JOHNSON CITY
TENNESSEE

Purchasing Department

209 Water Street
Johnson City, TN 37601
(423) 975-2716

ADDENDUM

TO: All Prospective Vendors

FROM: Debbie Dillon,
Director of Purchasing

SUBJECT: Addendum No. 1 ITB # 6441
Lower Brush Creek 42" Interceptor Contract 1

DATE: October 8, 2020

Consider this addendum an integral part of the above referenced Invitation to Bid:

See attached addendum #1 that includes pre-bid notes and supplemental information as prepared by Hazen & Sawyer Architect.

All other specifications/requirements remain the same. **Vendor to acknowledge receipt of this addendum by acknowledging on the bid submittal form.** Failure to acknowledge this addendum could be cause for rejection of your submittal. If your bid has already been submitted please contact this office.

/dd

ADDENDUM NUMBER 1

October 8, 2020

CITY OF JOHNSON CITY

DEPARTMENT OF WATER AND SEWER SERVICES

LOWER BRUSH CREEK 42" INTERCEPTOR – CONTRACT 1

ITB NO. 6441

TO: ALL INTERESTED PARTIES CONCERNING THE BID DOCUMENTS FOR THE CITY OF JOHNSON CITY-LOWER BRUSH CREEK 42" INTERCEPTOR PROJECT – Contract 1:

A non-mandatory virtual Pre-Bid Conference was held at 2:00 PM local time on Tuesday October 6, 2020.

Project Manual – Volume I

NA

Project Manual – Volume II

NA

Additional Information

1. Pre-Bid Conference meeting notes, October 6, 2020,

2. Bid Tab for Lower Brush Creek February 19, 2020 bid opening,

Questions/Responses

Questions are due in writing to the Engineer by Friday, October 16, 2020. Submit all questions to morr@hazenandsawyer.com. Questions received after 2pm ET will not be answered.

1. **Question:** We don't seem to have a copy of the completed bid tab from the original bid on this project this last Feb/March on the ITB #6366. Is this something that you would be able to acquire and send me a copy?
   Response: Certified Bid Tab for ITB# 6366 is attached.

2. **Question:** Can we get a copy of the bore logs for the project? Also, The bid form states we are to write in the pipe material, but I only see PVC as an option for gravity pipe within the specs. Are other pipe materials such as DIP or FRP acceptable?
   Response: Bore logs are attached to the addendum as Supplemental Information. Only PVC and Ductile Iron are acceptable pipe materials.

3. **Question:** I'm not able to locate the Geotech Report, nor the Appendix spoken of below. Can you tell me where to find this? Also, anything new on the bid tabs from the first bid?
   Response: Bore logs are attached to the addendum as Supplemental Information. Certified Bid Tab for ITB# 6366 is attached.

4. **Question:** Ductile Iron specification in section 15006, Part 2 – Product. In section 2.01, A 3. All pipe, restraining devices, and accessories specified in this section shall be manufactured in the United States of America. For this project US Pipe would quote our Tyton Joint with Domestic Gaskets for the, but the section of 42" pipe going through the casing would be HP-Lok pipe. The HP-Lok pipe joint uses a locking ring to provide joint restraint. HP LOK Locking Rings are non-domestically produced miscellaneous minor components covered by the National Product Waiver for Minor Components within Iron and Steel Products (with Cost Ceiling) for State Revolving Fund Projects. Is this product acceptable since the non-domestic component is covered under this waiver?
   Response: Yes, the lock ring is a minor component when compared to the overall stick of pipe which is domestically produced.

5. **Question:** On the DBE forms, Do we need to submit the proof of who we contacted with the bid, or will that all be done at contract time?
   Response: The DBE certified letters and receipts are not needed until the Authority-to-Award/Bid Package documents are submitted to SRF. How ever the letters must be sent out prior to submitting bid.

6. **Question:** The spec book shows that any time over 40 hours for the RPR is to be paid by the contractor, can you confirm, and if so, do you have an hourly rate that we can include those costs in our bid?
   Response: Approximate over-time rate will be around $135/hr depending on the RPR assigned to the project.

7. **Question:** Do you have an original geotech?
   Response: The original Geotech reports are attached to this addendum as Supplemental Information prepared by Others.

8. **Question:** Is there a specific type of joint restraint for use on the pipe in the tunnel?
   Response: Joint restraints may pipe manufacturer specific, bell restraint harness, etc..

9. **Question:** The plans show the tunnel to use 72" casing, the bid item says 60", can you confirm which? If we are to use joint restraints on PVC, I don't know if it will fit in 60", would need to confirm.
   Response: The minimum diameter steel casing required is 60".

10. **Question:** I see average flows of 8.5 MGD and Peak flows of 20 MGD for the existing 30" SS line, but I don't see any flow data on the 24" Line coming into MH 1-30 (STA 91+48). Could you please provide the flows for that line.
    Response: Min = 0 mgd, Avg. = 0.54 mgd, Max = 9.8 mgd peak over 15 minute increment

11. **Question:** 3.03 QUALITY CONTROL AND MAINTENANCE
    A. Testing: Contractor shall perform leakage and pressure tests of the bypass pump suction and discharge piping using clean water prior to actual operation. Low pressure air test shall be conducted on suction piping at a test pressure of 5 psi. Contractor shall test discharge piping by filling with clean water and pressurizing to 75 psi and held for 2 hours with no leakage. The Engineer will be given 24 hours' notice prior to testing.-Would you consider changing to a clean water test at 1.5 times the operating pressure of the 20 MGD system design for 2 hours instead of 75 PSI for 2 hours test? Reason being commonly utilized HDPE discharge piping of SDR-26 HDPE is only rated for 80 PSI straight from the manufacturer and I believe 75 PSI would be a challenge for this scenario. (HDPE spec sheet attached).
    Response: 75 psi is required

12. **Question:** PART 1 – GENERAL 1.01 THE REQUIREMENT
E. Contractor shall install bypass pumps at an elevation a minimum of 2 feet above the 100-year flood elevation if at all possible or shall provide an acceptable emergency plan, subject to Engineer's review, if the pumps are installed below the 100-year flood elevation and flooding occurs. However, Contractor's Bid shall be based on maintaining operation at all times during required operation of the bypass pumping system.- Could you provide historical flood date for the different areas of the project?
Response: Refer to https://msc.fema.gov/portal/home for FEMA flood maps.

- **End of Addendum** -

Supplemental Information prepared by Others

1. Geotechnical Evaluation Report by Foundation Systems Engineering, PC, dated April 11, 2016.
2. Addendum Letter - Expansive Shale Materials by Foundation Systems Engineering, PC, dated April 21, 2016.
3. Limited Environmental Site Investigation by Foundation Systems Engineering, PC, dated April 22, 2016.

PRE-BID MEETING - Notes
Lower Brush Creek 42-inch Interceptor – Contract 1
Bid # 6441
October 6, 2020, 2:00 PM ET
City of Johnson City Purchasing Department, 209 Water Street

1. Introductions

a. Owner - Johnson City Water & Sewer Services, Tom Witherspoon – Director
b. Owner – Johnson City Water & Sewer Services, Jon Lane – Asst. Director
c. Owner – Johnson City Purchasing Dept., Debbie Dillon - Director
d. Engineer – Hazen and Sawyer – Mike Orr – Project Manager

2. Project Scope/Description

The construction to be performed (Work) consists of installation of approximately 13,425 LF of 42" gravity sewer pipe in open trench with appurtenances and 70 LF of 60" steel casing installed by auger bore and jack. The Work includes all excavation support, trenching, backfilling, site grading, pipe work and all necessary appurtenances, testing and television inspection as shown on the Drawings and as set out more fully in the Specifications. Contractor shall provide all necessary materials, labor and equipment to complete the Work.

3. Bid Documents

a. Refer to Section 00130 and 00300 for Requirements for Bids and Contracts and Instructions to Bidders
   i. Digital Copies of the Documents can be purchased from the Hazen and Sawyer Nashville office, 545 Mainstream Dr, Suite 420, Nashville, TN 37228. The cost, not including shipping, will be $50. Contact Mary Lawrence: 615-783-1515, mlawrence@hazenandsawyer.com

   ii. Bidder must be on file as a plan holder by obtaining bid documents from Hazen and Sawyer to submit a bid.

4. Qualifications

a. Refer to Section 00411, Bid Qualification Form
   i. Each bidder shall complete all parts of the Bid Qualification Form for Bid to be considered complete and responsive,
   ii. Owner reserves the right to reject any bid if bidder fails to satisfy the qualifications.

b. Refer to the Bid submittal requirements in Section 00300 of the Specifications

5. Sealed Solicitation General Terms and Conditions

a. Refer to PDF page 10 of the Project Manual for the City's Acknowledgement Form
   i. Form must be completed, signed, returned with bid submittal.

PRE-BID MEETING - Notes
Lower Brush Creek 42-inch Interceptor – Contract 1
Bid # 6441
October 6, 2020, 2:00 PM ET
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6. Bidder Questions and Addenda

a. Request for Information. Submit by email to Hazen and Sawyer. morr@hazenandsawyer.com

   i. Hazen will incorporate the question and response in an addendum document for distribution to Plan Holders by City Engineer's office.

b. Questions received less than 4 calendar days (96 hours) prior to the date for opening of Bids will not be answered. Please submit all questions by 2 PM on October 16th? 2020

7. Bid Opening

a. Date/Time – Tuesday, October 20, 2020 @ 2:00 PM Local Time
b. Location – Office of the Director of Purchasing of the City of Johnson City at 209 Water Street, Johnson City, TN 37601.
c. Solicitations will be opened publicly via a Zoom web conference only. See meeting ID and password information in the Invitation to Bid.
d. The entire Project Manual must be returned with bid response.

8. Contract Completion Time

a. Substantial Completion within 540 Calendar Days from Notice To Proceed.
b. Final Completion within 30 calendar days from Substantial Completion.

9. Liquidated Damages

a. The project herein described is to be substantially completed within 540 calendar days from the date of the Notice to Proceed with final completion 30 days thereafter as indicated in the contract. Liquidated damages for delay of completion of contract work will be assessed at $1,600 per Calendar Day.

10. Project Specific Requirements

a. Carefully review plans for parcel specific instructions.
b. This is an SRF funded project therefore Bidders are required to solicit SBEs.
c. TDEC Permits: ARAP, NPDES, Clean Water, Drinking Water, and Environmental Guidance have been attained.
d. Department of the Army: Lower Brush Creek Crossing
e. Johnson City Power Board (Brightridge): Coordination Summary and Cost Estimate
f. TVA: GENERAL CONDITIONS FOR A CROSSING AND LAND USE ON A TVA TRANSMISSION LINE EASEMENT/RIGHT-OF-WAY

PRE-BID MEETING - Notes
Lower Brush Creek 42-inch Interceptor – Contract 1
Bid # 6441
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11. Site Access

a. All work to be completed shall be on the property easements unless otherwise shown.
b. If needed, the Contractor is responsible for acquiring all required right of entry and temporary construction easements on private properties in order to access existing sewers and perform the required work.
c. The Contractor shall provide the City a copy of any agreements between neighboring property owners for temporary use of land for construction purposes.
d. The Contractor shall pay fee and acquire any required permit necessary for work in the road ROW.
e. Prior to bid submittal, coordinate site visits through Jon Lane (423) 975-2629.

12. Safety

a. Site Safety is the Contractor's responsibility. The safety provisions of applicable laws and building and construction codes shall be observed, and the Contractor shall take or cause to be taken such additional as necessary.

13. Work Hours

a. Work Hour Restrictions – The normal times of work for this Contract shall generally be between the hours of 7:00 a.m. and 6:00 p.m., Monday through Friday. The Contractor may elect to work beyond these hours or on weekends with the following requirements. Work performed outside of the normal working times shall be evaluated on a case by case basis and shall require approval by the Owner. Contractor shall submit a request to work beyond the normal work hours a minimum of 48 hours in advance of the desired work time. Owner will accommodate extra work times when possible but is not obligated to approve any requests for working outside of the normal work times.

14. Funding

a. This project is being funded by the City and State Revolving Fund.

15. Allowances

a. The Contractor shall include in the Bid Total all allowances stated in the Contract Documents. These allowances shall cover the net cost of the services provided.

PRE-BID MEETING - Notes
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16. Other Items

a. It is the Contractors responsibility to repair any existing utilities that are damaged during construction.
b. The items discussed here today are not intended to be all-inclusive. It is the Contractor's responsibility to review the Contract Documents and comply with all provisions.
c. All questions shall be submitted writing to become part of the contract documents as an addendum. Verbal discussions are non-binding.
d. All Addenda must be acknowledged for bid to be valid.
e. It is the Contractor's responsibility to obtain a site to store materials.
f. Bore & Jack of Watauga Rd, 70LF.
g. Bypass Pumping: Refer to Spec Section 02665 and Bid Form Items 32-33.
    1. **The Contractor is responsible for providing adequate sewer bypass pumping and 24/7 management of the sewer bypass pumping system during construction activities performed under the contract. In anticipation of excessive rain events, Contractor shall connect new sanitary sewer pipe to existing sanitary sewer pipe and temporarily decommission the sewer bypass system. Any reportable sanitary sewer overflow (SSO) event caused as a direct result of the Contractor's activities during the project will result in a non-disputable damage amount of $10,000.00 per occurrence paid to the Owner.**
h. Blasting: Blasting is allowed in this project, blasting within 50 feet of Lower Brush Creek is currently prohibited pending TDEC guidance in approved ARAP. Contractor responsible for all blasting safety and any resulting damage as defined in the specifications.
i. Ductile Iron and PVC are allowed pipe materials per Specs for 42" , bidder must indicate material on bid in space for Item 3 on bid form.
j. Pipe Bedding and Backfill shall be per detail shown on Sheet D02 of project plans. Import of soil may be required to provide adequate final cover.
k. All excavation is Unclassified.
l. An as-built survey of installed pipe will be required for monthly work completed to accompany each pay estimate.

17. Notes & Clarifications

a. Contractor responsible for all costs associated with any electrical relocations required to complete the work.

b. Contractor responsible for identifying permanent spoil site as needed to complete to the project.

c. It is the intend of the Owner for SRF to fund the entire project.

BID NO. 6366 TABULATION - Lower Brush Creek 42" Interceptor

Owner: City of Johnson City, TN
Engineer: Hazen and Sawyer
Bid Date: Wednesday, February 19, 2020, 2:00 pm ET

Item No.	Description	Unit	Estimated Quantity	Hazen OPCC Unit Price	Hazen OPCC Total	S.J. Louis Construction of Texas, 520 South 6th Avenue, Mansfield, TX 76063 Unit Price	S.J. Louis Construction of Texas Total	Ruby-Collins, Inc., 4875 Martin Court, SE, Smyrna, GA 30082 Unit Price	Ruby-Collins, Inc. Total	Cleary Construction Inc., 2006 Wdmonton Road, Tompkinsville, KY 42167 Unit Price	Cleary Construction Inc. Total	Garney Companies, Inc., 200 Crutchfield Avenue, Nashville, TN 37210 Unit Price	Garney Companies, Inc. Total
1	Mobilization and General Conditions (max. 3% of Bid)	LS	1	$ 692,600.00	$ 692,600.00	$ 800,000.00	$ 800,000.00	$ 942,035.00	$ 942,035.00	$ 980,000.00	$ 980,000.00	$ 768,000.00	$ 768,000.00
2	Clearing and Grubbing	LF	22,000	$ 3.90	$ 85,800.00	$ 18.20	$ 400,400.00	$ 10.00	$ 220,000.00	$ 12.00	$ 264,000.00	$ 6.00	$ 132,000.00
3	36" DI Interceptor Sewer Pipe (PC 150, 0' - 25' depth). List Interior Coating being bid: Ceramapure PL 90	LF	40	$ 4,065.00	$ 162,600.00	$ 947.00	$ 37,880.00	$ 1,075.00	$ 43,000.00	$ 1,138.00	$ 45,520.00	$ 575.00	$ 23,000.00
4	42" DI Interceptor Sewer Pipe (PC 150, 0' - 25' depth). List Interior Coating being bid: Ceramapure PL 90	LF	18,763	$ 587.50	$ 11,023,262.50	$ 1,052.00	$ 19,738,676.00	$ 1,110.00	$ 20,826,930.00	$ 939.00	$ 17,618,457.00	$ 805.00	$ 15,104,215.00
5	42" DI Interceptor Sewer Pipe (PC 250, >25' depth or where indicated on drawings). List Interior Coating being bid: Ceramapure PL 90	LF	1,950	$ 656.50	$ 1,280,175.00	$ 1,089.00	$ 2,123,550.00	$ 1,155.00	$ 2,252,250.00	$ 1,259.00	$ 2,455,050.00	$ 1,880.00	$ 3,666,000.00
6	42" DIP PC 150, Epoxy Lines, R/J, w/spacers and end seals. List Interior Coating being bid: Ceramapure PL 90	LF	322	$ 669.50	$ 215,579.00	$ 1,177.00	$ 378,994.00	$ 1,260.00	$ 405,720.00	$ 960.00	$ 309,120.00	$ 465.00	$ 149,730.00
7	Trenchless Installation for 42" DIP R/J Carrier, Watauga Rd	LS	1	$ 252,400.00	$ 252,400.00	$ 197,000.00	$ 197,000.00	$ 175,000.00	$ 175,000.00	$ 249,000.00	$ 249,000.00	$ 200,000.00	$ 200,000.00
8	Trenchless Installation for 42" DIP R/J Carrier, Smith St.	LS	1	$ 440,700.00	$ 440,700.00	$ 420,000.00	$ 420,000.00	$ 450,000.00	$ 450,000.00	$ 480,000.00	$ 480,000.00	$ 405,000.00	$ 405,000.00
9	18: PS46 PVC, Sht. C112	LF	40	$ 115.00	$ 4,600.00	$ 259.00	$ 10,360.00	$ 100.00	$ 4,000.00	$ 426.00	$ 17,040.00	$ 205.00	$ 8,200.00
10	8" SDR 35 PVC	LF	2,000	$ 80.75	$ 161,500.00	$ 137.00	$ 274,000.00	$ 35.00	$ 70,000.00	$ 316.00	$ 632,000.00	$ 170.00	$ 340,000.00
11	6" SDR 35 PVC Sewer Lateral	LF	200	$ 32.00	$ 6,400.00	$ 135.00	$ 27,000.00	$ 25.00	$ 5,000.00	$ 238.00	$ 47,600.00	$ 185.00	$ 37,000.00
12	4" SDR 35 PVC Sewer Lateral	LF	300	$ 27.75	$ 8,325.00	$ 134.00	$ 40,200.00	$ 25.00	$ 7,500.00	$ 234.00	$ 70,200.00	$ 185.00	$ 55,500.00
13	8" DIP PC 350 RJ, List Interior Coating being bid: Ceramapure PL 90	LF	180	$ 94.00	$ 16,920.00	$ 173.00	$ 31,140.00	$ 115.00	$ 20,700.00	$ 375.00	$ 67,500.00	$ 390.00	$ 70,200.00
14	Creek Crossing #1: Lower Brush Creek	LS	1	$ 83,800.00	$ 83,800.00	$ 16,000.00	$ 16,000.00	$ 50,000.00	$ 50,000.00	$ 124,000.00	$ 124,000.00	$ 75,000.00	$ 75,000.00
15	Creek Crossing #2: Sta. 12+25	LS	1	$ 36,000.00	$ 36,000.00	$ 24,000.00	$ 24,000.00	$ 50,000.00	$ 50,000.00	$ 128,000.00	$ 128,000.00	$ 75,000.00	$ 75,000.00
16	Creek Crossing #3: Sta. 152+50	LS	1	$ 31,300.00	$ 31,300.00	$ 31,000.00	$ 31,000.00	$ 50,000.00	$ 50,000.00	$ 138,000.00	$ 138,000.00	$ 75,000.00	$ 75,000.00
17	7' ϕ Manhole Base w/48" Riser Transition	EA	52	$ 8,167.00	$ 424,684.00	$ 16,400.00	$ 852,800.00	$ 8,500.00	$ 442,000.00	$ 19,500.00	$ 1,014,000.00	$ 21,000.00	$ 1,092,000.00
18	8' ϕ Manhole Base w/48" Riser Transition	EA	15	$ 8,687.00	$ 130,305.00	$ 19,300.00	$ 289,500.00	$ 10,850.00	$ 162,750.00	$ 27,000.00	$ 405,000.00	$ 30,000.00	$ 450,000.00
19	4' ϕ Manhole Base	EA	8	$ 1,988.00	$ 15,904.00	$ 10,100.00	$ 80,800.00	$ 3,500.00	$ 28,000.00	$ 5,600.00	$ 44,800.00	$ 10,000.00	$ 80,000.00
20	4' ϕ Manhole Riser, Including Eccentric Cone and Grade Rings to finished grade	VF	658	$ 420.00	$ 276,360.00	$ 90.00	$ 59,220.00	$ 175.00	$ 115,150.00	$ 184.00	$ 121,072.00	$ 110.00	$ 72,380.00
21	Anti-Seep Collar Upstream of each MH	EA	76	$ 1,205.00	$ 91,580.00	$ 1,500.00	$ 114,000.00	$ 1,000.00	$ 76,000.00	$ 5,000.00	$ 380,000.00	$ 5,600.00	$ 425,600.00
22	Manhole "Standard" Frame and Cover	EA	56	$ 596.50	$ 33,404.00	$ 300.00	$ 16,800.00	$ 350.00	$ 19,600.00	$ 400.00	$ 22,400.00	$ 750.00	$ 42,000.00
23	Manhole "Water-Tight" Frame and Cover	EA	19	$ 700.00	$ 13,300.00	$ 700.00	$ 13,300.00	$ 675.00	$ 12,825.00	$ 875.00	$ 16,625.00	$ 1,100.00	$ 20,900.00
24	Removal of Existing 30" Sewer Pipe during installation of new 42" Interceptor	LF	10,650	$ 26.75	$ 284,887.50	$ 15.00	$ 159,750.00	$ 5.00	$ 53,250.00	$ 100.00	$ 1,065,000.00	$ 5.00	$ 53,250.00
25	Removal of Existing Manholes during installation of new 42" Interceptor	EA	34	$ 4,776.00	$ 162,384.00	$ 1,500.00	$ 51,000.00	$ 300.00	$ 10,200.00	$ 2,950.00	$ 100,300.00	$ 200.00	$ 6,800.00
26	Abandon Exist Manholes (and adjacent Sewer Pipe) In-Place	EA	27	$ 2,974.00	$ 80,298.00	$ 2,000.00	$ 54,000.00	$ 300.00	$ 8,100.00	$ 2,500.00	$ 67,500.00	$ 2,600.00	$ 70,200.00
27	Temporary Connection and Removal of existing 30" sewer to New Manhole 1-7	LS	1	$ 22,400.00	$ 22,400.00	$ 10,000.00	$ 10,000.00	$ 10,000.00	$ 10,000.00	$ 66,000.00	$ 66,000.00	$ 35,000.00	$ 35,000.00
28	Connection of Existing 4" Sewer Service to New Manhole via outside drop connection	EA	2	$ 5,200.00	$ 10,400.00	$ 4,500.00	$ 9,000.00	$ 3,500.00	$ 7,000.00	$ 3,250.00	$ 6,500.00	$ 7,000.00	$ 14,000.00
29	Connection of Existing 6" Sewer Service to New Manhole via outside drop connection	EA	7	$ 6,129.00	$ 42,903.00	$ 4,900.00	$ 34,300.00	$ 4,500.00	$ 31,500.00	$ 3,250.00	$ 22,750.00	$ 8,000.00	$ 56,000.00
30	Connection of Existing 8" Sewer to New Manhole via outside drop connection	EA	11	$ 7,809.00	$ 85,899.00	$ 5,300.00	$ 58,300.00	$ 6,500.00	$ 71,500.00	$ 14,000.00	$ 154,000.00	$ 10,000.00	$ 110,000.00
31	Connection of Existing 10" Sewer to New Manhole 1-4	LS	1	$ 2,200.00	$ 2,200.00	$ 5,000.00	$ 5,000.00	$ 15,000.00	$ 15,000.00	$ 14,000.00	$ 14,000.00	$ 10,000.00	$ 10,000.00
32	Connection of Existing 18" Sewer to New Manhole 1-52	LS	1	$ 6,400.00	$ 6,400.00	$ 8,000.00	$ 8,000.00	$ 3,500.00	$ 3,500.00	$ 23,000.00	$ 23,000.00	$ 15,000.00	$ 15,000.00
33	Connection of Existing two (2) 10" Sewer Mains to New Manhole 1-52A	LS	1	$ 4,400.00	$ 4,400.00	$ 10,000.00	$ 10,000.00	$ 2,000.00	$ 2,000.00	$ 26,000.00	$ 26,000.00	$ 15,000.00	$ 15,000.00
34	Connection of Existing 24" discharge pipe from WTP to the New Manhole 1-30 via outside drop connection	LS	1	$ 10,100.00	$ 10,100.00	$ 16,000.00	$ 16,000.00	$ 20,000.00	$ 20,000.00	$ 48,000.00	$ 48,000.00	$ 40,000.00	$ 40,000.00
35	Connection of New 36" Trunk Sewer to existing MH 1-65	LS	1	$ 29,200.00	$ 29,200.00	$ 7,000.00	$ 7,000.00	$ 15,000.00	$ 15,000.00	$ 39,000.00	$ 39,000.00	$ 40,000.00	$ 40,000.00
36	Connection of New 42" Trunk Sewer to Existing Manhole/Stubout at Sta. 0+00	EA	1	$ 43,900.00	$ 43,900.00	$ 7,000.00	$ 7,000.00	$ 100,000.00	$ 100,000.00	$ 37,000.00	$ 37,000.00	$ 40,000.00	$ 40,000.00
37	Connection of Existing Sewer Services to New 42" Interceptor Sewer w/Saddle Tap and Cleanout at Easement	EA	13	$ 5,700.00	$ 74,100.00	$ 3,500.00	$ 45,500.00	$ 650.00	$ 8,450.00	$ 3,200.00	$ 41,600.00	$ 5,000.00	$ 65,000.00
38	Connection of Existing Sewer Services to New 8" Sewer Mains w/8"x6" Tee and a Cleanout at Easement	EA	9	$ 3,400.00	$ 30,600.00	$ 3,300.00	$ 29,700.00	$ 500.00	$ 4,500.00	$ 2,000.00	$ 18,000.00	$ 3,000.00	$ 27,000.00
39	Concrete Cap for 42" Interceptor Sewer, Detail 0222128	LF	1,000	$ 47.75	$ 47,750.00	$ 114.00	$ 114,000.00	$ 100.00	$ 100,000.00	$ 83.00	$ 83,000.00	$ 95.00	$ 95,000.00

BID NO. 6366 TABULATION - Lower Brush Creek 42" Interceptor

Owner: City of Johnson City, TN
Engineer: Hazen and Sawyer
Bid Date: Wednesday, February 19, 2020, 2:00 pm ET

Item No.	Description	Unit	Estimated Quantity	Hazen OPCC Unit Price	Hazen OPCC Total	S.J. Louis Construction of Texas 520 South 6th Avenue Mansfield, TX 76063 Unit Price	S.J. Louis Construction of Texas Total	Ruby-Collins, Inc. 4875 Martin Court, SE Smyrna, GA 30082 Unit Price	Ruby-Collins, Inc. Total	Cleary Construction Inc. 2006 Wdmonton Road Tompkinsville, KY 42167 Unit Price	Cleary Construction Inc. Total	Garney Companies, Inc. 200 Crutchfield Avenue Nashville, TN 37210 Unit Price	Garney Companies, Inc. Total
40	6" Ductile Iron Waterline, includes fittings and connection to existing 4" waterline.	LF	480	$ 73.25	$ 35,160.00	$ 134.00	$ 64,320.00	$ 65.00	$ 31,200.00	$ 100.00	$ 48,000.00	$ 120.00	$ 57,600.00
41	6" Gate Valve	EA	1	$ 1,300.00	$ 1,300.00	$ 900.00	$ 900.00	$ 1,000.00	$ 1,000.00	$ 1,300.00	$ 1,300.00	$ 2,000.00	$ 2,000.00
42	Waterline Blowoff Assembly per Detail on D06	EA	1	$ 6,000.00	$ 6,000.00	$ 3,100.00	$ 3,100.00	$ 2,000.00	$ 2,000.00	$ 2,000.00	$ 2,000.00	$ 3,200.00	$ 3,200.00
43	3/4" Water Service, Includes tap and service line from watermain to meters	EA	4	$ 200.00	$ 800.00	$ 2,600.00	$ 10,400.00	$ 1,650.00	$ 6,600.00	$ 1,700.00	$ 6,800.00	$ 1,750.00	$ 7,000.00
44	Sewer Flow Control and Bypass Pumping for the Project	A	1	$ 1,043,700.00	$ 1,043,700.00	$ 1,050,000.00	$ 1,050,000.00	$ 1,050,000.00	$ 1,050,000.00	$ 1,050,000.00	$ 1,050,000.00	$ 1,050,000.00	$ 1,050,000.00
45	Diesel Fuel used in Bypass Pumps	A	1	$ 1,180,700.00	$ 1,180,700.00	$ 1,200,000.00	$ 1,200,000.00	$ 1,200,000.00	$ 1,200,000.00	$ 1,200,000.00	$ 1,200,000.00	$ 1,200,000.00	$ 1,200,000.00
46	Undercut Pipe Trench Subgrade and Refill with Crushed Stone, #57, as directed by Engineer	CY	5,000	$ 18.25	$ 91,250.00	$ 43.00	$ 215,000.00	$ 0.05	$ 250.00	$ 100.00	$ 500,000.00	$ 50.00	$ 250,000.00
47	Asphalt Surface, TDOT 411-01.11, Grading "E", PG64-22	TN	330	$ 136.50	$ 45,045.00	$ 238.00	$ 78,540.00	$ 150.00	$ 49,500.00	$ 245.00	$ 80,850.00	$ 205.00	$ 67,650.00
48	Asphalt Binder, TDOT 307-01.07, Grading "BM", PG64-22	TN	465	$ 148.50	$ 69,052.50	$ 238.00	$ 110,670.00	$ 150.00	$ 69,750.00	$ 235.00	$ 109,275.00	$ 120.00	$ 55,800.00
49	Aggregate Base, TDOT 303-01.01	TN	300	$ 214.50	$ 64,350.00	$ 36.00	$ 10,800.00	$ 30.00	$ 9,000.00	$ 50.00	$ 15,000.00	$ 20.00	$ 6,000.00
50	Misc. Concrete Pavement	CY	100	$ 430.00	$ 43,000.00	$ 448.00	$ 44,800.00	$ 375.00	$ 37,500.00	$ 850.00	$ 85,000.00	$ 500.00	$ 50,000.00
51	Misc. Concrete, if directed by Owner/Engineer	CY	100	$ 500.00	$ 50,000.00	$ 150.00	$ 15,000.00	$ 200.00	$ 20,000.00	$ 850.00	$ 85,000.00	$ 150.00	$ 15,000.00
52	Flowable Fill per Detail 0222118A	CY	20	$ 115.00	$ 2,300.00	$ 120.00	$ 2,400.00	$ 200.00	$ 4,000.00	$ 200.00	$ 4,000.00	$ 120.00	$ 2,400.00
53	Misc. Gravel Road Repair (Crusher Run), 6" depth	SY	4,500	$ 11.25	$ 50,625.00	$ 7.00	$ 31,500.00	$ 30.00	$ 135,000.00	$ 16.00	$ 72,000.00	$ 2.00	$ 9,000.00
54	NPDES Compliance, Erosion Prevention and Sediment Control	LS	1	$ 576,100.00	$ 576,100.00	$ 115,500.00	$ 115,500.00	$ 222,550.00	$ 222,550.00	$ 230,000.00	$ 230,000.00	$ 260,000.00	$ 260,000.00
55	Temporary Seeding and Mulching	LF	25,000	$ 2.80	$ 70,000.00	$ 1.90	$ 47,500.00	$ 2.30	$ 57,500.00	$ 8.00	$ 200,000.00	$ 2.50	$ 62,500.00
56	Permanent Seeding and Mulching	LF	25,000	$ 14.25	$ 356,250.00	$ 3.25	$ 81,250.00	$ 2.50	$ 62,500.00	$ 11.00	$ 275,000.00	$ 3.50	$ 87,500.00
57	Woodlyn RD Pump Station, Abandon in Place	LS	1	$ 16,800.00	$ 16,800.00	$ 10,000.00	$ 10,000.00	$ 55,000.00	$ 55,000.00	$ 35,000.00	$ 35,000.00	$ 25,000.00	$ 25,000.00
58	Misc. Asphalt Paving, if directed by Owner/Engineer	TN	100	$ 155.00	$ 15,500.00	$ 238.00	$ 23,800.00	$ 150.00	$ 15,000.00	$ 245.00	$ 24,500.00	$ 120.00	$ 12,000.00
59	Misc. Stone, if directed by Owner/Engineer	TN	500	$ 20.75	$ 10,375.00	$ 30.00	$ 15,000.00	$ 30.00	$ 15,000.00	$ 30.00	$ 15,000.00	$ 25.00	$ 12,500.00
60	Misc. Rip Rap for ditch or slope stabilization, if directed by Owner/Engineer	TN	1,500	$ 161.00	$ 241,500.00	$ 70.00	$ 105,000.00	$ 35.00	$ 52,500.00	$ 35.00	$ 52,500.00	$ 25.00	$ 37,500.00
61	Misc. Slope Stabilization Matting, if directed by Owner/Engineer	SF	25,000	$ 2.90	$ 72,500.00	$ 0.20	$ 5,000.00	$ 0.25	$ 6,250.00	$ 0.60	$ 15,000.00	$ 0.25	$ 6,250.00
62	Traffic Control Plan and Implementation	LS	1	$ 98,800.00	$ 98,800.00	$ 20,000.00	$ 20,000.00	$ 25,000.00	$ 25,000.00	$ 35,000.00	$ 35,000.00	$ 50,000.00	$ 50,000.00
63	Alignment Stakeout and Monthly Progress Survey	MN	24	$ 4,458.00	$ 106,992.00	$ 1,000.00	$ 24,000.00	$ 500.00	$ 12,000.00	$ 3,000.00	$ 72,000.00	$ 2,500.00	$ 60,000.00
64	Final Site Cleanup and Closeout Documents	LS	1	$ 48,800.00	$ 48,800.00	$ 35,000.00	$ 35,000.00	$ 35,000.00	$ 35,000.00	$ 35,000.00	$ 35,000.00	$ 35,000.00	$ 35,000.00
65	Removal and Disposal of Contaminated Trench Soils, if directed by Owner/Engineer	TN	10,000	$ 31.00	$ 310,000.00	$ 40.00	$ 400,000.00	$ 75.00	$ 750,000.00	$ 18.00	$ 180,000.00	$ 70.00	$ 700,000.00
66	Replacement of Removed Contaminated Trench Solid with stone or compactable backfill material, if directed by Owner/Engineer	TN	10,000	$ 6.70	$ 67,000.00	$ 5.00	$ 50,000.00	$ 15.00	$ 150,000.00	$ 34.00	$ 340,000.00	$ 25.00	$ 250,000.00
67	NBR Gaskets for Ductile Iron Pipe installed from Sta. 178+00 to 210+75 if directed by Engineer based on soil test results	EA	164	$ 570.50	$ 93,562.00	$ 400.00	$ 65,600.00	$ 475.00	$ 77,900.00	$ 600.00	$ 98,400.00	$ 420.00	$ 68,880.00
68	Field Office, Equipment, and Services for RPR	MN	24	$ 1,496.00	$ 35,904.00	$ 3,000.00	$ 72,000.00	$ 1,500.00	$ 36,000.00	$ 2,500.00	$ 60,000.00	$ 2,000.00	$ 48,000.00
69	Project Contingency Allowance, if directed by Owner/Engineer	A	1	$ 450,000.00	$ 450,000.00	$ 450,000.00	$ 450,000.00	$ 450,000.00	$ 450,000.00	$ 450,000.00	$ 450,000.00	$ 450,000.00	$ 450,000.00
	Total of All Unit Price Bid Items	**Total**		**$**	**21,678,685.50**	**$**	**30,952,250.00**	**$**	**31,526,460.00**	**$**	**32,817,659.00**	**$**	**28,999,755.00**
													Low Bid

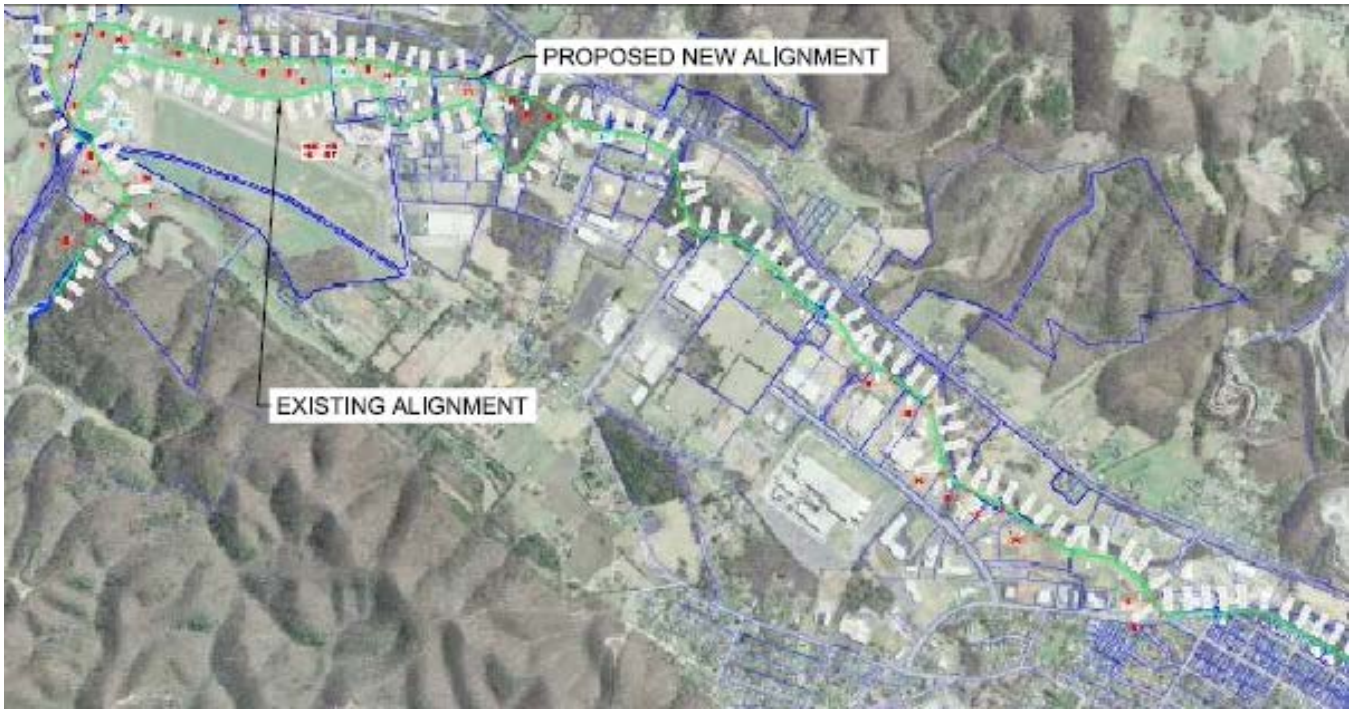
Michael L. Orr, P.E.

#107627

I hereby certify that the above Bid Tabulation is true and correct for the bids received by City of Johnson City on Wednesday, February 19, 2020 2pm ET, and represents the bids for the Lower Brush Creek Interceptor Project, Bid No. 6366

Supplemental Information prepared by Others

GEOTECHNICAL EVALUATION REPORT



BRUSH CREEK INTERCEPTOR PROJECT
WASHINGTON COUNTY
JOHNSON CITY, TENNESSEE

CLIENT: HAZEN AND SAWYER

REPORT DATE: APRIL 11, 2016

FSE PROJECT NUMBER: 216100

Foundation Systems Engineering, P.C.
Geotechnical Engineering and Consulting

Foundation Systems Engineering, P.C.
Geotechnical Engineering and Consulting

April 11, 2016

Mr. Scott Woodard, PE
Hazen and Sawyer
227 French Landing Drive, Suite 420
Nashville, TN 37228

RE: GEOTECHNICAL EVALUATION REPORT
BRUSH CREEK INTERCEPTOR PROJECT
WASHINGTON COUNTY
JOHNSON CITY, TENNESSEE
FSE FILE NO.: 216100

Dear Mr. Woodard:

At your authorization of FSE proposal 16.011, we have completed a preliminary geotechnical exploration of the above referenced site. The purpose of the evaluation was to gather site and subsurface information from which to provide engineering recommendations concerning site preparation methods, excavation considerations, below grade wall lateral pressures and dewatering methods. The following report presents our findings and recommendations. Our services have been provided using the firms of Foundation Systems Engineering, P.C. (FSE) and Construction Materials Laboratory (CML).

We have appreciated the opportunity to provide our geotechnical engineering and testing services. If you have any questions regarding the information within this report, please contact us at your convenience.

Sincerely,
Foundation Systems Engineering, P.C.

Allen Browning, MS, PE
Project Engineer

George R. Cross, P.E.
Geotechnical Engineer
TN State No.: 104229

GRC /AB/kjm

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EXECUTIVE SUMMARY

The proposed project includes the removal and replacement of existing 30 and 36 inch diameter piping with 42 inch piping along existing and new sewer line alignments located in Johnson City, Tennessee. The site location and boundaries are depicted in the exhibit drawings included with this report.

The subsurface conditions on the site were explored with the use of fifty four (54) soil test borings and eleven (11) test pit excavations. The approximate location of the test borings and test pit excavations are indicated on the *Boring Location Plans* provided. The soil test borings and test pit excavations were drilled to depths varying from 1 to 20 feet below the existing grade.

Four (4) of the planned test locations were not drilled or excavated due to property access restrictions. These locations were noted as B-18 through B-21 on the drawing provided by Hazen and Sawyer.

A summary of our findings and recommendations is listed below.

- The test locations encountered fill, alluvial and residual soil types.
- The fill soil types generally included low and high plasticity gravels, silts and clay with limestone boulders, sand stone river cobbles and shale fragments up to boulder in size. The fill soil consistency was encountered in a generally stiff to soft condition and was encountered at test locations B-1, B-1A, B-1B, B-2, B-2A, B-2B, B-3, B-3A, B-3B, B-7, B-29, B-29A, B-31, B-32, B-34, B-34A, E1, E1A, E2, E2, E3, E3A, TP-1, TP-2, TP-3, TP-5, TP-7and TP-9 to an approximate depth varying from 2 to 6 feet. The fill soil layer consistency is variable and sidewall collapse could occur during wet weather periods.
- The alluvial soil types generally included red, tan and brown, low and high plasticity sand, silts and clays with sandstone and limestone rock fragments up to boulder in size. The alluvial soil consistency was encountered in a generally stiff to very soft condition. The alluvial soil was encountered at all test locations except TP10, TP11, B1, B1A, B1B, B2, B2B, B17B, B19, B29, B29A, B29A, B34, B34A. Deposits of sandstone river cobbles may make excavations difficult and or unstable in some areas. Sidewall collapse was observed at the test pit near station 29+50.
- The residual soil types generally included red, tan and brown, low and high plasticity silts and clays with iron staining. The residual soil consistency was encountered in a generally medium to very soft condition and was encountered at test locations B31, E1A, TP10 and TP11.
- Auger/ test pit refusal was encountered at test locations B1, B1A, B1B, B2, B2A, B2B, B3, B3A, B3B, B4, B5, B5, B7, B7A, B8, B9, B10, B11, B12, B12A, B13, B14, B14A, B16, B16A, B17, B17A, B17B, B24, B24A, B25, B25A, B26, B26A, B27, B27A, B28, B29, B29A, B32, B33, B33A, B33B, B34, B34A, E1, E2, E2A, E3, E3A, TP1, TP2, TP3, TP7, TP8, TP9, TP10 and TP11.
- The auger refusal material could not be determined at all locations. This was due to the presence of rock fill, limestone boulders or sandstone river cobbles in the boring locations.

- Along the alignment large boulders were encountered in both fill and alluvial deposits during drilling. A layer of dense river cobbles was also encountered in alluvial deposits. This layer of cobbles varied in size from gravel to boulder. These findings caused several shallow refusals and were observed during the test pit excavations.
- The elevation of refusal varied significantly between test locations. Variable conditions should be anticipated during trench excavations and horizontal drilling situations.
- Groundwater was encountered at test locations B1A, B2, B2A, B2B, B3, B3A, B3B, B16, B16A, B26, B26A, B28, B33, B33A, TP1, and TP9 at the time of drilling. The groundwater was encountered at depths varying from approximately 1 to 7 feet below ground surface. Changes in groundwater elevations will occur during wet weather periods. Shallow groundwater conditions should be anticipated.
- Based on our observations and testing, the fill and alluvial soils encountered on the site should be classified as a type “C” soil in accordance with the OSHA Excavations Manual. This includes the majority of soil types encountered during the geotechnical evaluation.
- This summary should be used in conjunction with the entire report for design purposes. Details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled “General Qualifications” should be read for an understanding of the report limitations.

SCOPE OF SERVICES

Item	Description
Information Reviewed	-USGS Topographic Mapping, Johnson City, TN (2004) Quadrangle -Geologic Mapping of Tennessee -2012 International Building Code -Civil Overall Alignment by Hazen and Sawyer (dated December of 2015) -Overall Alignment by Hazen and Sawyer (dated March of 2016) -60% Design Review Drawings by Hazen and Sawyer (dated December of 2015)
Site Reconnaissance	Walk down of site to observe: - topographic features - drainage patterns - ground surface cover - surface improvements - exposed rock - karst features
Soil Test Borings	-Forty nine (49) soil test borings advanced to auger refusal or planned termination depth with a Skid Steer and a CME 75 drill rig - (CME 75) Standard Penetration testing (SPT), 4 tests in upper 10 feet, 1 every 5 feet thereafter -(Skid Steer) Dynamic Cone Penetrometer testing (DCP), at 5 feet increments -Backfilled boring locations with soil cuttings
Environmental Test Borings	-Five (5) environmental soil test borings advanced to auger refusal or planned termination depth with a CME 75 drill rig -Continuous split spoon sampling using EPA sampling procedures -Backfilled boring locations with soil cuttings mixed with bentonite
Soil Test Pits	- Eleven(11) soil test pit excavations - Advanced to termination or refusal depths with a Caterpillar Excavator - Observation of excavation for soil type, consistency and moisture Content, Presence of Rock Fill or Bedrock - Backfilled excavated locations with excavated soil
Boring/ Test Pit Layout	- Soil test borings and test pit locations were located in the field by FSE using the drawings provided.
Laboratory Testing	- Forty nine (49) Natural Moisture Content determinations - Seven (7) Atterberg Limits determinations - Seven (7) Soil Gradation determinations
Groundwater Measurement	Groundwater measurements made at the time of drilling.

PROJECT/SITE INFORMATION

PROJECT DESCRIPTION

Item	Description
Project Location	Northwest portion of Johnson City, Tennessee
Project Information	**Improvements** - Replacement of 30 and 36 inch diameter piping with 42 inch diameter piping - Approximately 6200 linear feet of sewer line will be replaced -Depth of excavations will vary from 6 to18 feet below current ground surface elevations -There are four (4) locations where horizontal drilling will be required for a total length of 568 linear feet

SITE DESCRIPTION (STATIONS 0+00 TO 13+00)

Item	Description
Site Description	The area is covered with primarily grass and some tree vegetation. The proposed alignment and surrounding area have had previous site grading during the construction for the old sewer line. There are limey shale boulders stacked along the sloped areas to southeast side of the alignment area from rock being drilled and blasted during past construction activities.
Topography	USGS Mapping - General area consists of moderately sloping terrain, characterized by alternating ridges and valleys. The alignment goes along an existing drainage feature for the areas to the northeast and southwest. Review of USGS topographic mapping does indicate the presence of a blue line stream feature adjoining the alignment to the north side. This blue line stream is a tributary to Brush Creek. Mapping Provided - The alignment ground surface drops in elevation from an elevation of 1449 to 1435 feet in an east to west direction. Karst Activity - None observed

SITE DESCRIPTION (STATIONS 13+00 TO 23+00)

Item	Description
Site Description	The area is covered with primarily grass vegetation. The proposed alignment and surrounding area have had previous site grading during the construction for the old sewer line and roadways Riverview Drive and Watauga Road. These roadways are asphalt covered two lane highways.

Topography	USGS Mapping - General area consists of moderately sloping terrain, characterized by alternating ridges and valleys. The alignment goes along a series of rolling hills towards the intersection Riverview Drive and Watauga Road. Review of USGS topographic mapping does indicate the presence of blue line stream features adjoining the alignment to the south and north sides. The alignment crosses the blue line stream that is a tributary to Brush Creek. The blue line stream to the north is Brush Creek. Mapping Provided - The alignment ground surface rises and drops in elevation from an elevation of 1449 to 1461 feet and then drops to 1453 feet near Watauga Road. Karst Activity - None observed

SITE DESCRIPTION (STATIONS 23+00 TO 31+00)

Item	Description
Site Description	The area is covered with primarily grass vegetation. The alignment goes along the edge of a field that is used for hay. This field also adjoins a private airfield used by charter planes. There are sandstone cobbles and limestone rock fragments that can be seen along the ground surface in some locations.
Topography	USGS Mapping - General area consists of moderately sloping terrain, characterized by alternating ridges and valleys. The alignment goes along lower portion of a small ridge feature that falls in elevation to the north towards Watauga Road. Review of USGS topographic mapping does indicate the presence of a blue line stream feature adjoining the alignment to the north side. The blue line stream to the north is Brush Creek. Mapping Provided - The alignment ground surface rises in elevation from an elevation of 1455 to 1463 feet in an east to west direction. There are areas along the alignment where the elevation drops up to 5 feet before rising again. Karst Activity - None observed

SITE DESCRIPTION (STATIONS 31+00 TO 64+00)

Item	Description
Site Description	The area is covered with primarily grass vegetation. There are areas of dense tree and brush overgrowth The alignment goes along the edge of a field that is used for hay. This field also adjoins a private airfield used by charter planes. There are limestone rock pinnacles and fragments that can be seen along the ground surface in some locations. In areas of dense tree and brush overgrowth the limestone rock pinnacles are more pronounced and cover larger portions of area.

Topography	USGS Mapping - General area consists of moderately sloping terrain, characterized by alternating ridges and valleys. The alignment goes along lower portion of a small ridge feature that falls in elevation to the north and east towards Watauga Road and Brush Creek. Review of USGS topographic mapping does indicate the presence of a blue line stream feature adjoining the alignment to the north and east sides. The blue line stream is Brush Creek. Mapping Provided - The alignment ground surface rises and drops in elevation. At the highest point the ground surface elevation is 1468 feet. At the lowest point the ground surface elevation is 1456. There are elevation variations of up to 25 feet along this section of the alignment. Karst Activity - None observed

SITE DESCRIPTION (STATIONS 84+00 TO 95+00)

Item	Description
Site Description	The area is covered with primarily dense tree and brush overgrowth vegetation. There are areas that have been cut and fill grading performed for the access road adjoining the water treatment plant near this area.
Topography	USGS Mapping - General area consists of moderately sloping terrain, characterized by alternating ridges and valleys. The alignment goes along lower portion of a small ridge feature that falls in elevation to the north and east towards a drainage feature and Brush Creek. Review of USGS topographic mapping does indicate the presence of a blue line stream feature adjoining the alignment to the east side. The blue line stream is Brush Creek. Mapping Provided - The alignment ground surface rises in elevation from an elevation of 1493 to 1519 feet in a north to south direction. There are areas along the alignment where the elevation drops up to 5 feet before rising again. Karst Activity - None observed

SITE DESCRIPTION (STATIONS 128+00 TO 152+00)

Item	Description
Site Description	The area is covered with primarily grass vegetation with some areas of dense small tree and brush overgrowth. This area adjoins a series of factories to the northwest.

Topography	USGS Mapping - General area consists of moderately sloping terrain, characterized by alternating ridges and valleys. The alignment goes along lower portion of a small ridge feature and two drainage features that falls in elevation to the southeast towards Brush Creek. Review of USGS topographic mapping does indicate the presence of a blue line stream feature adjoining the alignment to the southeast side. The blue line stream is Brush Creek. Mapping Provided - The alignment ground surface rises and drops in elevation. At the highest point the ground surface elevation is 1545 feet. At the lowest point the ground surface elevation is 1531. There are elevation variations of up to 10 feet along this section of the alignment. Karst Activity - None observed

SITE DESCRIPTION (STATIONS 152+00 TO 167+00)

Item	Description
Site Description	The area is covered with primarily grass vegetation with some areas of dense small tree and brush overgrowth. This area has had cut and fill grading performed as part of the surrounding development for an access road and surrounding building. There are areas of limestone boulders and construction debris that can be seen along the ground surface.
Topography	USGS Mapping - General area consists of moderately sloping terrain, characterized by alternating ridges and valleys. The alignment goes along lower portion of a small ridge feature that falls in elevation to the southeast towards Brush Creek. Review of USGS topographic mapping does indicate the presence of a blue line stream feature adjoining the alignment to the southeast side. The blue line stream is Brush Creek. Mapping Provided - The alignment ground surface rises in elevation from an elevation of 1539 to 1556 feet in a northeast to southwest direction. There are areas along the alignment where the elevation drops up to 5 feet before rising again. Karst Activity - None observed

SITE DESCRIPTION (STATIONS 167+00 TO 177+00)

Item	Description
Site Description	The area is covered with primarily grass vegetation with some areas of dense small tree and brush overgrowth. This area is used for hay and livestock by the owners.

Topography	USGS Mapping - General area consists of moderately sloping terrain, characterized by alternating ridges and valleys. The alignment goes along lower portion of a small ridge feature that falls in elevation to the south and east towards Brush Creek. Review of USGS topographic mapping does indicate the presence of a blue line stream feature adjoining the alignment to the south and east sides. The blue line stream is Brush Creek. Mapping Provided - The alignment ground surface rises in elevation from an elevation of 1545 to 1560 feet in a northeast to southwest direction. There are areas along the alignment where the elevation drops up to 5 feet before rising again. Karst Activity - None observed

SITE DESCRIPTION (STATIONS 177+00 TO 210+00)

Item	Description
Site Description	The area is covered with primarily grass vegetation with some areas of dense small tree and brush overgrowth. This portion of the alignment crosses the roadways Smith Street, Steel Street, East Millard Street, Mercury Road, Prime Street and the parking lot for Allied Metals. These roadways are asphalt and gravel covered. There are areas of limestone boulders that can be seen at the ground surface and at areas that adjoin Brush Creek.
Topography	USGS Mapping - General area consists of moderately sloping terrain, characterized by alternating ridges and valleys. The alignment goes along a low lying area that adjoins Brush Creek. Review of USGS topographic mapping does indicate the presence of a blue line stream feature adjoining the alignment to the south and east sides. The blue line stream is Brush Creek. Mapping Provided - The alignment ground surface rises and drops in elevation. At the highest point the ground surface elevation is 1586 feet. At the lowest point the ground surface elevation is 1574. There are elevation variations of up to 10 feet along this section of the alignment. Karst Activity - None observed
Environmental Concerns	The sites that adjoin the alignment in this area have a history of environmental issues that have been brought to the attention of the Tennessee Department of Environment and Conservation (TDEC). Environmental soil test borings were performed in this area as a result. The findings of those borings will be addressed in a separate report.

AREA GEOLOGY

Item	Description
Geology (Stations 0+00 to 13+00)	The alignment area is located in the Valley and Ridge physiographic province of East Tennessee. A review of published geologic mapping indicates that the subject site is located over sedimentary bedrock of the Sevier Shale Formation. The Sevier Shale Formation consists of calcareous, fine grained, blue, gray and black, shale bedrock. The formation generally strikes in a northeast/southwest direction with a dip direction to the northwest or southeast. The formation is highly folded/fractured due to past tectonic movement. The dark gray and black calcareous shale bedrock can be expansive in nature. The expansion is generally caused by a chemical weathering process that results in gypsum formation between the layers of the shale bedrock. This type of shale was encountered in the test borings. A review of published USGS topographic mapping does not indicate sinkhole formations on the project site or nearby adjacent area.
Geology (Stations 13+00 to 210+00)	The project site is located in the Valley and Ridge physiographic province of East Tennessee. A review of published State of Tennessee geologic mapping of the area indicates that the project location lies within the sedimentary bedrock of the Knox Group. The Knox Group consists of fine grained, light to dark gray, well bedded limestone and dolomite with seams of abundant chert. Localized concentration of bedding planes; fractures and other discontinuities often result in weathering and decomposition extending to greater depths into the subsurface profile. Ridges or lenses of weathering resistant rock form pinnacles and ledges of unweathered rock extending nearly to the ground surface. The localized greater depths of decomposition, solution cavities and rock pinnacles all combine to form what is a highly irregular rock surface profile. Karst Considerations - Sedimentary bedrock containing dolomite and limestone material is subject to karst activity or the formation of closed ground depressions known as sinkholes. The depth of the soil profile is continually altered over geologic time by gradual weathering at the soil/rock interface, and more rapidly by erosion of surficial soils. Weathering of the parent bedrock is generally more rapid near fracture zones. Therefore, the bedrock surface will be irregular.

SUBSURFACE DESCRIPTION

The following is a brief summary of the soils encountered at the soil test boring locations. Additional subsurface details may be seen on the attached *Test Boring Records*. Subsurface stratification indicated on the test boring records is approximate and represents our interpretation of the soils encountered at the Standard Penetration and Dynamic Cone Penetrometer testing intervals.

Item	Description
Ground Cover	Topsoil (B-1 through B-7; TP-1 through TP -5) - Approximately 3 to 36 inches Topsoil (B-8 through B-17, B-33 and B-34; TP-6 through TP -8) - Approximately 3 to 16 inches Topsoil (B-24 through B-31; E-1 and E-1A; TP-9) - Approximately 6 to 18 inches Topsoil (B-32) - Approximately 4 to 6 inches Limestone Gravel (E-2 through E-3A) - Approximately 12 to16 inches Comments - Variation in ground cover will occur across the site.
Fill Soil (B-1, B-1A, B-1B, B-2, B-2A, B-2B, B-3, B-3A, B-3B; TP-1, TP-2, TP-3)	Origin - Man-made; placed on the site during past construction activity. Test Locations - Test locations B-1, B-1A, B-1B, B-2, B-2A, B-2B, B-3, B-3A, B-3B, TP-1, TP-2, TP-3 Description - Brown and tan, low and high plasticity, gravels, silts and clay with sand stone river cobbles and shale fragments up to boulder in size Consistency - Stiff to Soft, moist to very moist Depth - Varies from 2 to 5 feet below ground surface Comments - The fill soil layer is variable and sidewall collapse could occur during wet weather periods.
Fill Soil (B-7, TP-5, B-29, B-29A, TP-9, B-31, B-32, B-34, B-34A, E1, E1A, E2, E2, E3, E3A)	Origin - Man-made; placed on the site during past construction activity. Test Locations - Test locations B-7, TP-5, B-29, B-29A, TP-9, B-31, B-32, B-34, B-34A, E1, E1A, E2, E2, E3, E3A Description - Brown, gray, red and tan, low and high plasticity, gravels, silts and clay with sand stone river cobbles and limestone fragments up to boulder in size Consistency - Stiff to Soft, very moist to wet Depth - Varies from 2 to 6 feet below ground surface Comments - The fill soil layer is variable and sidewall collapse could occur during wet weather periods.

Alluvial Soil	Origin - Native, derived from the soil sediment transport and deposit onto the site by past water flow over the area Test Locations - All test locations except TP10, TP11, B1, B1A, B1B, B2, B2B, B17B, B19, B29, B29A, B29A, B34, B34A Description - red, tan and brown, low and high plasticity sand, silts and clays with sandstone and limestone rock fragments up to boulder in size Consistency - Stiff to very soft Moisture condition- Very moist to Very Wet Depth - Varies from 2 to depths greater than 20 feet below ground surface Comments - Large deposits of sandstone river cobbles may make excavations difficult in some area. Sidewall collapse was observed at the test pit near station 29+50
Residual Soil	Origin - Native, product of weathering process of underlying bedrock Test Locations - Test locations B31, E1A, TP10 and TP11 Description - red, tan and brown, low and high plasticity silts and clays with iron staining Consistency - Medium to very soft Moisture condition- Very moist to Very Wet Depth - Depths greater than 13 feet at TP10; Depths greater than 9 feet at TP11; Depths greater than 20 feet at B31; Depths greater than 20 feet at E1A Comments - Increased moisture was encountered at greater depths

Rock Fill/River Cobble Bedrock/ Auger Refusal/ Test Pit Refusal	Auger refusal - Test locations B1, B1A, B1B, B2, B2A, B2B, B3, B3A, B3B, B4, B5, B5, B7, B7A, B8, B9, B10, B11, B12, B12A, B13, B14, B14A, B16, B16A, B17, B17A, B17B, B24, B24A, B25, B25A, B26, B26A, B27, B27A, B28, B29, B29A, B32, B33, B33A, B33B, B34, B34A, E1, E2, E2A, E3, E3A Test Pit Refusal - Test locations TP1, TP2, TP3, TP7, TP8, TP9, TP10 and TP11 Depth - Varied from 1 to 19 feet below ground surface Rock fill/ Limestone Boulders -Along the alignment large boulders were encountered in both fill and alluvial deposits during drilling that caused several shallow refusals. This was determined during the test pit excavations. Dense River Cobbles- A layer of dense river cobbles were encountered in alluvial deposits during drilling that caused several shallow refusals. This was determined during the test pit excavations. This layer of cobbles varied in size from gravel to boulder. Shale Bedrock- At test locations TP1 through TP3, there was gray and black shale bedrock encountered. Limestone Bedrock - At test pit locations TP7, TP8, TP9, TP10 and TP11, limestone bedrock was encountered at refusal. At TP7, TP8 and TP9 several limestone boulders were removed during the test pit excavation. Comments - The auger refusal material could not be determined at all locations. This was due to the presence of rock fill, limestone boulders or sandstone river cobbles in the boring locations.
Groundwater	Locations Encountered - Test locations B1A, B2 , B2A, B2B, B3, B3A, B3B, B16, B16A, B26, B26A, B28, B33, B33A, TP1, and TP9 Depth - Varies from approximately 1 to 7 feet below ground surface Comments - Changes in groundwater elevations will occur during wet weather periods.

SOIL TEST LOCATIONS SUMMARY

Test Location Number	Station No.	Ground Surface Elev. (ft)[1]	Elevation of Refusal[2] or Termination (ft)	Elevation of Ground Water[3] (ft)	Depth of Boring (ft)	Refusal (R)[2] or Termination (T)
B-1	6+02	1435	1432.5	NA	2.5	R
B-1A	8+00	1435	1430	1434.2	5.0	R
B-1B	7+02	1435	1432	NA	3.0	R
B-2	9+00	1437	1433.5	1434	3.5	R
B-2A	8+99	1437	1430.5	1436	6.5	R
B-2B	9+99	1437	1433.5	1434	3.5	R
B-3	12+00	1442	1437.5	1438	4.5	R
B-3A	10+80	1442	1436	1438	6.0	R
B-3B	12+10	1442	1436	1438	6.0	R
B-4	14+50	1457	1438	NA	19.0	R
B-4A	16+40	1457	1437	NA	20.0	T
B-5	18+00	1454	1445.5	NA	8.5	R
B-6	20+50	1454	1434	NA	20.0	T
B-7	22+25	1455	1446	NA	9.0	R
B-7A	22+35	1455	1446	NA	9.0	R
B-8	24+00	1457	1440.5	NA	16.5	R
B-9	29+50	1450	1448	NA	2.0	R
B-10	34+25	1461	1443.5	NA	17.5	R
B-11	38+00	1456	1444.5	NA	11.5	R
B-12	42+25	1463	1456	NA	7.0	R
B-12A	42+80	1463	1454	NA	9.0	R
B-13	46+00	1464	1449.5	NA	14.5	R
B-14	50+00	1469	1464	NA	5.0	R
B-14A	50+10	1469	1462	NA	7.0	R
B-15	55+00	1465	1450	NA	15.0	T
B-16	58+00	1466	1461	1561	5.0	R
B-16A	58+00	1466	1461	1561	5.0	R
B-17	62+00	1477	1474	NA	3.0	R
B-17A	62+00	1477	1472.5	NA	4.5	R
B-17B	63+00	1477	1472	NA	5.0	R
B-24	138+50	1536	1529.5	NA	6.5	R
B-24A	139+00	1536	1528	NA	8.0	R
B-25	143+00	1542	1533.5	NA	8.5	R
B-25A	143+00	1542	1537.5	NA	4.5	R
B-26	151+00	1544	1539.5	1540	4.5	R
B-26A	150+00	1544	1539.5	1540	4.5	R
B-27	154+00	1542	1538	NA	4.0	R
B-27A	154+00	1542	1537	NA	5.0	R
B-28	158+00	1554	1546.5	1547	7.5	R
B-29	162+80	1556	1555	NA	1.0	R
B-29A	162+50	1556	1552	NA	4.0	R
B-30	177+25	1557	1542	1550	15.0	T

B-31	179+00	1576	1556	1568	20.0	T
B-32	208+50	1583	1576	NA	7.0	R
B-33	0+50	1558	1554.5	1556	3.5	R
B-33A	1+00	1558	1554.5	1556	3.5	R
B-33B	1+50	1558	1554	NA	4.0	R
B-34	39+00	1550	1547	NA	3.0	R
B-34A	39+50	1550	1546	NA	4.0	R
E1	182+50	1581	1579	NA	2.0	R
E1A	183+00	1581	1561	NA	20.0	T
E2	205+50	1580	1578	NA	2.0	R
E2A	206+00	1580	1572.5	NA	7.5	R
E3	208+00	1581	1576.5	NA	4.5	R
E3A	207+80	1581	1576.5	NA	4.5	R
TP-1	6+50	1435	1430	1430.2	5.0	R
TP-2	9+30	1437	1433	NA	4.0	R
TP-3	11+80	1442	1437	NA	5.0	R
TP-4	18+00	1454	1439.5	NA	14.5	T
TP-5	22+20	1455	1440.5	NA	14.5	T
TP-6	29+50	1459	1447	NA	12.0	T
TP-7	45+00	1463	1457	NA	6.0	R
TP-8	58+50	1463	1457	NA	6.0	R
TP-9	162+50	1556	1549	1550	7.0	R
TP-10	90+00	1498	1485	NA	13.0	R
TP-11	88+00	1510	1501	NA	9.0	R

Notes:

1. Elevations and stations should be considered approximate. No formal survey was performed by FSE at the test locations. The elevation and station data was derived from drawings provided by Hazen and Sawyer.

2. Refusal material should not be considered to be bedrock in all locations. The elevation of refusal varied significantly between test locations. The varied elevation of boulder rock and/or bedrock will create difficult working conditions in areas along the alignment. Variable conditions should be anticipated during trench excavations and horizontal drilling situations.

3. The groundwater elevations will vary through the project and may vary rapidly in response to wet weather conditions.

LABORATORY TESTING

NATURAL MOISTURE CONTENT

The Natural Moisture Content tests provide data that assist in evaluating the onsite soil moisture for engineering properties and the amount of moisture conditioning that may be required for their reuse as onsite fill soil.

Natural Moisture Content Data Summary

Boring Location	Depth (Feet)	Natural Moisture Content (%)	Boring Location	Depth (Feet)	Natural Moisture Content (%)
B2	2.5-3.5	18.0	**B24**	2.5-5.0	25.8
B3	2.5-3.5	24.2	**B25**	2.5-5.0	34.4
B4	8.0-10.0	19.2	**B25**	7.0-8.5	30.7
B4	13.5-15.0	19.6	**B26**	2.5-5.0	26.8
B6	2.5-3.5	15.0	**B27**	2.5-5.0	26.4
B6	9.0-11.0	18.4	**B30**	1.0-2.5	20.7
B6	13.0-15.0	33.2	**B30**	3.5-5.0	23.9
B7	2.5-5.0	24.7	**B30**	6.0-7.5	29.8
B7	8.0-10.0	21.9	**B30**	8.5-10.0	38.8
B8	5.0-7.0	14.6	**B31**	3.5-5.0	33.0
B8	8.0-10.0	33.1	**B31**	8.5-10.0	25.3
B8	13.0-15.0	30.9	**B31**	13.5-15.0	43.0
B10	2.5-5.0	35.5	**B31**	18.5-20.0	38.2
B10	8.0-10.0	24.7	**B32**	1.0-2.5	24.8
B10	13.0-15.0	36.9	**B32**	3.5-5.0	27.4
B11	2.5-5.0	20.2	**B34**	1.0-2.5	19.2
B11	8.0-10.0	35.2	**TP6**	3.0-12.0	25.0
B12	2.5-5.0	26.7	**TP7**	2.0-6.0	22.0
B13	2.5-5.0	20.6	**TP8**	3.0-6.0	20.8
B13	8.0-10.0	27.0	**TP9**	2.0-6.0	24.3
B13	13.0-15.0	24.8	**TP10**	2.0-7.0	31.9
B14	2.5-5.0	29.2	**TP10**	7.0-13.0	28.1
B15	2.5-5.0	26.1	**TP11**	2.0-4.0	30.4
B15	8.0-10.0	29.9	**TP11**	4.0-9.0	35.8
B16	2.5-5.0	19.9			

SOIL GRADATION TEST

The soil gradation test is performed to determine the grain size distribution of a soil type. The soil is passed through a set of sieves and separated into three groups by size. Particles larger than a #4 sieve are classified as gravel, those smaller than a #4 but larger than a #200 sieve are sands and particles less than a #200 sieve are classified as fines. In some cases, a hydrometer test may be performed on the fine particles to further classify them into silts and clays. This information is used to assist in soil classification.

The following table summarizes the results of the Standard Proctor testing:

Soil Gradation Data Summary				
Sample Location	**Depth (Feet)**	**% Gravel**	**% Sand**	**% Fines**
B2	3.0 - 5.0	37.4	26.7	35.9
B10	2.5 - 5.0	0.7	9.9	89.4
B13	8.0 - 10.0	0.8	12.4	86.8
B25	7.0 - 8.5	0.2	1.5	98.3
B31	8.5 - 10.0	0.8	44.9	54.3
B32	3.5 - 5.0	0.1	15.5	84.4
TP11	4.0 - 9.0	11.0	1.8	87.2

ATTERBERG LIMITS

The Atterberg Limits Determination provides the Liquid and Plastic limits for soil classification purposes and to assist in evaluating the soil for engineering properties.

The following table summarizes the Atterberg Limits Determination Testing:

Atterberg Limits Data Summary						
Boring Location	**Sample Depth (Feet)**	**Natural Moisture Content (%)**	**Liquid Limit (%)**	**Plastic Limit (%)**	**Plasticity Index**	**USCS Soil Classification**
B2	3.0 - 5.0	18	42	27	15	GM
B10	2.5 - 5.0	35.5	53	38	15	MH
B13	8.0 - 10.0	53	26	27	27	CH
B25	7.0 - 8.5	30.7	47	25	22	CL
B31	8.5 - 10.0	25.3	39	18	21	CL
B32	3.5 - 5.0	27.4	39	22	17	CL
TP11	4.0 - 9.0	35.8	55	31	24	MH

TESTING SUMMARY

The soils encountered on the site are classified as low and high plasticity silts, clays and gravel mixes based on the USCS soil classification system. These soil types are given the soil symbols ML, CL, MH, CH and GM. The soils types have a low to high potential for volume change due to changing moisture contents.

Such soils have poor to fair compaction characteristics with compaction typically achieved using a vibratory sheepsfoot roller.

Loss of shear strength can occur rapidly upon wetting.

The results of the natural moisture content testing indicate that the onsite soils are generally above the optimum moisture content for compaction. With proper moisture conditioning and compaction, the onsite, nonorganic soil material will be suitable for reuse as structural fill material.

RECOMMENDATIONS

Based on the information obtained from the subsurface exploration, we offer the following engineering recommendations for the proposed removal and replacement of existing 30 and 36 inch diameter piping with 42 inch piping along existing and new sewer line alignments located in Johnson City, Tennessee.

FILL MATERIAL SPECIFICATIONS

Engineer Fill Description and Recommended Uses		
Fill Type[1]	**USCS Classification**	**Acceptable Location for Placement**
Soil	Various (PI<25)	All Locations and elevations
Well graded granular	GW[2]	All Locations and elevations

1. Controlled, compacted fill should consist of approved materials that are free of organic matter, debris, particles greater than 4 inches. Frozen material should not be used and fill should not be placed on a frozen subgrade. Minimum Standard Proctor (ASTM D-698) dry unit weight 90 pcf. Each soil type should be submitted to the geotechnical engineer for evaluation.

2. Similar to TDOT Section 903.05 Type A, Grading D crushed limestone aggregate, limestone screenings, or such as well graded gravel or crushed stone.

Item	Description
Fill Lift Thickness	8 inches or less in loose thickness when heavy, self-propelled compaction equipment is used
	4 to 6 inches in loose thickness when hand guided equipment (i.e. jumping jack or plate compactor) is used
Compaction (Areas - upper 2 ft. from finish subgrade)	At least 98% of the materials Standard Proctor maximum dry density (ASTM D 698)
Compaction (Areas - below 2 ft. from finish subgrade)	At least 95% of the materials Standard Proctor maximum dry density (ASTM D 698)
Moisture Content Cohesive Soil	Within the range of 2% below to 2% above the optimum moisture content value as determined by the standard Proctor test at the time of placement and compaction
Testing Frequency	1 test per 1000 square feet or less of fill area for each soil fill lift or 1 test per 100 linear feet of trench per lift.
Testing Personnel	A qualified soil technician, under the direction of a geotechnical engineer, should perform the soil density testing.

BEDDING AND BACKFILL

It is recommended that the new sewer pipe be underlain by a minimum of 6 inches of bedding material. In addition, a minimum of 12 inches of bedding material is also recommended above the top of the pipe. It is recommended that the soils engineer review the bottom of the excavations and determine the suitability of the supporting materials. The loose soil at the bottom of the excavations, if present should also be removed and replaced with bedding soil.

The soils encountered in the excavations may be used as backfill materials provided that they are free of any debris, vegetation or deleterious materials. Additionally, the fill materials should also be free of cobbles and rocks larger than 4 inches in diameter. Any wet soil from the excavations, should be dried before utilizing as backfill soil. As an alternative to on-site soil, imported, predominantly granular soil may be utilized for backfill purposes. The backfill soil should be placed within the excavation in thin layers, 8 inches or less in thickness, and be compacted to at least 90 percent to the maximum laboratory density. Aggregate base and upper 12 inches of subgrade below the pavement areas should be compacted to minimum 95 percent of their respective maximum densities. Care should be exercised to prevent damage to the pipes during the compaction effort.

EXCAVATED SLOPES / TRENCHES

Excavations should be sloped or shored in accordance with local, state, and federal regulations, including OSHA (29CFR Part 1926) excavation safety standards. It should be noted that the Contractor is solely responsible for site safety. This information is provided only as a service and under no circumstances should FSE be assumed to be responsible for construction site safety.

The fill or alluvial soils at this site are generally classified as Type C according to the OSHA standard, which should be sloped at 1.5 (H) to 1(V) or flatter in excavations less than 20 feet deep.

The residual soils at this site could be classified as Type B according to the OSHA standards, which should be sloped to 1(H) to 1(V) or flatter in excavations less than 20 feet deep. Each excavation should be observed and classified by an OSHA-competent person.

TEMPORARY EXCAVATIONS AND SHORING

If excavations with vertical walls are planned, temporary shoring should be designed and implemented at the site. Surcharge loads adjacent to the shoring due to soil stockpiles, construction equipment, etc., should be applied.

KARST (SINKHOLE) ACTIVITY

Past experience has found that sites where grading/construction activities remove all or a portion of the stiff upper crust of soil overburden are at a higher risk of sinkhole activity (dropouts) than sites where no such excavation is made. Similarly, sinkholes may be induced by ponding water or from leaking pipes, etc.

Soil supported foundations or utilities overlying rock units that are susceptible to solutioning and sinkhole development are at risk of damage from sinkhole activity.

During grading activities the ground surface should be observed for indications of subsurface sinkhole activity. These indications could include areas of excessively soft or wet soil or sudden changes in coloration.

Care should be taken to avoid creating localized low areas where surface water could pond. Provide positive drainage at all times. If rain is anticipated, use a smooth drum roller to seal the exposed ground surface to prevent water infiltration.

Utility trenches should *not* be bedded with open graded gravel to limit subsurface lateral water movement on the site. We recommend the use of compacted, select crushed gravel with fines, (TDOT 303) or other suitable material.

GROUNDWATER CONTROL

Based on our subsurface investigation, the groundwater was encountered at varying depths during the time of drilling at the site. However, the actual conditions will vary due to seasonal fluctuations of the groundwater depth. If groundwater is encountered in the temporary excavations, a dewatering plan should be implemented. At all times, the groundwater should be at least 2 feet below the bottom of the excavation.

Dewatering requirements will be greatest during the winter/spring months when groundwater levels are at their highest. During the late summer to early fall, groundwater levels will be at their lowest.

The Contractor should be responsible for design and implementation of the dewatering system, and should submit a dewatering plan to the owner for review prior to construction.

VARIABLE SUBSURFACE CONDITIONS

The elevation of refusal varied significantly between test locations. The varied elevation of boulder rock and/or bedrock will create difficult working conditions in areas along the alignment. Variable conditions should be anticipated during trench excavations and horizontal drilling situations.

DIFFICULT DRILLING CONDITIONS - HORIZONTAL DIRECTIONAL DRILLING

HDD is a steerable trenchless method of installing underground pipes in a shallow arc along a prescribed bore path by using a surface-launched drilling rig. This installation method is particularly sensitive to the presence of gravels, cobbles or more resistant soil layers which can deflect the drill head from its desired alignment.

In several locations where horizontal drilling will be required, there will be layers of cobbles and/or boulders encountered along with bedrock. Horizontal drilling should be anticipated to be difficult in these areas.

BELOW GRADE WALL - UPLIFT AND LATERAL PRESSURES

The recommended estimated soil parameters for the below grade wall design are listed in the Table below.

Uplift Pressures - Uplift forces on below-grade structures such as manholes will be generated by a difference in water level in the soil adjacent to the structure and inside the structure. If the backfill around any buried structure is a sand or silt material, the backfill will approach saturation during periods of heavy rainfall and the effective static water level will be at the surface. The uplift pressures will be resisted by adhesion or skin friction of the soil to the wall and by the dead weight of the structure. An allowable skin friction for an engineered clay fill compacted to a minimum of 95 percent of the Standard Effort (ASTM D 698) maximum dry density may be considered to be 300 pounds per square foot (psf). The upper 4 feet of skin friction should be neglected for a clay backfill due to potential for soil shrinkage away from the structure.

An alternate design method would be to place a heel extending out from the utility foundation into the backfill and rely on the weight of the soil above the heel on a 4-vertical to 1-horizontal slope to resist the uplift forces. The unit weight of soil above and below the water table for a properly compacted backfill will be 125 pounds per cubic foot (pcf) and 60 pcf, respectively. The preparation of the upper 3 feet of soil immediately above the heel is critical to reduce the possibility of an upward bearing failure. The entire thickness of fill should be compacted to the above recommended values.

Lateral Earth Pressures - Backfill around embedded structures will impose active to at-rest earth pressures against the embedded walls. Design lateral earth pressures for backfill are estimated to be equivalent to a fluid pressure of 110 pcf for in-situ native clayey backfill. These pressures include hydrostatic pressures but do not include surcharge forces imposed by construction or vehicular loading. The lateral pressure produced by surcharge may be computed as 50 percent of the vertical surcharge pressure applied as a constant pressure over the full depth of the buried structure.

Below Grade Wall Design Parameters

Material Type	Compacted No. 57 Stone	Compacted On Site Soil[1]
Angle of Friction degrees	35	20
At Rest Pressure Coefficient, K_o	0.43	0.66
Active Pressure Coefficient, K_a	0.27	0.49
Passive Pressure Coefficient, K_p	NA	2.04
Unit Weight of Material, pcf	110	125
Cohesion (c), psf	NA	0

1. For the planned below grade walls, the on-site soil containing organics or with particle sizes greater than 4 inches are not recommended for use as backfill.

SITE DRAINAGE

Drainage should be monitored during construction to control flow in and around excavations. If necessary, pumps, ditches or other grading methods should be used to prevent water from saturating the excavation sides and undesired flow into Brush Creek.

Groundwater will be encountered during the excavations. The groundwater will vary quickly in response to weather and stream level conditions.

GENERAL QUALIFICATIONS

This report has been prepared for the exclusive use of Sawyer and Hazen for the removal and replacement of existing 30 and 36 inch diameter piping with 42 inch piping along existing and new sewer line alignment located in Johnson City, Tennessee. This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The conclusions contained in this report are based upon applicable standards of our practice in this geographic area at the time this report was prepared. No other warranty, expressed or implied, is made.

Foundation Systems Engineering, P.C., is not responsible for any claims, damages, or liability associated with any other party's interpretation of this report's subsurface data or reuse of this report's subsurface data or engineering analysis without our express written authorization.

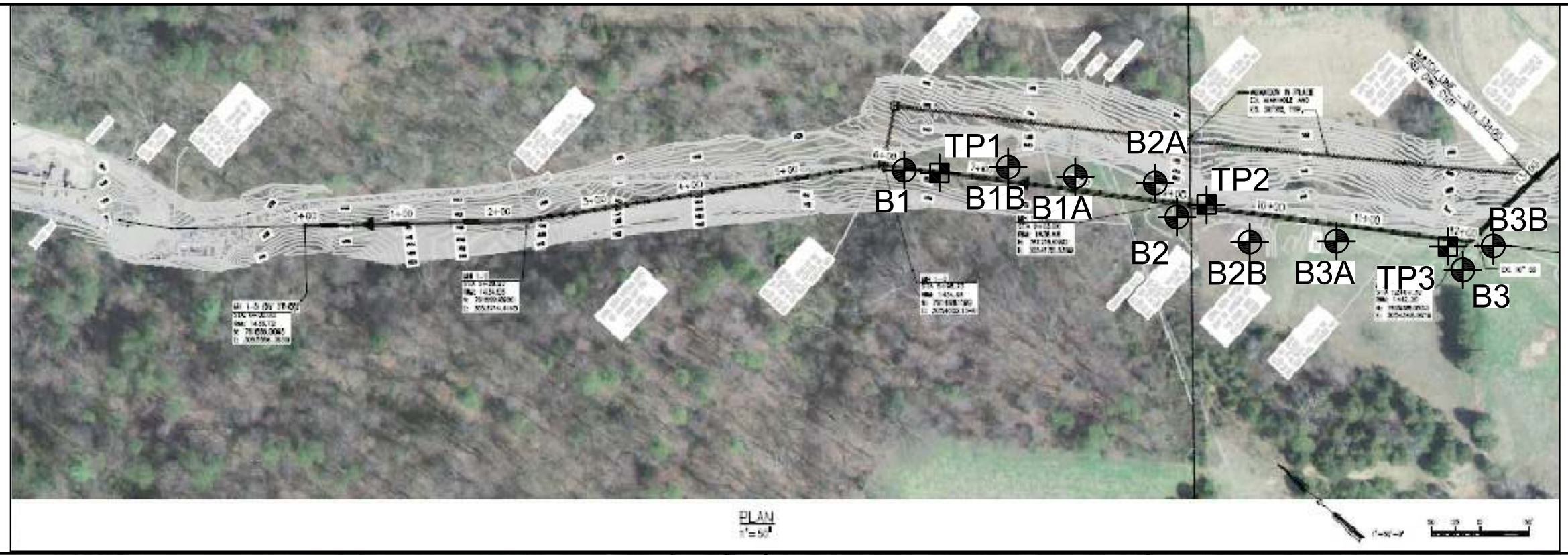
The analyses and professional opinions submitted herein are based, in part, upon the data obtained from the subsurface evaluation. The nature and extent of subsurface variations between the borings will not become evident until construction. Evaluation of the environmental subsurface conditions was beyond the scope of this report.

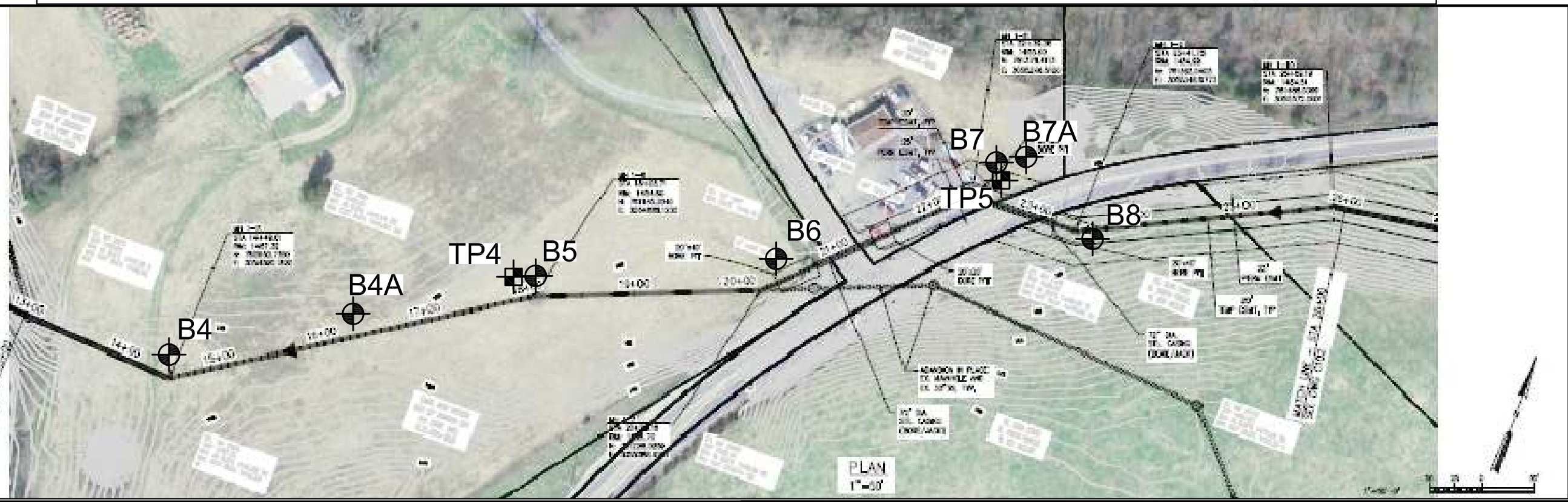
We strongly recommend that the services of a geotechnical engineer be obtained for the construction phase of the project to provide engineering evaluation and testing services.

APPENDICIES

Boring Location Plan Station 0+00 to 26+00
Boring Location Plan Station 26+00 to 54+00
Boring Location Plan Station 54+00 to 69+00
Boring Location Plan Station 84+00 to 99+00
Boring Location Plan Station 125+00 to 153+00
Boring Location Plan Station 153+00 to 181+00
Boring Location Plan Station 181+00 to 210+00
Test Boring Records
Aerial Map w/ New and Old Alignment
Area Topographic Map
Area Geology Map
Lab Data
General Notes
Test Descriptions

APPENDICIES





LEGEND

B# SOIL TEST BORING

TP# TEST PIT LOCATION

Foundation Systems Engineering, P.C.
Geotechnical Engineering and Consulting

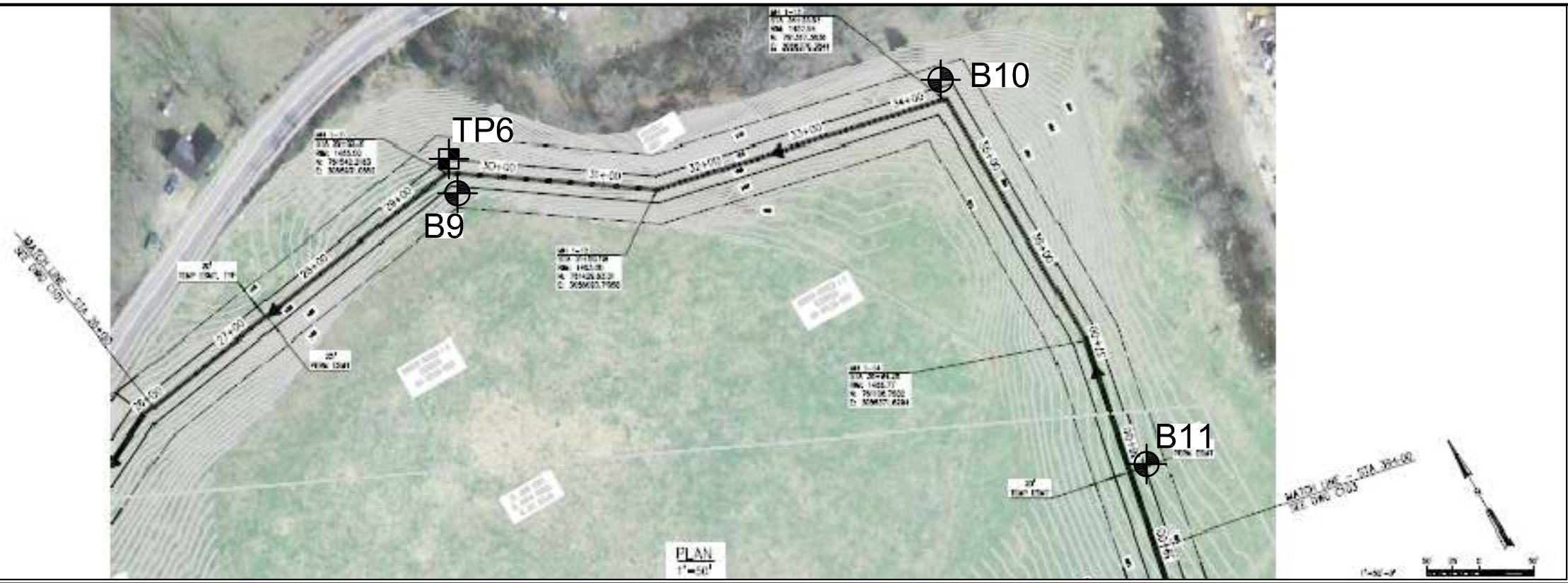
P.O. BOX 5267
KINGSPORT, TN 37663

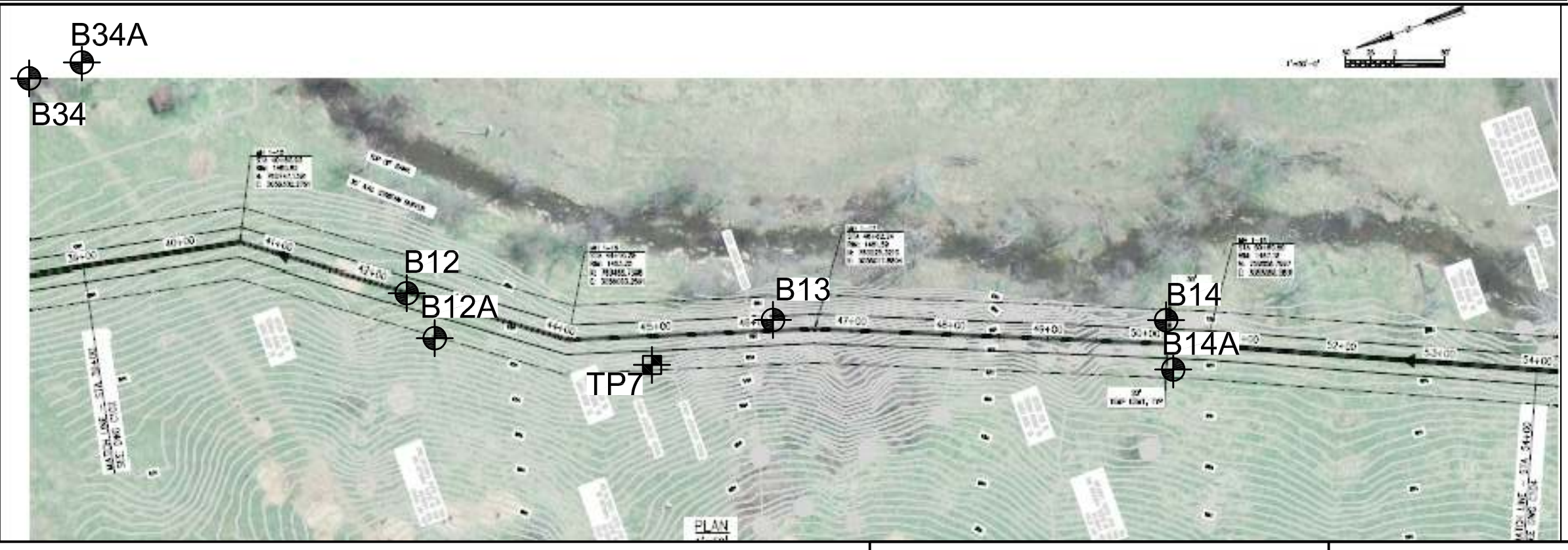
423-239-9226
FAX 239-8677

www.fsepc.com

BORING LOCATION PLAN STA. 0+00 TO 26+00
BRUSH CREEK INTERCEPTOR PROJECT
JOHNSON CITY, TENNESSEE

FOR: HAZEN AND SAWYER		
DRAWN BY: AB	NOTES: LOCATIONS ARE APPROXIMATE	
PROJ #: 216100		
SCALE: NONE	DATE: 04/07/16	DWG #: BLP -1





LEGEND

B# SOIL TEST BORING

TP# TEST PIT LOCATION

Foundation Systems Engineering, P.C.
Geotechnical Engineering and Consulting

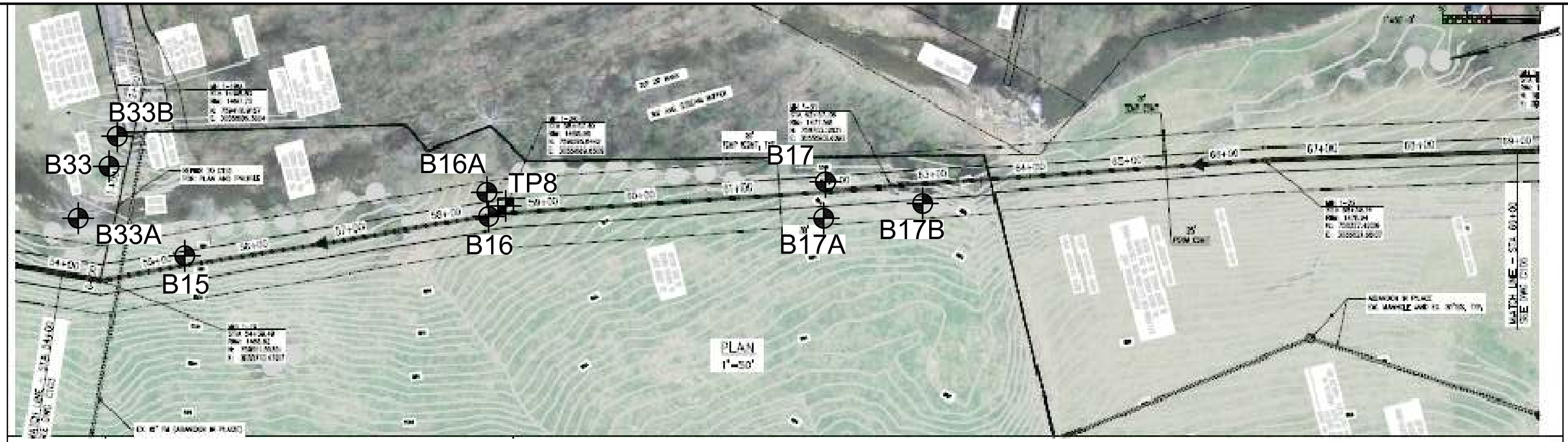
P.O. BOX 5267
KINGSPORT, TN 37663

423-239-9226
FAX 239-8677

www.fsepc.com

BORING LOCATION PLAN STA. 26+00 TO 54+00
BRUSH CREEK INTERCEPTOR PROJECT
JOHNSON CITY, TENNESSEE

FOR: HAZEN AND SAWYER		
DRAWN BY: AB	NOTES:	
PROJ #: 216100	LOCATIONS ARE APPROXIMATE	
SCALE: NONE	DATE: 04/07/16	DWG #: BLP- 2



LEGEND

B# SOIL TEST BORING

TP# TEST PIT LOCATION

Foundation Systems Engineering, P.C.
Geotechnical Engineering and Consulting

P.O. BOX 5267
KINGSPORT, TN 37663

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FAX 239-8677

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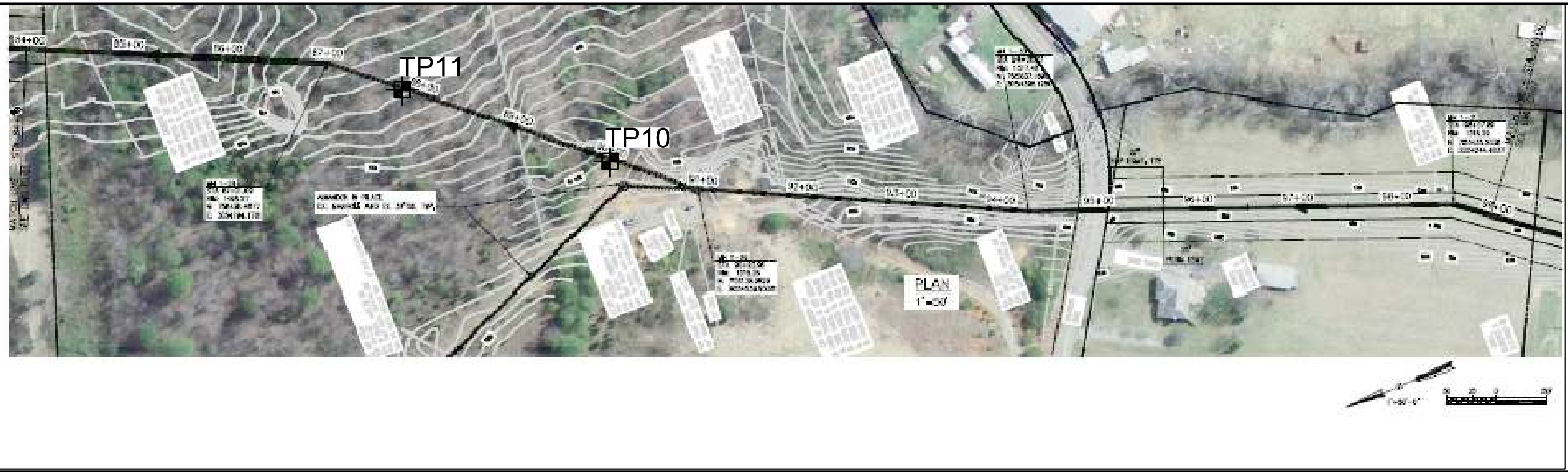
BORING LOCATION PLAN STA. 54+00 TO 69+00
BRUSH CREEK INTERCEPTOR PROJECT
JOHNSON CITY, TENNESSEE

FOR: HAZEN AND SAWYER		
DRAWN BY: AB	NOTES:	
PROJ #: 216100	LOCATIONS ARE APPROXIMATE	
SCALE: NONE	DATE: 04/07/16	DWG #: BLP - 3



LEGEND

B# SOIL TEST BORING

TP# TEST PIT LOCATION

Foundation Systems Engineering, P.C.
Geotechnical Engineering and Consulting

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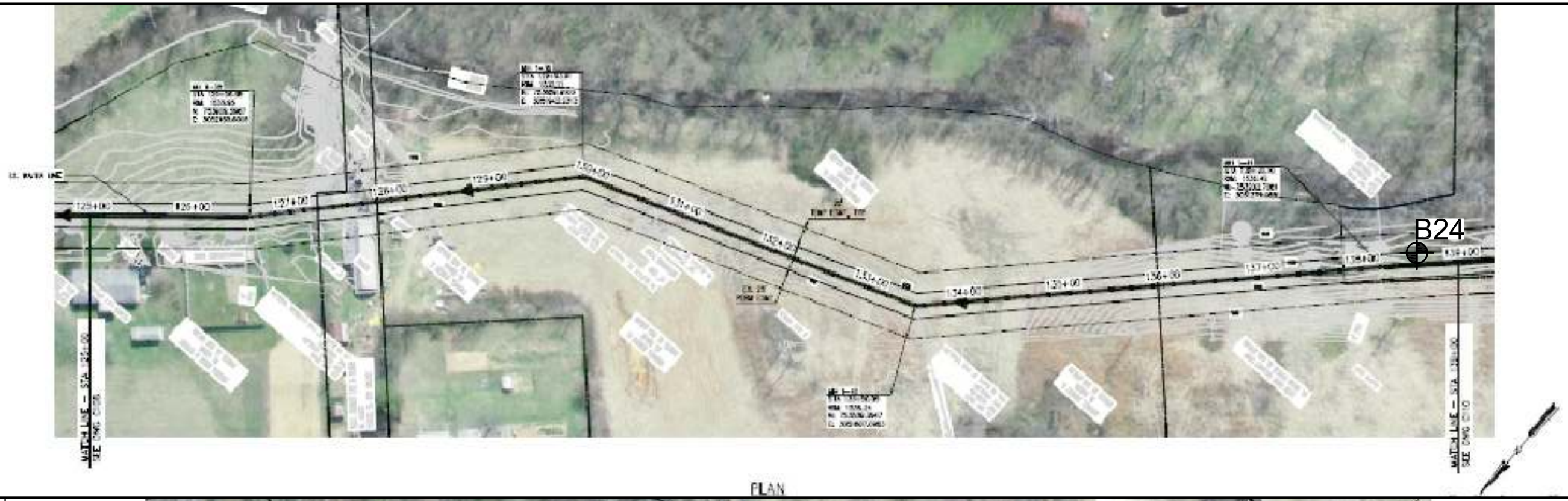
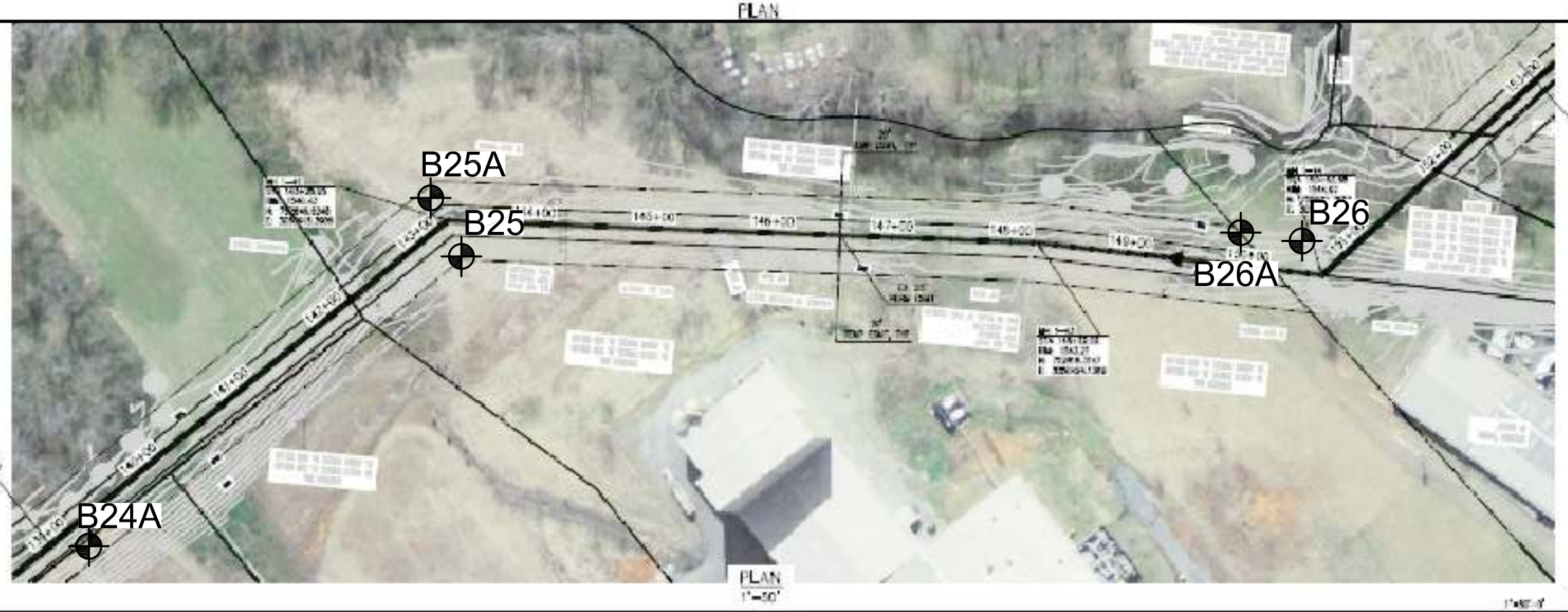
BORING LOCATION PLAN STA. 84+00 TO 99+00
BRUSH CREEK INTERCEPTOR PROJECT
JOHNSON CITY, TENNESSEE

FOR: HAZEN AND SAWYER		
DRAWN BY: AB	NOTES:	
PROJ #: 216100	LOCATIONS ARE APPROXIMATE	
SCALE: NONE	DATE: 04/07/16	DWG #: BLP - 4





LEGEND

B# SOIL TEST BORING

TP# TEST PIT LOCATION

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Geotechnical Engineering and Consulting

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KINGSPORT, TN 37663

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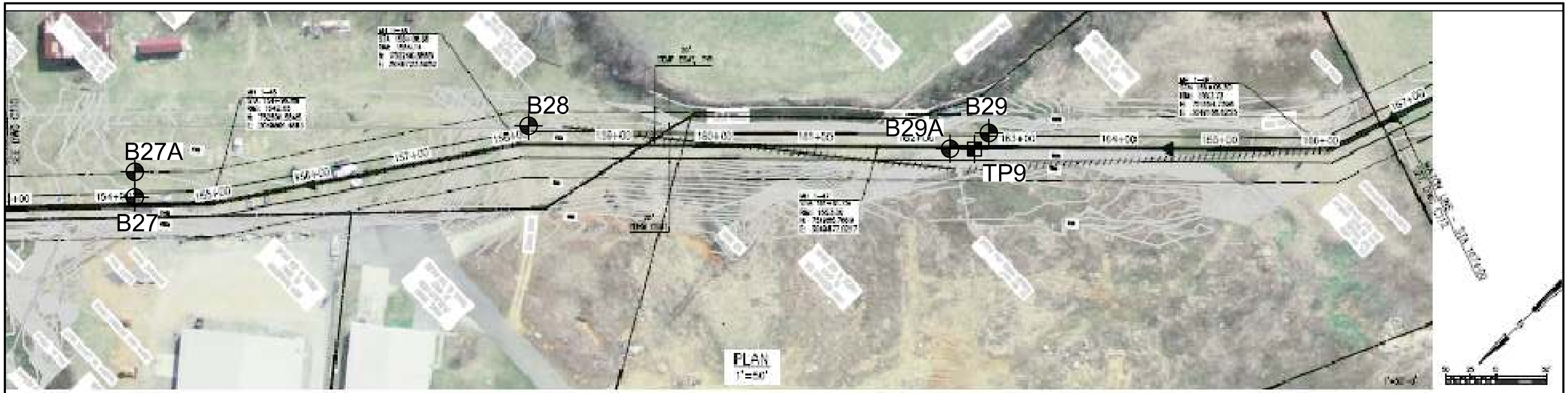
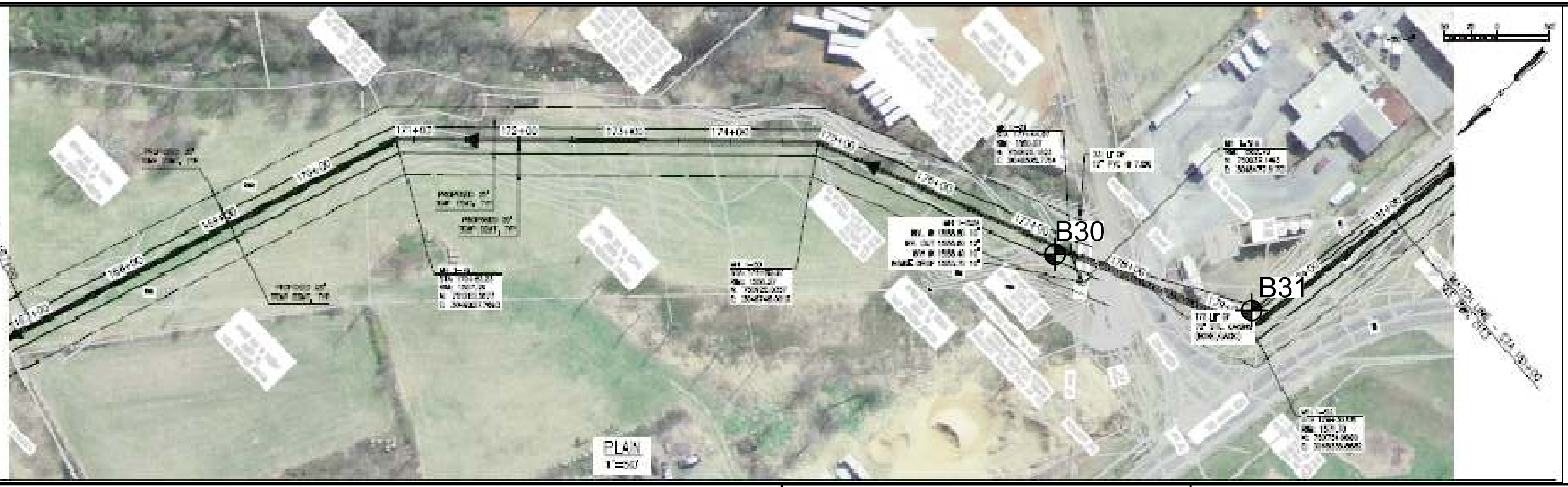
BORING LOCATION PLAN STA. 125+00 TO153+00
BRUSH CREEK INTERCEPTOR PROJECT
JOHNSON CITY, TENNESSEE

FOR: HAZEN AND SAWYER		
DRAWN BY: AB	NOTES:	
PROJ #: 216100	LOCATIONS ARE APPROXIMATE	
SCALE: NONE	DATE: 04/07/16	DWG #: BLP - 5





LEGEND

B# SOIL TEST BORING

TP# TEST PIT LOCATION

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Geotechnical Engineering and Consulting

P.O. BOX 5267
KINGSPORT, TN 37663

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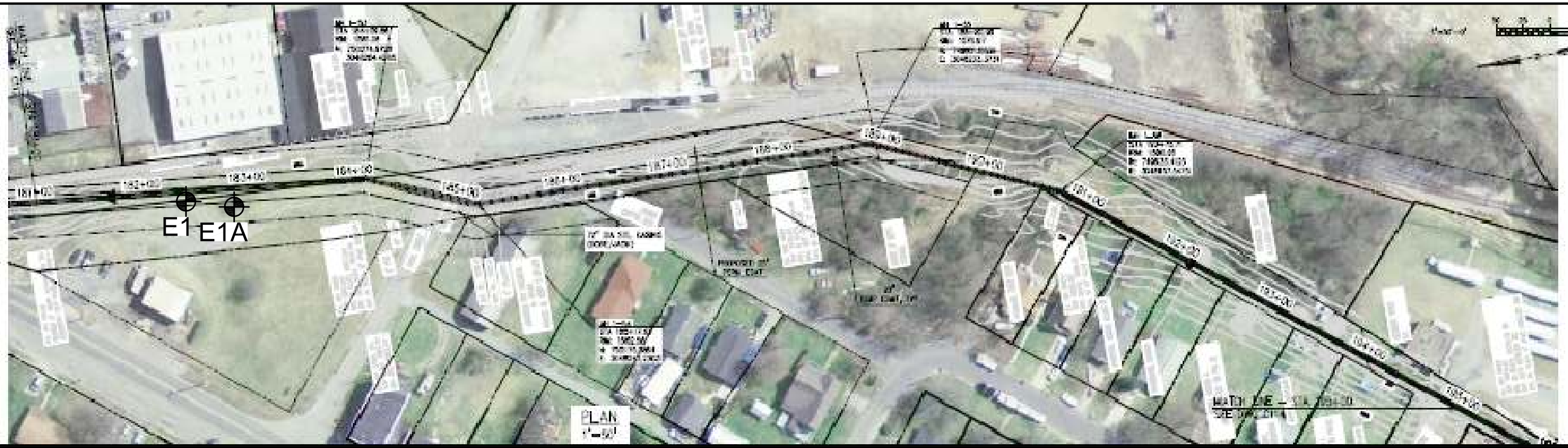
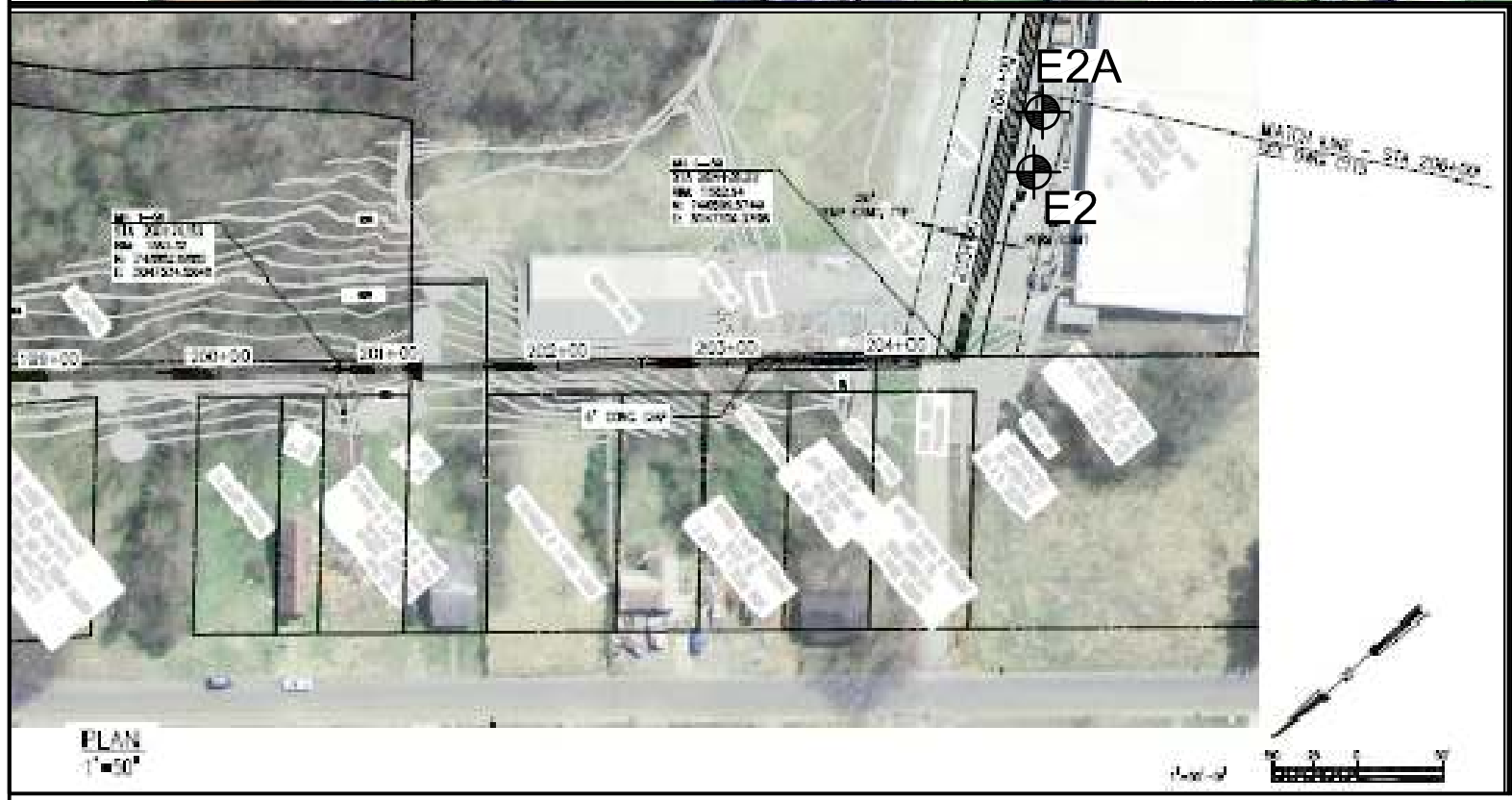
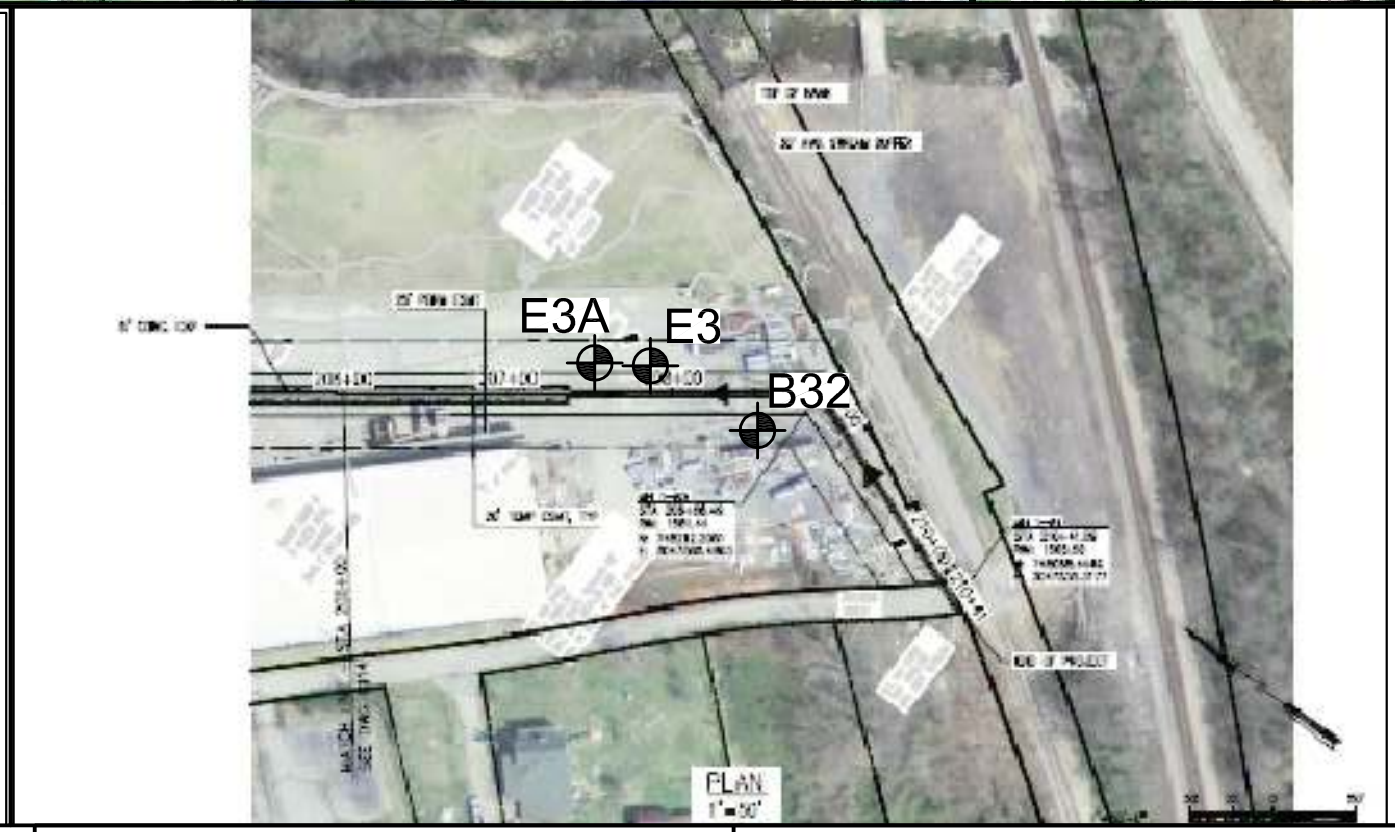
BORING LOCATION PLAN STA. 153+00 TO 181+00
BRUSH CREEK INTERCEPTOR PROJECT
JOHNSON CITY, TENNESSEE

FOR: HAZEN AND SAWYER		
DRAWN BY: AB	NOTES:	
PROJ #: 216100	LOCATIONS ARE APPROXIMATE	
SCALE: NONE	DATE: 04/07/16	DWG #: BLP - 6







LEGEND

- B# SOIL TEST BORING
- TP# TEST PIT LOCATION
- E# ENVIRONMENTAL TEST BORING

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Geotechnical Engineering and Consulting

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BORING LOCATION PLAN STA. 181+00 TO 210+00
BRUSH CREEK INTERCEPTOR PROJECT
JOHNSON CITY, TENNESSEE

FOR: HAZEN AND SAWYER		
DRAWN BY: AB	NOTES:	
PROJ #: 216100	LOCATIONS ARE APPROXIMATE	
SCALE: NONE	DATE: 04/07/16	DWG #: BLP - 7

Project: **LOWER BRUSH CREEK** Project Location: **JOHNSON CITY, TENNESSEE** Project Number: **216100**	Log of Boring B-1 **Sheet 1 of 1**

Date(s) Drilled **03/08/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **2.5**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1435**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **DCP**	Station **6+02**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1435	0								TOPSOIL	
			1	7-9-13					FILL, Stiff, Very Moist to Wet, Tan Brown, Silty GRAVEL with River Cobbles and Shot Rock.	
									Auger Refusal at 2.5 Feet.	
1430	5									
1425	10									
1420	15									
1415	20									
1410	25									
1405	30									

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Project: **LOWER BRUSH CREEK** Project Location: **JOHNSON CITY, TENNESSEE** Project Number: **216100**	Log of Boring B-1A **Sheet 1 of 1**

Date(s) Drilled **03/08/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **5.0**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1435**
Groundwater Level and Date Measured **0.8**	Sampling Method(s) **DCP**	Station **8+00**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1435	0								TOPSOIL	
			1	2-2-3					FILL, Stiff, Very Moist to Wet, Tan Brown, Silty GRAVEL with River Cobbles and Shot Rock.	
1430	5								Auger Refusal at 5.0 Feet.	
1425	10									
1420	15									
1415	20									
1410	25									
1405	30									

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Project: **LOWER BRUSH CREEK**
Project Location: **JOHNSON CITY, TENNESSEE**
Project Number: **216100**

Log of Boring B-1B

Sheet 1 of 1

Date(s) Drilled **03/08/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **3.0**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1435**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **DCP**	Station **7+02**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1435	0								TOPSOIL	
		X	18	6-8-11					FILL, Stiff, Very Moist to wet, Tan Brown, Silty GRAVEL with Shot Rock and River Cobbles.	
									Auger Refusal at 3.0 Feet.	
1430	5									
1425	10									
1420	15									
1415	20									
1410	25									
1405	30									

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Project: **LOWER BRUSH CREEK** Project Location: **JOHNSON CITY, TENNESSEE** Project Number: **216100**	Log of Boring B-2 **Sheet 1 of 1**

Date(s) Drilled **03/08/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **3.5**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1437**
Groundwater Level and Date Measured **3.0**	Sampling Method(s) **DCP**	Station **9+00**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1437	0								TOPSOIL Mixed with Limestone Gravel	
			1	4-9-11	18.0	42	15		FILL, Stiff to Medium, Very Moist to Wet, Brown Tan, Silty GRAVEL with River Cobbles and Black Shale.	
									Auger Refusal at 3.5 Feet.	
1432	5									
1427	10									
1422	15									
1417	20									
1412	25									
1407	30									

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Project: **LOWER BRUSH CREEK** Project Location: **JOHNSON CITY, TENNESSEE** Project Number: **216100**	Log of Boring B-2A **Sheet 1 of 1**

Date(s) Drilled **03/08/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **6.5**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1437**
Groundwater Level and Date Measured **1.0**	Sampling Method(s) **DCP**	Station **8+99**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1437	0								TOPSOIL	
			1	1-2-2					FILL, Soft, Very Wet, Tan Brown, Silty GRAVEL with River Cobbles and Shot Rock.	
1432	5								ALLUVIAL, Soft, Very Wet, Brown Tan, Silty GRAVEL with River Cobbles.	
									Auger Refusal at 6.5 Feet.	
1427	10									
1422	15									
1417	20									
1412	25									
1407	30									

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Project: **LOWER BRUSH CREEK**
Project Location: **JOHNSON CITY, TENNESSEE**
Project Number: **216100**

Log of Boring B-2B

Sheet 1 of 1

Date(s) Drilled **03/08/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **3.5**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1437**
Groundwater Level and Date Measured **3.0**	Sampling Method(s) **DCP**	Station **9+99**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1437	0								TOPSOIL	
		X	1	4-9-11	18.0	42	15		FILL, Stiff to Medium, Very Moist to Wet, Brown Tan, Silty GRAVEL with River Cobbles and Black Shale.	
									Auger Refusal at 3.5 Feet.	
1432	5									
1427	10									
1422	15									
1417	20									
1412	25									
1407	30									

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Project: **LOWER BRUSH CREEK** Project Location: **JOHNSON CITY, TENNESSEE** Project Number: **216100**	Log of Boring B-3 **Sheet 1 of 1**

Date(s) Drilled **03/08/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **4.5**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1442**
Groundwater Level and Date Measured **4.0**	Sampling Method(s) **DCP**	Station **12+00**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1442	0								TOPSOIL	
									FILL, Stiff, Very Moist, Tan Brown, Silty GRAVEL with River Cobbles and Iron Staining.	
			1	5-7-9	24.2					
			2	2-5-4					ALLUVIAL, Medium, Very Wet, Brown Tan, Silty GRAVEL with River Cobbles.	
1437	5								Auger Refusal at 4.5 Feet.	
1432	10									
1427	15									
1422	20									
1417	25									
1412	30									

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Project: **LOWER BRUSH CREEK** Project Location: **JOHNSON CITY, TENNESSEE** Project Number: **216100**	Log of Boring B-3A **Sheet 1 of 1**

Date(s) Drilled **03/08/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **6.0**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1442**
Groundwater Level and Date Measured **4.0**	Sampling Method(s) **DCP**	Station **10+80**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1442	0								TOPSOIL	
									FILL, Stiff, Very Moist, Tan Brown, Silty GRAVEL with River Cobbles.	
			1	6-8-7					ALLUVIAL, Medium, Very Wet, Brown Tan, Clayey SILT with River Cobbles.	
			2	3-4-4						
1437	5								Auger Refusal at 6.0 Feet.	
1432	10									
1427	15									
1422	20									
1417	25									
1412	30									

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Project: **LOWER BRUSH CREEK** Project Location: **JOHNSON CITY, TENNESSEE** Project Number: **216100**	Log of Boring B-3B **Sheet 1 of 1**

Date(s) Drilled **03/08/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **6.0**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1442**
Groundwater Level and Date Measured **4.0**	Sampling Method(s) **DCP**	Station **12+10**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1442	0								TOPSOIL	
									FILL, Stiff, Very Moist, Tan Brown, Silty GRAVEL with River Cobbles.	
			1	6-8-7					ALLUVIAL, Medium, Very Wet, Brown Tan, Clayey SILT with River Cobbles.	
			2	3-4-4						
1437	5								Auger Refusal at 6.0 Feet.	
1432	10									
1427	15									
1422	20									
1417	25									
1412	30									

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Project: **LOWER BRUSH CREEK** Project Location: **JOHNSON CITY, TENNESSEE** Project Number: **216100**	Log of Boring B-4 **Sheet 1 of 1**

Date(s) Drilled **03/08/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **19.0**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1457**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **DCP**	Station **14+50**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1457	0								TOPSOIL	
									ALLUVIAL, Stiff, Very Moist, Tan Red, Silty CLAY with Sand Seams and Cobbles, Dense Cobble Layer 8 to 11 Feet.	
			1	8-5-5						
1452	5									
			2	7-10-33	19.2					Elevated blow counts due to presence of cobbles.
1447	10									
									ALLUVIAL, Stiff, Very Moist to Moist, Tan, Clayey SILT.	
			3	15-15-16	19.6					
1442	15									
									Auger Refusal at 19.0 Feet.	
1437	20									
1432	25									
1427	30									

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Project: **LOWER BRUSH CREEK** Project Location: **JOHNSON CITY, TENNESSEE** Project Number: **216100**	Log of Boring B-4A **Sheet 1 of 1**

Date(s) Drilled **03/08/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **20.0**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1457**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **DCP**	Station **16+40**
Borehole Backfill **Soil Cuttings**	Comment	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1457	0								TOPSOIL	
			1	7-8-10					ALLUVIAL, Stiff, Very Moist, Red Tan, Silty CLAY with Sand Seams and Cobbles. Dense Cobble Layer at 8 to 10 Feet.	
			2	8-11-40						
1452	5									
			3	12-14-15						Elevated blow counts due to presence of cobbles.
1447	10									
									ALLUVIAL, Stiff, Very Moist to Moist, Tan, Clayey SILT.	
1442	15									
1437	20								Boring Terminated at 20.0 Feet.	
1432	25									
1427	30									

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Project: **LOWER BRUSH CREEK**
Project Location: **JOHNSON CITY, TENNESSEE**
Project Number: **216100**

Log of Boring B-5
Sheet 1 of 1

Date(s) Drilled **03/08/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **8.5**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1454**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **DCP**	Station **18+00**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1454	0								TOPSOIL with Roots.	
									Loamy, Soft, Very Moist, Clayey SILT.	
		X	1	1-1-3						
1449	5								ALLUVIAL, Stiff, Very Moist to Wet, Tan Red, Silty CLAY with Sand Seams and River Cobbles.	
		X	2	6-5-7						
									Auger Refusal at 8.5 Feet.	
1444	10									
1439	15									
1434	20									
1429	25									
1424	30									

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Project: **LOWER BRUSH CREEK** Project Location: **JOHNSON CITY, TENNESSEE** Project Number: **216100**	Log of Boring B-6 **Sheet 1 of 1**

Date(s) Drilled **03/08/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **20.0**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1454**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **DCP**	Station **20+50**
Borehole Backfill **Soil Cuttings**	Comment	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1454	0								TOPSOIL	
			1	2-2-2	15.0				ALLUVIAL, Medium to Stiff, Very Moist, Tan Red, Silty CLAY with Sand Seams and River Cobbles.	
1449	5									
			2	5-7-8	18.4					
1444	10								ALLUVIAL, Soft to Very Soft, Very Moist to Wet, Tan Red, Silty CLAY.	
			3	15+	33.2					
1439	15									
1434	20								Boring Terminated at 20.0 Feet.	
1429	25									
1424	30									

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Project: **LOWER BRUSH CREEK**
Project Location: **JOHNSON CITY, TENNESSEE**
Project Number: **216100**

Log of Boring B-7
Sheet 1 of 1

Date(s) Drilled **03/08/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **9.0**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1455**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **DCP**	Station **22+25**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1455	0								TOPSOIL	
									FILL, Stiff, Very Moist, Black Gray Red, Silty CLAY with Concrete and Asphalt Fragments.	
			1	7-6-7	24.7				ALLUVIAL, Stiff, Very Moist, Tan Red, Silty CLAY with Iron Staining, Sand Seams and River Cobbles.	
1450	5									
			2	6-7-8	21.9					
1445	10								Auger Refusal at 9.0 Feet.	
1440	15									
1435	20									
1430	25									
1425	30									

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Project: **LOWER BRUSH CREEK** Project Location: **JOHNSON CITY, TENNESSEE** Project Number: **216100**	Log of Boring B-7A **Sheet 1 of 1**

Date(s) Drilled **03/08/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **9.0**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1455**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **DCP**	Station **22+35**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1455	0								TOPSOIL	
									FILL, Stiff, Very Moist, Black Gray Red, Silty CLAY with Concrete and Asphalt.	
		X	1	6-7-8						
									ALLUVIAL, Stiff, Very Moist, Tan Red, Silty CLAY with Iron Staining, Sand Seams and River Cobbles.	
1450	5									
		X	2	8-7-7						
1445	10								Auger Refusal at 9.0 Feet.	
1440	15									
1435	20									
1430	25									
1425	30									

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Project: **LOWER BRUSH CREEK**
Project Location: **JOHNSON CITY, TENNESSEE**
Project Number: **216100**

Log of Boring B-8
Sheet 1 of 1

Date(s) Drilled **03/10/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **16.5**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1457**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **DCP**	Station **24+00**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1457	0								TOPSOIL	
									ALLUVIAL, Stiff, Very Moist to Moist, Tan Red Silty CLAY with Sand, River Cobbles and Iron Staining.	
1452	5	X	1	4-9-20	14.6					Elevated blow counts due to river cobbles.
		X	2	5-5-7	33.1				ALLUVIAL, Medium to Soft, Very Moist to Wet, Tan Red, Silty CLAY with Sand Seams and River Cobbles.	
1447	10									
		X	3	2-4-8	30.9					
1442	15								Auger Refusal at 16.5 Feet.	
1437	20									
1432	25									
1427	30									

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Project: **LOWER BRUSH CREEK**
Project Location: **JOHNSON CITY, TENNESSEE**
Project Number: **216100**

Log of Boring B-9
Sheet 1 of 1

Date(s) Drilled **03/10/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **2.0**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1460**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **DCP**	Station **29+50**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1460	0								TOPSOIL	
			1	6-3-4					ALLUVIAL, Medium, Very Moist, Brown Tan, Silty CLAY with Sand Seams and River Cobbles.	
									Auger Refusal at 2.0 Feet.	
1455	5									
1450	10									
1445	15									
1440	20									
1435	25									
1430	30									

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Project: **LOWER BRUSH CREEK**
Project Location: **JOHNSON CITY, TENNESSEE**
Project Number: **216100**

Log of Boring B-10
Sheet 1 of 1

Date(s) Drilled **03/10/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **17.5**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1461**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **DCP**	Station **34+25**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1461	0								TOPSOIL	
									FILL, Soft, Very Wet, Tan Brown, Silty CLAY with River Cobbles.	
									ALLUVIAL, Soft, Very Wet, Brown Tan, Clayey SILT with Cobbles.	
			1	4-5-5	35.5	53	15			
1456	5									
			2	8-14-11	24.7					
1451	10									
			3	12-14-26	36.9					
1446	15									
									Auger Refusal at 17.5 Feet.	
1441	20									
1436	25									
1431	30									

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Project: **LOWER BRUSH CREEK** Project Location: **JOHNSON CITY, TENNESSEE** Project Number: **216100**	Log of Boring B-11 **Sheet 1 of 1**

Date(s) Drilled **03/10/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **11.5**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1456**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **DCP**	Station **38+00**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1456	0								TOPSOIL with Cobbles.	
									ALLUVIAL, Medium to Stiff, Very Moist to Wet, Brown Tan, Clayey SILT with Sand Seams and Iron Staining.	
1451	5		1	4-4-4	20.2					
			2	6-6-7	35.2					
1446	10								Auger Refusal at 11.5 Feet.	
1441	15									
1436	20									
1431	25									
1426	30									

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Project: **LOWER BRUSH CREEK**
Project Location: **JOHNSON CITY, TENNESSEE**
Project Number: **216100**

Log of Boring B-12
Sheet 1 of 1

Date(s) Drilled **03/10/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **7.0**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1463**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **DCP**	Station **42+25**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1463	0								TOPSOIL	
									ALLUVIAL, Stiff, Very Moist, Tan Red to Brown Tan, Silty CLAY.	
		X	1	6-5-6	26.7					
1458	5									
									Auger Refusal at 7.0 Feet.	
1453	10									
1448	15									
1443	20									
1438	25									
1433	30									

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Project: **LOWER BRUSH CREEK**
Project Location: **JOHNSON CITY, TENNESSEE**
Project Number: **216100**

Log of Boring B-12A
Sheet 1 of 1

Date(s) Drilled **03/10/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **9.0**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1463**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **DCP**	Station **42+80**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1463	0								TOPSOIL	
									ALLUVIAL, Stiff, Very Moist, Tan Red to Brown Tan, Silty CLAY.	
			1	7-5-6						
1458	5									
1453	10								Auger Refusal at 9.0 Feet.	
1448	15									
1443	20									
1438	25									
1433	30									

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Project: **LOWER BRUSH CREEK**
Project Location: **JOHNSON CITY, TENNESSEE**
Project Number: **216100**

Log of Boring B-13
Sheet 1 of 1

Date(s) Drilled **03/10/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **14.5**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1464**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **DCP**	Station **46+00**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1464	0								TOPSOIL	
									ALLUVIAL, Stiff, Moist, Brown Tan, Clayey SILT with Sand Seams and Iron Staining.	
			1	4-8-8	20.6					
1459	5									
			2	8-8-15	27.0	53	27			
1454	10									
			3	7-9-10	24.8					
1449	15								Auger Refusal at 14.5 Feet.	
1444	20									
1439	25									
1434	30									

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Project: **LOWER BRUSH CREEK**
Project Location: **JOHNSON CITY, TENNESSEE**
Project Number: **216100**

Log of Boring B-14
Sheet 1 of 1

Date(s) Drilled **03/10/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **5.0**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1469**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **DCP**	Station **50+00**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1469	0								TOPSOIL	
									ALLUVIAL, Medium, Very Moist, Tan Red, Silty CLAY with Sand Seams.	
		X	1	4-4-4	29.2					
1464	5								Auger Refusal at 5.0 Feet.	
1459	10									
1454	15									
1449	20									
1444	25									
1439	30									

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Project: **LOWER BRUSH CREEK** Project Location: **JOHNSON CITY, TENNESSEE** Project Number: **216100**	Log of Boring B-14A **Sheet 1 of 1**

Date(s) Drilled **03/10/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **7.0**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1469**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **DCP**	Station **50+10**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1469	0								TOPSOIL	
									ALLUVIAL, Medium, Very Moist, Tan Red, Silty CLAY with Sand Seams.	
1464	5									
									Auger Refusal at 7.0 Feet.	
1459	10									
1454	15									
1449	20									
1444	25									
1439	30									

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Project: **LOWER BRUSH CREEK**
Project Location: **JOHNSON CITY, TENNESSEE**
Project Number: **216100**

Log of Boring B-15
Sheet 1 of 1

Date(s) Drilled **03/10/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **15.0**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1465**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **DCP**	Station **55+00**
Borehole Backfill **Soil Cuttings**	Comment	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1465	0								TOPSOIL	
									ALLUVIAL, Stiff, Very Moist, Brown Tan, Clayey SILT.	
			1	5-5-7	26.1					
1460	5								ALLUVIAL, Very Soft, Very Wet, Tan, Clayey SILT.	
			2	1	29.9					
1455	10									
			3	1						
1450	15								Boring Terminated at 15.0 Feet.	
1445	20									
1440	25									
1435	30									

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Project: **LOWER BRUSH CREEK** Project Location: **JOHNSON CITY, TENNESSEE** Project Number: **216100**	Log of Boring B-16 **Sheet 1 of 1**

Date(s) Drilled **03/10/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **5.0**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1466**
Groundwater Level and Date Measured **5.0**	Sampling Method(s) **DCP**	Station **58+00**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1466	0								TOPSOIL	
									ALLUVIAL, Medium, Very Moist, Tan Red to Brown Tan, Silty CLAY with Sand Seams.	
		X	1	4-4-5	19.9					
1461	5								Auger Refusal at 5.0 Feet.	
1456	10									
1451	15									
1446	20									
1441	25									
1436	30									

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Project: **LOWER BRUSH CREEK** Project Location: **JOHNSON CITY, TENNESSEE** Project Number: **216100**	Log of Boring B-16A **Sheet 1 of 1**

Date(s) Drilled **03/10/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **5.0**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1466**
Groundwater Level and Date Measured **5.0**	Sampling Method(s) **DCP**	Station **58+00**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1466	0								TOPSOIL	
			1	3-4-4					ALLUVIAL, Medium, Very Moist, Tan Red to Brown Tan, Silty CLAY with Sand Seams.	
1461	5								Auger Refusal at 5.0 Feet.	
1456	10									
1451	15									
1446	20									
1441	25									
1436	30									

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Project: **LOWER BRUSH CREEK** Project Location: **JOHNSON CITY, TENNESSEE** Project Number: **216100**	Log of Boring B-17 **Sheet 1 of 1**

Date(s) Drilled **03/10/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **5.0**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1477**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **DCP**	Station **62+00**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1477	0								TOPSOIL	
			1	4-4-4					ALLUVIAL, Medium, Very Moist, Red Tan, Silty CLAY.	
									Auger Refusal at 3.0 Feet.	
1472	5									
1467	10									
1462	15									
1457	20									
1452	25									
1447	30									

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Project: **LOWER BRUSH CREEK** Project Location: **JOHNSON CITY, TENNESSEE** Project Number: **216100**	Log of Boring B-17A **Sheet 1 of 1**

Date(s) Drilled **03/10/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **4.5**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1477**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **DCP**	Station **62+00**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1477	0								TOPSOIL	
			1	6-5-4					ALLUVIAL, Medium, Very Moist, Red Tan, Silty CLAY with Sand Seams.	
1472	5								Auger Refusal at 4.5 Feet.	
1467	10									
1462	15									
1457	20									
1452	25									
1447	30									

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Project: **LOWER BRUSH CREEK** Project Location: **JOHNSON CITY, TENNESSEE** Project Number: **216100**	Log of Boring B-17B **Sheet 1 of 1**

Date(s) Drilled **03/10/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **5.0**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1477**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **DCP**	Station **63+00**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1477	0								TOPSOIL	
			1	4-3-4					FILL, Medium, Very Moist, Tan Red, Silty CLAY with Sand Seams and Limestone Fragments up to Boulder in Size.	
1472	5								Auger Refusal at 5.0 Feet.	
1467	10									
1462	15									
1457	20									
1452	25									
1447	30									

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Project: **LOWER BRUSH CREEK** Project Location: **JOHNSON CITY, TENNESSEE** Project Number: **216100**	Log of Boring B-24 **Sheet 1 of 1**

Date(s) Drilled **03/10/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **5.0**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1536**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **DCP**	Station **138+50**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1536	0								TOPSOIL	
									ALLUVIAL, Stiff, Very Moist, Brown Tan, Clayey SILT with Sand Seams.	
		X	1	5-7-8	25.8					
1531	5									
									Auger Refusal at 6.5 Feet.	
1526	10									
1521	15									
1516	20									
1511	25									
1506	30									

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Project: **LOWER BRUSH CREEK**
Project Location: **JOHNSON CITY, TENNESSEE**
Project Number: **216100**

Log of Boring B-24A

Sheet 1 of 1

Date(s) Drilled **03/10/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **8.0**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1536**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **DCP**	Station **139+00**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1536	0								TOPSOIL	
									ALLUVIAL, Stiff, Very Moist, Brown Tan, Clayey SILT with Sand Seams.	
		X	1	6-7-7						
1531	5									
									Auger Refusal at 8.0 Feet.	
1526	10									
1521	15									
1516	20									
1511	25									
1506	30									

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Project: **LOWER BRUSH CREEK** Project Location: **JOHNSON CITY, TENNESSEE** Project Number: **216100**	Log of Boring B-25 **Sheet 1 of 1**

Date(s) Drilled **03/10/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **8.5**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1542**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **DCP**	Station **143+00**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1542	0								TOPSOIL	
									ALLUVIAL, Wet, Medium to Soft, Red Tan, Clayey SILT with Sand Seams.	
		X	1	4-4-5						
1537	5									
		X	2	5-5-9	30.7	47	22			
									Auger Refusal at 8.5 Feet.	
1532	10									
1527	15									
1522	20									
1517	25									
1512	30									

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Project: **LOWER BRUSH CREEK**
Project Location: **JOHNSON CITY, TENNESSEE**
Project Number: **216100**

Log of Boring B-25A
Sheet 1 of 1

Date(s) Drilled **03/10/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **4.5**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1542**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **DCP**	Station **143+00**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1542	0								TOPSOIL	
			1	3-2-2					ALLUVIAL, Medium to Soft, Wet, Red Tan, Clayey SILT with Sand Seams.	
1537	5								Auger Refusal at 4.5 Feet.	
1532	10									
1527	15									
1522	20									
1517	25									
1512	30									

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Project: **LOWER BRUSH CREEK**
Project Location: **JOHNSON CITY, TENNESSEE**
Project Number: **216100**

Log of Boring B-26
Sheet 1 of 1

Date(s) Drilled **03/10/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **4.5**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1544**
Groundwater Level and Date Measured **4.0**	Sampling Method(s) **DCP**	Station **151+00**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1544	0								TOPSOIL	
									ALLUVIAL, Medium, Wet, Brown Tan, Clayey SILT with Sand Seams.	
		X	1	3-5-5	26.8					
1539	5								Auger Refusal at 4.5 Feet.	
1534	10									
1529	15									
1524	20									
1519	25									
1514	30									

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Project: **LOWER BRUSH CREEK**
Project Location: **JOHNSON CITY, TENNESSEE**
Project Number: **216100**

Log of Boring B-26A

Sheet 1 of 1

Date(s) Drilled **03/10/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **4.5**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1544**
Groundwater Level and Date Measured **4.0**	Sampling Method(s) **DCP**	Station **150+00**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1544	0								TOPSOIL	
			1	4-5-4					ALLUVIAL, Medium, Wet, Brown Tan, Clayey SILT with Sand Seams.	
1539	5								Auger Refusal at 4.5 Feet.	
1534	10									
1529	15									
1524	20									
1519	25									
1514	30									

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Project: **LOWER BRUSH CREEK**
Project Location: **JOHNSON CITY, TENNESSEE**
Project Number: **216100**

Log of Boring B-27
Sheet 1 of 1

Date(s) Drilled **03/10/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **4.0**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1542**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **DCP**	Station **154+00**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1542	0								TOPSOIL	
									ALLUVIAL, Very Soft, Wet, Brown Tan, Clayey SILT with Sand Seams.	
		X	1	1-1-1	26.4					
1537	5								Auger Refusal at 4.0 Feet.	
1532	10									
1527	15									
1522	20									
1517	25									
1512	30									

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Project: **LOWER BRUSH CREEK** Project Location: **JOHNSON CITY, TENNESSEE** Project Number: **216100**	Log of Boring B-27A **Sheet 1 of 1**

Date(s) Drilled **03/10/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **5.0**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1542**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **DCP**	Station **154+00**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1542	0								TOPSOIL	
									ALLUVIAL, Very Soft, Wet, Brown Tan, Clayey SILT with Sand Seams.	
1537	5								Auger Refusal at 5.0 Feet.	
1532	10									
1527	15									
1522	20									
1517	25									
1512	30									

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Project: **LOWER BRUSH CREEK** Project Location: **JOHNSON CITY, TENNESSEE** Project Number: **216100**	Log of Boring B-28 **Sheet 1 of 1**

Date(s) Drilled **03/10/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **7.5**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1554**
Groundwater Level and Date Measured **7.0**	Sampling Method(s) **DCP**	Station **158+00**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1554	0								TOPSOIL	
									ALLUVIAL, Very Soft, Wet, Brown Tan, Clayey SILT.	
1549	5									
									Auger Refusal at 7.5 Feet.	
1544	10									
1539	15									
1534	20									
1529	25									
1524	30									

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Project: **LOWER BRUSH CREEK**
Project Location: **JOHNSON CITY, TENNESSEE**
Project Number: **216100**

Log of Boring B-29
Sheet 1 of 1

Date(s) Drilled **03/10/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **1.0**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1556**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **DCP**	Station **162+80**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1556	0								TOPSOIL	
									FILL, Soft, Wet, Brown Red, Silty CLAY and Limestone Fragments up to Boulder in Size.	
									Auger Refusal at 1.0 Feet.	
1551	5									
1546	10									
1541	15									
1536	20									
1531	25									
1526	30									

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Project: **LOWER BRUSH CREEK**
Project Location: **JOHNSON CITY, TENNESSEE**
Project Number: **216100**

Log of Boring B-29A
Sheet 1 of 1

Date(s) Drilled **03/10/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **4.0**
Drill Rig Type **Bobcat**	Drilling Contractor **CML - Knoxville**	Approximate Surface Elevation **1556**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **DCP**	Station **162+50**
Borehole Backfill **Soil Cuttings**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1556	0								TOPSOIL	
									FILL, Very Soft, Wet, Red Brown, Clayey SILT and Limestone Fragments up to Boulder in Size.	
1551	5								Auger Refusal at 4.0 Feet.	
1546	10									
1541	15									
1536	20									
1531	25									
1526	30									

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Project: **LOWER BRUSH CREEK**
Project Location: **JOHNSON CITY, TENNESSEE**
Project Number: **216100**

Log of Boring B-30
Sheet 1 of 1

Date(s) Drilled **03/18/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **15.0**
Drill Rig Type **CME 75**	Drilling Contractor **CML - Johnson City**	Approximate Surface Elevation **1557**
Groundwater Level and Date Measured **7.0**	Sampling Method(s) **SPT**	Station **177+25**
Borehole Backfill **Soil Cuttings**	Comments	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1557	0								TOPSOIL	
			1	6	20.7				ALLUVIAL, Medium, Very Moist, Brown Tan, Claye SILT with Sand Seams.	
			2	4	23.9					
1552	5									
		▽	3	5	29.8					
			4	3	38.8				ALLUVIAL, Soft, Very Wet, Tan Red, Silty CLAY.	
1547	10									
			5	2						
1542	15								Boring Terminated at 15.0 Feet.	
1537	20									
1532	25									
1527	30									
1522	35									
1517	40									

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Project: **LOWER BRUSH CREEK**
Project Location: **JOHNSON CITY, TENNESSEE**
Project Number: **216100**

Log of Boring B-31
Sheet 1 of 1

Date(s) Drilled **03/18/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **20.0**
Drill Rig Type **CME 75**	Drilling Contractor **CML - Johnson City**	Approximate Surface Elevation **1576**
Groundwater Level and Date Measured **8.0**	Sampling Method(s) **SPT**	Station **179+00**
Borehole Backfill **Soil Cuttings**	Comments	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1576	0		1	50=1"					TOPSOIL	
									FILL, Soft, Very Moist, Tan Black, Sandy SILT with Limestone and Sandstone Gravel.	
			2	6	33.0					
1571	5		3	6					ALLUVIAL, Soft, Very Moist to Very Wet, Red Tan, Clayey SILT and Sand Seams.	
			4	3	25.3	39	21			
1566	10									
			5	4	43.0				RESIDUAL, Very Soft, Very Wet, Brown Tan, Clayey SILT with Iron Staining.	
1561	15									
			6	3	38.2					
1556	20								Boring Terminated at 20.0 Feet.	
1551	25									
1546	30									
1541	35									
1536	40									

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Project: **LOWER BRUSH CREEK**
Project Location: **JOHNSON CITY, TENNESSEE**
Project Number: **216100**

Log of Boring B-32
Sheet 1 of 1

Date(s) Drilled **03/17/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **7.0**
Drill Rig Type **CME 75**	Drilling Contractor **CML - Johnson City**	Approximate Surface Elevation **1583**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **SPT**	Station **208+50**
Borehole Backfill **Soil Cuttings**	Comments **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1583	0								TOPSOIL	
			1	6	24.8				FILL, Medium, Very Moist, Tan Red, Silty CLAY.	
			2	4	27.4	39	17		ALLUVIAL, Soft, Wet, Tan Brown, Clayey SILT with Sand Seams.	
1578	5								Auger Refusal at 7.0 Feet.	
1573	10									
1568	15									
1563	20									
1558	25									
1553	30									
1548	35									
1543	40									

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Project: **LOWER BRUSH CREEK**
Project Location: **JOHNSON CITY, TENNESSEE**
Client **HAZEN SAWYER**

Log of Boring B-33
Sheet 1 of 1

Date(s) Drilled **03/11/2016**	Drilling Contractor **CML - Knoxville**	FSE File Number **216100**
Drilling Method **Hollow Stem Augers**	Logged By **Allen Browning**	Total Depth of Borehole **3.5**
Drill Rig Type **Bobcat**	Checked By **Allen Browning**	Approximate Surface Elevation **1558**
Borehole Backfill **Soil Cuttings**	Sampling Method(s) **DCP**	Groundwater Depth (ft) **2.0**
	Comments **Refusal on limestone boulders**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1558	0								TOPSOIL	
			1	1-1-1					ALLUVIAL, Very Loose, Wet, Gray Brown, Clayey SAND.	
1553	5								Auger Refusal at 3.5 Feet.	
1548	10									
1543	15									
1538	20									
1533	25									
1528	30									

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Project: **LOWER BRUSH CREEK** Project Location: **JOHNSON CITY, TENNESSEE** Client **HAZEN SAWYER**	Log of Boring B-33A **Sheet 1 of 1**

Date(s) Drilled **03/11/2016**	Drilling Contractor **CML - Knoxville**	FSE File Number **216100**
Drilling Method **Hollow Stem Augers**	Logged By **Allen Browning**	Total Depth of Borehole **3.0**
Drill Rig Type **Bobcat**	Checked By **Allen Browning**	Approximate Surface Elevation **1558**
Borehole Backfill **Soil Cuttings**	Sampling Method(s) **DCP**	Groundwater Depth (ft) **2.0**
	Comments **Refusal on limestone boulders**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1558	0								TOPSOIL	
			1	1-1-1					ALLUVIAL, Very Loose, Wet, Gray Brown, Clayey SAND.	
									Auger Refusal at 3.0 Feet.	
1553	5									
1548	10									
1543	15									
1538	20									
1533	25									
1528	30									

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Project: **LOWER BRUSH CREEK** Project Location: **JOHNSON CITY, TENNESSEE** Client **HAZEN SAWYER**	Log of Boring B-33B **Sheet 1 of 1**

Date(s) Drilled **03/11/2016**	Drilling Contractor **CML - Knoxville**	FSE File Number **216100**
Drilling Method **Hollow Stem Augers**	Logged By **Allen Browning**	Total Depth of Borehole **4.0**
Drill Rig Type **Bobcat**	Checked By **Allen Browning**	Approximate Surface Elevation **1558**
Borehole Backfill **Soil Cuttings**	Sampling Method(s) **DCP**	Groundwater Depth (ft) **N/A**
	Comments **Refusal on limestone boulders**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Dynamic Cone Penetrometer	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1558	0								TOPSOIL	
			1	1-1-1					ALLUVIAL, Soft, Very Moist, Brown Tan, Clayey SILT.	
1553	5								Auger Refusal at 4.0 Feet.	
1548	10									
1543	15									
1538	20									
1533	25									
1528	30									

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Project: **LOWER BRUSH CREEK**
Project Location: **JOHNSON CITY, TENNESSEE**
Project Number: **216100**

Log of Boring B-34
Sheet 1 of 1

Date(s) Drilled **03/18/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **3.0**
Drill Rig Type **CME 75**	Drilling Contractor **CML - Johnson City**	Approximate Surface Elevation **1550**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **SPT**	Station **39+00**
Borehole Backfill **Soil Cuttings**	Comments **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1550	0		1	50=1"	19.2				TOPSOIL	
									FILL, Medium, Very Moist, Black Brown Gray, Clayey SILT with Sand Seams.	
1545	5								Auger Refusal at 3.0 Feet.	
1540	10									
1535	15									
1530	20									
1525	25									
1520	30									
1515	35									
1510	40									

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Project: **LOWER BRUSH CREEK**
Project Location: **JOHNSON CITY, TENNESSEE**
Project Number: **216100**

Log of Boring B-34A

Sheet 1 of 1

Date(s) Drilled **03/18/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Augers**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **4.0**
Drill Rig Type **CME 75**	Drilling Contractor **CML - Johnson City**	Approximate Surface Elevation **1550**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **SPT**	Station **39+50**
Borehole Backfill **Soil Cuttings**	Comments **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1550	0								TOPSOIL	
			1	7					FILL, Medium, Very Moist, Black Brown Gray, Clayey SILT with Sand Seams.	
1545	5								Auger Refusal at 4.0 Feet.	
1540	10									
1535	15									
1530	20									
1525	25									
1520	30									
1515	35									
1510	40									

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Project: **LOWER BRUSH CREEK** Project Location: **JOHNSON CITY, TENNESSEE** Project Number: **216100E**	Log of Boring E1 **Sheet 1 of 1**

Date(s) Drilled **03/15/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **2.0**
Drill Rig Type **CME 75**	Drilling Contractor **CML - JC**	Approximate Surface Elevation **1581**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **SPT**	Station **182+50**
Borehole Backfill **Soil Cuttings with Bentonite**	Comments **Refusal material unkown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1581	0								TOPSOIL	
			1	2					FILL, Soft, Moist, Black Brown, Clayey SILT with Limestone Rock and Asphalt Fragments.	
									Auger Refusal at 2.0 Feet.	
1576	5									
1571	10									
1566	15									
1561	20									
1556	25									
1551	30									
1546	35									
1541	40									

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Project: **LOWER BRUSH CREEK** Project Location: **JOHNSON CITY, TENNESSEE** Project Number: **216100**	Log of Boring E1A **Sheet 1 of 1**

Date(s) Drilled **03/15/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **20.0**
Drill Rig Type **CME 75**	Drilling Contractor **CML - Johnson City**	Approximate Surface Elevation **1581**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **SPT**	Station **183+00**
Borehole Backfill **Soil Cuttings with Bentonite**	Comment **Offset of Boring E1**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS	PID Reading, ppm
1581	0					TOPSOIL		
			1	5		FILL, Medium to Soft, Black Brown to Red Brown, Clayey SILT with Limestone Rock Fragments.		0.3
			2	2				1.0
1576	5							
			3	8		RESIDUAL, Medium to Stiff, Very Moist to Wet, Tan Red, Silty CLAY with Iron Staining.		0.8
			4	10				1.4
1571	10		5					1.2
			6					2.0
			7					0.4
1566	15		8					6.4
1561	20					Boring Terminated at 20.0 Feet.		
1556	25							
1551	30							

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Project: **LOWER BRUSH CREEK** Project Location: **JOHNSON CITY, TENNESSEE** Project Number: **216100**	Log of Boring E2 **Sheet 1 of 1**

Date(s) Drilled **03/15/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **2.0**
Drill Rig Type **CME 75**	Drilling Contractor **CML - Johnson City**	Approximate Surface Elevation **1580**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **SPT**	Station **205+50**
Borehole Backfill **Soil Cuttings with Bentonite**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS	PID Reading, ppm
1580	0					LIMESTONE GRAVEL		
			1	10		FILL, Stiff, Moist, Tan Red, Silty CLAY with Limestone Fragments.		0.6
						Auger Refusal at 2.0 Feet.		
1575	5							
1570	10							
1565	15							
1560	20							
1555	25							
1550	30							

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Project: **LOWER BRUSH CREEK** Project Location: **JOHNSON CITY, TENNESSEE** Project Number: **216100**	Log of Boring E2A **Sheet 1 of 1**

Date(s) Drilled **03/15/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **7.5**
Drill Rig Type **CME 75**	Drilling Contractor **CML - Johnson City**	Approximate Surface Elevation **1580**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **SPT**	Station **206+00**
Borehole Backfill **Soil Cuttings with Bentonite**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS	PID Reading, ppm
1580	0					LIMESTONE GRAVEL		
			1	6		FILL, Stiff, Moist, Tan Red, Silty CLAY with Limestone Fragments.		
			2			ALLUVIAL, Stiff, Very Moist, Brown Tan, Clayey SILT.		0.7
1575	5		3					1.8
			4					2.1
						Auger Refusal at 7.5 Feet.		
1570	10							
1565	15							
1560	20							
1555	25							
1550	30							

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Project: **LOWER BRUSH CREEK** Project Location: **JOHNSON CITY, TENNESSEE** Project Number: **216100**	Log of Boring E3 **Sheet 1 of 1**

Date(s) Drilled **03/15/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **4.5**
Drill Rig Type **CME 75**	Drilling Contractor **CML - Johnson City**	Approximate Surface Elevation **1581**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **SPT**	Station **208+00**
Borehole Backfill **Soil Cuttings with Bentonite**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS	PID Reading, ppm
1581	0					LIMESTONE GRAVEL		
						FILL, Medium to Soft, Wet, Brown Tan, Clayey SILT with Hydrocarbon Odors.		
			1					460
			2					814
1576	5					Auger Refusal at 4.5 Feet.		
1571	10							
1566	15							
1561	20							
1556	25							
1551	30							

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Project: **LOWER BRUSH CREEK** Project Location: **JOHNSON CITY, TENNESSEE** Project Number: **216100**	Log of Boring E3A **Sheet 1 of 1**

Date(s) Drilled **03/15/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **4.5**
Drill Rig Type **CME 75**	Drilling Contractor **CML - Johnson City**	Approximate Surface Elevation **1581**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **SPT**	Station **207+80**
Borehole Backfill **Soil Cuttings with Bentonite**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS	PID Reading, ppm
1581	0					LIMESTONE GRAVEL		
						FILL, Medium to Soft, Wet, Brown Tan, Clayey SILT with Hydrocarbon Odors.		
			1					460
			2					814
1576	5					Auger Refusal at 4.5 Feet.		
1571	10							
1566	15							
1561	20							
1556	25							
1551	30							

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Project: **LOWER BRUSH CREEK**
Project Location: **JOHNSON CITY, TENNESSEE**
Project Number: **216100**

Key to Log of Boring

Sheet 1 of 1

1 Elevation (feet)	2 Depth (feet)	3 Sample Type	4 Sample Number	5 Sampling Resistance, blows/ft	6 Graphic Log	7 MATERIAL DESCRIPTION	8 REMARKS AND OTHER TESTS	9 PID Reading, ppm

COLUMN DESCRIPTIONS

1. Elevation (feet): Elevation (MSL, feet).
2. Depth (feet): Depth in feet below the ground surface.
3. Sample Type: Type of soil sample collected at the depth interval shown.
4. Sample Number: Sample identification number.
5. Sampling Resistance, blows/ft: Number of blows to advance driven sampler one foot (or distance shown) beyond seating interval using the hammer identified on the boring log.
6. Graphic Log: Graphic depiction of the subsurface material encountered.
7. MATERIAL DESCRIPTION: Description of material encountered. May include consistency, moisture, color, and other descriptive text.
8. REMARKS AND OTHER TESTS: Comments and observations regarding drilling or sampling made by driller or field personnel.
9. PID Reading, ppm: The reading from a photo-ionization detector, in parts per million.

FIELD AND LABORATORY TEST ABBREVIATIONS

NMC: Natural Moisture Content, percent
LL: Liquid Limit, percent
PI: Plasticity Index, percent
SA: Sieve analysis (percent passing No. 200 Sieve)
UC: Unconfined compressive strength test, Qu, in ksf

MATERIAL GRAPHIC SYMBOLS

- Asphaltic Concrete (AC)
- Bentonite
- Bentonite chips
- Bentonite powder
- Bentonite plug
- Boulders
- Fat CLAY, CLAY w/SAND, SANDY CLAY (CH)
- Fat CLAY/SILT (CH-MH)
- Fat CLAY/PEAT (CH-OH)
- Lean CLAY, CLAY w/SAND, SANDY CLAY (CL)
- Lean-Fat CLAY, CLAY w/SAND, SANDY CLAY (CL-CH)
- SILTY CLAY (CL-ML)
- Lean CLAY/PEAT (CL-OL)
- Claystone
- Portland Cement Concrete
- Cuttings
- AF
- Clayey GRAVEL (GC)
- Clayey GRAVEL to Gravelly CLAY (GC-CH)
- Clayey GRAVEL to Gravelly CLAY (GC-CL)
- Silty GRAVEL (GM)
- Silty GRAVEL to Clayey GRAVEL (GM-GC)
- Silty GRAVEL to Gravelly SILT (GM-MH)
- Silty GRAVEL to Gravelly SILT (GM-ML)
- Poorly graded GRAVEL (GP)
- Poorly graded GRAVEL with Silt (GP-GM)
- Granite
- Grass and/or topsoil
- Gravel
- Grout
- Well graded GRAVEL (GW)
- Well graded GRAVEL with Silt (GW-GM)
- Poorly to Well graded GRAVEL (GW-GP)
- Limestone
- Artificial Fill
- SILT, SILT w/SAND, SANDY SILT (MH)
- SILT, SILT w/SAND, SANDY SILT (ML)
- SILT, SILT with SAND, SANDY SILT (ML-MH)
- High plasticity PEAT (OH)
- Low plasticity PEAT (OL)
- Low to High plasticity PEAT (OL-OH)
- Sandstone
- Clayey SAND (SC)
- Clayey SAND to Sandy CLAY (SC-CH)
- Clayey SAND to Sandy CLAY (SC-CL)
- Shale
- Silt
- Siltstone
- Silty SAND (SM)
- Silty SAND to Sandy SILT (SM-MH)
- Silty SAND to Sandy SILT (SM-ML)
- Silty to Clayey SAND (SM-SC)
- Poorly graded SAND (SP)
- Poorly graded SAND with Clay (SP-SC)
- Poorly graded SAND with Silt (SP-SM)
- Well graded SAND (SW)
- Well graded SAND with Clay (SW-SC)
- Well graded SAND with Silt (SW-SM)

TYPICAL SAMPLER GRAPHIC SYMBOLS

- Auger sampler
- Bulk Sample
- 3-inch-OD California w/ brass rings
- CME Sampler
- Grab Sample
- 2.5-inch-OD Modified California w/ brass liners
- Pitcher Sample
- 2-inch-OD unlined split spoon (SPT)
- Shelby Tube (Thin-walled, fixed head)

OTHER GRAPHIC SYMBOLS

- Water level (at time of drilling, ATD)
- Water level (after waiting)
- Minor change in material properties within a stratum
- Inferred/gradational contact between strata
- Queried contact between strata

GENERAL NOTES

1: Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.
2: Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

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TEST PIT OBSERVATION RECORD

Foundation Systems Engineering, P.C.
Geotechnical Engineering and Consulting

TEST PIT NO:	**1**	PROJECT NAME:	Lower Brush Creek
EXCAVATOR:	Caterpillar 322B	PROJECT LOCATION:	Johnson City, Tennessee
OBSERVED BY:	Allen Browning, MS, PE	FSE PROJECT NO:	216100
DATE EXCAVATED :	3-21-2016	ELEVATION:	1435 FT STATION: 6+50

DEPTH (FEET)	MATERIAL DESCRIPTION	CONSISTENCY ESTIMATE
0 - 1.0	Topsoil	
1.0 - 4.0	Fill, very moist, brown, Clayey SILT w/ Sandstone river cobbles and Shale rock fragments from gravel to boulder in size	Medium
4.0 - 5.0	Alluvial, wet, brown gray tan, Silty GRAVEL w/ Sandstone river cobbles	Stiff

Note: Test pit refusal at 5 feet on Shale Bedrock. Groundwater encountered at 4.8 feet below ground surface.

TEST PIT OBSERVATION RECORD

Foundation Systems Engineering, P.C.
Geotechnical Engineering and Consulting

TEST PIT NO:	**2**	PROJECT NAME:	Lower Brush Creek
EXCAVATOR:	Caterpillar 322B	PROJECT LOCATION:	Johnson City, Tennessee
OBSERVED BY:	Allen Browning, MS, PE	FSE PROJECT NO:	216100
DATE EXCAVATED :	3-21-2016	ELEVATION:	1437 FT STATION: 9+30

DEPTH (FEET)	MATERIAL DESCRIPTION	CONSISTENCY ESTIMATE
0 - 0.8	Topsoil	
0.8 -2.0	Fill, moist, brown, Silty GRAVEL w/ Sandstone river cobbles and Shale rock fragments from gravel to boulder in size	Medium
2.0 - 4.0	Alluvial, wet, brown tan, Silty Gravel	Stiff
Note: Test pit refusal at 4 feet on Shale Bedrock. Groundwater was not encountered.		

TEST PIT OBSERVATION RECORD

Foundation Systems Engineering, P.C.
Geotechnical Engineering and Consulting

TEST PIT NO:	**3**	PROJECT NAME:	Lower Brush Creek
EXCAVATOR:	Caterpillar 322B	PROJECT LOCATION:	Johnson City, Tennessee
OBSERVED BY:	Allen Browning, MS, PE	FSE PROJECT NO:	216100
DATE EXCAVATED :	3-21-2016	ELEVATION:	1442 FT STATION: 11+80

DEPTH (FEET)	MATERIAL DESCRIPTION	CONSISTENCY ESTIMATE
0 - 0.5	Topsoil	
0.5 - 2.0	Fill, moist, brown, Silty GRAVEL w/ Sandstone river cobbles and Shale rock fragments from gravel to boulder in size	Medium
2.0 - 4.5	Alluvial, very moist, brown tan, Silty GRAVEL	Medium
4.5 - 5.0	Residual, black and gray, weathered shale	Very Hard

Note: Test pit refusal at 5 feet on Shale Bedrock. Groundwater was not encountered.

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TEST PIT OBSERVATION RECORD

Foundation Systems Engineering, P.C.
Geotechnical Engineering and Consulting

TEST PIT NO:	**4**	PROJECT NAME:	Lower Brush Creek
EXCAVATOR:	Caterpillar 322B	PROJECT LOCATION:	Johnson City, Tennessee
OBSERVED BY:	Allen Browning, MS, PE	FSE PROJECT NO:	216100
DATE EXCAVATED :	3-21-2016	ELEVATION:	1454 FT STATION: 18+00

DEPTH (FEET)	MATERIAL DESCRIPTION	CONSISTENCY ESTIMATE
0 - 3.0	Topsoil	
3.0 - 9.0	Alluvial, very moist, brown red tan, Clayey SILT w/ Sand seams. There was a dense Sandstone cobble layer from 7 to 9 feet	Medium
9.0 - 14.5	Alluvial, very moist, brown Tan, Clayey SILT	Stiff
Note: Test pit terminated at 14.5 feet. Groundwater was not encountered.		

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TEST PIT OBSERVATION RECORD

Foundation Systems Engineering, P.C.
Geotechnical Engineering and Consulting

TEST PIT NO:	**5**	PROJECT NAME:	Lower Brush Creek
EXCAVATOR:	Caterpillar 322B	PROJECT LOCATION:	Johnson City, Tennessee
OBSERVED BY:	Allen Browning, MS, PE	FSE PROJECT NO:	216100
DATE EXCAVATED :	3-21-2016	ELEVATION:	1455 FT STATION: 22+20

DEPTH (FEET)	MATERIAL DESCRIPTION	CONSISTENCY ESTIMATE
0 - 0.3	Topsoil	
0.3 - 3.0	Fill, very moist, brown red to gray brown, Silty CLAY w/ Asphalt fragments, Sandstone cobbles, Limestone and Concrete fragments	Medium
3.0 - 9.0	Alluvial, very moist, tan red, Clayey SILT	Medium
9.0 - 14.5	Alluvial, very moist to wet, brown tan, Clayey SILT w/ Sand seams. There was a dense Sandstone cobble layer from 9 to 11 feet	Stiff

Note: Test pit terminated at 14.5 feet. Groundwater was not encountered.

TEST PIT OBSERVATION RECORD

Foundation Systems Engineering, P.C.
Geotechnical Engineering and Consulting

TEST PIT NO:	**6**	PROJECT NAME:	Lower Brush Creek
EXCAVATOR:	Caterpillar 322B	PROJECT LOCATION:	Johnson City, Tennessee
OBSERVED BY:	Allen Browning, MS, PE	FSE PROJECT NO:	216100
DATE EXCAVATED :	3-22-2016	ELEVATION:	1459 FT STATION: 29+50

DEPTH (FEET)	MATERIAL DESCRIPTION	CONSISTENCY ESTIMATE
0 - 1.0	Topsoil w/ Limestone rock fragments and Sandstone river cobbles	
1.0 - 2.0	Alluvial, very moist, brown tan, Silty GRAVEL w/ Sand Seams and Sandstone river cobbles up to boulder in size	Medium
2.0 - 12.0	Alluvial, very moist, tan red, Silty CLAY w/ Sandstone river cobbles up to boulder in size	Loose/Soft
Note: Test pit terminated at 12 feet due to sidewalls falling in. Groundwater was not encountered.		

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TEST PIT OBSERVATION RECORD

Foundation Systems Engineering, P.C.
Geotechnical Engineering and Consulting

TEST PIT NO:	**7**	PROJECT NAME:	Lower Brush Creek
EXCAVATOR:	Caterpillar 322B	PROJECT LOCATION:	Johnson City, Tennessee
OBSERVED BY:	Allen Browning, MS, PE	FSE PROJECT NO:	216100
DATE EXCAVATED :	3-22-2016	ELEVATION:	1463 FT STATION: 45+00

DEPTH (FEET)	MATERIAL DESCRIPTION	CONSISTENCY ESTIMATE
0 - 1.2	Topsoil	
1.2 - 6.0	Alluvial, very moist, brown tan, Silty CLAY w/ Sand seams and Iron Staining	Medium

Note: Test pit refusal at 6 feet on Limestone bedrock. Groundwater was not encountered.

TEST PIT OBSERVATION RECORD

Foundation Systems Engineering, P.C.
Geotechnical Engineering and Consulting

TEST PIT NO:	**8**	PROJECT NAME:	Lower Brush Creek
EXCAVATOR:	Caterpillar 322B	PROJECT LOCATION:	Johnson City, Tennessee
OBSERVED BY:	Allen Browning, MS, PE	FSE PROJECT NO:	216100
DATE EXCAVATED :	3-22-2016	ELEVATION:	1463 FT STATION: 58+50

DEPTH (FEET)	MATERIAL DESCRIPTION	CONSISTENCY ESTIMATE
0 - 3.0	Topsoil w/ Limestone boulders up to 3 feet in diameter	
3.0 - 6.0	Alluvial, very moist, brown tan, Silty CLAY w/ Sand seams, Limestone Boulders and Iron Staining	Medium

Note: Test pit refusal at 6 feet on Limestone bedrock. Groundwater was not encountered.

TEST PIT OBSERVATION RECORD

Foundation Systems Engineering, P.C.
Geotechnical Engineering and Consulting

TEST PIT NO:	**9**	PROJECT NAME:	Lower Brush Creek
EXCAVATOR:	Caterpillar 322B	PROJECT LOCATION:	Johnson City, Tennessee
OBSERVED BY:	Allen Browning, MS, PE	FSE PROJECT NO:	216100
DATE EXCAVATED :	3-22-2016	ELEVATION:	1556 FT STATION: 162+50

DEPTH (FEET)	MATERIAL DESCRIPTION	CONSISTENCY ESTIMATE
0 - 0.5	Topsoil	
0.5 - 6.0	Fill, moist, black gray to tan brown, Clayey SILT w/ Limestone fragments up to boulder in size, brick, asphalt and organic material	Soft
6.0 - 7.0	Alluvial, wet, tan gray, Clayey SILT	Soft

Note: Test pit refusal at 7 feet on Limestone bedrock. Groundwater was encountered at 6 feet below ground surface.

TEST PIT OBSERVATION RECORD

Foundation Systems Engineering, P.C.
Geotechnical Engineering and Consulting

TEST PIT NO:	**10**	PROJECT NAME:	Lower Brush Creek
EXCAVATOR:	Caterpillar 322B	PROJECT LOCATION:	Johnson City, Tennessee
OBSERVED BY:	Allen Browning, MS, PE	FSE PROJECT NO:	216100
DATE EXCAVATED :	3-22-2016	ELEVATION:	1498 FT STATION: 90+00

DEPTH (FEET)	MATERIAL DESCRIPTION	CONSISTENCY ESTIMATE
0 - 1.1	Topsoil	
1.1 - 7.0	Residual, very moist, tan red, Silty CLAY w/ Silt seams and Iron Staining	Medium
7.0 - 13.0	Residual, very moist, red brown tan, Clayey SILT w/ Iron staining	Medium
Note: Test pit refusal at 13 feet on Limestone bedrock. Groundwater was not encountered.		

TEST PIT OBSERVATION RECORD

Foundation Systems Engineering, P.C.
Geotechnical Engineering and Consulting

TEST PIT NO:	**11**	PROJECT NAME:	Lower Brush Creek
EXCAVATOR:	Caterpillar 322B	PROJECT LOCATION:	Johnson City, Tennessee
OBSERVED BY:	Allen Browning, MS, PE	FSE PROJECT NO:	216100
DATE EXCAVATED :	3-22-2016	ELEVATION:	1510 FT STATION: 88+00

DEPTH (FEET)	MATERIAL DESCRIPTION	CONSISTENCY ESTIMATE
0 - 2.0	Topsoil	
2.0 - 9.0	Residual, very moist to wet, red brown tan, Clayey SILT w/ Iron staining	Medium to Soft

Note: Test pit refusal at 9 feet on Limestone bedrock. Groundwater was not encountered.

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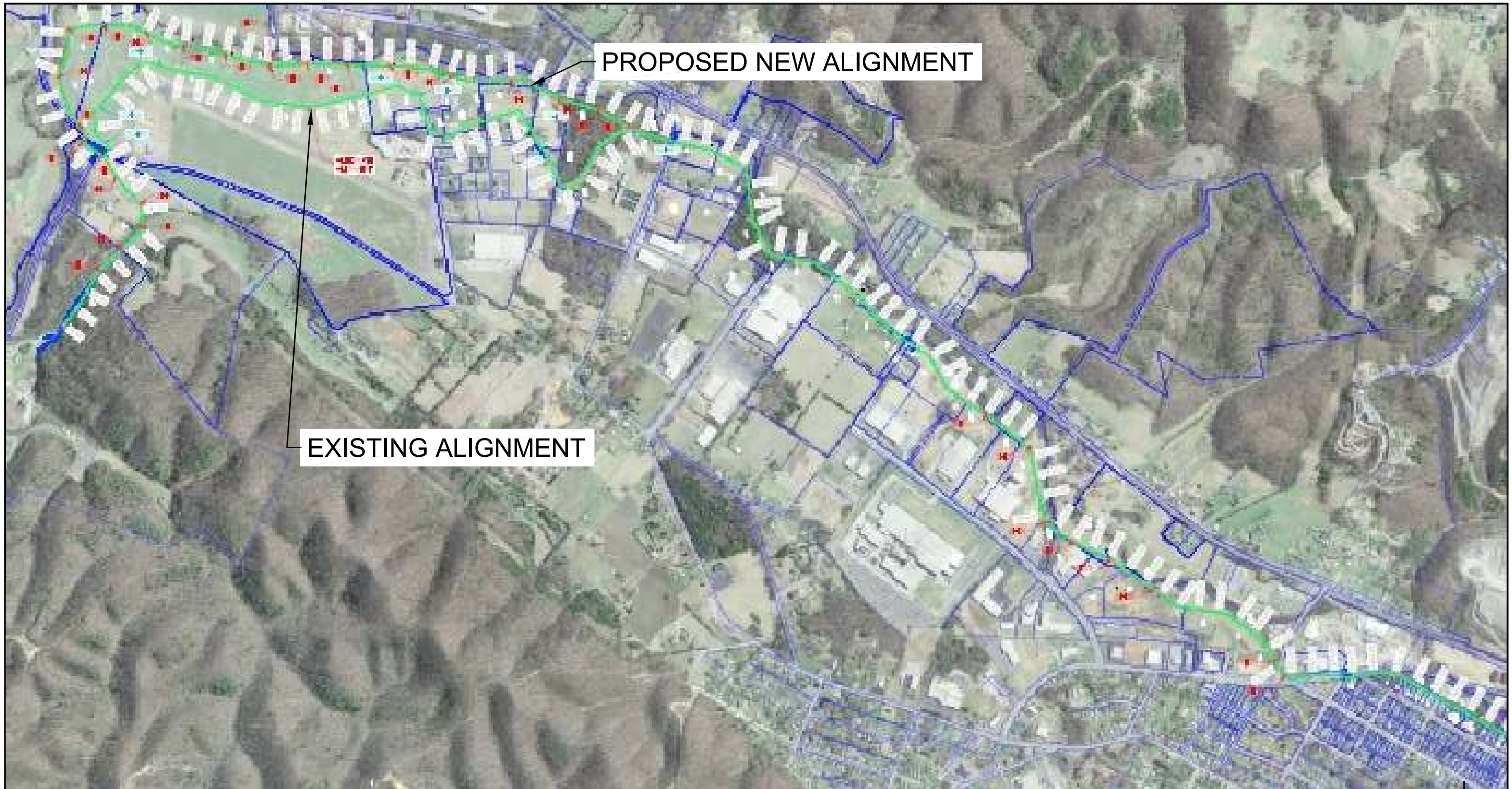

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Geotechnical Engineering and Consulting

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KINGSPORT, TN 37663

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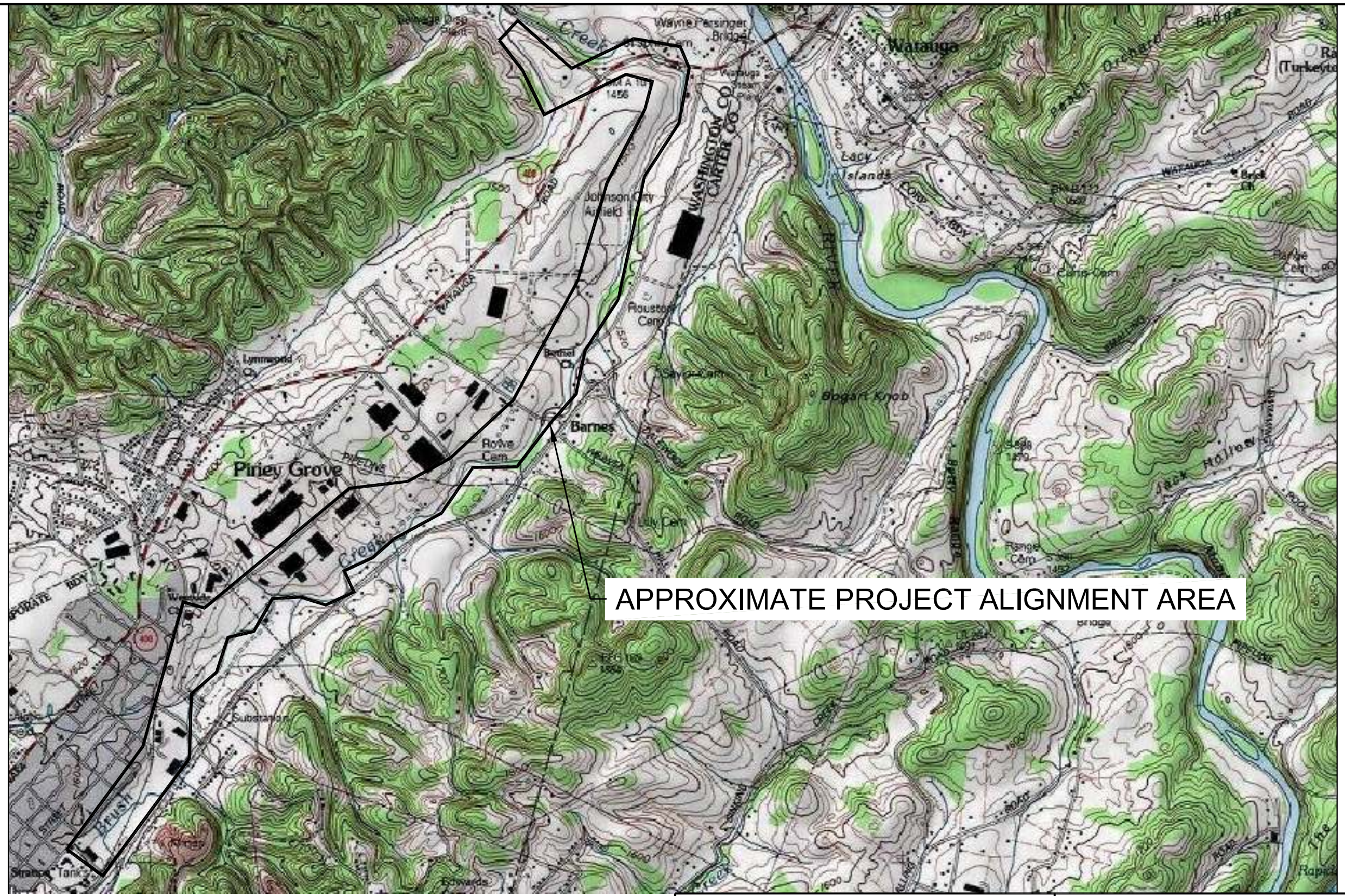
AERIAL MAP W/ NEW AND OLD ALIGNMENT
BRUSH CREEK INTERCEPTOR PROJECT
JOHNSON CITY, TENNESSEE

FOR: HAZEN AND SAWYER		
DRAWN BY: AB	NOTES:	
PROJ #: 216100		
SCALE: NONE	DATE: 04/07/16	DWG #: AERIAL



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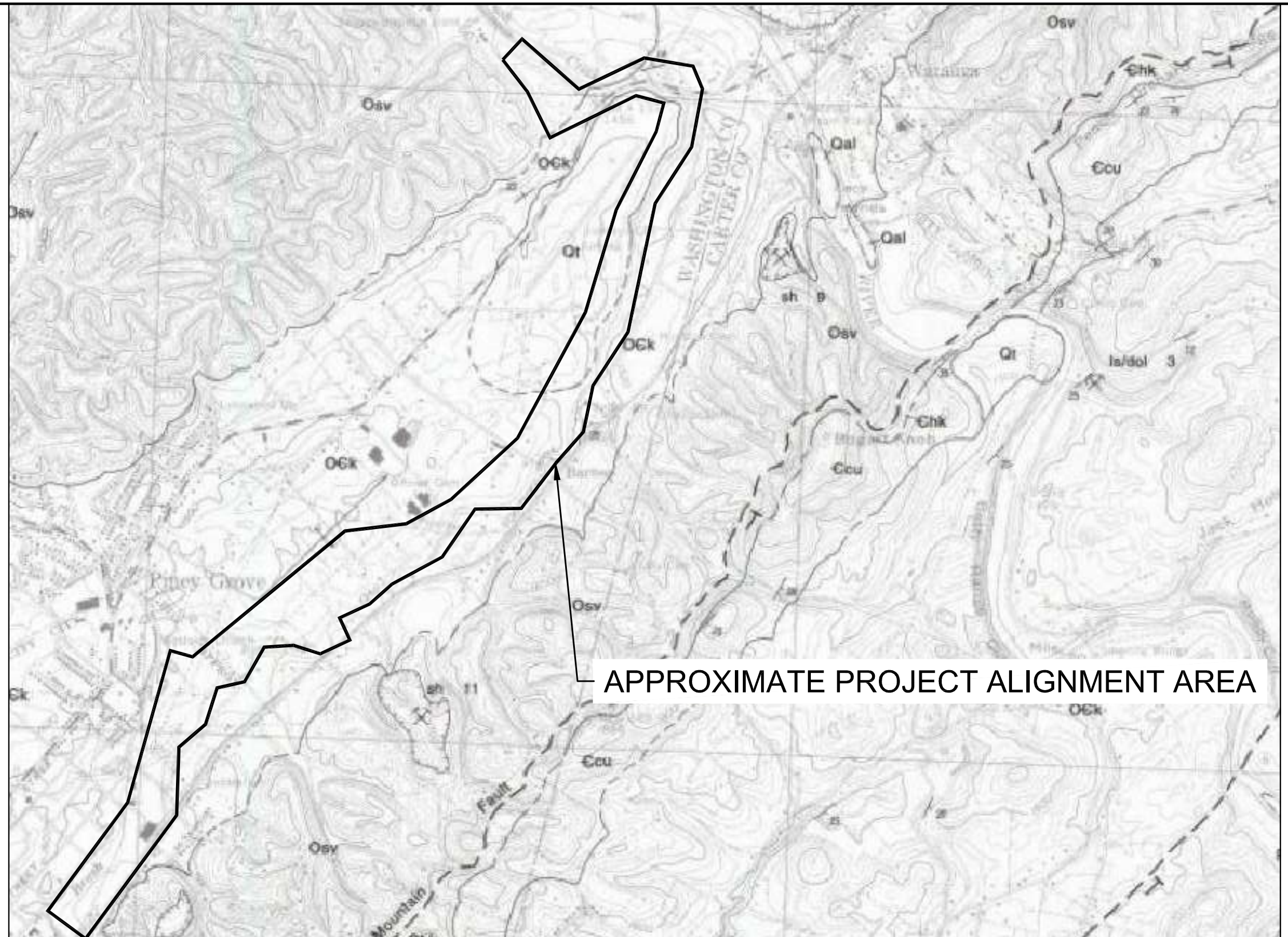
AREA TOPOGRAPHIC MAPPING
BRUSH CREEK INTERCEPTOR PROJECT
JOHNSON CITY, TENNESSEE

FOR:	HAZEN AND SAWYER		
DRAWN BY: AB	NOTES:		
PROJ #: 216100	ADAPTED FROM USGS MAPPING		
SCALE: NONE	DATE: 04/07/16	DWG #: TOPO	



SOIL LEGEND

OCk

Knox Group (Undifferentiated)

Primarily limestone, gray to blue-gray, fine- to very fine-grained, medium-, thick-, and massive-bedded with occasional thin beds. Reticulated thin partings or "ribbons" occur in the limestones. These may occur throughout the entire section, but appear to be more common in the lower third of the unit. Chert is extremely rare; where present it is normally black. Frosted sand grains occur but are not common. Gray, fine-grained dolomites and calcareous dolomites occur but make up a very small percentage of the overall unit. No fossils or dolomite were observed during the field mapping but may exist within the limestone formations.

In areas to the southwest and northwest of the Johnson City quadrangle a sandstone, or sandstones, exist(s) in the lower third of the unit. In those areas, the lower formation has been named Concocheague Limestone and the upper formation Jonesboro Limestone. However, since no sandstone was observed in the area of this investigation, this unit of predominate limestone has been classified as Knox Group (Undifferentiated) by the writer.

Osv

Sevier Shale

Shale, calcareous, silty, with some siltstone, gray, olive-gray and dark-gray to black, weathers to a light-brown to tan clay; fissile; thin-bedded; rare sandy limestone and calcareous facies occur in the northwest parts of the quadrangle; mica and pyrite occur frequently throughout the entire formation. No fossils or dolomite were observed, but graptolites have been reported by other investigators to be in this formation. The entire thickness of this unit was not observed in the study area.

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GEOLOGY MAP
BRUSH CREEK INTERCEPTOR PROJECT
JOHNSON CITY, TENNESSEE

FOR: HAZEN AND SAWYER		
DRAWN BY: AB	NOTES:	
PROJ #: 216100	ADAPTED FROM USGS MAPPING	
SCALE: NONE	DATE: 04/07/16	DWG #: GEOLOGY

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FSE File # 216100

Project: Lower Brush Creek

Date: 3/15/2016 Lab No: JC-161325

PHYSICAL TEST PROPERTIES & SOIL CLASSIFICATION

Boring Number	Depth	Location
B - 2	3.0' - 5.0'	

SIEVE ANALYSIS

Passing	Retained	Percent	Characteristics (Particles)
3"	3/4"	21.8	Coarse Gravel
3/4"	No. 4	15.6	Fine Gravel
No. 4	No. 10	9.4	Coarse Sand
No. 10	No. 40	10.7	Medium Sand
No. 40	No. 200	6.6	Fine sand
No. 200	_ _ _	35.9	Fines (Silt & Clay)

ATTERBERG LIMITS

Liquid Limits:	**42**
Plastic Limits:	**27**
Plasticity Index:	**15**
Natural Moisture, %:	**18**
Unified Soil Classification:	**GM**

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FSE File # 216100

Project: Lower Brush Creek

Date: 3/28/2016 Lab No: JC-161412

PHYSICAL TEST PROPERTIES & SOIL CLASSIFICATION

Boring Number	Depth	Location
B - 25	7.0' - 8.5'	

SIEVE ANALYSIS

Passing	Retained	Percent	Characteristics (Particles)
3"	3/4"	0.0	Coarse Gravel
3/4"	No. 4	0.2	Fine Gravel
No. 4	No. 10	0.0	Coarse Sand
No. 10	No. 40	0.4	Medium Sand
No. 40	No. 200	1.1	Fine sand
No. 200	_ _ _	98.3	Fines (Silt & Clay)

ATTERBERG LIMITS

Liquid Limits:	**47**
Plastic Limits:	**25**
Plasticity Index:	**22**
Natural Moisture, %:	**30.7**
Unified Soil Classification:	**CL**

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FSE File # 216100

Project: Lower Brush Creek

Date: 3/15/2016 Lab No: JC-161326

PHYSICAL TEST PROPERTIES & SOIL CLASSIFICATION

Boring Number	Depth	Location
B - 10	2.5' - 5.0'	

SIEVE ANALYSIS

Passing	Retained	Percent	Characteristics (Particles)
3"	3/4"	0.0	Coarse Gravel
3/4"	No. 4	0.7	Fine Gravel
No. 4	No. 10	1.4	Coarse Sand
No. 10	No. 40	4.3	Medium Sand
No. 40	No. 200	4.2	Fine sand
No. 200	_ _ _	89.4	Fines (Silt & Clay)

ATTERBERG LIMITS

Liquid Limits:	**53**
Plastic Limits:	**38**
Plasticity Index:	**15**
Natural Moisture, %:	**35.5**
Unified Soil Classification:	**MH**

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FSE File # 216100

Project: Lower Brush Creek

Date: 3/28/2016 Lab No: JC-161413

PHYSICAL TEST PROPERTIES & SOIL CLASSIFICATION

Boring Number	Depth	Location
B - 31	8.5' - 10.0'	

SIEVE ANALYSIS

Passing	Retained	Percent	Characteristics (Particles)
3"	3/4"	0.0	Coarse Gravel
3/4"	No. 4	0.8	Fine Gravel
No. 4	No. 10	0.8	Coarse Sand
No. 10	No. 40	14.7	Medium Sand
No. 40	No. 200	29.4	Fine sand
No. 200	_ _ _	54.3	Fines (Silt & Clay)

ATTERBERG LIMITS

Liquid Limits:	**39**
Plastic Limits:	**18**
Plasticity Index:	**21**
Natural Moisture, %:	**25.3**
Unified Soil Classification:	**CL**

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FSE File # 216100

Project: Lower Brush Creek

Date: 3/15/2016 Lab No: JC-161327

PHYSICAL TEST PROPERTIES & SOIL CLASSIFICATION

Boring Number	Depth	Location
B - 13	8.0' - 10.0'	

SIEVE ANALYSIS

Passing	Retained	Percent	Characteristics (Particles)
3"	3/4"	0.0	Coarse Gravel
3/4"	No. 4	0.8	Fine Gravel
No. 4	No. 10	1.4	Coarse Sand
No. 10	No. 40	4.4	Medium Sand
No. 40	No. 200	6.6	Fine sand
No. 200	_ _ _	86.8	Fines (Silt & Clay)

ATTERBERG LIMITS

Liquid Limits:	**53**
Plastic Limits:	**26**
Plasticity Index:	**27**
Natural Moisture, %:	**27.0**
Unified Soil Classification:	**CH**

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FSE File # 216100

Project: Lower Brush Creek

Date: 3/28/2016 Lab No: JC-161414

PHYSICAL TEST PROPERTIES & SOIL CLASSIFICATION

Boring Number	Depth	Location
B - 32	3.5' - 5.0'	

SIEVE ANALYSIS

Passing	Retained	Percent	Characteristics (Particles)
3"	3/4"	0.0	Coarse Gravel
3/4"	No. 4	0.1	Fine Gravel
No. 4	No. 10	1.0	Coarse Sand
No. 10	No. 40	4.7	Medium Sand
No. 40	No. 200	9.8	Fine sand
No. 200	_ _ _	84.4	Fines (Silt & Clay)

ATTERBERG LIMITS

Liquid Limits:	**39**
Plastic Limits:	**22**
Plasticity Index:	**17**
Natural Moisture, %:	**27.4**
Unified Soil Classification:	**CL**

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FSE File # 216100

Project: Lower Brush Creek

Date: 3/28/2016 Lab No: JC-161415

PHYSICAL TEST PROPERTIES & SOIL CLASSIFICATION

Boring Number	Depth	Location
TP - 11	4.0' - 9.0'	

SIEVE ANALYSIS

Passing	Retained	Percent	Characteristics (Particles)
3"	3/4"	5.0	Coarse Gravel
3/4"	No. 4	6.0	Fine Gravel
No. 4	No. 10	0.5	Coarse Sand
No. 10	No. 40	0.5	Medium Sand
No. 40	No. 200	0.8	Fine sand
No. 200	_ _ _	87.2	Fines (Silt & Clay)

ATTERBERG LIMITS

Liquid Limits:	**55**
Plastic Limits:	**31**
Plasticity Index:	**24**
Natural Moisture, %:	**35.8**
Unified Soil Classification:	**MH**

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FSE File #: 216100
Project : Lower Brush Creek
Date: 3/15/2016
Lab. No: JC-161324

SOIL DATA SUMMARY

BORING NUMBER	SAMPLE DEPTH	MOISTURE CONTENT	LIQUID LIMIT	PLASTIC LIMIT	PLASTIC INDEX	UNIFIED SOIL CLASSIFICATION
B - 2	2.5' - 3.5'	18.0	42	27	15	GM
B - 3	2.5' - 3.5'	24.2				
B - 4	8.0' - 10.0'	19.2				
B - 4	13.0' - 15.0'	19.6				
B - 6	2.5' - 5.0'	15.0				
B - 6	9.0' - 11.0'	18.4				
B - 6	13.0' - 15.0'	33.2				
B - 7	2.5' - 5.0'	24.7				
B - 7	8.0' - 10.0'	21.9				
B - 8	5.0' - 7.0'	14.6				
B - 8	8.0' - 10.0'	33.1				
B - 8	13.0' - 15.0'	30.9				
B - 10	2.5' - 5.0'	35.5	53	38	15	MH
B - 10	8.0' - 10.0'	24.7				
B - 10	13.0' - 15.0'	36.9				

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FSE File #: 216100
Project : Lower Brush Creek
Date: 3/15/2016
Lab. No: JC-161324

SOIL DATA SUMMARY

BORING NUMBER	SAMPLE DEPTH	MOISTURE CONTENT	LIQUID LIMIT	PLASTIC LIMIT	PLASTIC INDEX	UNIFIED SOIL CLASSIFICATION
B - 11	2.5' - 5.0'	20.2				
B - 11	8.0' - 10.0'	35.2				
B - 12	2.5' - 5.0'	26.7				
B - 13	2.5' - 5.0'	20.6				
B - 13	8.0' - 10.0'	27.0	53	26	27	CH
B - 13	13.0' - 15.0'	24.8				
B - 14	2.5' - 5.0'	29.2				
B - 15	2.5' - 5.0'	26.1				
B - 15	8.0' - 10.0'	29.9				
B - 16	2.5' - 5.0'	19.9				

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FSE File #: 216100
Project : Lower Brush Creek
Date: 3/28/2016
Lab. No: JC-161411

SOIL DATA SUMMARY

BORING NUMBER	SAMPLE DEPTH	MOISTURE CONTENT	LIQUID LIMIT	PLASTIC LIMIT	PLASTIC INDEX	UNIFIED SOIL CLASSIFICATION
B - 24	2.5' - 5.0'	25.8				
B - 25	2.5' - 5.0'	34.4				
B - 25	7.0' - 8.5'	30.7	47	25	22	CL
B - 26	2.5' - 5.0'	26.8				
B - 27	2.5' - 5.0'	26.4				
B - 30	1.0' - 2.5'	20.7				
B - 30	3.5' - 5.0'	23.9				
B - 30	6.0' - 7.5'	29.8				
B - 30	8.5' - 10.0'	38.8				
B - 31	3.5' - 5.0'	33.0				
B - 31	8.5' - 10.0'	25.3	39	18	21	CL
B - 31	13.5' - 15.0'	43.0				
B - 31	18.5' - 20.0'	38.2				

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FSE File #: 216100
Project : Lower Brush Creek
Date: 3/28/2016
Lab. No: JC-161411

SOIL DATA SUMMARY

BORING NUMBER	SAMPLE DEPTH	MOISTURE CONTENT	LIQUID LIMIT	PLASTIC LIMIT	PLASTIC INDEX	UNIFIED SOIL CLASSIFICATION
B - 32	1.0' - 2.5'	24.8				
B - 32	3.5' - 5.0'	27.4	39	22	17	CL
B - 34	1.0' - 2.5'	19.2				
TP - 6	3.0' - 12.0'	25.0				
TP - 7	2.0' - 6.0'	22.0				
TP - 8	3.0' - 6.0'	20.8				
TP - 9	2.0' - 6.0'	24.3				
TP - 10	2.0' - 7.0'	31.9				
TP - 10	7.0' - 13.0'	28.1				
TP - 11	2.0' - 4.0'	30.4				
TP - 11	4.0' - 9.0'	35.8	55	31	24	MH

TEST DESCRIPTION

STANDARD PENETRATION TEST (SPT) ASTM D1586-11

This test uses a thick-walled sample tube, with an outside diameter of 2 inches, an inside diameter of 1 3/8 inches, and a length of around 32 inches. This tube is driven into the ground at the bottom of a borehole by blows from a slide hammer with a weight of 140 lb falling through a distance of 30 in. The sample tube is driven into the ground and then the number of blows needed for the tube to penetrate each 6 inch increment up to a depth of 18 inches is recorded. The sum of the number of blows required for the second and third 6 inches of penetration is termed the "standard penetration resistance" or the "N-value".

In cases where 50 blows are insufficient to advance it through a 6 inch interval the penetration after 50 blows is recorded. The blow count provides an indication of the soil consistency and can be correlated to the bearing capacity of the soil.

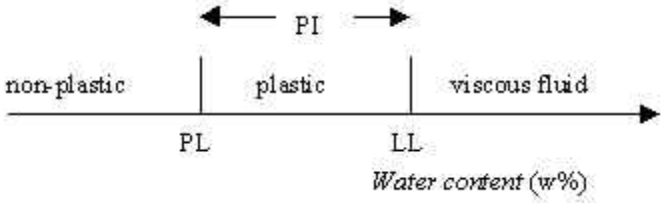
ATTERBERG LIMITS ASTM D4318-10

The objective of the Atterberg limits test is to obtain basic index information about the soil used to estimate strength and settlement characteristics. It is the primary form of classification for cohesive soils.

Fine-grained soil is tested to determine the liquid and plastic limits, which are moisture contents that define boundaries between material consistency states. These standardized tests produce comparable numbers used for soil identification, classification and correlations to strength.

The liquid (LL) and plastic (PL) limits define the water content boundaries between non-plastic, plastic and viscous fluid states. The plasticity index (PI) defines the complete range of plastic state. Figure 1 illustrates it nicely.

Figure 1: Atterberg limits illustration.



Liquid Limit (LL)

The liquid limit defines the boundary between plastic and viscous fluid states. It is determined using a standard "Liquid Limit Device," which drops a shallow cupfull of soil 1 cm consistently. When a groove cut through the sample closes 1/2", the number of drops is recorded and a moisture content sample processed.

Repeating the procedure for a total of four drop-count ranges provides enough data to plot on a semi-log scale. From the plot, the moisture content at 25 drops defines the Liquid Limit.

Plastic Limit (PL)

The plastic limit defines the boundary between non-plastic and plastic states. It is determined simply by rolling a thread of soil and adjusting the moisture content until it breaks at 1/8 inch diameter.

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS) — ASTM D2487

The Unified Soil Classification System (USCS) is a nationally recognized standard for classifying soils in accordance with their engineering properties. The parameters considered in this system are:

- Particle Size
- Water Holding and Plasticity
- Organic Content

The system identifies three major soil divisions; coarse-grained soils, fine-grained soils, and highly organic soils. These three divisions are further subdivided into a total of 15 basic soil groups. Based on the results of visual observations and prescribed laboratory tests, the soil is cataloged into basic soil groups, which include variations of gravel, sands, silty, clays and highly organic soils.

GENERAL NOTES

WATER LEVEL MEASUREMENT:

Water levels indicated on the boring logs are the levels measured in the borings at the times indicated. Groundwater levelsat other times and other locations across the site could vary. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soil, the accurate determination of groundwater levels may not be suitable with only short-term observations.

DESCRIPTIVE SOIL CLASSIFICATION:

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine grained soils on the basis of their consistency.

CONSISTENCY OF FINE-GRAINED SOILS

Unconfined Compressive Strength. Qu, psf	Standard Penetration or N-value (55) Blows/Ft.	Consistency
< 500	0 - 1	Very Soft
500-1,000	2 - 4	Soft
1,000 - 2,000	4 - 8	Medium Stiff
2,000 - 4,000	8 - 15	Stiff
4,000 - 8,000	15 - 30	Very Stiff
8,000+	> 30	Hard

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Standard Penetration or N-value (SS) Blows/Ft.	Relative Density
0 - 3	Very Loose
4 - 9	Loose
10 - 29	Medium Dense
30 - 50	Dense
>50	Very Dense

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75mm)
Sand	#4 to #200 sieve (4.75 to 0.075mm)
Silt or Clay	Passing #200 Sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	<5
With	5 -12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

Foundation Systems Engineering, P.C.
Geotechnical Engineering and Consulting

April 21, 2016

Mr. Scott Woodard, PE
Hazen and Sawyer
227 French Landing Drive, Suite 420
Nashville, TN 37228

RE: ADDENDUM LETTER - EXPANSIVE SHALE MATERIALS
BRUSH CREEK INTERCEPTOR PROJECT
WASHINGTON COUNTY
JOHNSON CITY, TENNESSEE
FSE FILE NO.: 216100

Dear Mr. Woodard:

During our geotechnical investigation, dark gray and black shale was encountered in the area from station 0+00 to 14+00. The dark gray and black calcareous shale bedrock can be expansive in nature. The expansion is caused by a chemical process that results in crystal formation on exposed surfaces and seams in shale fill and bedrock materials.

A sample of this shale was sent to Standard Laboratories, Inc. to determine the amount of pyritic sulfur in the shale. The pyritic sulfur test is used to determine the swell/heaving potential of the black/dark colored shale bedrock encountered on the site. In situations where the pyritic sulfur concentrations are higher than 0.1%, there is increased potential of heaving conditions when the shale is exposed to water and air.

The test results indicate a pyritic sulfur content of 0.35%. This indicates there is moderate to high potential of heave in the shale encountered on the site. Soil fill containing this dark gray/black colored shale should not be used beneath utilities, building and pavement areas.

Sincerely,
Foundation Systems Engineering, P.C.

Allen Browning, MS, PE
Project Engineer

George R. Cross, P.E.
Geotechnical Engineer
TN State No.: 104229

GRC /AB/kjm

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Knoxville, TN 37940
Ph: 865.577.3361 Fx: 865.573.1817

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STANDARD LABORATORIES,INC.
147 11TH AVENUE SO. CHARLESTON, WV 25303
PH:(304) 744-5472 FAX:(304) 744-4319

FOUNDATION SYSTEM
PO BOX 5267
KINGSPORT, TN. 37663

SAMPLE ID: B-3
JOB NAME: LOWER BRUSH CREEK
JOB# 216100
DATE SAMPLE: 3/11/2016
SAMPLE BY: B-3

LAB NUMBER: 160401131

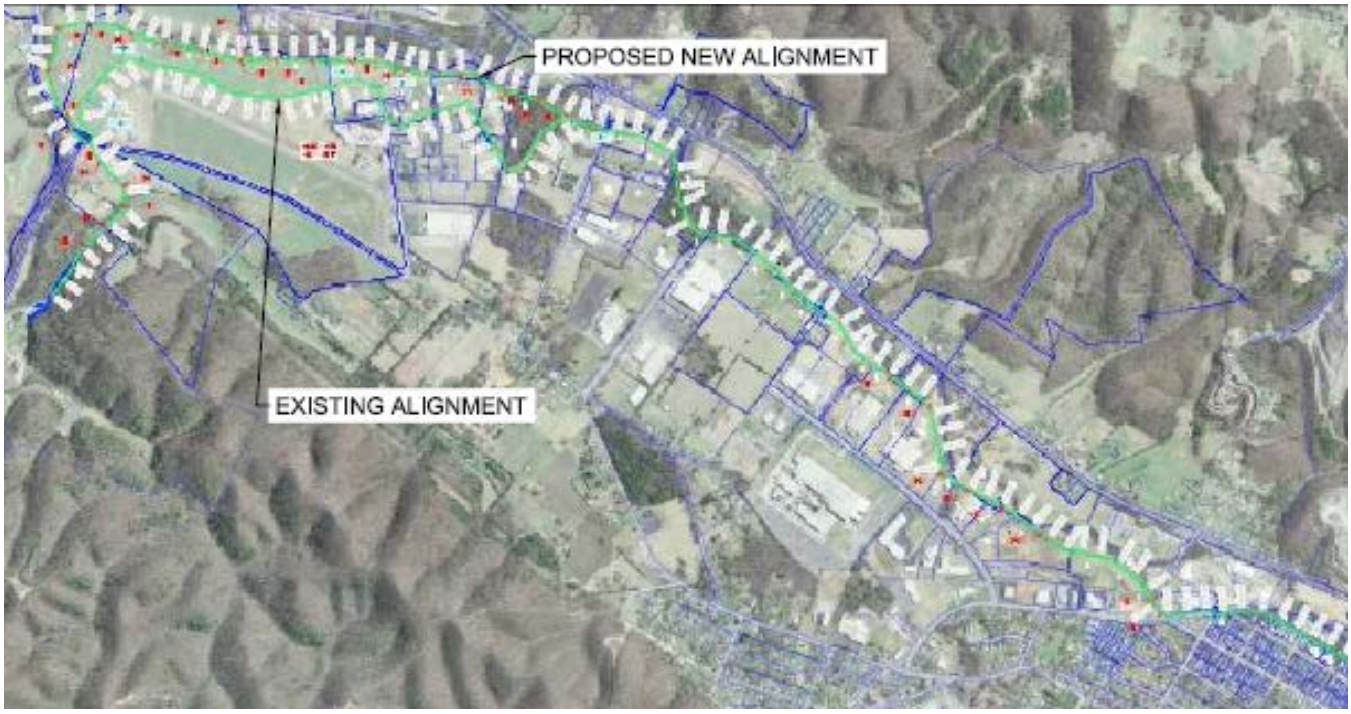
*% PYRITIC SULFUR, DRY BASIS:	0.35

*Analysis performed by Standard Laboratories, Freeburg.

SUBMITTED BY: _____

JEREMY LUTSY

LIMITED ENVIRONMENTAL SITE INVESTIGATION



BRUSH CREEK INTERCEPTOR PROJECT

STATIONS 177+00 - 185+00 & STATIONS 203+00 - 210+00
WASHINGTON COUNTY
JOHNSON CITY, TENNESSEE

CLIENT: HAZEN AND SAWYER

REPORT DATE: APRIL 22, 2016

FSE PROJECT NUMBER: 216100

Foundation Systems Engineering, P.C.
Geotechnical Engineering and Consulting

Foundation Systems Engineering, P.C.
Geotechnical Engineering and Consulting

April 22, 2016

Mr. Scott Woodard, PE
Hazen and Sawyer
227 French Landing Drive, Suite 420
Nashville, TN 37228

RE: LIMITED ENVIRONMENTAL SITE INVESTIGATION
BRUSH CREEK INTERCEPTOR PROJECT
STATIONS 177+00 - 185+00 & STATIONS 203+00 - 210+00
WASHINGTON COUNTY
JOHNSON CITY, TENNESSEE
FSE PROJECT NO.: 216100

Dear Mr. Woodard:

As authorized, Foundation Systems Engineering (FSE) is pleased to submit our report describing the findings of the Limited Environmental Site Investigation for the above property.

This investigation report was prepared in general accordance with the subcontract agreement.

The purpose of the limited environmental site investigation was to evaluate possible environmental conditions identified in previous environmental assessments for the adjoining areas.

We have appreciated the opportunity to provide our services on this project. If you have any questions regarding the information within this report, please contact us at your convenience.

Sincerely,
Foundation Systems Engineering, P.C.

Allen Browning, MS, P.E.
Project Engineer

George R. Cross, P.E.
Geotechnical Engineer
Tennessee No.: 104229

GEORGE R. CROSS REGISTERED ENGINEER AGRICULTURE COMMERCE No. 104229 STATE OF TENNESSEE
4-22-2016

GRC /AB/kjm

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Kingsport, TN 37663
Ph: 423.239.9226 Fx: 423.239.8677

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1. Environmental Test Location Plan (Sta. 181+00 - 210+00)
2. Test Boring Records
3. Area Topographic Map
4. Client Provided Mapping
5. Laboratory Testing Results

1.0 INTRODUCTION

Hazen and Sawyer engaged Foundation Systems Engineering to conduct a Limited Environmental Site Investigation (LESI) along approximately 1500 linear feet of the new sewer line alignment located in Johnson City, Tennessee. The general layout of the sites and boring locations are illustrated on the attached exhibit "Environmental Test Location Plan (Sta. 181+00 - 210+00)". The areas investigated were from stations 177+00 to 185+00 and stations 203+00 to 210+00 along the new alignment.

1.1 PURPOSE

The purpose of the limited environmental site investigation was to evaluate possible environmental conditions identified in previous environmental assessments for the adjoining areas. Areas of concern were highlighted on mapping provided by Hazen and Sawyer. This mapping is attached to this report and was used to identify the test locations for environmental testing.

1.2 SCOPE OF SERVICES

The scope of work for this investigation was performed in accordance with the subcontract agreement, dated February 16, 2016.

Specifically the scope of work included the following tasks:

- Review of Existing Information
- Field Exploration using five (5) soil borings and split spoon soil sampling in the areas highlighted by the client
- Test locations were backfilled with onsite soil and bentonite. They were then capped with asphalt patch and or soil cuttings
- Sampling and Chemical Analyses
- Evaluation of Results
- Discussion of Findings and Conclusions

1.3 STANDARD OF CARE

This Limited Environmental Site Investigation (LESI) was performed in accordance with the subcontract agreement, dated February 16, 2016. These limited environmental site investigation services were performed in accordance with the scope of work agreed with you, our client, as reflected in our proposal and were not restricted by ASTM E1903-11.

1.4 ADDITIONAL SCOPE LIMITATIONS

Findings, conclusions, and recommendations resulting from these services are based upon information derived from the on-site activities and other services performed under this scope of work; such information is subject to change over time. Certain indicators of the presence of hazardous substances, petroleum products, or other constituents may have been latent, inaccessible, unobservable, nondetectable or not present during these services, and we cannot represent that the site contains no hazardous substances, toxic materials, petroleum products, or other latent conditions beyond those identified during this LESI. Subsurface conditions may vary from those encountered at specific borings or wells or during other surveys, tests, assessments, investigations or exploratory services; the data, interpretations, findings, and our recommendations are based solely upon data obtained at the time and within the scope of these services.

1.5 RELIANCE

This report has been prepared for the exclusive use of Hazen and Sawyer and any authorization for use or reliance by any other party (except a governmental entity having jurisdiction over the site) is prohibited without the express written authorization of Hazen and Sawyer and FSE. Any unauthorized distribution or reuse is at the client's sole risk. Notwithstanding the foregoing, reliance by authorized parties will be subject to the terms, conditions, and limitations stated in the Agreement for Services.

2.0 SITE DESCRIPTION

2.1 SITE DESCRIPTION AND FEATURES

The area is covered with primarily grass vegetation with some areas of dense small tree and brush overgrowth. This portion of the alignment crosses the roadways Smith Street, Steel Street, East Millard Street, Mercury Road, Prime Street, and the parking lot for Allied Metals. The parking lot area of Allied Metals is a high traffic area with cars and tractor trailers going in and out of the facility throughout the day. These roadways are asphalt and gravel covered. There are areas of limestone boulders that can be seen at the ground surface and at areas that adjoin Brush Creek.

2.2 TOPOGRAPHY

The general area consists of moderately sloping terrain, characterized by alternating ridges and valleys. The alignment goes along a low lying area that adjoins Brush Creek. Review of USGS topographic mapping does indicate the presence of a blue line stream feature adjoining the alignment to the south and east sides. The blue line stream is Brush Creek.

2.3 AREA GEOLOGY

The project site is located in the Valley and Ridge physiographic province of East Tennessee. A review of published State of Tennessee geologic mapping of the area indicates that the project location lies within the sedimentary bedrock of the Knox Group. The Knox Group consists of fine grained, light to dark gray, well bedded limestone and dolomite with seams of abundant chert.

Localized concentration of bedding planes; fractures and other discontinuities often result in weathering and decomposition extending to greater depths into the subsurface profile. Ridges or lenses of weathering resistant rock form pinnacles and ledges of unweathered rock extending nearly to the ground surface. The localized greater depths of decomposition, solution cavities and rock pinnacles all combine to form what is a highly irregular rock surface profile.

2.4 SUMMARY OF PREVIOUS ASSESSMENTS & LABORATORY RESULTS

The following previous assessments, correspondence and laboratory results provided by both the City of Johnson City and Hazen and Sawyer were reviewed for the properties:

- Laboratory Results for the Rush Oil Bulk Plant Site dated January 5 of 2011. The testing was performed to determine if any hydrocarbon were migrating through the disturbed soil. The results for the investigated parameters were below detectable limits.
- Letter concerning a petroleum release at Dogwood Oil Company, dated September of 2008. The letter was sent by TH&P concerning a petroleum release along a newly constructed sewer interceptor.
- Limited Environmental Assessment Report for the Allied Metals Site, dated January 10 of 2013. The assessment determined there were petroleum hydrocarbons and other constituents of concern located on the site.
- Work plan request addressed from TDEC to Allied Metals Company, dated July of 2014. TDEC commented there was not enough data collected to determine the origination of the site contamination. TDEC requested a workplan be submitted to determine the source.
- Possible contaminated soils mapping provided by Hazen and Sawyer

The possible environmental conditions assessed as part of the Limited Environmental Site Investigation concerned the presence of contaminated soils in the areas of the new alignment on the sites.

3.0 FIELD EXPLORATION

3.1 SAMPLE COLLECTION

A total of five (5) soil borings were performed at the approximate locations as shown on the Environmental Test Location plan included with this report. The borings were performed on March 15, 2016. The borings were drilled to depths of 2 to 20 feet below grade to auger refusal or boring termination.

Groundwater was not encountered at any of the test locations. As a result no groundwater analysis was performed.

Soil samples were recovered at select intervals using a pushed, split spoon sampler and visually classified. The soil sampling tools were decontaminated using washing methods between sampling intervals.

Each of the soil boring locations were backfilled with onsite soil cutting and bentonite pellets and capped with asphalt patch or soil cuttings.

3.2 FIELD SCREENING

The soil samples collected were placed into sealed plastic bags and allowed to volatilize for approximately 20 minutes. The head space of the bagged samples was then screened with a photo ionization detector (PID) meter. The results are included on the environmental test boring logs.

There was minor (less than 100 ppm) vapor concentrations measured in the soil samples recovered during the investigation at test locations E1 through E2A.

There were however high (greater than 100 ppm) vapor concentrations measured in the soil samples E3 and E3A.

There are no regulatory criteria for combustible soil vapors; however, soil vapors are often used as a field screening tool to practically identify soil impacted with combustible liquids or petroleum hydrocarbons.

Elevated soil vapor concentrations (greater than 100 ppm) can be indicative of the presence of volatile combustion products (i.e., gasoline and to a lesser extent diesel and fuel oil).

3.3 COMPLETION OF SAMPLING ACTIVITIES

Drilling equipment and non-dedicated sampling equipment were decontaminated using a Liquinox/water wash and scrubbing, followed by a distilled water rinse. Following completion of sampling activities, the borings were plugged and abandoned with bentonite pellets and soil cuttings to generally match the surrounding ground surface. Latex gloves were donned prior to the collection of each sample. The samples were immediately placed in a cooler containing ice and submitted to the laboratory under chain-of-custody procedures.

Any onsite soil that was removed from the site other than the collected samples sent to the laboratory for analysis, was placed in a sealed container. This sealed container was transported to the lab until the analysis was complete.

Personal health and safety precautions were followed in accordance with applicable standard and state law or local equivalents and any requirements imposed by the owner, occupant, or field personnel.

4.0 LABORATORY ANALYTICAL RESULTS

4.1 LABORATORY ANALYTICAL PROGRAM

Three soil samples were submitted to Microbac Laboratories in Johnson City, Tennessee for analysis of Volatile Organic Compounds (VOCs), Semi-Volatile Compounds (SVOCs), RCRA 8 Metals, Polynuclear Aromatic Hydrocarbons (PAHs); and extractable petroleum hydrocarbons (EPH).

The soils samples that were selected for testing were borings E1A from 1.0 to 8.0 feet, E2A from 2.5 to 7.0 feet and E3 from 2.0 to 4.0 feet.

Groundwater was not encountered at any of the test locations. As a result no groundwater analysis was performed.

4.2 SOIL ANALYTICAL RESULTS

The results of the laboratory analyses are shown in the table below.

Soil Analysis Results - Semi-Volatile Compounds (SVOCs) & extractable petroleum hydrocarbons (EPH)					
Parameter	**Units**	**TDEC Action Level**	**E1A (1.0'-8.0')**	**E2A (2.5'-7.0')**	**E3 (2.0'-4.0')**
SVOCs	mg/kg	NA[1]	ND[2]	ND[2]	ND
EPHs	mg/kg	500	44.6	30.0	79.0
Soil Analysis Results - Polynuclear Aromatic Hydrocarbons (PAHs)					
Parameter	**Units**	**TDEC Action Level**	**E1A (1.0'-8.0')**	**E2A (2.5'-7.0')**	**E3 (2.0'-4.0')**
Phenanthrene	mg/kg	NA[1]	ND[2]	ND[2]	0.006
Fluoranthene	mg/kg	NA[1]	ND[2]	ND[2]	0.007
Pyrene	mg/kg	NA[1]	ND[2]	ND[2]	0.007
Benzo(a)anthracene	mg/kg	NA[1]	ND[2]	ND[2]	0.004
Chrysene	mg/kg	NA[1]	ND[2]	ND[2]	0.005
Naphalene	mg/kg	135	0.020	ND[2]	ND[2]
Methylnaphthalene	mg/kg	NA[1]	0.005	ND[2]	ND[2]
Soil Analysis Results - RCRA 8 Metals					
Parameter	**Units**	**TDEC Action Level[3]**	**E1A (1.0'-8.0')**	**E2A (2.5'-7.0')**	**E3 (2.0'-4.0')**
Arsenic	mg/kg	500	ND[2]	ND[2]	2.4
Chromium	mg/kg	100	ND[2]	ND[2]	17.3
Mercury	mg/kg	20	ND[2]	ND[2]	0.103
Barium	mg/kg	10,000	60.5	ND	138
Cadmium	mg/kg	100	0.376	0.352	0.382
Lead	mg/kg	1,000	18.8	16.1	65.4
Selenium	mg/kg	100	4.30	4.15	4.37
Silver	mg/kg	500	0.344	0.332	0.350
Soil Analysis Results - Volatile Organic Compounds (VOCs)					
Parameter	**Units**	**TDEC Action Level**	**E1A (1.0'-8.0')**	**E2A (2.5'-7.0')**	**E3 (2.0'-4.0')**
Ethylbenzene	mg/kg	143	0.0096	0.770	0.440
m.p-Xylene	mg/kg	NA[1]	0.044	4.000	2.300
o-Xylene	mg/kg	NA[1]	0.021	1.900	1.200
Toluene	mg/kg	6.78	0.070	3.400	2.200
Total Xylenes	mg/kg	9.6	0.065	5.800	3.400

Notes:

1. Action Level Not Established
2. Below Laboratory Detection Levels
3. TDEC does not specify an action level but references EPA Region 4 screening levels for risk criteria

5.0 CONCLUSIONS AND RECOMMENDATIONS

This investigation was performed in accordance with the subcontract agreement, dated February 16, 2016. The purpose of the LESI activities was to evaluate possible environmental conditions identified in previous environmental assessments for the adjoining areas.

5.1 CONCLUSIONS

Levels of Extractable Petroleum Hydrocarbons (EPH), Polynuclear Aromatic Hydrocarbons (PAHs), Volatile Organic Compounds (VOCs) and RCRA 8 Metals were detected in each test locations.

At all test locations, the detectable levels for each parameter tested were at levels not requiring action in accordance with TDEC guidelines.

Since chemicals of concern (COC) were observed at each location at a detectable level, there will be locations during construction with higher levels that will require special storage, handling and disposal.

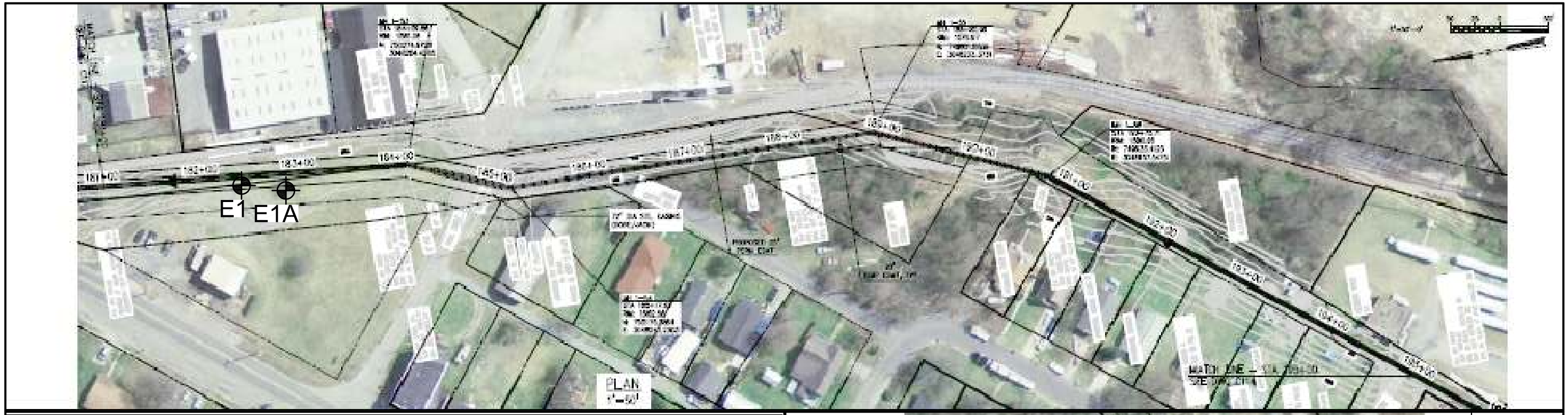
5.2 RECOMMENDATIONS

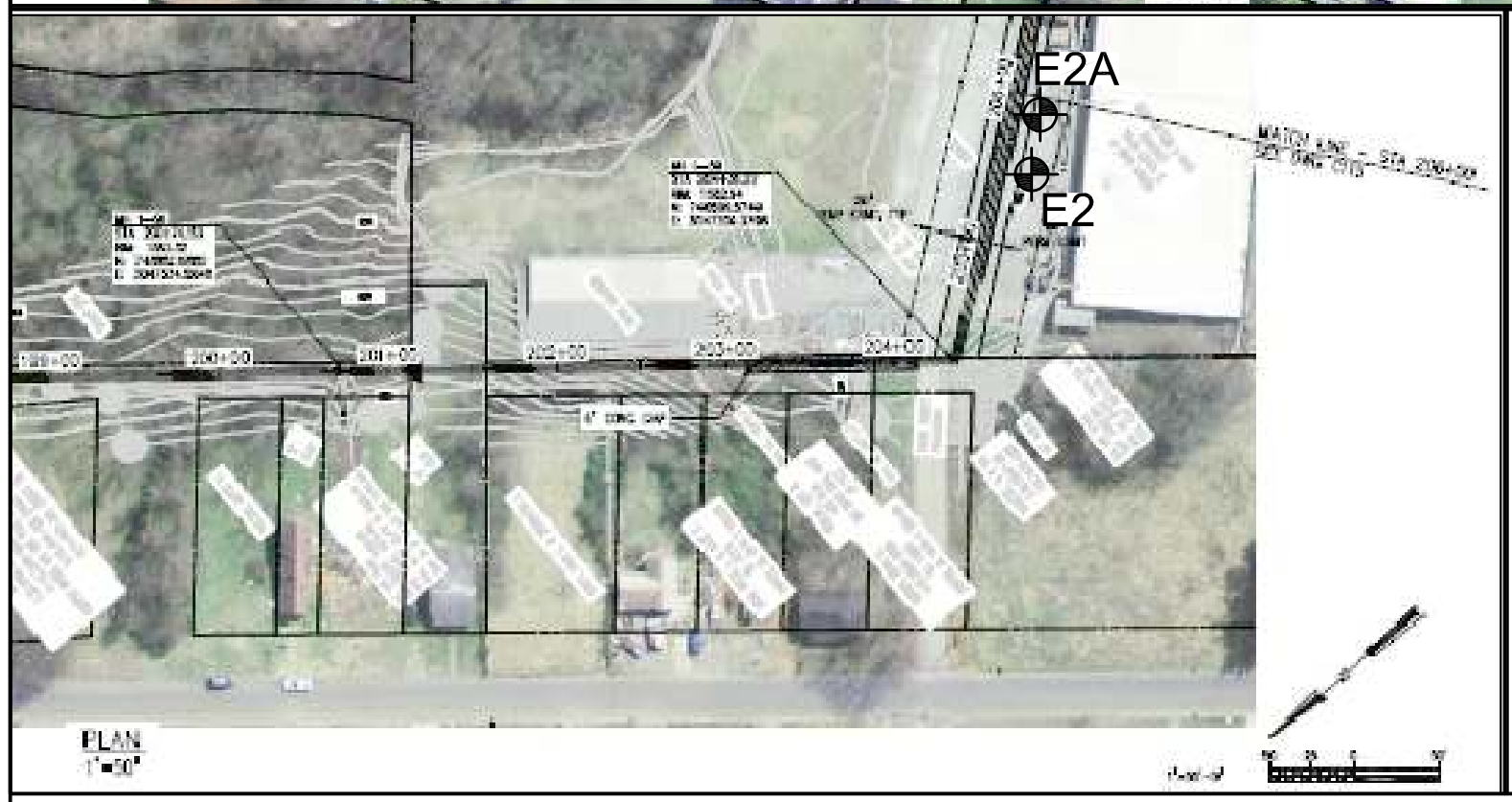
Based on the information collected by FSE during the Limited Environmental Site Investigation. It is recommended that soils excavated in the areas adjoining Allied Metals and Volunteer Oil be screened by an environmental professional at the time of the excavation. The potential for encountering contaminated soils should be anticipated. Storage, handling, and disposal procedures should be implemented in accordance with TDEC and EPA guidelines.

5.3 LIMITATIONS OF INVESTIGATION

This investigation is limited to the suspect areas observed as part of this report. During construction, there may be other suspect areas revealed. If any suspect areas are encountered they should be evaluated by an Environmental Professional.

APPENDICIES





LEGEND

E# ENVIRONMENTAL TEST BORING

Foundation Systems Engineering, P.C.
Geotechnical Engineering and Consulting

P.O. BOX 5267
KINGSPORT, TN 37663

423-239-9226
FAX 239-8677

www.fsepc.com

ENVIRONMENTAL TEST LOCATION PLAN
STA. 181+00 TO 210+00
BRUSH CREEK INTERCEPTOR PROJECT
JOHNSON CITY, TENNESSEE

FOR: HAZEN AND SAWYER		
DRAWN BY: AB	NOTES:	
PROJ #: 216100	LOCATIONS ARE APPROXIMATE	
SCALE: NONE	DATE: 04/07/16	DWG #: BLP - 7

Project: **LOWER BRUSH CREEK** Project Location: **JOHNSON CITY, TENNESSEE** Project Number: **216100E**	Log of Boring E1 **Sheet 1 of 1**

Date(s) Drilled **03/15/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **2.0**
Drill Rig Type **CME 75**	Drilling Contractor **CML - JC**	Approximate Surface Elevation **1581**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **SPT**	Station **182+50**
Borehole Backfill **Soil Cuttings with Bentonite**	Comments **Refusal material unkown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Water Content, %	LL, %	PI, %	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1581	0								TOPSOIL	
			1	2					FILL, Soft, Moist, Black Brown, Clayey SILT with Limestone Rock and Asphalt Fragments.	
									Auger Refusal at 2.0 Feet.	
1576	5									
1571	10									
1566	15									
1561	20									
1556	25									
1551	30									
1546	35									
1541	40									

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Project: **LOWER BRUSH CREEK** Project Location: **JOHNSON CITY, TENNESSEE** Project Number: **216100**	Log of Boring E1A **Sheet 1 of 1**

Date(s) Drilled **03/15/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **20.0**
Drill Rig Type **CME 75**	Drilling Contractor **CML - Johnson City**	Approximate Surface Elevation **1581**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **SPT**	Station **183+00**
Borehole Backfill **Soil Cuttings with Bentonite**	Comment **Offset of Boring E1**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS	PID Reading, ppm
1581	0					TOPSOIL		
			1	5		FILL, Medium to Soft, Black Brown to Red Brown, Clayey SILT with Limestone Rock Fragments.		0.3
			2	2				1.0
1576	5							
			3	8		RESIDUAL, Medium to Stiff, Very Moist to Wet, Tan Red, Silty CLAY with Iron Staining.		0.8
			4	10				1.4
1571	10		5					1.2
			6					2.0
			7					0.4
1566	15		8					6.4
1561	20					Boring Terminated at 20.0 Feet.		
1556	25							
1551	30							

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Project: **LOWER BRUSH CREEK** Project Location: **JOHNSON CITY, TENNESSEE** Project Number: **216100**	Log of Boring E2 **Sheet 1 of 1**

Date(s) Drilled **03/15/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **2.0**
Drill Rig Type **CME 75**	Drilling Contractor **CML - Johnson City**	Approximate Surface Elevation **1580**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **SPT**	Station **205+50**
Borehole Backfill **Soil Cuttings with Bentonite**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS	PID Reading, ppm
1580	0					LIMESTONE GRAVEL		
			1	10		FILL, Stiff, Moist, Tan Red, Silty CLAY with Limestone Fragments.		0.6
						Auger Refusal at 2.0 Feet.		
1575	5							
1570	10							
1565	15							
1560	20							
1555	25							
1550	30							

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Foundation Systems Engineering, P.C.
Geotechnical Engineering and Consulting

Project: **LOWER BRUSH CREEK**
Project Location: **JOHNSON CITY, TENNESSEE**
Project Number: **216100**

Log of Boring E2A

Sheet 1 of 1

Date(s) Drilled **03/15/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **7.5**
Drill Rig Type **CME 75**	Drilling Contractor **CML - Johnson City**	Approximate Surface Elevation **1580**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **SPT**	Station **206+00**
Borehole Backfill **Soil Cuttings with Bentonite**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS	PID Reading, ppm
1580	0					LIMESTONE GRAVEL		
			1	6		FILL, Stiff, Moist, Tan Red, Silty CLAY with Limestone Fragments.		
			2			ALLUVIAL, Stiff, Very Moist, Brown Tan, Clayey SILT.		0.7
1575	5		3					1.8
			4					2.1
						Auger Refusal at 7.5 Feet.		
1570	10							
1565	15							
1560	20							
1555	25							
1550	30							

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Geotechnical Engineering and Consulting

Project: **LOWER BRUSH CREEK**
Project Location: **JOHNSON CITY, TENNESSEE**
Project Number: **216100**

Log of Boring E3
Sheet 1 of 1

Date(s) Drilled **03/15/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **4.5**
Drill Rig Type **CME 75**	Drilling Contractor **CML - Johnson City**	Approximate Surface Elevation **1581**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **SPT**	Station **208+00**
Borehole Backfill **Soil Cuttings with Bentonite**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS	PID Reading, ppm
1581	0					LIMESTONE GRAVEL		
						FILL, Medium to Soft, Wet, Brown Tan, Clayey SILT with Hydrocarbon Odors.		
			1					460
			2					814
1576	5					Auger Refusal at 4.5 Feet.		
1571	10							
1566	15							
1561	20							
1556	25							
1551	30							

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Project: **LOWER BRUSH CREEK** Project Location: **JOHNSON CITY, TENNESSEE** Project Number: **216100**	Log of Boring E3A **Sheet 1 of 1**

Date(s) Drilled **03/15/2016**	Logged By **Allen Browning**	Checked By **Allen Browning**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type **N/A**	Total Depth of Borehole **4.5**
Drill Rig Type **CME 75**	Drilling Contractor **CML - Johnson City**	Approximate Surface Elevation **1581**
Groundwater Level and Date Measured **N/A**	Sampling Method(s) **SPT**	Station **207+80**
Borehole Backfill **Soil Cuttings with Bentonite**	Comment **Refusal material unknown. Possibly boulders or bedrock.**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS	PID Reading, ppm
1581	0					LIMESTONE GRAVEL		
						FILL, Medium to Soft, Wet, Brown Tan, Clayey SILT with Hydrocarbon Odors.		
			1					460
			2					814
1576	5					Auger Refusal at 4.5 Feet.		
1571	10							
1566	15							
1561	20							
1556	25							
1551	30							

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Project: **LOWER BRUSH CREEK**
Project Location: **JOHNSON CITY, TENNESSEE**
Project Number: **216100**

Key to Log of Boring
Sheet 1 of 1

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS	PID Reading, ppm
1	2	3	4	5	6	7	8	9

COLUMN DESCRIPTIONS

1 Elevation (feet): Elevation (MSL, feet).
2 Depth (feet): Depth in feet below the ground surface.
3 Sample Type: Type of soil sample collected at the depth interval shown.
4 Sample Number: Sample identification number.
5 Sampling Resistance, blows/ft: Number of blows to advance driven sampler one foot (or distance shown) beyond seating interval using the hammer identified on the boring log.
6 Graphic Log: Graphic depiction of the subsurface material encountered.
7 MATERIAL DESCRIPTION: Description of material encountered. May include consistency, moisture, color, and other descriptive text.
8 REMARKS AND OTHER TESTS: Comments and observations regarding drilling or sampling made by driller or field personnel.
9 PID Reading, ppm: The reading from a photo-ionization detector, in parts per million.

FIELD AND LABORATORY TEST ABBREVIATIONS

NMC: Natural Moisture Content, percent
LL: Liquid Limit, percent
PI: Plasticity Index, percent
SA: Sieve analysis (percent passing No. 200 Sieve)
UC: Unconfined compressive strength test, Qu, in ksf

MATERIAL GRAPHIC SYMBOLS

- Asphaltic Concrete (AC)
- Bentonite
- Bentonite chips
- Bentonite powder
- Bentonite plug
- Boulders
- Fat CLAY, CLAY w/SAND, SANDY CLAY (CH)
- Fat CLAY/SILT (CH-MH)
- Fat CLAY/PEAT (CH-OH)
- Lean CLAY, CLAY w/SAND, SANDY CLAY (CL)
- Lean-Fat CLAY, CLAY w/SAND, SANDY CLAY (CL-CH)
- SILTY CLAY (CL-ML)
- Lean CLAY/PEAT (CL-OL)
- Claystone
- Portland Cement Concrete
- Cuttings
- AF
- Clayey GRAVEL (GC)
- Clayey GRAVEL to Gravelly CLAY (GC-CH)
- Clayey GRAVEL to Gravelly CLAY (GC-CL)
- Silty GRAVEL (GM)
- Silty GRAVEL to Clayey GRAVEL (GM-GC)
- Silty GRAVEL to Gravelly SILT (GM-MH)
- Silty GRAVEL to Gravelly SILT (GM-ML)
- Poorly graded GRAVEL (GP)
- Poorly graded GRAVEL with Silt (GP-GM)
- Granite
- Grass and/or topsoil
- Gravel
- Grout
- Well graded GRAVEL (GW)
- Well graded GRAVEL with Silt (GW-GM)
- Poorly to Well graded GRAVEL (GW-GP)
- Limestone
- Artificial Fill
- SILT, SILT w/SAND, SANDY SILT (MH)
- SILT, SILT w/SAND, SANDY SILT (ML)
- SILT, SILT with SAND, SANDY SILT (ML-MH)
- High plasticity PEAT (OH)
- Low plasticity PEAT (OL)
- Low to High plasticity PEAT (OL-OH)
- Sandstone
- Clayey SAND (SC)
- Clayey SAND to Sandy CLAY (SC-CH)
- Clayey SAND to Sandy CLAY (SC-CL)
- Shale
- Silt
- Siltstone
- Silty SAND (SM)
- Silty SAND to Sandy SILT (SM-MH)
- Silty SAND to Sandy SILT (SM-ML)
- Silty to Clayey SAND (SM-SC)
- Poorly graded SAND (SP)
- Poorly graded SAND with Clay (SP-SC)
- Poorly graded SAND with Silt (SP-SM)
- Well graded SAND (SW)
- Well graded SAND with Clay (SW-SC)
- Well graded SAND with Silt (SW-SM)

TYPICAL SAMPLER GRAPHIC SYMBOLS

- Auger sampler
- Bulk Sample
- 3-inch-OD California w/ brass rings
- CME Sampler
- Grab Sample
- 2.5-inch-OD Modified California w/ brass liners
- Pitcher Sample
- 2-inch-OD unlined split spoon (SPT)
- Shelby Tube (Thin-walled, fixed head)

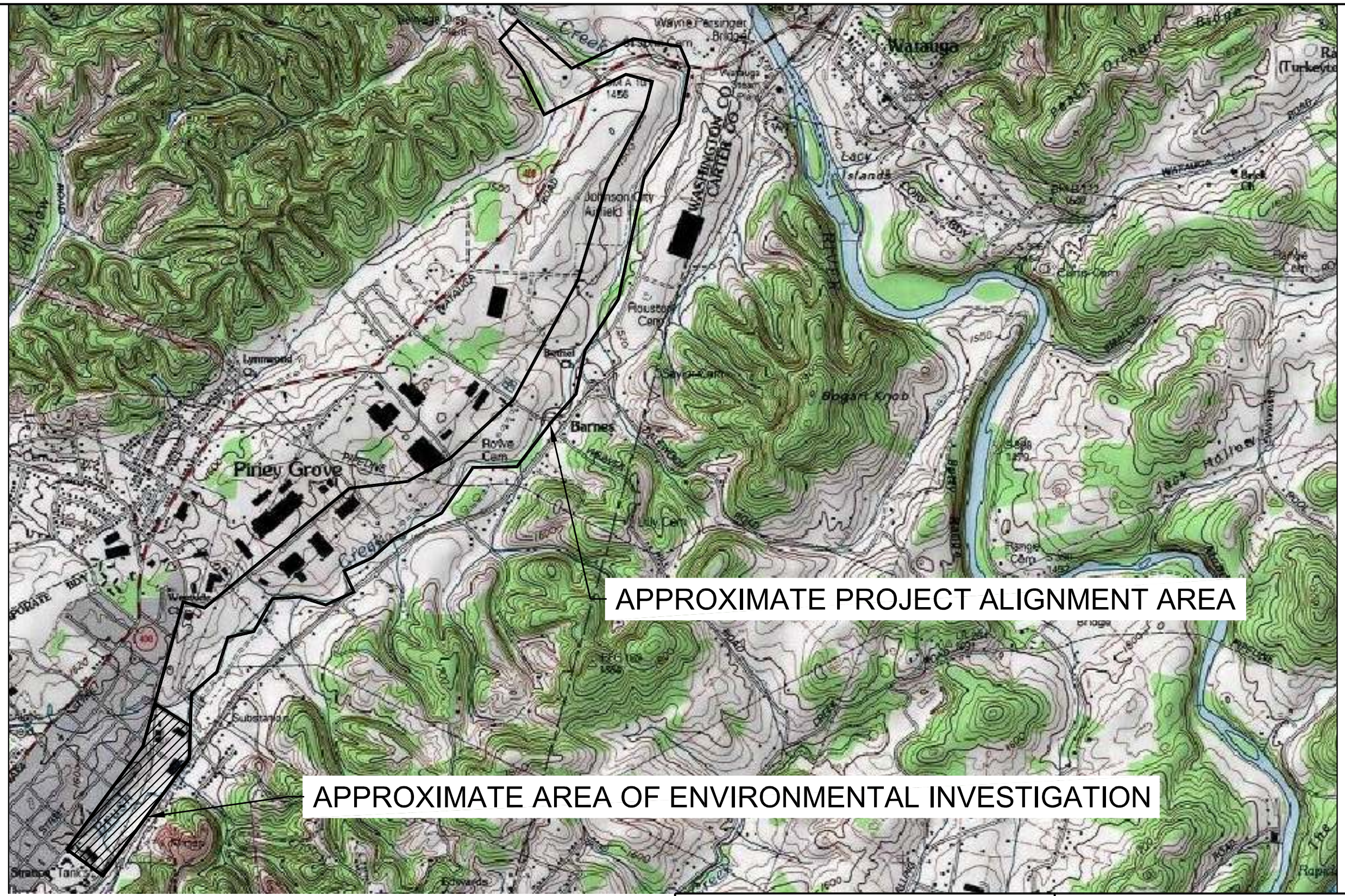
OTHER GRAPHIC SYMBOLS

- Water level (at time of drilling, ATD)
- Water level (after waiting)
- Minor change in material properties within a stratum
- Inferred/gradational contact between strata
- Queried contact between strata

GENERAL NOTES

1: Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.
2: Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

T:\2016 Projects\2016 Job Files\216100 - Lwr Brush Crk Sewer\Lab Data\216000 ENV SPT LOGS.bg4[Lower Brush Creek PID.tpl]



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Geotechnical Engineering and Consulting

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KINGSPORT, TN 37663

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AREA TOPOGRAPHIC MAPPING
BRUSH CREEK INTERCEPTOR PROJECT
JOHNSON CITY, TENNESSEE

FOR: HAZEN AND SAWYER		
DRAWN BY: AB	NOTES:	
PROJ #: 216100	ADAPTED FROM USGS MAPPING	
SCALE: NONE	DATE: 04/07/16	DWG #: TOPO

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CLIENT PROVIDED MAPPING
BRUSH CREEK INTERCEPTOR PROJECT
JOHNSON CITY, TENNESSEE

FOR: HAZEN AND SAWYER		
DRAWN BY: AB	NOTES:	
PROJ #: 216100	LOCATIONS ARE APPROXIMATE	
SCALE: NONE	DATE: 04/07/16	DWG #: CLM

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George Cross
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Date Reported: 4/18/2016
Date Received: 3/18/2016
Cust #: RF003
PO#:

Workorder: **1604529** **Project:** 216100 - Lower Brush Creek

Analyte	Result	Units	Qualifier	MDL	MRL	Analyst	Analyzed	Method
E1A, 1'-8' Sampled: 03/15/2016 11:00								
1604529-01 (Solid)								
Classical Chemistry Parameters								**Ha**
						Analyzed By:Empirical Laboratories, LLC		
% Solids	**72**	%		1.0	1.0	KWH/J	04/12/2016 09:15	SM2540B
Extractable Petroleum Hydrocarbons by GC								**Ha**
						Analyzed By:Empirical Laboratories, LLC		
Extractable Petroleum Hydrocarbons (EPH)	**44.6**	mg/Kg dry	Ha, D	13.2	26.2	KBG	04/10/2016 06:14	TNEPH (C12-C40)
Surrogate: o-Terphenyl		*50-150*	Ha		*95.6 %*		04/10/2016 06:14	*TNEPH (C12-C40)*
GCMS Volatiles								
						Analyzed By:Microbac Laboratories, Inc. - Chic		
1,1,1,2-Tetrachloroethane	<0.76	µg/Kg		0.76	9.4	jln	03/28/2016 17:51	SW-846 8260B
1,1,1-Trichloroethane	<1.0	µg/Kg		1.0	4.7	jln	03/28/2016 17:51	SW-846 8260B
1,1,2,2-Tetrachloroethane	<1.2	µg/Kg		1.2	4.7	jln	03/28/2016 17:51	SW-846 8260B
1,1,2-Trichloroethane	<1.2	µg/Kg		1.2	4.7	jln	03/28/2016 17:51	SW-846 8260B
1,1-Dichloroethane	<1.0	µg/Kg		1.0	4.7	jln	03/28/2016 17:51	SW-846 8260B
1,1-Dichloroethene	<1.1	µg/Kg		1.1	4.7	jln	03/28/2016 17:51	SW-846 8260B
1,2-Dichloroethane	<1.5	µg/Kg		1.5	4.7	jln	03/28/2016 17:51	SW-846 8260B
1,2-Dichloropropane	<1.1	µg/Kg		1.1	4.7	jln	03/28/2016 17:51	SW-846 8260B
2-Butanone	<1.1	µg/Kg		1.1	9.4	jln	03/28/2016 17:51	SW-846 8260B
2-Hexanone	<2.1	µg/Kg		2.1	9.4	jln	03/28/2016 17:51	SW-846 8260B
4-Methyl-2-Pentanone	<2.0	µg/Kg		2.0	9.4	jln	03/28/2016 17:51	SW-846 8260B
Acetone	<4.1	µg/Kg		4.1	47	jln	03/28/2016 17:51	SW-846 8260B
Acrolein	<21	µg/Kg		21	94	jln	03/28/2016 17:51	SW-846 8260B
Acrylonitrile	<25	µg/Kg		25	94	jln	03/28/2016 17:51	SW-846 8260B
Benzene	<0.80	µg/Kg		0.80	4.7	jln	03/28/2016 17:51	SW-846 8260B
Bromodichloromethane	<0.79	µg/Kg		0.79	4.7	jln	03/28/2016 17:51	SW-846 8260B
Bromoform	<1.5	µg/Kg		1.5	4.7	jln	03/28/2016 17:51	SW-846 8260B
Bromomethane	<1.4	µg/Kg		1.4	9.4	jln	03/28/2016 17:51	SW-846 8260B
Carbon Disulfide	<0.97	µg/Kg		0.97	9.4	jln	03/28/2016 17:51	SW-846 8260B
Carbon tetrachloride	<0.99	µg/Kg		0.99	4.7	jln	03/28/2016 17:51	SW-846 8260B
Chlorobenzene	<0.51	µg/Kg		0.51	4.7	jln	03/28/2016 17:51	SW-846 8260B
Chloroethane	<1.8	µg/Kg		1.8	9.4	jln	03/28/2016 17:51	SW-846 8260B
Chloroform	<0.58	µg/Kg		0.58	4.7	jln	03/28/2016 17:51	SW-846 8260B

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Workorder: **1604529** **Project:** 216100 - Lower Brush Creek

E1A, 1'-8' Sampled: 03/15/2016 11:00

1604529-01 (Solid)

GCMS Volatiles

Analyzed By:Microbac Laboratories, Inc. - Chic

Chloromethane	<1.1	µg/Kg	1.1	9.4	jln	03/28/2016 17:51	SW-846 8260B
cis-1,2-Dichloroethene	<0.67	µg/Kg	0.67	4.7	jln	03/28/2016 17:51	SW-846 8260B
cis-1,3-Dichloropropene	<0.49	µg/Kg	0.49	4.7	jln	03/28/2016 17:51	SW-846 8260B
Dibromochloromethane	<0.94	µg/Kg	0.94	4.7	jln	03/28/2016 17:51	SW-846 8260B
Ethylbenzene	**9.6**	µg/Kg	0.86	4.7	jln	03/28/2016 17:51	SW-846 8260B
m,p-Xylene	**44**	µg/Kg	1.6	4.7	jln	03/28/2016 17:51	SW-846 8260B
Methylene chloride	<1.9	µg/Kg	1.9	19	jln	03/28/2016 17:51	SW-846 8260B
Methyl-t-Butyl Ether	<1.7	µg/Kg	1.7	4.7	jln	03/28/2016 17:51	SW-846 8260B
o-Xylene	**21**	µg/Kg	0.84	4.7	jln	03/28/2016 17:51	SW-846 8260B
Styrene	<0.70	µg/Kg	0.70	4.7	jln	03/28/2016 17:51	SW-846 8260B
Tetrachloroethene	<1.1	µg/Kg	1.1	4.7	jln	03/28/2016 17:51	SW-846 8260B
Toluene	**70**	µg/Kg	0.73	4.7	jln	03/28/2016 17:51	SW-846 8260B
trans-1,2-Dichloroethene	<0.92	µg/Kg	0.92	4.7	jln	03/28/2016 17:51	SW-846 8260B
trans-1,3-Dichloropropene	<1.1	µg/Kg	1.1	4.7	jln	03/28/2016 17:51	SW-846 8260B
Trichloroethene	<1.3	µg/Kg	1.3	4.7	jln	03/28/2016 17:51	SW-846 8260B
Trichlorofluoromethane	<1.1	µg/Kg	1.1	9.4	jln	03/28/2016 17:51	SW-846 8260B
Vinyl Acetate	<2.0	µg/Kg	2.0	9.4	jln	03/28/2016 17:51	SW-846 8260B
Vinyl chloride	<1.2	µg/Kg	1.2	9.4	jln	03/28/2016 17:51	SW-846 8260B
Total 1,2-Dichloroethene	<1.4	µg/Kg	1.4	9.4	jln	03/28/2016 17:51	SW-846 8260B
Total Xylenes	**65**	µg/Kg	2.4	4.7	jln	03/28/2016 17:51	SW-846 8260B
Surrogate: 1,2-Dichloroethane-d4		*51.7-162*		*125 %*		03/28/2016 17:51	*SW-846 8260B*
Surrogate: 4-Bromofluorobenzene		*57.4-135*		*96.5 %*		03/28/2016 17:51	*SW-846 8260B*
Surrogate: Dibromofluoromethane		*63.5-139*		*101 %*		03/28/2016 17:51	*SW-846 8260B*
Surrogate: Toluene-d8		*66.6-143*		*98.6 %*		03/28/2016 17:51	*SW-846 8260B*

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Workorder: **1604529** **Project:** 216100 - Lower Brush Creek

E1A, 1'-8' Sampled: 03/15/2016 11:00

1604529-01 (Solid)

Metals, Total by EPA 6000/7000 Series Methods

Analyzed By:Microbac Knoxville Division

Arsenic	**5.73**	mg/kg		0.473	1.24	JRE	03/29/2016 16:32	SW846 6010C
Chromium	**24.9**	mg/kg		0.0937	0.621	JRE	03/29/2016 16:32	SW846 6010C
Mercury	**0.0938**	mg/kg	M1	0.000735	0.00619	CWC	03/28/2016 17:11	SW846 7471B

PAH - Low Level

Analyzed By:Microbac Laboratories, Inc. - Ohio

Naphthalene	**20.6**	ug/kg DRY	2.03	4.05	SCB	03/28/2016 18:17	BNASIM
Acenaphthylene	ND	ug/kg DRY	2.03	4.05	SCB	03/28/2016 18:17	BNASIM
Acenaphthene	ND	ug/kg DRY	2.03	4.05	SCB	03/28/2016 18:17	BNASIM
Fluorene	ND	ug/kg DRY	2.03	4.05	SCB	03/28/2016 18:17	BNASIM
Phenanthrene	ND	ug/kg DRY	2.03	4.05	SCB	03/28/2016 18:17	BNASIM
Anthracene	ND	ug/kg DRY	2.03	4.05	SCB	03/28/2016 18:17	BNASIM
Fluoranthene	ND	ug/kg DRY	2.03	4.05	SCB	03/28/2016 18:17	BNASIM
Pyrene	ND	ug/kg DRY	2.03	4.05	SCB	03/28/2016 18:17	BNASIM
Benzo(a)anthracene	ND	ug/kg DRY	2.03	4.05	SCB	03/28/2016 18:17	BNASIM
Chrysene	ND	ug/kg DRY	2.03	4.05	SCB	03/28/2016 18:17	BNASIM
Benzo(b)fluoranthene	ND	ug/kg DRY	2.03	4.05	SCB	03/28/2016 18:17	BNASIM
Benzo(k)fluoranthene	ND	ug/kg DRY	2.03	4.05	SCB	03/28/2016 18:17	BNASIM
Benzo(a)pyrene	ND	ug/kg DRY	2.03	4.05	SCB	03/28/2016 18:17	BNASIM
Indeno(1,2,3-cd)pyrene	ND	ug/kg DRY	2.03	4.05	SCB	03/28/2016 18:17	BNASIM
Dibenzo(a,h)anthracene	ND	ug/kg DRY	2.03	4.05	SCB	03/28/2016 18:17	BNASIM
Benzo(g,h,i)perylene	ND	ug/kg DRY	2.03	4.05	SCB	03/28/2016 18:17	BNASIM
1-Methylnaphthalene	ND	ug/kg DRY	2.03	4.05	SCB	03/28/2016 18:17	BNASIM
2-Methylnaphthalene	**5.81**	ug/kg DRY	2.03	4.05	SCB	03/28/2016 18:17	BNASIM
Surrogate: Nitrobenzene-d5		*23-120*		*36.5 %*		03/28/2016 18:17	*BNASIM*
Surrogate: 2-Fluorobiphenyl		*30-115*		*37.8 %*		03/28/2016 18:17	*BNASIM*
Surrogate: p-Terphenyl-d14		*18-137*		*50.9 %*		03/28/2016 18:17	*BNASIM*

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Cust #: RF003
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Workorder: **1604529** **Project:** 216100 - Lower Brush Creek

E1A, 1'-8' Sampled: 03/15/2016 11:00

1604529-01 (Solid)

Percent Solids

Analyzed By:Microbac Laboratories, Inc. - Ohio

Percent Solids	**70.9**	weight %	1.00	1.00	AC	03/25/2016 07:43	D2216

SEMIVOLATILE ORGANICS

Analyzed By:Microbac Laboratories, Inc. - Ohio

1,2,4-Trichlorobenzene	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
1,2-Dichlorobenzene	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
1,3-Dichlorobenzene	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
1,4-Dichlorobenzene	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
1,3-Dinitrobenzene	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
1-Methylnaphthalene	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
2,3,4,6-Tetrachlorophenol	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
2,4,5-Trichlorophenol	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
2,4,6-Trichlorophenol	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
2,4-Dichlorophenol	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
2,4-Dimethylphenol	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
2,4-Dinitrophenol	ND	ug/kg DRY	674	1350	SCB	04/05/2016 13:25	SW8270C
2,4-Dinitrotoluene	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
2,6-Dinitrotoluene	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
2-Chloronaphthalene	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
2-Chlorophenol	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
2-Methylnaphthalene	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
2-Methylphenol	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
2-Nitroaniline	ND	ug/kg DRY	674	1350	SCB	04/05/2016 13:25	SW8270C
2-Nitrophenol	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
3,3'-Dichlorobenzidine	ND	ug/kg DRY	270	540	SCB	04/05/2016 13:25	SW8270C
3-,4-Methylphenol	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
3-Nitroaniline	ND	ug/kg DRY	674	1350	SCB	04/05/2016 13:25	SW8270C
4,6-Dinitro-2-methylphenol	ND	ug/kg DRY	674	1350	SCB	04/05/2016 13:25	SW8270C
4-Bromophenyl phenyl ether	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
4-Chloro-3-methylphenol	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
4-Chloroaniline	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
4-Chlorophenyl phenyl ether	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
4-Nitroaniline	ND	ug/kg DRY	674	1350	SCB	04/05/2016 13:25	SW8270C
4-Nitrophenol	ND	ug/kg DRY	674	1350	SCB	04/05/2016 13:25	SW8270C
Acenaphthene	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C

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E1A, 1'-8' Sampled: 03/15/2016 11:00

1604529-01 (Solid)

SEMIVOLATILE ORGANICS

Analyzed By:Microbac Laboratories, Inc. - Ohio

Acenaphthylene	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
Aniline	ND	ug/kg DRY	674	1350	SCB	04/05/2016 13:25	SW8270C
Anthracene	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
Benzidine	ND	ug/kg DRY	1020	2050	SCB	04/05/2016 13:25	SW8270C
Benzo(a)anthracene	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
Benzo(a)pyrene	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
Benzo(b)fluoranthene	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
Benzo(g,h,i)Perylene	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
Benzo(k)fluoranthene	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
Benzoic acid	ND	ug/kg DRY	540	8190	SCB	04/05/2016 13:25	SW8270C
Benzyl alcohol	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
Bis(2-Chloroethoxy)Methane	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
Bis(2-Chloroethyl)ether	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
bis(2-Chloroisopropyl)ether	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
bis(2-Ethylhexyl)phthalate	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
Butyl Benzyl Phthalate	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
Carbazole	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
Chrysene	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
Dibenz(a,h)anthracene	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
Dibenzofuran	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
Diethyl phthalate	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
Dimethyl phthalate	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
Di-N-Butylphthalate	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
Di-n-octyl phthalate	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
Diphenylamine	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
Fluoranthene	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
Fluorene	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
Hexachlorobenzene	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
Hexachlorobutadiene	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
Hexachlorocyclopentadiene	ND	ug/kg DRY	614	1230	SCB	04/05/2016 13:25	SW8270C
Hexachloroethane	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
Indeno(1,2,3-cd)pyrene	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
Isophorone	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C
Naphthalene	ND	ug/kg DRY	135	270	SCB	04/05/2016 13:25	SW8270C

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E1A, 1'-8' Sampled: 03/15/2016 11:00

1604529-01 (Solid)

SEMIVOLATILE ORGANICS

Analyzed By:Microbac Laboratories, Inc. - Ohio

Nitrobenzene	ND	ug/kg DRY		135	270	SCB	04/05/2016 13:25	SW8270C
N-Nitrosodimethylamine	ND	ug/kg DRY		135	270	SCB	04/05/2016 13:25	SW8270C
N-Nitrosodipropylamine	ND	ug/kg DRY		135	270	SCB	04/05/2016 13:25	SW8270C
Pentachlorophenol	ND	ug/kg DRY		674	1350	SCB	04/05/2016 13:25	SW8270C
Phenanthrene	ND	ug/kg DRY		135	270	SCB	04/05/2016 13:25	SW8270C
Phenol	ND	ug/kg DRY		135	270	SCB	04/05/2016 13:25	SW8270C
Pyrene	ND	ug/kg DRY		135	270	SCB	04/05/2016 13:25	SW8270C
Pyridine	ND	ug/kg DRY		674	1350	SCB	04/05/2016 13:25	SW8270C
Surrogate: 2,4,6-Tribromophenol		*19-122*			*35.7 %*		04/05/2016 13:25	*SW8270C*
Surrogate: 2-Fluorobiphenyl		*30-115*			*32.4 %*		04/05/2016 13:25	*SW8270C*
Surrogate: 2-Fluorophenol		*25-121*			*29.3 %*		04/05/2016 13:25	*SW8270C*
Surrogate: Nitrobenzene-d5		*23-120*			*34.4 %*		04/05/2016 13:25	*SW8270C*
Surrogate: p-Terphenyl-d14		*18-137*			*37.5 %*		04/05/2016 13:25	*SW8270C*
Surrogate: Phenol-d5		*24-113*			*27.2 %*		04/05/2016 13:25	*SW8270C*

E1A, 1'-8' Sampled: 03/15/2016 11:00

1604529-01RE1 (Solid)

Metals, Total by EPA 6000/7000 Series Methods

Analyzed By:Microbac Knoxville Division

Barium	**60.5**	mg/kg		0.765	1.66	JRE	03/31/2016 12:32	SW846 6010C
Cadmium	<0.376	mg/kg	L	0.376	3.11	JRE	03/31/2016 12:32	SW846 6010C
Lead	**18.8**	mg/kg		1.46	8.28	JRE	03/31/2016 12:32	SW846 6010C
Selenium	<4.30	mg/kg	L, Q11	4.30	8.28	JRE	03/31/2016 12:32	SW846 6010C
Silver	<0.344	mg/kg	L	0.344	0.414	JRE	03/31/2016 12:32	SW846 6010C

E2A , 2.5;-7' Sampled: 03/15/2016 13:00

1604529-02 (Solid)

Classical Chemistry Parameters **Ha**

Analyzed By:Empirical Laboratories, LLC

% Solids	**85**	%		1.0	1.0	KWH/J	04/12/2016 09:15	SM2540B

Extractable Petroleum Hydrocarbons by GC **Ha**

Analyzed By:Empirical Laboratories, LLC

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Date Received: 3/18/2016
Cust #: RF003
PO#:

Workorder: **1604529** **Project:** 216100 - Lower Brush Creek

E2A , 2.5;-7' Sampled: 03/15/2016 13:00

1604529-02 (Solid)

Extractable Petroleum Hydrocarbons by GC

Ha

Analyzed By:Empirical Laboratories, LLC

Extractable Petroleum Hydrocarbons (EPH)	**30.0**	mg/Kg dry	Ha, D	7.71	15.3	KBG	04/10/2016 06:47	TNEPH (C12-C40)
Surrogate: o-Terphenyl		*50-150*	Ha		*90.2 %*		04/10/2016 06:47	*TNEPH (C12-C40)*

GCMS Volatiles

Analyzed By:Microbac Laboratories, Inc. - Chic

1,1,1,2-Tetrachloroethane	<0.80	µg/Kg		0.80	9.9	jln	03/28/2016 19:02	SW-846 8260B
1,1,1-Trichloroethane	<1.1	µg/Kg		1.1	5.0	jln	03/28/2016 19:02	SW-846 8260B
1,1,2,2-Tetrachloroethane	<1.3	µg/Kg		1.3	5.0	jln	03/28/2016 19:02	SW-846 8260B
1,1,2-Trichloroethane	<1.2	µg/Kg		1.2	5.0	jln	03/28/2016 19:02	SW-846 8260B
1,1-Dichloroethane	<1.1	µg/Kg		1.1	5.0	jln	03/28/2016 19:02	SW-846 8260B
1,1-Dichloroethene	<1.2	µg/Kg		1.2	5.0	jln	03/28/2016 19:02	SW-846 8260B
1,2-Dichloroethane	<1.5	µg/Kg		1.5	5.0	jln	03/28/2016 19:02	SW-846 8260B
1,2-Dichloropropane	<1.1	µg/Kg		1.1	5.0	jln	03/28/2016 19:02	SW-846 8260B
2-Butanone	<1.1	µg/Kg		1.1	9.9	jln	03/28/2016 19:02	SW-846 8260B
2-Hexanone	<2.2	µg/Kg		2.2	9.9	jln	03/28/2016 19:02	SW-846 8260B
4-Methyl-2-Pentanone	<2.1	µg/Kg		2.1	9.9	jln	03/28/2016 19:02	SW-846 8260B
Acetone	<4.3	µg/Kg		4.3	50	jln	03/28/2016 19:02	SW-846 8260B
Acrolein	<22	µg/Kg		22	99	jln	03/28/2016 19:02	SW-846 8260B
Acrylonitrile	<26	µg/Kg		26	99	jln	03/28/2016 19:02	SW-846 8260B
Benzene	<0.84	µg/Kg		0.84	5.0	jln	03/28/2016 19:02	SW-846 8260B
Bromodichloromethane	<0.83	µg/Kg		0.83	5.0	jln	03/28/2016 19:02	SW-846 8260B
Bromoform	<1.6	µg/Kg		1.6	5.0	jln	03/28/2016 19:02	SW-846 8260B
Bromomethane	<1.5	µg/Kg		1.5	9.9	jln	03/28/2016 19:02	SW-846 8260B
Carbon Disulfide	<1.0	µg/Kg		1.0	9.9	jln	03/28/2016 19:02	SW-846 8260B
Carbon tetrachloride	<1.0	µg/Kg		1.0	5.0	jln	03/28/2016 19:02	SW-846 8260B
Chlorobenzene	<0.53	µg/Kg		0.53	5.0	jln	03/28/2016 19:02	SW-846 8260B
Chloroethane	<1.9	µg/Kg		1.9	9.9	jln	03/28/2016 19:02	SW-846 8260B
Chloroform	<0.61	µg/Kg		0.61	5.0	jln	03/28/2016 19:02	SW-846 8260B
Chloromethane	<1.1	µg/Kg		1.1	9.9	jln	03/28/2016 19:02	SW-846 8260B
cis-1,2-Dichloroethene	<0.70	µg/Kg		0.70	5.0	jln	03/28/2016 19:02	SW-846 8260B
cis-1,3-Dichloropropene	<0.51	µg/Kg		0.51	5.0	jln	03/28/2016 19:02	SW-846 8260B
Dibromochloromethane	<0.99	µg/Kg		0.99	5.0	jln	03/28/2016 19:02	SW-846 8260B
Ethylbenzene	<0.91	µg/Kg		0.91	5.0	jln	03/28/2016 19:02	SW-846 8260B
m,p-Xylene	**7.6**	µg/Kg		1.7	5.0	jln	03/28/2016 19:02	SW-846 8260B

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Workorder: **1604529** **Project:** 216100 - Lower Brush Creek

E2A , 2.5;-7' Sampled: 03/15/2016 13:00

1604529-02 (Solid)

GCMS Volatiles

Analyzed By:Microbac Laboratories, Inc. - Chic

Methylene chloride	<2.0	µg/Kg	2.0	20	jln	03/28/2016 19:02	SW-846 8260B
Methyl-t-Butyl Ether	<1.8	µg/Kg	1.8	5.0	jln	03/28/2016 19:02	SW-846 8260B
o-Xylene	<0.89	µg/Kg	0.89	5.0	jln	03/28/2016 19:02	SW-846 8260B
Styrene	<0.74	µg/Kg	0.74	5.0	jln	03/28/2016 19:02	SW-846 8260B
Tetrachloroethene	<1.2	µg/Kg	1.2	5.0	jln	03/28/2016 19:02	SW-846 8260B
Toluene	**9.8**	µg/Kg	0.77	5.0	jln	03/28/2016 19:02	SW-846 8260B
trans-1,2-Dichloroethene	<0.97	µg/Kg	0.97	5.0	jln	03/28/2016 19:02	SW-846 8260B
trans-1,3-Dichloropropene	<1.2	µg/Kg	1.2	5.0	jln	03/28/2016 19:02	SW-846 8260B
Trichloroethene	<1.3	µg/Kg	1.3	5.0	jln	03/28/2016 19:02	SW-846 8260B
Trichlorofluoromethane	<1.2	µg/Kg	1.2	9.9	jln	03/28/2016 19:02	SW-846 8260B
Vinyl Acetate	<2.1	µg/Kg	2.1	9.9	jln	03/28/2016 19:02	SW-846 8260B
Vinyl chloride	<1.3	µg/Kg	1.3	9.9	jln	03/28/2016 19:02	SW-846 8260B
Total 1,2-Dichloroethene	<1.5	µg/Kg	1.5	9.9	jln	03/28/2016 19:02	SW-846 8260B
Total Xylenes	**12**	µg/Kg	2.5	5.0	jln	03/28/2016 19:02	SW-846 8260B
Surrogate: 1,2-Dichloroethane-d4		*51.7-162*		*127 %*		03/28/2016 19:02	*SW-846 8260B*
Surrogate: 4-Bromofluorobenzene		*57.4-135*		*94.1 %*		03/28/2016 19:02	*SW-846 8260B*
Surrogate: Dibromofluoromethane		*63.5-139*		*99.7 %*		03/28/2016 19:02	*SW-846 8260B*
Surrogate: Toluene-d8		*66.6-143*		*101 %*		03/28/2016 19:02	*SW-846 8260B*

Metals, Total by EPA 6000/7000 Series Methods

Analyzed By:Microbac Knoxville Division

Arsenic	**2.96**	mg/kg	0.455	1.20	JRE	03/29/2016 16:38	SW846 6010C
Chromium	**14.3**	mg/kg	0.0902	0.598	JRE	03/29/2016 16:38	SW846 6010C
Mercury	**0.0285**	mg/kg	0.000953	0.00802	CWC	03/28/2016 17:14	SW846 7471B

PAH - Low Level

Analyzed By:Microbac Laboratories, Inc. - Ohio

Naphthalene	ND	ug/kg DRY	2.04	4.07	SCB	03/28/2016 19:36	BNASIM
Acenaphthylene	ND	ug/kg DRY	2.04	4.07	SCB	03/28/2016 19:36	BNASIM
Acenaphthene	ND	ug/kg DRY	2.04	4.07	SCB	03/28/2016 19:36	BNASIM
Fluorene	ND	ug/kg DRY	2.04	4.07	SCB	03/28/2016 19:36	BNASIM
Phenanthrene	ND	ug/kg DRY	2.04	4.07	SCB	03/28/2016 19:36	BNASIM
Anthracene	ND	ug/kg DRY	2.04	4.07	SCB	03/28/2016 19:36	BNASIM
Fluoranthene	ND	ug/kg DRY	2.04	4.07	SCB	03/28/2016 19:36	BNASIM
Pyrene	ND	ug/kg DRY	2.04	4.07	SCB	03/28/2016 19:36	BNASIM
Benzo(a)anthracene	ND	ug/kg DRY	2.04	4.07	SCB	03/28/2016 19:36	BNASIM

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Cust #: RF003
PO#:

Workorder: **1604529** **Project:** 216100 - Lower Brush Creek

E2A , 2.5;-7' Sampled: 03/15/2016 13:00

1604529-02 (Solid)

PAH - Low Level

Analyzed By:Microbac Laboratories, Inc. - Ohio

Chrysene	ND	ug/kg DRY	2.04	4.07	SCB	03/28/2016 19:36	BNASIM
Benzo(b)fluoranthene	ND	ug/kg DRY	2.04	4.07	SCB	03/28/2016 19:36	BNASIM
Benzo(k)fluoranthene	ND	ug/kg DRY	2.04	4.07	SCB	03/28/2016 19:36	BNASIM
Benzo(a)pyrene	ND	ug/kg DRY	2.04	4.07	SCB	03/28/2016 19:36	BNASIM
Indeno(1,2,3-cd)pyrene	ND	ug/kg DRY	2.04	4.07	SCB	03/28/2016 19:36	BNASIM
Dibenzo(a,h)anthracene	ND	ug/kg DRY	2.04	4.07	SCB	03/28/2016 19:36	BNASIM
Benzo(g,h,i)perylene	ND	ug/kg DRY	2.04	4.07	SCB	03/28/2016 19:36	BNASIM
1-Methylnaphthalene	ND	ug/kg DRY	2.04	4.07	SCB	03/28/2016 19:36	BNASIM
2-Methylnaphthalene	ND	ug/kg DRY	2.04	4.07	SCB	03/28/2016 19:36	BNASIM
Surrogate: Nitrobenzene-d5		*23-120*		*77.0 %*		03/28/2016 19:36	*BNASIM*
Surrogate: 2-Fluorobiphenyl		*30-115*		*77.4 %*		03/28/2016 19:36	*BNASIM*
Surrogate: p-Terphenyl-d14		*18-137*		*71.9 %*		03/28/2016 19:36	*BNASIM*

Percent Solids

Analyzed By:Microbac Laboratories, Inc. - Ohio

Percent Solids	**69.7**	weight %	1.00	1.00	AC	03/25/2016 07:43	D2216

SEMIVOLATILE ORGANICS

Analyzed By:Microbac Laboratories, Inc. - Ohio

1,2,4-Trichlorobenzene	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
1,2-Dichlorobenzene	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
1,3-Dichlorobenzene	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
1,4-Dichlorobenzene	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
1,3-Dinitrobenzene	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
1-Methylnaphthalene	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
2,3,4,6-Tetrachlorophenol	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
2,4,5-Trichlorophenol	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
2,4,6-Trichlorophenol	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
2,4-Dichlorophenol	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
2,4-Dimethylphenol	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
2,4-Dinitrophenol	ND	ug/kg DRY	671	1340	SCB	04/05/2016 13:56	SW8270C
2,4-Dinitrotoluene	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
2,6-Dinitrotoluene	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
2-Chloronaphthalene	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
2-Chlorophenol	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
2-Methylnaphthalene	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C

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Workorder: **1604529** **Project:** 216100 - Lower Brush Creek

E2A , 2.5;-7' Sampled: 03/15/2016 13:00

1604529-02 (Solid)

SEMIVOLATILE ORGANICS

Analyzed By:Microbac Laboratories, Inc. - Ohio

2-Methylphenol	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
2-Nitroaniline	ND	ug/kg DRY	671	1340	SCB	04/05/2016 13:56	SW8270C
2-Nitrophenol	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
3,3'-Dichlorobenzidine	ND	ug/kg DRY	269	538	SCB	04/05/2016 13:56	SW8270C
3-,4-Methylphenol	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
3-Nitroaniline	ND	ug/kg DRY	671	1340	SCB	04/05/2016 13:56	SW8270C
4,6-Dinitro-2-methylphenol	ND	ug/kg DRY	671	1340	SCB	04/05/2016 13:56	SW8270C
4-Bromophenyl phenyl ether	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
4-Chloro-3-methylphenol	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
4-Chloroaniline	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
4-Chlorophenyl phenyl ether	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
4-Nitroaniline	ND	ug/kg DRY	671	1340	SCB	04/05/2016 13:56	SW8270C
4-Nitrophenol	ND	ug/kg DRY	671	1340	SCB	04/05/2016 13:56	SW8270C
Acenaphthene	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
Acenaphthylene	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
Aniline	ND	ug/kg DRY	671	1340	SCB	04/05/2016 13:56	SW8270C
Anthracene	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
Benzidine	ND	ug/kg DRY	1020	2040	SCB	04/05/2016 13:56	SW8270C
Benzo(a)anthracene	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
Benzo(a)pyrene	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
Benzo(b)fluoranthene	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
Benzo(g,h,i)Perylene	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
Benzo(k)fluoranthene	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
Benzoic acid	ND	ug/kg DRY	538	8150	SCB	04/05/2016 13:56	SW8270C
Benzyl alcohol	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
Bis(2-Chloroethoxy)Methane	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
Bis(2-Chloroethyl)ether	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
bis(2-Chloroisopropyl)ether	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
bis(2-Ethylhexyl)phthalate	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
Butyl Benzyl Phthalate	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
Carbazole	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
Chrysene	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
Dibenz(a,h)anthracene	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
Dibenzofuran	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C

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E2A , 2.5;-7' Sampled: 03/15/2016 13:00

1604529-02 (Solid)

SEMIVOLATILE ORGANICS

Analyzed By:Microbac Laboratories, Inc. - Ohio

Diethyl phthalate	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
Dimethyl phthalate	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
Di-N-Butylphthalate	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
Di-n-octyl phthalate	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
Diphenylamine	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
Fluoranthene	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
Fluorene	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
Hexachlorobenzene	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
Hexachlorobutadiene	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
Hexachlorocyclopentadiene	ND	ug/kg DRY	611	1220	SCB	04/05/2016 13:56	SW8270C
Hexachloroethane	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
Indeno(1,2,3-cd)pyrene	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
Isophorone	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
Naphthalene	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
Nitrobenzene	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
N-Nitrosodimethylamine	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
N-Nitrosodipropylamine	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
Pentachlorophenol	ND	ug/kg DRY	671	1340	SCB	04/05/2016 13:56	SW8270C
Phenanthrene	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
Phenol	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
Pyrene	ND	ug/kg DRY	134	269	SCB	04/05/2016 13:56	SW8270C
Pyridine	ND	ug/kg DRY	671	1340	SCB	04/05/2016 13:56	SW8270C
Surrogate: 2,4,6-Tribromophenol		*19-122*		*60.8 %*		04/05/2016 13:56	*SW8270C*
Surrogate: 2-Fluorobiphenyl		*30-115*		*51.2 %*		04/05/2016 13:56	*SW8270C*
Surrogate: 2-Fluorophenol		*25-121*		*46.8 %*		04/05/2016 13:56	*SW8270C*
Surrogate: Nitrobenzene-d5		*23-120*		*54.7 %*		04/05/2016 13:56	*SW8270C*
Surrogate: p-Terphenyl-d14		*18-137*		*60.8 %*		04/05/2016 13:56	*SW8270C*
Surrogate: Phenol-d5		*24-113*		*43.0 %*		04/05/2016 13:56	*SW8270C*

E2A , 2.5;-7' Sampled: 03/15/2016 13:00

1604529-02RE1 (Solid)

Metals, Total by EPA 6000/7000 Series Methods

Analyzed By:Microbac Knoxville Division

Barium	**70.0**	mg/kg	0.737	1.60	JRE	03/31/2016 12:38	SW846 6010C

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PO#:

Workorder: **1604529** **Project:** 216100 - Lower Brush Creek

E2A , 2.5;-7' Sampled: 03/15/2016 13:00

1604529-02RE1 (Solid)

Metals, Total by EPA 6000/7000 Series Methods

Analyzed By:Microbac Knoxville Division

Cadmium	<0.362	mg/kg	L	0.362	2.99	JRE	03/31/2016 12:38	SW846 6010C
Lead	**16.1**	mg/kg		1.40	7.98	JRE	03/31/2016 12:38	SW846 6010C
Selenium	<4.15	mg/kg	L, Q11	4.15	7.98	JRE	03/31/2016 12:38	SW846 6010C
Silver	<0.332	mg/kg	L	0.332	0.399	JRE	03/31/2016 12:38	SW846 6010C

E3, 2'-4' Sampled: 03/15/2016 15:00

1604529-03 (Solid)

Classical Chemistry Parameters **Ha**

Analyzed By:Empirical Laboratories, LLC

% Solids	**79**	%		1.0	1.0	KWH/J	04/12/2016 09:15	SM2540B

Extractable Petroleum Hydrocarbons by GC **Ha**

Analyzed By:Empirical Laboratories, LLC

Extractable Petroleum Hydrocarbons (EPH)	**198**	mg/Kg dry	Ha, D	25.8	51.2	KBG	04/10/2016 07:21	TNEPH (C12-C40)
Surrogate: o-Terphenyl		*50-150*	Ha		*105 %*		04/10/2016 07:21	*TNEPH (C12-C40)*

GCMS Volatiles

Analyzed By:Microbac Laboratories, Inc. - Chic

1,1,1,2-Tetrachloroethane	<0.78	µg/Kg		0.78	9.7	jln	03/28/2016 19:26	SW-846 8260B
1,1,1-Trichloroethane	<1.1	µg/Kg		1.1	4.8	jln	03/28/2016 19:26	SW-846 8260B
1,1,2,2-Tetrachloroethane	<1.3	µg/Kg		1.3	4.8	jln	03/28/2016 19:26	SW-846 8260B
1,1,2-Trichloroethane	<1.2	µg/Kg		1.2	4.8	jln	03/28/2016 19:26	SW-846 8260B
1,1-Dichloroethane	<1.1	µg/Kg		1.1	4.8	jln	03/28/2016 19:26	SW-846 8260B
1,1-Dichloroethene	<1.2	µg/Kg		1.2	4.8	jln	03/28/2016 19:26	SW-846 8260B
1,2-Dichloroethane	<1.5	µg/Kg		1.5	4.8	jln	03/28/2016 19:26	SW-846 8260B
1,2-Dichloropropane	<1.1	µg/Kg		1.1	4.8	jln	03/28/2016 19:26	SW-846 8260B
2-Butanone	<1.1	µg/Kg		1.1	9.7	jln	03/28/2016 19:26	SW-846 8260B
2-Hexanone	<2.1	µg/Kg		2.1	9.7	jln	03/28/2016 19:26	SW-846 8260B
4-Methyl-2-Pentanone	<2.0	µg/Kg		2.0	9.7	jln	03/28/2016 19:26	SW-846 8260B
Acetone	<4.2	µg/Kg		4.2	48	jln	03/28/2016 19:26	SW-846 8260B
Acrolein	<22	µg/Kg		22	97	jln	03/28/2016 19:26	SW-846 8260B
Acrylonitrile	<26	µg/Kg		26	97	jln	03/28/2016 19:26	SW-846 8260B
Benzene	**110**	µg/Kg		0.82	4.8	jln	03/28/2016 19:26	SW-846 8260B
Bromodichloromethane	<0.81	µg/Kg		0.81	4.8	jln	03/28/2016 19:26	SW-846 8260B

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Workorder: **1604529** **Project:** 216100 - Lower Brush Creek

E3, 2'-4' Sampled: 03/15/2016 15:00

1604529-03 (Solid)

GCMS Volatiles

Analyzed By:Microbac Laboratories, Inc. - Chic

Bromoform	<1.5	µg/Kg		1.5	4.8	jln	03/28/2016 19:26	SW-846 8260B
Bromomethane	<1.4	µg/Kg		1.4	9.7	jln	03/28/2016 19:26	SW-846 8260B
Carbon Disulfide	<0.99	µg/Kg		0.99	9.7	jln	03/28/2016 19:26	SW-846 8260B
Carbon tetrachloride	<1.0	µg/Kg		1.0	4.8	jln	03/28/2016 19:26	SW-846 8260B
Chlorobenzene	<0.52	µg/Kg		0.52	4.8	jln	03/28/2016 19:26	SW-846 8260B
Chloroethane	<1.8	µg/Kg		1.8	9.7	jln	03/28/2016 19:26	SW-846 8260B
Chloroform	<0.60	µg/Kg		0.60	4.8	jln	03/28/2016 19:26	SW-846 8260B
Chloromethane	<1.1	µg/Kg		1.1	9.7	jln	03/28/2016 19:26	SW-846 8260B
cis-1,2-Dichloroethene	<0.69	µg/Kg		0.69	4.8	jln	03/28/2016 19:26	SW-846 8260B
cis-1,3-Dichloropropene	<0.50	µg/Kg		0.50	4.8	jln	03/28/2016 19:26	SW-846 8260B
Dibromochloromethane	<0.97	µg/Kg		0.97	4.8	jln	03/28/2016 19:26	SW-846 8260B
Ethylbenzene	**770**	µg/Kg	E	0.89	4.8	jln	03/28/2016 19:26	SW-846 8260B
m,p-Xylene	**4000**	µg/Kg	E	1.7	4.8	jln	03/28/2016 19:26	SW-846 8260B
Methylene chloride	<1.9	µg/Kg		1.9	19	jln	03/28/2016 19:26	SW-846 8260B
Methyl-t-Butyl Ether	<1.7	µg/Kg		1.7	4.8	jln	03/28/2016 19:26	SW-846 8260B
o-Xylene	**1900**	µg/Kg	E	0.87	4.8	jln	03/28/2016 19:26	SW-846 8260B
Styrene	<0.72	µg/Kg		0.72	4.8	jln	03/28/2016 19:26	SW-846 8260B
Tetrachloroethene	<1.1	µg/Kg		1.1	4.8	jln	03/28/2016 19:26	SW-846 8260B
Toluene	**3400**	µg/Kg	E	0.75	4.8	jln	03/28/2016 19:26	SW-846 8260B
trans-1,2-Dichloroethene	<0.95	µg/Kg		0.95	4.8	jln	03/28/2016 19:26	SW-846 8260B
trans-1,3-Dichloropropene	<1.1	µg/Kg		1.1	4.8	jln	03/28/2016 19:26	SW-846 8260B
Trichloroethene	<1.3	µg/Kg		1.3	4.8	jln	03/28/2016 19:26	SW-846 8260B
Trichlorofluoromethane	<1.1	µg/Kg		1.1	9.7	jln	03/28/2016 19:26	SW-846 8260B
Vinyl Acetate	<2.0	µg/Kg		2.0	9.7	jln	03/28/2016 19:26	SW-846 8260B
Vinyl chloride	<1.2	µg/Kg		1.2	9.7	jln	03/28/2016 19:26	SW-846 8260B
Total 1,2-Dichloroethene	<1.5	µg/Kg		1.5	9.7	jln	03/28/2016 19:26	SW-846 8260B
Total Xylenes	**5800**	µg/Kg	E	2.4	4.8	jln	03/28/2016 19:26	SW-846 8260B
Surrogate: 1,2-Dichloroethane-d4		*51.7-162*			*121 %*		03/28/2016 19:26	*SW-846 8260B*
Surrogate: 4-Bromofluorobenzene		*57.4-135*			*101 %*		03/28/2016 19:26	*SW-846 8260B*
Surrogate: Dibromofluoromethane		*63.5-139*			*97.0 %*		03/28/2016 19:26	*SW-846 8260B*
Surrogate: Toluene-d8		*66.6-143*			*103 %*		03/28/2016 19:26	*SW-846 8260B*

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PO#:

Workorder: **1604529** **Project:** 216100 - Lower Brush Creek

E3, 2'-4' Sampled: 03/15/2016 15:00

1604529-03 (Solid)

Metals, Total by EPA 6000/7000 Series Methods

Analyzed By:Microbac Knoxville Division

Arsenic	<2.40	mg/kg	L	2.40	6.31	JRE	03/29/2016 16:56	SW846 6010C
Barium	**138**	mg/kg		0.778	1.68	JRE	03/29/2016 16:56	SW846 6010C
Cadmium	<0.382	mg/kg	L	0.382	3.16	JRE	03/29/2016 16:56	SW846 6010C
Chromium	**17.3**	mg/kg		0.476	3.16	JRE	03/29/2016 16:56	SW846 6010C
Lead	**65.4**	mg/kg		1.48	8.42	JRE	03/29/2016 16:56	SW846 6010C
Mercury	**0.103**	mg/kg		0.000716	0.00603	CWC	03/28/2016 17:16	SW846 7471B
Selenium	<4.37	mg/kg	L, Q11	4.37	8.42	JRE	03/29/2016 16:56	SW846 6010C
Silver	<0.350	mg/kg	L, Q11	0.350	0.421	JRE	03/29/2016 16:56	SW846 6010C

PAH - Low Level

Analyzed By:Microbac Laboratories, Inc. - Ohio

Naphthalene	ND	ug/kg DRY		1.67	3.34	SCB	03/28/2016 20:02	BNASIM
Acenaphthylene	ND	ug/kg DRY		1.67	3.34	SCB	03/28/2016 20:02	BNASIM
Acenaphthene	ND	ug/kg DRY		1.67	3.34	SCB	03/28/2016 20:02	BNASIM
Fluorene	ND	ug/kg DRY		1.67	3.34	SCB	03/28/2016 20:02	BNASIM
Phenanthrene	**6.11**	ug/kg DRY		1.67	3.34	SCB	03/28/2016 20:02	BNASIM
Anthracene	ND	ug/kg DRY		1.67	3.34	SCB	03/28/2016 20:02	BNASIM
Fluoranthene	**7.79**	ug/kg DRY		1.67	3.34	SCB	03/28/2016 20:02	BNASIM
Pyrene	**7.24**	ug/kg DRY		1.67	3.34	SCB	03/28/2016 20:02	BNASIM
Benzo(a)anthracene	**4.97**	ug/kg DRY		1.67	3.34	SCB	03/28/2016 20:02	BNASIM
Chrysene	**5.21**	ug/kg DRY		1.67	3.34	SCB	03/28/2016 20:02	BNASIM
Benzo(b)fluoranthene	ND	ug/kg DRY		1.67	3.34	SCB	03/28/2016 20:02	BNASIM
Benzo(k)fluoranthene	ND	ug/kg DRY		1.67	3.34	SCB	03/28/2016 20:02	BNASIM
Benzo(a)pyrene	ND	ug/kg DRY		1.67	3.34	SCB	03/28/2016 20:02	BNASIM
Indeno(1,2,3-cd)pyrene	ND	ug/kg DRY		1.67	3.34	SCB	03/28/2016 20:02	BNASIM
Dibenzo(a,h)anthracene	ND	ug/kg DRY		1.67	3.34	SCB	03/28/2016 20:02	BNASIM
Benzo(g,h,i)perylene	ND	ug/kg DRY		1.67	3.34	SCB	03/28/2016 20:02	BNASIM
1-Methylnaphthalene	ND	ug/kg DRY		1.67	3.34	SCB	03/28/2016 20:02	BNASIM
2-Methylnaphthalene	ND	ug/kg DRY		1.67	3.34	SCB	03/28/2016 20:02	BNASIM
Surrogate: Nitrobenzene-d5		*23-120*	*		*12.6 %*		03/28/2016 20:02	*BNASIM*
Surrogate: 2-Fluorobiphenyl		*30-115*	*		*12.2 %*		03/28/2016 20:02	*BNASIM*
Surrogate: p-Terphenyl-d14		*18-137*	*		*10.1 %*		03/28/2016 20:02	*BNASIM*

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Cust #: RF003
PO#:

Workorder: **1604529** **Project:** 216100 - Lower Brush Creek

E3, 2'-4' Sampled: 03/15/2016 15:00

1604529-03 (Solid)

Percent Solids

Analyzed By:Microbac Laboratories, Inc. - Ohio

Percent Solids	**68.8**	weight %	1.00	1.00	AC	03/25/2016 07:43	D2216

SEMIVOLATILE ORGANICS

Analyzed By:Microbac Laboratories, Inc. - Ohio

1,2,4-Trichlorobenzene	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
1,2-Dichlorobenzene	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
1,3-Dichlorobenzene	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
1,4-Dichlorobenzene	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
1,3-Dinitrobenzene	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
1-Methylnaphthalene	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
2,3,4,6-Tetrachlorophenol	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
2,4,5-Trichlorophenol	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
2,4,6-Trichlorophenol	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
2,4-Dichlorophenol	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
2,4-Dimethylphenol	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
2,4-Dinitrophenol	ND	ug/kg DRY	649	1300	SCB	04/05/2016 14:28	SW8270C
2,4-Dinitrotoluene	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
2,6-Dinitrotoluene	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
2-Chloronaphthalene	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
2-Chlorophenol	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
2-Methylnaphthalene	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
2-Methylphenol	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
2-Nitroaniline	ND	ug/kg DRY	649	1300	SCB	04/05/2016 14:28	SW8270C
2-Nitrophenol	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
3,3'-Dichlorobenzidine	ND	ug/kg DRY	260	520	SCB	04/05/2016 14:28	SW8270C
3-,4-Methylphenol	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
3-Nitroaniline	ND	ug/kg DRY	649	1300	SCB	04/05/2016 14:28	SW8270C
4,6-Dinitro-2-methylphenol	ND	ug/kg DRY	649	1300	SCB	04/05/2016 14:28	SW8270C
4-Bromophenyl phenyl ether	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
4-Chloro-3-methylphenol	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
4-Chloroaniline	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
4-Chlorophenyl phenyl ether	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
4-Nitroaniline	ND	ug/kg DRY	649	1300	SCB	04/05/2016 14:28	SW8270C
4-Nitrophenol	ND	ug/kg DRY	649	1300	SCB	04/05/2016 14:28	SW8270C
Acenaphthene	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C

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E3, 2'-4' Sampled: 03/15/2016 15:00

1604529-03 (Solid)

SEMIVOLATILE ORGANICS

Analyzed By:Microbac Laboratories, Inc. - Ohio

Acenaphthylene	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
Aniline	ND	ug/kg DRY	649	1300	SCB	04/05/2016 14:28	SW8270C
Anthracene	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
Benzidine	ND	ug/kg DRY	984	1970	SCB	04/05/2016 14:28	SW8270C
Benzo(a)anthracene	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
Benzo(a)pyrene	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
Benzo(b)fluoranthene	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
Benzo(g,h,i)Perylene	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
Benzo(k)fluoranthene	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
Benzoic acid	ND	ug/kg DRY	520	7870	SCB	04/05/2016 14:28	SW8270C
Benzyl alcohol	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
Bis(2-Chloroethoxy)Methane	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
Bis(2-Chloroethyl)ether	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
bis(2-Chloroisopropyl)ether	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
bis(2-Ethylhexyl)phthalate	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
Butyl Benzyl Phthalate	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
Carbazole	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
Chrysene	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
Dibenz(a,h)anthracene	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
Dibenzofuran	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
Diethyl phthalate	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
Dimethyl phthalate	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
Di-N-Butylphthalate	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
Di-n-octyl phthalate	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
Diphenylamine	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
Fluoranthene	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
Fluorene	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
Hexachlorobenzene	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
Hexachlorobutadiene	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
Hexachlorocyclopentadiene	ND	ug/kg DRY	591	1180	SCB	04/05/2016 14:28	SW8270C
Hexachloroethane	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
Indeno(1,2,3-cd)pyrene	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
Isophorone	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
Naphthalene	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C

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1427 Lakeside Lane
Kingsport, TN 37663

Date Reported: 4/18/2016
Date Received: 3/18/2016
Cust #: RF003
PO#:

Workorder: **1604529** **Project:** 216100 - Lower Brush Creek

E3, 2'-4' Sampled: 03/15/2016 15:00

1604529-03 (Solid)

SEMIVOLATILE ORGANICS

Analyzed By:Microbac Laboratories, Inc. - Ohio

Nitrobenzene	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
N-Nitrosodimethylamine	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
N-Nitrosodipropylamine	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
Pentachlorophenol	ND	ug/kg DRY	649	1300	SCB	04/05/2016 14:28	SW8270C
Phenanthrene	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
Phenol	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
Pyrene	ND	ug/kg DRY	130	260	SCB	04/05/2016 14:28	SW8270C
Pyridine	ND	ug/kg DRY	649	1300	SCB	04/05/2016 14:28	SW8270C
Surrogate: 2,4,6-Tribromophenol		*19-122*		*56.3 %*		04/05/2016 14:28	*SW8270C*
Surrogate: 2-Fluorobiphenyl		*30-115*		*49.2 %*		04/05/2016 14:28	*SW8270C*
Surrogate: 2-Fluorophenol		*25-121*		*43.7 %*		04/05/2016 14:28	*SW8270C*
Surrogate: Nitrobenzene-d5		*23-120*		*52.4 %*		04/05/2016 14:28	*SW8270C*
Surrogate: p-Terphenyl-d14		*18-137*		*60.2 %*		04/05/2016 14:28	*SW8270C*
Surrogate: Phenol-d5		*24-113*		*40.3 %*		04/05/2016 14:28	*SW8270C*

E3, 2'-4' Sampled: 03/15/2016 15:00

1604529-03RE1 (Solid)

GCMS Volatiles

Analyzed By:Microbac Laboratories, Inc. - Chic

Ethylbenzene	**440**	µg/Kg	H	44	240	JLN	03/31/2016 15:10	SW-846 8260B
m,p-Xylene	**2300**	µg/Kg	H	84	240	JLN	03/31/2016 15:10	SW-846 8260B
o-Xylene	**1200**	µg/Kg	H	43	240	JLN	03/31/2016 15:10	SW-846 8260B
Toluene	**2200**	µg/Kg	H	37	240	JLN	03/31/2016 15:10	SW-846 8260B
Total Xylenes	**3400**	µg/Kg	H	120	240	JLN	03/31/2016 15:10	SW-846 8260B

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2109 West Market Street Johnson City, TN 37064 | 423.926.6385 p | 423.926.6997 f | www.microbac.com
2631 Grandview Avenue Nashville, TN 37211 | 615.242.1480 p | 612.242.5522 f | www.microbac.com

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CERTIFICATE OF ANALYSIS

George Cross
Foundation Systems Engineering
1427 Lakeside Lane
Kingsport, TN 37663

Date Reported: 4/18/2016
Date Received: 3/18/2016
Cust #: RF003
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Workorder: **1604529** **Project:** 216100 - Lower Brush Creek

Certifications

Code	Description	Number	Expires
20160130_DOD_	DoD ELAP QSM5.0, Certificate Number L2226, NPW/SCM	L2226	01/30/2016
20160220_Soil_P	USDA Permit to Receive Soil, P330-13-00052	P330-13-00052	02/20/2016
20160318_WA_N	State of Washington, Department of Ecology – NELAP, Lab ID: C934-15, NPW/SCM	C934-15	03/18/2016
20160630_FL_NE	State of Florida, Department of Health – NELAP, Lab ID: E87646, NPW/SCM	E87646-20-08/31/20	06/30/2016
20160630_GA_N	State of Georgia, Environmental Protection Agency – NELAP, Self Certification, NPW/SC	Self	06/30/2016
20160630_KY_U	Commonwealth of Kentucky, Department of Environmental Protection – UST, Certificate I	77	06/30/2016
20160630_NJ_NE	State of New Jersey, Department of Environmental Protection – NELAP Primary, Lab ID:	TN473	06/30/2016
20160731_UT_NI	State of Utah, Department of Health – NELAP, Certificate Number: TN0042015-7, NPW/S	TN0042015-7	07/31/2016
20161214_VA_NE	Commonwealth of Virginia, Department of General Services – NELAP, Certificate Numbe	8129	12/14/2016
20161231_KY_W	Commonwealth of Kentucky, Energy and Environment Cabinet – WWLCP, Laboratory Nu	98017	12/31/2016
20161231_NC_D	State of North Carolina, Department of Environment and Natural Resources - Certificate I	643	12/31/2016
20161231_TX_NE	State of Texas, Commission on Environmental Quality – NELAP, Certificate Number: T10	T104704307-16-12	12/31/2016
A2LA	A2LA ISO/IEC 17025 Env. DoD Testing	3045.02	09/30/2016
A2LA_	A2LA ISO/IEC 17025 Biological Testing	3045.01	09/30/2016
A2LAB-KNX	ISO 17025 KNX food	3131.01	05/31/2017
A2LAB-NSH	ISO 17025 NSH food	3131.02	06/30/2016
A2LA-KNX	ISO 17025 KNX environmental	3131.03	05/31/2017
AL	Alabama Department of Environmental Mgmt	41780	12/31/2015
CDC-ELITE	Center of Disease Control Legionella ELITE Membership		04/21/2016
GA	Georgia Dept Natural Resources	980	04/30/2017
ILDPH	Illinois DOPH Micro analysis of drinking water	1755266	12/31/2016
ILEPA	Illinois EPA wastewater and solid waste analysis	200064	04/01/2016
INDEM	Indiana DEM support lab wastewater and solid waste	A305-9-292	12/31/2013
INDH	Indiana SDH Micro analysis of drinking water	M-45-8	12/31/2016
INSDH	Indiana SDH chemical analysis of drinking water	C-45-03	08/14/2016
ISBOAH	Indiana State Board of Animal Health for microbiological analysis of dairy containers	18137	05/01/2016
KSDOH	Kansas Dept Health & Env. NELAP	E-10397	05/31/2016
KY	Commonwealth of Kentucky	98025	12/31/2015
KYDEP	Kentucky Wastwater Laboratory Certification Program	90147	12/31/2016
KYEPP	Kentucky EPPC analysis Underground Storage Tanks	75	04/01/2016
NYDOH	New York State Department of Health Wadsworth	52733	04/01/2016
PADEP	Pennsylvania Department of Environmental Protect	68-04863	07/31/2016
PEDEP	Pennsylvania DEP Registration for Air analysis	68-04863	

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TN_DW	State of Tennessee	TN02017	04/30/2017
TN_DW	North Carolina DENR NPDES effluent, surface water	TNNC597	12/31/2016
USDA	US Department of Agriculture		12/31/2015
USDAS	USDA Permit To Receive Soil	P330-12-00174	09/18/2016
VELAP	Virginia Department of General Services Division of Consolidated Laboratory Services	7990	06/14/2016
WADOE	Washington State Department of Ecology	C992	10/23/2016

Notes and Definitions

U	Analyte included in the analysis, but not detected
Q11	Minimum reporting level verification standard recovery is below acceptance limits.
ND	Not detected at or above the reporting limit (RL)
M1	Matrix spike recovery is outside of acceptance limits, biased high.
L	Elevated reporting limit due to sample matrix interference.
J	[Undefined]
Ha	The result was received, extracted and/or analyzed outside of the EPA recommended holding time.
H	Analyte was prepared and/or analyzed outside of the analytical method holding time
E	Value above quantitation range
D	Dilution performed on sample.
B	Target analyte is detected in the method blank at or above method criteria. Sample result is greater than 10 times amount found in blanks. Blank hit is insignificant to reported result.
*	Surrogate or spike compound out of range
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

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Workorder: **1604529** **Project:** 216100 - Lower Brush Creek

Microbac Laboratories, Inc. - Knoxville

Maraea Clark, Project Manager

Thank you for your business. For any feedback, please contact Joe Sloan, at 865-977-1200. You may also contact J Trevor Boyce, President at president@microbac.com.

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CHAIN OF CUSTODY RECORD

Page ____ of ____

1604529-01 Sampled: 03/15/2016 11:00
Foundation Systems Engineering

Account Name and Address
Foundation Systems
201 Colonial Heights Road
Kingsport TN 37663

Contact: gcross@fsepc.com
George Cross
Fax: ✓ **Yes** ✓ **No**
Fax # 423 239-9226
Phone # 423-292 3474

Project Name Lower Brush Creek
Project Number 216100
Sampler(s): (signature)

Sample #	Sample Date	Sample Time	Comp Grab	# Cont.	Sample I.D.	VOCs	SVOCs	FRH	RCRA 8 metals	PAH				CK
1	3/15	11AM		4	E1A, 1'-8'	X	X	X	X	X				
2	3/15	1Pm		4	E2A, 2.5'-7'	X	X	X	X	X				
3	3/15	3Pm		4	E3, 2'-4'	X	X	X	X	X				

Preservative	
pH<2 CUSO4/H3PO4/FAS	Phenol
pH<2 H2SO4+NaThios	Ammonia
pH<2 H2SO4	T. Phos,COD,TOC,TKN
pH<2 HCL	Oil & Grease
pH<2 HNO3	Metals-Total, Hardness
pH<2 1:1HCL	VOC's, BTEX/GRO
pH>9 NaOH+ZNAcetate	Sulfide
pH>12 NaOH	Cyanide
Unpreserved	
Unpreserved TTO's	SVOC's*
HCL	VOC's*

Relinquished by: (signature)	Date	Time	Received by: (signature)	Date	Time
Allen Brown	3/18/16	9:07			
Relinquished by: (signature)	**Date**	**Time**	**Received by: (signature)**	**Date**	**Time**
			K. Harvey	3/18/16	0907

Cooler Temp: 2.1°C
Properly Preserved? YES (X) NO ( )
Chlorine Check? YES ( ) NO ( )
*If present NA2SO4 added to sample

pH ____ Temp. ____ Date/Time ____

COMPOSITE INFO: Start Date ____ Start Time ____ Stop Date ____ Stop Time ____

FLOW ____ GPD

LOG-IN RECORD # 1604529

Sample Receipt Checklist

Client Name: Foundation Systems

Date/Time Received: 3/15/16 0907

Work Order: 1604529

No. of Samples: 3

Received By: KS

No. of Containers: 12

Checklist Completed By: KS

Carrier: FedEX UPS Client Field Services Other _____

Shipping container in good condition?	~~YES~~	NO	
Custody seals intact on cooler?	YES	NO	~~Not~~ Present
Custody seals intact on samples?	YES	NO	~~Not~~ Present
Chain of Custody present?	~~YES~~	NO	
Chain of Custody includes proper client information?	~~YES~~	NO	
Chain of Custody includes proper collection information and signatures?	~~YES~~	NO	
Chain of Custody includes dates and times of sample collection?	~~YES~~	NO	
Chain of Custody includes proper sample descriptions?	~~YES~~	NO	
Chain of Custody agrees with sample labels?	~~YES~~	NO	
Chain of Custody identifies proper sample matrix?	~~YES~~	NO	
Chain of Custody identifies proper number of samples?	~~YES~~	NO	
Chain of Custody includes required analysis?	~~YES~~	NO	
Chain of Custody signed when relinquished and received?	~~YES~~	NO	
Samples are in proper containers/bottles?	~~YES~~	NO	
Sample containers are intact?	~~YES~~	NO	
Sufficient sample volume collected for requested analysis?	~~YES~~	NO	
VOA vials for aqueous samples have zero headspace?	~~YES~~	NO	
Samples received within holding times?	YES	NO	~~Not~~ Present
Samples received on ice?	~~YES~~	NO	
Thermal preservation required?	~~YES~~	NO	
Sample properly preserved?	~~YES~~	NO	Temp. 2.1°C
	~~YES~~	NO	

If No, adjusted by? _____ Date/Time: _____

Is Client Notification Required? YES NO

If Yes, contacted by? _____ Date: _____

If the sample acceptance criteria are lacking in any respect, the receiving personnel should consult with the lab management and either:

Reject the sample and retain all records of communications (written or verbal) with the client regarding the disposition of the rejected samples, or

Completely document any decision to proceed with the sample analysis which fails to meet sample acceptance criteria. A statement that the analytical results may have been compromised shall be included and the final results will be qualified as well by the appropriate section head.

Comments: _____