

Jordan Lake Water Reclamation and Reuse Phase 2 RTP South

Preliminary Engineering Report

Wake County

Project number: 60601978

November 4, 2019

Quality information

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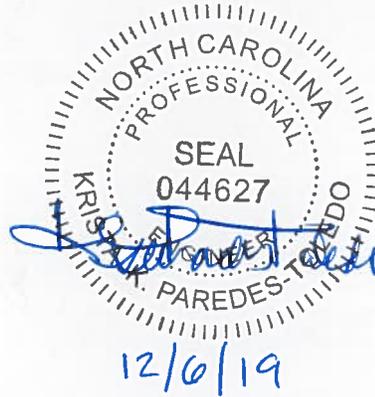
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Figure 1 – Proposed Reclaimed Water Main Alignment

1. Executive Summary

In 2003, Wake County completed a Water Reclamation and Reuse Plan for Research Triangle Park (RTP) South. The plan, developed in concert with the Town of Cary and Durham County, contemplated providing reclaimed water from the Durham County Triangle Wastewater Treatment Plant (WWTP) to RTP South and the surrounding area. The system was designed to serve customers in the Durham County portion of RTP and Cary's customers in the Wake County portion. In 2010 and 2013, construction was completed on Phases I and II, respectively, of the original design prepared by AECOM's legacy firm, URS Corporation. The original design plans included a portion of work in Wake County, described as RTP South, which was not constructed. This project updates the original design of the unconstructed portion which was intended to serve the then-undeveloped portion of RTP South along Louis Stephens Drive, Little Drive, and Davis Drive.

This report describes data collection, conclusions, and recommendations related to final design, permitting, budgeting, and construction of the project. Conclusions and recommendations are summarized as follows:

1. The project scope has been modified to include the Town of Cary request to extend the planned RTP South reclaimed water main to connect with the existing 12-inch reclaimed water main that serves the Parkside Town Commons shopping center, delete the planned 6-inch reclaimed water main proposed on Davis Drive and instead connect to the existing 16-inch reclaimed water main on the opposite side of Davis Drive (requiring an additional road crossing).
2. Review of record drawings identified gaps in the original design due to the existing main terminating at locations other than originally planned, in the vicinity of the intersection of Louis Stephens Drive and Little Drive. Extending the proposed mains to the termination points of the existing main will require the addition of an HDD crossing under the existing 36-inch storm sewer that crosses Louis Stephens Drive just north of Little Drive.
3. The original design planned for a 12-inch reclaimed water main, transitioning to an 8-inch and 6-inch main west to east from Little Drive to Davis Drive. Because the Davis Drive termination will now connect to an existing 16-inch main it is concluded that all 8-inch and 6-inch pipe will be revised to be installed as 12-inch.
4. Eight connection points have been identified as described in Section 2.4 and shown in Figure 1. Three of the proposed connection points are currently interconnected with the nearest potable water main. These interconnections must be completely removed before a connection with the proposed reclaimed water main is made.
5. Development plans were investigated for parcels along the route of the new reclaimed water main. There are no anticipated meter connections planned as part of this project.
6. The existing 12-inch ductile iron pipe under the Interstate-540 (I-540) crossing on Little Drive was installed prior to 2008, it is not encased, and it has not contained water since its installation. The existing pipe will need to be pressure tested, and slip lined, if necessary, prior to connection to the new work.
7. The jack and bore crossing under Louis Stephens Drive was shifted to avoid potential conflict with existing 30-inch gravity sewer that runs parallel to Louis Stephen Drive and is approximately 20 feet deep.
8. Existing geotechnical data and recommendations were reviewed for the project areas and it is concluded that rock is likely present at depths ranging from 3 feet to 8 feet. A sufficient budget and schedule allowance for hard rock removal will be extremely important in order to avoid construction delays and change orders.

9. Existing right-of-way appears sufficient for installation of the new work. No temporary or permanent easement acquisitions are needed. However, an encroachment agreement with the North Carolina Department of Transportation (NCDOT) will be required as all the roads within the project area are Secondary Roads within Division 5 of the NCDOT.
10. Permitting activities for the project prior to bid will include erosion and sediment control permitting from North Carolina Department of Environmental Quality (NCDEQ), development plan approval from the Town of Cary, and a three-party encroachment agreement from the NCDOT. Additionally, prior to commencement of work, the Contractor must obtain a Stormwater General Construction Permit from NCDEQ.
11. As with any construction project, one of the greatest risks is uncertainty in existing field subsurface conditions. AECOM's preliminary engineering review included review of existing geotechnical, survey, and stakeholder information in an effort to reduce uncertainty.
12. The preliminary cost opinion for this project is currently \$3.0 million. The amount equates to an approximate cost of \$200 per linear foot of installed pipe, which is in line with other recent projects in the Triangle area. The preliminary cost opinion includes:
 - a. assumption of approximately 3 feet of rock removal for those areas where the boring data indicated the presence of rock, plus an additional contingency of \$108,000 (approximately 33% of the estimated rock removal cost) for additional rock removal.
 - b. a contingency of 5% for change orders.
 - c. an additional overall project contingency of 10%.
13. As design progresses through permitting, it is recommended that the cost opinion be updated with more accurate quantities, and current unit prices based upon similar work by local contractors.
14. A concern is the presence of hard rock as discussed in the geotechnical report. Hard rock may require blasting to remove, which can cause project delays and additional permitting requirements. Additionally, because the precise amount of rock cannot be quantified prior to construction, AECOM recommends that the project budget maintain a \$108,000 contingency to address possible hard rock removal.
15. It is recommended that Wake County maintain a full-time resident project representative to verify quantities of rock removal and conditions encountered during construction.

2. Project Description

2.1 Background

In 2003, Wake County completed a Water Reclamation and Reuse Plan for Research Triangle Park (RTP) South. The plan, developed in coordination with the Town of Cary and Durham County, contemplated providing reclaimed water from the Durham County Triangle Wastewater Treatment Plant (WWTP) to RTP South and the surrounding area. The system was designed to serve customers in the Durham County portion of RTP and Cary's customers in the Wake County portion. In 2010 and 2013, construction was completed on Phases I and II, respectively, of the original design prepared by AECOM's legacy firm, URS Corporation. The original design plans included a portion of work in Wake County, described as RTP South, which was not constructed.

2.2 Location

The unconstructed portion of the original project was intended to serve the then-undeveloped portion of RTP South along Louis Stephens Drive, Little Drive, and Davis Drive. The project area lies within Wake County and has planned interconnections with the Town of Cary. Current potential customers in the vicinity of the proposed project include Parkside Town Commons, NetApp, Parkside Elementary (which opened in August 2019), and Fujifilm Diosynth Biotechnologies. Other parcels adjacent to the project site remain undeveloped with no current development plans underway.

2.3 Change of Scope

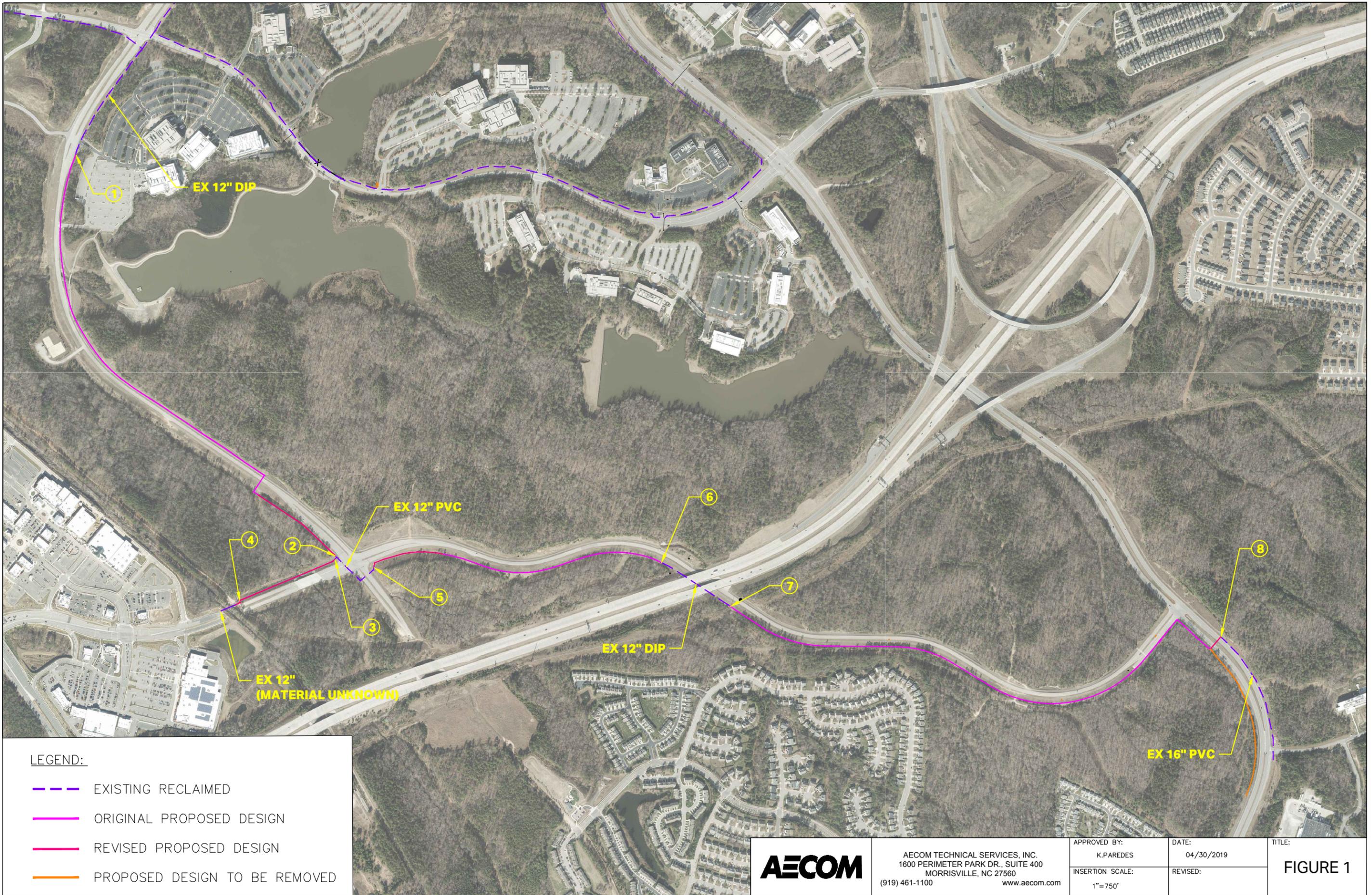
On April 17th, 2019 a stakeholder meeting was held with all project stakeholders to discuss any requested changes to the project scope. Minutes from this meeting can be found in **Appendix A**. At this meeting the Town of Cary provided record drawings for three separate areas within the project limits. These record drawings included:

1. Record drawings prepared by the Wooten Company in late 2011 for the portion of reclaimed water main that was constructed up to the intersection of Little and Davis Drives.
2. A record drawing of the sanitary sewer outfall along O'Kelly Chapel Road, prepared by McAdams in 2014, that showed the existing reclaimed line adjacent to Parkside Town Commons shopping center.
3. Record drawings for the Technical Services Building for the Fujifilm Diosynth company, prepared by Clark Nexsen in 2015, that shows the existing 16-inch reclaimed water main that was constructed along Davis Drive as part of their project.

Based on these drawings the Town of Cary requested an extension of the planned RTP South reclaimed water main to connect with the existing 12-inch reclaimed water that serves the Parkside Town Commons shopping center. Additionally, the 16-inch reclaimed water main that was built along Davis Drive negates the need for the planned 6-inch reclaimed water main that was proposed. However, the 6-inch main was planned for the west side of Davis Drive and the existing 16-inch main is on the east side. This will require a change to the original design and an additional road crossing.

Review of record drawings also identified several gaps in the original design due to the existing main terminating at locations different than originally planned. In the original design, it was assumed that the existing main at the intersection of Louis Stephens Drive and Little Drive extended approximately 800 ft north along Louis Stephens Drive, and 600 feet east along Little Drive from the intersection. The actual termination points are just north and east of the intersection. Extending the proposed mains to the termination points of the existing main will require the addition of a deep crossing under the existing 36-inch storm sewer that crosses Louis Stephens Drive just north of Little Drive. Due to the depth of the crossing and proximity to the edge of pavement, positive shoring will likely be required. The additional sections being added as part of the revised design are shown in **Figure 1**.

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LEGEND:

-  EXISTING RECLAIMED
-  ORIGINAL PROPOSED DESIGN
-  REVISED PROPOSED DESIGN
-  PROPOSED DESIGN TO BE REMOVED



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APPROVED BY:
K.PAREDES
INSERTION SCALE:
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DATE:
04/30/2019
REVISED:

TITLE:
FIGURE 1

The original design planned for a 12-inch reclaimed water main, transitioning to an 8-inch main along Little Drive just past the intersection with Louis Stephens Drive, transitioning to a 6-inch reclaimed main on Little Drive just prior to the intersection with Davis Drive. All stakeholders agree that revising the proposed design to install a 12-inch main instead of a combination of 12-inch, 8-inch, and 6-inch makes the most sense hydraulically as this area will now connect to an existing 16-inch main.

2.4 Condition of Existing Assets

There are currently eight connections to be made between the proposed reclaimed water main and existing portions of the main. These eight connection points can be seen in **Figure 1** and are as follows:

1. At the existing 12-inch reclaimed water main on the east side of Louis Stephens Drive in front of the NetApp building.
2. At the northwest corner of the Louis Stephens Drive and Little Drive intersection, from the existing 12-inch reclaimed water main and plug to the north along Louis Stephens Road.
3. At the northwest corner of the Louis Stephens Drive and Little Drive intersection, from the existing 12-inch reclaimed water main and plug to the west along O'Kelly Chapel Road.
4. At the existing 12-inch main on the north side of O'Kelly Chapel Road, just east of the CSX railroad right-of-way.
5. At the existing 12-inch reclaimed water main on the southeast corner of the Louis Stephens Drive and Little Drive intersection towards the east along Little Drive.
6. At the north side of the existing 12-inch reclaimed water main that passes under I-540 on the west side of Little Drive.
7. At the south side of the existing 12-inch reclaimed water main that passes under I-540 on the west side of Little Drive.
8. At the existing 16-inch reclaimed water main located on the east side of Davis Drive in front of the Fujifilm Diosynth building.

The existing 12-inch ductile iron pipe under the I-540 crossing on Little Drive was installed prior to 2008 and is not encased. It is assumed that the gaskets on this section of pipe are most likely brittle due to the lack of water in the pipe and will fail when pressure tested. It is recommended that this section of pipe be pressure tested independently, prior to connection with the proposed main, and slip lined if necessary.

Three of the proposed connection points (points 4, 5, and 8) are currently interconnected with the nearest potable water main. These interconnections must be completely removed before connection with the proposed reclaimed water main is made.

The existing connection at the Fuji Diosynth facility will need to be removed prior to the proposed water main connecting with the existing 16-inch reclaimed water main that runs adjacent to Fuji's property. If Fuji desires to have reclaimed water, they will need to make the modification to their system to remove the existing interconnection between their irrigation lines and the potable water system.

3. Advanced Planning Phase

3.1 Water Main Route and Interconnect

The project is approximately 15,000 linear feet of 12-inch reclaimed water main. The proposed route for the reclaimed water main shall connect to the existing 12-inch reclaimed main on the east side of Louis Stephens Drive until it crosses to the west side of the road at a location approximately 1,400 feet north of the intersection with Davis Drive. At the intersection of Louis Stephens and Little Drives, the reclaimed water main branches towards the west along the north side of O' Kelly Chapel Road where it connects with an existing reclaimed main just south of the Parkside Town Commons shopping center. The main

continues across the intersection from north to south on the western side, turns east and continues on the southern shoulder of Little Drive. At the point where I-540 crosses Little Drive, the reclaimed main ties into a segment of reclaimed main that was installed circa to 2008, when I-540 was constructed. The length of this existing section is approximately 700 linear feet and, as described in Section 2.4, is most likely in poor condition and should be independently pressure tested before a connection is made. From the southern connection point of this existing segment the main continues along the southern side of Little Drive until it reaches the intersection with Davis Drive, at which point it turns south and follows Davis Drive along the western side for a short time. Approximately 350 feet south of the intersection the main crosses from the west to the east side of Davis Drive in order to connect with the existing 16-inch reclaimed water main.

3.2 Potential Construction Concerns

The proposed alignment for the reclaimed water main crosses several site features which will require installation methods other than traditional trenching:

1. Along Louis Stephens Drive there is a stream crossing and a large 9-ft by 9-ft box culvert which is recommended to be crossed using horizontal directional drilling (HDD).
2. Two road crossings (Louis Stephens Drive and Davis Drive) will require jack and boring of a steel encasement pipe. The original alignment would have required a HDD under a stream that crosses Davis Drive, however, the revised alignment will replace that HDD with a jack and bore.
3. In the stakeholder meeting held on April 17, 2019, it was discussed that the jack and bore crossing under Louis Stephens Drive should be shifted in order to avoid any potential conflict with the existing 30-inch gravity sewer that runs parallel to Louis Stephens Drive. The existing sewer in this area is approximately 20 feet deep. The bore pit has been shifted to the south in order to avoid placing the bore pit and any associated equipment directly over the sewer line.
4. Another construction concern is the use of the existing 12" ductile iron main that crosses under I-540. It is believed that this existing 12" ductile iron pipe is not encased and has remained dry since its installation in 2008. It is expected that the pipe gaskets have become brittle and will fail. Prior to connection to this portion of the main, a 24 hour pressure test should be performed to determine the integrity of the existing installation. If the pipe fails the 24 hour pressure test, lining of the main is suggested. Lining will require coordination with the NCDOT.

3.3 Anticipated Connections

Development plans were investigated for parcels along the route of the new reclaimed water main. Currently there are no anticipated meter connections planned to be constructed as part of this project. The Fujifilm Diosynth Biotechnologies building has already installed a 4-inch DIP connection to the existing 16-inch reclaimed main that exists on the eastern side of Davis Drive. This service line has an existing 4-inch DIP interconnection with the potable water main which must be removed before the 16-inch main is placed into service. Wake County will not make alterations to the potable or reclaim water connection on private property as part of this project.

The new Parkside Elementary school which opened in August of 2019 does not have dual plumbing or irrigation and has not requested a connection to the reclaimed water main.

Research Triangle Foundation staff identified no additional parcels, currently developed or in the process of being developed, as candidates for connection.

3.4 Water Main Sizing

The Jordan Lake RTP South reclaimed water main project was originally planned as 12-inch main decreasing to 8-inch and 6-inch and a dead-end as the main progressed from west to east. The Town of Cary confirmed that the reclaimed water (RW) main installed in the current project area along Davis Drive is a 16-inch main. It is not advisable to decrease the pipe sizes prior to the 16-inch main connections. It is

recommended that no portions of the proposed main be decreased in size. The proposed reclaimed water main will remain a 12-inch line from the connection point on Louis Stephens Drive, until the connection with the existing 16-inch main on Davis Drive.

3.5 Geotechnical Data

The original project included a geotechnical evaluation which was broken up into two phases. Phase I of the geotechnical evaluation was performed in October 2007 and included borings along Louis Stephens Drive and the western portion of Little Drive. The bores for Phase I were numbered B-53 through B-69. Phase II of the geotechnical evaluation was performed in March of 2008 and included borings along Davis Drive and the eastern portion of Little Drive. The bores for Phase II were numbered B-70 through B-83.

In both Phase I and II, “the majority of the borings extended through moderate to high consistency soils, partially weathered rock, and hard rock.” Augur refusal was encountered at bores B-54, B-57, and B-64, indicating hard rock. The depths of refusal varied from 3 feet to 8 feet. Hard rock is typically difficult to remove by means other than mechanical removal, such as grinding and hoe-ramming, and often requires blasting. It is recommended that the project budget include generous contingency to address possible hard rock removal.

Additional recommendations from the geotechnical reports include the possible need for trench dewatering through pumping or ditching. The reports also include a more in-depth summary of the recommended type of excavation equipment depending on the soil types.

The full text of the geotechnical reports for Phase I and Phase II can be found in **Appendices B and C** respectively.

3.6 Easement Requirements

It is anticipated that all the proposed water main will fall within the existing right-of-way. As such it is not expected that any easements will be required. Additionally, there is sufficient distance between the proposed main and the edge of right-of-way to negate the need for any temporary construction easement (TCE).

Although no easement will be needed, it is expected that the existing 12-inch ductile iron pipe under the I-540 crossing of Little Drive may require lining as part of this project. An encroachment agreement with the North Carolina Department of Transportation (NCDOT) will be required as all the roads within the project area are Secondary Roads within Division 5 of the NCDOT.

3.7 Permits Required and Approvals

It is anticipated that this project will require the following approvals:

1. Erosion and Sediment Control (E&SC) Permit from NCDEQ – Any land disturbance greater than 1.0 acres requires and erosion and sediment control plan approval through the State. The fee for an Erosion and Sediment Control Permit through NCDEQ is \$65.00 per acre of disturbance.
2. Development Plan Approval - The Town of Cary has delegated authority from the State for reclaimed water systems and will issue the required reclaimed water permit as the project falls within the Town of Cary’s service area of Research Triangle Park (RTP). This will be done with a Development Plan Approval. All proposed engineering plans are submitted online to the Town of Cary’s Planning and Development Services department through their electronic plan review site (<https://townofcary.idtplans.com/secure/>). The fee for a Development Plan review is \$300.00. The \$300.00 fee is broken up into two payments of \$150.00, the first portion of which is due with the submittal of the application, and the second portion of which is due upon approval of the plan.

3. NCDOT 3rd Party Encroachment Agreement – Any work within the right-of-way of a state road requires the execution of an encroachment agreement. The project includes work within the following State Roads:
 - i. Louis Stephens Drive (SR-2153)
 - ii. Little Drive (SR-2153)
 - iii. Davis Drive (SR-1613)
 - iv. O'Kelly Chapel Road (SR-1628)

It is expected that the Three-Party Utility Agreement, Non Controlled Access (Form 16.6) will be required with Wake County acting as the applicant, the Town of Cary acting as party maintaining the water mains, and entering into an agreement with the NCDOT. There is no fee associated with an encroachment agreement.

4. The Contractor will be required to file for the NCGO1 Stormwater General Construction Permit Notice of Intent (NOI) prior to beginning construction. The NOI requires an annual fee of \$100.00 per year. Upon completion of the project, the Contractor will file a Notice of Termination (NOT).

4. Preliminary Project Budget Opinions

4.1 Preliminary Cost Opinion

The preliminary cost opinion for this project is currently \$3.0 million for approximately 15,000 linear feet of 12-inch reclaimed water main including eight interconnections and abandonment of three potable water connections. A significant portion of the estimated construction cost is related to rock removal. It was assumed that approximately 3 feet of rock removal would be required for those areas where the boring data indicated the presence of rock, and that approximately 20% of the rest of the alignment may encounter rock. An additional contingency of \$108,000 (approximately 33% of the estimated rock removal cost) was included to address possible hard rock removal or additional permitting concerns related to rock blasting. A contingency of 5% for possible change orders was included, as well as an overall project contingency of 10%.

The amount equates to an approximate cost of \$200 per linear foot of installed pipe, which is in line with other recent projects in the Triangle area. As design progresses, this estimate will be updated with more accurate quantities, and current unit prices based upon similar work by local contractors. The preliminary cost opinion can be found as **Appendix D** to this report.

5. Conclusions and Recommendations

5.1 Conclusions

The following conclusions are made after examination of the preliminary design for the Phase 2 RTP South reclaimed water main, updated with current field conditions and input from stakeholders:

1. The project scope has been modified to include the Town of Cary request to extend the planned RTP South reclaimed water main to connect with the existing 12-inch reclaimed water that serves the Parkside Town Commons shopping center, delete the planned 6-inch reclaimed water main proposed on Davis Drive and instead connect to the existing 16-inch reclaimed water main on the opposite side of Davis Drive (requiring an additional road crossing).

2. Review of record drawings identified gaps in the original design due to the existing main terminating at locations other than originally planned in the vicinity of the intersection of Louis Stephens Drive and Little Drive. Extending the proposed mains to the termination points of the existing main will require the addition of an HDD crossing under the existing 36-inch storm sewer that crosses Louis Stephens Drive just north of Little Drive.
3. The original design planned for a 12-inch reclaimed water main, transitioning to an 8-inch and 6-inch main west to east from Little Drive to Davis Drive. Because the Davis Drive termination will now connect to an existing 16-inch main it is concluded that all 8-inch and 6-inch pipe will be revised to be installed as 12-inch.
4. Eight connection points have been identified as described in Section 2.4 and shown in Figure 1. Three of the proposed connection points are currently interconnected with the nearest potable water main. These interconnections must be completely removed before connection with the proposed reclaimed water main is made.
5. Development plans were investigated for parcels along the route of the new reclaimed water main. There are no anticipated meter connections planned as part of this project.
6. The existing 12-inch ductile iron pipe under the I-540 crossing on Little Drive was installed prior to 2008, it is not encased, and it has not contained water since its installation. It is necessary to pressure test the pipeline and slip lined, if necessary, prior to connection to the new work.
7. The jack and bore crossing under Louis Stephens Drive was shifted to avoid potential conflict with existing 30-inch gravity sewer that runs parallel to Louis Stephen and is approximately 20 feet deep.
8. Existing geotechnical data and recommendations were review for the project areas and it is concluded that rock is likely present at depths ranging from 3 feet to 8 feet. A sufficient budget and schedule allowance for hard rock removal will be extremely important in order to avoid construction delays and change orders.
9. Existing right-of-way appears sufficient for installation of the new work. No temporary or permanent easement acquisition are needed. An encroachment agreement with the North Carolina Department of Transportation (NCDOT) will be required as all the roads within the project area are Secondary Roads within Division 5 of the NCDOT.
10. Permitting activities for the project prior to bid will include erosion and sediment control permitting from North Carolina Department of Environmental Quality (NCDEQ) and development plan approval from the Town of Cary. Additionally, prior to commencement of work, the Contractor must obtain a Stormwater General Construction Permit from NCDEQ.
11. As with any construction project, one of the greatest risks is uncertainty in existing field subsurface conditions. AECOM's preliminary engineering review included review of existing geotechnical, survey, and stakeholder information in an effort to reduce uncertainty.
12. The preliminary cost opinion for this project is currently \$3.0 million. The amount equates to an approximate cost of \$200 per linear foot of installed pipe, which is in line with other recent projects in the Triangle area. The preliminary cost opinion includes:
 - a. assumption of approximately 3 feet of rock removal for the length of the project plus an additional contingency of \$108,000 (approximately 33% of the estimated rock removal cost) for additional rock removal.
 - b. a contingency of 5% for change orders.
 - c. an additional overall project contingency of 10%.

5.2 Recommendations

AECOM recommends the following as the project progresses through final permitting, bidding, and construction:

1. As design progresses through permitting, it is recommended that the cost opinion be updated with more accurate quantities, current unit prices based upon similar work by local contractors, and less conservative contingencies if perceived risk is diminished.
2. A concern is the presence of hard rock as discussed in the geotechnical report. Hard rock may require blasting to remove, which can cause project delays and additional permitting requirements. Additionally, because the precise amount of rock cannot be quantified prior to construction, AECOM recommends that the project budget maintain a \$108,000 contingency to address possible hard rock removal.
3. It is recommended that Wake County maintain a full-time resident project representative to verify quantities of rock removal and conditions encountered during construction.

Appendix A – Stakeholder Meeting Minutes

Meeting Minutes

Meeting name Jordan Lake Stakeholder Meeting	Meeting date April 17, 2019	Attendees Mary Brice, AECOM Krista Paredes, AECOM Megan Jones, AECOM Tom Covington, Wake County Glen Harrell, Town of Cary Rick Jordan, Town of Cary Jeff Adkins, Town of Cary Donald Dittmer, Research Triangle Foundation
Time 9:00 am	Location AECOM Morrisville Office	
Project name JL Reclaimed Water Main Ph 2	AECOM project number 60601978	
Prepared by Krista Paredes-Toledo		

1. Safety Moment

1.1 Tornado Safety

The keys to severe weather safety

Know Your Risk	Pledge to Prepare and Take Action	Be an Example
<p>The first step to becoming weather-ready is to understand the type of hazardous weather that can affect where you live and work, and how the weather could impact you and your family. Check the weather forecasts regularly and visit readync.org to learn more about becoming prepared.</p>	<p>Pledge to prepare by visiting readync.org. Take the first step to make sure that you and your family are prepared for severe weather. This includes building an emergency kit, filling out a family safety and communication plan, keeping important papers in a safe place, and having multiple sources for weather alerts.</p>	<p>Once you have taken action to prepare, get involved, and share your story with your family and friends. Studies show that many people use social media in the event of a disaster to let relatives and friends know that they are safe. This is an important trend because people are most likely to take preparedness steps if they observe the preparations taken by others.</p>

1.1.1 Tornado watch vs. tornado warning

- Under a tornado watch the conditions are right for a tornado to form but tornados are not yet forming.
- Under a tornado warning a tornado is occurring or will soon occur and people should take cover.

1.2 For more information visit: <https://www.weather.gov/rah/2019ncswpw>

2. Introductions

2.1 Wake County Contacts

- Thomas Covington, Facilities Project Manager

2.2 AECOM Contacts

- Mary Brice, Project Manager
- Krista Paredes, Deputy Project Manager and Lead Engineer
- Megan Jones, Engineer in Training

2.3 Town of Cary Contacts

- Glen Harrell, Utilities Engineering Manager
- Jeff Adkins, Water Resources Manager

- Rick Jordan, Reclaimed Water Supervisor

2.4 Research Triangle Foundation Contacts

- Tim Brock, Senior Planner
- Blake Cashmore, Assistant Planner
- Donald Dittmer, General Manager of Construction & Facilities

3. Project Overview

3.1 Phase 1, 2012-2013; Phase 2, shelved until now

3.2 Survey underway to update existing plans with current utilities, site features, and Phase 1 locations

3.3 Town of Cary transmitted as-builts/record drawings related to this project via FTP folder

4. Discussion Topics

4.1 25-yr Growth Plan

4.2 Confirmation of Line Sizes

4.2.1 Town of Cary confirmed that 16" reclaimed water (RW) main is installed in the current project area along Davis Drive.

4.2.2 The Jordan Lake project was planned as 12" decreasing to 8" and 6" progressing west to east. It is not advisable to connect 6" to the existing 16". Line sizes will be revised to 12" throughout.

4.3 Future Connections

4.3.1 No need to extend to Northwest Park area (south of I-540), taken off Master Plan.

4.3.2 Property owned by Acute Investments LLC at NE intersection of Little Drive and Louis Stephens Drive, no known need for connection at this time (see action items).

4.3.3 Probable connection at Fuji/Diosynth (see action items).

4.4 Possible Easement Acquisitions

4.4.1 Original design did not require permanent easement. All line is currently in ROW. Temporary construction easement (TCE) was obtained from Research Triangle Foundation.

4.4.2 Donald Dittmer is Research Triangle Foundation contact if additional TCE is needed.

4.5 Other Discussion Items

4.5.1 Town of Cary noted that 12" RW is existing on O'Kelly Chapel Road and wishes that Wake County include a final segment to connect their terminus with this project. Will require approximately 1,200 linear feet and a stream crossing, tie into existing on NE side of railroad tracks.

4.5.2 Three locations were identified where potable/reclaim interconnects exist and must be removed during project:

4.5.2.1 Little Drive near intersection with Louis Stephens Drive

4.5.2.2 Davis Drive at Technical Services building.

4.5.2.3 Parkside Commons

4.5.3 Little Dr and Louis Stephens intersection (by Wooten): stub outs exist on 2 corners.

4.5.4 12" on Little Drive at I-540 crossing is empty direct-bury ductile iron pipe (DIP). It is possible that gaskets will be in poor condition. Original plan called for pressure testing of existing pipe prior to connection with new construction; however, it may be prudent to CIPP line the existing 12" DIP to

prolong service life. Glen can provide record drawing for the 12" RW that is shown on the sewer record drawing.

- 4.5.5 Town of Cary has delegation authority to permit reclaimed water line extensions.
- 4.5.6 After June 1st, reclaimed water permit will be an additional approval with site plan.
- 4.5.7 Project will need to go through Cary Development Services for permitting.
- 4.5.8 Contractor shall coordinate with Town of Cary for removal of existing potable connections/conversion to RW.
- 4.5.9 Wake County has funding for on-site (5' from building foundation to right-of-way) and off-site (tap to right-of-way) connection expenses. Consider an informational notification letter to adjacent property-owners to request connections as part of this project. Will require a deadline for request to be included in this project.
- 4.5.10 Summary of impacts to project scope:
 - 4.5.10.1 Add approximately 1,200 linear feet of 12" RW with one stream crossing on O'Kelly Chapel Road. Railroad encroachment?
 - 4.5.10.2 Upsize approximately 6,600 linear feet of 8" RW to 12" RW on Little Drive.
 - 4.5.10.3 Upsize approximately 500 linear feet of 6" RW to 12" RW on Little Drive.
 - 4.5.10.4 Upsize approximately 500 linear feet of 6" RW to 12" RW on Davis Drive.
 - 4.5.10.5 Delete approximately 1,500 linear feet of 6" RW from project.
 - 4.5.10.6 Remove three existing interconnects with the potable water system.
 - 4.5.10.7 Survey needed on O'Kelly Chapel Road and Davis Drive.

5. Action Items

5.1 AECOM

- 5.1.1 We spoke with surveyor immediately after today's meeting and learned that their field work is complete. We sent a request for cost for additional survey and utility locate on O'Kelly Chapel, Little Drive, and Davis Drive.
- 5.1.2 Shift alignment on Louis Stephens in vicinity of 30" gravity sewer.
- 5.1.3 Update and share schedule with additional survey needs, Town of Cary permitting timelines, and additional time for construction contracting.
- 5.1.4 Coordinate with Town of Cary to contact Fuji regarding location and size of connection.

5.2 Glen Harrell

- 5.2.1 Record drawings with irrigation system at Technical Services Bldg.
- 5.2.2 Identify the permitting "Tier" for this project.

5.3 Donald Dittmer

- 5.3.1 Share RTP master utility plan or existing utility locations for project area, if available.
- 5.3.2 Enquire about development plan/connection request at Acute Investments LLC property.

Appendix B - Phase I Geotechnical Report

**FINAL SUBSURFACE EXPLORATION REPORT
PROPOSED PHASE I OF JORDAN LAKE WATER
RECLAMATION AND REUSE PROJECT
WAKE COUNTY, NORTH CAROLINA**

S&ME PROJECT NO. 1051-06-265

Prepared For:
URS Corporation – North Carolina
Morrisville, North Carolina

Prepared By:
S&ME, Inc.
3201 Spring Forest Road
Raleigh, North Carolina 27616

October 18, 2007



October 18, 2007

URS Corporation – North Carolina
1600 Perimeter Park Drive, Suite 400
Morrisville, North Carolina 27560

Attention: Mr. Marco R. Menendez, P.E., PMP
Project Manager

Reference: Final Subsurface Exploration Report
Proposed Phase I of Jordan Lake Water
Reclamation and Reuse Project
Wake County, North Carolina
S&ME Project No. 1051-06-265

Dear Mr. Menendez:

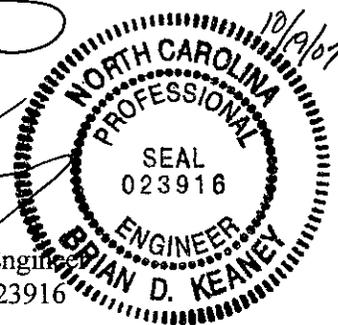
S&ME, Inc. is pleased to submit this report of the final subsurface exploration for the referenced project. Work was conducted in accordance with S&ME Proposal P111-06E (2nd Revision). The purpose of the exploration was to evaluate subsurface conditions as they relate to the presence of materials expected to require difficult excavation. This report presents a summary of pertinent project information, exploration sampling methods, logs and locations of borings, description of subsurface soils, and comments regarding potential excavation difficulty of encountered materials.

S&ME, Inc. appreciates the opportunity to provide geotechnical engineering services for this project. If you have any questions or need additional information concerning this report, please contact us.

Sincerely,
S&ME, Inc.

Lauren Raup
Staff Professional

Brian D. Keaney, P.E.
Project Geotechnical Engineer
N.C. Registration No. 23916



Keith Brown, P.E.
Branch Manager
N.C. Registration No. 22540

Attachments

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APPENDICES

Figure 1A – 1O Boring Location Plan

Figure 2A – 2H Test Boring Profiles

 Alston Avenue

 Kit Creek Road Profile 1

 Kit Creek Road Profile 2

 Davis Drive

 Louis Stephens Road Profile 1

 Development Drive

 Louis Stephens Road Profile 2

 Little Drive

Summary of Depths to Partially Weathered Rock (PWR) and Auger Refusal

Legend to Soil Classification and Symbols

Test Boring Logs

Laboratory Test Results

1.0 PROJECT AND SITE DESCRIPTION

We understand the project consists of the design and construction of a distribution system of reclaimed water within Research Triangle Park (RTP) south area, extending from the Durham/Wake County line to Thomas Brooks Park in Cary. The Wake County portion of the project, or Phase I as it is referred to in this report, is predominately RTP south, which is defined as that portion of Research Triangle Park within Wake County that remains unincorporated. Proposed Phase I pipeline routes within RTP south include Development Drive, Louis Stephens Drive, Kit Creek Road, and Davis Drive from Kit Creek Road northward to Delta. The section of Alston Avenue south of the Durham/Wake County line to Kit Creek Road has been included in Phase I of this project. The RTP Expansion Phase includes Louis Stephens Drive, south of Kit Creek Road, and Little Drive to Davis Drive. The Town of Cary's Phase II portion is Alston Avenue south of Kit Creek Road, then Green Level to Durham Road to the intersection with Green Level Church Road, and then onto Green Hope School road and into Thomas Brooks Park.

The length of the project is approximately 13 miles. The proposed main water line will be a 4 to 20 inch diameter ductile iron pipe and will extend parallel to existing roadways within roadway right-of-way limits. Proposed pipe invert depths will be about 5 to 6 feet below the existing ground surfaces. Bore and jacking methods are proposed beneath the intersection of Kit Creek Road with NC 55, and Kit Creek Road with CSX Railroad.

2.0 AREA GEOLOGY

The site is located within one of several trough shaped basins that are present within the Piedmont Physiographic Province. The basins were formed during the Triassic and early Jurassic periods as a result of faulting and regional subsidence. Over time, the basins were filled with sediment eroded from the adjacent igneous and metamorphic formations. Although the basins may be grouped into areas having distinguishable geologic characteristics, locally the area is simply referred to as the Triassic Basin. Sedimentary sandstone, siltstone, mudstone and conglomerates are the predominant rock types within the Triassic Basin. Igneous intrusions (dikes and sills) are present within the sedimentary rocks in many areas. Near the ground surface, Triassic rocks and igneous intrusions are often discontinuous with depth. The Triassic rocks can be present as relatively thin layers and the intrusions in the form of boulders. Typical soils within the Triassic Basin consist of silts, clays and clayey/silty sands. Near the surface the silts and clays are often moderately to highly plastic. Where present, residual soils formed by weathering of igneous intrusions can be of a softer/wetter consistency than surrounding Triassic sediments (silts and clays).

3.0 EXPLORATION PROGRAM

Field exploration for this project included a visual site reconnaissance by representatives of S&ME and performance of sixty-six soil test borings (B-1 through B-69) along shoulders of existing roadway for proposed waterline routes. Three borings (B-26, B-31, and B-37) were

eliminated due to utility conflicts or on-going construction work interferences. Borings were performed at approximately 500 feet intervals. Boring locations were selected by representatives of URS Corporation and S&ME, Inc using the preliminary site plans dated August 20, 2007, provided by URS Corporation. An S&ME representative established boring locations in the field by using Global Positioning Satellite (GPS) coordinates. Approximate final boring locations are shown on Figures 1A through 1H in the Appendix.

Borings were performed to depths ranging from about 10 to 25 feet below existing grades using a CME 750 drill rig mounted on an all-terrain carrier and a Diedrich D-50 tuck mounted rig. Split-spoon samples of subsurface soils were taken at approximate 2.5 foot intervals above a depth of 10 feet and at 5 foot intervals below 10 feet. Standard penetration tests were conducted in conjunction with split-spoon sampling in general accordance with ASTM D 1586-99. Three bulk samples of auger cuttings were collected in borings B-6, B-33, and B-64 between depths of 0 to 6 feet below the existing ground surface. Boreholes were observed for groundwater at completion of drilling.

At the completion of drilling operations, boreholes were backfilled up to the original ground surface with auger cuttings. Plastic borehole closure devices were placed near the tops of boreholes in an attempt to improve ground surface stability. Representative split-spoon and bulk soil samples were returned to our laboratory for quantitative testing and visual classification in accordance with Unified Soil Classification System (USCS) guidelines.

The CME 750 drill rig is equipped with a hydraulic automatic hammer. Standard penetration tests were performed with an autohammer and not with a traditional rope, cathead and safety hammer. Research has shown that the standard penetration resistance (N-value) determined by the autohammer is different than the N-value determined by the safety hammer method. Most correlations that are published in the technical literature are based on the N-value determined by the safety hammer method. This is commonly termed N_{60} as the rope and cathead with a safety hammer delivers about 60 percent of the theoretical energy delivered by a 140 pound hammer falling 30 inches. Several researches have proposed correction factors for the use of hammers other than the safety hammer. The correction is made by the following equation:

$$N_{60} = N_{\text{field}} * C_E$$

N_{field} is the value recorded in the field and N_{60} is the value to be used in correlation. C_E is the energy correction factor for the hammer used. A correction factor of 1.3 is typically used for the autohammer used during drilling.

The N-values reported on the profile and Test Boring Records are the actual, field derived blow counts (N_{field}). However, only corrected results should be used for analysis.

Representative soil samples obtained during the field exploration were tested in S&ME's laboratory to verify visual classifications of the soils and to evaluate the soils engineering index properties. Laboratory testing included:

- Natural Moisture Content (ASTM D 2216)
- Atterberg Limits (ASTM D 4318)
- Grain Size Analysis (ASTM D 422)
- Standard Proctor Compaction (ASTM D 698)
- pH of Soils (ASTM G51)
- Soil Resistivity (ASTM G57)

Results of the laboratory testing are presented in the Appendix.

Test Boring Records and the profiles of Generalized Subsurface Conditions (Figures 2A through 2H) are included in the Appendix of this report. Stratification lines shown on Test Boring Records and profiles are intended to represent approximate depths of changes in soil types. Naturally, transitional changes in soil types are often gradual and cannot be defined at particular depths. Ground surface elevations shown on these documents were interpolated from a provided topographic plan and should be considered approximate.

3.1 Limitations of Exploration Program

With any subsurface exploration program, limitations to the information gathered exist. Without being a complete list, the following limitations apply to information gathered during the exploration:

- Borings were performed at approximate 500-foot spacings. Conditions between borings including the elevation of rock are unknown.
- Soil test borings were performed at accessible locations along the proposed alignment within the road right-of-ways and at sufficient distances to avoid underground and overhead utilities. In several cases, the soil borings will not be in the actual pipeline location.
- Portions of the roadways which have been filled in the past may contain boulders or rock pieces within the fill. Boulders or rock pieces will create difficult excavations during construction.

4.0 SUBSURFACE CONDITIONS

A surficial layer of topsoil, ranging in thickness from about 1 inch to 6 inches, was encountered in the borings. A surficial layer of rip-rap and gravel was encountered in boring B-15 with a thickness of approximately 6 inches. Beneath the surficial layers, borings encountered fill, alluvium, residual soils, and partially weathered rock. The majority of the borings extended through moderate to high consistency soils, partially weathered rock, and hard rock. A brief summary of these materials is discussed below.

Fill

Fill soils were encountered along many sections throughout the project. Fill was encountered to depths ranging from the existing ground surface to about 12 feet below existing grades. Fill soils consisted of silts (ML, MH), clays (CL, CH), and sands (SM, SC). Standard Penetration Test (SPT) resistance values (N-values) in the fill soils range from 2 to 42 blows per foot (bpf). These values indicate that the existing fill have soft to hard consistency and very loose to very dense relative density. Rock pieces were encountered in portions of the fill. Rock pieces typically cause SPT values to increase when encountered. As such, the consistency and relative density correlation with SPT blow count in fill containing rock pieces is unconservative (values indicated material is harder). Moisture contents of the encountered fill were typically dry of optimum to moist.

Alluvium

Alluvium is water deposited soils found below and adjacent to streams or lakes. Alluvial soils were encountered below fill soils in test boring B-55 located near the watershed located on Louis Stephens Drive. Alluvial soils were encountered at depths ranging from about 3 to 17 feet and mainly were classified as firm clays and very loose to loose sands. Standard Penetration Test (SPT) resistance values (N-values) in the alluvial soils range from 2 to 7 blows per foot (bpf). These values indicate that the alluvium has a firm consistency and a very loose to loose relative density. Moisture contents of the encountered alluvial soils were typically moist to wet of optimum moisture.

Residuum

Most of the borings extended through residual soils common to the Triassic Basin. Residual soils were encountered to depths ranging from about 0.5 to 10 feet below existing grades. Residual soils consist of sandy and silty clays (CL, CH), sandy and clayey silts (ML, MH), and silty and clayey sands (SM, SC). Standard Penetration Test (SPT) resistance values (N-values) in the residual soils range from 3 to 90 blows per foot (bpf). These values indicate that the residuum has a firm to very hard consistency and a very loose to very dense relative density. Moisture contents of the encountered residual soils were typically dry of optimum moisture to moist with some instances of soils exhibiting moisture contents wet of optimum moisture.

Partially Weathered Rock

Partially weathered rock (PWR) and hard rock were encountered below fill and residual soils at many locations. Borings encountered partially weathered rock at depths ranging from approximately 0.5 feet to 23.5 feet below the ground surface. Partially weathered rock is defined as material exhibiting standard penetration values in excess of 100 blows per foot (77 with autohammer). SPT N-values in partially weathered rock ranged from 50 blows in

6 inches to 50 blows in 0 inches of penetration. Partially weathered rock can be penetrated with some difficulty by power augers. In some borings, layers of high consistency soil were encountered within partially weathered rock. Partially weathered rock materials were typically dry of optimum moisture.

Material which refused auger advancement was encountered in test borings B-13 through B-14, B-19, B-34, B-46, B-49, B-54, B-57, and B-64. Auger refusal occurred at depths ranging from about 3 feet to 15 feet. Auger refusal generally indicates the top of hard rock or boulders. Very hard soils, partially weathered rock, and hard rock are difficult to excavate in trench form. Recommendations on excavations extending through these materials are provided in section 6.1 of this report.

Groundwater

Water was observed in seven (7) of the soil test borings at the time of boring completion. Observed water levels ranged from about 2.5 feet to 15.5 feet below the ground surface. Groundwater elevations can be expected to fluctuate due to seasonal variations in rainfall, evaporation, and other factors. Additionally, perched water may exist during wet periods of the year above less permeable fine-grained materials, such as silts, clays, or rock materials.

4.1 Pipe Route Locations

Alston Avenue

Beneath the surficial layer of topsoil, fill and residual soils were typically encountered. Fill was encountered in soil test borings B-2, B-3, B-5, B-6, and B-10. Fill was encountered to depths ranging from 0.5 to 7 feet below the ground surface and consisted of clays, clayey silts, and silty and clayey sands with trace amounts of gravel and organics. Residual soils were encountered below the ground surface in borings B-1, B-2, B-4, B-5, and B-8 through B-10 beneath surficial layers to depths of approximately 10 feet. In boring B-10, residuum was encountered beneath a layer of partially weathered rock at a depth ranging from approximately 7 feet to termination depth. Residual soils primarily consisted of silts, sandy silts, and clayey and silty sands. Partially weathered rock materials were encountered approximately 0.5 to 9.5 feet below the existing ground surface. All borings located on Alston Avenue, from the Wake/Durham County line to just south of the intersection with Kit Creek Road, encountered partially weathered rock with the exception of borings B-2, B-8, and B-9 which were terminated in residual soils. Auger refusal was not encountered in the soil test borings located on Alston Avenue.

Groundwater was not encountered in any of the borings located along Alston Avenue.

Kit Creek Road

Beneath the surficial layer of topsoil, fill and residual soils were typically encountered. A surficial layer of rip-rap and gravel was encountered in boring B-15 to a depth of 6 inches. Fill was encountered in soil test borings B-11, B-14 through B-17, B-21 through B-25, B-27 through B-30, and B-32. Fill was encountered to depths ranging from 0.5 to 12 feet below the ground surface and consisted of clays, silts, and silty and clayey sands with trace amounts of gravel and organics. Residual soils were encountered below the ground surface in borings B-11 through B-13, B-18, B-19, B-24, B-25, and B-30 to depths ranging from approximately 0.5 to 10 feet. Residual soils primarily consisted of sandy silts, clayey silts, clays, and clayey and silty sands. Partially weathered rock materials were encountered approximately 0.5 to 23 feet below the existing ground surface. Borings B-11 through B-14 located on Kit Creek Road, between the intersection with Alston Avenue and N.C. 55, encountered partially weathered rock. All borings located on Kit Creek Road, between the intersection with N.C. 55 and Louis Stephens Drive, encountered partially weathered rock except in the fill area near boring B-21. All borings located on Kit Creek Road, between the intersection with Louis Stephens Drive and Davis Drive, encountered partially weathered rock except in the fill area near boring B-24 and B-30. Auger refusal was encountered in soil test borings B-13, B-14, and B-19 at depths ranging from approximately 5 to 14 feet below the ground surface. Borings B-26 and B-31 were omitted due to utility conflicts and limited accessibility.

Groundwater was encountered in soil test borings B-14, B-15, and B-17 at depths ranging from about 11.5 to 15.5 feet below the ground surface.

Davis Drive

Beneath the surficial layer of topsoil, fill and residual soils were typically encountered. Fill was encountered in soil test borings B-35, B-36, and B-38. Fill was encountered to depths ranging from 0.5 to 10 feet below the ground surface and consisted of clays, silty clays, sandy silts, and clayey sands with trace amounts of gravel and organics. Residual soils were encountered in boring B-35 at a depths ranging from approximately 8.5 feet to termination depth. Residual soils primarily consisted of sandy silts. Partially weathered rock materials were encountered approximately 0.5 to 9 feet below existing ground surfaces. Partially weathered rock was encountered in borings B-34 and B-38 located on Davis Drive, extending from the Kit Creek Road intersection towards the Development Drive intersection. Auger refusal was encountered in soil test boring B-34 at a depth of approximately 3 feet. Boring B-37 was omitted due to utility conflicts.

Groundwater was encountered in soil test borings B-35 at a depth of about 5.0 feet below the ground surface.

Development Drive

Beneath the surficial layer of topsoil, fill and residual soils were typically encountered. Fill was encountered in soil test borings B-44 through B-48 and B-51. Fill was encountered to depths ranging from 0.5 to 10 feet below the ground surface and consisted of silts, clays, and silty and clayey sands with trace amounts of gravel and organics. Residual soils were encountered below the ground surface in borings B-49 and B-50 and extended to depths ranging from approximately 2 to 5 feet. Residual soils primarily consisted of silty clays and silts. Partially weathered rock materials were encountered approximately 2 to 9 feet below existing ground surfaces. All borings located on Development Drive, between the intersections with Louis Stephens Drive and Davis Drive, encountered partially weathered rock with the exception of borings B-45 and B-48, which were located in fill areas. Auger refusal was encountered in soil test borings B-46 and B-49 at depths of approximately 5.5 and 6.5 feet, respectively.

Groundwater was not encountered in any of the soil test borings located along Development Drive.

Louis Stephens Drive

Beneath the surficial layer of topsoil, fill and residual soils were typically encountered. Fill was encountered in soil test borings B-40 through B-43, B-53, B-55, B-56, B-58, B-61, and B-62. Fill was encountered to depths ranging from 0.5 to 10 feet below the ground surface and consisted of clays, sandy clays, sandy silts, and silty and clayey sands with trace amounts of gravel and organics. Residual soils were encountered below the ground surface in borings B-43, B-56 through B-60, and B-62 to depths ranging from about 0.5 to 10 feet. Residual soils primarily consisted of clays, silts, and silty and clayey sands. Near the culvert crossing at boring B-55, a layer of alluvium classified as firm clay and very loose to loose silty and clayey sands was encountered at a depth ranging from about 3 to 17 feet below the existing ground surface. Partially weathered rock was encountered in borings B-39, B-41, B-52, B-54 through B-57, and B-62 at depths from about 0.5 to 19.5 feet below the existing ground surface. Auger refusal was encountered in soil test borings B-54 and B-57 at depths ranging from approximately 3.5 to 5.5 feet below the ground surface.

Groundwater was encountered in soil test borings B-41, B-55, and B-56 at depths ranging from about 5.5 to 8.0 feet below the ground surface.

Little Drive

Beneath the surficial layer of topsoil, fill and residual soils were typically encountered. Fill was encountered in soil test borings B-63, B-64, B-67, and B-68. Fill was encountered to depths ranging from 0.5 to 10 feet below the ground surface and consisted of clays, sandy clays, and silty and clayey sands with trace amounts of gravel and organics. Residual soils were encountered below the ground surface in boring B-66 to a depth of approximately 1.5

feet. In boring B-69, residuum was encountered within partially weathered rock at a depth ranging from approximately 3 to 5 feet. Residual soils primarily consisted of silty sands. Partially weathered rock materials were encountered approximately 0.5 to 9 feet below the existing ground surface. All borings located on Little Drive, between the intersection with Louis Stephens Drive and future interchange with I-540, encountered partially weathered rock except in the fill area near boring B-68. Auger refusal was encountered in soil test borings B-64 at a depth of approximately 7 feet below the ground surface.

Groundwater was encountered in soil test borings B-66 and B-67 at depths ranging from about 5.0 to 7.5 feet below the ground surface.

5.0 LABORATORY TEST RESULTS

Laboratory tests were performed on representative bulk (bag) samples obtained during the field exploration phase of this project. These tests included classification tests (Atterberg limits and grain size distribution) to aid in estimating the physical properties of the soils and standard Proctor moisture-density testing to determine the compaction characteristics of potential fill materials. In addition, pH and resistivity tests were performed. The results of the laboratory tests and brief descriptions of the laboratory test procedures performed during this phase of the exploration are presented in the Appendix of this report.

Classification tests were performed on all three bulk samples. The Atterberg Limits test results indicate, for the bulk sample taken from boring B-6, a liquid limit and plasticity index of 37 and 19, respectively, indicating a moderate to high plasticity soil. The bulk sample obtained at soil test boring B-33 had a liquid limit and plasticity index of 26 and 7, respectively, indicating a low plasticity soil. The third bulk sample, obtained from soil test boring B-64, exhibited a liquid limit and plasticity index of 25 and 5, respectively, indicating a low plasticity soil. Grain-size testing results indicate that soils on site are predominantly composed of silty clayey fine to coarse sands and fine sandy silty clays with some gravel present in the bulk samples.

Results of resistivity testing on the bulk samples indicate resistivity values ranging from 2,667 to 3,032 ohms-cm. Results of pH testing indicated pH values ranging from 5.17 to 5.63.

Results of standard Proctor moisture-density tests (ASTM D698) indicate maximum dry densities ranging from approximately 113.0 to 126.5 pounds per cubic foot with corresponding optimum moisture contents of 9.0 to 14.9 percent. The natural moisture contents of the bulk samples ranged from approximately 4.0 to 19.1 percent. The bulk sample from B-6 had a natural moisture content that was approximately 4 percent above optimum moisture content. The bulk samples from soil test borings B-33 and B-16 were approximately 5 percent below optimum moisture content.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Excavation of very hard soils, partially weathered rock, and hard rock will be needed. Materials which are expected to require difficult excavation were encountered at depths ranging from about 0.5 to 22.5 feet across the project. Near surface soils are moisture sensitive and will rapidly deteriorate when wet. Groundwater is expected at some bore and jack locations and along drainage features along the project corridor.

When reviewing the following recommendations, please note that the project corridors have been previously graded. Past experience with previously graded sites indicates that unexpected conditions often exist. These may include deeper deposits of poorly compacted fill, deleterious materials within the fills, active and abandoned utility lines, and others.

The following sections provide more detailed conclusions and recommendations regarding site development.

6.1 Excavations

Based on borings, we expect that excavations will extend through moderate to high consistency soils, partially weathered rock and hard rock. Hard digging and blasting will be necessary to excavate materials at this site.

All excavations should be sloped or shored in accordance with local, state, and federal regulations, including OSHA (29 CFR Part 1926) excavation trench safety standards. The contractor is solely responsible for site safety. This information is provided only as a service, and under no circumstance should S&ME be assumed to be responsible for construction site safety.

Localized zones of groundwater may be present within the near surface soils following periods of rainfall. We expect that groundwater infiltration can likely be controlled by ditching and/or pumping from sumps within excavations.

Our comments regarding excavation of various materials are presented below. When reviewing these comments, please note that the location and depth of partially weathered rock and hard rock varies over relatively short horizontal distances. As a result, there is a potential that rock in various forms may be encountered intermediate of the boring locations or at higher elevations. We recommend that the pipeline be embedded as shallow as possible below final grades to reduce the amount of difficult excavation required.

Moderate Consistency Soils - Past experience indicates that these materials can be excavated by routine earth moving equipment. Local excavation for shallow utility trenches can be accomplished by a track-mounted backhoe.

High Consistency Soils and Highly Weathered to Partially Weathered Rock - The subsurface exploration indicates that high consistency soils and highly weathered to partially weathered rock exist along portions of the alignment. Excavation of utility trenches is slow and difficult even with the use of large track mounted backhoes equipped with rock teeth. Based on past experience, a portion of these materials (typically SPT values of 50 blows in 4 inches and softer) can be excavated with a large track mounted backhoe such as a CAT-325 or larger, equipped with new rock teeth; however, the excavation process is typically very slow. Therefore, it is generally more expedient to preloosen very hard soils, partially weathered rock with light blasting in confined excavations.

It is important to note that the success of excavation with track mounted backhoes in confined excavations is dependent upon many factors. These include weakness seams within these materials, orientation of the seams, skill of the operator, and the diligence with which the contractor pursues excavation. As a result, it is impossible to accurately predict the quantities of materials requiring blasting. Also, as evidenced by borings performed for this exploration, the elevation and consistency, partially weathered rock, and hard rock varies significantly at this site.

Slightly Weathered Rock to Hard Rock

The subsurface exploration indicates that slightly weathered to hard rock exists along portions of the alignment. These materials when encountered will require blasting, a hoe-ran or other pneumatic equipment to improve the speed of excavation.

Rock excavation for trenches should be defined as materials and obstructions encountered that cannot be practically excavated with a large track mounted backhoe such as a CAT-325 or larger, equipped with new rock teeth. Practical excavation is defined as the ability to remove at least 10 cubic yards during one (1) hour of continuous digging.

If blasting is performed near existing structures, blast induced vibrations should be monitored. The blasting subcontractor should be responsible for maintaining induced vibrations below acceptable levels. Depending on the sensitivity of the structure to vibration, accepted levels are typically defined as a maximum peak particle velocity on the order of 1 to 2 inches per second. Older, more sensitive structures may require that vibrations (as measured by the peak particle velocity) are less than these values. Prior to blasting, we recommend that a preblast survey of nearby structures be performed to determine and document existing conditions.

6.2 Groundwater Concerns During Excavation

Based on results of our borings, we expect excavations to pipe inverts will encounter perched water/groundwater. The presence of groundwater should be expected along the proposed alignment during open cut trenches near the watershed along Louis Stephens Road south of Kit Creek Road. Additionally, groundwater should be expected at other drainage features and low-lying areas. Shoring or relatively flat excavation slopes along with dewatering measures will be required to control infiltration and prevent sloughing/collapse of excavation sidewalls. We do not expect perimeter well points will be effective in dewatering sandy and silty clays and sandy and clayey silts encountered within proposed pipeline excavations. Side trenches within the excavation combined with pumping from collection sumps will be required. We expect less dewatering will be needed with shoring than with open excavation and flattened slopes. All excavation slopes or shoring should comply with current OSHA Trench Protection Guidelines. Slope and shoring design should properly account for hydrostatic pressures and seepage. The method of groundwater control will be dependent upon the Contractor's construction methods. As a result, actual measures to control groundwater should be determined by the Contractor.

6.3 High Plasticity Soils

Highly plastic silts and clays were encountered within several borings. It has been our experience that highly plastic soils, with plasticity indices greater than 30, do not perform well when exposed near final subgrade elevations due to their potential to shrink and swell with changes in moisture content and loss of strength when wet. When encountered, highly plastic soils should be undercut within 1 foot below the pipe inverts.

6.4 Reuse of On-site Soils

In general, a majority of the soils at this site having a Unified Soil Classification (USCS) designation of CL, ML, SM, SP, or SW are suitable for reuse as trench backfill provided that the moisture content is properly controlled during placement and compaction. Depending on prevailing weather conditions during fill placement, some drying or wetting of soils may be required prior to their placement as trench backfill. Highly plastic soils having a USCS designation of MH or CH are not suitable for reuse as trench backfill as discussed above.

A portion of the partially weathered rock and hard rock encountered should break down to gravel, sand, and silt-sized particles upon compaction. Conversely, it is likely that materials containing boulders and weathered rock fragments will also be encountered where blasting or hard digging is required. Rock pieces greater than 3 inches in diameter should not be placed as trench backfill. Rock pieces should be thoroughly mixed with soil and compacted as recommended below. In no case should boulders or rock pieces be stacked on top of each other, which could create void spaces and lead to raveling of the soil fill.

It may be necessary to add moisture to excavated partially weathered rock materials to achieve adequate compaction. We recommend that compaction moisture be at or slightly above the optimum compaction moisture content. It has been our experience that partially weathered rock materials compacted dry of the optimum moisture content will lose strength and become more compressible if later exposed to moisture. Increased compressibility and loss of strength can result in post construction settlement. Adding moisture will also help break down partially weathered rock to gravel and soil size particles.

6.5 Bedding Materials

Washed stone (NCDOT Select Material Class VI - No. 57 or 67) or dry sand (NCDOT Select Material Class III) will likely be needed as a bedding material below most of the pipe sections installed within open trenches. Bedding material will provide a more stable working surface for pipe placement and will facilitate installation of the pipe to design grades. The need for bedding will depend primarily on the extent of groundwater and surface water infiltration that occurs.

Bedding materials should be placed on stable subgrades. At least 4 inches of bedding material is recommended between partially weathered rock/hard rock and the piping.

6.6 Trench Backfill

After proper site preparation, trench areas may be raised to their design subgrade elevations using suitable soils compacted in 6 inch loose lifts. A degree of compaction corresponding to at least 95 percent of the soil's standard Proctor maximum dry density (ASTM D 698) should be achieved. Fill soils should be maintained within 2 percent of optimum moisture during compaction.

Beneath pavements and sidewalks, compact the final 8 inches below finished subgrades to at least 100% of the soil's standard Proctor maximum dry density (ASTM D 698) within 2 percent of optimum moisture.

Site preparation including fill placement and compaction should be observed by the geotechnical engineer or a qualified soils technician. A sufficient number of density tests should be conducted to confirm that adequate compaction is achieved.

6.7 Boring and Jacking

Bore and jack construction methods are proposed along Kit Creek Road at the crossing beneath NC 55 and CSX railroad line and at the intersection of Kit Creek Road and Louis Stephens Drive. The boring and jacking contractor should closely review the subsurface conditions described in this report and boring logs. Installation techniques and equipment should account for interlayered sands and clays with shallow perched groundwater, and

partially weathered rock and possible hard rock. The installation method selected should be the responsibility of the contractor.

Based upon the subsurface conditions encountered at the NC 55 roadway and CSX railroad crossing, fill material consisting of sandy soils overlying clayey soils within the top 12 feet are expected on the west side of NC 55 at boring B-14. These fill soils overly partially weathered rock and auger refusal materials at 14 feet. On the east side of NC 55 but west of the CSX railroad, between borings B-15 and B-16, 5 to 7 feet of fill overlying partially weathered rock was encountered. On the east side of the CSX railroad, at boring B-17, about 12 feet of fill overlying partially weathered rock was encountered. Based upon proposed pipe invert elevations and expected excavations, boring through low/moderate consistency soils and partially weathered rock/hard rock is expected. Partially weathered rock and hard rock may exist at higher elevations between borings. Therefore, the contractor should be prepared to make any necessary adjustments that may be required to advance through hard materials. The contractor should take precautions to prevent damage to the roadway above during construction.

Based upon the subsurface conditions encountered at the intersection of Kit Creek Road and Louis Stephens Drive, fill soils and partially weathered rock should be encountered. The subsurface conditions within the top ten feet below existing grades and topography indicate that residual material (soils and weathered rock) transition to fill soils along the proposed alignment from Kit Creek Road heading east across Louis Stephens Drive. The subsurface conditions within the top ten feet below existing grades indicate fill soils and residual materials (soils and weathered rock) along the proposed alignment from Louis Stephens Road heading north across Kit Creek Road.

Utility construction using trenchless installations within NCDOT right-of-way should be performed in accordance with the latest edition of the *NCDOT Standard Specifications for Roads and Structures*, Section 1500.

6.8 Corrosion Protection

Based upon our laboratory test results for pH and resistivity, the soils are generally considered to have moderate corrosion potential.

7.0 QUALIFICATIONS OF REPORT

This report has been prepared in accordance with generally accepted engineering practice for specific application to this project. Any wetland, environmental, or contaminant assessment efforts are beyond the scope of this geotechnical exploration. Therefore, those issues are not addressed in this geotechnical exploration report. The conclusions and recommendations contained in this report are based on the applicable standards of our

profession at the time this report was prepared. No other warranty, express or implied, is made.

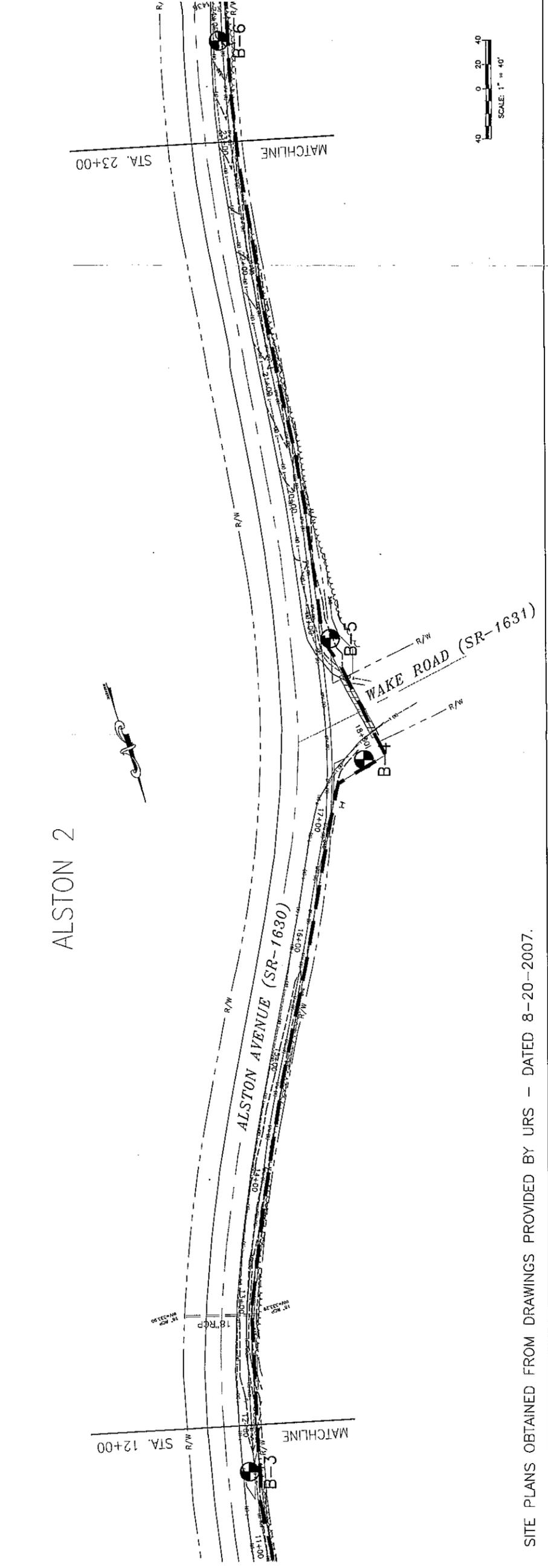
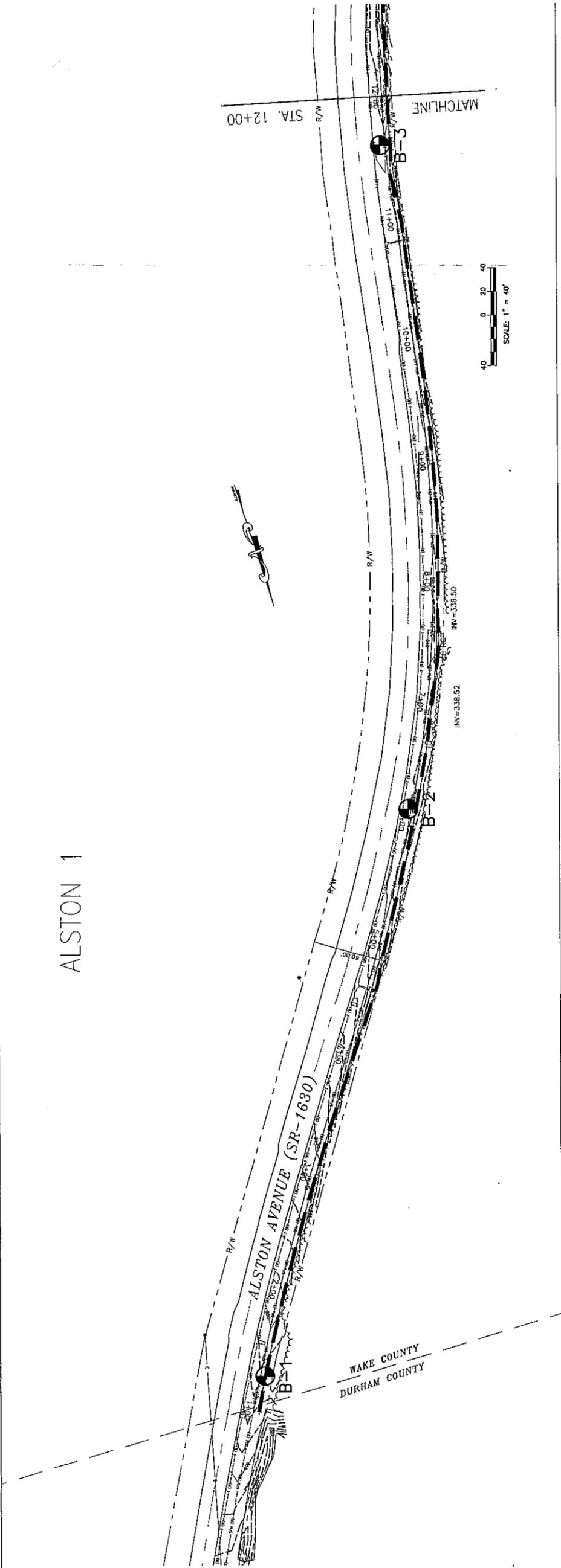
Conclusions and recommendations submitted in this report are based, in part, upon the data obtained from the subsurface exploration. The nature and extent of variations between the borings made may not become evident until construction. If variations appear evident, then it will be necessary to re-evaluate the recommendations of this report. In the event that any changes in the nature, design, or location of the proposed pipeline are planned, the conclusions and recommendations contained in this report should be reviewed, modified or confirmed in writing. We recommend that our firm be provided the opportunity for general review of final design specifications to confirm that our recommendations are properly interpreted and implemented.

SITE PLANS OBTAINED FROM DRAWINGS PROVIDED BY URS - DATED 8-20-2007.

JORDAN LAKE WATER RECLAMATION & REUSE PROJECT
PHASE I
BORING LOCATION PLAN
ALSTON AVENUE, KIT CREEK ROAD, DEVELOPMENT DRIVE, LOUIS STEPHENS ROAD
WAKE COUNTY/DURHAM COUNTY, NORTH CAROLINA



SCALE: GRAPHIC	APPROVED BY: BDK	DATE: OCTOBER 2007	TRP
JOB NO. 1051-06-265	FIGURE 1A		



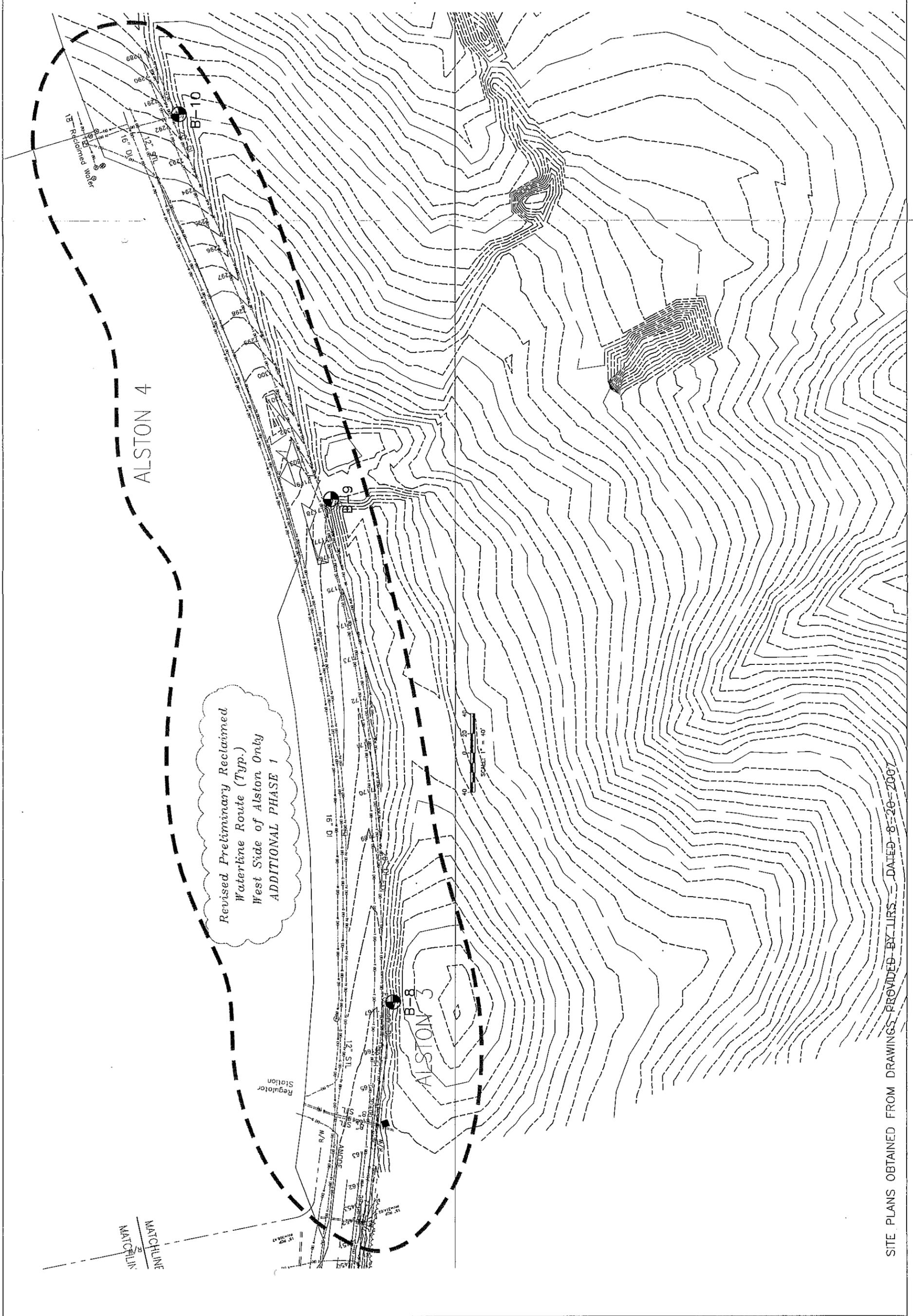
SITE PLANS OBTAINED FROM DRAWINGS PROVIDED BY IJRS - DATED 8-20-2007

BORING LOCATION PLAN

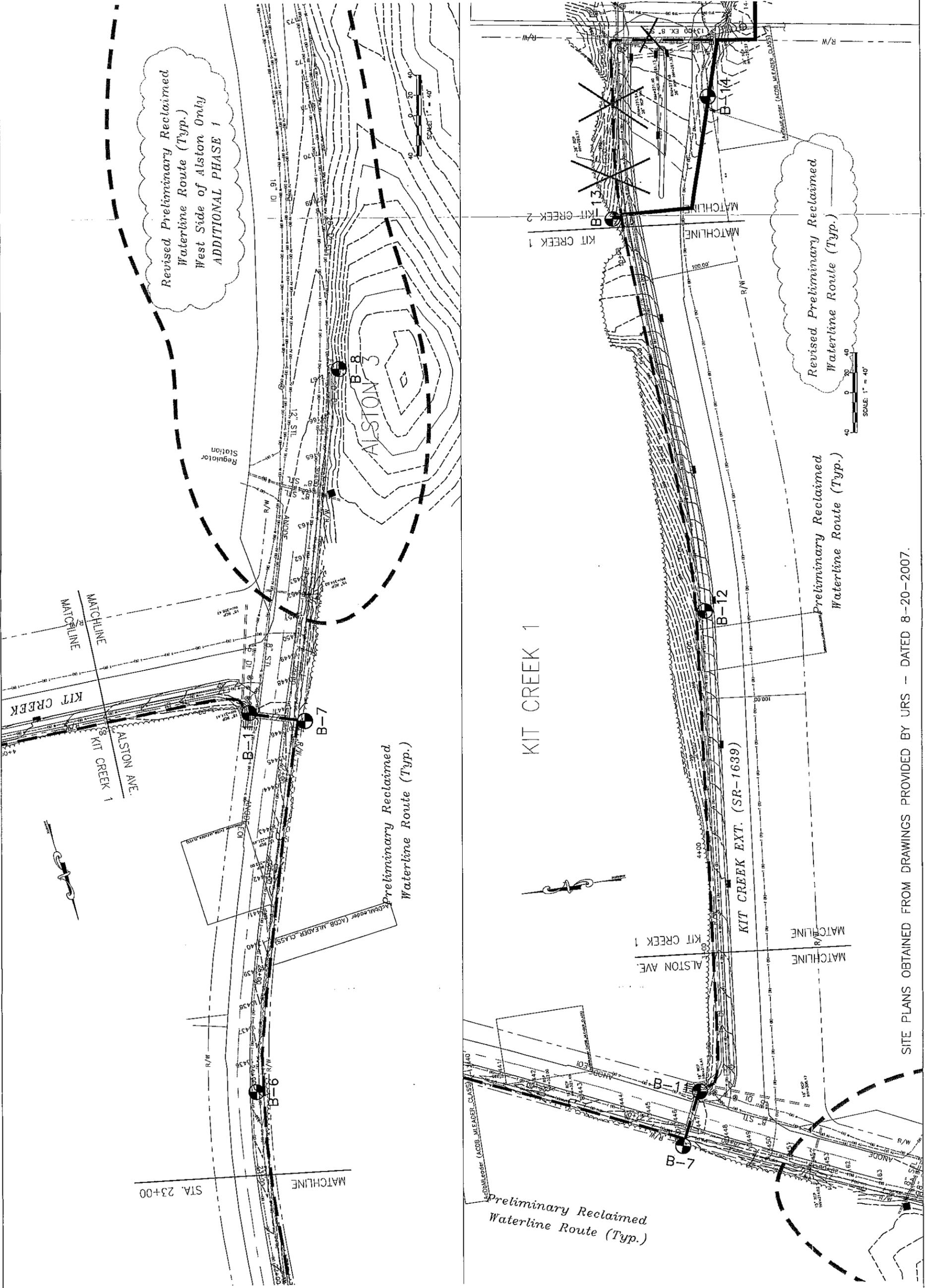
JORDAN LAKE WATER RECLAMATION & REUSE PROJECT
PHASE I
ALSTON AVENUE, KIT CREEK ROAD, DEVELOPMENT DRIVE, LOUIS STEPHENS ROAD
WAKE COUNTY/DURHAM COUNTY, NORTH CAROLINA



SCALE: GRAPHIC	APPROVED BY: BDK
DATE: OCTOBER 2007	DRAWN BY: TRP
JOB NO. 1051-06-265	FIGURE 1B



SITE PLANS OBTAINED FROM DRAWINGS PROVIDED BY URS - DATED 8-20-2007.



BORING LOCATION PLAN

JORDAN LAKE WATER RECLAMATION & REUSE PROJECT
PHASE I
ALSTON AVENUE, KIT CREEK ROAD, DEVELOPMENT DRIVE, LOUIS STEPHENS ROAD
WAKE COUNTY/DURHAM COUNTY, NORTH CAROLINA

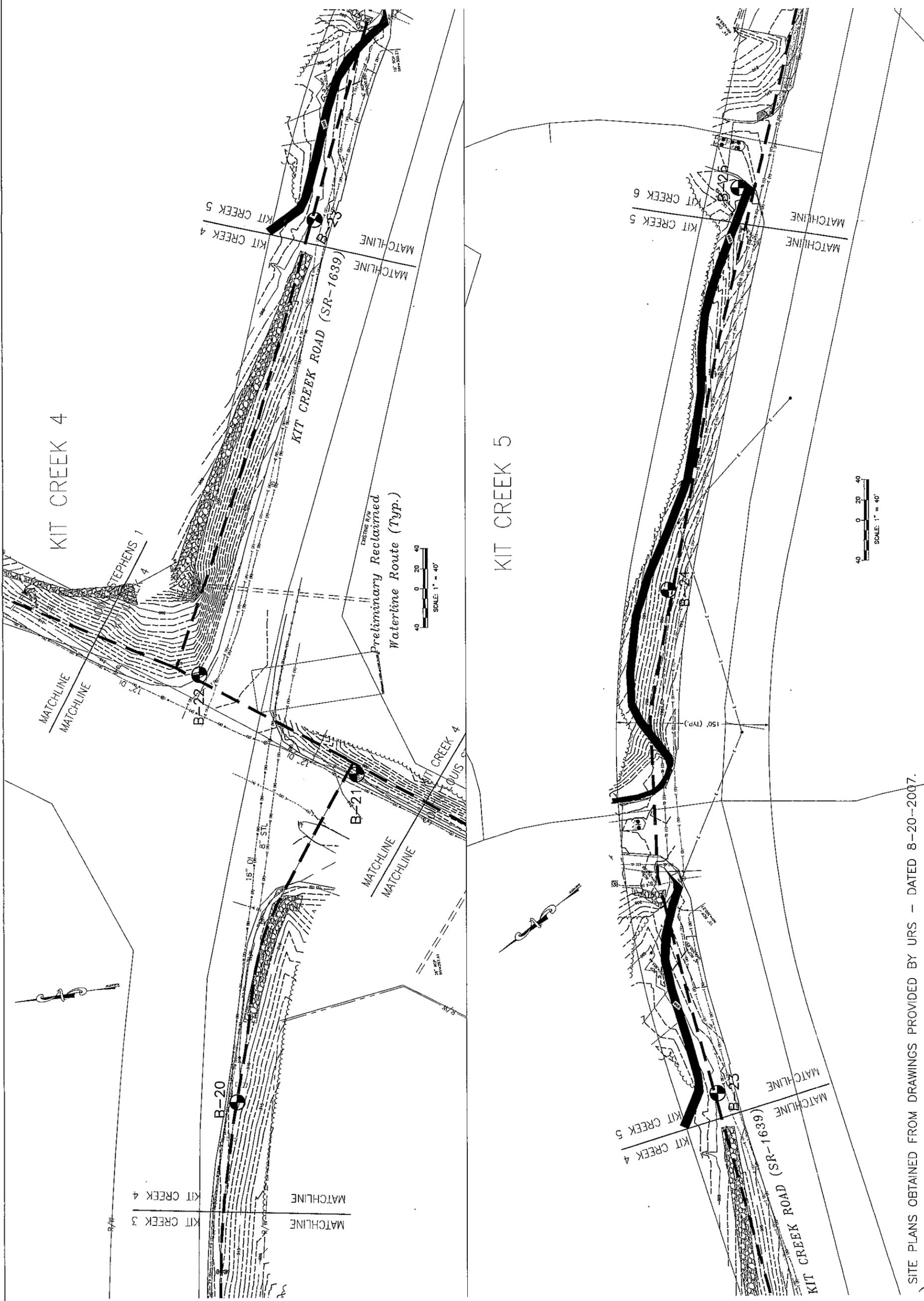


SCALE: GRAPHIC	APPROVED BY: BDK
DATE: OCTOBER 2007	DRAWN BY: TRP
JOB NO. 1051-06-265	FIGURE 1C

FIGURE	1E
DATE:	OCTOBER 2007
APPROVED BY:	BDK
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JOB NO.	1051-06-265



JORDAN LAKE WATER RECLAMATION & REUSE PROJECT
PHASE I
BORING LOCATION PLAN
 ALSTON AVENUE, KIT CREEK ROAD, DEVELOPMENT DRIVE, LOUIS STEPHENS ROAD
 WAKE COUNTY/DURHAM COUNTY, NORTH CAROLINA



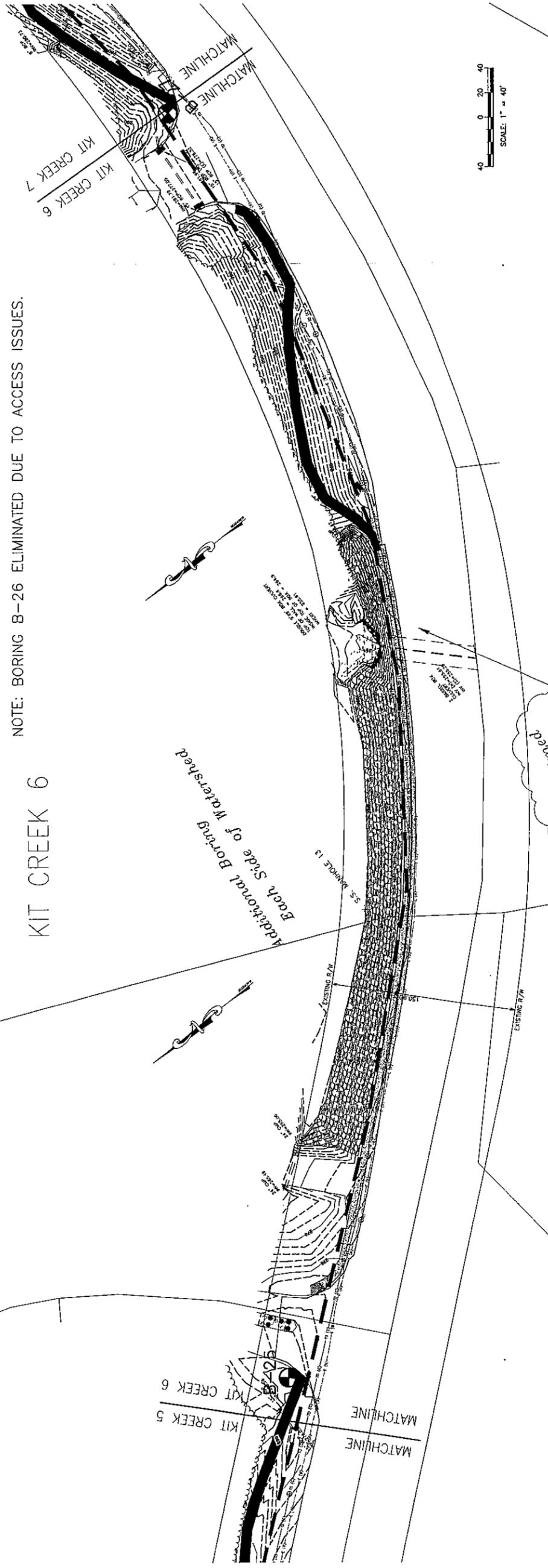
SITE PLANS OBTAINED FROM DRAWINGS PROVIDED BY URS - DATED 8-20-2007.

BORING LOCATION PLAN

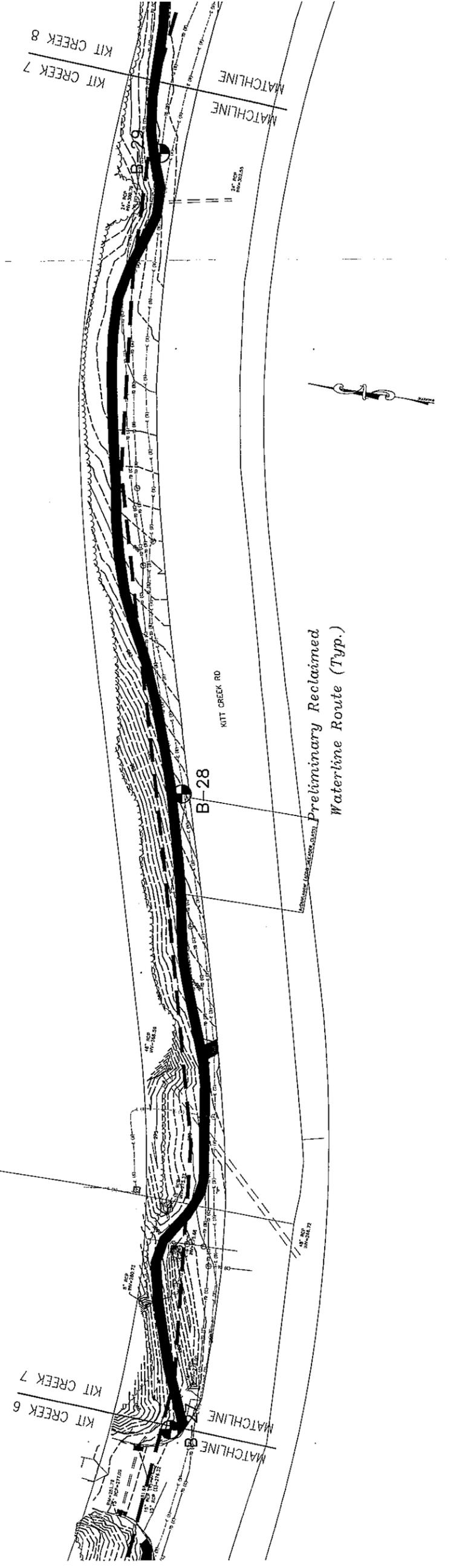
JORDAN LAKE WATER RECLAMATION & REUSE PROJECT
PHASE I
ALSTON AVENUE, KIT CREEK ROAD, DEVELOPMENT DRIVE, LOUIS STEPHENS ROAD
WAKE COUNTY/DURHAM COUNTY, NORTH CAROLINA



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JOB NO. 1051-06-265	FIGURE 1F



KIT CREEK 7



NOTE: BORING B-26 ELIMINATED DUE TO ACCESS ISSUES.

KIT CREEK 6

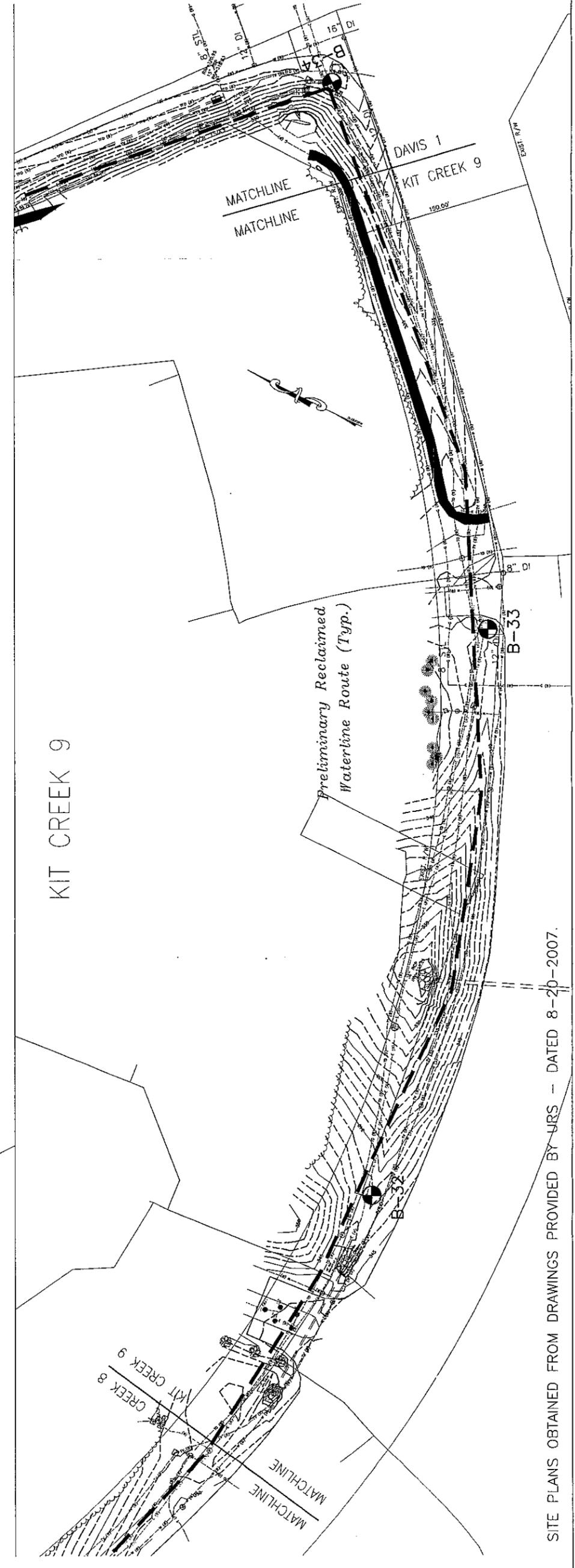
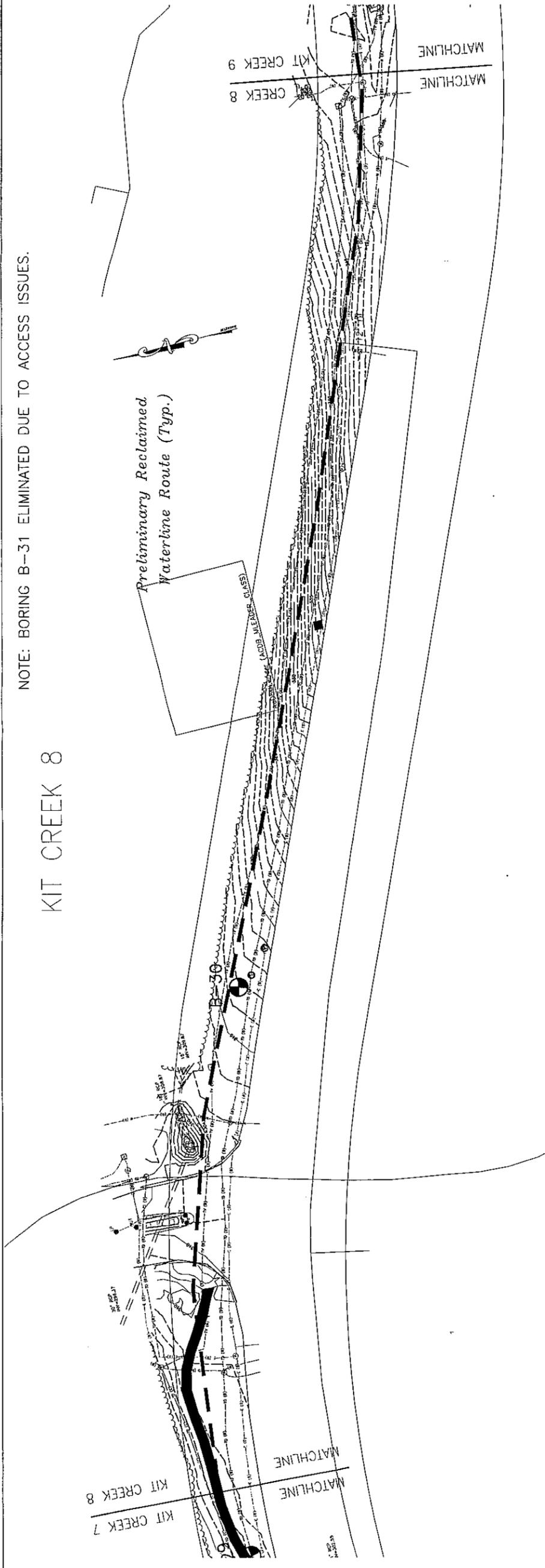
APPROVED BY: BDK	SCALE: GRAPHIC
DRAWN BY: TRP	DATE: OCTOBER 2007
FIGURE 1G	JOB NO. 1051-06-265

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JORDAN LAKE WATER RECLAMATION & REUSE PROJECT
PHASE I
 BORING LOCATION PLAN

ALSTON AVENUE, KIT CREEK ROAD, DEVELOPMENT DRIVE, LOUIS STEPHENS ROAD
 WAKE COUNTY/DURHAM COUNTY, NORTH CAROLINA



NOTE: BORING B-31 ELIMINATED DUE TO ACCESS ISSUES.

KIT CREEK 8

KIT CREEK 9

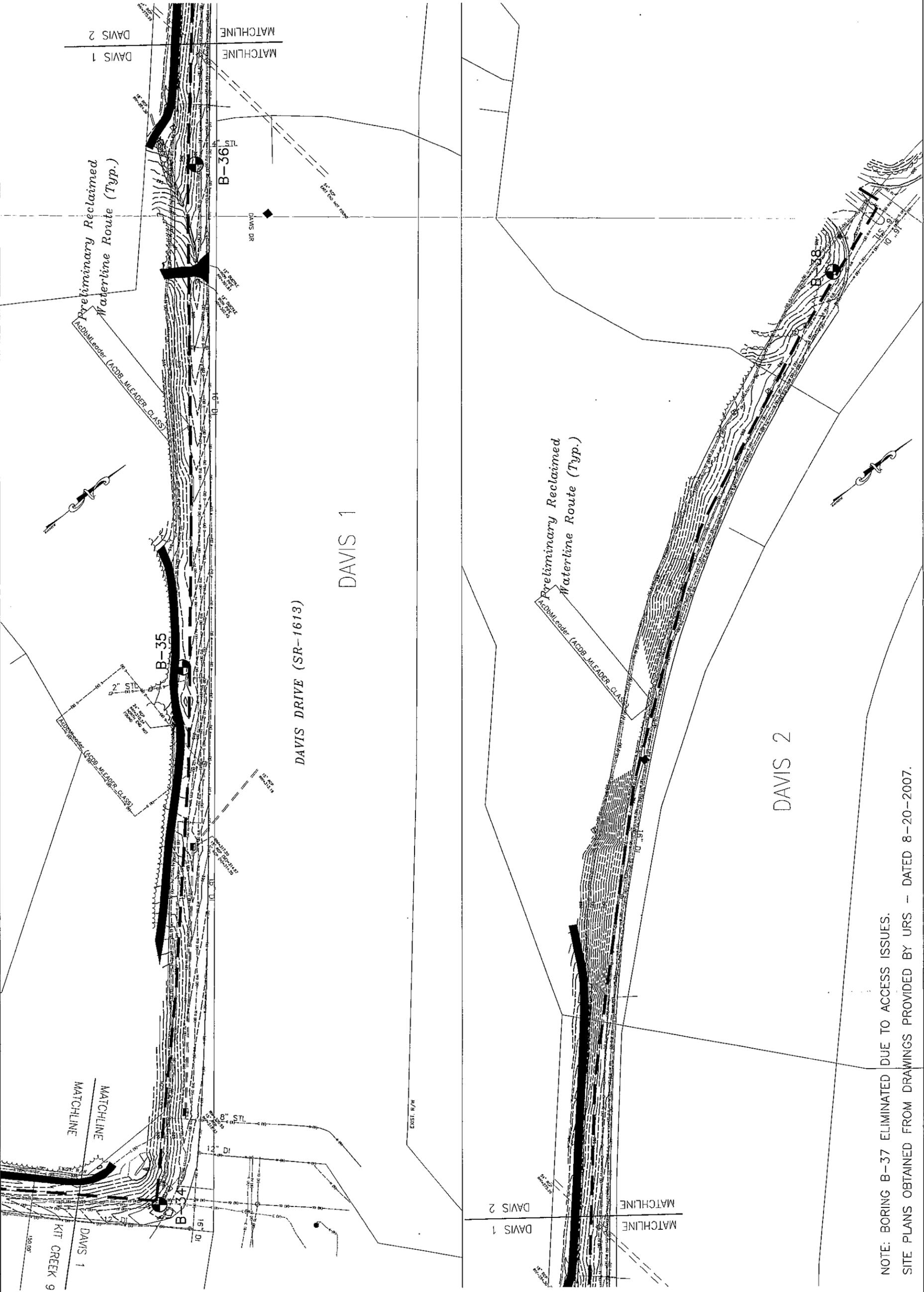
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 FIGURE 1H

SCALE: GRAPHIC
 JOB NO. 1051-06-265



JORDAN LAKE WATER RECLAMATION & REUSE PROJECT
PHASE I
 BORING LOCATION PLAN
 ALSTON AVENUE, KIT CREEK ROAD, DEVELOPMENT DRIVE, LOUIS STEPHENS ROAD
 WAKE COUNTY/DURHAM COUNTY, NORTH CAROLINA

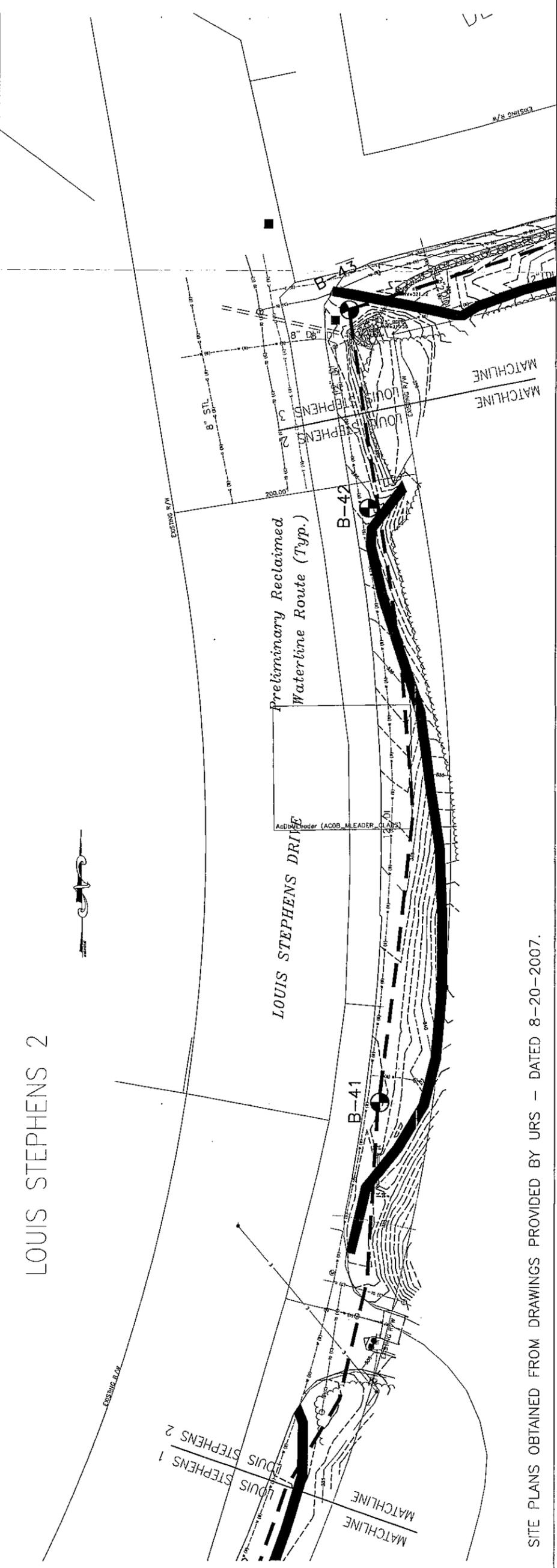
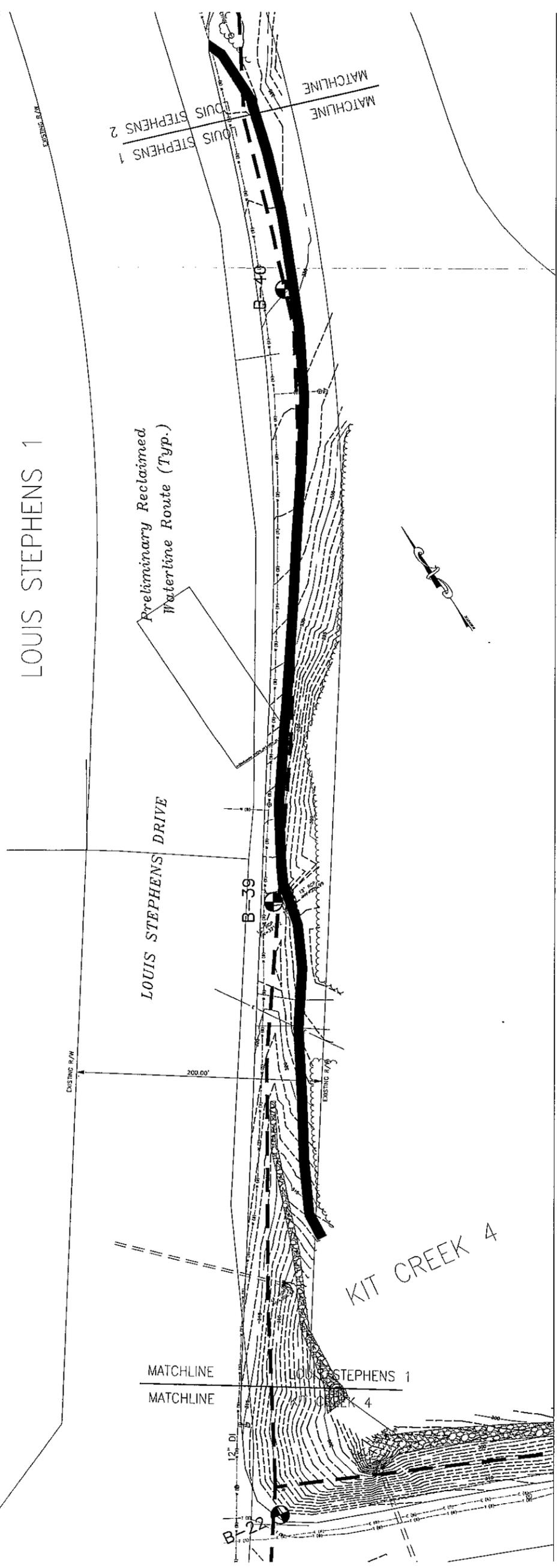


NOTE: BORING B-37 ELIMINATED DUE TO ACCESS ISSUES.
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SCALE: GRAPHIC	APPROVED BY: BDK
DATE: OCTOBER 2007	DRAWN BY: TRP
JOB NO. 1051-06-265	FIGURE 11

BORING LOCATION PLAN



SITE PLANS OBTAINED FROM DRAWINGS PROVIDED BY URS - DATED 8-20-2007.

SITE PLANS OBTAINED FROM DRAWINGS PROVIDED BY URS - DATED 8-20-2007.



BORING LOCATION PLAN

PHASE I
JORDAN LAKE WATER RECLAMATION & REUSE PROJECT
ALSTON AVENUE, KIT CREEK ROAD, DEVELOPMENT DRIVE, LOUIS STEPHENS ROAD
WAKE COUNTY/DURHAM COUNTY, NORTH CAROLINA



ENVIRONMENTAL SERVICES
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DATE: OCTOBER 2007

JOB NO. 1051-06-265

APPROVED BY: BDK

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FIGURE 1J

SITE PLANS OBTAINED FROM DRAWINGS PROVIDED BY URS - DATED 8-20-2007.

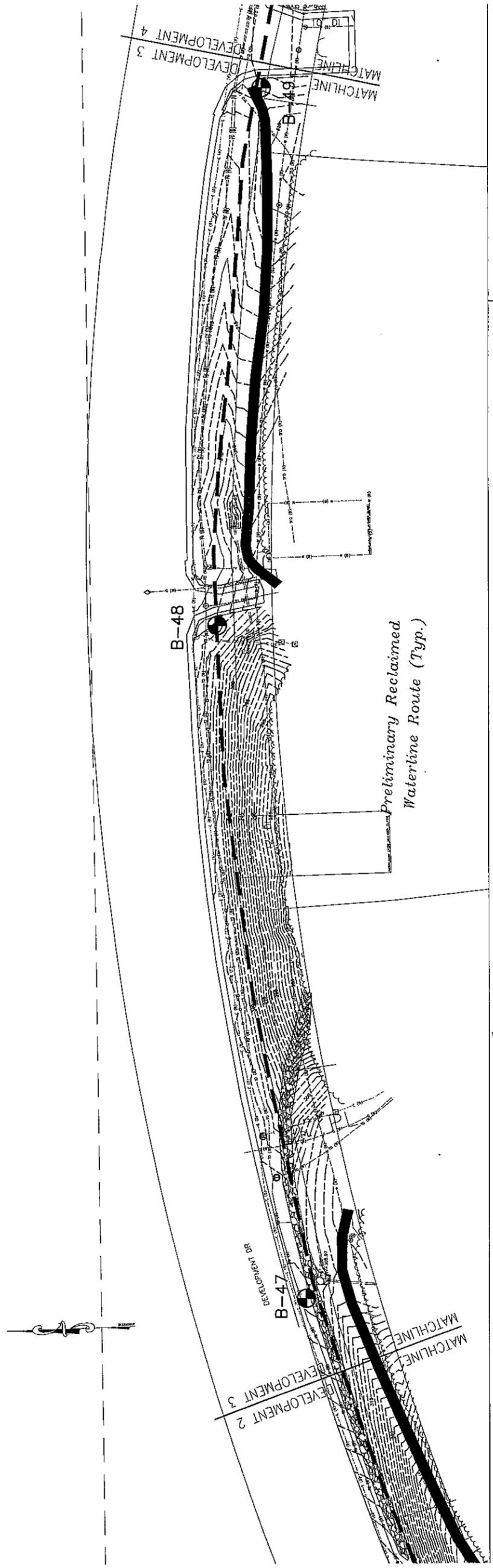
BORING LOCATION PLAN

ALSTON AVENUE, KIT CREEK ROAD, DEVELOPMENT DRIVE, LOUIS STEPHENS ROAD
WAKE COUNTY/DURHAM COUNTY, NORTH CAROLINA
PHASE I
JORDAN LAKE WATER RECLAMATION & REUSE PROJECT

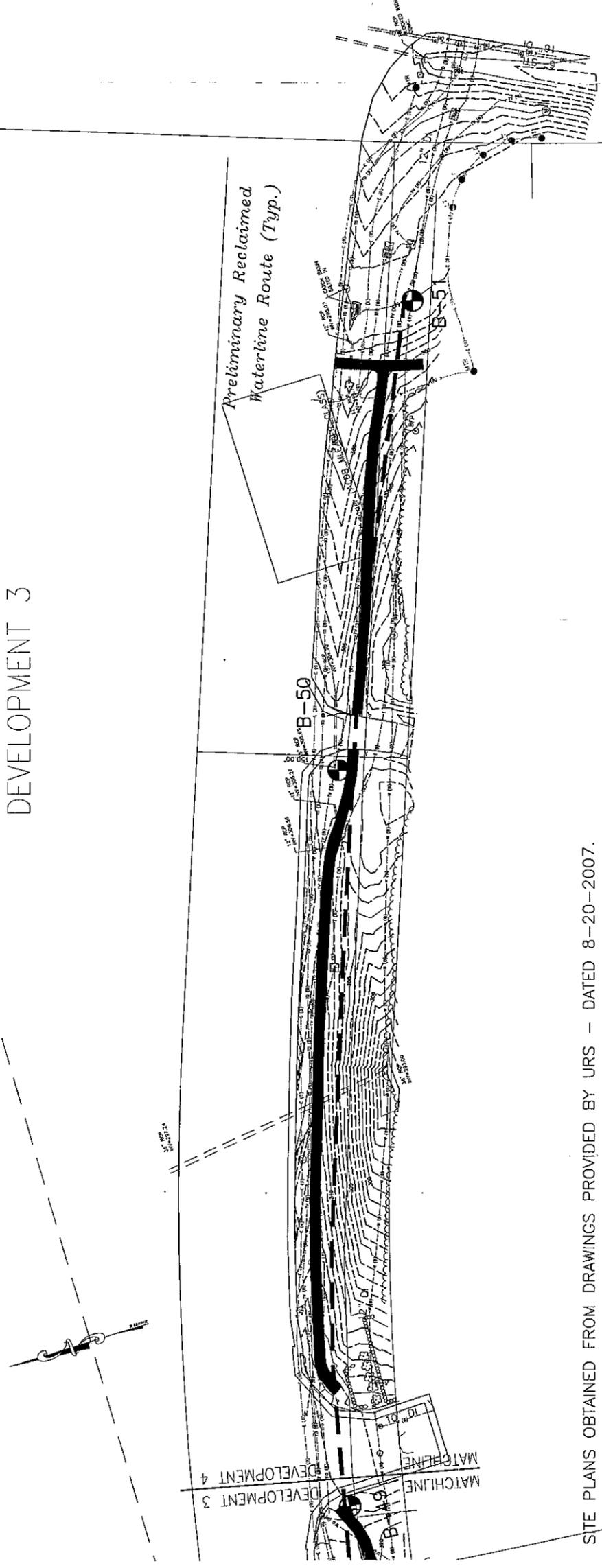


SCALE: GRAPHIC	APPROVED BY: BDK
DATE: OCTOBER 2007	DRAWN BY: TRP
JOB NO. 1051-06-265	FIGURE 1K

DEVELOPMENT 3



DEVELOPMENT 3

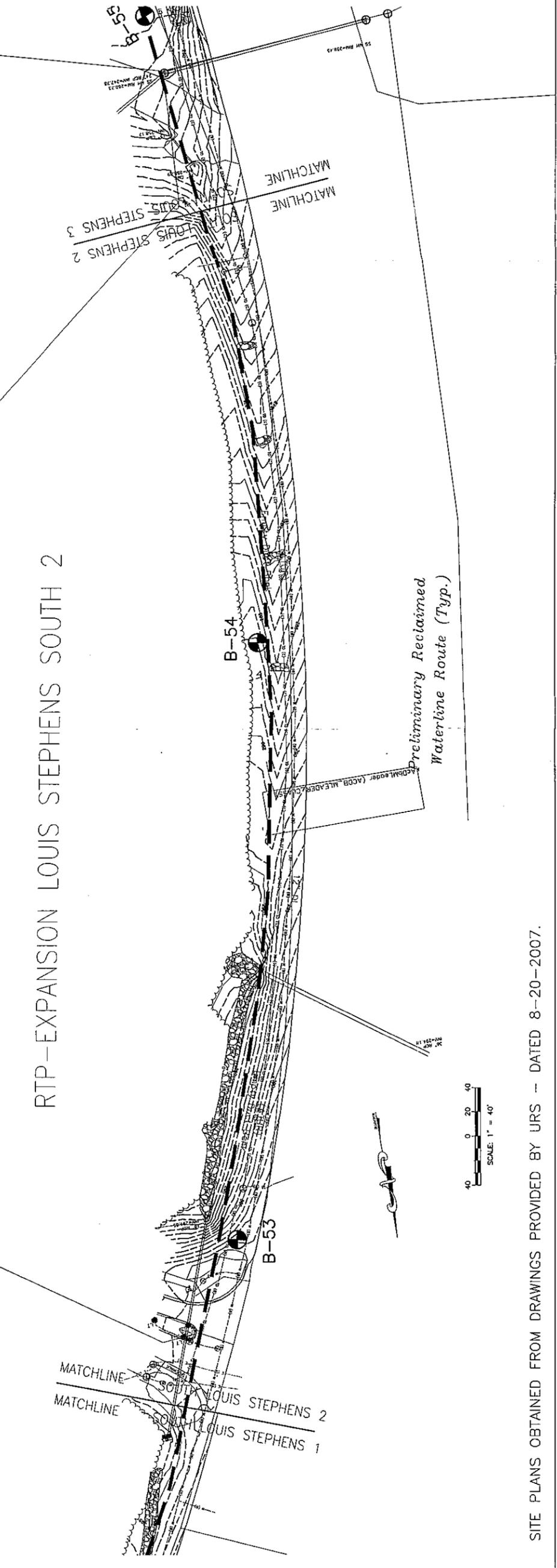
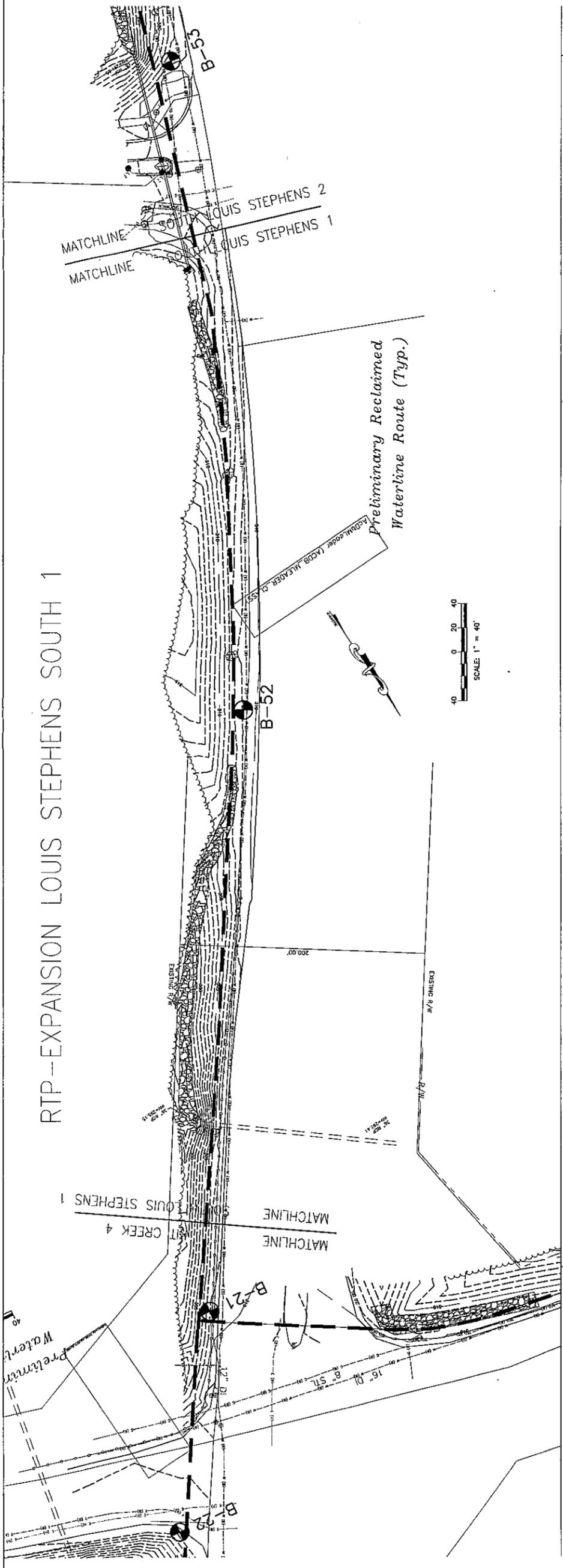


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 DATE: OCTOBER 2007
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 FIGURE 1L

SCALE: GRAPHIC
 JOB NO. 1051-06-265

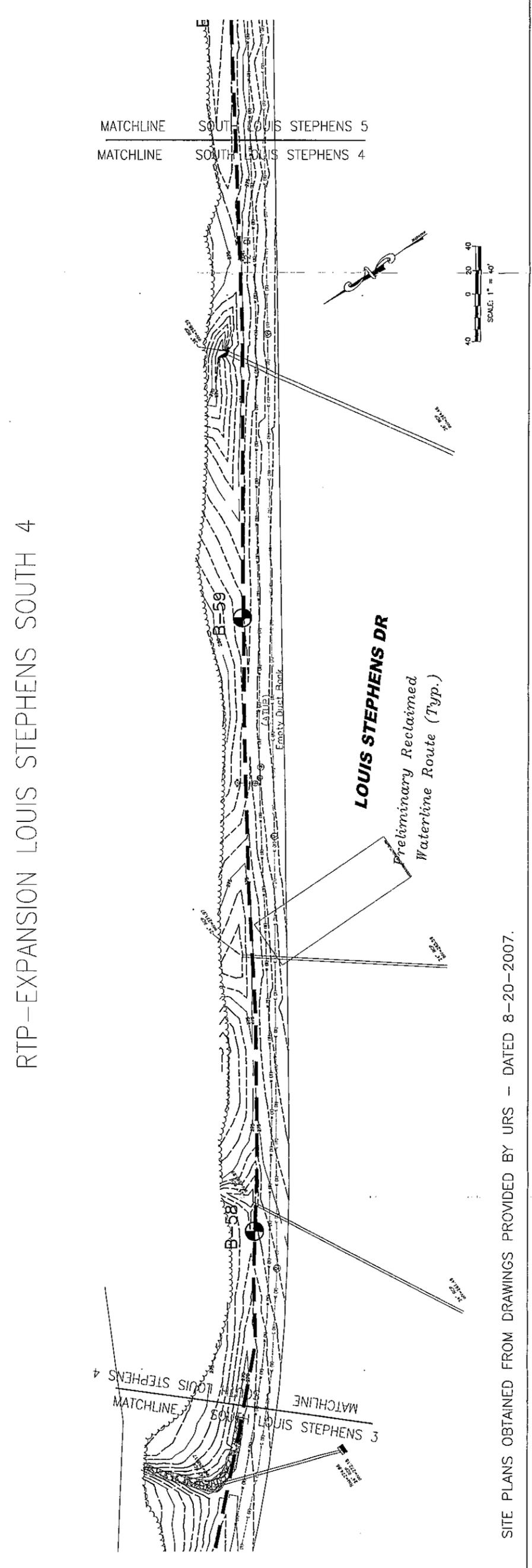
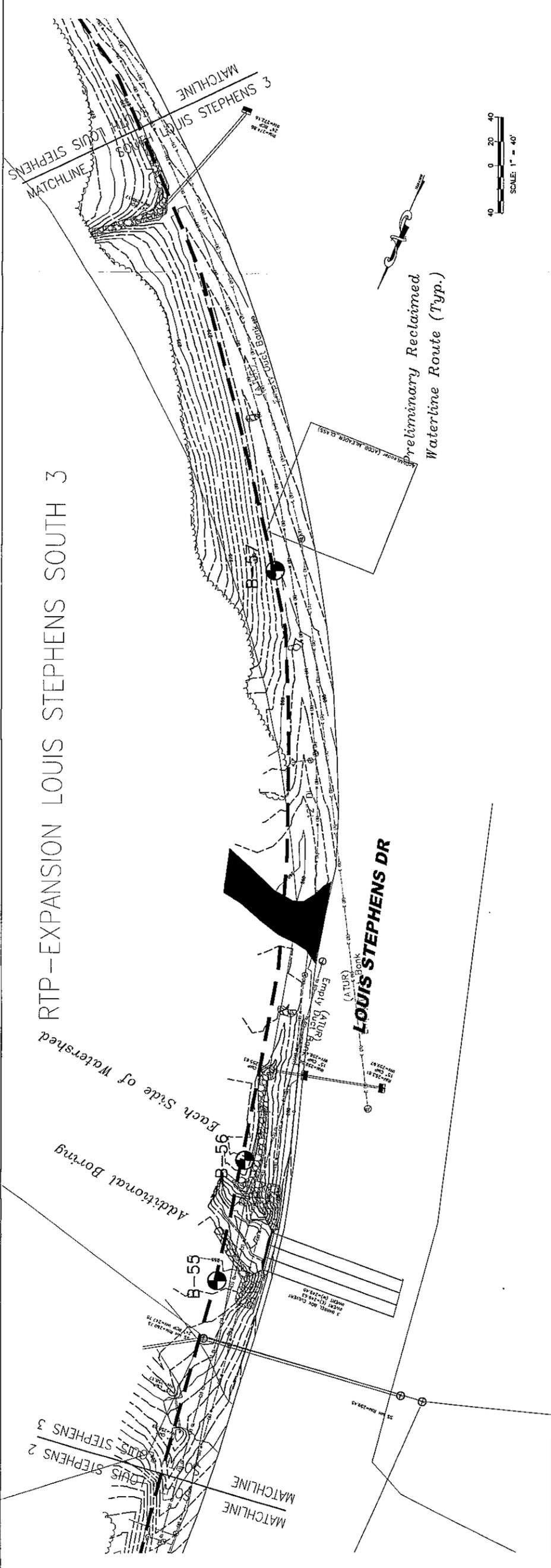


JORDAN LAKE WATER RECLAMATION & REUSE PROJECT
PHASE I
 BORING LOCATION PLAN
 ALSTON AVENUE, KIT CREEK ROAD, DEVELOPMENT DRIVE, LOUIS STEPHENS ROAD
 WAKE COUNTY/DURHAM COUNTY, NORTH CAROLINA



SITE PLANS OBTAINED FROM DRAWINGS PROVIDED BY URS -- DATED 8-20-2007.

<p>JORDAN LAKE WATER RECLAMATION & REUSE PROJECT PHASE I BORING LOCATION PLAN</p>		<p>ALSTON AVENUE, KIT CREEK ROAD, DEVELOPMENT DRIVE, LOUIS STEPHENS ROAD WAKE COUNTY/DURHAM COUNTY, NORTH CAROLINA</p>	
<p>SCALE: GRAPHIC</p>	<p>DATE: OCTOBER 2007</p>	<p>JOB NO. 1051-06-265</p>	<p>FIGURE 1M</p>
<p>APPROVED BY: BDK</p>	<p>DRAWN BY: TRP</p>	<p>S&ME ENVIRONMENTAL SERVICES ENGINEERING · TESTING</p>	



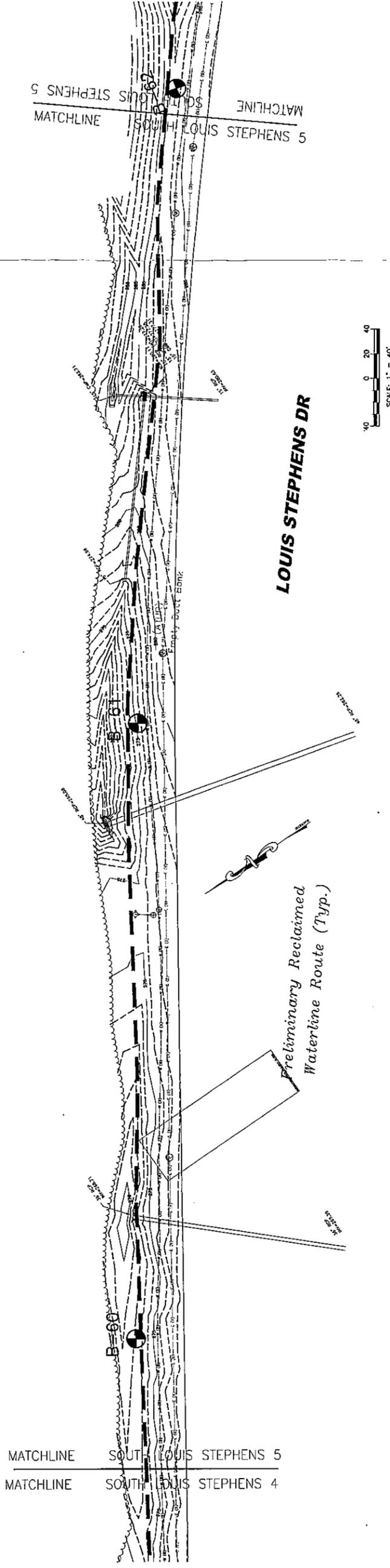
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APPROVED BY: BDK	SCALE: GRAPHIC
DRAWN BY: TRP	DATE: OCTOBER 2007
FIGURE 1N	JOB NO. 1051-06-265

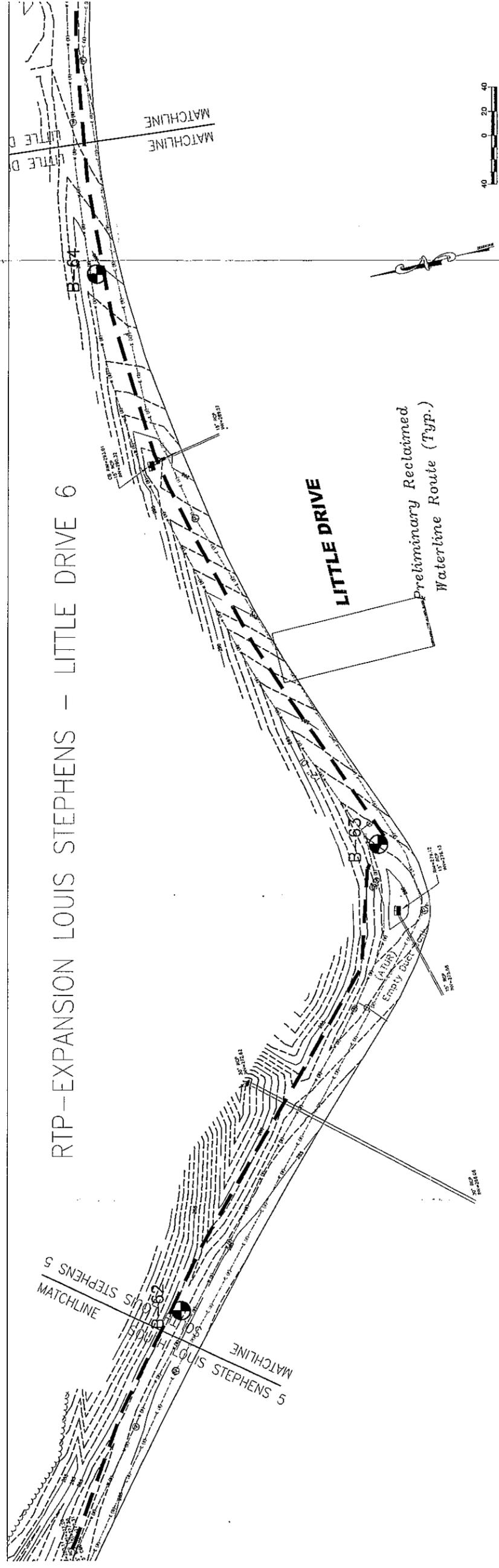
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JORDAN LAKE WATER RECLAMATION & REUSE PROJECT
PHASE I
 BORING LOCATION PLAN
 ALSTON AVENUE, KIT CREEK ROAD, DEVELOPMENT DRIVE, LOUIS STEPHENS ROAD
 WAKE COUNTY/DURHAM COUNTY, NORTH CAROLINA

RTP-EXPANSION LOUIS STEPHENS SOUTH 5



RTP-EXPANSION LOUIS STEPHENS - LITTLE DRIVE 6



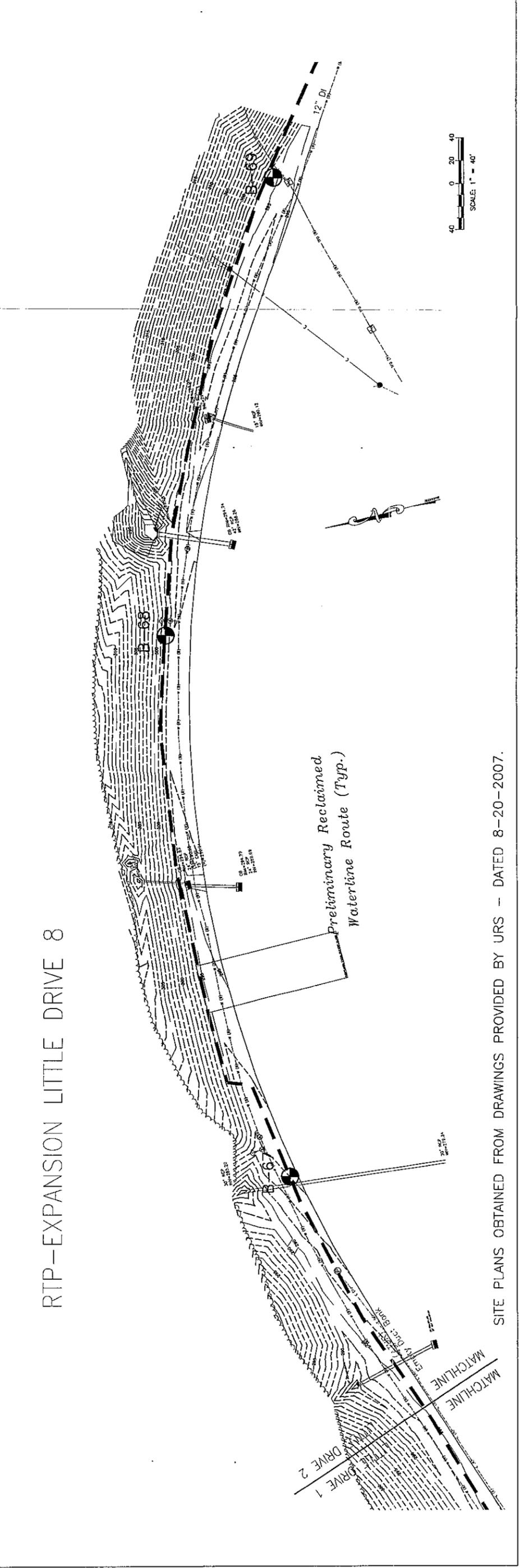
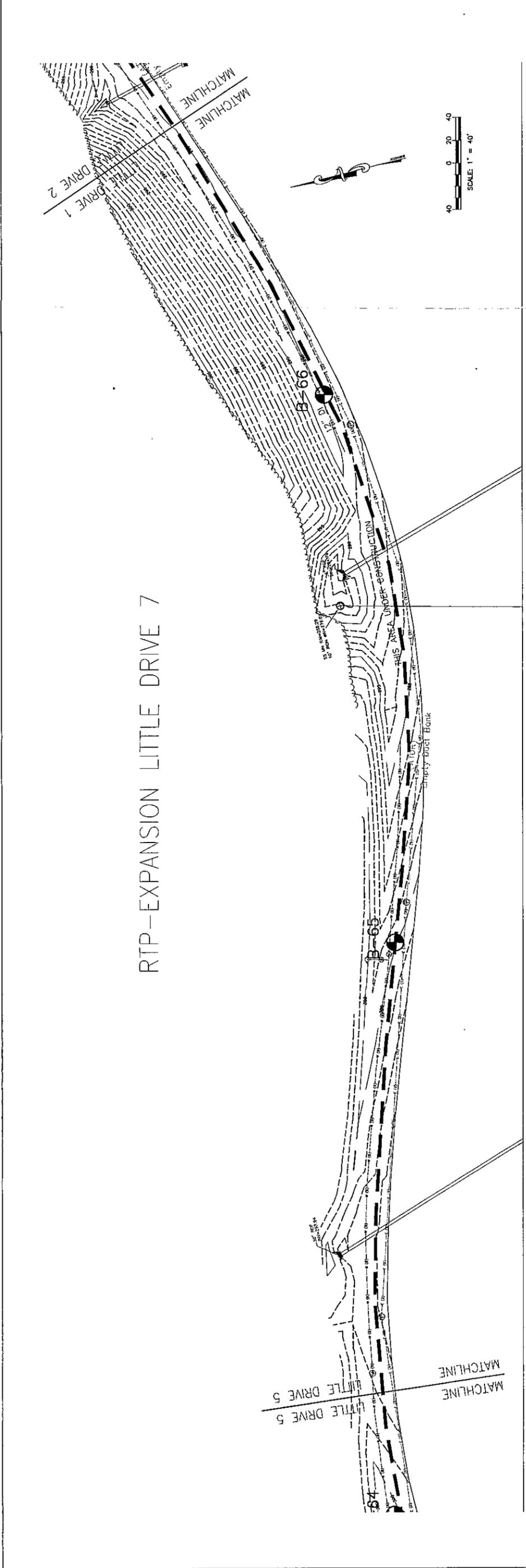
SITE PLANS OBTAINED FROM DRAWINGS PROVIDED BY URS - DATED 8--20--2007.

SCALE: GRAPHIC	APPROVED BY: BDK
DATE: OCTOBER 2007	TRP
JOB NO. 1051-06-265	FIGURE 10

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JORDAN LAKE WATER RECLAMATION & REUSE PROJECT
 PHASE I
 BORING LOCATION PLAN

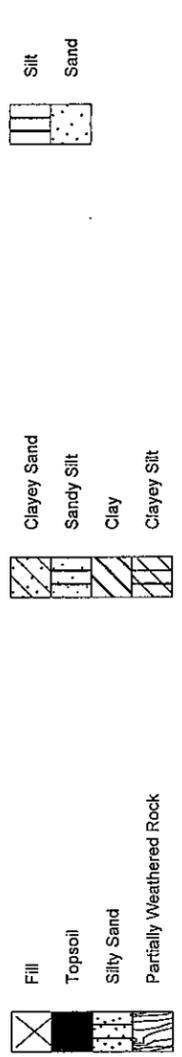
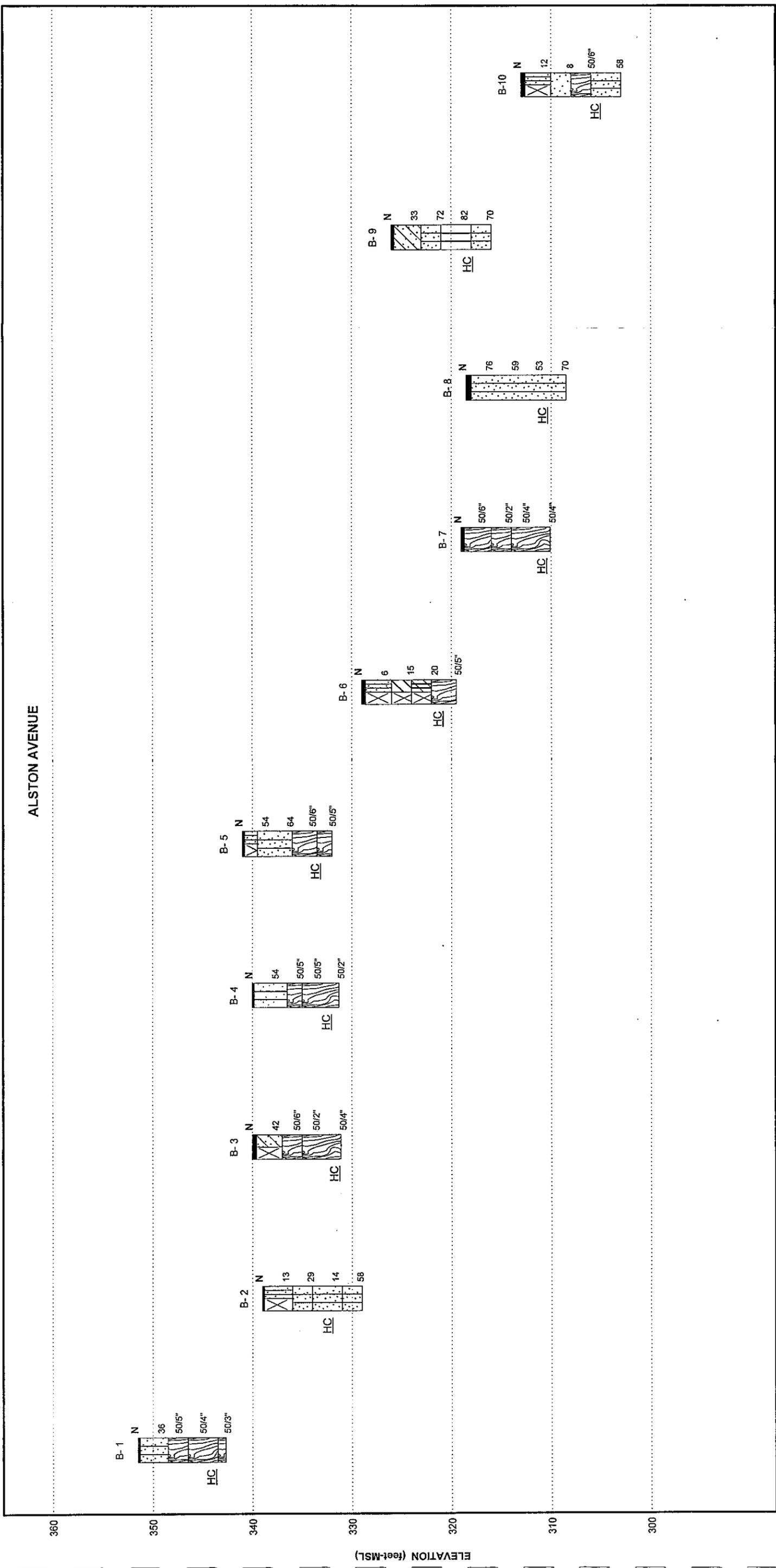
ALSTON AVENUE, KIT CREEK ROAD, DEVELOPMENT DRIVE, LOUIS STEPHENS ROAD
 WAKE COUNTY/DURHAM COUNTY, NORTH CAROLINA



SITE PLANS OBTAINED FROM DRAWINGS PROVIDED BY URS - DATED 8-20-2007.

GENERALIZED SUBSURFACE CONDITIONS

ALSTON AVENUE



N = Standard Penetration Test resistance value (blows per foot). The depicted stratigraphy is shown for illustrative purposes only. The actual subsurface conditions will vary between boring locations.

SCALE: (V) 1" = 10'
 CHECKED BY:
 DATE: 10/18/2007
 JOB NO: 1051-06-265



3201 Spring Forest Road
 Raleigh, NC 27616
 (919) 872-2660
 (919) 876-3958 fax
 www.smeinc.com

GENERALIZED SUBSURFACE CONDITIONS
Jordan Lake WRRP
 Wake County, North Carolina

FIGURE NO. **2A**

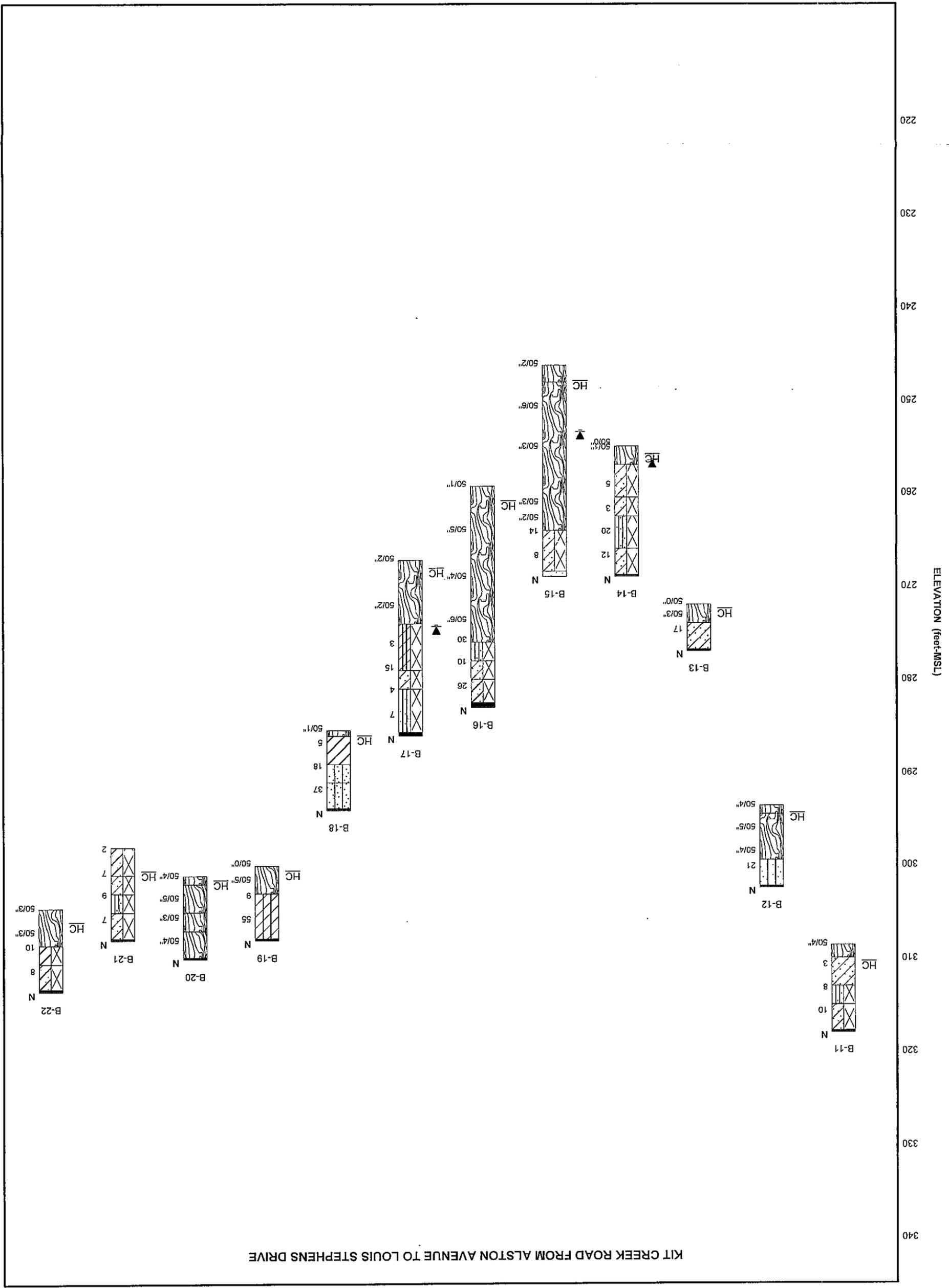
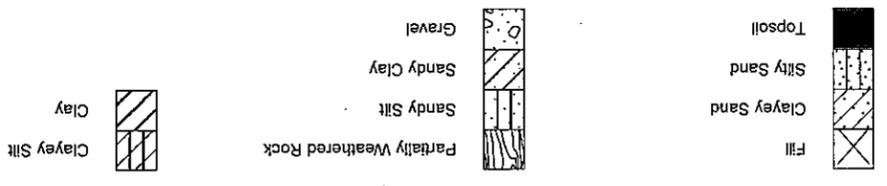


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GENERALIZED SUBSURFACE CONDITIONS
 Jordan Lake WRRP
 Wake County, North Carolina

FIGURE NO. 2B

N = Standard Penetration Test resistance value (blows per foot). The depicted stratigraphy is shown for illustrative purposes only. The actual subsurface conditions will vary between boring locations.

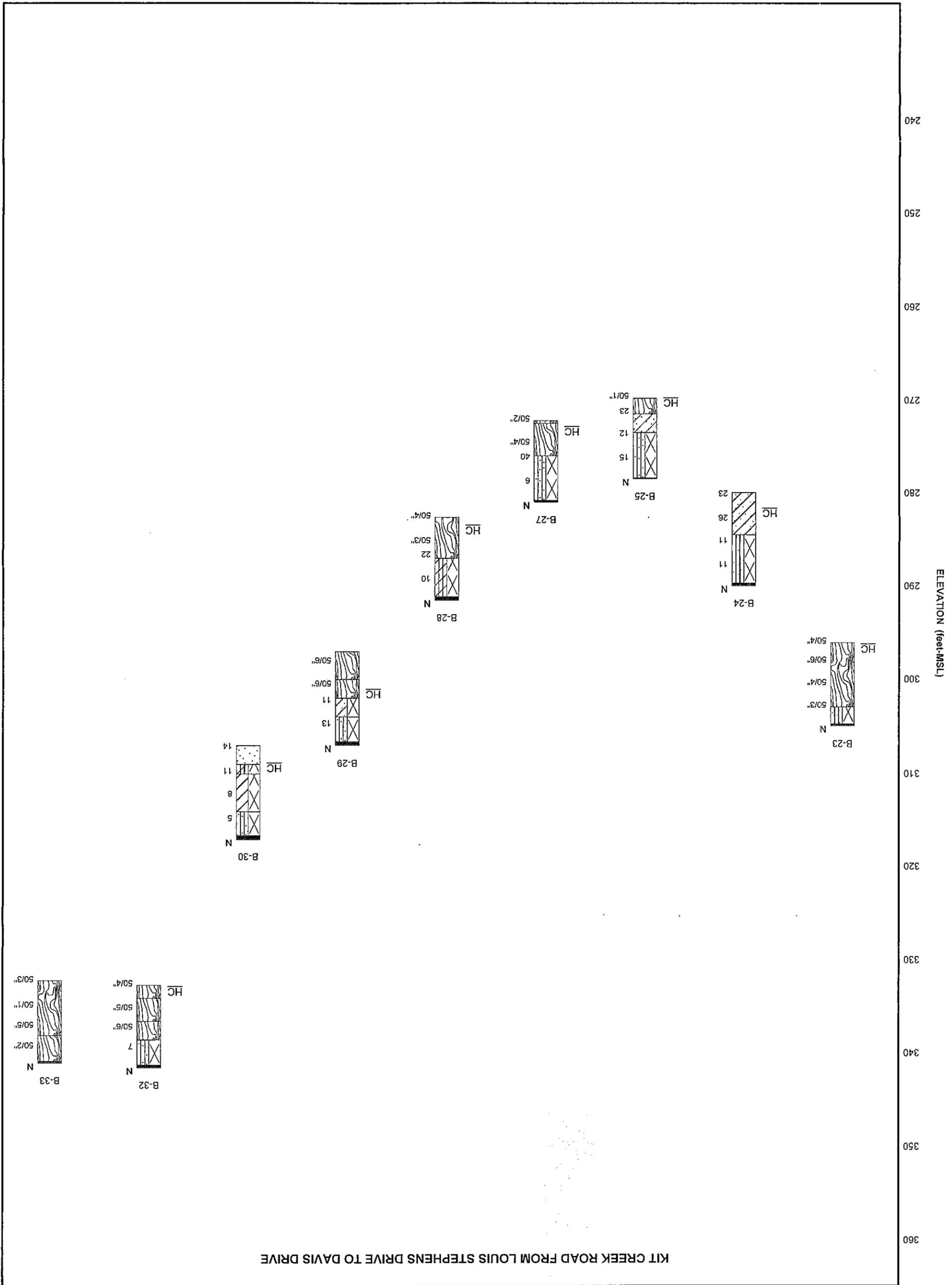
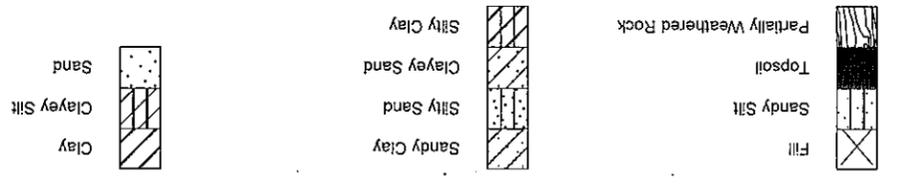




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GENERALIZED SUBSURFACE CONDITIONS
 Jordan Lake WRRP
 Wake County, North Carolina

N = Standard Penetration Test resistance value (blows per foot). The depicted stratigraphy is shown for illustrative purposes only. The actual subsurface conditions will vary between boring locations.

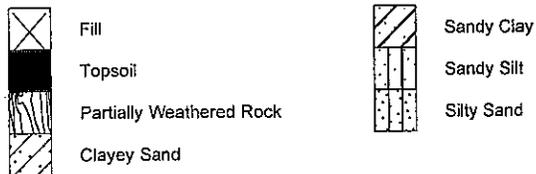
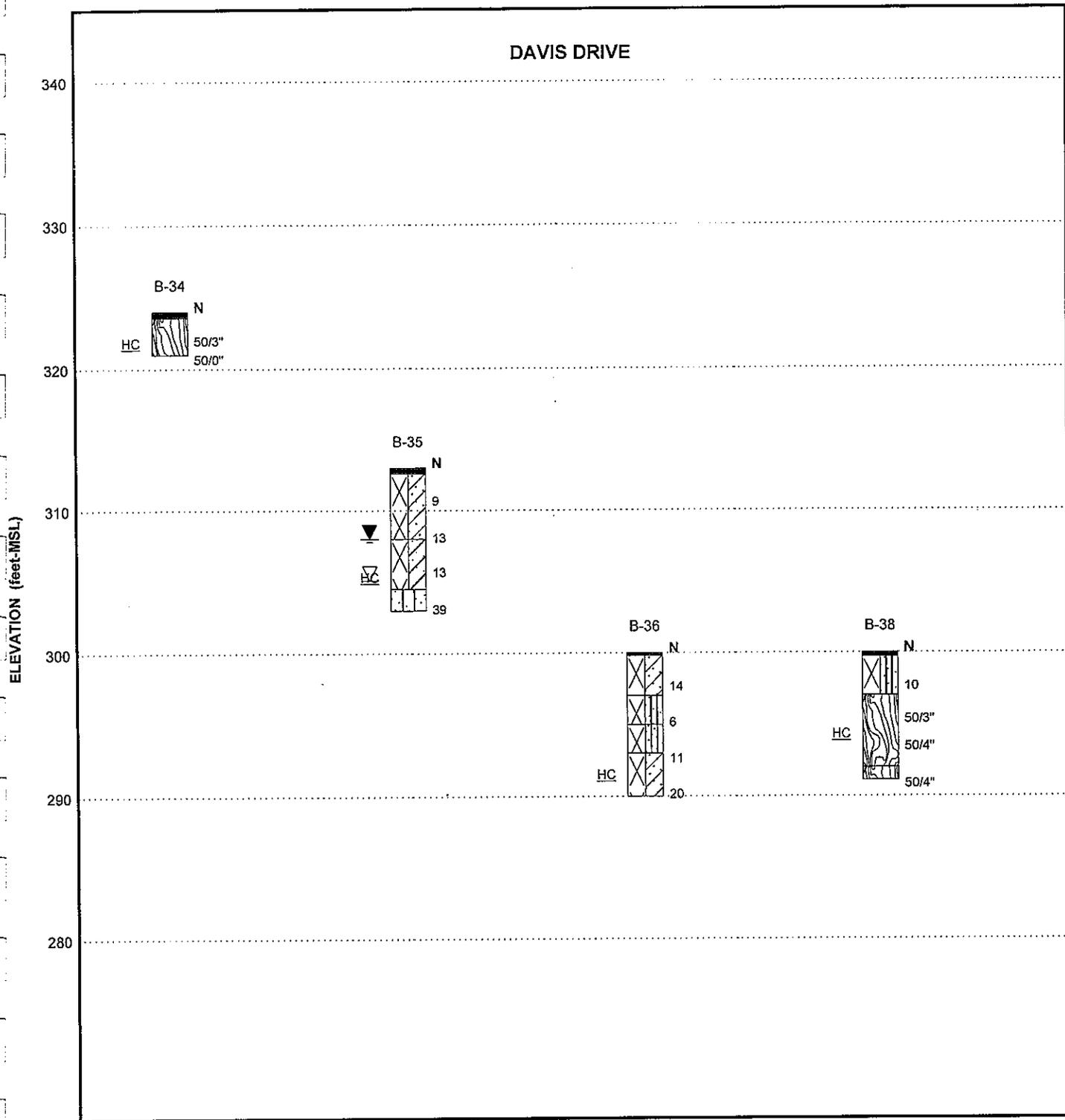


KIT CREEK ROAD FROM LOUIS STEPHENS DRIVE TO DAVIS DRIVE

GENERALIZED SUBSURFACE CONDITIONS

GENERALIZED SUBSURFACE CONDITIONS

DAVIS DRIVE



N = Standard Penetration Test resistance value (blows per foot). The depicted stratigraphy is shown for illustrative purposes only. The actual subsurface conditions will vary between boring locations.

SCALE:	(V) 1" = 10'
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DATE:	10/11/2007
JOB NO:	1051-06-265



GENERALIZED SUBSURFACE CONDITIONS

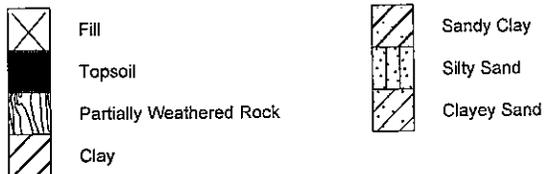
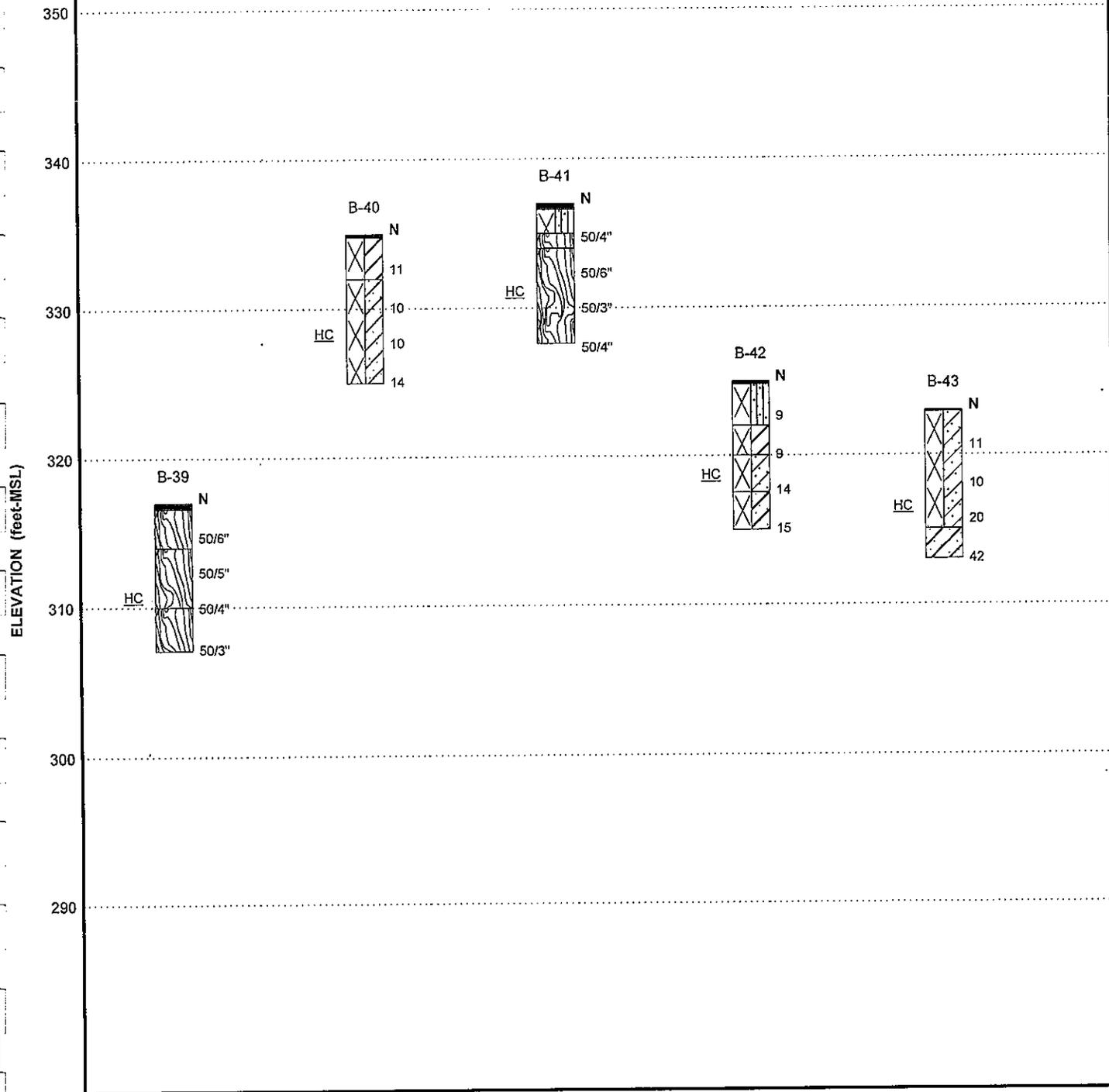
Jordan Lake WRRP

Wake County, North Carolina

FIGURE NO.
2D

GENERALIZED SUBSURFACE CONDITIONS

LOUIS STEPHENS DRIVE FROM KIT CREEK ROAD TO DEVELOPMENT DRIVE



N = Standard Penetration Test resistance value (blows per foot). The depicted stratigraphy is shown for illustrative purposes only. The actual subsurface conditions will vary between boring locations.

SCALE: (V) 1" = 10'

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DATE: 10/11/2007

JOB NO: 1051-06-265



GENERALIZED SUBSURFACE CONDITIONS

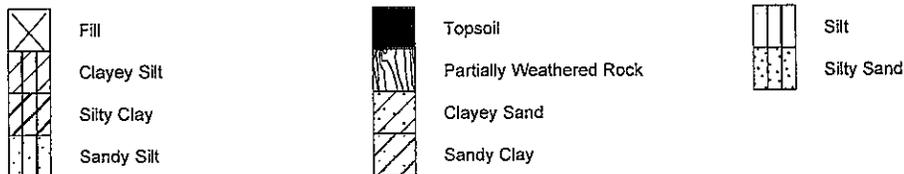
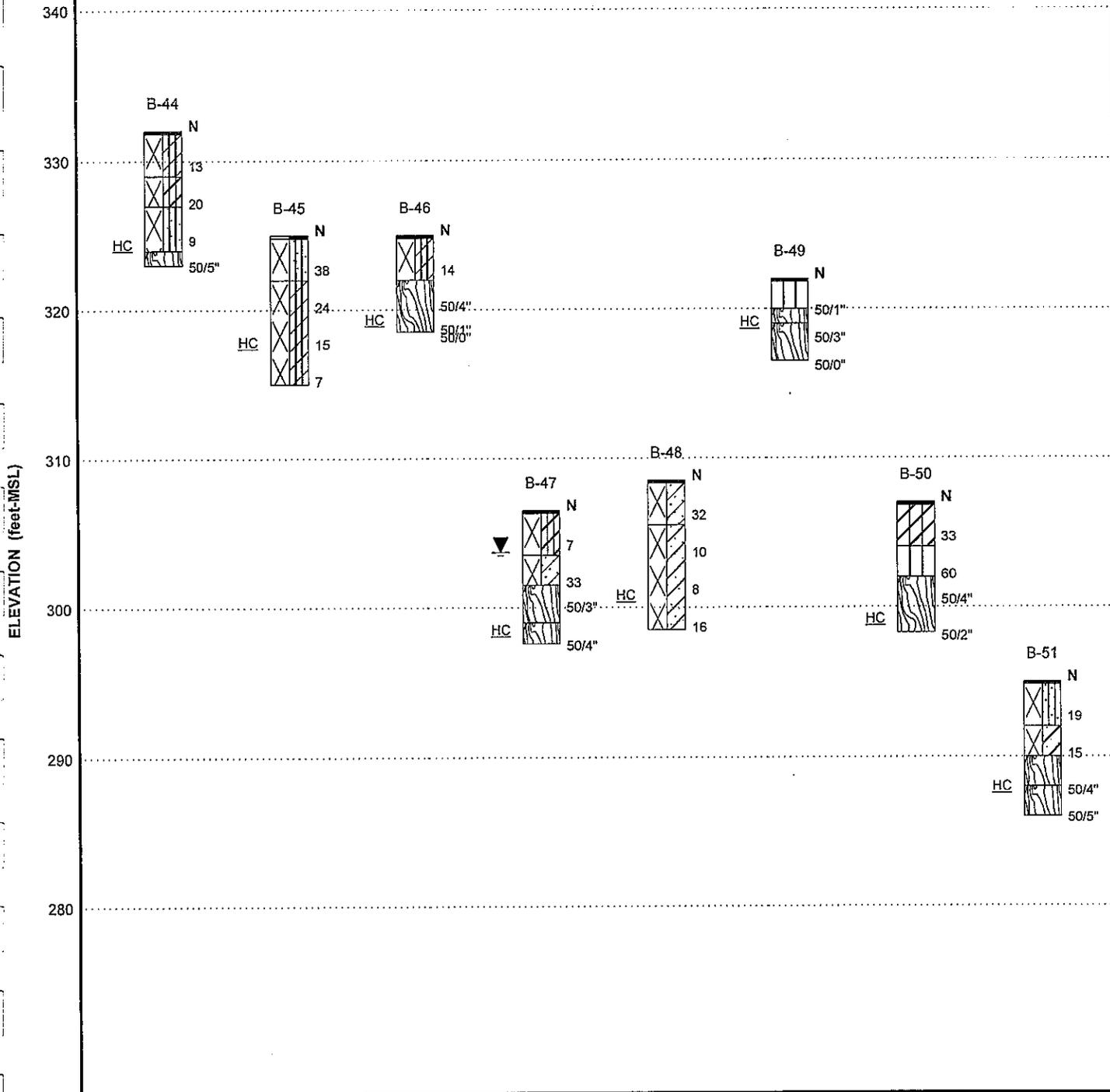
Jordan Lake WRRP
Wake County, North Carolina

FIGURE NO.

2E

GENERALIZED SUBSURFACE CONDITIONS

DEVELOPMENT DRIVE



N = Standard Penetration Test resistance value (blows per foot). The depicted stratigraphy is shown for illustrative purposes only. The actual subsurface conditions will vary between boring locations.

SCALE:	(V) 1" = 10'
CHECKED BY:	
DATE:	10/11/2007
JOB NO:	1051-06-265

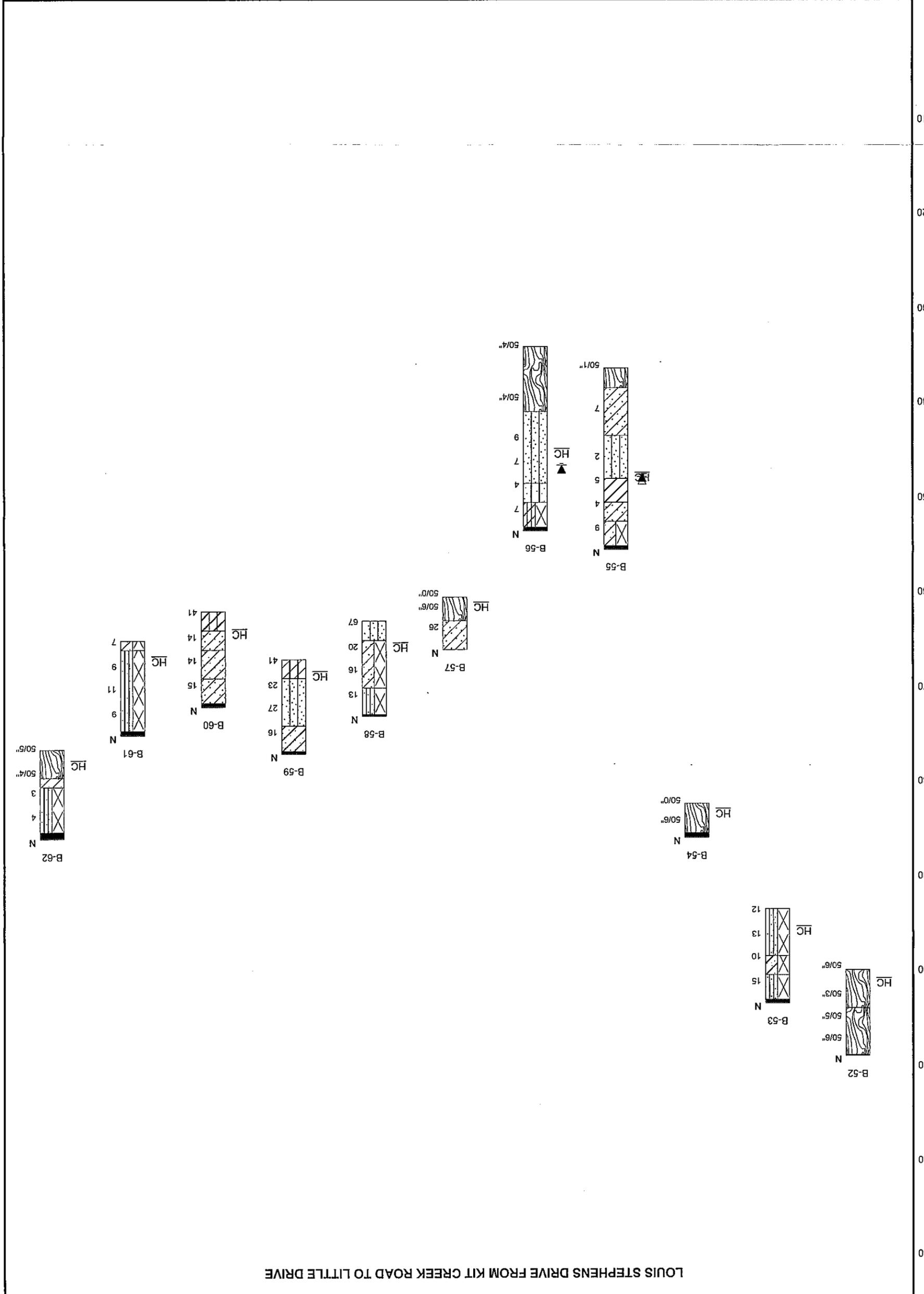
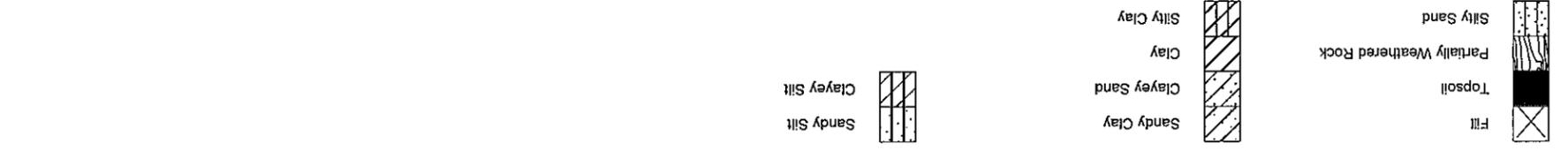


GENERALIZED SUBSURFACE CONDITIONS
Jordan Lake WRRP
 Wake County, North Carolina

FIGURE NO.
2F



N = Standard Penetration Test resistance value (blows per foot). The depicted stratigraphy is shown for illustrative purposes only. The actual subsurface conditions will vary between boring locations.

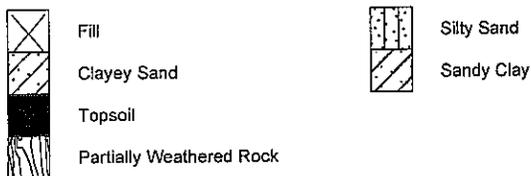
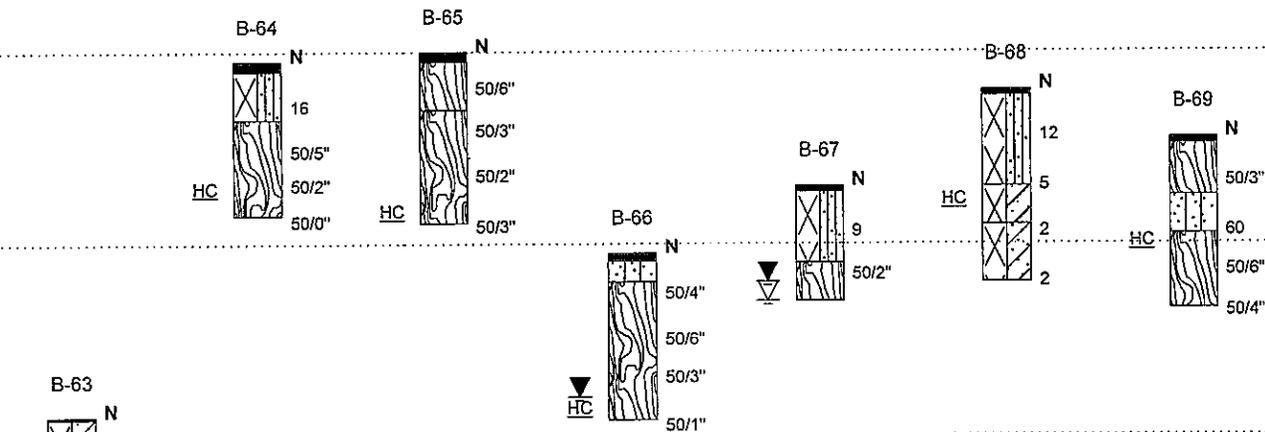


GENERALIZED SUBSURFACE CONDITIONS

LITTLE DRIVE

ELEVATION (feet-MSL)

320
310
300
290
280
270
260



N = Standard Penetration Test resistance value (blows per foot). The depicted stratigraphy is shown for illustrative purposes only. The actual subsurface conditions will vary between boring locations.

SCALE: (V) 1" = 10'

CHECKED BY:

DATE: 10/11/2007

JOB NO: 1051-06-265



GENERALIZED SUBSURFACE CONDITIONS

Jordan Lake WRRP
Wake County, North Carolina

FIGURE NO.

2H



Jordan Lake Water Reclamation and Reuse Project - Phase I

Wake County, North Carolina

S&ME Project Number 1051-06-265

Depths to Partially Weathered Rock (PWR) and Auger Refusal

Boring Location	Approximate Depth to PWR (ft.)	Approximate Depth to Auger Refusal (ft.)	Total Depth of Boring (ft.)
B-1	3.0	--	8.8
B-2	--	--	10.0
B-3	3.0	--	8.9
B-4	3.5	--	8.7
B-5	5.0	--	9.0
B-6	7.0	--	9.5
B-7	1.0	--	8.9
B-8	--	--	10.0
B-9	--	--	10.0
B-10	5.0	--	10.0
B-11	8.0	--	9.4
B-12	3.0	--	8.9
B-13	3.0	5.0	5.0
B-14	12.0	14.0	14.0
B-15	5.0	--	22.8
B-16	7.0	--	23.7
B-17	12.0	--	18.8
B-18	8.0	--	8.6
B-19	5.0	8.0	8.0
B-20	1.0	--	8.9
B-21	--	--	10.0
B-22	5.0	--	8.9
B-23	2.0	--	8.9
B-24	--	--	10.0
B-25	7.0	--	8.7
B-27	5.0	--	8.8
B-28	4.5	--	8.9
B-29	5.0	--	10.0
B-30	--	--	10.0
B-32	3.0	--	8.9
B-33	1.0	--	8.9
B-34	1.0	3.0	3.0
B-35	--	--	10.0
B-36	--	--	10.0
B-38	3.0	--	8.9
B-39	1.0	--	9.9
B-40	--	--	10.0
B-41	2.0	--	9.4
B-42	--	--	10.0
B-43	--	--	10.0
B-44	8.0	--	9.0
B-45	--	--	10.0
B-46	3.0	6.5	6.5
B-47	5.0	--	8.9
B-48	--	--	10.0
B-49	2.0	5.5	5.5
B-50	5.0	--	8.7
B-51	5.0	--	9.0
B-52	surface	--	9.0
B-53	--	--	10.0
B-54	surface	3.6	3.6
B-55	17.0	--	19.1
B-56	12.5	--	19.4
B-57	3.0	5.6	5.6
B-58	--	--	10.0
B-59	--	--	10.0
B-60	--	--	10.0
B-61	--	--	10.0
B-62	6.5	--	9.5
B-63	5.0	--	8.8
B-64	3.0	8.0	8.0
B-65	1.0	--	8.9
B-66	1.5	--	8.7
B-67	4.0	--	6.0
B-68	--	--	10.0
B-69	1.0	--	8.9

SPT = Standard Penetration Test Boring (ASTM D 1586)

-- = Partially Weathered Rock or Auger refusal not encountered

* = Layer of partially weathered rock underlain by residual soils

LEGEND TO SOIL CLASSIFICATION AND SYMBOLS

SOIL TYPES

(Shown in Graphic Log)

	Fill
	Asphalt
	Concrete
	Topsoil
	Gravel
	Sand
	Silt
	Clay
	Organic
	Silty Sand
	Clayey Sand
	Sandy Silt
	Clayey Silt
	Sandy Clay
	Silty Clay
	Partially Weathered Rock
	Cored Rock

WATER LEVELS

(Shown in Water Level Column)

-  = Water Level At Termination of Boring
-  = Water Level Taken After 24 Hours
-  = Loss of Drilling Water
- HC = Hole Cave

CONSISTENCY OF COHESIVE SOILS

CONSISTENCY

	STD. PENETRATION RESISTANCE BLOWS/FOOT
Very Soft	0 to 2
Soft	3 to 4
Firm	5 to 8
Stiff	9 to 15
Very Stiff	16 to 30
Hard	31 to 50
Very Hard	Over 50

RELATIVE DENSITY OF COHESIONLESS SOILS

RELATIVE DENSITY

	STD. PENETRATION RESISTANCE BLOWS/FOOT
Very Loose	0 to 4
Loose	5 to 10
Medium Dense	11 to 30
Dense	31 to 50
Very Dense	Over 50

SAMPLER TYPES

(Shown in Samples Column)

-  Shelby Tube
-  Split Spoon
-  Rock Core
-  No Recovery

TERMS

Standard Penetration Resistance - The Number of Blows of 140 lb. Hammer Falling 30 in. Required to Drive 1.4 in. I.D. Split Spoon Sampler 1 Foot. As Specified in ASTM D-1588.

REC - Total Length of Rock Recovered in the Core Barrel Divided by the Total Length of the Core Run Times 100%.

RQD - Total Length of Sound Rock Segments Recovered that are Longer Than or Equal to 4" (mechanical breaks excluded) Divided by the Total Length of the Core Run Times 100%.



DATE DRILLED: 10/3/07	ELEVATION: 351.5 ft	NOTES: Boring location is approximate.
DRILLING METHOD: 2-1/4" HSA	BORING DEPTH: 8.8 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: A. Martin	DRILL RIG: Diedrich D-50	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value
						10	20	30	60	80	
	[Dotted pattern]	TOPSOIL		[X]							
	[Dotted pattern]	RESIDUAL: Dense Yellow-Orange Silty Fine SAND (SM), Dry		[X]	349.5						36
5	[Wavy pattern]	PARTIALLY WEATHERED ROCK Sampled as Red-Brown and Gray Silty Clayey Fine SAND (SC), Dry		[X]	346.5						50/5"
	[Wavy pattern]	PARTIALLY WEATHERED ROCK Sampled as Red-Brown SILT (ML) With Trace Fine Sand, Dry		[X]							50/4"
10	[Wavy pattern]	PARTIALLY WEATHERED ROCK Sampled as Tan and Brown Fine to Medium SAND (SP) With Trace Silt, Dry	HC	[X]	341.5						50/3"
		Boring terminated at 8.8 feet below existing ground surface. Borehole caved at 7.7 feet below existing ground surface and at 6.9 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.									
15					336.5						
20					331.5						
25					326.5						
30					321.5						

S&ME COMPANY STANDARD 51-285.GPJ S&ME.GDT 10/11/07

- NOTES:**
1. THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.
 2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



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DATE DRILLED: 10/3/07	ELEVATION: 339.0 ft	NOTES: Boring location is approximate.
DRILLING METHOD: 2-1/4" HSA	BORING DEPTH: 10.0 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: A. Martin	DRILL RIG: Diedrich D-50	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
	X	TOPSOIL										
	X	FILL: Medium Dense Brown-Red Silty Fine to Coarse SAND (SM) With Trace Gravel, Dry		X								13
5	X	RESIDUAL: Medium Dense Gray-Pink Silty Fine to Coarse SAND (SM), Dry		X	334.0							29
	X	Medium Dense Tan-Red Silty Fine to Coarse SAND (SM), Dry	HC	X								14
10	X	Very Dense Gray-Maroon Silty Fine to Coarse SAND (SM), Dry		X	329.0							58
15		Boring terminated at 10 feet below existing ground surface. Borehole caved at 6.9 feet below existing ground surface and at 5 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.			324.0							
20					319.0							
25					314.0							
30					309.0							

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

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 2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.

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Raleigh, NC 27616

DATE DRILLED: 10/3/07	ELEVATION: 340.0 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 8.9 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
	TOPSOIL			X								
	FILL: Very Dense Red-Brown Micaceous Silty Clayey Fine SAND (SC) With Trace Gravel and Root Hairs, Moist			X	337							42
	PARTIALLY WEATHERED ROCK Sampled as Pink and Gray Silty Fine to Coarse SAND (SM), Dry			X								50/6"
5	PARTIALLY WEATHERED ROCK Sampled as Pink and Gray Fine to Coarse SAND (SW) With Trace Silt and Gravel, Dry			X	335.0							50/2"
			HC	X								50/4"
10		Boring terminated at 8.9 feet below existing ground surface. Borehole caved at 8.6 feet below existing ground surface and at 8.3 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.			330.0							
15					325.0							
20					320.0							
25					315.0							
30					310.0							

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

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 2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.

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Raleigh, NC 27616

DATE DRILLED: 10/3/07	ELEVATION: 340.0 ft	NOTES: Boring location is approximate.
DRILLING METHOD: 2-1/4" HSA	BORING DEPTH: 8.7 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: A. Martin	DRILL RIG: Diedrich D-50	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
0 - 1	TOPSOIL	RESIDUAL: Very Hard Tan-Red To Red-Brown Fine Sandy SILT (ML), Dry		X								
1 - 5	PARTIALLY WEATHERED ROCK	Sampled as Red-Brown SILT (ML-MH) With Trace Fine Sand, Dry		X	336.5							54
5 - 8.7	PARTIALLY WEATHERED ROCK	Sampled as Pink and Gray Silty Fine SAND (SM), Dry	HC	X	335.0							50/5"
8.7	Boring terminated at 8.7 feet below existing ground surface. Borehole caved at 7.8 feet below existing ground surface and at 6 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.			X	330.0							50/5"
10					330.0							50/2"
15					325.0							
20					320.0							
25					315.0							
30					310.0							

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

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 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.

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DATE DRILLED: 10/3/07	ELEVATION: 341.0 ft	NOTES: Boring location is approximate.
DRILLING METHOD: 2-1/4" HSA	BORING DEPTH: 9.0 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: A. Martin	DRILL RIG: Diedrich D-50	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value
						10	20	30	60	80	
0 - 1	X	TOPSOIL FILL: Very Dense Tan-Orange Silty Fine SAND (SM) With Trace Root Hairs, Dry RESIDUAL: Very Dense Brown and Pink Silty Fine SAND (SM), Moist		X							54
1 - 5	X	PARTIALLY WEATHERED ROCK Sampled as Brown Fine Sandy Clayey SILT (ML-MH), Dry		X	336.0						64
5 - 9	X	PARTIALLY WEATHERED ROCK Sampled as Red-Brown Silty Clayey Fine SAND (SC), Dry	HC	X							50/6"
9 - 10	X	Boring terminated at 9 feet below existing ground surface. Borehole caved at 7.7 feet below existing ground surface and at 6.2 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.		X	331.0						50/5"
15					326.0						
20					321.0						
25					316.0						
30					311.0						

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/18/07

NOTES:

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2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



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DATE DRILLED: 10/3/07	ELEVATION: 329.0 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 9.5 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
	TOPSOIL											
	FILL: Loose Red-Brown Silty Fine to Coarse SAND (SM) With Trace Gravel, Dry			X								6
	FILL: Stiff Orange and Gray CLAY (CL) With Trace Silt, Root Hairs and Fine Sand, Moist			X								15
5	FILL: Very Stiff Brown with Black Fine Sandy Clayey SILT (MH), Dry			X	324.0							20
	PARTIALLY WEATHERED ROCK Sampled as Brown Fine Sandy SILT (ML), Dry		HC	X								50/5"
10	Boring terminated at 9.5 feet below existing ground surface. Borehole caved at 8 feet below existing ground surface and at 7.9 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.			X	319.0							
15	*Bulk Sample Obtained Between 0 - 6 Feet.				314.0							
20					309.0							
25					304.0							
30					299.0							

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

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2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



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DATE DRILLED: 10/3/07	ELEVATION: 319.0 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 8.9 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value
						10	20	30	60	80	
	TOPSOIL				319.5						
	PARTIALLY WEATHERED ROCK	Sampled as Orange-White Silty Fine SAND (SM), Dry		X							● 50/6"
5	PARTIALLY WEATHERED ROCK	Sampled as Orange-Gray Silty Fine to Coarse SAND (SM), Moist		X	314.0						● 50/2"
	PARTIALLY WEATHERED ROCK	Sampled as Pink-Gray Fine SAND (SM) With Trace Silt, Dry		X							● 50/4"
			HC	X							● 50/4"
10		Boring terminated at 8.9 feet below existing ground surface. Borehole caved at 8.4 feet below existing ground surface and at 7.9 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.			309.0						
15					304.0						
20					299.0						
25					294.0						
30					289.0						

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

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 2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



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DATE DRILLED: 10/4/07	ELEVATION: 318.5 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 10.0 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value
						10	20	30	60	80	
0	TOPSOIL										
0 - 5	RESIDUAL: Very Dense Tan to Tan-Red Silty Fine to Coarse SAND (SM), Dry to Moist			X							76
5				X	313.5						59
5 - 10			HC	X							53
10		Boring terminated at 10 feet below existing ground surface. Borehole caved at 8 feet below existing ground surface and at 7.6 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.		X	308.5						70
15					303.5						
20					298.5						
25					293.5						
30					288.5						

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/18/07

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 2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



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DATE DRILLED: 10/4/07	ELEVATION: 326.0 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 10.0 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
	TOPSOIL											
	RESIDUAL: Dense Orange-Tan and Gray Clayey Fine to Coarse SAND (SC), Dry			X								33
5	Very Dense Pink and Gray Silty Fine to Coarse SAND (SM), Dry			X	321.0							72
	Very Hard Red-Brown SILT (ML) With Trace Fine Sand, Dry			X								82
	Very Dense Tan-Gray Silty Fine SAND (SM), Dry		HC	X								70
10	Boring terminated at 10 feet below existing ground surface. Borehole caved at 8 feet below existing ground surface and at 7.9 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.											
15					311.0							
20					306.0							
25					301.0							
30					296.0							

S&ME COMPANY STANDARD 51-265.GPJ S&ME-GDT 10/11/07

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 2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



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3201 Spring Forest Road
Raleigh, NC 27616

DATE DRILLED: 10/4/07	ELEVATION: 313.0 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 10.0 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
0		TOPSOIL										
0 - 2.5		FILL: Medium Dense Brown-Orange and Tan Silty Fine to Coarse SAND (SM) With Trace Gravel, Dry										12
2.5 - 5		RESIDUAL: Medium Dense Pink-Tan and Gray Fine to Coarse SAND (SM) With Trace Silt, Dry										8
5 - 7.3		PARTIALLY WEATHERED ROCK Sampled as Pink-Brown Silty Fine to Coarse SAND (SM), Dry			308.0							50/6"
7.3 - 10		Very Dense Orange-Tan Silty Fine to Coarse SAND (SM), Dry										58
10		Boring terminated at 10 feet below existing ground surface. Borehole caved at 7.8 feet below existing ground surface and at 7.3 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.			303.0							
15					298.0							
20					293.0							
25					288.0							
30					283.0							

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

- NOTES:**
1. THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.
 2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.

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DATE DRILLED: 10/3/07	ELEVATION: 318.0 ft	NOTES: Boring location is approximate.
DRILLING METHOD: 2-1/4" HSA	BORING DEPTH: 9.4 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: A. Martin	DRILL RIG: Diedrich D-50	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
	TOPSOIL											
	FILL: Loose Brown Silty Clayey Fine SAND (SC) With Trace Root Hairs and Rock Pieces, Dry			X								10
	FILL: Loose Red With Gray Silty Fine to Coarse SAND (SM) With Trace Root Hairs and Rock Pieces, Moist			X								8
5		Very Loose Tan-Orange Clayey Fine SAND (SC) With Trace Silt, Moist		X	313.0							3
	PARTIALLY WEATHERED ROCK Sampled as Red-Brown Silty Fine SAND (SM) With Trace Clay, Dry		HC	X								50/4"
10		Boring terminated at 9.4 feet below existing ground surface. Borehole caved at 7.5 feet below existing ground surface and at 7.8 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.			308.0							
15					303.0							
20					298.0							
25					293.0							
30					288.0							

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

- NOTES:**
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 2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



DATE DRILLED: 10/3/07	ELEVATION: 302.5 ft	NOTES: Boring location is approximate.
DRILLING METHOD: 2-1/4" HSA	BORING DEPTH: 8.9 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: A. Martin	DRILL RIG: Diedrich D-50	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
	TOPSOIL			X								
	RESIDUAL: Very Stiff Red-Brown Fine Sandy SILT (ML), Dry			X								21
5	PARTIALLY WEATHERED ROCK	Sampled as Red-Brown SILT (ML-MH) With Trace Fine Sand and Rock Fragments, Dry		X	297.5							50/4"
	PARTIALLY WEATHERED ROCK	Sampled as Gray-Brown Fine to Coarse Sandy SILT (ML), Dry	HC	X								50/5"
10		Boring terminated at 8.9 feet below existing ground surface. Borehole caved at 8 feet below existing ground surface and at 5.9 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.		X	292.5							50/4"
15					287.5							
20					282.5							
25					277.5							
30					272.5							

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

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 2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



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DATE DRILLED: 10/3/07	ELEVATION: 277.0 ft	NOTES: Boring location is approximate.
DRILLING METHOD: 2-1/4" HSA	BORING DEPTH: 5.0 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: A. Martin	DRILL RIG: Diedrich D-50	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value
						10	20	30	60	80	
	TOPSOIL										
	RESIDUAL: Medium Dense Pink-Tan and Brown Silty Clayey Fine SAND (SC), Dry			X							17
	PARTIALLY WEATHERED ROCK	Sampled as Brown Silty Fine SAND (SM) With Trace Clay, Dry		X							50/3"
5		Auger refusal occurred in borehole at a depth of 5 feet below existing ground surface. Borehole caved at 4.4 feet below existing ground surface and at 3 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.			272.0						50/0"
10					267.0						
15					262.0						
20					257.0						
25					252.0						
30					247.0						

S&ME COMPANY STANDARD 51-265.GPJ S&ME-GDT 10/11/07

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2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
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DATE DRILLED: 10/5/07	ELEVATION: 269.0 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 14.0 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB, 12.5' After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
0		TOPSOIL										
0-5		FILL: Medium Dense Tan-Brown Clayey Fine SAND (SC) With Trace Root Hairs, Moist										
5		FILL: Medium Dense Tan-Orange to Brown Clayey Silty Fine SAND (SM), Dry to Moist			264.0							12
5-10		FILL: Soft Gray-Brown Fine Sandy CLAY (CH) With Trace Roots, Moist										
10		FILL: Loose Gray-Brown Clayey Fine SAND (SC) With Trace Roots, Moist			259.0							5
10-15		PARTIALLY WEATHERED ROCK Sampled as Pink and Gray Silty Fine SAND (SM), Dry										
15		Auger refusal occurred in borehole at a depth of 14 feet below existing ground surface. Borehole caved at 13 feet below existing ground surface. Borehole was observed dry at termination of boring. Groundwater was observed in borehole at a depth of 12.5 feet after 24 hours.			254.0							50/1" 50/0"
20					249.0							
25					244.0							
30					239.0							

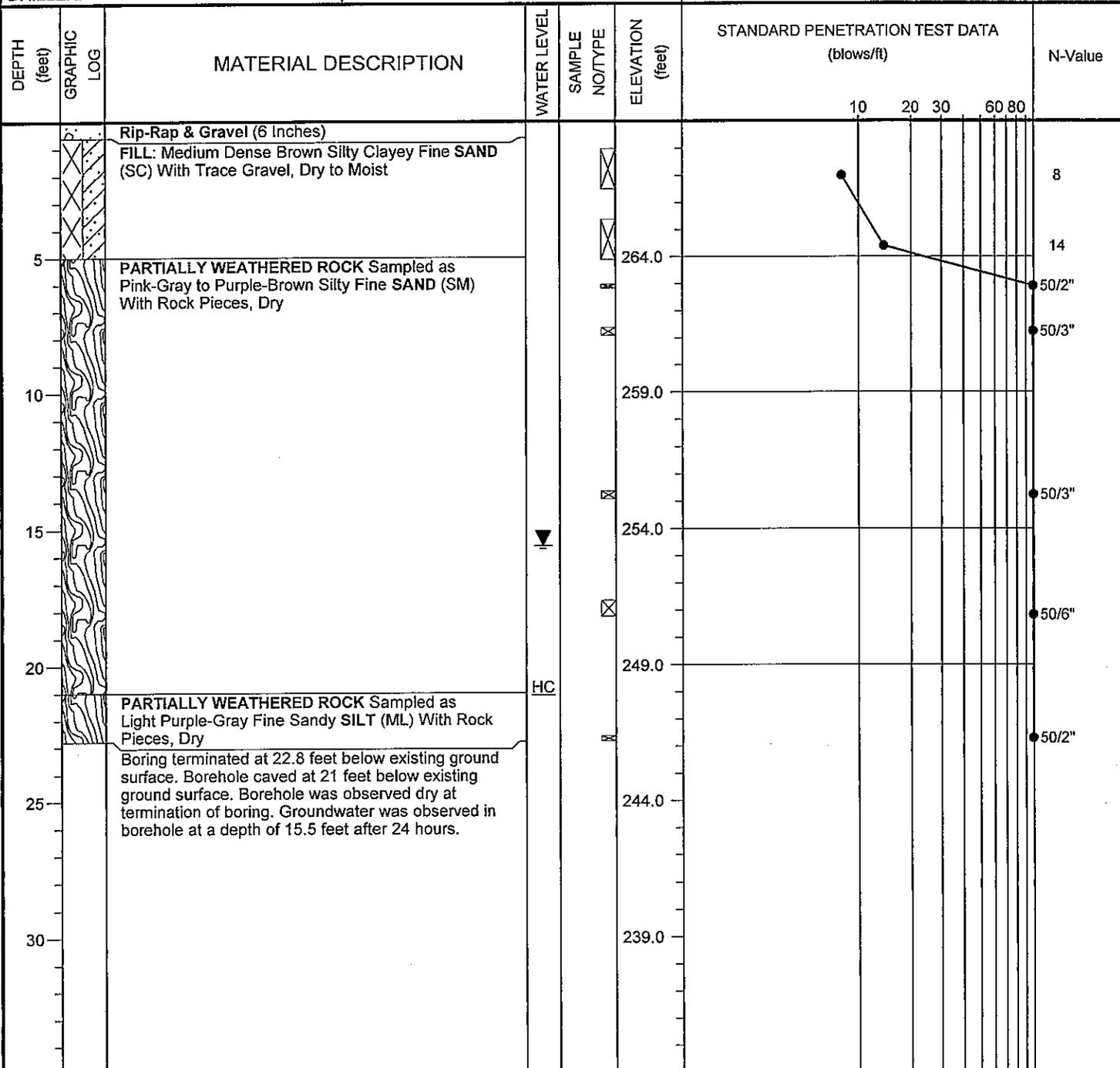
S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/1/07

- NOTES:
- THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.
 - BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
 - PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
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DATE DRILLED: 10/5/07	ELEVATION: 269.0 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 22.8 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB, 15.5' After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	



S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

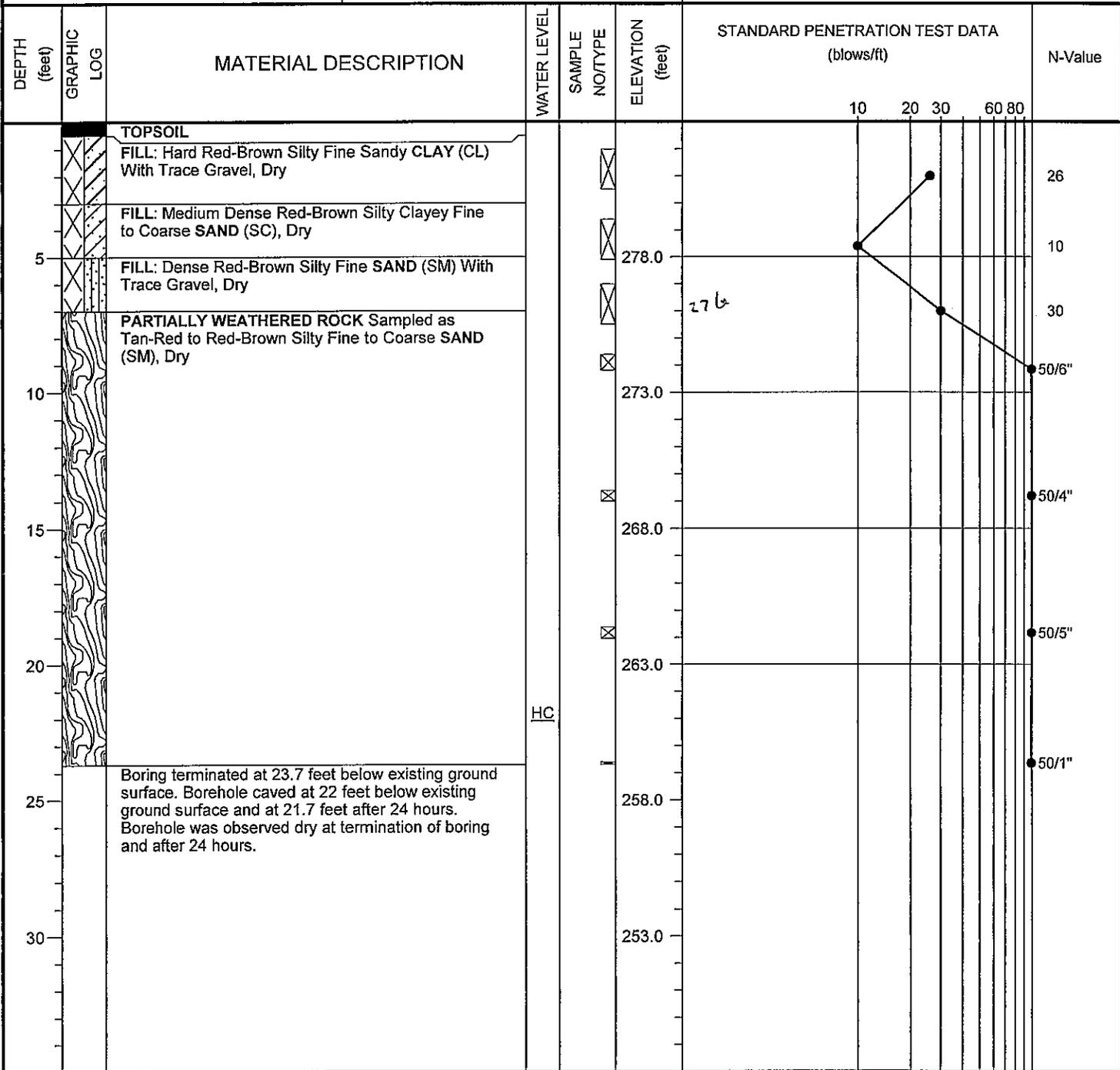
- NOTES:**
1. THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.
 2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.

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DATE DRILLED: 10/4/07	ELEVATION: 283.0 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 23.7 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	



S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

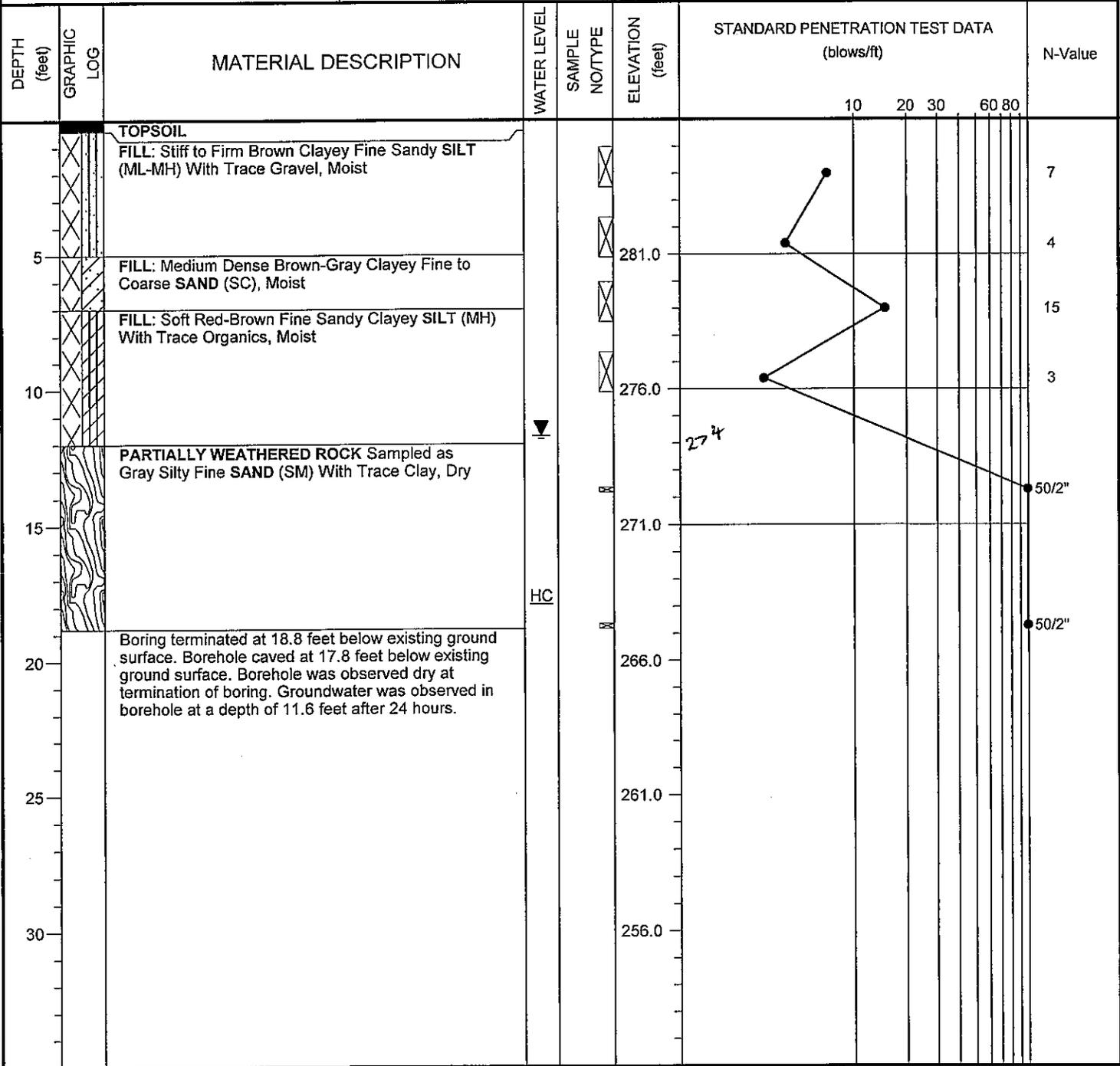
- NOTES:**
1. THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.
 2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



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DATE DRILLED: 10/5/07	ELEVATION: 286.0 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 18.8 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB, 11.6' After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	



S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

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 2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



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DATE DRILLED: 10/3/07	ELEVATION: 294.0 ft	NOTES: Boring location is approximate.
DRILLING METHOD: 2-1/4" HSA	BORING DEPTH: 8.6 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: A. Martin	DRILL RIG: Diedrich D-50	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)				N-Value
						10	20	30	60 80	
0 - 1	TOPSOIL	RESIDUAL: Dense Brown-Red Silty Fine to Coarse SAND (SM) With Trace Rock Fragments, Dry		X						37
1 - 4	Medium Dense Brown-Red Silty Fine to Coarse SAND (SM), Dry			X						18
4 - 7	Firm Red-Brown CLAY (CH) With Trace Fine Sand, Moist			X	289.0					5
7 - 8.6	PARTIALLY WEATHERED ROCK	Sampled as Brown Fine to Coarse SAND (SW) With Trace Silty and Clay, Dry Boring terminated at 8.6 feet below existing ground surface. Borehole caved at 7.9 feet below existing ground surface and at 7 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.	HC	-	284.0					50/1"
8.6 - 10										
10 - 15					279.0					
15 - 20					274.0					
20 - 25					269.0					
25 - 30					264.0					

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/16/07

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 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



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 Raleigh, NC 27616

DATE DRILLED: 10/3/07	ELEVATION: 308.0 ft	NOTES: Boring location is approximate.
DRILLING METHOD: 2-1/4" HSA	BORING DEPTH: 8.0 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: A. Martin	DRILL RIG: Diedrich D-50	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
0	TOPSOIL	RESIDUAL: Very Hard to Stiff Red-Brown Fine Sandy Clayey SILT (ML-MH), Dry		X								
5	PARTIALLY WEATHERED ROCK	Sampled as Red-Brown Silty Fine SAND (SM), Dry		X	303.0							55
7.3		Auger refusal occurred in borehole at a depth of 8 feet below existing ground surface. Borehole caved at 7.3 feet below existing ground surface and 5.9 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.	HC	X	298.0							9
10					293.0							50/5"
15					288.0							50/0"
20					283.0							
25					278.0							
30												

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/1/07

NOTES:

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4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



DATE DRILLED: 10/3/07	ELEVATION: 310.0 ft	NOTES: Boring location is approximate.
DRILLING METHOD: 2-1/4" HSA	BORING DEPTH: 8.9 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: A. Martin	DRILL RIG: Diedrich D-50	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
		TOPSOIL										
		PARTIALLY WEATHERED ROCK Sampled as Pink and Tan-Gray Fine to Coarse SAND (SW) With Trace Silt and Rock Fragments, Dry		X								● 50/4"
5		PARTIALLY WEATHERED ROCK Sampled as Gray and Maroon Clayey Silty Fine to Coarse SAND (SM) With Trace Rock Fragments, Dry		X	305.0							● 50/3"
		PARTIALLY WEATHERED ROCK Sampled as Gray and Maroon Fine to Coarse Sandy SILT (ML), Dry		X								● 50/5"
10		PARTIALLY WEATHERED ROCK Sampled as Gray and Maroon Silty Clayey Fine to Coarse SAND (SC), Dry	HC	X	300.0							● 50/4"
		Boring terminated at 8.9 feet below existing ground surface. Borehole caved at 8.3 feet below existing ground surface and at 6.4 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.										
15					295.0							
20					290.0							
25					285.0							
30					280.0							

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

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 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



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 3201 Spring Forest Road
 Raleigh, NC 27616

DATE DRILLED: 9/27/07	ELEVATION: 308.0 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 10.0 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
	TOPSOIL											
	X	FILL: Loose Red-Brown Silty Clayey Fine SAND (SC) With Trace Roots, Dry		X								7
	X	FILL: Medium Dense Brown Silty Fine to Coarse SAND (SM), Moist		X	303.0							9
5	X	FILL: Stiff Tan-Brown Silty Clayey Fine SAND (SC), Moist		X								7
	X	FILL: Soft Brown and Red Fine Sandy CLAY (CH) With Trace Wood Pieces, Moist to Wet	HC	X								2
10		Boring terminated at 10 feet below existing ground surface. Borehole caved at 7.3 feet below existing ground surface and at 5.3 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.		X	298.0							
15					293.0							
20					288.0							
25					283.0							
30					278.0							

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/18/07

NOTES:

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3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



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 Raleigh, NC 27616

DATE DRILLED: 9/27/07	ELEVATION: 313.5 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 8.9 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
	TOPSOIL											
	FILL	FILL: Stiff Brown Silty Fine Sandy CLAY (CL) With Trace Roots and Rock Pieces, Moist		X								8
	FILL	FILL: Stiff Red-Brown to Brown CLAY (CH) With Some Silty Sand, Roots and Rock Pieces, Moist		X								10
5	PARTIALLY WEATHERED ROCK	PARTIALLY WEATHERED ROCK Sampled as Red-Brown to Pink-Red Silty Fine SAND (SM) With Rock Fragments, Dry	HC	X	308.5							50/3"
10		Boring terminated at 8.9 feet below existing ground surface. Borehole caved at 7.3 feet below existing ground surface and at 7 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.		X	303.5							50/3"
15					298.5							
20					293.5							
25					288.5							
30					283.5							

S&ME COMPANY STANDARD 51-255.GPJ S&ME-GDT 10/11/07

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2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



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DATE DRILLED: 10/2/07	ELEVATION: 305.0 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 8.9 ft	
LOGGED BY: B. Keaney	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
	X	TOPSOIL										
	X	FILL: Stiff Tan-Maroon Fine Sandy SILT (ML), Dry		X								50/3"
5	X	PARTIALLY WEATHERED ROCK Sampled as Tan-Orange Silty Fine SAND (SM), Dry		X	300.0							50/4"
	X			X								50/6"
10	X	Boring terminated at 8.9 feet below existing ground surface. Borehole caved at 8.6 feet below existing ground surface and at 7.1 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.	HC	X	295.0							50/4"
15					290.0							
20					285.0							
25					280.0							
30					275.0							

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

- NOTES:**
1. THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.
 2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
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DATE DRILLED: 10/2/07	ELEVATION: 290.0 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 10.0 ft	
LOGGED BY: B. Keaney	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)				N-Value
						10	20	30	60 80	
0	TOPSOIL									
0 - 5	FILL: Stiff Gray Fine Sandy SILT (ML), Dry			X						11
5				X	285.0					11
5 - 10	RESIDUAL: Hard Maroon Fine Sandy CLAY (CL), Dry		HC	X						26
10				X	280.0					23
10 - 30	Boring terminated at 10 feet below existing ground surface. Borehole caved at 8.2 feet below existing ground surface and at 7.4 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.									
15					275.0					
20					270.0					
25					265.0					
30					260.0					

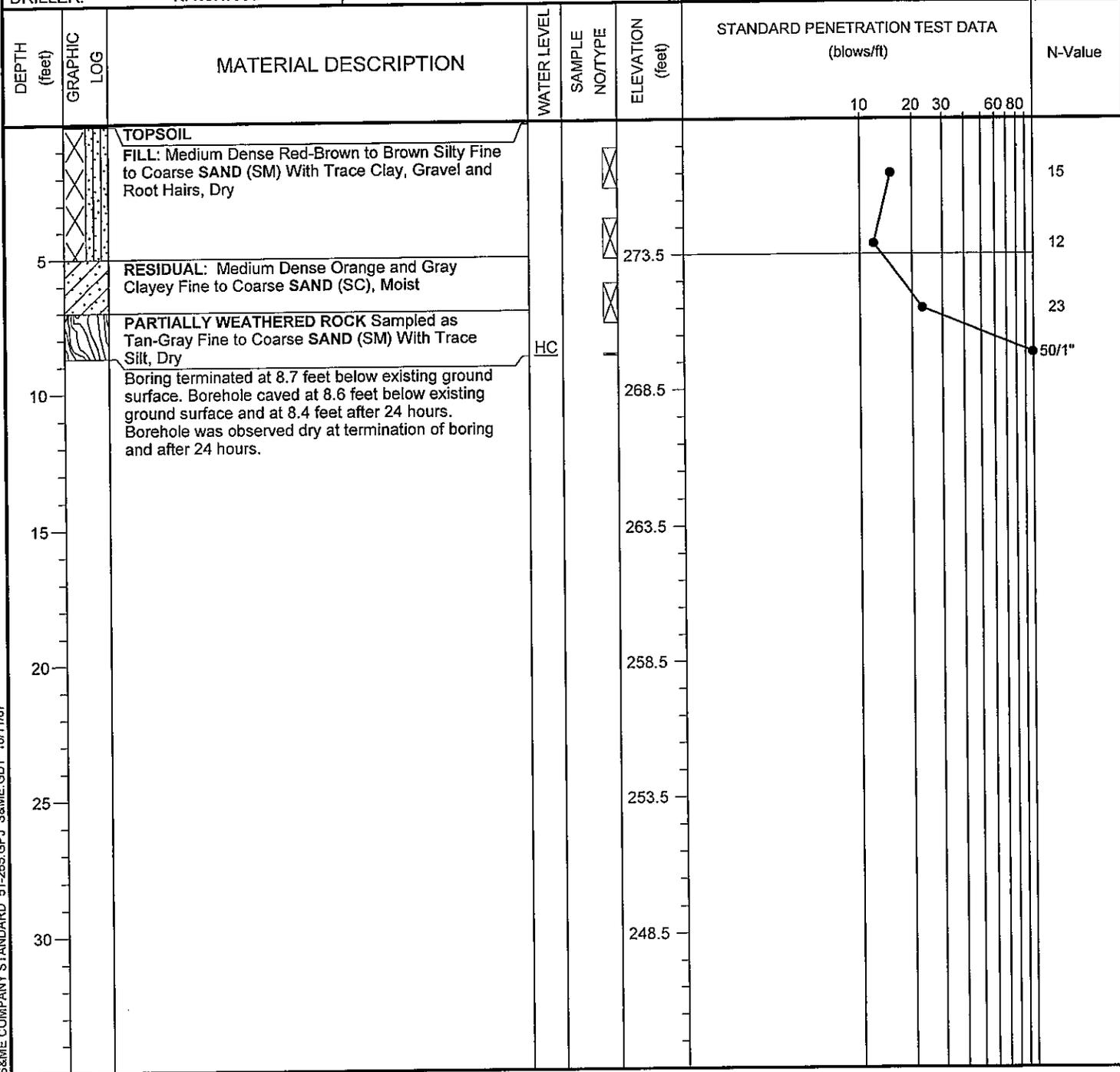
S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/1/07

- NOTES:**
1. THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.
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 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
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DATE DRILLED: 10/2/07	ELEVATION: 278.5 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 8.7 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	



S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

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 2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.

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DATE DRILLED: 10/2/07	ELEVATION: 281.0 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 8.8 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
0	X	TOPSOIL FILL: Loose to Dense Brown to Maroon Silty Fine to Coarse SAND (SM), Moist to Dry		X							6	
5	X	PARTIALLY WEATHERED ROCK Sampled a Pink-Gray Fine to Coarse SAND (SM) With Trace Silt, Dry		X	276.0							40
10	X	PARTIALLY WEATHERED ROCK Sampled as Pink-Gray and Yellow-Brown Silty Fine to Coarse SAND (SM), Dry to Moist Boring terminated at 8.8 feet below existing ground surface. Borehole caved at 8 feet below existing ground surface and at 7.9 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.	HC	X	271.0							50/4"
15					266.0							50/2"
20					261.0							
25					256.0							
30					251.0							

S&ME COMPANY STANDARD 51-265.GPJ S&ME-GDT 10/11/07

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 2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



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DATE DRILLED: 10/3/07	ELEVATION: 291.5 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 8.9 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value		
						10	20	30	60	80			
0 - 5		TOPSOIL FILL: Stiff Red-Brown Silty CLAY (CH) With Trace Fine Sand and Roots, Dry to Moist PARTIALLY WEATHERED ROCK Sampled as Pink-Gray to Pink-Brown Silty Fine to Coarse SAND (SM) With Trace Rock Fragments, Dry		X	286.5	10	22	50/3"	50/4"	10	22	50/3"	50/4"
5 - 8.9		Boring terminated at 8.9 feet below existing ground surface. Borehole caved at 7.9 feet below existing ground surface and at 7 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.	HC	X	281.5								
10					276.5								
15					271.5								
20					266.5								
25					261.5								
30													

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

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 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
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DATE DRILLED: 10/8/07	ELEVATION: 307.0 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 10.0 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
	TOPSOIL											
	FILL: Medium Dense Tan-Red Clayey Silty Fine SAND (SM) With Root Hairs, Dry			X								13
	FILL: Stiff Red Fine Sandy CLAY (CL-CH) With Root Hairs, Moist			X								11
5		PARTIALLY WEATHERED ROCK Sampled as Red-Orange Clayey Silty Fine SAND (SM), Dry	HC	X	302.0							50/6"
		PARTIALLY WEATHERED ROCK Sampled as Red and Gray Clayey Fine Sandy SILT (ML), Dry		X								50/6"
10		Boring terminated at 10 feet below existing ground surface. Borehole caved at 5.8 feet below existing ground surface and at 5.4 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.			297.0							
15					292.0							
20					287.0							
25					282.0							
30					277.0							

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/12/07

- NOTES:**
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 2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
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DATE DRILLED: 10/3/07	ELEVATION: 317.0 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 10.0 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
	TOPSOIL											
	X	FILL: Loose Red-Brown Silty Fine to Coarse SAND (SM) With Trace Silt and Root Hairs, Dry		X								5
5	X	FILL: Stiff Red-Brown and Tan CLAY (CH) With Trace Silt and Fine Sand and Roots, Moist		X	312.0							8
	X	FILL: Stiff Red Clayey SILT (ML-MH), Moist	HC	X								11
10	X	RESIDUAL: Medium Dense Tan Fine to Coarse SAND (SW) With Trace Silt, Moist		X	307.0							14
		Boring terminated at 10 feet below existing ground surface. Borehole caved at 8 feet below existing ground surface and at 7.8 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.										
15					302.0							
20					297.0							
25					292.0							
30					287.0							

S&ME COMPANY STANDARD 51-265.CPJ S&ME.GDT 10/11/07

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 2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



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DATE DRILLED: 10/3/07	ELEVATION: 341.5 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 8.9 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
	TOPSOIL			X								
	FILL: Loose Red Silty Fine SAND (SM) With Trace Clay, Gravel and Root Hairs, Dry			X								
5	PARTIALLY WEATHERED ROCK	Sampled as Red Silty Fine to Coarse SAND (SM) With Trace Rock Fragments, Dry		X	336.5							7
	PARTIALLY WEATHERED ROCK	Sampled as Pink-Gray Silty Fine to Coarse SAND (SM), Dry		X								50/6"
	PARTIALLY WEATHERED ROCK	Sampled as Red Silty Fine to Coarse SAND (SM), Dry	HC	X								50/5"
10		Boring terminated at 8.9 feet below existing ground surface. Borehole caved at 8.6 feet below existing ground surface. Borehole was observed dry at termination of boring.		X	331.5							50/4"
15					326.5							
20					321.5							
25					316.5							
30					311.5							

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

- NOTES:**
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 2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



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DATE DRILLED: 10/3/07	ELEVATION: 341.0 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 8.9 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
		TOPSOIL										
		PARTIALLY WEATHERED ROCK Sampled as Red-Brown Silty Clayey Fine to Coarse SAND (SC), Moist		☒								● 50/2"
5		PARTIALLY WEATHERED ROCK Sampled as Brown-Red to Pink Gray Silty Fine SAND (SM) With Trace Rock Pieces, Dry		☒	336.0							● 50/5"
												● 50/1"
10		Boring terminated at 8.9 feet below existing ground surface. Borehole caved at 8.6 feet below existing ground surface and 7.3 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.		☒	331.0							● 50/3"
		*Bulk Sample Obtained Between 0 - 6 Feet.										
15					326.0							
20					321.0							
25					316.0							
30					311.0							

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

NOTES:

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2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
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DATE DRILLED: 10/8/07	ELEVATION: 324.0 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 3.0 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
		TOPSOIL PARTIALLY WEATHERED ROCK Sampled as Brown-Red Clayey Silty Fine SAND (SM), Dry	HC	☒								
5		Auger refusal occurred in borehole at a depth of 3 feet below existing ground surface. Borehole caved at 2.5 feet below existing ground surface. Borehole was observed dry at termination of boring.			319.0							● 50/3" ● 50/0"
10					314.0							
15					309.0							
20					304.0							
25					299.0							
30					294.0							

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

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3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



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DATE DRILLED: 10/3/07	ELEVATION: 313.0 ft
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 10.0 ft
LOGGED BY: L. Raup	WATER LEVEL: 7.9' @ TOB, 5' After 24 Hrs
DRILLER: R. Norwood	DRILL RIG: CME-550x

NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
0	TOPSOIL											
5	FILL	Stiff to Very Stiff Red-Brown to Gray and Orange Silty Clayey Fine SAND (SC) With Trace Root Hairs and Gravel, Dry to Moist	▼	X	308.0	10	20	30	60	80	9	
5	FILL	Very Stiff Red-Brown and Gray Fine Sandy CLAY (CL), Moist	▼	X	308.0	10	20	30	60	80	13	
10	RESIDUAL	Hard Red-Brown Fine Sandy SILT (ML), Dry	▼	X	303.0	10	20	30	60	80	13	
10	Boring terminated at 10 feet below existing ground surface. Borehole caved at 8 feet below existing ground surface. Groundwater was observed in borehole at a depth of 7.9 feet below existing ground surface and at 5 feet after 24 hours.											39
15					298.0							
20					293.0							
25					288.0							
30					283.0							

S&ME COMPANY STANDARD 51-265.GPJ S&ME GDT 10/1/07

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 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



DATE DRILLED: 10/3/07	ELEVATION: 300.0 ft	NOTES: Boring location is approximate.
DRILLING METHOD: 2-1/4" HSA	BORING DEPTH: 10.0 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: A. Martin	DRILL RIG: Diedrich D-50	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
	TOPSOIL											
	X	FILL: Medium Dense Red-Brown Silty Clayey Fine SAND (SC) With Trace Root Hairs, Dry		X								14
5	X	FILL: Firm Red-Brown Fine Sandy SILT (ML-MH) With Trace Clay and Gravel, Moist		X	295.0							6
	X	FILL: Stiff Red-Brown Silty CLAY (CL-CH), Moist		X								11
10	X	FILL: Medium Dense Red-Brown Silty Clayey Fine SAND (SC) With Trace Rock Pieces, Dry	HC	X	290.0							20
		Boring terminated at 10 feet below existing ground surface. Borehole caved at 8.8 feet below existing ground surface and at 6.5 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.										
15					285.0							
20					280.0							
25					275.0							
30					270.0							

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

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DATE DRILLED: 10/8/07	ELEVATION: 300.0 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 8.9 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NOTYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
0	X	TOPSOIL										
0 - 5	X	FILL: Stiff Red-Brown Clayey Fine Sandy SILT (MH) With Trace Gravel and Root Hairs, Dry		X								10
5	X	PARTIALLY WEATHERED ROCK Sampled as Brown-Red Clayey Silty Fine SAND (SM) With Rock Fragments, Dry	HC	X	295.0							50/3"
5 - 10	X	PARTIALLY WEATHERED ROCK Sampled as Brown-Red Silty Clayey Fine SAND (SC) With Rock Fragments, Dry		X								50/4"
10	X	Boring terminated at 8.9 feet below existing ground surface. Borehole caved at 6 feet below existing ground surface and at 5.9 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.		X	290.0							50/4"
15					285.0							
20					280.0							
25					275.0							
30					270.0							

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

- NOTES:**
1. THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.
 2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



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DATE DRILLED: 9/27/07	ELEVATION: 317.0 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 9.9 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NOTYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
		TOPSOIL										
		PARTIALLY WEATHERED ROCK Sampled as Brown-Red Fine Sandy Clayey SILT (ML), Dry		X								● 50/6"
5		PARTIALLY WEATHERED ROCK Sampled as Brown-Red Silty CLAY (CL), Dry		X	312.0							● 50/5"
			HC	X								● 50/4"
10		PARTIALLY WEATHERED ROCK Sampled as Gray-Red Silty Fine to Coarse SAND (SM) With Rock Fragments, Dry		X	307.0							● 50/3"
		Boring terminated at 9.9 feet below existing ground surface. Borehole caved at 6.6 feet below existing ground surface and at 5.7 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.										
15					302.0							
20					297.0							
25					292.0							
30					287.0							

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

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 2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



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DATE DRILLED: 9/27/07	ELEVATION: 335.0 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 10.0 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)	N-Value
	X	TOPSOIL					
	X	FILL: Stiff Red-Brown CLAY (CH) With Some Silty Sand and Roots, Moist		X		10	11
5	X	FILL: Stiff to Very Stiff Brown to Tan and Gold Fine Sandy CLAY (CL-CH) With Some Wood Pieces and Trace Silt, Moist		X	330.0	10	10
	X		HC	X		10	
10	X	Boring terminated at 10 feet below existing ground surface. Borehole caved at 7 feet below existing ground surface and at 6.2 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.		X	325.0	14	14
15					320.0		
20					315.0		
25					310.0		
30					305.0		

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

- NOTES:**
1. THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.
 2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



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DATE DRILLED: 9/27/07	ELEVATION: 337.0 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 9.4 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
0	TOPSOIL											
0 - 1	FILL	Dense Red-Brown Silty Fine SAND (SM) With Trace Gravel and Wood, Dry		X								50/4"
1 - 2	PARTIALLY WEATHERED ROCK	Sampled as Pink-Red Silty Fine SAND (SM) With Trace Clay and Rock Fragments, Dry		X								50/6"
2 - 9.4	PARTIALLY WEATHERED ROCK	Sampled as Red-Brown Silty CLAY (CL-MH) With Trace Fine Sand, Dry	HC	X	332.0							50/3"
9.4		Boring terminated at 9.4 feet below existing ground surface. Borehole caved at 6.2 feet below existing ground surface and at 5.8 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.		X	327.0							50/4"
15					322.0							
20					317.0							
25					312.0							
30					307.0							

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

- NOTES:**
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 2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.

DATE DRILLED: 9/20/07	ELEVATION: 325.0 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 10.0 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
	TOPSOIL											
	X	FILL: Medium Dense Red-Brown Silty Fine SAND (SM) With Trace Gravel, Dry		X								9
	X	FILL: Stiff Brown and Tan CLAY (CH) With Some Silty Sand and Root Hairs, Moist		X								9
5	X	FILL: Medium Dense Orange and Gray Clayey Fine SAND (SC), Dry	HC	X	320.0							14
	X	FILL: Very Stiff Orange and Gray Fine Sandy CLAY (CH) Trace Wood Pieces, Moist		X								15
10		Boring terminated at 10 feet below existing ground surface. Borehole caved at 6.6 feet below existing ground surface and at 6.3 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.		X	315.0							
15					310.0							
20					305.0							
25					300.0							
30					295.0							

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

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 2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
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DATE DRILLED: 9/20/07	ELEVATION: 323.0 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 10.0 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
0	TOPSOIL											
5	FILL: Medium Dense Reddish-Brown and Gray Silty Clayey Fine to Coarse SAND (SC) With Trace Roots and Wood Pieces, Dry to Moist			X	318.0	11						
10	RESIDUAL: Very Hard Reddish-Brown Fine to Coarse Sandy CLAY (CL), Dry		HC	X	313.0	42						
10	Boring terminated at 10 feet below existing ground surface. Borehole caved at 6.8 feet below existing ground surface and at 6 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.											
15					308.0							
20					303.0							
25					298.0							
30					293.0							

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

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 2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



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DATE DRILLED: 10/2/07	ELEVATION: 332.0 ft	NOTES: Boring location is approximate.
DRILLING METHOD: 2-1/4" HSA	BORING DEPTH: 9.0 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: A. Martin	DRILL RIG: Diedrich D-50	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
	TOPSOIL											
	FILL	FILL: Stiff Red Clayey SILT (MH) With Trace Fine Sand, Dry		X								13
	FILL	FILL: Very Stiff Red-Brown Silty CLAY (CL), Dry		X								20
5	FILL	FILL: Stiff Red Clayey Fine to Coarse Sandy SILT (MH), Moist		X	327.0							9
	PARTIALLY WEATHERED ROCK	PARTIALLY WEATHERED ROCK Sampled as Gray-Pink Fine Sandy SILT (ML), Dry Boring terminated at 9 feet below existing ground surface. Borehole caved at 7.9 feet below existing ground surface and at 5.9 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.	HC	X	322.0							50/5"
10					322.0							
15					317.0							
20					312.0							
25					307.0							
30					302.0							

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

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 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
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DATE DRILLED: 10/2/07	ELEVATION: 325.0 ft	NOTES: Boring location is approximate.
DRILLING METHOD: 2-1/4" HSA	BORING DEPTH: 10.0 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: A. Martin	DRILL RIG: Diedrich D-50	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
	X	FILL: TOPSOIL										
	X	FILL: Hard Red-Brown Fine Sandy SILT (MH) With Trace Clay and Root Hairs, Dry		X								38
5	X	FILL: Very Stiff to Firm Red-Brown Fine Sandy Clayey SILT (MH) With Trace Gravel and Root Hairs, Dry to Moist		X	320.0							24
	X		HC	X								15
10	X	Boring terminated at 10 feet below existing ground surface. Borehole caved at 7.5 feet below existing ground surface and at 5.4 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.		X	315.0							7
15					310.0							
20					305.0							
25					300.0							
30					295.0							

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

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3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



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DATE DRILLED: 10/2/07	ELEVATION: 325.0 ft	NOTES: Boring location is approximate.
DRILLING METHOD: 2-1/4" HSA	BORING DEPTH: 6.5 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: A. Martin	DRILL RIG: Diedrich D-50	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value
						10	20	30	60	80	
	TOPSOIL										
	FILL: Stiff Red-Brown Clayey SILT (MH), Moist			X							
5	PARTIALLY WEATHERED ROCK	Sampled as Gray-Red Clayey Silty Fine to Coarse SAND (SM), Dry		X	320.0						14
		Auger refusal occurred in borehole at a depth of 6.5 feet below existing ground surface. Borehole caved at 6 feet below existing ground surface and at 4.2 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.	HC								
10					315.0						
15					310.0						
20					305.0						
25					300.0						
30					295.0						

S&ME COMPANY STANDARD 51-265.GPJ S&ME_GDT 10/11/07

NOTES:

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3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



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DATE DRILLED: 10/2/07	ELEVATION: 306.5 ft	NOTES: Boring location is approximate.
DRILLING METHOD: 2-1/4" HSA	BORING DEPTH: 8.9 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB, 2.7' After 24 Hrs.	
DRILLER: A. Martin	DRILL RIG: Diedrich D-50	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
	TOPSOIL											
	FILL: Firm Red and Brown Fine Sandy Silty CLAY (CL-CH) With Trace Roots, Moist		▼	X								7
	FILL: Dense Red-Brown Silty Clayey Fine SAND (SC), Dry			X								33
5		PARTIALLY WEATHERED ROCK Sampled as Pink-Gray Silty Fine SAND (SM), Dry		X	301.5							50/3"
		PARTIALLY WEATHERED ROCK Sampled as Orange-Red Clayey Fine SAND (SC), Dry	HC	X								50/4"
10		Boring terminated at 8.9 feet below existing ground surface. Borehole caved at 8.3 feet below existing ground surface. Borehole was observed dry at termination of boring. Groundwater was observed in borehole at a depth of 2.7 feet after 24 hours.			296.5							
15					291.5							
20					286.5							
25					281.5							
30					276.5							

S&ME COMPANY STANDARD 51-285.GPJ S&ME.GDT 10/11/07

- NOTES:**
1. THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.
 2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



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DATE DRILLED: 10/2/07	ELEVATION: 308.5 ft	NOTES: Boring location is approximate.
DRILLING METHOD: 2-1/4" HSA	BORING DEPTH: 10.0 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: A. Martin	DRILL RIG: Diedrich D-50	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
	TOPSOIL											
	X	FILL: Dense Red Silty Clayey Fine SAND (SC) With Root Hairs, Dry		X								32
5	X	FILL: Firm to Very Stiff Brown-Red Fine Sandy CLAY (CL) With Trace Gravel and Root Hairs, Moist		X	303.5							10
	X		HC	X								8
10	X	Boring terminated at 10 feet below existing ground surface. Borehole caved at 8 feet below existing ground surface and at 6.9 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.		X	298.5							16
15					293.5							
20					288.5							
25					283.5							
30					278.5							

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

- NOTES:**
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 2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



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DATE DRILLED: 10/2/07	ELEVATION: 322.0 ft	NOTES: Boring location is approximate.
DRILLING METHOD: 2-1/4" HSA	BORING DEPTH: 5.5 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB	
DRILLER: A. Martin	DRILL RIG: Diedrich D-50	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value
						10	20	30	60	80	
0	TOPSOIL	RESIDUAL: Very Stiff Red and Brown SILT (MH) With Trace Fine to Coarse Sand and Root Hairs, Moist		☒							● 50/1"
5	PARTIALLY WEATHERED ROCK	Sampled as Red and Brown SILT (ML) With Trace Fine to Coarse Sand, Moist	HC	☒	317.0						● 50/3"
5.5	PARTIALLY WEATHERED ROCK	Sampled as Brown-Pink Silty Fine SAND (SM), Dry									● 50/0"
5.5	Auger refusal occurred in borehole at a depth of 5.5 feet below existing ground surface. Borehole caved at 3.2 feet below existing ground surface. Borehole was observed dry at termination of boring.										
10					312.0						
15					307.0						
20					302.0						
25					297.0						
30					292.0						

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

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 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.

DATE DRILLED: 10/2/07	ELEVATION: 307.0 ft	NOTES: Boring location is approximate.
DRILLING METHOD: 2-1/4" HSA	BORING DEPTH: 8.7 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: A. Martin	DRILL RIG: Diedrich D-50	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value
						10	20	30	60	80	
	[Hatched Box]	TOPSOIL		[X]							
		RESIDUAL: Hard Red Fine Sandy Silty CLAY (CL), Dry		[X]							33
		Very Hard Red SILT (ML), Moist		[X]							60
5	[Wavy Box]	PARTIALLY WEATHERED ROCK Sampled as Red SILT (ML), Dry		[X]	302.0						50/4"
		Boring terminated at 8.7 feet below existing ground surface. Borehole caved at 8.1 feet below existing ground surface and at 6.3 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.	HC	[X]							50/2"
10			297.0								
15			292.0								
20			287.0								
25		282.0									
30		277.0									

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/1/07

NOTES:

1. THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.
2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



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DATE DRILLED: 10/2/07	ELEVATION: 295.0 ft	NOTES: Boring location is approximate.
DRILLING METHOD: 2-1/4" HSA	BORING DEPTH: 9.0 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: A. Martin	DRILL RIG: Diedrich D-50	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
0	TOPSOIL											
0-1	FILL	Medium Dense Orange and Tan Silty Fine SAND (SM) With Trace Root Hairs, Dry		X								19
1-2	FILL	Very Stiff Tan and Red Fine Sandy CLAY (CH) With Trace Silt and Root Hairs, Moist		X								15
2-3	PARTIALLY WEATHERED ROCK	Sampled as Maroon Clayey Fine Sandy SILT (ML), Dry		X	290.0							50/4"
3-4	PARTIALLY WEATHERED ROCK	Sampled as Red-Brown Clayey SILT (ML), Dry	HC	X								50/5"
4-9		Boring terminated at 9 feet below existing ground surface. Borehole caved at 7.3 feet below existing ground surface and at 5.6 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.		X	285.0							
15					280.0							
20					275.0							
25					270.0							
30					265.0							

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/1/07

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 2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.

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DATE DRILLED: 9/27/07	ELEVATION: 309.0 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 9.0 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value
						10	20	30	60	80	
	TOPSOIL			☒							● 50/6"
5	PARTIALLY WEATHERED ROCK	Sampled as Orange-Red to Brown-Red Silty Fine to Coarse SAND (SM), Dry		☒	304.0						● 50/5"
	PARTIALLY WEATHERED ROCK	Sampled as Brown-Red Silty Fine SAND (SM), Dry	HC	☒							● 50/3"
10		Boring terminated at 9 feet below existing ground surface. Borehole caved at 8 feet below existing ground surface and at 7.9 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.		☒	299.0						● 50/6"
15					294.0						
20					289.0						
25					284.0						
30					279.0						

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

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 2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



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DATE DRILLED: 9/28/07	ELEVATION: 303.5 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 10.0 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
	TOPSOIL											
	[Symbol]	FILL: Medium Dense Brown and Red Silty Fine to Coarse SAND (SM) With Trace Wood Pieces, Dry		[Symbol]								15
	[Symbol]	FILL: Stiff Tan and Brown Silty Fine Sandy CLAY (CL) With Some Wood Pieces, Moist		[Symbol]								10
5	[Symbol]	FILL: Medium Dense Brown Silty Fine SAND (SM) With Trace Wood Pieces, Dry		[Symbol]	298.5							13
10	[Symbol]	Boring terminated at 10 feet below existing ground surface. Borehole caved at 8 feet below existing ground surface and at 8.5 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.	HC	[Symbol]	293.5							12
15					288.5							
20					283.5							
25					278.5							
30					273.5							

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

NOTES:

1. THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.
2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



DATE DRILLED: 9/28/07	ELEVATION: 286.0 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 3.6 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
	TOPSOIL			☒								
	PARTIALLY WEATHERED ROCK	Sampled as Red-Brown to Pink-Gray Silty Fine to Coarse SAND (SM) With Rock Fragments, Dry	HC									● 50/6"
5		Auger refusal occurred in borehole at a depth of 3.6 feet below existing ground surface. Borehole caved at 2.9 feet below existing ground surface. Borehole was observed dry at termination of boring.			281.0							● 50/0"
10					276.0							
15					271.0							
20					266.0							
25					261.0							
30					256.0							

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

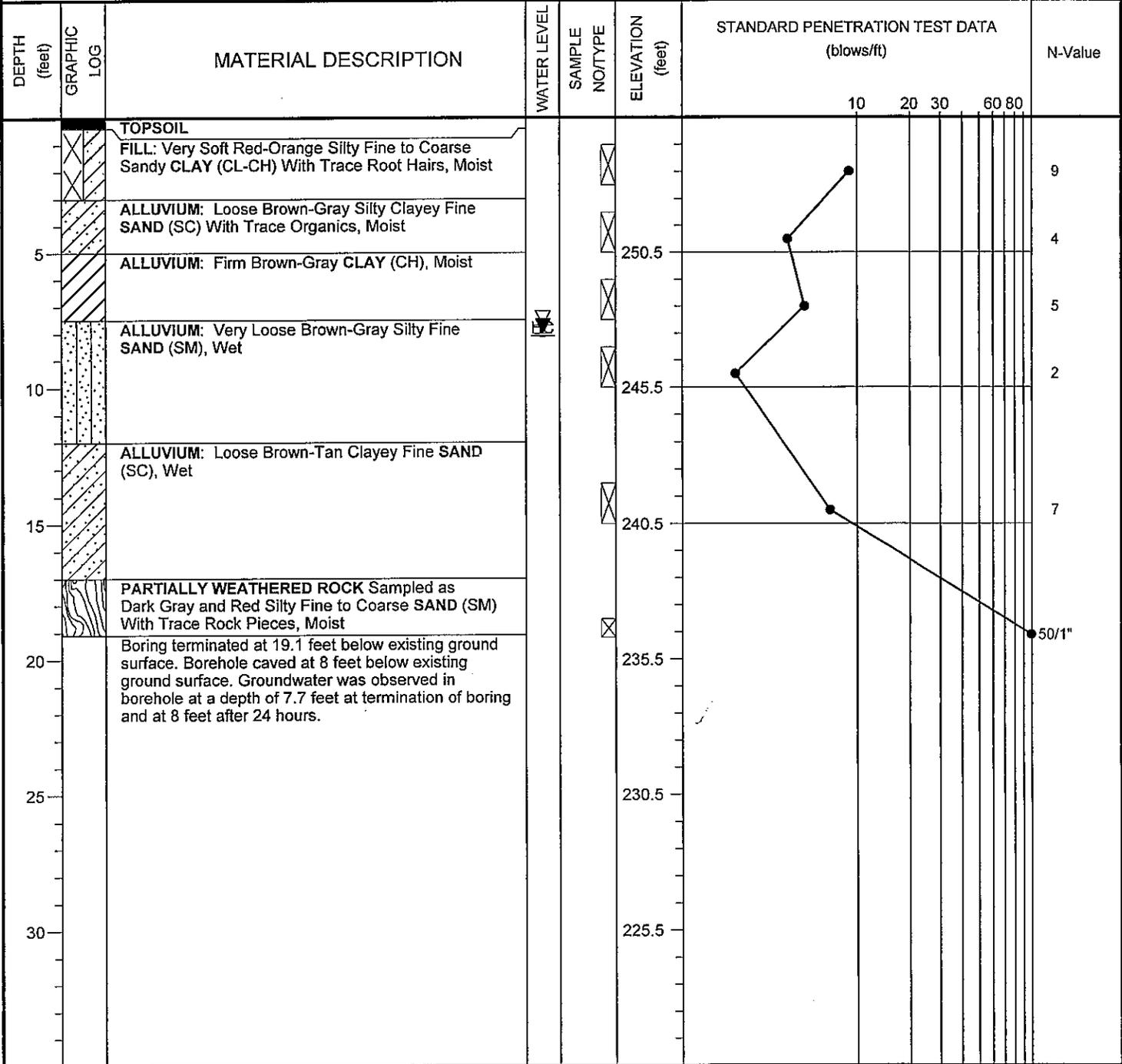
- NOTES:**
1. THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.
 2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
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DATE DRILLED: 10/8/07	ELEVATION: 255.5 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 19.1 ft	
LOGGED BY: L. Raup	WATER LEVEL: 7.7' @ TOB, 8' After 24 Hrs	
DRILLER: R. Norwood	DRILL RIG: CME-550x	



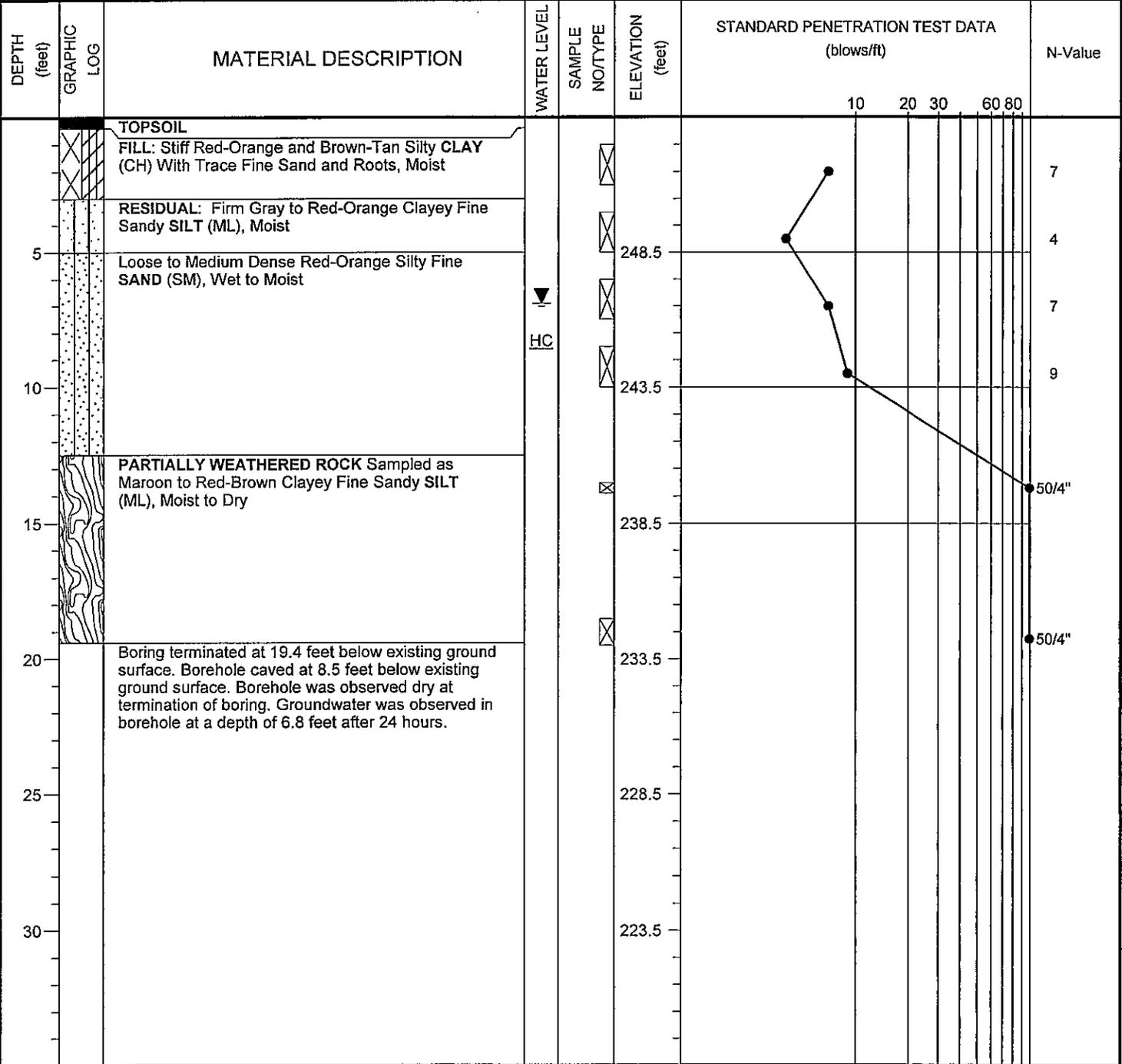
S&ME COMPANY STANDARD 51-265.GPJ S&ME GDT 10/11/07

NOTES:

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4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.

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DATE DRILLED: 10/8/07	ELEVATION: 253.5 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 19.4 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB, 6.8' After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	



S&ME COMPANY STANDARD 51-265.GPJ S&ME-GDT 10/1/07

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 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.

DATE DRILLED: 9/28/07	ELEVATION: 266.0 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 5.6 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value
						10	20	30	60	80	
5		RESIDUAL: Medium Dense Red Silty Clayey Fine SAND (SC), Dry PARTIALLY WEATHERED ROCK Sampled as Red-Brown to Pink-Gray Silty Clayey Fine SAND (SC), Dry	HC	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	261.0						26
		Auger refusal occurred in borehole at a depth of 5.6 feet below existing ground surface. Borehole caved at 4.8 feet below existing ground surface. Borehole was observed dry at termination of boring.									50/6"
10					256.0						50/0"
15					251.0						
20					246.0						
25					241.0						
30					236.0						

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

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 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



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DATE DRILLED: 9/28/07	ELEVATION: 273.0 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 10.0 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
		TOPSOIL										
		FILL: Medium Dense Orange-Yellow Silty Fine SAND (SM) With Trace Clay, Dry		X								13
5		FILL: Medium Dense Orange and Gray Clayey Fine to Coarse SAND (SC) Trace Root Hairs and Gravel, Moist to Dry		X	268.0							16
			HC	X								20
10		RESIDUAL: Very Dense Gray-Brown Silty Fine to Coarse SAND (SM), Dry		X	263.0							67
		Boring terminated at 10 feet below existing ground surface. Borehole caved at 7.6 feet below existing ground surface and at 7.9 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.										
15					258.0							
20					253.0							
25					248.0							
30					243.0							

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

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4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



DATE DRILLED: 9/28/07	ELEVATION: 277.0 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 10.0 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
0	TOPSOIL	RESIDUAL: Very Stiff Orange and Tan Fine Sandy CLAY (CL), Dry										
5	Dense to Medium Dense Tan With Orange Silty Fine SAND (SM) With Trace Clay, Dry to Moist				272.0							16
10	Very Hard Reddish-Brown Clayey SILT (ML) With Trace Fine Sand, Dry		HC		267.0							23
10	Boring terminated at 10 feet below existing ground surface. Borehole caved at 8.6 feet below existing ground surface and at 8.3 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.				267.0							41
15					262.0							
20					257.0							
25					252.0							
30					247.0							

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

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DATE DRILLED: 9/28/07	ELEVATION: 272.0 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 10.0 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value
						10	20	30	60	80	
0	TOPSOIL										
0 - 1	RESIDUAL: Medium Dense Orange and Gray-Black Clayey Fine SAND (SC) With Trace Silt, Moist			X							15
1 - 5	Very Stiff Tan-Orange and Gray Fine Sandy CLAY (CH), Moist			X	267.0						14
5 - 8	Medium Dense Tan-Gray Clayey Fine SAND (SC), Moist			X							14
8 - 10	Hard Red-Brown and Gray Fine Sandy Silty CLAY (CL), Moist		HC	X	262.0						41
10 - 30	Boring terminated at 10 feet below existing ground surface. Borehole caved at 8 feet below existing ground surface and at 8.2 after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.										
15					257.0						
20					252.0						
25					247.0						
30					242.0						

S&ME COMPANY STANDARD 51-265.GPJ S&ME-GDT 10/11/07

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 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



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DATE DRILLED: 10/1/07	ELEVATION: 275.0 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 10.0 ft	
LOGGED BY: B. Keaney	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value
						10	20	30	60	80	
0 - 10	X X X X X X X X X X	TOPSOIL/GRAVEL FILL: Stiff Red-Brown Fine Sandy SILT (ML), Moist	HC	X							9
5				X	270.0						
10	X X X X X X X X X X	FILL: Stiff Brown-Tan Fine Sandy CLAY (CL), Moist Boring terminated at 10 feet below existing ground surface. Borehole caved at 8.2 feet below existing ground surface and at 8 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.		X							9
10 - 10.2	X X X X X X X X X X			X	265.0						7
15					260.0						
20					255.0						
25					250.0						
30					245.0						

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/1/07

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 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.

DATE DRILLED: 10/1/07	ELEVATION: 286.0 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 9.5 ft	
LOGGED BY: B. Keaney	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
0	TOPSOIL/GRAVEL											
0 - 5	FILL: Soft to Firm Maroon Fine Sandy SILT (ML), Moist			X								4
5 - 8.2	RESIDUAL: Hard Maroon Fine Sandy CLAY (CL), Moist			X	281.0							3
8.2 - 9.5	PARTIALLY WEATHERED ROCK Sampled as Maroon Fine Sandy CLAY (CL), Moist		HC	X								50/4"
9.5	Boring terminated at 9.5 feet below existing ground surface. Borehole caved at 8.2 feet below existing ground surface and after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.			X	276.0							50/5"
10 - 15					271.0							
15 - 20					266.0							
20 - 25					261.0							
25 - 30					256.0							

S&ME COMPANY STANDARD 51-266.GPJ S&ME.GDT 10/1/07

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DATE DRILLED: 10/1/07	ELEVATION: 281.0 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 8.8 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value
						10	20	30	60	80	
0 - 5	TOPSOIL	FILL: Medium Dense Brown-Red Clayey Fine to Coarse SAND (SC) With Trace Silt, Rock Pieces and Root Hairs, Dry		X							23
5 - 8.8	PARTIALLY WEATHERED ROCK	Sampled as Reddish-Brown Fine Sandy SILT (ML) With Trace Clay and Rock Pieces, Dry	HC	X	276.0						9
8.8 - 8.8		Boring terminated at 8.8 feet below existing ground surface. Borehole caved at 8 feet below existing ground surface and at 7.9 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.		X	271.0						50/3"
10 - 10				M	271.0						50/2"
15					266.0						
20					261.0						
25					256.0						
30					251.0						

S&ME COMPANY STANDARD 51-265.GPJ S&ME-GDT 10/1/07

- NOTES:**
1. THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.
 2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



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DATE DRILLED: 10/1/07	ELEVATION: 299.5 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 8.0 ft	
LOGGED BY: L. Raup	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
	X	TOPSOIL										
	X	FILL: Medium Dense Red-Brown Silty Clayey Fine SAND With Gravel (SC-SM) With Trace Root Hairs, Dry		X								
5	X	PARTIALLY WEATHERED ROCK Sampled as Pink-Gray Silty Fine to Coarse SAND (SM) With Trace Rock Pieces, Dry		X	294.5						16	50/5"
10		Auger refusal occurred in borehole at a depth of 8 feet below existing ground surface. Borehole caved at 6.9 feet below existing ground surface and at 6.3 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.	HC		289.5							50/2"
15		*Bulk Sample Obtained Between 0 - 6 Feet.			284.5							50/0"
20					279.5							
25					274.5							
30					269.5							

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/1/07

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 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



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DATE DRILLED: 10/1/07	ELEVATION: 300.0 ft	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILLING METHOD: 3-1/4" HSA	BORING DEPTH: 8.9 ft	
LOGGED BY: B. Kearney	WATER LEVEL: Dry @ TOB & After 24 Hrs.	
DRILLER: R. Norwood	DRILL RIG: CME-550x	

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
	TOPSOIL											
	PARTIALLY WEATHERED ROCK	Sampled as Red-Brown Fine Sandy SILT (ML), Dry		X								50/6"
5	PARTIALLY WEATHERED ROCK	Sampled as Red-Gray Silty Fine SAND (SM), Dry		X	295.0							50/3"
				X								50/2"
10		Boring terminated at 8.9 feet below existing ground surface. Borehole caved at 8.6 feet below existing ground surface and at 7.6 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.	HC	X	290.0							50/3"
15					285.0							
20					280.0							
25					275.0							
30					270.0							

S&ME COMPANY STANDARD 51-265.GPJ S&ME-GDT 10/1/07

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 2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
 4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.

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PROJECT:		Jordan Lake WRRP Wake County, North Carolina 1051-06-265			TEST BORING RECORD		B-66					
DATE DRILLED:		10/1/07		ELEVATION:		289.5 ft		NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.				
DRILLING METHOD:		3-1/4" HSA		BORING DEPTH:		8.7 ft						
LOGGED BY:		B. Keaney		WATER LEVEL:		Dry @ TOB, 7.4' After 24 Hrs.						
DRILLER:		R. Norwood		DRILL RIG:		CME-550x						
DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
		TOPSOIL										
		RESIDUAL: Dense Red-Gray Silty Fine SAND (SM), Dry		⊗								50/4"
5		PARTIALLY WEATHERED ROCK Sampled as Red-Gray Silty Fine SAND (SM), Dry		⊗	284.5							50/6"
			▼ HC	⊗								50/3"
10		Boring terminated at 8.7 feet below existing ground surface. Borehole caved at 8.4 feet below existing ground surface. Groundwater was observed in borehole at a depth of 7.4 feet after 24 hours.			279.5							50/1"
15					274.5							
20					269.5							
25					264.5							
30					259.5							

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

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2. BORING, SAMPLING AND PENETRATION TEST DATA IS IN GENERAL ACCORDANCE WITH ASTM D-1586.
3. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
4. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
5. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



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PROJECT:			TEST BORING RECORD								
Jordan Lake WRRP Wake County, North Carolina 1051-06-265			B-67								
DATE DRILLED: 10/2/07		ELEVATION: 293.0 ft		NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.							
DRILLING METHOD: 3-1/4" HSA		BORING DEPTH: 6.0 ft									
LOGGED BY: L. Raup		WATER LEVEL: 6' @ TOB, 5' After 24 Hrs.									
DRILLER: R. Norwood		DRILL RIG: CME-550x									
DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value
						10	20	30	60	80	
		TOPSOIL FILL: Medium Dense Brown-Red Silty Fine SAND (SM) With Trace Clay, Moist		⊗							9
5		PARTIALLY WEATHERED ROCK Sampled as Brown-Red Silty Clayey Fine to Coarse SAND (SC), Moist Boring terminated at 6 feet below existing ground surface. Groundwater was observed in borehole at a depth of 6 feet at termination of boring and at 5 feet after 24 hours.	▼	⊗	288.0						50/2"
10		* Boring Terminated Due to Utility Line Conflict.			283.0						
15					278.0						
20					273.0						
25					268.0						
30					263.0						

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

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PROJECT:		Jordan Lake WRRP Wake County, North Carolina 1051-06-265			TEST BORING RECORD		B-68				
DATE DRILLED:		10/8/07		ELEVATION:		298.0 ft		NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.			
DRILLING METHOD:		3-1/4" HSA		BORING DEPTH:		10.0 ft					
LOGGED BY:		L. Raup		WATER LEVEL:		Dry @ TOB & After 24 Hrs.					
DRILLER:		R. Norwood		DRILL RIG:		CME-550x					
DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)				N-Value	
						10	20	30	60	80	
		TOPSOIL									
		FILL: Medium Dense to Loose Red-Brown Silty Fine to Coarse SAND (SM) With Trace Clay, Dry									12
5		FILL: Soft Red-Brown Fine Sandy CLAY (CH) With Trace Gravel and Roots, Moist	HC		293.0						5
		FILL: Very Loose Red-Brown Clayey Fine SAND (SC) With Trace Gravel and Roots, Moist									2
10		Boring terminated at 10 feet below existing ground surface. Borehole caved at 6 feet below existing ground surface and at 5.9 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.			288.0						2
15					283.0						
20					278.0						
25					273.0						
30					268.0						

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

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PROJECT:		Jordan Lake WRRP Wake County, North Carolina 1051-06-265			TEST BORING RECORD		B-69					
DATE DRILLED:		10/8/07		ELEVATION:		295.5 ft		NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.				
DRILLING METHOD:		3-1/4" HSA		BORING DEPTH:		8.9 ft						
LOGGED BY:		L. Raup		WATER LEVEL:		Dry @ TOB & After 24 Hrs.						
DRILLER:		R. Norwood		DRILL RIG:		CME-550x						
DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	SAMPLE NO/TYPE	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/ft)					N-Value	
						10	20	30	60	80		
		TOPSOIL										
		PARTIALLY WEATHERED ROCK Sampled as Red-Brown Silty Clayey Fine SAND (SC) With Rock Fragments, Moist		X								
		Very Dense Red-Brown and Pink Clayey Silty Fine to Coarse SAND (SM) With Trace Rock Pieces, Dry		X								
5		PARTIALLY WEATHERED ROCK Sampled as Red Silty Fine to Coarse SAND (SM) With Trace Rock Fragments, Dry	HC	X	290.5							50/3"
		Boring terminated at 8.9 feet below existing ground surface. Borehole caved at 5.7 feet below existing ground surface and at 5.3 feet after 24 hours. Borehole was observed dry at termination of boring and after 24 hours.		X	285.5							60
10												50/6"
15					280.5							50/4"
20					275.5							
25					270.5							
30					265.5							

S&ME COMPANY STANDARD 51-265.GPJ S&ME.GDT 10/11/07

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- PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.
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- WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



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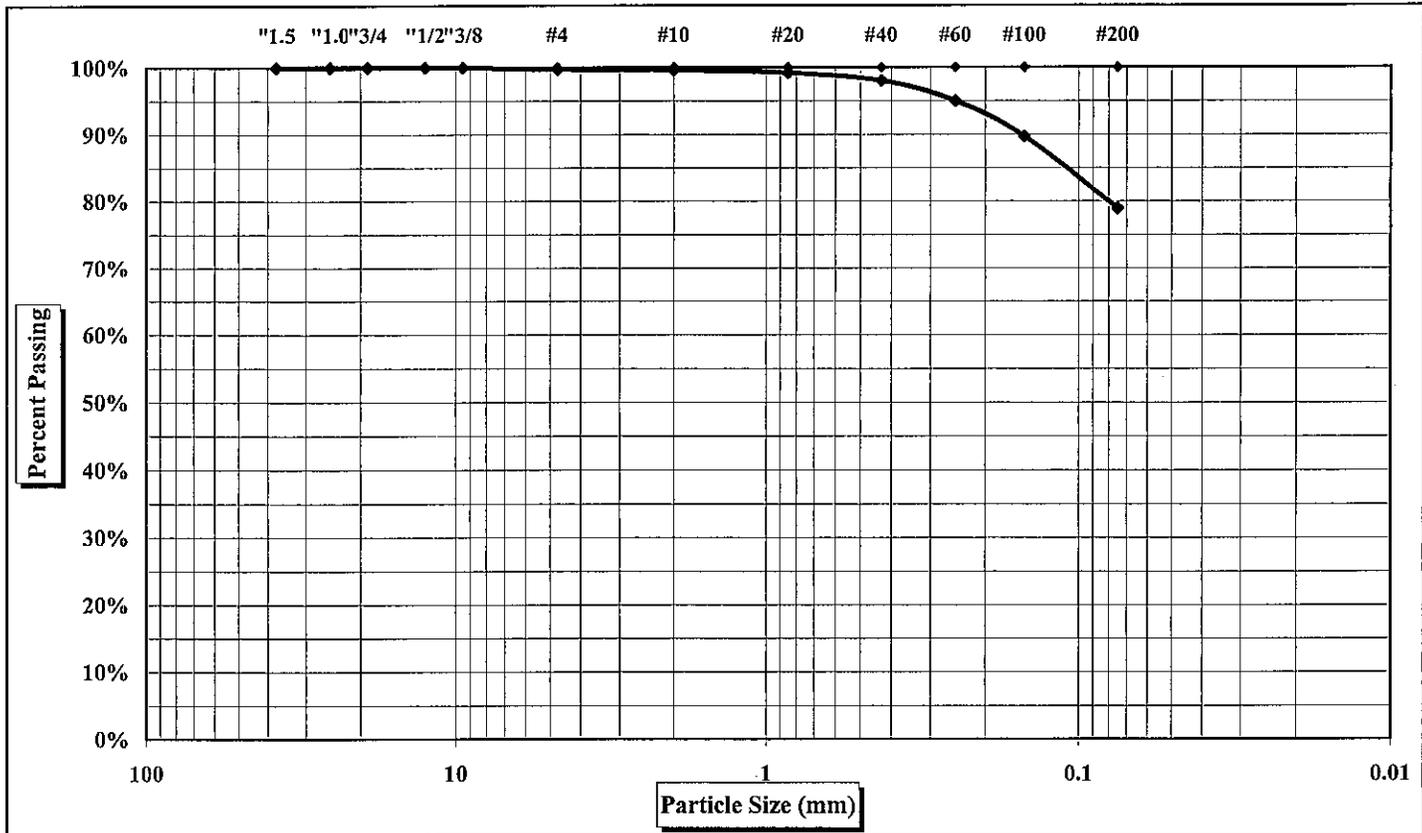
Particle Size Analysis of Soils

ASTM D 422

S&ME Project #: 1051-06-265
Project Name: Jordan Lake WRRP
Client Name: URS Corporation
Client Address:

Report Date: 10/11/07
Test Date(s): 10/8 - 10/11/07

Boring #:	B-6	Sample #:	Bulk
Location:	Site-Borehole	Sample Date:	10/1/07
Sample Description:	Tan Sandy Silty CLAY (CL)		
		Depth (ft):	0 - 6 ft.



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size	3/8"	Gravel	0%	Medium Sand	2%
Silt & Clay (% Passing #200)	78.9%	Coarse Sand	0%	Fine Sand	19%
Apparent Relative Density	2.714	Moisture Content	19.1%	Organic Content	ND
Liquid Limit	37	Plastic Limit	18	Plastic Index	19

ND=Not determined

Description of Sand & Gravel

Rounded
 Angular
 Hard & Durable
 Soft
 Weathered & Friable

References: ASTM D 422: Particle Size Analysis of Soils *Hydrometer portion of test method not utilized.*
 ASTM D 421: Dry Preparation of Soil Samples ASTM D 854: Specific Gravity of Soils
 ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils
 ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

Technical Responsibility: Mal Krajan _____ Laboratory Manager
Signature Position

S&ME, INC. 3201 Spring Forest Road, Raleigh, NC. 27616 B-6 Classification



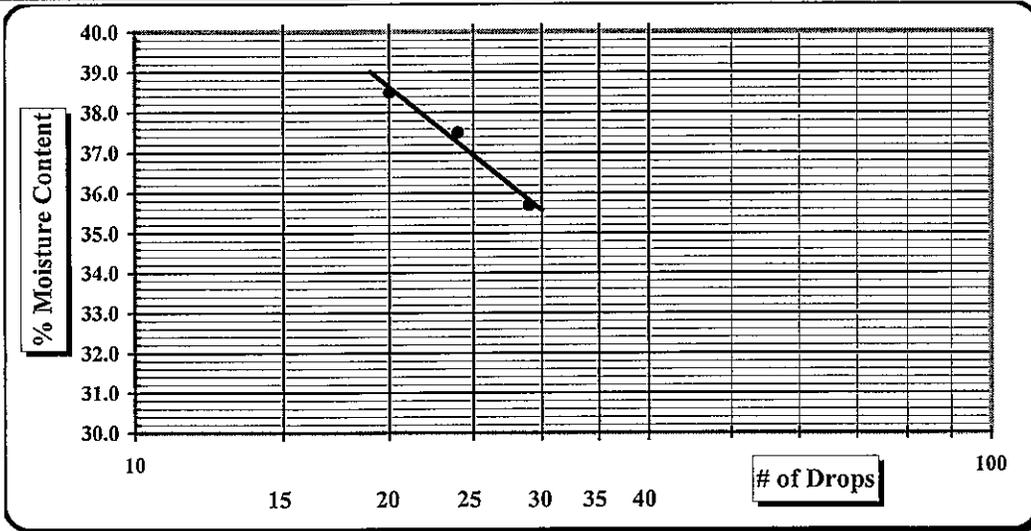
Liquid Limit, Plastic Limit, and Plastic Index

Project #: **1051-06-265**
 Project Name: **Jordan Lake WRRP**
 Client Name: **URS Corporation**
 Client Address:

Report Date: **10/11/07**
 Test Date(s): **10/8 - 10/11/07**

Boring #: **B-6** Sample #: **Bulk** Sample Date: **10/1/07**
 Location: **Site-Borehole** Offset: **NA** Depth (ft): **0 - 6 ft.**
 Sample Description: **Tan Sandy Silty CLAY (CL)**

Pan #	Test #	Liquid Limit					Plastic Limit			
		1	2	3	4	5	6	1	2	3
	Tare #	32	12	102				23	14	
A	Tare Weight	20.93	21.13	20.83				8.59	8.49	
B	Wet Soil Weight + A	33.41	33.93	34.90				18.16	18.45	
C	Dry Soil Weight + A	30.13	30.44	30.99				16.70	16.90	
D	Water Weight (B-C)	3.28	3.49	3.91				1.46	1.55	
E	Dry Soil Weight (C-A)	9.20	9.31	10.16				8.11	8.41	
F	% Moisture Content (D/E)*100	35.7%	37.5%	38.5%				18.0%	18.4%	
N	# OF DROPS	29	24	20				<i>Moisture Contents determined by ASTM D 2216</i>		
LL	LL = F * FACTOR									
Ave.	Average							18.2%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.990	29	1.018
24	0.995	30	1.022
25	1.000		

Notes: Estimate the % Retained on the #40 Sieve

Special Sampling Methods:			
Sample Preparation:	Wet Preparation <input type="checkbox"/>	Dry Preparation <input checked="" type="checkbox"/>	Air Dried <input checked="" type="checkbox"/>
Liquid limit Test:	Multipoint Method <input checked="" type="checkbox"/>	One-point Method <input type="checkbox"/>	NP, Non-Plastic <input type="checkbox"/>
Classification:	ASTM D 2487 <input checked="" type="checkbox"/>	AASHTO M 145 <input type="checkbox"/>	Liquid Limit <u>37</u>
Liquid limit Test:	ASTM D 4318 <input checked="" type="checkbox"/>	AASHTO T 89 <input type="checkbox"/>	Plastic Limit <u>18</u>
Plastic limit Test:	ASTM D 4318 <input checked="" type="checkbox"/>	AASHTO T 90 <input type="checkbox"/>	Plastic Index <u>19</u>
			Group Symbol <u>CL</u>

Technician Name: Johnathan Lewis Certification # _____
 Technical Responsibility: Mal Krajan Signature _____ Laboratory Manager
Position _____



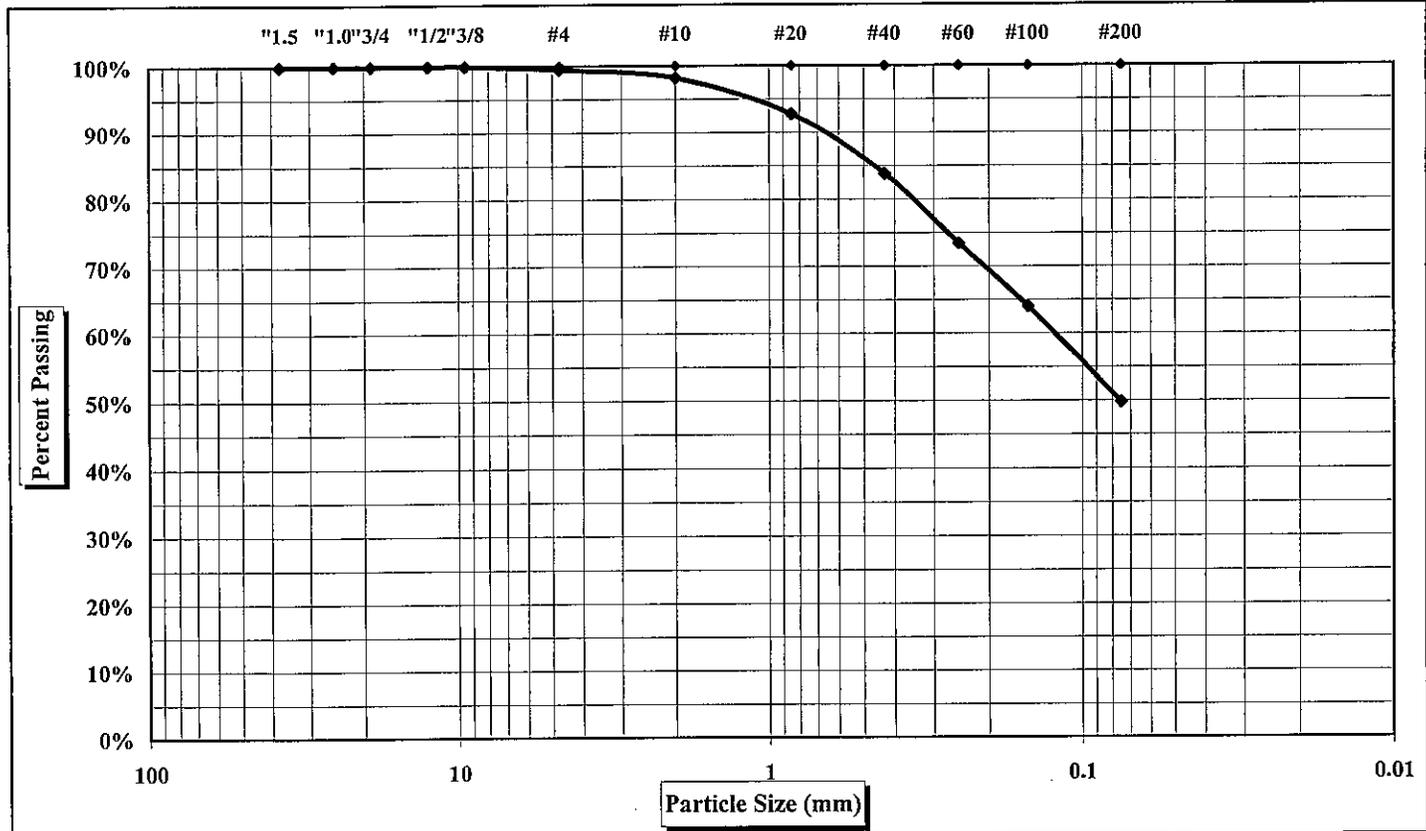
Particle Size Analysis of Soils

ASTM D 422

S&ME Project #: 1051-06-265
Project Name: Jordan Lake WRRP
Client Name: URS Corporation
Client Address:

Report Date: 10/11/07
Test Date(s): 10/8 - 10/11/07

Boring #:	B-33	Sample #:	Bulk	Sample Date:	10/1/07
Location:	Site-Borehole			Depth (ft):	0 - 6 ft.
Sample Description: Brown Silty Clayey SAND (SC)					



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size	3/8"	Gravel	1%	Medium Sand	14%
Silt & Clay (% Passing #200)	49.8%	Coarse Sand	1%	Fine Sand	34%
Apparent Relative Density	2.692	Moisture Content	4.6%	Organic Content	ND
Liquid Limit	26	Plastic Limit	19	Plastic Index	7

ND=Not determined

Description of Sand & Gravel

Rounded
 Angular
 Hard & Durable
 Soft
 Weathered & Friable

References: ASTM D 422: Particle Size Analysis of Soils *Hydrometer portion of test method not utilized.*
 ASTM D 421: Dry Preparation of Soil Samples ASTM D 854: Specific Gravity of Soils
 ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils
 ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

Technical Responsibility: Mal Krajan _____ Laboratory Manager
Signature Position

S&ME, INC. 3201 Spring Forest Road, Raleigh, NC. 27616 B-33 Classification



Liquid Limit, Plastic Limit, and Plastic Index

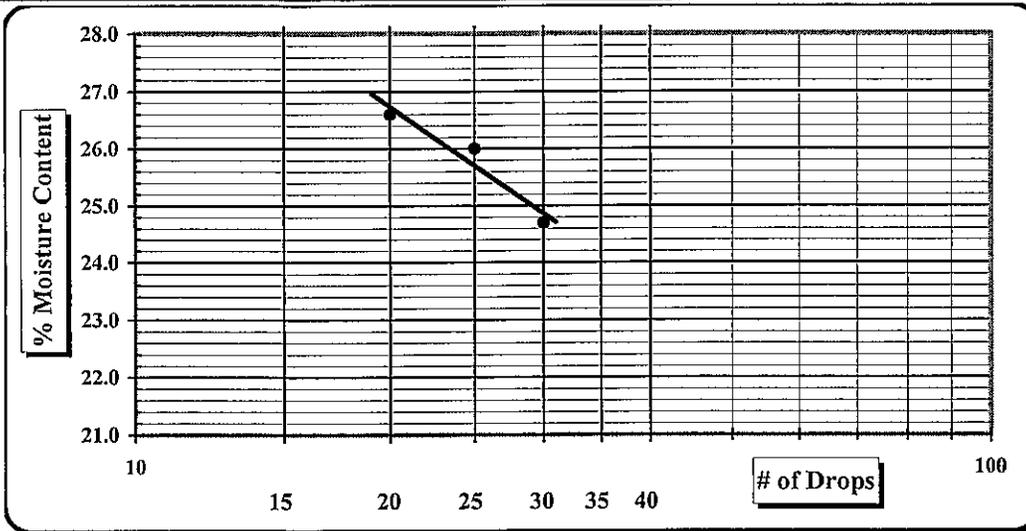
Project #: **1051-06-265**
 Project Name: **Jordan Lake WRRP**
 Client Name: **URS Corporation**
 Client Address:

Report Date: **10/11/07**
 Test Date(s): **10/8 - 10/11/07**

Boring #: **B-33** Sample #: **Bulk** Sample Date: **10/1/07**
 Location: **Site-Borehole** Offset: **NA** Depth (ft): **0 - 6 ft.**

Sample Description: **Brown Silty Clayey SAND (SC)**

Pan #	Test #	Liquid Limit						Plastic Limit		
		1	2	3	4	5	6	1	2	3
	Tare #	98	101	134				49	222	
A	Tare Weight	21.05	21.00	13.61				20.99	20.76	
B	Wet Soil Weight + A	34.18	33.02	27.99				31.74	31.70	
C	Dry Soil Weight + A	31.58	30.54	24.97				30.04	29.98	
D	Water Weight (B-C)	2.60	2.48	3.02				1.70	1.72	
E	Dry Soil Weight (C-A)	10.53	9.54	11.36				9.05	9.22	
F	% Moisture Content (D/E)*100	24.7%	26.0%	26.6%				18.8%	18.7%	
N	# OF DROPS	30	25	20				<i>Moisture Contents determined by ASTM D 2216</i>		
LL	LL = F * FACTOR									
Ave.	Average							18.8%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.990	29	1.018
24	0.995	30	1.022
25	1.000		

Notes: Estimate the % Retained on the #40 Sieve

Special Sampling Methods:

Sample Preparation:	Wet Preparation <input type="checkbox"/>	Dry Preparation <input checked="" type="checkbox"/>	Air Dried <input checked="" type="checkbox"/>	NP, Non-Plastic <input type="checkbox"/>
Liquid limit Test:	Multipoint Method <input checked="" type="checkbox"/>	One-point Method <input type="checkbox"/>		Liquid Limit <u>26</u>
Classification:	ASTM D 2487 <input checked="" type="checkbox"/>	AASHTO M 145 <input type="checkbox"/>		Plastic Limit <u>19</u>
Liquid limit Test:	ASTM D 4318 <input checked="" type="checkbox"/>	AASHTO T 89 <input type="checkbox"/>		Plastic Index <u>7</u>
Plastic limit Test:	ASTM D 4318 <input checked="" type="checkbox"/>	AASHTO T 90 <input type="checkbox"/>		Group Symbol <u>SC</u>

Technician Name: Johnathan Lewis

Certification #

Technical Responsibility: Mal Krajan

Signature

Laboratory Manager

Position



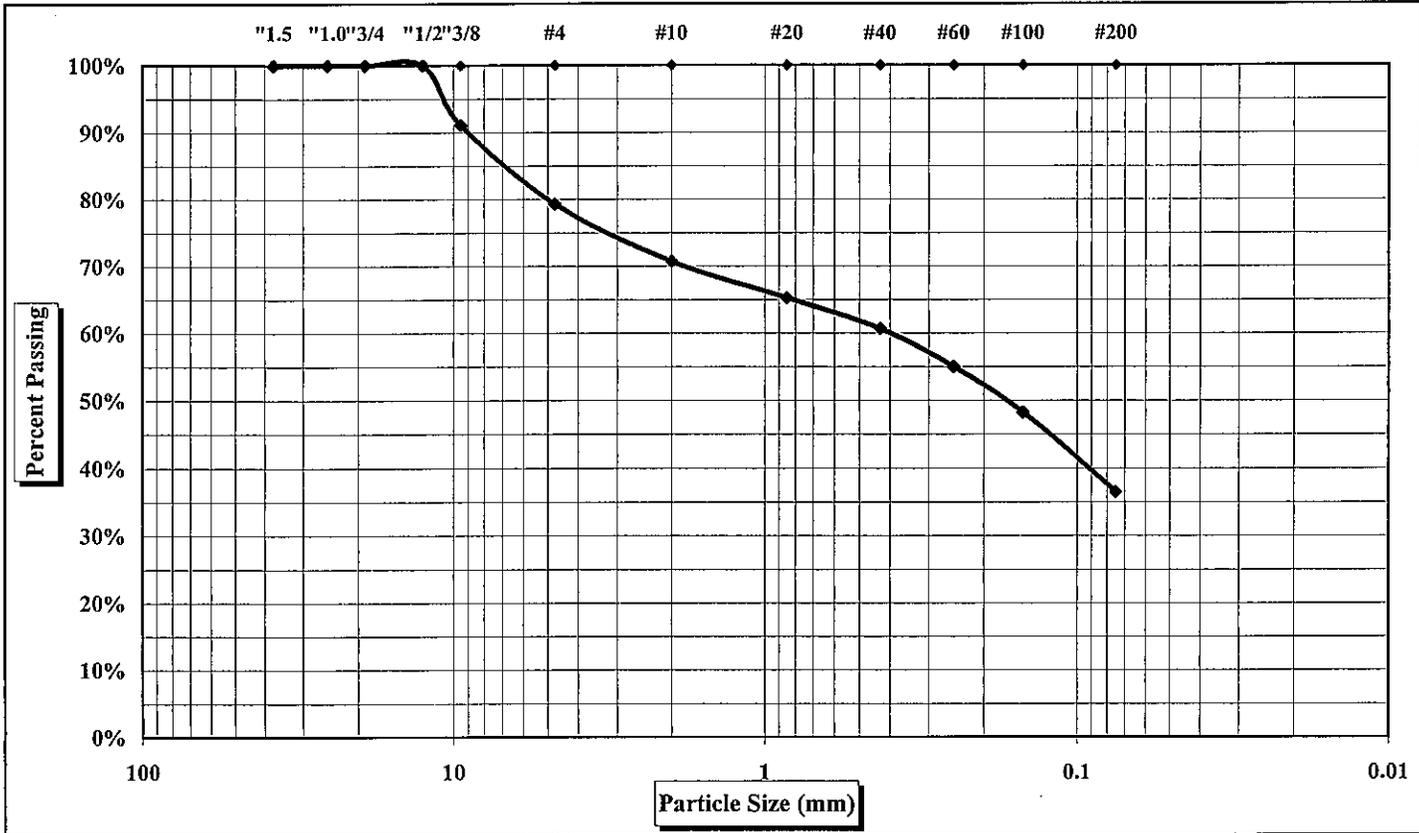
Particle Size Analysis of Soils

ASTM D 422

S&ME Project #: 1051-06-265
Project Name: Jordan Lake WRRP
Client Name: URS Corporation
Client Address:

Report Date: 10/11/07
Test Date(s): 10/8 - 10/11/07

Boring #: B-64	Sample #: Bulk	Sample Date: 10/1/07
Location: Site-Borehole	Depth (ft): 0 - 6 ft.	
Sample Description: Brown Silty Clayey SAND with Gravel (SC-SM)		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and > 2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size	1/2"	Gravel	21%	Medium Sand	10%
Silt & Clay (% Passing #200)	36.5%	Coarse Sand	9%	Fine Sand	24%
Apparent Relative Density	2.643	Moisture Content	4.0%	Organic Content	ND
Liquid Limit	25	Plastic Limit	20	Plastic Index	5

ND=Not determined

Description of Sand & Gravel

Rounded Angular Hard & Durable Soft Weathered & Friable

References: ASTM D 422: Particle Size Analysis of Soils *Hydrometer portion of test method not utilized.*
 ASTM D 421: Dry Preparation of Soil Samples
 ASTM D 854: Specific Gravity of Soils
 ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils
 ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

Technical Responsibility: Mal Krajan Laboratory Manager
Signature Position



Liquid Limit, Plastic Limit, and Plastic Index

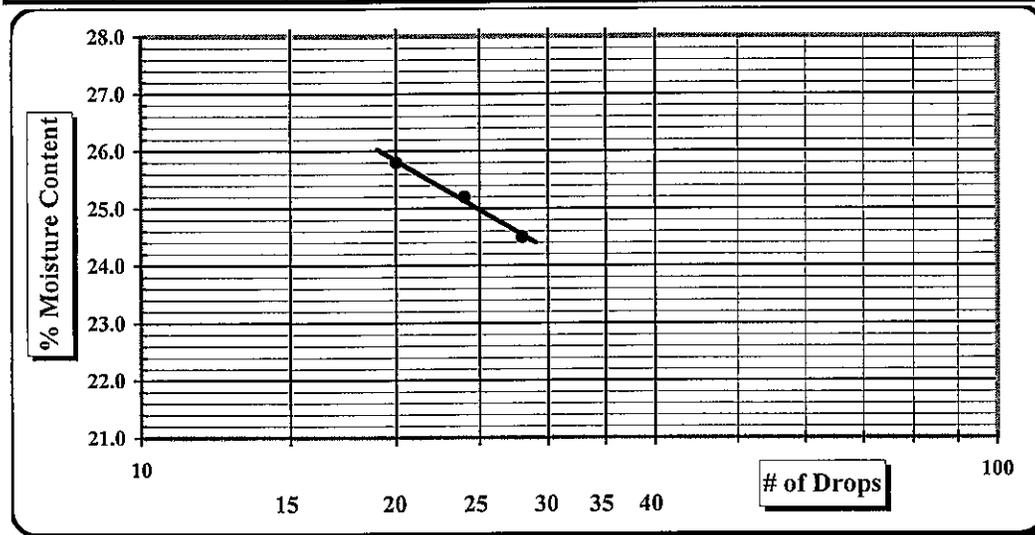
Project #: **1051-06-265**
 Project Name: **Jordan Lake WRRP**
 Client Name: **URS Corporation**
 Client Address:

Report Date: **10/11/07**
 Test Date(s): **10/8 - 10/11/07**

Boring #: **B-64** Sample #: **Bulk** Sample Date: **10/1/07**
 Location: **Site-Borehole** Offset: **NA** Depth (ft): **0 - 6 ft.**

Sample Description: **Brown Silty Clayey SAND with Gravel (SC-SM)**

Pan #	Test #	Liquid Limit						Plastic Limit		
		1	2	3	4	5	6	1	2	3
	Tare #	18	19	6				7	21	
A	Tare Weight	8.58	8.65	11.04				8.53	8.49	
B	Wet Soil Weight + A	22.69	25.79	28.90				14.89	19.10	
C	Dry Soil Weight + A	19.80	22.34	25.38				13.84	17.34	
D	Water Weight (B-C)	2.89	3.45	3.52				1.05	1.76	
E	Dry Soil Weight (C-A)	11.22	13.69	14.34				5.31	8.85	
F	% Moisture Content (D/E)*100	25.8%	25.2%	24.5%				19.8%	19.9%	
N	# OF DROPS	20	24	28				<i>Moisture Contents determined by ASTM D 2216</i>		
LL	LL = F * FACTOR									
Ave.	Average							19.9%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.990	29	1.018
24	0.995	30	1.022
25	1.000		

Notes: Estimate the % Retained on the #40 Sieve

Special Sampling Methods:

Sample Preparation:	Wet Preparation <input type="checkbox"/>	Dry Preparation <input checked="" type="checkbox"/>	Air Dried <input checked="" type="checkbox"/>	NP, Non-Plastic <input type="checkbox"/>
Liquid limit Test:	Multipoint Method <input checked="" type="checkbox"/>	One-point Method <input type="checkbox"/>		Liquid Limit <u>25</u>
Classification:	ASTM D 2487 <input checked="" type="checkbox"/>	AASHTO M 145 <input type="checkbox"/>		Plastic Limit <u>20</u>
Liquid limit Test:	ASTM D 4318 <input checked="" type="checkbox"/>	AASHTO T 89 <input type="checkbox"/>		Plastic Index <u>5</u>
Plastic limit Test:	ASTM D 4318 <input checked="" type="checkbox"/>	AASHTO T 90 <input type="checkbox"/>		Group Symbol <u>SC-SM</u>

Technician Name: Johnathan Lewis

Certification #

Technical Responsibility: Mal Krajan

Signature

Laboratory Manager

Position



pH of Soil

ASTM D4972

Project #: 1051-06-264	Report Date: 10/10/07
Project Name: Jordan Lake WRRP	Test Date(s) 10/8 - 10/10/07
Client Name: URS Corporation	
Client Address:	

Boring No. B-6	Sample No.	Bulk	Sample Date: Unknown
Location: Site Borehole	Offset:	N/A	Elevation: 0 - 6 ft.
Sample Description: Tan Sandy Silty CLAY (CL)			

Equipment:

Balance (GPI/GI): S&ME ID# 1024	pH Meter (Method A): S&ME ID# 1365
Sieve No. 10: S&ME ID# 1046	

pH Calibration

Buffer Solution	Results
pH buffer 7.00	7.01
pH buffer 4.01	4.01
pH buffer 10.00	10
Buffer Temperature °C	21.1

Measuring pH of Soil

Measurements	
Weight of Air Dry Soil (g)	20.02
Distilled Water (ml)	20
Temperature °C	21.7
pH Readings	5.61

Reference:
ASTM G51: pH of Soil for Use in Corrosion Testing

Remarks:

Technician Name: Mal Krajan

Certification #

Technical Responsibility: Mal Krajan

Signature

Laboratory Manager

Position



pH of Soil

ASTM D4972

Project #: 1051-06-264 **Report Date:** 10/10/07
Project Name: Jordan Lake WRRP **Test Date(s)** 10/8 - 10/10/07
Client Name: URS Corporation
Client Address:

Boring No. B-33 **Sample No.** Bulk **Sample Date:** 10/1/07
Location: Site Borehole **Offset:** N/A **Elevation:** 0 - 6 ft.
Sample Description: Brown Silty Clayey SAND (SC)

Equipment:

Balance (GPI/GI): S&ME ID# 1024 **pH Meter (Method A):** S&ME ID# 1365
Sieve No. 10: S&ME ID# 1046

pH Calibration

Buffer Solution	Results
pH buffer 7.00	7.01
pH buffer 4.01	4.01
pH buffer 10.00	10
Buffer Temperature °C	21.1

Measuring pH of Soil

Measurements	
Weight of Air Dry Soil (g)	20.02
Distilled Water (ml)	20
Temperature °C	22.6
pH Readings	5.17

Reference:
ASTM G51: pH of Soil for Use in Corrosion Testing

Remarks:

Technician Name: Mal Krajan

Certification #

Technical Responsibility: Mal Krajan

Signature

Laboratory Manager

Position



pH of Soil

ASTM D4972

Project #: 1051-06-264	Report Date: 10/10/07
Project Name: Jordan Lake WRRP	Test Date(s) 10/8 - 10/10/07
Client Name: URS Corporation	
Client Address:	

Boring No. B-64	Sample No.	Bulk	Sample Date:	Unknown
Location: Site Borehole	Offset:	N/A	Elevation:	0 - 6 ft.
Sample Description: Brown Silty Clayey SAND with Gravel (SC-SM)				

Equipment:

Balance (GPI/G1): S&ME ID# 1024	pH Meter (Method A): S&ME ID# 1365
Sieve No. 10: S&ME ID# 1046	

pH Calibration

Buffer Solution	Results
pH buffer 7.00	7.01
pH buffer 4.01	4.01
pH buffer 10.00	10
Buffer Temperature °C	21.1

Measuring pH of Soil

Measurements	
Weightt of Air Dry Soil (g)	20.01
Distilled Water (ml)	20
Temperature °C	22.2
pH Readings	5.63

Reference: ASTM G51: pH of Soil for Use in Corrosion Testing

Remarks:

Technician Name: Mal Krajan Certification #

Technical Responsibility: Mal Krajan _____
Signature Laboratory Manager
Position



Soil Resistivity

ASTM G-57

Project #: 1051-06-264	Report Date: 10/10/2007
Project Name: Jordan Lake WRRP	Test Date(s): 10/8 - 10/10/07
Client Name: URS Corporation	
Client Address:	

Boring No.: B-6	Sample No.:	Bulk:	Sample Date: 10/1/07
Location: Site Borehole	Offset:	N/A	Depth (ft): 0 - 6 ft.
Sample Description: Tan Sandy Silty CLAY (CL)			

Equipment:

Balance (GPI/GI): S&ME ID# 1024	Standard Box S&ME ID# 13240
Oven: S&ME ID# 1046	Amp-Meter S&ME ID# 13239

Moisture Content Determination

<i>As Received Condition</i>	13.0%
<i>After 24-hr Condition</i>	22.0%

Resistivity (ohms - cm)

<i>As Received Condition</i>	5200
<i>After 24-hr Condition</i>	3032

Remarks:

Technician Name: <u>Mal Krajan</u>	_____	
	<i>Certification #</i>	
Technical Responsibility: <u>Mal Krajan</u>	_____	<u>Laboratory Manager</u>
	<i>Signature</i>	<i>Position</i>



Soil Resistivity

ASTM G-57

Project #: 1051-06-264	Report Date: 10/10/2007
Project Name: Jordan Lake WRRP	Test Date(s) 10/8 - 10/10/07
Client Name: URS Corporation	
Client Address:	

Boring No. B-33	Sample No.	Bulk	Sample Date: 10/1/07
Location: Site Borehole	Offset:	N/A	Depth (ft): 0 - 6 ft.
Sample Description: Brown Silty Clayey SAND (SC)			

Equipment:

Balance (GPI/GI): S&ME ID# 1024	Standard Box S&ME ID# 13240
Oven: S&ME ID# 1046	Amp-Meter S&ME ID# 13239

Moisture Content Determination

<i>As Received Condition</i>	9.4%
<i>After 24-hr Condition</i>	19.1%

Resistivity (ohms - cm)

<i>As Received Condition</i>	8867
<i>After 24-hr Condition</i>	2827

Remarks:

Technician Name: Mal Krajan _____
Certification #

Technical Responsibility: Mal Krajan _____ Laboratory Manager
Signature Position



Soil Resistivity

ASTM G-57

Project #: 1051-06-264	Report Date: 10/10/2007
Project Name: Jordan Lake WRRP	Test Date(s): 10/8 - 10/10/07
Client Name: URS Corporation	
Client Address:	

Boring No.: B-64	Sample No.:	Bulk:	Sample Date: 10/1/07
Location: Site Borehole	Offset:	N/A	Depth (ft): 0 - 6 ft.
Sample Description: Brown Silty Clayey SAND with Gravel (SC-SM)			

Equipment:

Balance (GPI/G1): S&ME ID# 1024	Standard Box S&ME ID# 13240
Oven: S&ME ID# 1046	Amp-Meter S&ME ID# 13239

Moisture Content Determination

<i>As Received Condition</i>	5.6%
<i>After 24-hr Condition</i>	15.1%

Resistivity (ohms - cm)

<i>As Received Condition</i>	5100
<i>After 24-hr Condition</i>	2667

Remarks:

Technician Name: <u>Mal Krajan</u>	_____	
	<i>Certification #</i>	
Technical Responsibility: <u>Mal Krajan</u>	_____	<u>Laboratory Manager</u>
	<i>Signature</i>	<i>Position</i>

Appendix C - Phase II Geotechnical Report

**FINAL SUBSURFACE EXPLORATION REPORT
PROPOSED PHASE II OF JORDAN LAKE WATER
RECLAMATION AND REUSE PROJECT
WAKE COUNTY, NORTH CAROLINA**

S&ME PROJECT NO. 1051-06-265

Prepared For:
URS Corporation – North Carolina
Morrisville, North Carolina

Prepared By:
S&ME, Inc.
3201 Spring Forest Road
Raleigh, North Carolina 27616

March 20, 2008



March 20, 2008

URS Corporation – North Carolina
1600 Perimeter Park Drive, Suite 400
Morrisville, North Carolina 27560

Attention: Mr. Marco R. Menendez, P.E., PMP
Project Manager

Reference: **Final Subsurface Exploration Report**
Proposed Phase II of Jordan Lake Water
Reclamation and Reuse Project
Wake County, North Carolina
S&ME Project No. 1051-06-265

Dear Mr. Menendez:

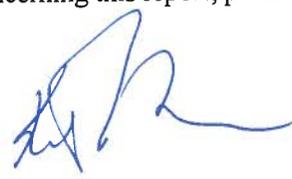
S&ME, Inc. is pleased to submit this report of the final subsurface exploration for the referenced project. Work was conducted in accordance with S&ME Proposal P111-06E (2nd Revision). The purpose of the exploration was to evaluate subsurface conditions as they relate to the presence of materials expected to require difficult excavation. This report presents a summary of pertinent project information, exploration sampling methods, logs and locations of borings, description of subsurface soils, and comments regarding potential excavation difficulty of encountered materials.

S&ME, Inc. appreciates the opportunity to provide geotechnical engineering services for this project. If you have any questions or need additional information concerning this report, please contact us.

Sincerely,
S&ME, Inc.


Brian D. Keaney, P.E.
Project Geotechnical Engineer
N.C. Registration No. 23916




Keith Brown, P.E.
Branch Manager
N.C. Registration No. 22540

Attachments

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APPENDICES

Figure 1A – 1E Boring Location Plan

Figure 2A – 2I Test Boring Profiles

 Little Drive

 Davis Drive

 Kit Creek at Alston Avenue

 Green Level to Durham Road

 Green Level Church Road

 Thomas Brooks Park

Summary of Depths to Partially Weathered Rock (PWR) and Auger Refusal

Legend to Soil Classification and Symbols

Test Boring Logs

Laboratory Test Results

1.0 PROJECT AND SITE DESCRIPTION

We understand the project consists of the design and construction of a distribution system of reclaimed water within southern Research Triangle Park (RTP), extending from the Durham/Wake County line to Thomas Brooks Park in Cary. The Wake County portion of the project, or Phase I as it is referred to in this report, is predominately RTP south, which is defined as that portion of Research Triangle Park within Wake County that remains unincorporated. Proposed Phase I pipeline routes within RTP south include Development Drive, Louis Stephens Drive, Kit Creek Road, and Davis Drive from Kit Creek Road northward to Delta. The section of Alston Avenue south of the Durham/Wake County line to Kit Creek Road has been included in Phase I of this project. The RTP Expansion Phase includes Louis Stephens Drive, south of Kit Creek Road, and Little Drive to Davis Drive. The subsurface exploration report for Phase I was submitted in our report dated October 18, 2007.

The Town of Cary's Phase II portion is Alston Avenue south of Kit Creek Road, then Green Level to Durham Road to the intersection with Green Level Church Road, and then onto Green Hope School road and into Thomas Brooks Park.

The length of the project is approximately 13 miles. The proposed main water line will be a 4 to 20 inch diameter ductile iron pipe and will extend parallel to existing roadways within roadway right-of-way limits. Proposed pipe invert depths will be about 5 to 6 feet below the existing ground surfaces. Bore and jacking methods are proposed beneath Kit Creek crossing located along Alston Avenue.

2.0 AREA GEOLOGY

The site is located within one of several trough shaped basins that are present within the Piedmont Physiographic Province. The basins were formed during the Triassic and early Jurassic periods as a result of faulting and regional subsidence. Over time, the basins were filled with sediment eroded from the adjacent igneous and metamorphic formations. Although the basins may be grouped into areas having distinguishable geologic characteristics, locally the area is simply referred to as the Triassic Basin. Sedimentary sandstone, siltstone, mudstone and conglomerates are the predominant rock types within the Triassic Basin. Igneous intrusions (dikes and sills) are present within the sedimentary rocks in many areas. Near the ground surface, Triassic rocks and igneous intrusions are often discontinuous with depth. The Triassic rocks can be present as relatively thin layers and the intrusions in the form of boulders. Typical soils within the Triassic Basin consist of silts, clays and clayey/silty sands. Near the surface the silts and clays are often moderately to highly plastic. Where present, residual soils formed by weathering of igneous intrusions can be of a softer/wetter consistency than surrounding Triassic sediments (silts and clays).

3.0 EXPLORATION PROGRAM

Field exploration for this project included a visual site reconnaissance by representatives of S&ME and performance of fifty-three soil test borings (B-70 through B-133) along shoulders of existing roadway for proposed waterline routes. Sixty-eight borings were proposed; however, fifteen borings were eliminated (B-102, B-103, B-107, B-110, B-116, B-117, B-120, B-123 B-124, B-129, B-130, and B-134 – B-137) due to utility conflicts. Borings were performed at approximately 500 foot intervals. Boring locations were selected by representatives of S&ME, Inc. and in coordination with URS. Preliminary alignment plans dated January 10, 2008, provided by URS Corporation were used. An S&ME representative established boring locations in the field by using Global Positioning Satellite (GPS) coordinates. Approximate final boring locations are shown on Figures 1A through 1E in the Appendix.

Borings were performed to depths ranging from about 3 to 28 feet below existing grades using a CME 550x drill rig mounted on an all-terrain carrier and a Diedrich D-50 track mounted rig. Split-spoon samples of subsurface soils were taken at approximate 2.5 foot intervals above a depth of 10 feet and at 5 foot intervals below 10 feet. Standard penetration tests were conducted in conjunction with split-spoon sampling in general accordance with ASTM D 1586-99. Five bulk samples of auger cuttings were collected in borings B-75, B-90, B-106, B-122 and B-127 between depths of 0 to 10 feet below the existing ground surface. Boreholes were observed for groundwater at completion of drilling.

For safety reasons, at the completion of drilling operations borings performed adjacent to existing roadways were backfilled up to the original ground surface with auger cuttings. Plastic borehole closure devices were placed near the tops of boreholes in an attempt to improve ground surface stability. Representative split-spoon and bulk soil samples were returned to our laboratory for quantitative testing and visual classification in accordance with Unified Soil Classification System (USCS) guidelines.

The CME 550x and D-50 drill rigs are equipped with a hydraulic automatic hammers. Standard penetration tests were performed with an autohammer and not with a traditional rope, cathead and safety hammer. Research has shown that the standard penetration resistance (N-value) determined by the autohammer is different than the N-value determined by the safety hammer method. Most correlations that are published in the technical literature are based on the N-value determined by the safety hammer method. This is commonly termed N_{60} as the rope and cathead with a safety hammer delivers about 60 percent of the theoretical energy delivered by a 140 pound hammer falling 30 inches. Several researches have proposed correction factors for the use of hammers other than the safety hammer. The correction is made by the following equation:

$$N_{60} = N_{\text{field}} * C_E$$

N_{field} is the value recorded in the field and N_{60} is the value to be used in correlation. C_E is the energy correction factor for the hammer used. A correction factor of 1.3 is typically used for the autohammer used during drilling.

The N-values reported on the profile and Test Boring Records are the actual, field derived blow counts (N_{field}). However, only corrected results should be used for analysis.

Representative soil samples obtained during the field exploration were tested in S&ME's laboratory to verify visual classifications of the soils and to evaluate the soils engineering index properties. Laboratory testing included:

- Natural Moisture Content (ASTM D 2216)
- Atterberg Limits (ASTM D 4318)
- Grain Size Analysis (ASTM D 422)
- Standard Proctor Compaction (ASTM D 698)
- pH of Soils (ASTM G51)
- Soil Resistivity (ASTM G57)

Results of the laboratory testing are presented in the Appendix.

Test Boring Records and the profiles of Generalized Subsurface Conditions (Figures 2A through 2I) are included in the Appendix of this report. Stratification lines shown on Test Boring Records and profiles are intended to represent approximate depths of changes in soil types. Naturally, transitional changes in soil types are often gradual and cannot be defined at particular depths. Ground surface elevations are not shown on these documents.

3.1 Limitations of Exploration Program

With any subsurface exploration program, limitations to the information gathered exist. Without being a complete list, the following limitations apply to information gathered during the exploration:

- Borings were performed at approximate 500-foot spacings. Conditions between borings including the elevation of rock are unknown.
- Soil test borings were performed at accessible locations along the proposed alignment within the road right-of-ways and at sufficient distances to avoid underground and overhead utilities. In several cases, the soil borings will not be in the actual pipeline location.
- Portions of the roadways which have been filled in the past may contain boulders, construction debris or rock pieces within the fill. Boulders, construction debris or rock pieces will create difficult excavations during construction.

4.0 SUBSURFACE CONDITIONS

A surficial layer of topsoil, ranging in thickness from about 1 inch to 12 inches, was encountered in several borings. A surficial layer of gravel was encountered in borings B-118 and B-121 with thicknesses ranging from approximately 6 inches to 2 feet. Beneath the surficial layers, borings encountered fill, alluvium, residual soils, and partially weathered rock. The majority of the borings extended through moderate to high consistency soils, partially weathered rock, and hard rock. A brief summary of these materials is discussed below.

Fill

Fill soils were encountered along many sections throughout the project. Fill was encountered to depths ranging from the existing ground surface to about 10 feet below existing grades. Fill soils consist of silts (ML, MH), clays (CL, CH), and sands (SM, SC). Standard Penetration Test (SPT) resistance values (N-values) in the fill soils range from 2 to 35 blows per foot (bpf). These values indicate that the existing fill have very soft to hard consistency and loose to dense relative density. Gravel pieces and some organics were encountered in portions of the fill. Rock pieces typically cause SPT values to increase when encountered. As such, the consistency and relative density correlation with SPT blow count in fill containing rock pieces is unconservative (values indicated material is harder). Moisture contents of the encountered fill were typically dry of optimum to wet.

Alluvium

Alluvium is water deposited soils found below and adjacent to streams or lakes. Alluvial soils were encountered below fill soils in test borings B-84 and B-85 located near the Kit Creek where it crosses beneath Alston Avenue. Alluvial soils were encountered at depths ranging from about 5 to 27.5 feet and mainly were classified as clayey silts and very loose to loose sands. Standard Penetration Test (SPT) resistance values (N-values) in the alluvial soils range from 3 to 8 blows per foot (bpf). These values indicate that the alluvium has a stiff consistency and a very loose to loose relative density. Moisture contents of the encountered alluvial soils were typically wet of optimum moisture.

Residuum

Most of the borings extended through residual soils common to the Triassic Basin. Residual soils were encountered to depths ranging from about 0.1 to 18 feet below existing grades. Residual soils consist of sandy and silty clays (CL, CH), sandy and clayey silts (ML, MH), and silty sands (SM). Standard Penetration Test (SPT) resistance values (N-values) in the residual soils range from 7 to 69 blows per foot (bpf). These values indicate that the residuum has a stiff to very hard consistency and a medium dense to very dense relative density. Moisture contents of the encountered residual soils were typically dry of

optimum moisture to moist with some instances of soils exhibiting moisture contents wet of optimum moisture.

Partially Weathered Rock

Partially weathered rock (PWR) and hard rock were encountered below fill, alluvial, and residual soils at many locations. Borings encountered partially weathered rock at depths ranging from approximately 0.3 feet to 27.5 feet below the ground surface. Partially weathered rock is defined as material exhibiting standard penetration values in excess of 100 blows per foot (77 with autohammer). SPT N-values in partially weathered rock ranged from 50 blows in 6 inches to 50 blows in 0 inches of penetration. Partially weathered rock can be penetrated with some difficulty by power augers. In some borings, layers of high consistency soil were encountered within partially weathered rock. Partially weathered rock materials were typically dry of optimum moisture.

Material which refused auger advancement was encountered in test borings B-84, B-87, B-93, and B-99. Auger refusal occurred at depths ranging from about 3 feet to 16.5 feet. Auger refusal generally indicates the top of hard rock or boulders. Very hard soils, partially weathered rock, and hard rock are difficult to excavate in trench form. Recommendations on excavations extending through these materials are provided in section 6.1 of this report.

Groundwater

Water was observed in three (3) of the soil test borings at the time of boring completion. Observed water levels ranged from about 4.5 feet to 12.5 feet below the ground surface. Water was observed in ten (10) of the soil test borings after a 24 hour waiting period prior to backfilling. Observed 24 hour water levels ranged from about the ground surface to 12 feet below the ground surface. Groundwater elevations can be expected to fluctuate due to seasonal variations in rainfall, evaporation, and other factors. Additionally, perched water may exist during wet periods of the year above less permeable fine-grained materials, such as silts, clays, or rock materials.

4.1 Pipe Route Locations

Little Drive

Beneath the surficial layer of topsoil, fill and residual soils were typically encountered. Fill was encountered in soil test borings B-70, B-72, B-73, B-74, B-76, and B-78. Fill was encountered to depths ranging from the ground surface to 10 feet below the ground surface and consisted of low and high plasticity clays, low plasticity silts and silty sands with trace amounts of gravel and organics. Residual soils were encountered below the ground surface in borings B-71, B-75, and B-77 to depths ranging from approximately 1.5 feet to termination depths of 10 feet. Partially weathered rock materials were encountered approximately 1.5 to 6.5 feet below the existing ground surface. Auger refusal was not

encountered in soil test borings performed along Little Drive from the I-540 crossing to the intersection with Davis Drive.

Groundwater was not encountered in soil test borings B-70 to B-78 immediately after drilling operations.

Davis Drive

Beneath the surficial layer of topsoil, fill and residual soils were typically encountered. Fill was encountered in soil test borings B-78 through B-83. Fill was encountered to depths ranging from 5.5 to 10 feet below the ground surface and consisted of low and high plasticity clays, low and high plasticity silts, and silty to clayey sands, sandy silts, and clayey sands with trace amounts organics. Residual soils were encountered in borings B-78, B-81, B-82, and B-83 at a depths ranging from approximately 5.5 to termination depths of 10 feet. Residual soils primarily consisted of low to high plasticity clays. Partially weathered rock materials were encountered at approximately 5.5 feet below the existing ground surface at borings B-79 and B-81. Auger refusal was not encountered in soil test borings performed along Davis Drive south of Little Drive to the Town of Morrisville town limits.

Groundwater was encountered in soil test boring B-81 at a depth of about 6.0 feet below the ground surface.

Kit Creek Crossing at Alston Avenue

Beneath the surficial layer of topsoil, fill, alluvium, and residual soils were typically encountered. Fill was encountered in soil test borings B-84 and B-85. Fill was encountered to depths ranging from 5 to 12 feet below the ground surface and consisted of silty clays, sandy silts, and clayey sands with trace amounts of gravel and organics. Alluvial soils were encountered below the fill materials in both borings between depths of about 5 to 27.5 feet. Alluvial soils consisted of clayey silts and silty to clayey sands. Residual soils were encountered below the alluvial soils in boring B-84 to a depth of approximately 16 feet. Residual soils primarily consisted of sandy silts. Partially weathered rock materials were encountered approximately 16 to 27.5 feet below the existing ground surface. Auger refusal was encountered in soil test boring B-84 at a depth of 16.5 feet.

Groundwater was encountered in the borings at depths ranging from about 4.5 to 12.5 feet immediately after drilling operations.

Green Level to Durham Road

Beneath the surficial layer of topsoil, fill and residual soils were typically encountered. Fill was encountered in soil test borings B-86, B-89, B-90, B-92, B-95, B-96, B-97, B-100, B-101, B-105, B-108, B-111, B-112, B-113, B-114, B-118, B-121, and B-122. Soil test

borings B-102, B-103, B-107, B-110, B-116, B-117, and B-120 were not performed due to utility conflicts. Fill was encountered to depths ranging from 1.5 to boring termination depths of 10 feet below the ground surface and consisted of low to high plasticity clays, low to high plasticity silts, and silty to clayey sands with trace amounts of gravel and organics. Residual soils were encountered below the ground surface in borings B-87, B-88, B-91, B-93, B-98, B-104, B-106, B-109, and B-115; and the remaining borings beneath surficial layers to depths of approximately 1.5 to 18 feet. In boring B-106 and B-112, residuum was encountered beneath a layer of partially weathered rock at depths ranging from approximately 5.5 feet to a termination depth of 10 feet. Residual soils primarily consisted of low to high plasticity clays, low plasticity silts, and silty sands. Partially weathered rock materials were encountered approximately 0.3 to 18 feet below the existing ground surface. Auger refusal was encountered in soil test borings B-87, B-93, and B-99 at a depths ranging from 3 to 9 feet.

Groundwater was measured in soil test boring B-87, B-95, B-100, B-101, B-106, B-114, and B-121 at a depths at depths ranging from about 0 to 12.0 feet below the ground surface. Perched water conditions due to surface runoff were observed above less permeable fine-grained materials in several of the borings.

Green Level Church Road

Beneath the surficial layer of topsoil, fill and residual soils were typically encountered. Fill was encountered in soil test borings B-125, B-126 and B-127. Soil test borings B-123 and B-124 were not performed due to utility conflicts. Fill was encountered to depths ranging from 2 to 5.5 feet below the ground surface and consisted of low to high plasticity clays. Residual soils were encountered in borings borings B-125, B-126, and B-127 at a depths ranging from the existing ground surface to termination depths of 10 feet. Residual soils primarily consisted of low to high plasticity clays and low to high plasticity silts. Partially weathered rock materials were not encountered within 10 feet below the ground surface. Auger refusal was not encountered in soil test borings performed along Green Level Church Road.

Groundwater was encountered in soil test boring B-125 at a depth of about 5.0 feet below the ground surface after 24 hour waiting period prior to backfilling.

Thomas Brooks Park

Beneath the surficial layer of topsoil, fill and residual soils were typically encountered. Fill was encountered in soil test borings B-127, B-128, B-131, B-132, and B-133. Soil test borings B-129 and B-130 were not performed due to utility conflicts. Fill was encountered to depths ranging from 2 to 6.5 feet below the ground surface and consisted of low to high plasticity clays. Residual soils were encountered in borings borings B-125, B-126, and B-127 at a depths ranging from the existing ground surface to termination depths of 10 feet.

Residual soils primarily consisted of low to high plasticity clays, low plasticity silts, and silty to clayey sands. Partially weathered rock materials were encountered at about 3 feet below the ground surface in soil test boring B-132. Auger refusal was not encountered in soil test borings performed within Thomas Brooks Park.

Groundwater was encountered in soil test boring B-133 at a depth of about 6.5 feet below the ground surface after 24 hour waiting period prior to backfilling.

Green Hope School Road

Soil test borings B-134 to B-137 were not performed due to utility conflicts. Based upon our Preliminary Subsurface Exploration Report dated October 27, 2006, five CPT soundings performed along the north side of Green Hope School Road were pushed to termination depth of 8.5 to 10 feet. Refusal was not encountered in test soundings performed along Green Hope School Road alignment.

5.0 LABORATORY TEST RESULTS

Laboratory tests were performed on representative bulk (bag) samples obtained during the field exploration phase of this project. These tests included classification tests (Atterberg limits and grain size distribution) to aid in estimating the physical properties of the soils and standard Proctor moisture-density testing to determine the compaction characteristics of potential fill materials. In addition, pH and resistivity tests were performed. The results of the laboratory tests and brief descriptions of the laboratory test procedures performed during this phase of the exploration are presented in the Appendix of this report.

Classification tests were performed on all five bulk samples. The Atterberg Limits test results indicate, liquid limits and plasticity indices ranging from 21 to 65 and 2 to 37, respectively, indicating a low to high plasticity soils. Grain-size testing results indicate that soils on site are predominantly composed of sandy to silty clays and silty clayey sands.

Results of resistivity testing on the bulk samples indicate resistivity values ranging from 10,840 to 20,733 ohms-cm in an as received condition and values ranging from 5,218 to 8,314 ohms-cm after a 24 hour condition. Results of pH testing indicated pH values ranging from 5.27 to 5.74.

Results of standard Proctor moisture-density tests (ASTM D698) indicate maximum dry densities ranging from approximately 98.0 to 120.9 pounds per cubic foot with corresponding optimum moisture contents of 11.3 to 23.9 percent. The natural moisture contents of the bulk samples ranged from approximately 8 to 28 percent. The bulk samples from soil test borings B-75, B-90, and B-106 were below optimum moisture content by about 3 to 5 percent. The bulk samples from soil test borings B-122 and B-127 had natural moisture content that were approximately 3 to 4 percent above optimum moisture content.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Excavation of very hard soils, partially weathered rock, and hard rock will be needed. Materials which are expected to require difficult excavation were encountered at depths ranging from about 0.3 to 27.5 feet across the project. Near surface soils are moisture sensitive and will rapidly deteriorate when wet. Groundwater is expected at some bore and jack locations and along drainage features along the project corridor.

When reviewing the following recommendations, please note that the project corridors have been previously graded. Past experience with previously graded sites indicates that unexpected conditions often exist. These may include deeper deposits of poorly compacted fill, deleterious materials within the fills, active and abandoned utility lines, and others.

The following sections provide more detailed conclusions and recommendations regarding site development.

6.1 Excavations

Based on borings, we expect that excavations will extend through moderate to high consistency soils, partially weathered rock and hard rock. Hard digging and blasting will be necessary to excavate materials at this site.

All excavations should be sloped or shored in accordance with local, state, and federal regulations, including OSHA (29 CFR Part 1926) excavation trench safety standards. The contractor is solely responsible for site safety. This information is provided only as a service, and under no circumstance should S&ME be assumed to be responsible for construction site safety.

Localized zones of perched water may be present within the near surface soils following periods of rainfall. We expect that groundwater infiltration can likely be controlled by ditching and/or pumping from sumps within excavations.

Our comments regarding excavation of various materials are presented below. When reviewing these comments, please note that the location and depth of partially weathered rock and hard rock varies over relatively short horizontal distances. As a result, there is a potential that rock in various forms may be encountered intermediate of the boring locations or at higher elevations. We recommend that the pipeline be embedded as shallow as possible below final grades to reduce the amount of difficult excavation required.

Moderate Consistency Soils - Past experience indicates that these materials can be excavated by routine earth moving equipment. Local excavation for shallow utility trenches

can be accomplished by a track-mounted backhoe.

High Consistency Soils and Highly Weathered to Partially Weathered Rock - The subsurface exploration indicates that high consistency soils and highly weathered to partially weathered rock exist along portions of the alignment. Excavation of utility trenches is slow and difficult even with the use of large track mounted backhoes equipped with rock teeth. Based on past experience, a portion of these materials (typically SPT values of 50 blows in 4 inches and softer) can be excavated with a large track mounted backhoe such as a CAT-325 or larger, equipped with new rock teeth; however, the excavation process is typically very slow. Therefore, it is generally more expedient to preloosen very hard soils, partially weathered rock with light blasting in confined excavations.

It is important to note that the success of excavation with track mounted backhoes in confined excavations is dependent upon many factors. These include weakness seams within these materials, orientation of the seams, skill of the operator, and the diligence with which the contractor pursues excavation. As a result, it is impossible to accurately predict the quantities of materials requiring blasting. Also, as evidenced by borings performed for this exploration, the elevation and consistency, partially weathered rock, and hard rock varies significantly at this site.

Slightly Weathered Rock to Hard Rock

The subsurface exploration indicates that slightly weathered to hard rock exists along portions of the alignment. These materials when encountered will require blasting, a hoe-ram or other pneumatic equipment to improve the speed of excavation.

Rock excavation for trenches should be defined as materials and obstructions encountered that cannot be practically excavated with a large track mounted backhoe such as a CAT-325 or larger, equipped with new rock teeth. Practical excavation is defined as the ability to remove at least 10 cubic yards during one (1) hour of continuous digging.

If blasting is performed near existing structures, blast induced vibrations should be monitored. The blasting subcontractor should be responsible for maintaining induced vibrations below acceptable levels. Depending on the sensitivity of the structure to vibration, accepted levels are typically defined as a maximum peak particle velocity on the order of 1 to 2 inches per second. Older, more sensitive structures may require that vibrations (as measured by the peak particle velocity) are less than these values. Prior to blasting, we recommend that a preblast survey of nearby structures be performed to determine and document existing conditions.

6.2 Groundwater Concerns during Excavation

Based on results of our borings, we expect excavation to pipe inverts will encounter perched water/groundwater. The presence of groundwater should be expected along the proposed alignment during open cut trenches near the watershed along Alston Avenue near Kit Creek, along Green Level to Durham Road near Nancy Branch and Morris Branch, and within the southeastern corner of Thomas Brooks Park. Additionally, groundwater should be expected at other drainage features and low-lying areas. Shoring or relatively flat excavation slopes along with dewatering measures will be required to control infiltration and prevent sloughing/collapse of excavation sidewalls. We do not expect perimeter well points will be effective in dewatering sandy and silty clays and sandy and clayey silts encountered within proposed pipeline excavations. Side trenches within the excavation combined with pumping from collection sumps will be required. We expect less dewatering will be needed with shoring than with open excavation and flattened slopes. All excavation slopes or shoring should comply with current OSHA Trench Protection Guidelines. Slope and shoring design should properly account for hydrostatic pressures and seepage. The method of groundwater control will be dependent upon the Contractor's construction methods. As a result, actual measures to control groundwater should be determined by the Contractor.

6.3 High Plasticity Soils

Highly plastic silts and clays were encountered within several borings. It has been our experience that highly plastic soils, with plasticity indices greater than 30, do not perform well when exposed near final subgrade elevations due to their potential to shrink and swell with changes in moisture content and loss of strength when wet. When encountered, highly plastic soils should be undercut within 1 foot below the pipe inverts.

6.4 Reuse of On-site Soils

In general, a majority of the soils at this site having a Unified Soil Classification (USCS) designation of CL, ML, SM, SP, or SW are suitable for reuse as trench backfill provided that the moisture content is properly controlled during placement and compaction. Depending on prevailing weather conditions during fill placement, some drying or wetting of soils may be required prior to their placement as trench backfill. Highly plastic soils having a USCS designation of MH or CH are not suitable for reuse as trench backfill as discussed above.

A portion of the partially weathered rock and hard rock encountered should break down to gravel, sand, and silt-sized particles upon compaction. Conversely, it is likely that materials containing boulders and weathered rock fragments will also be encountered where blasting or hard digging is required. Rock pieces greater than 3 inches in diameter should not be placed as trench backfill. Rock pieces should be thoroughly mixed with soil and compacted

as recommended below. In no case should boulders or rock pieces be stacked on top of each other, which could create void spaces and lead to raveling of the soil fill.

It may be necessary to add moisture to excavated partially weathered rock materials to achieve adequate compaction. We recommend that compaction moisture be at or slightly above the optimum compaction moisture content. It has been our experience that partially weathered rock materials compacted dry of the optimum moisture content will lose strength and become more compressible if later exposed to moisture. Increased compressibility and loss of strength can result in post construction settlement. Adding moisture will also help break down partially weathered rock to gravel and soil size particles.

6.5 Bedding Materials

Washed stone (NCDOT Select Material Class VI - No. 57 or 67) or dry sand (NCDOT Select Material Class III) will likely be needed as a bedding material below most of the pipe sections installed within open trenches. Bedding material will provide a more stable working surface for pipe placement and will facilitate installation of the pipe to design grades. The need for bedding will depend primarily on the extent of groundwater and surface water infiltration that occurs.

Bedding materials should be placed on stable subgrades. At least 4 inches of bedding material is recommended between partially weathered rock/hard rock and the piping.

6.6 Trench Backfill

After proper site preparation, trench areas may be raised to their design subgrade elevations using suitable soils compacted in 6 inch loose lifts. A degree of compaction corresponding to at least 95 percent of the soil's standard Proctor maximum dry density (ASTM D 698) should be achieved. Fill soils should be maintained within 2 percent of optimum moisture during compaction.

Beneath pavements and sidewalks, compact the final 8 inches below finished subgrades to at least 100% of the soil's standard Proctor maximum dry density (ASTM D 698) within 2 percent of optimum moisture.

Site preparation including fill placement and compaction should be observed by the geotechnical engineer or a qualified soils technician. A sufficient number of density tests should be conducted to confirm that adequate compaction is achieved.

6.7 Boring and Jacking

Bore and jack construction methods are proposed along Alston Avenue beneath Kit Creek. The boring and jacking contractor should closely review the subsurface conditions described in this report and boring logs. Installation techniques and equipment should account for interlayered sands and clays with groundwater, shallow perched groundwater,

and partially weathered rock and possible hard rock. The installation method selected should be the responsibility of the contractor.

Based upon the subsurface conditions encountered at borings B-84 and B-85, at the Kit Creek crossing, fill material consisting of loose clayey sands, stiff clays, and very soft to stiff silts overly alluvial sandy soils. These alluvial sandy soils are below the groundwater, observed between 4.5 to 12 feet below the existing grades. Alluvial soils overly very hard residual silts and partially weathered rock and auger refusal materials at about 16.5 to 28.7 feet below the existing grades. Based upon proposed pipe invert elevations and expected excavations, boring through fill and loose sandy soils below the water table is expected. Partially weathered rock and hard rock may exist at higher elevations between borings. Therefore, the contractor should be prepared to make any necessary adjustments that may be required to advance through hard materials.

Utility construction using trenchless installations within NCDOT right-of-way should be performed in accordance with the latest edition of the *NCDOT Standard Specifications for Roads and Structures*, Section 1500.

6.8 Corrosion Protection

Bulk samples deemed representative based on visual and manual classification were selected from five borings and were tested in our laboratory for pH and resistivity (specific conductance). The average pH test result was 5.56 and the resistivity test results indicate an average resistivity of 16,239 ohms-cm in the as received condition and 6,947 ohms-cm after a 24 hour condition. Various studies have related the resistivity of the soil to the corrosivity as a means of predicting corrosion potential. The table shown below is taken from the publication "Underground Corrosion" prepared by the American Society for Testing and Materials, Bulletin STP-741.

Soil Corrosivity versus Resistivity

<u>Soil Corrosivity</u>	<u>Soil Resistivity (ohms-cm)</u>
Very corrosive	0 to 2,000
Corrosive	2,000 to 5,000
Moderately corrosive	5,000 to 10,000
Mildly corrosive	10,000 to 25,000
Relatively less corrosive	25,000 to 50,000
Progressively non-corrosive	50,000 to 100,000

Although a number of other factors are important, apparent resistivity is considered a reliable indicator of corrosivity in soil. Therefore, the sampled soils appear to have a moderate to mild potential for corrosivity based on the resistivity test results. Cathodic

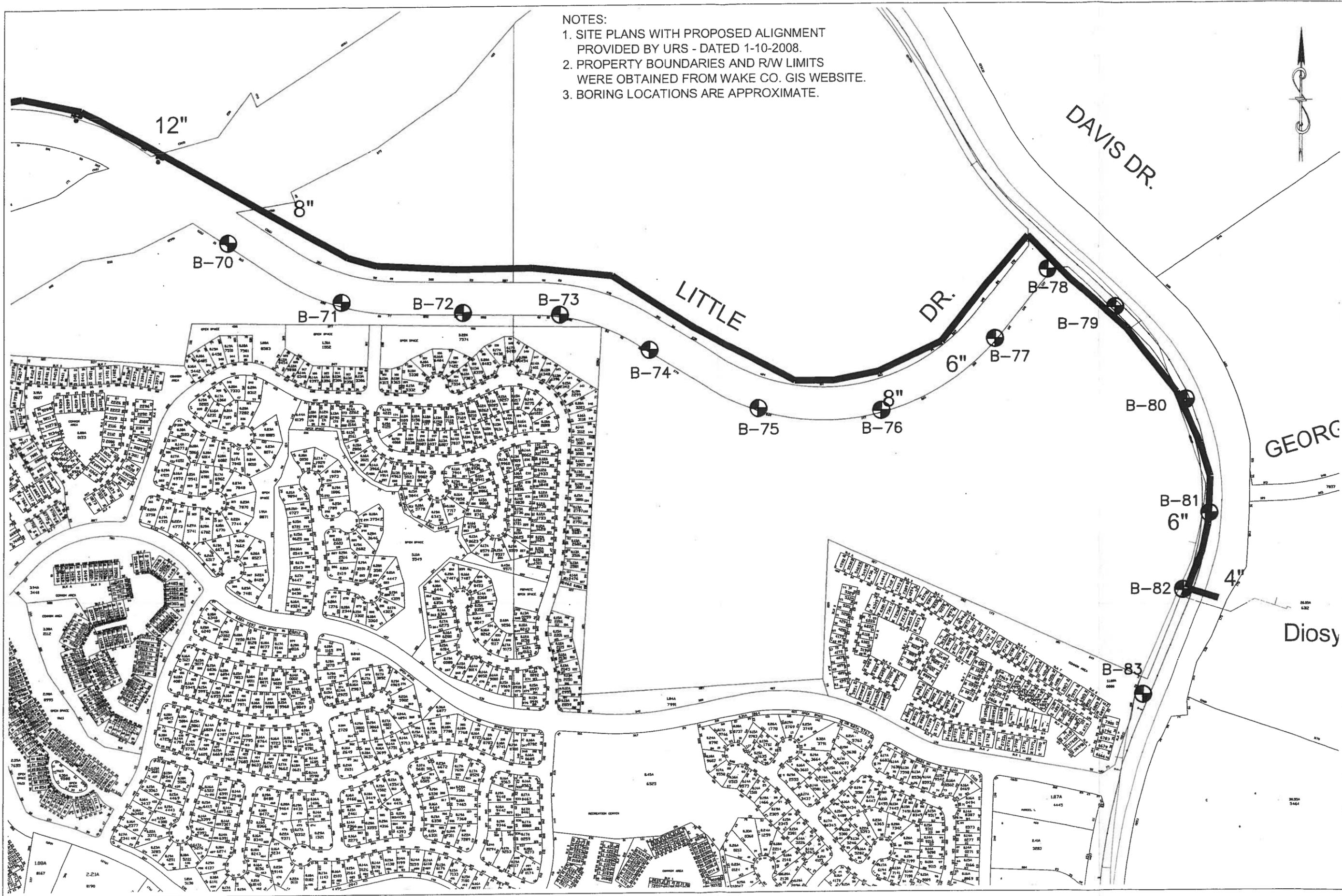
protection is typically recommended where resistivity is less than 25,000 ohms-cm.

7.0 QUALIFICATIONS OF REPORT

This report has been prepared in accordance with generally accepted engineering practice for specific application to this project. Any wetland, environmental, or contaminant assessment efforts are beyond the scope of this geotechnical exploration. Therefore, those issues are not addressed in this geotechnical exploration report. The conclusions and recommendations contained in this report are based on the applicable standards of our profession at the time this report was prepared. No other warranty, express or implied, is made.

Conclusions and recommendations submitted in this report are based, in part, upon the data obtained from the subsurface exploration. The nature and extent of variations between the borings made may not become evident until construction. If variations appear evident, then it will be necessary to re-evaluate the recommendations of this report. In the event that any changes in the nature, design, or location of the proposed pipeline are planned, the conclusions and recommendations contained in this report should be reviewed, modified or confirmed in writing. We recommend that our firm be provided the opportunity for general review of final design specifications to confirm that our recommendations are properly interpreted and implemented.

S:\PROJECTS\2006\06-265\GEOTECH\OADD\PHASE II FINAL\06-265 PHASE II FINAL BORING LOC PLAN



NOTES:

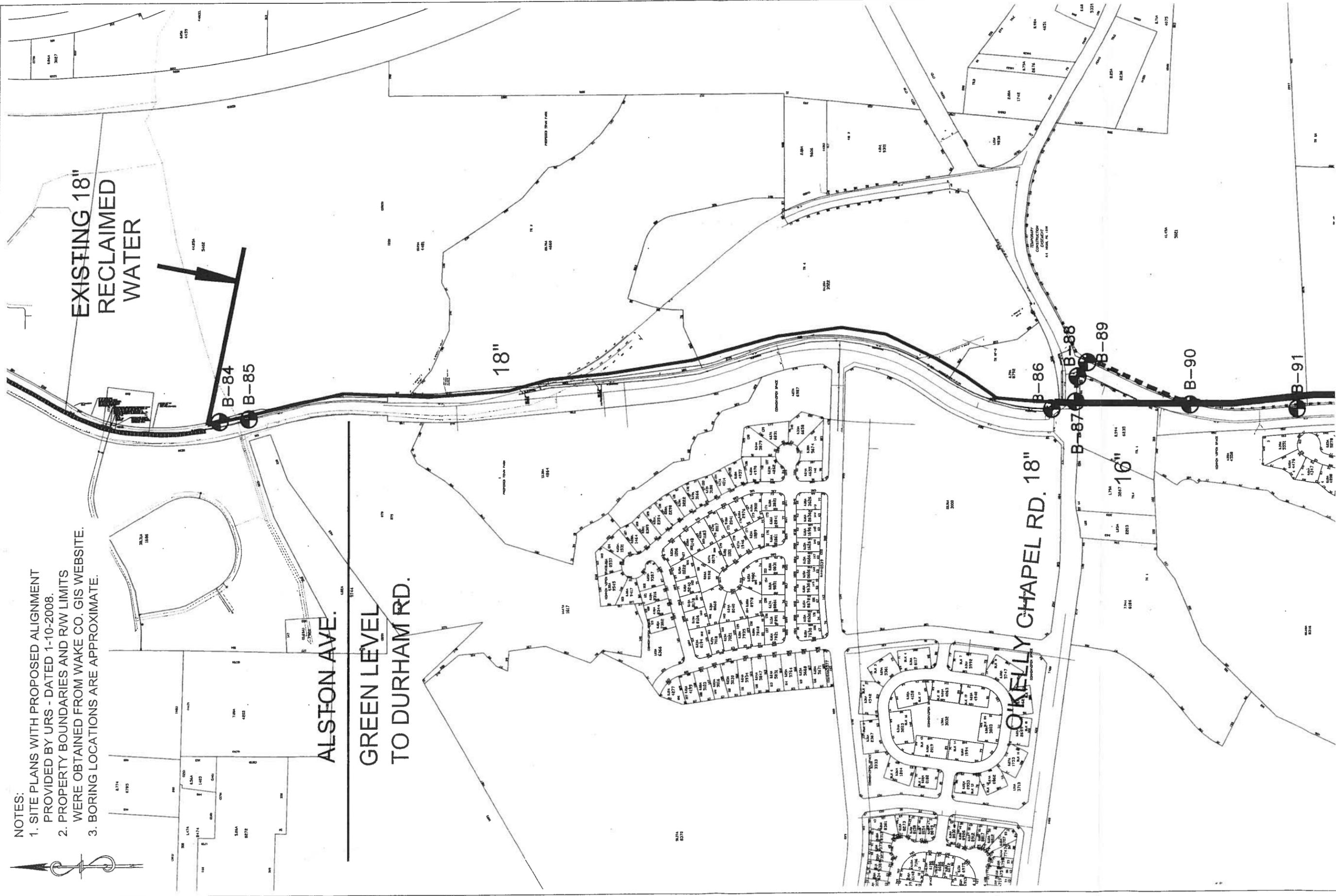
1. SITE PLANS WITH PROPOSED ALIGNMENT PROVIDED BY URS - DATED 1-10-2008.
2. PROPERTY BOUNDARIES AND R/W LIMITS WERE OBTAINED FROM WAKE CO. GIS WEBSITE.
3. BORING LOCATIONS ARE APPROXIMATE.

BORING LOCATION PLAN		APPROVED BY:	BDK
JORDAN LAKE WATER RECLAMATION & REUSE PROJECT PHASE II		DATE:	MARCH 2008
LITTLE DRIVE AND DAVIS DRIVE WAKE COUNTY / DURHAM COUNTY, NORTH CAROLINA		DRAWN BY:	TRP
		JOB NO. 1051-06-265	FIGURE 1A



NOTES:

- 1. SITE PLANS WITH PROPOSED ALIGNMENT PROVIDED BY URS - DATED 1-10-2008.
- 2. PROPERTY BOUNDARIES AND R/W LIMITS WERE OBTAINED FROM WAKE CO. GIS WEBSITE.
- 3. BORING LOCATIONS ARE APPROXIMATE.



BORING LOCATION PLAN

JORDAN LAKE WATER RECLAMATION & REUSE PROJECT
PHASE II

ALSTON AVE. / GREEN LEVEL TO DURHAM RD. / O'KELLY CHAPEL RD.
WAKE COUNTY / DURHAM COUNTY, NORTH CAROLINA

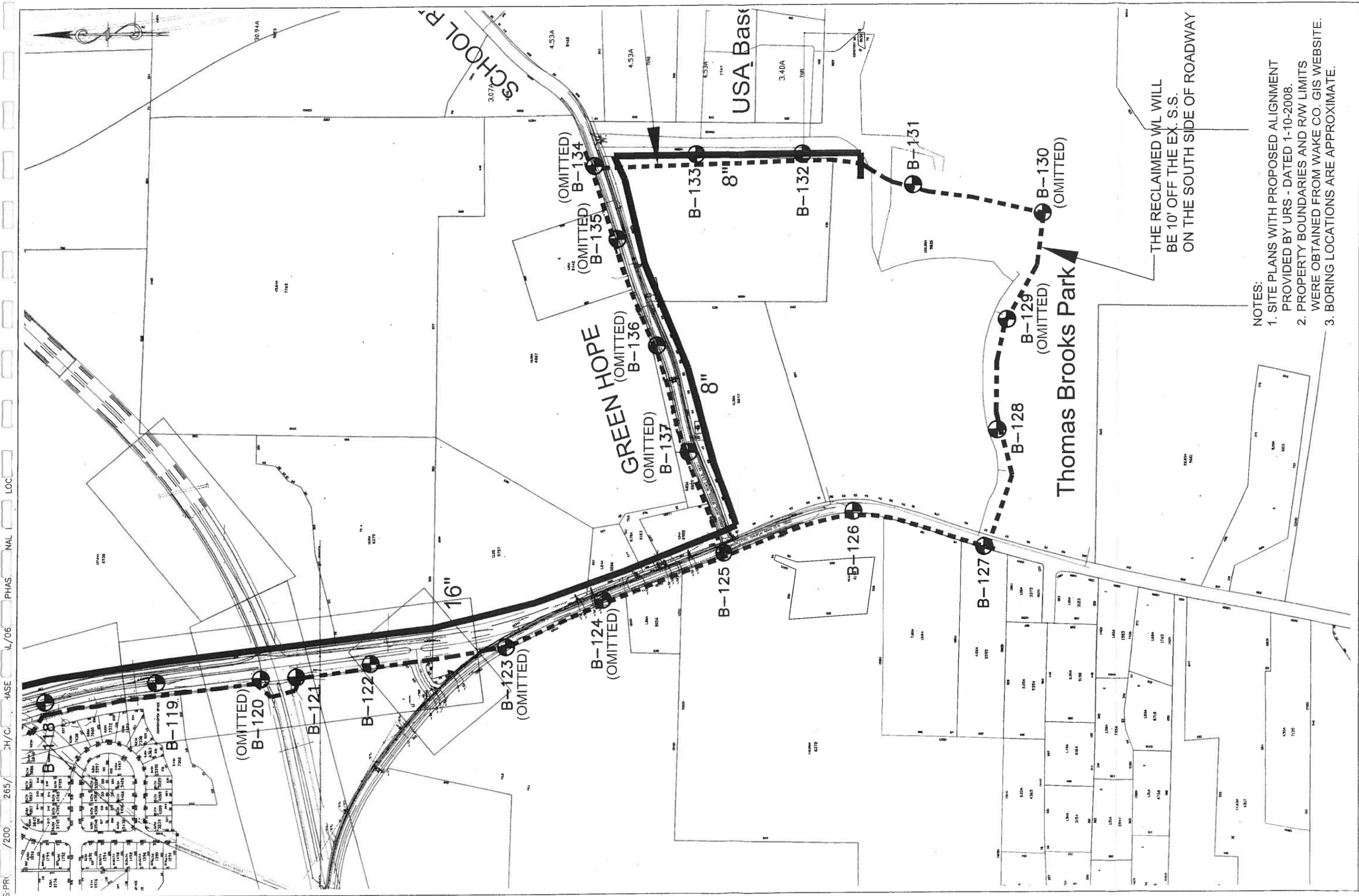


S&ME
ENVIRONMENTAL SERVICES
ENGINEERING · TESTING

SCALE: 1" = 400' APPROVED BY: BDK

DATE: MARCH 2008 DRAWN BY: TRP

JOB NO. 1051-06-265 FIGURE 1B



- NOTES:
1. SITE PLANS WITH PROPOSED ALIGNMENT PROVIDED BY URS - DATED 1-10-2008.
 2. PROPERTY BOUNDARIES AND R/W LIMITS WERE OBTAINED FROM WAKE CO. GIS WEBSITE.
 3. BORING LOCATIONS ARE APPROXIMATE.

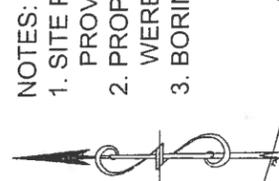
BORING LOCATION PLAN

JORDAN LAKE WATER RECLAMATION & REUSE PROJECT
PHASE II

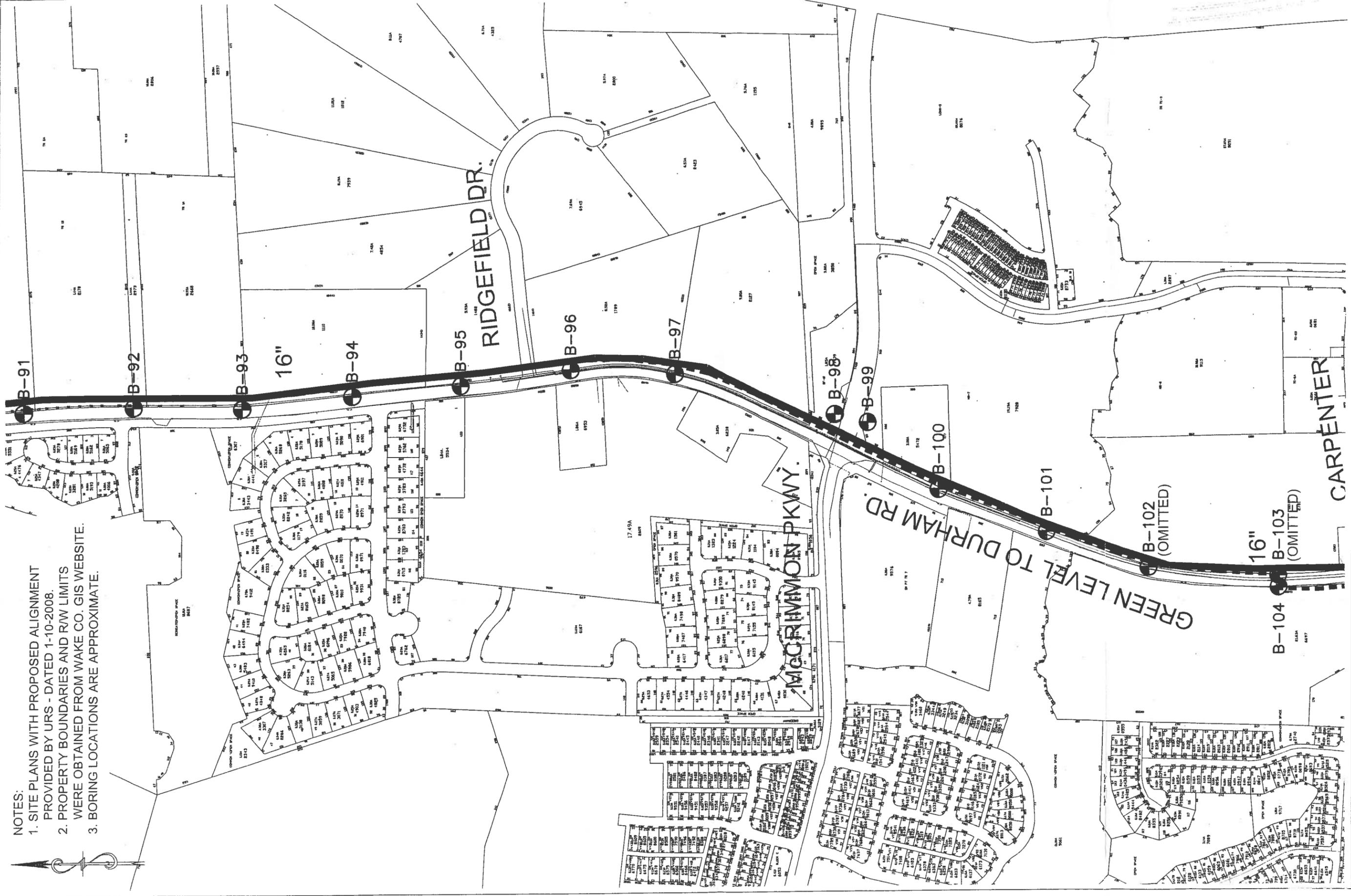
GREEN LEVEL TO DURHAM RD. / GREEN LEVEL CH. RD. / GREEN HOPE SCH. RD. / TH. BROOKS PK.
WAKE COUNTY / DURHAM COUNTY, NORTH CAROLINA



SCALE:	1" = 400'	APPROVED BY:	BDK
DATE:	MARCH 2008	DRAWN BY:	TRP
JOB NO.	1051-06-265	FIGURE	1E



- NOTES:
1. SITE PLANS WITH PROPOSED ALIGNMENT PROVIDED BY URS - DATED 1-10-2008.
 2. PROPERTY BOUNDARIES AND R/W LIMITS WERE OBTAINED FROM WAKE CO. GIS WEBSITE.
 3. BORING LOCATIONS ARE APPROXIMATE.



BORING LOCATION PLAN

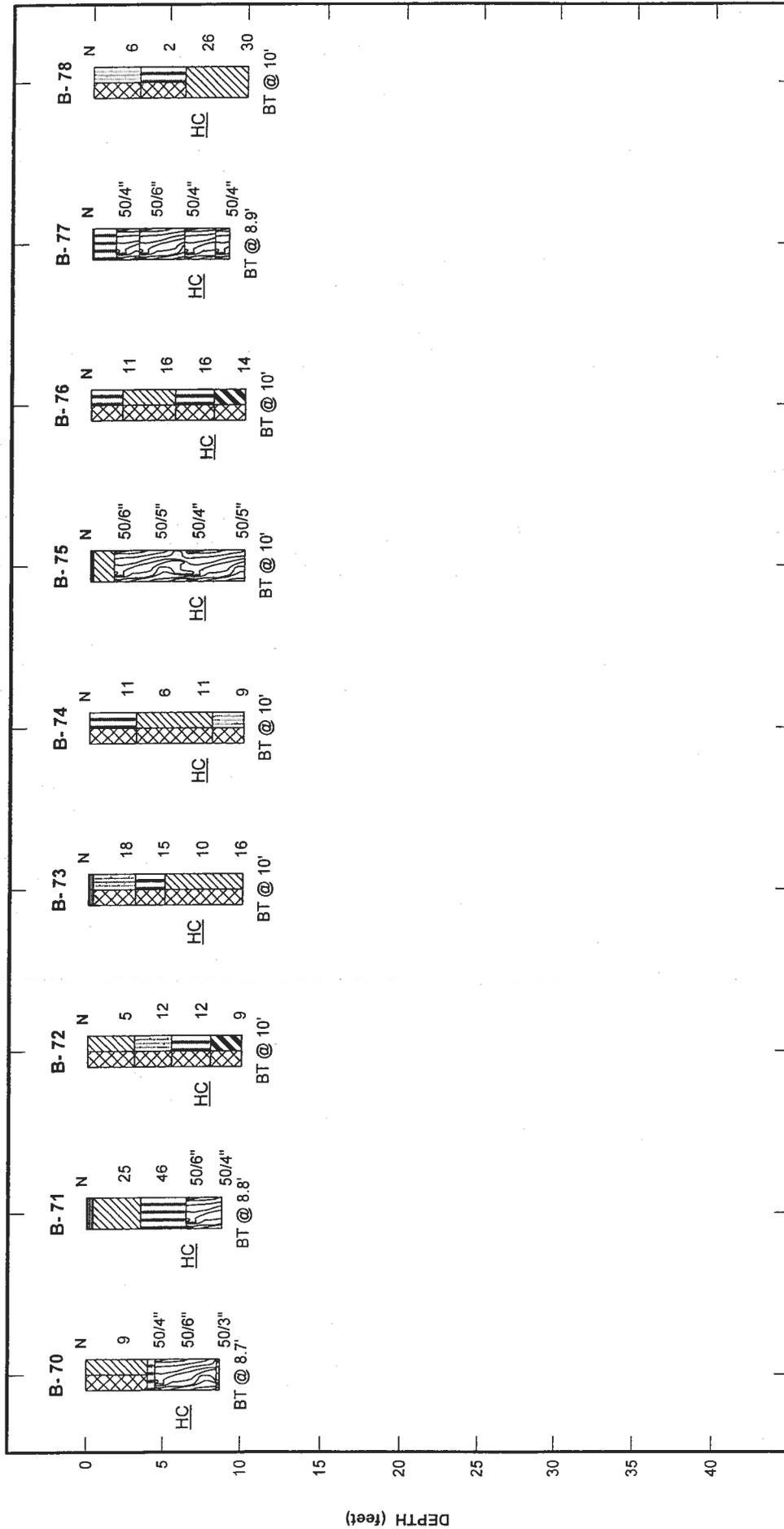
JORDAN LAKE WATER RECLAMATION & REUSE PROJECT
 PHASE II

GREEN LEVEL TO DURHAM RD. / McCRIMMON PKWY.
 WAKE COUNTY / DURHAM COUNTY, NORTH CAROLINA



SCALE: 1" = 400'	APPROVED BY: BDK
DATE: MARCH 2008	DRAWN BY: TRP
JOB NO. 1051-06-265	FIGURE 1C

GENERALIZED SUBSURFACE CONDITIONS



N = Standard Penetration Test resistance value (blows per foot). The depicted stratigraphy is shown for illustrative purposes only. The actual subsurface conditions will vary between boring locations.

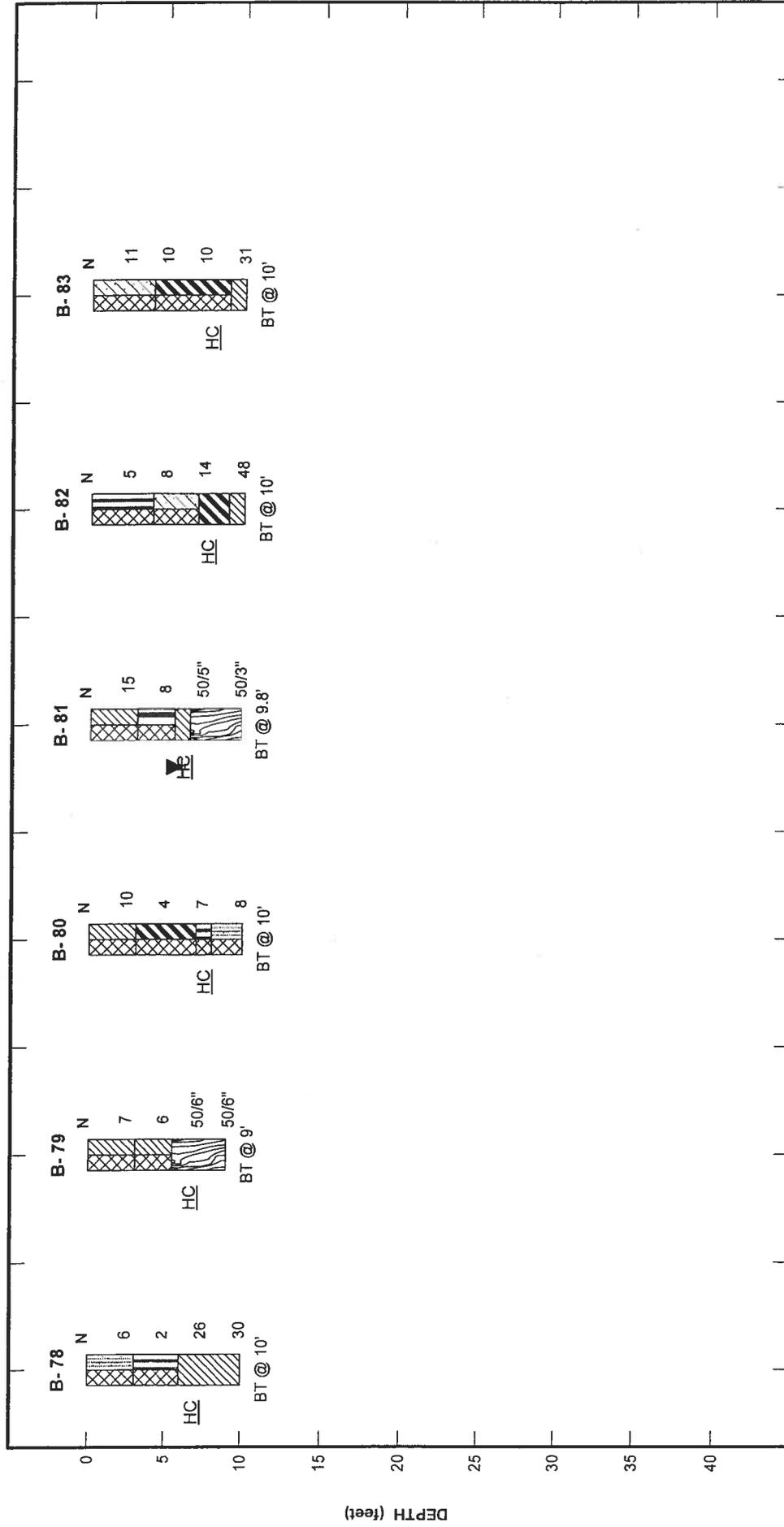
JOB NO: 1051-06-265

DATE: 3/18/08

3201 SPRING FOREST ROAD
 RALEIGH, NORTH CAROLINA 27616

Diagram: LITTLE DRIVE
 Project: Jordan Lake WRRP Phase II
 Location: Wake County, North Carolina

GENERALIZED SUBSURFACE CONDITIONS



- SM, Silty Sand
- CH, High Plasticity Clay
- ML, Low Plasticity Silt
- MH, High Plasticity Silt
- CL, Low Plasticity Clay
- SC, Clayey Sand
- Partially Weathered Rock

N = Standard Penetration Test resistance value (blows per foot). The depicted stratigraphy is shown for illustrative purposes only. The actual subsurface conditions will vary between boring locations.

JOB NO: 1051-06-265

DATE: 3/18/08

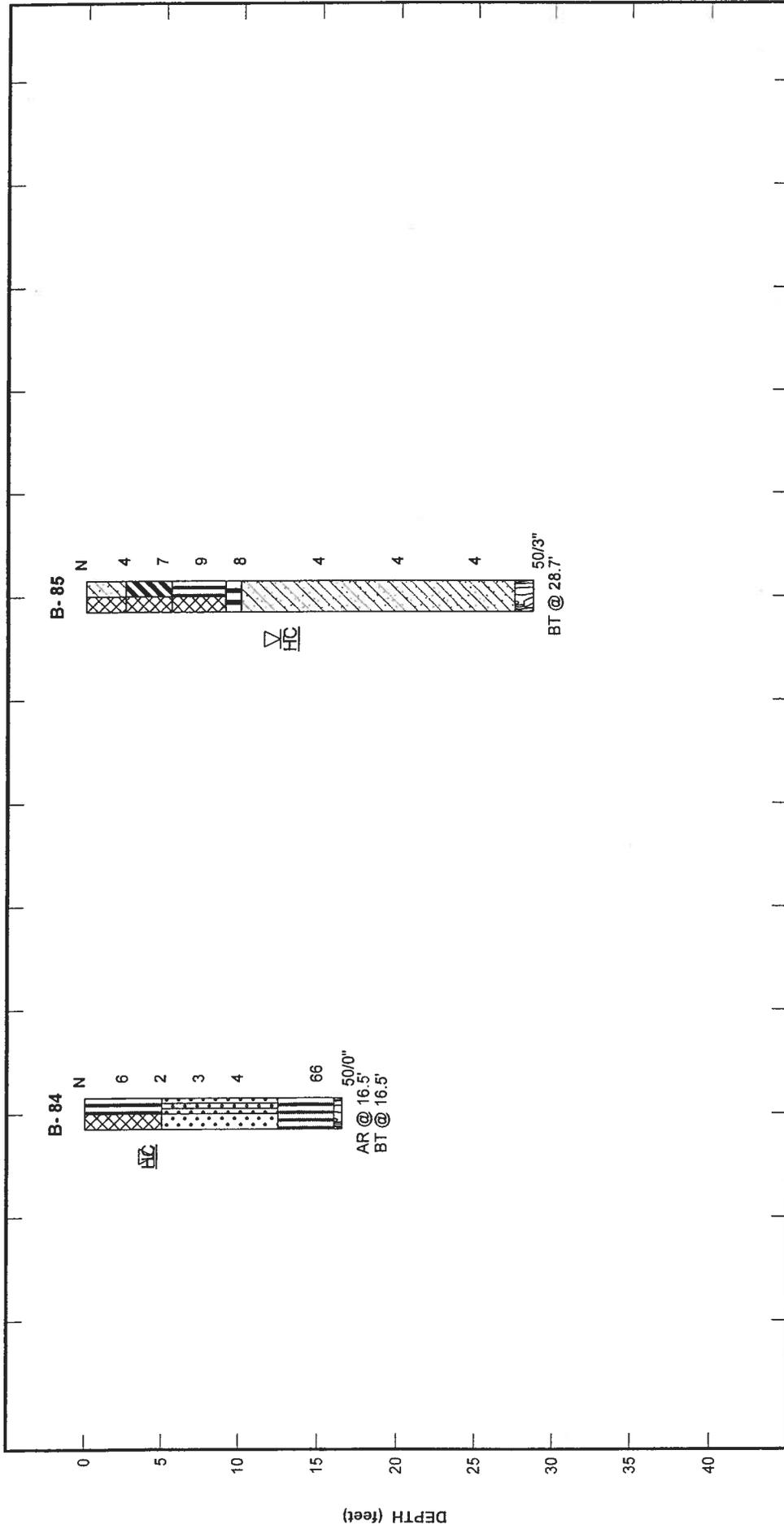
3201 SPRING FOREST ROAD
RALEIGH, NORTH CAROLINA 27616

Diagram: DAVIS DRIVE
Project: Jordan Lake WRRP Phase II
Location: Wake County, North Carolina



Figure 2B

GENERALIZED SUBSURFACE CONDITIONS



N = Standard Penetration Test resistance value (blows per foot). The depicted stratigraphy is shown for illustrative purposes only. The actual subsurface conditions will vary between boring locations.

JOB NO: 1051-06-265

DATE: 3/18/08

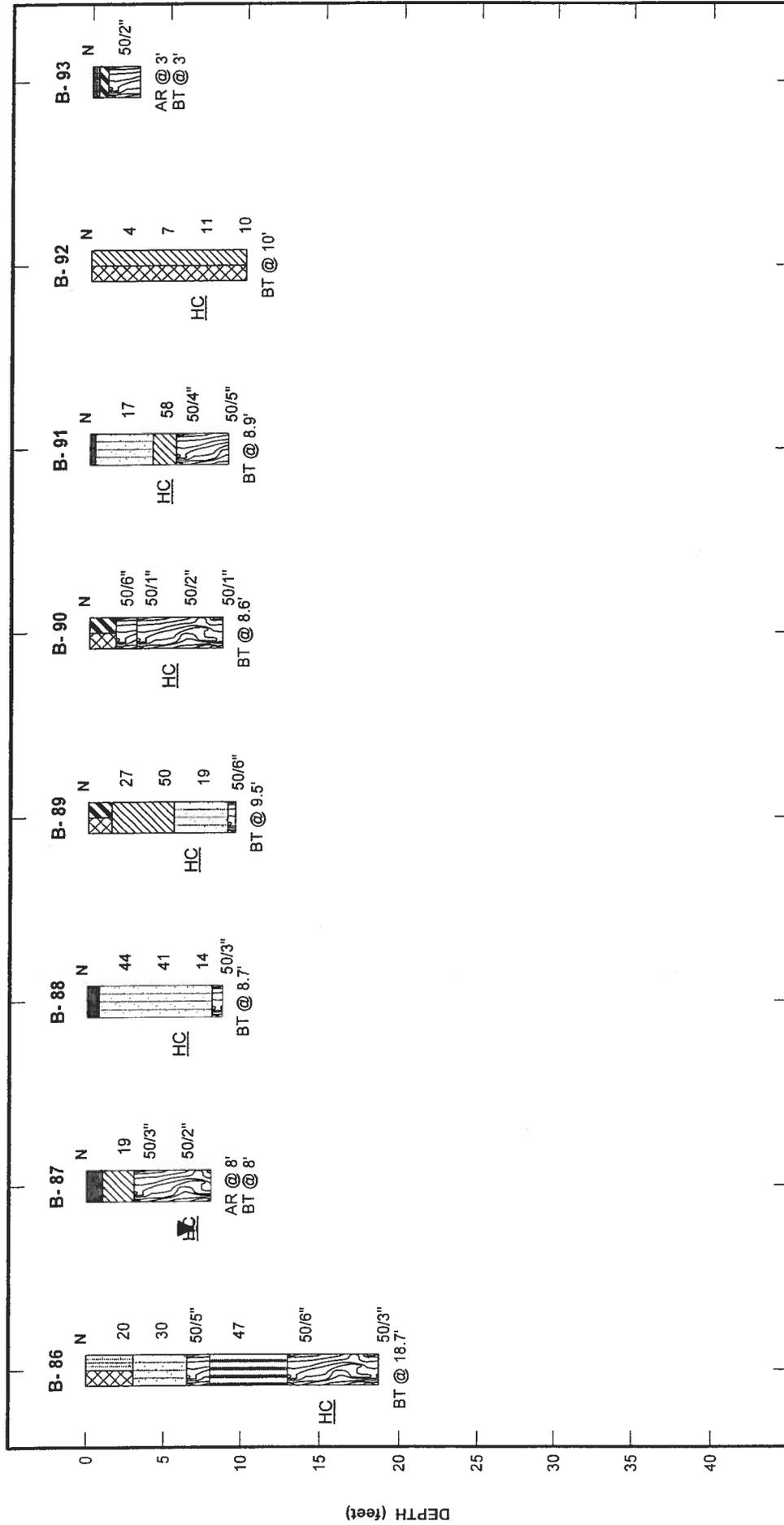
3201 SPRING FOREST ROAD
 RALEIGH, NORTH CAROLINA 27616

Diagram: KITT CREEK at ALSTON AVENUE
 Project: Jordan Lake WRRP Phase II
 Location: Wake County, North Carolina

Figure 2C



GENERALIZED SUBSURFACE CONDITIONS



N = Standard Penetration Test resistance value (blows per foot). The depicted stratigraphy is shown for illustrative purposes only. The actual subsurface conditions will vary between boring locations.



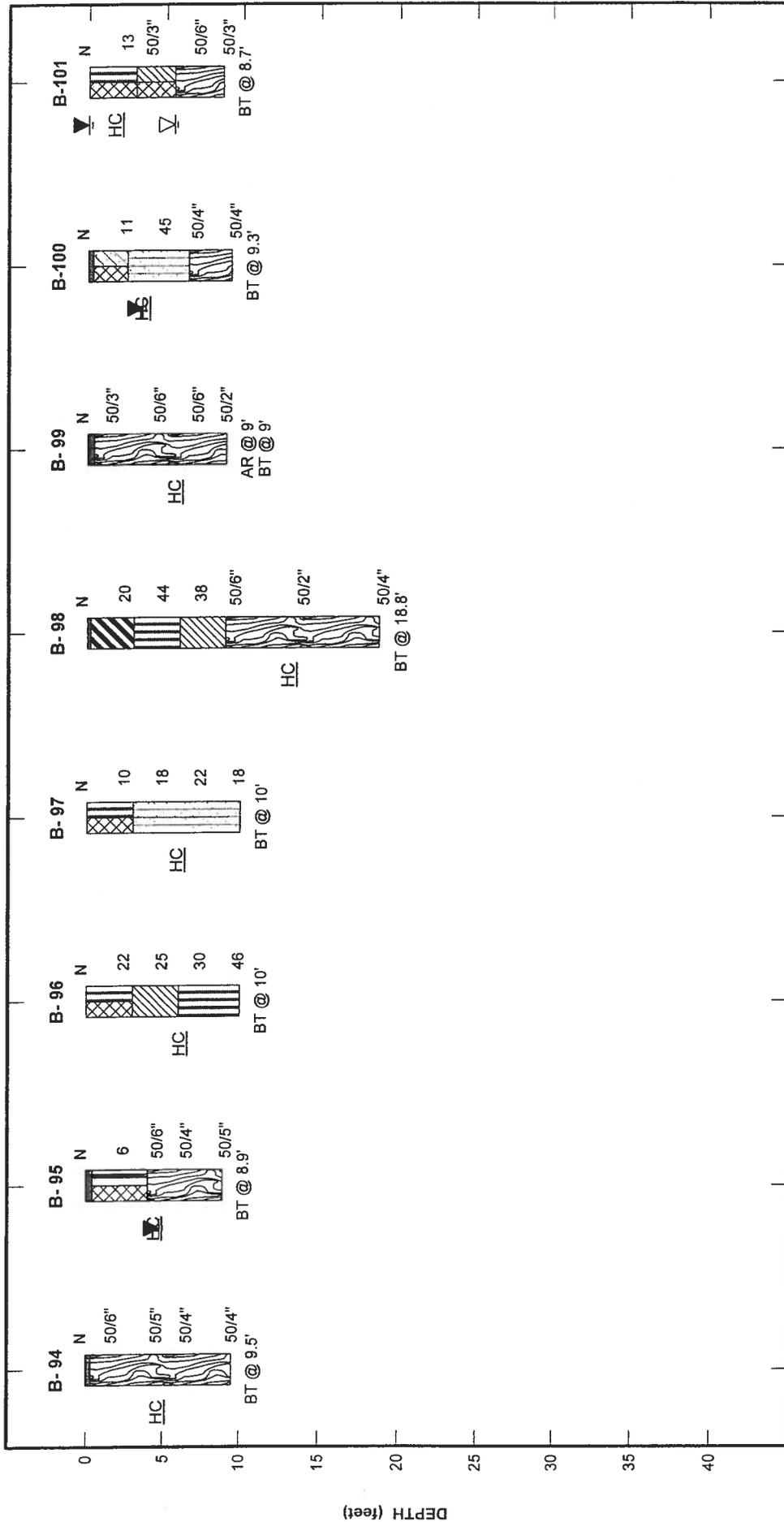
JOB NO: 1051-06-265

DATE: 3/18/08

3201 SPRING FOREST ROAD
 RALEIGH, NORTH CAROLINA 27616

Diagram: GREEN LEVEL TO DURHAM ROAD
 Project: Jordan Lake WRRP Phase II
 Location: Wake County, North Carolina

GENERALIZED SUBSURFACE CONDITIONS



Topsoil
CL, Low Plasticity Clay

Partially Weathered Rock
SM, Silty Sand

MH, High Plasticity Silt
CH, High Plasticity Clay

ML, Low Plasticity Silt
SC, Clayey Sand

N = Standard Penetration Test resistance value (blows per foot). The depicted stratigraphy is shown for illustrative purposes only. The actual subsurface conditions will vary between boring locations.

JOB NO: 1051-06-265

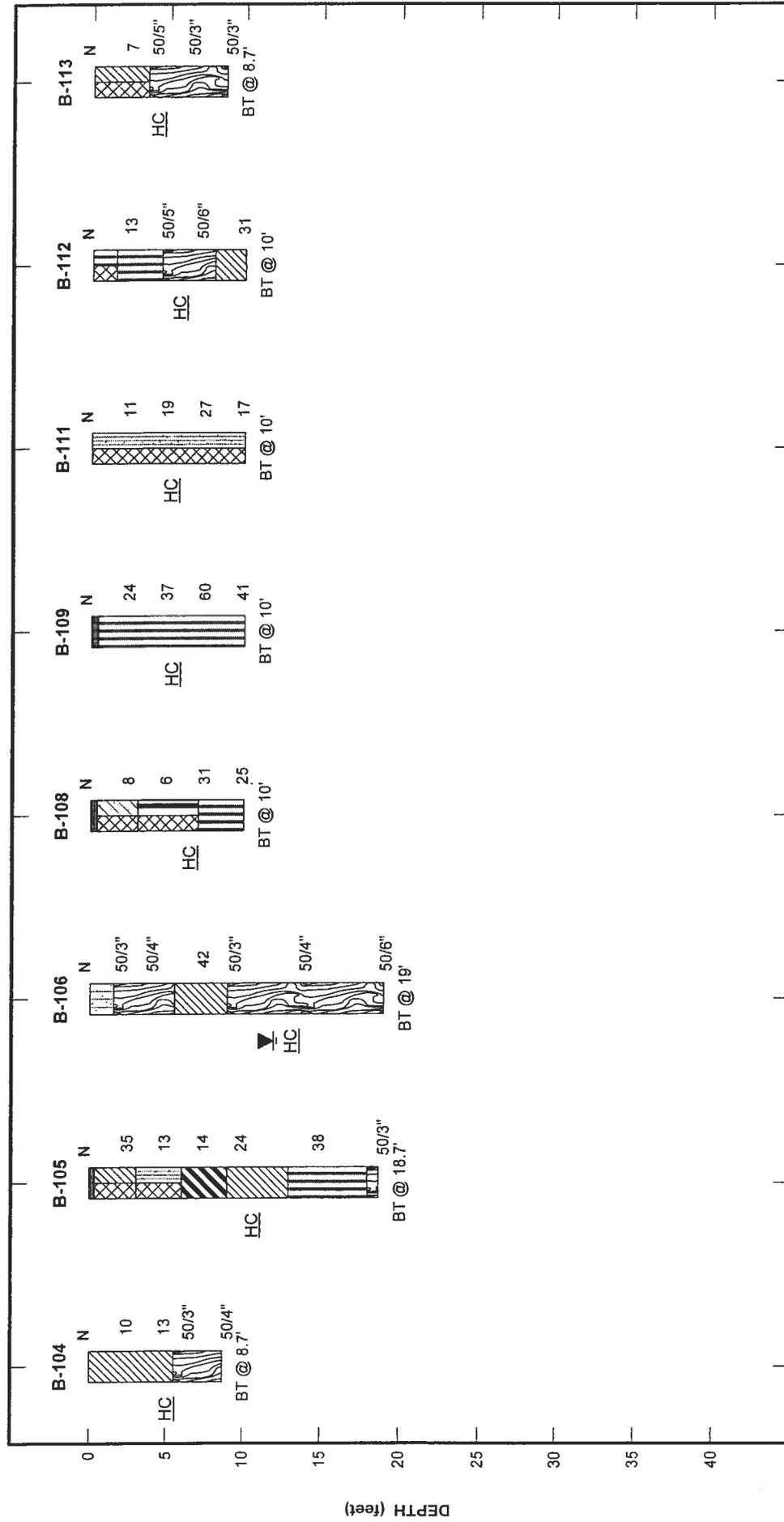
DATE: 3/18/08

3201 SPRING FOREST ROAD
RALEIGH, NORTH CAROLINA 27616

Diagram: GREEN LEVEL TO DURHAM ROAD
Project: Jordan Lake WRRP Phase II
Location: Wake County, North Carolina



GENERALIZED SUBSURFACE PROFILE



N = Standard Penetration Test resistance value (blows per foot). The depicted stratigraphy is shown for illustrative purposes only. The actual subsurface conditions will vary between boring locations.

JOB NO: 1051-06-265
 DATE: 3/18/08

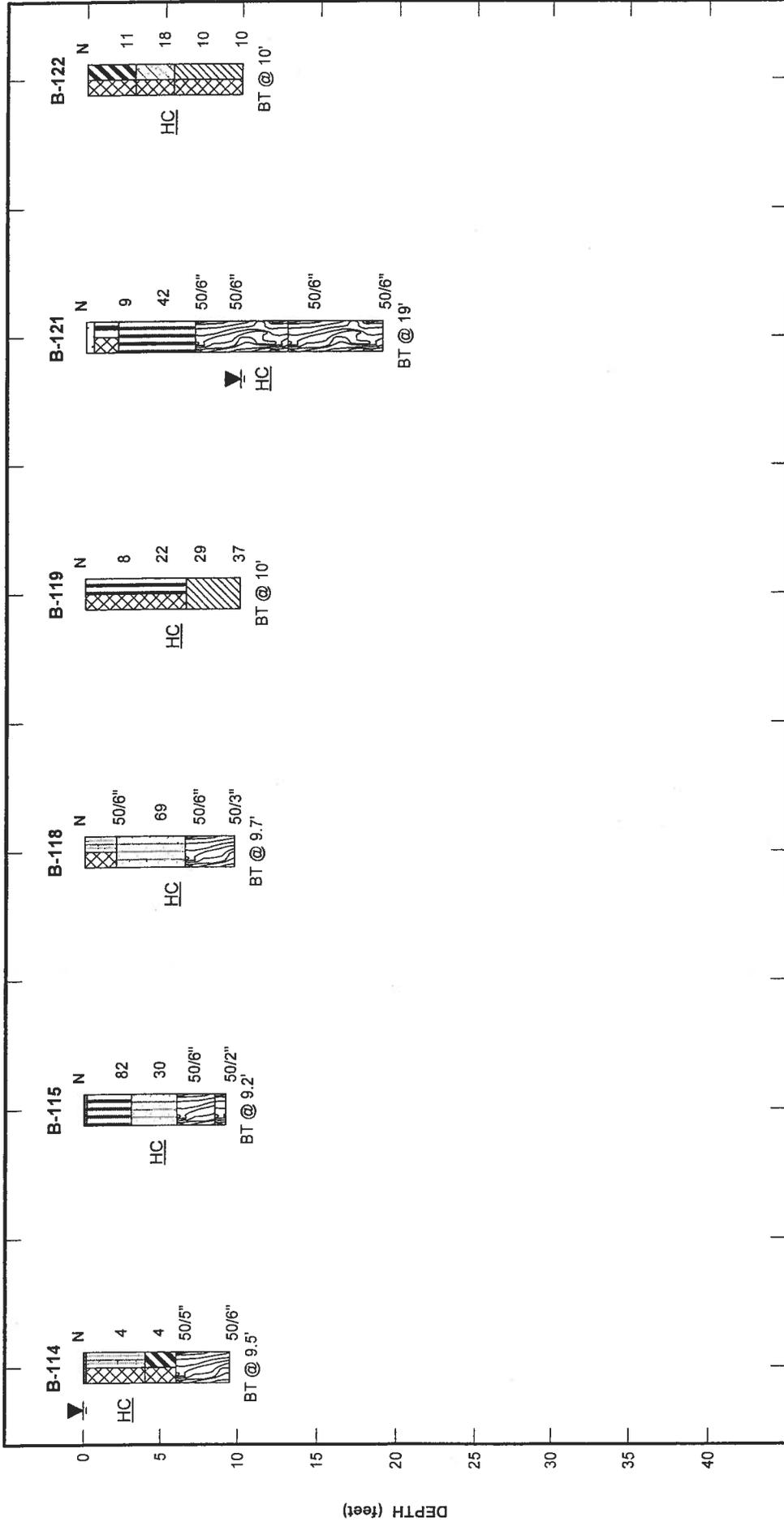


3201 SPRING FOREST ROAD
 RALEIGH, NORTH CAROLINA 27616

Diagram: GREEN LEVEL TO DURHAM ROAD
 Project: Jordan Lake WRRP Phase II
 Location: Wake County, North Carolina

Figure 2F

GENERALIZED SUBSURFACE PROFILE



N = Standard Penetration Test resistance value (blows per foot). The depicted stratigraphy is shown for illustrative purposes only. The actual subsurface conditions will vary between boring locations.

JOB NO: 1051-06-265
 DATE: 3/18/08

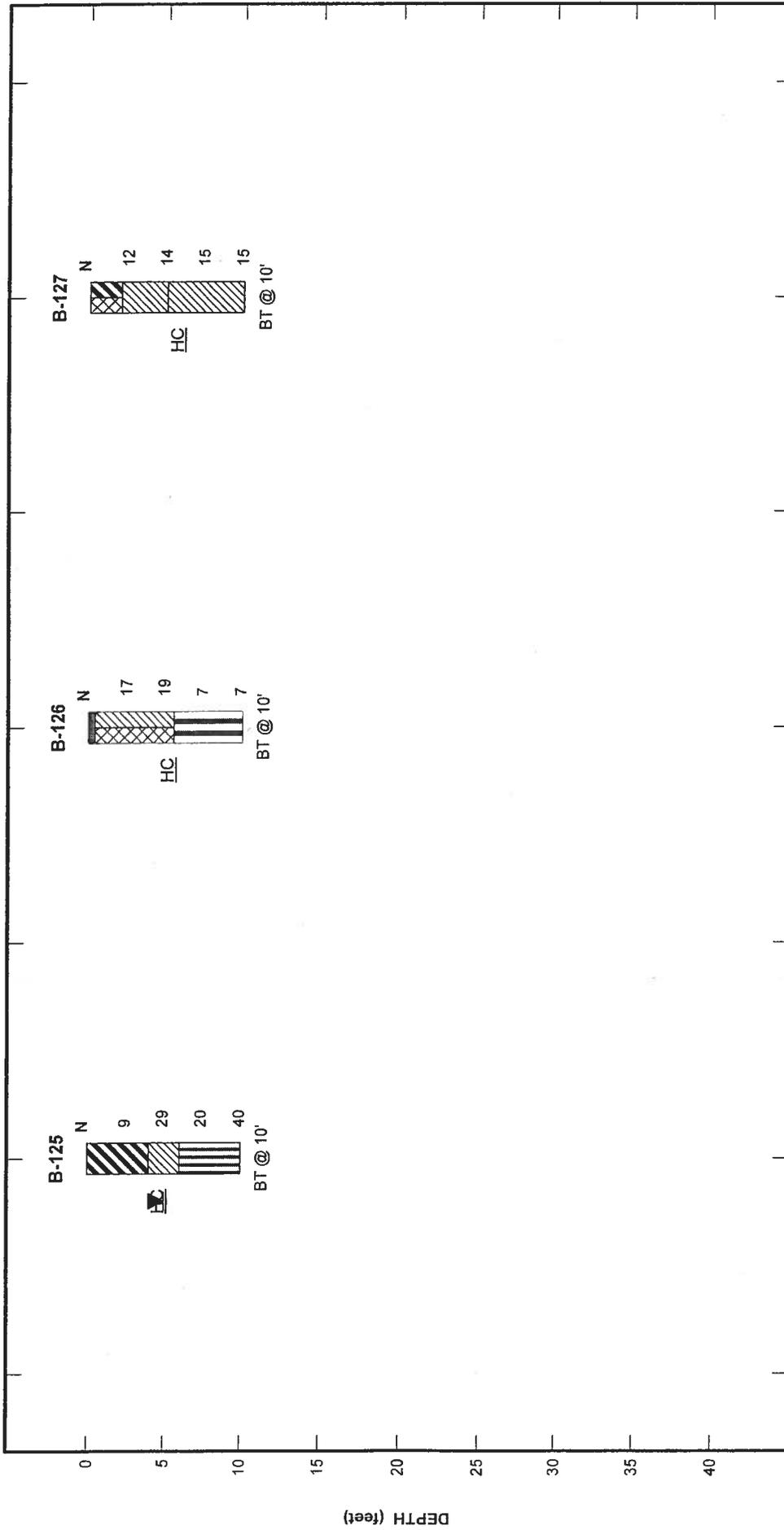
3201 SPRING FOREST ROAD
 RALEIGH, NORTH CAROLINA 27616

Diagram: GREEN LEVEL TO DURHAM ROAD
 Project: Jordan Lake WRRP Phase II
 Location: Wake County, North Carolina

Figure 2G



GENERALIZED SUBSURFACE CONDITIONS



-  CH, High Plasticity Clay
-  MH, High Plasticity Silt
-  CL, Low Plasticity Clay
-  ML, Low Plasticity Silt
-  Topsoil

N = Standard Penetration Test resistance value (blows per foot). The depicted stratigraphy is shown for illustrative purposes only. The actual subsurface conditions will vary between boring locations.

JOB NO: 1051-06-265

DATE: 3/18/08

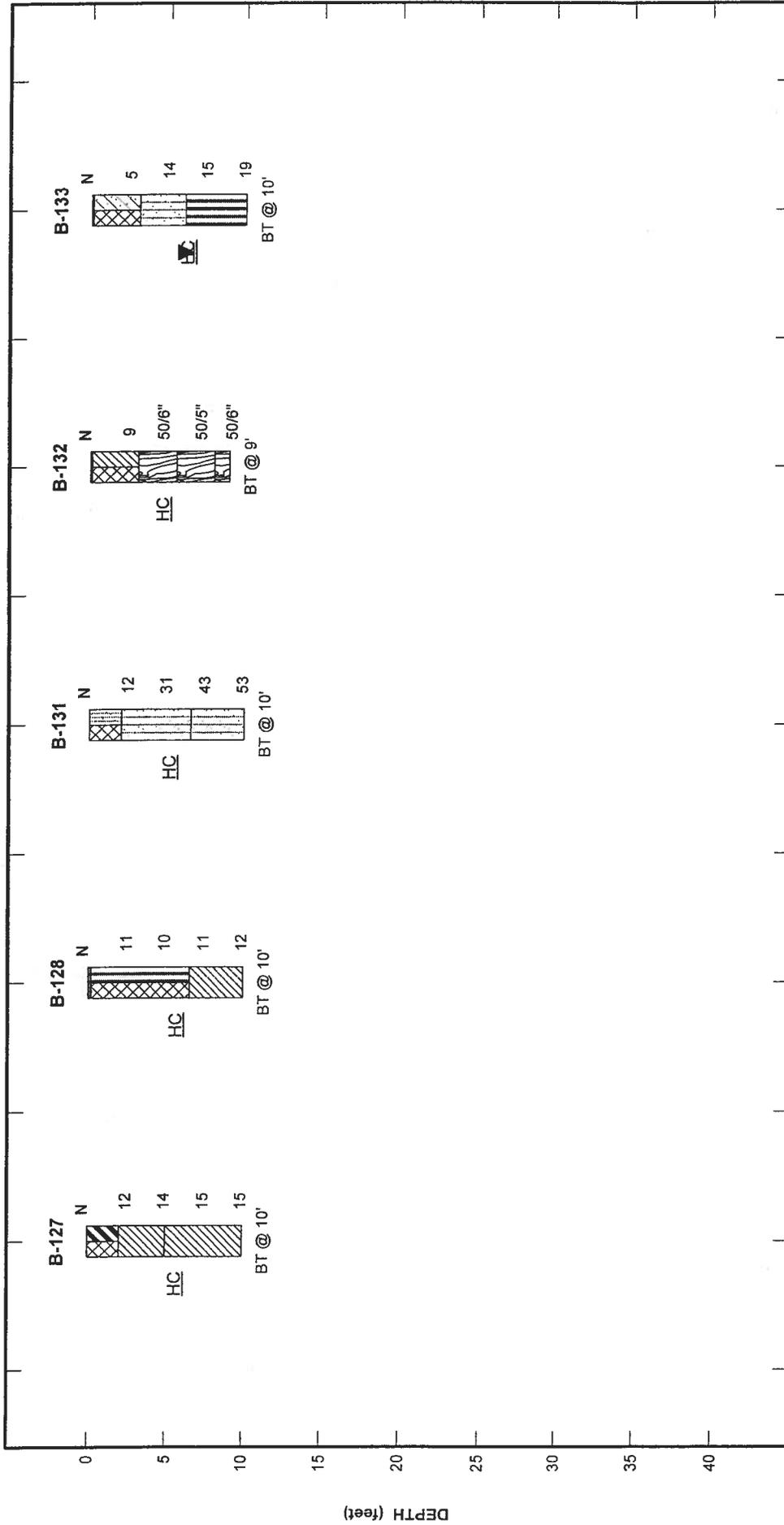
3201 SPRING FOREST ROAD
 RALEIGH, NORTH CAROLINA 27616

Diagram: GREEN LEVEL CHURCH ROAD
 Project: Jordan Lake WRRP Phase II
 Location: Wake County, North Carolina

Figure
 2H



GENERALIZED SUBSURFACE CONDITIONS



N = Standard Penetration Test resistance value (blows per foot). The depicted stratigraphy is shown for illustrative purposes only. The actual subsurface conditions will vary between boring locations.

JOB NO: 1051-06-265

DATE: 3/18/08

3201 SPRING FOREST ROAD
 RALEIGH, NORTH CAROLINA 27616

Diagram: THOMAS BROOKS PARK
 Project: Jordan Lake WRRP Phase II
 Location: Wake County, North Carolina





Jordan Lake Water Reclamation and Reuse Project - Phase II
Wake County, North Carolina
S&ME Project Number 1051-06-265

Depths to Partially Weathered Rock (PWR) and Auger Refusal

Boring Location	Approximate Depth to PWR (ft.)	Approximate Depth to Auger Refusal (ft.)	Total Depth of Boring (ft.)
B-70	4.5	--	8.7
B-71	6.5	--	8.8
B-72	--	--	10.0
B-73	--	--	10.0
B-74	--	--	10.0
B-75	1.5	--	10.0
B-76	--	--	10.0
B-77	1.5	--	8.9
B-78	--	--	10.0
B-79	5.5	--	9.0
B-80	--	--	10.0
B-81	6.5	--	9.8
B-82	--	--	10.0
B-83	--	--	10.0
B-84	16.0	16.5	16.5
B-85	27.5	--	28.7
B-86	6.5* / 13.0	--	18.7
B-87	3.0	8.0	8.0
B-88	8.0	--	8.7
B-89	9.0	--	9.5
B-90	1.7	--	8.6
B-91	5.5	--	8.9
B-92	--	--	10.0
B-93	1.0	3.0	3.0
B-94	0.3	--	9.5
B-95	4.0	--	8.9
B-96	--	--	10.0
B-97	--	--	10.0
B-98	9.0	--	18.8
B-99	0.4	9.0	9.0
B-100	6.5	--	9.3
B-101	5.5	--	8.7
B-104	5.5	--	8.7
B-105	18.0	--	18.7
B-106	1.5* / 9.0	--	19.0
B-108	--	--	10.0
B-109	--	--	10.0
B-111	--	--	10.0
B-112	4.5*	--	10.0
B-113	3.5	--	8.7
B-114	6.0	--	9.5
B-115	6.0	--	9.2
B-118	6.5	--	9.7
B-119	--	--	10.0
B-121	7.0	--	19.0
B-122	--	--	10.0
B-125	--	--	10.0
B-126	--	--	10.0
B-127	--	--	10.0
B-128	--	--	10.0
B-131	--	--	10.0
B-132	3.0	--	9.0
B-133	--	--	10.0

SPT = Standard Penetration Test Boring (ASTM D 1586)

-- = Partially Weathered Rock or Auger refusal not encountered

* = Layer of partially weathered rock underlain by residual soils

LEGEND TO SOIL CLASSIFICATION AND SYMBOLS

SOIL TYPES

(Shown in Graphic Log)



Fill



Asphalt



Concrete



Topsoil



Gravel



Sand



Silt



Clay



Organic



Silty Sand



Clayey Sand



Sandy Silt



Clayey Silt



Sandy Clay



Silty Clay



Partially Weathered Rock



Cored Rock

WATER LEVELS

(Shown in Water Level Column)

- = Water Level At Termination of Boring
- = Water Level Taken After 24 Hours
- = Loss of Drilling Water
- HC = Hole Cave

CONSISTENCY OF COHESIVE SOILS

<u>CONSISTENCY</u>	<u>STD. PENETRATION RESISTANCE BLOWS/FOOT</u>
Very Soft	0 to 2
Soft	3 to 4
Firm	5 to 8
Stiff	9 to 15
Very Stiff	16 to 30
Hard	31 to 50
Very Hard	Over 50

RELATIVE DENSITY OF COHESIONLESS SOILS

<u>RELATIVE DENSITY</u>	<u>STD. PENETRATION RESISTANCE BLOWS/FOOT</u>
Very Loose	0 to 4
Loose	5 to 10
Medium Dense	11 to 30
Dense	31 to 50
Very Dense	Over 50

SAMPLER TYPES

(Shown in Samples Column)

- Shelby Tube
- Split Spoon
- Rock Core
- No Recovery

TERMS

Standard Penetration Resistance - The Number of Blows of 140 lb. Hammer Falling 30 in. Required to Drive 1.4 in. I.D. Split Spoon Sampler 1 Foot. As Specified in ASTM D-1588.

REC - Total Length of Rock Recovered in the Core Barrel Divided by the Total Length of the Core Run Times 100%.

RQD - Total Length of Sound Rock Segments Recovered that are Longer Than or Equal to 4" (mechanical breaks excluded) Divided by the Total Length of the Core Run Times 100%.



PROJECT: **Jordan Lake WRRP Phase II
Wake County, North Carolina**
S&ME Project No. 1051-06-265

BORING LOG B-70

DATE DRILLED: 2/19/08
 DRILL RIG: Diedrich D-50
 DRILLER: A. Martin
 HAMMER TYPE: Automatic

ELEVATION:
 BORING DEPTH: 8.7 ft
 WATER LEVEL: Dry@TOB
 LOGGED BY: B. Keaney

NOTES: Boring location is approximate.
 Standard penetration testing (SPT) performed
 with autohammer. Reported SPT results are
 uncorrected.

SAMPLING METHOD: Split spoon

DRILLING METHOD: 2 1/4" H.S.A.

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL ELEVATION (feet)	SAMPLE NO. SPT REC. (in.) SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE	
					1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	/ CORE REMARKS					
								10	20	30	60	80	
0 - 5		SANDY CLAY (CL), stiff, brown, moist, (FILL)		3	4	5							9
5 - 5.4		SANDY SILT (ML), hard, reddish tan, moist, (RESIDUUM)		9	20	50/4"							50/4"
5.4 - 5.6		SANDY CLAY (CL), reddish brown, moist to dry, (PARTIALLY WEATHERED ROCK)	HC	50/6"									50/6"
5.6 - 8.7		SILTY SAND (SM), reddish tan, dry, fine grained, (PARTIALLY WEATHERED ROCK) Boring terminated at 8.7 feet		50/3"									50/3"

S&ME BORING LOG 265 PHASE II.GPJ S&ME.GDT 3/17/08

- NOTES:**
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 - BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.
 - STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 - WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



PROJECT: **Jordan Lake WRRP Phase II
Wake County, North Carolina**
S&ME Project No. 1051-06-265

BORING LOG B-71

DATE DRILLED: **2/19/08** ELEVATION:
 DRILL RIG: **CME-550x** BORING DEPTH: **8.8 ft**
 DRILLER: **R. Norwood** WATER LEVEL: **Dry@TOB**
 HAMMER TYPE: **Automatic** LOGGED BY: **B. Keaney**

NOTES: **Boring location is approximate.
Standard penetration testing (SPT) performed
with autohammer. Reported SPT results are
uncorrected.**

SAMPLING METHOD: **Split spoon** NORTHING: EASTING:

DRILLING METHOD: **3/4" H.S.A.**

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO. SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE	
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	/ CORE REMARKS					
											10	20	30	60/80	
		(TOPSOIL)													
		SANDY CLAY (CL), hard, brown, dry, (RESIDUUM)			4		10	15							25
5		SANDY SILT (ML), very hard, reddish brown, dry, (RESIDUUM)			9		14	32							46
		SANDY SILT (ML), reddish brown, dry, (PARTIALLY WEATHERED ROCK)	HC		27		50/6"								50/6"
		Boring terminated at 8.8 feet					50/4"								50/4"

S&ME BORING LOG 265 PHASE II.GPJ S&ME.GDT 3/17/08

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 3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



PROJECT: **Jordan Lake WRRP Phase II
Wake County, North Carolina**
S&ME Project No. 1051-06-265

BORING LOG B-72

DATE DRILLED: **2/19/08** ELEVATION:
 DRILL RIG: **Diedrich D-50** BORING DEPTH: **10.0 ft**
 DRILLER: **A. Martin** WATER LEVEL: **Dry@TOB**
 HAMMER TYPE: **Automatic** LOGGED BY: **B. Keaney**

NOTES: **Boring location is approximate.
Standard penetration testing (SPT) performed
with autohammer. Reported SPT results are
uncorrected.**

SAMPLING METHOD: **Split spoon** NORTHING: EASTING:

DRILLING METHOD: **2 1/4" H.S.A.**

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL ELEVATION (feet)	SAMPLE NO. SPT REC. (in.) SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE	
					1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	/ CORE REMARKS					
								10	20	30	60	80	
5		SANDY CLAY (CL), firm, reddish brown, with gravel, wet, (FILL)		2	2	3							5
5		SILTY SAND (SM), medium dense, purpleish red, moist, fine grained, (FILL)		6	6	6							12
		SANDY SILT (ML), very stiff, reddish brown, moist, (FILL)	HC	4	5	7							12
10		SILTY CLAY (CH), stiff, tan, moist to wet, (FILL)		4	4	5							9
10		Boring terminated at 10 feet											

S&ME BORING LOG 265 PHASE II.GPJ S&ME.GDT 3/17/08

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4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



DATE DRILLED: 2/14/08	ELEVATION:
DRILL RIG: CME-550x	BORING DEPTH: 10.0 ft
DRILLER: R. Norwood	WATER LEVEL: Dry@TOB
HAMMER TYPE: Automatic	LOGGED BY: B. Keaney
SAMPLING METHOD: Split spoon	NORTHING:
	EASTING:

NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.

DRILLING METHOD: 3/4" H.S.A.

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO	SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE
								1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	/ CORE REMARKS				
											10	20	30	60	80
0	(TOPSOIL)														
1		SILTY SAND (SM), medium dense, reddish brown, moist, fine grained, (FILL)				7	8	10							
2		SANDY SILT (ML), very stiff, brown, trace organics, moist, (FILL)				5	7	8							
3		SANDY CLAY (CL), stiff to very stiff, reddish brown, with gravel, moist, (FILL)				4	4	6							
4			HC			15	10	6							
10		Boring terminated at 10 feet													

S&ME BORING LOG 265 PHASE II.GPJ S&ME.GDT 3/17/08

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PROJECT: **Jordan Lake WRRP Phase II**
Wake County, North Carolina
 S&ME Project No. 1051-06-265

BORING LOG B-74

DATE DRILLED: 2/19/08
 DRILL RIG: Diedrich D-50
 DRILLER: A. Martin
 HAMMER TYPE: Automatic

ELEVATION:
 BORING DEPTH: 10.0 ft
 WATER LEVEL: Dry@TOB
 LOGGED BY: B. Keaney

NOTES: Boring location is approximate.
 Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.

SAMPLING METHOD: Split spoon

NORTHING: EASTING:

DRILLING METHOD: 2 1/4" H.S.A.

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE
								1st 6in / RUN #	2nd 6in / REC	3rd 6in / ROD	/ CORE REMARKS				
											10	20	30	6080	
0 - 1		SANDY SILT (ML), stiff, brown and tan, moist, (FILL)						3	4	7					11
1 - 5		SANDY CLAY (CL), firm, reddish brown, moist, (FILL)						3	3	3					6
5 - 8			HC					5	5	6					11
8 - 10		SILTY SAND (SM), medium dense, tannish red, moist, (FILL)						6	5	4					9
10		Boring terminated at 10 feet													

NOTES:

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- STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
- WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



S&ME BORING LOG 265 PHASE II.GPJ S&ME.GDT 3/17/08

DATE DRILLED: 2/19/08	ELEVATION:
DRILL RIG: Diedrich D-50	BORING DEPTH: 10.0 ft
DRILLER: A. Martin	WATER LEVEL: Dry@TOB
HAMMER TYPE: Automatic	LOGGED BY: B. Keaney

NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.

SAMPLING METHOD: Split spoon NORTHING: EASTING:

DRILLING METHOD: 2 1/4" H.S.A.

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO. SPT REC. (ft.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE	
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	/ CORE REMARKS					
										10	20	30	60	80	
0 - 1	[Cross-hatched]	SANDY SILT (ML), stiff, reddish tan, moist, (FILL)					4	5	6						11
1 - 5	[Diagonal lines]	SANDY CLAY (CL), very stiff, tan, moist, (FILL)					4	7	9						16
5 - 7	[Cross-hatched]	SANDY SILT (ML), very stiff, reddish tan, moist, (FILL)	HC				9	7	9						16
7 - 10	[Diagonal lines]	SANDY CLAY (CH), very stiff, tan, trace roots, moist, (FILL)					7	7	7						14
10		Boring terminated at 10 feet													

S&ME BORING LOG 265 PHASE II.GPJ S&ME.GDT 3/17/08

NOTES:

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3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



PROJECT: **Jordan Lake WRRP Phase II
Wake County, North Carolina**
S&ME Project No. 1051-06-265

BORING LOG B-77

DATE DRILLED: 2/19/08 ELEVATION:
 DRILL RIG: CME-550x BORING DEPTH: 8.9 ft
 DRILLER: R. Norwood WATER LEVEL: Dry@TOB
 HAMMER TYPE: Automatic LOGGED BY: B. Keaney

NOTES: Boring location is approximate.
 Standard penetration testing (SPT) performed
 with autohammer. Reported SPT results are
 uncorrected.

SAMPLING METHOD: Split spoon NORTHING: EASTING:

DRILLING METHOD: 3/4" H.S.A.

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO. SPT REC. (in.) SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE	
						1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	/ CORE REMARKS					
									10	20	30	60	80	
		(TOPSOIL)												
		SANDY SILT (ML), tannish gray, dry, (RESIDUUM)				30	50/4"							50/4"
		SANDY SILT (ML), tannish gray, dry, (PARTIALLY WEATHERED ROCK)				50/6"								50/6"
5		SANDY CLAY (CL), brownish gray, moist to dry, (PARTIALLY WEATHERED ROCK)				50/4"								50/4"
		SANDY SILT (ML), tan, moist to dry, (PARTIALLY WEATHERED ROCK)	HC			50/4"								50/4"
		SANDY CLAY (CL), reddish brown, moist to dry, (PARTIALLY WEATHERED ROCK)				50/4"								50/4"
		Boring terminated at 8.9 feet												

S&ME BORING LOG 265 PHASE II.GPJ S&ME GDT 3/17/08

NOTES:

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3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



DATE DRILLED: 2/19/08	ELEVATION:
DRILL RIG: Diedrich D-50	BORING DEPTH: 10.0 ft
DRILLER: A. Martin	WATER LEVEL: Dry@TOB
HAMMER TYPE: Automatic	LOGGED BY: B. Keaney

NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.

SAMPLING METHOD: Split spoon NORTHING: EASTING:

DRILLING METHOD: 2 1/4" H.S.A.

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE
								1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	/ CORE REMARKS				
											10	20	30	6080	
0 - 4		SILTY SAND (SM), loose, tannish green, with gravel, moist, (FILL)				2		3	3						6
4 - 5		SANDY SILT (ML), very soft, grayish tan, with gravel, trace organics, moist, (FILL)				3		1	1						2
5 - 10		SANDY CLAY (CL), hard, tan, moist, (RESIDUUM)	HC			6		12	14						26
10		Boring terminated at 10 feet				13		14	16						30

NOTES:

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- STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
- WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



S&ME BORING LOG 265 PHASE II LGPJ S&ME.GDT 3/17/08

PROJECT:

Jordan Lake WRRP Phase II
Wake County, North Carolina
 S&ME Project No. 1051-06-265

BORING LOG B-79

DATE DRILLED: 2/19/08	ELEVATION:	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILL RIG: Diedrich D-50	BORING DEPTH: 9.0 ft	
DRILLER: A. Martin	WATER LEVEL: Dry@TOB	
HAMMER TYPE: Automatic	LOGGED BY: B. Keaney	
SAMPLING METHOD: Split spoon		NORTHING:
DRILLING METHOD: 2 1/4" H.S.A.		EASTING:

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			REMARKS	N VALUE
								1st 6in / RUN #	2nd 6in / REC	3rd 6in / ROD		
5		SANDY CLAY (CL), stiff, reddish brown, trace roots, moist, (FILL)						4	3	4		7
		SANDY CLAY (CL), firm, tan, with gravel, moist, (FILL)						3	3	3		6
		SANDY CLAY (CL), reddish tan, dry, (PARTIALLY WEATHERED ROCK)	HC					27	50/6"			50/6"
		Boring terminated at 9 feet						50/6"				50/6"

S&ME BORING LOG 265 PHASE II.GPJ S&ME.GDT 3/18/08

- NOTES:**
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 - STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 - WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



DATE DRILLED: 2/19/08	ELEVATION:
DRILL RIG: Diedrich D-50	BORING DEPTH: 10.0 ft
DRILLER: A. Martin	WATER LEVEL: Dry@TOB
HAMMER TYPE: Automatic	LOGGED BY: B. Keaney

NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.

SAMPLING METHOD: Split spoon NORTHING: EASTING:

DRILLING METHOD: 2 1/4" H.S.A.

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO. SPT REC. (ft.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE	
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	/ CORE REMARKS					
0 - 1	[Hatched pattern]	SANDY CLAY (CL), stiff, reddish brown, moist, (FILL)			7	CL	7	5	5						10
1 - 4	[Diagonal hatched pattern]	SILTY CLAY (CH), firm, grayish tan, moist, (FILL)			2	CH	2	2	2						4
4 - 6	[Horizontal hatched pattern]	SANDY SILT (ML), stiff, grayish black, some organics, moist, (FILL)	HC		3	ML	2	5	5						7
6 - 10	[Vertical hatched pattern]	SILTY SAND (SM), loose, tannish gray, moist, fine grained, (FILL)			6	SM	5	3	3						8
10		Boring terminated at 10 feet													

NOTES:

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3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



S&ME BORING LOG 265 PHASE II.GPJ S&ME.GDT 3/17/08

PROJECT: **Jordan Lake WRRP Phase II**
Wake County, North Carolina
 S&ME Project No. 1051-06-265

BORING LOG B- 81

DATE DRILLED: **2/19/08** ELEVATION:
 DRILL RIG: **Diedrich D-50** BORING DEPTH: **9.8 ft**
 DRILLER: **A. Martin** WATER LEVEL: **6.0' After 24 Hrs, Dry@TOB**
 HAMMER TYPE: **Automatic** LOGGED BY: **B. Keaney**

NOTES: **Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.**

SAMPLING METHOD: **Split spoon** NORTHING: EASTING:

DRILLING METHOD: **2 1/4" H.S.A.**

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO. SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE	
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	/ CORE REMARKS					
											10	20	30	6080	
0 - 1.5		SANDY CLAY (CL), very stiff, reddish brown, moist, (FILL)					10	9	6						15
1.5 - 3.5		CLAYEY SILT (MH), stiff, reddish brown, moist, (FILL)					4	4	4						8
3.5 - 4.5		SANDY CLAY (CL), hard, maroon gray, moist to dry, (RESIDUUM)	HC				21	38	50/5'						50/5"
4.5 - 9.8		SANDY CLAY (CL), maroon gray, dry, (PARTIALLY WEATHERED ROCK)					34	35	50/3'						50/3"
		Boring terminated at 9.8 feet													

NOTES:

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3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
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S&ME BORING LOG 265 PHASE II.GPJ S&ME.GDT 3/17/08

DATE DRILLED: 2/20/08	ELEVATION:
DRILL RIG: Diedrich D-50	BORING DEPTH: 10.0 ft
DRILLER: A. Martin	WATER LEVEL: Dry@TOB
HAMMER TYPE: Automatic	LOGGED BY: B. Keaney

NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected. Boring offset 22 feet from original location.

SAMPLING METHOD: Split spoon	NORTHING:	EASTING:
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DRILLING METHOD: 2 1/4" H.S.A.

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO. SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	/ CORE REMARKS				
										10	20	30	6080	
0 - 5		SANDY SILT (ML), firm, tan, moist, (FILL)					3	2	3					5
5 - 8		CLAYEY SAND (SC), loose, gray, moist, (FILL)					3	3	5					8
8 - 10		SANDY CLAY (CH), very stiff, tannish gray, moist, (RESIDUUM)	HC				3	4	10					14
10 - 48		SANDY CLAY (CL), very hard, reddish gray, moist to dry, (RESIDUUM) Boring terminated at 10 feet					7	15	33					48

NOTES:

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- STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
- WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



S&ME BORING LOG 265 PHASE II.GPJ S&ME.GDT 3/17/08

PROJECT: **Jordan Lake WRRP Phase II
Wake County, North Carolina**
S&ME Project No. 1051-06-265

BORING LOG B- 83

DATE DRILLED: 2/19/08
 DRILL RIG: Diedrich D-50
 DRILLER: A. Martin
 HAMMER TYPE: Automatic

ELEVATION:
 BORING DEPTH: 10.0 ft
 WATER LEVEL: Dry@TOB
 LOGGED BY: B. Keaney

NOTES: Boring location is approximate.
 Standard penetration testing (SPT) performed
 with autohammer. Reported SPT results are
 uncorrected.

SAMPLING METHOD: Split spoon

NORTHING:
 EASTING:

DRILLING METHOD: 2 1/4" H.S.A.

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO. SPT REC. (in.) SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE	
						1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	/ CORE REMARKS					
									10	20	30	60	80	
0 - 5		CLAYEY SAND (SC), medium dense, gray, moist, (FILL)			4	5	6							11
5 - 10		SILTY CLAY (CH), stiff, tannish gray, moist, (FILL)			3	4	6							10
10		SANDY CLAY (CL), hard, reddish brown, moist to dry, (RESIDUUM)	HC		4	4	6							10
10		Boring terminated at 10 feet			6	12	19							31

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S&ME BORING LOG 265 PHASE II.GPJ S&ME.GDT 3/17/08

PROJECT: **Jordan Lake WRRP Phase II
Wake County, North Carolina**
S&ME Project No. 1051-06-265

BORING LOG B- 84

DATE DRILLED: 2/20/08
 DRILL RIG: Diedrich D-50
 DRILLER: A. Martin
 HAMMER TYPE: Automatic

ELEVATION:
 BORING DEPTH: 16.5 ft
 WATER LEVEL: 4.5'@TOB
 LOGGED BY: B. Keaney

NOTES: Boring location is approximate.
 Standard penetration testing (SPT) performed
 with autohammer. Reported SPT results are
 uncorrected.

SAMPLING METHOD: Split spoon NORTHING: EASTING:

DRILLING METHOD: 2 1/4" H.S.A.

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO. SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE	
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	/ CORE REMARKS					
										10	20	30	60	80	
0 - 5		SANDY SILT (ML), firm to very soft, brown, moist to wet, (FILL)					2	3	3						6
5 - 10		SILTY SAND (SW-SM), very loose, tannish gray, wet, fine to coarse grained, (ALLUVIUM)	4.5'				3	1	1						2
10 - 15							1	1	2						3
15 - 16.5							2	2	2						4
15 - 16.5		SANDY SILT (ML), very hard, maroon gray, moist, (RESIDIUM)					18	23	43						66
16.5 - 50/0"		SANDY SILT (ML), maroon gray, dry, (PARTIALLY WEATHERED ROCK) Auger refusal at 16.5 feet Boring terminated at 16.5 feet					50/0"								50/0"

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S&ME BORING LOG 265 PHASE II.GPJ S&ME.GDT 3/17/08

PROJECT:

Jordan Lake WRRP Phase II
Wake County, North Carolina
 S&ME Project No. 1051-06-265

BORING LOG B-85

DATE DRILLED: 2/28/08	ELEVATION:	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILL RIG: CME-550x	BORING DEPTH: 28.7 ft	
DRILLER: K. Richardson	WATER LEVEL: 12.5'@TOB	
HAMMER TYPE: Automatic	LOGGED BY: B. Keaney	
SAMPLING METHOD: Split spoon		NORTHING:
DRILLING METHOD: 3/4" H.S.A.		EASTING:

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO. SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	10	20	30	60/80	
0 - 1	[Pattern]	CLAYEY SAND (SC), loose, gray, with gravel, moist, (FILL)				3	2	2						4
1 - 2	[Pattern]	SILTY CLAY (CH), stiff, dark brown, trace sand, some organics, moist to wet, (FILL)				2	3	4						7
2 - 3	[Pattern]	SANDY SILT (ML), stiff, dark brown, moist, (FILL)				4	4	5						9
3 - 4	[Pattern]	CLAYEY SILT (MH), stiff, tannish gray, moist to wet, (ALLUVIUM)				4	4	4						8
4 - 10	[Pattern]	CLAYEY SAND (SC), loose, gray, with roots, wet, (ALLUVIUM)	HC			2	2	2						4
10 - 15	[Pattern]													
15 - 20	[Pattern]													
20 - 25	[Pattern]													
25 - 28.7	[Pattern]	SILTY SAND (SM), reddish brown, dry, (PARTIALLY WEATHERED ROCK)												
28.7		Boring terminated at 28.7 feet												

S&ME BORING LOG 265 PHASE II.GPJ S&ME.GDT 3/17/08

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PROJECT: **Jordan Lake WRRP Phase II
Wake County, North Carolina**
S&ME Project No. 1051-06-265

BORING LOG B- 86

DATE DRILLED: **2/20/08** ELEVATION: **~ 341**
 DRILL RIG: **Diedrich D-50** BORING DEPTH: **18.7 ft**
 DRILLER: **A. Martin** WATER LEVEL: **Dry@TOB**
 HAMMER TYPE: **Automatic** LOGGED BY: **B. Keaney**

NOTES: **Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.**

SAMPLING METHOD: **Split spoon** NORTHING: EASTING:
 DRILLING METHOD: **2 1/4" H.S.A.**

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO. SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE	
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / ROD	/ CORE REMARKS					
										10	20	30	60	80	
0 - 2		SILTY SAND (SM), medium dense, brown, with gravel, moist, (FILL)		340			11	11	9						20
2 - 5		SILTY SAND (SM), dense, tan, moist, (RESIDUUM)		336			14	13	17						30
5 - 8		SILTY SAND (SM), tannish gray, moist to dry, (PARTIALLY WEATHERED ROCK)					21	50/5"							50/5"
8 - 10		SANDY SILT (ML), very hard, maroon gray, moist, (RESIDUUM)		321			12	21	26						47
10 - 15		SANDY CLAY (CL), reddish brown, moist to dry, (PARTIALLY WEATHERED ROCK)	HC	328 326			50/6"								50/6"
15 - 18.7		Boring terminated at 18.7 feet		326			50/3"								50/3"

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S&ME BORING LOG 265 PHASE II.GPJ S&ME.GDT 3/17/08

DATE DRILLED: 2/19/08
 DRILL RIG: CME-550x
 DRILLER: R. Norwood
 HAMMER TYPE: Automatic

ELEVATION: 344
 BORING DEPTH: 8.0 ft
 WATER LEVEL: 6.9' After 24 Hrs, Dry@TOB
 LOGGED BY: B. Keaney

NOTES: Boring location is approximate.
 Standard penetration testing (SPT) performed
 with autohammer. Reported SPT results are
 uncorrected.

SAMPLING METHOD: Split spoon NORTHING: EASTING:

DRILLING METHOD: 3/4" H.S.A.

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO. SPT REC. (in.) SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft) / CORE REMARKS				N VALUE	
						1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	10	20	30	60/80		
0 - 1		(TOPSOIL)												
1 - 3		SILTY CLAY (CL), very stiff, reddish brown, trace sand, moist, (RESIDUUM)				7	8	11						19
3 - 5		SILTY CLAY (CL), reddish brown, trace sand, moist to dry, (PARTIALLY WEATHERED ROCK)				50/3"								50/3"
5 - 8		Auger refusal at 8 feet Boring terminated at 8 feet				50/2"								50/2"

S&ME BORING LOG 265 PHASE II.GPJ S&ME.GDT 3/17/08

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PROJECT:

Jordan Lake WRRP Phase II
Wake County, North Carolina
S&ME Project No. 1051-06-265

BORING LOG B-88

DATE DRILLED: 2/19/08

ELEVATION: 345

NOTES: Boring location is approximate.
Standard penetration testing (SPT) performed
with autohammer. Reported SPT results are
uncorrected.

DRILL RIG: CME-550x

BORING DEPTH: 8.7 ft

DRILLER: R. Norwood

WATER LEVEL: Dry@TOB

HAMMER TYPE: Automatic

LOGGED BY: B. Keaney

SAMPLING METHOD: Split spoon

NORTHING:

EASTING:

DRILLING METHOD: 3/4" H.S.A.

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO. SPT REC. (in.) SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE	
						1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	/ CORE REMARKS					
									10	20	30	60	80	
		(TOPSOIL)												
		SILTY SAND (SM), very dense to medium dense, reddish gray, moist to dry, fine grained, (RESIDUUM)				10	23	21						44
5						12	14	27						41
			HC			9	7	7						14
		SILTY SAND (SM), reddish gray, moist, fine grained, (PARTIALLY WEATHERED ROCK)				50/3"								50/3"
		Boring terminated at 8.7 feet												

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3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



S&ME BORING LOG 265 PHASE II.GPJ S&ME.GDT 3/17/08

PROJECT: **Jordan Lake WRRP Phase II
Wake County, North Carolina**
S&ME Project No. 1051-06-265

BORING LOG B- 89

DATE DRILLED: **2/20/08** ELEVATION: **345**
 DRILL RIG: **CME-550x** BORING DEPTH: **9.5 ft**
 DRILLER: **K. Richardson** WATER LEVEL: **Dry@TOB**
 HAMMER TYPE: **Automatic** LOGGED BY: **B. Keaney**

NOTES: Boring location is approximate.
Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.

SAMPLING METHOD: **Split spoon** NORTHING: EASTING:

DRILLING METHOD: **3/4" H.S.A.**

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO. SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE	
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / ROD	/ CORE REMARKS					
											10	20	30	60	80
		SILTY CLAY (CH), light brown, moist, (FILL)													
		SANDY CLAY (CL), hard to very hard, brown, moist, (RESIDUUM)													
5		SILTY SAND (SM), medium dense, reddish gray, moist to dry, fine grained, (RESIDUUM)	HC		34		5	10	17						27
		SILTY SAND (SM), reddish gray, moist to dry, fine grained, (PARTIALLY WEATHERED ROCK)					15	17	33						50
							7	9	10						19
					33C		23	50/6"							50/6"
		Boring terminated at 9.5 feet													

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3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



S&ME BORING LOG 265 PHASE II.GPJ S&ME.GDT 3/17/08

PROJECT: **Jordan Lake WRRP Phase II**
Wake County, North Carolina
 S&ME Project No. 1051-06-265

BORING LOG B-90

DATE DRILLED: 2/20/08
 DRILL RIG: CME-550x
 DRILLER: K. Richardson
 HAMMER TYPE: Automatic

ELEVATION: 334
 BORING DEPTH: 8.6 ft
 WATER LEVEL: Dry@TOB
 LOGGED BY: B. Keaney

NOTES: Boring location is approximate.
 Standard penetration testing (SPT) performed
 with autohammer. Reported SPT results are
 uncorrected. Bulk sample obtained from 1 to 10
 feet.

SAMPLING METHOD: Split spoon NORTHING: EASTING:

DRILLING METHOD: 3/4" H.S.A.

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO. SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE	
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / ROD	/ CORE REMARKS					
										10	20	30	60	80	
		SANDY CLAY (CH), reddish brown, moist, (FILL)													
		SANDY SILT (ML), brown, moist, (PARTIALLY WEATHERED ROCK)			32.25	3	50/6"								50/6"
		SANDY CLAY (CL), gray to reddish gray, with rock fragments, moist to dry, (PARTIALLY WEATHERED ROCK)	HC		331		50/1"								50/1"
5					330		50/2"								50/2"
							50/1"								50/1"
		Boring terminated at 8.6 feet													

S&ME BORING LOG 265 PHASE II.GPJ S&ME.GDT 3/17/08

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3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



PROJECT: **Jordan Lake WRRP Phase II
Wake County, North Carolina**
S&ME Project No. 1051-06-265

BORING LOG B- 91

DATE DRILLED: 2/20/08
 DRILL RIG: CME-550x
 DRILLER: R. Norwood
 HAMMER TYPE: Automatic

ELEVATION: 318
 BORING DEPTH: 8.9 ft
 WATER LEVEL: Dry@TOB
 LOGGED BY: B. Keaney

NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.

SAMPLING METHOD: Split spoon

NORTHING: EASTING:

DRILLING METHOD: 3/4" H.S.A.

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO. SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE	
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / ROD	/ CORE REMARKS					
											10	20	30	60 80	
		(TOPSOIL)													
		SILTY SAND (SM), medium dense, reddish brown, moist, fine grained, (RESIDUUM)			315	4	5	12							17
5		SANDY CLAY (CL), very hard, brown, moist, (RESIDUUM)	HC		312.5	7	21	37							58
		SANDY CLAY (CL), tannish gray, moist to dry, (PARTIALLY WEATHERED ROCK)			312	50/4"									50/4"
		Boring terminated at 8.9 feet				50/5"									50/5"

NOTES:

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3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



S&ME BORING LOG 265 PHASE II.GPJ S&ME GDT 3/17/08

PROJECT: **Jordan Lake WRRP Phase II**
Wake County, North Carolina
 S&ME Project No. 1051-06-265

BORING LOG B-92

DATE DRILLED: 2/20/08
 DRILL RIG: Diedrich D-50
 DRILLER: A. Martin
 HAMMER TYPE: Automatic

ELEVATION: 790
 BORING DEPTH: 10.0 ft
 WATER LEVEL: Dry@TOB
 LOGGED BY: B. Keaney

NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.

SAMPLING METHOD: Split spoon

NORTHING: EASTING:

DRILLING METHOD: 2 1/4" H.S.A.

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO. SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE	
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / ROD	/ CORE REMARKS					
											10	20	30	60	80
0 - 10		SANDY CLAY (CL), firm to stiff, dark gray and brown, with gravel, moist, (FILL)	HC				3	2	2						
							5	4	3						
							5	6	5						
							5	4	6						
		Boring terminated at 10 feet													

NOTES:

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4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



S&ME BORING LOG 265 PHASE II.GPJ S&ME.GDT 3/17/08

PROJECT: **Jordan Lake WRRP Phase II
Wake County, North Carolina**
S&ME Project No. 1051-06-265

BORING LOG B- 93

DATE DRILLED: 2/20/08
 DRILL RIG: CME-550x
 DRILLER: R. Norwood
 HAMMER TYPE: Automatic

ELEVATION: 305.5
 BORING DEPTH: 3.0 ft
 WATER LEVEL: Dry@TOB
 LOGGED BY: B. Keaney

NOTES: Boring location is approximate.
 Standard penetration testing (SPT) performed
 with autohammer. Reported SPT results are
 uncorrected.

SAMPLING METHOD: Split spoon NORTHING: EASTING:

DRILLING METHOD: 3/4" H.S.A.

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO. SPT REC. (in.) SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE	
						1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	/ CORE REMARKS					
									10	20	30	60	80	
		(TOPSOIL)			304.5									
		SILTY CLAY (CH), brown, moist, (RESIDUUM)			22	50/2"								50/2"
		SILTY SAND (SM), gray, moist to dry, fine grained, (PARTIALLY WEATHERED ROCK)												
		Auger refusal at 3 feet Boring terminated at 3 feet												

S&ME BORING LOG 265 PHASE II.GPJ S&ME.GDT 3/17/08

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 - STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
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PROJECT: **Jordan Lake WRRP Phase II**
Wake County, North Carolina
 S&ME Project No. 1051-06-265

BORING LOG B- 94

DATE DRILLED: 2/20/08
 DRILL RIG: CME-550x
 DRILLER: R. Norwood
 HAMMER TYPE: Automatic

ELEVATION: 327.5
 BORING DEPTH: 9.5 ft
 WATER LEVEL: Dry@TOB
 LOGGED BY: B. Keaney

NOTES: Boring location is approximate.
 Standard penetration testing (SPT) performed
 with autohammer. Reported SPT results are
 uncorrected.

SAMPLING METHOD: Split spoon

NORTHING: EASTING:

DRILLING METHOD: 3/4" H.S.A.

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO. SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / ROD	/ CORE REMARKS				
								10	20	30	60	80		
		(TOPSOIL)			327									
		SANDY CLAY (CL), maroon brown, moist to dry, (PARTIALLY WEATHERED ROCK)	HC			50/6"								50/6"
5						40	50/5"							50/5"
						50/4"								50/4"
						28	50/4"							50/4"
		Boring terminated at 9.5 feet												

NOTES:

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2. BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.
3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



S&ME BORING LOG 265 PHASE II.GPJ S&ME.GDT 3/17/08

PROJECT: **Jordan Lake WRRP Phase II
Wake County, North Carolina**
S&ME Project No. 1051-06-265

BORING LOG B- 95

DATE DRILLED: **2/20/08** ELEVATION: **347.5**
 DRILL RIG: **CME-550x** BORING DEPTH: **8.9 ft**
 DRILLER: **R. Norwood** WATER LEVEL: **4.8' After 24 Hrs, Dry@TOB**
 HAMMER TYPE: **Automatic** LOGGED BY: **B. Keaney**

NOTES: **Boring location is approximate.
Standard penetration testing (SPT) performed
with autohammer. Reported SPT results are
uncorrected.**

SAMPLING METHOD: **Split spoon** NORTHING: EASTING:

DRILLING METHOD: **3/4" H.S.A.**

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO. SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE	
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / RGD	/ CORE REMARKS					
										10	20	30	60	80	
		(TOPSOIL)													
		CLAYEY SILT (MH), firm, brown, moist to wet, (FILL)			345.5	2	2	4							6
		SANDY CLAY (CL), reddish brown, moist to dry, (PARTIALLY WEATHERED ROCK)			342.5	7	50/6"								50/6"
5							50/4"								50/4"
							50/5"								50/5"
		Boring terminated at 8.9 feet													

S&ME BORING LOG 265 PHASE II.GPJ. S&ME.GDT 3/17/08

- NOTES:**
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 - STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
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PROJECT: **Jordan Lake WRRP Phase II**
Wake County, North Carolina
 S&ME Project No. 1051-06-265

BORING LOG B- 96

DATE DRILLED: 2/20/08
 DRILL RIG: Diedrich D-50
 DRILLER: A. Martin
 HAMMER TYPE: Automatic

ELEVATION: 357
 BORING DEPTH: 10.0 ft
 WATER LEVEL: Dry@TOB
 LOGGED BY: B. Keaney

NOTES: Boring location is approximate.
 Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.

SAMPLING METHOD: Split spoon
 NORTHING: EASTING:

DRILLING METHOD: 2 1/4" H.S.A.

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO. SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE	
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	/ CORE REMARKS					
											10	20	30	60 80	
0 - 1		SANDY SILT (ML), very stiff, tan, moist, (FILL)					4	9	13						22
1 - 5		SANDY CLAY (CL), hard, reddish brown, moist to dry, (RESIDUUM)					10	10	15						25
5 - 10		SANDY SILT (ML), very stiff to very hard, tannish red, moist to dry, (RESIDUUM)	HC				10	10	20						30
10		Boring terminated at 10 feet			34		11	17	29						46

- NOTES:**
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 - BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.
 - STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 - WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



S&ME BORING LOG 265 PHASE II GP.1 S&ME.GDT 3/17/08

DATE DRILLED: 2/20/08	ELEVATION: 357	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILL RIG: Diedrich D-50	BORING DEPTH: 10.0 ft	
DRILLER: A. Martin	WATER LEVEL: Dry@TOB	
HAMMER TYPE: Automatic	LOGGED BY: B. Keaney	
SAMPLING METHOD: Split spoon		NORTHING: EASTING:
DRILLING METHOD: 2 1/4" H.S.A.		

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)	N VALUE
								1st 6in / RUN #	2nd 6in / REC	3rd 6in / ROD		
0 - 3		SANDY SILT (ML), stiff, orangeish tan, moist, (FILL)						3	4	6		10
3 - 5		SILTY SAND (SM), medium dense, tan, moist, (RESIDUUM)						6	8	10		18
5 - 7			HC					7	9	13		22
7 - 10								6	8	10		18
10		Boring terminated at 10 feet		347								

- NOTES:**
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S&ME BORING LOG 265 PHASE II.GPJ S&ME.GDT 3/17/08

DATE DRILLED: 2/20/08	ELEVATION: 321
DRILL RIG: CME-550x	BORING DEPTH: 18.8 ft
DRILLER: R. Norwood	WATER LEVEL: Dry@TOB
HAMMER TYPE: Automatic	LOGGED BY: B. Keaney

NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.

SAMPLING METHOD: Split spoon NORTHING: EASTING:

DRILLING METHOD: 3/4" H.S.A.

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO. SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE	
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	/ CORE REMARKS					
										10	20	30	60	80	
0		(TOPSOIL)													
0-3		SILTY CLAY (CH), very stiff, brown, dry to moist, (RESIDUUM)		321	6	6	8	12							20
3-5		SANDY SILT (ML), very hard, tannish yellow, dry, (RESIDUUM)			12	12	19	25							44
5-8		SANDY CLAY (CL), hard, maroon, dry, (RESIDUUM)		315	13	13	13	25							38
8-18.8		SANDY CLAY (CL), maroon, dry, (PARTIALLY WEATHERED ROCK)	HC	312	16	50/6"									50/6"
18.8		Boring terminated at 18.8 feet				50/2"									50/2"
						50/4"									50/4"

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 - STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 - WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



S&ME BORING LOG 265 PHASE II.GPJ S&ME_GDT 3/17/08

PROJECT: **Jordan Lake WRRP Phase II
Wake County, North Carolina**
S&ME Project No. 1051-06-265

BORING LOG B- 99

DATE DRILLED: **2/21/08**
 DRILL RIG: **CME-550x**
 DRILLER: **R. Norwood**
 HAMMER TYPE: **Automatic**

ELEVATION:
 BORING DEPTH: **9.0 ft**
 WATER LEVEL: **Dry@TOB**
 LOGGED BY: **B. Keaney**

NOTES: **Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.**

SAMPLING METHOD: **Split spoon**

NORTHING: EASTING:

DRILLING METHOD: **3/4" H.S.A.**

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO. SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE	
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	/ CORE REMARKS					
							10	20	30	60		80			
0		(TOPSOIL)													
5		SANDY CLAY (CL), brownish gray, dry, (PARTIALLY WEATHERED ROCK)	HC				50/3"								50/3"
							21 50/6"								50/6"
							22 50/6"								50/6"
							50/2"								50/2"
9		Auger refusal at 9 feet Boring terminated at 9 feet													

S&ME BORING LOG 265 PHASE II.GPJ S&ME.GDT 3/17/08

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3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
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PROJECT: **Jordan Lake WRRP Phase II**
Wake County, North Carolina
 S&ME Project No. 1051-06-265

BORING LOG B-101

DATE DRILLED: **2/21/08** ELEVATION:
 DRILL RIG: **Diedrich D-50** BORING DEPTH: **8.7 ft**
 DRILLER: **A. Martin** WATER LEVEL: **0.0' After 24 Hrs, 5.5'@TOB**
 HAMMER TYPE: **Automatic** LOGGED BY: **B. Keaney**

NOTES: **Boring location is approximate.**
Standard penetration testing (SPT) performed
with autohammer. Reported SPT results are
uncorrected.

SAMPLING METHOD: **Split spoon** NORTHING: EASTING:
 DRILLING METHOD: **2 1/4" H.S.A.**

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO. SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft) / CORE REMARKS	N VALUE
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / ROD		
		SANDY SILT (ML), very stiff, tan and gray, moist, (FILL)	HC		4		4	5	8		13
		SANDY CLAY (CL), brown and gray, with rock fragments, moist to wet, (FILL)			50/3"						50/3"
5		SILTY SAND (SM), maroon brown, moist, (PARTIALLY WEATHERED ROCK)			14		14	50/6"			50/6"
		Boring terminated at 8.7 feet			50/3"						50/3"

S&ME BORING LOG 265 PHASE II.GPJ S&ME.GDT 3/17/08

NOTES:

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3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



PROJECT: **Jordan Lake WRRP Phase II
Wake County, North Carolina**
S&ME Project No. 1051-06-265

BORING LOG B-104

DATE DRILLED: 2/21/08
 DRILL RIG: Diedrich D-50
 DRILLER: A. Martin
 HAMMER TYPE: Automatic

ELEVATION:
 BORING DEPTH: 8.7 ft
 WATER LEVEL: Dry@TOB
 LOGGED BY: B. Keaney

NOTES: Boring location is approximate.
 Standard penetration testing (SPT) performed
 with autohammer. Reported SPT results are
 uncorrected.

SAMPLING METHOD: Split spoon NORTHING: EASTING:

DRILLING METHOD: 2 1/4" H.S.A.

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO. SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	/ CORE REMARKS				
5		SANDY CLAY (CL), stiff to very stiff, brownish red, moist, (RESIDUUM)			6	5	5							10
		SANDY CLAY (CL), tannish red, moist to dry, (PARTIALLY WEATHERED ROCK)	HC		5	6	7							13
					50/3"									50/3"
					50/4"									50/4"
		Boring terminated at 8.7 feet												

S&ME BORING LOG 265 PHASE II.GPJ S&ME.GDT 3/17/08

NOTES:

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2. BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.
3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



DATE DRILLED: 2/21/08	ELEVATION:	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILL RIG: CME-550x	BORING DEPTH: 18.7 ft	
DRILLER: R. Norwood	WATER LEVEL: Dry@TOB	
HAMMER TYPE: Automatic	LOGGED BY: B. Keaney	
SAMPLING METHOD: Split spoon		NORTHING:
DRILLING METHOD: 3/4" H.S.A.		EASTING:

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft) / CORE REMARKS	N VALUE
								1st 6in / RUN #	2nd 6in / REC	3rd 6in / ROD		
0		(TOPSOIL)										
0-1		SANDY CLAY (CL), hard, light brown, moist to dry, (FILL)			7	19	16					35
1-5		SILTY SAND (SM), medium dense, tan, trace roots, moist to dry, (FILL)			8	7	6					13
5-7		SANDY CLAY (CH), very stiff, gray, moist, (RESIDUUM)			4	5	9					14
7-10		SANDY CLAY (CL), hard, brown, moist, (RESIDUUM)			5	8	16					24
10-15		SANDY SILT (ML), hard, maroon, moist, (RESIDUUM)	HC		7	14	24					38
15-18.7		SANDY CLAY (CL), reddish brown, dry, (PARTIALLY WEATHERED ROCK) Boring terminated at 18.7 feet			50/3"							50/3"

S&ME BORING LOG 265 PHASE II.CPJ S&ME.GDT 3/17/08

NOTES:

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3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



PROJECT: **Jordan Lake WRRP Phase II
Wake County, North Carolina**
S&ME Project No. 1051-06-265

BORING LOG B-106

DATE DRILLED: **2/21/08** ELEVATION:
 DRILL RIG: **Diedrich D-50** BORING DEPTH: **19.0 ft**
 DRILLER: **A. Martin** WATER LEVEL: **12' After 24 Hrs, Dry@TOB**
 HAMMER TYPE: **Automatic** LOGGED BY: **B. Keaney**

NOTES: **Boring location is approximate.
Standard penetration testing (SPT) performed
with autohammer. Reported SPT results are
uncorrected. Bulk sample obtained from 1 to 6
feet.**

SAMPLING METHOD: **Split spoon** NORTHING: EASTING:

DRILLING METHOD: **2 1/2" H.S.A.**

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO. SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE	
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / ROD	/ CORE REMARKS					
										10	20	30	60	80	
0		SILTY SAND (SM), gray, moist to wet, (RESIDUUM)			6	50/3"									50/3"
1		SILTY SAND (SM), gray, moist to wet, (PARTIALLY WEATHERED ROCK)				50/4"									50/4"
5		SANDY CLAY (CL), very hard, maroon gray, moist, (RESIDUUM)			26	14 28									42
10		SANDY CLAY (CL), reddish brown, moist to dry, (PARTIALLY WEATHERED ROCK)			38	50/3"									50/3"
15			HC			50/4"									50/4"
19		Boring terminated at 19 feet				50/6"									50/6"

S&ME BORING LOG 265 PHASE II GPJ S&ME.GDT 3/17/08

NOTES:

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3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



DATE DRILLED: 2/21/08	ELEVATION:
DRILL RIG: CME-550x	BORING DEPTH: 10.0 ft
DRILLER: R. Norwood	WATER LEVEL: Dry@TOB
HAMMER TYPE: Automatic	LOGGED BY: B. Keaney

NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.

SAMPLING METHOD: Split spoon NORTHING: EASTING:

DRILLING METHOD: 3/4" H.S.A.

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE
								1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	/ CORE REMARKS				
											10	20	30	6080	
0		(TOPSOIL)													
0 - 3		CLAYEY SAND (SC), loose, reddish brown and gray, with gravel, moist to wet, (FILL)				3		4	4						8
3 - 5		CLAYEY SILT (MH), firm, brown, with gravel, wet, (FILL)				2		2	4						6
5 - 10		SANDY SILT (ML), hard, maroon brown, moist, (RESIDUUM)	HC			4		10	21						31
10		Boring terminated at 10 feet				4		7	18						25

NOTES:

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- STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
- WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



S&ME BORING LOG 265 PHASE II.SPJ_S&ME_GDT 3/17/08

PROJECT: **Jordan Lake WRRP Phase II
Wake County, North Carolina**
S&ME Project No. 1051-06-265

BORING LOG B-109

DATE DRILLED: 2/21/08
 DRILL RIG: CME-550x
 DRILLER: R. Norwood
 HAMMER TYPE: Automatic

ELEVATION:
 BORING DEPTH: 10.0 ft
 WATER LEVEL: Dry@TOB
 LOGGED BY: B. Keaney

NOTES: Boring location is approximate.
 Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.

SAMPLING METHOD: Split spoon

DRILLING METHOD: 3/4" H.S.A.

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO. SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE	
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	/ CORE REMARKS					
											10	20	30	60	80
0		(TOPSOIL)													
0 - 5		SANDY SILT (ML), hard to very hard, tannish green and black, moist, (RESIDUUM)													
5			HC												
5 - 6					10	Δ	10	8	16						24
6 - 7					10	Δ	10	16	21						37
7 - 8					17	Δ	17	26	34						60
8 - 9					12	Δ	12	17	24						41
9 - 10		Boring terminated at 10 feet													

S&ME BORING LOG 265 PHASE II.GPJ S&ME_GDT 3/17/08

NOTES:

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PROJECT: **Jordan Lake WRRP Phase II
Wake County, North Carolina**
S&ME Project No. 1051-06-265

BORING LOG B-111

DATE DRILLED: 2/27/08
 DRILL RIG: CME-550x
 DRILLER: K. Richardson
 HAMMER TYPE: Automatic

ELEVATION:
 BORING DEPTH: 10.0 ft
 WATER LEVEL: Dry@TOB
 LOGGED BY: B. Keaney

NOTES: Boring location is approximate.
 Standard penetration testing (SPT) performed
 with autohammer. Reported SPT results are
 uncorrected.

SAMPLING METHOD: Splitt spoon
 NORTHING:
 EASTING:

DRILLING METHOD: 3/4" H.S.A.

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO. SPT REC. (in.) SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE	
						1st 6in / RUN #	2nd 6in / REC	3rd 6in / ROD	/ CORE REMARKS					
									10	20	30	60	80	
5		SILTY SAND (SM), medium dense to dense, tannish gray, moist, (FILL)	HC		3	5	6							11
					7	9	10							19
					7	11	16							27
10		Boring terminated at 10 feet			6	8	9							17

S&ME BORING LOG 265 PHASE II.GPJ S&ME.GDT 3/17/08

- NOTES:**
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 2. BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



DATE DRILLED: 2/27/08	ELEVATION:	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILL RIG: CME-550x	BORING DEPTH: 10.0 ft	
DRILLER: K. Richardson	WATER LEVEL: Dry@TOB	
HAMMER TYPE: Automatic	LOGGED BY: B. Keaney	
SAMPLING METHOD: Split spoon		NORTHING: EASTING:

DRILLING METHOD: 3/4" H.S.A.

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE
								1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	/ CORE REMARKS				
											10	20	30	6080	
0 - 1		SANDY SILT (ML), tannish brown, moist, (FILL)													
1 - 5		SANDY SILT (ML), very stiff, brown, moist, (RESIDUUM)													13
5 - 7		SANDY CLAY (CL), brown, moist to dry, (PARTIALLY WEATHERED ROCK)	HC												50/5"
7 - 10		SANDY CLAY (CL), hard, brown, moist to dry, (RESIDUUM)													50/6"
10		Boring terminated at 10 feet													31

NOTES:

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2. BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.
3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



S&ME BORING LOG 265 PHASE II.GPJ S&ME.GDT 3/17/08

PROJECT: **Jordan Lake WRRP Phase II
Wake County, North Carolina**
S&ME Project No. 1051-06-265

BORING LOG B-113

DATE DRILLED: **2/27/08** ELEVATION:
 DRILL RIG: **CME-550x** BORING DEPTH: **8.7 ft**
 DRILLER: **K. Richardson** WATER LEVEL: **Dry@TOB**
 HAMMER TYPE: **Automatic** LOGGED BY: **B. Keaney**

NOTES: **Boring location is approximate.
Standard penetration testing (SPT) performed
with autohammer. Reported SPT results are
uncorrected. Boring offset 48 feet from original
location.**

SAMPLING METHOD: **Split spoon** NORTHING: EASTING:

DRILLING METHOD: **3/4" H.S.A.**

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO. SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	/ CORE REMARKS				
										10	20	30	60&80	
0 - 5		SANDY CLAY (CL), stiff, brownish gray, moist, (FILL)					2	2	5					7
5 - 8.7		SILTY SAND (SM), gray to reddish gray, moist to dry, fine grained, (PARTIALLY WEATHERED ROCK)	HC				50/5"							50/5"
		Boring terminated at 8.7 feet					50/3"							50/3"
							50/3"							50/3"

S&ME BORING LOG 265 PHASE II.GPJ S&ME.GDT 3/17/08

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3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



DATE DRILLED: 2/21/08	ELEVATION:	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILL RIG: CME-550x	BORING DEPTH: 9.5 ft	
DRILLER: R. Norwood	WATER LEVEL: 0.0' After 24 Hrs, Dry@TOB	
HAMMER TYPE: Automatic	LOGGED BY: B. Keaney	
SAMPLING METHOD: Split spoon		NORTHING:
DRILLING METHOD: 3/4" H.S.A.		EASTING:

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE
								1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	10	20	30	60/80	
		(TOPSOIL)													
		SILTY SAND (SM), loose, gray, wet, (FILL)	HC			3	3	2	2						4
5		SANDY CLAY (CH), firm, tannish gray, wet, (FILL)				3	3	2	2						4
		SANDY SILT (ML), reddish brown, dry, (PARTIALLY WEATHERED ROCK)				50/5	50/5								50/5"
		Boring terminated at 9.5 feet				28	28	50/6	50/6						50/6"

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S&ME BORING LOG 265 PHASE II.GPJ S&ME.GDT 3/17/08

PROJECT:

Jordan Lake WRRP Phase II
Wake County, North Carolina
S&ME Project No. 1051-06-265

BORING LOG B-115

DATE DRILLED: 2/21/08	ELEVATION:	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILL RIG: CME-550x	BORING DEPTH: 9.2 ft	
DRILLER: R. Norwood	WATER LEVEL: Dry@TOB	
HAMMER TYPE: Automatic	LOGGED BY: B. Keaney	
SAMPLING METHOD: Split spoon		NORTHING:
DRILLING METHOD: 3/4" H.S.A.		EASTING:

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO. SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	/ CORE REMARKS				
										10	20	30	60	80
0		(TOPSOIL)												
0.5		SANDY SILT (ML), very hard, maroon gray, dry, (RESIDUUM)			36	32	50							82
1.5		SILTY SAND (SM), dense, tan, dry, fine grained, (RESIDUUM)			11	16	14							30
5.0		SANDY CLAY (CL), maroon, moist to dry, (PARTIALLY WEATHERED ROCK)	HC		18	50/6"								50/6"
8.0		SANDY SILT (ML), brown, moist to dry, (PARTIALLY WEATHERED ROCK)			32	50/2"								50/2"
9.2		Boring terminated at 9.2 feet												

S&ME BORING LOG 265 PHASE II.GPJ S&ME.GDT 3/17/08

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- WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



PROJECT:

**Jordan Lake WRRP Phase II
Wake County, North Carolina**
S&ME Project No. 1051-06-265

BORING LOG B-118

DATE DRILLED: 2/27/08	ELEVATION:	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILL RIG: CME-550x	BORING DEPTH: 9.7 ft	
DRILLER: K. Richardson	WATER LEVEL: Dry@TOB	
HAMMER TYPE: Automatic	LOGGED BY: B. Keaney	
SAMPLING METHOD: Split spoon	NORTHING:	EASTING:
DRILLING METHOD: 3 1/4" H.S.A.		

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			REMARKS	N VALUE
								1st 6in / RUN #	2nd 6in / REC	3rd 6in / ROD		
		SAND (SM), and gravel, (FILL)					▲	12	50/6"			50/6"
		SILTY SAND (SM), very dense, tannish red, moist, fine grained, (RESIDUUM)					▲	20	26	43		69
5		SILTY SAND (SM), reddish brown, dry, fine grained, (PARTIALLY WEATHERED ROCK)					▲	23	32	50/6"		50/6"
		Boring terminated at 9.7 feet					▲	6	20	50/3"		50/3"

S&ME BORING LOG 265 PHASE II.GPJ S&ME.GDT 3/18/08

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- WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



DATE DRILLED: 2/27/08	ELEVATION:	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILL RIG: CME-550x	BORING DEPTH: 10.0 ft	
DRILLER: K. Richardson	WATER LEVEL: Dry@TOB	
HAMMER TYPE: Automatic	LOGGED BY: B. Keaney	

SAMPLING METHOD: **Split spoon** NORTHING: EASTING:

DRILLING METHOD: **3/4" H.S.A.**

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO. SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)			N VALUE
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	/ CORE REMARKS			
										10 20 30 60 80			
5	[Cross-hatched pattern]	SANDY SILT (ML), stiff to very stiff, tannish gray, moist, (FILL)	HC		1	[Sample symbol]	1	3	5		8		
					5	[Sample symbol]	5	10	12		22		
	[Diagonal hatched pattern]	SANDY CLAY (CL), hard, gray, moist, (POSSIBLE FILL)			6	[Sample symbol]	6	11	18		29		
10		Boring terminated at 10 feet			11	[Sample symbol]	11	17	20		37		

S&ME BORING LOG 265 PHASE II.GPJ S&ME_GDT 3/17/08

DATE DRILLED: 2/25/08	ELEVATION:	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILL RIG: CME-550x	BORING DEPTH: 19.0 ft	
DRILLER: K. Richardson	WATER LEVEL: 10' After 24 Hrs, Dry@TOB	
HAMMER TYPE: Automatic	LOGGED BY: B. Keaney	
SAMPLING METHOD: Split spoon		NORTHING: EASTING:
DRILLING METHOD: 3/4" H.S.A.		

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO. SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	/ CORE REMARKS				
										10	20	30	6080	
	[Cross-hatched pattern]	GRAVEL												
	[Horizontal lines pattern]	CLAYEY SILT (MH), stiff, maroon, moist, (FILL)												
5	[Vertical lines pattern]	SANDY SILT (ML), very hard, brownish maroon, moist, (RESIDUUM)					5	3	6					9
	[Vertical lines pattern]	SANDY SILT (ML), maroon gray, moist, (PARTIALLY WEATHERED ROCK)					9	17	25					42
	[Vertical lines pattern]	SANDY SILT (ML), maroon gray, moist, (PARTIALLY WEATHERED ROCK)					16	30	50/6"					50/6"
10	[Wavy lines pattern]	SANDY SILT (ML), maroon gray, moist, (PARTIALLY WEATHERED ROCK)	▼	HC			19	50/6"						50/6"
	[Wavy lines pattern]	SILTY SAND (SM), gray to reddish gray, moist, (PARTIALLY WEATHERED ROCK)					25	50/6"						50/6"
15	[Wavy lines pattern]	SILTY SAND (SM), gray to reddish gray, moist, (PARTIALLY WEATHERED ROCK)					50/6"							50/6"
		Boring terminated at 19 feet					50/6"							50/6"

S&ME BORING LOG - 255 PHASE II.GPJ S&ME.GDT 3/17/08

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 4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.



DATE DRILLED: 2/25/08	ELEVATION:	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected. Bulk sample obtained from 1 to 8.5 feet.
DRILL RIG: CME-550x	BORING DEPTH: 10.0 ft	
DRILLER: K. Richardson	WATER LEVEL: Dry@TOB	
HAMMER TYPE: Automatic	LOGGED BY: B. Keaney	

SAMPLING METHOD: Split spoon	NORTHING:	EASTING:
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DRILLING METHOD: 3/4" H.S.A.

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO.	SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE	
								1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	/ CORE REMARKS					
											10	20	30	60	80	
5	[Diagonal Hatching]	SANDY SILTY CLAY (CH), stiff, light brown, moist, (FILL)			3	5	6									11
5	[Diagonal Hatching]	CLAYEY SAND (SC), medium dense, tan, trace silt, moist to wet, (FILL)			5	8	10									18
10	[Diagonal Hatching]	SANDY CLAY (CL), stiff, tannish gray, moist to wet, (FILL)	HC		5	4	6									10
10		Boring terminated at 10 feet			4	4	6									10

S&ME BORING LOG 265 PHASE II.GPJ S&ME GDT 3/17/08

DATE DRILLED: 2/25/08	ELEVATION:	NOTES: Boring location is approximate. Standard penetration testing (SPT) performed with autohammer. Reported SPT results are uncorrected.
DRILL RIG: CME-550x	BORING DEPTH: 10.0 ft	
DRILLER: K. Richardson	WATER LEVEL: 5' After 24 Hrs, Dry@TOB	
HAMMER TYPE: Automatic	LOGGED BY: B. Keaney	

SAMPLING METHOD: Split spoon	NORTHING:	EASTING:
DRILLING METHOD: 3/4" H.S.A.		

DEPTH (feet)	GRAPHIC LOG	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet)	SAMPLE NO. SPT REC. (in.)	SAMPLE TYPE	BLOW COUNT / CORE DATA			STANDARD PENETRATION TEST DATA (blows/ft)				N VALUE
							1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	/ CORE REMARKS				
							10	20	30	60	80			
5	[Diagonal Hatching]	SILTY CLAY (CH), stiff, tan, trace sand, moist, (POSSIBLE FILL)			4	4	5					9		
5	[Diagonal Hatching]	SANDY CLAY (CL), hard, reddish brown, moist, (RESIDUUM)	[Water Level Icon]		7	12	17					29		
10	[Vertical Stripes]	SANDY SILT (ML), very stiff to very hard, grayish tan, moist, (RESIDUUM)			5	8	12					20		
10		Boring terminated at 10 feet			13	20	20					40		

S&ME BORING LOG 265 PHASE II.GPJ S&ME.GDT 3/17/08

Appendix D – Preliminary Cost Opinion

**WAKE COUNTY
JORDAN LAKE WATER RECLAMATION AND REUSE PHASE 2 RTP SOUTH PROJECT
COST ESTIMATE**

Pay Item No.	Item Description	Unit	Quantity	Unit Price \$	Item Total \$
	Mobilization (Max 5% Base Bid)	LS	1	\$ 124,000	\$ 124,000
	Traffic Control	LS	1	\$ 25,000	\$ 25,000
	Erosion & Sediment Control	LS	1	\$ 50,000	\$ 50,000
	Tree Protection	LF	0	\$ 4	\$ -
	Clearing and Grubbing	AC	1	\$ 8,600	\$ 8,600
	C900 PVC 12-inch Reclaimed Water Pipe	LF	11791	\$ 75	\$ 884,325
	DI 12-inch Reclaimed Water Pipe, RJ	LF	477	\$ 135	\$ 64,395
	Concrete Encasement	CY	35	\$ 500	\$ 17,494
	CIPP Lining of 12" pipe	LF	568	\$ 100	\$ 56,800
	DI Fittings	LBS	5955	\$ 16	\$ 95,280
	12-inch Gate Valves	Ea	18	\$ 5,100	\$ 91,800
	Air Release Valves	Ea	4	\$ 5,425	\$ 21,700
	Blow-off Assembly Type 1	Ea	5	\$ 8,306	\$ 41,532
	Blow-off Assembly Type 2	Ea	2	\$ 4,669	\$ 9,338
	Bore & Jack 20-inch Casing Pipe	LF	283	\$ 450	\$ 127,350
	20-inch Encasement Pipe	LF	283	\$ 140	\$ 39,620
	Horizontal Directional Drill of 12-inch HDPE Pipe	LF	751	\$ 325	\$ 244,075
	HDD Mobilization	EA	2	\$ 5,025	\$ 10,050
	Rock Removal	CY	933	\$ 350	\$ 326,457
	Rock Contingency	LS	1	\$ 108,000	\$ 108,000
	Aggregate Backfill	CY	443	\$ 37	\$ 16,170
	Select Backfill	CY	665	\$ 82.00	\$ 54,489
	Imported Borrow Backfill	CY	100	\$ 50	\$ 5,000
	Cleanup & Seeding	SY	3323	\$ 2.50	\$ 8,306
	Pavement Replacement Asphalt	SY	22	\$ 300	\$ 6,667
	Multi-purpose asphalt trail replacement	SY	39	\$ 12.00	\$ 462
	Sidewalk Replacement Concrete	SY	0	\$ 50.00	\$ -
	Curb and Gutter Replacement	LF	10	\$ 65	\$ 650
	Guardrail Replacement	LF	110	\$ 16	\$ 1,782
	Connection to Existing Reclaimed Water Piping	EA	8	\$ 10,000	\$ 80,000
	Positive Shoring	LS	1	\$ 20,000	\$ 20,000
	Testing Allowance	EA	4	\$ 3,550	\$ 14,200
	Utility Relocation Allowance	LS	1	\$ 30,000	\$ 30,000
	Close Out	LS	1	\$ 20,000	\$ 20,000
	Five Percent (5%) Change Order Allowance	%	1	5%	\$ 130,177
Subtotal:					\$ 2,733,718
Contingency (10%):					\$ 273,372
Total:					\$ 3,007,090

