Document Title:	90% Removal Design Package for North Dredge Cell (Dike C) Perimeter Containment				
Document/RDP No.:	RDP-0113-E	Project No.:		WBS Code:	011303
Reviewed by:	Multiple	Organization:	Jacobs, Civil Projects	Date:	08Feb2011
Response by:	Multiple	Organization:	Stantec	Date:	11 March 2011

No.	Section / Para / Page	Reviewer Comment	Response to Comment
1.	Title (Drawings and Specs)	For consistency, we need to use the same terminology across the program. The term “closure”, while technically including all of the design packages, is being defined as the final Cap and Cover, and should not be put in the title for this package. The term “stabilization” is appropriate for the wall construction; we should eliminate use of the term “deep mixing” or “soil-cement”. Replace those terms with “stabilization” or “stabilized wall” throughout. The term “containment” is used to define the perimeter system, including both the stabilized wall and the rock berm and the earthen berm. So, this removal design package should be referred to as the “North Dredge Cell (Dike C) Perimeter Containment”, since all those elements are in this design. Drawing title blocks, and headers/footers in the Specifications should be changed to reflect this consistent title.	The project title will be changed to “North Dredge Cell (Dike C) Perimeter Containment”. This change will be reflected in the Drawings, Specifications, and QC Plan. In the Calculation Package, this change in nomenclature will be implemented only on the cover sheets. See the response to Comment #2, regarding the terms “deep mixing” and “soil cement”.
2.	SHT 02 (Global change)	Replace “deep mixing” with “stabilization” or “stabilized wall”. This is a global comment and will not be repeated, but shows up on most every drawing and in the specifications. Similarly, replace “soil cement” with “stabilized wall”.	“Deep Mixing” will be replaced with “Perimeter Wall Stabilization” (PWS). The term “soil cement” will be retained. Our design documents use “soil cement” as an adjective (“soil-cement wall”), but also as a noun (for the material). The suggested change in terminology does not address the noun usage. The proposed construction methodology will involve a cement-bentonite material; technically, bentonite is a soil, such that the material can be generically described as “soil cement”. Consistent with the goal of maintaining a generic, performance-based specification (see response to Comment #118), we would be opposed to identifying the material specifically as “cement bentonite”.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
3.	SHT 02	Note 1: Deep Mixing: Replace with the definition of what we are going to do – "Stabilization". This defines Deep Mixing as ground improvement accomplished by mixing grout with in place soils. We are utilizing Cement-Bentonite not mixed with soil in place. Note 1: The QC Manager for the stabilized wall construction testing is not required to be a PE in the State of Tennessee. That is a requirement for Stantec as the Engineer of Record. Please see comments on the Special Conditions, which redefines the QC Manager.	These comments refer to definitions under Note 2 on Sheet 02. "Deep Mixing" will be replaced with "Perimeter Wall Stabilization". The definition will be expanded to include both mixing grout with the in situ soil, and excavation/replacement with self-hardening slurry. The titles, responsibilities, etc. for the QC/QA team will be revised in accordance with the response to Comment #61. The notes on Sheet 02 will be revised to be consistent with the Special Conditions section of the Specifications.
4.	SHT 02	Note 2: To be consistent with the specification, list QA Manager under this note and state his responsibilities.	The titles, responsibilities, etc. for the QC/QA team will be revised in accordance with the response to Comment #61. The notes on Sheet 02 will be revised to be consistent with the Special Conditions section of the Specifications.
5.	SHT 02	Note 5 – Why proof roll – what affect or damage will this have on the walls? Proofrolling between shear walls 10 ft apart is not appropriate. If the construction pad is solid, the slurry wall operation should not affect the base and proofrolling isn't needed. If a layer of #10 screenings (sand) is placed first, then proof rolling will only rut unless the sand is confined.	Proof rolling is necessary to establish a base for the embankment platform and subsequent earthen berm construction. The construction platform may be in a poor condition after the PWS construction is complete, necessitating additional preparation of the surface before starting the embankment construction. Proof rolling will not damage the shear walls, provided they have reached acceptable strength per the specifications. See also the response to Comment #44.
6.	SHT 02	Note 7: Suggest that this wording be revised to be more definitive of the purpose of "these Drawings", They are not just an "aid in project construction". They are the construction drawings that are to be referenced along with specifications, and other parts of the contract documents.	Concur. Wording will be revised.
7.	SHT 02	Notes 10 & 11 – These say basically the same thing. Please combine into one note.	Concur.
8.	SHT 02	Note 14 – There are other methods used to protect instrumentation in place; either describe the other methods currently being used or delete the specificity and just say to protect them.	Concur. Note will be revised to allow other types of protection.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
9.	SHT 02	Notes 14, 19, 26, and 29: These notes require all "subcontractors" to build stuff that they won't build – either CP will build them or the Stabilization Contractor will. Delete "subcontractor" from these four notes (OK to leave 'subcontractor' in other notes, where the work applies to them).	We will revise notes to indicate: • Note 14 – All contractors and subcontractors are responsible for protecting instrumentation from damage. However, the Earthwork Contractor will be responsible for removing instruments, extending instruments, and/or placing protective fencing or other barriers. • Note 19 – During construction, each contractor or subcontractor shall maintain their own staging and storage areas. The Earthwork Contractor is responsible for access roads (see Comment #10), plus restoration of staging and storage areas. • Note 26 – The Earthwork Contractor (only) will be responsible for maintaining sediment control devices. • Note 29 – TVA will be responsible for all construction surveying (see Comment #135).
10.	SHT 02	Note 19 – Delete "all contractors". CP is responsible for haul roads.	Note 19 will be changed to reference the "Earthwork Contractor".
11.	SHT 02	Note 24 – Add complying with TVA requirements to go along with the manufacturers recommendations.	Concur.
12.	SHT 02	Note 26 – Change Construction Manager to SWMP Manager.	Concur. As this role has not been previously defined, we will need to add SWMP Manager to the definitions under Note 2, and in the Special Conditions section of the Specifications.
13.	SHT 02	Note 28 – change "QC or QA Manager" to "QC and QA Manager"	Concur.
14.	SHT 02	Note 32, 33, and 34 – Consider deleting these notes. Operation of borrow area does not need to be included in this design package, since TVA will manage the borrow area.	Notes will remain. The borrow areas are part of the construction work.
15.	SHT 02	Note 35 – Delete "drilling" from "platform".	Concur. Terminology will be changed from "drilling platform" to "construction platform" throughout the Drawings and Specifications.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
16.	SHT 02	Note 38 – Where does this apply? If this is for the two 48 inch concrete pipes they will be removed prior to this project and the note is not needed. See also, comment on specs – general – 90% Proctor compaction is not needed, since this is not stacked ash. CP will be digging down approx. 20' with sloped sides. It is not reasonable to expect to get the surface dense enough for a 90% proctor. Undisturbed areas will not pass a 90% proctor in all cases. The Stabilization Contractor has been told that the surface will support a D6 LGP dozer.	One 48-inch diameter HDPE pipe (crossing Baseline A near Sta. A165+40) will be removed, requiring excavation and backfill from the east/west haul road to the pipe outlet, including areas underlying ash stacking. Ash material used for backfill shall be compacted in accordance with the established criteria for stacking. We now understand that there are two buried 48-inch diameter concrete pipes near Sta. A170+00 (see response to Comment #22). If these pipes are excavated, the excavation backfill will be within the stabilized footprint and will not form part of the ash landfill. Hence, this backfill will not need to meet the compaction criteria for ash stacking, as long as the final surface is commensurate with other areas prepared for the PWS Contractor. The Drawings and Specifications will be revised per the response to Comment #64. Note 38 will be revised accordingly.
17.	SHT02	Note 39: Revise this note. There is no need to excavate out previous stone and replace with compacted ash. However, we need to warn the stabilization contractor that this stone layer exists, so that they can be prepared to "plug" it.	Concur, based on the methodology selected for the soil-cement wall construction. Note 39 will be revised to read: "Buried stone fill may exist at various locations within the project limits. Where known to exist, the approximate location of stone fill is indicated on the Drawings. Existing stone fill shall be excavated by the Perimeter Wall Stabilization Contractor as needed to construct the soil-cement walls." The starting location for this design segment is being moved (see Comment #24), so the Dike D Buttress (shown on the drawings) will be encountered in a future construction package.
18.	SHT 02	Note 41 - Delete	Concur.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
19.	SHT 02	Note 42 – Shouldn't the design provide where the wall is to be built instead of relying on the contractor to provide? Note 42 and Note 48 should be combined. The Deep Mixing Contractor should adhere to the drawings, not propose a layout of the walls prior to construction as requested in Note 42. If the contractor wants to propose a modification, he will comply with Note 48. If Stantec is asking for the contractor's construction sequence in Note 42, please modify the note to clarify that intent.	The design allows flexibility in the methods and equipment utilized by the PWS Contractor. The outer limits of the stabilized area and the general layout of the wall construction are defined in the drawings. In accordance with the limitations in Section 02650 of the Specifications, the thickness of the walls may be chosen by the Contractor, with the minimum spacing of the shear and buttress walls being a function of the wall thickness. This flexible design approach was adopted to facilitate best-value bids from the construction industry. Accordingly, the exact location of the various walls cannot be defined in the design drawings. The PWS Contractor is required to submit Shop Drawings for review and approval prior to construction. Note 42 calls attention to this requirement.
20.	SHT 02	Note 43 – Delete, since this is the same as Note 39.	Note 43 will be combined with Note 39. The combined note will alert the contractor to the existence of the subsurface stone. See also response to Comment #17.
21.	SHT 02	Note 46 – Verify that this matches the SWMP, or delete and just reference the SWMP.	The revegetation requirements referenced are consistent with those in the ash stacking design packages. Depending on construction sequencing, areas of this project may remain in an undisturbed condition for a period ranging from a few months to over a year.
22.	SHT 03, 04, 05, 06	There is another set of buried pipes shown in the corner of the wall near STA 170+00 to 171+00. Please label the two 48" concrete pipes to be removed (they are shown but they are not labeled). We need to warn the stabilization contractor that these pipes exist, so that they can be prepared to plug or remove them.	The pipes will be labeled on Sheet 04, with a reference to this note: "Two buried concrete pipes remain from the pre-failure facility; the approximate location of one pipe is indicated. The pipes are approximately 48 inches in diameter, and the lengths are unknown. These pipes will not be removed prior to perimeter stabilization. If the PWS Contractor elects to excavate these pipes, the area shall be backfilled with ash in accordance with the project specifications." See also the response to Comments #16 and #64.
23.	SHT 04	Please revise these drawings to reflect the ditch and pipe locations and grades that have been verbally approved by Stantec and will soon be issued as an FCN.	The referenced ditch and pipe locations are being reviewed and discussed, and the outlet pipe may be moved to a location within the next design segment (see response to Comment #24). After the FCN is resolved, the drawings will be revised accordingly (in the 100% design submittal).

No.	Section / Para / Page	Reviewer Comment	Response to Comment
24.	SHT 04	Move the STARTING station from STA A160+50 to the existing "toe" of the Dike D slope, which is around STA A161+00 or even A162+00. There is no reason to have to excavate Dike D to build a working platform at a top elev of 754; and no reason to fill in a berm to build a working platform to a top elev of 765 – the contractor can build that short section together with the Lateral Expansion segment. The transition should be near-vertical.	Concur. The design will be revised to begin at Sta. A161+50. This change will allow removal of the Dike D rock buttress to be delayed until construction of Segment 2 (Lateral Expansion). In addition, the top-of-wall elevation for Segment 2 is being lowered, such that the transition slope in the profile at Sta. A160+50 to A161+16 needs to be changed. See the response to Comment #32, concerning transitions in the top-of-wall elevation.
25.	SHT 05	Delete the future slopes adjacent to the Swan Pond Road or within the future sediment control pond. That is future work that hasn't been designed yet and is not part of this package.	The North Berm and surface grading in this area of the site is a component of the stabilized perimeter design; without the North Berm, the PWS walls as designed in this area will not be stable in the post-earthquake condition. Hence, conceptual designs for these features must be included in this design package. As indicated by Note 6, the conceptual design shown may be refined in a future design packages, but these elements are required for seismic stability of the perimeter walls in the enclosed area.
26.	SHT 05	The North Berm (Detail 1, page 25) that has an arrow pointing to the North Berm area should reference Note 5 instead of Note 6. Note 6 is about the general layout of the Sediment Control Pond and Note 5 is specific to the construction of the North Berm. Add the word "FUTURE" to the arrow pointing to the "North Berm", and change the detail callout to Detail 1, page 08. But if the North Berm is future design package, it shouldn't be shown anyway.	Note 5 refers to the Rock Berm along the outer perimeter of soil-cement walls, and not to the North Berm. With changes to the design of the Rock Berm (see Comment #36), however, Note 5 is no longer needed and will be deleted. The North Berm, which will not appear on the revised Sheet 5, will be labeled as the "Future North Berm". The North Berm is included in this design package, as discussed in the response to Comment #25. Note 6 will be revised to reflect that it is applicable to both the North Berm and the area enclosed by the North Berm. The references to details on Sheet 25 are correct.
27.	SHT 05	Add the word "ROCK BERM" to the arrow pointing to the 2H:1V slope. That would be consistent with the callout for the Earthen Berm that you show on SHT 06. It would be appropriate to also add the detail callout to Detail 1, page 08.	Concur. The reference should be to Detail 2 on Sheet 08.
28.	SHT 05	Delete the callout to STAGE 1 DIKE C BUTTRESS. It doesn't really apply to this contract and there really is nothing shown there anyway.	The buttress is labeled for informational purposes and will be retained.
29.	SHT 05	The arrow titled "INBOARD LIMITS OF DEEP MIXING" doesn't appear to be pointing to any line. Add a clearer line of demarcation. (And change to "stabilized wall", of course).	The inboard limits of stabilization is not important to Sheet 5 and the call out will be deleted.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
30.	SHT 05	What does the dashed line outside of the wall represent? All excavation outside of the wall will be performed as a part of the excavation package and not this package. There are two conditions: current grades, and final grades. Show current grades as the latest LIDAR. Show final grades as pre-1951 embayment contours.	The dashed line on Sheet 5 is a boundary between two basemaps. A note and arrow will be added to provide clarification. The pre-1951 contours are shown within the boundary to represent approximate final grades after ash excavation (per Note 4). The basemap outside the boundary is based on the July 23, 2010, LiDAR survey, which was the most up-to-date mapping available when work for this design package began. It is not practical to update the basemap for each new LiDAR survey; doing so would require significant rework, and the cost and schedule implications are not justified. As previously established for the project, each design effort starts with a current basemap, but does not update for subsequent, periodic basemap surveys.
31.	SHT 06	There are transition slopes shown at about STA 161+00 and about STA 175+00. Indicate the maximum surface slope in the direction of that slope – is 2:1 acceptable? The baseline appears to indicate the top of the slurry wall to be elevation 754. Looking at the detail 1, sheet 7 – In order to achieve a 2% slope, one side of the wall is 756 and the other is 754, so the middle would be approximately 755. Clarify what “top of DSM” means – top of stabilized wall? Please clarify what Baseline A represents. It does not appear to be center of the walls or the center of the berm although center of the berm is more apparent in other cross sections.	The transition slopes are 6:1 (16.67%) as shown on Sheet 08. Steeper slopes are not acceptable. See response to Comment #32. The 2% cross-slope and top of stabilized wall elevations are depicted on the cross sections on Sheet 08-18. “Top of Deep Mixing” (or Top of Perimeter Wall Stabilization) refers to the top of the constructed walls to be achieved when the completed walls are graded off, prior to the construction of the embankment platform. Baseline A is a line to facilitate construction of the geometry described in the Drawings. The stabilized footprint is not centered on the baseline. For this segment, the earthen berm is centered on the baseline (this might not be the case for all segments); the baseline labels on Sheets 06 and 08 will be revised to more clearly indicate this design geometry.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
32.	SHT 07	The transition grades for the top of the stabilized wall are shown at 16.67% and 1%, respectively. Make these abrupt, steep slopes – 2:1 or steeper. The slurry method will create abrupt transitions, not long, flat transitions. Indicate the elevation of the top of the stabilized wall between STA 176+00 and 179+50 – the intent appears to be elev 761.00.	Near-vertical transitions are unacceptable for subsequent construction of the compacted earth berm. Steep or abrupt transitions in the profile, which would result in significant vertical exposures of the shear walls, will not be permitted. As indicated in Exhibit 20, differential soil pressures on the shear walls during construction have the potential to fracture the walls. The design profile uses slopes of 6:1 or flatter, which is consistent with the allowable differential backfill heights on the shear walls. For 3-ft thick shear walls built on 14.1-ft centers, the top of adjacent shear walls would need to step down 2.35 ft to follow the final 6:1 slope. Four-foot thick walls on 20.4-ft centers would step down 3.4 ft. We anticipate that the walls will be built to a level top surface, and then cut back to the design grades. The PWS Contractor will need to define and describe (in their Work Plan and/or Shop Drawings) the method for constructing the elevation transitions in the perimeter and shear walls. The top of stabilized wall along the baseline from Sta. 176+00 to 179+50 should follow the profile shown on Sheet 07. We will revise the design so the baseline profile will be level at Elev. 760.0 to Sta. A179+50. We will need to raise the top of wall to meet grade along Swan Pond Road, but that transition can be accommodated in the future design package (see response to Comment #46).
33.	SHT 07	Delete Note 4. There is no need to excavate out previous stone and replace with compacted ash. However, we need to warn the stabilization contractor that this stone layer exists, so that they can be prepared to “plug” it.	See response to Comment #17.
34.	SHT 08	Please consider moving the earthen berm further toward the inboard perimeter wall. Also consider reducing the overall height of the berm. Also consider steepening the interior slope of the berm to 2:1. These actions would allow the berm to be constructed BEFORE having to excavate the ash at the Rock Berm.	The berm crest elevation (765 ft) is an established minimum design criterion. Moving the berm reduces ash storage capacity and impacts planned final drainage patterns. The suggested changes would entail significant rework of the design and unnecessary schedule delays. The perimeter berm may be built in stages. The berm might be constructed to partial height on the inboard side, which would then allow ash stacking to proceed on the interior. With review and approval, the Construction Manager may stage the work in this manner without changing the design package.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
35.	SHT 08	Detail 1 (Station A175+00) and Notes 4 & 5: The "Limits of Excavation (See Note 11)" on the right side of the section contradicts Notes 4 & 5, plus our understanding of what ash is to be removed. This states that ash will be allowed to remain in a large portion of the area along the Northwest Corner of Embayment. This needs to be revised, since all ash is to be removed from the Northwest Corner.	This comment is not consistent with the project requirements for the ash removal. As indicated in Note 5, ash will be removed from the embayment outside the limits of the facility, in accordance with the approved work plan. The North Berm is located inside the footprint of the former ash pond and dredge cell, and is part of the facility closure design. Ash will be left inside in the North Berm, in the area bordering Swan Pond Road. On Sheet 8, the typical section in Detail 1 depicts an area behind the North Berm, and correctly references Note 11. The references to Notes 4 and 5 will be removed from Detail 1. The typical section in Detail 2 includes areas of the embayment, which will be excavated as indicated in Notes 4 and 5. Note 5 will be revised to indicate applicability to areas of the embayment outside the Rock Berm and the North Berm.
36.	SHT 08	Detail 2 (Station A164+00) and Note 10: Eliminate the temporary excavation of ash inside the perimeter wall. This is not practical, given the confines of the shear walls, to dig 4 ft down, then replace with excavated ash. This is a constructability and cost-tradeoff issue that needs to be resolved as a team. This design and requirement to temporarily excavate during excavation of ash on the exterior, will prevent any construction of the earthen berm until after ash has been removed from the middle embayment around Segment C. This is not practical, as construction needs to start on the earthen berm sooner and have a place to put the middle embayment ash inside the Dredge Cell. This is another reason to revise the Earthen Berm design to minimize size and location. This excavation area will be a trap for water during ash removal, will increase the cost, and will remove some of the stabilized material that will result from spreading out the spoils (residue or overflow) from the Outboard and Shear Wall construction.	This issue was discussed extensively during site meetings February 15 and 16. TVA asked Stantec to consider an alternative design that would replace the buttressed wall with a much thicker outboard perimeter wall. Preliminary calculations indicated that the outer wall would need to be about 12 feet thick, if the buttress walls were eliminated. The rock berm would be simpler to construct, but this design option would be significantly more expensive overall, due to the increased volume of soil cement. Instead, the design will be revised to eliminate the interior excavation of ash (between the shear walls). This will involve leaving a larger wedge of ash against the wall exterior, and will require additional rock in the berm. "Shot Rock" will be replaced with a durable stone aggregate, that will be easier to place between the buttress walls. While there are design details to resolve, this approach should be feasible. TVA Civil Projects indicated the modified design would be constructible. Replacing the buttress walls with a much thicker outboard perimeter wall will be considered as a backup design option.
37.	SHT 08	Suggest shading or adding pattern to the area designated as "SHOT ROCK" within the "ROCK BERM". Too many crossing lines to define limits clearly.	A hatch pattern for Shot Rock is included on Sheet 08. The reviewer may have had a poor quality reproduction.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
38.	SHT 08	It is confusing to show "typical" cross-sections, then also show specific station locations on them, followed up by cross-sections at regular intervals. Suggest just deleting the Station identifiers on SHT 08 (OR) give ranges where this typical section applies (e.g., STA 160+50 to STA 172+00 for the bottom detail and STA 172+00 to STA 179+50 for the top detail).	Concur. Specific station labels will be removed from Sheet 08, and will be replaced with the applicable range of stations.
39.	SHT 08	Please show where the CENTERLINE is and where the BASELINE is. It can be deduced that the offsets are from Baseline, but it isn't clear whether the Centerline coincides with the Baseline, or is offset 3.7 ft. In other words, is the earthen berm "centered" over the baseline whereas the stabilized wall is offset 3.7 ft? it isn't clear what the design intent is.	The centerline (offset = 0) corresponds to Baseline A, as labeled on Sheet 08. The Earthen Berm is centered on the baseline for this segment; the stabilized width is not centered on the baseline. The baseline label will be revised to more clearly indicate this design geometry.
40.	SHT 08	Show stone on the road on top of the berm, for haul road.	Stone may be added to the haul road as needed, but is not a required element of this design package. Only the outer geometry of the earthen berm has been defined here. Interior details of the earthen berm will be refined in the closure design package, as needed to accommodate cap requirements, including termination of the flexible membrane liner in the cover.
41.	SHT 08	Notes 5 and 9: This refers to the RAWP (July 28, 2010). Note that the excavation is shown in approved removal design package RDP-0112-A, and subsequent design packages as they are developed for approval. The RAWP does not delineate excavation of the ash. Change this same callout on all the other sheets that use this same RAWP callout.	The references will be changed to design package RDP-0112-A. This change will be implemented in Note 4 on Sheet 05, Notes 5 and 9 of Sheet 08, and Note 5 of Sheet 25.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
42.	SHT 08	Note 9: This says to excavate only to Elev 741.0. Then on SHT23, the section shows a 2:1 slope below Elev 741.0. Can a 2:1 slope be built in wet ash? Suggest that SHT23 be changed to a 4:1 slope below Elev 741.0, and that such a slope be shown on this sheet as well as a "typical" section when the embayment is below Elev 741.0.	Note 9 applies only to the area between buttress walls; the design intent is to excavate to the top of clay or to Elev. 741 ft, whichever is higher. (This detail may be revised – see response to Comment #36). Where this will leave ash in place, the area immediately outside the end of the buttress walls will be excavated downward on a 2:1 slope until the natural soils are encountered. This is depicted on all relevant cross sections on succeeding sheets (Stations A165+00, A166+00, A167+00, etc.) and on Sheet 23. Note that the 2:1 slope in ash represents a minimum excavation limit. The material may (or may not) slough during excavation, resulting in additional ash removal and an effective slope flatter than 2:1. Because this ash is of limited height and is backed by the soil-cement walls, temporary instability and sloughing during construction can be tolerated during the time before the rock berm is built.
43.	SHT 08	Note 11: Delete this note – there is no North Berm on this drawing.	Note 11 is applicable and refers to the area retained behind the North Berm, even though the North Berm itself does not appear within the limits of the cross section shown.
44.	SHT 08 Through SHT 18	Please explain the purpose of the 1.0' Embankment Platform (TDOT No. 10 screening product) sand layer. It appears to be a filter drainage layer, not a firm foundation layer. The specifications call for this to be installed in three 4" compacted layers. This will be a very expensive and difficult item to construct and maintain while the Earthen Berm material is placed, spread, and compacted on it. The area this sand layer is going to be placed on is not compacted material and this sand layer will probably be very uneven or destroyed by the time the two lifts of the Earthen Berm are placed. If this is to be a firm foundation layer, then a coarser material needs to be specified. If this is to be a drainage layer, then consider replacing this drainage layer with a geonet drainage composite, which is readily constructible. Or consider a geocell, which would be more readily constructible than three 4" lifts of loose sand.	The purpose of the Embankment Platform is to establish a firm base and construction platform for the Earthen Berm. While not designed as a drainage layer, this material would prevent the development of a saturated zone within the toe of the ash slope if the groundwater rose to levels above those predicted. The design has not used geosynthetics, to avoid the potential inclusion of a weak plane in a critical area of support for the landfill outslopes. A firm subgrade is required for construction of the compacted earthen berm. Proof rolling of the subgrade is required prior to placement of the Embankment Platform (see the response to Comment #5). The No.10 screening product layer thickness stated is a minimum constructed thickness. If deformation occurs, then more No. 10 product should be added To facilitate construction, the drawings and specifications will be revised to reflect two 6-inch lifts (instead of three 4-inch lifts) of the No. 10 screening product. An additional layer of compacted, coarse aggregate (minimum thickness of 3 inch) will also be included at the base of the earthen berm, to further stiffen the base prior to placement and compaction of the first embankment lift.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
45.	SHT 08	Station A162 and A163 RT edge appears to be 33.6 ft. Should it not be 33.3 ft and if not why. Is this supposed to represent a break on the berm or left edge? If so labeling needs to be improved to be able to distinguish the berm from the walls. Please show the elevations of the top of the inside and outside wall. Elevations appear to be 756 and 754; then on 10W217-17 at station 176+00 the elevations appear to change to 761 and elevation 759. Elevations should be marked on all cross sections.	The comment refers to Sheet 10. The noted label represents a break in slope on the Earthen Berm, on the ground surface. The offset of 33.6 ft is computed from the elevations and slopes of the ground surface. The label does not reference the interior face of the outboard perimeter wall (which would be at an offset of 33.3 ft, if the wall was 3 ft thick). To clarify, an additional label will be added to locate the outer face of the outboard perimeter wall (at 36.3 ft in this case). This will then provide all horizontal offsets needed to construct both the soil-cement walls and the earthen berm. The elevations of the top of the soil-cement walls at Baseline A are shown on the profile (Sheet 07). The top of stabilization elevations at the inside and outside limits may be computed using the offsets and cross slope. To aid layout during construction, we will add labels for the top of wall elevation at the extreme inboard and outboard limits (end of buttress walls) on all cross sections.
46.	SHT 17	The transitional horizontal change in the wall alignment away from the Baseline is confusing, and not uniform. If you make a transition, then make the wall straight between STA 176+00 and 179+50 (it is currently “bowed” or “segmented”). But this transitional shift is really so subtle and not entirely needed. Why not just keep all of Segment 1 at the same offsets: 53.7’ LT and 46.3’ RT? It is only 3 ft shift anyway, for all the confusion. Furthermore, extending the alignment of Dike C to the area of the Lateral Expansion would cause the wall to be built out over the side slope of the Dike C. Clarify: will Dike C be lowered, so that there is no construction on the slope? Or will the offset be shifted again at Dike D? Better yet, why not just increase the offset to more like 60’ LT and 40’ RT for all of Segment 1 and avoid any such shift?	The design of this segment was planned to include transitions to the next design segments. The horizontal transition from Sta. A176+00 to A179+50 was included to bring the alignment into the desired position for the Swan Pond Road segment. We agree, however, that this causes unnecessary confusion in the current design segment. This transition will be moved to the future design segment so that the offsets of the stabilized width will be kept constant (at 46.3 and 53.7 ft) between Sta. A176+00 to A179+50. Furthermore, the starting point for this design segment will be changed to Sta. 161+50 (see response to Comment #24). The horizontal and vertical transitions to the Lateral Expansion Segment will be accomplished in that future design package. Sudden shifts in horizontal alignment are being avoided In the overall perimeter design. The current plan is to maintain a straight alignment of the outboard perimeter wall at the junction of Segments 1 and 2, near the northern end of Dike D. We are currently beginning the design effort for the Lateral Expansion segment, and will need to consider all constraints for horizontal alignment, elevation of the top of soil-cement walls, and restrictions related to constructability.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
47.	SHT 17	Show the ash being excavated down to the pre-1951 contours in the northwest corner, which will require a "wedge" of ash to remain adjacent to the wall, sloping down to the bottom sediment. That slope should be consistent with the slope shown in "typical" sections below elev 741, but could also extend up above elev 741. Suggest the same 9-ft different in fill height on either side of the wall, would raise the elevation of the residual ash "wedge" within the buttress walls.	See response to Comment #35.
48.	SHT 19	Show the section at STA 179+50 in order to clarify what the offset is at the end station. The offset isn't shown on any other sheet except these cross-sections. Of course, if the offset is kept constant at 60' LT and 40' RT, there would be no need for this clarification. It is common practice to show the section at the actual start and end stations, however.	See response to Comment #46 - the offsets will be kept constant. The extra cross section at Sta. A179+50 will be added.
49.	SHT 20	Please change the "soil cement" wall to "stabilized wall" or "C-B". Suggest showing the Centerline and the Baseline on this sheet – even though it doesn't cover the full length of the wall Segment 1.	The term "soil-cement wall" will be retained. See the response to Comment #2. This is a typical layout of the soil-cement walls, and does not represent the actual construction layout in any particular location of the site. The layout with respect to the baseline, including station locations, will be shown on the approved PWS Contractor's Shop Drawings. See response to Comment #19.
50.	SHT 20	Show the Station location of the first shear wall, or at least one of the shear walls. The "spacing" may be regular, but at least one shear wall needs to be located so as to be able to locate all the others from it.	See response to Comment #19. The requested detail will be shown on the PWS Contractor's Shop Drawings.
51.	SHT 21	The transitions in elevation on both the east and west side of this section of wall should be relocated to better serve the site and make the coordination with haul roads and other site functions easier.	This Comment should reference Sheets 04 and 07. The top-of-wall transition in elevation was moved to its current location (at Station A175+00) as requested in Comment 6 of the 30% submittal review notes. This transition cannot occur to the east of the existing haul road, because this would make the outboard perimeter wall 6 ft taller. The taller wall would not be stable during excavations between the buttress walls. The transition at the eastern end will no longer be included in this design package, which will now start at Sta. A161+50. See response to Comment #24.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
52.	SHT 21	If the North Berm is constructed as a part of this package then site access for delivery of materials is lost. Delete the North Berm, since it should be future construction package.	This Comment should reference Sheet 05. The North Berm is necessary for the seismic performance of this design segment and will be retained. See response to Comment #25. Note that the crest in the North Berm will provide a potential access road for construction. Construction of the North Berm may be delayed until later in the project, to avoid the interruption of material delivery. Staging of construction for the various design elements should be planned accordingly by the Construction Manager.
53.	SHT 22	Detail 2 - The requirement to excavate on both sides of the shear wall to install the pipe is problematic. The wall should be designed so that the 5' or 6' of differential earth on either side of these walls will not cause a failure (as Note 2 suggests). If there is a problem with this scenario, then the scenario excavating outside of the outboard perimeter wall down 15' to 20' to remove the ash and place the buttress would also be a problem without a failure to the wall. The Perimeter Wall allows 9 ft differential earth on either side of the wall; this allows only 4 ft differential earth. Change to 6 ft and eliminate the excavation on the other sides of the shear walls. The pipe is only 5 ft deep to the pipe invert, so 6 ft should be suitable.	The restriction on excavations adjacent to the shear walls is required to provide stability and avoid fracture of the shear walls. The analyses supporting the 4-ft differential restriction is provided in Exhibit 20 of the Calculation Package. The restriction cannot be arbitrarily changed to 6 feet. While excavation on the backside of the adjacent wall will take time and effort, strengthening the wall is likely to be more costly. On the outboard perimeter wall, a greater vertical exposure can be tolerated because of the lateral support provided by the buttress walls.
54.	SHT 22	Move the pipe location to match what is being shown on the proposed FCN.	See response to Comment #23.
55.	SHT 22	Consider using 48" HDPE pipe in lieu of the 48" RCP; this will provide greater ease of installation, which would counter any increased pipe cost.	Concrete pipe was selected based on anticipated loading from heavy construction equipment. See Exhibit 24 of the Calculation Package.
56.	SHT 23	Delete this sheet. In order to construct the pipe through the wall to begin with, we'll have to excavate out the ash and put in the shot rock. So, we'll build the full length of pipe at one time, and don't need this "plan".	The sheet allows for a phased construction and will be retained for clarity. This does not preclude alternative construction methods or sequencing that provide for stability and promote worker safety.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
57.	SHT 25	Delete this sheet. The North Berm and sediment control pond are all conceptual and have not yet been designed. They are not included in this removal design package, but will be in some future package. The team needs to meet and discuss solutions for the sediment pond. The rock buttress should be built alongside the stabilized wall, so that the remaining ash can be removed, as required. There is no need to backfill the sediment control pond. The north berm can be built of earth fill, not all Shot Rock. The latest LIDAR survey has this area being relatively flat at Elev 760 or so, so that the "existing groundline" is not accurate.	The North Berm is necessary for the seismic performance of this design segment and will be retained. See response to Comment #25. See response to Comment #35, regarding the required removal of ash from the embayment adjacent to the facility perimeter. A conceptual design for the North Berm is shown in the drawings, as indicated in Note 6 of Sheet 25. The berm design can be refined, including selection of materials, in a future design package. Regarding the existing ground line, see response to Comment #30.
58.	SHT 27	Show on this sheet all new instruments to be installed. Are all of these instruments in place? If not what is the schedule for their installation? Will this take place after the wall is constructed or before?	No new instrumentation is proposed to support construction of this design package. The specifications allow for new instrumentation, if needed. The sheet legend will be revised to designate that the instruments shown are existing.
59.	General	Add page numbers (x of y) on all documents	Concur. The page numbers will be added on the 100% design submittal.
60.	Specs Special Conditions Section 1.4 & 1.5	Please define the terms and, more importantly, the roles and responsibilities for QA and QC.	The terms, roles, and responsibilities will be defined for the QA Manager, QC Manager, and QC Representative. See the response to Comment #61.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
61.	Specs Special Conditions	Sect 1.6. Revise to "Roles and Responsibilities Matrix". Delete the lines of authority or reporting between "boxes". This isn't an organization chart, but a definition of who is in what roles. For example, the Stabilization Contractor doesn't "report" to the Stabilization QA Manager – they report to the TCM directly. And the Earthwork Contractor doesn't report to the Earthwork QC Manager either. The "boxes" could be reformatted to a table format to eliminate the perception of organizational reporting structure. The team should reconsider the titles given to the QC Managers. Jacobs is still the overall QA Manager for the program; even though the QC testing for the stabilization is not done by Stantec, the "QC Manager" title could still be retained by Jim Andrew. This would be a lot less confusing than having separate roles for same people. This option would require that the Stabilization contractor not have a designated "QC Manager" – but there isn't one named in this Spec anyway, and GeoCon will likely be amenable to having a different title for their QC lead, like "QC Lead" or "Contractor Quality Control Manager".	In this specification section and others, we will adopt the following: • The "QA Manager" (Jacobs) will be responsible for the overall Quality Assurance for the Kingston Recovery Project, with a primary focus on ensuring compliance and documentation consistent with the TVA quality procedures. • The "QC Manager" (Stantec) for construction will be focused on reviewing and evaluating test data and other as-built information to check for compliance and consistency with the design. The QC Manager will represent the design Engineer of Record (Stantec) and will be a Professional Engineer licensed in Tennessee. • The "QC Representative" will be responsible for reporting QC data collected by the "QC Team" during construction. - Stantec will perform QC testing for the Earthwork Construction, and the QC Representative may (or may not) be the same individual as the QC Manager. - The Stabilization Contractor will have their own, separate QC Team. They will designate a QC Representative, who will be responsible for providing all QC data to the QC Manager. The lines on the chart were intended to indicate the flow of quality control data or information, not to indicate lines of authority. In the interest of better clarity, the chart will be replaced with a table as suggested.
62.	Specs Special Conditions	Section 1.6; When this is revised to be a "Roles and Responsibilities Matrix" it should be noted that there will be a separate TCM for the Stabilization Contractor; there really isn't a TCM for the Earthwork Contractor.	A table will be used to define the QA/QC functions, per the response to Comment #61. Clarification of the management relationship between the PWS Contractor and the technical contract manager (TCM) will be provided in Para. 1.1 of the Special Conditions.
63.	Specs, General	The tech specs are full of "deep mixing", "drilling platform", "soil-cement walls", etc wording that should be removed before submittal for approval.	See the responses to Comments #2 and #15. "Soil cement" will be retained. "Deep Mixing" will be replaced with "Perimeter Wall Stabilization" (PWS). "Drilling platform" will be replaced with "construction platform".

No.	Section / Para / Page	Reviewer Comment	Response to Comment
64.	Specs, general	There is no ash stacking in this specification. There are some backfilling operations for which obtaining a numerical compaction equal to 90% of Proctor just isn't constructible – for instance, for the 30-ft deep pipes that have to be removed. The team suggested a performance spec for incidental backfill, like "3 passes of a D-6 dozer".	There is ash placement where the existing ground surface is below the stabilization surface, and where obstructions are removed prior to soil-cement wall construction. See response to Comment #16. The specifications (and notes on the Drawings) will be revised to provide for different compaction standards in two areas: • On the interior side of the inboard perimeter wall, all ash placement will be considered part of "ash stacking" and subject to compaction requirements consistent with the ash stacking design packages. • Within the footprint of the perimeter wall stabilization, or any other areas outside of the inboard perimeter wall, the strength of the ash embankment is not critical to the performance of the closed dredge cell and less stringent compaction requirements are appropriate. The suggested performance spec will be adopted: "…no less than three passes of a D-6 (or equivalent) dozer or larger, on lifts that do not exceed 12 inches in compacted thickness."
65.	Section 02100	Other State or Local Plans – add Federal laws Non-Storm water Discharges – need to add that spill kits will be required. A disposal plan will be required and approved by TVA.	Will add Federal laws. We will also note that spill kits are required and that a disposal plan, subject to approval by TVA, will also be required.
66.	Spec 02100, 1.3.3	GeoCon's QC Lead won't be a PE – so if we don't reconsider the titles, this spec would have to be changed. If we keep Jim Andrew as the QC Manager overall, then no change needed to this spec.	See response to Comment #61. Section 02100 applies only to the work performed by the Earthwork Contractor. Stantec will be the QC Manager for the Earthwork.
67.	Spec 02100, 3.1.1	Erosion and sediment control is required by all contractors, not just the Earthwork Contractor. The Stabilization Contractor is required to comply with all erosion and sediment control and best management practices within their respective work areas. Rewrite paragraphs 3.1.1, 3.1.2, 3.1.3, and BMPs to make applicable to all contractors.	Section 02100 is germane only to the Earthwork Contractor. Section 02650 will be revised to include applicable components, from Section 02100, for the PWS Contractor.
68.	Spec 02100, Sect 3.1.3.3	Typo: "The CM <u>will</u> provide inspection…."	Concur.
69.	Spec 02100, Sect 3.2.2	Revise 2nd & 3rd sentence to read: "Install <u>silt fence</u> below proposed disturbed areas in accordance with the plans and details, and as needed in other areas to reduce sediment washing into <u>or from</u> work areas."	Concur with both.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
70.	Spec 02100, Sect 3.3	Consider deleting this section, Slope Protection: Most of the section duplicates what is already handled in the site wide SWPP and Jacobs qualified/certified inspector activity.	We prefer to keep this wording as a reminder to the Contractor of what is expected and we reference the SWMP elsewhere within this section of specifications
71.	Spec 02100, BMP Section	Sediment and Erosion Control Measures: #5 – This calls for temporary revegetation if no disturbance in 21 days where a previous section 3.1.2.2 stated 14 days. Do not place a time table and see comment 3.1.2.2.	These two items are actually saying two separate things; one is related to erosion control and the other to dust control. A timetable is needed to establish targets for temporary stabilization. To provide better clarity and consistency, the sections will be revised to read as follows: Paragraph 3.1.2.2: Control dust generation by spraying graded areas with water. If a graded area will not be disturbed again within the next 14 days, spray with Flexterra or equivalent hydromulch, at a rate of 2,000 pounds per acre, to control dusting. BMP - Sediment and Erosion Control Measures: #5: Re-vegetate areas as they achieve final grade. To control erosion, re-vegetate all areas where no additional disturbance is planned within the next 21 days.
72.	Spec 02100, BMP Section	Maintenance: Calls for check dams to be cleaned out when 1/3 full. TN BMP's call for ½. Please revise to be consistent.	Concur.
73.	Spec 02150 Section 1.3	Definitions: These duplicate many of the terms throughout the Tech spec sections which makes it much more cumbersome and does not add value. Note: as a suggestion, it would be very helpful to put all the "definitions" into a single section – the special conditions section would be perfect. That way, there would automatically be consistent language between sections and it would avoid the multitude of repetitious language in every section.	These definitions are shown in each section to be more consistent with a Construction Specifications Institute (CSI) format specification. This allows each section to stand alone. Since the defined terms will vary in Section 02650, it is helpful in this case to be repetitive.
74.	Spec 02150 Sect 1.3.8	Replace this definition with the definition for <u>Stabilization</u>.	"Deep Mixing" will be replaced with "Perimeter Wall Stabilization" (PWS). See response to Comment #2.
75.	Spec 2150 Sect 1.3.12	Revise per previous comment.	See previous response.
76.	Spec 02150, Sect. 2.1.3	Delete this section. CP generates the schedule for their work activities not the Construction Manager. Stabilization contractor will generate schedule as part of their contract requirement.	The specification references a general overall schedule depicting completion of milestones, not a specific work schedule.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
77.	Spec 02150, Sect. 2.2.1	Some instruments are already protected with concrete barriers rather than orange safety fence. The specification has "orange safety fence shall be installed", change to "may" and allow other protective measures.	We will note that the QC Manager may approve alternate means of protection. This revision will be made in this specification section, and in Note 14 on Sheet 02 of the drawings.
78.	Spec 02150, Sect. 2.2.1	Change the last sentence to reflect submittal of final construction survey points to QC manager not necessarily staking which is done off the construction drawings.	Section 2.2.1 does not address staking. In section 2.2.2 last sentence we will remove the reference to staking.
79.	Spec 02150, Sect. 2.2.5	Earthwork QC team is not defined in the definition section.	We will add a definition for the Earthwork QC Team, which works under the direction of the Earthwork QC Manager.
80.	Spec 2150, Sect 3.1	This section applies to the Stabilization Contractor as well, who must also make sure the laydown areas comply with regulations, that housekeeping is maintained, that trash is managed, etc. Revise to make applicable to all contractors.	Section 2150 is germane only to the Earthwork Contractor. Section 02650 will be revised to include applicable components, from Section 02150, for the PWS Contractor.
81.	Spec 2150, Sect 3.1	Clearing and Disposal – Second sentence: why mow and then grub if all of the organic material is going to the same place	Mowing is performed to reduce the volume of organic material and to allow better visual observation of the ground when scraping. Mowing also reduces continuity of organic material.
82.	Spec 02200 Sect 1.3	Definitions: duplicate definitions (see previous comment).	See response to Comment #73.
83.	Spec 02200 Sect 1.5	This section applies to the Stabilization Contractor as well, who must control dust from its operations. CP will provide water trucks for spraying, but GeoCon must control dust emissions.	Section 02200 is germane only to the Earthwork Contractor. Section 02650 will be revised to include applicable components, from Section 02200, for the PWS Contractor.
84.	Spec 02200 Sect 1.4	Delete this paragraph. The QC Manager is to monitor and report, not direct excavation widths and depths or make field changes or direct field work. The drawings and specs should clarify the requirements, and should not leave this up to subjectivity of the QC Manager.	The QC Manager is the Engineer of Record for construction. The role is not limited to monitoring or reporting, but includes any necessary design changes. No other entity can make design changes without the expressed written approval of the EOR. The specifications clearly state that such changes shall be routed through TVA and the regulatory authority.
85.	Spec 02200 Sect 2.2	Rock excavation will have to be performed where the last sentence indicates otherwise.	There is no rock excavation (excavation of intact or weathered bedrock) for the Earthwork Contractor portion of the project. Any riprap or other loose rock excavated is not considered rock excavation.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
86.	Spec 02200 Sect 3.1.1	Remove "Deep Mixing" or include Cement-Bentonite (C-B) or Slurry Wall to reflect what we are proposing to do. Explain why there is breakdown of different types of excavation – consider just defining one general type.	"Deep Mixing" will be replaced with "Perimeter Wall Stabilization". The definition of excavation types is provided to describe the envisioned work to the Contractor.
87.	Spec 02200 Sect 3.2	Typo: "….in the preparation of the subgrade for Stabilization and the preparation of subgrade after Stabilization…"	A comma is missing. We will correct the typo.
88.	Spec 02300 Section 1.3	Duplicate definitions – see previous commetn	See response to Comment #73.
89.	Spec 02300 Section 1.4	Delete this paragraph. The QC Manager is to monitor and report, not direct excavation widths and depths or make field changes or direct field work. The drawings and specs should clarify the requirements, and should not leave this up to subjectivity of the QC Manager.	See response to Comment #84.
90.	Spec 02300 Sect 1.5	The TCM can only designate what Engineering has approved as useable construction barrow material that has been tested.	References to the TCM will be eliminated in the Earthwork specifications and changed to TVA.
91.	Spec 02300 Sect 1.6	Delete : "…which the Earthwork QC Manager considers objectionable…" and replace with "other objectionable material." This spec should clarify what is acceptable and should not leave this up to subjectivity of the QC Manager.	Concur with first sentence. Acceptable materials are described in Part 3 of this section.
92.	Spec 02300 Parts 2, 3	Terminology is mixed. Use "Earthen Berm Materials" to match the drawings instead of the various interchangeable uses of terms like "earth materials" or "earthfill materials" or "embankment materials in paragraphs 2.1 and 3.1 and 5.2.	Will make material call outs as "Earthen Berm Materials" throughout these sections.
93.	Spec 02300 Para 2.1	Delete "Approved" from header. Delete the 2nd sentence in its entirety. Neither the QC Manager nor the Construction Manager is going to direct CP in where to stockpile earthen berm materials. And there will be no "approval" process.	"Approved" will be deleted from the header. The second sentence will be retained. The Contractor should not put stockpiles in a ditch, load the Dredge Cell, etc. The QC Manager and Construction Manager will not direct stockpile location - that is up to the Contractor to propose. This is meant as a concurrence measure. The approval process does not have to be adversarial; the location approval will be documented in daily field reports by the QC Manager.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
94.	Spec 02300 Para 2.2	Delete "Rock Berm" – there is a whole separate specification 02350 for the rock berm, and that material isn't included anywhere else in Spec 02300. In the first sentence, this para says "directly incorporated into the work" – yet para 5.3.1 says it must be stockpiled onsite so that there is time to get test results back. Rectify this conflict. Delete the 2nd half of the sentence in its entirety. Neither the QC Manager nor the Construction Manager is going to direct CP in where to stockpile earthen berm materials. And there will be no "approval" process.	Concur with deletion of "rock berm". The first sentence in Paragraph 2.2 reads "Such material shall be delivered to the site and directly incorporated into the work or stockpiled at approved locations adjacent to the Work". The word "or" allows flexibility. Paragraph 5.3.1 states "EARTHWORK CONTRACTOR shall obtain the No.10 screening product material soon enough to allow QC testing as to ensure that acceptable material is available at the time required for proper utilization in the embankment." This does not direct the Contractor to stockpile on site as the material can be tested at the point of last stockpiling, which can be the quarry as stated in Section 4.3.1 (B) of the QC Plan. The second half of the sentence will be retained. See response to Comment #93.
95.	Spec 02300 Para 3.1	Change "organic" to "objectionable" to match para 1.6. Delete the 3rd sentence entirely – the role of the QC Manager is defined in the CQCP, not here.	Concur. This is an appropriate location to inform the Contractor that the suitability is subject to approval. How the QC Manager will do this is defined in the QC Plan.
96.	Spec 02300 Sect. 3.2	Putting sand down and placing clay material above will be difficult at best. Please evaluate other alternatives to relieve water pressure behind the wall that are simpler and less expensive.	See response to Comment #44. This section of the specifications will be revised accordingly.
97.	Spec 02300 Sect. 3.3	Delete this section: no value added.	The section will be retained. Water sources for achieving moisture content or dust control are important information for the Contractor and for the reviewer.
98.	Spec 02300 Sect 4.1	Revise header to "Subgrade Preparation for Earthen Berm". Revise first sentence of para 4.1.1: "Following completion of the stabilized wall construction, the subgrade shall be …" Revise last sentence of para 4.1.1: "Soft materials shall be stabilized to achieve a surface that will accommodate construction equipment…" The surface preparation was based on DSM while the C-B contractor is using an excavator and crane mats to support equipment. This section needs to reflect tracking with D-6 dozer after close to grade. Some bridging may be necessary but the contract is written with no guarantee for the Slurry Wall contractor.	Concur – the header will be revised. The first sentence will be revised to read: "Following completion of the Perimeter Wall Stabilization, the subgrade shall be . . ." Concur with revision to last sentence. The condition of the subgrade prepared for the Perimeter Wall Stabilization work is addressed in Section 02650, Paragraph 1.1.5.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
99.	Spec 02300 para 5.2.1	Delete the 2nd sentence in its entirety. This is specifying CP sequence of borrow material excavation. Leave that to CP.	The second sentence does not direct the Contractor in means and methods. It simply instructs the Contractor to have the right material ready for construction so there are no schedule delays.
100.	Spec 02300 para 5.2.2 and para 5.3.2	Format: Both of these paragraphs should be moved to para 5.1, since they are general requirements that apply to both types of embankments.	Concur.
101.	Spec 02300 para 5.3.1	Revise to allow two 6-inch lifts. It is achievable to obtain satisfactory compaction on a 6-inch lift of granular material. Thinner lifts would cause other risks of material degradation and constructability, especially when the whole layer is to be built to a 12-inch thickness.	Concur. See response to Comment #44.
102.	Spec 02300 Para 6.2	Delete the first sentence in its entirety. It repeats "spreading" and the repetition isn't needed. Revise the moisture content range to within four percent or provide justification for the basis of why 4% is not an acceptable range. The 3rd sentence says "with sufficient moisture". This is a different criterion – so is it required to provide a narrow range of optimum, or is it acceptable to provide only sufficient moisture? These are conflicting requirements. Delete the 4th sentence in its entirety. Testing is defined in the QC Plan by definition and doesn't need to be pointed out in this one place in the specifications.	Concur, delete first sentence. The moisture content is specified to be within +/-2% of optimum, which is a range of 4%. To improve clarity, the sentence will be re-phrased to read "… shall be maintained at a moisture content no drier than optimum minus 2% water content, and no wetter than optimum plus 2% water content, where optimum moisture content is determined by ASTM D-698." The 3rd sentence only applies to #10 screening product. The moisture range specified is for the soil. Concur, delete fourth sentence.
103.	Spec 02300 Part 7	Para 7.1.1: Delete "…in the opinion of the Earthwork QC Manager…", and delete "…in an approved (by the Earthwork QC Manger) manner…" and delete again "..in the opinion of the Earthwork QC Manager. This spec should clarify what is acceptable and should not leave this up to subjectivity of the QC Manager.	The specification allows some latitude to the QC Manager to make adjustments in the moisture content, based on response of the material to passes of equipment. The variability in materials from various portions of a borrow area and potential mixing of soils may cause rejection of a properly compacted lift that does not exactly conform to a specific Proctor test result.
104.	Spec 02300 Para 7.1.1	Replace "the prepared foundation" with "<u>a completed layer</u>", since this spec is really describing surfaces between layers (lifts).	Concur.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
105.	Spec 02300 Para 7.1.2	Replace "will be crowned" with "shall be sloped". The top of the wall is sloped in one direction, and the berm can be sloped that way as well – no need to build a "crown". Delete: "with a smooth drum roller". Earthen materials around here will be clayey and should be compacted with a sheepsfoot or rubber tired roller to create a rough interface. A smooth interface is not only unneeded, it is detrimental to lift bonding.	Concur. The use of a smooth drum roller described in the paragraph is for end of day activities to promote runoff of water. It is not a compaction specification. Paragraph 8.1.1 describes the use of a tamping foot roller for the soils.
106.	Spec 02300 Para 8.1.1	In 2nd sentence, replace "contains" with "conditioned to"	The proper terminology for this purpose is "contains". We don't know that the material needs to be conditioned.
107.	Spec 02300 Para 8.1.2	Revise to within 4% of optimum. Revise to 6-inch lift. Delete "or as established by the Earthwork QC Manager based on field observations and testing." This spec should clarify what is acceptable and should not leave this up to subjectivity of the QC Manager. Delete the last sentence in its entirety. This spec should clarify what is acceptable and should not leave this up to whim of the QC Manager. In addition, this platform is sand with very little fines; it isn't practical to expect heavy equipment to drive over 4 inch lifts of sand or to make several "passes" of equipment. Specify the compactive effort or specify a density requirement.	The moisture content is specified to be within +/-2% of optimum, which is a range of 4%. To improve clarity, the sentence will be re-phrased to read "… moisture content shall be no drier than optimum minus 2% water content, and no wetter than optimum plus 2% water content, where optimum moisture content is determined by ASTM D-698." Concur on 6-inch lift for #10 screening product. See response to Comment #44. See response to Comment #103. "Construction Manager" will be changed to "QC Manager" in the last sentence. This specification gives the QC Manager latitude to decrease the number of passes. The intent is to provide a platform that will accommodate construction equipment.
108.	Spec 02300 Para 8.2.2	4 inch lift is difficult – Please change to 6 inch lift.	See response to Comment #101.
109.	Spec 02310 Sect. 1.3	Duplicate definitions – see previous comment.	See response to Comment #73.
110.	Spec 02310 Sect. 1.4	Last sentence requires supplier to certify flowable fill to meet project requirements – need to reference section 2.1 or 204.06 (b) of TDOT.	Concur.
111.	Spec 02310 Sect 2.1.3	The QC plan should require the inspection of pipe and fittings if required. What are 5 copies of handling instructions required for?	Two copies are for the Contractor and one copy each for TVA, the QC Manager and Construction Manager.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
112.	Spec 02310 Sect 3.2.1	Backfill material will be flowable fill for the one pipe. There are no other pipe trenches shown on the existing 90% drawings. Why have 3.2.1? Why no rock excavation?	The definition of excavation types is provided to describe the envisioned work to the Contractor. There is no rock excavation (excavation of intact bedrock) for the Earthwork Contractor portion of the project. Any riprap or other loose rock excavated is not considered rock excavation.
113.	Spec 02310 Sect 3.2.3	The drawings show excavating to the shear wall so we cannot excavate any wider than that to accommodate sheeting and bracing.	Noted.
114.	Spec 02310 Para 3.5	Require continuous placement of flowable fill until 12" above top of pipe. If flowable fill is not placed in lifts, the concrete pipe will float.	The word "continuously" refers to placement along the length of the pipe. In other words you do not place flowable fill in segments but in long linear lifts. The specification allows placement in lifts.
115.	Spec 02350 Sect 1.3	Duplicate definitions.	See response to Comment #73.
116.	Spec 02350 Sect 2.1	Revise to "Shot rock used <u>to construct the Rock Berm</u> shall consist of…"	This specification section will be changed, to improve constructability in response to Comment #36. The Rock Berm will be constructed of No. 2 aggregate, No. 57 aggregate, and stone riprap.
117.	Spec 02350 Sect 3.2	Delete this paragraph in its entirety. The subgrade will be approved based on ash removal to maximum elev 741 ft msl, not on an approval by the Earthwork QC Manager. Furthermore, it is not required to specify how CP will construct its haul roads or to surmise the acceptability of aggregates remaining on haul roads. This specification is not the place for that.	There will be concurrence that the subgrade elevation and the lines and grades designed have been met. This approval is not meant to be contingent upon a bearing strength or performance criteria and none has been specified here. Rock Berm construction occurs along the outslope and also with the North Berm construction. This language is consistent with Dike C Buttress Construction specifications. It is important to inform the Contractor that stone contaminated with ash will not be allowed to stay in place outside of the Dredge Cell. The haul road locations and means and methods are not being specified. The word "may" is utilized indicating that the Contractor has a choice.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
118.	Spec 02650	This specification needs to be revised in its entirety. It should be retitled “STABILIZATION”. Terms “deep Mixing” and “soil-cement” should be replaced with “Stabilization” and “stabilized material”. Methods should focus on slurry wall, with other methods as secondary options, except delete jet grouting entirely. Paras 1.4.8, 1.4.9, 1.4.10, 1.4.11, 1.4.13, 1.4.14, 1.4.15, 1.4.16 don’t apply anymore.	See response to Comment #2. The title of Section 02650 will be changed to “Perimeter Wall Stabilization”. Section 02650 is a performance specification, written explicitly to allow consideration of a range of construction proposals. It is not necessary to now customize or tailor this section to fit only the method of construction proposed by the selected contractor. We agree that some definitions and terms need to be expanded to better represent slurry trench methods, but text that does not conflict with slurry trench can be retained. While we expect the selected contractor and method of construction will be successful, it is still possible that other proposed methods meeting the requirements of this specification will need to be reconsidered. There are thus advantages to maintaining the generic aspects of the specification as currently written. The noted paragraphs continue to apply and will be retained, albeit with some revision: • Para. 1.4.8 (1.4.10 after revision): “Deep Mixing Method” will be replaced with “Perimeter Wall Stabilization”. The definition will be generalized to include slurry trench methods. • Para. 1.4.9 (1.4.11 after revision): “Drilling Platform” will be changed to “Construction Platform”. • Para. 1.4.10 (1.4.12 after revision): The definition of “Mixing Tool” will be expanded to include a trench excavation tool. • Para. 1.4.11 (1.4.13 after revision): Will add a sentence indicating that “Mixing Pass” does not apply to excavate and replace methods, such as self-hardening slurry trench. • Para. 1.4.13 (1.4.15 after revision): The term “Soil Cement” will be retained, but expanded to include self-hardening, cement-bentonite slurry that replaces excavated soils. See response to Comment #2. • Para. 1.4.14 (1.4.16 after revision): The definition of “Grout” is applicable as is. • Para. 1.4.15 (1.4.17 after revision): The definition of “Cement Factor” is valid for slurry trench wall. • Para. 1.4.16 (1.4.18 after revision): The last sentence of this paragraph indicates how a “Soil-Cement Column” will be defined for slurry trench construction.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
119.	Spec 02650 Para 1.1.4	Since the term "Earthwork Contractor" is noted here it needs to be defined in section 1.4 under definitions. Drilling platform is crane mats for excavator. Delete or qualify TS section. The second and third paragraph reflects work outside the scope of this section of the North Dredge Cell – Is this spec for more than just the North as noted on the cover?	A definition of "Earthwork Contractor" will be added under 1.4. As noted in the third sentence under Para. 1.1.4, crane mats (timber or other material) may be used in the construction platform. It is not clear what the reviewer meant by "TS section". The specification will be applied to other segments of the perimeter.
120.	Spec 02650 Para 1.3	Verify that ASTM D1633 is the correct compressive strength standard for cement-bentonite walls; the standard is for Soil-Cement Cylinders.	The standards cited for sampling and testing the soil-cement will be revised to reflect more appropriate methods: ASTM D4832 for molding wet grab specimens, ASTM D2113 for the cored specimens, and ASTM C39 for testing of both.
121.	Spec 02650 Sect. 1.4	Duplicate definitions that describe a process most likely not used – need to define Cement Bentonite.	With previously noted changes in terminology, these definitions apply to slurry trench methods. See response to Comment #118.
122.	Spec 02650 Sect. 1.5 General	Change to also reflect Cement Bentonite slurry wall (Sections 1.5.5, 1.5.7, 1.5.9, 1.5.10, 1.5.11, 1.5.13.	With previously noted changes in terminology, these paragraphs apply to slurry trench methods. See response to Comment #118.
123.	Spec 02650 Sect. 1.5.3	This information was provided for contract evaluation.	Noted.
124.	Spec 02650 Section 1.5.4	Needs to be revised to be applicable for excavation – not a drilling platform.	The specifications will be changed to use the term "Construction Platform".
125.	Spec 02650 Para 1.5.7	Need to revise this mix design requirement to reflect a cement-bentonite wall. Also, it will be difficult to get 56 day results, or even 28 day results, 15 days prior to construction. This schedule needs to be revised.	The mix design requirement is applicable to cement-bentonite. Regardless of concerns for schedule, test results from the mix design program are needed to demonstrate the adequacy of the mix prior to construction. Without strength test results provided in advance of construction, it would be impossible to know that the proposed materials will meet the design requirements.
126.	Spec 02650 Para 1.5.12	Having the contractor provide shop drawings 30 days prior to construction is not reasonable. They will not have an approved design in order to make this schedule.	Adequate time is needed for the review of the shop drawings to confirm that they meet the design intent.
127.	Spec 02650 Para Part 2	Under products, include bentonite, slag, and any other materials that are pertinent for a cement-bentonite wall. The whole section needs to be reworked to reflect the use of cement bentonite slurry.	See the response to Comment #118. Bentonite and the other potential materials can be considered "Grout Admixtures".

No.	Section / Para / Page	Reviewer Comment	Response to Comment
128.	Spec 02650 Para 2.2.3	Why did the compressive strength requirements change from the previous revision?	The compressive strength requirements are consistent with the current design, and are derived from analysis (see Exhibit 16 in the Calculation Package). These analyses and results were affected by changes in the geometry of the cross section, reflecting refinements implemented in the design process.
129.	Spec 02650 Para 2.2.4	Why is the contractor now required to take core samples? It had been determined that wet grab samples were acceptable and preferred for the slurry trench method.	See Comment #177. External peer reviewers (USACE and URS) disagreed, arguing that wet grab samples were not sufficient for judging acceptance. Coring provides for more reliable measurements of material strength and, importantly, an indication of uniformity or heterogeneity within the completed walls.
130.	Spec 02650 Sect. 2.3	Wall Layout – Are all the subsections, tables, and formulas identical with C-B slurry walls and just need to be worded accordingly?	Yes - the referenced requirements do not need revision in this regard.
131.	Spec 02650 Sect. 3	Need to reflect C-B wall technology	With previously noted changes in terminology, these paragraphs apply to slurry trench methods. See response to Comment #118. Para. 3.2.1 (Mixing Equipment) will be augmented to include requirements for the excavation equipment used with slurry trench methods. The other paragraphs of this section do not need modification.
132.	Spec 02650 Para 4.2	Note when the Health and Safety Plan and the Mobilization Plan are required to be submitted and list these in Section 1.5, Submittals. Alternatively, leave the submittals clauses to the contractual documents, and delete from this specificiation.	The referenced submittals will be added to the Submittals paragraph.
133.	Spec 02650 Sect. 4.3.1	Paragraph 2 appears to be misleading as the specification and drawings appear to dictate the dimensions and spacing on the walls and the contract. Delete second sentence as it is covered in other sections.	The referenced paragraph is correct, and makes reference to other paragraphs as needed.
134.	Spec 02650 Sect. 4.3.2 & 4.3.3	Delete – Duplicate from other section	The requirements of Section 02650 apply to the Perimeter Wall Stabilization Contractor. The requirements in other sections apply to the Earthwork Contractor.
135.	Spec 02650 Para 4.3.4	Revise this section to reflect what TVA surveyors will stake for the contractor and what the stabilization contractor will need to do themselves. Paragraph not consistent with contract discussions.	The section will be modified. Based on the approved Shop Drawings, TVA surveyors will stake out every other shear wall at three points on the shear/buttress wall centerline: end of the buttress wall, centerline of the outboard perimeter wall, and centerline of the inboard perimeter wall.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
136.	Spec 02650 Sect. 4.3.5	Change to also reflect C-B slurry wall.	With previously noted changes in terminology, this paragraph applies to slurry trench methods. See response to Comment #118.
137.	Spec 02650 Sect. 4.3.6	Delete – no longer applicable.	With previously noted changes in terminology, this paragraph applies to slurry trench methods. See response to Comment #118.
138.	Spec 02650 Sect. 4.3.7	Does this section not duplicate the requirement for details on shop drawings? Are tests required to verify joints are as strong as required?	The requirements are not duplicated. Testing of the joints is not required. See also the response to Comment #164.
139.	Spec 02650 Sect. 4.3.8 (9,11, 13,14,16)	Change to also reflect C-B slurry wall.	With previously noted changes in terminology, these paragraphs apply to slurry trench methods. See response to Comment #118. Para. 4.3.8 (4.3.9 after revision) will be augmented to cover excavation equipment that would be used with slurry trench methods. Para. 4.3.13 (4.3.14 after revision) will be revised to allow the Contractor to propose alternate criteria for approval. The other noted paragraphs apply without revision.
140.	Spec 02650 Sect. 4.3.10 And 4.3.12	Delete, as these to not apply to a C-B wall.	With previously noted changes in terminology, these paragraphs apply to slurry trench methods. See response to Comment #118. Para 4.3.10 (4.3.11 after revision) will be modified to indicate these requirements do not apply if materials excavated from the trench are replaced completely with grout.
141.	Spec 02650 Sect. 4.4	Tolerances: Need to reflect the slurry wall technology and methods for verifying vertical alignment, depth verifications, and centering of wall.	With previously noted changes in terminology, these paragraphs apply to slurry trench methods. See response to Comment #118. The tolerance for horizontal alignment will be revised, per Comment #170.
142.	Spec 02650 Sect. 4.5	Change to also reflect C-B slurry wall.	With previously noted changes in terminology, this paragraph applies to slurry trench methods. See response to Comment #118. The requirements for managing spoils (defined in Para. 1.4.14) are the same for slurry trench methods of construction.
143.	Spec 02650 Para 4.6	Note the details of what will be included in the demonstration project, i.e., note that the demonstration will reflect the current design with buttress wall, rock embedment requirement, overlaps, etc., rather than just a “continuous, linear” 150’ wall.	The demonstration section will be expanded to involve a total wall length of at least 400 ft, with three 100-ft long shear/buttress walls, a 50-ft inboard perimeter wall, a 50-ft long outboard perimeter wall, and 6 connections between these walls. Full rock embedment will be required. This will result in 50-ft of stabilized perimeter to the full dimensions of the design layout.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
144.	Spec 02650 Sect. 4.7 and 4.8	Change to reflect C-B slurry wall and these need to be consistent with contract discussions for bid purposes.	See responses to Comments #61 and #118.
145.	Spec 02650 Sect. 4.9 – 4.11	Change to reflect C-B slurry wall.	With previously noted changes in terminology, these paragraphs apply to slurry trench methods. See response to Comment #118.
146.	Spec 02650 Para 4.8.1	Item 3; in earlier correspondence the contractor was told they can discard material greater than 0.5". Why were several bullets from the previous revision omitted in this revision? There is no bullet that states that we will need 14, 28, 56 day breaks plus a spare; has this changed?	Item 3 will be revised to clarify: soil particles are to be cut to pass the 0.5 inch opening, but rock fragments retained on the 0.5-inch sieve may be discarded. The acceptance criteria for soil-cement strength has been changed to use core samples, instead of wet grab samples (see response to Comment #129). Wet grabs are still required as part of the Contractor's QC Program. Testing requirements will be defined in the approved QC Plan, and were thus deleted from this paragraph in the specifications.
147.	Spec 02650 para 1.1.4	Last para: Revise to "as steep as 2:1" or steeper; there needs to be an abrupt change in elevation, not gradual slopes between sections of the slurry wall (or sections of a DSM wall for that matter). Delete the last sentence in its entirety. The 1700 ft of Dike C at the Lateral Expansion aren't in this package. Furthermore, the stabilized wall alignment will have to be redesigned so that it doesn't occur over any 3:1 outboard slope of Dike C.	See response to Comments #32 and #119. Vertical or abrupt changes in elevation are not tolerable; the maximum slope along the alignment is 6:1. Concur with deletion of the last sentence. The selected method of construction will be unable to construct shear walls across a 3:1 side slope. Moreover, changes in the design criteria (related to Ash Pond water levels) for the Lateral Expansion Segment will facilitate design changes that will eliminate the need to construct across this side slope on Dike C.
148.	Spec 02936	This should be part of the closure plan after the FML and clay cap have been placed. At this stage of dredge cell closure we should be preventing erosion.	This section of the specification will be retained in this design package. Areas that will be disturbed for any appreciable time without further disturbance will need to be revegetated. Depending on how construction sequencing occurs, some areas may be constructed a year or more before the final in-fill and capping occurs.
149.	CALCS	Exhibit 1: Page 3, Table 1, why is the ash pond segment not included?	The Ash Pond segment should be included - the table will be corrected.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
150.	Section 02650	General comment – the role of a Quality Assurance Manager is not to approve work. 1.5.2 Work Plan – 1 – Contractor to provide certifications of it operators and batch plant operators 1.5.2 Work Plan – 3 – Add spill kits are to be provided. 1.5.3 Description of Equipment – Calibration documentation and a calibration plan is required to be provided. 1.5.9 Remediation Plan for Defective Soil-Cement Walls – a repair procedure will be required. Contractor to provide Lab certifications, Material and Mix design plan, QC plan, Batch Plant equipment calibration documentation.	The roles and responsibilities within the QA/QC program will be redefined - see the response to Comment #61. 1.5.2. Certifications are not required. 1.5.2. Requirements to provide spill kits will be added to Section 02100. See response to Comment #65. 1.5.3. Requirements to provide calibration documentation and a calibration plan for instruments will be added. 1.5.9 (1.5.8 after revision). Concur. A repair procedure will be required as part of the Remediation Plan. Requirements as noted will be included.
151.	QC Plan Sect. 4.1	What does treated and untreated ash surfaces mean in the second paragraph?	That reference will be removed. It was referring to ash treated with lime as a moisture conditioning agent, which is not applicable here.
152.	QC Plan Sect. 4.2.a	How is subgrade to be compacted within the walls that are built? This is before the #10 screenings material is added then why not compact the material above?	The subgrade can be compacted by roller after the wall has met its designated strength.
153.	QC Plan Sect. 4.2.c	How are the slurry walls to be protected from heavy equipment and still cover the entire area?	Once cured, the top portion of the slurry walls will have strength comparable to that of flowable fill and passes of equipment will not be detrimental to the design intent.
154.	QC Plan Sect. 4.3 2b and d	This 4 inch lift seems to be overkill for screenings and how do you scarify without spending excessive time and effort? What bond did we have in the subsurface ash?	See response to Comment #44. Six-inch lifts will be used for the screening product. Scarification can be achieved by tracking, bucket teeth or anything that roughens the surface. The subsurface ash is a sluiced product. It was not smooth-drum rolled nor was it part of an engineered fill.
155.	QC Plan Sect. 4.3.2.c	How does a roller get around in the lattice structure of shear walls? It doesn't appear practical.	See response to Comment #152.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
156.	QC Plan Sect. 4.4.2.C	Why specify the moisture and the proctor? The proctor alone will make the moisture be within an acceptable range. Specifying both may yield a situation where one is met and the other one isn't.	Soil properties, particularly for clayey soils, will vary with both density and compaction water content. Moisture content is specified in addition to density to help an embankment maintain its density after placement. Placement well above the wet side of optimum moisture content can lead to subsequent rutting and pumping. Placement well dry of optimum results in increased compactive effort and potential changes in density later when the material becomes saturated. The specifications in 4.4.2.c, for both relative compaction and water content, are commonly used in earthwork construction. Based on widespread industry experience over decades, these specifications are necessary to obtain good performance in compacted soil embankments.
157.	QC Plan Sect. 4.4.2.g	Final vegetation should be done at a later date as top soil would be needed to make vegetative material grow long term.	See the response to Comment #148. This is not "final" in terms of closure but in terms of preparing the slope to allow revegetation. Based on sequencing of construction, areas may remain undisturbed for periods ranging from months to over a year before in-fill and capping occur. The earth berm can be treated with soil amendments that allow grass to grow without needing topsoil.
158.	QC Plan Section 4.5	Why specify the moisture %. The proctor should be sufficient. This is a requirement that is not met by the majority of the area that is currently close to grade – why not track the fill material in with heavy equipment (i.e. trucks, pans, D-6 dozer for fill).	The moisture content requirements in Section 02300 of the Technical Specifications are consistent with previous ash stacking. Moisture content is subject to change based on the response of the ash material to passes of equipment. As stated in the response to Comment #64, ash backfill within the footprint of the stabilized perimeter will not be held to the same standard.
159.	QC Plan Section 5.3.2.d	This requires 36" of riprap/shot rock below water level. The drawing reflects that shot-rock invert is 741' elevation for several cross sections shown. This would be 4' above water level in the winter.	5.3.2.d will be deleted. Lines and grades are sufficient.

Document Title:	90% Removal Design Package for North Dredge Cell (Dike C) Perimeter Containment				
Document/RDP No.:	RDP-0113-E	Project No.:		WBS Code:	011303
Reviewed by:	Multiple	Organization:	TVA, Jacobs, USACE, and others	Date:	Feb 15, 16, 24
	The comments below were communicated verbally during project review meetings held at the Kingston project site on the dates noted				
Response by:	Multiple	Organization:	Stantec	Date:	11 March 2011

No.	Section / Para / Page	Reviewer Comment	Response to Comment
160.	Sheet 08 Note 10	Revise the design so that the interior excavation between the shear walls is not required for stability during construction of the rock berm. This will improve constructability of the design.	The rock berm next to the buttressed wall will be re-designed with this goal. The revised design will likely leave more unexcavated ash between the buttress walls (outside the outboard perimeter wall), require more rock in the rock berm, and may necessitate restrictions on construction loads at the top of the excavated walls.
161.	Sheet 08	Consider using a smaller gradation of stone for the rock berm. Shot rock will be difficult to place in the area between the buttress walls.	We will specify a durable stone aggregate. The strength of this material is important, but a wide range of materials will perform satisfactorily. A smaller aggregate gradation that can be constructed more easily will be acceptable.
162.	Spec 02650 Para 1.5.8	The specifications should indicate that the Contractor's QC Plan must include testing of wet grab samples, at a frequency to be specified in the approved QC plan.	Concur.
163.	Spec 02650 Para 4.3.6	Depending on the method and sequence of construction, joints can be expected to develop in different places at the intersection of the shear walls and perimeter walls. Do the specifications need to establish a required sequence?	Yes - a new requirement will be added to Para. 4.3.6. If the wall overlaps are formed by cutting through or across a previously completed wall, then joints will occur in the first wall along both faces of the newer wall. At the outer intersections, the shear/buttress wall shall be built first, and the outboard perimeter wall shall be built last and cut through the shear walls. The inboard perimeter wall may be built first, but only if the shear walls are not cut through the inboard perimeter wall.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
164.	Spec 02650 Para 4.3.7	We may need acceptance criteria for the joints in the soil-cement walls.	Because the slurry trench method results in relatively long, continuous panels, construction joints will occur only at certain locations in the layout. Joints were considered in the design analyses; the FLAC3D calculations (see the revised Exhibit 21) show that the design will perform satisfactorily, even with partial strength at the expected joint locations. The focus here is on defining what final product is acceptable, with consideration for slurry trench construction methods. Acceptability criteria for the joints are difficult to quantitatively define or measure by testing. Hence, the criteria are defined in terms of soil-cement age at the joint. For now, construction joints older than 7 days will be considered “cold joints”. This criterion may be modified after the demonstration test or later during the project, on the basis of tests and field observations. A reinforced or thicker joint will be required where construction creates a cold joint. No special treatment is required for joints not classified as cold joints. The following (draft) language will be added to the specifications (Section 02650): **Definitions** • A “construction joint” is any connection, including butt joints and tee joints, between two or more soil-cement walls that are constructed on different days. • A “butt joint” occurs where the end of one soil-cement wall is connected to the end of a previously constructed soil-cement wall, forming a longer wall segment along the same general alignment. • A “tee joint” occurs where one soil-cement wall intersects another soil-cement wall, where the intersecting walls are generally perpendicular to one another. The joint itself occurs where the newer and older soil-cement materials meet. • A “cold joint” is a construction joint that requires reinforcement or strengthening. The criteria for classifying a cold joint are provided in Para. ____ **Construction Joints** Construction joints, including butt joints and tee joints, that are formed with an existing wall that is more than 7 days old shall be considered a cold joint. This definition of a cold joint may be altered in writing by the QC Manager, on the basis of laboratory testing and/or observed field results that show other criteria will result in joint strengths consistent with the overall design. Where formed, a cold joint shall be reinforced by doubling the wall thickness, to full depth of the joint including rock embedment. The double wall thickness shall extend past the joint in both directions for a distance not less than twice the wall thickness.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
165.	Spec 02650 Para 4.6	The demonstration section should include the construction of at least two overlaps where the shear walls meet the perimeter walls	See response to Comment #143.
166.	Spec 02650 Para 4.8.1	If the walls are built by slurry replacement (full excavation of a trench under self-hardening slurry), then the QC wet grab samples may be obtained at the batch plant.	Concur, although this would not apply if the grout is mixed in the ground with the in situ soils. Note that the capability to acquire wet grab samples is still required, allowing TVA to obtain wet grab samples when and where desired. See the response to Comment #146.
167.	Spec 02650 Para 4.8.2	Coring of the soil cement walls for QC testing is currently within the scope of the Deep Mixing Contractor. Should this be changed so that TVA would perform the coring?	Poor workmanship during drilling and handling operations can result in damaged or weakened core samples. In the case where retrieved cores do not meet strength criteria, there is the potential for disputes to arise over the quality of the coring operations. Stantec thus recommended that all required QC coring remain within the Perimeter Wall Stabilization Contractor's scope of work. TVA has opted to engage a separate contractor to core the completed soil-cement walls, as required for QC testing. This change in scope will be reflected in the revised specifications (Section 02650). The project team is aware that high quality cores are needed, and appropriate drilling equipment, a skilled drilling crew, patience, and appropriate handling of the recovered core will be required.
168.	Spec 02650 Para 4.9.1	It would be helpful to identify the acceptance criteria here, regarding strength, recovery, and discontinuities of the soil cement cores	References will be included in Para. 4.9.1. Strength requirements are defined in Para. 2.2.3, minimum core recovery is specified in Para. 4.9.1, and uniformity requirements are given in Para. 2.2.1.
169.	Spec 02650 Para 4.9.1	Define the length of core run to be used computing the required minimum recovery of 85%.	The text will be changed to define a core run as 5 feet in length.
170.	Spec 2650 Para 4.4.2	Considering that the selected construction methodology will result in continuous walls, the tolerance for horizontal alignment (≤ 3 inch from plan) may be unnecessarily restrictive.	Concur. The horizontal alignment tolerance will be increased to 6 inches.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
171.	Spec 2650 Para 4.3.7 and 4.4.3	The tolerance for vertical alignment needs to consider the expected butt joints, where the ends of two construction panels will be formed.	Concur. We will add a requirement that all intersections or joints between two walls will result in full contact that is not less than two-thirds the thickness of the thinner wall, to full depth. This criteria is consistent with the tolerance for verticality of 1%. If two 3-ft thick walls are butt jointed, and both walls are battered in opposite directions at 1% from vertical, then the overlap at the bottom of a 50-ft deep wall would be = (3' – 2% of 50') = 2 ft. The two-thirds contact requirement should be readily achievable with good control over verticality and horizontal layout.
172.	Spec 02650 Para 4.8.2	We should set a time limit for when core samples must be collected. The time needs to allow flexibility for scheduling of the coring rigs, but allow enough time for retrieved samples to be selected and sent to the laboratory for testing before 56 days.	Concur. We will add a restriction that coring of the test parcels must be completed no later than 42 days after completion of the soil-cement wall. This will allow 14 subsequent days to get the selected specimens tested for 56-day strengths. We will also set a minimum cure time of 14 days before coring of a test parcel may begin. See Comment #207.

Document Title:	90% Removal Design Package for North Dredge Cell (Dike C) Perimeter Containment				
Document/RDP No.:	RDP-0113-E	Project No.:		WBS Code:	011303
Reviewed by:	Multiple	Organization:	GEI	Date:	21 Feb 2011
Response by:	Multiple	Organization:	Stantec	Date:	11 March 2011

No.	Section / Para / Page	Reviewer Comment	Response to Comment
173.	10W217-08	We also suggest the downstream rock berm extend down to the top of lean clay and not allow loose wet ash to remain in between the rockfill and clay. If the berm is placed over loose wet ash, the earthquake induced lateral spreading will likely cause the rock slope to be flatter than the estimated 13% earthquake slope angle. The December 22, 2008 failed ash final angle of response of the liquefied ash was less 1%.	Concur. Per the design, the toe of the rock berm (downstream of the buttress walls) will be founded upon the native soils, not ash. Note that part of the rock berm, between the buttress walls, will be underlain by ash in some areas. This geometry was modeled in the berm deformation analysis (see sketch on Page 9 of Exhibit #26) that predicted a post-earthquake slope of 13%. Unfortunately, the rock berm geometry was not clear in the cross section selected for Detail 2 on Sheet 08. We will revise the sheet and add notes to better communicate the design intention.
174.	10W217-08. Note 2	Is there a schedule of socket depth for hard shale and/or weathered shale? We suggest the specifications address this condition.	There is only one specification for the depth of rock embedment. See the response to Comment #182.
175.	W10W217-25	Consider adding non-woven geotextile against the upstream slope of the North Berm to prevent seepage induced backfill or fly ash migration thought the berm.	We agree that a filter media would be needed between the rock fill and backfill at this location. As indicated in Note 6 on Sheet 25, the berm cross section shown is conceptual, and the North Berm design will be refined in a future design package. An earthen berm may be selected, which would eliminate the need for a filter media. If a rock fill is used, a sand zone may be preferred instead of a geotextile. These issues will be re-considered in the future design effort for this element.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
176.	Exhibit 9 – Soft Stiffness Properties	GEI just completed resonant column testing of the Kingston dredge cell flyash. Specimens were prepared by moist compaction to densities of 90 and 95% of the standard Proctor maximum density. These results and the Stantec estimated values used in the 1D Ground Response and 2D FLAC analyses are presented [in a table in GEI's letter]…. GEI compacted ash moduli are similar to the computed hydraulically placed ash moduli. The GEI test results were performed on a sample from Cell 1 that did not fail. Consideration for additional testing may be required to determine whether the laboratory test results are representative of entire site. We suggest the design process continue with literature adopted parameters and we can adjust final grading of the stack if final analysis and designs dictate such.	Noted. These differences in properties will not change our conclusion that liquefaction of the saturated ash should be expected in the design earthquake. Hence, the results from these on-going laboratory tests will not significantly alter the overall design for the stabilized perimeter. We anticipate that the dynamic FLAC analysis of the closed landfill will not be overly sensitive to these differences in ash stiffness. The lower laboratory moduli may result in somewhat greater predicted displacements, but our current results indicate small surface deformations (less than 1 foot) for the design earthquake. These effects can be further assessed after the laboratory testing program is complete.
177.	Exhibit 14 – Properties of Soil-Cement and Stabilized Foundation	There are important questions related to the reliability of the compressive strength of the grab type soil cement samples obtained during the 2010 Deep Mixing Pilot Test Program by RECON and MACTEC. Therefore, we concur with Section 02650 Part 2.2.3 Strength Criteria for Soil-Cement of the Technical Specifications that states Soil-Cement samples used for determining the Unconfined Compressive Strength of the constructed soil-cement wall shall be cored specimens. We recommend that the wording of Section 3.2 of Exhibit 14 be changed to be consistent with the wording in Technical Specification 02650.	Concur. Section 3.2 of Exhibit 14 will be revised to indicate the strength criteria will be applied to tests on core samples, consistent with Specification 02650.
178.	Exhibit 16 – Reliability Analysis for Soil-Cement Strength	In Section 6, two general approaches are discussed to determine sampling/testing frequency termed the "parcel approach" and "daily production approach". Within the specifications the required approach is one of test parcels, which is a specific case of the "parcel approach" for the soil cement deep mixing walls. This approach should be explained in more detail in Section 6 and referred to in Section 7.	Concur. The definition of test parcels used in the specifications will be described in Exhibit 16. This will provide an opportunity to further explain how the selected test parcels (20% of the overall wall length) is related to expected production rate: Assuming a daily production rate of 500 cubic yards of deep mixing per rig, about 90 ft of 3-ft thick wall can be built in a day (assumes an average depth of 50 ft). It would then take 5 to 6 days for one mixing rig to construct 500 linear feet of wall, with one 100-ft test parcel (20% of the completed wall). Hence, we anticipate about one test parcel per week per mixing rig (the actual frequency will depend on the production rate achieved by the contractor).

No.	Section / Para / Page	Reviewer Comment	Response to Comment
179.	Exhibit 16 – Reliability Analysis for Soil-Cement Strength	We noticed that specific percentages of samples acceptable for each strength value are somewhat different from those presented within the 60% Specifications, and thus we assume that the 90% Specifications will be updated.	The percentages were affected by changes in the geometry of the cross section, reflecting refinements implemented in the design process. See the response to Comment #128. Para. 2.2.3 of Specification Section 02650 has been updated to be consistent with the numbers in Exhibit 16.
180.	Exhibit 16 – Reliability Analysis for Soil-Cement Strength	In the first full paragraph in Page 11, the percent of specimens that must be higher than a given strength seem to be in error. Based on Figure 2, the text should read 60% of the specimens tested should exceed 95% of the mean strength, 80% should exceed 80% of the mean strength and 95% should exceed 60% of the mean strength. This matches the text in the 2nd full paragraph on page 11.	Figure 2 can be confusing, because it uses the "percent of mean strength" on the ordinate axis. The first full paragraph on Page 11 does not infer a particular COV value, so it is not possible to indicate a percentage of mean strength here. We will revise the sentence to read as follows: "That is, 60 percent of the specimens tested must meet or exceed some specified strength level, 80 percent of the specimens tested must meet or exceed a lower specified strength, and 95 percent (essentially all) specimens tested must meet or exceed some minimal specified strength." We note that this confusion within Exhibit 16 does not alter the manner in which the specified limits are stated in Section 7 of Exhibit 16, or Section 02650 Para. 2.2.3 of the Specifications.
181.	Exhibit 18 – Analysis for Rock Embedment	The computations of rock embedment for the soilcrete walls are based on the peak thrust during the earthquake from the soil upstream of the buttress plus the inertia of the buttress and dike fill containment system. We agree with the computations for socket depths in weathered shale. We do suggest a lesser socket depth for wall keyed into hard or unweathered solid shale. We generally concur the combination of upstream thrust (188.6 kips/ft) force with the containment inertia load (W x 0.114 = 63.4 kips/ft) acting on the containment system, as provided in updated Exhibit 23.	Concur. Regarding embedment in unweathered shale, see response to Comment #182.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
182.	Exhibit 18 – Analysis for Rock Embedment	We understand that Stantec has performed a calculation for the depth of embedment for the soil cement walls socketed into soft (soil like) and hard (rock like) shale. Stantec determined for a 3.0 foot thick wall in soft shale conditions the minimum depth of embedment should be 2.7 feet and for hard shale 1.2 feet. Therefore, Stantec has specified that the embedment depth of the Soil-cement walls shall be 2.7 feet for the entire segment. However, if excavating to 2.7 feet becomes difficult due to hard shale conditions the depth could be lessened to 1.2 feet with Stantec's approval. We recommend that these calculations be included in this Exhibit 18.	We estimated strength parameters for weathered shale (c = 2100 psf, ϕ = 30°), as documented in Exhibit 17. The analyses in Exhibit 18 then show that a rock embedment of 2.7 ft in the weathered shale is adequate for 3-ft thick walls. We made a separate assessment of the unweathered shale. Based on estimated strength parameters (c = 4000 psf, ϕ = 35°), we determined that the depth of embedment should be 1.2 feet for 3-ft thick walls in unweathered shale. These calculations for the unweathered shale are attached here (Attachment 1). We are opposed to making this calculation (for lesser rock embedment in unweathered shale) part of the design package or project specifications: • We have not determined how harder shale in a limited area of the stabilized footprint should be accounted for in the assessment of composite sliding resistance. • The difference (18 inches of penetration for a 3-ft thick wall) is not large, considering the precision of depth measurements and the method of construction. • Of greater concern is the expected difficulty in distinguishing "weathered shale" from "unweathered shale" based on excavation difficulty during construction. TVA is currently proceeding with the evaluation of proposals and the award of a contract for perimeter wall stabilization. Each contractor has had the opportunity to review available data on the shale rock and has bid the job to achieve the required rock embedment. In our opinion, introducing a lesser requirement for rock embedment, which depends on how difficult the rock is to excavate, will encourage disputes during construction. Our preference is to proceed to construction using a specified, uniform depth for rock embedment. If difficult excavation conditions are encountered during construction, we will have adequate boring log data to consider the possibility that harder, unweathered shale occurs in select areas of the site. Via the QC program, the Engineer of Record (Stantec) will have the field information to assess these conditions and could, through the field change process, alter the specification accordingly. These changes would be based on engineering analyses like those in Attachment 1, and would be subject to review.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
183.	Exhibit 18 – Analysis for Rock Embedment	We recommend each page of the hand computations have the "checked by" line be initialed by the reviewer.	Concur. Note that the calculations were checked, as indicated on the cover sheet, even though the individual pages were not initialed.
184.	Exhibit 19 – Bearing Capacity Analysis	We recommend each page of the hand computations have the "checked by" line be initialed by the reviewer.	Concur. Note that the calculations were checked, as indicated on the cover sheet, even though the individual pages were not initialed.
185.	Exhibit 21 – Structural Analyses for Stabilized Foundation	The 3D structural analysis of the soilcrete walls is presented in Section 3 of this exhibit and it is based on the same forces used for the analysis of required embedment in the weathered shale presented in Exhibit 18. The results are presented as peak values of shear stress in a section along the center of a shear wall, indicating factors of safety (FOS) for shear strength versus shear stress mostly greater than 1.5 with no FOS values less than unity (1.0).	Concur, with one clarification. The tabulation in Section 3.1 of Exhibit 21 reports the percentage of soil-cement zones with a given FOS; the values in the table are based on all soil-cement elements (perimeter walls and shear walls), not just the shear walls.
186.	Exhibit 21 – Structural Analyses for Stabilized Foundation	It was noted in other analyses in the exhibit, for example Figure 7 that the highest shear stresses occur at the intersection of the faces of the transverse shear wall (100 feet in length) with the inboard perimeter or longitudinal wall, rather than at the center of the shear wall. What is the Factor of safety against shear failure at the intersection of the walls?	The factor of safety against shear failure at the intersection of the inboard perimeter wall and the shear wall was found to be adequate. Results at two locations where several zones had a factor of safety between 1.0 and 1.5 are presented on Figure 1 (Attachment 2). Figure 1 will be added to Exhibit 21.
187.	Exhibit 21 – Structural Analyses for Stabilized Foundation	The Exhibit does not present shear stresses within the 15 to 25-foot span perimeter (longitudinal) soil cement walls. Were completed FOS satisfactory?	The factor of safety against shear failure within the inboard perimeter wall was found to be adequate. See Figure 1 (Attachment 2), which will be added to Exhibit 21. Factor of safety results along the inboard perimeter soilcrete away from the intersection with the shear wall are shown in this figure (extending to the line of symmetry for the panel layout).

No.	Section / Para / Page	Reviewer Comment	Response to Comment
188.	Exhibit 21 – Structural Analyses for Stabilized Foundation	There was no information presented relative to the presence, if any, of tensile stress within either the perimeter or shear walls using updated driving stresses.	Figure 2 (Attachment 2) shows the stresses in the X, Y, and Z directions at locations where the tensile stresses are the highest. In general, tensile stresses occurred in only limited areas of the model and were not widespread. In the X and Y plots, the horizontal sections shown are within the ash and the Z plot is taken from near the bottom of the alluvial layer. Positive stresses represent tensile stresses within the FLAC model. The maximum tensile stresses calculated within the model were 693 psf, 2729 psf, and 1370 psf in the X, Y, and Z directions respectively. The tensile strength assigned to the model was 10% of the unconfined compressive strength or 2880 psf. Therefore, the maximum tensile stresses did not exceed the tensile strength during application of the upstream pressure boundary and the inertial loads. Figure 2 will be added to Exhibit 21.
189.	Exhibit 21 – Structural Analyses for Stabilized Foundation	Please show the elevations of the downstream post-earthquake rock berm buttress in Figures 14, 16 and 17. Stantec assumed the rock fill will drop from E. 757 feet down to El. 747.2 feet to resulting in 13% post earthquake slope. GEI assumed the post earthquake toe berm would drop to El. 740 feet due to lateral spreading of the rock fill berm situated over the left-in-place loose wet ash. Please consider modeling the stability of the exposed downstream longitudinal wall for an exposed height of 13 feet as a result of the displacement of the rockfill down to El. 740 feet after the earthquake. We could accept a lower FS than 1.5 in the longitudinal wall for this condition, per Exhibit 15, Paragraph 1. Alternatively, place the rockfill on lean clay after all the fly ash is removed downstream of the soil cement wall.	The crest of the rock berm is at Elev. 747 in the FLAC3D model, consistent with a predicted settlement of 10 feet at Sta. A168+00. Deformations in the rock berm were predicted using a separate FLAC analysis, which is presented in Exhibit 26. The toe of the rock berm will be founded on the lean clay, and will not be subject to extensive lateral spreading as assumed by the reviewers. The design geometry was not clearly depicted on Sheet 08 of the Drawings, which appears to have caused some confusion. See the response to Comment #173.
190.	Exhibit 22 – 3D Analysis for Equivalent 2D Stiffness	The purpose of the analysis presented in this exhibit was to obtain composite moduli property of the buttress to use in a dynamic 2D FLAC analysis. We agree with the conclusion that the composite moduli is about 0.2 of the moduli for the soilcrete. Note that the area replacement ratio (ARR) is 0.26. However, the composite properties are intended to present the shear walls and the soil in between, and not the longitudinal walls that are included separately in the 2D dynamic analysis. The ARR excluding the longitudinal walls is about 0.2, which means that the contribution of the soil to the composite moduli is negligible, which is reasonable.	Concur.

<table>
<tr><th>No.</th><th>Section / Para / Page</th><th>Reviewer Comment</th><th>Response to Comment</th></tr>
<tr><td>191.</td><td>Exhibit 23 – Dynamic Analysis for Earthquake Loading</td><td>The most important result of the 2D dynamic analysis is the magnitude of the peak value of the thrust on the buttress from the upstream soils during the earthquake, estimated as 188.6 kips/ft. This value is important for the analysis of the required rock embankment for the walls (Exhibit 18) and for the analysis of the structural integrity of the walls including potential buckling of the transverse shear walls (Exhibits 21 and 25). Therefore it is desirable to provide as much information as possible to support the value of the peak upstream thrust. For example one could obtain a value of the initial thrust, prior to the earthquake and liquefaction from the data in Figure 3.1. It would also be helpful to obtain the value of the thrust at the end of the earthquake, i.e., with no shaking but still have a trust loading from the fluid pressure of liquefied ash and soil on the containment system. These time sequence or additional values of the thrust can be compared with the 188 kips/foot value to confirm the estimated peak trust is reasonable, since upstream thrust loads will be different. Also these additional values can be obtained by other simplified methods (as presented within the GEI review letter for the 60% submittal dated December 27, 2010) and compared with the FLAC results.</td><td>The pressure distribution applied to the FLAC3D structural analysis and the rock embedment analysis was based on a linear approximation of the maximum horizontal stress seen on the face of the inboard wall during the dynamic FLAC simulations. The horizontal pressures along the inboard wall are plotted for static (pre-earthquake), earthquake (maximum), and post-earthquake conditions in Figure 3 (Attachment 2). The linear approximation is indicated for each case.

The total thrust, computed from the FLAC results and the linear approximations, can be compared to the values calculated by GEI using simplified methods:
<table>
<tr><th></th><th>Dynamic FLAC Model (kips/ft)</th><th>Linear Approximation (kips/ft)</th><th>GEI Calculations (kips/ft)</th></tr>
<tr><td>Static</td><td>123</td><td>139</td><td>134</td></tr>
<tr><td>Maximum</td><td>168</td><td>186</td><td>218</td></tr>
<tr><td>Post Earthquake</td><td>160</td><td>170</td><td>186</td></tr>
</table>
GEI's calculations are based on full liquefaction of the foundation soils, as well as fully mobilized active earth pressures (K=1). While these assumptions are reasonable for hand calculations, the FLAC model predicts less liquefaction and an earth pressure coefficient less than 1, and therefore the values of thrust are somewhat less under earthquake and post-earthquake conditions.

Figure 3 will be included in the revised Exhibit 23. Note that we used a slightly higher value of 188.6 kips/ft as the maximum thrust in some of our design calculations. This value was computed in an earlier FLAC analysis and, being conservative, was not updated in the final calculations.</td></tr>
</table>

No.	Section / Para / Page	Reviewer Comment	Response to Comment
192.	Exhibit 23 – Dynamic Analysis for Earthquake Loading	In Figures 4.6 to 4.9 a different displacement is shown for the left and right side of the shear wall for an analysis in the longitudinal direction. The difference is small but it seems to be more than the possible compression of the wall. I presume that the two points in question are not on the face of the walls but in the soil near the wall. A further explanation of this these results is requested.	In the dynamic FLAC analysis of the shear walls, the history points plotted in Figures 4.6 to 4.9 (Exhibit 23) were on the face of the soilcrete wall, and not in the liquefied soils. The differential displacements are indicative of a slight expansion in the thickness of the soilcrete wall. We looked into the FLAC results in more detail, and noted that there is also some slight upward movement of the wall top. These predicted behaviors are not realistic, and appear to be artifacts of the numerical simulation. We submitted these results to Itasca for their review. Itasca suggests that these unrealistic deformations are probably caused by the large difference in material properties between the cemented wall and liquefied ash. The weight of the overlying berm will cause some stress concentrations, which are difficult to precisely model, as the liquefied ash moves downward relative to the wall. In any case, the noted displacements are trivial and can be neglected when judging the overall behavior of a shear wall subjected to transverse dynamic loads.
193.	Exhibit 25 – Buckling Analysis for Shear Walls	We agree with the methodology of the buckling analysis of the soilcrete walls. In selecting the most critical station in page 6 there is a comparison of depth of the walls (b) at various stations. The selected critical section Station 168+00 was not the station with the largest b value (Station 178+00). We understand that Station 178+-- is buttressed by Swan Pond Road and has more passive resistance than does Station 168+00. For Case1d, the lowest buckling load would be the highest b, which is Station 178+00 and not for Station 168+00. Of course this assumes other factors are equal which they may not be, but this should be more clearly explained why Station 168+00 were selected as the most critical station.	The lateral pressure on the shear walls, as considered in the buckling analysis, was computed in the dynamic FLAC simulations (Exhibit 23). The FLAC model represents the critical cross section for overall stability, at Sta. A168+00. We did not develop a separate dynamic FLAC model for the design section at Sta. A178+00, and have not computed the lateral, dynamic pressures at that location. Given the results for buckling at Sta. A168+00, and the conservatism of the simplifying assumptions (i.e., neglecting support from the clay layer), we are satisfied that the shear walls at Sta. A178+00 are unlikely to buckle.
194.	Exhibit 25 – Buckling Analysis for Shear Walls	Note that in page 6 the last equation should be H = b = 41 feet, not H = a.	Concur. The equation will be corrected to read H = b = 41.0 ft.
195.	Exhibit 25 – Buckling Analysis for Shear Walls	We recommend each page of the hand computations have the “checked by” line be initialed by the reviewer.	Concur. Note that the calculations were checked, as indicated on the cover sheet, even though the individual pages were not initialed.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
196.	Exhibit 26 – Deformation of Rock Berms	From this exhibit we understand that the deformation (settlement) of the rock berm upon liquefaction of the underlying sands and ash is estimated using a static FLAC analysis in which the strengths in these soils are reduced to their undrained steady strength values (S_{us}) and then the mass deform until equilibrium is reached. It appears that the inertia of the moving mass was not considered. This is an important factor which would increase the computed deformations. In back figuring the S_{us} strength from actual liquefaction failures it is customary to consider the kinematics of the movements, see papers by Davis et al., 1988, Castro 1995, and Olson and Stark, 2001. The failure is initiated when the shear strength drops to a S_{us} a value lower than the driving shear stress, and thus the mass accelerates. When the mass configuration has a driving shear stress equal to S_{us} the acceleration becomes zero and it reaches maximum velocity. Thereafter it decelerates as the driving stress becomes lower than S_{us} until it stops. We recommend that consideration be given to the kinematics of the movement and the inertia effects, possibly using the same FLAC model.	This analysis did not simply seek a geometry at which the rock mass would be statically stable with a liquefied foundation. The inertia of the moving mass was inherently considered in the FLAC simulation. Starting with the berm in static equilibrium, the foundation soils were abruptly reduced to their liquefied strength. This set the berm in motion, and the analysis continued until static equilibrium was re-established. The FLAC code includes momentum or inertia in the basic formulation, so the acceleration and de-acceleration of the mass were considered, and the kinematics of the problem were represented. However, these particular analyses were run in FLAC's "standard configuration", which scales grid point masses to speed up the calculations. The inertial effects, therefore, were slightly less than would be computed with unscaled grid point masses. Results from additional parametric simulations, run using FLAC's "dynamic configuration", suggest that the effects of scaled grid point masses were small in this case. In the revised Exhibit 26, the FLAC analysis for the rock berm settlement will be updated to represent the revised berm geometry.
197.	Exhibit 26 – Deformation of Rock Berms	GEI assumed the rockfill berm drops from El. 757 feet down to El. 740 feet with nearly level ground downstream due to lateral spreading since a thin layer of wet loose ash will be left in place over the lean clay. This is lower than El. 747.4 feet and the 13% slope from FLAC. Please consider modeling the stability of the exposed downstream longitudinal soil cement wall for an exposed height of 13 feet for displaced rockfill down to El. 7 40 feet after the earthquake. We could accept a lower FS lower than 1.5 in the longitudinal wall or this condition, per Exhibit 15, Paragraph 1. Alternatively, place the rockfill on lean clay with all of the fly ash removed under the rockfill toe berm.	The toe of the rock berm will be founded on the clay, there will not be a continuous layer of ash under the rock berm. See the response to Comment #173.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
198.	Exhibit 26 – Deformation of Rock Berms	Note on Page 9 of the calculations that the detail of the excavation of the ash down to the top of the clay downstream of the buttress is not shown in the drawings, for example see Drawing No. 10W217-08 which shows a thin layer of ash left under the entire footprint of the rockfill toe berm. We understand Drawing No. 10W217-08 will be modified to show the cross-section at Station 168+-00 which shows the downstream portion of the rock berm will bear directly on natural silty clay and on the failed fly-ash. We understand fly ash may remain between the transverse shear walls downstream of the longitudinal wall.	The sketch on Page 9 of this exhibit correctly depicts the design; Sheet 08 of the Drawings will be revised to prevent further confusion. See the response to Comment #173.
199.	Exhibit 27 – Stability of Buttressed Perimeter Wall	We agree with the analysis methodology except for the assumption of the post earthquake geometry of the rockfill along the slough as noted in our comments on Exhibits 21 and 26. The estimates of earth pressures on the downstream buttress walls are reasonable and we concur that the analysis is valid only to the depth at which the moment reverses.	Concur. Regarding the post-earthquake geometry of the rock berm, See responses to Comments #189 and #196-198.
200.	Technical Specifications	We have reviewed and understand the Special condition section of the specifications and concur that the earthquake and soilcrete deep mixing engineer of record is Stantec. All of the deep mixing submittals and work plans should be reviewed and approved by Stantec prior to the start of the work.	Correct – Stantec is the Engineer of Record for this design package and associated construction. The deep mixing submittals required in Section 02650 will be reviewed by Stantec for approval. The QC roles will be better clarified in accordance with the response to Comment #61.
201.	Section 02350 Paragraph 3.1	Paragraph 3.1 needs to state that the downstream portion of the rockfill be placed against native clay and not on top of sluiced or failed flyash.	Concur. Appropriate language will be added to Para. 3.1.
202.	Section 02650 Paragraph 1.1.2	Refers to allowing a slurry trench method to construct soilcrete walls. There are advantages with a common wall width, uniform geometry. But there are issues with cold construction joints and reduced shear strength to resist sliding along a bentonite filter cake that forms along the excavation face, unless polymer or cement slurry is used to hold the trench open.	These issues were considered in the technical evaluations of the contractor proposals. Self-hardening, cement-bentonite slurry does not form a bentonite filter cake. The specifications are being revised to address the construction of joints in a slurry wall (see the response to Comment #164).
203.	Section 02650 Paragraph 1.4	Please define slurry trench and whether cement bentonite or polymer slurry will be allowed.	In Para. 1.4.8 (1.4.10 after revision), “Deep Mixing Method” will be replaced with “Perimeter Wall Stabilization”. The definition will be generalized to include slurry trench methods, with polymer, bentonite, and/or cement slurry mixes.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
204.	Section 02650 Paragraph 1.4	If bentonite slurry is used to open trench for a soil cement wall, what will be the method to demonstrate adequate shear strength to resist sliding along the bentonite cake that forms on the excavation walls and base of the rock socket? The coefficient of friction of soil bentonite cake could be less than 01. or have a friction angle less than 10 degrees.	This issue would be appropriately considered in the technical evaluations of a contractor proposal to use bentonite slurry. Note that self-hardening, cement-bentonite slurry does not form a bentonite filter cake.
205.	Section 02650 Paragraph 2.3.4	The text implies the minimum rock socket depth is in weathered shale. We suggest a note be added to allow a lesser depth, subject to Stantec approval if hard, unweathered shale is encountered. It would be good to define hard shale in terms of core RQD and minimum uniaxial compressive strength.	We prefer to keep the specification as is. See the response to Comment #182.
206.	Section 02650 Paragraph 2.2	Will there be a limit on the amount of bentonite in the mix for the soil cement wall? The way the text is written, bentonite is excluded from the design mix. We concur with this approach, as bentonite in soil cement will weaken the structure.	There is no expressed limit on the use of bentonite. However, the mix must achieve the strength requirements in Para. 2.2.3, which will effectively limit the use of bentonite in the cementitious grout.
207.	Section 02650 Paragraph 3.4.2	There is no minimum waiting period to core the curing soil cement wall. Coring of soilcrete should be delayed 14 or 28 days to allow curing and maximize core recovery.	Concur. We will set a minimum cure time of 14 days before coring of a test parcel may begin. This specification will appear in Para. 4.8.2 of Section 02650. See also the response to Comment #172.
208.	Section 02650 Paragraph 4.3	Why is there no discussion on slurry trench methodology? There needs to be rules on how wall elements are joined together, especially if transverse and longitudinal walls are built as different times and need to be made integral.	With previously noted changes in terminology, Para. 4.3 will apply to slurry trench methods. The specifications will be revised to address the issue of joints. See the response to Comment #164. Regarding the sequence of construction at the wall intersections, Para. 4.3.6 will be revised in accordance with Comment #163.
209.	Section 02650 Paragraphs 4.3.6 and 4.3.7	This text needs to be modified if slurry trench methods are used.	With previously noted changes in terminology, these paragraphs apply to slurry trench methods. See response to Comment #118. Regarding the sequence of construction at the wall intersections, Para. 4.3.6 will be revised in accordance with Comment #163.
210.	Section 02650 Paragraph 4.3.13	Text needs to address the method on wall integration between old and new constructed wall elements. In other words, how does the contractor connect a new wall with a cured wall?	The specifications will be revised to address the issue of joints. See the response to Comment #164.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
211.	Section 02650 Paragraph 4.6	We concur with demonstration section prior to production wall construction. This system should be installed at least two months prior production for QA evaluations. The sides of the wall should be exposed to allow cold joint evaluation.	TVA will have the opportunity to partially excavate the demonstration section, prior to approving full production work. Excavation of the demonstration section is not considered a design requirement, and is not part of the scope of work for the Perimeter Wall Stabilization Contractor. TVA can further assess the need for excavating the joints, based on observations during construction of the demonstration section. See the response to Comment #164, regarding the revised specifications for construction joints. Excavation of the demonstration section, which will be built in 10 to 15 feet of loose ash, will create concerns for worker safety. The excavation would need to sloped back (requiring a significant excavation), or supported with sheet piling or a trench box. This excavation could be accomplished between the buttress walls in the demonstration section. In addition to allowing an examination of the joints, this would give TVA-Civil Projects an opportunity to assess the difficulty of excavating material between the buttress walls (see the response to Comment #36).
212.	Section 02650 Paragraph 4.8.2	There is no specified time limit to allow the soil cement to cure before it is cored. There should be time limits set to not allow the coring process to hinder project goals.	Concur. We will set a minimum cure time of 14 days before coring of a test parcel may begin. See also the response to Comment #172.
213.	Quality Control Plan	We suggest the QC Plan be expanded to include all of the tests and QC requirements for deep mixing, soilcrete, or soil-cement mix walls. In addition, address slurry trench methods to ensure continuity of buttress walls. The QC Plan should address assuming the minimum thickness of the wall, adequacy and continuity of all wet and cold construction joints, and the adequacy of the depth and width of the requisite rock socket for the deep mix wall.	The Quality Control Plan for perimeter wall stabilization (PWS) will be developed by the PWS Contractor, and submitted for review and approval by TVA and the Engineer of Record. See Section 02650, Para. 1.5.8.

No.	Section / Para / Page	Reviewer Comment	Response to Comment
214.	Quality Control Plan	We also recommend that sand cone density test be used to calibrate the nuclear density meter for soil density measurement.	Random drive tube samples shall be collected and subjected to laboratory density and moisture testing, and used to calibrate the nuclear density gauge. This requirement will be added to the QC Plan. We understand that the Reviewers are concerned about densification when tube samples are driven into loose ash, and are recommending sand cone tests or pushed Shelby tubes. In this design package, however, nearly all of the compaction work will involve earth materials in the perimeter berm. There will be little ash compaction associated with construction of the stabilized perimeter. The concern for ash densification in a drive tube sample is more critical to ash stacking, which is covered by separate design packages. Calibration of the nuclear density meter in compacted ash will be addressed as part of ash stacking. The results or conclusions will be applied where minor quantities of compacted ash are used in the perimeter stabilization work; a separate calibration study is not warranted here.

ATTACHMENT 1

Calculations for Embedment in Unweathered Shale

See Comment #182

Stantec

Embedment in "Unweathered Shale"

(Reference Exhibit 17 for procedures)

If "unweathered shale" is encountered during construction, would we allow less rock embedment?

RMR of "unweathered shale"

1. UNC = 3500 psi Rating = 3

2. RQD:
   - Typically RQD = 25 - 50
     Rating = 8

3. Discontuity Spacing:
   - Typically maybe 5 per foot?
   - Assume spacing 2-8 inch
     Rating = 8

4. Discontinuity Condition:
   - Assume "slightly weathered"
     Rating = 25

5. Groundwater (Dry) Rating = 15

6. Joint Orientation = unfavorable
   Rating = -15

∴ RMR = 3 + 8 + 8 + 25 + 15 - 15 = 44

Designed by: AFR 12/8/10 Checked by: GY 3/10/2011

Recycled Cert no. SCS-COC-00867 © 1996 FSC

Printed on FSC-certified and 100 percent recycled postconsumer waste paper.

- For RMR = 44, Rock is Class III "Fair"

→ Initial Estimate (Table 4) $c = 5000$ psf $\phi = 30°$

Parameters for 1980 Hoek & Brown Criteria

RMR = 44, Fair Quality Shale

From Table 5;

$\sigma_{ci} = 3500$ psi

$m = 0.183$

$s = 0.00293$

Parameters for 2002 Generalized Hoek & Brown

$\sigma_{ci} = 3500$ psi

$m_i = 6$ for shale Table 6

$D = 0.5$

} Same as estimate for "weathered shale"

GSI = 30 to 50 based on Table 7

⇒ Assume GSI = 40

from spreadsheet calculations:

$m_b = 0.345$

$s = 0.000335$ $a = 0.511$

Recycled Cert no. SCS-COC-00867 © 1996 FSC

Printed on FSC-certified and 100 percent recycled postconsumer waste paper.

Equivalent Mohr - Coulomb Parameters:

- Use 2002 Generalized Hoek & Brown as best estimate
- Expected stress range = 20 to 30 psi

→ In this pressure range, the strength envelope can be approximated using equivalent values of

$$c' = 4000 \text{ psf}$$
$$\phi' = 35 \text{ degs}$$

	Weathered Shale	Unweathered Shale
c'	2100 psf	4000 psf
ϕ'	30°	35°

Note: Above calculations completed using "Hoek Brown Parameters.xls" but changes to file not saved.

Recycled Cert no. SCS-COC-00867 © 1996 FSC

Printed on FSC-certified and 100 percent recycled postconsumer waste paper.

Required Embedment in Rock

→ In "weathered shale"

- $c' = 2100$ psf $\phi' = 30°$
- For 3-foot thick walls, current design requires $d_r \geq 2.7$ feet
- Excess Capacity = 6.2%

→ If assume "unweathered shale"

- $c' = 4000$ psf $\phi' = 35°$
- For 3-foot thick walls, an equivalent capacity design would require $d_r \geq 1.2$ feet
- Excess capacity = 7.6%

→ Both of these solutions assume embedment of all walls in a consistent material. The composite assumption may not be valid,

Recycled Cert no. SCS-COC-00867 © 1996 FSC

Printed on FSC-certified and 100 percent recycled postconsumer waste paper.

Conclusion (PRELIMINARY)

	Weathered Shale	Unweathered Shale
c' (psf)	2100	4000
ϕ' (deg)	30	35
Required dr (feet) if all walls $t = 3.0'$	2.7 ft	1.2 ft
if $t = 4.0'$	3.1 ft	1.5 ft

- Both analyses assume full embedment in that material. dr = 1.2 ft may not be adequate if consider only part of wall length would be in weathered shale

- Likely that we will have difficulty determining top of rock depth to an accuracy better than ± 6 inches, maybe only ± 1 foot.

  ∴ An embedment specification of 1.2 ft may be difficult to implement with confidence during construction.

  → Might need to consider an embedment of 2 ft as minimum acceptable

Recycled Cert no. SCS-COC-00867 © 1996 FSC

Printed on FSC-certified and 100 percent recycled postconsumer waste paper.

ATTACHMENT 2

Supplemental Plots from FLAC

See Comments #186, #187, #188, #191

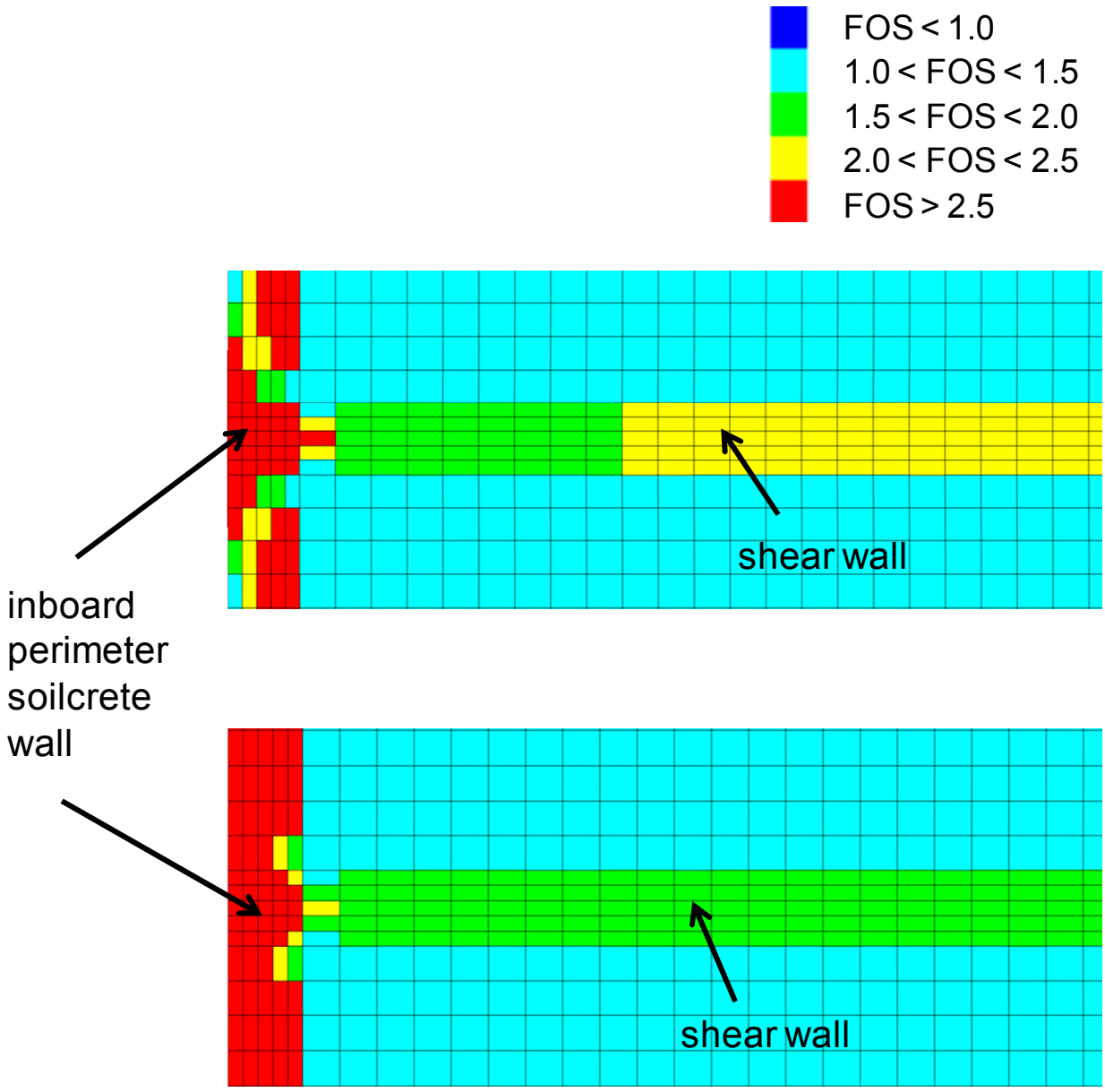

Figure 1: Factors of safety within horizontal section of final model (a: within ash; b: within sands).

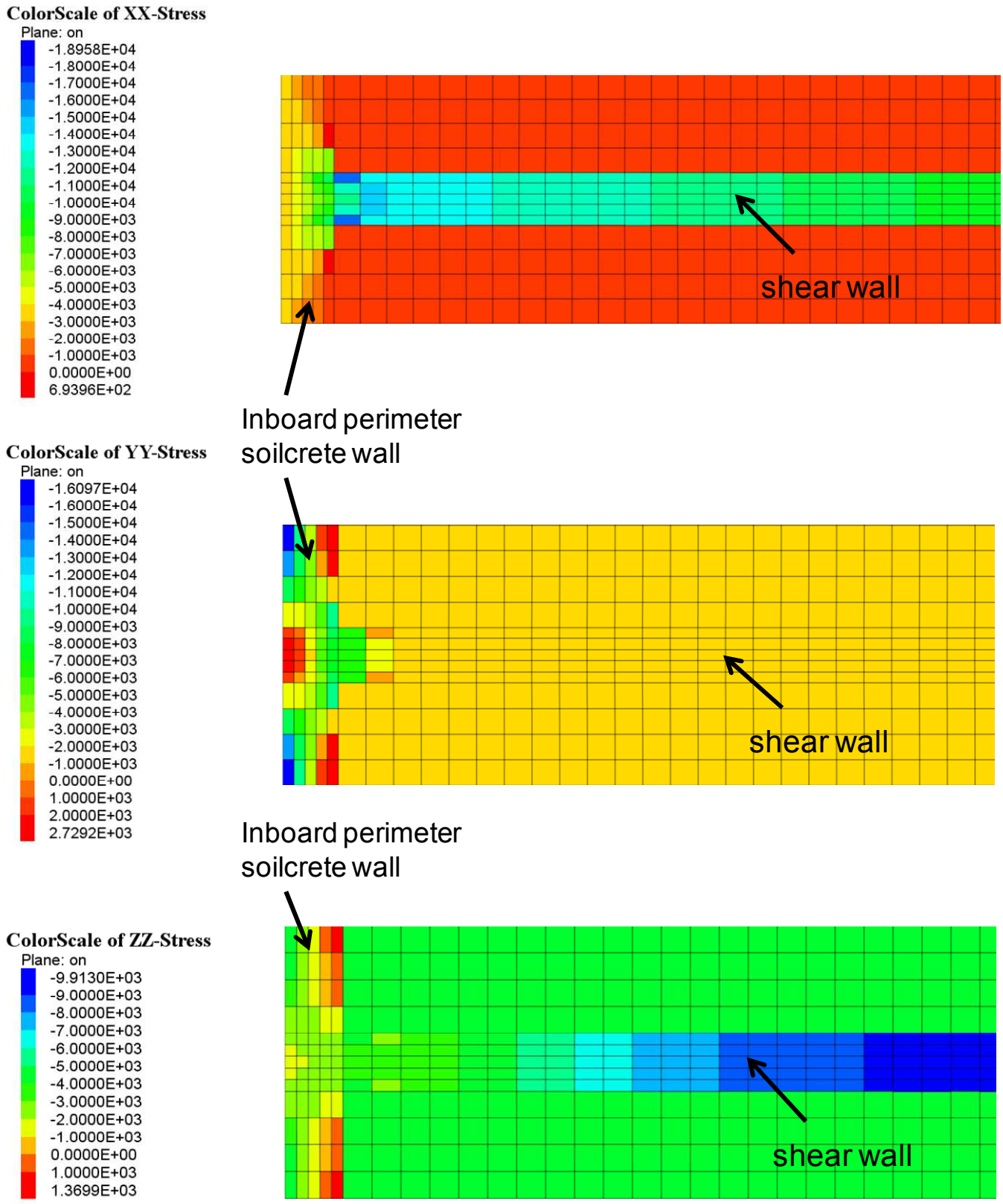

Figure 2: Stresses (psf) within horizontal section of final model (negative represents compression and positive values tension).

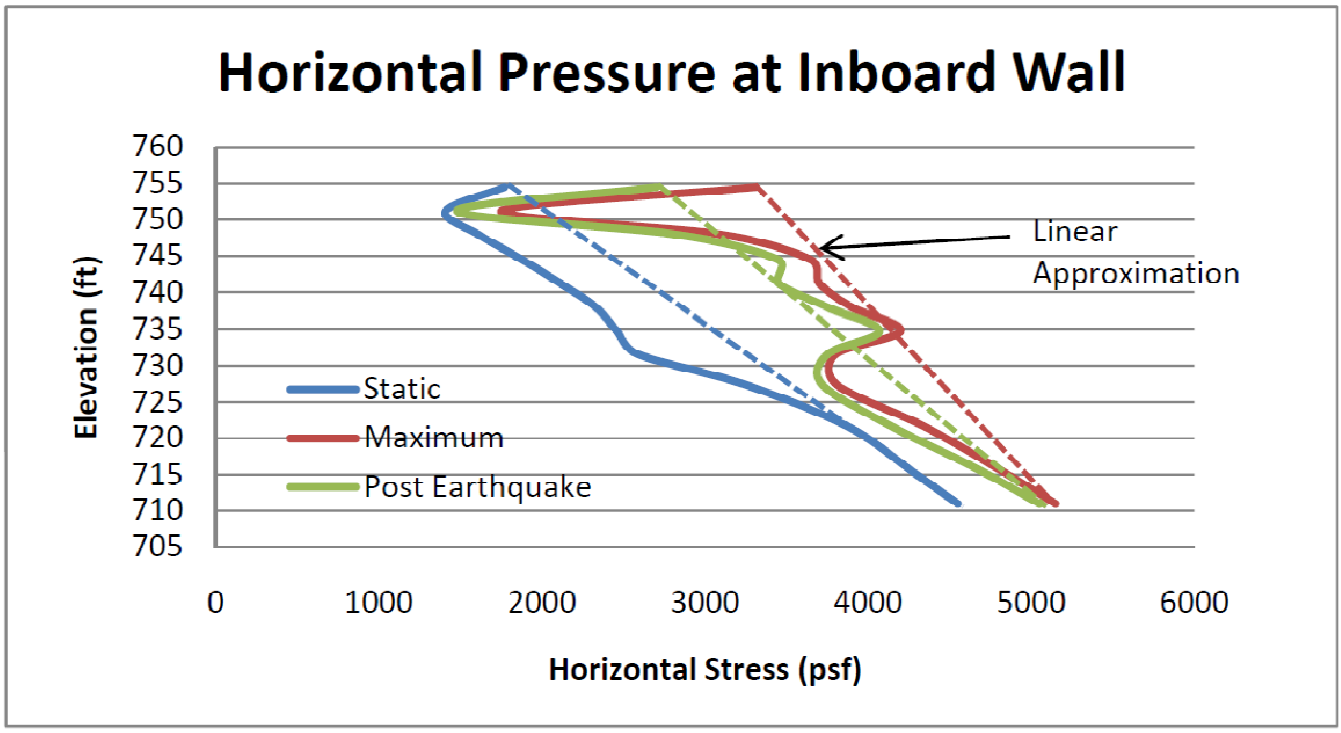

Figure 3: Horizontal stresses on the inboard perimeter wall, computed in the FLAC dynamic simulation of the M = 6.0 earthquake.