Addendum 02

Lagoon 5 Renovation for the

T.E. Maxson Wastewater Treatment Facility

City of Memphis, Tennessee

City Project: SW02011

April 15, 2025

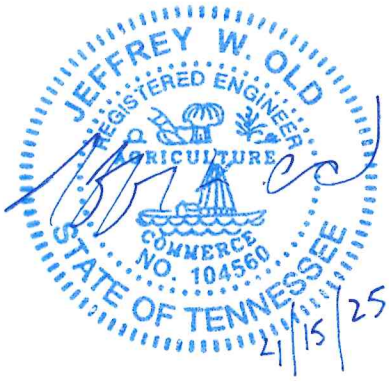
The following information is included with Addendum No. 2 for the above-referenced project. Bidders shall fully consider and acknowledge this Addendum in the preparation and submittal of their formal Bid. Failure to do so may result in the rejection of the Bid.

Be advised that this Addendum does not result in a change of the Bid Date. It remains 2:00PM local time, May 7, 2025.

List of Attachments:

1) Bidder Questions and Answers by Project Team.
2) Heavy Wage Rate Table
3) Map showing Hydrant Location
4) Pre-Bid Meeting Sign-In Sheet
5) Geotechnical Report (Bidder information only, not part of the Contract Documents)
6) Updated Bid Schedule, Specification Section 00310.
7) Updated Instructions to Bidders Specification Section 00100. This section has been updated with the new construction duration.
8) Updated Construction Contract, Specification Section 00510. This section has been updated with the new construction duration.
9) Unscanned Civil Plans.

Note that attachments 5 and 9 are separate files and not included in this PDF.



Attachment 1

Bidder Questions and Answers by Project Team as of April 15, 2025.

1) Could Emerson's work be an allowance on the bid document?
    a. Yes, see Attachment 6 for the updated bid schedule.
2) Is there a quantity for the off-site disposal of dewatered sludge?
    a. Yes, see Attachment 6 for the updated bid schedule.
3) Can the number of calendar days be extended to greater than 550? The scope of work is not possible to complete in that timeline.
    a. Yes, see Attachments 7 and 8 for the update to allow for 770 working days to complete work. Note that the contract documents define working days as calendar days.
4) Would the City be willing to use wage rates other than "Building" due to a majority of the work being heavy civil?
    a. The City will be using Heavy Wage rate, not Highway. Please see Attachment 2 for the new wage rate table.
5) Is there a dedicated spot on-site for the dewatering process?
    a. Nothing dedicated but placement of equipment will be flexible.
6) Where are the nearest power and water sources relative to the lagoon for dewatering operations?
    a. Power is located near the lagoon directly north of Lagoon 5. It can be hooked up in the existing PLC building at the southeast corner of the adjacent lagoon.
    b. The nearest water hydrant location can be seen in Attachment 3. It is approximately a 1600 ft run from the hydrant to the northwest edge of the Lagoon.
7) Where is the location of the on-site disposal location? Are contractors required to spread dewatered sludge on-site?
    a. On-site sludge disposal location is west of Lagoon 5 as indicated in the Pre-Bid Conference.
    b. Contractors are responsible for moving and spreading sludge in the disposal area.
8) Can all expected 39,300 dry tons be disposed on-site if sludge disposal requirements are met?
    a. Yes, there is capacity to dispose all dewatered sludge on-site.
9) Does the City of Memphis have a negotiated rate with South Shelby landfill?
    a. No, there are no negotiated rates with South Shelby landfill but the preference of the City is to surface dispose all dried sludge onsite.
10) The plan sheets seem to be scanned and the scale might be slightly off. Can you provide plan sheets that have not been scanned?
    a. The plans provided are scans of mylar pages so that the City of Memphis could add wet signatures to the sheets. The graphic scales on the scanned PDFs have been checked by the project team and two independent sources and are deemed to be accurate. However, an unscanned set of civil plan sheets is included in Attachment 9.
11) Will dewatered sludge trucked off to landfills be considered hazardous?
    a. It is unlikely the sludge will be deemed hazardous but the preference of the City is to surface dispose all dried sludge onsite.

12) Will all excess soil be stored on-site during excavation?
    a. The project team is working with the plant staff to find a location for excavation spoils. This will be available with Addendum 3.
13) Can further details be provided on the construction of the ring wall? There are no dimensions on the detail and there is no steel shown in the ring wall.
    a. Further detail regarding the ring wall design will be provided in Addendum 3.

End of Attachment 1, Addendum 2 for Maxson Lagoon 5 Renovations.

DEPARTMENT OF LABOR (DOL) 2025 WAGE RATES

Construction Type: **HEAVY ***		
General Decision Number: TN20250134 / **MOD 0** Rates Effective January 3, 2025, through December 31, 2025		
WORK CLASSIFICATION	**Rates**	**Fringe Benefits**
Electrician	$34.90	$15.90
Operating Engineers (Bulldozer, Crane, and Forklift)	$33.15	$13.62
Laborer (Common/General)	$18.47	$6.65
Laborer Flagger	$8.73**	$0.00
Laborer (Pipelayer)	$11.68**	$0.00
Operator (Backhoe/Excavator/Trackhoe)	$16.82**	$0.00
Operator (Loader)	$13.50**	$0.00
Truck Driver (Dump Truck)	$10.76**	$0.00

* **HEAVY CONSTRUCTION PROJECTS - Projects that are not properly classified as either building, highway, or residential. Including sewer/water construction, dams, major bridges, and flood control.**

Note:
Welders for all construction types - Receive rate prescribed for craft performing operation to which welding is incidental.

**** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 ($17.75) or 13658 ($13.30). Please see the note on the next page of this wage determination

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	Executive Order 14026 generally applies to the contract. The contractor must pay all covered workers at least $17.75 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2025.
If the contract was awarded on or between January 1, 2015, and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	Executive Order 13658 generally applies to the contract. The contractor must pay all covered workers at least $13.30 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2025.


Hennington Ave
Hennington Ave
Buoy St
Hydrant Location

End of Attachment 3

Attachment 4

BLACK & VEATCH
Building a world of difference.

PRE-BID CONFERENCE SIGN-IN SHEET
LAGOON 5 RENOVATION
FOR THE
T. E. MAXSON WASTEWATER TREATMENT FACILITY
CITY OF MEMPHIS, TENNESSEE
CITY PROJECT: SW02011

APRIL 9, 2025, 10:00AM

NAME	ORGANIZATION	EMAIL ADDRESS
Jonathan Albertson	Zellner	jalbertson@zellnerconstruction.com
MAC HILL	ZELLNER CONSTRUCTION	MHILL@ZELLNERCONSTRUCTION.COM
BRIAN WALKER	M+H Contractors	bewalker@wemovetheearth.com
DANNY R. STOPPENHAGEN	CHRIS-HILL CONSTRUCTION	danny@chrishillconstruction.com
John Coleman	Magnolia Underground	jcoleman@magnoliaunderground.us
Beamon Hetzel	Shelby Electric	bhetzel@shelbyelectric.net

BLACK & VEATCH
Building a world of difference.

PRE-BID CONFERENCE SIGN-IN SHEET
LAGOON 5 RENOVATION
FOR THE
T. E. MAXSON WASTEWATER TREATMENT FACILITY
CITY OF MEMPHIS, TENNESSEE
CITY PROJECT: SW02011

APRIL 9, 2025, 10:00AM

NAME	ORGANIZATION	EMAIL ADDRESS
SHANNON MCEARLES	CHRIS-HILL CONSTRUCTION	SHANNON@CHILLCONSTRUCTION.COM
Johnny Wood	Denali Water Solutions	johnny.wood@denaliwater.com
RANDY SOLLIE	DENALI	randy.sollie@denaliwater.com
Melissa Cox	CDM Smith	coxmae@cdmsmith.com
Clayton Bennett	Memphis	george.bennett@memphistn.gov
Steve Kirby	HAZEN CONST	csborne@hazenconstructor.com
Saied Wede	City of Memphis	Saied.wede@memphistn.gov

BLACK & VEATCH
Building a world of difference.

PRE-BID CONFERENCE SIGN-IN SHEET
LAGOON 5 RENOVATION
FOR THE
T. E. MAXSON WASTEWATER TREATMENT FACILITY
CITY OF MEMPHIS, TENNESSEE
CITY PROJECT: SW02011

APRIL 9, 2025, 10:00AM

NAME	ORGANIZATION	EMAIL ADDRESS
Colin Zipfick	American process group	CZipfick@amprocessgroup.com
Andy LeJeune	BAR Environmental	andy@bar-enviro.com
JERRY CALDWELL	Black & Veatch	caldwellj@bv.com
Katie Fye	Black & Veatch	fyek@bv.com
Jones Leonard	BV	leonardJH@bv.com
RON ROBINSON	CoM PUBLIC WORKS	
Valdes Hall	CoM Public Works	Valdes.hall@memphistn.gov
Rob Harrison	YuCon, LLC (MBE)	rob@yucanllc.com
Michael Gates	xylem	michael.gates@xylem.com
Kyle Lynch	Shelby Electric	klynch@shelbyelectric.net

SECTION 00310-BID FORM

To The Honorable Mayor of the City of Memphis, Tennessee

Sir:

In compliance with your Legal Notice to Bidders for the **T.E. Maxson Lagoon 5 Renovations (SW02011)**; the undersigned bidder, a _____ organized and existing under the laws of the State of _____;having examined the drawings, specifications and contract form provided hereto, and being fully advised as to the extent and character of the work to be performed and the equipment to be furnished, hereby proposes to furnish all labor, tools, materials, plant and equipment necessary for the **T.E. Maxson Lagoon 5 Renovations (SW02011)**.

The undersigned further proposes to perform all work and furnish all equipment in accordance with drawings and specifications prepared by Black & Veatch, and contract stipulations thereof, within the time limit specified, for the price so stated below.

BASE BID:

Alt #	Description	Quantity	Units	Unit Price	Item Total
1	Lump Sum for All Work Except Lagoon Residuals Removal	1	LS		
2	Existing Lagoon Residuals Removal – On Site Surface Disposal	39,300	Dry Tons		
3	Existing Lagoon Residuals Removal – Off-Site Landfill	5,000	Dry Tons		
4	Allowance for I&C Programming by Emerson	1	LS	$20,000.00	$20,000.00

Total of Base Bid:

_____

_____ ($_____) State amount in both words and figures.

BID ALTERNATE NO. 1:

Alt #	Description	Quantity	Units	Unit Price	Item Total
1	Import of Additional Select Material After Initial Consolidation	20,000	CY		

Total of Base Bid with Bid Alternate:

_____

_____ ($_____) State amount in both words and figures.

Bidder understands that the Owner reserves the right to reject any or all bids and to waive any informalities in bidding.

The bidder agrees that his bid shall be good and may not be withdrawn for a period of ONE HUNDRED TWENTY (120) days after the scheduled closing time for receiving bids.

Upon receipt of written notice of acceptance of this bid, Bidder will submit the following documents within ten (10) days:

1. Executed formal contract (attached as Section 00510)
2. Executed performance bond (attached as Section 00610)
3. Certificates of insurance coverage per Section 00710 Article 20

The bid security attached in the sum of five percent (5%) of the bid is to become the property of the Owner in the event the contract, bond and insurance certificates are not executed within the time limit set forth, as liquidated damages for the delay and additional expenses to the Owner caused thereby.

Bidder acknowledges receipt of Addendum(s) Nos. _____

_____

Respectfully submitted:

_____
Contractor's Name

_____
Signature

_____
Printed or Typed Name and Title

_____
Business Address

Corporate/Company Seal (Optional)

END OF SECTION 00310

SECTION 00100 - INSTRUCTIONS TO BIDDERS

1. PROJECT DESCRIPTION

Project consists of: The renovation of an existing lagoon, roughly 35 acres in surface area, into a three-celled lagoon with liners, covers, piping, gas collection system, electrical improvements, site work, erosion prevention and sediment control measures, controls and instrumentation, and other improvements.

2. BIDDING DOCUMENTS

For the mutual protection of the City, City's Consultant (hereafter "the Consultant"), and all subcontractors and material suppliers, partial sets of documents will not be issued. Therefore, all contractors intending to submit a bid shall obtain one (1) complete set of documents from the consultant or the consultant's designated plans provider for his bid to be accepted. This will also place the Contractor on the mailing list for possible addenda issuance.

Bidding documents are available per the instructions below:

a) Contractor Bidders: One (1) complete set of bidding documents, drawings, and specifications in electronic format shall be obtained from Black & Veatch by emailing a request to Jeff Old, oldjw@bv.com with the subject line: "Maxson Lagoon 5 Bid Document Request". Each bidder must request the plans so that the bidder's company can be logged and receive all bid-related communication.

b) Subcontractors, material suppliers, and other interested parties desiring to acquire a Construction Bid Set may request plans in the same way described above.

c) Each bidder will receive a bid envelope from Black & Veatch. They will be available at the Pre-Bid Meeting and by direct request to Jeff Old at the email address above.

3. PLAN ROOM DISTRIBUTION:

Complete sets of contract documents are available for review at the following locations:

a) Builders Exchange Plan Room; 642 South Cooper Street; Memphis, TN; Phone: (901) 272-7495.

b) Memphis Area Minority Contractors Association, 480 Dr. M.L. King Jr. Avenue, Memphis, TN 38103, Phone: (901) 526-9300. (MAMCA_1@hotmail.com)

4. ADDENDA

The Consultant will forward one (1) copy of all addenda to holders of each set of documents. All such addenda will become a part of the contract documents and subject to all conditions contained therein, and must be listed on the Bid Form for the bid to be accepted. Note: no addendum shall be issued within seven (7) calendar days prior to the date set for opening of bids, unless said addendum, delays the opening of said bids.

5. INTERPRETATION

Requests for interpretation should solely be addressed to the Consultant either in writing or via telephone. No oral interpretation will be made to any bidder as to meaning of drawings and specifications. Requests for interpretation will be accepted up to fourteen (14) calendar days prior to date set for opening of bids. All interpretations will be made in the form of an addendum and will be issued as promptly as practicable to all parties registered with the Consultant as having documents. Note: no addendum shall be issued inside of seven (7) calendar days prior to the date set for opening of bids, unless said addendum, delays the opening of said bids.

6. PREPARATION OF BIDS

Each bid must be submitted using the forms attached hereto, and must include in the Bid Envelope the following fully executed items:

a) The written bid on the form provided by the City's Consultant; all spaces must be completed in ink or typewritten.

b) Bid security in the form of a Bid Bond or certified check in the amount of 5% of the bidder's proposed bid if the bid amount exceeds $100,000.

c) City of Memphis Construction Contract Certificate of Nondiscrimination on the form provided.

d) City of Memphis Minority/Women Business Enterprise Program on the form provided.

e) Good Faith Effort Documentation M/WBE Program on the form provided.
(only if M/WBE goal not obtained)

f) City of Memphis Construction Contract Certificate of a Drug Free Workplace on the form provided.

7. BIDS

Bid Forms with attachments are incorporated herein.

8. BID EXCLUSIONS/QUALIFICATIONS

Any bid that is qualified in any way or which contains any exclusions will automatically be classified as non-conforming and shall not be given consideration for contract award.

9. BID GUARANTEE REQUIREMENTS

Submit bid guarantee as a guarantee that:

a) Bidder will not withdraw bid for one hundred twenty (120) days after opening of proposals without Owner's written consent.

b) If bid is accepted, bidder will enter into formal contract with Owner, within ten (10) days after receipt of contract documents for execution.

c) If bid is accepted, bidder will execute required Performance bond and will obtain required insurance coverage within ten (10) days after receipt of contract.

d) Contract between Owner and Contractor will be submitted to the Contractor for signature, then returned to the Owner for signature. Performance Bond and all certificates of insurance must be submitted by the Contractor at the same time as he returns the signed contract to the Owner.

For bid proposals which exceed $100,000, a bidder's bond or certified or cashier's check made payable to the City of Memphis on a solvent bank will be provided in the amount of 5% of the bid. Said instrument to remain in effect and will be returned only after the contract has been fully executed and secured. Additionally, the successful bidder shall execute a performance bond in an amount equal to 100% of the contract sum as security for the faithful performance of the contract and for the payment of labor and material furnished and incorporated into the work. The only acceptable form of instrument for this bond is bound herein. Bond shall be furnished through an agent domiciled and legally authorized to do business in the State of Tennessee, and delivered to the Owner not later than ten (10) calendar days after the date shown on written notice from the City. The proposed surety company must be one acceptable to the City of Memphis.

Bidder shall be liable to the Owner for full amount of bid guarantee as representing damage to the Owner on account of default of bidder if:

(a) Bid is withdrawn within one hundred twenty (120) days after receipt of bids without approval of Owner.

(b) Bidder fails to enter into contract with Owner and execute required Performance Bond and provide required insurance coverage within ten (10) calendar days subsequent to notice of award of contract.

10. EXAMINATION OF SITE

Before submitting a bid, the bidder shall personally visit the site of proposed work and arrive at a clear understanding of the conditions under which the work is to be performed. No consideration will be allowed subsequently by reason of error or oversight on the part of the bidder or on account of interference by either the City or existing conditions. Neglecting any of the above requirements will not be acceptable as reason for delay in the work or for adjustments of the contract sum. Bidders must make an appointment with Noah McClellan at telephone # (901) 636-0305 to visit the project site.

11. FIELD MEASUREMENTS

The Contractor shall make his own measurements to verify square footage, dimensions and quantities to complete the project. The dimensions and areas indicated on the drawings are for reference only and are not to be construed as the actual dimensions and areas.

12. STATE OF TENNESSEE CONTRACTOR REQUIREMENTS

If bid is $25,000 or over, bidders must be licensed contractors in the State of Tennessee as required by Title 62, Chapter 6, of the Tennessee Code Annotated. CLASSIFICATION FOR THIS PROJECT SHALL BE **MU**.

Additionally, the bidder shall include the name, license number, expiration date thereof, and license classification of the contractor applying to the bid for electrical, plumbing, heating/ ventilation/air conditioning and masonry, on the outside of the envelope containing the bid; otherwise, the bid shall not be opened or considered. In the event the aforementioned classifications are not applicable to the project, the bidder shall indicate not applicable (NA) on the appropriate line.

13. SUBCONTRACTORS

No less than thirty percent (30%) of the total contract cost of the work shall be performed by the Contractor's own organization, thus limiting the total allowable amount of subletting to no more than seventy percent (70%) of the total contract cost of the work to be performed. All transactions, negotiations, and correspondence of the City shall be with the Contractor. The City will refer all matters regarding payments, changes, scheduling work progress, etc. of sub-contractors to the contractor. Sub-contractors shall be recognized only in the capacity of employees or work crews of the contractor and shall be subject to the same requirements as to character and competence. The Contractor shall not assign, transfer, convey, sell, or otherwise dispose of the whole or any part of the contract to any person, firm, or corporation without the written consent of the City. Subletting any part of the work to be done under the contract shall not, under any circumstances, relieve the Contractor of any liabilities or obligations. At pre-construction the contractor shall submit copies of executed sub-contracts to the City.

If the Contractor shall sublet any part of this contract, the Contractor shall be as fully responsible to the City for the acts or omissions of the subcontractor and of the persons either directly or indirectly employed by his subcontractor as he is for the acts and omissions of persons directly employed by himself. Within fourteen days (14) after bids are opened, the apparent low bidder and any other bidder so requested, shall submit a list of all subcontractors he expects to use in the work. An experience statement with pertinent information as to similar projects and other evidence of qualifications shall be furnished for each named subcontractor, as requested by the City. If the City, after due investigation, has reasonable objection to any proposed subcontractor, City may, before contract execution, request the apparent low bidder to submit an acceptable substitute without an increase in his bid. If the apparent low bidder declines to make any such substitution, he will not thereby sacrifice his bid security. Any subcontractor so listed and to whom the City does not make any written objection prior to contract execution will be deemed acceptable by City.

Contractor shall not be required to employ any subcontractor against whom he has reasonable objection.

The use of subcontractors listed by the bidder and accepted by the City prior to contract execution will be required in the performance of the work.

14. CONTINGENCY ALLOWANCE

Once bids have been received and a successful bid identified, the City may add a contingency allowance to the construction contract as part of the total contract amount. This contingency allowance is to be used for any possible construction change orders that occur during the life of the contract and shall be reflected as a separate line item on the schedule of values. Any unused portion of the allowance remaining at the completion of the contract shall revert back to the City as a credit.

While calculating bond and insurance costs for bid preparation purposes only, bidders should add 8% to their overall bid to accommodate the increase in the contract amount due to the possible inclusion of a contingency allowance by the City after bids have been taken.

15. EQUAL BUSINESS OPPORTUNITY PROGRAM (EBO)

This project is subject to the requirements of Ordinance #5384 which establishes the Equal Business Opportunity Program. It is the responsibility of the bidder to see that all requirements of the ordinance are met. The goal of the M/WBE Program is to increase the participation of

M/WBE's in the Owner's purchasing activities. Toward achieving that objective, the M/WBE participation goal for this project is hereby established as:

THE TOTAL GOAL OF 30 MBE%

THE TOTAL GOAL OF 7 WBE%

These percentages are defined as the dollar value of subcontracts awarded to certified minority or women-owned business enterprises divided by the base bid amount.

The Participation Plan must include: (1) level and dollar amount of participation your firm anticipates to achieve in the performance of the contract resulting from this RFP; (2) the type of work to be performed by the M/WBE participation; and (3) the names of the M/WBEs the Bidder plans to utilize in the performance of the contract resulting from this solicitation.

The Bidder must complete the Equal Business Opportunity Program Compliance Form included in Section 00430 of this specification.

IT IS THE RESPONSIBILITY OF THE BIDDER TO VERIFY WITH THE CITY OF MEMPHIS CONTRACT COMPLIANCE OFFICE (CONTACT INFO BELOW) THAT ANY M/WBE FIRM(S) UTILIZED TO MEET THE PARTICIPATION GOAL ARE CERTIFIED AS A M/WBE FIRM. A listing of current M/WBE certified firms can be found on the City of Memphis web site home page (www.cityofmemphis.org). On the City's home page under "Doing Business with the City", go to the link entitled "Certified MWSBE Search". Here an entire listing of all certified MWBE and SBE firms can be found or a search can be performed for a particular firm. One or a combination of several M/WBEs may be utilized to meet the established goal.

If a Bidder desires to utilize an M/WBE firm not included on the list included in this specification, it is the Bidder's responsibility to confirm that the desired firm is certified by the City of Memphis. Such confirmation must be obtained from the City's Contract Compliance Office, in writing, before the proposal/response due date. Requests for verification must be submitted to the City's Contract Compliance Office listed below:

Contract Compliance Officer
City of Memphis
Contract Compliance Office
125 North Main Street, Suite 546
Memphis, TN 38103
Phone: (901) 576-6210
Fax: (901) 576-6560

a) BID SUBMITTAL REQUIREMENTS

1. The bidder shall include with his bid the form found in Section 00430 of this specification.

2. If the bidder is a certified M/WBE and approved by the City of Memphis, then the participation goal for the M/WBE classification of the bidder shall be deemed met.

3. If the bidder has not met the required participation goal (as stated above) in its bid, as documented on the Section 00430 form, then documentation of the bidder's "good faith effort" ***shall be submitted with its bid. The Good Faith Efforts Documentation is included in Section 00430 of this specification.*** This documentation shall include, but not be limited to the following:

(1) Attendance at pre-bid conference.

(2) Copies of written notification sent to all City of Memphis certified M/WBEs that perform the type of work to be subcontracted, in sufficient time to allow said M/WBEs to participate effectively, soliciting said M/WBEs' interest in working on the project and advising the M/WBEs;

(a) Of the specific work the bidder intends to subcontract;

(b) That their interest in the project is being solicited

(c) How to obtain information for the review and inspection of the plans, specifications and requirements of the bid.

(3) A written statement that economically feasible portions of work were selected to be performed by M/WBEs, including, where appropriate, segmenting elements of work or combining elements of work into economically feasible units. The ability of the bidder to perform the work with its own work force will not in itself excuse the bidder from making good faith efforts to meet participation goals.

(4) A statement of the efforts made to negotiate with M/WBEs, including:

(a) The names, addresses, and telephone number of M/WBEs, who were contacted;

(b) The date negotiations took place;

(c) A description of the information provided to M/WBEs regarding the plans, specifications, and requirements for portions of the work to be performed.

(5) A statement of the efforts made to assist M/WBEs contacted who need assistance in obtaining bonding, insurance, financing, or in reviewing the plans, specifications, and requirements of the bid.

(6) A statement that the bidder submitted all quotations received from M/WBEs and, for those quotations not accepted, a statement of the reasons why the M/WBE will not be used to work on the project.

(7) As to each M/WBE contacted which the bidder considered not to be qualified, a statement of the reasons for the bidder's conclusion based on a thorough investigation of said M/WBEs' capabilities.

The determination of whether a bidder has made a good faith effort will be made by the City's Contract Compliance Officer, Director of Finance and the Purchasing Agent, prior to the award of the project.

b) SUPPLEMENTAL SUBMITTAL REQUIREMENTS

1. Within fourteen (14) days after contract notification of award, the bidder shall submit Letters of Intent from the certified M/WBE subcontractors identified in the Section 00430 form submitted with its bid.

2. Within ten (10) days after receipt of an executed contract from the Owner, the contractor shall submit copies of executed subcontracts with the certified M/WBE's identified in the bid documents. The executed subcontract shall include the scope of work to be performed by the M/WBE subcontractor.

3. At the completion of the work, the Contractor shall submit to the Owner a final schedule of participating certified M/WBE's subcontractors, showing the final amount of each subcontract and payments.

4. With the submittal of Application for Payment, the Contractor shall provide certification that he has paid all previous progress payments to M/WBE subcontractors utilizing the form found in section 00640 or section 00641 (as appropriate) of the contract documents.

c) CHANGES TO DESIGNATED M/WBE SUBCONTRACTORS

1. Proposed changes to the designated participating of women or minority business enterprises in a bidder's bid, on any project, after submission of bids, including during performance of a contract, must be submitted to the Owner. Bidders and contractors must make every effort to replace a woman or minority business enterprise subcontractor with another certified woman or minority business enterprise, based on said enterprises' availability. All substitutes for women or minority business enterprise subcontractors or joint ventures require prior approval of the Owner, not to be unreasonably withheld; and said approval may be granted for reasons including, but not limited to, the following.

   (1) Subcontractor requests that its subcontract or joint venture agreement with the prime contractor be voided;

   (2) Subcontractor is unable to perform the work;

   (3) Subcontractor has consistently performed unacceptable work.

d) FAILURE TO SUBMIT REQUIRED INFORMATION

1. A bidder's failure to submit any of the information required by this chapter may render the bid non-responsive and ineligible for consideration.

A determination by the Owner that the bidder or contractor has failed to comply with any provision of this chapter shall subject the offending party to any or all of the following penalties:

1. Declare the bidder's bid nonresponsive and ineligible to receive the involved contract;

2. If the bidder or contractor is a M/WBE, denial or revocation of the City certification as a M/WBE for a period not to exceed one (1) year;

3. Withholding from the contractor in violation ten (10) percent (%) of all future payments, in addition to retainage, under the involved project until it is determined that the contractor is in compliance;

4. Withholding from the contractor in violation all future payments under the involved project until it is determined that the Contractor is in compliance;

5. Exclusion from submitting a bid for any future procurement by the City until such time as the contractor demonstrates that it will comply with all of the applicable provisions contained in this chapter;

6. Termination, by the City, of the contract.

16. PRE-BID CONFERENCE

A Pre-Bid Conference will be held on April 9, 2025 at 10:00AM local time at T.E. Maxson Wastewater Treatment Plant Conference Room, 2671 Plant Road Memphis, TN 38109. All parties interested in bidding on this project are hereby invited and urged to attend this meeting. Failure to attend the pre-bid meeting will count against said "good faith effort" as required by the M/WBE program.

17. POST BID OBJECTIONS

No objections with regard to the application, meaning, or interpretation of these specifications will be considered after the opening of the subject bids.

18. RECEIPT AND OPENING OF BIDS

The City of Memphis (herein called the "City") invites bids on the forms attached hereto. All blanks must be appropriately filled in. Bids will be received by the City at the office of the City Purchasing Agent, Room 354, City Hall, 125 N. Main, Memphis, TN 38103, until 2:00p.m. local time on May 7, 2025: and then at City Council Chambers publicly opened and read aloud.

Each bid shall be submitted in a sealed envelope, with the name, license number, expiration date thereof, and license classification of the contractors applying to bid for the prime contract and for the electrical, plumbing, heating, ventilation, and air conditioning contracts, appear on the outside of the envelope containing the bid. All bidders are requested but not required to use the “City of Memphis Bid Envelope” with all applicable information filled out on the outside of the envelope including:

a) Name of Project:

b) Contractor's Name:

c) Contractor's Address:

d) Contractor's License Number, expiration date, and that part of the classification applying to the bid. This information shall also be provided for the contractor applying to the bid for electrical, plumbing, heating/ventilation/air conditioning, and masonry work.

e) The above due date, and bid opening time:

If forwarded by mail, the sealed envelope containing the bid must be enclosed in another envelope addressed to City Purchasing Agent; Room 354, City Hall; 125 N. Main; Memphis, TN 38103.

Any bid may be withdrawn prior to the above scheduled time for opening of bids or authorized postponement thereof. Any bid received after the time and date specified shall not be opened. Bidders must comply with all applicable licensing requirements.

The City of Memphis reserves the right to reject any and all bids and to waive any informality in bidding.

THE CITY OF MEMPHIS RESERVES THE RIGHT TO DELAY AWARD OF THIS CONTRACT FOR A PERIOD OF UP TO ONE HUNDRED TWENTY (120) DAYS AFTER RECEIPT OF BIDS.

19. TIME OF COMPLETION

The work shall begin immediately upon date indicated on the Notice-to-Proceed and shall be completed in accordance with the following schedule:

Work shall be completed within Seven Hundred Seventy (770) Calendar Days.

All time noted above is based upon consecutive calendar days (and the time allowed for each bid item is intended to be concurrent with the other bid items). Upon acceptance of this contract, the contractor agrees to pay the City of Memphis the sum of **$1500** per day for liquidated damages for every calendar day that the work remains incomplete beyond specify completion time for each bid item of work) days from date of Notice-to-Proceed. Additionally, the Contractor agrees to pay the City of Memphis **$1500** per day for liquidated damages for each calendar day the punch list work and submission of all close-out documents remains incomplete beyond thirty (30) days from date of Substantial Completion.

Construction time shall include all normal weather conditions, such as rain, snow, and freezing temperatures. Extension of time will not be allowed for the normal inclement weather, as recorded by the Memphis Area Office of the National Weather Service. Claims for delay attributed to unusually severe weather must be supported by National Weather Service climatological data covering the period in question and the same calendar period for the five preceding years.

20. NONDISCRIMINATION

All entities contracting with the City agree to abide by and to take affirmative action when necessary to ensure compliance with the nondiscrimination clauses set out below and agree to show proof of non-discrimination upon request and to post in conspicuous places available to all associate agents and their employees. In the event of non-compliance with city nondiscrimination clauses, or with provisions of Executive Orders 11141 (age), 11246, 11375 (women), 12086 (Viet Nam veterans), 110478 (federal employees), 11625 (minority business) 11701 (veterans), Title 41, Chapter 60 (handicapped) and specifically the handicapped affirmative action clause in Section 60-741.6.9 of OFCCP Rules, and any and all other federal laws prohibiting discrimination, contracts may be canceled, terminated, or suspended in whole or in part by the City of Memphis.

The bidder shall execute the specified City of Memphis Certificate agreeing that, if awarded the contract, he/she shall not discriminate against any subcontractor, employee, or applicant for employment on the grounds of race, color, national origin or sex, in accordance with the citations listed in the above paragraph; and shall require the execution of such a certificate for each subcontractor prior to award of any subcontract with the further requirement that each subcontractor shall include identical requirements in any lower tier subcontracts which might in turn be made. FAILURE TO EXECUTE AND SUBMIT SUCH CERTIFICATE WITH THE BID SHALL CAUSE THE BID TO BE REJECTED AS NON-CONFORMING.
The successful bidder and all subcontractors under the general contract shall maintain copies of their payrolls and all subcontracts for each weekly payroll period for the life of the

construction and for a period of ***FIVE YEARS*** after final release and payment is made by the City to the contractor.

21. PREVAILING WAGE ORDINANCE

It is the policy of the City of Memphis that a responsible bidder awarded a contract by the City of Memphis that falls within the guidelines of the current City of Memphis Prevailing Wage Ordinance must comply with the most current Prevailing Wage Rates (as determined by the U.S. Department of Labor) for corresponding classes of laborers and mechanics employed on similar projects in the area **on the date the legal notice is published**. Any firm, individual, partnership or corporation that is awarded a contract by the City of Memphis for the construction, improvement, enlargement, alteration or replacement of a City of Memphis public work or project in excess of **$50,000** shall be required by the City of Memphis to pay local Prevailing Wages for laborers, workers, mechanics or others, as listed by the Tennessee Department of Labor, Classification of Workers, established for Region 1, at the time the project is bid and continue until the completion of such project. **Furthermore, the entity awarded the contract will classify its employees according to the State of Tennessee, Department of Labor and Workforce Development, Classification of Workers, and if applicable, adhere to the guidelines for apprentice and apprenticeship programs.** Toward achieving that objective, the Prevailing Wage Program is hereby established and requires each bidder to abide by the following:

a). CONTRACTOR/SUBCONTRACTOR RESPONSIBILITIES

Every contractor and all subcontractors **must**:

1. Classify all workers in conformity with the wage rate as determined by the U.S. Department of Labor. Refer to https://sam.gov for the most current classifications and wage rate determinations.

2. Post and keep posted in a conspicuous place at the site of the construction work a copy of the Prevailing Wage Rates and make these rates available to all covered workers employed on the project at all reasonable times. Fringe benefits, when listed by the U.S. Department of Labor, **are** included in City Prevailing Wage Rates and must be paid to laborers/mechanics on City-funded projects.

3. Pay overtime compensation of one and one-half times the basic rate of pay for all hours worked over 40 per week as required by any applicable federal or state laws, rules or regulations.

4. Make only those deductions from wages authorized by law. Indicate the amount of FICA, Withholding Tax and if applicable “Other” when a voluntary deduction is withheld. A voluntary deduction must be authorized in writing and signed by the employee. A short note from the employee is all that is needed and should accompany the first payroll that identifies the deduction.

5. Keep contracts for the construction, demolition, improvement, enlargement, alteration or replacement of a City of Memphis public work or project as a single contract, and **not** deliberately divide it into multiple contracts for the sole purpose of circumventing the Prevailing Wage Ordinance.

6. **Notify the Prevailing Wage Office at the address set forth below of the contract(s) contractor and/or subcontractors have been awarded, and list subcontractors expected to be used**. **Award recipients shall submit**

expected classifications of laborers/mechanics to ensure all worker classifications have prevailing wages listed. If classifications are not listed, the Prevailing Wage Office will determine the wages to be used for such classifications.

7. Submit payroll reports on a **weekly** basis to the Prevailing Wage Office utilizing the LCPtracker certified payroll reporting software. Each weekly certified payroll report must be submitted by the award recipient within **7 DAYS** after the regular payment date period. It is the responsibility of the award recipient to review **ALL** payroll reports for proper compliance prior to submitting such reports to the Prevailing Wage Office. The award recipient is responsible for the full compliance of all subcontractors and will be held accountable for any payroll reporting and wage restitution. The contractor and subcontractor must complete a Statement of Compliance which states that the certified payrolls are correct and complete, and that the wage rates paid to the workers during the reporting period equal or exceed the Prevailing Wage Rates included in the construction contract, and that the classifications used conform with the work the employee performs. The primary contractor is responsible for submitting all certified payrolls including those of the subcontractor(s) used through the life of the construction project.

b) PAYMENTS TO COVERED WORKERS

1. CLASSIFICATION OF COVERED WORKERS

All contractors and subcontractors must classify covered workers in the contract and payroll records, in conformity with the schedule of classifications appearing in the "City of Memphis Prevailing Wage Rates with Fringe Benefits" which are bound herein. The contractor and subcontractors must pay each worker at least the minimum Prevailing Wage rate for that classification regardless of their level of skill. The only workers who can be paid less than the rate for their craft are apprentice and trainees who are registered in an approved Bureau of Apprenticeship Training (BAT) program. For an employee with split classifications, list the employee once for each classification, distribute the hours of work accordingly and list the rate of pay and gross earnings for each classification.

2. INSPECTION OF RECORDS

The contractor and subcontractor(s) will make their employment records available for inspection by representatives of the contracting agency, the Prevailing Wage Commission, and the Tennessee Department of Labor, and will permit such representatives to visit construction projects at all reasonable times.

3. RESTITUTION FOR UNDERPAYMENT OF WAGES

Where underpayment of wages has occurred, the employer will be required to pay wage restitution to the affected employee. Wage restitution must be paid promptly in the full amount due, less the permissible and authorized deductions. Wage restitution is the difference between the hourly wage paid to the employee and the Prevailing Wage Rate required, as stated on the Prevailing Wage Rates schedule, for all hours worked in which underpayment occurred. The difference in the wage rate is called the "Adjustment Rate." The Adjustment Rate multiplied by the number of hours worked equals the gross amount of restitution due the employee.

4. BOND FOR COMPLIANCE

The bond of the contractor or subcontractor shall contain a provision obligating such contractor or subcontractor to a faithful performance of each requirement imposed upon such contractor or subcontractor under the terms of the contract.

5. VIOLATIONS, PENALTIES, SANCTIONS

A contractor who knowingly or willfully fails to comply with the provisions of the Prevailing Wage Ordinance as determined by the Prevailing Wage Commission shall be fined not less than the maximum amount allowable under Tennessee Code Annotated § 6-54-306, as amended, for each violation. Any contractor who is found to have knowingly or willingly committed two (2) violations of the Prevailing Wage Ordinance in any twenty-four (24)- month period shall be prohibited from being awarded a contract by the City of Memphis for a period of twenty-four (24) months from adjudication of the second violation.

c) SUBCONTRACTS

The contractor shall insert in all subcontracts the clause set forth in (b) and a clause requiring the subcontractors to include these clauses in any lower tier subcontracts which they may enter, together with a clause requiring this insertion in any further subcontracts that may in turn be made.

d) CITY OF MEMPHIS PREVAILING WAGE OFFICE

City of Memphis
Prevailing Wage Office
125 N. Main St.
Memphis, TN 38103
(901) 636-6311
prevailingwage@memphistn.gov

End of Section 00100

SECTION 00510 - CONSTRUCTION CONTRACT

Contract For: **T.E. Maxson Lagoon 5 Renovations (SW02011)**

This Agreement made and entered into as of this _____ day of _____, 20____ by and between _____ (hereafter "Contractor"), and the City of Memphis, a Municipal Corporation organized under the laws of the State of Tennessee (hereafter "City").

Whereas City published a legal Notice to Bidders pursuant to _____ and issued drawings and specifications for the construction and performance of specified incidental work; and

Whereas Contractor submitted a proposal dated _____, in accordance with such Notice to Bidders, drawings and specifications; and such proposal was accepted by City as the lowest and best bid;

NOW, THEREFORE, in consideration of the mutual covenants, conditions, and promises herein contained, the receipt and sufficiency of which is hereby acknowledged, the parties hereby agree as follows:

Contractor hereby agrees to construct the project in accordance with the drawings and specifications bid upon and provided hereto, and in accordance with all other documents incorporated herein as set forth in this Section, at the stipulated sum price of_____ _____ ($_____)

Contractor shall promptly begin construction on the date specified hereafter in the written Notice to Proceed provided by City's Consultant, and shall fully complete all work within **770** calendar days.

Should Contractor fail to complete all work within 770 calendar days, Contractor shall pay City **$1,500.00** per day as liquidated damages for each working day required for the completion of the contract beyond the time stipulated. Additionally, Contractor shall pay City **$1,500.00** per day as liquidated damages for each working day that all punchlist work and submission of all close-out documents remain incomplete beyond thirty (30) days from the date of substantial completion.

A. Contractor agrees to execute a Performance Bond in an amount equal to 100% of the contract sum with Surety to be approved by the Mayor and City Attorney, or their designated representatives, as security for full and faithful performance of the contract and for the payment of labor and material furnished.

B. City reserves the right to require that Contractor provide an additional bond or bonds in such form and amount, and with such surety or sureties as approved by City, should City determine that the surety or sureties provided by Contractor to be insufficient to cover the performance of Contractor's work. In such event, no further payment shall be due Contractor until such new or additional bonds shall be provided in the manner and form satisfactory to City. This Contract shall not take effect until such Bond has been executed and approved.

C. Contractor agrees to maintain the different types of insurance deemed appropriate by City as expressly set forth in the Contract Specifications with insurance companies acceptable to City at Contractor's sole cost and expense, and shall provide evidence of such insurance to City contemporaneous with the commencement of this Agreement.

Upon completion of all work to be performed under this Agreement, Contractor shall provide a written statement of all work performed. Any outstanding balance owed by City shall be paid to Contractor or Contractor's successors or assigns out of the funds designated by City for this

project, excepting therefrom any sum to be lawfully retained under the terms of this Agreement, and all such funds as may be due the City,

The Mayor or his designated representative shall have the right to suspend the work provided for herein due to any default by Contractor, and such suspension shall not affect the right of the City to any damages for such breach.

The Mayor or his designated representative reserves the right to discharge the Contractor for breach of any provision of this Contract, and such discharge shall not affect the right of the City against Sureties on the bond provided.

It is agreed an enumeration of drawings, specifications and addenda which form a part of this Contract, as set forth in Article 2 of the General Conditions, "Contract Documents", is as follows:

Project Manual dated
Legal Notice to Bidders
Instructions to Bidders
Bid Form
Bid Bond
City of Memphis Construction Contractor's Certificate of Nondiscrimination
City of Memphis Minority/Women Business Enterprise Program
City of Memphis Construction Contractor's Certificate of a Drug Free Workplace
Construction Contract
Escrow Agreement
Performance Bond
Partial Release of Liens for Subcontractors
Final Release of Liens for Subcontractors
Final Release of Liens for General Contractors
General Conditions of the Contract for Construction
Drawings as listed in Index of Drawings, Section 00850
Addenda Issued
City of Memphis Standard Construction Specifications

Witness the signatures of the parties hereto, by their duly authorized officers, on the day and year first written.

CONTRACTOR

_____	_____
Contractor's Company Name	Corporate Secretary - Signature
_____	_____
Signature	Printed or Typed Name
_____	
Printed or Typed Name and Title	

_____CITY OF MEMPHIS_____
Owner

APPROVED AS TO LEGAL FORM	APPROVED
_____	_____
City Attorney	Director of Public Works

_____
Mayor

ATTESTED:

_____
Deputy Comptroller

END OF SECTION 00510

Attachment 5

SUBSURFACE EXPLORATION REPORT
LAGOON 5 IMPROVEMENTS
T.E. MAXSON FACILITY
MEMPHIS, TENNESSEE

Prepared for:

BLACK & VEATCH CORPORATION
Chesterfield, Missouri

Prepared by:

GEOTECHNOLOGY, INC.
Memphis, Tennessee

Geotechnology, Inc. Project No. J022562.01

November 5, 2014

GEOTECHNOLOGY INC
FROM THE GROUND UP

November 5, 2014 J022562.01

Mr. Kevin M. Nelson
Engineering Manager - Water
Black & Veatch Corporation
16035 Swingley Ridge Road, Suite 230
Chesterfield, Missouri 63017

SUBSURFACE EXPLORATION REPORT
LAGOON 5 IMPROVEMENTS
T.E. MAXSON FACILITY
MEMPHIS, TENNESSEE

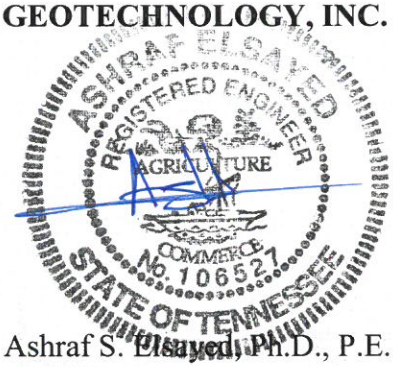
Dear Mr. Nelson:

Enclosed is the draft report of the subsurface exploration performed by Geotechnology, Inc. for the referenced project. The report includes our understanding of the project, observed site conditions, conclusions and/or recommendations, and support data as listed in the Table of Contents.

It has been our pleasure to provide these services to you, and we would welcome the opportunity to provide other services during the course of the project. Please contact us if you need further information or clarification about this document.

Very truly yours,

GEOTECHNOLOGY, INC.



Ashraf S. Elsayed, Ph.D., P.E.
Chief Engineer – Memphis Branch

ZRA/DBA/ASE/JAB:zra

Copies submitted: (3) Hard copies
(1) PDF copy

J022562.01

SUBSURFACE EXPLORATION REPORT
LAGOON 5 IMPROVEMENTS
T.E. MAXSON FACILITY
MEMPHIS, TENNESSEE

TABLE OF CONTENTS

ILLUSTRATIONS

APPENDICES

J022562.01

DRAFT SUBSURFACE EXPLORATION REPORT
LAGOON 5 IMPROVEMENTS
T.E. MAXSON FACILITY
MEMPHIS, TENNESSEE

SECTION I - PROJECT DATA

AUTHORIZATION

The services documented in this report were provided in accordance with the terms, conditions, and scope of services described in Geotechnology's Proposal No. P022562.01 dated November 12, 2013. A representative of Black & Veatch authorized our services.

PURPOSE AND SCOPE OF SERVICES

The City of Memphis requested consulting engineering services for proposed modifications to Lagoon 5 located at the T.E. Maxson Wastewater Treatment Facility. The purpose of our services was to assess the stability and seepage potential of the proposed embankment, and provide recommendations for stability and seepage improvements, if deemed necessary. Briefly, services consisted of site reconnaissance, drilling 12 borings, laboratory testing, engineering analyses, developing recommendations and preparing this report. Important information prepared by The Association of Engineering Firms Practicing in the Geosciences (ASFE) for studies of this type is presented in Appendix A for your review.

PROJECT AND SITE DESCRIPTION

The project site is located on the south side of Riverport Road and on the east side of Paul Lowry Road in the Pigeon Industrial Park of Memphis, Tennessee as shown on Plate 1 approximately 2.3 miles east of the Mississippi River. Sludge Lagoons 5 is located in the southeast portion of the facility. The area of the existing lagoon is approximately 1,400 feet by 1,200 feet, impounded by embankments that range from approximately 12 to 30 feet in height with inclinations of approximately 1V:3H. Based on the provided plans[1], the top of the existing embankments range from approximately El 218[2] to 225 and the toe elevations range from approximately El 206 to 210. The lagoon was filled with sludge and water at the time of our exploration. The sludge level in the existing lagoon is approximately El 215. Sludge disposal areas and surface drainage features (ditches) are located to the north, south and west of the sludge lagoon. Lake McKellar is located approximately one mile north of Lagoon 5. The Horn Lake cutoff is located approximately 150 feet to the east of the lagoon. The outboard slope of the embankment on the eastern side of the lagoon varies in height from approximately 15 to 20 feet and is covered with trees. The slopes of the embankments on the south, west, and north sides are currently grass-covered. Asphalt and gravel drives are present at the top of the embankments.

[1] T.E. Maxson WWTP Lagoon Improvements- Contract No. 3 Sheets SI-1 to SI-2. Dated June 1, 2001, by Black & Veach.

[2] Elevations provided herein are in feet with a vertical reference datum of Mean Sea Level (MSL)

Based on the provided plan, the proposed improvements include dividing Lagoon 5 into three sublagoons (Lagoon 5A, 5B and 5C), reconstructing the existing southern embankment approximately 150 feet to the south, reconstructing the eastern embankment approximately 130 feet west and excavating the bottom of the three lagoons to El 188. The proposed inboard and outboard slope inclinations are approximately 1V:3H according to the topographic maps provided by Black & Veatch. The height of the proposed embankments will be approximately 40 feet measured from the toe of the embankment inside the lagoon (El 188) to the top of the embankment (El 228.5 at Lagoon 5A, El 228 at Lagoon 5B, and El 227.5 at Lagoon 5C). The toe of the embankment on the outboard slope of the lagoon varies in elevation between approximately El 205 on the south side of Lagoon 5C to approximately El 215 on the north side of the Lagoon 5A. The lagoons will be lined with high-density polyethylene (HDPE) and covered with floating HDPE as indicated to us by a representative of Black & Veatch. Other improvements include the installation of a storm sewer pipeline that will extend from Paul Lowry Road to the southern perimeter of Lagoon 5C.

SECTION II - FIELD EXPLORATION AND LABORATORY TESTING

FIELD EXPLORATION

The field exploration consisted of drilling 12 borings, designated as Borings B-1 to B-12, at the approximate locations shown on Plate 2. The borings were located by personnel from Geotechnology using reference points at the site. An additional boring was planned at the toe of the eastern slope near the Horn Lake cutoff, but the boring was inaccessible to our drill rig due to trees. In addition, the area of the proposed interior embankments to the north and south of Lagoon 5B was not accessible to our drill rig and was not part of this field exploration; this area should be explored prior to start of construction.

The borings were drilled to approximate depths ranging from 40 to 80 feet with track-mounted Diedrich D-50 and CME 550 rotary drill rigs using hollow-stem auger and rotary wash drilling methods. Standard Penetration Tests (SPT's) were performed using an automatic hammer. The collected samples were described by the drill crew, transported to our laboratory for further testing, and examined by an engineer from Geotechnology. The boring logs are presented in Appendix B. An explanation of the terms and symbols used on the boring logs is also provided in Appendix B.

The boring logs represent conditions observed at the time of exploration and have been edited to incorporate results of the laboratory test data, as appropriate. Unless noted on the boring logs, the lines designating the changes between various strata represent approximate boundaries. The transition between materials could be gradual or could occur between recovered samples. The stratification given on the boring logs, or described herein, is for use by Geotechnology in its analyses and should not be used as the basis of design or construction cost estimates without realizing that there can be variation from that shown or described.

The boring logs and related information depict subsurface conditions only at the specific locations and times where sampling was conducted. The passage of time could result in changes in conditions, interpreted to exist, at or between the locations where sampling was conducted.

LABORATORY TESTING

Soil samples collected from the borings were visually examined in the laboratory and subsequently classified in general accordance with the Unified Soil Classification System (ASTM D 2487 and D 2488).

Laboratory tests were performed on select soil samples to evaluate pertinent engineering and index properties. The testing included: moisture content determinations, grain size analyses, Atterberg limits, direct shear, unconsolidated-undrained triaxial compression (UU), and hydraulic conductivity. The laboratory test results are presented on the boring logs or in Appendix C. The laboratory test and corresponding test method standard used are presented in the following table.

SUMMARY OF LABORATORY TESTS AND METHODS	
Laboratory Test	**ASTM Test Method**
Moisture Content	D 2216
Atterberg Limits	D 4318
Grain Size Distribution	D 422
Unconsolidated-Undrained Triaxial Compression (UU)	D 2850
Direct Shear Test of Soils Under Consolidated-Drained Conditions	D 3080
Standard Test Methods for Measurement of Hydraulic Conductivity	D 5084

SECTION III - SUBSURFACE CONDITIONS

REVIEW OF AVAILABLE SUBSURFACE INFORMATION

Geotechnology reviewed two geotechnical reports[3,4] previously performed at the site. The reports include boring logs that were drilled in the vicinity of Lagoon 5. The logs are attached in Appendices E and F. The boring logs from the previous exploration were in general agreement with the conditions encountered in this exploration. The information was utilized during this study.

[3] Evaluation of the T.E. Maxson Wastewater Treatment Facility Sewage Sludge Surface Disposal Units. Dated February 15, 1994. By Hall, Blake and Associates, Inc. for the City of Memphis.

[4] Subsurface Exploration Report: Embankment Stability Evaluation for T.E. Maxson Facility. Dated June 14, 2013. By Geotechnology, Inc. for Fisher & Arnold.

STRATIGRAPHY

The embankments consist of both fine- and coarse-grained material. The fine-grained material consists of clay and sandy clay (CL), fat clay (CH), and silt and sandy silt (ML). The moisture contents of the tested fine-grained samples typically ranged from approximately 12 to 86 percent. The liquid limit (LL) and plasticity index (PI) values of these tested samples ranged from 23 to 100 percent and from 4 to 69 percent, respectively. The SPT N-values ranged from 2 to 11 blows per foot (bpf). Laboratory compression tests (UU) that were performed on relatively undisturbed samples resulted in undrained shear strengths ranging from 460 to 1,340 pounds per square foot (psf). The results of field and laboratory tests indicate soft to stiff consistencies for the fine-grained soil.

The coarse-grained soils consist of silty sand (SM), clayey sand (SC), poorly graded sand (SP), and sand with silt (SP-SM). The SPT N-values corresponding to the coarse-grained soils ranged from 4 to 33 bpf, indicating very loose to dense conditions. The moisture contents of these tested coarse-grained samples typically ranged from approximately 4 to 39 percent.

In general, the soil stratigraphy at the site consisted of strata of predominantly fat clay and or lean clay underlain by coarse-grained soil. Information regarding the approximate elevations and thickness of the fine and coarse grained soils is presented in the following table. The indicated strata are underlain by predominantly sand, silty sand, or sandy silt to the termination depth of the borings if not indicated in the table. Soft clay was observed in borings B-3 and B-6 at approximately El 192 and El 185.

Stratigraphy Summary						
Boring	Upper Fine-grained Soil		Intermediate Fine-grained Soil		Coarse-grained Soil	
	Top Elevation	Bottom Elevation	Top Elevation	Bottom Elevation	Top Elevation	Bottom Elevation
B-1	212	198	NE[5]	NE	198	TD[6]
B-2	215	196	185	183	196	185
B-3	212	179	NE	NE	179	TD
B-4	209	194	NE	NE	194	TD
B-5	211	192	172	TD	192	172
B-6	215	199	185	177	199	185
B-7	220	202	197	192	202	192
B-8	218	199	175	170	199	175
B-9	216	197	182	178	197	182
B-10	225	206	181	176	206	181
B-11	225	196	NE	NE	196	TD
B-12	228	197	184	182	197	184

GROUNDWATER

Groundwater was encountered in Borings B-5 and B-8 at approximate depths of 18 and 23.5 feet, respectively, which corresponds to approximate water levels of El 193 to El 194.5, respectively. The Mississippi River water level during the exploration was approximately at an average EL 198. Groundwater levels are anticipated to vary significantly over time due to precipitation, water levels in the lagoons, the Mississippi River stage, or other factors not evident at the time of exploration.

SECTION IV – EVALUATION & CONCLUSIONS

SEISMIC INFORMATION

The plant lies within the influence of the New Madrid Seismic Zone (NMSZ). For seismic analysis purposes, the Site Class was estimated to be Category D, “stiff soil” profile based on the soil undrained strength and blow count (N-value). However, per the IBC 2012, if the soil is susceptible to liquefaction, the site specific class shall be F. Hence, a site specific ground response analysis is required. A peak ground acceleration (PGA) of 0.50g was estimated using information provided in IBC 2012 and ASCE 7-10.

[5] Not encountered
[6] Layer extends to the termination depth of the boring.

LIQUEFACTION ANALYSIS

A study was performed to determine the liquefaction potential. Both field and laboratory data were used to perform the analysis. The field measurements include the depth of the water table and SPT N-values. The laboratory data include USCS soil classification, soil unit weight, and percent fines of soil samples obtained from various strata. An earthquake magnitude (M_w) of 7.7 (probability of exceedance of 2% in 50 year, or 2,500-year return interval) was considered. A corresponding peak ground acceleration of 0.50g was determined using information provided in IBC 2012 and ASCE 7-10. For this analysis, groundwater was assumed to be at the ground surface level.

Subsurface conditions (as characterized by the field and laboratory data) and earthquake characteristics were used to determine the safety factors against liquefaction in each soil layer, as well as the associated dynamic settlement during the design seismic event. Based on the analysis, there is liquefaction potential at the site. The results of the analyses are presented in the following table. The estimated dynamic settlements were calculated using the LiquefyPro software developed by CivilTech Software. The zones with a liquefaction factor of safety less than 1.0 were inferred from the results of LiquefyPro and the SPT liquefaction triggering evaluation after Idriss and Boulanger (2008).

Results of Liquefaction Analysis

Boring	Zones with Liquefaction Factor of Safety Less Than 1.0	Estimated Dynamic Settlement (in)
B-1	20 to 60 feet	7
B-2	19 to 70 feet	6
B-3	33 to 65 feet	12
B-4	16 to 60 feet	8
B-5	18 to 40 feet	3
B-6	38 to 60 feet	8
B-7	18 to 23 feet and 28 to 80 feet	15
B-8	20 to 60 feet	7
B-9	29 to 34 and 38 to 50 feet	4
B-10	19 to 44 and 49 to 60 feet	9
B-11	35 to 60 feet	6
B-12	32 to 80 feet	9

Based on the analyses, the site is susceptible to liquefaction. In addition to the settlement and reduced shear strength associated with liquefaction, there is also risk for lateral spreading in the areas around the embankments.

Please note that the current state of practice for liquefaction hazard assessment is based on what is known as “the Simplified Method” as introduced by Seed (1971) and subsequent modifications/revisions by many researchers (Seed 1982, Idriss 1999, Youd 2001, and Idriss and

Boulanger 2008, among others). The simplified method was based on observations and assessments of soil zones that either liquefied or did not liquefy in the upper 50 feet. There are reported uncertainties in the values of one of the inputs to the method (the stress reduction factor, or r_d) at depths greater than 50 feet. In addition, Geotechnology is not aware of documentation of zones deeper than 50 feet that have liquefied.

Remediation of Potentially Liquefiable Deposits. Soil improvement at the site may include vibro-compaction, vibro-replacement, compaction grouting or deep dynamic compaction. Soil improvement should extend beyond the embankment footprint laterally one-half the depth of the soil improvement and below the potentially liquefiable soils. Potentially liquefiable soils were observed up to the termination depth of the majority of the borings. Geotechnology is not aware of documentation of zones deeper than 50 feet that have liquefied. It is our professional opinion that soil improvement should extend to a depth of approximately 50 feet below the ground level to approximately El 138. We estimate that sands with a plasticity Index (PI) of less than 7 would need to be densified to a $(N_1)_{60}$[7] value of 30 blows per foot (bpf) to provide a minimum factor of safety of 1 or larger against liquefaction. Once soil improvement is implemented, additional soil borings or cone penetration test (CPT) soundings should be performed to confirm that the required relative density of the sands has been achieved prior to commencement of construction.

Vibro-compaction or vibro-replacement (stone columns) may be used to densify sand in potentially liquefiable areas. These construction methods involve lowering a crane-supported vibrating probe into the soil. The vibration energy, at times assisted by water jets, pushes the soil away from the probe, resulting in a denser soil mass. The void created by the probe is filled by the surrounding sand (vibro-compaction) or replaced by crushed stone (vibro-replacement or stone columns) as the probe is removed. The vibro-replacement technique has an additional advantage since the stone columns act as drainage paths, thus accelerating dissipation of excess pore water pressure induced by an earthquake.

Compaction grouting consists of pumping cementitious or silica grout under pressure into the ground. The grout is pumped in stages to create grout bulbs which densify the cohesionless soils by displacement. Jet grouting is a method which involves hydraulically eroding the surrounding soils with water jets and mixing the soil with cementitious grout slurry to cement the soil particles together. The resulting mixture is referred to as “soilcrete.”

[7] $(N_1)_{60}$ = SPT field N-value corrected to Energy Ratio of 60% and an effective overburden stress of 1 atm.

SETTLEMENT ANALYSIS

Settlement analyses were performed using the soil profile encountered in the borings to estimate the settlement which will occur in the underlying material soil under the weight of the proposed embankments. The characteristics of the subsurface soils were interpreted using the results of the field and laboratory tests.

The lagoon bottom was assumed to be impermeable due to the presence of the membrane. The construction of the inner embankments separating Lagoons 5A, 5B, and 5C was assumed to take a duration of three months with the embankment height increasing by one third the final height of approximately 40 feet within each month. The embankments at the outboard sides of the lagoons, to be added on top of the existing embankments, were assumed to be completed within one month. A dewatering system was assumed to be maintaining the water table at a level of 36 inches below the base of the lagoons during construction and to be turned off at the end of the construction. The lagoons were assumed to be filled to the operation level within one month from the end of construction.

The estimated settlement by the end of construction of the proposed embankments separating Lagoons 5A, 5B, and 5C was estimated to range from approximately 15 to 20 inches. The estimated remaining settlement at these embankment is approximately 3 to 4 inches with approximately 70% of this remaining settlement expected to occur within the first three months of lagoon operation. The estimated settlement at the centers of the lagoons by the end of the embankment construction period is less than 2 inches. The estimated remaining settlement at the centers of the lagoons, after filling the lagoons, ranges approximately between 8 and 10 inches with approximately 90% of the remaining settlement is expected to occur within the first month of lagoon operation. Consequently, an estimated differential settlement of approximately 7 to 8 inches is anticipated between the embankment toe and the centers of the lagoons within the first month of lagoon operation based on the assumptions stated in the preceding paragraph. Please note that the estimated settlements were based on the condition that no ground improvement will be implemented prior to embankment construction. The total estimated settlements until the indicated stages are presented in the following table in inches.

Results of Settlement Analysis (inches)					
	End of Embankment Construction	**After the Lagoons are Filled**	**One Month after Filling Lagoons**	**Two Months after Filling Lagoons**	**Total**
Under the Embankment	15 to 20	15 to 20	16 to 20	18 to 20	19 to 20
Center of the Lagoons	1 to 2	8 to 10	8 to 10	8 to 10	9 to 10

The estimated 15 to 20 inches settlement at the end of embankment construction can be countered by placing equivalent additional fill at the top of the embankment. The estimated

additional 3 to 4 inches of the settlement under the embankment is expected to occur within two months from filling the lagoons can be accommodated for by placing an additional equivalent thickness of fill originally, or by placing 3 or 4 inches of additional fill approximately two months from filling the lagoons. The embankments should be designed to accommodate for the placement of the additional fill keeping the width of the top of the slope as desired.

Geotechnology did not have enough soil data to estimate settlement below the embankments that will separate lagoons 5A, 5B and 5C. These embankments will be located in areas that were not accessible at the time of our field exploration. Additional soil exploration, including soil borings and laboratory testing, must be completed for the stability and settlement of these proposed embankments to be accessed.

SEEPAGE ANALYSIS

Geotechnology performed numerical modeling of seepage through and under the lagoon using the SEEP/W module in GeoStudio 2012 finite element program developed by GEO-SLOPE International Ltd. Using SEEP/W, hydraulic conductivity values are assigned to each soil type in the lagoon and underlying soil stratigraphy. The seepage analysis results were used to evaluate the stability of the proposed outboard slopes of the proposed lagoons. We did not include the presence of a liner in the model. The seepage analysis results were not used for the global stability analysis of the inboard slopes because the presence of the membrane/liner will reduce/eliminate the development of seepage forces during the normal operation of the lagoons. In the scenario of a membrane failure, the developed seepage forces will not reduce the stability of the inboard slopes. However, in the scenario of a membrane failure, the seepage forces will reduce the stability of the outboard slopes. The global stability analyses were performed using the SLOPE/W module of GeoStudio 2012. We analyzed each section for steady state seepage conditions by importing seepage forces from the corresponding SEEP/W model for steady state flow. The seepage analysis model was based on the existing soil properties at the lagoon and underlying stratigraphy as observed in our soil exploration. Spencer's procedure was used to compute factors of safety. The seepage forces influence the stability of the outboard slopes of the lagoon. Global stability analysis results for the outboard slopes, taking into account the seepage forces, are summarized in the slope stability section of this report.

Hydraulic Conductivity. Hydraulic conductivity values for each soil type were selected based on grain size distributions, laboratory hydraulic conductivity test results, and published correlations with soil index properties. Saturated hydraulic conductivity values applied in the SEEP/W models are summarized in the following table.

HYDRAULIC CONDUCTIVITY VALUES USED IN SEEPAGE MODELS	
Material Description	**Hydraulic Conductivity (cm/sec)**
Lean Clay Fill	$1.5x10^{-6}$
Fat Clay (CH)	$2x10^{-7}$
Lean Clay (CL)	$3x10^{-7}$
Silt (ML)	$1.5x10^{-4}$
Sandy Silt (ML)	$1.5x10^{-3}$
Silty Sand (SM)	$6x10^{-3}$
Fine Sand, trace silt (SP-SM)	$1.8x10^{-2}$
Fine Sand (SP)	$3x10^{-2}$
Medium Sand (SP)	$9x10^{-2}$

The seepage forces are significant for the analysis of the external slopes of the lagoon which were modeled at 1V:3H. Seepage was analyzed for a steady state flow condition using maximum pool elevations for the three sections of the lagoon. Water levels at the toe of the lagoon were modeled to correlate with piezometric data from the site. Model results include seepage direction, flow, and potentiometric head contours through the lagoon embankment and the underlying soil profile. The estimated water seepage quantities from the analysis are summarized in the following table.

SEEPAGE ANALYSIS RESULTS FOR THE PROPOSED LAGOON		
Analysis Section Location	**Applicable Borings**	**Seepage (gallons per day per lineal foot of embankment)**
North Side	B-10, M-26	400
Northwest Corner	B-9, M-25	190
West Side	B-6, B-7, B-8, TH-15	2,000
Southwest Corner	B-4, B-5, M-1, M-2	5,100
South Side	B-3, TH-14	3,300
Southeast Corner	B-1, B-2	2,900
East Side	B-12, TH-13	1,100

As shown in the previous table, the seepage calculated by the flow models is significant, which should be expected since the soil comprising the bottom of the lagoon will be silty sand and sandy silt soils of relatively high hydraulic conductivity. A compacted clay or synthetic liner should be used to reduce seepage. The lagoons will be lined with high-density polyethylene (HDPE) and covered with floating HDPE as indicated to us by a representative of Black & Veatch.

SLOPE STABILITY

Geotechnology performed stability analyses of six different cross sections to generate the soil profile of the embankments. Information about the cross sections used to generate the soil profiles is presented in the following table. The outboard slope of the lagoon embankment was assumed to be 1V:3H as indicated to us by a representative of Black & Veatch. The inboard slope of the lagoon embankment was flattened from a slope of 1V:2.75H until a stable slope was achieved in the short term and long term scenarios; this was achieved with an inboard slope of the embankment of 1V:3H. The height of the slope inside the lagoon is approximately 40 feet. Please note that the slope stability analyses were based on the condition that no ground improvement will be implemented prior to embankment construction.

EMBANKMENT CROSS SECTIONS

Cross Section	Borings	Location	Lagoon
1	B-1, B-2	Southeast Corner	Lagoon 5C
2	B-3, TH-14	South Side	Lagoon 5C
3	B-4, B-5, M-1, M-2	Southwest Corner	Lagoon 5C
4	B-6, B-7, B-8, TH-15	West Side	Lagoon 5A/B/C
5	B-9,B-10, M-25, M-26	North Side	Lagoon 5A
6	B-11, B-12, TH-13	East Side	Lagoon 5A/B/C

Soil properties used in the analysis were selected based on field and laboratory testing, published correlations with soil index properties, and Geotechnology's experience with similar materials. The properties used in the analyses models are summarized in the following table.

SOIL PROPERTIES USED IN THE GLOBAL STABILITY MODELS					
Soil Description	Unit Weight (pcf)	Drained Shear Strength		Undrained Shear Strength	
		Cohesion (psf)	Friction Angle (deg.)	Cohesion (psf)	Friction Angle (deg.)
Silty Sand/Sandy Silt (MH/ML/SM)	120	0	28	0	28
Fat Clay (CH)	116	50	20	700-1,000	0
Soft Fat Clay (CH)	120	50	20	500	0
Borrow Material	120	50	26	1,000	0
Loose Silty Sand	120	0	32	0	32
Loose Clayey Sand	120	0	32	0	32
Medium Dense Sand	120	0	34	0	34
Sand with Gravel	120	0	34	0	34
Potentially Liquifiable Soil[8]	120	N/A	N/A	0	10

The slope stability analyses were performed using the SLOPE/W software developed by GEO-SLOPE International Ltd. Spencer's procedure was used to compute factors of safety. Four stability conditions were used to analyze each cross section: long-term, short-term, seismic, and post-earthquake. For the long-term, seismic, and post-earthquake conditions, the water level was assumed to be near El 222.5, which corresponds approximately to the water level to be maintained during the operation of the lagoons (El 222.5 at Lagoon 5A, El 222 at Lagoon 5B, and El 221.5 at Lagoon 5C) as communicated to us by a representative of Black & Veatch. For the short-term condition, the water level was assumed to be maintained at the bottom of the lagoon during the construction process. In addition, for the short-term condition, A 250 psf surcharge load was considered on the top of the berm to account for the surcharge load due to the construction traffic. A horizontal seismic coefficient (k_h) of 0.25g was utilized for the seismic stability analyses. The stability conditions are summarized in the following table.

STABILITY CONDITIONS		
Stability Condition	Loading	Shear Strength
Long Term	Static	Drained
Short Term	Static	Undrained
Seismic	Earthquake/ Transient	Reduced Undrained
Post-Seismic	Static	Undrained/ Residual Liquefied

[8] Residual shear strength of liquefied soils obtained using empirical correlations by Idriss and Boulanger, 2007.

For the analysis of the inboard slopes, the stability analyses were performed assuming the presence of an impermeable liner. The presence of the impermeable liner prevents the development of seepage forces on the inboard slopes. If the liner is broken during the operation of the lagoons, the seepage forces will not reduce the stability of the inboard slopes. However, the stability of the outboard slopes will be reduced. Hence, the seepage forces were considered in the analysis of the stability of the outboard 1V:3H slopes

Rapid drawdown analysis was not performed based on the condition that the lagoon will be lined. In addition, the water level will be maintained during operation between El 221.5 and 225.5. If the liner is compromised, and the lagoon will be emptied or the water level will be lowered below the indicated operation levels, an evaluation of the rate at which the lagoon should be emptied should be performed to prevent the development of a rapid drawdown condition and/or slope failure during the dewatering process. Stability analysis results are summarized in the following table; the SLOPE/W output plots are presented in Appendix D.

SUMMARY OF SLOPE STABILITY ANALYSIS

Cross Section No.	Condition				
	Long-Term	Short-Term	Seismic	Post-Seismic	Long-term Steady State Seepage[9]
Target Minimum FOS[10]	1.50	1.30	1.10	1.10	1.2
1	1.57	2.14	**0.89**	**0.73**	1.9
2	**1.48**	1.32	**0.61**	1.17	1.4
3	1.56	2.09	**0.81**	**0.71**	1.7
4	1.55	1.96	**0.85**	**0.88**	2.0
5	1.52	1.66	**0.80**	**0.95**	1.9
6	1.52	1.92	**0.83**	**0.71**	1.6

Assessment and Recommendations. Insufficient factors of safety (FOS) were calculated for the seismic condition for every cross section. For the post-earthquake condition, insufficient FOS were calculated at all the modeled cross sections except at Cross Section No. 2.

The FOS can be increased by performing ground improvement. The same ground improvement techniques discussed previously in the "Remediation of Potentially Liquefiable Deposits" could be applied and should be evaluated by a specialty consultant. A friction angle of 46 degrees in cohesionless soils, and an undrained shear strength of 1,500 psf in the cohesive soil

[9] Analyses performed only for the outboard embankment slopes for steady state seepage out of the lagoons.
[10] Table 6-1b, Minimum Factors of Safety – Levee Slope Stability, EM 1110-2-1913, April 30, 2000.

would result in a sufficient FOS for the seismic condition with a horizontal seismic coefficient (k_h) of 0.25g corresponding for a PGA of 0.5g.

A site-specific ground response analysis may justify the use of a lower horizontal seismic coefficient (k_h), but no less than 80% of the value based on the IBC 2012. A PGA equal to 0.4g is 80% of that determined per IBC 2012. A friction angle of 46 degrees in the cohesionless soils, and an undrained shear strength of 1,100 psf in the cohesive soil would result in a sufficient FOS for the seismic condition with a horizontal seismic coefficient (k_h) of 0.2g corresponding for a PGA of 0.4g. This last option is pending justification with a site-specific ground response analyses.

STRUCTURES FOUNDATIONS

Shallow Foundations

Based on the provided plans, multiple structures will be installed on the embankments. The foundations of these structures will be supported on the compacted fill. Spread footings can be proportioned for a maximum net allowable bearing pressure of 1,600 psf. For strip footings, a maximum net allowable bearing pressure of 1,200 psf can be used. The minimum lateral dimensions for strip and spread footings should be 18 and 24 inches, respectively. We recommend that the footings bear a minimum of 18 inches below grade.

GENERAL EARTHWORK RECOMMENDATIONS

The following procedures are recommended for site preparation in the lagoons and embankment fill areas.

Cut Areas. In areas where cut will be required to bring the site to grade, the top 6 inches of the resulting subgrade should be compacted to a minimum of 95% of the maximum dry unit weight as determined by the standard Proctor test (ASTM D 698).

Preparation of Fill Areas. In areas where filling will be required to bring the site to grade, the following procedures are recommended.

(a) Remove all organic matter, foreign material and debris.

(b) Compact the top 6 inches of cleared subgrade to a minimum of 95% of the maximum dry unit weight as determined by the standard Proctor compaction test (ASTM D 698).

Suitable Lagoon Soil Liner Materials. Fill material for use in the lagoons should consist of natural cohesive soils that have a plasticity index greater than 15 percent, and a fine-grained content greater than 90 percent. Such materials should be free from organic matter, debris or other deleterious materials.

Suitable Embankment Material. Fill materials should be approved by the engineer or his representative in advance of construction. Fill material should consist of natural fine-grained soils that have a maximum liquid limit of 45 and a plasticity index of not more than 20. Such materials should be free from organic matter and debris. Relevant soil materials were observed in few of the borings, for instance Borings B-6, B-11, and B-12. However, the volume of soil materials may not be sufficient for the construction of the embankments of the lagoons and offsite soil materials may be needed.

Fill and Backfill Placement. Fill or backfill should be placed in lifts of uniform thickness and compacted. The compacted lift thickness, however, should generally not exceed 6 inches. Each lift should be compacted to a minimum of 95% of the maximum dry density as determined by the standard Proctor test. Moisture content should be controlled to within 0% / +3% of optimum in the lagoon area to achieve a lower hydraulic conductivity. At the locations where hydraulic conductivity is not a concern, moisture content can be controlled to within ±2% of optimum.

Dewatering. As discussed earlier, water level during drilling at Borings B-5 and B-8 was observed at approximate water levels of El 193 to El 194.5, respectively. The site is located in the flood plain of Mississippi River, and the groundwater level at the site can fluctuate with river stages. Accordingly, the level of groundwater at the time of construction could be above the final grade of the lagoon bottom at El 188. Depending on the level of groundwater at the time of construction, it may be necessary to dewater the excavation to facilitate construction under relatively dry conditions and to prevent subgrade disturbance. Multistage wellpoints and deep wells are effective dewatering systems. The groundwater should be lowered to at least 3 feet, preferably 5 feet, below the bottom of any anticipated excavation. The effect of buoyancy on the structures and the membrane should be evaluated before terminating the dewatering system. It is our professional opinion that groundwater monitoring system should be installed during construction and the groundwater level should be monitored and recorded and used in the evaluation of the buoyancy on the structures and membrane. Dewatering systems are typically provided by specialty firms using a design/build arrangement.

Control of surface runoff. Control of surface runoff should be maintained in compliance with the rules and regulations set forth in the Federal Water Pollution Control Act (1977). Additionally, any and all permits related to site grading activities and control of storm water during construction activities should be obtained from the appropriate governmental jurisdiction(s).

SECTION V - RECOMMENDED ADDITIONAL SERVICES

The conclusions and recommendations given in this report are based on interpretation of exploration data and Geotechnology's experience. The client must recognize that variations could occur from conditions observed in the borings. Actual subsurface conditions could vary from those encountered in the borings.

Geotechnology did not perform slope stability analyses for the proposed embankments that will separate Lagoons 5A, 5B and 5C. These embankments will be located in areas that were not accessible at the time of our field exploration. Additional soil exploration including soil borings and laboratory testing must be completed for the stability and settlement of these proposed embankments to be accessed.

Geotechnology has provided two options for the soil site improvements. One of the options is pending the performance of a site specific ground response analysis. If this option is to be considered, a site specific ground response analysis will be required. In addition, if the soil improvements required to mitigate the soil susceptible to liquefaction is not to be performed, a site-specific ground response analysis will be required for the assessment of the site classification.

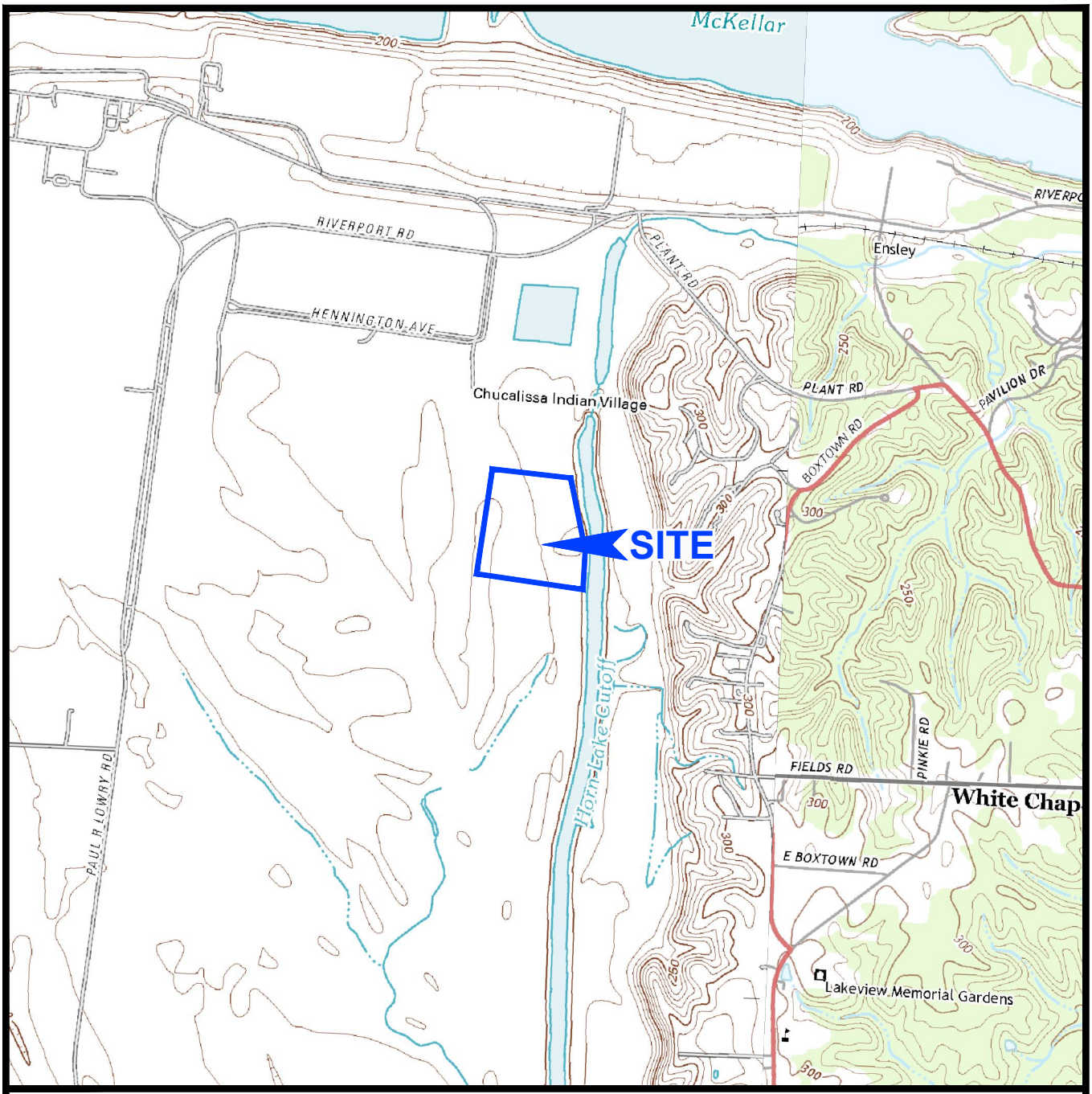
SECTION VI - LIMITATIONS OF REPORT

This report has been prepared on behalf of and for the exclusive use of the client for specific application to the named project as described herein. If this report is provided to prospective contractors, the client should make it clear that the information is provided for information only and not as a warranty of subsurface conditions described in this report.

Geotechnology has attempted to conduct the services reported herein in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality and under similar conditions. The recommendations and conclusions contained in this report are professional opinions. No other representation, expressed or implied, is included or intended.

Unless specifically stated in our proposal or this report, the scope of our services for this phase of the project did not include any environmental assessment or investigation for the presence or absence of wetlands or hazardous or toxic material in the soil, surface water, groundwater or air, on or below or around this site. Any statements in this report or on the boring logs regarding odors noted or unusual or suspicious items or conditions observed are strictly for the information of our client. Our scope did not include any services to investigate or detect the presence of mold or any other biological contaminants (such as spores, fungus, bacteria, viruses, and the by-products of such organisms) on and around the site, or any services designed or intended to prevent or lower the risk of the occurrence of an infestation of mold or other biological contaminants.

The analyses, conclusions, and recommendations contained in this report are based on the data obtained from the subsurface exploration. The field exploration methods used indicate subsurface conditions only at the specific locations where samples were obtained, only at the time they were obtained, and only to the depths penetrated. Discrete sampling cannot be relied on to accurately reflect natural variations in stratigraphy that could exist between sample locations and/or intervals.



NOTES

1. Plan adapted from 7.5 minute U.S.G.S. maps for Fletcher Lake, Arkansas-Tennessee and Southwest Memphis, Tennessee-Arkansas quadrangles last revised in 2013

0 2,000 4,000

SCALE IN FEET

N

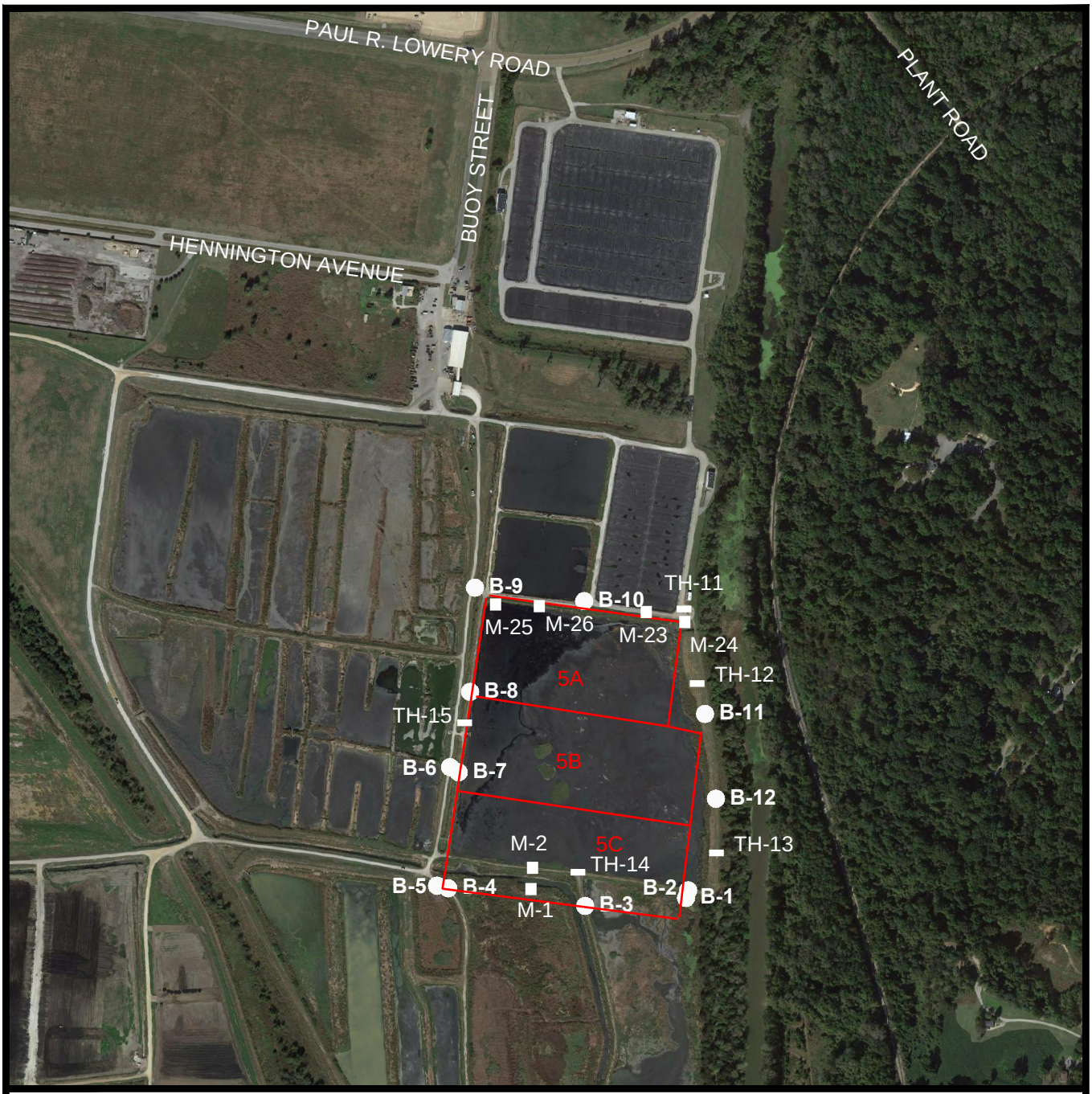
Drawn By: WAH	Ck'd By:	App'vd By:
Date: 6-18-14	Date:	Date:

GEOTECHNOLOGY INC
FROM THE GROUND UP

Maxson WWTP
Lagoon 5 Improvements
Memphis, Tennessee

SITE LOCATION AND TOPOGRAPHY

Project Number	PLATE 1
J022562.01	



NOTES

1. Plan adapted from an October 24, 2013 aerial photograph courtesy of Google Earth.

2. Borings were located in the field with reference to existing site features and are shown approximate only.

LEGEND

- Boring Location
- Approximate Proposed Top of Embankement
- Approximate Boring Location from Previous Geotechnology Report
- Approximate Boring Location from Previous Hall, Blake and Associates Report

0 400 800 1,600

SCALE IN FEET

N

Drawn By: WAH	Ck'd By:	App'vd By:
Date: 6-18-14	Date:	Date:

GEOTECHNOLOGY INC
FROM THE GROUND UP

Maxson WWTP
Lagoon 5 Improvements
Memphis, Tennessee

AERIAL PHOTOGRAPH OF SITE AND BORING LOCATIONS

Project Number	PLATE 2
J022562.01	

APPENDIX A

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL ENGINEERING REPORT

Important Information about Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely on Your ASFE-Member Geotechnical Engineer for Additional Assistance

Membership in ASFE/The Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.

ASFE THE GEOPROFESSIONAL BUSINESS ASSOCIATION

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@asfe.org www.asfe.org

IIGER01115.0MRP

APPENDIX B

LOGS OF BORINGS B-1 THROUGH B-12

Surface Elevation: 212 | Completion Date: 6/13/14

Datum MSL

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
0	Soft to stiff, brown and gray CLAY - (CL) trace organics		1-1-2	SS1
5			4-5-6	SS2
			3-2-4	SS3
10			2-2-2	SS4
15	Very Loose, brown, silty, CLAYEY SAND - (SC-SM)		3-2-2	SS5
20	Medium dense, brown and tan, silty SAND - SM		7-7-11	SS6
25	Loose to medium dense, gray SAND with clay - (SP-SC)		8-5-8	SS7
30			5-3-2	SS8
35	Medium dense to dense, gray SAND with silt - (SP-SM)		6-6-12	SS9
40			7-12-16	SS10
45			7-11-14	SS11
50			11-15-17	SS12
55	Medium dense, gray SAND - (SP) trace gravel		8-9-12	SS13
60	Boring terminated at 60 feet.		9-9-12	SS14
65				
70				
75				
80				

SHEAR STRENGTH, tsf

△ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002.WL J022562.01_MAXSON WWTP LAGOON 5.GPJ GTINC 0638301.GDT 6/16/14

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

3 1/8" AUGER 3 3/4" HOLLOW STEM

WASHBORING FROM 15 FEET

JDD DRILLER CDS LOGGER

D-50 DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: LTD/DBA	Checked by:	App'vd. by:
Date: 6/16/14	Date:	Date:

GEOTECHNOLOGY INC
FROM THE GROUND UP

Maxson WWTP Lagoon 5
Black & Veatch

LOG OF BORING: B - 1

Project No. J022562.01

Surface Elevation: 215 | Completion Date: 6/16/14

Datum MSL

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
0	FILL: Gravel to 6 inches.		3-4-6	SS1
	Medium stiff to stiff, brown to gray, silty, fat CLAY - (CH)		2-4-5	SS2
5			3-4-5	SS3
			3-4-6	SS4
10				
			2-3-2	SS5
15	Medium stiff, brown CLAY - (CL)		92	ST6
	Medium dense, brown and gray, silty SAND - SM		2-1-4	SS7
20				
			10-12-13	SS8
25				
			8-10-9	SS9
30				
	Stiff, gray, fat CLAY - CH			
	Medium dense, gray, silty SAND - (SM)		4-9-9	SS10
35				
	with organics		3-3-7	SS11
40				
			11-14-14	SS12
45				
			10-11-16	SS13
50				
			12-16-16	SS14
55				
			7-14-14	SS15
60				
	trace gravel		9-11-13	SS16
65				
	Medium dense, gray and tan SAND - (SP)		14-12-16	SS17
70	Boring terminated at 70 feet.			
75				
80				

SHEAR STRENGTH, tsf

△ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002.WL J022562.01_MAXSON WWTP LAGOON 5.GPJ GTINC 0638301.GDT 6/17/14

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

3 1/8" AUGER 3 3/4" HOLLOW STEM

WASHBORING FROM ___ FEET

JDD DRILLER CDS LOGGER

D-50 DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: CDS	Checked by:	App'vd. by:
Date: 6/17/14	Date:	Date:

GEOTECHNOLOGY INC
FROM THE GROUND UP

Maxson WWTP Lagoon 5
Black & Veatch

LOG OF BORING: B - 2

Project No. J022562.01

Surface Elevation: 212 | Completion Date: 6/12/14

Datum MSL

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	FILL: Brown, clay with sand and gravel - CL		3-3-4	SS1
	Soft to medium stiff, gray, fat CLAY - (CH)		2-3-4	SS2
				ST3
			2-3-4	SS4
				ST5
			2-4-4	SS6
	trace organics		1-1-1	SS7
	with sand		2-3-5	SS8
	with sand		7-2-5	SS9
	Medium dense, gray SAND - (SP)		7-8-10	SS10
			9-11-11	SS11
	Very Loose, gray, clayey SAND - (SC)		5-2-2	SS12
			2-1-3	SS13
			4-2-2	SS14
	Medium dense, gray, silty SAND - SM		12-13-11	SS15
			8-7-9	SS16
			10-11-18	SS17
	with gravel			
	Medium dense to dense, gray SAND trace gravel - SP		7-6-6	SS18
			11-13-19	SS19
	Boring terminated at 80 feet.			

SHEAR STRENGTH, tsf

△ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

74 >>

72 >>

82 >>

67 >>

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002.WL J022562.01_MAXSON WWTP LAGOON 5.GPJ GTINC 0638301.GDT 6/18/14

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

3 1/8" AUGER 3 3/4" HOLLOW STEM

WASHBORING FROM 15 FEET

JDD DRILLER CDS LOGGER

D-50 DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: LTD	Checked by:	App'vd. by:
Date: 6/12/14	Date:	Date:

GEOTECHNOLOGY INC
FROM THE GROUND UP

Maxson WWTP Lagoon 5
Black & Veatch

LOG OF BORING: B - 3

Project No. J022562.01

Surface Elevation: 209 | Completion Date: 6/13/14

Datum MSL

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
0	Soft to stiff, gray, fat CLAY - (CH)		4-4-5	SS1
5			3-4-5	SS2
			1-2-4	SS3
10			2-2-4	SS4
15			1-2-2	SS5
	Loose to medium dense, gray SAND with silt - (SP-SM)		90	ST
20			3-4-5	SS6
25			4-7-8	SS7
30			5-5-8	SS8
35			5-5-5	SS9
40			7-11-13	SS10
45	Loose to dense, gray and tan SAND - (SP)		10-12-17	SS11
50			6-6-6	SS12
55			5-5-5	SS13
60			9-14-22	SS14
	Boring terminated at 60 feet.			
65				
70				
75				
80				

SHEAR STRENGTH, tsf

△ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

80 >>

65 >>

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002.WL J022562.01_MAXSON WWTP LAGOON 5.GPJ GTINC 0638301.GDT 6/16/14

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

3 1/8" AUGER 3 3/4" HOLLOW STEM

WASHBORING FROM 10 FEET

CSM DRILLER CDF LOGGER

CME 550 DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: LTD	Checked by:	App'vd. by:
Date: 6/16/14	Date:	Date:

GEOTECHNOLOGY INC
FROM THE GROUND UP

Maxson WWTP Lagoon 5
Black & Veatch

LOG OF BORING: B - 4

Project No. J022562.01

Surface Elevation: 211 | Completion Date: 6/16/14

Datum MSL

DEPTH IN FEET	DESCRIPTION OF MATERIAL	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	FILL: Brown, silty SAND with gravel - SM	3-3-5	SS1
	Soft to stiff, brown and gray, fat CLAY - (CH)	3-4-6	SS2
5		2-2-3	SS3
		2-2-3	SS4
10			ST5
		0-2-2	SS6
15	▽		
	Loose to medium dense, gray SAND with silt - (SP-SM)	2-2-5	SS7
20			
		5-5-5	SS8
25			
		8-10-9	SS9
30			
		6-14-12	SS10
35			
	Stiff, gray, fat CLAY - CH	7-5-4	SS11
40	Boring terminated at 40 feet.		
45			
50			
55			
60			
65			
70			
75			
80			

SHEAR STRENGTH, tsf

△ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

100 >>

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002.WL J022562.01_MAXSON WWTP LAGOON 5.GPJ GTINC 0638301.GDT 6/17/14

GROUNDWATER DATA

ENCOUNTERED AT 18 FEET ▽

DRILLING DATA

3 1/8" AUGER 3 3/4" HOLLOW STEM

WASHBORING FROM 20 FEET

MMH DRILLER CDS LOGGER

CME 550 DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: DBA	Checked by:	App'vd. by:
Date: 6/17/13	Date:	Date:

GEOTECHNOLOGY INC
FROM THE GROUND UP

Maxson WWTP Lagoon 5
Black & Veatch

LOG OF BORING: B - 5

Project No. J022562.01

Surface Elevation: 215 Completion Date: 6/11/14

Datum MSL

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
0	FILL: Brown, silty SAND with gravel - SM		3-3-4	SS1
	Medium stiff to stiff, gray, sandy CLAY - (CL)		3-4-8	SS2
5			4-4-7	SS3
			3-3-6	SS4
10				
			1-1-5	SS5
15				ST6
	Loose to medium dense, gray and tan, sandy SILT - ML		5-2-7	SS7
20				
	trace organics		7-7-7	SS8
25				
			6-8-15	SS9
30	Soft, gray, fat CLAY - CH			
			2-1-1	SS10
35				
	Medium dense, gray, silty SAND - (SM)			ST11
40				
			6-4-7	SS12
45				
	Medium dense, gray SAND - SP		12-12-15	SS13
50				
			8-8-10	SS14
55				
			11-10-12	SS15
60	Boring terminated at 60 feet.			
65				
70				
75				
80				

SHEAR STRENGTH, tsf

△ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

3 1/8" AUGER 3 3/4" HOLLOW STEM

WASHBORING FROM 10 FEET

JDD DRILLER CDS LOGGER

D-50 DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: DBA	Checked by:	App'vd. by:
Date: 6/13/14	Date:	Date:

GEOTECHNOLOGY INC
FROM THE GROUND UP

Maxson WWTP Lagoon 5
Black & Veatch

LOG OF BORING: B - 6

Project No. J022562.01

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002.WL J022562.01_MAXSON WWTP LAGOON 5.GPJ GTINC 0638301.GDT 6/18/14

Surface Elevation: 220 | Completion Date: 6/12/14

Datum MSL

DEPTH IN FEET	DESCRIPTION OF MATERIAL	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	FILL: Gravel to 1 foot.	2-2-5	SS1
	FILL: Brown and gray, fat CLAY, trace sand and gravel - CH	1-2-2	SS2
5	trace gravel		
	Medium stiff, brown and gray, fat CLAY - (CH)	2-3-4	SS3
	trace organics		ST4
10			
	Soft, brown, sandy CLAY - CL	2-2-2	SS5
15			
	Loose, brown SAND - SP	2-3-6	SS6
20			
	Stiff, brown, fat CLAY - CH	0-7-5	SS7
25	silty sand seam		
	Loose to medium dense, gray SAND - SP	6-9-9	SS8
30			
		2-5-2	SS9
35			
	Loose to medium dense, gray, silty SAND - (SM)	6-9-10	SS10
40			
		4-3-7	SS11
45			
		7-9-16	SS12
50			
	Medium dense, gray SAND - SP	6-7-6	SS13
55	trace gravel		
	trace gravel	5-7-9	SS14
60			
	with gravel	10-9-13	SS15
65			
	Loose, gray, silty SAND - SM	7-3-2	SS16
70			
	Medium dense, gray SAND trace gravel - SP	6-11-12	SS17
75			
		10-6-11	SS18
80	Boring terminated at 80 feet.		

SHEAR STRENGTH, tsf

△ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

81 >>

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002.WL J022562.01_MAXSON WWTP LAGOON 5.GPJ GTINC 0638301.GDT 6/18/14

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

3 1/8" AUGER 3 3/4" HOLLOW STEM

WASHBORING FROM 20 FEET

MMH DRILLER DWC LOGGER

CME 550 DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: DBA	Checked by:	App'vd. by:
Date: 6/13/14	Date:	Date:

GEOTECHNOLOGY INC
FROM THE GROUND UP

Maxson WWTP Lagoon 5
Black & Veatch

LOG OF BORING: B - 7

Project No. J022562.01

Surface Elevation: 218 | Completion Date: 6/12/14

Datum MSL

DEPTH IN FEET	DESCRIPTION OF MATERIAL	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	FILL: Brown, fat CLAY with sand and gravel - CH	2-8-7	SS1
	soil cement		
5	Soft to medium stiff, gray, fat CLAY trace sand - (CH)	2-4-3	SS2
		1-2-5	SS3
	trace roots		
10	trace gravel	2-3-4	SS4
15		1-2-2	SS5
20	Medium dense, gray, silty SAND - SM	2-4-5	SS6
25	▽	3-5-11	SS7
30		8-10-12	SS8
35		10-14-12	SS9
40		1-7-7	SS10
45	Soft, gray CLAY with sand - (CL)	1-2-2	SS11
			ST
50	Medium dense, gray and tan SAND - SP	7-7-9	SS13
55	trace gravel	11-8-8	SS14
60	with gravel	8-9-9	SS15
	Boring terminated at 60 feet.		
65			
70			
75			
80			

SHEAR STRENGTH, tsf

△ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

86 >>

72 >>

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002.WL J022562.01_MAXSON WWTP LAGOON 5.GPJ GTINC 0638301.GDT 6/18/14

GROUNDWATER DATA

ENCOUNTERED AT 23.5 FEET ▽

DRILLING DATA

3 1/8" AUGER 3 3/4" HOLLOW STEM

WASHBORING FROM 25 FEET

MMH DRILLER DWC LOGGER

CME 550 DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: DBA	Checked by:	App'vd. by:
Date: 6/13/14	Date:	Date:

GEOTECHNOLOGY INC
FROM THE GROUND UP

Maxson WWTP Lagoon 5
Black & Veatch

LOG OF BORING: B - 8

Project No. J022562.01

Surface Elevation: 216 | Completion Date: 6/13/14

Datum MSL

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	FILL: Gravel to 3 inches.		3-4-5	SS1
5	FILL: Brown and gray, fat CLAY - (CH) with sand		5-4-7	SS2
	Soft to medium stiff, gray CLAY with sand - (CL)		2-3-3	SS3
10			1-1-2	SS4
15			2-2-3	SS5
			89	ST
20	Soft, gray, sandy SILT - ML		1-2-1	SS6
25			1-2-2	SS7
30	Dense, gray, silty SAND - SM		5-13-18	SS8
35	Medium stiff, gray, fat CLAY with sand - (CH)		6-4-3	SS9
				ST
40	Medium stiff, gray, sandy SILT - ML		2-3-4	SS10
45	Medium dense to dense, gray and tan SAND - SP		9-9-10	SS11
50	Boring terminated at 50 feet.		12-14-19	SS12
55				
60				
65				
70				
75				
80				

SHEAR STRENGTH, tsf

△ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

60

63 >>

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002.WL J022562.01_MAXSON WWTP LAGOON 5.GPJ GTINC 0638301.GDT 6/16/14

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

3 1/8" AUGER 3 3/4" HOLLOW STEM

WASHBORING FROM 10 FEET

CSM DRILLER CDF LOGGER

CME 550 DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: LTD	Checked by:	App'vd. by:
Date: 6/16/14	Date:	Date:

GEOTECHNOLOGY INC
FROM THE GROUND UP

Maxson WWTP Lagoon 5
Black & Veatch

LOG OF BORING: B - 9

Project No. J022562.01

Surface Elevation: 225 | Completion Date: 6/11/14

Datum MSL

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
0	FILL: Asphalt and gravel to 6 inches.			
	Soft to medium stiff, gray, fat CLAY - (CH)		2-2-3	SS1
5			1-2-2	SS2
			1-2-4	SS3
10			84	ST4
15			2-2-4	SS5
20	Medium dense, gray, silty SAND - (SM)		1-3-3	SS6
			5-9-9	SS7
25				
30	with fat clay seam		5-3-8	SS8
35	Medium stiff, gray, sandy SILT - ML		3-4-3	SS9
40	Medium dense, gray, silty SAND - SM		0-6-11	SS10
45	Medium stiff, gray, fat CLAY - CH		4-4-3	SS11
50	Medium dense, gray, silty SAND - SM		5-6-8	SS12
55	Medium dense, gray, SAND - SP with gravel		9-9-9	SS13
60	trace gravel Boring terminated at 60 feet.		10-10-13	SS14

SHEAR STRENGTH, tsf

△ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

71 >>

86

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

3 1/8" AUGER 3 3/4" HOLLOW STEM

WASHBORING FROM 25 FEET

MMH DRILLER CSM LOGGER

CME 550 DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: LTD	Checked by:	App'vd. by:
Date: 6/12/14	Date:	Date:

GEOTECHNOLOGY INC
FROM THE GROUND UP

Maxson WWTP Lagoon 5
Black & Veatch

LOG OF BORING: B-10

Project No. J022562.01

LOG OF BORING 2002.WL J022562.01_MAXSON WWTP LAGOON 5.GPJ GTINC 0638301.GDT 6/18/14

Surface Elevation: 225 | Completion Date: 6/11/14

Datum MSL

DEPTH IN FEET	DESCRIPTION OF MATERIAL	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	FILL: Medium stiff, brown and gray SILT with sand - ML	2-3-3	SS1
5		2-3-3	SS2
	FILL: Loose, brown and gray, silty SAND - SM	1-2-3	SS3
10	Soft to medium stiff, gray CLAY with sand - (CL)	2-1-2	SS4
			ST5
15	sandy silt seam	1-1-2	SS6
20	with decomposed wood	3-3-4	SS7
25	Soft, gray, fat CLAY - CH	2-1-2	SS8
30	Medium stiff, gray and brown, sandy SILT - ML	2-3-4	SS9
35	Medium dense, gray and brown, silty SAND - SM	5-7-12	SS10
40		7-10-10	SS11
45	Loose, gray SAND - (SP) silty sand layer	2-2-6	SS12
50	with decomposed wood	2-4-3	SS13
			ST14
55	Medium dense, gray, silty SAND - (SM)	5-3-8	SS15
60	Boring terminated at 60 feet.	9-8-5	SS16
65			
70			
75			
80			

SHEAR STRENGTH, tsf

△ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002.WL J022562.01_MAXSON WWTP LAGOON 5.GPJ GTINC 0638301.GDT 6/18/14

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

3 1/8" AUGER 3 3/4" HOLLOW STEM

WASHBORING FROM 20 FEET

MMH DRILLER CSM LOGGER

CME 550 DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: LTD	Checked by:	App'vd. by:
Date: 6/12/14	Date:	Date:

GEOTECHNOLOGY INC
FROM THE GROUND UP

Maxson WWTP Lagoon 5
Black & Veatch

LOG OF BORING: B-11

Project No. J022562.01

Surface Elevation: 228 | Completion Date: 6/17/14

Datum MSL

DEPTH IN FEET	DESCRIPTION OF MATERIAL	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	FILL: Soft, brown, sandy, silty CLAY - (CL-ML)	2-1-2	SS1
5	Soft to medium stiff, brown to gray, sandy, fat CLAY - CH	2-1-2	SS2
	with silt	2-2-2	SS3
10		2-3-3	SS4
15	Medium stiff, brown to gray, silty CLAY - CL	1-2-3	SS5
			ST6
20	Stiff, gray, fat CLAY - CH	4-6-6	SS7
25	Soft, gray to brown CLAY with sand - (CL)	1-1-2	SS8
			ST9
30	Medium stiff, gray, fat CLAY - CH	3-3-2	SS10
	Medium dense, brown, silty SAND - SM		
35	Medium dense, brown to gray SAND - SP	6-10-17	SS11
40		6-6-9	SS12
45	Soft, gray, fat CLAY with sand - (CH)	3-2-2	SS13
	Medium stiff to stiff, gray, sandy SILT - ML		ST14
50	Loose to medium dense, gray, silty SAND - (SM)	3-4-5	SS15
55		9-9-7	SS16
60		5-7-13	SS17
65		7-5-8	SS18
70	Medium dense to dense, gray SAND - SP	10-10-16	SS19
75		13-14-18	SS20
80		13-14-12	SS21
	Boring terminated at 80 feet.		

SHEAR STRENGTH, tsf

△ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

74

>>

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

3 1/8" AUGER 3 3/4" HOLLOW STEM

WASHBORING FROM 20 FEET

MMH DRILLER CDS LOGGER

CME 550 DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: CDS	Checked by:	App'vd. by:
Date: 6/17/14	Date:	Date:

GEOTECHNOLOGY INC
FROM THE GROUND UP

Maxson WWTP Lagoon 5
Black & Veatch

LOG OF BORING: B-12

Project No. J022562.01

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002.WL J022562.01_MAXSON WWTP LAGOON 5.GPJ GTINC 0638301.GDT 6/18/14

BORING LOG: TERMS AND SYMBOLS

GENERAL NOTES

1. *Information on each boring log is a compilation of subsurface conditions based on soil or rock classifications obtained from the field as well as from laboratory testing of samples. The strata lines on the logs may be approximate or the transition between the strata may be gradual rather than distinct. Water level measurements refer only to those ob - served at the times and places indicated, and may vary with time, geologic condition or construction activity.*
2. *Relative composition and Unified Soil Classification designations are based on visual estimates and are approximate only. If laboratory tests were performed to classify the soil, the unified designation is show in parenthesis.*
3. *Value given in Unit Dry Weight/SPT Column is either a unit dry weight in pounds per cubic foot, if adjacent to a ST sample designation, or blows per 6-inch increment if adjacent to a SS sample designation.*

ABBREVIATIONS

UU/2	*Shear Strength from Unconsolidated – Undrained Triaxial Test (ASTM D2850)*
QU/2	*Shear Strength from Unconfined Compression Test (ASTM D2166)*
SV	*Shear Strength from Field Vane (ASTM D2573)*
PL	*Plastic Limit (ASTM D4318)*
LL	*Liquid Limit (ASTM D4318)*

LEGEND

CS	Continuous Sampler
GB	Grab Sample Taken From Auger Cuttings Or Wash Water Return
NX 100/42	NX Rock Core with Percent Recovery/R.Q.D. Given In Adjacent Column
PST	Three Inch Diameter Piston Tube Sample
SS	Split Spoon Sample (Standard Penetration Test)
ST	Three Inch Diameter Shelby Tube Sample
*	Sample Not Recovered
SV	Field Vane Test

SPLIT – BARREL SAMPLER DRIVING RECORD

Blow Per Foot (N-Value)	*Description*
25	*25 blows drove sampler 12 inches after initial 6 inches of seating.*
75/10”	*75 blows drove sampler 10 inches after initial 6 inches of seating.*
50/S3”	*50 blows drove sampler 3 inches during initial 6 inch seating interval.*

NOTES: 1. To avoid damage to sampling tools, driving is limited to 50 blows during any six inch interval.
2. N-Value (Blow Count) is the standard penetration resistance based on the total number of blows, using a 140-lb hammer with 30-inch free fall, required to drive a split spoon the last two of three, 6-inch drive increments. (Example: 4/7/9, N = 7 + 9 = 16). Values are shown as a summation on grid plot and may be shown as 4/7/9 in Unit Dry Weight – SPT column.

RELATIVE COMPOSITION

Trace……...0-10 %
With/Some……...11-35 %
Soil modifier such…... > 35 %
As silty, clayey, sandy, etc.

DENSITY OF GRANULAR SOILS

Descriptive Term:	***N—Value***
Very Loose	*0 - 4*
Loose	*5 - 10*
Medium Dense	*11 - 30*
Dense	*31 - 50*
Very Dense	*> 50*

STRENGTH OF COHESIVE SOILS

Consistency	**Undrained Shear Strength Tons Per Sq. Ft.**	**Field Test**	**Approximate N-Value Range**
Very Soft	*less than 0.12*	*Thumb will penetrate soil more than 1”*	*0 - 1*
Soft	*.13 to 0.25*	*Thumb will penetrate soil about 1”*	*2 - 4*
Medium Stiff	*0.26 to 0.50*	*Thumb will penetrate soil about ¼”*	*5 – 8*
Stiff	*0.51 to 1.00*	*Thumb hardly indents soil*	*9 – 15*
Very Stiff	*1.01 to 2.00*	*Thumb will not indent soil, but readily indented with thumbnail*	*16 – 30*
Hard	*greater than 2.00*	*Thumbnail will not indent soil*	*> 30*

SOIL GRAIN SIZE

U.S. STANDARD SIEVE

12”	3”	¾“	4	10	40	200		
BOULDERS	COBBLES	GRAVEL		SAND			SILT	CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE		
300	76.2	19.1	4.76	2.00	0.42	0.074	0.002	

SOIL GRAIN SIZE IN MILLIMETERS

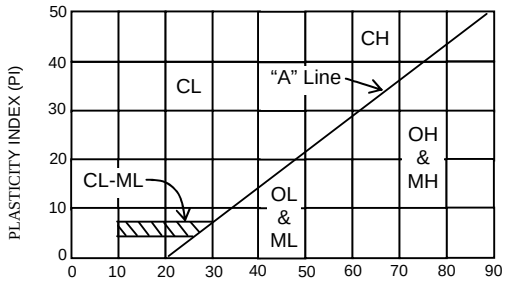
SOIL STRUCTURE

Calcareous *– Having appreciable quantities of carbonate.*
Fissured *– Containing shrinkage or relief cracks, often filled with sand or silt; usually more or less vertical.*
Slickensided *– Having planes of weakness that appear slick and glossy. The degree of slickensidedness depends upon the spacing of slickensides and the ease of breaking along those planes.*
Layer *-- Inclusion greater than 3 inches thick.*
Seam *– Inclusion 1/8 inch to 3 inches thick extending through the sample*
Parting *– Inclusion less than 1/8 inch thick.*
Pocket *– Inclusion of material of different texture that is smaller than the diameter of the sample.*
Interlayered *– Soil samples composed of alternating layers of different soil types.*
Intermixed *– Soil samples composed of pockets of different soil types and a layered or laminated structure is not evident.*
Laminated *– Soil sample composed of alternating partings or seams of different soil type.*

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			SYMBOL	DESCRIPTION
Coarse-Grained Soils (More than 50% Larger than No 200 Sieve Size)	Gravel and Gravelly Soils	Clean Gravels Little or no Fines	GW	Well-Graded Gravel, Gravel-Sand Mixture
			GP	Poorly –Graded Gravel, Gravel-Sand Mixture
		Gravels with Appreciable Fines	GM	Silty Gravel, Gravel-Sand-Silt Mixture
			GC	Clayey-Gravel, Gravel-Sand-Clay Mixture
	Sand and Sandy Soils	Clean Sands Little or no Fines	SW	Well-Graded Sand, Gravelly Sand
			SP	Poorly Graded Sand, Gravelly Sand
		Sands with Appreciable Fines	SM	Silty Sand, Sand-Silt Mixture
			SC	Clayey Sand, Sand-Clay Mixture
Fine-Grained Soils (More than 50% Smaller than No 200 Sieve Size)	Silts and Clays	Liquid Limit Less Than 50	ML	Silt, Clayey Silt, Silty or Clayey Very Fine Sand, Slight Plasticity
			CL	Clay, Sandy Clay, Silty Clay, Low to Medium Plasticity
			OL	Organic Silts, or Silty Clays of Low Plasticity
	Silts and Clays	Liquid Limit More Than 50	MH	Silt, Fine Sandy or Silt Soil with High Plasticity
			CH	Clay, High Plasticity
			OH	Organic Clay of Medium to High Plasticity
	Highly Organic Soils		PT	Peat, Humus, Swamp Soil

PLASTICITY CHART



RELATIVE PLASTICITY

Nonplastic	Cannot Roll Into Ball
Trace Plasticity	Barely Roll Into Ball
Medium Plastic	Can be Rolled Into Ball
Highly Plastic	No Rupture by Kneading

VISUAL DESCRIPTION CRITERIA*

TABLE 1: CRITERIA FOR DESCRIBING ANGULARITY OF COARSE-GRAINED PARTICLES

Description	Criteria
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces
Subangular	Particles are similar to angular description but have rounded edges
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges
Rounded	Particles have smoothly curved sides and no edges

TABLE 2: CRITERIA FOR DESCRIBING PARTICLE SHAPE

Description	Criteria
Flat	Particles with width/thickness X3
Elongated	Particles with length/width X3
Flat and Elongated	Particles meet criteria for both flat and elongated

TABLE 3: CRITERIA FOR DESCRIBING MOISTURE CONDITION

Description	Criteria
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp, but no visible water
Wet	Visible free water, usually soil is below the water table

TABLE 4: CRITERIA FOR DESCRIBING REACTION WITH HCL

Description	Criteria
None	No visible reaction
Weak	Some reaction, with bubbles forming slowly
Strong	Violent reaction, with bubbles forming rapidly

TABLE 6: CRITERIA FOR DESCRIBING CEMENTATION

Description	Criteria
Weak	Crumbles or breaks with handling or little finger pressure
Moderate	Crumbles or breaks with considerable finger pressure
Strong	Will not crumble or break with finger pressure

NOTES: 1. Tables adapted from ASTM D2488 "Description and identification of Soils" (Visual-Manual Procedure)
2. Tables 5, 7 and 11 incorporated into other information on this plate.

TABLE 8: CRITERIA FOR DESCRIBING DRY STRENGTH

Description	Criteria
None	The dry specimen crumbles into powder with mere pressure of handling
Low	The dry specimen crumbles into powder with some finger pressure
Medium	The dry specimen breaks into pieces or crumbles with considerable finger pressure
High	The dry specimen cannot be broken with finger pressure. Specimen will break into pieces between thumb and a hard surface.
Very High	The dry specimen cannot be broken between the thumb and a hard surface

TABLE 9: CRITERIA FOR DESCRIBING DILATANCY

Description	Criteria
None	No visible change in the specimen
Slow	Water appears slowly on the surface of the specimen during shaking and does not disappear or disappears slowly upon squeezing.
Rapid	Water appears quickly on the surface of the specimen during shaking and disappears quickly upon squeezing.

TABLE 10: CRITERIA FOR DESCRIBING TOUGHNESS

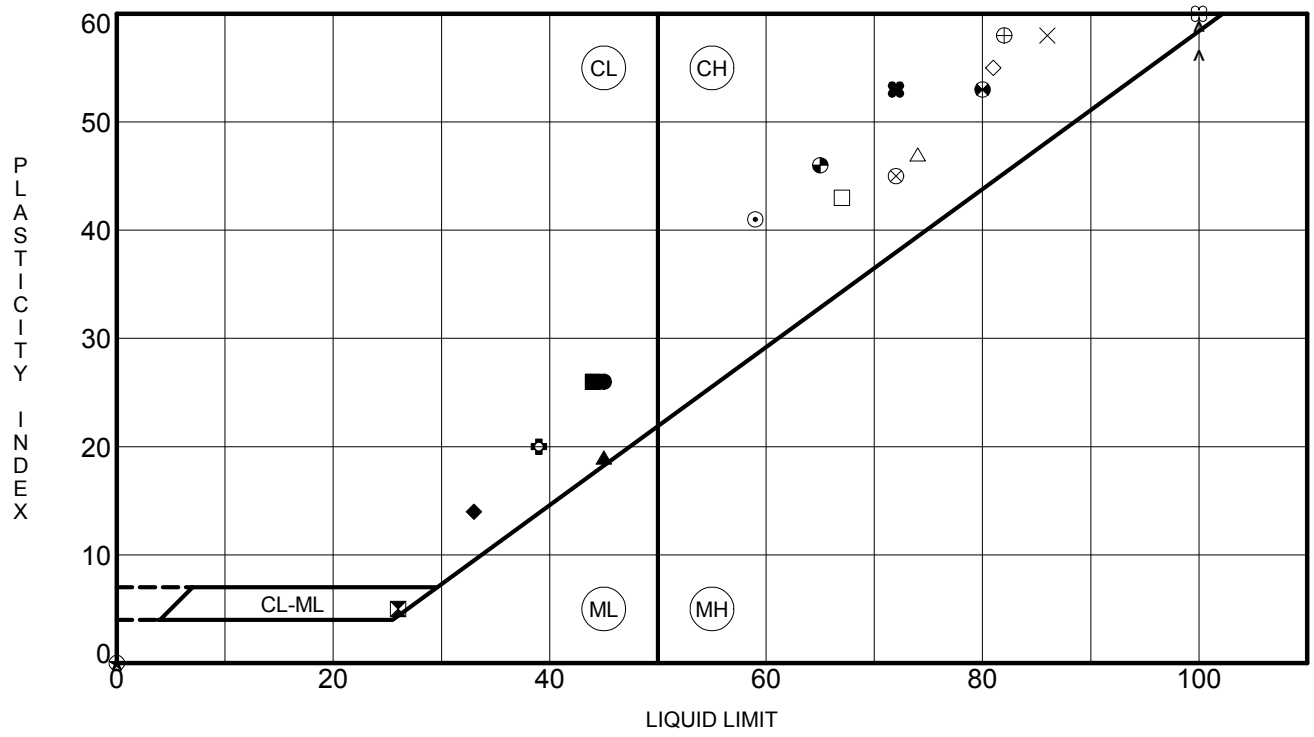
Description	Criteria
Low	Only slight pressure is required to roll the thread near the plastic limit. The thread and the lump are weak and soft.
Medium	Medium pressure is required to roll the thread to near the plastic limit. The thread and the lump have medium stiffness
High	Considerable pressure is required to roll the thread to near the plastic limit. The thread and the lump have very high stiffness

TABLE 12: IDENTIFICATION OF INORGANIC FINE-GRAINED SOILS FROM MANUAL TESTS

Soil Symbol	Dry Strength	Dilatancy	Toughness
ML	None to low	Slow to rapid	Low or thread cannot be formed
CL	Medium to high	None to slow	Medium
MH	Low to medium	None to slow	Low to medium
CH	High to very high	none	High

APPENDIX C

LABORATORY TEST RESULTS



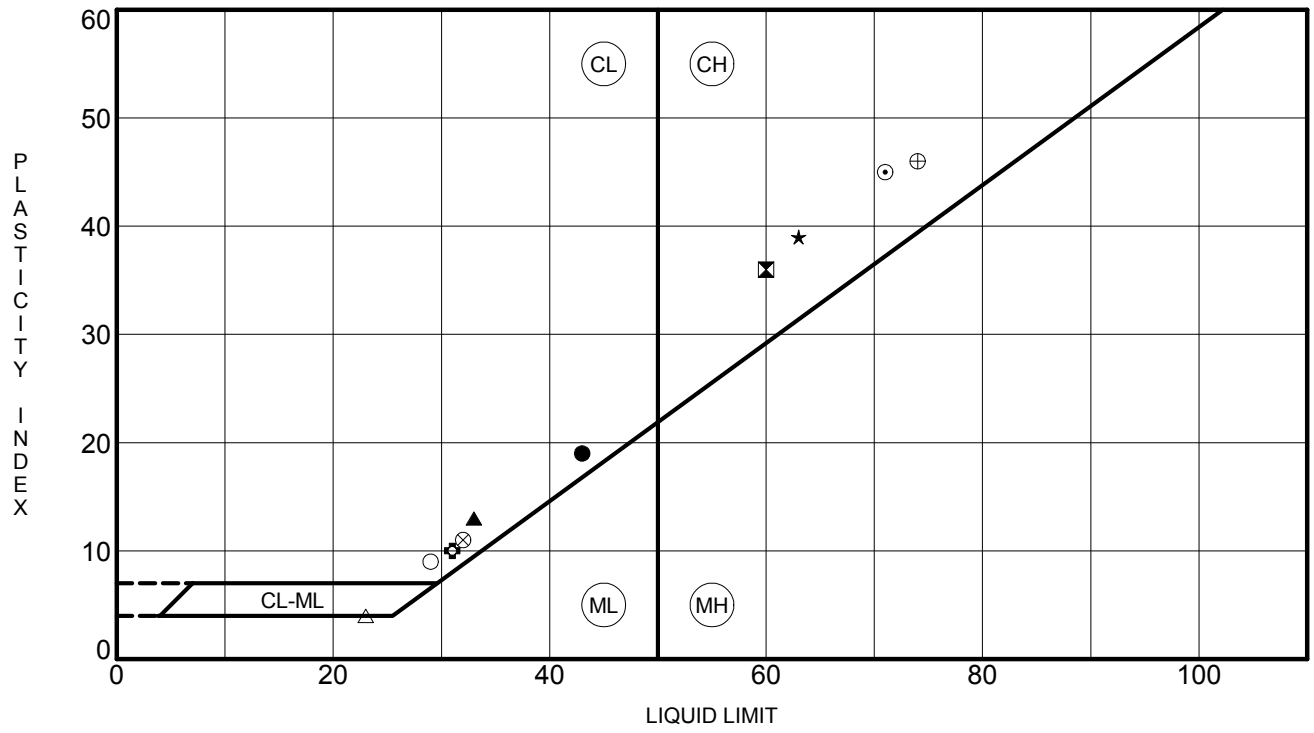
	Specimen Identification		LL	PL	PI	Fines	Classification
●	B - 1	8.5	45	19	26		LEAN CLAY(CL)
⧓	B - 1	13.5	26	21	5	40	SILTY, CLAYEY SAND(SC-SM)
▲	B - 1	28.5	45	26	19	10	POORLY GRADED SAND with CLAY(SP-SC)
★	B - 1	43.5	NP	NP	NP	8	POORLY GRADED SAND with SILT(SP-SM)
⊙	B - 2	0.0	59	18	41		FAT CLAY(CH)
✿	B - 2	15.0	39	19	20	86	LEAN CLAY(CL)
○	B - 2	38.5	NP	NP	NP	21	SILTY SAND(SM)
△	B - 3	6.0	74	27	47		FAT CLAY(CH)
⊗	B - 3	10.0	72	27	45		FAT CLAY(CH)
⊕	B - 3	28.5	82	24	58		FAT CLAY(CH)
□	B - 3	48.5	67	24	43	27	CLAYEY SAND(SC)
⊛	B - 4	6.0	80	27	53		FAT CLAY(CH)
◕	B - 4	15.0	65	19	46		FAT CLAY(CH)
☆	B - 4	33.5	NP	NP	NP	5	POORLY GRADED SAND with SILT(SP-SM)
⊠	B - 5	10.0	100	31	69		FAT CLAY(CH)
■	B - 6	15.0	44	18	26	69	SANDY LEAN CLAY(CL)
◆	B - 6	33.5	33	19	14	94	FAT CLAY(CH)
◇	B - 7	8.0	81	26	55		FAT CLAY(CL)
⨯	B - 8	8.5	86	28	58		FAT CLAY(CH)
✖	B - 8	13.5	72	19	53	75	FAT CLAY with SAND(CH)

GEOTECHNOLOGY INC
FROM THE GROUND UP

ATTERBERG LIMITS RESULTS

Maxson WWTP Lagoon 5
Black & Veatch
J022562.01

US_ATTERBERG_LIMITS_J022562.01_MAXSON WWTP LAGOON 5.GPJ_US_LAB.GDT_8/8/14



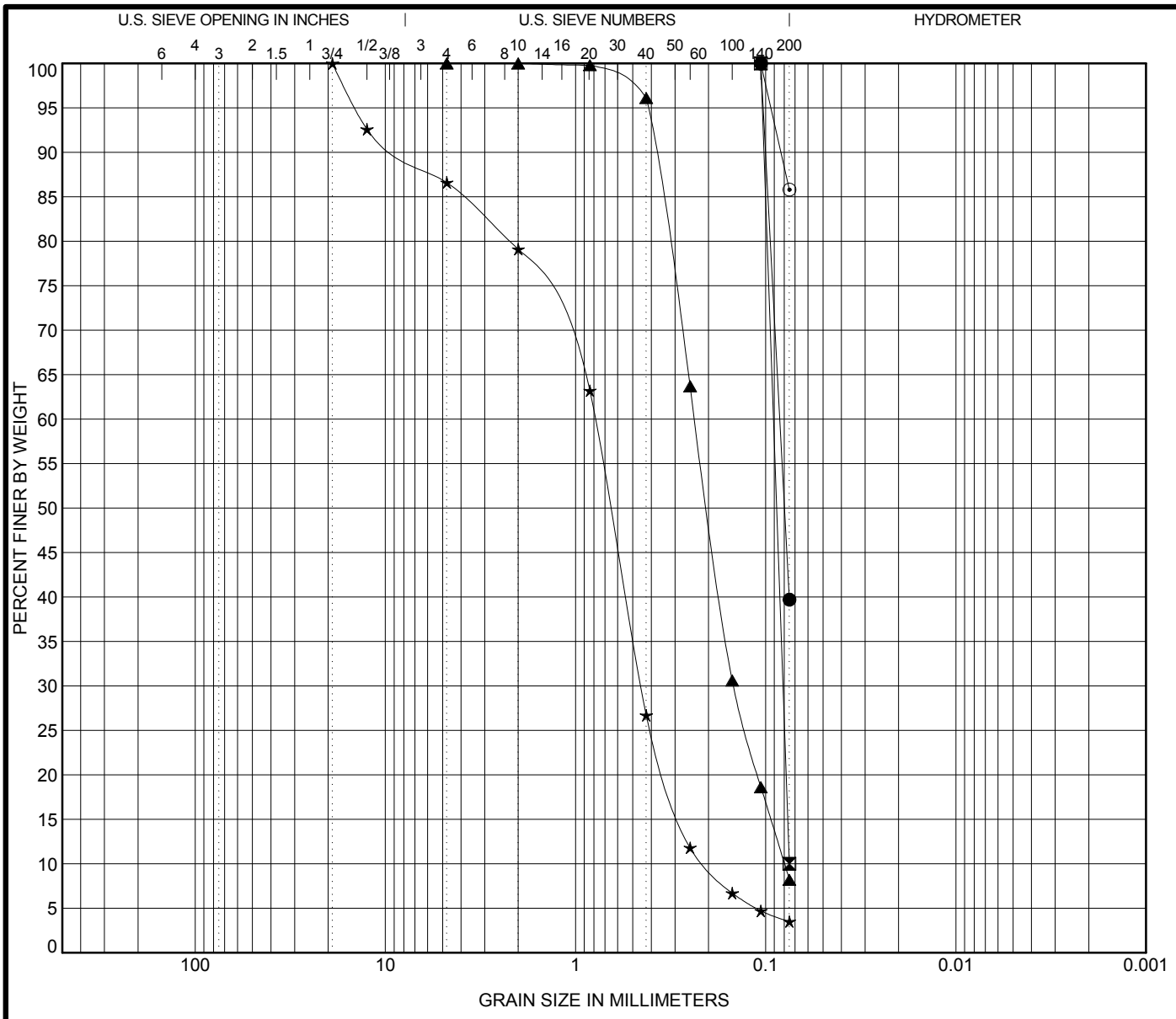
	Specimen Identification		LL	PL	PI	Fines	Classification
●	**B - 8**	**45.0**	**43**	**24**	**19**	**70**	**LEAN CLAY with SAND(CL)**
⊠	**B - 9**	**1.0**	**60**	**24**	**36**		**FAT CLAY(CH)**
▲	**B - 9**	**15.0**	**33**	**20**	**13**		**LEAN CLAY(CL)**
★	**B - 9**	**35.0**	**63**	**24**	**39**	**80**	**FAT CLAY with SAND(CH)**
⊙	**B-10**	**8.0**	**71**	**26**	**45**		**FAT CLAY(CH)**
✿	**B-11**	**3.5**	**31**	**21**	**10**	**75**	**SILT with SAND(ML)**
○	**B-11**	**10.0**	**29**	**20**	**9**	**74**	**LEAN CLAY with SAND(CL)**
△	**B-12**	**0.0**	**23**	**19**	**4**		**SILTY CLAY(CL-ML)**
⊗	**B-12**	**25.0**	**32**	**21**	**11**	**71**	**LEAN CLAY with SAND(CL)**
⊕	**B-12**	**45.0**	**74**	**28**	**46**	**81**	**FAT CLAY with SAND(CH)**

GEOTECHNOLOGY INC
FROM THE GROUND UP

ATTERBERG LIMITS RESULTS

Maxson WWTP Lagoon 5
Black & Veatch
J022562.01

US_ATTERBERG_LIMITS_J022562.01_MAXSON WWTP LAGOON 5.GPJ US_LAB.GDT 8/8/14



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	B - 1	13.5	SILTY, CLAYEY SAND(SC-SM)	26	21	5		
⊠	B - 1	28.5	POORLY GRADED SAND with CLAY(SP-SC)	45	26	19	0.96	1.21
▲	B - 1	43.5	POORLY GRADED SAND with SILT(SP-SM)	NP	NP	NP	1.16	2.97
★	B - 1	58.5	POORLY GRADED SAND(SP)				1.24	3.79
⊙	B - 2	15.0	LEAN CLAY(CL)	39	19	20		

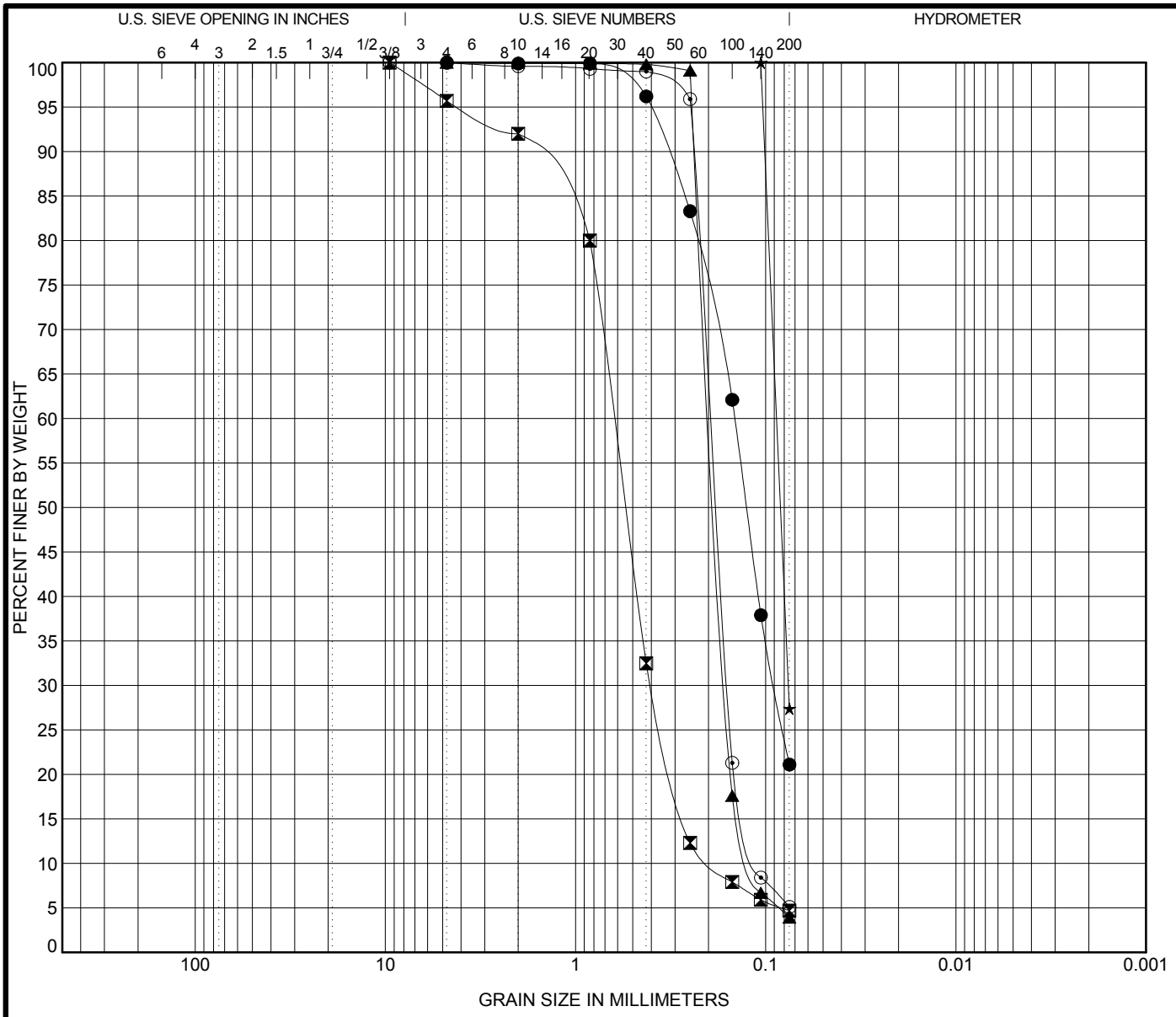
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B - 1	13.5	0.106	0.084			0.0	60.3	39.7	
⊠	B - 1	28.5	0.106	0.091	0.081	0.075	0.0	90.0	10.0	
▲	B - 1	43.5	4.75	0.236	0.147	0.08	0.0	91.8	8.2	
★	B - 1	58.5	19	0.791	0.452	0.209	13.4	83.1	3.5	
⊙	B - 2	15.0	0.106				0.0	14.2	85.8	

GEOTECHNOLOGY INC
FROM THE GROUND UP

GRAIN SIZE DISTRIBUTION

Maxson WWTP Lagoon 5
Black & Veatch
J022562.01

US GRAIN_SIZE J022562.01 MAXSON WWTP LAGOON 5.GPJ US_LAB.GDT 8/8/14



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	B - 2	38.5	SILTY SAND(SM)	NP	NP	NP		
⊠	B - 2	63.5	POORLY GRADED SAND(SP)				1.31	3.29
▲	B - 3	38.5	POORLY GRADED SAND(SP)				1.14	1.66
★	B - 3	48.5	CLAYEY SAND(SC)	67	24	43		
⊙	B - 4	33.5	POORLY GRADED SAND with SILT(SP-SM)	NP	NP	NP	1.17	1.77

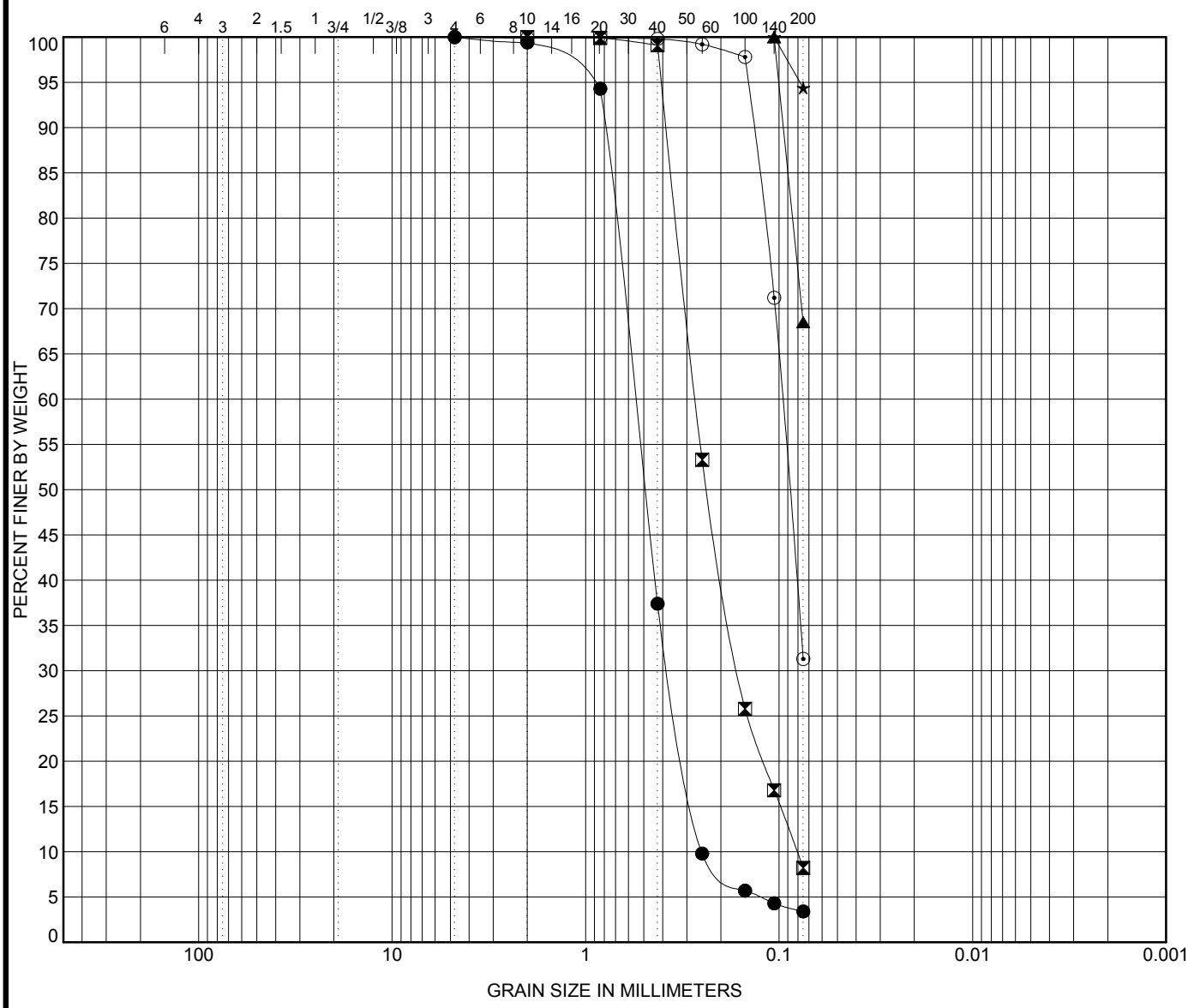
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B - 2	38.5	4.75	0.146	0.09		0.0	78.9	21.1	
⊠	B - 2	63.5	9.5	0.631	0.398	0.191	4.3	91.0	4.7	
▲	B - 3	38.5	4.75	0.196	0.162	0.118	0.0	96.1	3.9	
★	B - 3	48.5	0.106	0.088	0.076		0.0	72.6	27.4	
⊙	B - 4	33.5	9.5	0.196	0.159	0.111	0.0	94.9	5.1	

GEOTECHNOLOGY INC
FROM THE GROUND UP

GRAIN SIZE DISTRIBUTION

Maxson WWTP Lagoon 5
Black & Veatch
J022562.01

US GRAIN SIZE J022562.01 MAXSON WWTP LAGOON 5.GPJ US LAB.GDT 8/8/14



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	B - 4	48.5	POORLY GRADED SAND(SP)				0.97	2.22
⊠	B - 5	18.5	SAND with SILT(SP-SM)				1.21	3.35
▲	B - 6	15.0	SANDY LEAN CLAY(CL)	44	18	26		
★	B - 6	33.5	FAT CLAY(CH)	33	19	14		
⊙	B - 6	43.5	SILTY SAND(SM)					

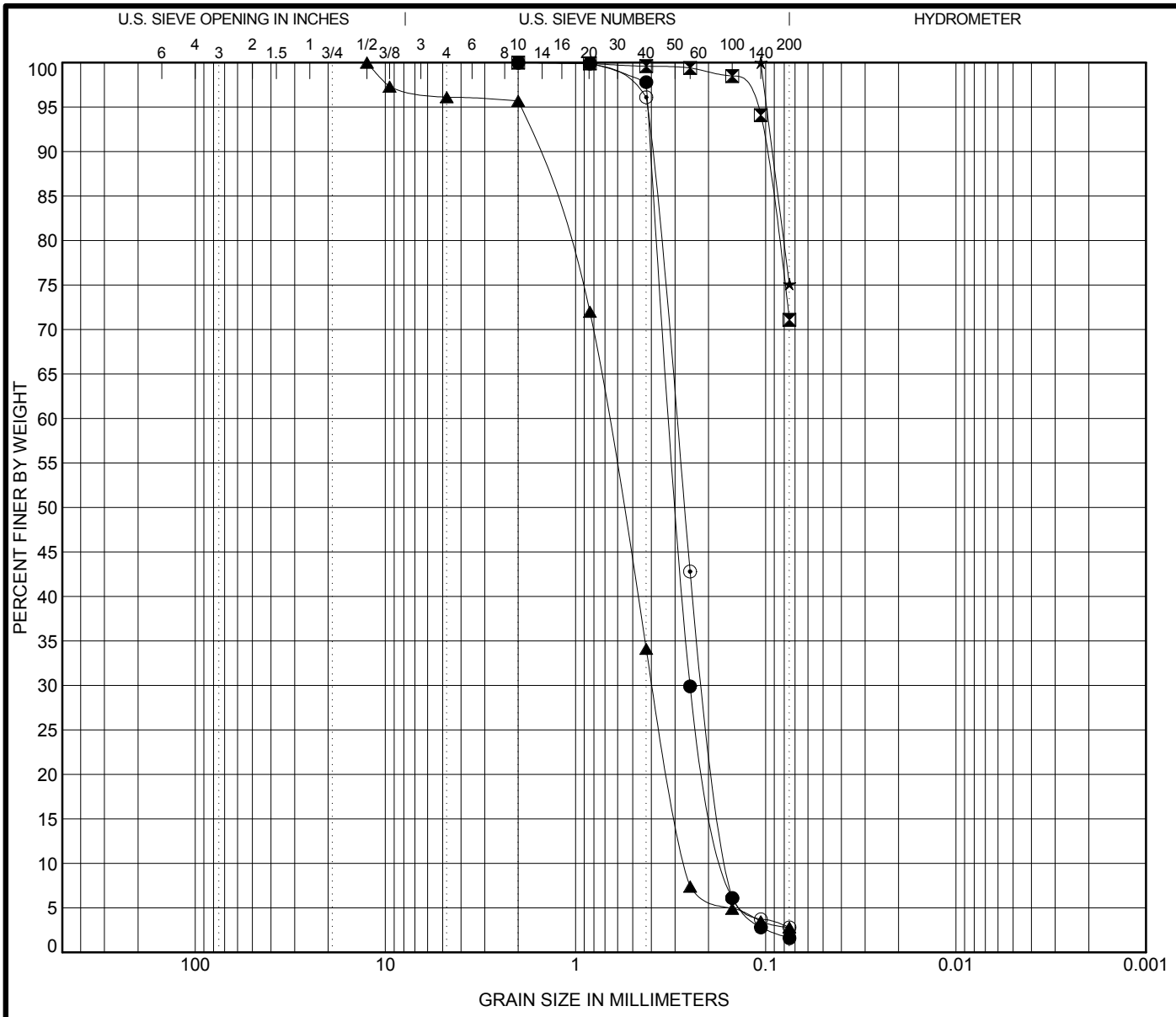
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B - 4	48.5	4.75	0.557	0.369	0.251	0.0	96.6	3.4	
⊠	B - 5	18.5	2	0.27	0.162	0.081	0.0	91.8	8.2	
▲	B - 6	15.0	0.106				0.0	31.5	68.5	
★	B - 6	33.5	0.106				0.0	5.6	94.4	
⊙	B - 6	43.5	4.75	0.096			0.0	68.7	31.3	

GEOTECHNOLOGY INC
FROM THE GROUND UP

GRAIN SIZE DISTRIBUTION

Maxson WWTP Lagoon 5
Black & Veatch
J022562.01

US_GRAIN_SIZE_J022562.01_MAXSON WWTP LAGOON 5.GPJ_US_LAB.GDT_8/8/14



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	B - 7	18.5	POORLY GRADED SAND(SP)				1.21	1.94
⊠	B - 7	43.5	SILTY SAND(SM)					
▲	B - 7	58.5	POORLY GRADED SAND(SP)				0.86	2.57
★	B - 8	13.5	FAT CLAY with SAND(CH)	72	19	53		
⊙	B - 8	28.5	POORLY GRADED SAND(SP)				0.93	1.87

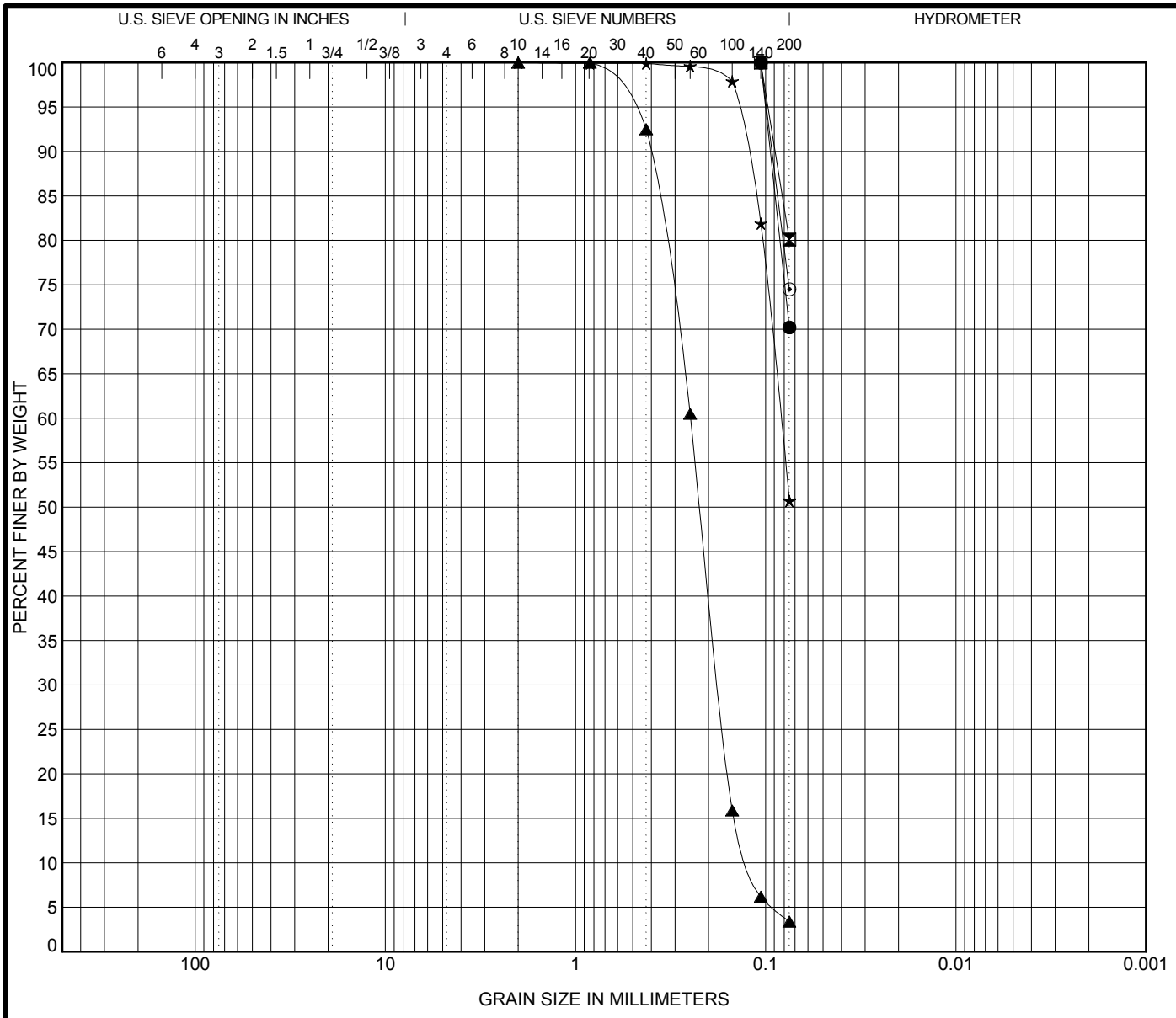
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B - 7	18.5	2	0.316	0.25	0.163	0.0	98.4	1.6	
⊠	B - 7	43.5	2				0.0	28.9	71.1	
▲	B - 7	58.5	12.5	0.677	0.392	0.263	3.9	93.3	2.8	
★	B - 8	13.5	0.106				0.0	24.9	75.1	
⊙	B - 8	28.5	2	0.297	0.209	0.158	0.0	97.2	2.8	

GEOTECHNOLOGY INC
FROM THE GROUND UP

GRAIN SIZE DISTRIBUTION

Maxson WWTP Lagoon 5
Black & Veatch
J022562.01

US GRAIN SIZE J022562.01 MAXSON WWTP LAGOON 5.GPJ US LAB.GDT 8/8/14



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	B - 8	45.0	LEAN CLAY with SAND(CL)	43	24	19		
⊠	B - 9	35.0	FAT CLAY with SAND(CH)	63	24	39		
▲	B-10	23.5	POORLY GRADED SAND(SP)				1.03	2.05
★	B-10	33.5	SANDY SILT(ML)					
⊙	B-11	3.5	SILT with SAND(ML)	31	21	10		

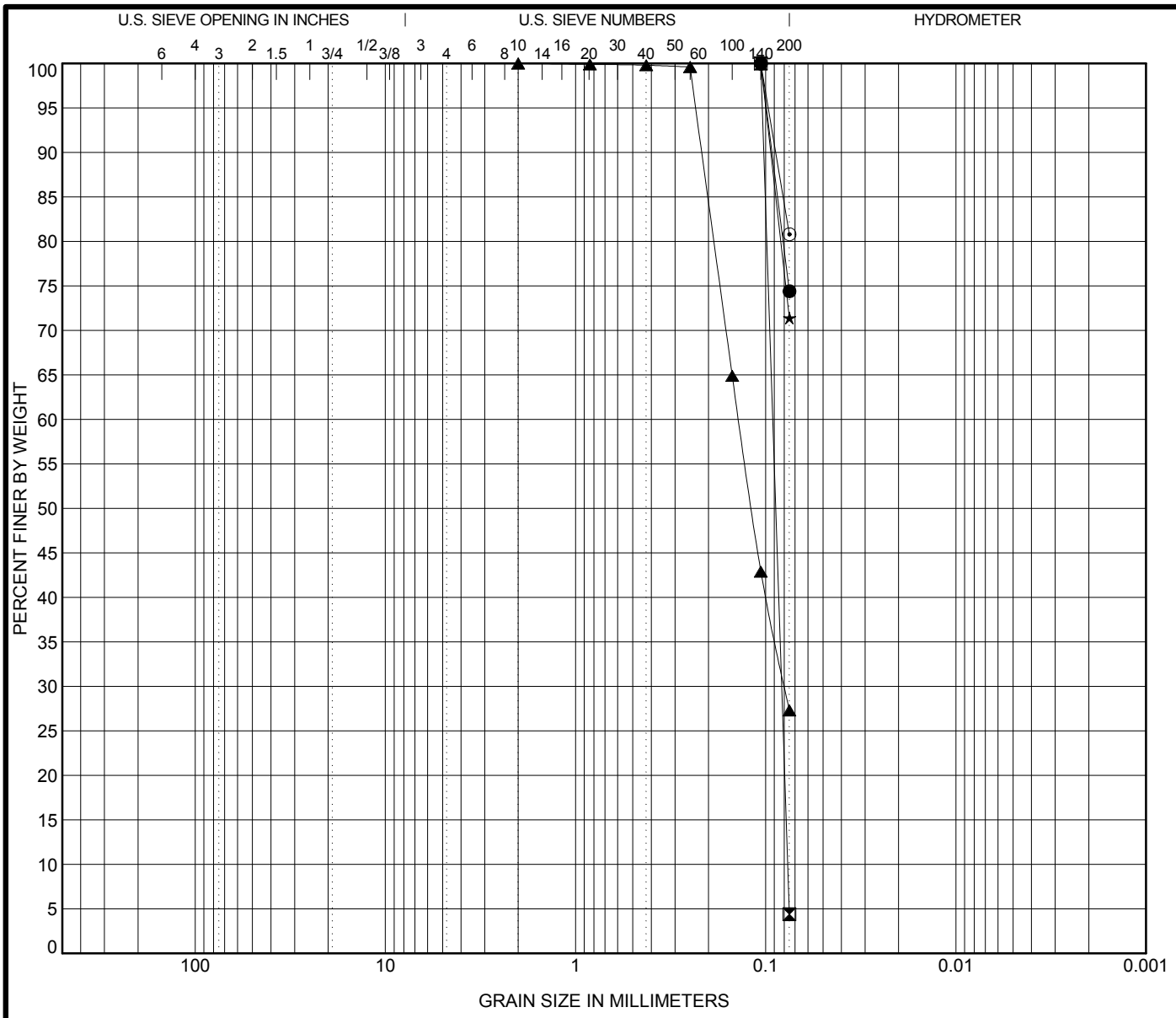
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B - 8	45.0	0.106				0.0	29.8	70.2	
⊠	B - 9	35.0	0.106				0.0	19.9	80.1	
▲	B-10	23.5	2	0.249	0.176	0.121	0.0	96.6	3.4	
★	B-10	33.5	2	0.083			0.0	49.3	50.7	
⊙	B-11	3.5	0.106				0.0	25.5	74.5	

GEOTECHNOLOGY INC
FROM THE GROUND UP

GRAIN SIZE DISTRIBUTION

Maxson WWTP Lagoon 5
Black & Veatch
J022562.01

US GRAIN SIZE J022562.01 MAXSON WWTP LAGOON 5.GPJ US LAB.GDT 8/8/14



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	B-11	10.0	LEAN CLAY with SAND(CL)	29	20	9		
⊠	B-11	50.0	POORLY GRADED SAND(SP)				0.96	1.20
▲	B-11	58.5	SILTY SAND(SM)					
★	B-12	25.0	LEAN CLAY with SAND(CL)	32	21	11		
⊙	B-12	45.0	FAT CLAY with SAND(CH)	74	28	46		

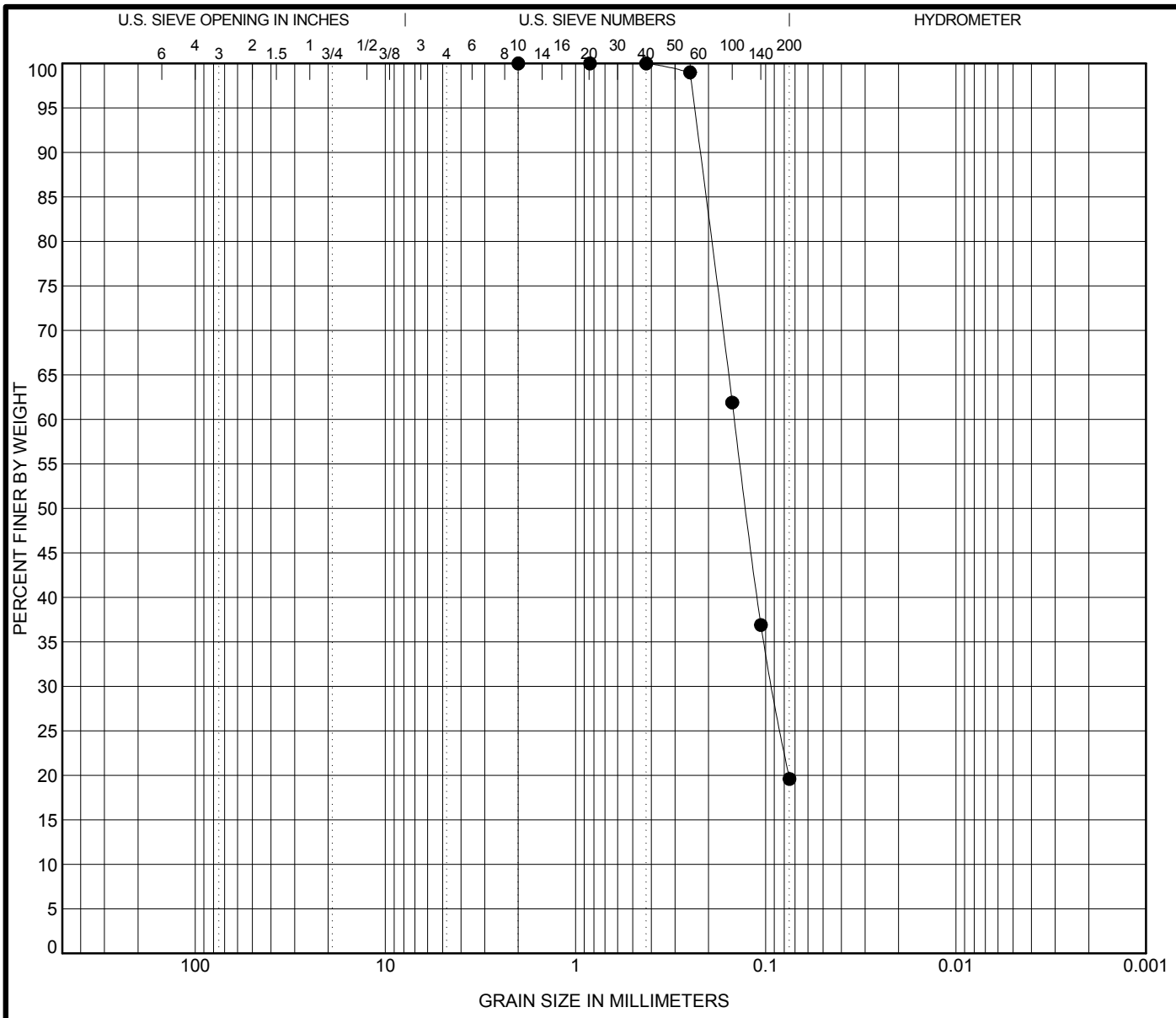
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-11	10.0	0.106				0.0	25.6	74.4	
⊠	B-11	50.0	0.106	0.092	0.082	0.077	0.0	95.6	4.4	
▲	B-11	58.5	2	0.139	0.08		0.0	72.7	27.3	
★	B-12	25.0	0.106				0.0	28.6	71.4	
⊙	B-12	45.0	0.106				0.0	19.2	80.8	

GEOTECHNOLOGY INC
FROM THE GROUND UP

GRAIN SIZE DISTRIBUTION

Maxson WWTP Lagoon 5
Black & Veatch
J022562.01

US GRAIN SIZE J022562.01 MAXSON WWTP LAGOON 5.GPJ US LAB.GDT 8/8/14



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**B-12**	**58.5**	**SILTY SAND(SM)**					

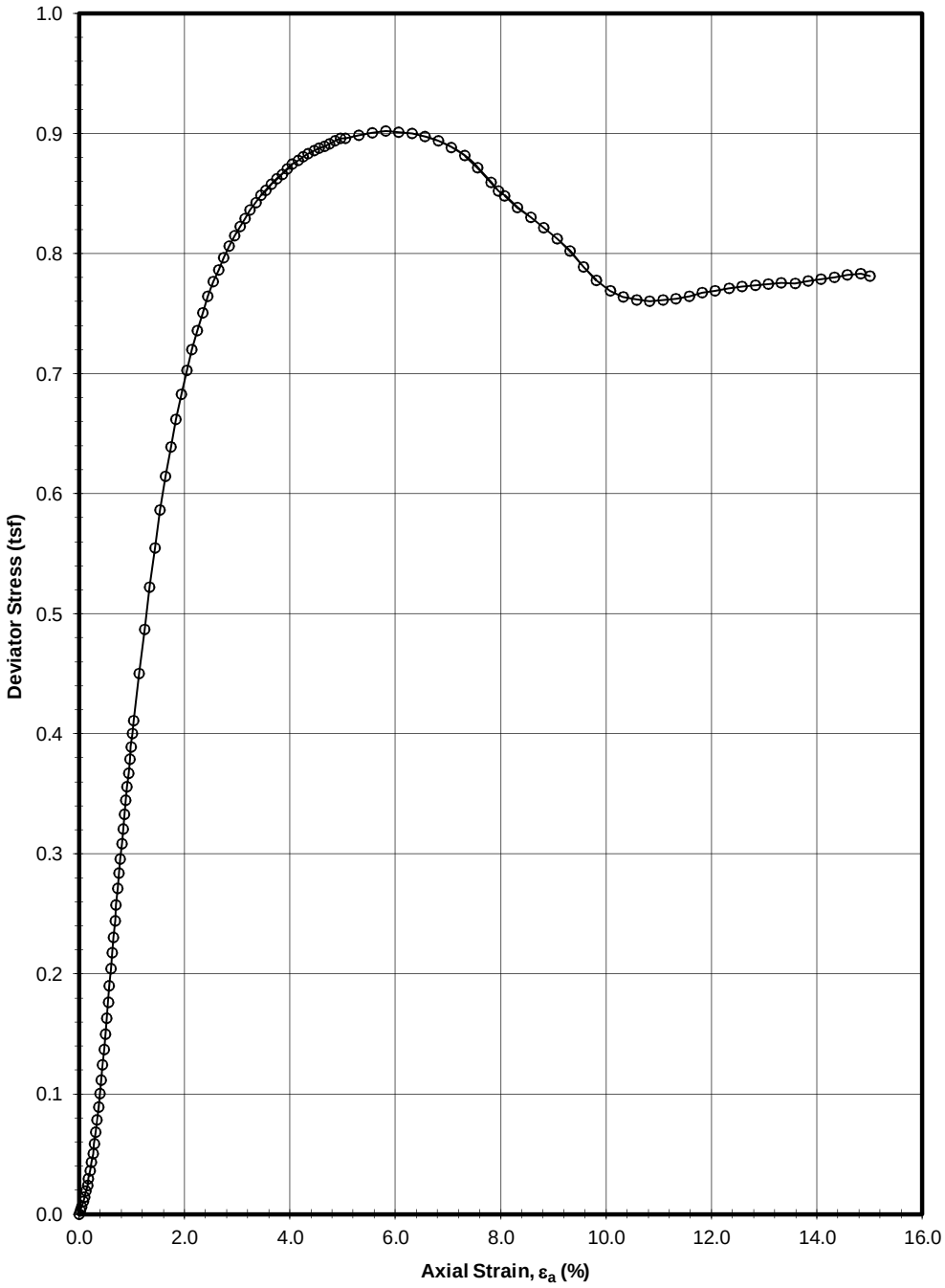
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-12**	**58.5**	**2**	**0.146**	**0.092**		**0.0**	**80.4**	**19.6**	

GEOTECHNOLOGY INC
FROM THE GROUND UP

GRAIN SIZE DISTRIBUTION

Maxson WWTP Lagoon 5
Black & Veatch
J022562.01

US_GRAIN_SIZE J022562.01 MAXSON WWTP LAGOON 5.GPJ US_LAB.GDT 8/8/14



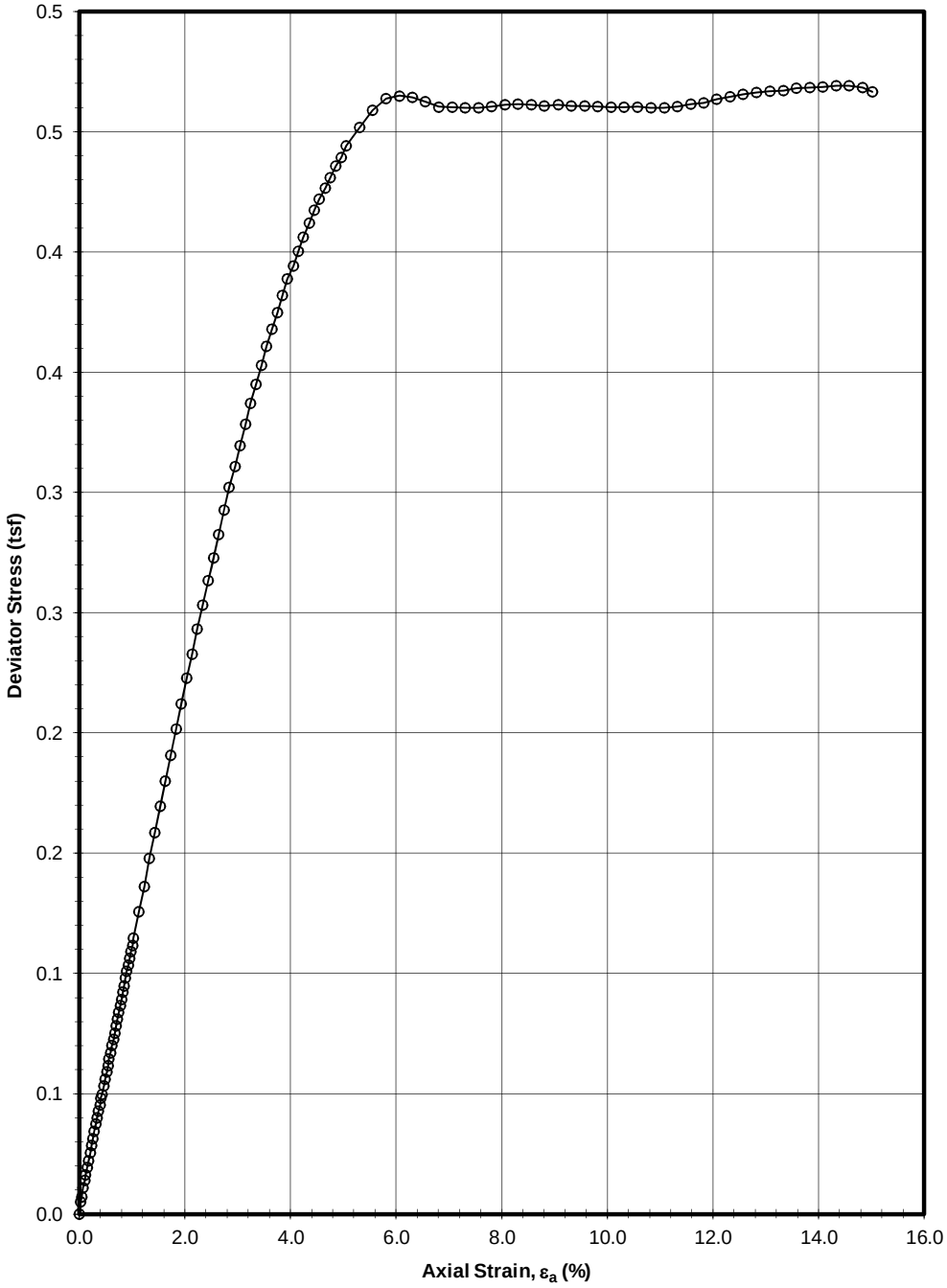
UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

ASTM D 2850

Project No.: J022562.01

Boring: B-2

Sample: ST-6 - Depth: 15 ft.



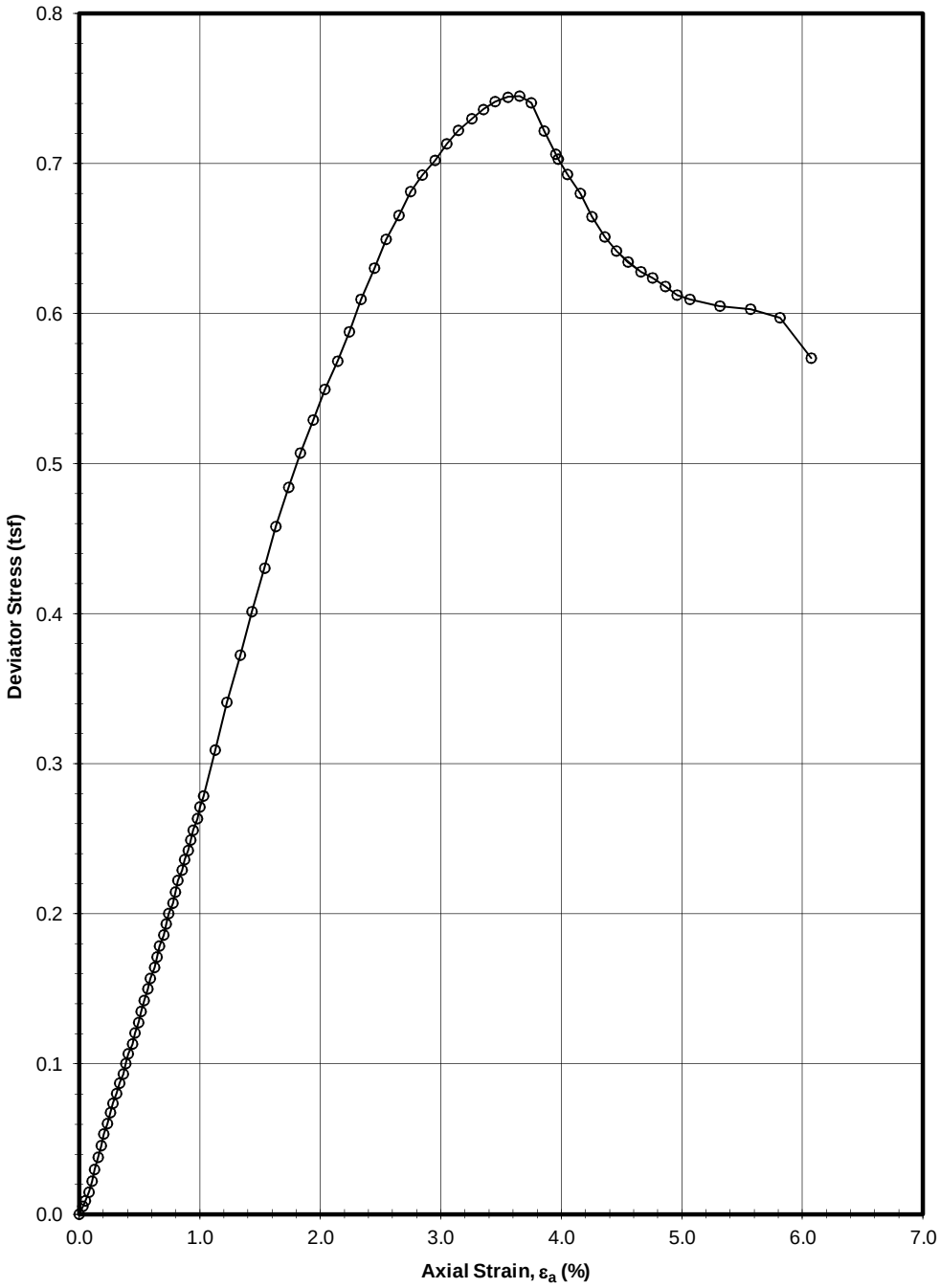
UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

ASTM D 2850

Project No.: J022562.01

Boring: B-4

Sample: ST-1 - Depth: 15 ft.



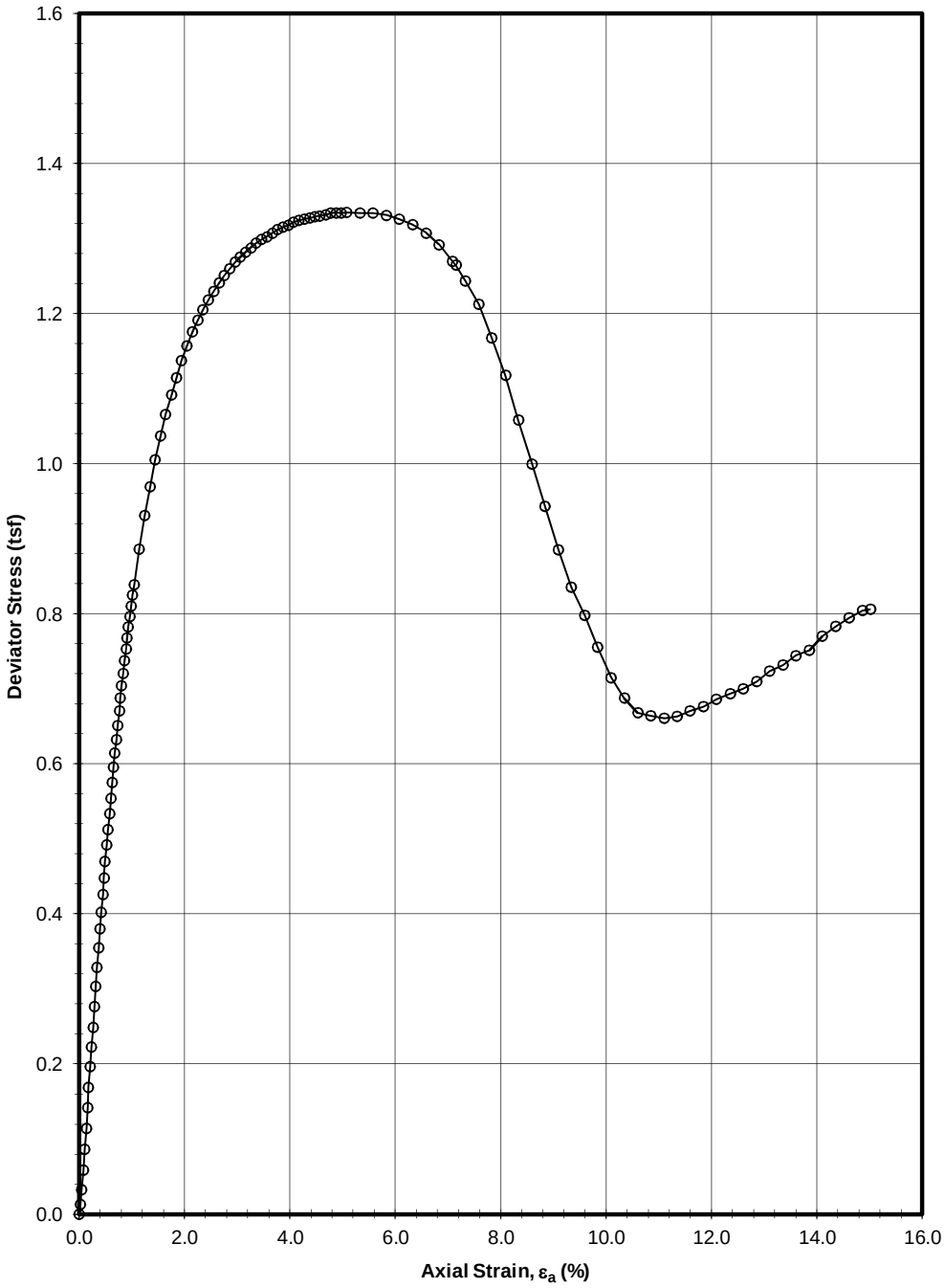
UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

ASTM D 2850

Project No.: J022562.01

Boring: B-9

Sample: ST - Depth: 15 ft.



UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

ASTM D 2850

Project No.: J022562.01

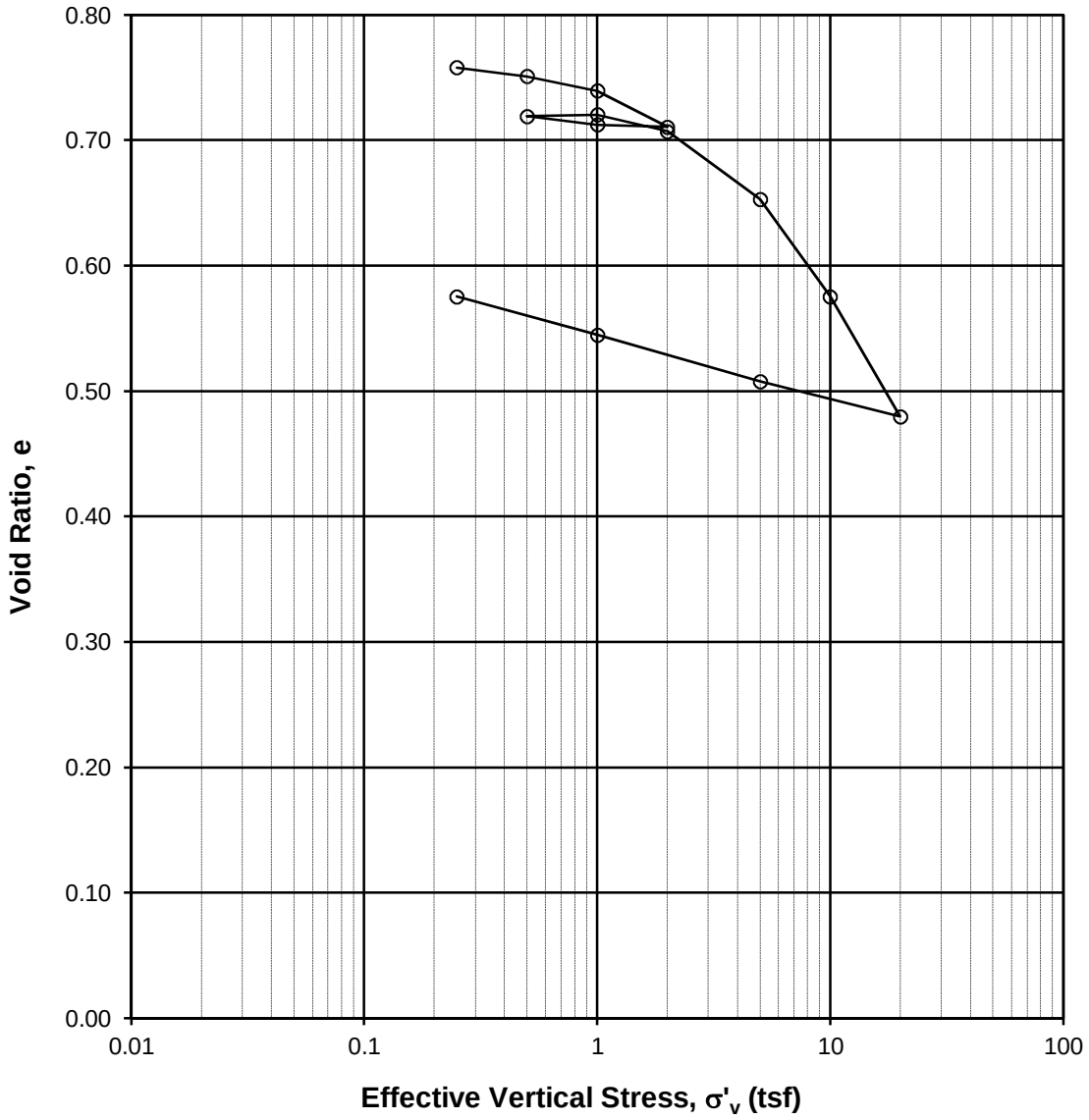
Boring: B-10

Sample: ST-4 - Depth: 8 ft.

GEOTECHNOLOGY INC
FROM THE GROUND UP

Liquid Limit=	74	Plastic Limit=	27	Plastic Index =	47	USCS:	CH

Compression Index, C_c =	0.32	Void Ratio, e_o =	0.76
Recompression Index, C_r =	0.05	Preconsolidation Pressure =	3 tsf



1-D CONSOLIDATION TEST: INCREMENTAL

ASTM D 2435

Project No.: J022562.01

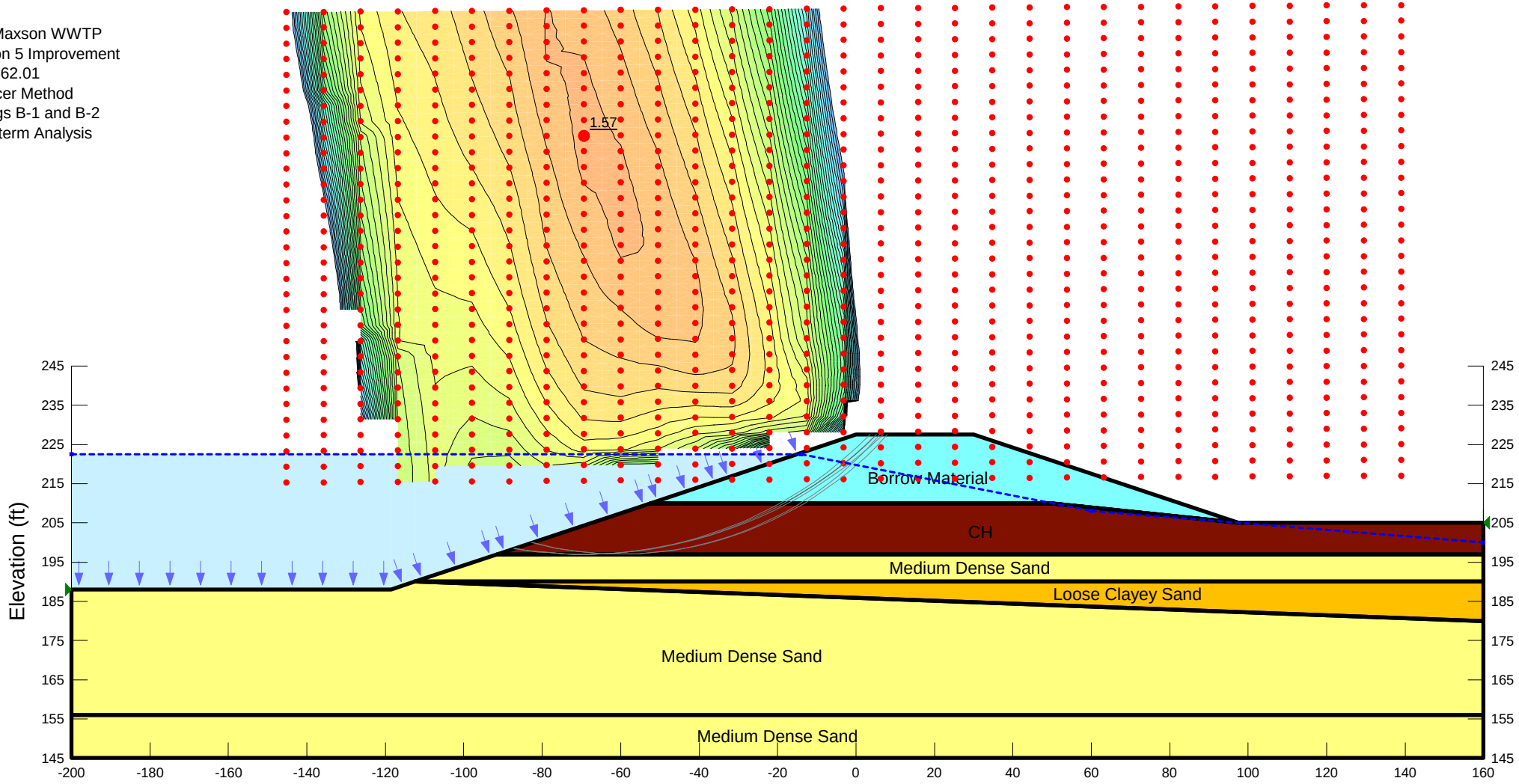
Boring: B-3

Sample: ST-3 - Depth: 6

APPENDIX D

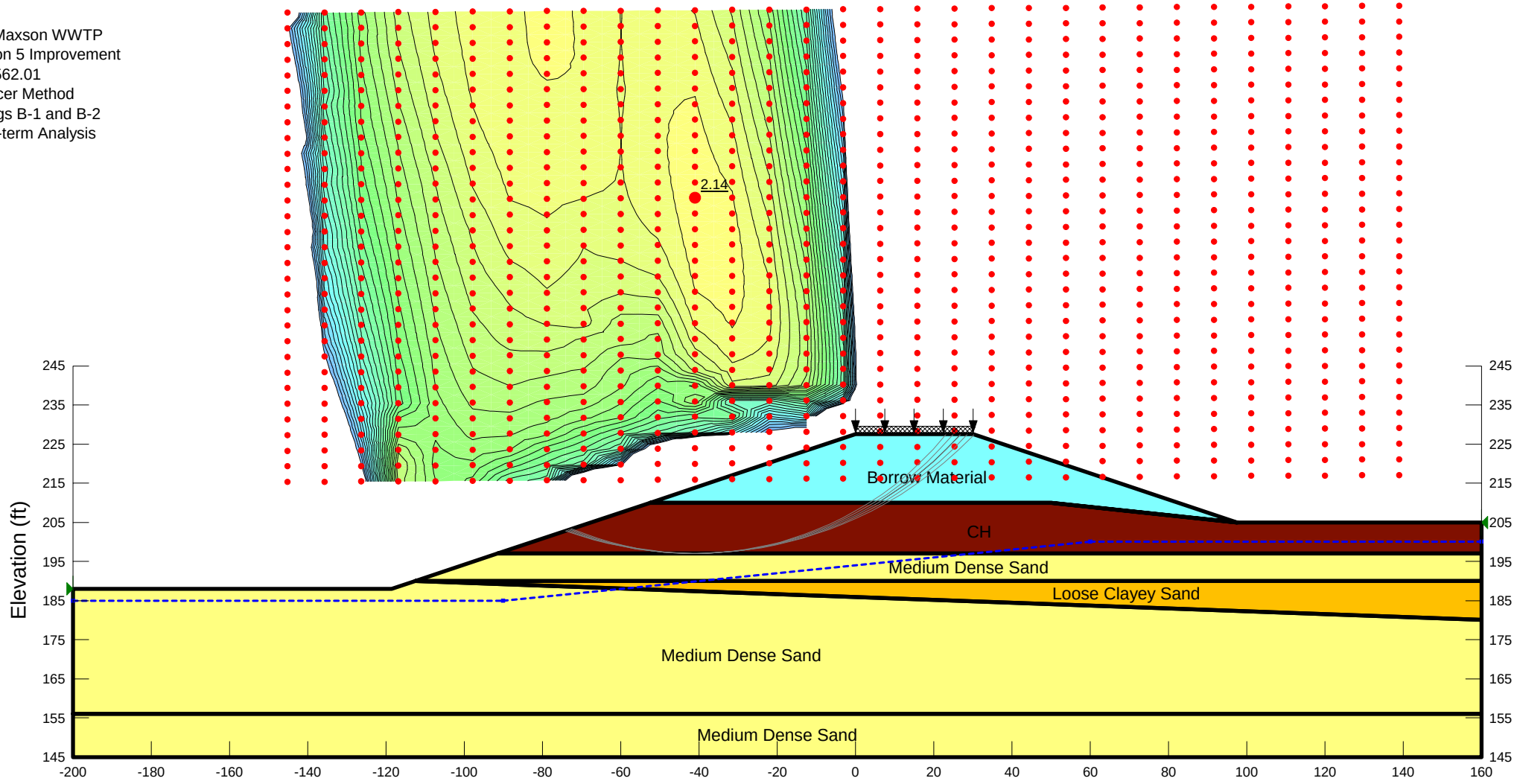
SLOPE STABILITY ANALYSIS RESULTS

T.E. Maxson WWTP
Lagoon 5 Improvement
J022562.01
Spencer Method
Borings B-1 and B-2
Long-term Analysis



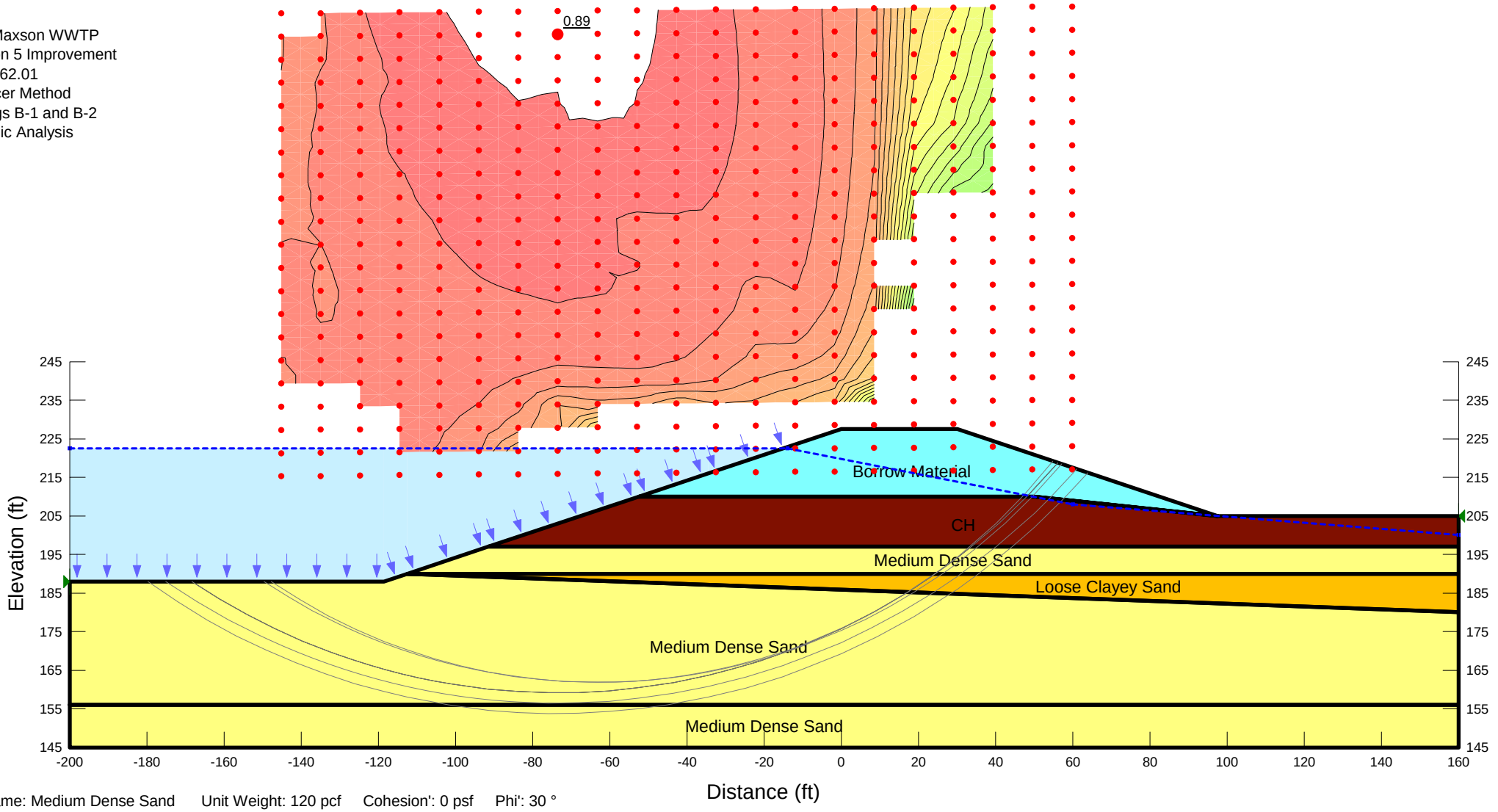
Name: Medium Dense Sand Unit Weight: 120 pcf Cohesion': 0 psf Phi': 34 °
Name: Borrow Material Unit Weight: 120 pcf Cohesion': 50 psf Phi': 26 °
Name: CH Unit Weight: 116 pcf Cohesion': 50 psf Phi': 20 °
Name: Loose Clayey Sand Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °

T.E. Maxson WWTP
Lagoon 5 Improvement
J022562.01
Spencer Method
Borings B-1 and B-2
Short-term Analysis



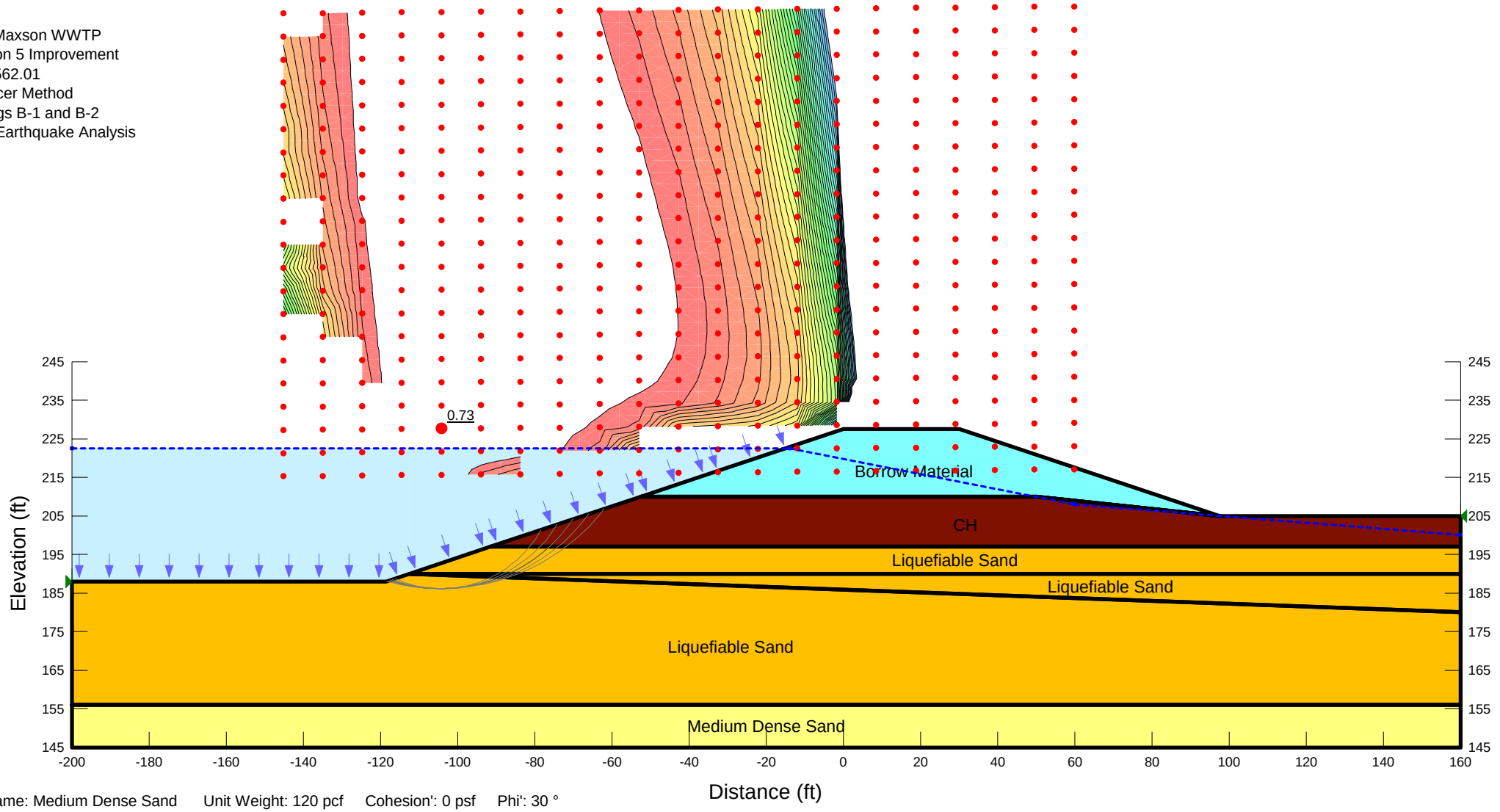
Name: Medium Dense Sand Unit Weight: 120 pcf Cohesion': 0 psf Phi': 34 °
Name: Borrow Material Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 0 °
Name: CH Unit Weight: 116 pcf Cohesion': 800 psf Phi': 0 °
Name: Loose Clayey Sand Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °

T.E. Maxson WWTP
Lagoon 5 Improvement
J022562.01
Spencer Method
Borings B-1 and B-2
Seismic Analysis



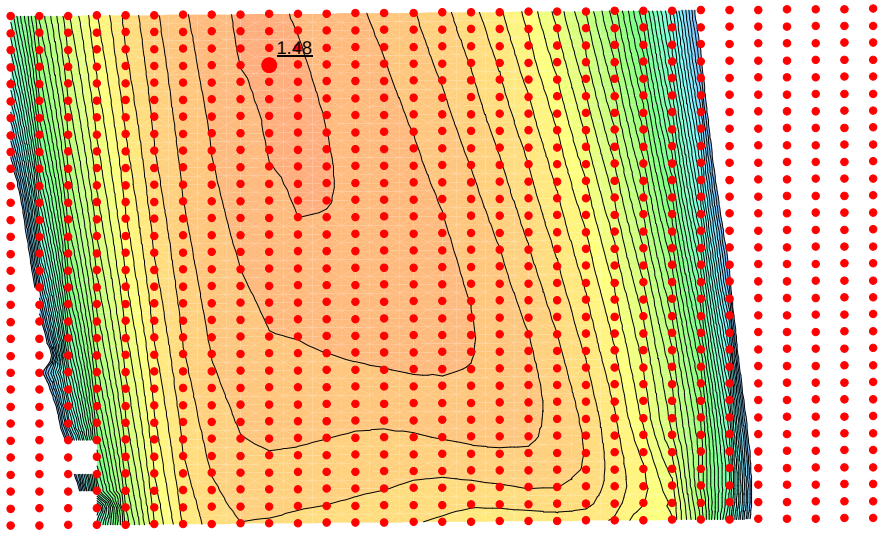
Name: Medium Dense Sand Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
Name: Borrow Material Unit Weight: 120 pcf Cohesion': 850 psf Phi': 0 °
Name: CH Unit Weight: 116 pcf Cohesion': 640 psf Phi': 0 °
Name: Loose Clayey Sand Unit Weight: 120 pcf Cohesion': 0 psf Phi': 24 °

T.E. Maxson WWTP
Lagoon 5 Improvement
J022562.01
Spencer Method
Borings B-1 and B-2
Post Earthquake Analysis

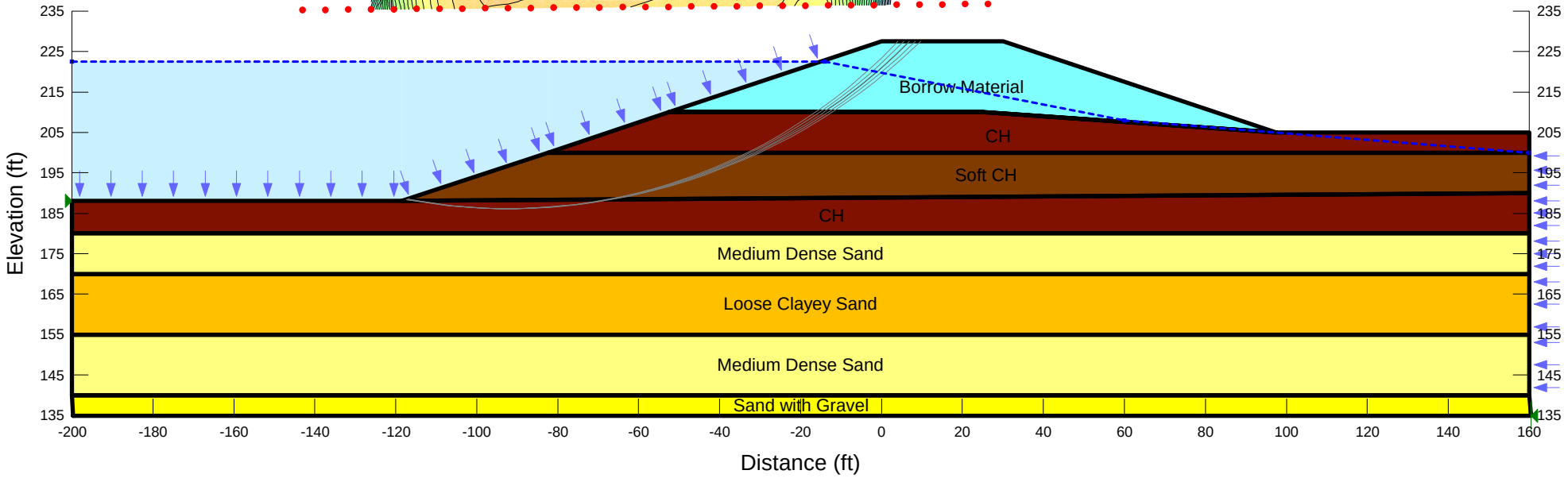


Name: Medium Dense Sand Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
Name: Borrow Material Unit Weight: 120 pcf Cohesion': 40 psf Phi': 22 °
Name: CH Unit Weight: 116 pcf Cohesion': 40 psf Phi': 16 °
Name: Liquefiable Sand Unit Weight: 120 pcf Cohesion': 0 psf Phi': 10 °

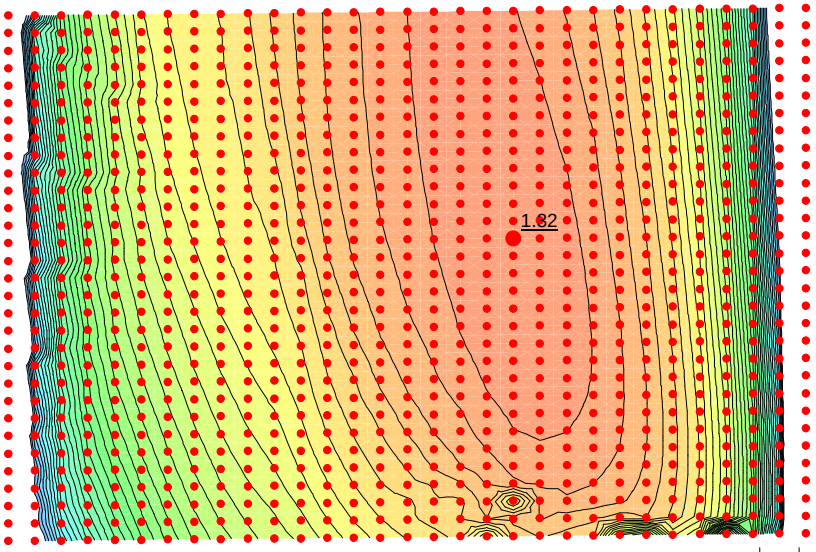
T.E. Maxson WWTP
Lagoon 5 Improvement
J022562.01
Spencer Method
Borings B-3 and TH-14
Long-term Analysis



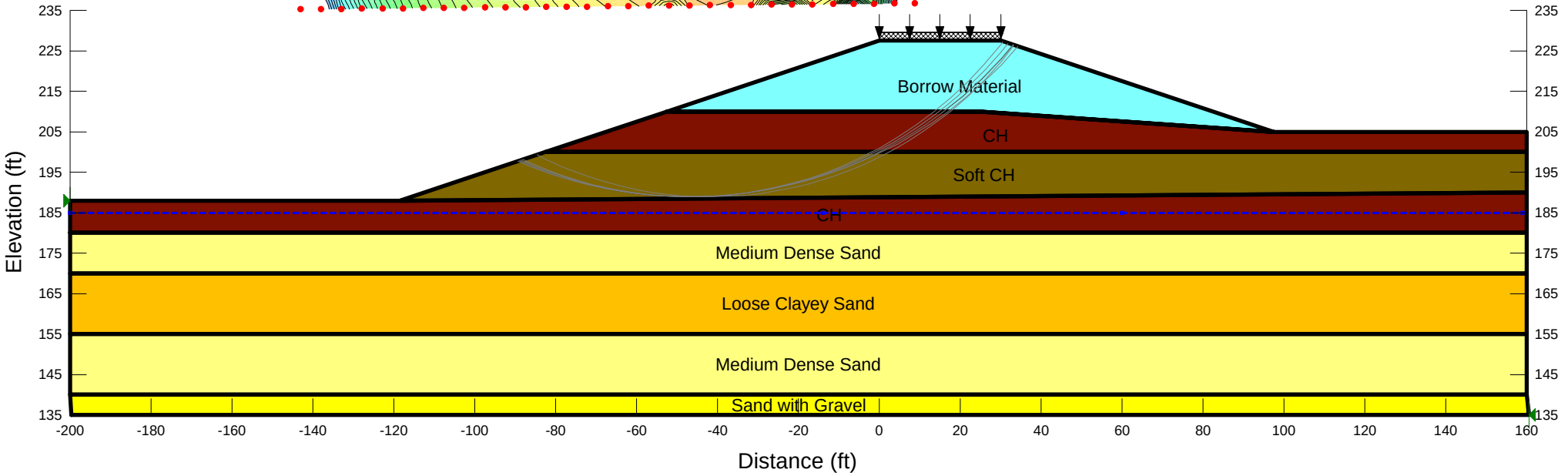
Name: Medium Dense Sand Unit Weight: 120 pcf Cohesion': 0 psf Phi': 34 °
Name: Borrow Material Unit Weight: 120 pcf Cohesion': 50 psf Phi': 26 °
Name: CH Unit Weight: 116 pcf Cohesion': 50 psf Phi': 20 °
Name: Loose Clayey Sand Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 °
Name: Sand with Gravel Unit Weight: 120 pcf Cohesion': 0 psf Phi': 34 °
Name: Soft CH Unit Weight: 116 pcf Cohesion': 50 psf Phi': 20 °



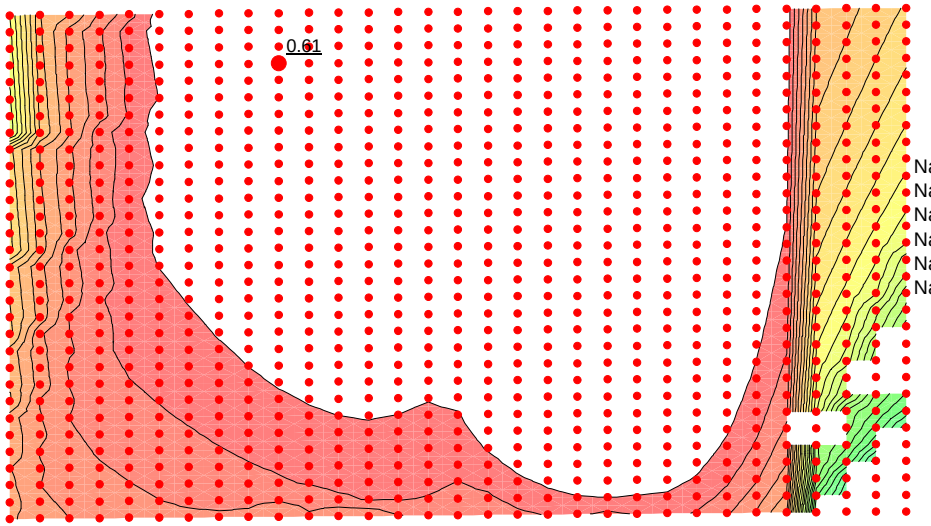
T.E. Maxson WWTP
Lagoon 5 Improvement
J022562.01
Spencer Method
Borings B-3 and TH-14
Short-term Analysis



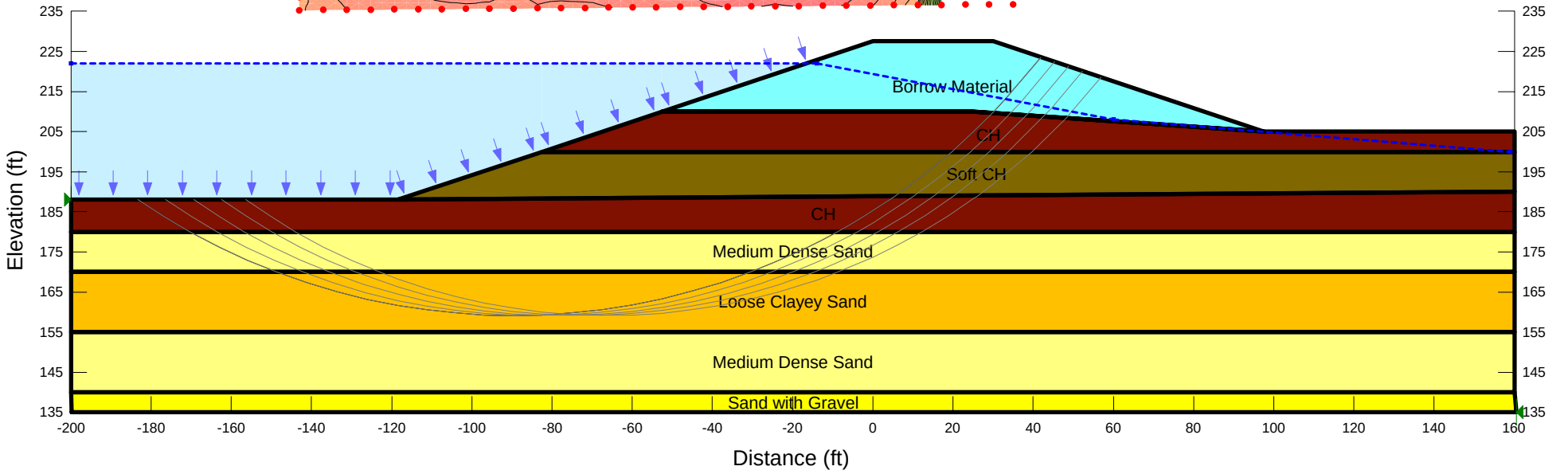
Name: Medium Dense Sand Unit Weight: 120 pcf Cohesion': 0 psf Phi': 34 °
Name: Borrow Material Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 0 °
Name: CH Unit Weight: 116 pcf Cohesion': 900 psf Phi': 0 °
Name: Loose Clayey Sand Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
Name: Sand with Gravel Unit Weight: 120 pcf Cohesion': 0 psf Phi': 34 °
Name: Soft CH Unit Weight: 116 pcf Cohesion': 500 psf Phi': 0 °



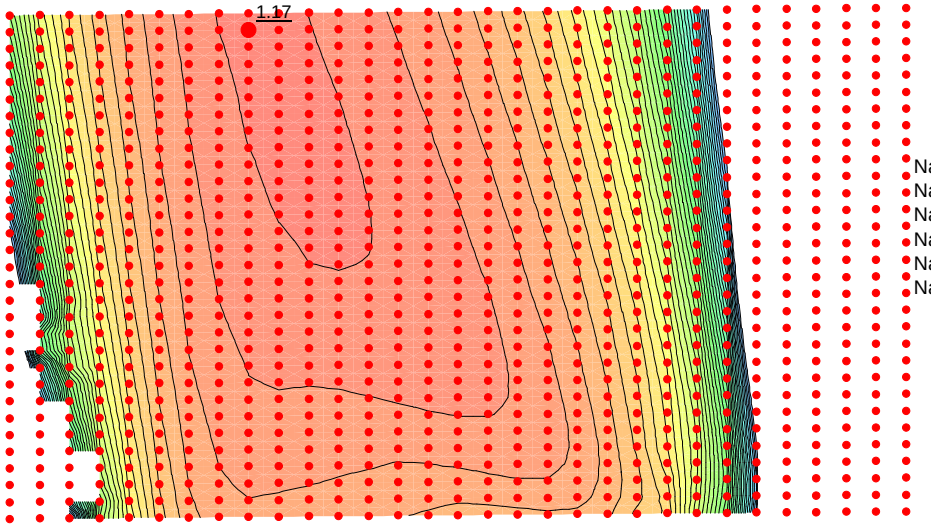
T.E. Maxson WWTP
Lagoon 5 Improvement
J022562.01
Spencer Method
Borings B-3 and TH-14
Seismic Analysis



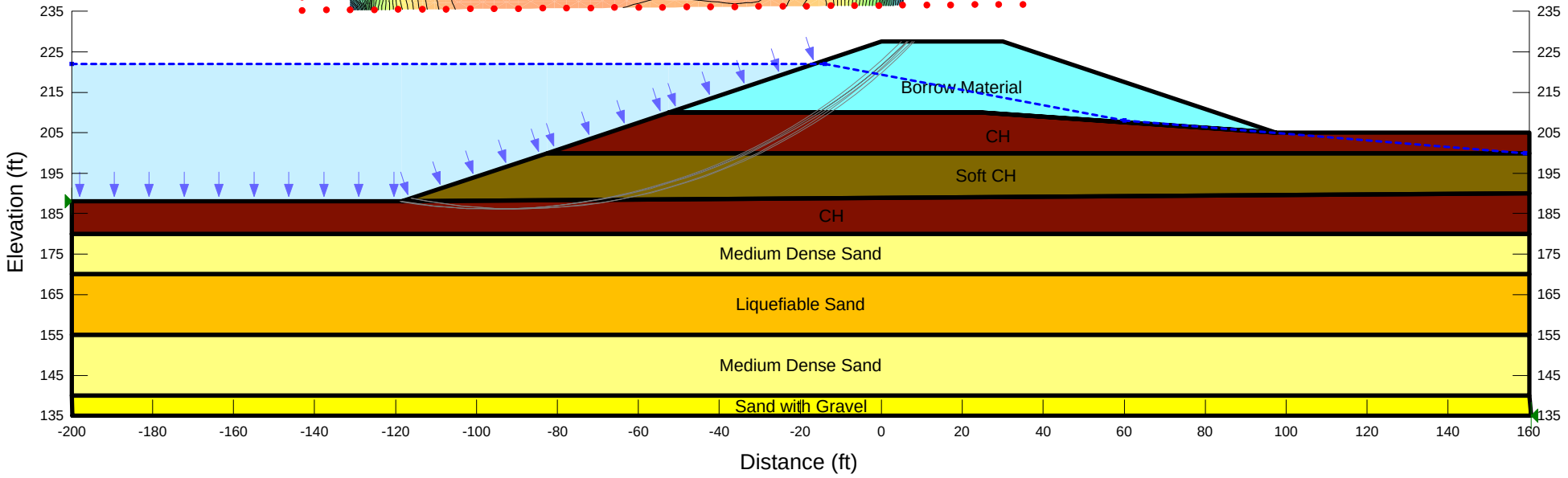
Name: Medium Dense Sand Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
Name: Borrow Material Unit Weight: 120 pcf Cohesion': 850 psf Phi': 0 °
Name: CH Unit Weight: 116 pcf Cohesion': 765 psf Phi': 0 °
Name: Loose Clayey Sand Unit Weight: 120 pcf Cohesion': 0 psf Phi': 24 °
Name: Sand with Gravel Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
Name: Soft CH Unit Weight: 116 pcf Cohesion': 425 psf Phi': 0 °



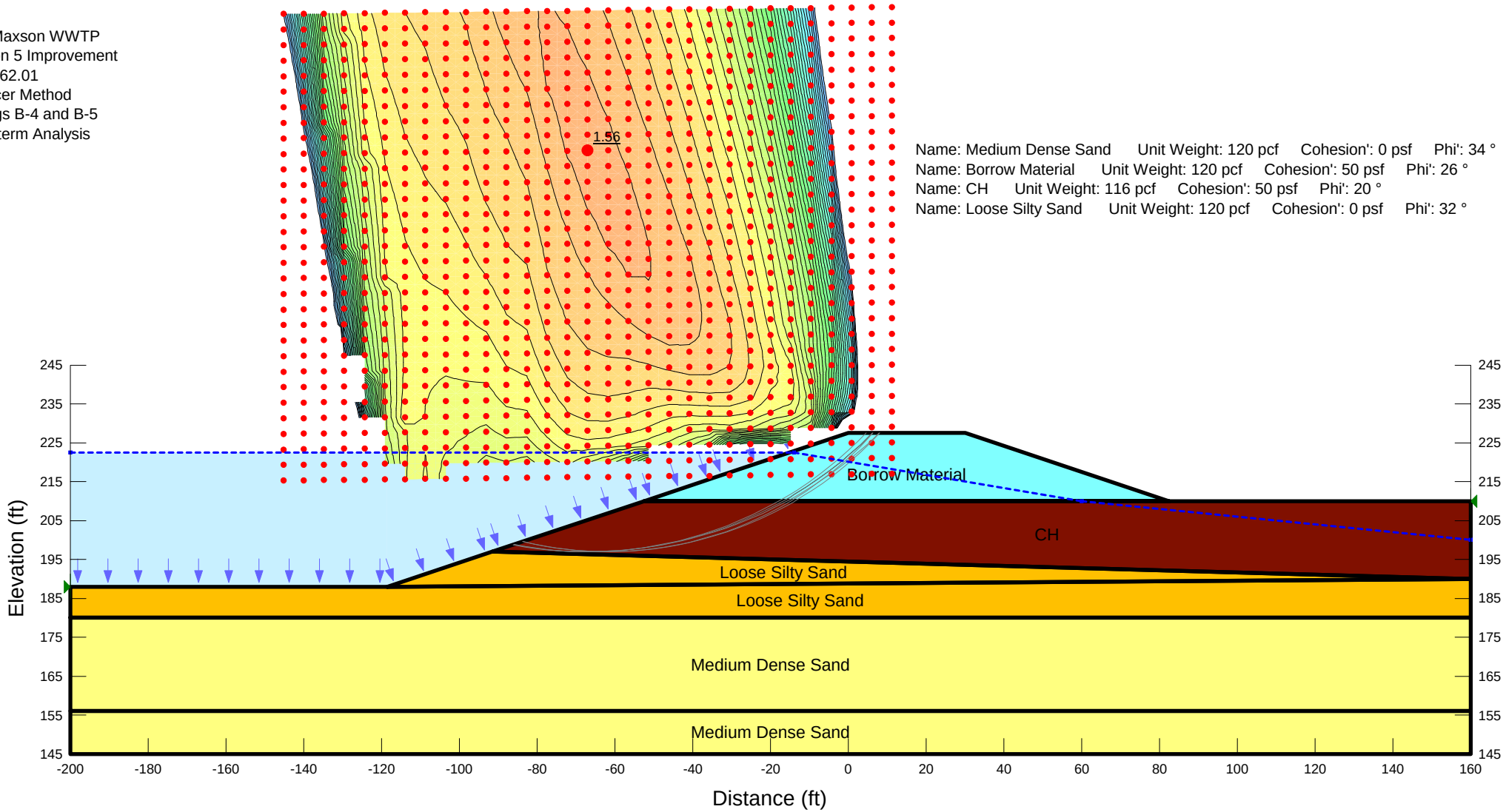
T.E. Maxson WWTP
Lagoon 5 Improvement
J022562.01
Spencer Method
Borings B-3 and TH-14
Post Earthquake Analysis



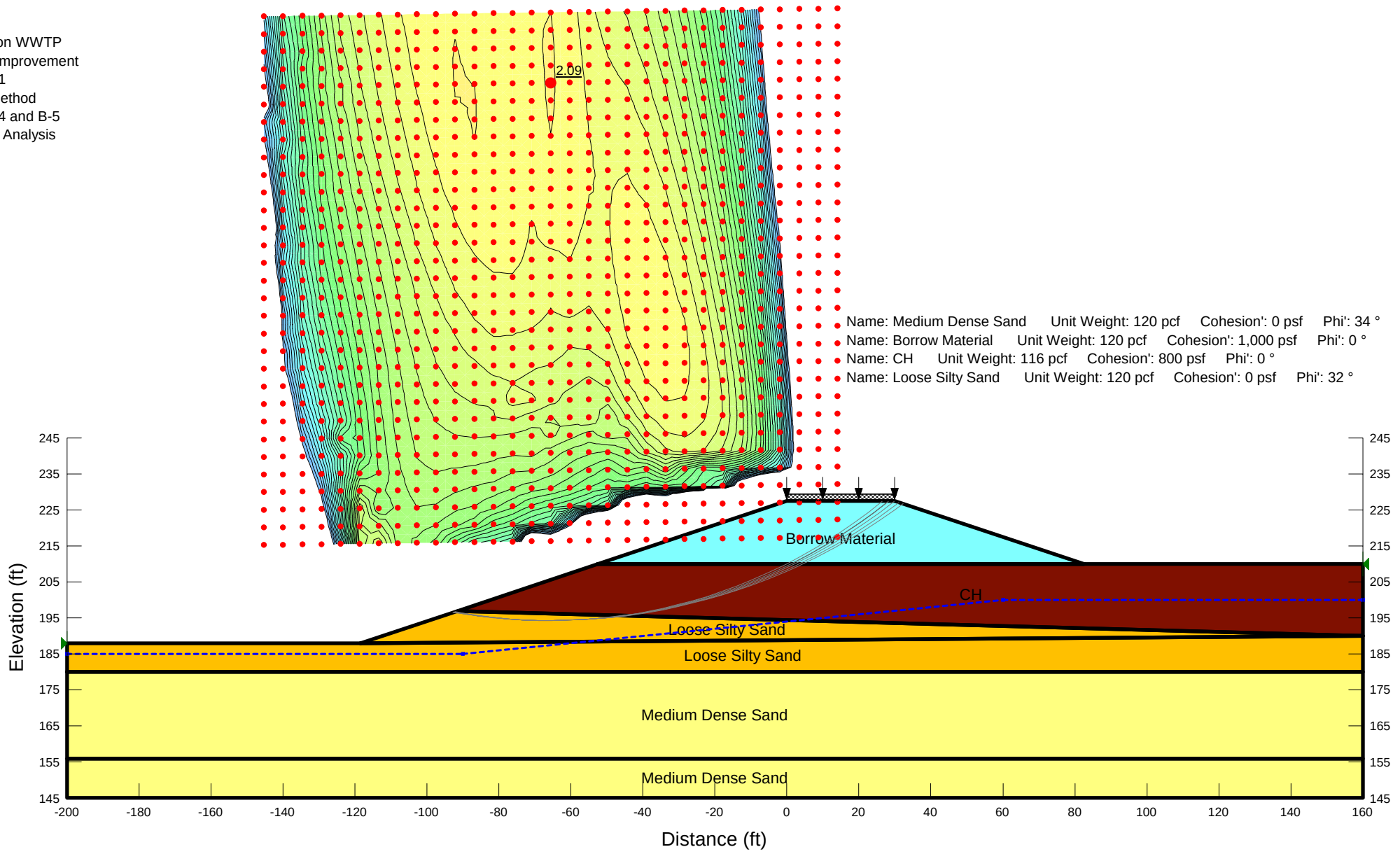
Name: Medium Dense Sand Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
Name: Borrow Material Unit Weight: 120 pcf Cohesion': 40 psf Phi': 22 °
Name: CH Unit Weight: 116 pcf Cohesion': 40 psf Phi': 16 °
Name: Liquefiable Sand Unit Weight: 120 pcf Cohesion': 0 psf Phi': 10 °
Name: Sand with Gravel Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
Name: Soft CH Unit Weight: 116 pcf Cohesion': 40 psf Phi': 16 °



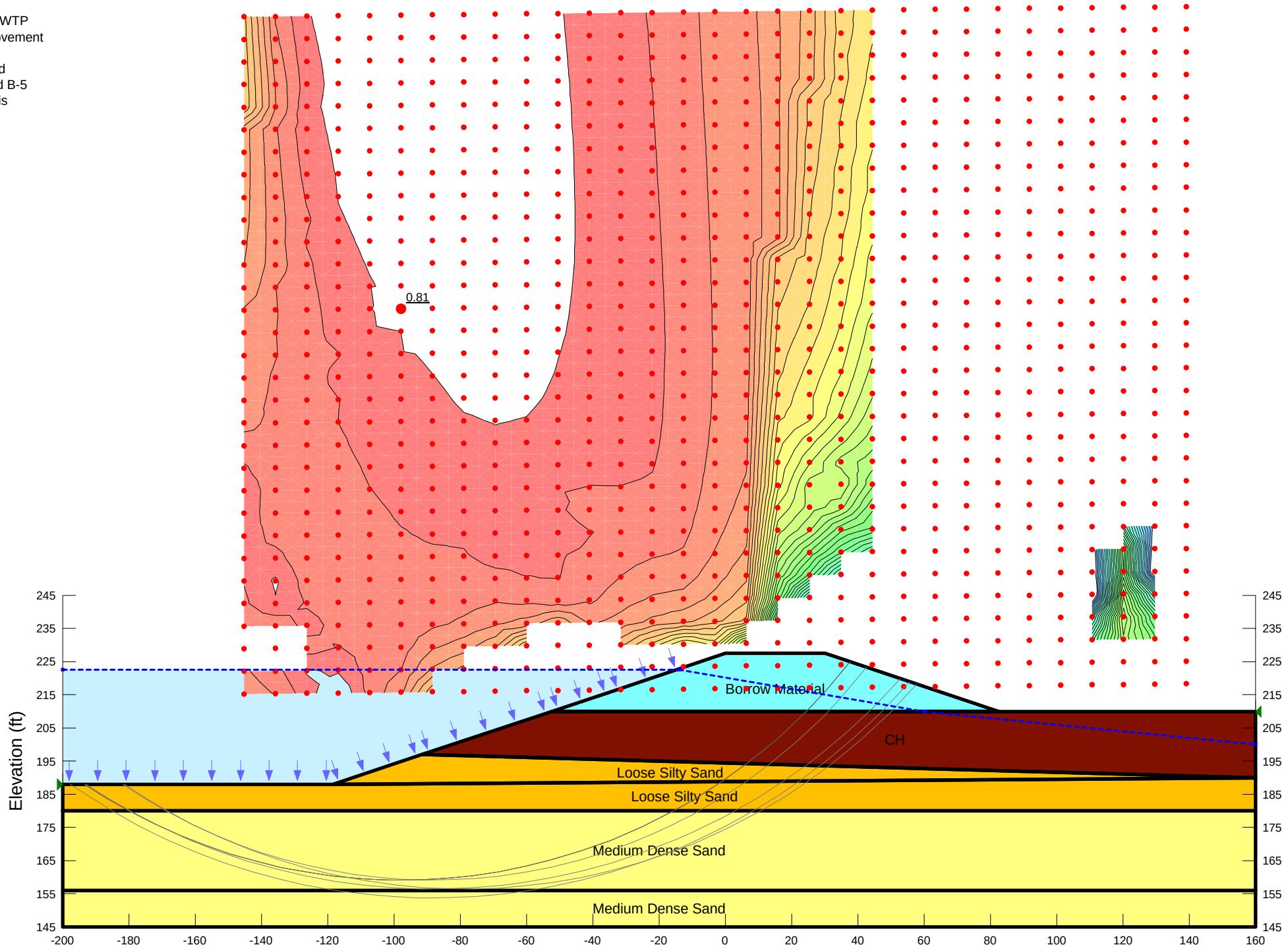
T.E. Maxson WWTP
Lagoon 5 Improvement
J022562.01
Spencer Method
Borings B-4 and B-5
Long-term Analysis



T.E. Maxson WWTP
Lagoon 5 Improvement
J022562.01
Spencer Method
Borings B-4 and B-5
Short-term Analysis

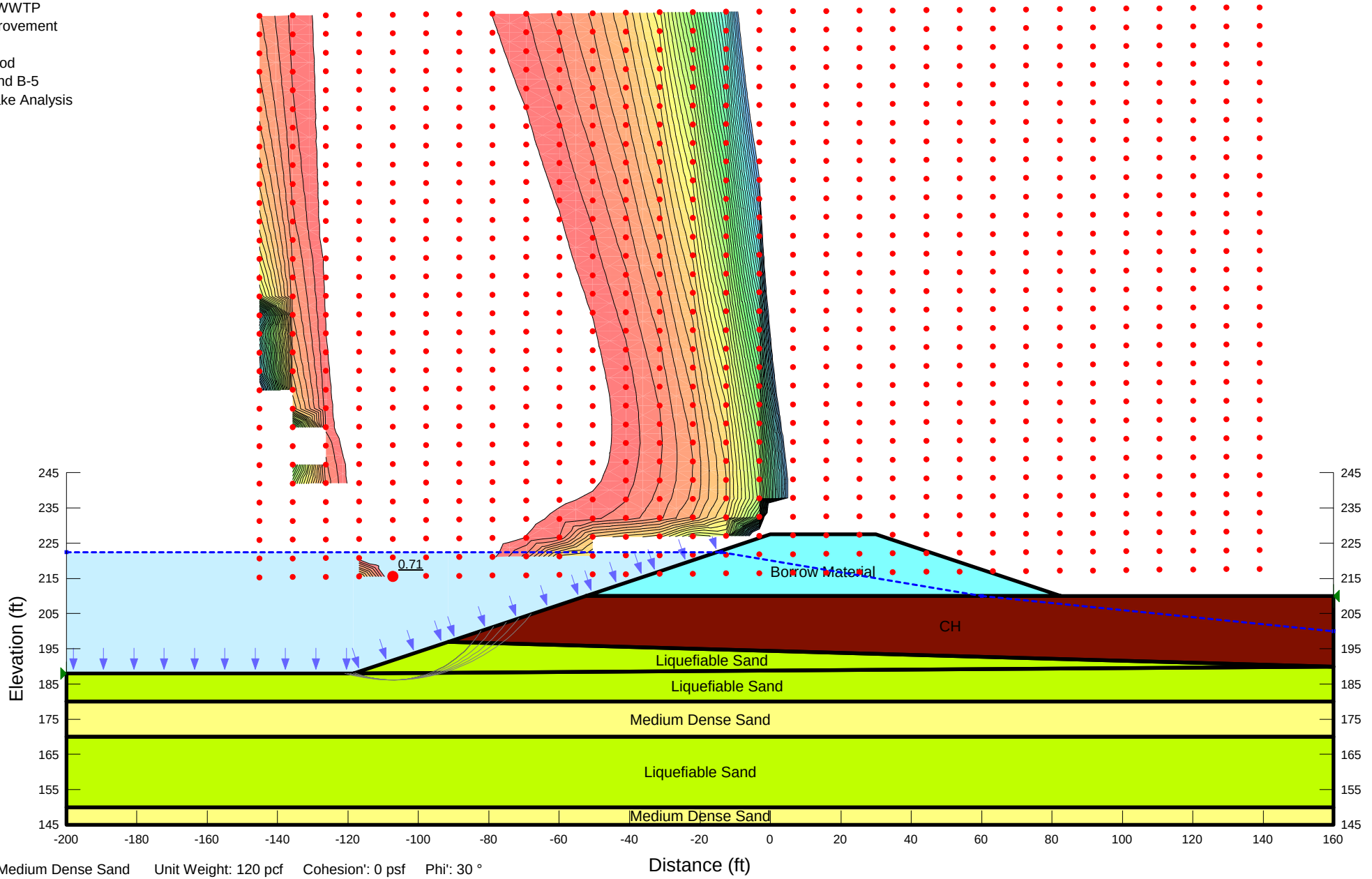


T.E. Maxson WWTP
Lagoon 5 Improvement
J022562.01
Spencer Method
Borings B-4 and B-5
Seismic Analysis



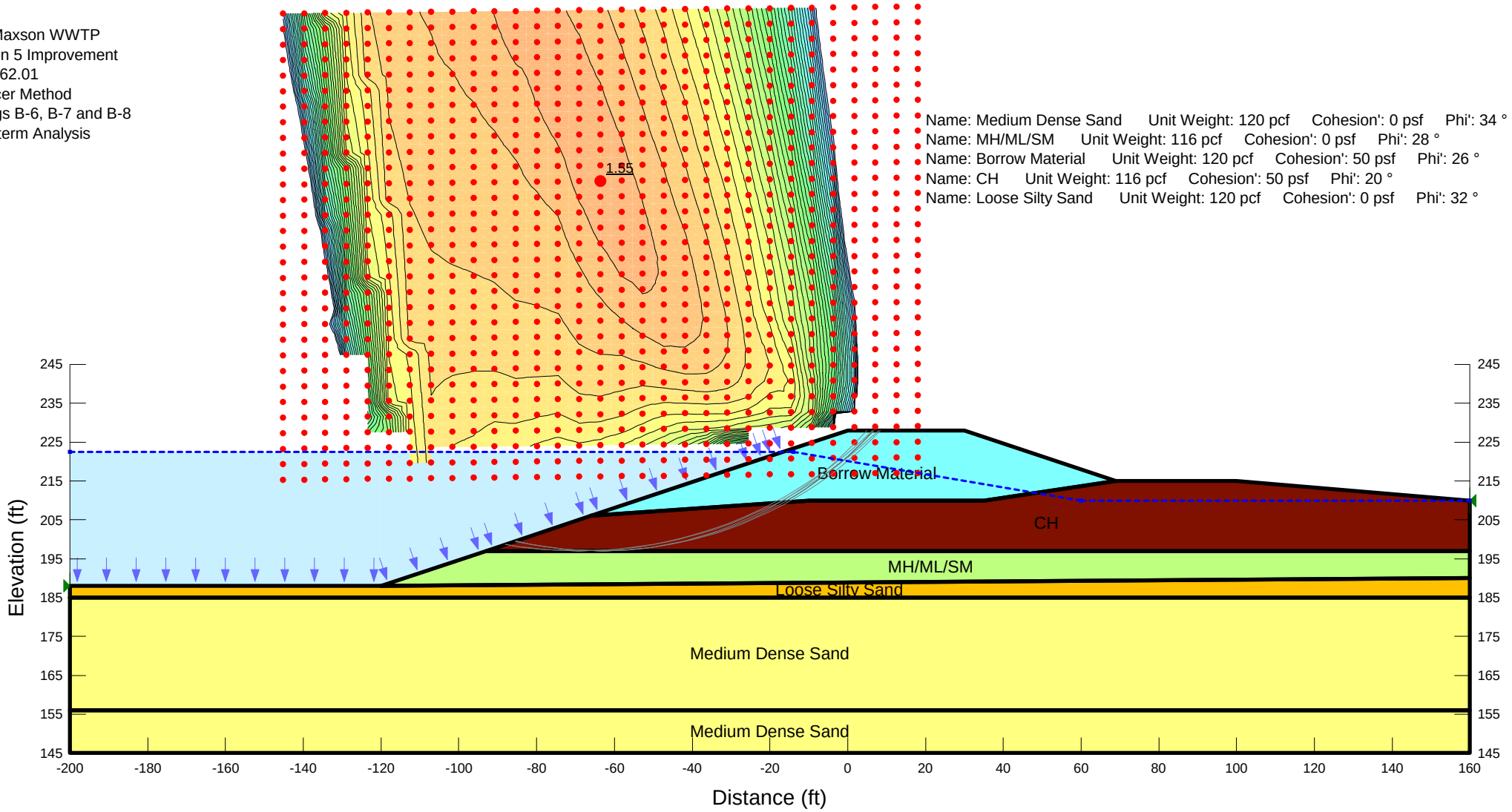
Name: Medium Dense Sand Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
Name: Borrow Material Unit Weight: 120 pcf Cohesion': 850 psf Phi': 0 °
Name: CH Unit Weight: 116 pcf Cohesion': 640 psf Phi': 0 °
Name: Loose Silty Sand Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °

T.E. Maxson WWTP
Lagoon 5 Improvement
J022562.01
Spencer Method
Borings B-4 and B-5
Post Earthquake Analysis

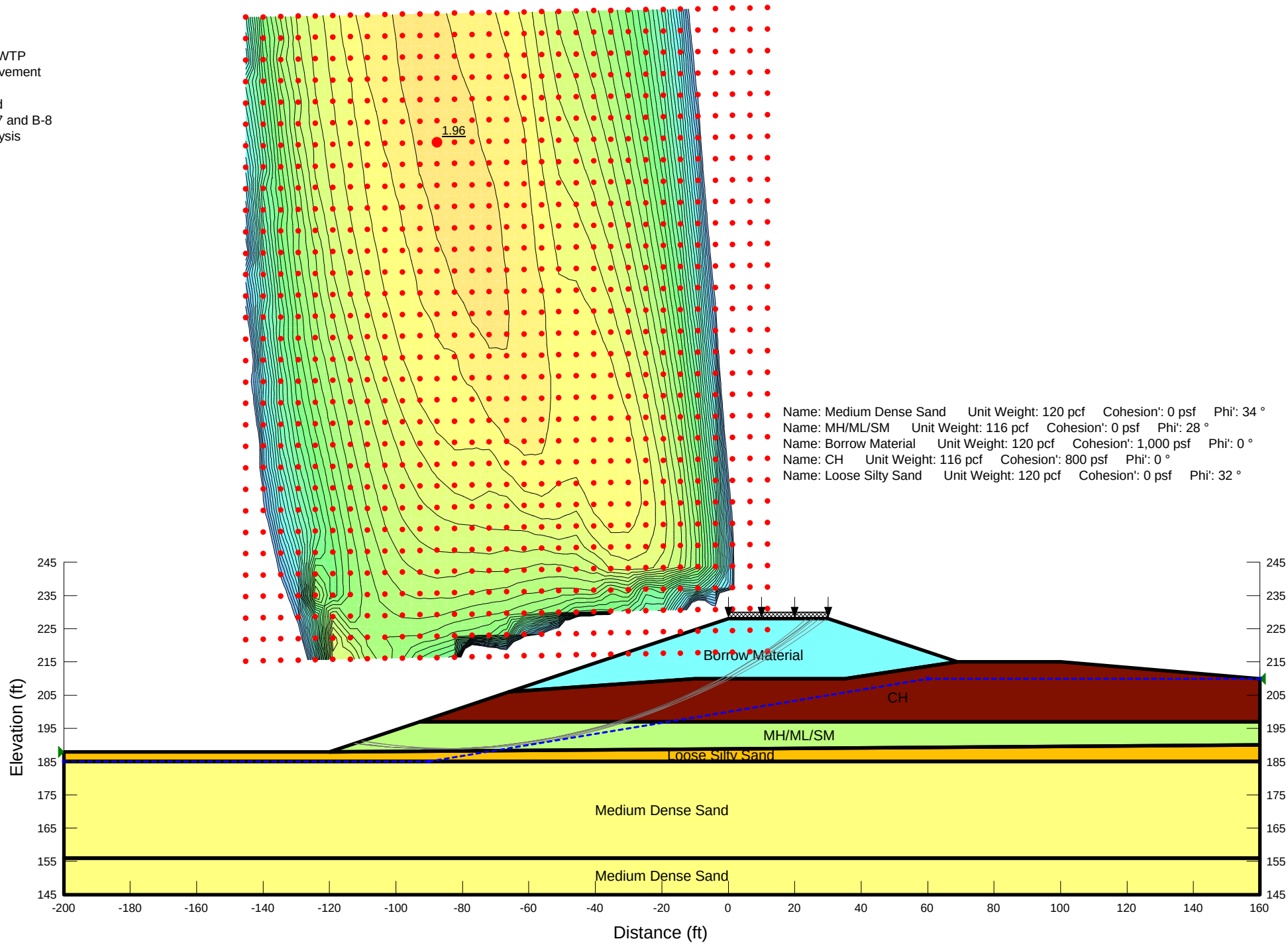


Name: Medium Dense Sand Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
Name: Borrow Material Unit Weight: 120 pcf Cohesion': 40 psf Phi': 22 °
Name: CH Unit Weight: 116 pcf Cohesion': 40 psf Phi': 16 °
Name: Liquefiable Sand Unit Weight: 120 pcf Cohesion': 0 psf Phi': 10 °

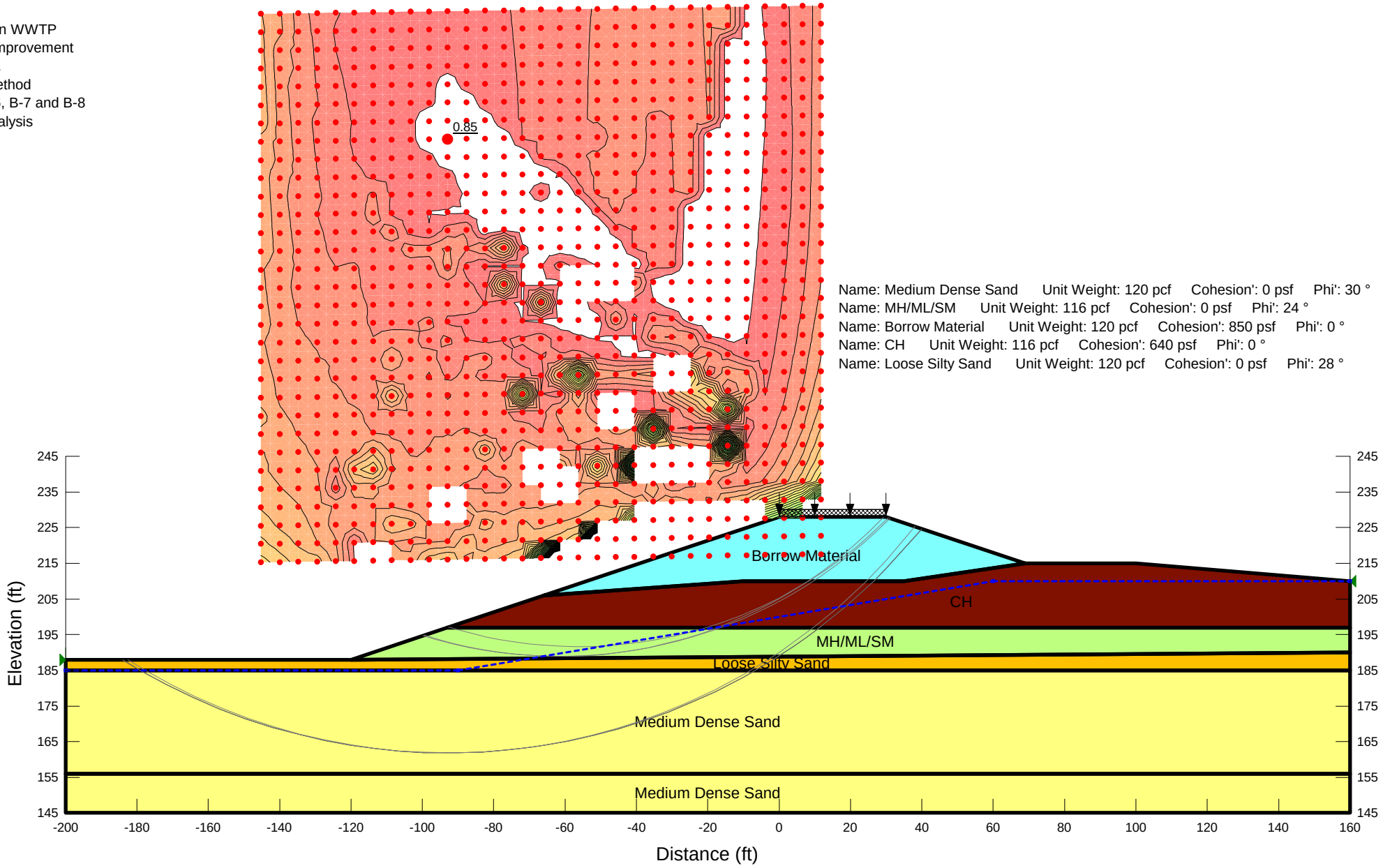
T.E. Maxson WWTP
Lagoon 5 Improvement
J022562.01
Spencer Method
Borings B-6, B-7 and B-8
Long-term Analysis



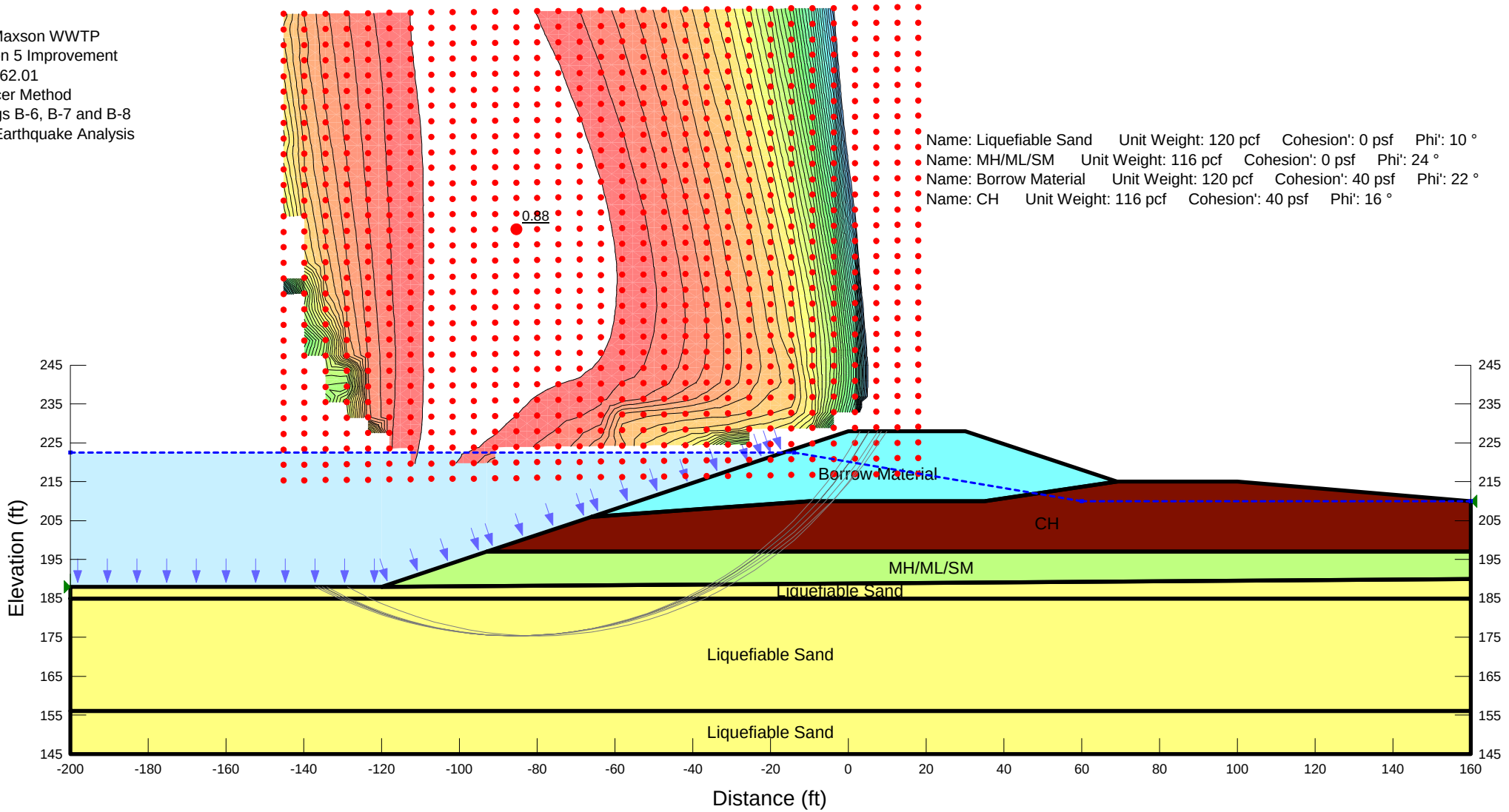
T.E. Maxson WWTP
Lagoon 5 Improvement
J022562.01
Spencer Method
Borings B-6, B-7 and B-8
Short-term Analysis



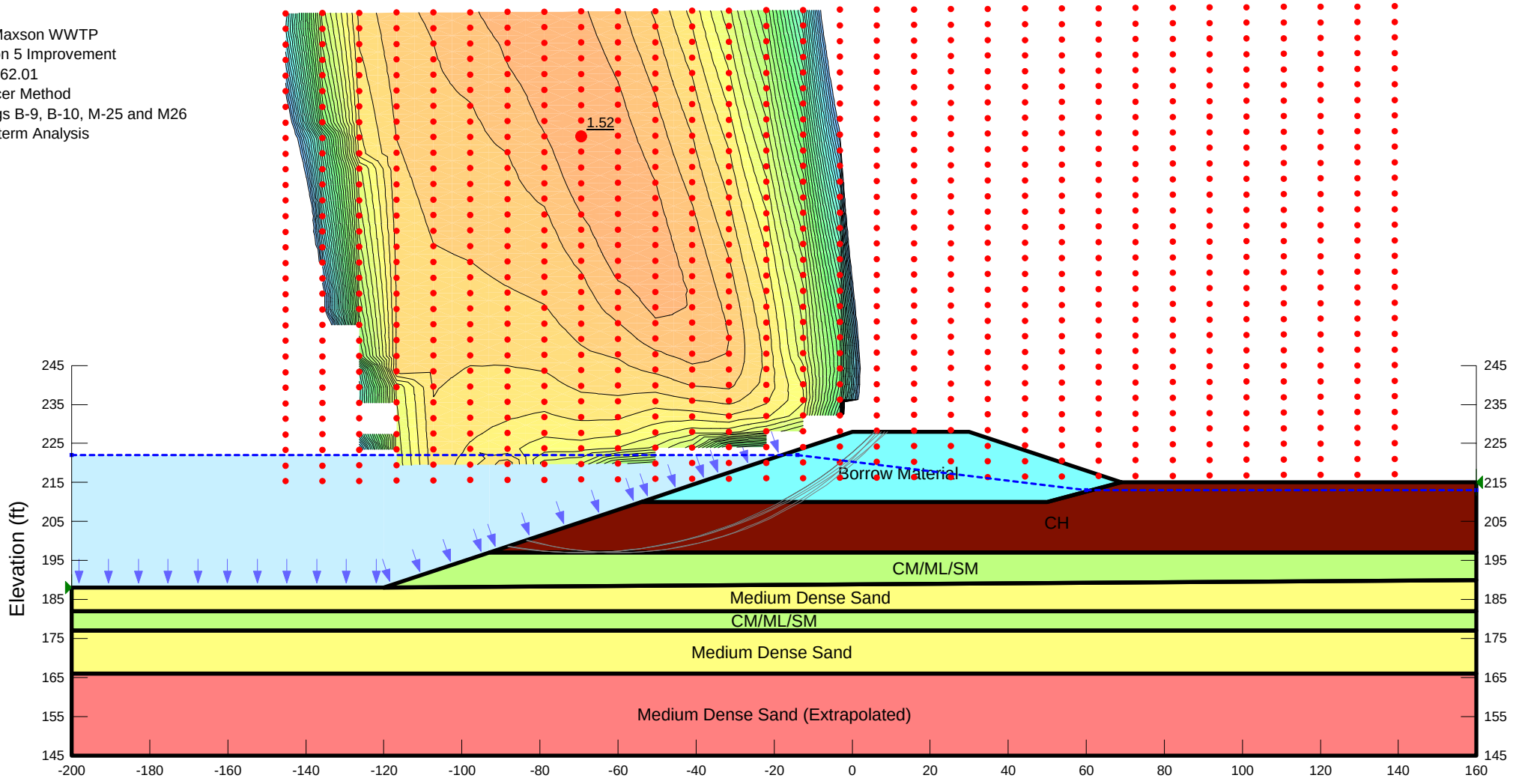
T.E. Maxson WWTP
Lagoon 5 Improvement
J022562.01
Spencer Method
Borings B-6, B-7 and B-8
Seismic Analysis



T.E. Maxson WWTP
Lagoon 5 Improvement
J022562.01
Spencer Method
Borings B-6, B-7 and B-8
Post Earthquake Analysis

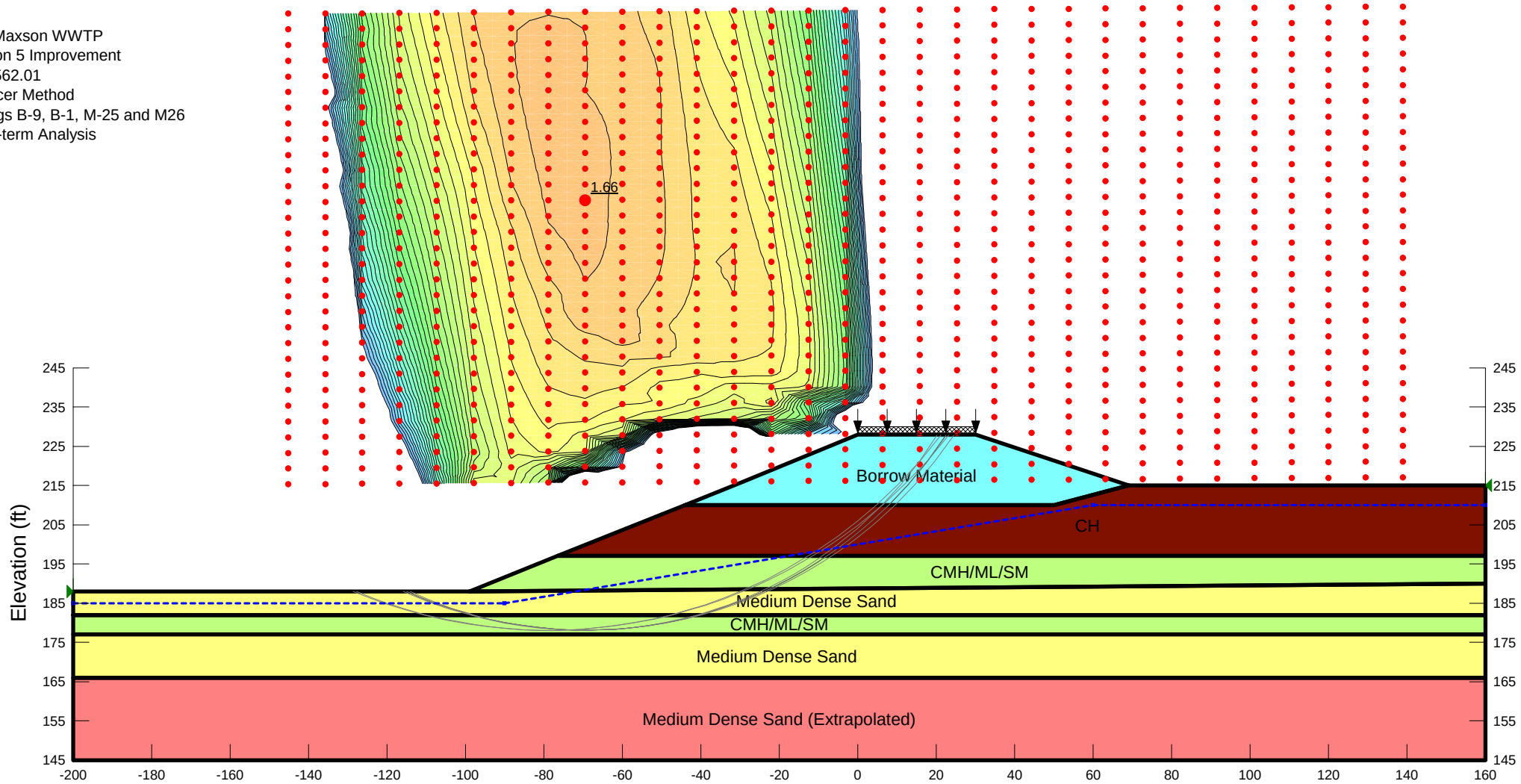


T.E. Maxson WWTP
Lagoon 5 Improvement
J022562.01
Spencer Method
Borings B-9, B-10, M-25 and M26
Long-term Analysis



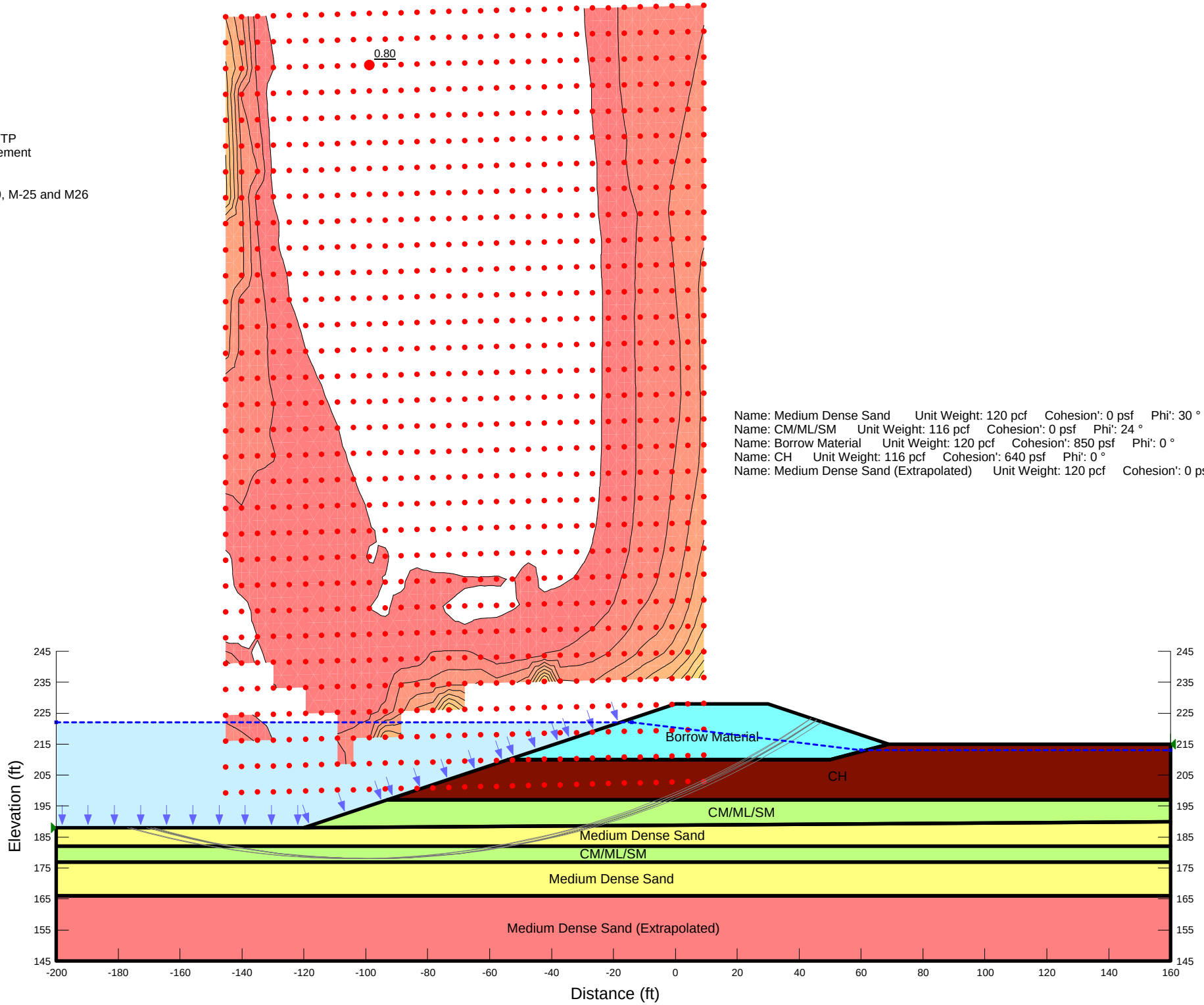
Name: Medium Dense Sand Unit Weight: 120 pcf Cohesion': 0 psf Phi': 34 °
Name: CM/ML/SM Unit Weight: 116 pcf Cohesion': 0 psf Phi': 28 °
Name: Borrow Material Unit Weight: 120 pcf Cohesion': 50 psf Phi': 26 °
Name: CH Unit Weight: 116 pcf Cohesion': 50 psf Phi': 20 °
Name: Medium Dense Sand (Extrapolated) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 34 °

T.E. Maxson WWTP
Lagoon 5 Improvement
J022562.01
Spencer Method
Borings B-9, B-1, M-25 and M26
Short-term Analysis



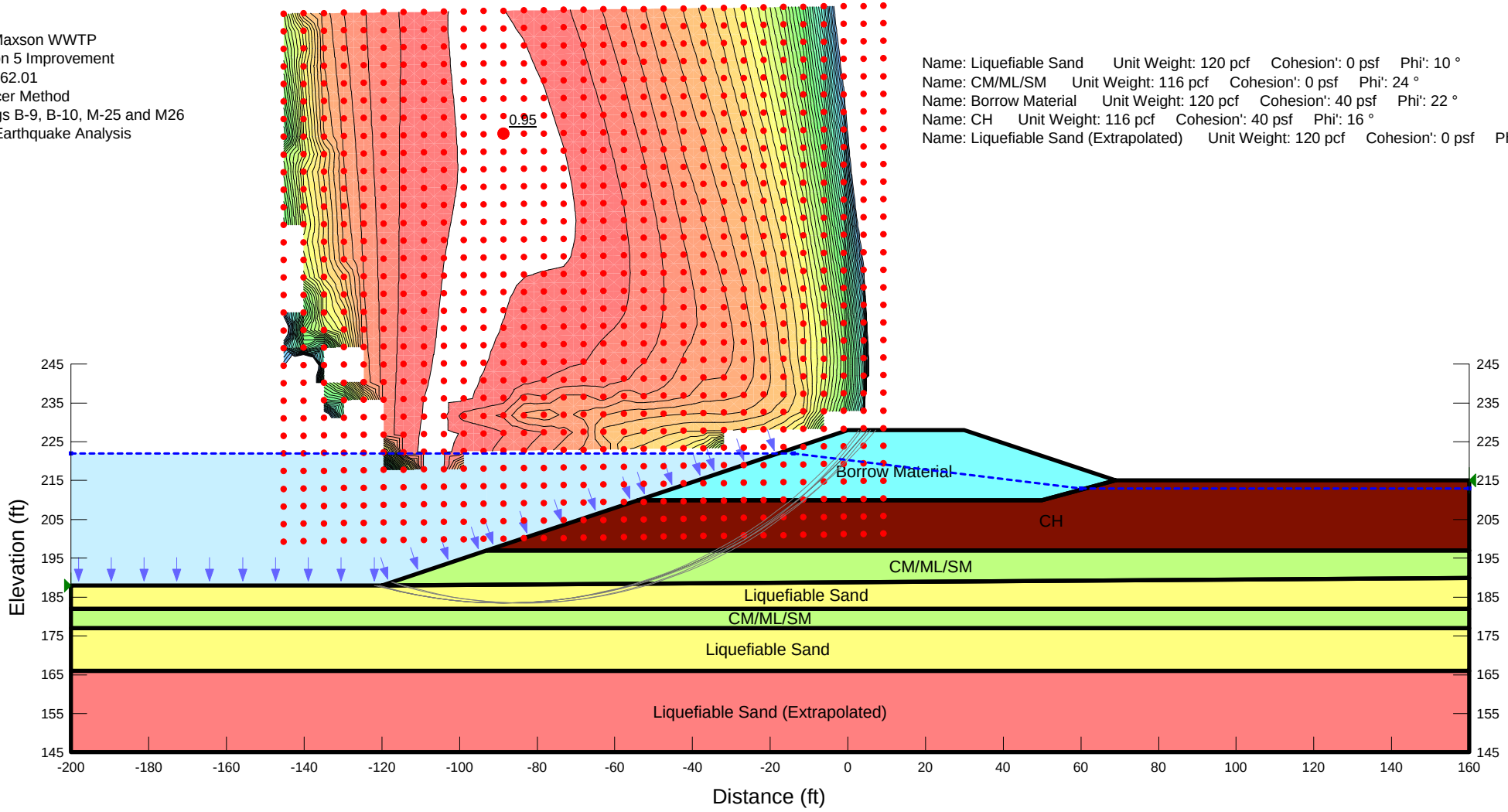
Name: Medium Dense Sand Unit Weight: 120 pcf Cohesion': 0 psf Phi': 34 °
Name: CMH/ML/SM Unit Weight: 116 pcf Cohesion': 0 psf Phi': 28 °
Name: Borrow Material Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 0 °
Name: CH Unit Weight: 116 pcf Cohesion': 800 psf Phi': 0 °
Name: Medium Dense Sand (Extrapolated) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 34 °

T.E. Maxson WWTP
Lagoon 5 Improvement
J022562.01
Spencer Method
Borings B-9, B-10, M-25 and M26
Seismic Analysis

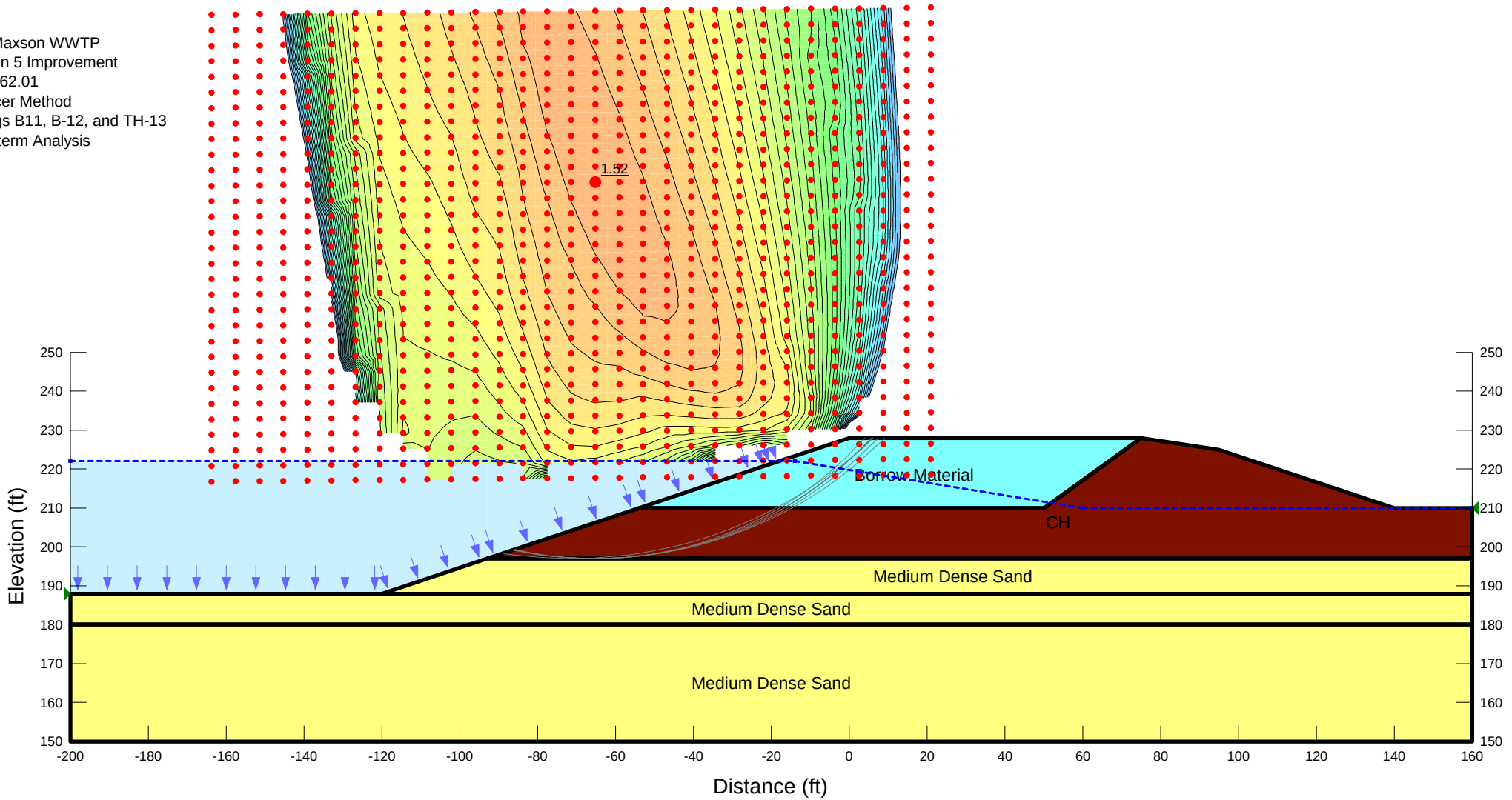


T.E. Maxson WWTP
Lagoon 5 Improvement
J022562.01
Spencer Method
Borings B-9, B-10, M-25 and M26
Post Earthquake Analysis

Name: Liquefiable Sand Unit Weight: 120 pcf Cohesion': 0 psf Phi': 10 °
Name: CM/ML/SM Unit Weight: 116 pcf Cohesion': 0 psf Phi': 24 °
Name: Borrow Material Unit Weight: 120 pcf Cohesion': 40 psf Phi': 22 °
Name: CH Unit Weight: 116 pcf Cohesion': 40 psf Phi': 16 °
Name: Liquefiable Sand (Extrapolated) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 10 °

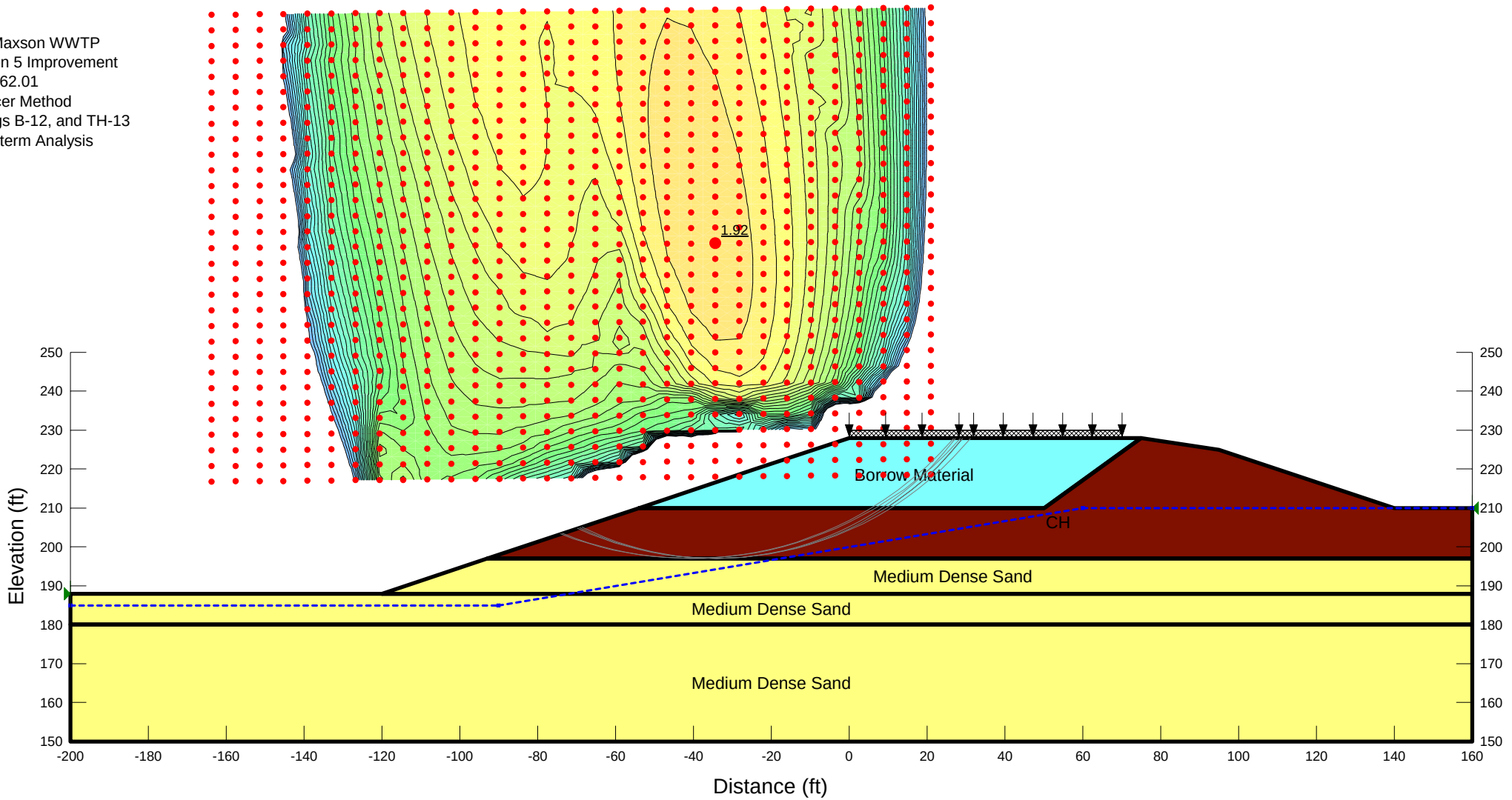


T.E. Maxson WWTP
Lagoon 5 Improvement
J022562.01
Spencer Method
Borings B11, B-12, and TH-13
Long-term Analysis



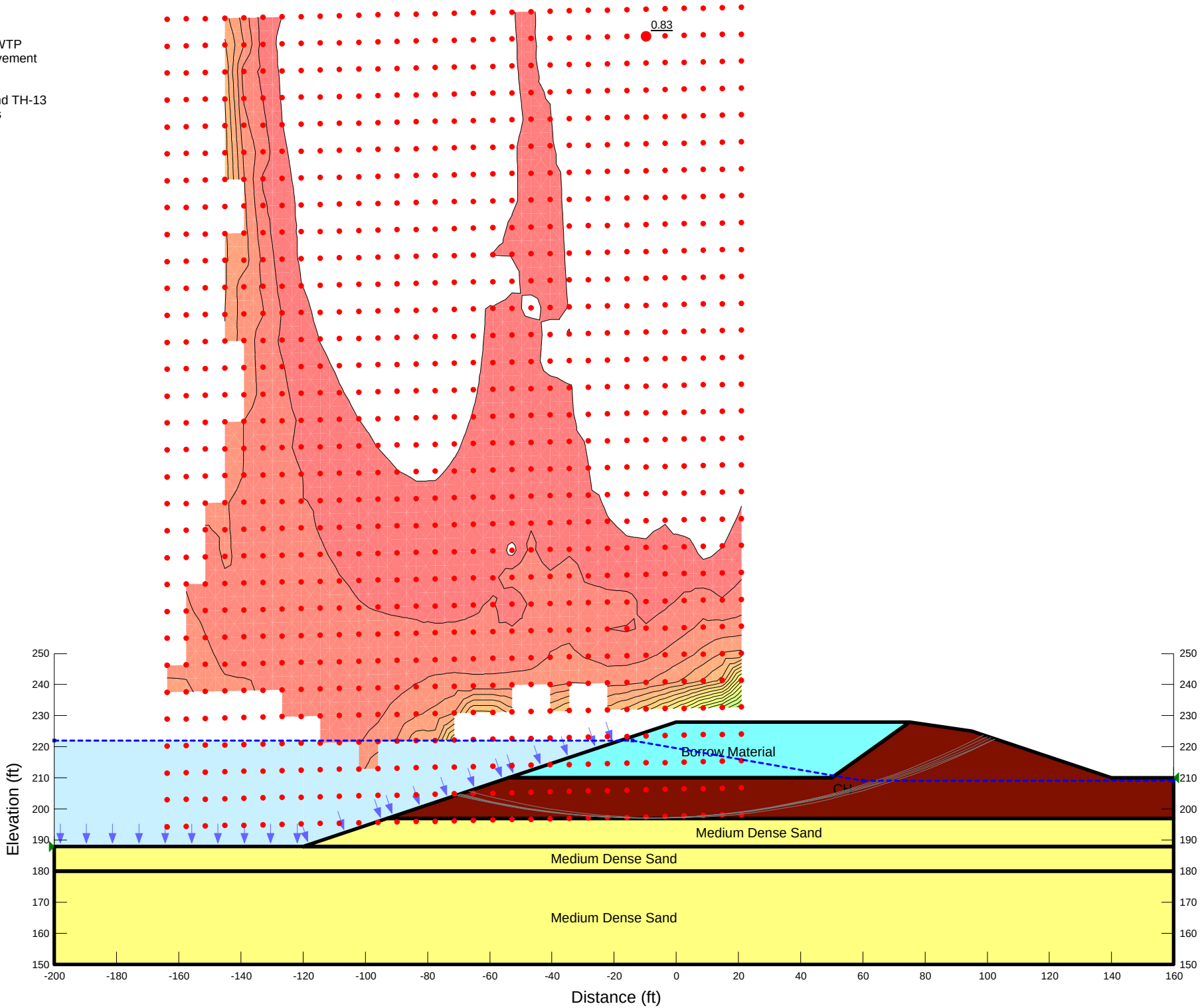
Name: Medium Dense Sand Unit Weight: 120 pcf Cohesion': 0 psf Phi': 34 °
Name: Borrow Material Unit Weight: 120 pcf Cohesion': 50 psf Phi': 26 °
Name: CH Unit Weight: 116 pcf Cohesion': 50 psf Phi': 20 °

T.E. Maxson WWTP
Lagoon 5 Improvement
J022562.01
Spencer Method
Borings B-12, and TH-13
Short-term Analysis



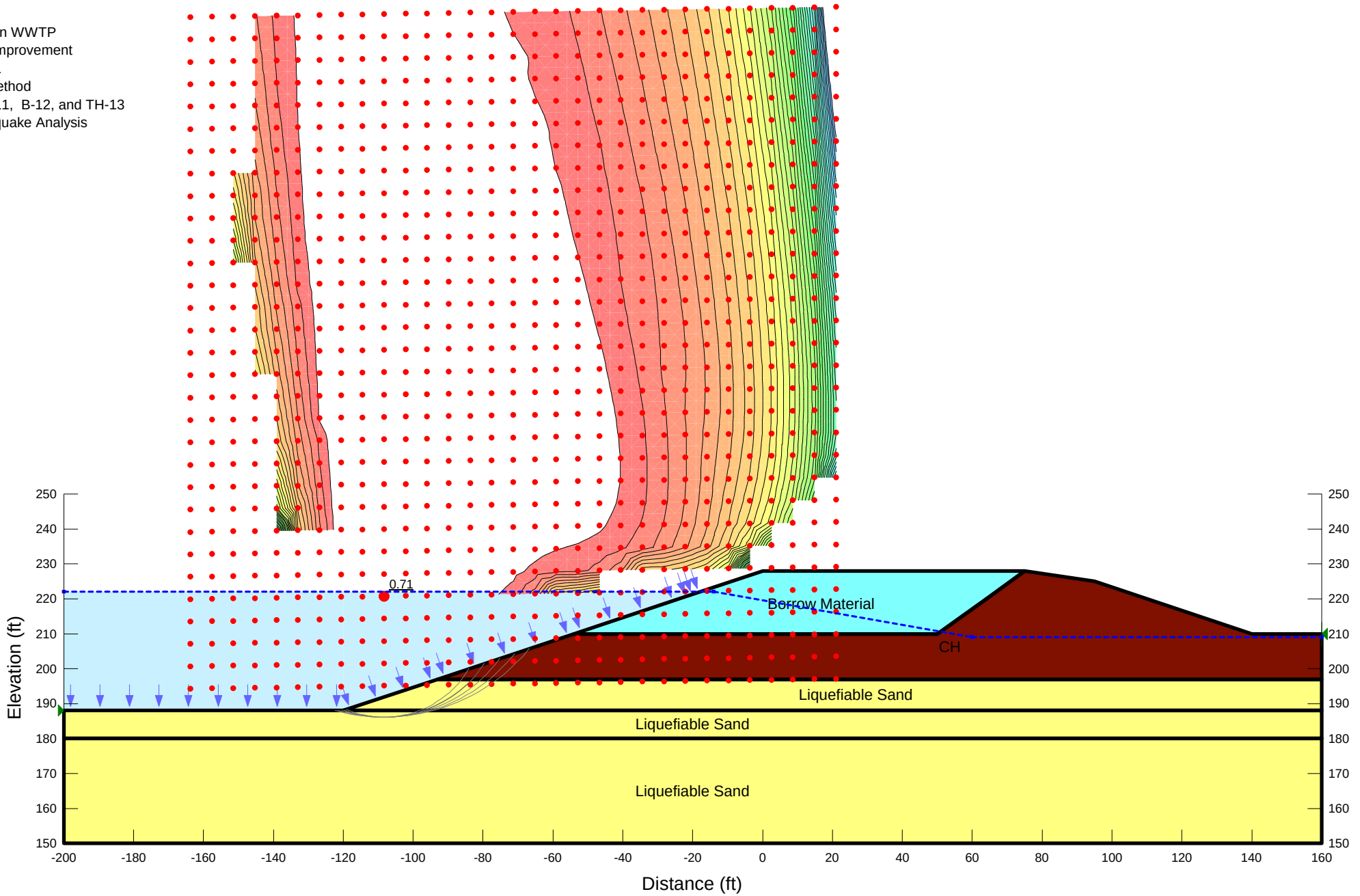
Name: Medium Dense Sand Unit Weight: 120 pcf Cohesion': 0 psf Phi': 34 °
Name: Borrow Material Unit Weight: 120 pcf Cohesion': 1,000 psf Phi': 0 °
Name: CH Unit Weight: 116 pcf Cohesion': 700 psf Phi': 0 °

T.E. Maxson WWTP
Lagoon 5 Improvement
J022562.01
Spencer Method
Borings B-12, and TH-13
Seismic Analysis



Name: Medium Dense Sand Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
Name: Borrow Material Unit Weight: 120 pcf Cohesion': 850 psf Phi': 0 °
Name: CH Unit Weight: 116 pcf Cohesion': 560 psf Phi': 0 °

T.E. Maxson WWTP
Lagoon 5 Improvement
J022562.01
Spencer Method
Borings B-11, B-12, and TH-13
Post Earthquake Analysis



Name: Liquefiable Sand Unit Weight: 120 pcf Cohesion': 0 psf Phi': 10 °
Name: Borrow Material Unit Weight: 120 pcf Cohesion': 40 psf Phi': 22 °
Name: CH Unit Weight: 116 pcf Cohesion': 40 psf Phi': 16 °

APPENDIX E

LOGS FROM PREVIOUS EXPLORATION BY GEOTECHNOLOGY

Surface Elevation: 210.7 | Completion Date: 7/9/12
Datum MSL | Northing: 289330.89 | Easting: 730607.517

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Very stiff to stiff, gray and brown, fat CLAY - CH		8-7-10	SS1
5			4-6-6	SS2
			4-5-6	SS3
	Medium stiff to soft, brown and gray, sandy SILT - ML		3-3-3	SS4
10				
			3-2-1	SS5
15			95	ST6
			2-2-2	SS7
20				
	Medium dense, gray and brown, silty SAND - SM		7-9-12	SS8
25	Boring terminated at 25 feet.			
30				
35				
40				
45				
50				

SHEAR STRENGTH, tsf
Δ - UU/2 O - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002 WL J020438.02 MAXSON LEVEES.GPJ GTINC 0636301.GPJ 6/12/12

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

__ AUGER 3.25 HOLLOW STEM
WASHBORING FROM __ FEET
DT DRILLER CM LOGGER
D 50 DRILL RIG
HAMMER TYPE Auto

REMARKS:

Drawn by: DBA	Checked by:	App'vd. by:
Date: 7/10/12	Date:	Date:

GEOTECHNOLOGY INC
FROM THE GROUND UP

Maxson Levees
Fisher and Arnold

LOG OF BORING: M- 1

Project No. J020438.02

Surface Elevation: 217.1
Datum MSL
Completion Date: 7/9/12
Northing: 289354.78
Easting: 730644.526

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Very stiff to medium stiff, brown and gray, fat CLAY - (CH)		3-6-14	SS1
5			3-4-4	SS2
	95.5 percent passing the No. 200 sieve.		92 86 85	ST3
10			2-3-4	SS4
15	with sand		2-4-7	SS5
20	Loose to medium dense, brown and gray, silty SAND (SM)		3-4-5	SS6
25	with CH seam		2-3-2	SS7
30	Boring terminated at 30 feet.		7-8-6	SS8
35				
40				
45				
50				

SHEAR STRENGTH, tsf
Δ - UU/2 ○ - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

64 >>

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

__ AUGER 3.25 HOLLOW STEM
WASHBORING FROM __ FEET
DT DRILLER CM LOGGER
D 50 DRILL RIG
HAMMER TYPE Auto

REMARKS:

Drawn by: DBA	Checked by:	App'vd. by:
Date: 7/10/12	Date:	Date:

GEOTECHNOLOGY INC
FROM THE GROUND UP

Maxson Levees
Fisher and Arnold

LOG OF BORING: M- 2

Project No. J020438.02

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002 WL J020438.02 MAXSON LEVEES.GPJ GTINC 0638301.GPJ 6/12/12

Surface Elevation: 214.25
Datum MSL
Completion Date: 7/3/12
Northing: 291580.08
Easting: 731352.81

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Medium dense, brown and gray, silty SAND - SM		3-11-15	SS1
			6-9-9	SS2
5	Loose, gray, clayey SAND - SC		5-4-5	SS3
	Soft, grey, fat CLAY - CH			
10	with sand		2-1-2	SS4
	with sand		2-1-2	SS5
15				
	Medium dense, gray, silty SAND - SM ▽		3-5-7	SS6
20	Boring terminated at 20 feet.			
25				
30				
35				
40				
45				
50				

SHEAR STRENGTH, tsf
Δ - UU/2 O - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002.WL J020438.02 MAXSON LEVEES.GPJ GTINC 0638301.GPJ 6/12/12

GROUNDWATER DATA

ENCOUNTERED AT 19.5 FEET ▽

DRILLING DATA

___ AUGER 3.25 HOLLOW STEM
WASHBORING FROM ___ FEET
MH DRILLER CM LOGGER
D 50 DRILL RIG
HAMMER TYPE Auto

REMARKS:

Drawn by: DBA	Checked by:	App'vd. by:
Date: 7/6/12	Date:	Date:

GEOTECHNOLOGY INC
FROM THE GROUND UP

Maxson Levees
Fisher and Arnold

LOG OF BORING: M-21

Project No. J020438.02

Surface Elevation: 223.50 | Completion Date: 7/3/12
Datum MSL | Northing: 291516.31 | Easting: 731392.025

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Loose to dense, brown and gray, silty SAND - SM		5-4-5	SS1
5			7-14-17	SS2
			2-5-3	SS3
	Medium stiff to soft, gray, fat CLAY - (CH)		1-2-3	SS4
10				
			1-2-2	SS5
15				
	Stiff, gray, sandy SILT - ML		4-7-10	SS6
20	Soft, gray, fat CLAY - CH			
	with sand		2-2-2	SS7
25				
	Medium dense, gray, silty SAND - SM ▽		5-9-12	SS8
30	Boring terminated at 30 feet.			
35				
40				
45				
50				

SHEAR STRENGTH, tsf
Δ - UU/2 ○ - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

61 >>

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

ENCOUNTERED AT 29.5 FEET ▽

DRILLING DATA

__ AUGER 3.25 HOLLOW STEM
WASHBORING FROM __ FEET
MH DRILLER CM LOGGER
D 50 DRILL RIG
HAMMER TYPE Auto

REMARKS:

Drawn by: DBA	Checked by:	App'vd. by:
Date: 7/6/12	Date:	Date:

GEOTECHNOLOGY INC
FROM THE GROUND UP

Maxson Levees
Fisher and Arnold

LOG OF BORING: M-22

Project No. J020438.02

LOG OF BORING 2002 WL J020438.02 MAXSON LEVEES.GPJ GTINC.0638301.GPJ 8/1/2012

Surface Elevation: 220.9 | Completion Date: 7/6/12

Datum MSL | Northing: 290724.11 | Easting: 730570.792

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Stiff, gray, silty CLAY - CL		5-4-5	SS1
	Stiff to medium stiff, gray and brown, fat CLAY - CH		3-4-5	SS2
5	with sand		3-3-5	SS3
			2-2-3	SS4
10				
			1-2-3	SS5
15				
			3-4-5	SS6
20				
			2-2-3	SS7
25				
	Medium dense, gray and brown, silty SAND - (SM)		5-5-6	SS8
30	Boring terminated at 30 feet.			
35				
40				
45				
50				

SHEAR STRENGTH, tsf

Δ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002.WL J020438.02 MAXSON LEVEES.GPJ GTINC 0638301.GPJ 6/12/12

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

__ AUGER 3.25 HOLLOW STEM

WASHBORING FROM __ FEET

JH DRILLER JH LOGGER

D 50 DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: DBA	Checked by:	App'vd. by:
Date: 7/9/12	Date:	Date:

GEOTECHNOLOGY INC

FROM THE GROUND UP

Maxson Levees
Fisher and Arnold

LOG OF BORING: M-23

Project No. J020438.02

Surface Elevation: 217.8 | Completion Date: 7/14/12

Datum MSL | Northing: 290597.36 | Easting: 731413.216

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Stiff to medium stiff, brown and gray, sandy CLAY - (CL)		8-4-5	SS1
5			4-3-4	SS2
	Loose, brown and gray, silty SAND - SM		4-3-7	SS3
	Soft to medium stiff, gray, silty CLAY - (CL)		2-1-1	SS4
10			90	ST5
15			1-2-3	SS6
	Medium stiff, gray, fat CLAY - CH			
20			3-4-4	SS7
	Boring terminated at 20 feet.			
25				
30				
35				
40				
45				
50				

SHEAR STRENGTH, tsf

Δ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002.WL J020438.02 MAXSON_LEVEES.GPJ GTINC.0635801.GPJ 8/1/12

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

__ AUGER 3.25 HOLLOW STEM

WASHBORING FROM __ FEET

DT DRILLER NR LOGGER

D 50 DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: DBA	Checked by:	App'vd. by:
Date: 7/20/12	Date:	Date:

THE GEOTECHNOLOGY INC
FROM THE GROUND UP

Maxson Levees
Fisher and Arnold

LOG OF BORING: M-24

Project No. J020438.02

Surface Elevation: 219.1
Datum MSL
Completion Date: 7/6/12
Northing: 290724.11
Easting: 730570.792

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
0	Stiff, brown and gray, silty CLAY - (CL)		9-4-5	SS1
	with gravel		3-4-6	SS2
5			2-1-3	SS3
	with trace sand			
	Soft to stiff, brown and gray, fat CLAY - CH		2-4-6	SS4
10				
			3-5-6	SS5
15				
	Loose, gray, silty SAND - SM		4-4-4	SS6
20	Soft, gray, fat CLAY - CH			
	▽		3-2-1	SS7
25				
	Medium dense, gray, silty SAND - SM		5-6-6	SS8
30	with CH seam			
	Boring terminated at 30 feet.			
35				
40				
45				
50				

SHEAR STRENGTH, tsf
Δ - UU/2 ○ - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

GROUNDWATER DATA

ENCOUNTERED AT 23 FEET ▽

DRILLING DATA

__ AUGER 3.25 HOLLOW STEM
WASHBORING FROM __ FEET
DT DRILLER NR LOGGER
D 50 DRILL RIG
HAMMER TYPE Auto

REMARKS:

Drawn by: DBA	Checked by:	App'vd. by:
Date: 7/9/12	Date:	Date:

GEOTECHNOLOGY INC
FROM THE GROUND UP

Maxson Levees
Fisher and Arnold

LOG OF BORING: M-25

Project No. J020438.02

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002 WL J020438.02 MAXSON LEVEES.GPJ GTINC.0638301.GPJ 6/12/12

Surface Elevation: 220 | Completion Date: 7/6/12
Datum MSL | Northing: 1 | Easting: 24

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Medium stiff, gray and brown, fat CLAY - (CH)		4-3-4	SS1
5			3-3-5	SS2
			2-3-4	SS3
10	trace sand		2-3-5	SS4
15	trace sand		4-3-5	SS5
	Medium stiff to soft, gray and brown, ELASTIC SILT - (MH)		75	
20	trace sand ▽		1-2-3	SS6
25			3-3-4	SS7
30			2-1-2	SS8
	Loose, gray, silty SAND - SM		2-4-4	SS9
35	Boring terminated at 35 feet.			
40				
45				
50				

SHEAR STRENGTH, tsf
Δ - UU/2 ○ - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

64 >>
61 >>

GROUNDWATER DATA

ENCOUNTERED AT 20 FEET ▽

DRILLING DATA

__ AUGER 3.25 HOLLOW STEM
WASHBORING FROM __ FEET
DT DRILLER NR LOGGER
D 50 DRILL RIG
HAMMER TYPE Auto

REMARKS:

Drawn by: DBA	Checked by:	App'vd. by:
Date: 7/9/12	Date:	Date:

GEOTECHNOLOGY INC
FROM THE GROUND UP

Maxson Levees
Fisher and Arnold

LOG OF BORING: M-26

Project No. J020438.02

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

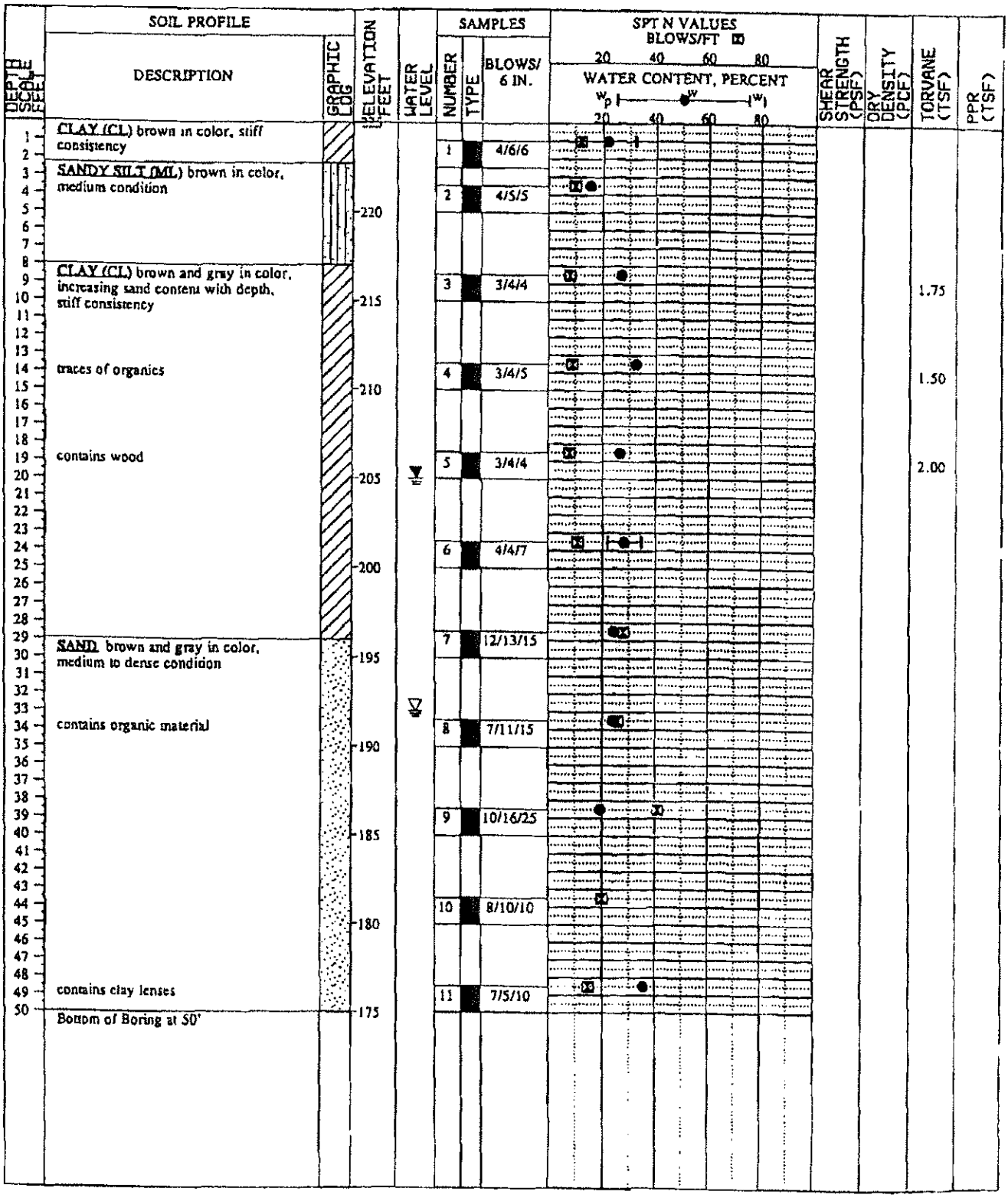
LOG OF BORING 2002.WL J020438.02 MAXSON LEVEES.GPJ GTINC.0638301.GPJ 6/12/12

APPENDIX F

LOGS FROM PREVIOUS EXPLORATION BY HALL, BLAKE AND ASSOCIATES

PROJECT T.E. Maxson WWTP Lagoon Modifications

FOR Black & Veatch, LLP



PROJECT NO. 98-12248 BORING NO. TH-11 PAGE 1 of 1

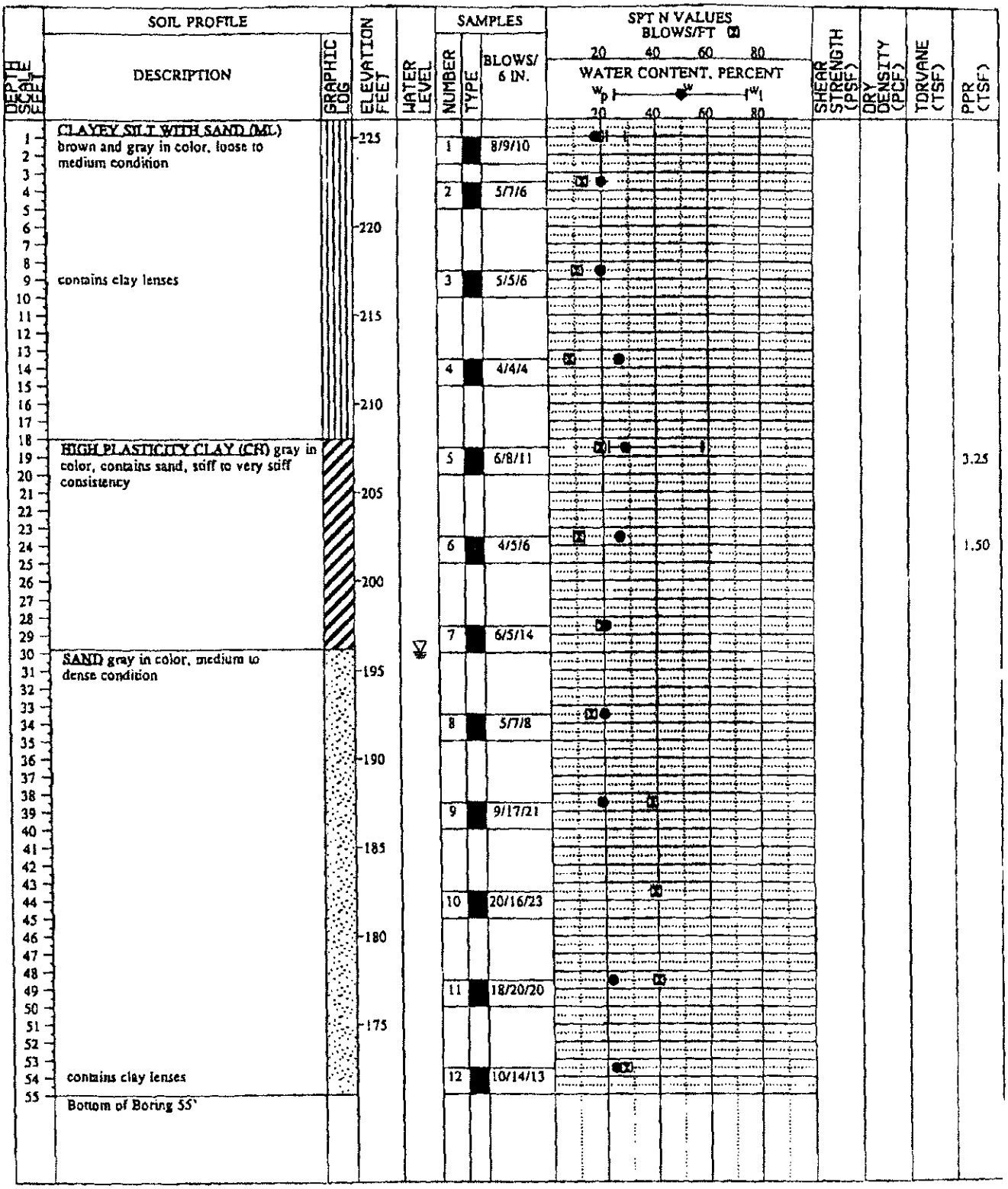
DATE 1/14/99

DRILLER A. Strole

HALL, BLAKE AND ASSOCIATES Inc.

PROJECT T.E. Maxson WWTP L

FOR Black & Veatch, LLP



PROJECT NO. 98-12248 BORING NO. TH-12 PAGE 1 of 1

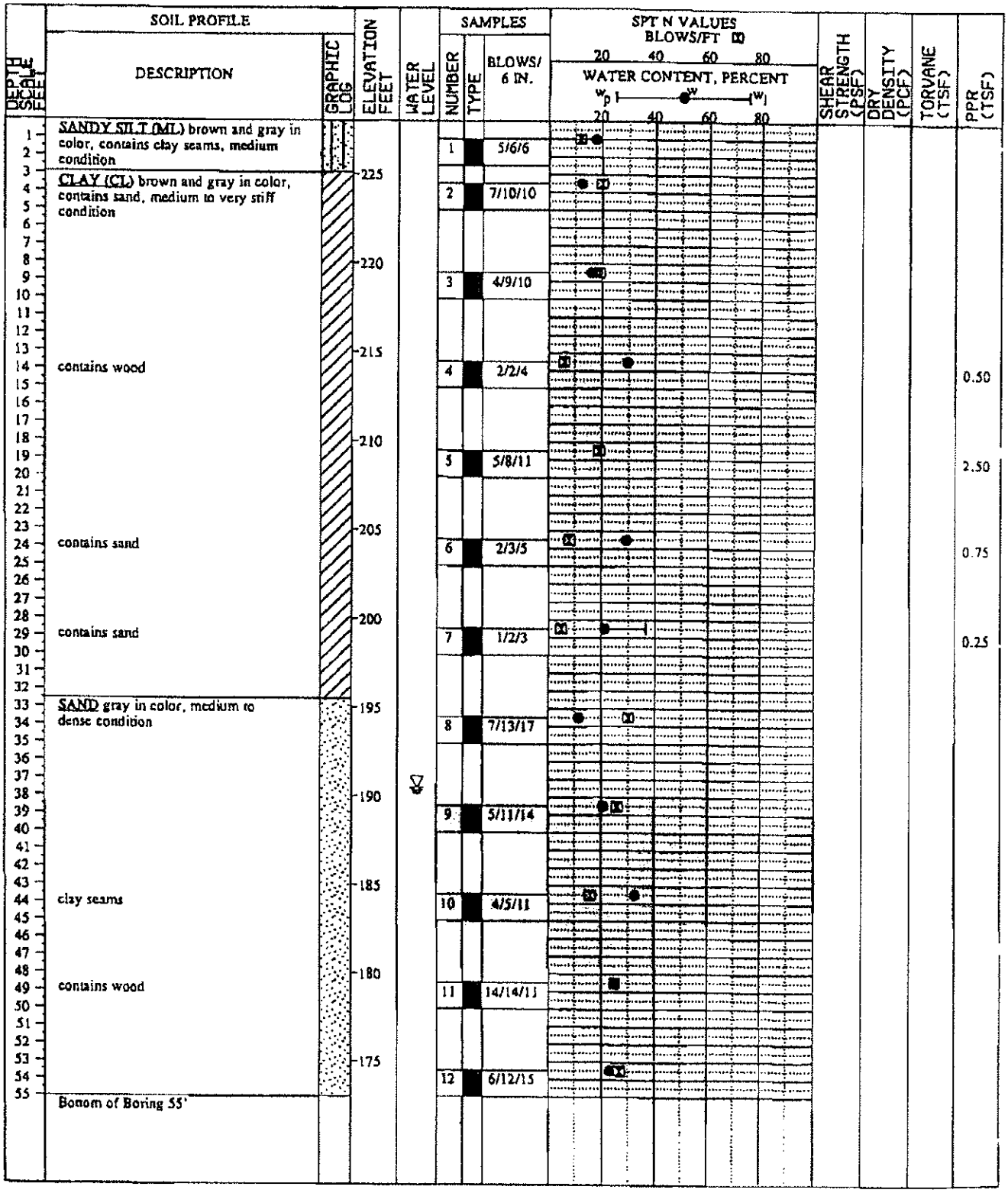
DATE 1/15/99

DRILLER D. Clark

HALL, BLAKE AND ASSOCIATES Inc.

PROJECT T.E. Maxson WWTP Lagoon Modifications

FOR Black & Veatch, LLP



PROJECT NO. 98-12248 BORING NO. TH-13 PAGE 1 of 1

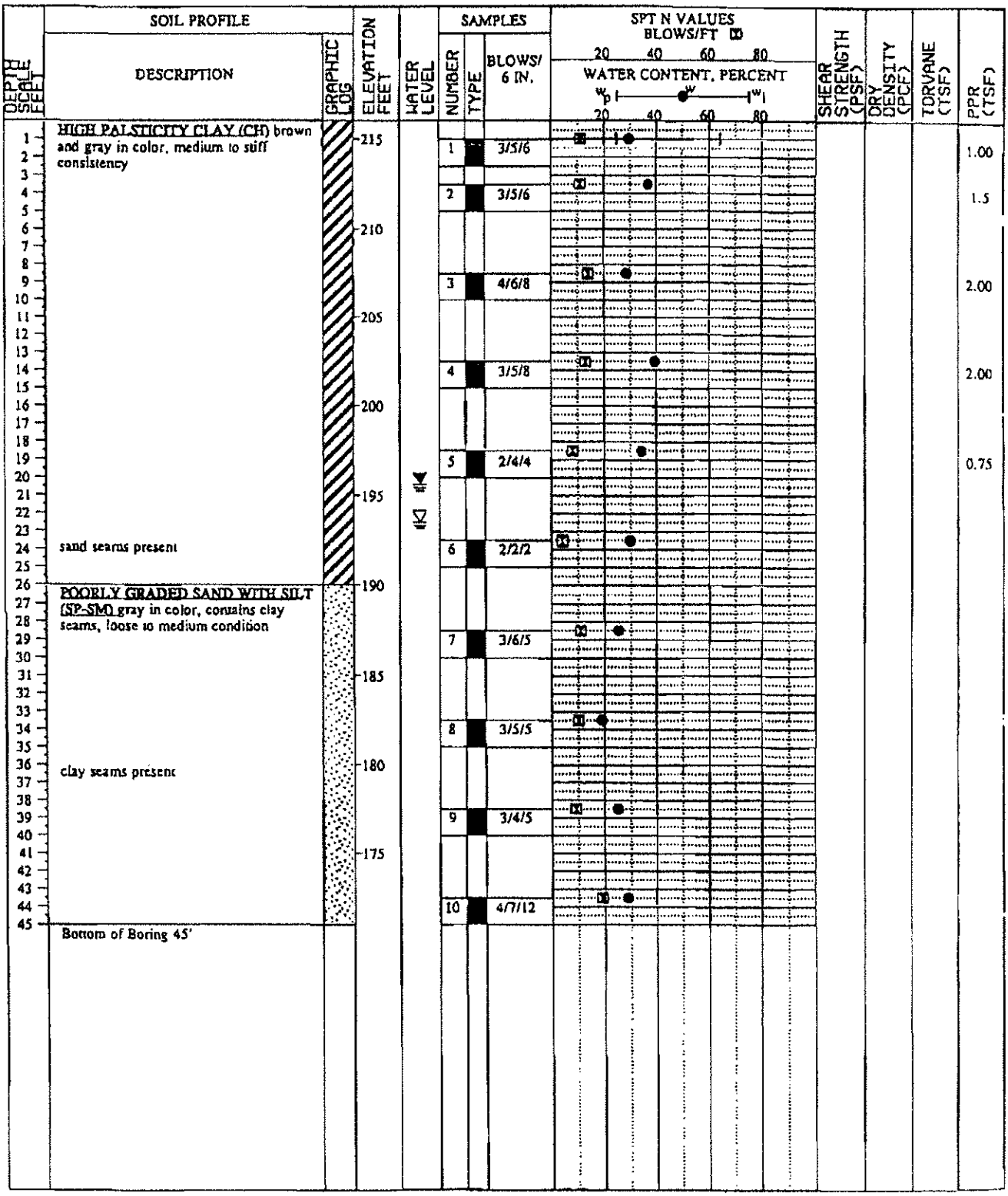
DATE 1/15/99

DRILLER J. Nichols

HALL, BLAKE AND ASSOCIATES Inc.

PROJECT T.E. Maxson WWTP Lagoon Modifications

FOR Black & Veatch, LLP



PROJECT NO. 98-12248 BORING NO. TH-14 PAGE 1 of 1

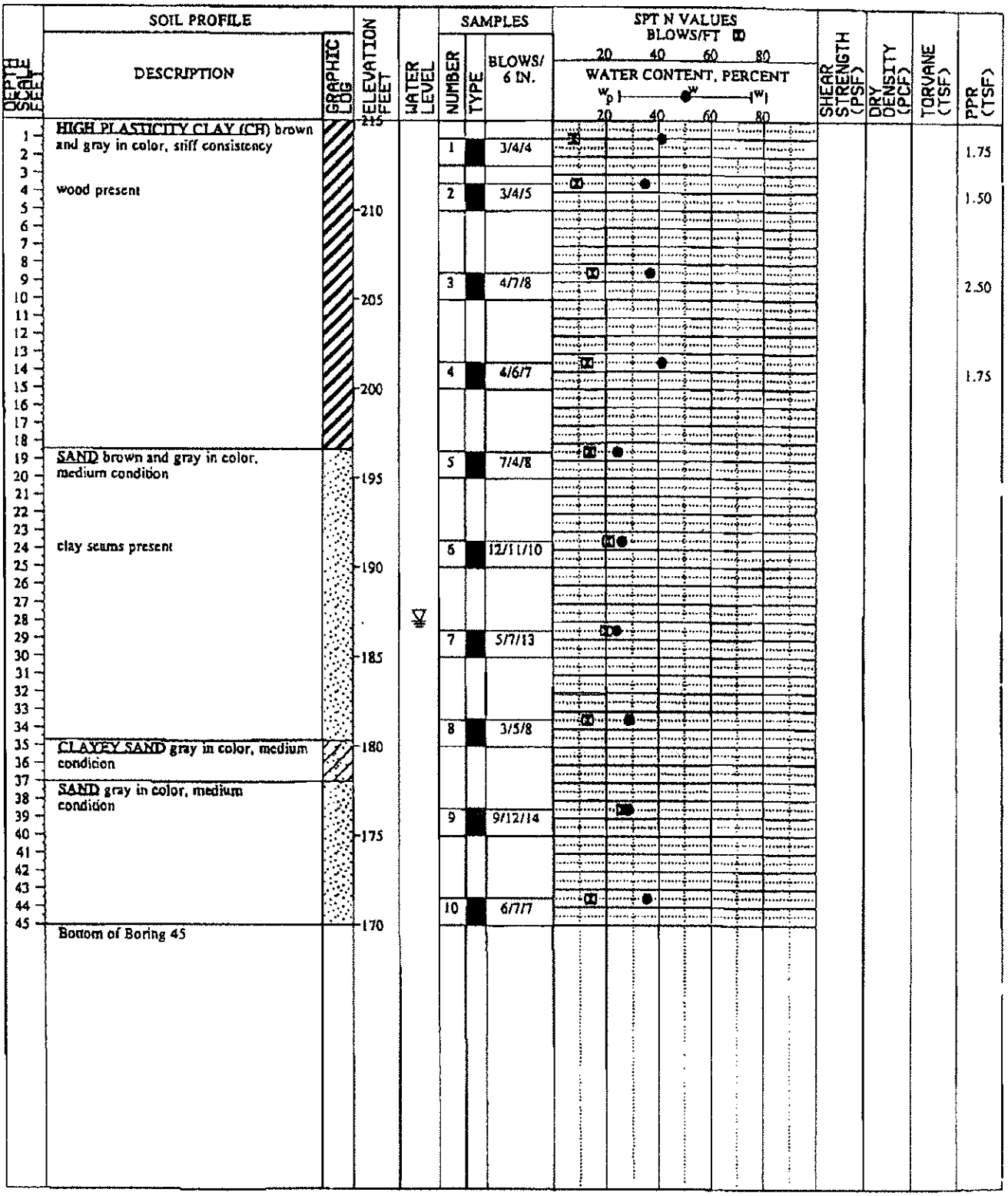
DATE 1/15/99

DRILLER J. Nichols

HALL, BLAKE AND ASSOCIATES Inc.

PROJECT T.E. Maxson WWTP Lagoon Modifications

FOR Black & Veatch, LLP



PROJECT NO. 98-12248 BORING NO. TH-15 PAGE 1 of 1

DATE 1/15/99

DRILLER D. Clark

HALL, BLAKE AND ASSOCIATES Inc.

End of Attachment 5

CP1	CP2	CP3	CP4	CP5	CP6
REBAR	REBAR	REBAR	REBAR	REBAR	PK NAIL
PI N=288829.3320 E=731126.5960	PI N=288742.8270 E=730425.9070	PI N=289877.7990 E=730272.4490	PI N=290414.0110 E=730352.3070	PI N=290721.3870 E=731046.3460	PI N=290659.7490 E=731513.0180
ELEV = 212.09	ELEV = 212.59	ELEV = 214.53	ELEV = 216.35	ELEV = 222.79	ELEV = 225.33

REVISION		
ITEM NO.	DESCRIPTION OF CHANGE	APPROVAL DATE

JEFFREY W. OLD
REGISTERED ENGINEER
AGRICULTURE COMMERCE
NO. 104560
STATE OF TENNESSEE
3/21/25

CONTROL POINTS

ENGINEER: Black & Veatch Corporation

SEWER BASIN NO-1 SHEET 5 OF 28

DIVISION OF ENGINEERING

T.E. MAXSON WWTF BIOSOLIDS LAGOON 5 RENOVATIONS

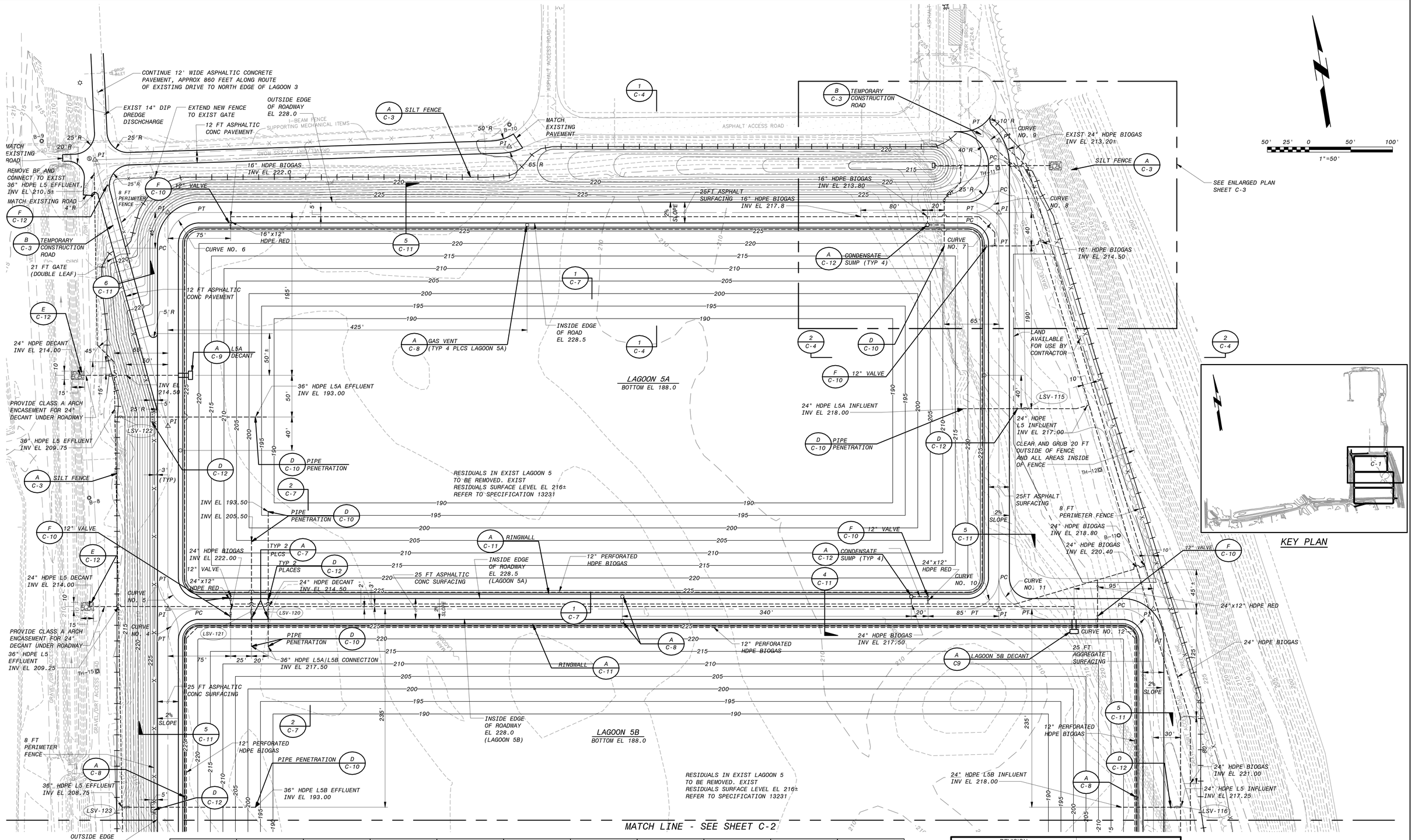
SURVEY: GEODESY	DATE: 6/2014	PROJECT NO: 183157
DESIGN BY: GMG	DATE: 10/2024	SCALE: AS NOTED
DRAWN BY: JAB	DATE: 10/2024	DATE: 10/2024

APPROVED

DEPUTY CITY ENGINEER DATE CITY ENGINEER DATE

PROJECT NO.: SW02011 FILE NO.: G-5

G183157
FG183157



CURVE NO. 4	CURVE NO. 5	RAMP NO. 1	ROAD	CURVE NO. 6	CURVE NO. 7	CURVE NO. 8	CURVE NO. 9	CURVE NO. 10	CURVE NO. 11	CURVE NO. 12
PI N=290196.72	PI N=290196.72	UPPER RAMP PI	LOWER RAMP PI	PI N=290665.52	PI N=290505.23	PI N=290505.23	PI N=290590.31	PI N=290036.43	PI N=290036.43	PI N=290006.63
E=730529.34	E=730529.34	N=290413.05	N=290741.93	E=730605.86	E=731587.87	E=731587.87	E=731601.76	E=731511.35	E=731511.35	E=731693.93
PT N=290159.71	PT N=290233.73	E=730564.65	E=730529.73	PT N=290659.48	PT N=290468.22	PT N=290509.66	PT N=290609.51	PT N=290042.47	PT N=290030.39	PT N=289969.62
E=730523.30	E=730535.38			E=730642.87	E=731581.83	E=731560.73	E=731579.41	E=731474.34	E=731548.36	E=731687.89
PC N=290190.68	PC N=290190.68	LOWER RAMP PI	PI N=290677.54	PC N=290628.51	PC N=290511.27	PC N=290532.37	PC N=290561.24	PC N=290073.44	PC N=290073.44	PC N=290012.67
E=730566.35	E=730566.35	N=290741.93	E=731021.90	E=730599.82	E=731550.86	E=731592.30	E=731597.01	E=731517.39	E=731517.39	E=731656.92
Δ= 90°00'00"	Δ= 90°00'00"	E=730529.73		Δ= 90°00'00"	Δ= 90°00'00"	Δ= 90°00'00"	Δ= 121°23'54.5"	Δ= 90°00'00"	Δ= 90°00'00"	Δ= 90°00'00"
T= 37.50'	T= 37.50'		END OF ROAD	T= 37.50'	T= 37.50'	T= 27.50'	T= 29.46'	T= 37.50'	T= 37.50'	T= 37.50'
R= 37.50'	R= 37.50'		N=290682.66	R= 37.50'	R= 37.50'	R= 27.50'	R= 52.50'	R= 37.50'	R= 37.50'	R= 37.50'
L= 58.90'	L= 58.90'		E=731033.31	L= 58.90'	L= 58.90'	L= 43.20'	L= 53.70'	L= 58.90'	L= 58.90'	L= 58.90'

REVISION		
ITEM NO.	DESCRIPTION OF CHANGE	APPROVAL DATE

JEFFREY W. OLD — REGISTERED ENGINEER — AGRICULTURE — No. 104568 — STATE OF TENNESSEE — 3/21/25

SITE PLAN (5A AND 5B)

ENGINEER: Black & Veatch Corporation

SEWER BASIN NO-1 SHEET 6 OF 29

DIVISION OF ENGINEERING

T.E. MAXSON WWTF BIOSOLIDS LAGOON 5 RENOVATIONS

SURVEY: GEODESY DATE: 6/2014 PROJECT NO: 183157

DESIGN BY: GMG DATE: 10/2024 SCALE: AS NOTED

DRAWN BY: JAB DATE: 10/2024

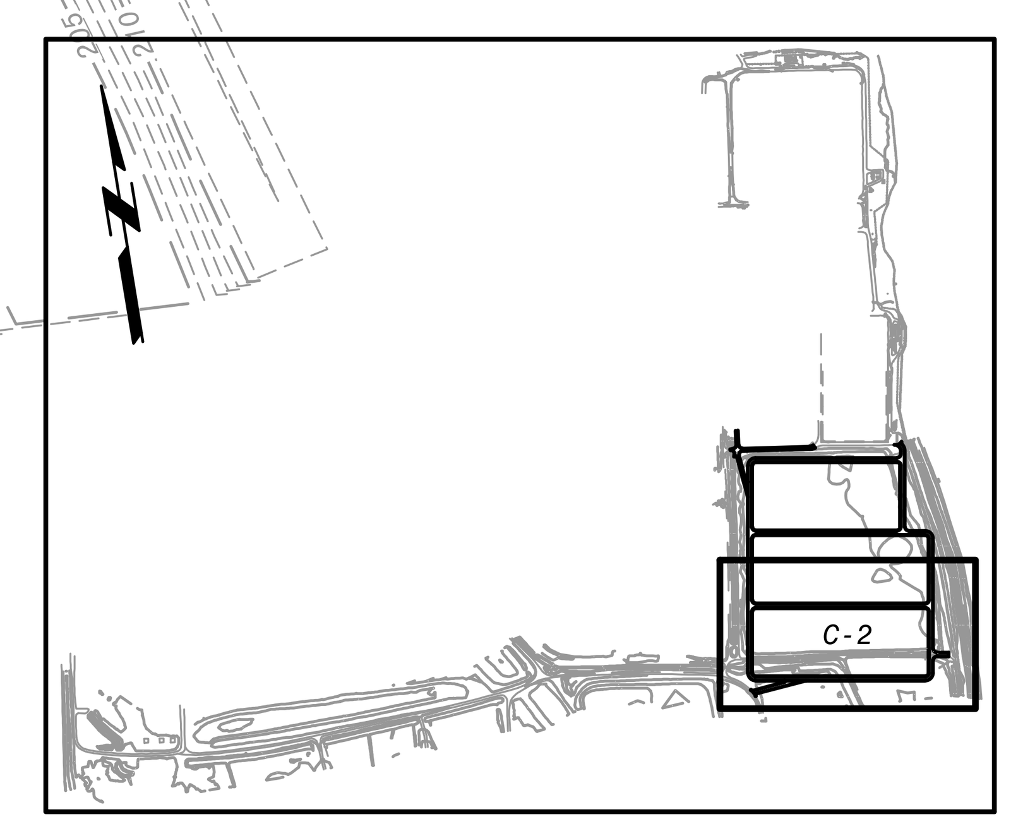
APPROVED

DEPUTY CITY ENGINEER DATE CITY ENGINEER DATE

PROJECT NO.: SW02011 FILE NO.: C-1

G183157
F4183157

MATCH LINE - SEE SHEET C-1
MATCH LINE - SEE SHEET C-1510
LAGOON 5B
BOTTOM EL 188.0
LAGOON 5C
BOTTOM EL 188.0
12" PERFORATED BIOGAS
SILT FENCE
CURVE NO. 3
12"x24" HDPE RED
INSIDE EDGE OF ROADWAY EL 228.00 (LAGOON 5B) (SEE NOTE 4)
25FT ASPHALTIC CONC SURFACING
RINGWALL
GAS VENT TYPICAL 4 PCLS LAGOON 5B AND 4 PLCS LAGOON 5C
24" HDPE BIOGAS
INV EL 205.50
INV EL 193.50
PIPE PENETRATION
CONDENSATE SUMP (TYP 4)
24" HDPE BIOGAS INV EL 213.50
TYP 2 PLCS
24" HDPE BIOGAS INV EL 216.70
36" HDPE L5B/L5C CONNECTION INV EL 217.50
LSV-119
LSV-118
8 FT PERIMETER FENCE
CLEAR AND GRUB 20 FT OUTSIDE OF FENCE AND ALL AREAS INSIDE OF FENCE (TYP)
24" HDPE BIOGAS INV EL 214.00
24" HDPE BIOGAS INV EL 214.50
24"x16" HDPE RED
16" HDPE BIOGAS
EXISTING MONITORING WELL TO REMAIN
12" VALVE
INV EL 214.50
CURVE NO. 2
24" HDPE DECANT INV EL 214.00
24" HDPE BIOGAS INV EL 222.00
INSIDE EDGE OF ROADWAY EL 227.5 (LAGOON 5C)
PROVIDE CLASS A ARCH ENCASEMENT FOR 24" DECANT UNDER ROADWAY
L5C DECANT
8 FT PERIMETER FENCE
12" PERFORATED HDPE BIOGAS
25 FT ASPHALTIC CONC SURFACING
RESIDUALS IN EXIST LAGOON 5 TO BE REMOVED. EXIST RESIDUALS SURFACE LEVEL EL 216±. REFER TO SPECIFICATION 13231
LSV-124
36" HDPE L5 EFFLUENT INV EL 207.75
36" HDPE L5C EFFLUENT INV EL 193.00
24" HDPE L5C INFLUENT INV EL 218.00
24" HDPE L5C INFLUENT INV EL 217.75
12" PERFORATED HDPE BIOGAS
16" HDPE BIOGAS INV EL 218.35
16" HDPE SD INV EL 220.00
16" HDPE SD INV EL 218.00
LSV-117
REMOVE EXIST CONCRETE DROP INLET AND PLUG OUTLET PIPE WITH CONCRETE
25 FT ASPHALTIC CONC SURFACING
GRAVEL/DIRT ACCESS ROAD
25 FT AGGREGATE SURFACING
REMOVE EXIST CONC DROP INLET
ASPHALTIC CONC EDGE OF PAVEMENT
16" HDPE BIOGAS INV EL 217.00
CONDENSATE SUMP (TYP 4)
16" HDPE BIOGAS INV EL 212.67
25 FT ASPHALT SURFACING
CURVE NO. 1
12"x16" HDPE RED
CURVE NO. 13
CURVE NO. 14
CURVE NO. 15
CURVE NO. 16
CURVE NO. 17
30 FT GATE (DOUBLE LEAF)
END OF PAVEMENT
OUTSIDE EDGE OF ROADWAY EL 227.00
25 FT ASPHALTIC CONC PAVEMENT
16" HDPE BIOGAS INV EL 222.00
TEMPORARY CONSTRUCTION ROAD
16" HDPE BIOGAS INV EL 211.00
12"x16" HDPE RED
SILT FENCE
50' 25' 0 50' 100'
1"=50'



KEY PLAN

RAMP NO. 2	CURVE NO. 1	CURVE NO. 2	CURVE NO. 3	CURVE NO. 13	CURVE NO. 14	CURVE NO. 15	CURVE NO. 16	END OF PAVEMENT	CURVE NO. 17
UPPER RAMP PI N=289201.29 E=730730.68 LOWER RAMP PI N=289167.21 E=730382.23	PI N=289259.13 E=730376.30 PT N=289296.14 E=730382.34 PC N=289253.09 E=730413.31 Δ= 90°00'00" T= 37.50' R= 37.50' L= 58.90'	PI N=289727.93 E=730452.82 PT N=289721.89 E=730489.83 PC N=289690.92 E=730446.78 Δ= 90°00'00" T= 37.50' R= 37.50' L= 58.90'	PI N=289727.93 E=730452.82 PT N=289721.89 E=730489.83 PC N=289764.94 E=730458.86 Δ= 90°00'00" T= 37.50' R= 37.50' L= 58.90'	PI N=289537.83 E=731617.41 PT N=289574.84 E=731623.45 PC N=289543.87 E=731580.40 Δ= 90°00'00" T= 37.50' R= 37.50' L= 58.90'	PI N=289537.83 E=731617.41 PT N=289500.82 E=731611.37 PC N=289543.87 E=731580.40 Δ= 90°00'00" T= 37.50' R= 37.50' L= 58.90'	PI N=289224.39 E=731566.25 PT N=289218.35 E=731603.26 PC N=289261.40 E=731572.29 Δ= 90°00'00" T= 37.50' R= 37.50' L= 58.90'	PI N=289224.39 E=731566.25 PT N=289218.35 E=731603.26 PC N=289187.38 E=731560.20 Δ= 90°00'00" T= 37.50' R= 37.50' L= 58.90'	POINT 3 N=289206.24 E=731677.44	PI N=289069.04 E=731540.89 PT N=289075.08 E=731503.88 PC N=289106.05 E=731546.93 Δ= 90°00'00" T= 37.50' R= 37.50' L= 58.90'

REVISION		
ITEM NO.	DESCRIPTION OF CHANGE	APPROVAL DATE

JEFFREY W. OLD REGISTERED ENGINEER AGRICULTURE COMMERCE NO. 104560 STATE OF TENNESSEE 3/21/25

SEWER BASIN NO-1 SHEET 7 OF 29

DIVISION OF ENGINEERING

T.E. MAXSON WWTF BIOSOLIDS LAGOON 5 RENOVATIONS

SITE PLAN (5B AND 5C)

ENGINEER: Black & Veatch Corporation

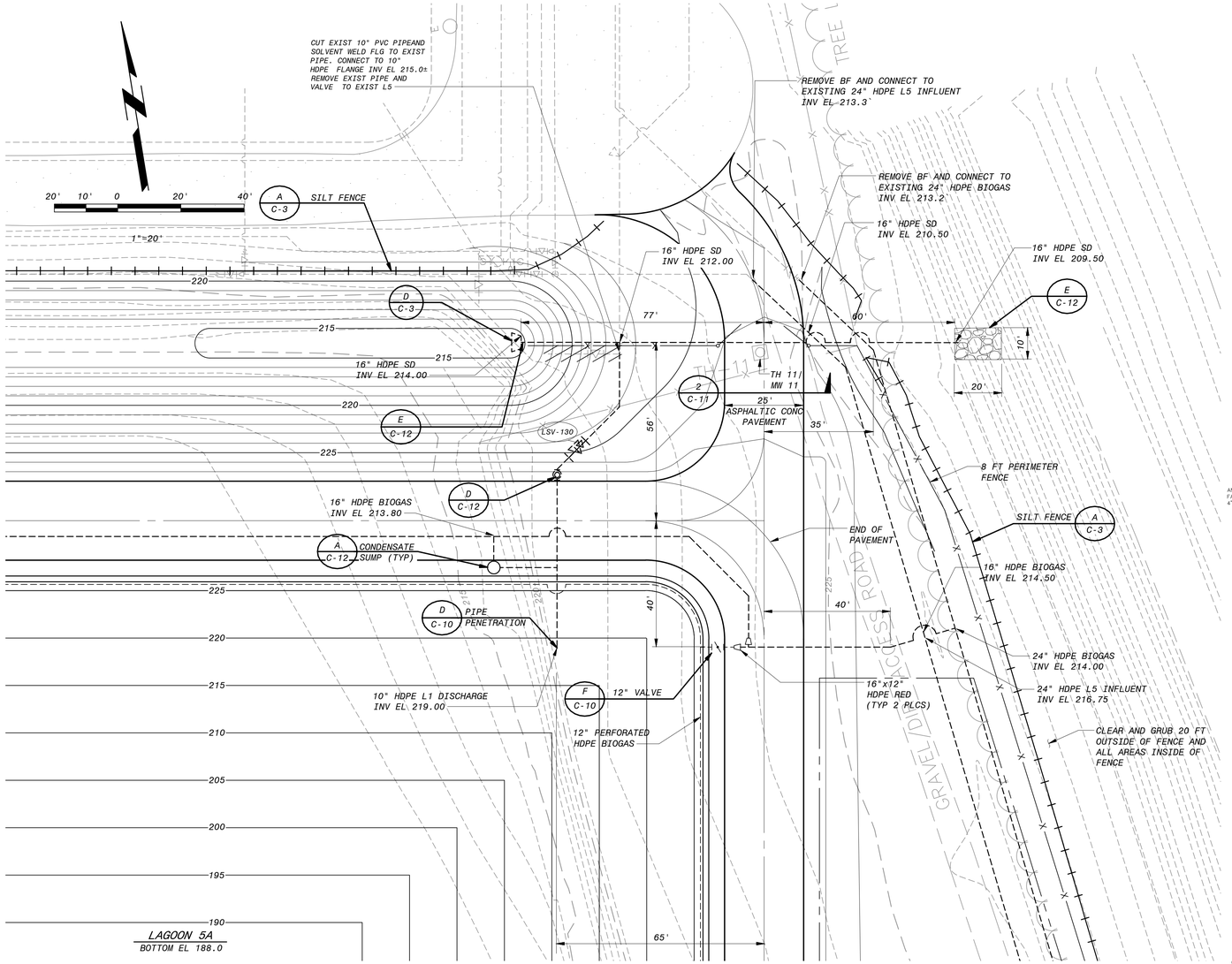
SURVEY: GEODESY DATE: 6/2014 PROJECT NO: 183157
DESIGN BY: GMG DATE: 10/2024 SCALE: AS NOTED
DRAWN BY: JAB DATE: 10/2024 DATE: 10/2024

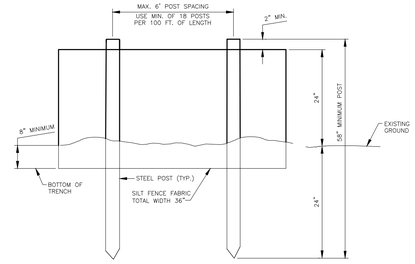
APPROVED

DEPUTY CITY ENGINEER DATE CITY ENGINEER DATE

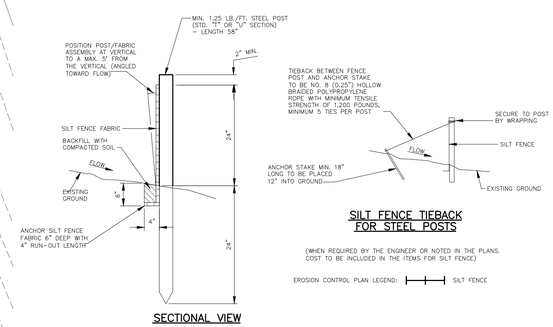
PROJECT NO.: SW02011 FILE NO.: C-2

G183157
FG183157





ELEVATION VIEW



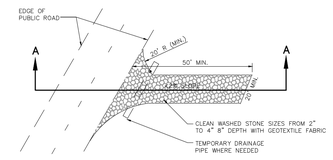
SECTIONAL VIEW

SILT FENCE TIEBACK FOR STEEL POSTS

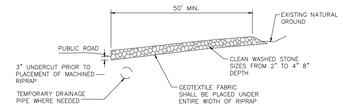
(WHEN REQUIRED BY THE ENGINEER OR NOTED IN THE PLANS. COST TO BE INCLUDED IN THE ITEMS FOR SILT FENCE)

EROSION CONTROL PLAN LEGEND: SILT FENCE

A DETAIL
NO SCALE



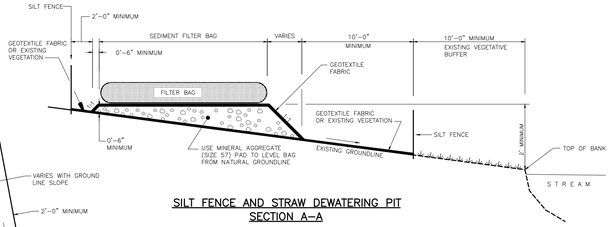
PLAN VIEW OF TEMPORARY CONSTRUCTION ROAD



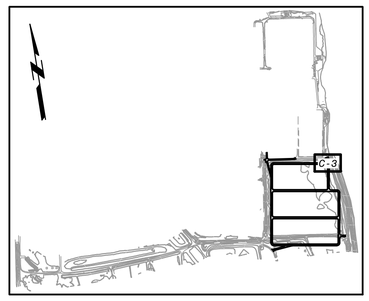
SECTION A–A

B DETAIL
NO SCALE

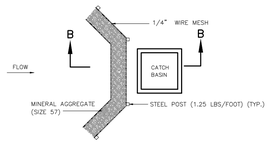
SILT FENCE AND STRAW DEWATERING PIT
PLAN VIEW



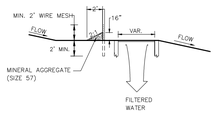
SILT FENCE AND STRAW DEWATERING PIT
SECTION A–A



KEY PLAN



HARDWARE CLOTH AND GRAVEL INLET PROTECTION (FLOW FROM ONE SIDE)



SECTION B–B

D DETAIL
NO SCALE

C DETAIL
NO SCALE

REVISION		
ITEM NO.	DESCRIPTION OF CHANGE	APPROVAL DATE

ENLARGED SITE PLAN

ENGINEER: Black & Veatch Corporation

JEFFREY W. OLD — LICENSED PROFESSIONAL ENGINEER — AGRICULTURE — NO. 104566 — STATE OF TENNESSEE — 3/21/25

SEWER BASIN NO-1 SHEET 8 OF 29

DIVISION OF ENGINEERING

T.E. MAXSON WWTF BIOSOLIDS LAGOON 5 RENOVATIONS

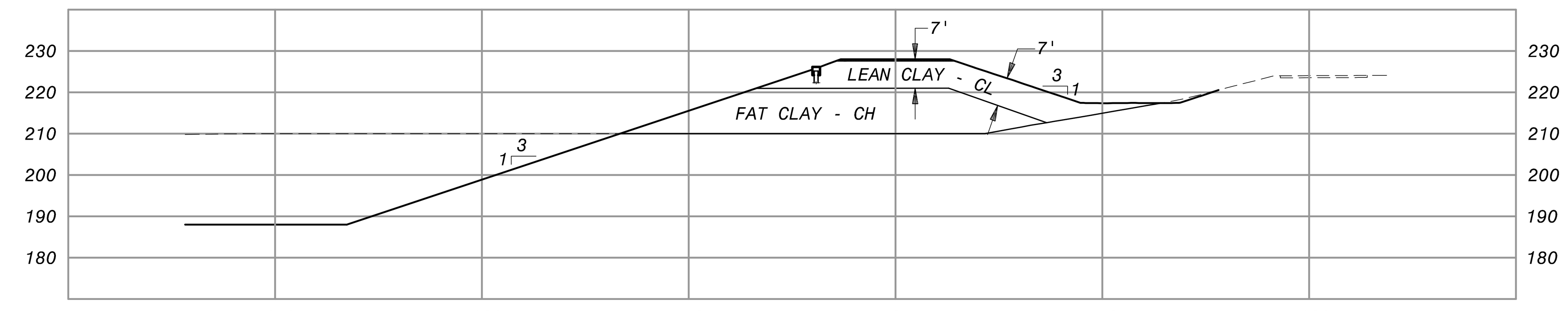
SURVEY: GEODESY	DATE: 6/2014	PROJECT NO: 183157
DESIGN BY: GMG	DATE: 10/2024	SCALE: AS NOTED
DRAWN BY: JAB	DATE: 10/2024	DATE: 10/2024

APPROVED

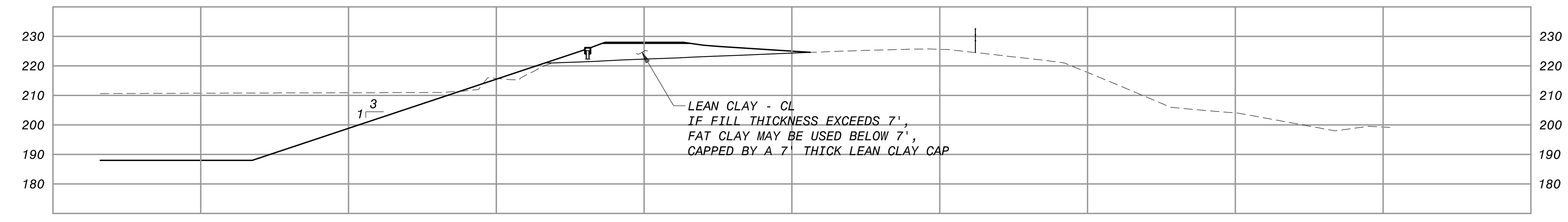
DEPUTY CITY ENGINEER DATE CITY ENGINEER DATE

PROJECT NO.: SW02011 FILE NO.: C-3

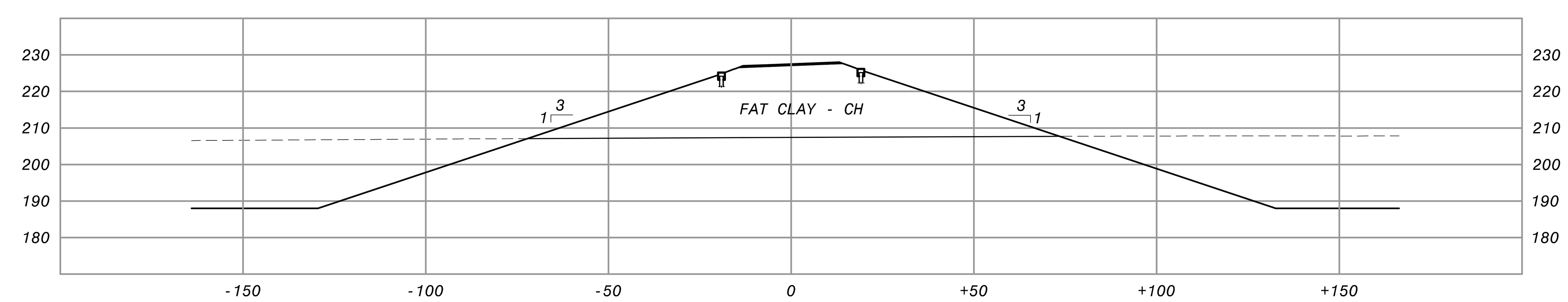
183157
183157



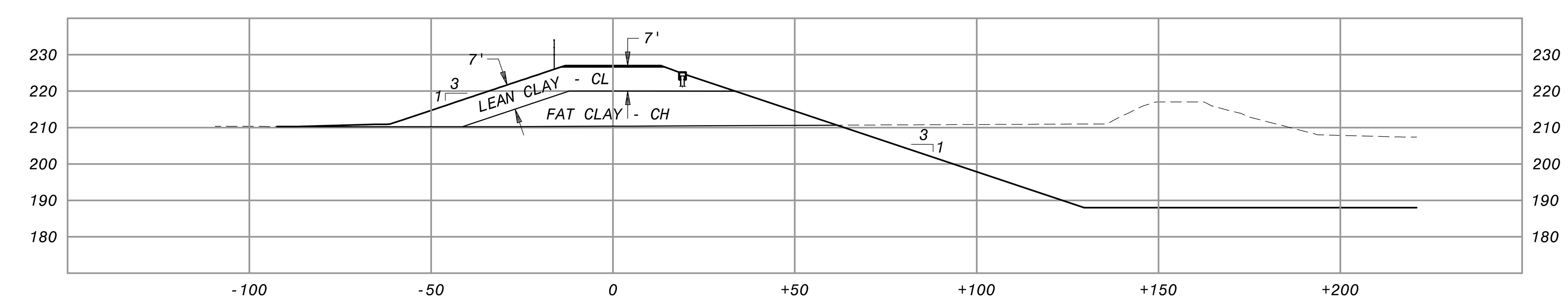
SECTION 1 / C-1
1"=30'



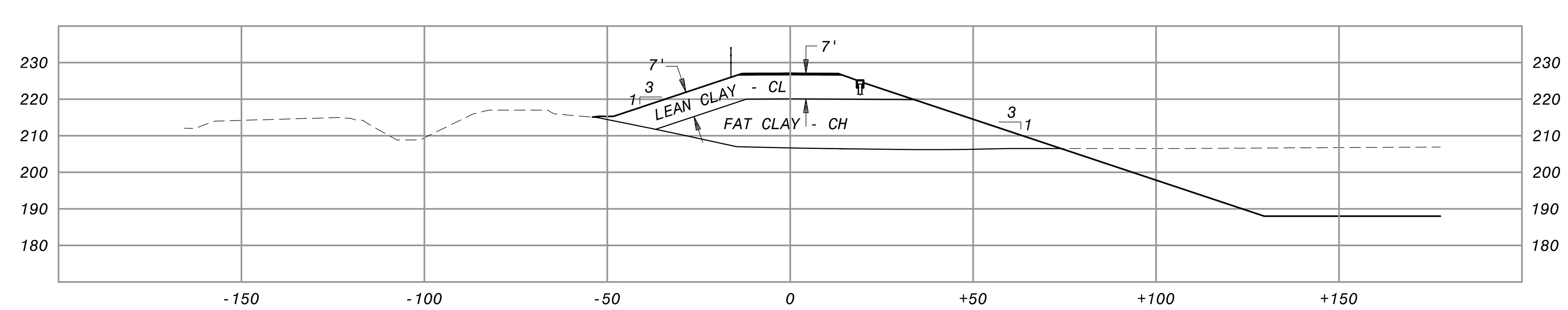
SECTION 2 / C-1
1"=30'



SECTION 3 / C-2
1"=30'



SECTION 4 / C-2
1"=30'



SECTION 5 / C-2
1"=30'

NOTES:

1. REMOVE ALL ORGANIC MATERIAL FROM SURFACES TO RECEIVE FILL.
2. COMPACT TOP 6" OF CLEARED SUBGRADE TO A MINIMUM OF 95% OF MAXIMUM DRY UNIT WEIGHT AS DETERMINED BY ASTM D698.
3. EXCAVATED MATERIAL WILL BE CLASSIFIED BY ENGINEER. IT WILL BE NECESSARY TO STOCK PIPE EXCAVATED LEAN CLAY MATERIAL UNTIL THE BERM CONSTRUCTION HAS PROGRESSED SUFFICIENTLY TO ALLOW THE LEAN CLAY CAP TO BE PLACED.
4. MATERIALS UNSUITABLE FOR BERM CONSTRUCTION, INCLUDING SANDS AND SILTS, SHALL BE DISPOSED OF AT THE SITE AT LOCATIONS WITHIN 1/4 MILE OF THE LAGOON EXCAVATION. MATERIALS SHALL BE GRADED FOR DRAINAGE BUT NEED NOT BE COMPACTED.
5. MATERIAL USED FOR BERM CONSTRUCTION SHALL BE PLACED IN LIFTS OF UNIFORM THICKNESS AND COMPACTED TO A MIMIMUM OF 95% OF MAXIMUM DRY UNIT WEIGHT AS DETERMINED BY ASTM D698. MOISTURE CONTENT SHALL BE WITHIN 0% - + 3% OF OPTIMUM FOR BERM CONSTRUCTION.

REVISION		
ITEM NO.	DESCRIPTION OF CHANGE	APPROVAL DATE

JEFFREY W. OLD REGISTERED ENGINEER AGRICULTURE COMMERCE NO. 104560 STATE OF TENNESSEE 3/21/25

SECTIONS

ENGINEER: Black & Veatch Corporation

SEWER BASIN NO-1 SHEET 9 OF 29

DIVISION OF ENGINEERING

T.E. MAXSON WWTF BIOSOLIDS LAGOON 5 RENOVATIONS

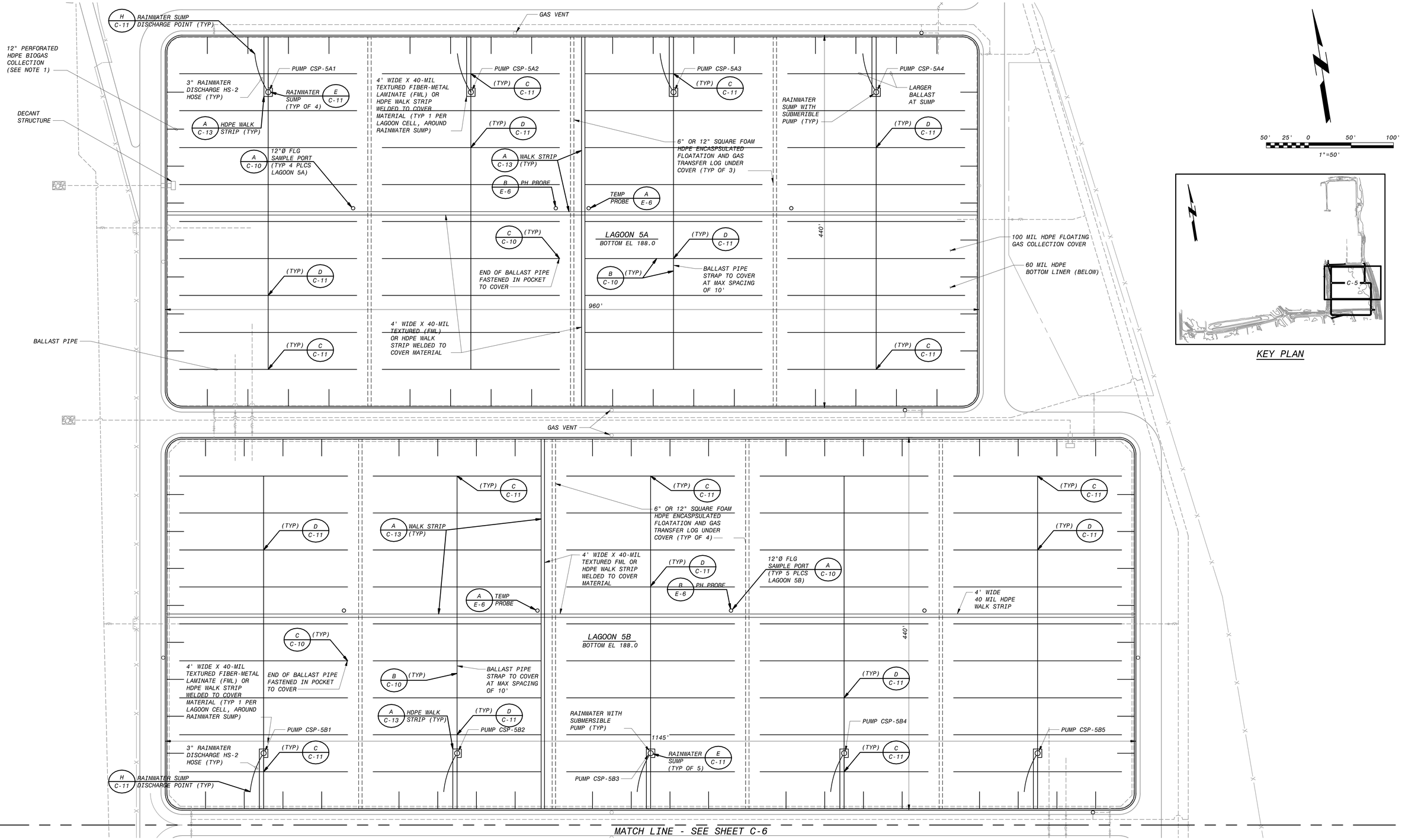
SURVEY: GEODESY	DATE: 6/2014	PROJECT NO: 183157
DESIGN BY: GMG	DATE: 10/2024	SCALE: AS NOTED
DRAWN BY: JAB	DATE: 10/2024	DATE: 10/2024

APPROVED

DEPUTY CITY ENGINEER DATE CITY ENGINEER DATE

PROJECT NO.: SW02011 FILE NO.: C-4

G183157
FG183157



NOTES:

1. 12" HDPE PERFORATED BIOGAS COLLECTION PIPE CONTINUOUS AROUND PERIMETER OF TANK. TOP OF PIPE APPROXIMATELY 8" BELOW TOP OF RINGWALL. GAS COLLECTION SLOPE LATERALS EXTEND DOWN SLOPE TO LOW WATER ELEVATION.
2. BALLAST PIPE SIZE/WEIGHT AND DETAILED LAYOUT SHALL BE DETERMINED BY THE GEOMEMBRANE AND FLOATING COVER INSTALLATION FIRM.
3. THIS SHEET DEPICTS THE FEATURES OF THE COVER. ALL OTHER PROJECT FEATURES ARE SHOWN SCREENED FOR CLARITY.

REVISION		
ITEM NO.	DESCRIPTION OF CHANGE	APPROVAL DATE

JEFFREY W. OLD — LICENSED PROFESSIONAL ENGINEER — AGRICULTURE — No. 104551 — STATE OF TENNESSEE — 3/12/25

COVER AND LINER PLAN

ENGINEER: Black & Veatch Corporation

SEWER BASIN NO-1 SHEET 10 OF 29

DIVISION OF ENGINEERING

T.E. MAXSON WWTF BIOSOLIDS LAGOON 5 RENOVATIONS

SURVEY: GEODESY	DATE: 6/2014	PROJECT NO: 183157
DESIGN BY: GMG	DATE: 10/2024	SCALE: AS NOTED
DRAWN BY: JAB	DATE: 10/2024	DATE: 10/2024

APPROVED

DEPUTY CITY ENGINEER DATE CITY ENGINEER DATE

PROJECT NO.: SW02011 FILE NO.: C-5

183157
SW02011

LAGOON 5B
BOTTOM EL 188.0

MATCH LINE -- SEE SHEET C-5

DECANT STRUCTURE

12" PERFORATED HDPE BIOGAS COLLECTION (SEE NOTE 1)

(TYP) C C-11

(TYP) D C-11

6" OR 12" SQUARE FOAM HDPE ENCASPSULATED FLOATATION AND GAS TRANSFER LOG UNDER COVER (TYP OF 4)

4" WIDE x 40-MIL TEXTURED FML OR HDPE WALK STRIP WELDED TO COVER MATERIAL

(TYP) D C-10

12"Ø FLG SAMPLE PORT (TYP 4 PLCS LAGOON 5C) A C-10

100 MIL HDPE FLOATING GAS COLLECTION COVER

60 MIL HDPE BOTTOM LINER (BELOW)

B E-6 PH PROBE

A E-6 TEMP PROBE

C C-10 (TYP)

A C-13 WALK STRIP (TYP)

LAGOON 5C
BOTTOM EL 188.0

440'

4' WIDE X 40-MIL TEXTURED FIBER-METAL LAMINATE (FML) OR HDPE WALK STRIP WELDED TO COVER MATERIAL (TYP 1 PER LAGOON CELL, AROUND RAINWATER SUMP)

END OF BALLAST PIPE FASTENED IN POCKET TO COVER

B C-10 (TYP)

BALLAST PIPE STRAP TO COVER AT MAX SPACING OF 10'

1145'

3" RAINWATER DISCHARGE HS-2 HOSE (TYP)

PUMP CSP-5C1

PUMP CSP-5C2

PUMP CSP-5C3

PUMP CSP-5C4

PUMP CSP-5C5

H C-11 RAINWATER SUMP DISCHARGE POINT (TYP)

RAINWATER SUMP WITH SUBMERSIBLE PUMP (TYP)

A C-13 WALK STRIP (TYP)

(TYP) C C-11

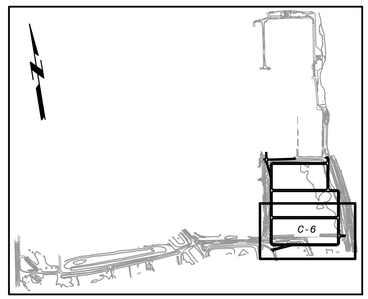
RAINWATER SUMP (TYP OF 5) E C-11

LARGER BALLAST AT SUMP

GAS VENT

50' 25' 0 50' 100'

1"=50'



KEY PLAN

NOTES:

1. 12" HDPE PERFORATED BIOGAS COLLECTION PIPE CONTINUOUS AROUND PERIMETER OF TANK. TOP OF PIPE APPROXIMATELY 8" BELOW TOP OF RINGWALL. GAS COLLECTION SLOPE LATERALS EXTEND DOWN SLOPE TO LOW WATER ELEVATION.
2. BALLAST PIPE SIZE/WEIGHT AND DETAILED LAYOUT SHALL BE DETERMINED BY THE GEOMEMBRANE AND FLOATING COVER INSTALLATION FIRM.
3. THIS SHEET DEPICTS THE FEATURES OF THE COVER. ALL OTHER PROJECT FEATURES ARE SHOWN SCREENED FOR CLARITY.

REVISION		
ITEM NO.	DESCRIPTION OF CHANGE	APPROVAL DATE

JEFFREY W. OLD REGISTERED ENGINEER AGRICULTURE COMMERCE NO. 104460 STATE OF TENNESSEE 3/21/25

COVER AND LINER PLAN

ENGINEER: Black & Veatch Corporation

SEWER BASIN NO-1 SHEET 11 OF 29

DIVISION OF ENGINEERING

T.E. MAXSON WWTF
BIOSOLIDS LAGOON 5
RENOVATIONS

SURVEY: GEODESY	DATE: 6/2014	PROJECT NO:	183157
DESIGN BY: GMG	DATE: 10/2024	SCALE:	AS NOTED
DRAWN BY: JAB	DATE: 10/2024	DATE:	10/2024

APPROVED

DEPUTY CITY ENGINEER DATE CITY ENGINEER DATE

PROJECT NO.: SW02011 FILE NO.: C-6

183157
6183157