Tennessee Valley Authority
Regulatory Submittal for Kingston Fossil Plant

Documents submitted:
Removal of Cantilevered Sheet Piling Wall, Revision 3 Work Plan
Work Package 132, Removal of Sheet Piling along Rim Ditch
Stability Analysis for Cross Section A-A and C-C by Geosyntec
Decontamination of Equipment and Vehicles End Points/Expectations

Date Submitted:
08/03/2010

Submitted to whom
Leo Francendese, EPA

Concurrence

Received	Not Applicable	TVA
☐	☒	Steve McCracken
☒	☐	Kathryn Nash
☒	☐	Tim Russ
☒	☐	Michelle Cagley MC
☒	☐	Tom Hefernan

Received	Not Applicable	Jacobs
☒	☐	Steve Richardson
☒	☐	Jack Howard
☒	☐	Steve Arrington
☐	☐	
☐	☐	
☐	☐	

Approvals

TVA Kathryn Nash Date 8/3/10

EPA Leo Francendese Date 8/3/10

consulted w/ TDEC

cc:

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

Work Plan for Removal of Cantilevered Sheet Piling Wall, Revision 3

1 Purpose

This Work Plan outlines the method to be used to remove the cantilevered sheet piling which is installed along the western boundary of the Rim Ditch.

The wall was designed by Glynn Geotechnical Engineering and installed by Sevenson Environmental Services (Sevenson) during the summer of 2009. (See Attachment 1).

2 Design

Glynn Geotechnical Engineering provided an opinion for the wall removal. (See Attachment 2).

3 Construction

The removal will begin at the northern end of the Rim Ditch, working to the south.

Sevenson will use a hydraulic vibratory unit attached to an excavator (300 or smaller) to remove the sheets.

The excavator will work from the crane mat road. The outside track of the excavator will be positioned approximately 5 ft from the cantilevered wall and the excavator body will be a minimum of 15 ft from the leading edge of the piling to be removed. The vibratory unit will be attached to the top of the sheet pile. The sheet will be vibrated out of the ground approximately 15 ft. The vibratory unit will then release the top of the sheet and be reattached to the side of the sheet and complete the sheet removal. While still attached to the side of the sheet, the excavator will then lay the sheet to ground. Stacks of two to four sheets will then be picked up by a loader with fork attachments for delivery to a decontamination area.

It may be necessary to cut or grind some sheets to facilitate removal. If this becomes necessary, all hot work permits will be completed and posted at the work area prior to beginning. Ground personnel will be allowed to work within 4 ft of the vibratory unit while it is in operation.

The sheets will be decontaminated using water trucks and pressure washers. All water generated by the decontamination activities will be directed to the Rim Ditch or to areas currently impacted by decontamination wash waters.

All equipment requiring decontamination will be decontaminated in accordance with the Site's "Decontamination of Equipment and Vehicles End Points/Expectations" document.

4 Schedule

It is anticipated that this activity would start the week of August 2, 2010.

5 Waste Management

No waste management issues are anticipated.

6 Health and Safety

Work will be conducted according to the Site Wide Safety and Health Plan and supplemented by the Job Safety Analysis. Appropriate personal protective equipment will be used.

RAWP 079

Kingston Ash Recovery Project
Removal of Cantilevered Sheet Piling Wall, Revision 3, Work Plan

Prepared by:
Jacobs

for the Tennessee Valley Authority

Revision	Description	Date
2	Removal of Cantilevered Sheet Piling Wall	07/30/10
3	Removal of Cantilevered Sheet Piling Wall	07/30/10

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It may be necessary to cut or grind some sheets to facilitate removal. If this becomes necessary, all hot work permits will be completed and posted at the work area prior to beginning. Ground personnel will be allowed to work within 4 ft of the vibratory unit while it is in operation.

The sheets will be decontaminated using water trucks and pressure washers. All water generated by the decontamination activities will be directed to the Rim Ditch or to areas currently impacted by decontamination wash waters.

All equipment requiring decontamination will be decontaminated in accordance with the Site's "Decontamination of Equipment and Vehicles End Points/Expectations" document.

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ATTACHMENT 1

Work Package 132
Removal of Sheet Piping Along Rim Ditch (Sevenson)

STEP Text

Contractor:	Sevenson Environmental	Location:	Kingston Fossil Plant
Work Package No:	WP- 132	Date:	7/20/10
Work Package Desc:	Removal of Sheet Piling Along Rim Ditch		

Note 1		Perform daily (minimum) pre-job briefings with crew. Each employee will have a pre-job briefing before each assignment, detailing the scope of the assigned task, the possible hazards, and steps to mitigate the identified hazards. Should the employee's daily assigned task be changed, a subsequent pre-job briefing will be given. Document briefings with signatures, and file in this Work Package. Once job has completed, perform post job briefing to discuss lessons learned from work execution or incidents.
Note 2		Anytime the work package is found to have a change in the plan or a deficient area of instruction, the Foreman/Supervisor will stop work and assess the situation. If the foreman/Supervisor determines that the required change or revised area of instruction can be safely mitigated then a new pre-job briefing will be performed outlining the step change and requirements to allow work to safely continue. The Foreman/Supervisor will document the change and supply the documented change to appropriate personnel so that the master file can be updated. If the determination is made that the change is too significant to allow work to continue safely, work will be stopped and the matter referred to senior level management and engineering for resolution. There will be no exceptions.
Note 3		This step text is arranged in sequence but is not intended for strict compliance. The Site Supervisor and/or Foreman may change the sequence in which the work is performed, providing the sequence change has no negative impact on job safety or work quality.

Step No.	Initial & Date As Steps Are Completed	Work Description: Removal of sheet pile along the Rim Ditch
1		Conduct a Pre-job Briefing & Review Hazards of this task
2		All employeees will use proper PPE
3		Employees will read & understand work description before signing
4		Removal of the sheets will be done from the crane mat road using an excavator (size/type to be determined) with a Movax attachement. The excavator will be positioned approximately 5' from the edge of the Rim Ditch.
5		Sheets will be pulled beginning with the weir walls and starting with the northern weir first. These sheets are 35' in length and will be pulled one (single) or two (double) at a time.
6		The Movax will be attached to the top of the sheet piles and vibrated out approximately 15'. The Movax will release the top of the sheets and re-attach to the side of the sheets and pull completely out
7		The sheets will be laid down on the ground, in stacks of 2 to 4 sheets, and picked up using a WA 380 front end loader. The sheets will be strapped to the loader, using ratchet straps. No berms will need to be removed prior to sheets being picked up by the loader.
8		The sheets will be brought to a decon area (to be determined) and pressure washed. The wash water will be diverted back into the Rim Ditch.
9		After completion of the removal of all weir wall sheet piles, removal of the 40' sheets will be next and followed be the removal of the 25' sheets.
10		The 40' sheets will be pulled beginning at the northern most location along the sheet pile wall. These sheets will be pulled 1 @ a time and handled in the same manner as the weir wall sheets.
11		It may be necessary to cut or grind weld from adjacent sheet prior to pulling

12		After all 40' long sheets are removed, the 25' sheets will be removed and deconned in the same manner. However, two sheets (double/pair) will be removed at a time.
13		Weights of the sheets: 40' Singles - 2,000#; 35' - 1,750; 25' - 1,250#. Capacity of PC220 w/Movax is 4,500#
14		Depending on Production, a second Movax may be utilized. If so, one removal operation will start at the most Northern edge of the Sheet Pile wall and the other will begin at the most Southern edge. Both operations will work toward the middle.
15		Before the removal operations are within each other's work zone, one of the operations will be stopped and the final sheets will be pulled by one Movax.
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25		

Jacobs Lead CM / DATE

Safe Plan of Action

Project No. E-1017
Job/Task: Removing Sheet Piling **Work Area:** Rim Ditch **Date:** _____

Steps of Task	Hazard/Reaction to Change	Safe Plan	Resources
Set Up Mats	• Pinch points • Slips, trips & falls • Poor ground conditions • Crushing • Moving equipment and materials	• Operator and ground personnel to maintain visual contact • Stay clear of equipment swing radius • Proper PPE	• Equipment inspection prior to running • Spotter • PPE: leather gloves, hearing protection • Two Minute Rule to check ground conditions when moving into a new area
Move Equipment into Place	• Pinch points • Slips, trips & falls • Crushing • Moving equipment • Working near edge of ditch	• Outside of excavator track to be parallel to and 5 feet away from sheet pile wall • Operator and ground personnel to maintain visual contact • Stay clear of equipment swing radius • Proper PPE	• Check area for work being performed by other contractors • Spotter. • PPE: leather gloves, hearing protection, PFD when working near the water
Start Pulling Sheets	• Pinch points, • Slips, trips & falls • Crushing • Moving equipment • Working near edge of ditch, changing ground conditions • Noise	• Outside of excavator track to be parallel to and 5 feet away from sheet pile wall • Front of excavator to maintain 15 feet to leading edge of sheets removed • Operator and ground personnel to maintain visual contact • Ground personnel to stay 8 feet from edge of ditch after sheets are removed • Stay clear of equipment swing radius and fall radius of sheets • Hearing protection in place when vibratory unit is operating	• Inspection of vibratory unit • PPE: leather gloves, hearing protection • Maintain awareness of your surroundings • Use spotter if necessary to watch for changing ground conditions • Keep work area clear of non-essential personnel • All ground personnel will stay at least 4 feet from vibratory unit while in operation
Moving Sheets with Loader	• Pinch Points • Slips, trips & falls - Know your surroundings • Crushing • Moving equipment • Lifted loads	• Check area for work being performed by other contractors. Verify path to decon area. • Operator and ground personnel to maintain visual contact • Stay clear of running equipment • Spotter • Maintain proper PPE	• Spotter will direct traffic if needed • Bind load to forks before transport • PPE: leather gloves, hearing protection, PFD when working near the water

Safe Plan of Action

Project No. E-1017
Job/Task: Removing Sheet Piling **Work Area:** Rim Ditch **Date:** _____

Steps of Task	Hazard/Reaction to Change	Safe Plan	Resources
Cutting or Grinding Sheets	• Burns, hot slag • Combustible materials in area • Working near moving equipment	• Hot work permits • Proper PPE, including hoods, face shields, burn jackets • Fire watch with extinguisher • Maintain contact with equipment operators	• Use Two Minute Rule before starting in a new area • All permits are signed and at work area before beginning work • Assure positive contact with operator before working near equipment • All ground personnel will stay at least 4 feet from vibratory unit while in operation. • PPE: leather gloves, hearing protection, burn protection, PFD when working near the water

Team Members' Signatures

_____ _____ _____ _____
_____ _____ _____ _____
_____ _____ _____ _____
_____ _____ _____ _____
_____ _____ _____ _____
_____ _____ _____ _____
_____ _____ _____ _____

The signature of the supervisor confirms the completion of the hazard assessment and Safe Plan of Action by the crew.

Supervisors Signature: _____ Date_____

Instructions: 1. Write name of job or task in space provided. 2. Conduct walk-through survey of work area. 3. Write the steps of the task in a safe sequence. 4. List all possible hazards involved in each step and reaction to change. 5. In the Safe Plan column, state actions that will be taken to prevent the hazards or injury from reaction to change. 6. In Resources column, list equipment, tools, etc. needed to do the job. 8. Ask each team member, who helped develop and will use this SPA, to sign in spaces provided. 9. Review the SPA at the end of the task for improvements.

Work shall stop when conditions change, the job changes, or a deficiency in the plan is discovered, and the current SPA will be modified or a new SPA created.

Safe Plan of Action

Project No. E-1017
Job/Task: Removing Sheet Piling **Work Area:** Rim Ditch **Date:** _____

Team Member Signature Sheet Continuation

Review checklist while completing front page of SPA. Check all that apply.

A new SPA is required if the job scope or work conditions change.

Required Permits	Hazards	Safe Plan
☐ Confined Space ☐ Critical Lift ☐ Hot Work ☐ Lock Out/Tag Out ☐ Soil Disturbance (Over 12") ☐ Utility Clearance	☐ Overhead Utilities	☐ Power de-energizing req'd. ☐ Insulation blankets req'd. ☐ Wire watcher req'd. ☐ Required clearance distance = _____Ft. ☐ Safe work zone marked
	☐ Crane or Other Lifting Equipment	☐ Signalman assigned ☐ Tag lines in use ☐ Area around crane barricaded ☐ Lifting equipment inspected ☐ Personnel protected from overhead load
	☐ Underground Utilities	☐ Reviewed as-builts ☐ Subsurface surveys ☐ Received dig permit ☐ Required clearance distance = _____ Ft. ☐ Safe work zone Marked
Required PPE ☐ Hard Hat, Class C ☐ Hard Hat, Class E *(Elect. Protect)* ☐ Ear Plugs/Ear Muffs	☐ Electrical	☐ Lock out/tag out/try out ☐ Permit req'd.? ☐ Confirm equipment is de-energized ☐ Reviewed electrical safety procedures
	☐ Excavations	☐ Permits ☐ Inspected prior to entering ☐ Proper sloping/shoring ☐ Barricades provided ☐ Access/egress provided ☐ Protection from accumulated water
Eye Protection: ☐ Safety Glasses ☐ Face Shield ☐ Chemical Goggles ☐ Welding Hood	☐ Fire Hazard	☐ Hot work permit ☐ Fire extinguishers ☐ Fire watch ☐ Adjacent area protected ☐ Unnecessary flammable material removed
	☐ Vehicular Traffic or Heavy Equipment	☐ Traffic barricades ☐ Cones ☐ Signs ☐ Flagmen ☐ Lane closure ☐ Communication with equipment operator
	☐ Noise >85 dB	Hearing protection required: ☐ Ear plugs ☐ Ear muffs ☐ Both
Hand Protection: ☐ Cut Resistant Gloves ☐ Welders Gloves ☐ Nitrile Gloves ☐ Surgical Gloves ☐ Rubber Gloves ☐ Elect. Insulated Gloves ☐ Arm Sleeves	☐ Hand & Power Tools	☐ Inspect general cond. ☐ GFCI in use ☐ Identified PPE required for each tool ☐ Reviewed safety requirements in operators manual(s) ☐ Guarding OK
	☐ Hand Hazards	List sharp tools, material, equipment: _____ ☐ PPE gloves, etc. ☐ Protected sharp edges as necessary
	☐ Manual Lifting	☐ Reviewed proper lifting tech. ☐ Identified material requiring lifting equipment ☐ Hand protection required ☐ Back support belts
	☐ Ladders	☐ Inspect general cond. before use ☐ Ladder inspected within last quarter ☐ Ladder tied off or held ☐ Proper angle and placement ☐ Reviewed ladder safety
Foot Protection: ☐ Sturdy Work Boots ☐ Safety Toe Boots ☐ Rubber Boots ☐ Rubber Boot Covers ☐ Dielectric Footwear	☐ Scaffolds	☐ Inspect general condition before use ☐ Tags in place ☐ Properly secured ☐ Toe boards used ☐ Footings adequate ☐ Materials properly stored on scaffold
	☐ Slips, Trips, Falls	☐ Inspect for trip hazards ☐ Hazards marked ☐ Tools and material properly stored ☐ Extension cords properly secured ☐ Work zone free of debris
	☐ Pinch Points	List potential pinch points: _____ ☐ Working near operating equipment ☐ Hand/body positioning
Respiratory. Protection: ☐ Dust Mask ☐ Air Purifying Respirator ☐ Supplied Air Respirator ☐ SCBA ☐ Emergency Escape Respirator	☐ Working with Chemicals	☐ List specific chemicals involved and list hazards and precaution on front side ☐ Reviewed MSDS ☐ Exposure monitoring req'd. ☐ Have proper containers and labels ☐ Identified proper PPE (respirators, clothing, gloves, etc.)
	☐ Asbestos or Lead Paint Potential	☐ Areas to be worked may contain asbestos or lead paint ☐ Asbestos controls incorporated ☐ Lead based point controls in place ☐ Exposure monitoring conducted
Special Clothing: ☐ Tyvek ® ☐ Poly Coated Tyvek ® ☐ Fire Resistant Coveralls ☐ Rain Suit ☐ Safety Vest	☐ Heat Stress Potential	☐ Heat stress monitoring (>85°) ☐ Liquids available ☐ Cool down periods ☐ Sun screen ☐ Reviewed heat stress symptoms
	☐ Cold Stress Potential	☐ Proper clothing (i.e., gloves, coat, coveralls) ☐ Wind chill <32° ☐ Reviewed cold stress symptoms ☐ Warm up periods
	☐ Environmental	☐ Air emissions ☐ Water discharge ☐ Hazardous wastes ☐ Other wastes ☐ Pollution prevention ☐ Waste minimization
Fall Protection: ☐ Harness ☐ Double Lanyard Required ☐ Anchorage Point Available ☐ Additional Anchorage Connector Needed e.g. Cross Arm Strap, etc. ☐ Retractable Device Needed ☐ Horizontal Life Line System Req'd. ☐ Fall Clearance Distance Adequate ☐ Fall Rescue/Retrieval Plan Set Up	☐ Natural or Site Hazards	☐ Weather ☐ Terrain ☐ Adjacent operations or processes ☐ Biological hazards ☐ Animals/reptiles/insects hazards
	☐ Adjacent Work/Processes	☐ Notified them of our presents ☐ Other workers adjacent, above, or below ☐ Coordinated with adjacent supervisor/customer/operator ☐ Need barriers between
	☐ Barricades/Covers	☐ Caution barricade tape req'd. ☐ Danger barricade tape req'd. ☐ Rigid railing req'd. ☐ Covers over opening ☐ Warning signs required
	Additional Information:	

Fossil Development and Construction
CONTRACTOR SAFETY
PRE-JOB BRIEF

Turn into Site Manager/Safety Department at end of day or completion of the work task.

The PJB shall be completed daily for each task. Post this PJB in a conspicuous location throughout the length of the task. Each crew member involved with the task shall sign this PJB at the beginning of shift.

Plant/Site: _____

Contractor: _____

Foreman: _____

Employee / Conducting PJB Name

_____

Date: _____

Location of Task: _____

_____

Task Description: _____

_____

Does the task require special training? Yes ☐ No ☐

If yes, what type? _____

_____

General Information

1. Should Safety Professional be involved in the planning of this job? Yes ☐ No ☐

Job Safety Analysis

1. What are the hazards associated with the job? Be **PARTICULARLY** careful about:

_____

_____

_____

_____

_____

Hazard Corrections: _____

_____

_____

_____

_____

2. Has job task specific JSA been completed / reviewed with all crew members for this task? Yes ☐ No ☐

3. Has the Two Minute Rule been observed before starting this job specific task? Yes ☐ No ☐

Rigging

1. Has the rigging plan been discussed and all paper work been completed? Yes ☐ No ☐ N/A ☐

Note: Complete Appendix (A) when using chain falls and com-a-longs Yes ☐ No ☐

2. Has rigging equipment been inspected? Yes ☐ No ☐

3. Person In-Charge of rigging

_____

4. Signal Person N/A ☐

_____

5. Person In-Charge / Signal person directed to wear a yellow safety vest during all rigging task. Yes ☐ N/A ☐

6. Cranes/Overhead power lines & associated electrical hazards evaluated (guy wires, poles, structures).

Yes ☐ No ☐ N/A ☐

7. Low clearance Electrical Hazards have been identified and flagged, (guy wires, conductors, etc.)

Yes ☐ No ☐ N/A ☐

Rigging Requirements Verified By:

Signature _____

Tools and Equipment

Has the required user inspection been completed on all tools, ladders, electrical cords, and safety equipment? Yes ☐ No ☐

Scaffolds / Ladders

Have all scaffolds/ladders been inspected and all scaffold tags been signed? Yes ☐ No ☐ N/A ☐

Emergency Equipment

Identify below the location of the nearest extinguisher and communication source and your assembly area.

_____

_____

_____

_____

Housekeeping

Is housekeeping safe & acceptable in the work area?

Yes ☐ No

☐ Location: _____

_____

_____

Fall Protection

Have areas been identified as requiring fall protection systems? (i.e. static lines, barricades, hole covers, etc.)

Yes ☐ No ☐

Have they been installed? Yes ☐ No ☐

Asbestos

Have all areas that may present an asbestos exposure hazard while executing task been identified including known asbestos containing material and potentially asbestos containing material? Yes ☐ No ☐ N/A ☐

Fire Protection

Are flammable / combustible materials stored, separated, inspected, and secured per procedure? Yes ☐ No ☐

Personal Protective Equipment Required

1. Hard Hat.....Yes ☐ No ☐
2. Fall Protection.....Yes ☐ No ☐
3. Eye / Face.....Yes ☐ No ☐
4. Respirator.....Yes ☐ No ☐
5. Foot.....Yes ☐ No ☐
6. Hand.....Yes ☐ No ☐
7. Hearing.....Yes ☐ No ☐
8. Knee Pads.....Yes ☐ No ☐
9. Tyveks.....Yes ☐ No ☐

Rev. 11 January 11, 2010

Applicable Permits
Procedures / Permits Required

1. Hot Work.....Yes ☐ No ☐
2. Clearance.....Yes ☐ No ☐
3. Excavation.....Yes ☐ No ☐
4. Signs / Barricades.....Yes ☐ No ☐
5. Confined Space.....Yes ☐ No ☐
6. Crane Lift.....Yes ☐ No ☐
7. Line Break / Hot Tapping.....Yes ☐ No ☐
8. Scaffolds.....Yes ☐ No ☐
9. Fire/Hole Watch.....Yes ☐ No ☐

Other (specify below).....Yes ☐ No ☐

Name_____

Employee Certifications Required

1. Crane Operator _____ ☐
2. Forklift Operator_____ ☐
3. Mobile Equipment Operator _____ ☐
4. Powder-Actuated Tool User _____ ☐
5. Competent Person (Lead, asbestos, excavation, confinedspace, hazard material, scaffolds)_____ ☐

Other (specify below)_____ ☐

_____

_____

FOREMAN'S POST JOB REVIEW

Foreman:_____

Date: _____

1. Was anyone injured or did an unplanned incident occur today? Yes ☐ No ☐
   If yes, explain: WHO, WHAT, TIME

_____

_____

2. Was it reported to your Supervisor? Yes ☐ No ☐
   If yes, state: Name, Date and Time

_____

3. What problems did you have with today's work assignment? _____

_____

_____

4. Miscellaneous concerns: _____

_____

5. Housekeeping left in good order? Yes ☐ No ☐

Explain if NO: _____

_____

_____

6. Reviewed by: _____

Supervisor: _____

General Foreman: _____

Validation Visits

Initial site PJB visit (Foreman), Time:.....

Foreman's Name: _____

PJB Covered_____ Suitable _____

If not suitable list changes: _____

_____

_____

Validation visits may be conducted by any Manager or Supervisor conducting an audit. One MUST be done by the foreman.

Site PJB Validation Visit: Time: _____

Name/Title: _____

PJB being followed: .....Yes ☐ No ☐

Comments/Recommendations _____

_____

_____

Site PJB Validation Visit: Time: _____

Name/Title: _____

PJB being followed: .....Yes ☐ No ☐

Comments/Recommendations _____

_____

_____

_____

"Additional Comments"

If PJB was not being followed during validation visit list action taken, ALSO LIST REVISIONS TO PJB:

_____

_____

_____

By my signature below I acknowledge instructions regarding this PJB prior to my job task / work shift.

Date:_____ Time: _____

Signatures

_____

_____

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APPENDIX (A)

RIGGING ACTIVITIES THAT REQUIRE ADDITIONAL PLANNING AND APPROVAL WHEN USING CHAIN FALLS AND COM-A-LONGS

1. Is the lift/hoist in a position that is beyond 15 degrees of vertical/plumb? ..... Yes ☐ No ☐
2. Is there multiple lift points? ..... Yes ☐ No ☐
3. Is the lift height greater than 20 feet? ..... Yes ☐ No ☐
4. Does component weigh greater than 80 percent of the rigging equipment capacity? ..... Yes ☐ No ☐
5. Is there any special rigging equipment (powered hoist, etc.)? ..... Yes ☐ No ☐
6. Is the material being lifted within two (2) feet of the hoisting device? ..... Yes ☐ No ☐
7. Is this a field rework/modification, specifically removing, modifying or taking out of service a component previously installed under new construction? ..... Yes ☐ No ☐

*** Rigging Specialist must sign:** **Rigging Specialist:** _____

*** TVA Review/Sign-off:** **TVA Review** _____ **N/A** ☐

CHECK LIST ITEMS TO CHECK WHEN USING CHAIN FALLS AND COM-A-LONGS

8. Is weight rigging/pick known? ..... Yes ☐ No ☐
9. Do you have the proper device, rigging, and attachments? ..... Yes ☐ No ☐
10. Do you have proper head room / clearance for the rigging? ..... Yes ☐ No ☐
11. Do you have the mandated use of shackles in place for connecting multiple rigging points? ..... Yes ☐ No ☐
12. What degree angle (never use slings under 30 degree)? ..... Yes ☐ No ☐
13. Softeners required? ..... Yes ☐ No ☐
14. Latches, hooks are all in place and working? ..... Yes ☐ No ☐
15. Levers / chains free moving? ..... Yes ☐ No ☐
16. Barricaded area around work? ..... Yes ☐ No ☐
17. Is structure adequate to handle the intended load? ..... Yes ☐ No ☐
18. Is load centered over lifting device? ..... Yes ☐ No ☐
19. Will more then one device be used? ..... Yes ☐ No ☐
20. Shackle required for securing slings to lifting device? ..... Yes ☐ No ☐
21. Is there a potential of material, rigging and/or damaging load intended to be lifted? ..... Yes ☐ No ☐
22. Need to keep clear of load, when lifted, can you work device without getting under load? ..... Yes ☐ No ☐
23. Have you thought out a plan and reviewed with crew? ..... Yes ☐ No ☐
24. Will there be hot work going on around the device, slings or work area? ..... Yes ☐ No ☐
25. Have device been checked prior to lift? ..... Yes ☐ No ☐
26. Lifting, hoisting and/or restraining of material that employs the use of a lifting/hoisting device other than a crane? ..... Yes ☐ No ☐
27. Have all items been reviewed and discussed with the crew? ..... Yes ☐ No ☐

APPENDIX (A)

PRE-JOB / JOB SAFETY ANALYSIS

Skills Required:	Approved By:	Approved By:
Required Personal Protective Equipment:		
Tools and Equipment Required:		
Job Preparation:		
Hazardous Materials:	Special Requirements:	

Number	ACTYIVITY	HAZARD	HAZARD CONTROLS
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

ATTACHMENT 2

Submittal 1017-012
Modification of Secondary Dewatering System

Sevenson Environmental 1134 Swan Pond Road Harriman, TN 37748 (865) 717-6526	**SUBMITTAL**

SUBMITTAL NO. 1017-012

PROJECT: **Dredging of the Emory River & Ash Processing**

SUBMITTED FOR : **Additional Information**

Submittal Description: **Modification of Secondary Dewatering System**

SUBMITTED TO: **Kathy Ellis** DATE: 7/29/2009

TVA
1134 Swan Pond Road
Harriman, TN 37748

SUBMITTED BY: Ira Rogers

INFORMATION FOR PROCESSING:

ITEM #	QTY.	DESCRIPTION	STATUS
1	1 pg	Modification of Secondary Dewatering System	
2	1 pg	Grain Size of Type 57 Stone	
3	16 pgs	Cantilevered Sheet Piling	

REMARKS: Copies will be hand delivered to Steve Arrington, ~~Mike Anderson~~

Ira Rogers Signature Date

NO. 1017-012

AGGREGATE ANALYSIS

PLANT: ROGERS GROUP INC. LOCATION: ROANE COUNTY

PROJECT: DATE: 7/17/2009

MATERIAL: *#57 Stone* SIZE:

LOSS ON WASH TEST: DATE OF WASH TEST: F.M.

ORIGINAL SAMPLE WEIGHT grams
DRY SAMPLE WEIGHT grams
PERCENT MOISTURE

SCREEN SIZE	WEIGHT RETAINED	PERCENT RETAINED	PERCENT PASSING	SPECIFICATIONS
1 1/2"	0.00	0.00%	100.00%	100
1"	0.48	2.11%	97.89%	95-100
3/4"	3.79	16.64%	83.36%	
1/2"	15.89	69.78%	30.22%	25-60
3/8"	19.20	84.32%	15.68%	
NO.4	22.08	96.97%	3.03%	0-10
NO.8	22.46	98.64%	1.36%	0-5
PAN				
TOTAL	22.77			

REMARKS:

SIGNATURE:

Civil • Structural • Geotechnical • Materials Testing • Consulting

Cantilevered Sheet Piling Design Calculations

TVA Kingston Fossil Plant

Kingston, Tennessee

"Rim Ditch" Dredge Support

prepared for:
Sevenson Environmental Services, Inc.
2749 Lockport Road
Niagara Falls, New York 14305

prepared by:
Glynn Geotechnical Engineering
415 South Transit Street
Lockport, New York 14094

MARK W. GLYNN
REGISTERED ENGINEER
AGRICULTURE
COMMERCE
No. 105138
STATE OF TENNESSEE

GGE 09-1103

July 27, 2009 (Revised)

GGE
a member of the GLYNN GROUP

Civil • Structural • Geotechnical • Materials Testing • Consulting

Cantilevered Sheet Piling Design Criteria and Summary

1. Cantilevered Sheet Piling design uses SPW911 computer software by Pile Buck, Inc.

2. Design uses Rankine Earth Pressure Coefficients.

3. Design Considers temporary (short term) support conditions and uses a factor of safety (FOS) of 1.2 applied to the estimated soil strength parameters (e.g., Kp/1.2 and c/1.2).

4. Design cases for both a 15' dredge depth (i.e., the "first" 800 l.f.) and a 10' dredge depth (i.e., the "last" 1000 l.f.) are evaluated and specified:

   a. The 15' dredge requires 40' long sheets with a min. toe depth of 25',
   b. The 10' dredge requires 25' long sheets with a min. toe depth of 15'

5. Soil parameters used in the design analyses were recommended by Geosyntec Consultants as noted in the following Tables (prepared and provided by Geosyntec)

Table 1: Material Properties for Initial 800 feet Section

Layers	Total Unit Weight (pcf)	Effective Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (deg)
Ground Surface to EL 760 ft	90	27.6	0	30
EL 760 – 735 ft	80	17.6	0	28
EL 735 – 708 ft	80	17.6	0	25

Table 2: Material Properties for Remaining 1000 Section

Layers	Total Unit Weight (pcf)	Effective Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (deg)
Ground Surface to EL 757 ft	90	27.6	0	30
EL 760 – 705 ft	80	17.6	0	28

Civil • Structural • Geotechnical • Materials Testing • Consulting

Cantilevered Sheet Piling Design Criteria and Summary (cont'd)

6. The following design criterion applies to the cantilevered sheet piling design at the section of the Rim Ditch subject to the 15' dredge depth (the "first" 800 l.f.):

    a. The construction surcharge load includes a Komatsu PC800 Excavator, supported on 20' wide timber distribution mats at an offset distance of 2' from the interior face of the sheet piling, and founded on a 24' reinforced road (crushed stone). The road subgrade elevation is 764.5.
    b. Construction will include dewatering measures to maintain the water level on the active (working platform) side of the sheet piling at or below el. 763.0 (7.27.09 rev.). The "active" side dewatering requirement is based on a preference to limit the total sheet piling length to 40'.

7. The following design criterion applies to the cantilevered sheet piling design at the section of the Rim Ditch subject to the 10' dredge depth (the "last" 1000 l.f.):

    a. The construction surcharge load includes a Komatsu PC800 (or alternate PC600) Excavator, supported on 20' wide timber distribution mats at an offset distance of 2' from the interior face of the sheet piling founded on a 24' reinforced road (crushed stone). The road subgrade elevation is 764.5.
    b. Construction will include dewatering measures to maintain the water level on the active (working platform) side of the sheet piling at or below el. 762.9 (7.27.09 rev.). The "active" side dewatering requirement is based on a preference to limit the total sheet piling length to 25'.

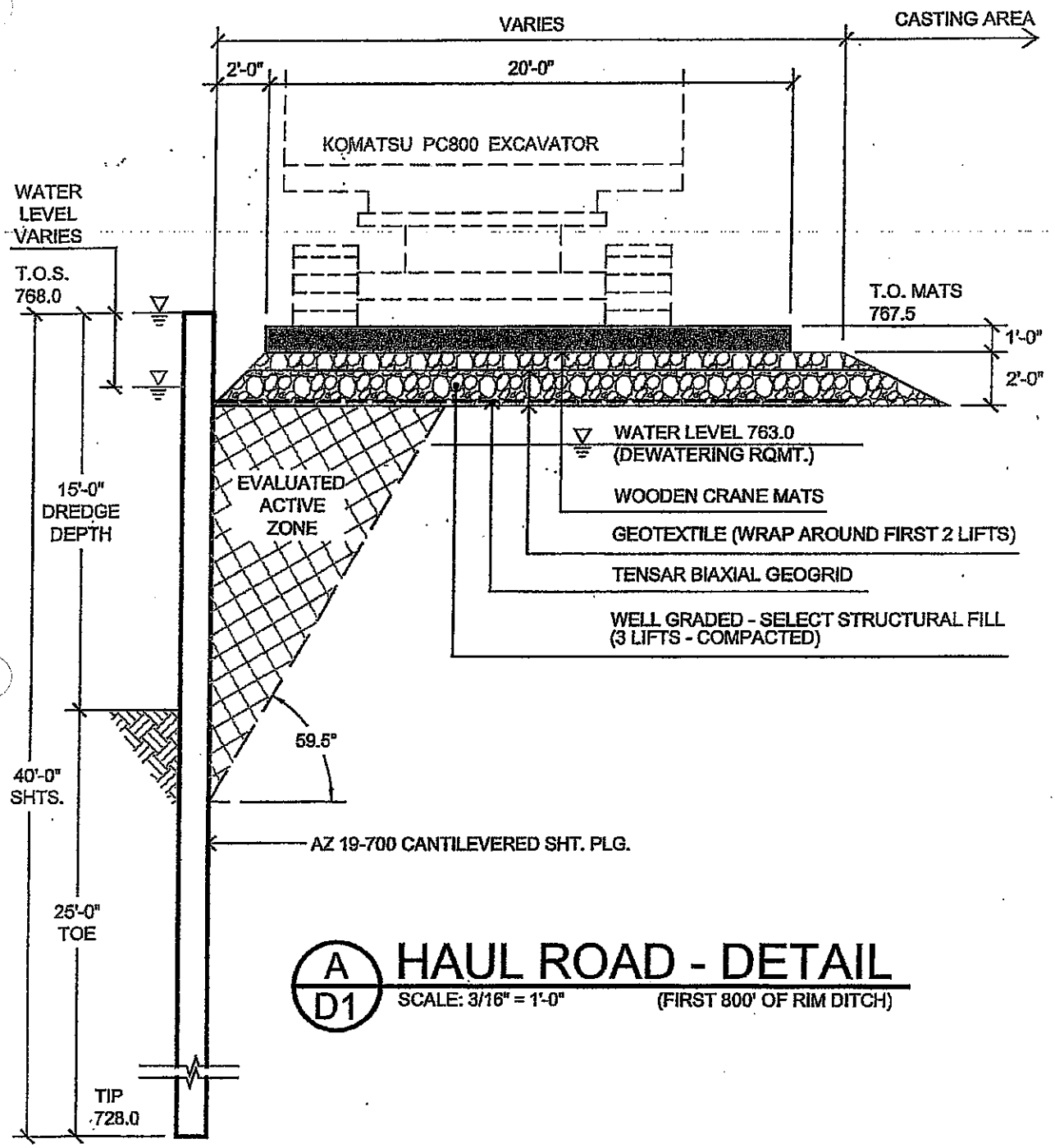
8. Design is based on cantilevered support without additional bracing.

9. Design based on ASTM A 572, Gr. 50 material (Fy = 50 ksi) and evaluates AZ 19-700 sheet piling by Arcelor Mittal.

10. Design analyses includes an evaluation of the limits of the active failure zone to determine a design restrained setback distance from the cantilevered sheet piling.

11. Attachments to this design summary include:

    a. Design cross-section drawings D1 and D2
    b. Surcharge and active failure zone evaluation calculations (4 sheets)
    c. "Pilebuck" SPW911 analysis output (8 sheets)

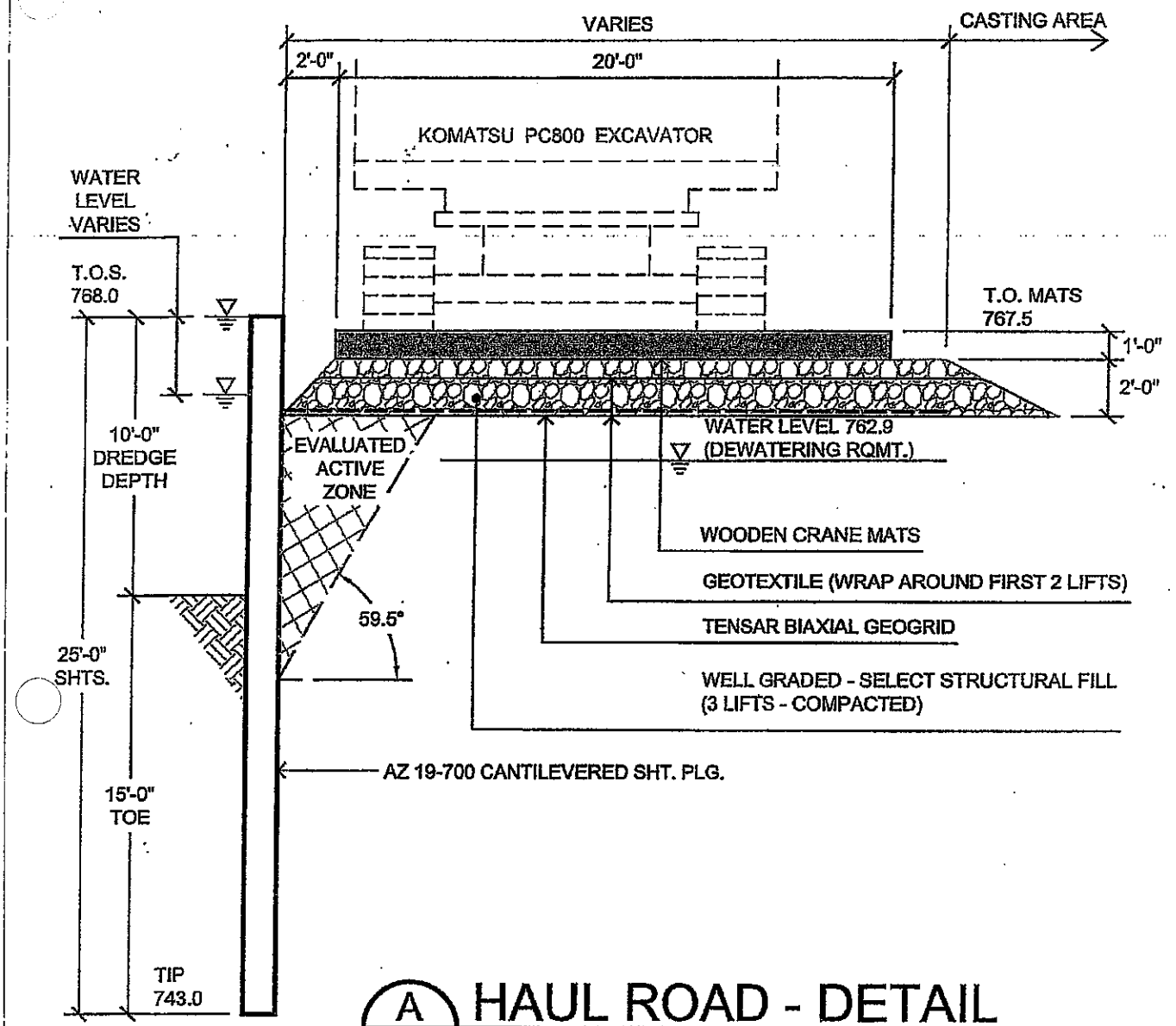


A D1 HAUL ROAD - DETAIL

SCALE: 3/16" = 1'-0" (FIRST 800' OF RIM DITCH)

GGE ENGINEERING • DESIGN
GLYNN GEOTECHNICAL ENGINEERING
415 S. TRANSIT STREET
LOCKPORT, NEW YORK 14094
VOICE (716) 625-6933 / FAX (716) 625-6983
www.glynngroup.com

PROJECT: KINGSTON FOSSIL PLANT				SHEET NO.:
SUBJECT: HAUL ROAD DETAIL (FIRST 800 LF)				D1
CLIENT: SEVENSON ENVIRONMENTAL SERVICES, INC.				
PROJ. NO.: 09-1103	SCALE: 3/16" = 1'-0"	DATE: 7.27.09 (REV)	BY: MJL/EMP	



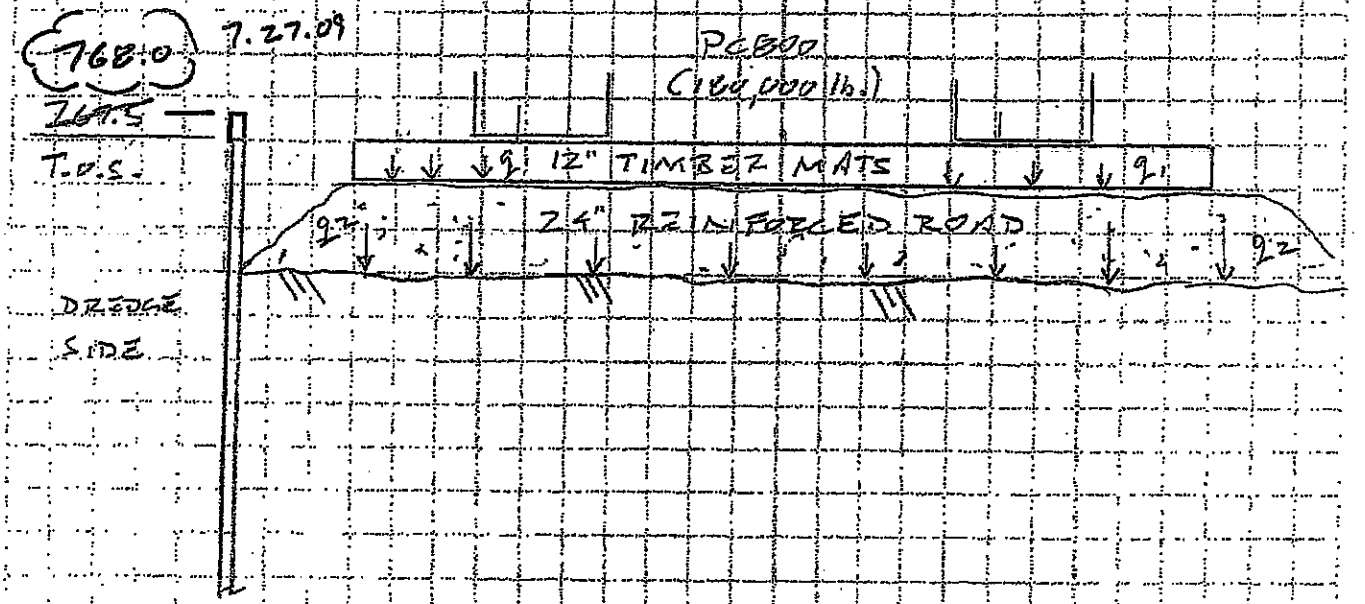
A/D2 HAUL ROAD - DETAIL

SCALE: 3/16" = 1'-0" (LAST 1000' OF RIM DITCH)

GGE ENGINEERING • DESIGN GLYNN GEOTECHNICAL ENGINEERING 415 S. TRANSIT STREET LOCKPORT, NEW YORK 14094 VOICE (716) 625-6983 / FAX (716) 625-6983 www.glynngroup.com	PROJECT: KINGSTON FOSSIL PLANT				SHEET NO.:
	SUBJECT: HAUL ROAD DETAIL (LAST 1000 LF)				D2
	CLIENT: SEVENSON ENVIRONMENTAL SERVICES, INC.				
	PROJ. NO.: 09-1103	SCALE: 3/16" = 1'-0"	DATE: 7.27.09(REV)	BY: MJL/EMP	

RE-EVALUATE CONST. SURCHARGE LOAD (1ST 800 L.F.)

7.27.09



SURCHARGE PRESSURE:

@ ROAD SURFACE:

$$q_1 = 180{,}000^{\#} / 20' \times 20' + 60 \text{ psf}$$

$$= 510 \text{ psf}$$

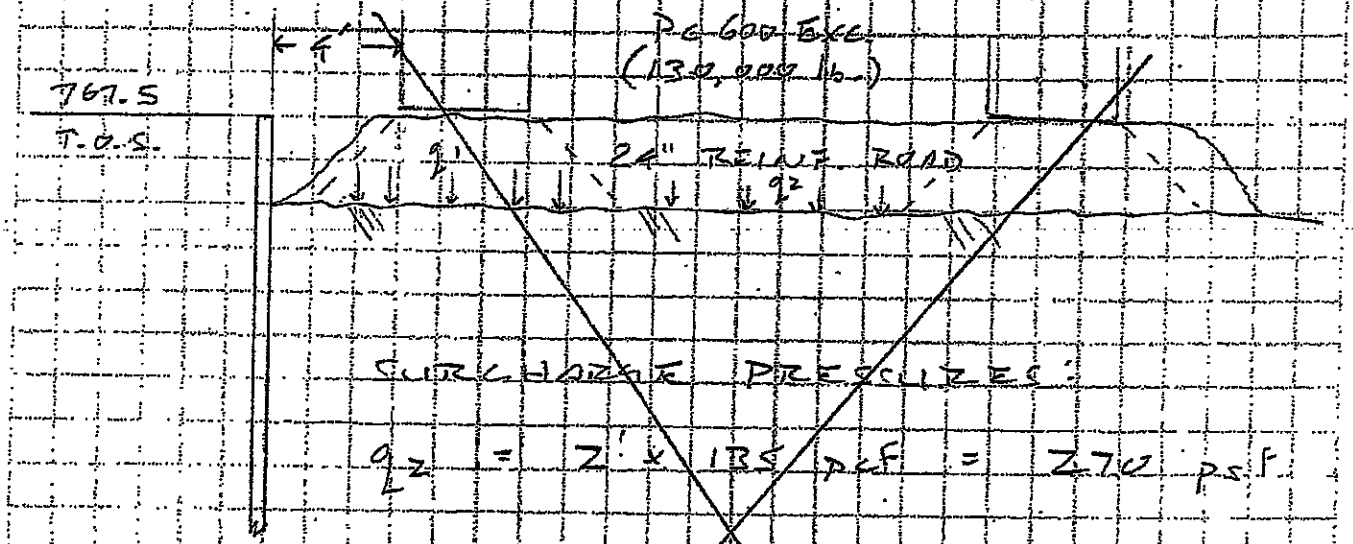
@ SUBGRADE: USE 1:1 PRISMATIC DIST. THRU REINF. ROAD SECTION

$$q_2 = \frac{510 \text{ psf} \times (20')^2}{(24')^2} + 2' \times 135 \text{ pcf}$$

$$= \underline{\underline{624 \text{ psf}}}$$

GGE ENGINEERING·DESIGN GLYNN GEOTECHNICAL ENGINEERING 415 South Transit Street Lockport, New York 14094 voice 716.625.6933 / fax 716.625.6983 www.glynngroup.com	PROJECT: TVA KINGSTON FOSSIL PLANT			SHEET NO: 1/4
	SUBJECT: RIM DITCH DREDGE			
	CLIENT: SEVENSON			
PROJECT NO: 09-1103	SCALE: —	DATE: 7.17.09	BY:	CHECKED BY:

CONSTRUCTION SURCHARGE LOAD
(LAST 1000 L.F.)



SURCHARGE PRESSURES:

$q_2 = 2' \times 135\ pcf = 270\ psf$

$$q_1 = \frac{130{,}000/2}{(3' + 4') \times (15.1 + 4')} + 270\ psf$$

$= 486\ psf + 270\ psf = 756\ psf$

EQUIV. UNIFORM SURCHARGE:

$$q_{eff} = \frac{2(7') \times 756\ psf + 5.83 \times 270\ psf}{(4' + 13.83' + 2')}$$

$= \underline{\underline{613\ psf}}$

USE MATS / ROAD

SECTION SIM. TO 1ST 600'

GGE ENGINEERING·DESIGN GLYNN GEOTECHNICAL ENGINEERING 415 South Transit Street Lockport, New York 14094 voice 716.625.6933 / fax 716.625.6983 www.glynngroup.com	PROJECT: TVA KINGSTON FOSSIL PLANT				SHEET NO: 2/4
	SUBJECT: RIM DITCH DREDGE				
	CLIENT: SEVENSON				
	PROJECT NO: 09-1108	SCALE: –	DATE: 7.17.09	BY: jg	CHECKED BY:

USING 36" REINF. ROAD:

$q_2 = 3' \times 135\ pcf = 405\ psf$

$q_1 = \frac{65{,}000}{(3'+6')\times(15.1'+6')} + 405\ psf$

$= 342\ psf + 405\ psf = 747\ psf$

$q_{eff} = \frac{2(9') \times 747\ psf + 2.83' \times 405\ psf}{(4' + 13.83' + 3')}$

$= \underline{\underline{700.5\ psf}}$

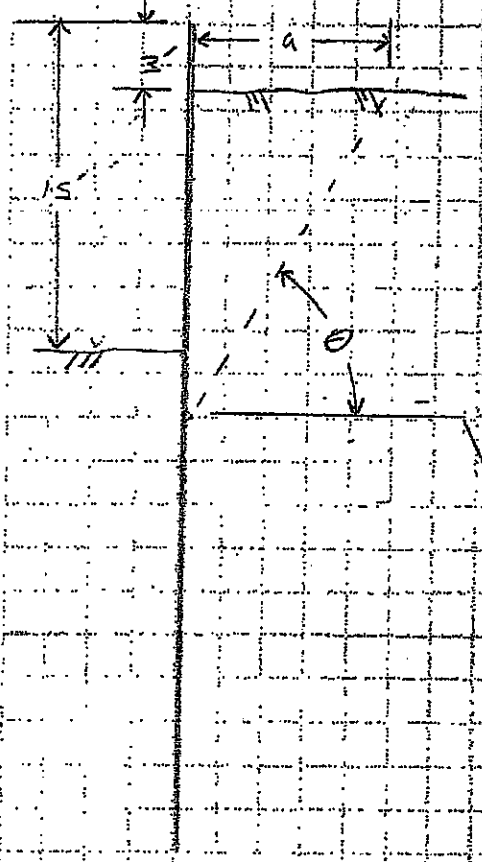
USE TIMBER MAT/

ROAD SECTION AS SHOWN

FOR 1ST 600 L.F.

GGE ENGINEERING·DESIGN GLYNN GEOTECHNICAL ENGINEERING 415 South Transit Street Lockport, New York 14094 voice 716.625.6933 / fax 716.625.6983 www.glynngroup.com	PROJECT: TVA KINGSTON FOSSIL PLANT			SHEET NO: 3/4
	SUBJECT: RIM DITCH DREDGE			
	CLIENT: SORENSON			
	PROJECT NO: 09-103	SCALE: –	DATE: 7-17-09	BY: JJ	CHECKED BY:

CASTING AREA/SETTLING POND SETBACK
(EVALUATE 15' DREDGE)



$a = 15.5' \times \tan(90 - 59°)$

$= \underline{9.31'}$

$\theta = 45 + \phi/2 = 45° + 28°/2 = 59°$

P = 0 @ -15.5' (FROM PILE BLOCK)

∴ AT A SETBACK DISTANCE OF 30', CASTING AREA/SETTLING POND WILL BE OUTSIDE OF ACTIVE FAILURE ZONE & NOT IMPACT CANT'D SHT. PLG.

GGE ENGINEERING·DESIGN GLYNN GEOTECHNICAL ENGINEERING 415 South Transit Street Lockport, New York 14094 voice 716.625.6933 / fax 716.625.6983 www.glynngroup.com	PROJECT: TVA KINGSTON FOSSIL PLANT			SHEET NO: 4/4
	SUBJECT: RING DITCH DREDGING			
	CLIENT: SEVENSON			
PROJECT NO: 09-1103	SCALE: –	DATE: 7.16.09	BY: JS	CHECKED BY:

Client: Sevenson Environmental, Inc.
Attn: Mr. Mike Elia

Title: Cantilevered Sheet Piling, 800 ft Section
Ref: SES
Page: 1
Date: 7.24.09

Sheet: AZ 19-700 Gr 50
Pressure: Rankine
FOS: 1.0 (K_p÷1.2; C÷1.2)
Toe: Cantilever

Maximum	d (ft)
○ 129.0 psf	11.50
□ 17527.4 ftlb/ft	23.94
● 1.7 in	-3.50

7.23.09 Design Revision:

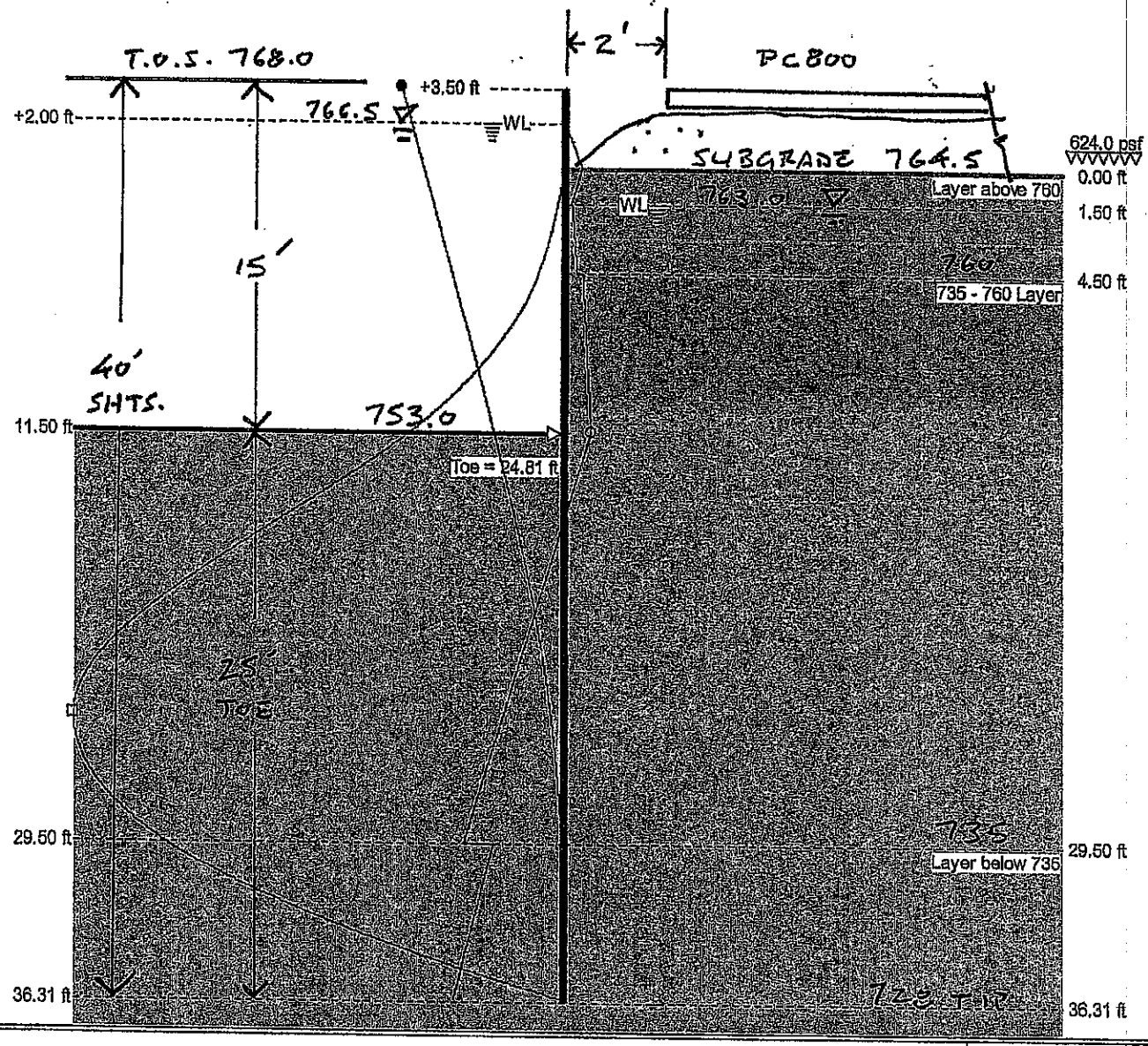
Active W.L. @ el. 763.0 (Dewatering requirement)

Passive W.L. @ el. 766.5 (Design W.L. in Ditch, 1.5' below T.O.S. @ el. 768.0)

624 psf Total Const. Surcharge (PC800 / 20' x 20' timber mats offset 2' from int. face of sht plg / 1:1 prismatic dist. thru 2' reinf. road section) Subgrade el. 764.5

Using Soil parameters as recommended by Geosyntec

Design dredge to 15' below T.O.S. = el. 753



Glynn Geotechnical Engineering

415 South Transit Street
Lockport, NY 14094
Tel: 716.625.6933
Fax: 716.625.6983

SPW911, v2.20

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Email: pilebuck@pilebuck.com
Web: www.pilebuck.com

Client: Sevenson Environmental, Inc.
Attn: Mr. Mike Elia

Title: Cantilevered Sheet Piling, 800 ft Section
Ref: SES
Page: 3
Date: 7.24.09

Sheet: AZ 19-700 Gr 50
Pressure: Rankine
FOS: 1.0 (K_p÷1.2; C÷1.2)
Toe: Cantilever

	Maximum	Ad(ft)
○	129.0 psf	11.50
□	17527.4 ftlb/ft	23.94
◇	1292.8 lb/ft	15.25
●	1.7 in	-3.50

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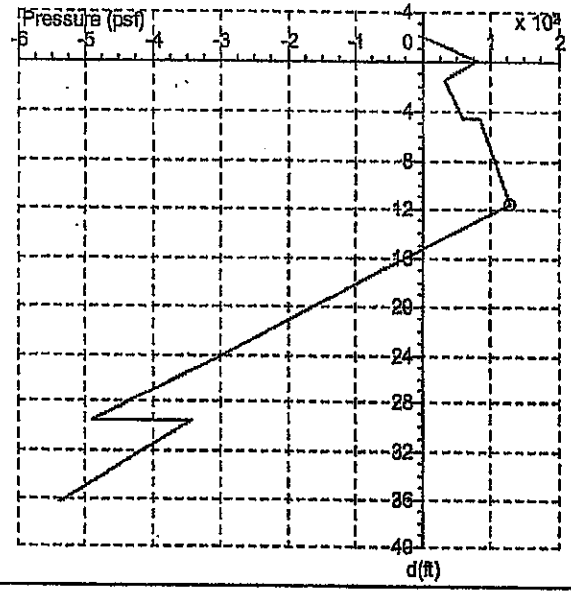
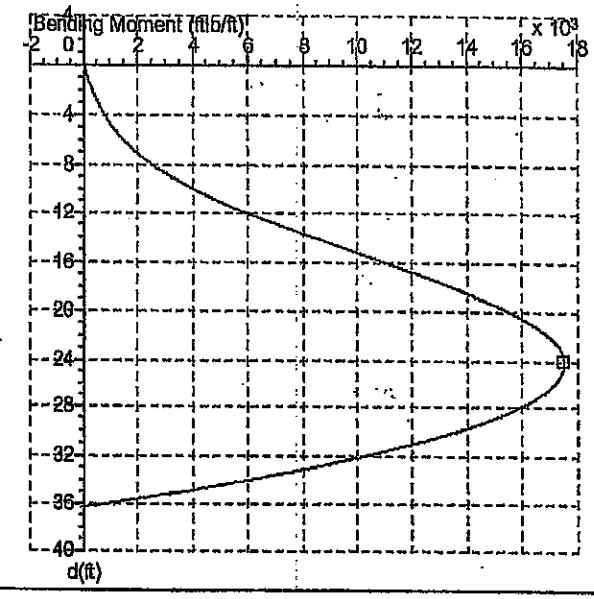
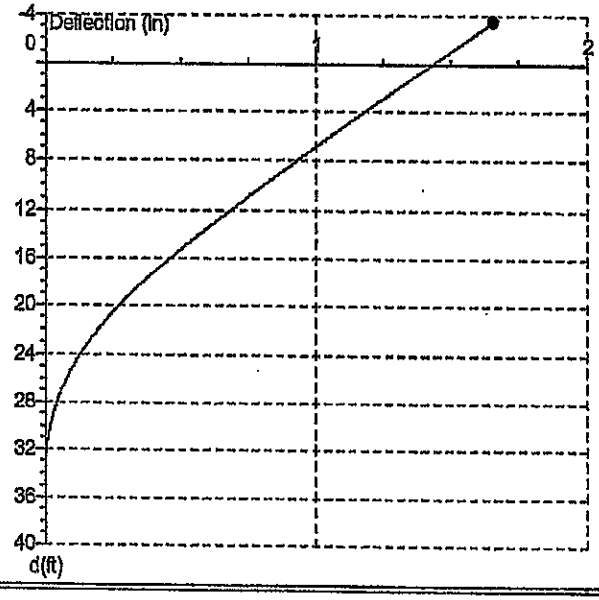
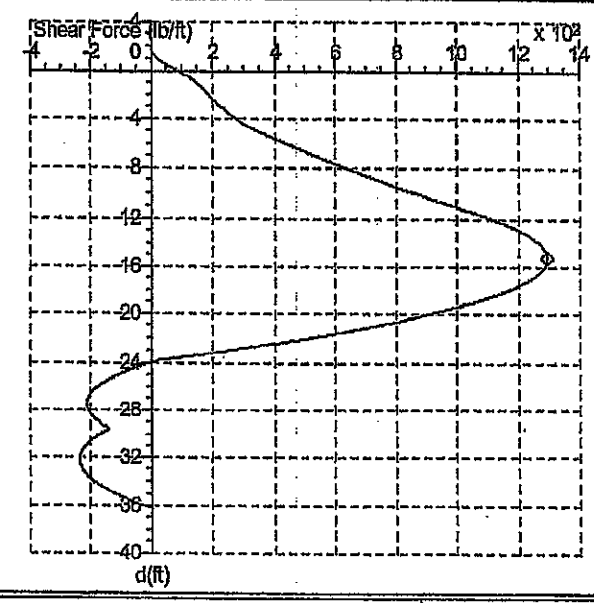
Using Soil parameters as recommended by Geosyntec

Design dredge to 15' below T.O.S. = el. 753









Glynn Geotechnical Engineering

415 South Transit Street
Lockport, NY 14094
Tel: 716.625.6933
Fax: 716.625.6983

SPW911, v2.20

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Email: pilebuck@pilebuck.com
Web: www.pilebuck.com

Client: Sevenson Environmental, Inc.
Attn: Mr. Mike Elia

Title: Cantilevered Sheet Piling, 800 ft Section
Ref: SES
Page: 2
Date: 7.24.09

Sheet: AZ 19-700 Gr 50
Pressure: Rankine
FOS: 1.0 (K_p÷1.2; C÷1.2)
Toe: Cantilever

7.23.09 Design Revision:

Active W.L. @ el. 763.0 (Dewatering requirement)

Passive W.L. @ el. 766.5 (Design W.L. in Ditch, 1.5' below T.O.S. @ el. 768.0)

624 psf Total Const. Surcharge (PC800 / 20' x 20' timber mats offset 2' from int. face of sht plg / 1:1 prismatic dist. thru 2' reinf. road section) Subgrade el. 764.5

Using Soil parameters as recommended by Geosyntec

Design dredge to 15' below T.O.S. = el. 753

Input Data

Depth Of Excavation = 11.50 ft
Surcharge = 624.0 psf
Depth Of Active Water = 1.50 ft
Depth Of Passive Water = +2.00 ft
Water Density = 62.40 pcf
Minimum Fluid Density = 31.82 pcf

Soil Profile

Depth (ft)	Soil Name	γ_t (pcf)	γ_s (pcf)	C (psf)	C_a (psf)	ϕ (°)	δ (°)	K_a	K_{pq}	K_p	K_{pc}
0.00	Layer above 760	90.00	27.60	0.0	0.0	30.0	0.0	0.33	0.00	3.00 (2.50)	0.00 (0.00)
4.50	735 - 760 Layer	80.00	17.60	0.0	0.0	28.0	0.0	0.36	0.00	2.77 (2.31)	0.00 (0.00)
29.50	Layer below 735	80.00	17.60	0.0	0.0	25.0	0.0	0.41	0.00	2.46 (2.05)	0.00 (0.00)

( ) indicates factored value used in calculations. Factor(s): K_p÷1.2; C÷1.2

Solution

Sheet

Sheet Name	I (in^4/ft)	E (ksi)	Z (in^3/ft)	σ (psi)	Maximum Bending Moment (ft-lb/ft)	Upstack (ft)	Toe (ft)	Pile Length (ft)
AZ 19-700 Gr 50	288.40	3.04E+07	34.80	32000.0	92689.5	3.50	24.81	39.81

Maxima

	Maximum	Depth
Bending Moment	17527.4 ftlb/ft	23.94 ft
Deflection	1.7 in	-3.50 ft
Pressure	129.0 psf	11.50 ft
Shear Force	1292.8 lb/ft	16.25 ft

Glynn Geotechnical Engineering
415 South Transit Street
Lockport, NY 14094
Tel: 716.625.6933
Fax: 716.625.6983

SPW911, v2.20
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Email: pilebuck@pilebuck.com
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Client: Sevenson Environmental, Inc.
Attn: Mr. Mike Elia

Title: Cantilevered Sheet Piling, 800 ft Section
Ref: SES
Page: 4
Date: 7.24.09

Sheet: AZ 19-700 Gr 50
Pressure: Rankine
FOS: 1.0 (K_p÷1.2; C÷1.2)
Toe: Cantilever

7.23.09 Design Revision:

Active W.L. @ el. 763.0 (Dewatering requirement)

Passive W.L. @ el. 766.5 (Design W.L. in Ditch, 1.5' below T.O.S. @ el. 768.0)

624 psf Total Const. Surcharge (PC800 / 20' x 20' timber mats offset 2' from int. face of sht plg / 1:1 prismatic dist. thru 2' reinf. road section) Subgrade el. 764.5

Using Soil parameters as recommended by Geosyntec

Design dredge to 15' below T.O.S. = el. 753

depth (ft)	P (psf)	M (ft-lb/ft)	D (in)	F (lb/ft)
0.00	80.6	55.5	1.4	83.8
0.32	69.7	87.1	1.4	108.6
0.64	59.9	122.1	1.4	127.8
0.96	49.1	167.3	1.4	145.7
1.28	38.2	217.9	1.4	160.0
1.61	33.1	267.0	1.3	170.1
1.93	36.1	325.1	1.3	181.6
2.25	39.1	387.3	1.3	194.2
2.57	41.8	446.8	1.3	206.3
2.89	44.8	517.4	1.3	220.7
3.21	47.9	592.9	1.2	236.1
3.54	50.9	673.7	1.2	252.6
3.86	53.6	751.2	1.2	268.2
4.18	56.6	842.9	1.2	286.6
4.50	71.4	940.8	1.1	306.3
4.82	86.7	1036.7	1.1	331.9
5.14	88.8	1150.1	1.1	361.1
5.46	90.9	1274.4	1.1	391.0
5.78	92.8	1394.7	1.1	418.4
6.11	94.9	1538.2	1.0	449.6
6.43	97.0	1692.1	1.0	481.5
6.75	98.9	1839.8	1.0	510.8
7.07	101.0	2014.2	1.0	544.0
7.39	103.1	2199.7	1.0	577.9
7.71	105.0	2376.4	0.9	609.0
8.03	107.1	2583.7	0.9	644.2
8.36	109.2	2802.7	0.9	680.1
8.68	111.3	3033.8	0.9	716.7
9.00	113.2	3252.3	0.9	750.3
9.32	115.3	3506.9	0.8	788.2
9.64	117.4	3774.2	0.8	826.9
9.96	119.3	4025.7	0.8	862.3
10.28	121.4	4317.8	0.8	902.2
10.61	123.5	4623.2	0.8	942.9
10.93	125.4	4909.6	0.8	980.1
11.25	127.5	5241.1	0.7	1022.1
11.57	125.7	5586.5	0.7	1064.5
11.89	115.5	5909.2	0.7	1100.3

depth (ft)	P (psf)	M (ft-lb/ft)	D (in)	F (lb/ft)
12.21	104.1	6279.8	0.7	1136.6
12.53	92.7	6661.8	0.7	1169.0
12.86	82.5	7014.4	0.6	1195.0
13.18	71.1	7414.8	0.6	1220.3
13.50	59.7	7822.9	0.6	1241.8
13.82	49.5	8196.0	0.6	1257.9
14.14	38.1	8615.6	0.6	1272.3
14.46	26.7	9039.3	0.5	1282.8
14.78	15.3	9466.1	0.5	1289.6
15.10	5.1	9851.6	0.5	1292.5
15.43	-6.3	10280.5	0.5	1292.1
15.75	-17.7	10708.7	0.5	1287.9
16.07	-27.9	11092.4	0.5	1281.0
16.39	-39.3	11515.8	0.4	1269.6
16.71	-50.7	11934.9	0.4	1254.5
17.03	-60.9	12307.3	0.4	1237.7
17.35	-72.3	12714.8	0.4	1215.4
17.68	-83.6	13114.2	0.4	1189.4
18.00	-93.9	13465.9	0.4	1162.7
18.32	-105.3	13846.8	0.3	1129.5
18.64	-116.6	14216.1	0.3	1092.5
18.96	-126.9	14537.6	0.3	1055.9
19.28	-138.3	14881.4	0.3	1011.8
19.60	-149.6	15210.1	0.3	963.8
19.92	-161.0	15522.2	0.3	912.1
20.25	-171.3	15788.0	0.3	862.3
20.57	-182.6	16065.4	0.2	803.4
20.89	-194.0	16322.8	0.2	740.8
21.21	-204.2	16536.1	0.2	681.1
21.53	-215.6	16751.8	0.2	611.3
21.85	-227.0	16943.7	0.2	537.7
22.17	-237.2	17095.1	0.2	468.2
22.50	-248.6	17238.5	0.2	387.4
22.82	-260.0	17354.5	0.2	302.8
23.14	-270.2	17434.4	0.2	223.5
23.46	-281.6	17495.0	0.1	131.8
23.78	-293.0	17524.6	0.1	36.3
24.10	-303.2	17525.1	0.1	-15.6

depth (ft)	P (psf)	M (ft-lb/ft)	D (in)	F (lb/ft)
24.42	-314.6	-17508.0	0.1	-52.1
24.75	-326.0	-17468.1	0.1	-84.8
25.07	-336.2	17414.7	0.1	-111.0
25.39	-347.6	17332.1	0.1	-136.6
25.71	-359.0	17225.8	0.1	-158.3
26.03	-370.4	17095.1	0.1	-176.3
26.35	-380.6	16960.4	0.1	-189.3
26.67	-392.0	16806.1	0.1	-200.1
26.99	-403.4	16605.2	0.1	-207.1
27.32	-413.6	16407.5	0.1	-210.2
27.64	-425.0	16156.0	0.1	-210.1
27.96	-436.3	15876.6	0.0	-206.2
28.28	-446.6	15608.7	0.0	-199.4
28.60	-458.0	15275.1	0.0	-188.4
28.92	-469.3	14911.8	0.0	-173.5
29.24	-479.6	14569.0	0.0	-156.9
29.57	-344.6	14202.4	0.0	-141.0
29.89	-354.2	13753.9	0.0	-164.1
30.21	-362.8	13335.0	0.0	-182.1
30.53	-372.4	12825.6	0.0	-199.1
30.85	-381.9	12282.9	0.0	-212.9
31.17	-391.5	11706.7	0.0	-223.5
31.49	-400.1	11180.6	0.0	-230.4
31.82	-409.7	10635.6	0.0	-235.0
32.14	-419.3	9989.0	0.0	-236.4
32.46	-427.9	9402.0	0.0	-234.9
32.78	-437.5	8706.5	0.0	-230.3
33.10	-447.1	7984.2	0.0	-222.5
33.42	-455.7	7329.7	0.0	-212.8
33.74	-465.3	6555.6	0.0	-198.9
34.06	-474.8	5855.0	0.0	-181.9
34.39	-483.5	5132.3	0.0	-163.9
34.71	-493.0	4278.8	0.0	-140.9
35.03	-502.6	3395.4	0.0	-114.6
35.35	-511.2	2597.6	0.0	-88.3
35.67	-520.8	1656.7	0.0	-56.1
35.99	-530.4	684.4	0.0	-20.6
36.31	-538.0	-65.7	0.0	10.0

Glynn Geotechnical Engineering

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Email: pilebuck@pilebuck.com
Web: www.pilebuck.com

Client: Sevenson Environmental, Inc.
Attn: Mr. Mike Elia

Title: Cantilevered Sheet Piling, 1000 ft Section
Ref: SES
Page: 1
Date: 7.27.09

Sheet: AZ 19-700 Gr 50
Pressure: Rankine
FOS: 1.0 (K_p+1.2; C+1.2)
Toe: Cantilever

Maximum		d (ft)
○	81.1 psf	-0.01
□	4492.4 ft*lb/ft	14.24
●	0.2 in	-3.50

7.23.09 Design Revison:

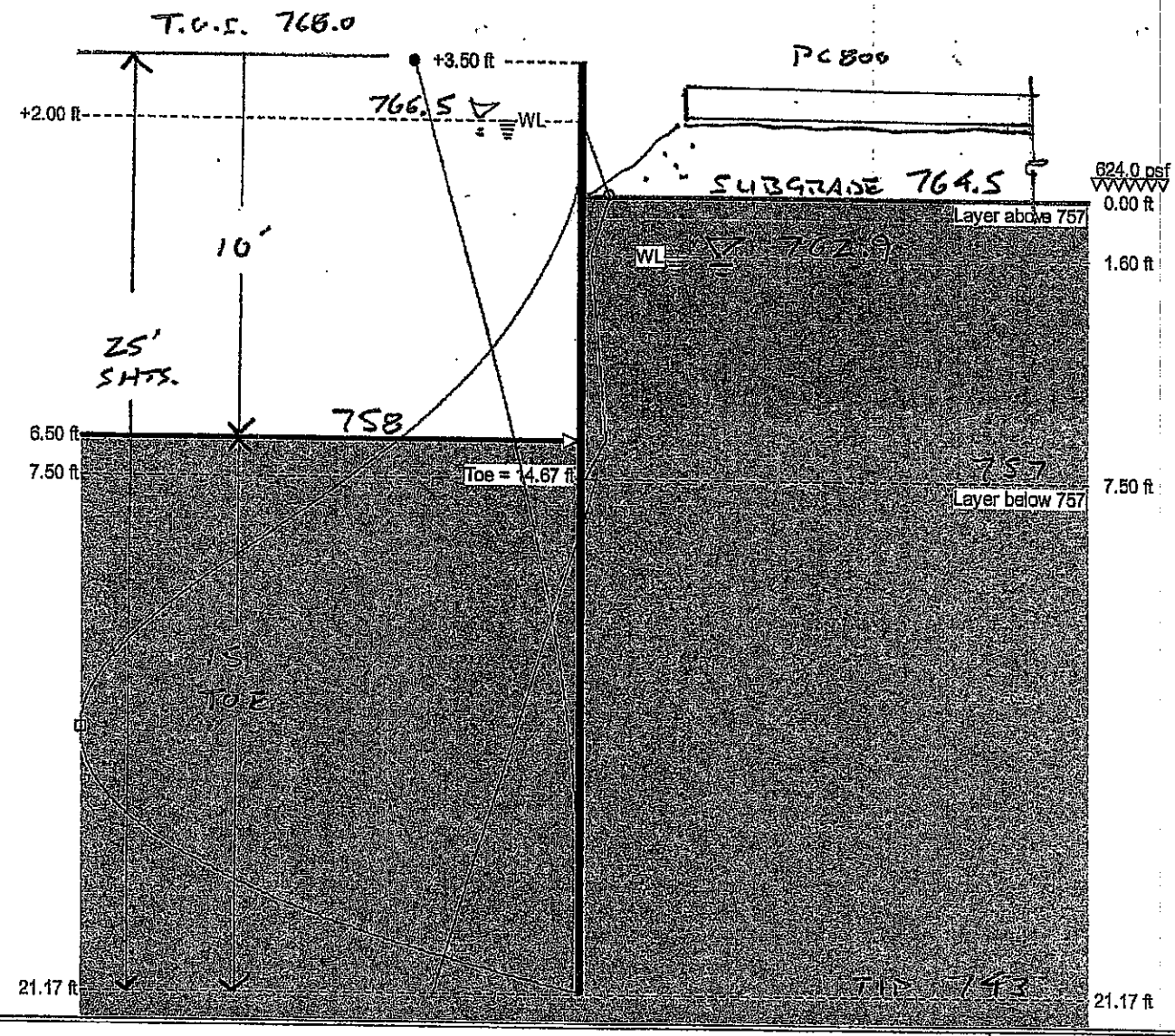
Active W.L. @ el. 762.9 (Dewatering Reqmt.

Passive W.L. @ el. 766.5 (Design W.L. in ditch, 1.5' below T.O.S.)

624 psf Total Const. Surcharge (PC800 / 20' x 20' timber mats offset 2' from int. face of sht. plg. / 1:1 prismatic dist. thru 2' reinf. road section) Subgrade el. 764.5

Using Soil Parameters as recommended by Geosyntec 7.17.09

Design Dredge to 10' below T.O.S. = el. 758



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Web: www.pilebuck.com

Client: Sevenson Environmental, Inc.
Attn: Mr. Mike Ella

Title: Cantilevered Sheet Piling, 1000 ft Section
Ref: SES
Page: 2
Date: 7.27.09

Sheet: AZ 19-700 Gr 50
Pressure: Rankine
FOS: 1.0 (K_p÷1.2; C÷1.2)
Toe: Cantilever

7.23.09 Design Revison:

Active W.L. @ el. 762.9 (Dewatering Reqmt.

Passive W.L. @ el. 766.5 (Design W.L. in ditch, 1.5' below T.O.S.)

624 psf Total Const. Surcharge (PC800 / 20' x 20' timber mats offset 2' from int. face of sht. plg. / 1:1 prismatic dist. thru 2' reinf. road section) Subgrade el. 764.5

Using Soil Parameters as recommended by Geosyntec 7.17.09

Design Dredge to 10' below T.O.S. = el. 758

Input Data

Depth Of Excavation = 6.50 ft
Surcharge = 624.0 psf
Depth Of Active Water = 1.60 ft
Depth Of Passive Water = +2.00 ft
Water Density = 62.40 pcf
Minimum Fluid Density = 31.82 pcf

Soil Profile

Depth (ft)	Soil Name	γ (pcf)	γ' (pcf)	C (psf)	C' (psf)	φ (°)	δ (°)	K_a	K_{ac}	K_p	K_{pc}
0.00	Layer above 757	90.00	27.60	0.0	0.0	30.0	0.0	0.33	0.00	3.00 (2.50)	0.00 (0.00)
7.50	Layer below 757	80.00	17.60	0.0	0.0	28.0	0.0	0.36	0.00	2.77 (2.31)	0.00 (0.00)

( ) indicates factored value used in calculations. Factor(s): K_p÷1.2; C÷1.2

Solution

Sheet

Sheet Name	I (in^4/ft)	E (psi)	Z (in^3/ft)	σ (psi)	Maximum Bending Moment (ftlb/ft)	Topstand (ft)	Toe (ft)	Pile Length (ft)
AZ 19-700 Gr 50	288.40	3.04E+07	34.80	32000.0	92689.5	3.50	14.67	24.67

Maxima

	Maximum	Depth
Bending Moment	4492.4 ftlb/ft	14.24 ft
Deflection	0.2 in	-3.50 ft
Pressure	81.1 psf	-0.01 ft
Shear Force	494.2 lb/ft	8.86 ft

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Web: www.pilebuck.com

Client: Sevenson Environmental, Inc.
Attn: Mr. Mike Ella

Title: Cantilevered Sheet Piling, 1000 ft Section
Ref: SES
Page: 3
Date: 7.27.09

Sheet: AZ 19-700 Gr 50
Pressure: Rankine
FOS: 1.0 (K_p÷1.2; C÷1.2)
Toe: Cantilever

	Maximum	d (ft)
○	81.1 psf	-0.01
□	4492.4 ftlb/ft	14.24
◇	494.2 lb/ft	8.85
●	0.2 in	-3.50

7.23.09 Design Revison:

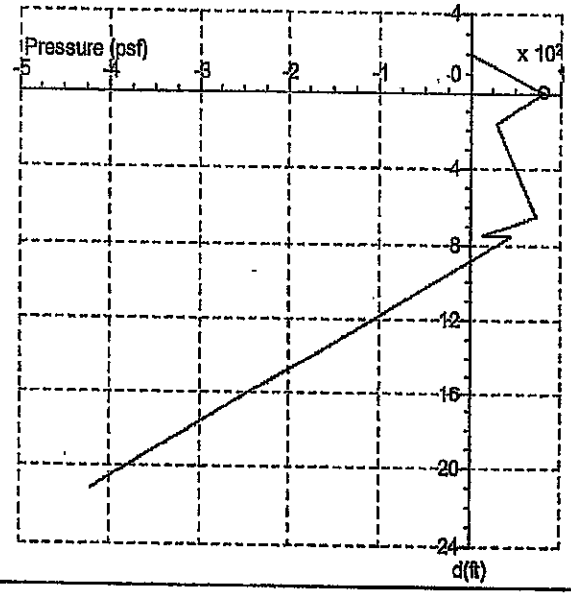
Active W.L. @ el. 762.9 (Dewatering Reqmt.

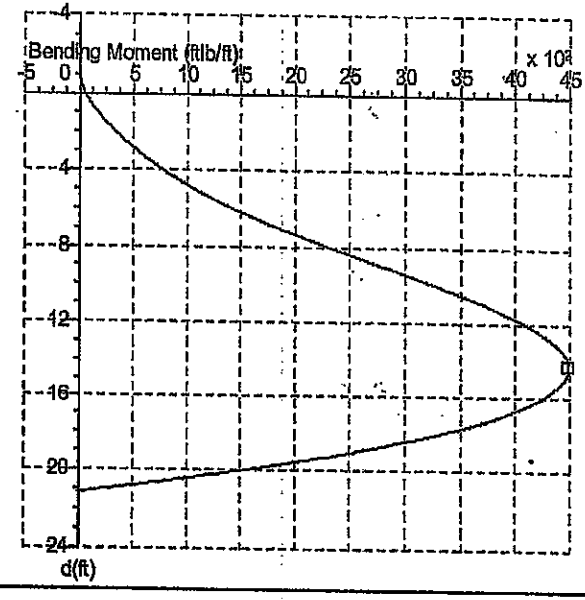
Passive W.L. @ el. 766.5 (Design W.L. in ditch, 1.5' below T.O.S.)

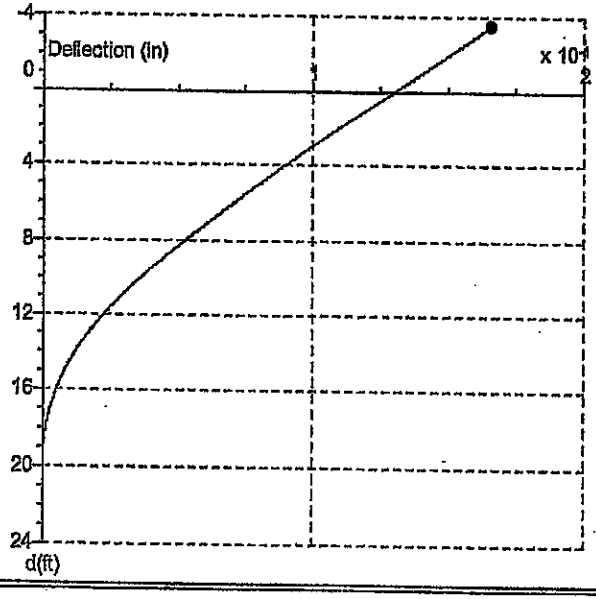
624 psf Total Const. Surcharge (PC800 / 20' x 20' timber mats offset 2' from int. face of sht. plg. / 1:1 prismatic dist. thru 2' reinf. road section) Subgrade el. 764.5

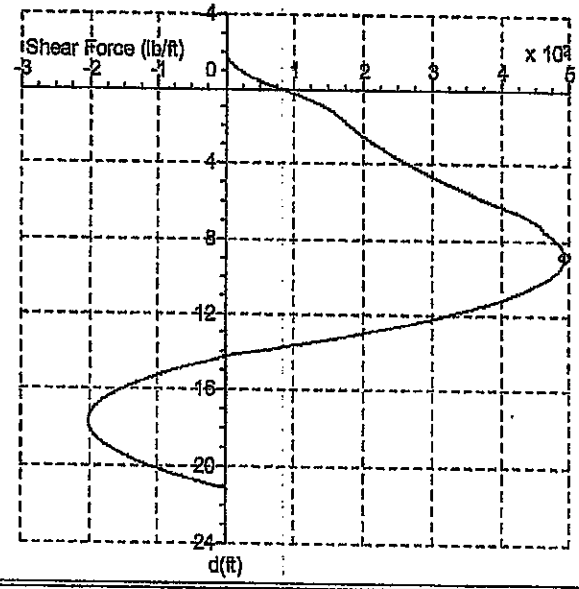
Using Soil Parameters as recommended by Geosyntec 7.17.09

Design Dredge to 10' below T.O.S. = el. 758









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Title: Cantilevered Sheet Piling, 1000 ft Section
Ref: SES
Page: 4
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Sheet: AZ 19-700 Gr 50
Pressure: Rankine
FOS: 1.0 (K_p÷1.2; C÷1.2)
Toe: Cantilever

7.23.09 Design Revison:

Active W.L. @ el. 762.9 (Dewatering Reqmt.

Passive W.L. @ el. 766.5 (Design W.L. in ditch, 1.5' below T.O.S.)

624 psf Total Const. Surcharge (PC800 / 20' x 20' timber mats offset 2' from int. face of sht. plg. / 1:1 prismatic dist. thru 2' reinf. road section) Subgrade el. 764.5

Using Soil Parameters as recommended by Geosyntec 7.17.09

Design Dredge to 10' below T.O.S. = el. 758

depth (ft)	P (psf)	M (ft-lb/ft)	D (in)	F (lb/ft)
0.06	80.6	55.3	0.1	83.2
0.19	74.6	71.9	0.1	97.5
0.37	68.5	91.0	0.1	110.6
0.56	62.5	112.5	0.1	122.7
0.75	56.4	136.1	0.1	133.6
0.94	50.4	161.6	0.1	143.4
1.12	44.3	188.9	0.1	152.1
1.31	37.6	221.0	0.1	160.5
1.50	31.6	251.2	0.1	166.8
1.69	29.7	282.5	0.1	172.3
1.87	31.4	314.9	0.1	178.0
2.06	33.1	348.3	0.1	183.9
2.25	34.8	382.8	0.1	190.2
2.44	36.5	418.6	0.1	196.8
2.62	38.1	455.5	0.1	203.8
2.81	39.8	493.8	0.1	211.0
3.00	41.7	538.0	0.1	219.4
3.18	43.4	579.2	0.1	227.3
3.37	45.1	621.9	0.1	235.5
3.56	46.8	666.2	0.1	244.0
3.75	48.4	712.0	0.1	252.8
3.93	50.1	759.5	0.1	261.9
4.12	51.8	808.8	0.1	271.4
4.31	53.5	859.8	0.1	281.1
4.50	55.2	912.6	0.1	291.2
4.68	57.0	973.5	0.1	302.8
4.87	58.7	1030.4	0.1	313.5
5.06	60.4	1089.3	0.1	324.5
5.24	62.1	1150.3	0.1	335.9
5.43	63.8	1213.4	0.1	347.6
5.62	65.5	1278.7	0.1	359.5
5.81	67.2	1346.2	0.1	371.8
5.99	68.8	1416.0	0.1	384.4
6.18	70.5	1488.2	0.1	397.3
6.37	72.4	1571.2	0.1	412.0
6.56	69.1	1648.5	0.1	425.4
6.74	58.0	1728.2	0.1	437.0
6.93	46.9	1809.9	0.1	446.6

depth (ft)	P (psf)	M (ft-lb/ft)	D (in)	F (lb/ft)
7.12	35.8	1893.1	0.1	454.1
7.31	24.8	1977.6	0.1	459.6
7.49	13.5	2063.0	0.1	463.1
7.68	40.5	2149.3	0.1	470.7
7.87	34.2	2236.9	0.1	477.6
8.05	27.1	2335.7	0.1	483.8
8.24	20.8	2425.6	0.1	488.1
8.43	14.4	2516.2	0.0	491.3
8.62	8.1	2607.2	0.0	493.3
8.80	1.7	2698.6	0.0	494.2
8.99	-4.6	2790.0	0.0	493.9
9.18	-11.0	2881.3	0.0	492.3
9.37	-17.3	2972.1	0.0	489.7
9.55	-24.4	3072.4	0.0	485.3
9.74	-30.7	3161.8	0.0	480.2
9.93	-37.0	3250.1	0.0	473.8
10.12	-43.4	3337.2	0.0	466.3
10.30	-49.7	3422.8	0.0	457.6
10.49	-56.1	3506.6	0.0	447.8
10.68	-62.4	3588.6	0.0	436.8
10.86	-68.8	3668.4	0.0	424.8
11.05	-75.1	3745.9	0.0	411.2
11.24	-82.2	3828.9	0.0	395.0
11.43	-88.5	3900.7	0.0	379.1
11.61	-94.8	3969.5	0.0	362.1
11.80	-101.2	4035.0	0.0	343.9
11.99	-107.5	4097.0	0.0	324.5
12.18	-113.9	4155.4	0.0	304.0
12.36	-120.2	4209.9	0.0	282.3
12.55	-126.6	4260.2	0.0	259.4
12.74	-132.9	4306.2	0.0	235.3
12.93	-140.0	4352.0	0.0	207.2
13.11	-146.3	4388.2	0.0	180.6
13.30	-152.6	4419.3	0.0	152.9
13.49	-159.0	4445.3	0.0	124.0
13.67	-165.3	4465.8	0.0	94.0
13.86	-171.7	4480.6	0.0	62.7
14.05	-178.0	4489.6	0.0	30.3

depth (ft)	P (psf)	M (ft-lb/ft)	D (in)	F (lb/ft)
14.24	-184.4	4492.4	0.0	-3.3
14.42	-190.7	4490.3	0.0	-18.9
14.61	-197.8	4481.8	0.0	-41.1
14.80	-204.1	4468.6	0.0	-59.9
14.99	-210.4	4450.0	0.0	-77.6
15.17	-216.8	4429.1	0.0	-94.0
15.36	-223.1	4399.9	0.0	-109.3
15.55	-229.5	4364.8	0.0	-123.4
15.73	-235.8	4323.6	0.0	-136.4
15.92	-242.2	4282.6	0.0	-148.1
16.11	-248.5	4229.7	0.0	-158.7
16.30	-255.6	4162.5	0.0	-169.1
16.48	-261.9	4095.6	0.0	-177.2
16.67	-268.2	4031.6	0.0	-184.2
16.86	-274.6	3951.9	0.0	-189.9
17.05	-280.9	3865.2	0.0	-194.5
17.23	-287.3	3771.2	0.0	-198.0
17.42	-293.6	3682.9	0.0	-200.2
17.61	-300.0	3574.9	0.0	-201.3
17.80	-306.3	3459.2	0.0	-201.2
17.98	-313.4	3319.8	0.0	-199.7
18.17	-319.7	3204.3	0.0	-197.1
18.36	-326.0	3064.7	0.0	-193.4
18.54	-332.4	2916.9	0.0	-188.4
18.73	-338.7	2760.6	0.0	-182.3
18.92	-345.1	2595.7	0.0	-175.1
19.11	-351.4	2444.2	0.0	-166.6
19.29	-357.8	2262.8	0.0	-157.0
19.48	-364.1	2072.4	0.0	-146.2
19.67	-371.2	1872.8	0.0	-132.8
19.86	-377.5	1663.8	0.0	-119.5
20.04	-383.8	1445.4	0.0	-105.1
20.23	-390.2	1217.3	0.0	-89.5
20.42	-396.5	979.5	0.0	-72.7
20.61	-402.9	763.2	0.0	-54.7
20.79	-409.2	506.6	0.0	-35.6
20.98	-415.6	239.7	0.0	-15.3
21.17	-421.2	-2.3	0.0	3.8

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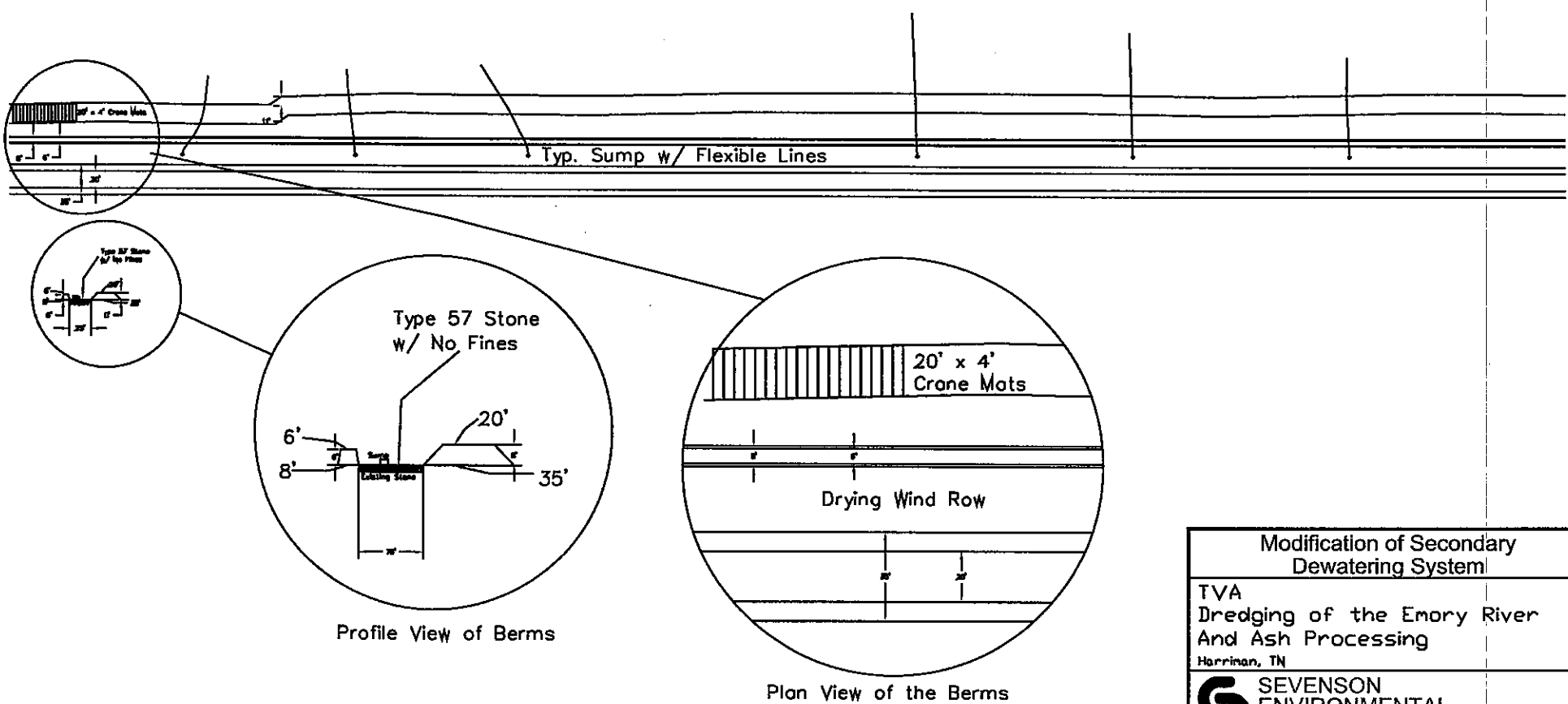

Note * 33 Tons of Type 57 Stone

Modification of Secondary Dewatering System

TVA
Dredging of the Emory River
And Ash Processing
Harriman, TN

SEVENSON ENVIRONMENTAL SERVICES, INC.

DRAWING		
11	DATE:	07/28/09
	DRAWN BY:	K.Dorn
	CHECKED BY:	J.Atkins
	CAD FILE:	Rim Ditch
	SCALE:	NTS

Subj: **FW: Kingston Fossil - Rim Ditch**
Date: 7/21/2010 1:16:41 P.M. Eastern Daylight Time
From: mglynn@glynngroup.com
To: Atkins149@AOL.com

Review as requested. Call if you have questions.

Mark W. Glynn, P.E.
Consulting Engineer, Principal
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mglynn@glynngroup.com

From: Matt Lengel [mailto:mlengel@glynngroup.com]
Sent: Wednesday, July 21, 2010 12:48 PM
To: 'Mark Glynn'
Cc: 'Jesse Grossman'
Subject: Kingston Fossil - Rim Ditch

Mark,
We have reviewed the sheeting removal concept for the rim ditch wall which consists of the following:

- PC300 Excavator positioned with tracks parallel to sheeting wall
- Excavator will be positioned 4' from sheeting wall (measure from wall to outside edge of nearest track)
- Sheets will be removed with movac at a distance not closer than 15' measured from the leading edge of the excavator track

It is our recommendation that crane mats be placed perpendicular to the sheeting.

Predicated on the information and recommendations listed above the excavator is safe in this scenario.

Matthew J. Lengel, P.E.
Senior Project Engineer

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Geosyntec consultants

1255 Roberts Boulevard, Suite 200
Kennesaw, Georgia 30144
PH 678.202.9500
FAX 678.202.9501
www.geosyntec.com

Memorandum

Date: 11 August 2009

To: Mr. Michael Anderson – Jacobs Engineering
Mr. J. Chris Buttram, P.E. – Tennessee Valley Authority
Mr. David Pauls, P.E. – U.S. Bureau of Reclamation

From: Robert C. Bachus, Ph.D., P.E. – Geosyntec Consultants

Subject: Stability Analyses for Cross Sections A-A and C-C
TVA Kingston Fossil Plant

This memorandum transmits the Calculation Package titled *Stability Analyses for Cross Sections A-A And C-C.* This calculation Package includes results of stability analyses performed by Geosyntec Consultants (Geosyntec) for ash placement within the Ball Field site (Site) at the Tennessee Valley Authority (TVA) Kingston Fossil Plant (KIF). The static stability analysis results are used to evaluate potential for shallow- and deep-seated failures along the cross sections previously identified by the U.S. Bureau of Reclamation (USBR) as A-A and C-C.

Based on information obtained from the previously referenced documents by Geosyntec, Mactec, AECOM, and Stantec, Geosyntec developed a subsurface profile across and beyond the Site boundaries and subsequently performed stability analyses for several slopes along Cross Sections A-A and C-C. The results of the slope stability analyses indicate the calculated values of FS for long term conditions are equal to or greater than the target values for the analyzed slopes along these cross sections. These results indicate that shallow- and deep-seated failures are not likely to occur along any portions of Cross Sections A-A and C-C. Shallow local surficial slips that are common in frictional materials as a result of Site operations can be easily addressed in the field. The stability analyses presented in the attached calculation Package specifically exclude Dike C, as the analysis for Dike C-C was previously performed by Stantec and provided to TVA under separate cover.

Geosyntec appreciates the opportunity to work with TVA on the KIF project. Should TVA and/or the USBR have any questions regarding the results provided in the attached Calculation Package, please do not hesitate to contact Geosyntec.

Attachment: Calculation Package: Stability Analyses for Cross Sections A-A and C-C

* * * * *

GR4327.Technical Memo.doc

Geosyntec consultants

COMPUTATION COVER SHEET

Client: **TVA** Project: **Dredge Cells Recovery** Project/ Proposal No.: Task No. **GR4327**

Title of Computations **Stability Analyses for Cross Sections A-A And C-C**

Computations by:	Signature		8/11/09
	Printed Name	Justin Wang	Date
	Title	Project Engineer	
Assumptions and Procedures Checked by: (peer reviewer)	Signature		8/11/09
	Printed Name	Robert C. Bachus	Date
	Title	Principal	
Computations Checked by:	Signature		8/11/09
	Printed Name	Ming Zhu	Date
	Title	Engineer	
Computations backchecked by: (originator)	Signature		8/11/09
	Printed Name	Justin Wang	Date
	Title	Project Engineer	
Approved by: (pm or designate)	Signature		8/11/09
	Printed Name	Robert C. Bachus	Date
	Title	Principal	

Approval notes:

Revisions (number and initial all revisions)

No.	Sheet	Date	By	Checked by	Approval

Written by:	**Justin Wang**	Date:	**08/11/09**	Reviewed by:	**Ming Zhu/Robert Bachus**	Date:	**08/11/09**
Client:	**TVA**	Project:	**Dredge Cells Recovery**	Project/ Proposal No.:	**GR4327**	Task No.:	**105**

STABILITY ANALYSES FOR CROSS SECTIONS A-A AND C-C

PURPOSE

The purpose of this calculation package is to present static stability analyses performed by Geosyntec Consultants (Geosyntec) for slopes along Cross Sections A-A and C-C at the Tennessee Valley Authority (TVA) Kingston Fossil Plant (KIF) Ball Field Site (Site). The static stability analyses are used to evaluate potential shallow- and deep-seated failures along the two cross sections. Geosyntec understands that stability analysis results near Dike C along Cross Section C-C have been developed previously by Stantec Consulting Services, Inc. (Stantec). Therefore this calculation package does not include the stability analysis calculations for Dike C.

BACKGROUND

TVA has selected the Site for the processing of ash and temporary storage of dewatered fly ash that is excavated and collected from the Emory River, the Swan Pond Creek Embayment, and other areas in and around KIF. The Site is triangular shape in plain view and comprises approximately 30 acres. The Site is located to the west of the Emory River and south of the existing Dredge Cells and Ash Pond, as shown in Figure 1.

Geosyntec (2009a) previously reported on slope stability analyses within the Temporary Ash Storage and Processing Area (i.e., within the Site) in February 2009, and Geosyntec (2009b) provided global stability analysis results for the rim ditch, including an assessment of the sheet pile walls along the rim ditch, in July 2009. These two reports were previously provided to TVA, who subsequently provided them to Jacobs Engineering (Jacobs) and the U.S. Bureau of Reclamation (USBR). During a teleconference between representatives from the USBR, TVA, Jacobs, and Geosyntec, Geosyntec was requested to extend the previous cross sections and then perform supplemental stability analyses along the two cross sections. Specifically, these areas: (i) extend the previous Cross Section A-A across the Site to the Intake Channel; and (ii) include a new section (i.e., Cross Section C-C) that runs through the Site and into the

existing Ash Pond. These two requested analysis cross sections are also shown on Figure 1.

In support of other ongoing activities at the KIF, both AECOM and Stantec recently advanced numerous subsurface borings and cone penetration test (CPT) soundings in the areas where USBR is requesting additional analyses. In preparing subsurface stratigraphy information and in selecting soil properties for the USBR-requested analyses, Geosyntec relied on information provided in the previous Geosyntec documents, as well as the boring logs prepared by Mactec (2009a), AECOM (2009) and Stantec (2009). Reference citations for these reports are provided at the end of this document.

STABILITY ANALYSES METHODOLOGY

Static stability analyses were performed using Spencer's method (1973), as implemented in the computer program SLIDE, version 5.0 developed by Rocscience (2006). Spencer's method, which satisfies both vertical and horizontal force equilibrium and moment equilibrium, is considered to be more rigorous than other methods, including the simplified Janbu method (Janbu, 1973) and the simplified Bishop method (Bishop, 1955).

Two failure modes were considered in the analyses: (i) rotational failure modes (i.e., circular slip surfaces); and (ii) translational failure modes (i.e., block slip surfaces). The purpose of the stability analyses is to evaluate the potential shallow- and deep-seated failure modes. Shallow surficial slips in frictional materials due to local Site operations are commonly computed, but are easily addressed in the field should they occur. The circular slip surfaces considered in the stability analyses were set to be a minimum 3 feet below the existing ground. No maximum depth of the circular slip surface was imposed. The block slip surfaces considered in the analyses were set to include both the soft sluiced ash and the slime layers previously encountered in other areas of the site. This elevation of the slime layer is located between the bottom of the historically placed ash and the underlying clay and silt soils.

Information required for the static stability analyses include slope geometry, subsurface ash/soil stratigraphy, groundwater table elevation, material properties of the subsurface soils, and external surface loading (if applicable) at the selected cross section locations. This information was obtained from the previously referenced documents by Geosyntec, Mactec, AECOM, and Stantec.

For these stability analyses, the calculated target factor of safety (FS) to be achieved for the long-term condition was 1.5 according to Hammer and Blackburn (1977) and USACE (2003).

ANALYZED CROSS SECTIONS

In accordance with the request from USBR, Cross Section A-A and Cross Section C-C were analyzed. A description of these cross sections follows.

Cross Section A-A

As shown on Figure 1, the length of Cross Section A-A is approximately 1,800 feet. The slopes along this cross section are those related to operations within the Temporary Ash Storage and Processing Area, Rim Ditch, Sluice Channel, East Dike, and sideslopes adjacent to the Inlet Channel. Currently, the dredged ash height in the Temporary Storage and Processing Area is approximately 10 feet. Geosyntec understands that the maximum allowable dredged ash height is 30 feet; therefore, Geosyntec used 30 feet as the dredged ash height in the subsequent stability analyses. In most cases the sideslopes range from approximately 4 horizontal to 1 vertical (4H:1V) to 3H:1V and approximately up to 30 feet in height. The true-scale geometry of the above ground features and subsurface stratigraphy along Cross Section A-A is presented in Figure 2.

Cross Section C-C

As shown on Figure 1, the total length of Cross Section C-C is approximately 4,500 feet. The slopes along this cross section are those related to the operations within Temporary Ash Storage and Processing Area, Ash Pond and its expansion dikes, and

Dike C. Similar to Cross Section A-A, Geosyntec used 30 feet as the height of dredged ash in the Temporary Storage and Processing Area in the stability analyses. In most cases the sideslopes range from approximately 4H:1V to 3H:1V and up to approximately 30 feet in height. The true-scale geometry of the above ground features and subsurface stratigraphy along Cross Section C-C is presented in Figure 3.

SUBSURFACE STRATIGRAPHY & MATERIAL PROPERTIES

In preparing subsurface stratigraphy information and in selecting soil properties for the USBR-requested analyses, Geosyntec relied on information provided in the previous Geosyntec documents, as well as the boring logs prepared by Mactec (2009a), AECOM (2009) and Stantec (2009). The material properties used in the stability analyses for Cross Sections A-A and C-C are summarized in Table 1. The subsurface stratigraphy for Cross Sections A-A and C-C are presented in Figures 4 and 5, respectively.

Based on the stability analyses presented in AECOM (2009), the Emory River water level was 740 feet, and the ash collection pond water level was 760 feet. The intake channel water level was assumed 740 feet in the stability analyses.

RESULTS AND CONCLUSIONS

Based on the observation of the geometry and subsurface stratigraphy of the Site along the two cross sections, the ground surface is relatively flat over the entire sections, interrupted by several relatively low profile earth dikes. The relatively flat ground surface and the low profile of the dikes typically cannot provide adequate driving force to mobilize a “deep-seated” movement. The slope stability results reported herein confirm this observation.

Geosyntec has computed the minimum FS for the earthen dikes along Sections A-A and C-C. The results are shown in Table 2. In all cases, the calculation results are equal to or significantly greater than the target value of 1.50. The critical failure surfaces for each of the considered slopes calculated from the stability analyses are shown graphically in Figures 6 through 9. An example SLIDE input file is presented in Attachment 1 of this calculation package.

The results of the slope stability analyses indicate the calculated values of FS are equal to or greater than the target values for the analyzed slopes along Cross Sections A-A and C-C under the long-term condition. Therefore, shallow- and deep-seated failures are not likely to occur for any of the dikes/slopes along the entire sections of A-A and C-C. As mentioned previously, Dike C along the extension of Cross Section C-C was previously analyzed by Stantec and results were reported to TVA under separate cover.

It should be noted that shallow surficial slips and/or sloughing may occur near the sideslope of the dredged ash in the Temporary Ash Storage and Processing area due to the operations of the excavation equipment. One area where sloughing has occurred is along the Rim Ditch. A sheet pile wall currently is being installed to improve the stability of the slopes adjacent the Rim ditch and to prevent further sloughing of sideslopes. Shallow sloughing is not anticipated to extend to the deep foundation materials and will not adversely impact the Intake Channel and the Emory River.

REFERENCES

AECOM (2009), "Root Cause Analysis of TVA Kingston Dredge Pond Failure from December 22, 2008," Volume 4, June 12, 2009

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Hammer, D.P., and Blackburn, E.D. (1977), "Design and Construction of Retaining Dikes for Containment of Dredged Material", Technical Report D-77-9, U.S. Army Engineer Water Experiment Station, Vicksburg, Mississippi, August 1977, pp. 93.

Geosyntec Consultants (2009a), "Technical Summary - Proposed Procedures for Construction, Operation, and Performance Monitoring in the Ball Field Temporary Ash Disposal Site", February 24, 2009

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Janbu, N. (1973), "Slope Stability Computations," Embankment Dam Engineering, Casagrande Memorial Volume, R. C. Hirschfield and S. J. Poulos, Eds., John Wiley, New York, 1973, pp. 47-86.

Mactec (2009a), "TVA Kingston – Phase 1 Geotube Disposal Area Soil Test Boring Log Record", January 2009

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Spencer, E. (1973), "The Thrust Line Criterion in Embankment Stability Analysis," Géotechnique, Vol. 23, No. 1, pp. 85-100, March 1973.

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U.S. Army Corps of Engineers (USACE) (2003), “Engineering and Design – Slope Stability”, Engineering Manual EM 1110-2-1902, October 2003, pp. 3-2.

TABLES

Table 1. Summary of Subsurface Stratigraphy and Material Properties

Material	Unit Weight (pcf)(2)	Drained Shear Strength(2)
Dredged Ash (1)	75	c=0, $\phi = 25^o$
Dike Material (Compacted Clay)	120	c=0, $\phi = 37^o$
Crust Layer (Compacted Ash) (1)	90	c=0, $\phi = 30^o$
Sluiced Ash (1)	80	c=0, $\phi = 25^o$
Slimes (2)	75	c=0, $\phi = 20^o$
Alluvium – Clay and Silt (1)	100	c=0, $\phi = 28^o$
Alluvium – Silty Sand (1)	100	c=0, $\phi = 30^o$

Notes:

1. Material properties were obtained based on review of subsurface borings previously advanced in the Ball Field Area for assessment of global stability as an ash stockpile area.
2. Material properties were obtained based on AECOM (2009).

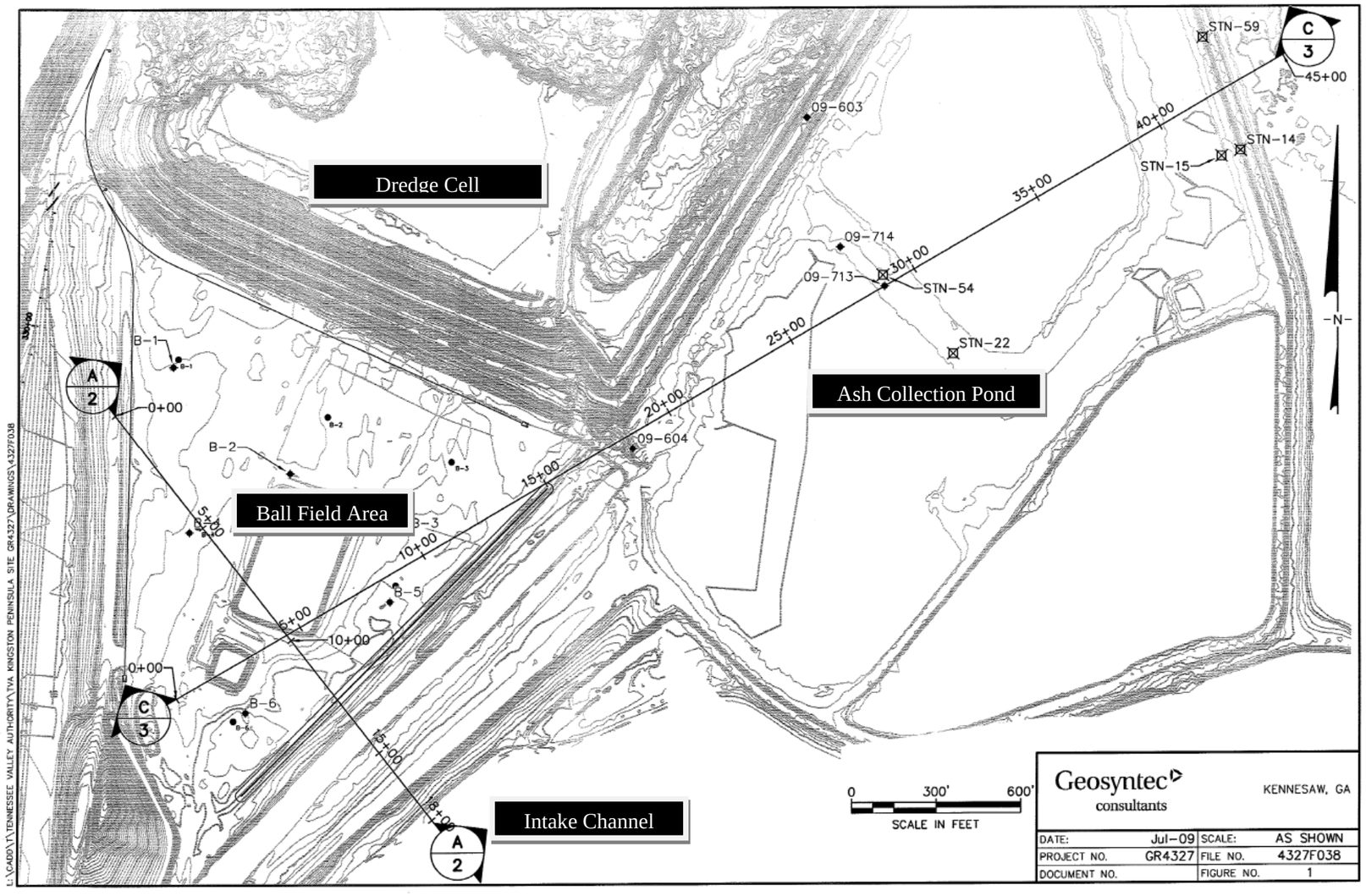
Table 2: Results of Slope Stability Analysis

Section	Failure Mode	Calculated FS	Target FS	Is FS OK?	Results Shown in Figure	Slide File Name
A-A	Circular Slip	1.5	1.5	Yes	6	A-A Section (Circular).sli
A-A	Block Slip	2.9	1.5	Yes	7	A-A Section (Block).sli
C-C	Circular Slip	1.5	1.5	Yes	8	C-C Section (Circular).sli
C-C	Block Slip	3.1	1.5	Yes	9	C-C Section (Block).sli

FIGURES

Written by: **Justin Wang** Date: **8/11/09** Reviewed by: **Ming Zhu/Robert Bachus** Date: **8/11/09**

Client: **TVA** Project: **Dredge Cells Recovery** Project/ Proposal No.: **GR4327** Task No.: **105**



Written by:	Justin Wang	Date:	8/11/09	Reviewed by:	Ming Zhu/Robert Bachus	Date:	8/11/09
Client:	TVA	Project:	Dredge Cells Recovery	Project/ Proposal No.:	GR4327	Task No.:	105

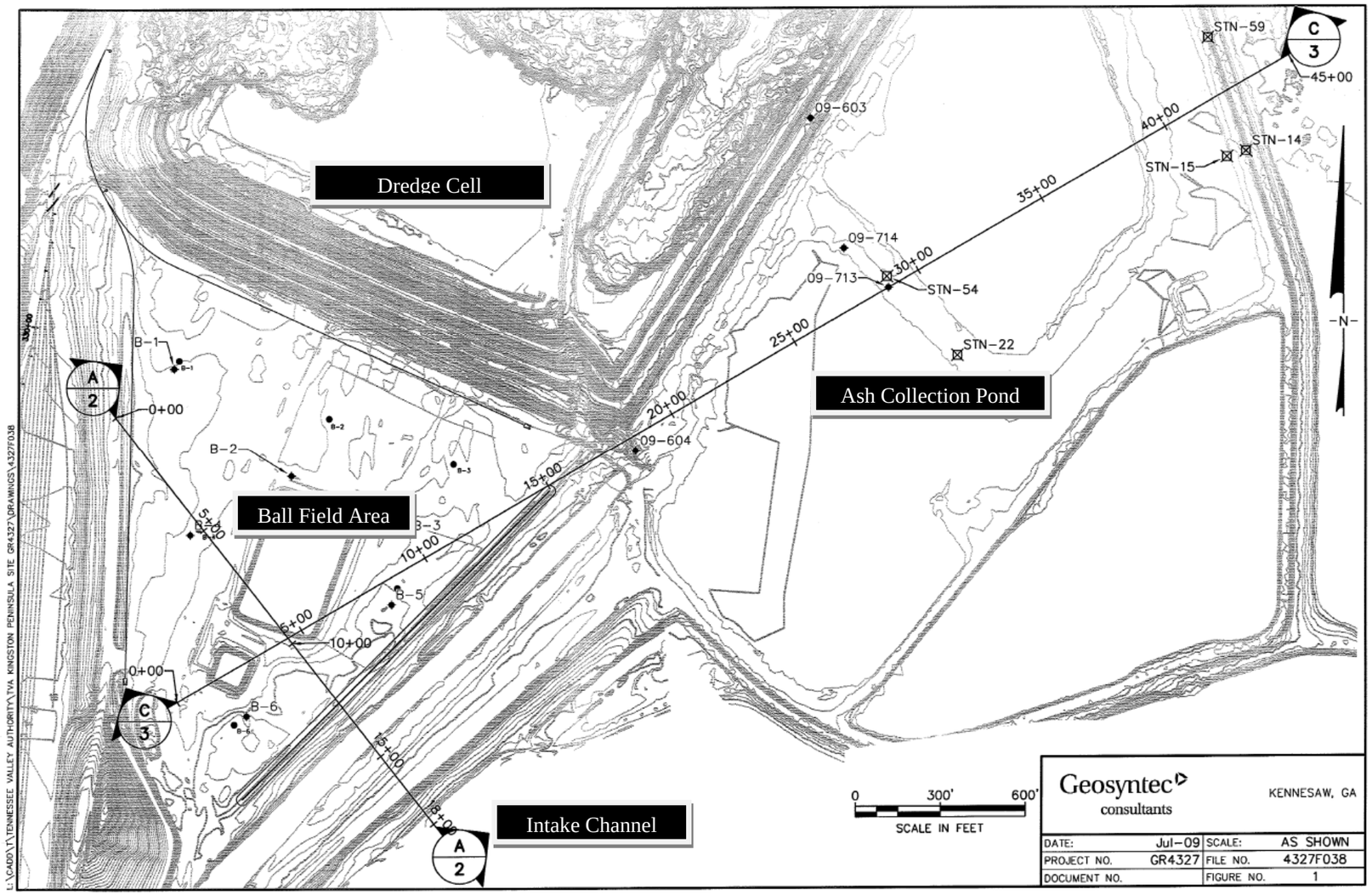


Figure 1. Locations of Cross Sections A-A and C-C

Written by: **Justin Wang** Date: **8/11/09** Reviewed by: **Ming Zhu/Robert Bachus** Date: **8/11/09**

Client: **TVA** Project: **Dredge Cells Recovery** Project/ Proposal No.: **GR4327** Task No.: **105**

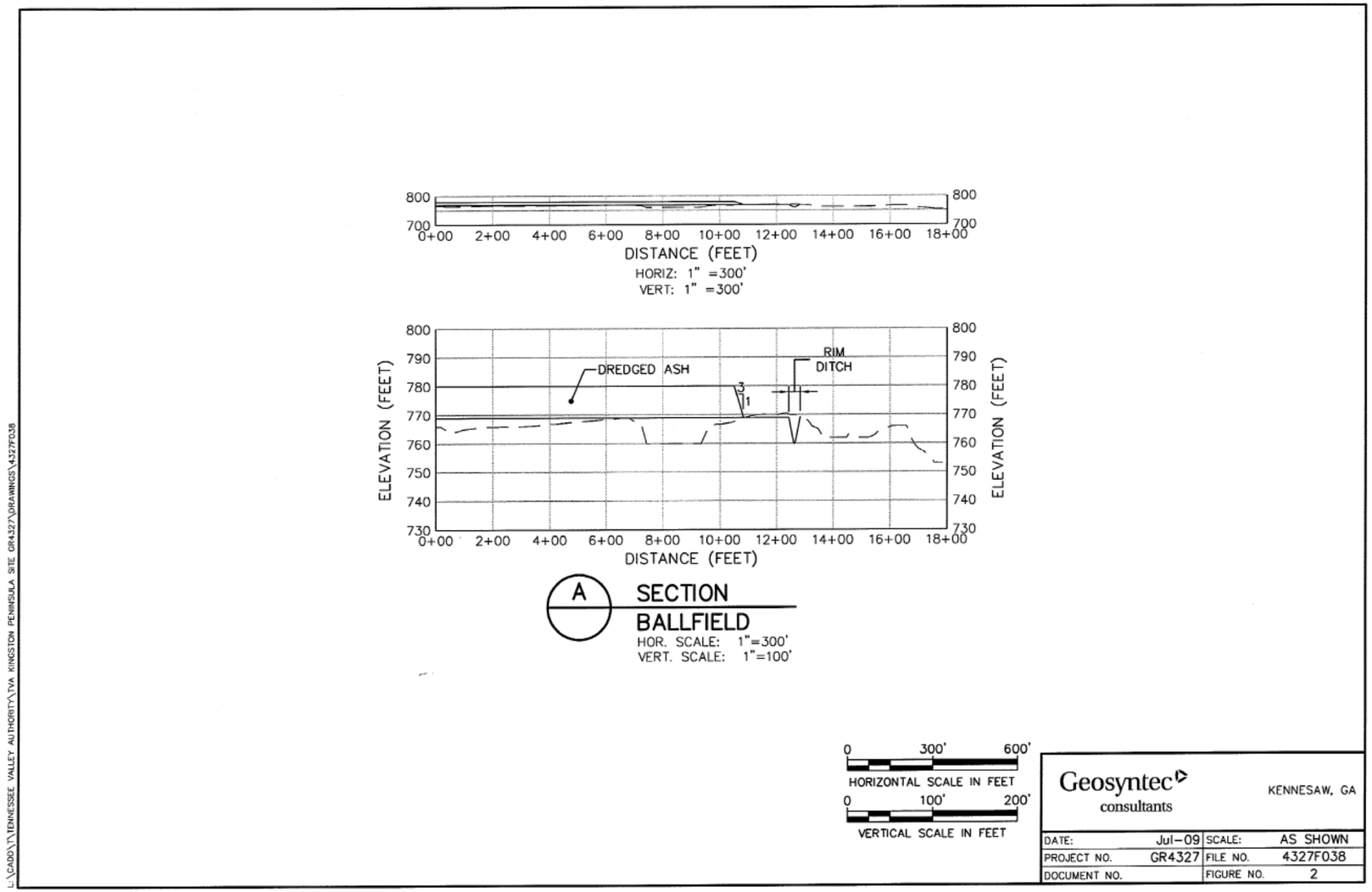


Figure 2. Cross Sections A-A

Written by: **Justin Wang** Date: **8/11/09** Reviewed by: **Ming Zhu/Robert Bachus** Date: **8/11/09**

Client: **TVA** Project: **Dredge Cells Recovery** Project/ Proposal No.: **GR4327** Task No.: **105**

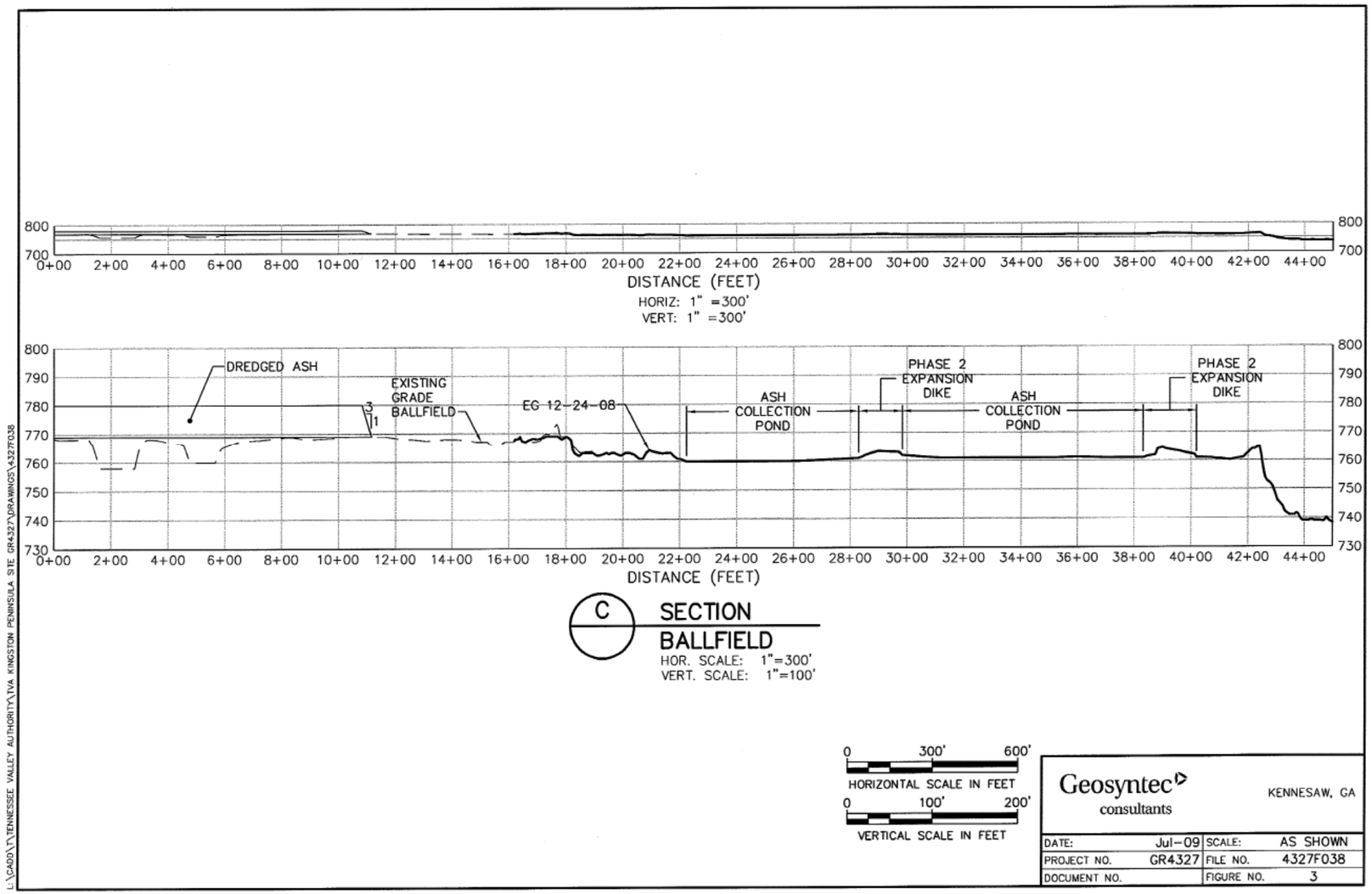


Figure 3. Cross Sections C-C

Written by: Justin Wang Date: 8/11/09 Reviewed by: Ming Zhu/Robert Bachus Date: 8/11/09

Client: TVA Project: Dredge Cells Recovery Project/ Proposal No.: GR4327 Task No.: 105

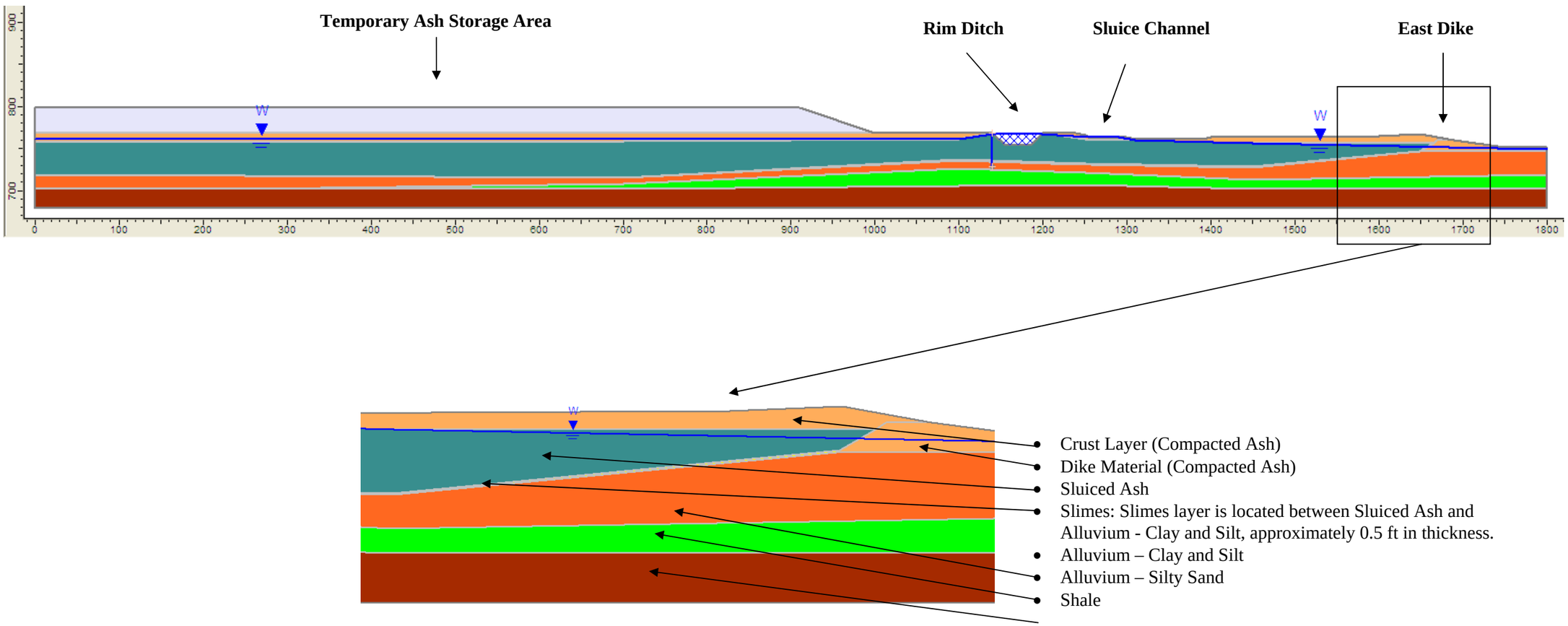


Figure 4. Subsurface Stratigraphy at Cross Section A-A

Written by:	Justin Wang	Date:	8/11/09	Reviewed by:	Ming Zhu/Robert Bachus	Date:	8/11/09
Client:	TVA	Project:	Dredge Cells Recovery	Project/ Proposal No.:	GR4327	Task No.:	105

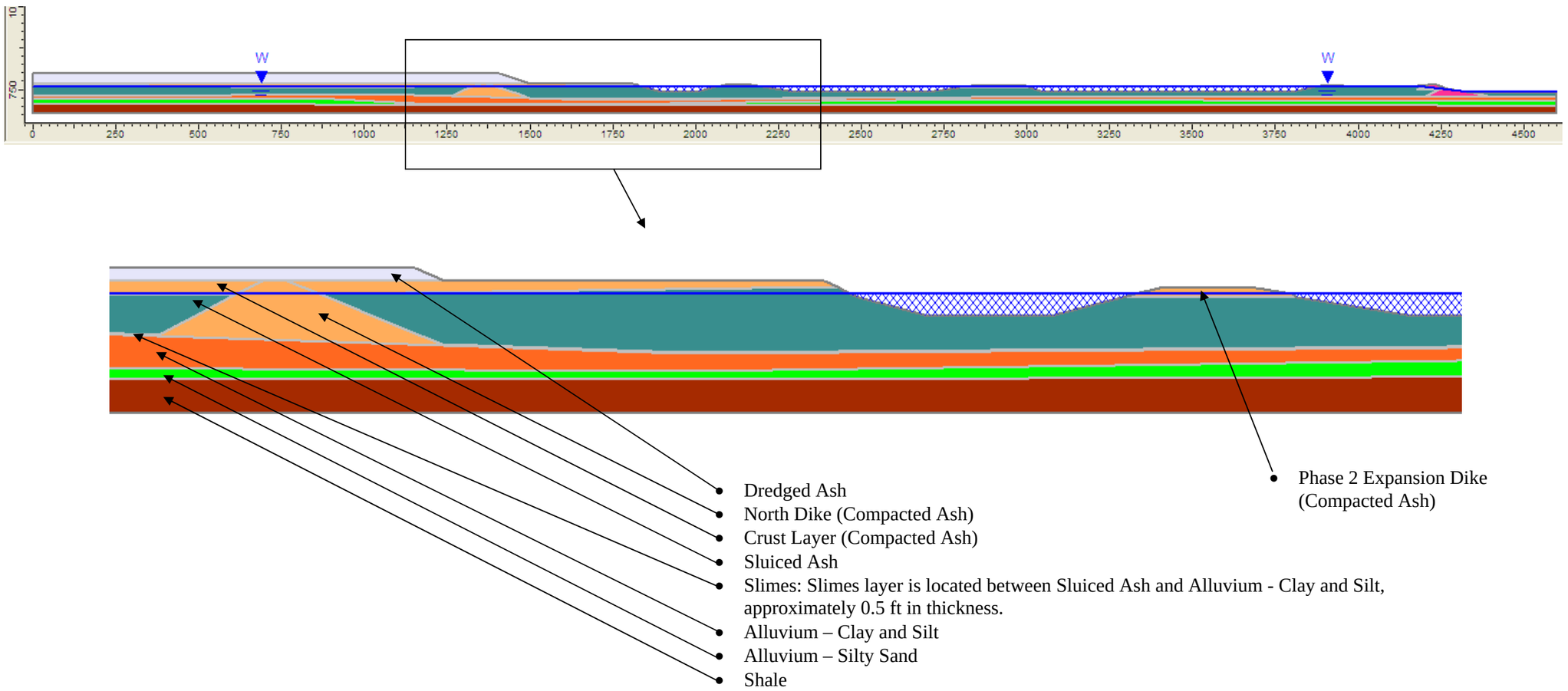


Figure 5. Subsurface Stratigraphy at Cross Section C-C

Written by:	Justin Wang	Date:	8/11/09	Reviewed by:	Ming Zhu/Robert Bachus	Date:	8/11/09
Client:	TVA	Project:	Dredge Cells Recovery	Project/ Proposal No.:	GR4327	Task No.:	105

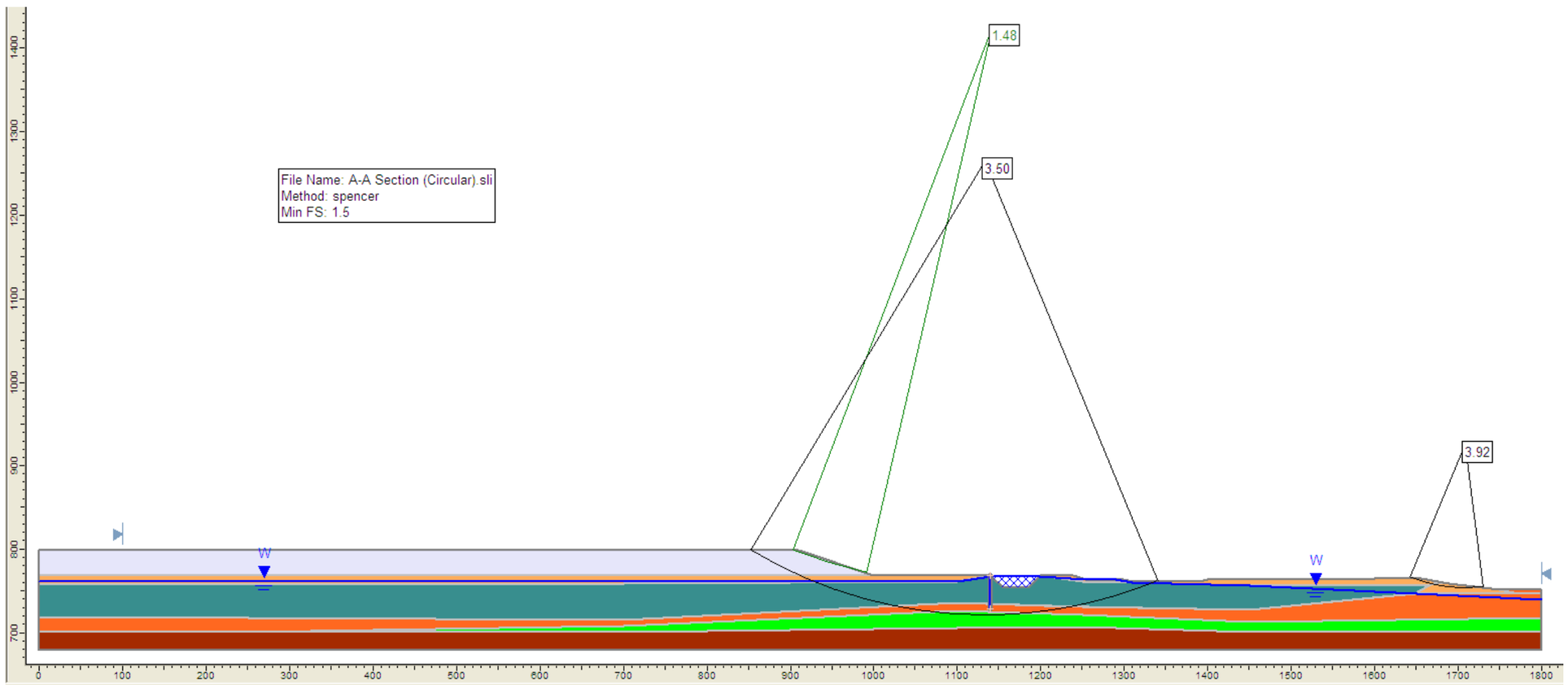


Figure 6. Stability Analysis Result for Cross Section A-A (Circular Type)

Written by: Justin Wang Date: 8/11/09 Reviewed by: Ming Zhu/Robert Bachus Date: 8/11/09

Client: TVA Project: Dredge Cells Recovery Project/ Proposal No.: GR4327 Task No.: 105

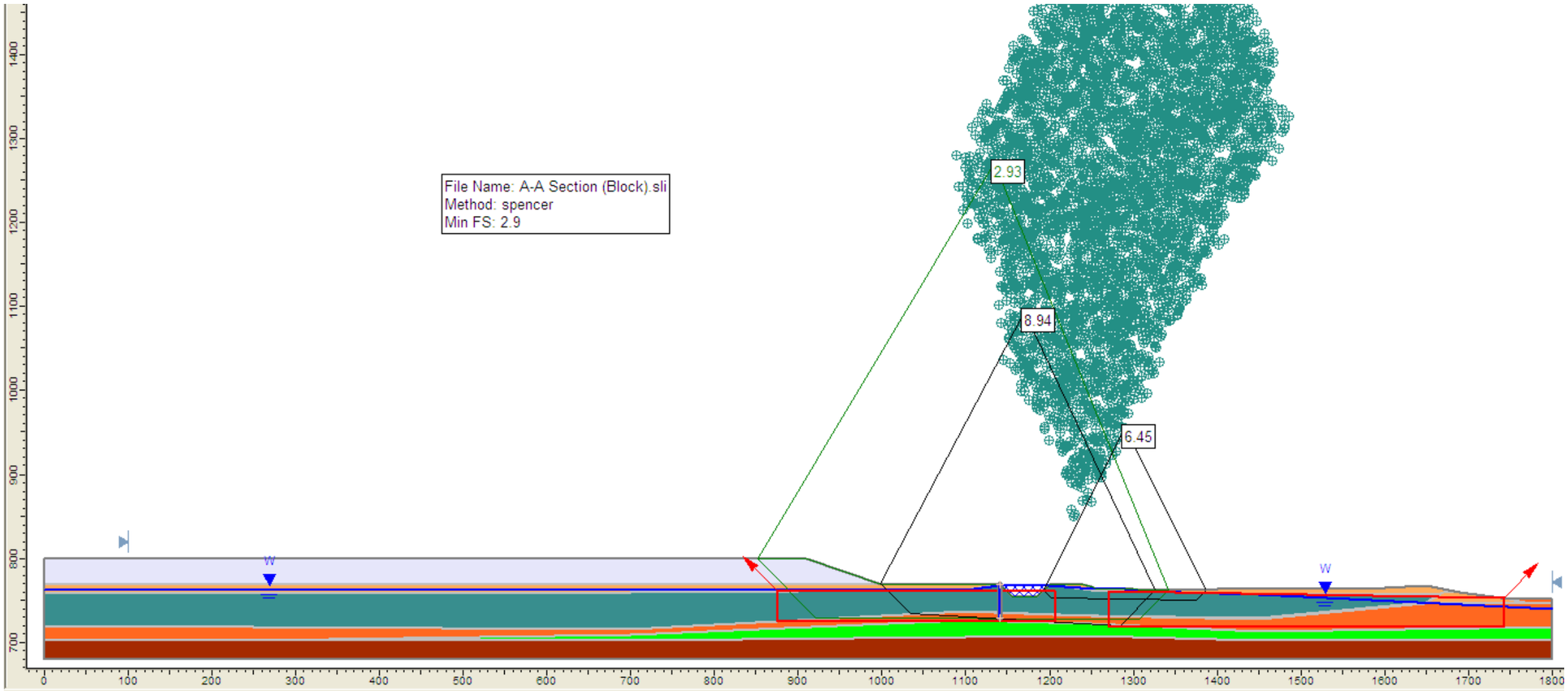


Figure 7. Stability Analysis Result for Cross Section A-A (Block Type)

Written by: Justin Wang Date: 8/11/09 Reviewed by: Ming Zhu/Robert Bachus Date: 8/11/09

Client: TVA Project: Dredge Cells Recovery Project/ Proposal No.: GR4327 Task No.: 105

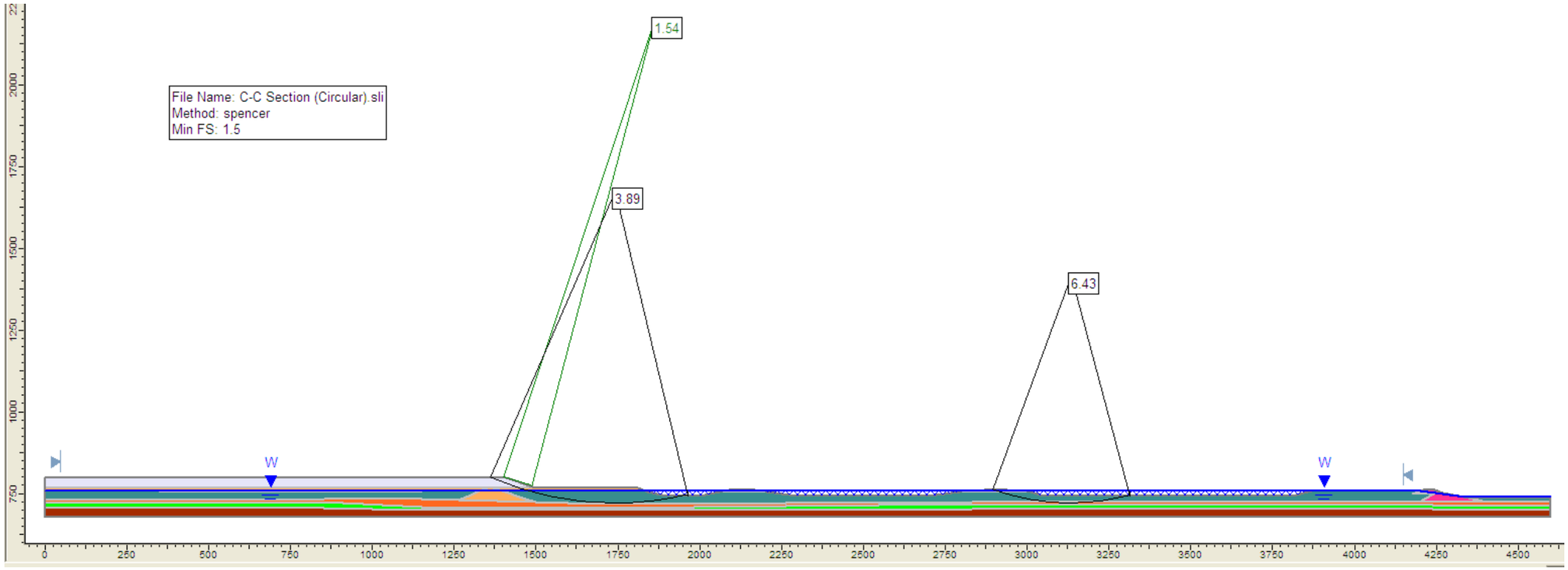


Figure 8. Stability Analysis Result for Cross Section C-C

Written by: Justin Wang Date: 8/11/09 Reviewed by: Ming Zhu/Robert Bachus Date: 8/11/09

Client: TVA Project: Dredge Cells Recovery Project/ Proposal No.: GR4327 Task No.: 105

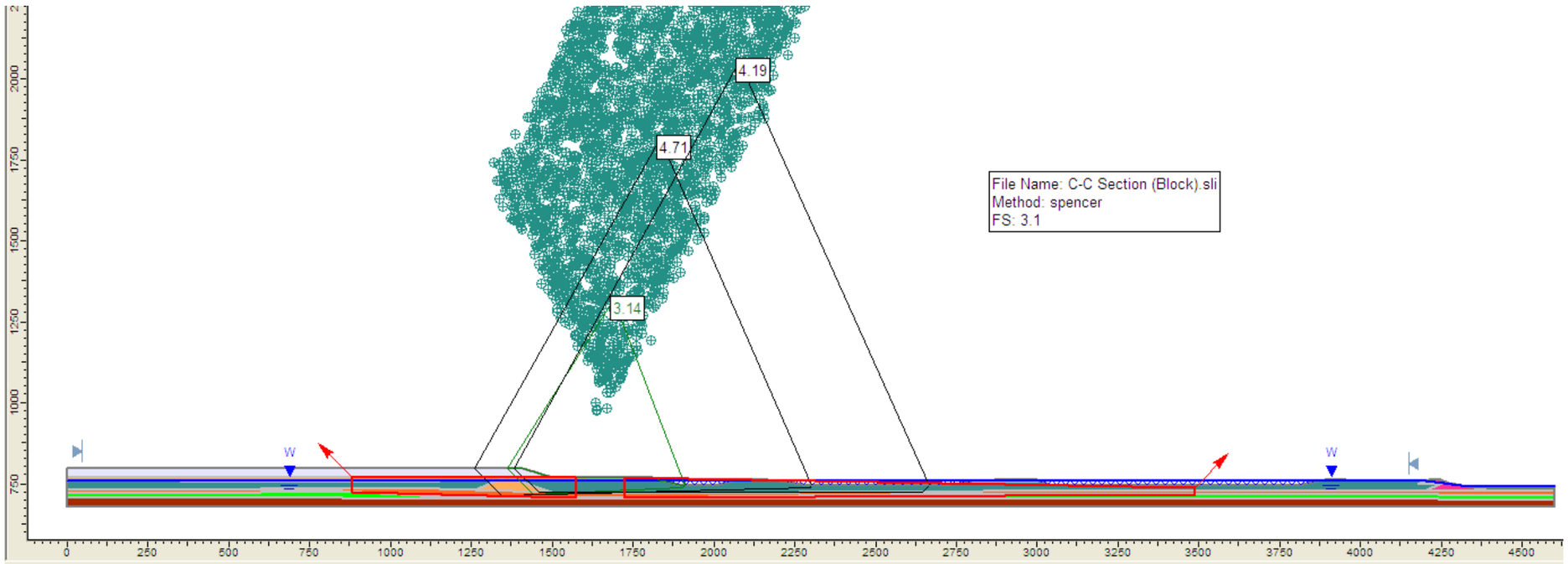


Figure 9. Stability Analysis Result for Cross Section C-C (Block Type)

ATTACHMENT 1

EXAMPLE SLIDE INPUT FILE

File Name: A-A Section (Block).sli

Document Name

File Name: A-A Section (Block).sli

Project Settings

Project Title: SLIDE - An Interactive Slope Stability Program
Failure Direction: Left to Right
Units of Measurement: Imperial Units
Pore Fluid Unit Weight: 62.4 lb/ft3
Groundwater Method: Water Surfaces
Data Output: Standard
Calculate Excess Pore Pressure: Off
Allow Ru with Water Surfaces or Grids: Off
Random Numbers: Pseudo-random Seed
Random Number Seed: 10116
Random Number Generation Method: Park and Miller v.3

Analysis Methods

Analysis Methods used:
Spencer

Number of slices: 25
Tolerance: 0.005
Maximum number of iterations: 50

Surface Options

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle): 135
Left Projection Angle (End Angle): 135
Right Projection Angle (Start Angle): 45
Right Projection Angle (End Angle): 45
Minimum Elevation: Not Defined
Minimum Depth: Not Defined

Material Properties

Material: Dredged Ash
Strength Type: Mohr-Coulomb
Unit Weight: 75 lb/ft3
Cohesion: 0 psf
Friction Angle: 20 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Crust (Compacted Ash)
Strength Type: Mohr-Coulomb
Unit Weight: 90 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Sluiced Ash
Strength Type: Mohr-Coulomb
Unit Weight: 80 lb/ft3
Cohesion: 0 psf
Friction Angle: 25 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Alluvium (Clay and Silts)
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 28 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Alluvium (Silty Sands and Silts)
Strength Type: Mohr-Coulomb
Unit Weight: 100 lb/ft3
Cohesion: 0 psf
Friction Angle: 30 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: Shale
Strength Type: Mohr-Coulomb
Unit Weight: 125 lb/ft3

Cohesion: 2500 psf
Friction Angle: 10 degrees
Water Surface: Water Table
Custom Hu value: 1

Material: SLIME
Strength Type: Mohr-Coulomb
Unit Weight: 75 lb/ft3
Cohesion: 0 psf
Friction Angle: 20 degrees
Water Surface: Water Table
Custom Hu value: 1

Support Properties

Support: Support 1
Support 1
Support Type: Micro-Pile
Force Application: Passive
Out-of-Plane Spacing: 1 ft
Pile Shear Strength: 113520 lb

List of All Coordinates

Material Boundary
0.000 769.000
1000.000 769.000

Material Boundary
1100.000 736.500
1240.000 732.000
1246.581 731.875

Material Boundary
0.000 758.000
250.000 758.000
700.000 759.500

Material Boundary
700.000 759.500
1100.000 762.000
1140.000 769.000

Material Boundary
0.000 702.600
250.000 702.000
700.000 702.000
1100.000 706.500
1250.000 707.500
1450.000 702.000
1800.000 702.000

Material Boundary
1100.000 726.500
1250.000 722.000
1450.000 713.000

Material Boundary
1450.000 713.000
1800.000 718.833

Material Boundary
250.000 702.000
700.000 708.500
1100.000 726.500

Material Boundary
0.000 718.000
250.000 718.000
700.000 715.500
1100.000 736.500
1246.581 731.875
1257.339 731.670
1450.000 728.000

Material Boundary
1450.000 728.000
1647.324 746.754

Material Boundary
0.000 718.500
250.000 718.500
700.000 716.000
1100.000 737.000
1250.000 732.000
1450.000 728.500
1648.898 747.576

Material Boundary
1647.324 746.754
1648.898 747.576
1664.904 757.000

1669.566	759.745
1670.000	760.000
1690.000	760.000

Material Boundary

1647.324	746.754
1772.583	746.754
1800.000	746.754

Material Boundary

1750.000	752.000
1772.583	746.754

Material Boundary

1450.000	757.000
1664.904	757.000

Material Boundary

1200.000	769.000
1250.000	762.000
1310.059	760.499
1450.000	757.000

External Boundary

1800.000	752.000
1750.000	752.000
1690.000	760.000
1650.000	767.000
1600.000	765.000
1400.000	764.000
1390.000	762.000
1310.000	762.000
1300.000	764.000
1290.000	764.000
1285.000	763.000
1257.000	763.000
1250.000	766.000
1240.000	769.000
1200.000	769.000
1185.000	754.000
1155.000	754.000
1140.000	769.000
1100.000	769.000
1000.000	769.000
910.000	799.000
0.000	799.000
0.000	769.000
0.000	758.000
0.000	718.500
0.000	718.000
0.000	702.600
0.000	680.000
1800.000	680.000
1800.000	702.000
1800.000	718.833
1800.000	746.754

Water Table

0.000	762.000
1100.000	762.000
1141.000	768.000
1199.000	768.000
1254.667	764.000
1290.000	764.000
1310.059	760.499
1450.000	757.000
1800.000	740.000

Support

1140.000	769.000
1140.000	729.000

Focus/Block Search Window

875.599	725.033
1207.549	725.033
1207.549	760.597
875.599	760.597

Focus/Block Search Window

1271.690	718.141
1742.526	718.141
1742.526	752.997
1271.690	761.458

Decontamination of Equipment and Vehicles
End Points/Expectations

- End points apply to all vehicles and equipment leaving the site (temporarily and permanently).
- Vehicles and equipment, in general, should be free of all ash, dirt and/or residue. All large quantities of ash and/or dirt will be removed (clumps, piles).
- Both power washers and water truck hoses are approved for use.
- If you can get your water stream to it, it should be hit.
- If an area cannot be cleaned after a substantial amount of time (i.e. water pressure is not removing the ash, dirt, residue) and time becomes restricted, supervisors/foremen will make the call/determination to move on. Workers need to make sure to keep supervisors/foremen notified of these problem areas.
- No major disassembly will be required on vehicles or heavy equipment.
- If parts can be actuated, it should be adjusted/moved when practical to accommodate better cleaning.
- Take care in areas that contain large quantities of grease or oil. These areas should be lightly cleaned (i.e. fog, quick pass), to free up any ash accumulated, but not to the point of removing the oil and/or grease.
- Supervisors/Foremen should be consistent in inspections to promote consistency in the workers cleaning the equipment.
- Supervisors, Foremen and workers should take their time and ensure complete coverage of the vehicle and/or equipment.
- If in doubt about anything, call the EPA On Scene Coordinator, Leo Francendese, at 404-606-2223.