) is submitting the enclosed Project Planning Document (PPD) for the Bottom Ash Pond Closure at the John Sevier Fossil Plant in Hawkins County, Tennessee.

The attached document is being submitted as a deliverable for the Phase 1 Conceptual Design and is designated as a Revision 0 submittal. It is anticipated that certain aspects of this PPD may change as the project progresses, and an update (Rev. 1) will be submitted at the conclusion of the Phase 2 Detailed Design efforts. However, please feel free to contact us if changes or additions need to be incorporated into this PPD or supporting documents before that time.

We appreciate the opportunity to assist TVA with these planning efforts and look forward to continued work at the John Sevier Fossil Plant.

Sincerely,

STANTEC CONSULTING SERVICES INC.

Hugo Aparicio, PE
Principal

Joshua Kopp, PE
Project Engineer

Project Planning Document (PPD)

John Sevier Fossil Plant

Bottom Ash Pond Closure

Revision 0

Project Planning Document
Bottom Ash Pond Closure
John Sevier Fossil Plant
Hawkins County, Tennessee

PPD RECORD OF REVISION

Rev No. & Date	DESCRIPTION OF REVISION
21 October 2011	Rev A – Draft PPD
28 October 2011	Rev 0 – Draft PPD
03 November 2011	Rev 0 – TDEC Submittal
09 March 2012	Rev 0 – Phase 1 Deliverable Submittal

Project Planning Document – Bottom Ash Pond Closure
TVA Project ID 203536

Approvals:	Signature	Date
Plant Manager:	_____	_____
RHO&M Program Manager:	_____	_____
Responsible Engineer:	_____	_____
CCP Engineering Manager:	_____	_____
Project Manager:	_____	_____
Manager of CCP Projects:	_____	_____
CCP Support Services:	_____	_____
Environmental:	_____	_____
CCP Construction Manager:	_____	_____

Project Planning Document – Bottom Ash Pond Closure
TVA Project ID 203536

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** Responsible Engineer (RE)

Project Planning Document (Rev. 0)

TVA Project ID: 203536
Bottom Ash Pond Closure
John Sevier Fossil Plant
Hawkins County, Tennessee

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Project Planning Document (Rev. 0)

TVA Project ID: 203536
Bottom Ash Pond Closure
John Sevier Fossil Plant
Hawkins County, Tennessee

1. Project Description / Problem / Issue

The Tennessee Valley Authority (TVA) John Sevier Fossil Plant (JSF) is located in northeast Tennessee near Rogersville, in Hawkins County, approximately 30 miles southwest of Kingsport, as shown in Figure 1. More specifically, the facility was constructed along the southern bank of the Holston River in the headwaters of Cherokee Lake.

Figure 1: Location Map

The John Sevier plant has four coal-fired generating units that generate ash as the primary byproduct (the units do not generate gypsum or scrubber sludge). Approximately 215,000 tons of dry fly ash and 20,000 dry tons of bottom ash per year are generated at peak operation. Although historically fly ash was wet sluiced to ponds such as the Ash Disposal Area J pond that is now closed, now it is handled dry by collecting it in silos and hauling to an onsite permitted dry stack disposal area (Dry Fly Ash Stack). The bottom ash is wet-sluiced from the plant to the Bottom Ash Pond. Figure 2 illustrates the location of the various facilities at JSF and an enlarged overview map is provided in Appendix A.

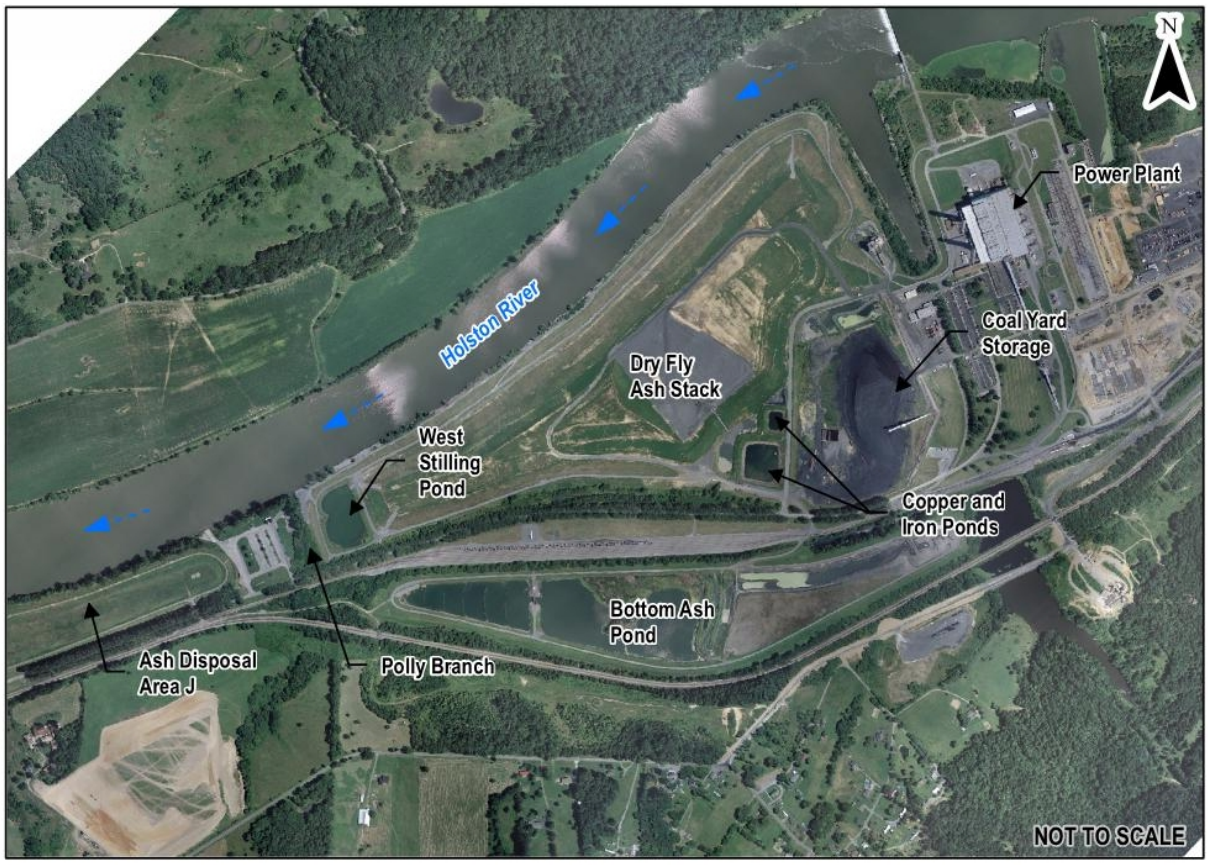


Figure 2: Plant Overview

1.1. Bottom Ash Pond

The Bottom Ash Pond (BAP) facility covers approximately 42 acres and was originally formed by constructing an 8,600-foot long earthen dike measuring approximately 20 feet in height and with a 16-foot wide crest. Sluiced discharges generally flow from east to west through the pond as waste materials settle out. A Stilling Pond area exists near the west end of the facility and is hydraulically connected to the remainder of the pond through a rock weir in an internal divider dike. As water passes through the Stilling Pond, it discharges through two concrete riser structures into Polly Branch, a tributary of the Holston River.

For the purposes of this document, the BAP may be considered to include three sub-areas located from east to west (Figure 3):

- Sub-Area 1, Dredge Cell. This sub-area contains bottom ash that settles during initial hydraulic deposition in the BAP as well as lesser amounts of finer grained ash that was recovered during periodic mechanical dredging of the BAP and consolidated in this sub-area. This sub-area also includes the channel transporting flows from the sluice and sump pipes to the Intermediate Pond.
- Sub-Area 2, Intermediate Pond. This sub-area contains finer grained ash that settled more slowly during hydraulic deposition.
- Sub-Area 3, Stilling Pond. This sub-area is used for gravity polishing of water prior to release through Outfall 001.

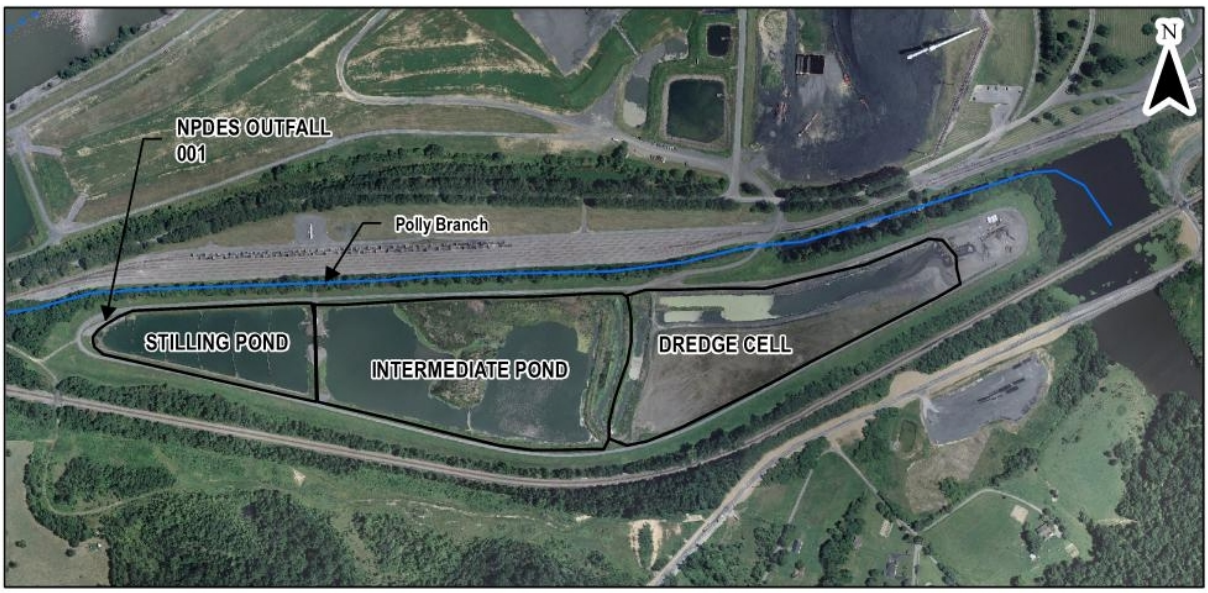


Figure 3: Bottom Ash Pond Sub-Areas

Currently, the BAP receives sluiced bottom ash, intermittent fly ash (sluiced to separate trench for settlement), and discharges from the Coal Yard Runoff Pond, Chemical Treatment Pond - Iron, Chemical Treatment Pond – Copper, and miscellaneous plant stormwater and wastewater discharges. Flows into the BAP are permitted to be discharged through Outfall 001 into Polly Branch under the National Pollutant Discharge Elimination System (NPDES) Permit No. TN0005436 (the 'Permit'), which is administered by the Tennessee Department of Environment and Conservation (TDEC).

Outfall 001 consists of a concrete pipe spillway system comprised of two (2) 48-inch concrete risers approximately 13 feet in height with removable corrugated metal skimmers. The risers are connected to 36-inch concrete pipe barrels that outlet through the embankment to Polly Branch. From the discharge point, Polly Branch flows open-channel generally west for a short distance, then turns northward through two culverts beneath the adjacent railroad and roadway embankment, before emerging into another open channel that discharges to the Holston River. In total, the stream traverses a distance of approximately 1,600 feet downstream of the outfall to the Holston River.

1.2. Bottom Ash Pond (BAP) Closure

As a part of other initiatives at the John Sevier Plant, the Bottom Ash Pond will be phased out of operation and ultimately decommissioned and closed. The approach for final closure for the BAP is the subject of this PPD and four distinct geometric configurations have been evaluated as a part of the Phase 1 Conceptual Design.

The operation of the BAP facility is currently regulated by the quality of its discharge waters, which are prescribed under the NPDES Permit mentioned above. In order to maintain compliance with the Permit, TVA has committed to TDEC to meet more stringent discharge limits from the pond by July 31, 2013. The consequence of this is that TVA must either discontinue discharges from the pond or reconfigure the discharges in advance of that date. Through discussions with TDEC, TVA has established that re-routing Outfall 001 directly to the Holston River (in lieu of Polly Branch) may be a viable option that allows discharges to continue through closure of the facility. This project is currently being executed as the '*JSF BAP Discharge Re-Route Project*', under TVA Project ID No. 602581.

It is anticipated that the relocated outfall will serve as the primary discharge structure for the BAP through the remaining operational life of the facility. Once the facility is no longer required, TVA has committed to close it by dewatering the wet areas; remove, consolidate, and/or re-grade the accumulated waste material; and install a permanent dry cover (cap) system. A plan to do this is also a requirement of the Permit and TVA submitted a draft closure plan to TDEC on July 25, 2011. TVA intends to submit an updated closure plan and schedule to TDEC prior to construction.

Selection of the final geometric configuration for the BAP Closure is largely contingent upon the timing of other construction activities at JSF. A Master Closure Strategy is currently being prepared for closure of not only the BAP, but also the Dry Fly Ash Stack (DFAS) and other ancillary waste management ponds at the JSF plant. The Master Closure Strategy includes potential closure concepts for those facilities as well as the anticipated sequence of activities. For the purposes of this PPD, it is assumed that the Master Closure Strategy could be altered to follow a sequence corresponding with the alternative being considered.

2. Project Goals and Objectives

The objective of this project is to close the JSF BAP under the NPDES permit regulatory framework. Depending on sequencing of construction, the BAP closure may occur after, or concurrent with discontinuation of pond inflows. For the purposes of this PPD, it is assumed that the inflow to the pond from process sources will have been discontinued prior to construction. The consequence is that alternate treatment or re-routing of any remaining process flows may be required before closure of the BAP in order to assure that it can be successfully dewatered during construction. Discharges that currently flow through the pond include: ash transport water, chemical and non-chemical metal cleaning wastewaters, coal pile runoff, sewage treatment plant effluent, wastewater from the landfill leachate collection system, and miscellaneous equipment cooling and lubricating water. The discontinuation of inflows and related closure activities for those ponds is being addressed as separate projects.

Four alternatives for the BAP Closure have been identified during this study and are described in more detail in Section 3. These alternatives were evaluated based on six criteria that outline the goals of the closure project:

1. Protection of Human Health and the Environment (“HH&E”) - This criterion addresses whether the alternative achieves and maintains protection of human health and the environment during implementation and after closure.

2. Regulatory Compliance - The selected alternative must comply with all applicable regulatory requirements, particularly those stipulated by the Permit. TDEC will be notified of the anticipated closure configuration and schedule, therefore this criterion also considers TDEC concurrence.

3. Permanence (“Long Term Effectiveness”) - This criterion addresses how an alternative reliably meets the goals of closure (principally items 1, 2, and 6) through and after closure. This includes an assessment of residual risk and management obligations after an alternative has met the stated project objectives.

4. Short-Term Effectiveness - This construction-related criterion addresses the effectiveness of each alternative in meeting project goals during construction and implementation. Factors considered in this criterion are the safety of workers and the public, disruption of site and surrounding land uses, and time necessary to implement the alternative.

5. Feasibility - This criterion addresses the technical and administrative feasibility of each alternative. Factors considered are listed below.
   - The availability of resources necessary to complete the alternative.
   - Flexibility of each alternative to allow modifications to adapt to changed conditions.
   - Adaptability of the alternative to monitoring/maintenance.
   - Adaptability of the alternative with the overall management of other JSF projects outlined in the JSF Master Closure Strategy.
   - Additional permitting or management obligations driven by the alternative, including sufficient time to complete the work.

6. Cost - This overall criterion relates to the cost of construction related to the closure activities. The ongoing costs of operation and maintenance are included inherently in the calculations.

3. Alternatives Considered

Four (4) alternative approaches were selected for consideration for the closure of the BAP. An abbreviated description of each alternative follows and evaluation of the alternatives is included in the following sections. Concept level drawings of each are included in Appendix B.

The alternatives considered include:

- Alternative A - No Action: This alternative would involve "no change" from current management of the BAP (except for the outfall reconfiguration described previously). A wet pond would be maintained in the current location and discharge stormwater and other remaining process flows would continue to discharge through it.

- Alternative B - Complete Cap: This alternative would involve closure of the complete 42-acre BAP by dewatering the pond, shaping and re-grading the top surface of the waste, and installing a cap system over the waste. The cap system would consist of a composite geomembrane and soil cover.

- Alternative C - Partial Cap: This alternative would involve closure of the BAP by dewatering, consolidating ash within about half (21 acres) of the current area, and installing a cap system over the waste in that location. The remaining 21 acres would be restored to an approximate dry “natural” condition (hereinafter, “the Restored Area”) by removing the dikes and ash, re-grading it to drain positively, placing vegetative cover soil, and vegetating the area. Sheet flow of unaffected stormwater runoff would be collected from the area in a series of perimeter ditches that discharge to Polly Branch Creek. Some of the soil dikes may be excavated and stockpiled for future use on other projects.

- Alternative D – Full Ash Removal: This alternative would involve dewatering the pond and excavating the area to remove all ash (estimated to be approximately 770,000 CY). Dike soils unaffected by contact with the ash could be excavated and stockpiled for future use on other projects. The Restored Area would be returned to approximate natural conditions as in Alternative C.

3.1. Alternative A – No Action

While considered herein as "No Action", it is assumed that the scope of this alternative would include basic actions common to each of the alternatives and serves as a baseline for comparison with other alternatives. Stormwater and wastewater flows to the BAP would continue to discharge through NPDES Outfall 001. Roadway access to the facility and around its perimeter would be maintained. Security fencing and signage would be established for long-term management of the area. Long term maintenance including periodic inspection programs, mowing, and repair work as needed is anticipated after closure construction.

The No Action alternative fails the assessment criteria listed below.

- This alternative leaves the ash exposed, which could cause potential threats to human health. It also allows potential accidental release of waste outside the BAP footprint, which could cause negative environmental effects.
- This alternative would not meet requirements for closing the BAP set forth in the Permit and therefore would not be approved by TDEC. The alternative thus fails the regulatory compliance criterion.
- This alternative does not meet the goals and objects of the project; therefore it fails the permanence criterion.
- Beyond typical operational and maintenance costs, this alternative does not require additional capital construction costs, therefore this is the least costly alternative considered.
- This alternative does not align with the JSF Master Closure Strategy as the facility would remain open.

In consideration of the foregoing, this alternative was judged to be unacceptable for further consideration.

3.2. Alternative B – Complete Cap

This alternative would entail placing a composite geomembrane and soil cover (cap) over the entire 42-acre complex. No ash or ash-affected soil would leave the facility.

To implement this alternative, the BAP will be dewatered via pumps, siphons, or other methods after wastewater discharges are discontinued or rerouted. After dewatering, ash and ash-affected soil within the BAP will be regraded to a minimum of two percent to establish positive drainage. A temporary stormwater detention pond will then be developed in the area of the Stilling Pond and stormwater will discharge through Outfall 001 during closure construction. This alternative will involve demolition of any remaining ash reclaiming structures or equipment, ash sluicing structures and pipe, and any other structures within the designated project footprint associated with the operation of the BAP.

This alternative will also involve demolition of any remaining ash reclaiming structures or equipment, ash sluicing structures and pipe, and any other structures within the designated project footprint associated with the operation of the BAP.

The facility will be capped using a composite geomembrane and soil cover system. It is expected that the cover system will consist of a 40-mil textured LLDPE geomembrane, geocomposite, and a geotextile separator, eighteen inches of protective cover soil, and six inches of vegetated cover soil.

Roadway access to the facility and around its perimeter would be maintained. Security fencing and signage would be established for long-term management of the area. Long term maintenance including periodic inspection programs, mowing, and repair work as needed is anticipated after closure construction.

Isolation of the ash by placement of a geomembrane and soil cover over the entire area of the BAP would meet all of the evaluation criteria. However, this alternative also results in the largest capped area leading to increased implementation and ongoing maintenance costs.

3.3. Alternative C – Partial Cap (Recommended Alternative)

To better estimate the volume and distribution of waste material and conditions anticipated during closure, a geotechnical exploration was performed within the BAP footprint by Stantec during November and December of 2011. The results of that exploration have been documented under a separate memorandum submitted to TVA on January 12, 2012 titled *'JSF Bottom Ash Pond Closure – Volumetric Computations'* and were used to evaluate Alternatives C and D (Appendix C).

This alternative would entail consolidating ash and ash-affected soil into a reduced area within the pond footprint. For the conceptual design, this area was determined to be the 21 acres on the east end of the pond. A clay divider dike will be constructed at the approximate mid-point of the pond to serve as the west dike of the closed facility. The ash will be capped with a composite geomembrane and soil cover. The remaining 21 acres will be restored to natural condition as previously described.

Construction implementation of this alternative would proceed in a manner similar to Alternative B. After dewatering, ash and ash-affected soil will be consolidated in the east end of the pond. The soil dikes in the area where the ash has been removed will be abandoned in place, excavated and used for regrading and capping, or excavated and stockpiled off site for use in other construction projects. A temporary stormwater detention pond will be developed in the area of the Stilling Pond and stormwater will discharge through Outfall 001 during closure construction.

The clay divider dike will be constructed concurrently to ash re-grading. After the ash and ash impacted soil are consolidated to the east end of the pond, the ash will be capped with a composite geomembrane and soil cover system.

Once the cover system has been installed and established, the temporary stormwater pond will be removed. The areas of the pond where ash has been removed will be restored to an approximate natural condition.

Consolidation of the ash to the eastern half of the former BAP, then isolating the ash with a composite geomembrane and soil cover system would meet all of the evaluation criteria. This alternative allows for restoration of about half of the BAP and reduces the footprint of the ash containment, reducing implementation and ongoing maintenance costs.

3.4. Alternative D – Full Ash Removal

This alternative would entail removing all ash and ash-affected soil from the BAP and consolidating the ash in the DFAS and/or off-site disposal facilities. It has been estimated that approximately 770,000 CY of ash would need to be removed and disposed from the BAP. Preliminary estimates indicate the DFAS is expected to have capacity for approximately 675,000 CY of material from the BAP. Therefore, approximately 95,000 CY of ash would need to be disposed of at off-site landfills. After the ash is removed, the soil dikes will be abandoned in place, excavated, and used for regrading and capping, or excavated and stockpiled off site for use in other construction projects.

Construction implementation of this alternative would proceed in a manner similar to Alternative B. After dewatering, ash and ash-affected soil will be removed from the area. Due to the volume involved, construction of this closure approach may require several construction seasons to complete. The soil dikes in the area where the ash has been removed will be abandoned in place, excavated and used for regrading and capping, or excavated and stockpiled off site for use in other construction projects.

Complete removal of ash and ash-affected soil would meet all of the evaluation criteria except that it would require longer to implement and has potential to not meet the feasibility criteria if the DFAS is closed before the BAP. Closure of the DFAS before the BAP (as outlined in the current JSF Master Closure Strategy) would eliminate the possibility of hauling ash to the DFAS. Hauling all the ash to the DFAS or an off-site landfill would be the most costly option.

3.5. Evaluation Summary and Recommended Alternative

Comparisons of each to project performance criteria for each alternative are provided in Table 1.

Table 1. Qualitative Review of the Bottom Ash Pond Closure Alternatives

Criterion/Alternative	A No Action	B Complete Cap	C Partial Cap	D Clean Closure
Protection of Human Health and the Environment	FAILS	MEETS	MEETS	MEETS
Regulatory Compliance	FAILS	MEETS	MEETS	MEETS
Permanence	FAILS	MEETS	MEETS	MEETS
Short Term Effectiveness	MEETS	MEETS	MEETS	MAY FAIL
Feasibility	MEETS	MEETS	MEETS	MAY FAIL
Cost (ranked with 1 being lowest)	1	2	3	4

Alternative C is the recommended alternative for closure of the BAP. The reasons for recommending this alternative are as follows:

- This alternative meets all of the evaluation criteria. Alternative A does not meet all the evaluation criteria and Alternative D has the potential to not meet all the criteria.
- The opinion of probable construction cost for this alternative is not the lowest. However, it is comparable to the lowest cost alternative (Alternative B) that meets the evaluation criteria. With the number of unknowns and the assumptions made in the cost estimate, the costs for Alternatives B and C are comparable enough to not be a significant factor in deciding between the two.
- This alternative allows for flexibility in the final geometry of the closed facility. The footprint area and height of the closed facility can be optimized during the Phase 2 design to achieve maximum benefits.
- This alternative has the option to remove ash and dispose of it in the DFAS or an off-site landfill. This option provides further flexibility in the final geometry of the closed facility.
- The reduced footprint of this alternative will likely translate to lower long-term operation and maintenance costs.
- The sections of dike on the west side of the pond will be available for use on future projects.
- This alternative is consistent with the Closure Plan previously submitted to TDEC on July 25, 2011. If any other alternative is selected, the Closure Plan will likely need to be updated and re-submitted to TDEC.

4. Scope of Recommended Design Solution

The process for construction implementation of the recommended design solution for the JSF BAP closure is described as follows:

- Removal from Service
- Dewatering
- Demolition of Existing Facilities
- Construction of Divider Dike
- Consolidation of Ash
- Final Cover
- Post Closure Management Infrastructure

4.1. Removal from Service

The first action related to closure will be to discontinue all waste stream discharges to the BAP from the JSF Plant. Wastewater may continue to be generated during closure and must be treated prior to its discharge to any receiving bodies of water. As necessary, this task may include the installation of an on-site pre-packaged wastewater treatment plant, as well as re-piping of various sources. This activity would occur separate from this project.

Closure of the BAP may need to be performed in phases depending on the final selection of the method and schedule to discontinue the waste stream discharges.

4.2. Dewatering

The next step will be dewatering the BAP. The free water in the BAP will be discharged through the NPDES Outfall 001 via pumps, siphons, or other methods. Additional detention times or alternate temporary treatment and control measures may be required to maintain compliance with the NPDES discharge quality limits. Ditches will be excavated within the BAP to allow as much water to drain by gravity to the Intermediate Pond as possible. A portion of water in the Intermediate Pond will drain to the Stilling Pond by gravity. After the water surface elevation drops below the bottom of the weir in the internal divider dike, pumps will have to be used to transport the water over the divider dike into the Stilling Pond.

4.3. Demolition of Existing Facilities

Once the NPDES flows are diverted from the BAP, the infrastructure within the project footprint will be removed and/or demolished. This infrastructure will include removal of the CO_2 injection system, electrical power sources, ash sluice and sump lines, bottom ash recovery system, existing spillway structures, instrumentation, etc.

After the ash has been regraded to the east side of the pond, the portions of the perimeter dike outside the Stilling Pond area and the planned ash consolidation area may be breached and ultimately flattened. The soils obtained from the dike demolition may be utilized in the construction of the soil cover system or stockpiled for other uses. These sections of dike may also be abandoned in place and left for demolition by future projects. The exception would be to provide channels through the dikes to allow the Recovered Area to drain.

4.4. Construction of Divider Dike

The west boundary of the closed pond will consist of a new divider dike constructed across the ash pond (north-south direction). The divider dike will be located at the approximate mid-point of the existing pond. The exact location of the dike will be determined during Phase 2 design. The location and size of the dike will be based on the optimal size of the footprint. It is anticipated this dike will be constructed from existing dike soil or from local borrow soil suitable for dam construction. Side slopes will be graded to no steeper than 3H:1V.

4.5. Consolidation of Ash

Ash in the western portion of the BAP will be recovered and placed for consolidation into the eastern end of the pond. It is assumed that minimal over excavation will be required to remove soil that has co-mingled with ash. According to results of the drilling performed by Stantec during November and December 2011, there is a well-defined top of clay/weathered shale and ash boundary within the pond. Therefore, Stantec recommended that additional over-excavation into the clay/weathered shale not be performed with the exception of inadvertent over-excavation caused by the earth-moving equipment as it scrapes and picks up the ash.

As the ash is consolidated, it will be graded to promote positive surface drainage and to support the cover system. The closure area will be graded with top slopes no flatter than 2% and no steeper than 5%. The ash will be compacted as it is placed to reduce post-construction settlement. Side slopes will be graded to no steeper than 3H:1V.

4.6. Final Cover

The final cover system, based on TVA's CCP Management Program Master Programmatic Document, will be constructed of the following materials and thicknesses, as listed in the order of construction (bottom to top):

- 40-mil LLDPE flexible membrane liner (FML)
- Geocomposite drainage layer
- Geotextile Separator
- 24 inches of cover soil including to 6 inches of vegetative cover

The cap will be integrated with perimeter ditches and outlet structures and graded to encourage positive drainage of surface water. Following capping, the area will be vegetated for erosion control.

4.7. Post Closure Management Plan

A post-closure management plan will be developed during the Phase 2 design that will likely include the following activities for the closed facility:

- Maintenance of drainage facilities and other erosion/sediment controls (if present) in a functional state until the vegetative cover is established sufficiently to render such maintenance unnecessary (short term requirement).
- Maintain the approved final contours and drainage systems of the site such that stormwater run-on is minimized, erosion of the cover/cap is controlled, and positive drainage is achieved.
- Vegetation management and maintenance. This includes mowing, prevention of unwanted plants (trees and brush), and revegetation of bare spots as needed.

5. Assumptions / Limitations / Risks

The recommended design solution has been developed around certain assumptions, limitations, and identified risks. The following unverified assumptions, limitations, and risks are recognized for the project:

5.1. Assumptions / Limitations

- TDEC will approve closure of the BAP through the NPDES process.
- NPDES monitoring at Outfall 001 during closure construction and until establishment of final vegetative cover will meet required discharge parameters.
- Process flows will be discontinued from the BAP before start of construction. Discontinuation of these flows will be accomplished under separate projects. According to the JSF Master Closure Strategy, these projects will be accomplished prior to closure of the BAP.
- Over-excavation into the BAP bottom will not be required to remove ash impacted soils.
- TVA will assess environmental concerns as part of the CEC process.
- No special or hazardous waste will be encountered.

5.2. Risks

A risk matrix and Monte Carlo Analysis for the BAP Closure project have been prepared and are provided in Appendix D. Potential risks and their costs and delays have been considered. Proposed mitigation efforts for each risk are also included. Items such as hauling an unexpectedly large amount of ash to another location and the need for additional fill have been given a probability and corresponding cost.

6. Environmental / Operational Impacts

Environmental/Permitting needs that have been identified with respect to the proposed BAP Closure are identified as follows:

- **TDEC Approval of Closure Plan** – A draft closure plan for the BAP was submitted on July 29, 2011 to TDEC. On September 8, 2011, TDEC issued comments on the draft plan. Closure of the BAP is subject to TDEC's final approval of the proposed closure process.

- **NPDES Permit Modification** – The NPDES permit will be modified to close Outfall 001, relocate Outfall 001, or add treatment which may include an on-site pre-packaged treatment plant.

- **Notice of Intent (NOI) and Stormwater Pollution Prevention Plan (SWPPP) for the Construction Permit** - Since more than one acre will be disturbed during the closure activities in association with the dike areas, a Notice of Intent (NOI) to discharge stormwater associated with construction activities will be submitted to TDEC's Division of Water Pollution Control (DWPC). A site-specific SWPPP must be developed and submitted as required by the NOI along with applicable permit fees.

  TVA will also need to obtain coverage under the Tennessee Multi-Sector Permit (TMSP) for stormwater discharges after construction is completed.

- **Categorical Exclusion Checklist (CEC) –** This TVA required document must be completed for all proposed actions at TVA facilities. It will verify that there are no extraordinary circumstances associated with this project and if there are, whether they are insignificant to require a categorical exclusion.

The following operational impacts have been noted and will be addressed:

- **Discontinuation of Existing Discharges –** Existing discharges into the BAP must be discontinued prior to the commencement of construction activities.

- **CO_2 Injection System –** This system is used to control the pH level in the ponds before the water is discharged. It will be decommissioned and removed from the BAP as part of this project.

7. Key Deliverables

There will be parallel activities by Team Members during Phase 2 design to meet schedule constraints. The site characterization, engineering design, and regulatory permitting will have parallel and overlapping elements in the approach.

The following is a list of the primary deliverable items.

Phase 1 – Planning and Conceptual Design

- Conceptual Design Plans
- Draft BAP Closure Plan document
- Project Planning Document (PPD)

Phase 2 – Detailed Design

- Issued for Review (IFR) plans (30%, 50% and 90%)
- Issued for Construction (IFC) plans (100%)
- Technical Specifications
- Design Report Calculations
- Basis of Design Report
- Opinion of Probable Construction Cost
- Storm Water Pollution Prevention Plan (SWPPP)
- Design Change Notification (DCN) (if applicable)
- Post Closure Plan
- NPDES Permit Modification (if necessary)
- USACE/ARAP Permitting
- Construction QA/QC Plan
- Construction Contingency Plan
- Revised PPD (if necessary)

Phase 3 – Construction Implementation

- Daily Construction Observation Field Reports and Quality Control Tests
- Construction Certification Report, including Record Drawings
- Project Closeout Documents

8. Engineering Materials / Contracts

8.1. Engineering Materials

Construction materials for closing the BAP will consist of readily available materials such as soil and rock for fill, vegetative soil, crushed stone, HDPE pipe, and concrete. Geosynthetic materials will be considered long lead items. Specific materials will be identified in the construction design drawings and will be further characterized in the project specifications.

8.2. Contracts

TVA will utilize their own construction capabilities, use a contractor already on site, or issue a Request for Proposal (RFP) to accomplish the work. The decision on who will perform the work will be made by TVA.

8.3. Procurement of Equipment and Materials

It is anticipated that the only major item that may require lengthy procurement times are the geosynthetic materials for the cap. TVA will decide whether to procure equipment and materials or to include those items in the RFP.

9. Cost Estimate

Opinions of probable cost have been prepared for each alternative as presented in Section 3. An expanded cost spreadsheet is included in Appendix E. Costs are considered preliminary and are subject to change as new information is obtained. A detailed level engineering cost estimate for the recommended design solution (Alternative C) has also been prepared.

The opinions of probable costs for each alternative are included in Table 2. These estimates includes all construction costs, engineering design fees (all three project phases), TVA management/oversight costs, operations and maintenance costs (30 years), and risk dollars.

Table 2. Opinions of Probable Construction Costs

	Alternative A	Alternative B	Alternative C	Alternative D
Construction Cost	$0	$16,500,000	$17,500,000	$30,800,000

A detailed opinion of probable cost will be developed for the recommended design solution during the Phase 2 design.

10. Schedule

A detailed level engineering and conceptual construction schedule has been prepared and is presented in Appendix F. This schedule has been entered into Primavera P6 and will be updated by the project team as the project progresses.

11. Drawings / Sketches

The Conceptual Design has been prepared and the drawings include a grading plan, selected sections, typical cap details, and a conceptual stormwater management plan. The conceptual drawings are in Appendix B.

In general, the final closure design package (IFC) will consist of the following types of drawings and is anticipated to include approximately 30 sheets. Early progressive submittals will contain partial sets as appropriate.

- Cover Sheet
- General Notes
- Existing Conditions/Demolition Plan/Erosion Control
- Storm Water Management Plan
- Site Layouts
- Grading Plans
- Plan and Profile
- Erosion and Sediment Control Plan
- Sections
- Details

Existing TVA Drawings to be Affected

At this time, it is known that the following existing TVA drawings will be affected due to revision or replacement. Note that this is not considered to be a comprehensive list of affected drawings. Additional drawings will be added to this list during the Phase 2 detailed design.

- TVA Drawing: 10W293-1, R2 (8/20/80)
- TVA Drawing: 10W293-2, R1 (4/25/78)
- TVA Drawing: 10W293-3, R0 (8/17/77)
- TVA Drawing: 10W294-01, R0 (3/26/79)
- TVA Drawing: 10N230, R1 (1/2/80)
- TVA Drawing: 10W287-19 R0, (9/20/07)

The list below contains existing systems (equipment) that are part of the BAP infrastructure, but which no TVA drawings have yet been identified. These are the systems of which Stantec is aware. If TVA can identify other systems, these should be brought to Stantec's attention as these will also need to be addressed in the Phase 2 design.

- Bottom Ash Recovery System
- Sluice, Sump, and Waste Pipes / Power Supply
- Weir Boxes
- pH Control System / Divider Dike
- Miscellaneous Drainage Pipes
- Instrumentation

12. References

Stantec Consulting Services, Inc., Report of Geotechnical Exploration, Dry Fly Ash Stack, Bottom Ash Disposal Area 2, Dry Fly Ash Stack, John Sevier Fossil Plant, Rogersville, Tennessee, Stantec Report 001 175569038, February 08, 2010. (Stantec 2010).

TVA, December 7, 2009 - TVA CCP Management Program Master Programmatic Document.

TVA, April 2011 – Coal Combustion Products Master Strategy Review.

NPDES Permit No. TN0005436 TVA· John Sevier Fossil Plant Rogersville, Hawkins County, Tennessee, April 29, 2011, State of Tennessee Department of Environment and Conservation Division of Water Pollution Control, effective May 1, 2011.

TVA and URS, July 2011 – Closure Plan Main Ash Pond Draft (Rev B), John Sevier Fossil Plant Rogersville, Tennessee; submittal to TDEC.

Master Closure Strategy

13. Attachments

Appendix A John Sevier Overview and Vicinity Maps

Appendix B Conceptual Drawings of Closure Alternatives

Appendix C Geotechnical Exploration Summary

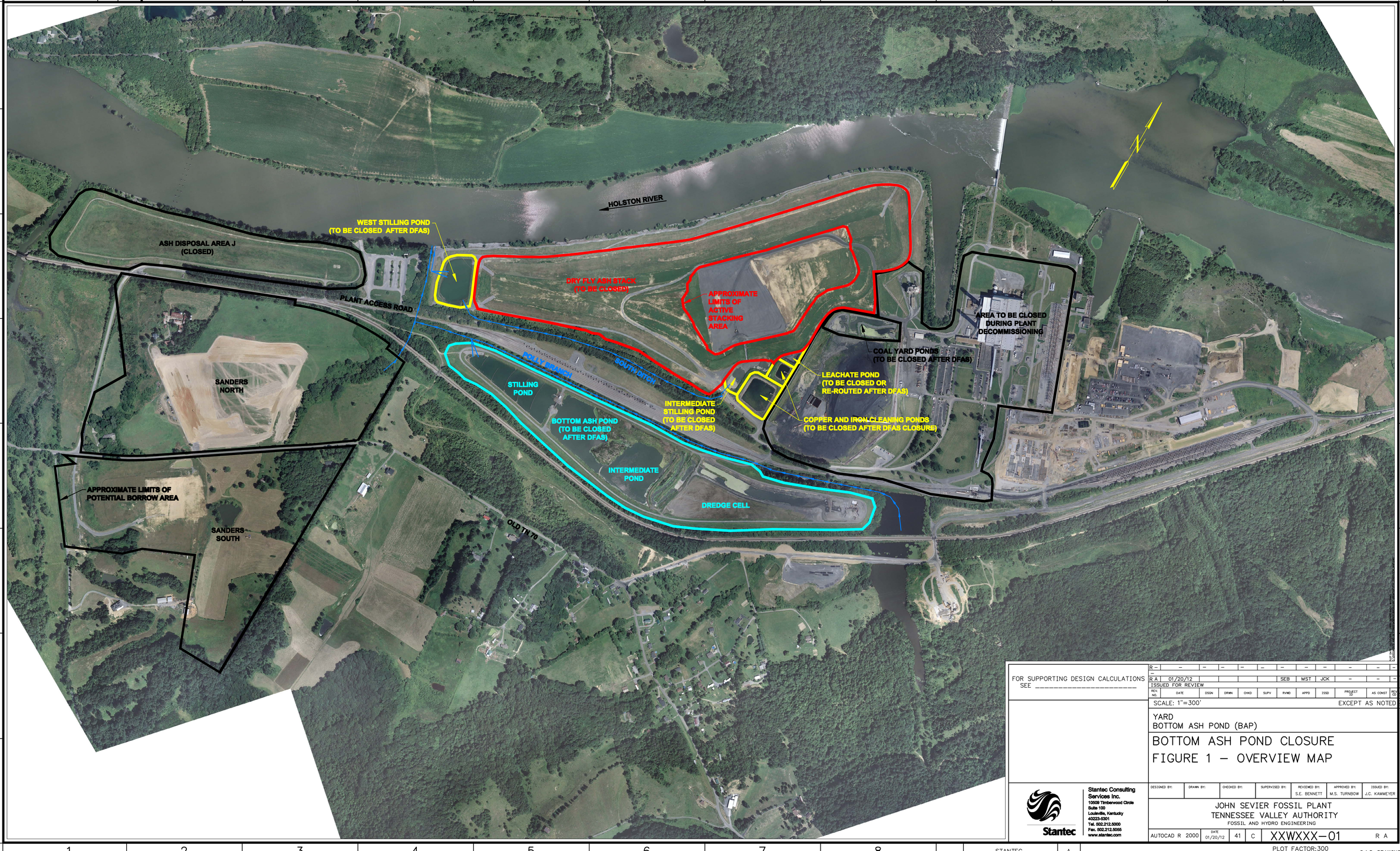
Appendix D Preliminary Opinion of Construction Costs

Appendix E Risk Matrix and Monte Carlo Analysis

Appendix F Schedule

Appendix A

John Sevier Overview and Vicinity Maps



FOR SUPPORTING DESIGN CALCULATIONS SEE _____

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R A	01/20/12					SEB	MST	JCK	–	–	DISCIPLINE INTERFACE
ISSUED FOR REVIEW											

SCALE: 1"=300' EXCEPT AS NOTED

YARD
BOTTOM ASH POND (BAP)

BOTTOM ASH POND CLOSURE
FIGURE 1 – OVERVIEW MAP

Stantec Consulting Services Inc.
10500 Timberwood Circle
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Fax. 502.212.5055
www.stantec.com

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				S.E. BENNETT	M.S. TURNBOW	J.C. KAMMEYER

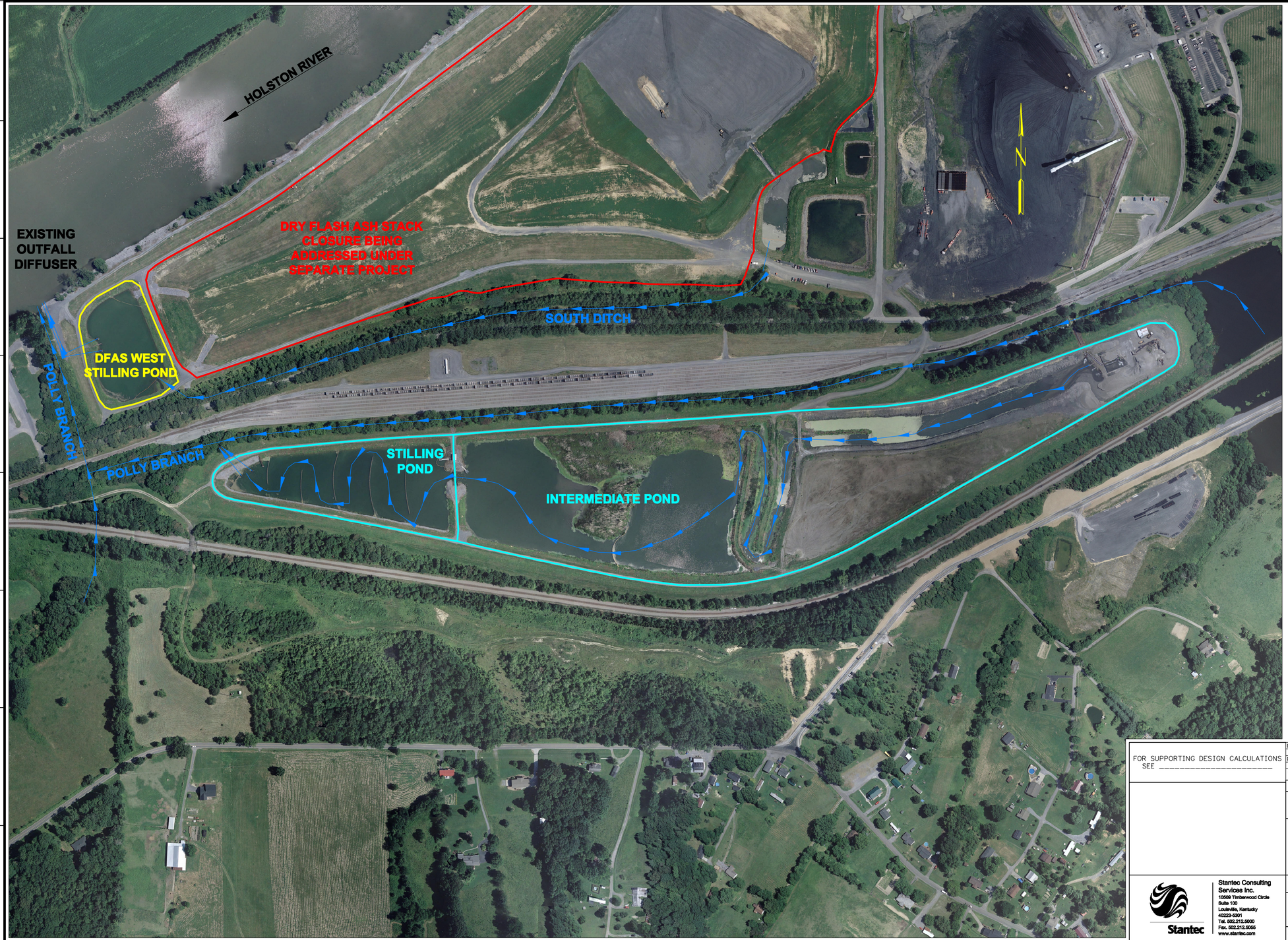
JOHN SEVIER FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 | DATE 01/20/12 | 41 | C | XXWXXX–01 | R A

STANTEC | A
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:300
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY



IMAGERY SOURCE NOTE:
AERIAL IMAGERY PROVIDED BY TVA BASED ON FLYOVER PERFORMED BY TUCK MAPPING SOLUTIONS IN MARCH, 2010.

75 0 150 300 FEET
GRAPHIC SCALE: 1" = 150'

PLOT DATE: 02/27/2012 USER: SBNEBNETT
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FOR SUPPORTING DESIGN CALCULATIONS SEE _____

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R A	01/20/12					SEB	MST	JCK	–	–	–

ISSUED FOR REVIEW

DISCIPLINE INTERFACE

SCALE: 1"=100' EXCEPT AS NOTED

YARD
BOTTOM ASH POND

DISCHARGE RE-ROUTE
FIGURE 2 – VICINITY MAP

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				S.E. BENNETT	M.S. TURNBOW	J.C. KAMMEYER

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FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000	DATE 01/20/12	41	C	XXWXXX-01	R A

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TASK COMPLETED BY:	REV NO.

PLOT FACTOR:100
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C.A.D. DRAWING
DO NOT ALTER MANUALLY

Appendix B

Conceptual Drawings of Closure Alternatives

CONCEPTUAL CLOSURE PLANS

MAIN ASH POND CLOSURE
JOHN SEVIER FOSSIL PLANT
ROGERSVILLE, HAWKINS COUNTY, TENNESSEE

PREPARED FOR

TENNESSEE VALLEY AUTHORITY

PREPARED BY

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Services Inc.
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Lexington, Kentucky
40511-2024
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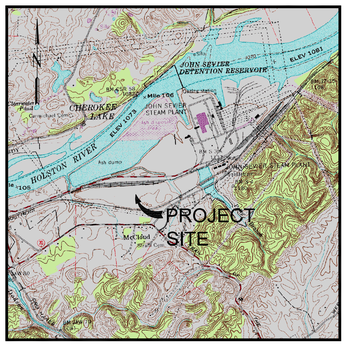

VICINITY MAP
NOT TO SCALE

10% SUBMITTAL
NOT FOR CONSTRUCTION

INDEX OF SHEETS

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FOR SUPPORTING DESIGN CALCULATIONS SEE _____

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10% SUBMITTAL											

DISCIPLINE INTERFACE

SCALE: NONE EXCEPT AS NOTED

YARD
MAIN ASH POND

POND CLOSURE CONCEPTS
COVER SHEET

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AUTOCAD R 2000	DATE 10/28/11	41	C	XXWXXX-01	R 0

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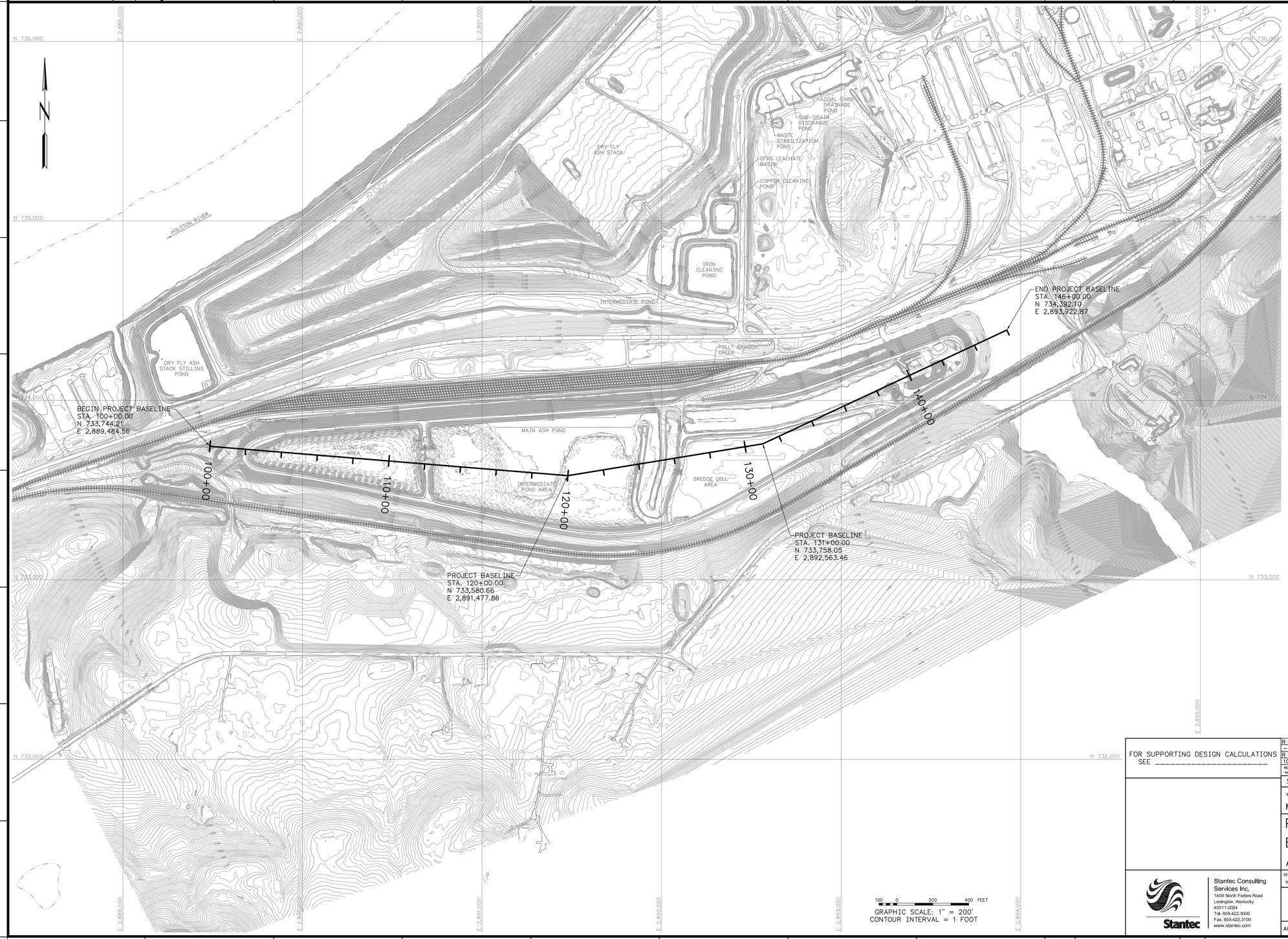

SURVEY CONTROL NOTE:

A GLOBAL POSITIONING SYSTEM (GPS) BASE STATION HAS BEEN ESTABLISHED AND TRANSFORMATION PARAMETERS DETERMINED BY TVA USING SELECTED SURVEY CONTROL MONUMENTS. CONTACT WITH TVA SURVEYING DEPARTMENT (423)751-8416 OR (423)751-2571 SHALL BE MADE BEFORE ANY SURVEY OR CONSTRUCTION WORK IS COMMENCED. BASE STATION FREQUENCIES AND TRANSFORMATION PARAMETERS WILL BE PROVIDED TO THE CONTRACTOR FOR USE IN CONSTRUCTION ACTIVITIES AT THE SITE. PREVIOUSLY USED OR ESTABLISHED CONTROL POINTS AND MONUMENTS SHALL NOT BE USED BY THE CONTRACTOR WITHOUT PRIOR APPROVAL BY TVA SURVEYING DEPARTMENT.

MAPPING SOURCE NOTE:

BASEMAP DEVELOPED FROM TOPOGRAPHIC SURVEY DATA PROVIDED BY TVA AND BASED ON DATA COMPILED FROM TUCK MAPPING SOLUTIONS AERIAL SURVEY DRAWING TITLED "462110.DWG" DATED 09/27/2010, FLOWN ON 6/18/2010, TVA GROUND SURVEY DRAWING "JS00096" DATED MARCH 2011, SURVEYED ON 02/17/2011, AND BATHYMETRIC SURVEY OF THE MAIN ASH POND DATED 05/09/11.

LEGEND

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1100 EXISTING HYDROGRAPHIC CONTOUR

GRAPHIC SCALE: 1" = 200'
CONTOUR INTERVAL = 1 FOOT

10% SUBMITTAL
NOT FOR CONSTRUCTION

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	10% SUBMITTAL									

DISCIPLINE INTERFACE
REV 1
REV 2
REV 3

SCALE: 1"=200' EXCEPT AS NOTED

YARD
MAIN ASH POND

POND CLOSURE CONCEPTS EXISTING CONDITIONS AND BASELINE LAYOUT

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K.R. BLAKLEY	D.M. GRAHAM	E.L. CAUDILL	H.R. APARICIO	S.E. BENNETT	M.S. TURNBOW	J.C. KAMMEYER

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AUTOCAD R 2000	DATE 10/28/11	41	C	XXWXXX-02	R 0

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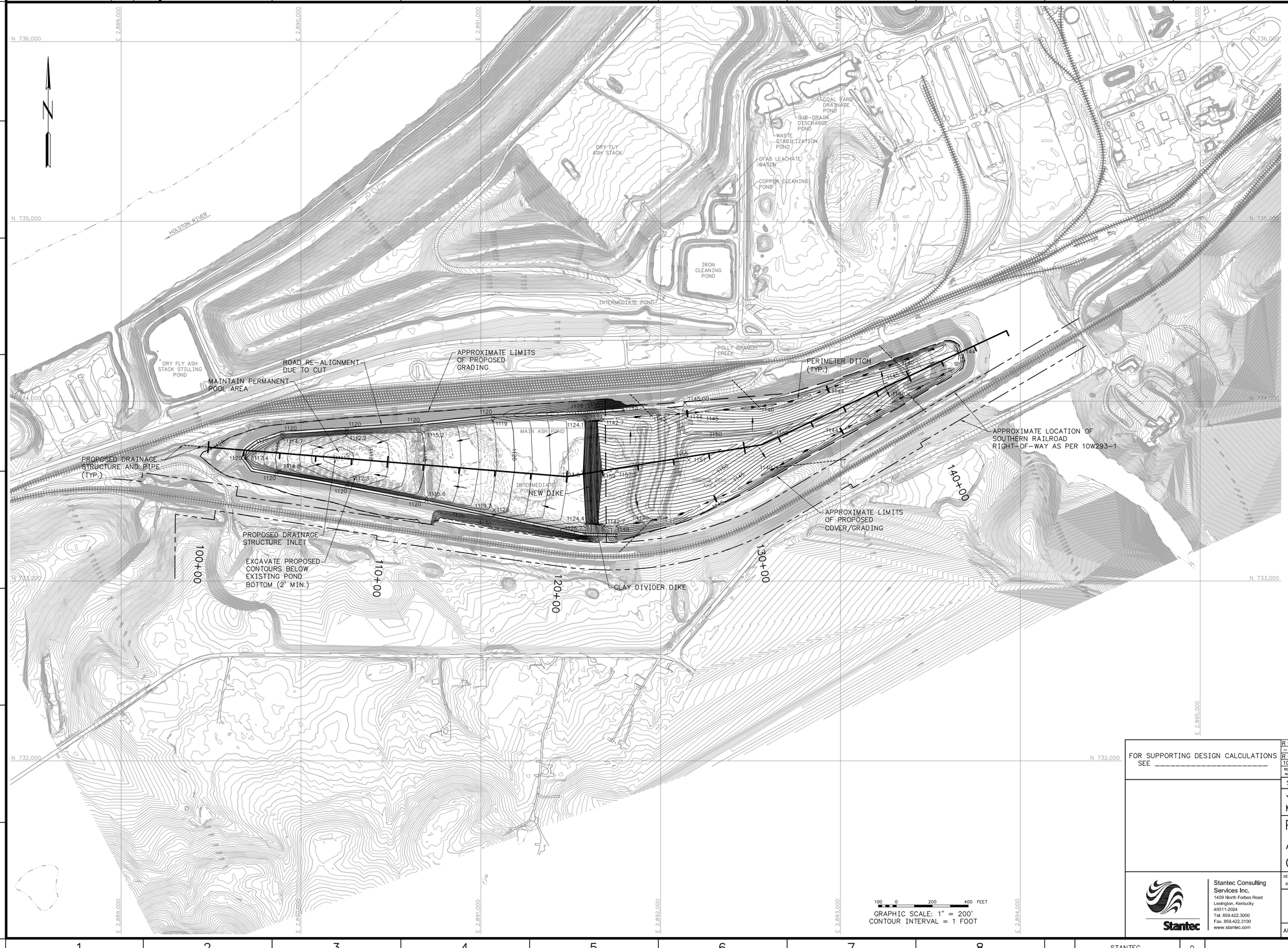

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MAPPING SOURCE NOTE:

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NOTE:

PROPOSED CONCEPTUAL REGRADE CONTOURS SHOWN FOR THIS ALTERNATIVE WERE PROVIDED BY TVA. STANTEC REVIEWED THE CONTOUR DATA FOR APPLICABILITY BUT DID NOT CREATE THE PROPOSED CONCEPT.

LEGEND

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- 1100 — EXISTING HYDROGRAPHIC CONTOUR
- 1100 — PROPOSED GRADING CONTOUR (FINISHED GRADE)
- SURFACE WATER FLOW
- DRAINAGE DIVIDE
- PERIMETER DITCH
- DRAINAGE PIPE CULVERT
- ×1100 — PROPOSED SPOT ELEVATION

10% SUBMITTAL
NOT FOR CONSTRUCTION

FOR SUPPORTING DESIGN CALCULATIONS SEE _____

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10% SUBMITTAL										

DISCIPLINE INTERFACE
REV. 1
REV. 2
REV. 3
REV. 4

SCALE: 1"=200' EXCEPT AS NOTED

YARD
MAIN ASH POND

POND CLOSURE CONCEPTS
ALTERNATIVE C
GRADING PLAN

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
K.R. BLAKLEY	D.M. GRAHAM	E.L. CAUDILL	H.R. APARICIO	S.E. BENNETT	M.S. TURNBOW	J.C. KAMMEYER

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AUTOCAD R 2000	DATE 10/28/11	41	C	XXWXXX-03	R 0

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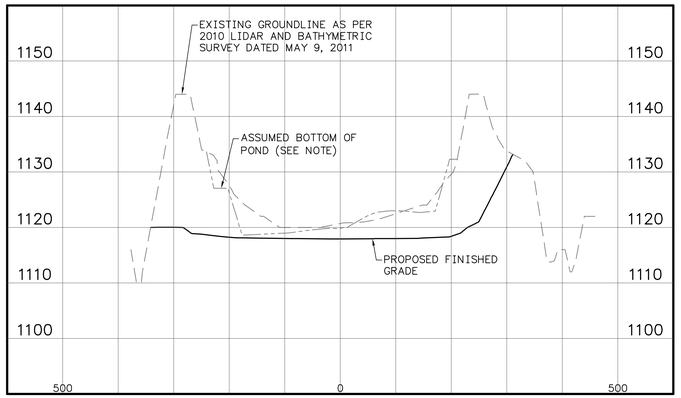

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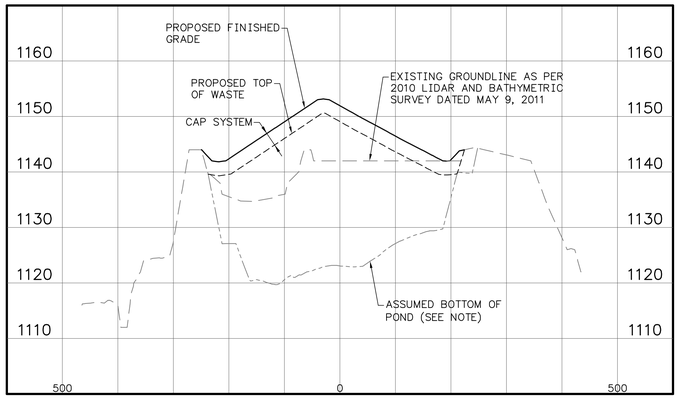

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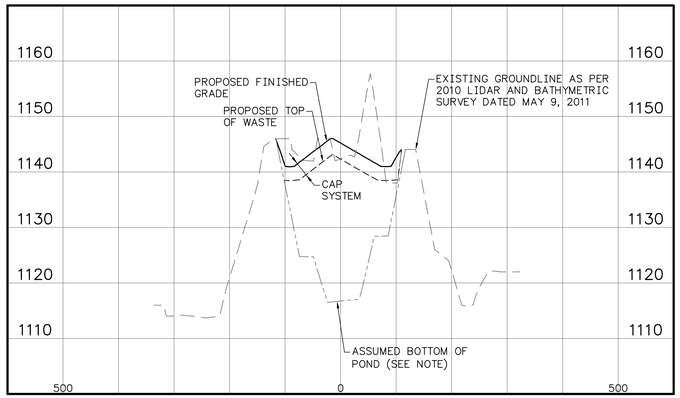

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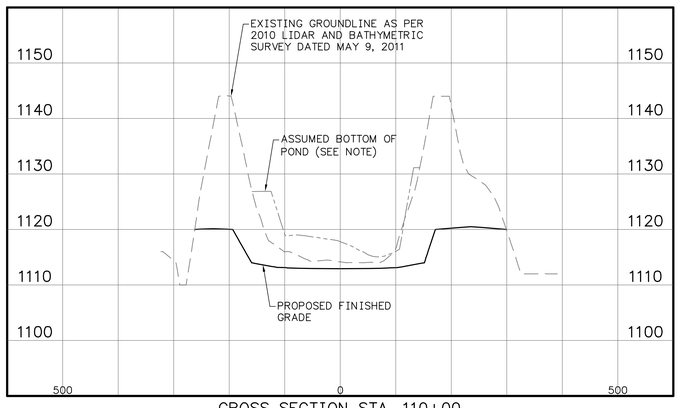

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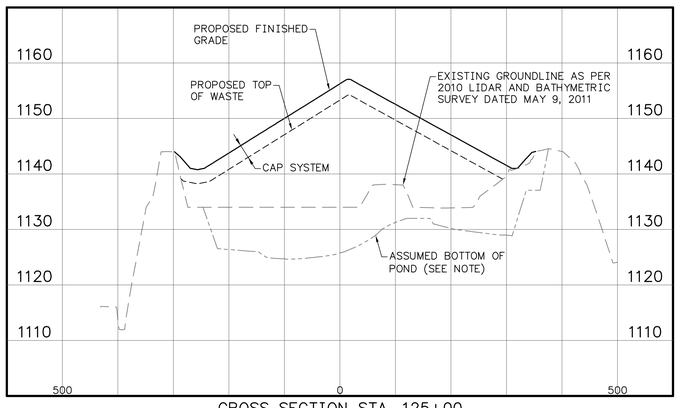

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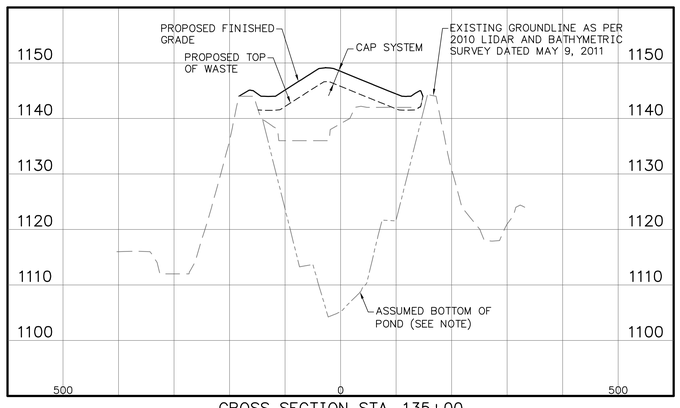

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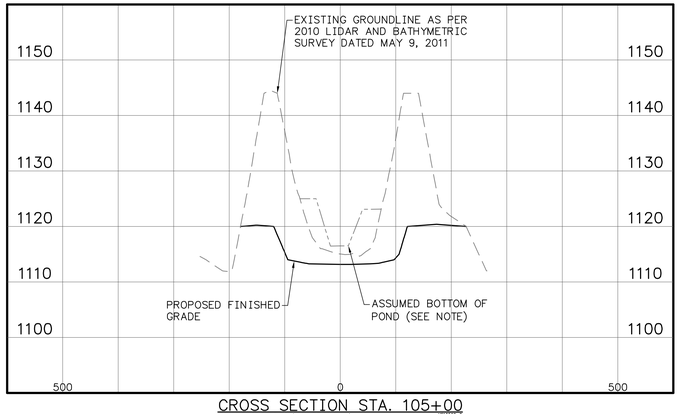

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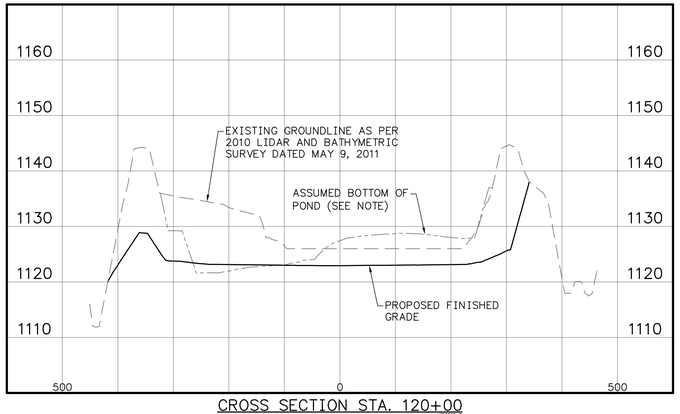

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1"=10' (VERTICAL)

NOTE:
ACTUAL AS-CONSTRUCTED BOTTOM OF POND SURFACE IS UNKNOWN. THE APPROXIMATE BOTTOM OF POND ELEVATIONS SHOWN WERE CREATED BY STANTEC BASED ON THE ORIGINAL POND DESIGN DRAWINGS 10W293-1 THROUGH 10W293-3 DATED 08/20/80 (REV. 2 RECORD AS CONSTRUCTED). PROPOSED FINISHED GRADE ELEVATIONS ARE BASED ON REGRADE CONTOURS PROVIDED BY TVA. SEE SHEET 1 ALTERNATIVE C.

10% SUBMITTAL NOT FOR CONSTRUCTION

FOR SUPPORTING DESIGN CALCULATIONS SEE _____

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV.
R 0	10/28/11	KRB	ACC	ELC	HRA	SEB	MST	JCK	–	–	–
10% SUBMITTAL											

DISCIPLINE INTERFACE

SCALE: AS SHOWN EXCEPT AS NOTED

YARD
MAIN ASH POND

POND CLOSURE CONCEPTS
ALTERNATIVE C
CROSS SECTIONS

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DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
K.R. BLAKLEY	A.C. CLINK	E.L. CAUDILL	H.R. APARICIO	S.E. BENNETT	M.S. TURNBOW	J.C. KAMMEYER

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AUTOCAD R 2000	DATE 10/28/11	41	C	XXWXXX-04	R 0

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PLOT FACTOR:100
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

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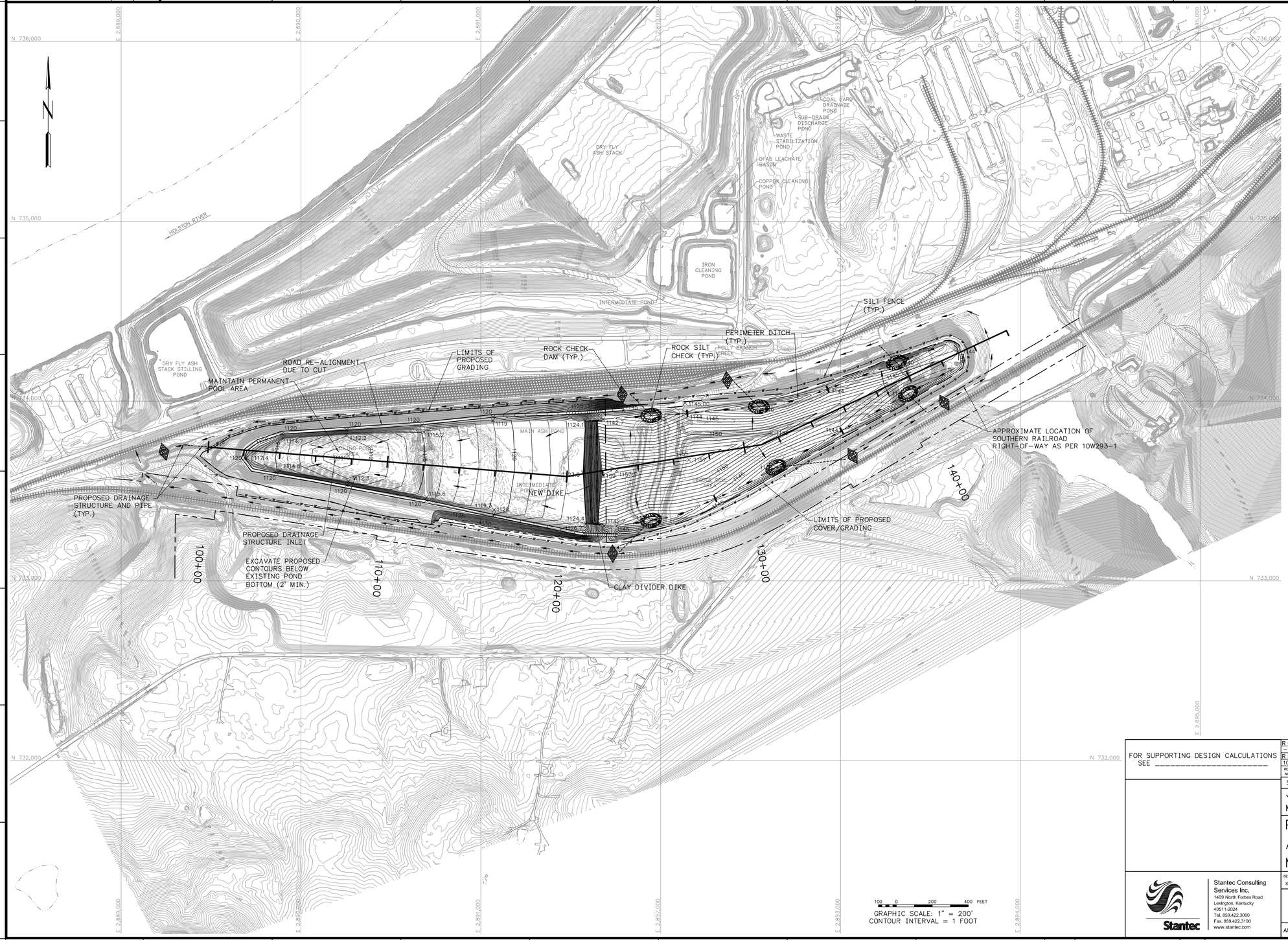

SURVEY CONTROL NOTE:

A GLOBAL POSITIONING SYSTEM (GPS) BASE STATION HAS BEEN ESTABLISHED AND TRANSFORMATION PARAMETERS DETERMINED BY TVA USING SELECTED SURVEY CONTROL MONUMENTS. CONTACT WITH TVA SURVEYING DEPARTMENT (423)751-8416 OR (423)751-2571 SHALL BE MADE BEFORE ANY SURVEY OR CONSTRUCTION WORK IS COMMENCED. BASE STATION FREQUENCIES AND TRANSFORMATION PARAMETERS WILL BE PROVIDED TO THE CONTRACTOR FOR USE IN CONSTRUCTION ACTIVITIES AT THE SITE. PREVIOUSLY USED OR ESTABLISHED CONTROL POINTS AND MONUMENTS SHALL NOT BE USED BY THE CONTRACTOR WITHOUT PRIOR APPROVAL BY TVA SURVEYING DEPARTMENT.

MAPPING SOURCE NOTE:

BASEMAP DEVELOPED FROM TOPOGRAPHIC SURVEY DATA PROVIDED BY TVA AND BASED ON DATA COMPILED FROM TUCK MAPPING SOLUTIONS AERIAL SURVEY DRAWING TITLED "462110.DWG" DATED 09/27/2010, FLOWN ON 6/18/2010, TVA GROUND SURVEY DRAWING "JS00096" DATED MARCH 2011, SURVEYED ON 02/17/2011, AND BATHYMETRIC SURVEY OF THE MAIN ASH POND DATED 05/09/11.

NOTE:

PROPOSED CONCEPTUAL REGRADE CONTOURS SHOWN FOR THIS ALTERNATIVE WERE PROVIDED BY TVA. STANTEC REVIEWED THE CONTOUR DATA FOR APPLICABILITY BUT DID NOT CREATE THE PROPOSED CONCEPT.

LEGEND

- 1100 — EXISTING CONTOUR
- 1100 — EXISTING HYDROGRAPHIC CONTOUR
- 1100 — PROPOSED GRADING CONTOUR (FINISHED GRADE)
- SURFACE WATER FLOW
- DRAINAGE DIVIDE
- PERIMETER DITCH
- DRAINAGE PIPE CULVERT
- ×1100 — PROPOSED SPOT ELEVATION

10% SUBMITTAL
NOT FOR CONSTRUCTION

PLOT DATE: 10/28/2011 USER: GRAHAM, DAVE
V:\1755\ACTIVE\135610879\GEOTECHNICAL\DRAWING\SHEET_FILES\REVA_PLOT\1056TO-101-SW.DWG

FOR SUPPORTING DESIGN CALCULATIONS SEE _____

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV. CD
R 0	10/28/11 10% SUBMITTAL	KRB	DMG	ELC	HRA	SEB	MST	JCK	–	–	–

DISCIPLINE INTERFACE

SCALE: 1"=200' EXCEPT AS NOTED

YARD
MAIN ASH POND

POND CLOSURE CONCEPTS ALTERNATIVE C – STORM WATER MANAGEMENT PLAN

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
K.R. BLAKLEY	D.M. GRAHAM	E.L. CAUDILL	H.R. APARICIO	S.E. BENNETT	M.S. TURNBOW	J.C. KAMMEYER

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Fax. 859.422.3100
www.stantec.com

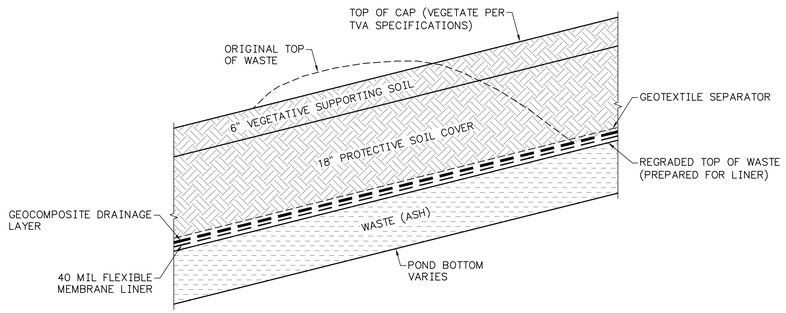
JOHN SEVIER FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000	DATE 10/28/11	41	C	XXWXXX-05	R 0

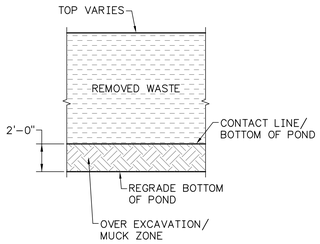
STANTEC	0
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:200
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

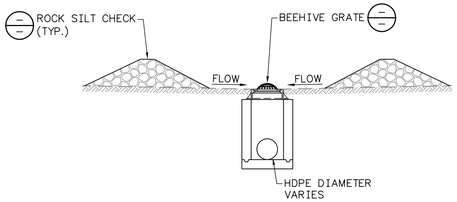


TYPICAL SECTION – WASTE REGRADE AND CAP
NOT TO SCALE

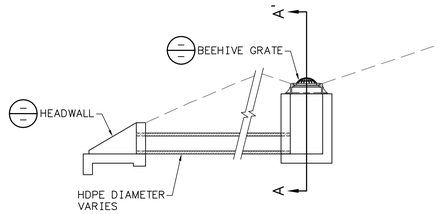


NOTE:
AREAS BELOW MUCK ZONE THAT ARE TO REMAIN BELOW PERMANENT POOL TO BE COMPACTED. AREAS BELOW MUCK ZONE THAT ARE TO BE ABOVE PERMANENT POOL TO BE VEGETATED.

TYPICAL SECTION – MAIN ASH POND EXCAVATION
SCALE: 1/4"=1'-0"

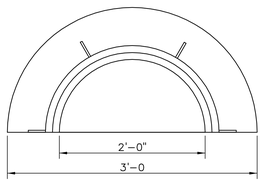


SECTION A–A'

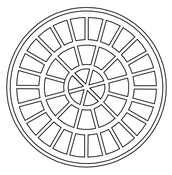


ELEVATION

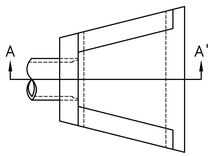
DETAIL – TYPICAL DISCHARGE STRUCTURE
SCALE: 1/4"=1'-0"



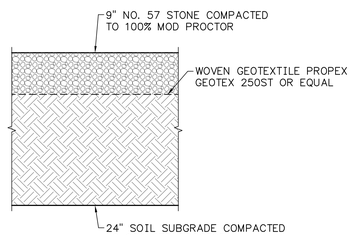
PLAN – GRATE FRAME



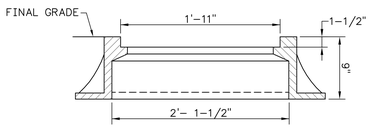
PLAN – GRATE



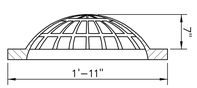
PLAN



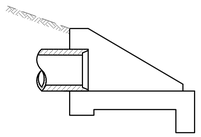
DETAIL – GRAVEL ROAD
SCALE: 1"=1'-0"



SECTION – GRATE FRAME

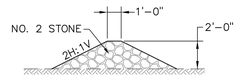


SECTION – GRATE



SECTION A–A'

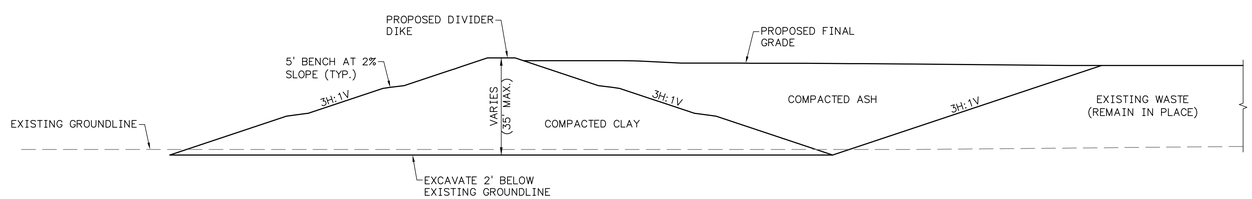
DETAIL – HEADWALL FOR 18" CULVERT
SCALE: 1/2"=1'-0"



DETAIL – ROCK SILT CHECK
SCALE: 1/4"=1'-0"

NOTES:
1. ALL METAL SHALL BE IN ACCORDANCE WITH ASTM A-48-83 CLASS 35B (GRAY IRON, 35,000 PSI OR HIGHER)
2. USE NEENAH R-2560-E BEEHIVE GRATE WITH FRAME OR EQUIVALENT.

DETAIL – CIRCULAR BEEHIVE GRATE AND FRAME
NOT TO SCALE



TYPICAL SECTION – DIVIDER DIKE
SCALE: 1"=20'

10% SUBMITTAL
NOT FOR CONSTRUCTION

PLOT DATE: 10/28/2011 USER: GLINDEMEIER, ADAM
V:\1755\ACTIVE\175501087\DESIGN\CIVIL\DRAWINGS\SHEET_FILES\REVA_P10\61087C-101-CIVIL.DWG

FOR SUPPORTING DESIGN CALCULATIONS SEE _____

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
R –	–	–	–	–	–	–	–	–	–	–
R 0	10/28/11	KRB	ACC	ELC	HRA	SEB	MST	JCK	–	–
10% SUBMITTAL										

DISCIPLINE INTERFACE
REV 01 1 2 3 4

SCALE: AS SHOWN EXCEPT AS NOTED

YARD
MAIN ASH POND

POND CLOSURE CONCEPTS
DETAILS

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
K.R. BLAKLEY	A.C. CLINK	E.L. CAUDILL	H.R. APARICIO	S.E. BENNETT	M.S. TURNBOW	J.C. KAMMEYER

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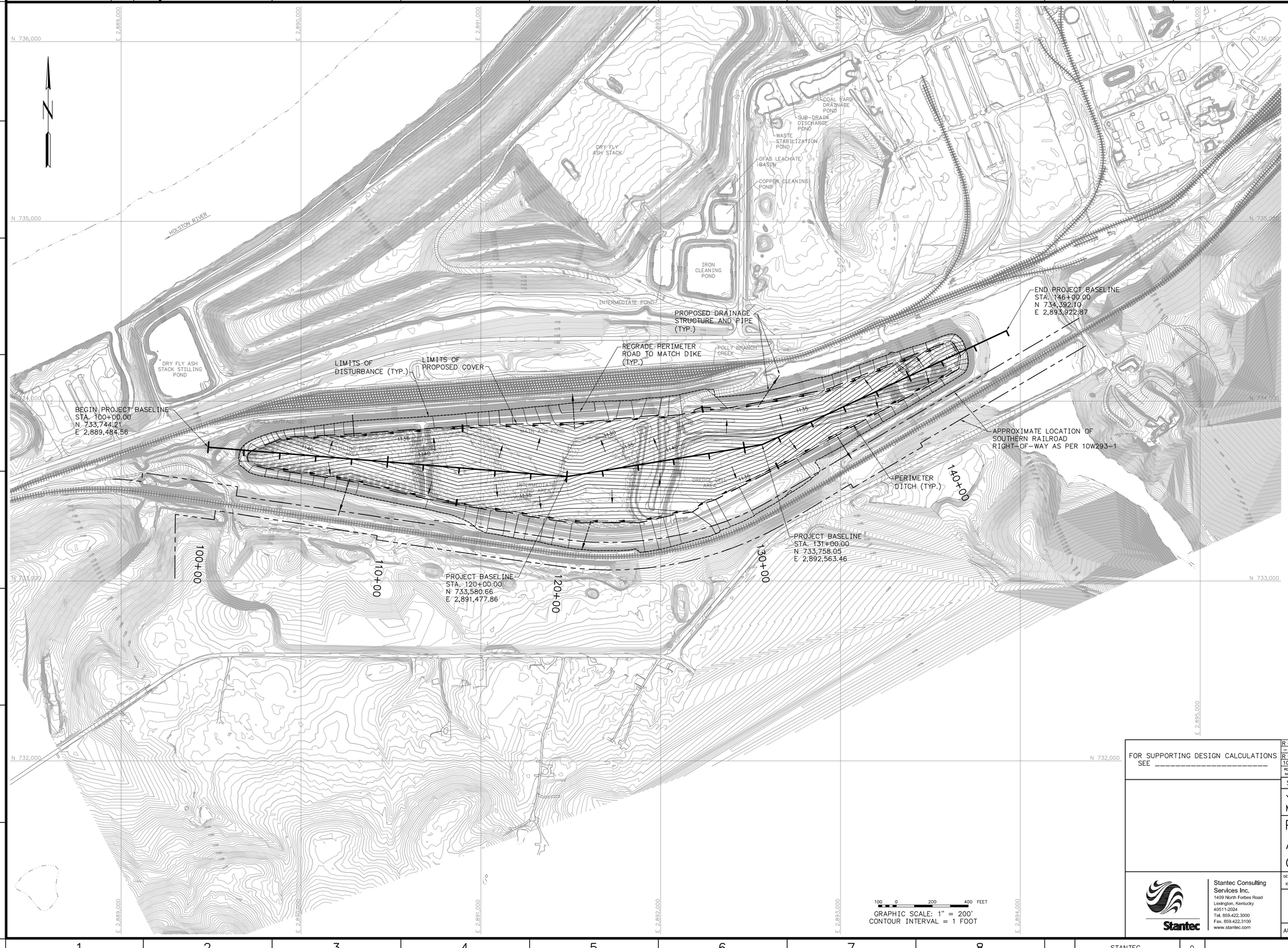
JOHN SEVIER FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000	DATE 10/28/11	41	C	XXWXXX-06	R 0

STANTEC	0
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:100 W_TVA

C.A.D. DRAWING DO NOT ALTER MANUALLY



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LEGEND

- 1100 — EXISTING CONTOUR
- 1100 — EXISTING HYDROGRAPHIC CONTOUR
- 1100 — PROPOSED GRADING CONTOUR (FINISHED GRADE)
- SURFACE WATER FLOW
- DRAINAGE DIVIDE
- PERIMETER DITCH
- DRAINAGE PIPE CULVERT

10% SUBMITTAL
NOT FOR CONSTRUCTION

FOR SUPPORTING DESIGN CALCULATIONS SEE _____

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
R –	–	–	–	–	–	–	–	–	–	–
R 0	10/28/11 10% SUBMITTAL	KRB	DMG	ELC	HRA	SEB	MST	JCK	–	–

DISCIPLINE INTERFACE
REV. 01 02 03 04

SCALE: 1"=200' EXCEPT AS NOTED

YARD
MAIN ASH POND

POND CLOSURE CONCEPTS
ALTERNATIVE B
GRADING PLAN

Stantec Consulting Services Inc.
1409 North Forbes Road
Lexington, Kentucky
40511-2024
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Fax. 859.422.3100
www.stantec.com

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
K.R. BLAKLEY	D.M. GRAHAM	E.L. CAUDILL	H.R. APARICIO	S.E. BENNETT	M.S. TURNBOW	J.C. KAMMEYER

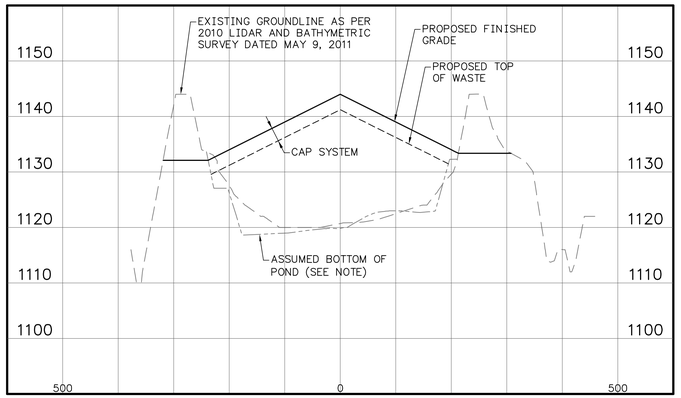
JOHN SEVIER FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000	DATE 10/28/11	41	C	XXWXXX-01	R 0

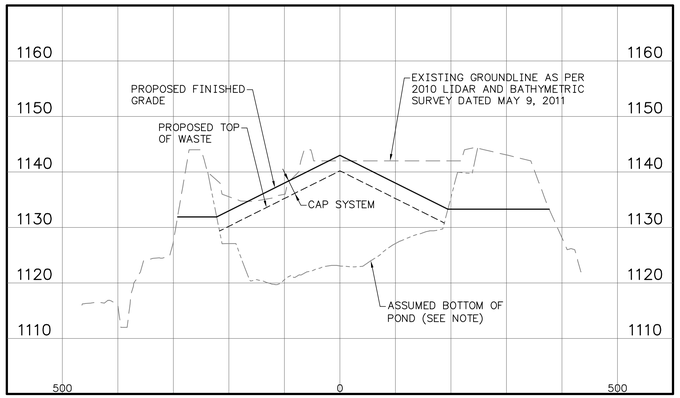
STANTEC	0
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:200
W_TVA

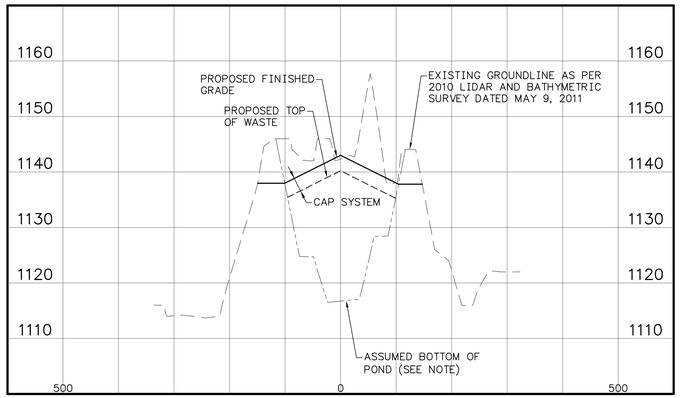
C.A.D. DRAWING
DO NOT ALTER MANUALLY



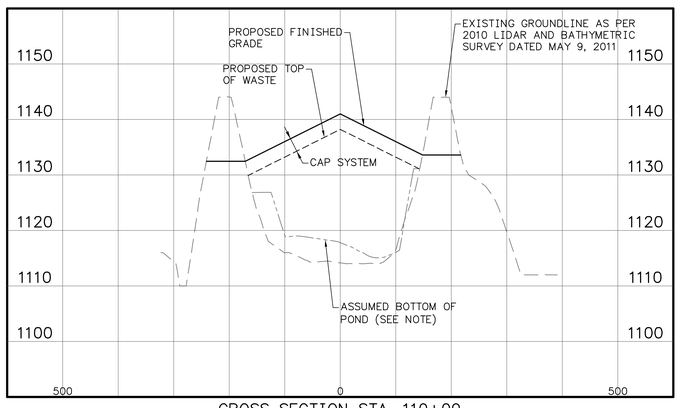
CROSS SECTION STA. 115+00
SCALE: 1"=100' (HORIZONTAL)
1"=10' (VERTICAL)



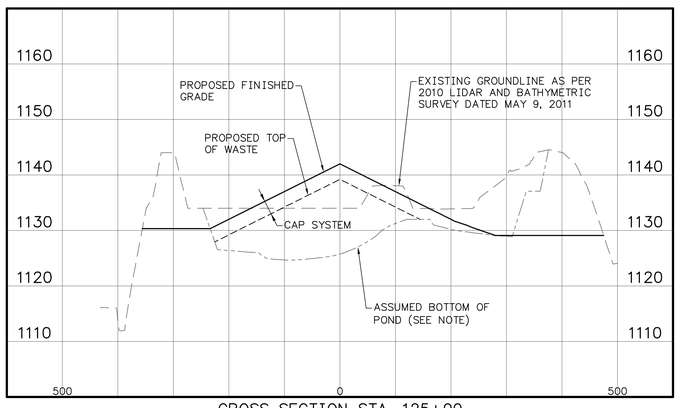
CROSS SECTION STA. 130+00
SCALE: 1"=100' (HORIZONTAL)
1"=10' (VERTICAL)



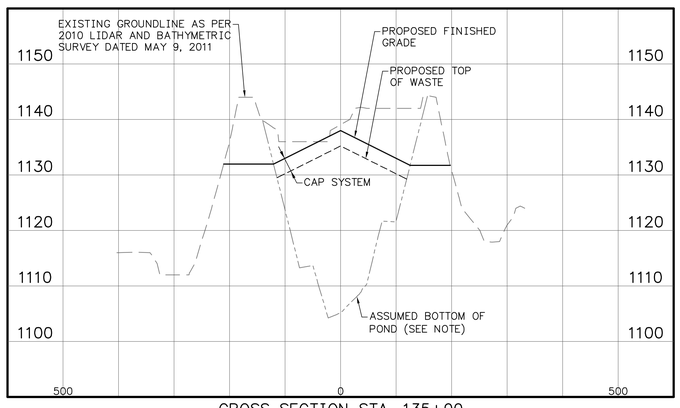
CROSS SECTION STA. 140+00
SCALE: 1"=100' (HORIZONTAL)
1"=10' (VERTICAL)



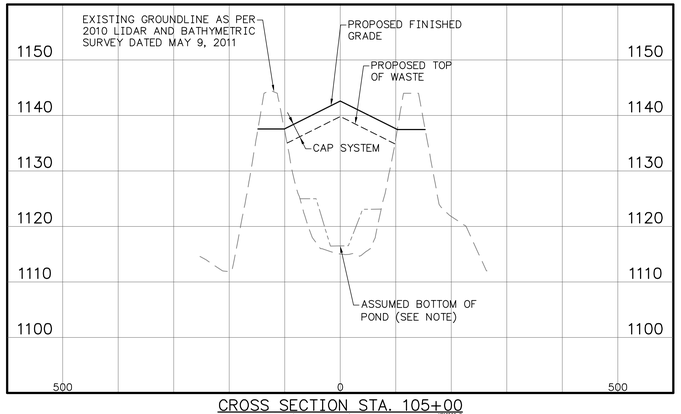
CROSS SECTION STA. 110+00
SCALE: 1"=100' (HORIZONTAL)
1"=10' (VERTICAL)



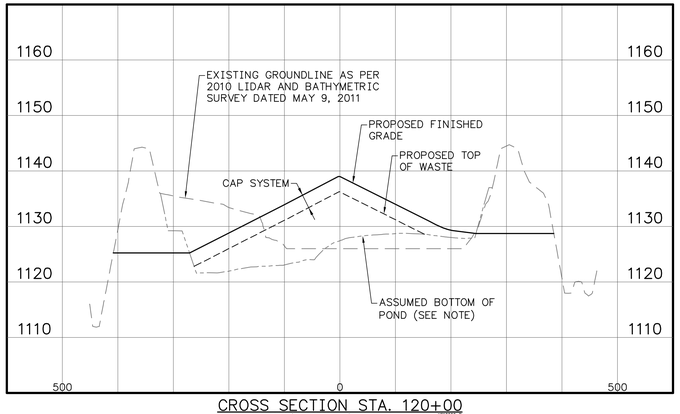
CROSS SECTION STA. 125+00
SCALE: 1"=100' (HORIZONTAL)
1"=10' (VERTICAL)



CROSS SECTION STA. 135+00
SCALE: 1"=100' (HORIZONTAL)
1"=10' (VERTICAL)



CROSS SECTION STA. 105+00
SCALE: 1"=100' (HORIZONTAL)
1"=10' (VERTICAL)



CROSS SECTION STA. 120+00
SCALE: 1"=100' (HORIZONTAL)
1"=10' (VERTICAL)

NOTE:
ACTUAL AS-CONSTRUCTED BOTTOM OF POND SURFACE IS UNKNOWN. THE APPROXIMATE BOTTOM OF POND ELEVATIONS SHOWN WERE CREATED BY STANTEC BASED ON THE ORIGINAL POND DESIGN DRAWINGS 10W293-1 THROUGH 10W293-3 DATED 08/20/80 (REV. 2 RECORD AS CONSTRUCTED).

10% SUBMITTAL NOT FOR CONSTRUCTION

FOR SUPPORTING DESIGN CALCULATIONS SEE _____

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV.
R –	–	–	–	–	–	–	–	–	–	–	–
R 0	10/28/11	KRB	ACC	ELC	HRA	SEB	MST	JCK	–	–	–
10% SUBMITTAL											DISCIPLINE INTERFACE

SCALE: AS SHOWN EXCEPT AS NOTED

YARD
MAIN ASH POND

POND CLOSURE CONCEPTS
ALTERNATIVE B
CROSS SECTIONS

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
K.R. BLAKLEY	A.C. CLINK	E.L. CAUDILL	H.R. APARICIO	S.E. BENNETT	M.S. TURNBOW	J.C. KAMMEYER

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JOHN SEVIER FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000	DATE 10/28/11	41	C	XXWXXX-02	R 0

STANTEC | 0
TASK COMPLETED BY: | REV NO.

PLOT FACTOR:100
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PLOT DATE: 10/28/2011 USER: CLINKENBARD, ADAM
K:\V1750\ACTIVE\75561087\GOTOEMAIL\DRAWING\SHEET_FILES\XEVA_P10\R10870-101-XSB.DWG

100 0 200 400 FEET
GRAPHIC SCALE: 1" = 200'
CONTOUR INTERVAL = 1 FOOT

SURVEY CONTROL NOTE:

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NOTE:

PROPOSED CONCEPTUAL REGRADE CONTOURS SHOWN FOR THIS ALTERNATIVE WERE PROVIDED BY TVA. STANTEC REVIEWED THE CONTOUR DATA FOR APPLICABILITY BUT DID NOT CREATE THE PROPOSED CONCEPT.

LEGEND

- 1100 — EXISTING CONTOUR
- 1100 — EXISTING HYDROGRAPHIC CONTOUR
- 1100 — PROPOSED GRADING CONTOUR (FINISHED GRADE)
- SURFACE WATER FLOW
- DRAINAGE DIVIDE
- PERIMETER DITCH

10% SUBMITTAL
NOT FOR CONSTRUCTION

FOR SUPPORTING DESIGN CALCULATIONS SEE _____

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT 10	AS CONST	REV. 00
R –	–	–	–	–	–	–	–	–	–	–	–
R 0	10/28/11	KRB	DMG	ELC	HRA	SEB	MST	JCK	–	–	–
10% SUBMITTAL											

DISCIPLINE INTERFACE

SCALE: 1"=200' EXCEPT AS NOTED

YARD
MAIN ASH POND

POND CLOSURE CONCEPTS
ALTERNATIVE D
GRADING PLAN

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
K.R. BLAKLEY	D.M. GRAHAM	E.L. CAUDILL	H.R. APARICIO	S.E. BENNETT	M.S. TURNBOW	J.C. KAMMEYER

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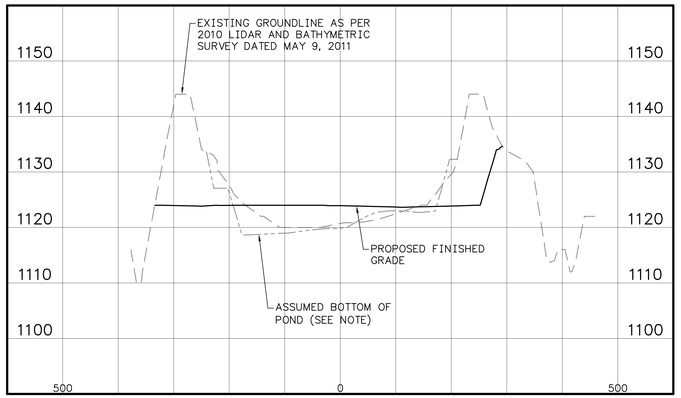
JOHN SEVIER FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000	DATE 10/28/11	41	C	XXWXXX-01	R 0

PLOT FACTOR:200
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

STANTEC	0
TASK COMPLETED BY:	REV NO.



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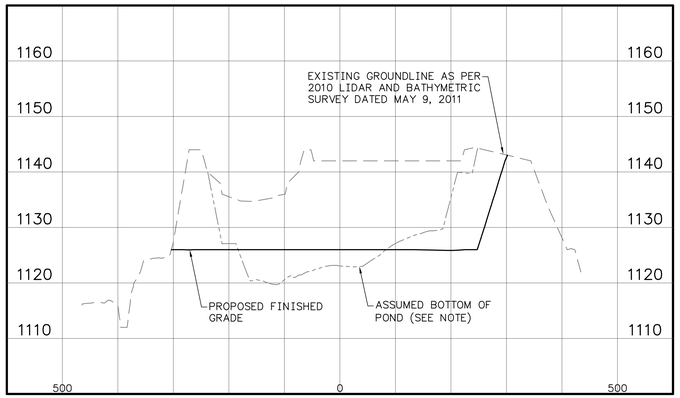

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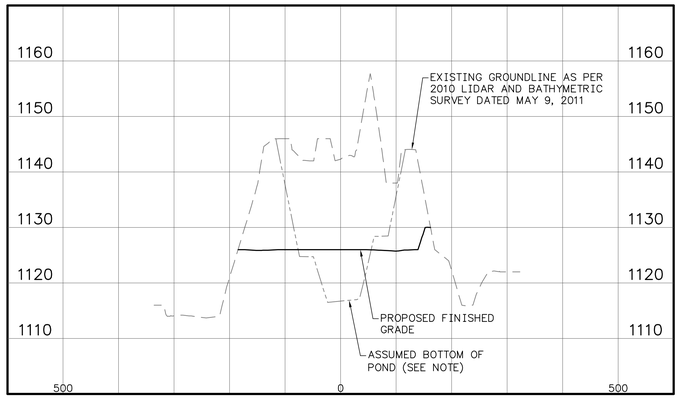

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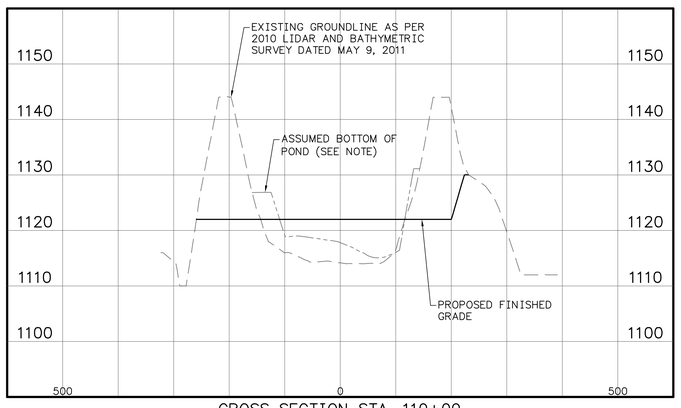

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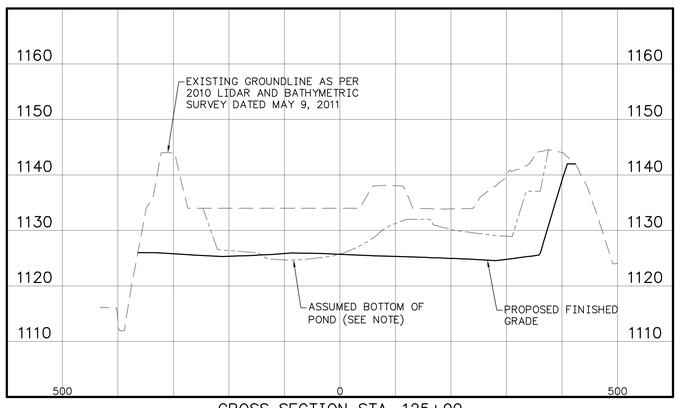

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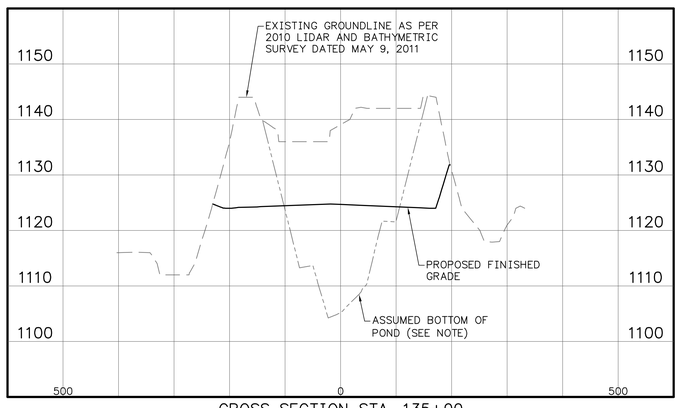

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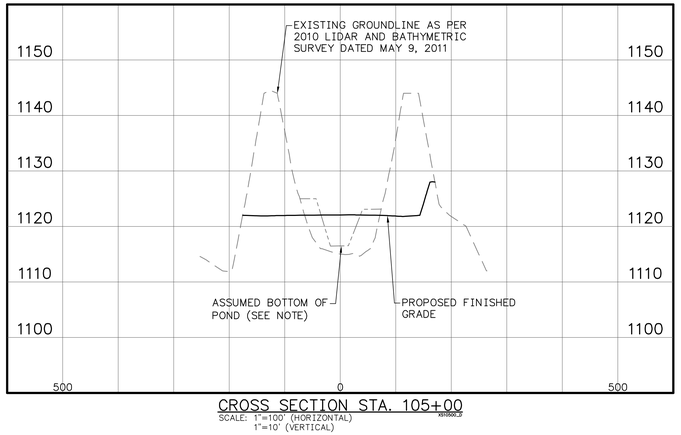

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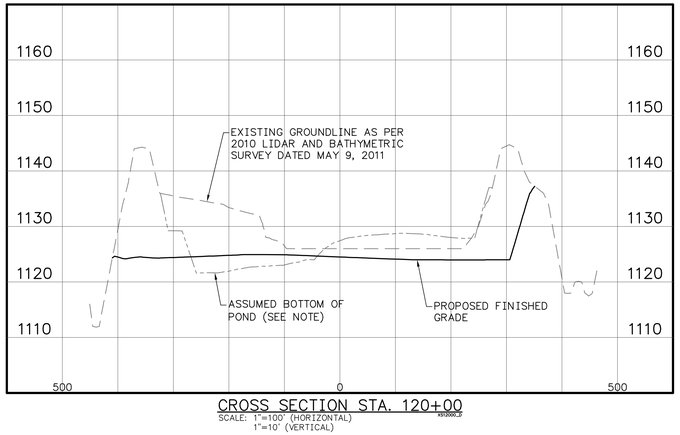


CROSS SECTION STA. 120+00
SCALE: 1"=100' (HORIZONTAL)
1"=10' (VERTICAL)

NOTE:
ACTUAL AS-CONSTRUCTED BOTTOM OF POND SURFACE IS UNKNOWN. THE APPROXIMATE BOTTOM OF POND ELEVATIONS SHOWN WERE CREATED BY STANTEC BASED ON THE ORIGINAL POND DESIGN DRAWINGS 10W293-1 THROUGH 10W293-3 DATED 08/20/80 (REV. 2 RECORD AS CONSTRUCTED). PROPOSED FINISHED GRADE ELEVATIONS ARE BASED ON REGRADE CONTOURS PROVIDED BY TVA. SEE SHEET 1 ALTERNATIVE D.

10% SUBMITTAL NOT FOR CONSTRUCTION

FOR SUPPORTING DESIGN CALCULATIONS SEE _____

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST
R –	–	–	–	–	–	–	–	–	–	–
R 0	10/28/11 10% SUBMITTAL	KRB	ACC	ELC	HRA	SEB	MST	JCK	–	–

DISCIPLINE INTERFACE
REV. 1
REV. 2
REV. 3
REV. 4

SCALE: AS SHOWN EXCEPT AS NOTED

YARD
MAIN ASH POND

POND CLOSURE CONCEPTS
ALTERNATIVE D
CROSS SECTIONS

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
K.R. BLAKLEY	A.C. CLINK	E.L. CAUDILL	H.R. APARICIO	S.E. BENNETT	M.S. TURNBOW	J.C. KAMMEYER

Stantec Consulting Services Inc.
1409 North Forbes Road
Lexington, Kentucky
40511-2024
Tel. 859.422.3000
Fax. 859.422.3100
www.stantec.com

JOHN SEVIER FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000	DATE 10/28/11	41	C	XXWXXX-02	R 0

STANTEC	0
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:100
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PLOT DATE: 10/28/2011 USER: GLINKENBERG, ADAM
V:\1753\ACTIVE\175561907\2011DWG\CAD\DRAWING\SHEET_FILES\REVA_P10\R10B72C-101-XSD.DWG

Appendix C

Geotechnical Exploration Summary

Memo

Stantec

To:	Shannon Bennett, Ron Skelton	From:	Hugo Aparicio, April Lashley, Joshua Kopp, Mike Sendelbach
File:	175561087	Date:	January 12, 2012

Reference: JSF Bottom Ash Pond Closure – Volumetric Computations

Stantec was requested to prepare an estimate of the existing volume of ash in the John Sevier Fossil (JSF) Plant Bottom Ash Pond (BAP). This memo outlines the methods, assumptions, and results of the volume estimate computations. Unless otherwise noted, volumetric calculations were carried out using the AutoCAD Civil 3D 2009 software package by building digital terrain models ("surfaces") and determining the differences between them.

For the purpose of this analysis, the BAP was separated into two areas: the East Pond and the Stilling Pond. A separate surface model was built for each pond.

Data Sources

BAP Boring Data

During November and December of 2011 Stantec performed drilling operations within the BAP. The purpose of the drilling was to locate the top of clay/weathered shale layer underlying the ponds. There were 47 borings advanced in the East Pond and four borings advanced in the Stilling Pond. The borings in the Stilling Pond and 19 borings in the East Pond were advanced from a drill rig positioned on a barge. The data from all the borings was used to build a '*BAP_2011_Borings'* surface.

Boring data collected during the Phase 2 geotechnical study was reviewed to obtain a better understanding of the new pond borings (to confirm the presence of clay and weathered shale).

Two borings were also advanced in the divider dike that separates the Stilling Pond from the East Pond. The purpose was to confirm the dike was constructed of clay as designed and that not ash was used. No ash was encountered in the borings.

Clean Out Surfaces

TVA provided contour data for three 'clean-out' surveys from 1994, 1995, and 1997 to Stantec. The contours represented the final groundline after the Bottom Ash Pond had

been cleaned out. The data was provided on paper drawings. Actual survey data was not provided; therefore Stantec cannot confirm the accuracy of the contours. Details describing the extent of the 'clean-out' were not available.

Stantec scanned the drawings, rectified them in AutoCAD, and digitized the contours. Surfaces were then derived from the contours ('*MAP Cleanout Surface_3-15-94', 'MAP Cleanout Surface_3-21-95', and 'MAP Cleanout Surface_11-17-97*').

Existing Surface

TVA provided Stantec with a surface ('*js000099.pro'*) of the main ash pond (East Pond) and Stilling Pond that was derived from survey data collected during May 2011. The survey consisted of GPS submeter hydrographic data and the pond water surface elevation which was surveyed based on a local bench mark elevation. All surveying was performed by TVA. Stantec merged the *'js000099.pro'* surface into the master basemap surface ('*175661025_01_conra_site_eg01_20111216'*).

Combining Data Sources

The *'MAP Cleanout Surface_11-17-97'* (henceforth '*1997 clean-out surface'*) displays a deeper excavation into the bottom of the pond compared to the other surveys and as such provides a more conservative volume estimate (i.e. greater volume). For this reason, the '*1997 clean-out'* surface was selected to be combined with the '*BAP_2011_Borings'* surface to form a surface that represents the top of clay/weathered shale throughout the ponds.

East Pond

The surface '*BAP_EAST_TOP_CLAY'* was built to represent the top of clay/weathered shale in the East Pond. For the '*1997 clean-out'* surface, the approximate upper half of the interior slope of the perimeter and divider dikes was assumed to represent the top of clay/weathered shale. This approximate upper half of the slope was extrapolated downward until it extended below the '*BAP_2011_Borings'* surface. The '*BAP_2011_Borings'* surface was assumed to represent the top of clay/weathered shale for the pond bottom. This surface was extrapolated outward until it extended past the '*1997 clean-out'* surface. The intersection of these two extrapolations was assumed to define the toe of the interior slope. This method was used for the entire East Pond.

Stilling Pond

The surface '*BAP_STILLING_POND_TOP_CLAY'* was built to represent the top of clay/weathered shale in the Stilling Pond. Since there were only four borings from the Stilling Pond, the '*1997 clean-out'* surface was assumed to represent the top of clay/weathered shale in this pond. The only exception was that the four borings in the pond were added to the surface. When modifying the '1997 clean-out' surface, effort was made to prevent abrupt changes in the areas near where the boring data was incorporated and to match the existing slopes of the surface to the extent possible.

Reference: JSF Bottom Ash Pond Closure – Volumetric Computations

Results

The '*BAP_EAST_TOP_CLAY'* and '*BAP_STILLING_POND_TOP_CLAY'* surfaces were subtracted from their respective location in the '*175661025_01_conra_site_eg01_20111216'* surface to derive the volume of ash above the top of clay/weathered shale. The volumes of ash calculated in the East Pond and Stilling Pond were 692,000 and 9,000 cubic yards, respectively, for a total of 701,000 cubic yards.

According to the drilling performed within the pond, there is a well-defined top of clay/weathered shale boundary. Therefore, Stantec recommends that additional over-excavation into the clay/weathered shale not be performed with the exception of inadvertent over-excavation caused by the earth-moving equipment as it scrapes and picks up the ash.

To account for the assumptions made when combining the data sources, Stantec recommends adding a contingency of ±10%, resulting in ±70,000 cubic yards. Therefore, Stantec's estimate for the total volume of ash in the Bottom Ash Pond is **631,000 to 771,000** cubic yards.

STANTEC CONSULTING SERVICES INC.

Joshua Kopp, PE
Project Engineer
joshua.kopp@stantec.com

Hugo Aparicio, PE
Principal
hugo.aparicio@stantec.com

Attachment: None

Categorical Exclusion Checklist for Proposed TVA Actions

Categorical Exclusion Number Claimed	Organization ID Number	**Tracking Number** *(NEPA Administration Use Only)*
1		25276

Form Preparer	Project Initiator/Manager	Business Unit
Bill Roddy	Shannon E. Bennett	FGD&C - CCP Projects & Engineering

Project Title	Hydrologic Unit Code
Bottom Ash Pond Drilling	

Description of Proposed Action *(Include Anticipated Dates of Implementation)* ☒ Continued on Page 3 *(if more than one line)*

For Proposed Action See Attachments and References

Initiating TVA Facility or Office	TVA Business Units Involved in Project
John Sevier Fossil Plant	

Location *(City, County, State)*

TN, Bottom Ash Pond (See attached)

Parts 1 through 4 verify that there are no extraordinary circumstances associated with this action:

Part 1. Project Characteristics

Is there evidence that the proposed action---	**No**	**Yes**	**Information Source**
1. Is major in scope?	X		Roddy B. 10/11/2011
2. Is part of a larger project proposal involving other TVA actions or other federal agencies?	X		Roddy B. 10/11/2011
*3. Involves non-routine mitigation to avoid adverse impacts?	X		Roddy B. 10/11/2011
4. Is opposed by another federal, state, or local government agency?	X		Roddy B. 10/11/2011
*5. Has environmental effects which are controversial?	X		Roddy B. 10/11/2011
*6. Is one of many actions that will affect the same resources?	X		Roddy B. 10/11/2011
7. Involves more than minor amount of land?	X		Roddy B. 10/11/2011

* If "yes" is marked for any of the above boxes, consult with NEPA Administration on the suitability of this project for a categorical exclusion.

Part 2. Natural and Cultural Features Affected

Would the proposed action---	**No**	**Yes**	**Per-mit**	**Commit-ment**	**Information Source for Insignificience**
1. Potentially affect endangered, threatened, or special status species?	X		No	No	Roddy B. 10/11/2011
2. Potentially affect historic structures, historic sites, Native American religious or cultural properties, or archaeological sites?	X		No	No	Roddy B. 10/11/2011
3. Potentially take prime or unique farmland out of production?	X		No	No	Roddy B. 10/11/2011
4. Potentially affect Wild and Scenic Rivers or their tributaries?	X		No	No	Roddy B. 10/11/2011
5. Potentially affect a stream on the Nationwide Rivers Inventory?	X		No	No	Roddy B. 10/11/2011
6. Potentially affect wetlands, water flow, or stream channels?	X		No	No	Roddy B. 10/11/2011
7. Potentially affect the 100-year floodplain?	X		No	No	Roddy B. 10/11/2011
8. Potentially affect ecologically critical areas, federal, state, or local park lands, national or state forests, wilderness areas, scenic areas, wildlife management areas, recreational areas, greenways, or trails?	X		No	No	Roddy B. 10/11/2011
9. Contribute to the spread of exotic or invasive species?	X		No	No	Roddy B. 10/11/2011
10. Potentially affect migratory bird populations?	X		No	No	Roddy B. 10/11/2011
11. Involve water withdrawal of a magnitude that may affect aquatic life or involve interbasin transfer of water?	X		No	No	Roddy B. 10/11/2011
12. Potentially affect surface water?	X		No	No	Roddy B. 10/11/2011
13. Potentially affect drinking water supply?	X		No	No	Roddy B. 10/11/2011
14. Potentially affect groundwater?	X		No	No	Roddy B. 10/11/2011
15. Potentially affect unique or important terrestrial habitat?	X		No	No	Roddy B. 10/11/2011
16. Potentially affect unique or important aquatic habitat?	X		No	No	Roddy B. 10/11/2011

Part 3. Potential Pollutant Generation

Would the proposed action potentially (including accidental or unplanned)---	No	Yes	Per-mit	Commit-ment	Information Source for Insignificience
1. Release air pollutants?	X		No	No	Roddy B. 10/11/2011
2. Generate water pollutants?	X		No	No	Roddy B. 10/11/2011
3. Generate wastewater streams?	X		No	No	Roddy B. 10/11/2011
4. Cause soil erosion?	X		No	No	Roddy B. 10/11/2011
5. Discharge dredged or fill materials?	X		No	No	Brodie A. C. 10/19/2011
6. Generate large amounts of solid waste or waste not ordinarily generated?	X		No	No	Roddy B. 10/11/2011
7. Generate or release hazardous waste (RCRA)?	X		No	No	For comments see attachments
8. Generate or release universal or special waste, or used oil?	X		No	No	Roddy B. 10/25/2011
9. Generate or release toxic substances (CERCLA, TSCA)?	X		No	No	Roddy B. 10/11/2011
10. Involve materials such as PCBs, solvents, asbestos, sandblasting material, mercury, lead, or paints?	X		No	No	Roddy B. 10/11/2011
11. Involve disturbance of pre-existing contamination?	X		No	No	Roddy B. 10/11/2011
12. Generate noise levels with off-site impacts?	X		No	No	Roddy B. 10/11/2011
13. Generate odor with off-site impacts?	X		No	No	Roddy B. 10/11/2011
14. Produce light which causes disturbance?	X		No	No	Roddy B. 10/11/2011
15. Release of radioactive materials?	X		No	No	Roddy B. 10/11/2011
16. Involve underground or above-ground storage tanks or bulk storage?	X		No	No	Roddy B. 10/11/2011
17. Involve materials that require special handling?	X		No	No	Roddy B. 10/25/2011

Part 4. Social and Economic Effects

Would the proposed action---	No	Yes	Commit-ment	Information Source for Insignificience
1. Potentially cause public health effects?	X		No	Roddy B. 10/11/2011
2. Increase the potential for accidents affecting the public?	X		No	Roddy B. 10/11/2011
3. Cause the displacement or relocation of businesses, residences, cemeteries, or farms?	X		No	Roddy B. 10/11/2011
4. Contrast with existing land use, or potentially affect resources described as unique or significant in a federal, state, or local plan?	X		No	Roddy B. 10/11/2011
5. Disproportionately affect minority or low-income populations?	X		No	Roddy B. 10/11/2011
6. Involve genetically engineered organisms or materials?	X		No	Roddy B. 10/11/2011
7. Produce visual contrast or visual discord?	X		No	Roddy B. 10/11/2011
8. Potentially interfere with recreational or educational uses?	X		No	Roddy B. 10/11/2011
9. Potentially interfere with river or other navigation?	X		No	Roddy B. 10/11/2011
10. Potentially generate highway or railroad traffic problems?	X		No	Roddy B. 10/11/2011

Part 5. Other Environmental Compliance/Reporting Issues

Would the proposed action---	No	Yes	Commit-ment	Information Source for Insignificience
1. Release or otherwise use substances on the Toxic Release Inventory list?	X		No	Roddy B. 10/11/2011
2. Involve a structure taller than 200 feet above ground level?	X		No	Roddy B. 10/11/2011
3. Involve site-specific chemical traffic control?	X		No	Roddy B. 10/11/2011
4. Require a site-specific emergency notification process?	X		No	Roddy B. 10/25/2011
5. Cause a modification to equipment with an environmental permit?	X		No	Roddy B. 10/11/2011
6. Potentially impact operation of the river system or require special water elevations or flow conditions??	X		No	Roddy B. 10/11/2011
7. Involve construction of a new building or renovation of existing building (i.e., major changes to lighting, HVAC, and/or structural elements of building of 2000 sq. ft or more) on which TVA will pay/pays the utilities??	X		No	Roddy B. 10/11/2011

Description of Proposed Action *(Include Anticipated Dates of Implementation)*	☐ Continued from Page 1

Parts 1 through 4: If "yes" is checked, describe in the discussion section following this form why the effect is insignificant. Attach any conditions or commitments which will ensure insignificant impacts. Use of non-routine commitments to avoid significance is an indication that consultation with NEPA Administration is needed.

An ☐ EA or ☐ EIS will be prepared.

Based upon my review of environmental impacts, the discussions attached, and/or consultations with NEPA Administration, I have determined that the above action does not have a significant impact on the quality of the human environment and that no extraordinary circumstances exist. Therefore, this proposal qualifies for a categorical exclusion under Section 5.2. 1 *of TVA NEPA Procedures.*

Project Initiator/Manager Shannon E. Bennett		Date 10/25/2011
TVA Organization FPG	E-mail sebennet@tva.gov	Telephone

Site Environmental Compliance Reviewer

Signature

Final Review/Closure

Bill Roddy 10/25/2011

Signature

Other Review Signatures *(as required by your organization)*

Tonya E Bailey 10/17/2011

Signature

Bill Roddy 10/25/2011

Signature

Signature

Signature

Signature

Attachments/References

Description of Proposed Action

The proposed geotechnical exploration of the existing Bottom Ash Pond consists of advancing approximately 22 borings. The actual number of borings advanced might be field adjusted according to accessibility issues and, if warranted, unexpected discoveries during the advancement of the original proposed borings. The borings on land will be performed using one of, or a combination of, all-terrain vehicle, truck- or track-mounted drill rigs. In certain instances where drilling should occur in areas of the pond with free water, a skid-mounted drill rig will be placed on a barge and placed in the pond using a crane. A small boat with a motor may be used to position the barge at the different boring locations, or the crane may be used to stabilize the barge and position it at each proposed boring location. See attached for complete scope.

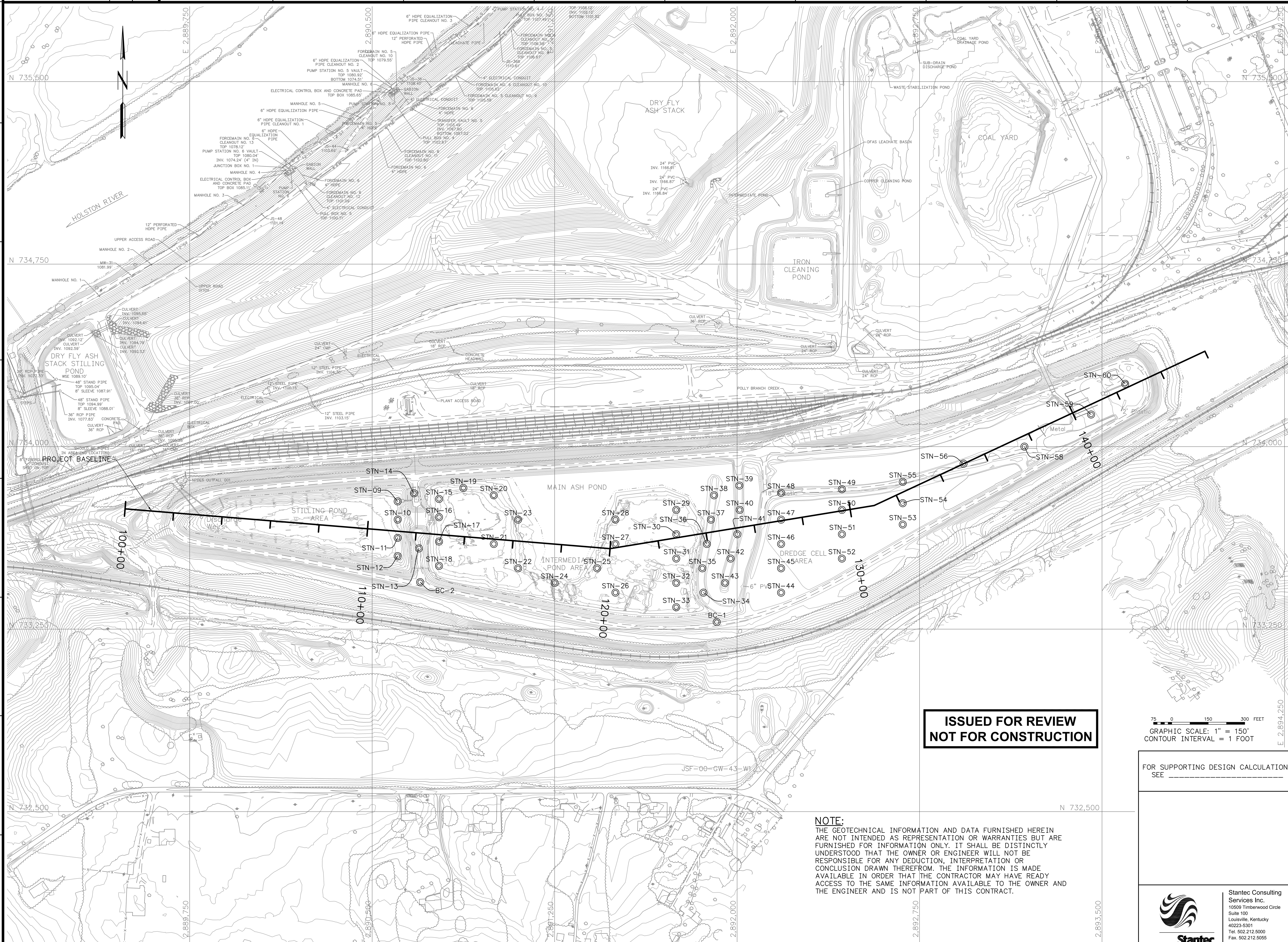
CEC General Comment Listing

1. Scope of Work
   By: Bill Roddy 10/11/2011
   Files: BADrillingWorkDescription.docx 10/11/2011 14,021 Bytes
2. Bill, Hugo replied to a different email in the chain with the answer to this question. But as part of our drilling program, we are not going to 'pierce' the clay layer below the ash in the pond. We will terminate each boring upon encountering clay. As such, and being in the middle of an ash pond, as opposed to the containment dikes, we will not backfill the borings under water, the sluiced ash around the boring will simply fill in the boring. On the borings drilled from land (interior dikes, roads, etc), they will still be within the limits of the dikes, but we proposed to backfill those borings with the auger cuttings (ash), to leave no gaps in the interior dikes or roads. But again, we will not be performing any borings on the containment dikes or within the clay. Please let me know if you have any questions. Thanks, Will Mattingly, EIT Project Engineer Stantec 1409 North Forbes Road Lexington KY 40511-2024 Ph: (859) 422-3092 Fx: (859) 422-3100 William.Mattingly@stantec.com stantec.com
   By: Bill Roddy 10/17/2011

CEC Comment Listing

Part 3 Comments

7. If any hazardous waste or special waste is generated from this project, it must be managed in accordance with TVA-SPP procedures. Notify the site PAE.
   By: Shondra Lynn White 10/21/2011



ISSUED FOR REVIEW
NOT FOR CONSTRUCTION

75 0 150 300 FEET
GRAPHIC SCALE: 1" = 150'
CONTOUR INTERVAL = 1 FOOT

NOTE:

THE GEOTECHNICAL INFORMATION AND DATA FURNISHED HEREIN ARE NOT INTENDED AS REPRESENTATION OR WARRANTIES BUT ARE FURNISHED FOR INFORMATION ONLY. IT SHALL BE DISTINCTLY UNDERSTOOD THAT THE OWNER OR ENGINEER WILL NOT BE RESPONSIBLE FOR ANY DEDUCTION, INTERPRETATION OR CONCLUSION DRAWN THEREFROM. THE INFORMATION IS MADE AVAILABLE IN ORDER THAT THE CONTRACTOR MAY HAVE READY ACCESS TO THE SAME INFORMATION AVAILABLE TO THE OWNER AND THE ENGINEER AND IS NOT PART OF THIS CONTRACT.

SURVEY CONTROL NOTE:

A GLOBAL POSITIONING SYSTEM (GPS) BASE STATION HAS BEEN ESTABLISHED AND TRANSFORMATION PARAMETERS DETERMINED BY TVA USING SELECTED SURVEY CONTROL MONUMENTS. CONTACT WITH TVA SURVEYING DEPARTMENT (423)751-8416 OR (423)751-2571 SHALL BE MADE BEFORE ANY SURVEY OR CONSTRUCTION WORK IS COMMENCED. BASE STATION FREQUENCIES AND TRANSFORMATION PARAMETERS WILL BE PROVIDED TO THE CONTRACTOR FOR USE IN CONSTRUCTION ACTIVITIES AT THE SITE. PREVIOUSLY USED OR ESTABLISHED CONTROL POINTS AND MONUMENTS SHALL NOT BE USED BY THE CONTRACTOR WITHOUT PRIOR APPROVAL BY TVA SURVEYING DEPARTMENT.

MAPPING SOURCE NOTE:

BASEMAP DEVELOPED FROM TOPOGRAPHIC SURVEY DATA PROVIDED BY TVA. IT IS BASED ON DATA FROM TUCK MAPPING SOLUTIONS AERIAL SURVEY DRAWING TITLED "462110.DWG" DATED 9/27/2010. SURVEY DATA COMPILED FROM THE FOLLOWING SOURCES WAS USED TO SUPPLEMENT THE AERIAL TOPOGRAPHY WITH UPDATED INFORMATION:

TASK ID	DESCRIPTION OF SURVEY	DATE OF SURVEY	REFERENCE DRAWING
RKQ934	GROUND SURVEY OF INTERMEDIATE SEDIMENT POND OF THE DRY FLY ASH STACK (DFAS)	07/19/2010	JS000089
RKQ943	GROUND SURVEY OF SPOIL PILES	08/26/2010	JS000093
RKQ944	GROUND SURVEY OF NORTHERN AND SOUTHERN SLOPES OF THE ACTIVE STACKING AREA OF THE DFAS	08/30/2010	
JSR814	HYDROGRAPHIC SURVEY OF THE INTERMEDIATE STILLING POND OF THE MAIN ASH POND	10/21/2010	JS000095
JSR822	HYDROGRAPHIC SURVEY OF THE STILLING AREA POND OF THE MAIN ASH POND	10/28/2010	JS000095
RKQ977	GROUND SURVEY OF THE DFAS	02/17/2011	JS000096
RKQ989	AS-BUILT PLANIMETRICS AND RIP-RAP AREA ON DFAS	04/27/2011	
JSR861	MAIN ASH AND STILLING PONDS	05/09/2011	JS000099
JCP521	GROUND SURVEY OF ROAD AND RE-GRADED/CLEANED OUT DITCH SOUTH OF THE DFAS	11/21/2011	JS000101
RKQ1022	GROUND SURVEY OF THE ACTIVE STACKING AREA ON THE DFAS	11/30/2011	JS000102
STN200	POLLY BRANCH AREA FROM BAP OUTFALLS TO HOLSTON RIVER	12/21/2011	2011_12_22_eg

LEGEND

1100 (solid line)	EXISTING CONTOUR
1100 (dashed line)	EXISTING HYDROGRAPHIC CONTOUR
◎	SOIL BORING WITH STANDARD PENETRATION TESTS

BORING LOCATION TABLE

BORING	NORTHING	EASTING
BC-1	733279.24	2891916.37
BC-2	733443.03	2890697.62
STN-09	733775.00	2890605.00
STN-10	733700.00	2890605.00
STN-11	733625.00	2890605.00
STN-12	733550.00	2890605.00
STN-13	733581.86	2890692.41
STN-14	733808.31	2890672.34
STN-15	733785.00	2890775.00
STN-16	733710.00	2890775.00
STN-17	733610.00	2890775.00
STN-18	733510.00	2890775.00
STN-19	733830.00	2890875.00
STN-20	733800.00	2891000.00
STN-21	733600.00	2891000.00
STN-22	733500.00	2891100.00
STN-23	733700.00	2891100.00
STN-24	733440.00	2891250.00
STN-25	733500.00	2891425.00
STN-26	733400.00	2891500.00
STN-27	733600.00	2891500.00
STN-28	733700.00	2891500.00
STN-29	733740.00	2891750.00
STN-30	733640.00	2891750.00
STN-31	733540.00	2891750.00
STN-32	733440.00	2891750.00
STN-33	733340.00	2891750.00

BORING LOCATION TABLE

BORING	NORTHING	EASTING
STN-34	733400.00	2891861.70
STN-35	733500.00	2891857.21
STN-36	733600.00	2891876.09
STN-37	733700.00	2891892.70
STN-38	733800.00	2891905.42
STN-39	733840.00	2892009.40
STN-40	733740.00	2892010.69
STN-41	733640.00	2892001.10
STN-42	733540.00	2891973.47
STN-43	733440.00	2891950.49
STN-44	733400.00	2892180.96
STN-45	733500.00	2892180.96
STN-46	733600.00	2892180.96
STN-47	733700.00	2892180.96
STN-48	733810.00	2892180.96
STN-49	733825.00	2892430.96
STN-50	733740.00	2892430.96
STN-51	733640.00	2892430.96
STN-52	733540.00	2892430.96
STN-53	733680.00	2892680.96
STN-54	733767.50	2892680.96
STN-55	733855.00	2892680.96
STN-56	733930.00	2892930.96
STN-58	734000.00	2893180.96
STN-59	734132.00	2893455.00
STN-60	734258.00	2893595.00

FOR SUPPORTING DESIGN CALCULATIONS SEE ______________________

REV. NO.	DATE	DSGN	DRWN	CHKD	SUPV	RVWD	APPD	ISSD	PROJECT ID	AS CONST	REV CD
R -	-	-	-	-	-	-	-	-	-	-	-
R A	03/01/12	KRB	DMG	ELC	HRA	SEB	MST	JCK	-	-	-
ISSUED FOR REVIEW											

DISCIPLINE INTERFACE 1 2 3 4

SCALE: 1"=150' EXCEPT AS NOTED

YARD
BOTTOM ASH POND

POND CLOSURE CONCEPTS GEOTECHNICAL EXPLORATION BORING LAYOUT

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SUPERVISED BY:	REVIEWED BY:	APPROVED BY:	ISSUED BY:
K.R. BLAKLEY	D.M. GRAHAM	E.L. CAUDILL	H.R. APARICIO	S.E. BENNETT	M.S. TURNBOW	J.C. KAMMEYER

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JOHN SEVIER FOSSIL PLANT
TENNESSEE VALLEY AUTHORITY
FOSSIL AND HYDRO ENGINEERING

AUTOCAD R 2000 | DATE 03/01/12 | 41 | C | XXWXXX-XX | R A

STANTEC	A
TASK COMPLETED BY:	REV NO.

PLOT FACTOR:150
W_TVA

C.A.D. DRAWING
DO NOT ALTER MANUALLY

PLOT DATE: 03/01/2012 USER: PETTY, RICHARD
\\US1243-F01\WORKGROUP\1755\ACTIVE\175561087\GEOTECHNICAL\DRAWING\SHEET_FILES\REVA_P10\61087C-101-BL1.DWG

Appendix D

Risk Matrix and Monte Carlo Analysis

DRAFT

TITLE: **CAPITAL PROJECT Phase 2**
JSF - Bottom Ash Pond Closure

				COST IMPACT			SCHEDULE IMPACT			Risk Management Method					
No.	RISK EVENT	LIKELIHOOD	Risk Level	Best Case	Most Likely	Worst Case	Best Case	Most Likely	Worst Case	avoid	transfer	mitigate	assume	Risk Mitigation Plan	COST BASIS
	Phase 2 approval														
1	Delay in Phase 2 approval greater than 1 month	Very Likely	Low	$10,000	$20,000	$30,000	1 mo	2 mo	3 mo				x	Prepare timely PPD documents for Board Approval meetings.	Total project cost less than $50 M therefore typical approval process. Add $2,500/wk for delay.
2	Revise PPD and Change Design Alternative	Likely	Low	$10,000	$15,000	$20,000	4 wks	6 wks	8 wks				x	Perform analysis of bottom ash depth and review alternatives analysis with revised inputs.	Add $2,500/wk for delay.
	Design														
3	Engineering Design Cost Estimate >10% Variance	Likely	Medium	$0	$150,000	$300,000	1 mo	2 mo	3 mo				x	Agree upon detailed scope prior to starting. Monitor project costs.	Preliminary estimated Ph. 2 design cost of $1.5 M. Best Case no variance, 10% variance Most Likely, 20% variance Worst Case.
4	Late design finish	Unlikely	Medium	$0	$0	$0	0	2 wks	2 mo					Schedule monitoring	Assume no major changes to original design Scope of Work.
5	Design changes based on regulatory comments increases schedule duration	Likely	Medium	$30,000	$60,000	$360,000	2 wks	1 mo	6 mo				x	Meet w/ regulators in advance and during process to attempt to confirm what regulators will want to see	Approx. $15K/week during design phase.
6	Karst Geology	Very Unlikely	Low	$30,000	$60,000	$90,000	2 wks	4 wks	6 wks				x	Limit excavation to existing bottom ash pond footprint	Approx. $15K/week during design phase.
7	Electrical power source capacity not adequate	N/A													
8	Relocate Transmission Lines	N/A													
9	Quantity of soil excavated from berms is not re-usable as cap and other required applications	Very Unlikely	Medium	$0	$20,000	$50,000	0	0	0				x	Earlier geotechnical sampling and testing has confirmed adequate soil material within existing perimeter dikes.	Worst Case - Perform Borrow Study
10	Borrow site not located / insufficient soil quantity	Unlikely	Medium	$0	$0	$100,000	0	0	8 wks			x		Phase 2 design will provide confirmation that a separate borrow area will not be needed.	Current design results in excess excavation materials to be removed from the site. No borrow area needed. Worst Case requires permitting of a borrow site.
11	Siesmic Issues	Very Unlikely	Low	$0	$0	$90,000	0	0	6 wks				x	Perform Siesmic evaluation and design accordingly during Phase 2	Siesmic design evaluations included in Phase 2 design scope of work. Worst Case - Unforseen siesmic case.
	Permitting/Environmental														
12	Environmental review completion delay	Very Unlikely	Medium	$0	$0	$240,000	0	0	6 mo				x	CEC is being performed now, additional permitting will be required with TDEC for closure plan.	Assume approximately $10K/week for delay time. Best Case and Most Likely no delay and Worst Case 6 months.
13	Solid Waste Permitting Delays	Likely	Medium	?	?	?	?	?	?	INPUT TO BE PROVIDED BY TVA ENVIRONMENTAL --> SOLID WASTE SPECIALIST					Approx. $15K/week during design phase.
14	Air permitting delays	Unlikely	Medium	?	?	?	?	?	?	INPUT TO BE PROVIDED BY TVA ENVIRONMENTAL --> AIR SPECIALIST					Paved Roads not included in cost estimated to reduce dust generation. Best and most likely case - no impact due to air quality. Worst case would require design of paved roads.
15	NPDES permit delays	Likely	High		?	?	?	?	?	INPUT TO BE PROVIDED BY TVA ENVIRONMENTAL --> INPUT FROM NPDES SPECIALIST					
16	Environmental findings creating delays	Unlikely	Low	$0	$100,000	$150,000	0	2 mo	4 mo				x	CEC is being performed prior to Phase 2 design	Approx. $15K/week during design phase for up to 10 wks.
17	Regulations change (ie EPA)	Imminent	High	?	?	?	?	?	?	INPUT TO BE PROVIDED BY TVA ENVIRONMENTAL					New regulations could impact ash ponds/stacks which store ash.
18	More Environmental/NEPA issues or mitigation required than Planned (i.e. wetlands, streams, historical/burial grounds) prior to Facility Construction.	Very Unlikely	Medium	$0	$50,000	$250,000	0	2 mo	4 mo				x	CEC is being performed prior to Phase 2 design	Best Case: assume no impacts. Most likely case assume some impacts and mitigation required. Worst case assume major impacts and mitigation required. (In-Lieu fees assumed).
19	Borrow site not permitted	N/A											x		Current design assumes borrow area is owned by TVA.
20	Additional Offsite Ash Storage Required	Unlikely	High	$0	$0	$60,000	0	0	4 wks				x	Geotechnical exploration will be performed to confirm bottom of ash pond and quantity of ash in place.	Best Case and Most Likely No Additional Off Site Storage Required. Worst Case would be an additional 100,000 CY of ash to haul/dispose to off-site landfill.

	Land Owner														
21	Land owner opposition - extension for monitoring wells not granted (hydro/geo)	N/A											x	Property Owned by TVA.	
22	Land owners attempt to negotiate prices higher than market value	N/A											x	Property Owned by TVA.	
23	Condemnation of property required to purchase	N/A											x	Property Owned by TVA.	
	Public														
24	Public/political opposiiton	? [Unlikely]	? [Medium]	TVA INPUT REQUIRED									x		
25	Lawsuit to stop project	Very Unlikely	? [Medium]	TVA INPUT REQUIRED									x		
	Security														
26	Security features required for property unknown	Unlikely	Low	$0	$5,000	$20,000	0	0	2 mo				x	Existing On-site TVA facility with required security features assumed to already be in-place.	Best Case - assume no security upgrade required. Most Likely - add additional design of fence upgrades. Worst case-additional design required for security upgrades.
27	Hyd/geo monitoring equipment is tampered/damaged	Unlikely	Low	$0	$20,000	$250,000	0	0	4 wks				x	Existing On-site TVA facility with required security features assumed to already be in-place.	Best Case no tampering, most Likely Worst minor cover damage, Worst Case contaminated wells, loss of data and install new wells.
	Other														
28	Construction bidding process delays	Unlikely	Medium	$0	$40,000	$80,000	0	1 mo	2 mo				x	Involve purchasing early in process	Extend project tracking / management / coordination time @ $10K/wk for up to 10 wks.
29	Long lead equipment and material unavailable	Very Unlikely	Low	$0	$0	$120,000	0	0	3 mo				x	Identify needed equipment early and order any specialized equipment in advance.	Extend project tracking / management / coordination time @ $10K/wk
30	Natural Disasters	Unlikely	Low	$0	$0	$20,000	0	0	2 wks				x		Extend project tracking / management / coordination time @ $10K/wk

Mid Points are: **Very Unlikey** 5%; **Unlikely** 25%; **Likely** 60%; **Very Likely** 85%; **Imminent** 95%.

DRAFT

TITLE: **CAPITAL PROJECT - Phase 3**
JSF - Bottom Ash Pond Closure

				COST IMPACT			SCHEDULE IMPACT			Risk Management Method					
No.	RISK EVENT	LIKELIHOOD	Risk Level	Best Case	Most Likely	Worst Case	Best Case	Most Likely	Worst Case	avoid	transfer	mitigate	assume	Risk Mitigation Plan	COST BASIS
	Phase 3 approval														
1	Delay in Phase 3 approval greater than 1 month	Unlikely	Low	$0	$40,000	$80,000	0	1 mo	2 mo				x		Extend project tracking / management / coordination time @ $10K/wk
	Construction														
2	Construction Bid Cost Variance from Estimate	Unlikely	High	-$1,000,000	$0	$1,000,000	0	0	0				x	Prepare detailed engineer's construction cost estimate with contingencies and risk matrix assessment to mitigate risks. Perform constructabilty review with contractor.	Capital cost is approx. $10M. Assume Best Case Bid Variance is -10%, Mostly Likely 0%, and Worst Cast +10%.
3	Construction Cost Increase Due to Changes During Design	Very Likely	Medium	-$1,000,000	$1,000,000	$2,000,000	0	0	3 mo					Construction cost estimate will be revised from "benchmark" unit rates to cover identified unit cost increases since their creation.	$10M Project, Best Case 10% Less Constr. Cost, Most Likely 10% Increase, Worst Case 20% Increase.
4	Fall and winter impacts on construction activities	Likely	High	$0	$400,000	$800,000	0	2 mo	4 mo				x	Plan for inclement weather delays during one-year construction schedule and cost estimate.	Assume $200K/month standing time.
5	EPA violations due to release of contaminants from construction vehicles or equipment.	Very Unlikely	Medium	$0	$20,000	$40,000	0	1d	1wk				x	Comply with CBMPP for project and maintain spill prevention controls on site.	soil cleanup/excavation and offsite disposal required. Worst case 100'x100'x2' excvation/removal (740cy) @ $10/CY excav. + $40/CY disposal
6	Excavated Berms Soil quality not satisfactory for Soil Backfill	Very Unlikely	High	$0	$0	$1,500,000	0	0	0				x	Earlier geotechnical sampling and testing has confirmed adequate soil material within existing perimeter dikes.	Assume worst case of 100,000 CY borrow soil hauled to site and placed at $15/CY.
7	Pond Bottom Elevation Deeper Than Anticipated/more Excavation and Ash Relocation Required	Likely	Medium	$0	$0	$700,000	0	0	3 wk					A geotechnical exploration is being performed to evaluate the pond bottom and ash volumes prior to Phase 2 design.	Worst case assumes overexcavation of two additional feet of the pond bottom. (70,000 CY at $10 per CY).
8	Additional Off-Site Ash Storage Required	Unlikely	High	$0	$0	$3,500,000	0	0	1 mo					Geotechnical exploration will be performed confirm bottom of ash pond and quantity of ash in place.	Best Case and Most Likely No Additional Off Site Storage Required. Worst Case would be an additional 100,000 CY of ash to haul/dispose to off-site landfill at $35/CY.
9	Human Performance or Safety Issues potential to shut down job.	Unlikely	Low	$0	$10,000	$25,000	0	2d	1wk				x	Safety programs are requried for all contractors working for TVA.	Estimated downtime costs @ $5,000/day
10	Unavailability / Unreliability of construction equipment.	Very Unlikely	Low	$0	$0	$0	0	0	0				x	Assume construction equipment delays should be accomodated by project schedule and avialable float.	Construction equipment delays not antiicipated to increase project costs.
11	Craft availability issues due to multiple TVA sites in outage simultaneously, as well as private sector requirements.	Very Unlikely	Low	$0	$0	$0	0	0	0				x	Assume adequate construction contractors and staffing exists for a landfill construction project.	Craft availability issues not anticipated for landfill construction.
12	Karst Geology Encountered During Construction	N/A													
13	Underground obstructions found	Unlikely	Medium	$0	$100,000	$400,000	0	2 wk	8 wk				x	Difficult to quantify amount of obstructions or construction debris buried within existing ash materials.	Assume $10,000/day when unknown obstructions are encountered.
14	Security features required for property unknown	Unlikely	Low	$0	$5,000	$100,000	0	0	2 mo				x	Existing On-site TVA facility with required security features assumed to already be in-place.	Best Case - assume no security upgrade required. Most Likely - add additional design of fence upgrades. Worst case-additional unexpected security issues/upgrades.
15	Natural Disasters	Unlikely	Medium	$0	$50,000	$700,000	0	2 wk	2 mo				x		Assume worst case one month idle time, contractor remobilization @ $200,000 plus $500,000 in site damage.
	QA/QC														
16	Compacted fill installed not passing testing	Very Unlikely	Medium	$0	$0	$1,000,000	0	0	0				x	Perform appropriate soil sampling and testing prior to construction and perform QC of materials and placement and compaction during construction.	Assume most of the excavated berm materials are acceptable and excess materials are available. Worst Case: 100,000 CY borrow shortage.
	Design & Long Lead Materials														
17	Long lead materials and equipment deliveries delay	Unlikely	Low	$0	$0	$25,000	0	0	1wk				x	Materials and equipment availability will be address in Phase 2 design and will be revisited during the bidding process.	Assume $100,000/month idle time. Limited amount of items to create problems. However the liner supply or its installation have potential for delay.
18	Mechanical equipment operation does not meet design performance requirements.	N/A													

	Environmental														
19	EPA/TDEC revision of current landfill requirements.	Unlikely	Low	$0	$100,000	$600,000	0	1 mo	6 mo				x	Design will be based on TVA Programmatic Documents.	Assume $100,000 per month idle time cost.
20	Air permitting delays	Unlikely	Medium	$0	$50,000	$1,000,000	0	1 mo	2 mo	INPUT TO BE PROVIDED BY TVA ENVIRONMENTAL --> AIR SPECIALIST					Paved Roads not included in cost estimated to reduce dust generation. Best case - no impact due to air quality. Most Likely case - Addiitional dust control mearsures required (water truck or polymer spray.) Worst case - pave all roads.
21	401/404 Floodplain Permitting/Mitigation	Unlikely	Medium	$0	$0	$300,000	0	0	1 mo				x	CEC and other environmental mitigation to be performed in earlier phases. Stream or wetland construction to be identified at that time.	Worst case assumes an in-lieu fee of $300 per foot for an estimated 1,000 LF of stream impact.
22	More than 24 inches of comingled soil/ash found at Bottom Ash Pond Bottom	Unlikely	Medium	$0	$250,000	$1,000,000	0	1mo	3mo				x	During geotechnical exploration confirm depth of comingled ash and clay along pond bottom.	Worst case: Extra 100,000 CY of material moved @ $10/CY.
23	Hazardous Waste Encountered with Bottom Ash Pond Excavation	Very Unlikely	High	$0	$0	$700,000	0	0	12 mo				x		Hazardous Waste Sampled, Tested, Containerized and shipped to a Hazardous Waste Landfill assumed ($500,000). One year construction down time @ $200,000.
24	Improper disclosure of property by owners at time of purchase (i.e. underground storage tanks)	N/A											x		JSF closure area is within TVA property limits.
	Commissioning/Startup														
25	Difficulty meeting new NPDES standards	Unlikely	Medium	$0	$50,000	$500,000	1mo	2mo	12 mo				x	Design of stormwater management system to comply with and consider effluent water quality.	Worst case is need to revise design and repermit stormwater management system and implement changes in the field.
26	Electrical power/controls not adequate	Very Unlikely	Medium	$0	$0	$300,000	0	0	6 mo				x	No electronic equipment expected.	Worst Case: Unexpected leachate sump/pump system may be required.
27	Training requirements not defined	Very Unlikely	Medium	$0	$20,000	$200,000	2wks	3wks	1mo	x				Prepare training documents in advance of startup.	Worst case is need to hire consultant or specialized training firm to develop training documents
28	Operational plan undefined	Very Unlikely	Low	$0	$20,000	$200,000	2wks	3wks	1mo	x				Prepare Operations Plan in advance of startup.	Worst case is need to hire consultant or specialized training firm to train operational staff.
29	Issues discovered during mechanical equipment startup / commissioning	Unlikely	Low	$0	$0	$50,000	0	2d	2 wk				x	No electronic equipment expected.	Worst Case: Unexpected leachate sump/pump system may be required.
	Other														
30	Scope creep within TVA	Very Likely	Medium	? [$0]	? [$300,000]	? [1,000,000]	? [2wks]	? [1mo]	? [3mos]				x		TVA to provide

Mid Points are: **Very Unlikey** 5%; **Unlikely** 25%; **Likely** 60%; **Very Likely** 85%; **Imminent** 95%.

Appendix E

Preliminary Opinion of Construction Costs

Draft (Rev 2)

Conceptual Construction Cost Estimate

Alternative Analysis

Bottom Ash Pond Closure
TVA John Sevier Facility
Rogersville, TN

Prepared for:
Tennessee Valley Authority
1101 Market Street
Chattanooga, Tennessee
37402-2801

March 19, 2012

Stantec

10509 Timberwood Circle, Suite 100
Louisville, KY 40223
502-212-5000

	PROJECT:	PLANT NAME:		SHEET:	REV. NO.
Stantec CALCULATION SHEET **DRAFT**	**JSF - Bottom Ash Pond Closure: Alternatives Analysis**	TVA John Sevier		1 of 6	2
	SUBJECT:	IMPOUNDMENT NAME:		TVA PROJECT #:	STANTEC JOB NO.
	Conceptual Construction Cost Estimate	Bottom Ash Pond		203536	175561087
	ACTIVITY:	ESTIMATE ID#:	PREPARED BY:	DATE LAST MODIFIED:	REVIEWED BY:
	Table of Contents & Revision Status		JDK	3/19/2012	AML

TABLE OF CONTENTS

REVISION NOTES

Revision	*Nature of Revision*	*Revision Date*
0	*Initial Submittal*	*3-Nov-11*
1	*Quantities revised to reflect new data obtained during December 2011 drilling.*	*3-Feb-12*
2	*Updated Phase 2 and 3 Engineering costs.*	*19-Mar-12*

ALTERNATIVE DESCRIPTIONS

Alternative	*Description*	*Capped Area*
A	***Do nothing.*** *Continue to operate the pond without closing.*	*0*
B	***Complete Closure:*** *Regrade the ash throughout the existing pond; cap the entire footprint.*	*36*
C	***Complete Closure of Reduced Footprint:*** *Regrade ash from west side of pond to east side; construct new divider dike; cap reduced footprint.*	*21*
D	***Clean Closure:*** *Transport all ash from the pond to the DFAS; grade the pond to drain.*	*0*

Stantec CALCULATION SHEET **DRAFT**	**PROJECT:** **JSF - Bottom Ash Pond Closure: Alternatives Analysis**	**PLANT NAME:** TVA John Sevier	**SHEET:** 2 of 6	**REV. NO.** 2
	SUBJECT: Conceptual Construction Cost Estimate	**IMPOUNDMENT NAME:** Bottom Ash Pond	**CLIENT PROJECT #:** 203536	**STANTEC JOB NO.** 175561087
	ACTIVITY: **Project Cost Summary Table**	**ESTIMATE ID#:** 0 / **PREPARED BY:** JDK	**DATE LAST MODIFIED:** 19-Mar-12	**REVIEWED BY:** AML

Consideration	Probable Closure Cost - 2012 Dollars				Comments
	Alternative A	**Alternative B**	**Alternative C**	**Alternative D**	
Mobilization/Initial Site Prep	$0	$350,000	$380,000	$630,000	Includes Mob and Demob costs as well as dewatering of the pond.
Earthwork/Subgrade Prep.	$0	$4,842,000	$7,034,000	$18,263,000	Regrading the ash and breaking the perimeter dike. Assumes fill materials will be taken from the breached dike and Sanders' Properties (TVA-owned).
Cap System	$0	$2,612,000	$1,523,000	$0	Assumes cover system consisting of 40-mil LLDPE textured, geomembrane, geocomposite drainage layer, 24-inch protective soil layer and 6-inch top soil.
Site Work/Site Restoration	$0	$1,166,000	$1,114,000	$1,266,000	Includes access roads, stormwater control features, site stabilization, etc.
Remediation Projects	$0	$0	$0	$0	None anticipated.
Other Site Specific Items	$0	$300,000	$300,000	$300,000	Includes removing and dismantling existing platforms, pumps, piping, etc. and grouting of pipes.
Construction Sub-Total	**$0**	**$9,270,000**	**$10,351,000**	**$20,459,000**	
Operations and Maintenace Costs (Annual Cost)	$0	$55,600	$37,300	$10,000	Annual maintenace cost including vegetation maintenance, sediment control, groundwater monitoring and analysis.
Operations and Maintenace Costs (30-Year Period)	**$0**	**$1,668,000**	**$1,119,000**	**$300,000**	
Engineering - Phase 1	$0	$401,000	$401,000	$401,000	Phase 1 Engineering: Planning and Conceptual Design (budget updated 01/23/12).
Engineering - Phase 2	$0	$682,000	$682,000	$682,000	Phase 2 Engineering: Design & Permitting.
Engineering - Phase 3	$0	$745,000	$745,000	$745,000	Phase 3 Engineering: Construction Administration.
Engineering Sub-Total	**$0**	**$1,828,000**	**$1,828,000**	**$1,828,000**	
TVA Construction Oversight	$0	$927,000	$1,035,000	$2,046,000	Estimated @ 10% of Construction Costs *(percent to be reviewed and adjusted by TVA).*
TVA Project Management	$0	$464,000	$518,000	$1,023,000	Estimated @ 5% of Construction Costs *(percent to be reviewed and adjusted by TVA).*
Escalation for Future Years Beyond 2011	$0	$464,000	$518,000	$1,023,000	Estimated @ 5% of Construction Costs *(percent to be reviewed and adjusted by TVA).*
Construction Risk Dollars	$0	$927,000	$1,035,000	$2,046,000	Estimated @ 10% of Construction Costs *(percent to be reviewed and adjusted by TVA).*
Project Risk Dollars (Design & Constr. Contingency)	$0	$927,000	$1,035,000	$2,046,000	Estimated @ 10% of Construction Costs *(percent to be reviewed and adjusted by TVA).*
TVA Management and Risk Sub-Total	**$0**	**$3,709,000**	**$4,141,000**	**$8,184,000**	
TOTAL PROJECT COST =	**$0**	**$16,475,000**	**$17,439,000**	**$30,771,000**	

Stantec CALCULATION SHEET **DRAFT**	PROJECT: **JSF - Bottom Ash Pond Closure: Alternatives Analysis**	PLANT NAME: TVA John Sevier		SHEET: 3 of 6	REV. NO. 2
	SUBJECT: Conceptual Construction Cost Estimate	IMPOUNDMENT NAME: Bottom Ash Pond		CLIENT PROJECT #: 203536	STANTEC JOB NO. 175561087
	ACTIVITY: **Detailed Construction Cost Estimate**	ESTIMATE ID#: 0	PREPARED BY: JDK	DATE LAST MODIFIED: 19-Mar-12	REVIEWED BY: AML

BASIS OF THE ESTIMATE		
YEAR & QUARTER COST BASIS	Quarter 1	2012
WORK PLANNED FOR YEARS (FROM / TO)	2013	2015

POND/STACK DETAILS	
DOES THE POND/STACK HAVE A LINER SYSTEM?	No
TYPE OF POND/STACK LINER SYSTEM	N/A
ASSUMED THICKNESS OF EMPLACED ASH AT CLOSURE	tbd

TOTAL AREA OF DISTURBANCE (FACILITY AREA)		Acre		0		51		50		51
OVERALL POND/STACK SIZE		Acre		42						
CLOSED AREA (DREDGE CELL OR ENTIRE AREA)		Acre		0		36		21		0
REMEDIATED AREA		Acre		0		15		29		51

SITE PREPARATION, EARTHWORK, CAP, SITE E&S AND SITE RESTORATION

					Do Nothing		Complete Closure		Complete Closure of Reduced Footprint		Clean Closure		
					Alternative A		Alternative B		Alternative C		Alternative D		
COST CATEGORY	TASK	ITEM	UNIT	INSTALLED UNIT COST	QUANTITY	TOTAL COST	QUANTITY	TOTAL COST	QUANTITY	TOTAL COST	QUANTITY	TOTAL COST	NOTES
MOBILIZATION/ SITE PREP	**MOBILIZATION / SITE PREP**												
	1	MOBILIZATION	LS	2.5% of construction estimate	0	$0	1	$230,000	1	$260,000	1	$510,000	Mob/Demob & G&A inc. Insurance: (2.5% of construction estimate) includes administration (mtgs, health & safety, trailer, phone/fax/electricity, temporary facilities, utilities, roll off boxes, waste disposal, and cleanup).
	2	REMOVAL OF FREE WATER	LS	$75,000	0	$0	1	$75,000	1	$75,000	1	$75,000	Free water to be removed prior to capping and remediation activities.
	3	CLEARING AND GRUBBING - BRUSH/GRASS	ACRE	$1,500	0	$0	10	$15,000	10	$15,000	10	$15,000	Includes an allowance of Brush & Grass clearing over 10-acre of Disturbed Area
	4	CLEARING AND GRUBBING - HEAVY WOODS	ACRE	$3,000	0	$0	10	$30,000	10	$30,000	10	$30,000	Includes an allowance of 10-acre of limited clearing of Heavy Wood
EARTHWORK/ SUBGRADE PREP.	**EARTHWORK**												
	5	STRUCTURAL FILL	CY	$10	0	$0	0	$0	144,000	$1,440,000	0	$0	Assumes structural fill for new dike between the Capped Area (Dredge Cell) and remediated area is required. Fill assumed to be sourced from TVA-owned land. R1: Revised Alt. C quantity to account for lower top of clay encountered during December 2011 drilling.
	6	SOIL BACKFILL	CY	$10	0	$0	0	$0	61,800	$618,000	260,000	$2,600,000	Assume backfilling required to bring Stilling Pond and Intermediate Pond areas to grade.
	7	SOIL EXCAVATION	CY	$10	0	$0	240,500	$2,405,000	274,000	$2,740,000	355,000	$3,550,000	Assume soil excavated from perimeter dikes around Stilling Pond and Intermediate Pond areas. R1: Revised Alt. C quantity to account for reduced excavation required.
	8	SOIL/WASTE REGRADING	CY	$8	0	$0	260,000	$2,080,000	256,000	$2,048,000	0	$0	Assume ash excavated from Stilling Pond and Intermediate Pond areas and placed in Dredge Cell for capping. R1: Revised Alt. C quantity based on new top of clay information from December 2011 drilling.
	9	BRIDGE LIFT	CY	$10	0	$0	0	$0	0	$0	0	$0	Not Required.
	10	SUBGRADE IMPROVEMENT - WICK DRAINS (IF REQUIRED)	ACRE	$75,000	0	$0	2	$150,000	1	$75,000	0	$0	Assumed required in the capped area which includes either the Dredge Cell area or the disturbed area.
	11	ANCHOR TRENCH / TOE DRAIN INSTALLATION	LF	$3	0	$0	9,000	$27,000	4,900	$14,700	0	$0	Assumed anchor trench / toe drain around the perimeter of the Capped Area.
	12	PERIMETER DITCH / DIVERSION BERM GRADING	LF	$20	0	$0	9,000	$180,000	4,900	$98,000	0	$0	Assumed 1-foot deep × 2-feet wide triangular ditch around the perimeter of the Capped Area.
	13	REMOVAL OF ASH - RELOCATION TO DFAS	CY	$13	0	$0	0	$0	0	$0	676,000	$8,788,000	Assume ash excavated from Stilling Pond and Intermediate Pond areas and relocated to DFAS. R1: Estimated capacity in DFAS for BAP material is 676,000 CY (per Stantec memo dated 10/18/2011). Also revised for new ash quantities determined by BAP drilling in December 2011.
	14	REMOVAL OF ASH - RELOCATION TO OFF-SITE STORAGE	CY	$35	0	$0	0	$0	0	$0	95,000	$3,325,000	Assume ash excavated from Stilling Pond and Intermediate Pond areas and relocated to off-site disposal facility. R1: Revised for new ash quantities determined by BAP drilling in December 2011.
CAP SYSTEM	**CAP SYSTEM INSTALLATION**												
	15	COMPACTED CLAY	CY	$10	0	$0	0	$0	0	$0	0	$0	Not required
	16	40-MIL LLDPE GEOMEMBRANE	SQ. FT.	$0.45	0	$0	1,569,000	$706,050	915,000	$411,750	0	$0	40-mil LLDPE, double-sided textured geomembrane installed over closed area.
	17	DOUBLE-SIDED GEOCOMPOSITE	SQ. FT.	$0.65	0	$0	1,763,000	$1,145,950	1,029,000	$668,850	0	$0	Geocomposite drainage layer placed over Capped Area. Estimate includes 7% overlap and 5% waste factor.
	19	PROTECTIVE COVER SOIL	CY	$5	0	$0	117,000	$585,000	68,000	$340,000	0	$0	24-inches of Protective Cover Soil placed over the closed area.
	20	TOPSOIL	CY	$6	0	$0	29,040	$174,240	16,940	$101,640	0	$0	6-inches of vegetative supporting soil layer placed over the closed area
	ROADS												
	21	GRAVEL ROAD	CY	$51	0	$0	3,400	$173,400	2,400	$122,400	1,000	$60,000	Perimeter Road will be required for site access and maintenance activities. Assume 12 ft wide × 9-inches thick. R1: Changed unit and unit cost to 'CY' and '$51', respectively, to match agreed upon unit rates.
	22	GEOTEXTILE BENEATH GRAVEL ACCESS ROAD	SQ. FT.	$0.20	0	$0	120,000	$24,000	85,200	$17,040	36,000	$7,200	Assume 12 feet wide access/perimeter road

BASIS OF THE ESTIMATE		
YEAR & QUARTER COST BASIS	Quarter 1	2012
WORK PLANNED FOR YEARS (FROM / TO)	2013	2015

POND/STACK DETAILS	
DOES THE POND/STACK HAVE A LINER SYSTEM?	No
TYPE OF POND/STACK LINER SYSTEM	N/A
ASSUMED THICKNESS OF EMPLACED ASH AT CLOSURE	tbd

TOTAL AREA OF DISTURBANCE (FACILITY AREA)		Acre		0		51		50		51	
OVERALL POND/STACK SIZE		Acre		42							
CLOSED AREA (DREDGE CELL OR ENTIRE AREA)		Acre		0		36		21		0	
REMEDIATED AREA		Acre		0		15		29		51	

SITE PREPARATION, EARTHWORK, CAP, SITE E&S AND SITE RESTORATION

					Do Nothing		Complete Closure		Complete Closure of Reduced Footprint		Clean Closure		
					Alternative A		Alternative B		Alternative C		Alternative D		
COST CATEGORY	TASK	ITEM	UNIT	INSTALLED UNIT COST	QUANTITY	TOTAL COST	QUANTITY	TOTAL COST	QUANTITY	TOTAL COST	QUANTITY	TOTAL COST	NOTES
	SITE E&S AND PONDS												
SITE WORK/ SITE RESTORATION	23	STORMWATER DETENTION BASIN STRUCTURES	EACH	$200,000	0	$0	0	$0	0	$0	0	$0	Assume stormwater ponds will be required within the remediated / closed area.
	24	STORMWATER PIPING	LF	$40	0	$0	1,050	$42,000	2,150	$86,000	870	$34,800	Assume piping required to discharge stormwater from the interior to an exterior discharge point. R1: Updated length of stormwater pipe for Alternative B.
	25	STORMWATER BASIN OUTLET STRUCTURES	EACH	$15,000	0	$0	7	$105,000	8	$120,000	13	$195,000	Assumed to include 1 temporary structure to accomodate flow to NPDES Outfall 001. R1: Updated quantity of structures for Alternative B.
	26	COMPACTED CLAY - STORM WATER POND	CY	$15	0	$0	0	$0	0	$0	0	$0	Not required
	27	40-MIL LLDPE GEOMEMBRANE - STORM WATER POND	SQ. FT.	$0.45	0	$0	0	$0	0	$0	0	$0	Not required
	28	GEOTEXTILE PROTECTIVE LAYER	SQ. FT.	$0.20	0	$0	0	$0	0	$0	0	$0	Not required
	29	PROTECTIVE COVER GRAVEL - STORM WATER POND	TONS	$30	0	$0	0	$0	0	$0	0	$0	Not required
	30	PERMANENT GRASS LINED CHANNELS	LF	$20	0	$0	5,400	$108,000	2,940	$58,800	4,800	$96,000	Assumes 60% of drainage ditches will require permanent grass lining.
	31	PERMANENT TRM-LINED CHANNELS	LF	$30	0	$0	2,700	$81,000	1,470	$44,100	2,400	$72,000	Assumes 30% of drainage ditches will require permanent TRM-lining.
	32	PERMANENT RIP RAP DRAINAGE CHANNELS	LF	$60	0	$0	900	$54,000	490	$29,400	800	$48,000	Assumes 10% of drainage ditches will require permanent riprap-lining.
	33	SITE EROSION AND SEDIMENT CONTROL	ACRE	$2,000	0	$0	51	$102,000	50	$100,000	51	$102,000	Assumes disturbances over entire area will require BMP's
SITE WORK/ SITE RESTORATION (cont.)	**SITE RESTORATION**												
	34	TOPSOIL (OUTSIDE CAP AREA)	CY	$6	0	$0	12,100	$72,600	23,400	$140,400	41,140	$246,840	6-inches of vegetative supporting soil layer placed outside capped area
	35	ROLLED TEMPORARY EROSION CONTROL MAT (ECM)	SQ. YD.	$2.25	0	$0	37,100	$83,475	36,300	$81,675	37,100	$83,475	Assume 15% of total disturbed area will require ECM for establishment of vegetation.
	36	ROLLED PERMANENT EROSION CONTROL MAT (TRM)	SQ. YD.	$4.50	0	$0	37,100	$166,950	36,300	$163,350	37,100	$166,950	Assume 15% of total disturbed area will require TRM for establishment of vegetation.
	37	FENCING	LF	$25	0	$0	0	$0	0	$0	0	$0	Not required
	38	SEED / FERTILIZE / MULCH	ACRE	$3,000	0	$0	51	$153,000	50	$150,000	51	$153,000	Assume the disturbed area will be mulched, fertilized, and seeded.
REMEDIATION PROJECTS	**REMEDIATION PROJECTS**												
	39	OVEREXCAVATION OF KARST	CY	$15	0	$0	0	$0	0	$0	0	$0	Not required
	40	REPLACEMENT OF KARST WITH ROCK FILL (50% OF DEPTH)	CY	$30	0	$0	0	$0	0	$0	0	$0	Not required
	41	REPLACEMENT OF KARST WITH SOIL FILL (50% OF DEPTH)	CY	$10	0	$0	0	$0	0	$0	0	$0	Not required
	42	SEEPAGE/DRAINAGE MITIGATION	LS	$0	0	$0	0	$0	0	$0	0	$0	Not required
	43	STABILITY MITIGATION	LS	$0	0	$0	0	$0	0	$0	0	$0	Not required
	44	EXCAVATION, TRANSPORTATION, DISPOSAL OF POND SEDIMENTS AS A HAZARDOUS WASTE	TONS	$350	0	$0	0	$0	0	$0	0	$0	Not required
OTHER SITE SPECIFIC ITEMS	**OTHER SITE SPECIFIC ITEMS**												
	45	REMOVE/PLUG/DISMANTLE PLATFORMS, PUMPS, PIPING	LS	$150,000	0	$0	1	$150,000	1	$150,000	1	$150,000	Allotment
	46	DEMO & DISPOSAL OF PIPING TO MAIN ASH POND	LS	$150,000	0	$0	1	$150,000	1	$150,000	1	$150,000	Allotment
	47	SOIL HAULED OFF SITE FOR RE-USE	CY	$0	0	$0	0	$0	76,200	$0	95,000	$0	Above pricing includes the removal of soils from the Bottom Ash Pond area for off-site storage/usage.
	48					$0		$0		$0	0	$0	
		APPROXIMATE CONSTRUCTION COST ESTIMATE				**$0**		**$9,268,665.0**		**$10,349,105**		**$20,458,265**	
		COST PER ACRE OF DISTURBED AREA				**$0.00**		**$181,739**		**$206,982**		**$406,770**	

Stantec CALCULATION SHEET **DRAFT**	PROJECT: **JSF - Bottom Ash Pond Closure: Alternatives Analysis**		PLANT NAME: TVA John Sevier	SHEET: 5 of 6	REV. NO. 2
	SUBJECT: Conceptual Construction Cost Estimate		IMPOUNDMENT NAME: Bottom Ash Pond	CLIENT PROJECT #: 203536	STANTEC JOB NO. 175561087
	ACTIVITY: **Operations and Maintenance Cost Estimate**	ESTIMATE ID#: 0	PREPARED BY: JDK	DATE LAST MODIFIED: 19-Mar-12	REVIEWED BY: AML

BASIS OF THE ESTIMATE		
YEAR & QUARTER COST BASIS	Quarter 1	2012
DURATION (FROM / TO)	2013	2033

POND/STACK DETAILS	
DOES THE POND/STACK HAVE A LINER SYSTEM?	No
TYPE OF POND/STACK LINER SYSTEM	N/A
ASSUMED THICKNESS OF EMPLACED ASH AT CLOSURE	tbd

TOTAL AREA OF DISTURBANCE (FACILITY AREA)		Acre		0		51		50		51	
OVERALL POND/STACK SIZE		Acre		42							
CLOSED AREA (DREDGE CELL OR ENTIRE AREA)		Acre		0		36		21		0	
REMEDIATED AREA		Acre		0		15		29		51	

SITE PREPARATION, EARTHWORK, CAP, SITE E&S AND SITE RESTORATION

					Do Nothing		Complete Closure		Complete Closure of Reduced Footprint		Clean Closure		
					Alternative A		Alternative B		Alternative C		Alternative D		
COST CATEGORY	TASK	ITEM	UNIT	UNIT COST	QUANTITY	TOTAL COST	QUANTITY	TOTAL COST	QUANTITY	TOTAL COST	QUANTITY	TOTAL COST	NOTES
	OPERATIONS AND MAINTENANCE												
OPERATIONS AND MAINTENANCE	1	Maintain Healthy Vegetation	ACRE	$740	0	$0	36	$26,640	21	$15,540	0	$0	Assumes vegetation will only be maintained on capped area. Areas returned to 'natural' condition are assumed to be allowed to grow and that no vegetative maintenance will be required.
	2	Maintain the drainage facilities, sediment ponds, and erosion/sedimentation control measures.	LS	$10,000	0	$0	1	$10,000	1	$10,000	1	$10,000	
	3	Repair Gullies or Rills.	CY	$5	0	$0	581	$2,904	339	$1,694	0	$0	Assumes 1% of capped area to a depth of 1 foot will be repaired annually.
	4	Maintain and monitor leachate collection, removal, and treatment system.	N/A	N/A	0	$0	0	$0	0	$0	0	$0	Not required for this project.
	5	Maintain and monitor gas collection system.	N/A	N/A	0	$0	0	$0	0	$0	0	$0	Not required for this project.
	6	Data collection and analysis of groundwater monitoring system.	EACH	$3,000	0	$0	5	$15,000	3	$9,000	0	$0	Assume 1 monitoring well per 10 acres (rounded) but a minimum of 3 wells required. Assume no wells needed if all ash is removed.
	7	Maintenance of groundwater monitoring system.	LS	$1,000	0	$0	1	$1,000	1	$1,000	0	$0	
		APPROXIMATE ANNUAL O&M ESTIMATE				**$0**		**$55,544.0**		**$37,234**		**$10,000**	
		COST PER ACRE OF CAPPED AREA				**$0.00**		**$1,089**		**$745**		**N/A**	

Stantec	PROJECT: JSF - Bottom Ash Pond Closure: Alternatives Analysis	PLANT NAME: TVA John Sevier		SHEET: 6 of 6	REV. NO. 2
	SUBJECT: Conceptual Construction Cost Estimate	IMPOUNDMENT NAME: Bottom Ash Pond		CLIENT PROJECT #: 203536	STANTEC JOB NO. 175561087
CALCULATION SHEET **DRAFT**	ACTIVITY: **Assumptions and Limitations**	ESTIMATE ID#: 0	PREPARED BY: JDK	DATE LAST MODIFIED: 19-Mar-12	REVIEWED BY: AML

	The following key assumptions and limitations are associated with the project design, implementation and performance:
1	The cost estimates were prepared using 2012 dollars.
2	This preliminary cost estimate has been based on conceptual (10%) designs. Stantec calculated quantities based on general take-offs from those designs and information gathered during the Phase 1: Planning and Conceptual Design. The concepts have not been finalized and are subject to change. The design concept was based upon Stantec's experience with similar projects and does not necessarily reflect actual site-specific conditions. Updated estimates should be prepared once Phase 1 design concepts are finalized.
3	The unit rate costs are per agreed to Unit rates per discussions with Stantec and TVA.
4	Fill material from TVA-owned land or off-site general fill soil. Estimate assumes that TVA will not pursue use of bottom ash to fill. Bottom Ash Pond area is about 36 acres. Alternative C proposes to breach the dikes and regrade CCP. After regrading, 21 acres will be capped and require 2-feet of fill plus 20% for crown plus fill to compensate settlement.
5	For Alternatives B and C, Stantec has assumed that all existing bottom ash will be closed in-place and no ash will be removed. The cover system is to consist of a 6-inch vegetative layer capable of sustaining native plant growth, 24-inch protective soil layer, 40-mil LLDPE geomembrane, and geocomposite.
6	This estimate assumes that existing, in-place sediments have been and will be characterized as non-hazardous.
7	This estimate assumes that the stormwater runoff from the Bottom Ash Pond will be handled in new ditches and stormwater management facilities. Stantec has assumed that the NPDES Outfall 001 will be used during construction. The demolition of Outfall 001 is not included in this estimate.
8	Stantec has assumed that the foundation soils/bottom ash will not require ground improvement and/or drainage measures to provide adequate support for the cover system.
9	This estimate assumes that crown soil, protective cover and topsoil will come from a TVA borrow source.
10	It is assumed that grass-lined terraces and rip rap letdowns will be constructed to convey stormwater from the closure area.
11	Removal of free water is assumed to require the same level of effort, equipment, and duration for each area of the Bottom Ash Pond regardless of size.
12	Stantec assumes that TDEC will permit the construction of stormwater basins within closed areas of the impoundment. Alternatively, stormwater basins may be constructed with a composite liner system consisting of 2 feet of clay and a 40-mil geomembrane liner.
13	The new CCP regulations will not preclude the use of the proposed cap system and the CCP's will not be deemed as a hazardous material under Sub-Title C designation.
14	The cost estimate includes capital costs, operation and maintenance costs, engineering costs, and TVA contingencies.
15	Phase 2 and Phase 3 engineering/construction efforts will be in accordance with the Programmatic Document, latest version.
16	This estimate assumes that TVA will conduct all Permitting activities to include discussions with TDEC and that TVA permit negotiations with TDEC will be successful and completed within the constraints of the project schedule.
17	TVA will perform all surveying for the project including: additional topography and features needed to complete the Phase 2 design and Phase 3 construction surveying.
18	Pricing does not reflect TVA's Construction Group conducting this work. Pricing reflects competitively bid, non-union projects.
19	Statements of Probable Construction Cost prepared by Stantec represent Stantec's judgment as a design professional familiar with the construction industry. It is recognized, however, that neither Stantec nor the Owner has control over the cost of labor, materials or equipment nor over the contractor's methods of determining the bid price or other competitive bidding, market, or negotiating conditions. Accordingly, Stantec cannot and does not warrant or represent that proposals, bids or actual construction costs will not vary from any statement of Probable Construction Cost or other estimates or evaluations prepared by Stantec.

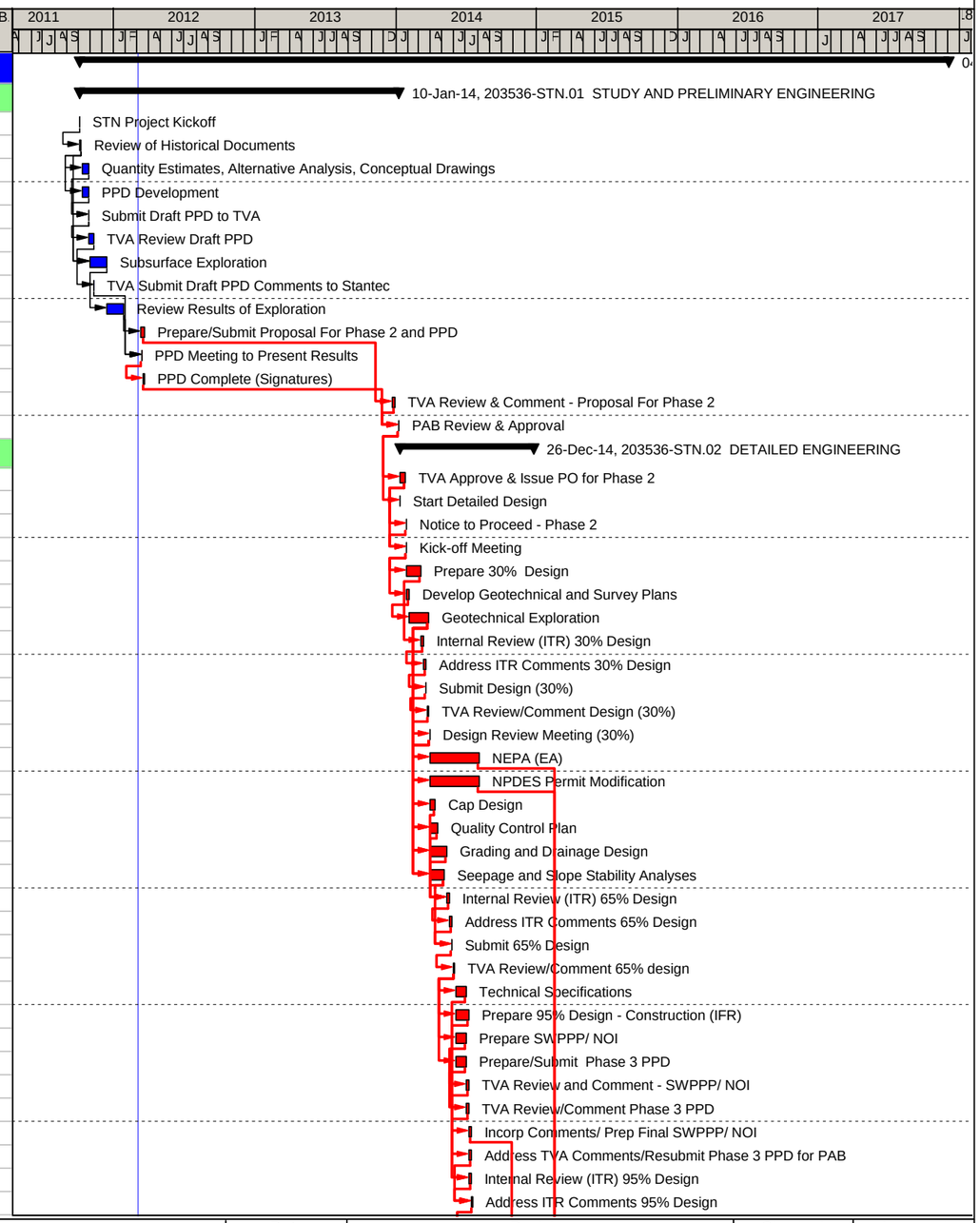
Appendix F

Schedule

Tennessee Valley Authority

JSF-Bottom Ash Pond Closure

Activity ID	Activity Name	Critical	Original Duration	aining uration	tivity % plete	Start	Finish	Predecessors	Successors	B.
203536-STN JSF-Bottom Ash Pond Closure										
203536-STN.01 STUDY AND PRELIMINARY ENGINEERING										
STN-00001	STN Project Kickoff	☐	1.0d	0.0d	100%	04-Oct-11 A	04-Oct-11 A	TVA-PM100	STN-00002, TVA-PM105	
STN-00002	Review of Historical Documents	☐	3.0d	0.0d	100%	05-Oct-11 A	07-Oct-11 A	STN-00001, TVA-PM1...	STN-00003, STN-0000...	
STN-00003	Quantity Estimates, Alternative Analysis, Conceptual...	☐	13.0d	0.0d	100%	11-Oct-11 A	27-Oct-11 A	STN-00002	STN-00005	
STN-00004	PPD Development	☐	13.0d	0.0d	100%	11-Oct-11 A	27-Oct-11 A	STN-00002	STN-00005	
STN-00005	Submit Draft PPD to TVA	☐	1.0d	0.0d	100%	28-Oct-11 A	28-Oct-11 A	STN-00003, STN-00004	TVA-00001, STN-00006	
TVA-00001	TVA Review Draft PPD	☐	9.0d	0.0d	100%	28-Oct-11 A	09-Nov-1...	STN-00005	TVA-00041	
STN-00006	Subsurface Exploration	☐	10.0d	0.0d	100%	31-Oct-11 A	14-Dec-1...	STN-00002, STN-000...	STN-00031	
TVA-00041	TVA Submit Draft PPD Comments to Stantec	☐	1.0d	0.0d	100%	10-Nov-1...	10-Nov-1...	TVA-00001	TVA-00060	
STN-00031	Review Results of Exploration	☐	2.0d	0.0d	100%	15-Dec-1...	27-Jan-12 A	STN-00006	TVA-00060, STN-00007	
STN-00007	Prepare/Submit Proposal For Phase 2 and PPD	☑	6.0d	6.0d	0%	12-Mar-12*	19-Mar-12	STN-00031	TVA-00003	
TVA-00060	PPD Meeting to Present Results	☑	1.0d	1.0d	0%	15-Mar-12*	15-Mar-12	STN-00031, TVA-000...	TVA-00002, TVA-PM125	
TVA-00002	PPD Complete (Signatures)	☑	5.0d	5.0d	0%	16-Mar-12	22-Mar-12	TVA-00060	TVA-00040, TVA-PM1...	
TVA-00003	TVA Review & Comment - Proposal For Phase 2	☑	6.0d	6.0d	0%	23-Dec-13	31-Dec-13*	STN-00007	TVA-00040, TVA-PM135	
TVA-00040	PAB Review & Approval	☑	3.0d	3.0d	0%	08-Jan-14	10-Jan-14	TVA-00002, TVA-000...	TVA-00006, TVA-00005	
203536-STN.02 DETAILED ENGINEERING										
TVA-00006	TVA Approve & Issue PO for Phase 2	☑	10.0d	10.0d	0%	13-Jan-14	27-Jan-14	TVA-00040	TVA-00007, TVA-00008	
TVA-00005	Start Detailed Design	☑	1.0d	1.0d	0%	13-Jan-14	13-Jan-14	TVA-00040	TVA-PM200	
TVA-00007	Notice to Proceed - Phase 2	☑	1.0d	1.0d	0%	28-Jan-14	28-Jan-14	TVA-00006	TVA-00008	
TVA-00008	Kick-off Meeting	☑	1.0d	1.0d	0%	29-Jan-14*	29-Jan-14	TVA-00006, TVA-000...	STN-00008, STN-00012	
STN-00008	Prepare 30% Design	☑	25.0d	25.0d	0%	30-Jan-14	06-Mar-14	TVA-00008	STN-00009	
STN-00012	Develop Geotechnical and Survey Plans	☑	5.0d	5.0d	0%	30-Jan-14	05-Feb-14	TVA-00008	STN-00013	
STN-00013	Geotechnical Exploration	☑	35.0d	35.0d	0%	06-Feb-14	27-Mar-14	STN-00012	TVA-00011, TVA-0001...	
STN-00009	Internal Review (ITR) 30% Design	☑	5.0d	5.0d	0%	07-Mar-14	13-Mar-14	STN-00008	STN-00010	
STN-00010	Address ITR Comments 30% Design	☑	5.0d	5.0d	0%	14-Mar-14	20-Mar-14	STN-00009	STN-00011	
STN-00011	Submit Design (30%)	☑	1.0d	1.0d	0%	21-Mar-14	21-Mar-14	STN-00010	TVA-00009	
TVA-00009	TVA Review/Comment Design (30%)	☑	5.0d	5.0d	0%	24-Mar-14	28-Mar-14	STN-00011	TVA-00010	
TVA-00010	Design Review Meeting (30%)	☑	1.0d	1.0d	0%	31-Mar-14	31-Mar-14	TVA-00009	STN-00014, STN-0001...	
TVA-00011	NEPA (EA)	☑	90.0d	90.0d	0%	01-Apr-14	06-Aug-14	TVA-00010, STN-00013	TVA-00022	
TVA-00012	NPDES Permit Modification	☑	90.0d	90.0d	0%	01-Apr-14	06-Aug-14	TVA-00010, STN-00013	TVA-00022	
STN-00014	Cap Design	☑	10.0d	10.0d	0%	01-Apr-14	14-Apr-14	TVA-00010, STN-00013	STN-00019	
STN-00015	Quality Control Plan	☑	15.0d	15.0d	0%	01-Apr-14	21-Apr-14	TVA-00010, STN-00013	STN-00019	
STN-00016	Grading and Drainage Design	☑	30.0d	30.0d	0%	01-Apr-14	12-May-14	TVA-00010, STN-00013	STN-00019	
STN-00017	Seepage and Slope Stability Analyses	☑	25.0d	25.0d	0%	01-Apr-14	05-May-14	TVA-00010, STN-00013	STN-00019, STN-00021	
STN-00019	Internal Review (ITR) 65% Design	☑	5.0d	5.0d	0%	13-May-14	19-May-14	STN-00014, STN-000...	STN-00020	
STN-00020	Address ITR Comments 65% Design	☑	5.0d	5.0d	0%	20-May-14	27-May-14	STN-00019	STN-00021	
STN-00021	Submit 65% Design	☑	1.0d	1.0d	0%	28-May-14	28-May-14	STN-00017, STN-00020	TVA-00013	
TVA-00013	TVA Review/Comment 65% design	☑	5.0d	5.0d	0%	29-May-14	04-Jun-14	STN-00021	STN-00022, STN-0001...	
STN-00018	Technical Specifications	☑	20.0d	20.0d	0%	05-Jun-14	02-Jul-14	TVA-00013	STN-00034	
STN-00022	Prepare 95% Design - Construction (IFR)	☑	25.0d	25.0d	0%	05-Jun-14	10-Jul-14	TVA-00013	STN-00034	
STN-00024	Prepare SWPPP/ NOI	☑	20.0d	20.0d	0%	05-Jun-14	02-Jul-14	TVA-00013	TVA-00015	
STN-00032	Prepare/Submit Phase 3 PPD	☑	20.0d	20.0d	0%	05-Jun-14	02-Jul-14	TVA-00013	TVA-00042	
TVA-00015	TVA Review and Comment - SWPPP/ NOI	☑	5.0d	5.0d	0%	03-Jul-14	10-Jul-14	STN-00024	STN-00025	
TVA-00042	TVA Review/Comment Phase 3 PPD	☑	5.0d	5.0d	0%	03-Jul-14	10-Jul-14	STN-00032	STN-00033	
STN-00025	Incorp Comments/ Prep Final SWPPP/ NOI	☑	5.0d	5.0d	0%	11-Jul-14	17-Jul-14	TVA-00015	STN-00026	
STN-00033	Address TVA Comments/Resubmit Phase 3 PPD for...	☑	5.0d	5.0d	0%	11-Jul-14	17-Jul-14	TVA-00042	STN-00035	
STN-00034	Internal Review (ITR) 95% Design	☑	5.0d	5.0d	0%	11-Jul-14	17-Jul-14	STN-00018, STN-00022	STN-00035	
STN-00035	Address ITR Comments 95% Design	☑	2.0d	2.0d	0%	18-Jul-14	21-Jul-14	STN-00033, STN-00034	STN-00023	



Remaining Level of Effort — Remaining Work — Summary
Actual Level of Effort — Critical Remaining Work
Actual Work — Milestone

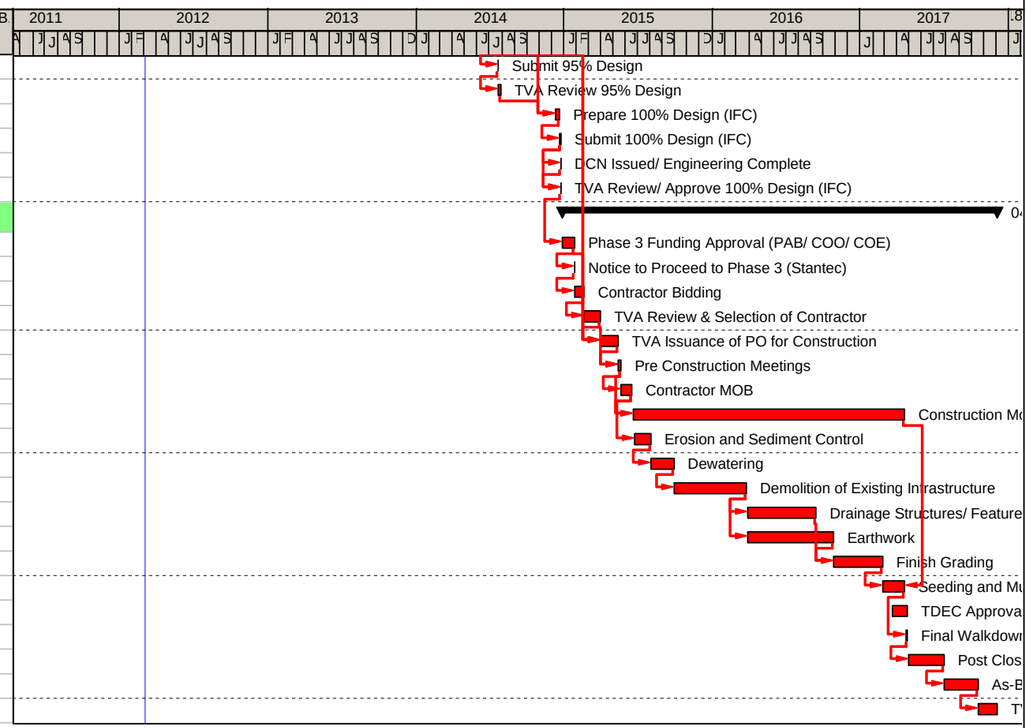
Data Date 05-Mar-12
Print Date 15-Mar-12 10:06

Date	Revision	Checked	Approved

Tennessee Valley Authority

JSF-Bottom Ash Pond Closure

Activity ID	Activity Name	Critical	Original Duration	aining uration	:tivity % plete	Start	Finish	Predecessors	Successors	B.
STN-00023	Submit 95% Design	☑	1.0d	1.0d	0%	22-Jul-14	22-Jul-14	STN-00035	TVA-00014	
TVA-00014	TVA Review 95% Design	☑	5.0d	5.0d	0%	23-Jul-14	29-Jul-14	STN-00023	STN-00026	
STN-00026	Prepare 100% Design (IFC)	☑	7.0d	7.0d	0%	12-Dec-14*	22-Dec-14	TVA-00014, STN-00025	STN-00027, TVA-PM2...	
STN-00027	Submit 100% Design (IFC)	☑	1.0d	1.0d	0%	23-Dec-14	23-Dec-14	STN-00026, TVA-PM2...	TVA-00016, TVA-00017	
TVA-00016	DCN Issued/ Engineering Complete	☑	1.0d	1.0d	0%	24-Dec-14	24-Dec-14	STN-00027	TVA-00017	
TVA-00017	TVA Review/ Approve 100% Design (IFC)	☑	1.0d	1.0d	0%	26-Dec-14	26-Dec-14	STN-00027, TVA-00016	TVA-PM235, TVA-00018	
203536-STN.03 IMPLEMENTATION										
TVA-00018	Phase 3 Funding Approval (PAB/ COO/ COE)	☑	20.0d	20.0d	0%	29-Dec-14	27-Jan-15	TVA-PM235, TVA-000...	TVA-00019, TVA-00022	
TVA-00019	Notice to Proceed to Phase 3 (Stantec)	☑	1.0d	1.0d	0%	28-Jan-15	28-Jan-15	TVA-00018	TVA-00020	
TVA-00020	Contractor Bidding	☑	15.0d	15.0d	0%	29-Jan-15	19-Feb-15	TVA-00019	TVA-00021	
TVA-00021	TVA Review & Selection of Contractor	☑	30.0d	30.0d	0%	20-Feb-15	02-Apr-15	TVA-00020	TVA-00024, TVA-00022	
TVA-00022	TVA Issuance of PO for Construction	☑	30.0d	30.0d	0%	03-Apr-15	14-May-15	TVA-00018, TVA-000...	TVA-PM300, TVA-00024	
TVA-00024	Pre Construction Meetings	☑	5.0d	5.0d	0%	15-May-15	21-May-15	TVA-00021, TVA-000...	STN-00028, TVA-00025	
TVA-00025	Contractor MOB	☑	20.0d	20.0d	0%	22-May-15	19-Jun-15	TVA-PM300, TVA-000...	TVA-00027, STN-0002...	
STN-00028	Construction Monitoring	☑	461.0d	461.0c	0%	22-Jun-15	21-Apr-17	TVA-00025, TVA-00024	TVA-00033, TVA-PM315	
TVA-00027	Erosion and Sediment Control	☑	30.0d	30.0d	0%	23-Jun-15	04-Aug-15	TVA-00025, TVA-PM3...	TVA-00028	
TVA-00028	Dewatering	☑	40.0d	40.0d	0%	05-Aug-15	30-Sep-15	TVA-00027	TVA-00029	
TVA-00029	Demolition of Existing Infrastructure	☑	120.0d	120.0c	0%	01-Oct-15	25-Mar-16	TVA-00028	TVA-00030, TVA-00031	
TVA-00030	Drainage Structures/ Features	☑	120.0d	120.0c	0%	28-Mar-16	14-Sep-16	TVA-00029	TVA-00032	
TVA-00031	Earthwork	☑	150.0d	150.0c	0%	28-Mar-16	27-Oct-16	TVA-00029	TVA-00032	
TVA-00032	Finish Grading	☑	80.0d	80.0d	0%	28-Oct-16	24-Feb-17	TVA-00030, TVA-00031	TVA-00033	
TVA-00033	Seeding and Mulching	☑	40.0d	40.0d	0%	27-Feb-17	21-Apr-17	TVA-00032, STN-00028	TVA-PM315, TVA-00036	
TVA-00044	TDEC Approval of Closure	☑	30.0d	30.0d	0%	20-Mar-17	28-Apr-17	TVA-PM310	TVA-PM325	
TVA-00036	Final Walkdown w/Punchlist	☑	5.0d	5.0d	0%	24-Apr-17	28-Apr-17	TVA-00033	TVA-PM310, STN-00029	
STN-00029	Post Closure Management Plan	☑	60.0d	60.0d	0%	01-May-17	25-Jul-17	TVA-PM315, TVA-000...	STN-00030	
STN-00030	As-Built CQA Report Submittal to TVA	☑	60.0d	60.0d	0%	26-Jul-17	19-Oct-17	STN-00029, TVA-PM3...	TVA-00035	
TVA-00035	TVA Review/Approval of As-Built CQA Report	☑	30.0d	30.0d	0%	20-Oct-17	04-Dec-17	STN-00030	TVA-PM325	



Remaining Level of Effort
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JSF-Bottom Ash Pond Closure

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