ATTACHMENT P

GEOTECHNICAL ENGINEERING SERVICES REPORT

For

Proposed Water Main Replacement on Rockbridge Road from Memorial Drive to Deshon Road Stone Mountain, DeKalb County, Georgia

> Prepared for: DeKalb County, Georgia C/O AECOM One Midtown Plaza 1360 Peachtree Street, Suite 500 Atlanta, GA 30309

Prepared by: Professional Service Industries, Inc. 95 Chastain Road, Suite 301 Kennesaw, Georgia 30144

PSI Project Number: 472451

November 21, 2016





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DeKalb County, Georgia C/O AECOM One Midtown Plaza 1360 Peachtree Street, Suite 500

Atlanta, Georgia 30309

- Attention: Moubin Al-Malla, PE. Phone: 404 965 9600 Email: <u>Moubin.al-malla@aecom.com</u>
- RE: Report of Geotechnical Subsurface Exploration Proposed Rockbridge Road Water Main Replacement Rockbridge Road from Memorial to Deshon Road DeKalb County, Georgia PSI Project No. 472451

Dear Maubin:

Professional Service Industries, Inc. (PSI) has completed a subsurface exploration program at the site of the above referenced project. The services were completed in general accordance with the Proposal for Geotechnical Engineering Services dated October 6, 2016, as authorized by Purchase Order 1032855,3. The following report presents the results of our study as well as opinions and recommendations pertaining to the geotechnical aspects of the project.

1 PROJECT INFORMATION

1.1 Site Location and Project Description

The project consists of replacement of about 40,000 linear feet of water main on Rockbridge Road from Memorial Drive to Deshon Road. The proposed water main will be located along the southern side of the right-of-way.

The recommendations provided in this report are based in part on the project information described above. If any of the noted information is incorrect or has changed, please inform PSI so that we may amend the recommendations presented in this report, if appropriate.

1.2 Scope of Geotechnical Services

The purpose of this exploration was to provide a geotechnical study for the primary purpose of evaluating excavation conditions at requested boring locations. The scope of work for this exploration included the following:

- We contacted the Georgia 811 Utilities Protection Center (UPC) to locate existing underground public utilities on-site. A subcontract utility locator was also engaged to check boring location for private utilities.
- We performed a site reconnaissance and located the borings in the field, based upon the provided site information.
- We performed forty-one Standard Penetration Test (SPT) soil borings and 3 associated offset borings at the approximate locations shown on the Boring Location Plan. Soil test borings were performed at this site using hollow-stem, continuous flight augers. At regular intervals, Standard Penetration Test and sampling operations were conducted in general compliance with the ASTM D1586 using an automatic hammer.
- We classified samples of soil obtained during the drilling operations and prepared boring logs for the test locations describing the types of soil encountered and other pertinent information in general accordance with the Unified Soil Classification System (USCS).
- We conducted a geotechnical engineering evaluation of the available data to develop conclusions and recommendations.
- We prepared this engineering report presenting PSI's boring logs, site observations and recommendations for development of the site.

2 SUBSURFACE CONDITIONS

2.1 Soil Test Boring Results

The following subsurface description is of a generalized nature and intended to highlight the major subsurface stratification features and material characteristics. The Boring Logs illustrated in the Appendix should be reviewed for specific information at individual boring locations. These records include soil descriptions, stratifications, and penetration resistances.

Underlying the existing groundcover many of the borings encountered up to 3 feet of fill. The fill generally consisted of loose to very dense clayey/silty SAND (SC/SM) or very stiff to hard sandy SILT (MH). The SPT N-values within the fill soils ranged from 10 to over 50 blows-per-foot (bpf). Higher penetration resistances were likely exaggerated by the sampler striking rock fragments.

Below the fill where encountered or below the existing groundcover in the remaining borings, residual soils typical of the Piedmont Physiographic Providence were encountered consisting of medium dense to very dense silty SAND (SM) as well as very

stiff to hard sandy SILT (ML). The SPT N-values within the residual soils ranged from 11 to over 50 blows-per-foot (bpf).

Partially weathered rock (PWR) was encountered in borings B-9, B-10, and B-40 at depths of 6 to 10 feet. A lens of PWR was encountered in borings B-1, B-9, B-14B and B-38 at varying depths ranging from 6 inches to 6 feet. Auger refusal occurred in boring B-14, B-14A, and B-14B at a depth of 3, 3, and 6 feet, respectively.

Groundwater was not encountered at the time of boring completion. Fluctuation of groundwater levels should be anticipated with seasonal changes in rainfall.

The stratifications shown on the Boring Logs represent the conditions only at the actual boring locations. Variations may occur and should be expected between boring locations. The stratifications represent the approximate boundary between subsurface materials and the actual transition may be gradual.

The stratification presented is based on visual examination of the recovered soil samples and the interpretation of field logs by a geotechnical engineer. Included on the logs are the Standard Penetration Test values (N-values) for the borings.

2.2 Laboratory Test Results

Laboratory testing was performed on six bulk soil samples of soil cuttings obtained during drilling. The laboratory tests included natural moisture content, percent fines, Atterberg Limits, and Moisture Density Relationships (Standard Proctors). Test on two additional samples are ongoing and the results will be submitted as an addendum. The laboratory test results are summarized in Table 1 and Table 2 below.

| Boring | Sample Depth | Moisture Content | Percent Fines | A | TTERB LIMIT | ERG S | USCS Soil |
|--------|-----------------|---------------------|------------------|----|----------------|----------|----------------|
| Number | (ft) | (%) | (%) | LL | PL | PI | Classification |
| B-1 | 0 – 10 | 14 | 61 | 55 | 30 | 25 | MH |
| B-6 | 0 – 10 | 8 | 41 | 33 | 21 | 12 | SC |
| B-12 | 0 – 10 | 14 | 59 | 58 | 33 | 25 | MH |
| B-22 | 0 – 10 | 14 | 48 | 60 | 30 | 30 | SC |
| B-32 | 0 – 10 | 12 | 50 | 58 | 32 | 26 | MH |
| B-38 | 0 – 10 | 6 | 29 | 26 | 19 | 7 | SC-SM |

 Table 1: Summary of Laboratory Test Results

| | | Standar | d Proctor |
|------------------|-------------------------|---------------------|------------------------|
| Boring Number | Sample Depth (ft) | Optimum Moisture | Maximum Dry Density |
| B-1 | 0 – 10 | 18.5 | 105.7 |
| B-6 | 0 – 10 | 13 | 116.8 |
| B-12 | 0 – 10 | 19 | 102.7 |
| B-22 | 0 – 10 | 16 | 107.3 |
| B-32 | 0 – 10 | 18 | 104.1 |
| B-38 | 0 – 10 | 12 | 116.6 |

Table 1: Summary of Laboratory Test Results - Continued

3 CONCLUSIONS AND RECOMMENDATIONS

3.1 General

The following geotechnical recommendations have been developed on the basis of the previously described project characteristics and subsurface conditions encountered. If there are any changes in these project criteria, a review should be made by PSI to determine if modifications to the recommendations are warranted.

3.2 Excavation Considerations

Moat borings encountered fill or residual soils from below surficial materials to boring termination depths at 10 feet. Our experience indicates these soils can typically be excavated with track mounted backhoes. At a few locations, partially weathered rock was penetrated that exhibited Standard Penetration Tests in excess of 100 blow per foot. In confined excavations, such as is anticipated for utility installation, most partially weathered rock can be excavated with large track mounted hydraulic excavators similar to a Caterpillar 300 series with the backhoe buckets equipped with hardened teeth. In some instances, the partially weathered rock was penetrated by the soil test augers but exhibited penetration resistances of 50 blows for less than 2 inches of penetration. In confined trench excavations, our experience indicates that the use of explosive will be required to excavate these rock-like Partially Weathered Rock zones. Such materials were encountered at boring B-14 below 2 feet and at B-40 below 6 feet.

3.8 Slope Considerations

Temporary excavations will be required for installation of the water main. Temporary slopes should be constructed in accordance with OSHA or other regulatory guidelines. The contractor is solely responsible for construction of safe excavations. Where site limitation prevents safe sloping, properly designed shoring in accordance with OSHA requirements should be installed.

3.3 Trench Fill

Trench fill should be placed in accordance with the requirement of the water authority.

4 REPORT LIMITATIONS

The geotechnical engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area at the time of this report. No other warranties are implied or expressed.

The recommendations submitted are based on the available soil information obtained by PSI and information provided by DeKalb County. If there are any revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, PSI should be notified immediately to determine if changes in the recommendations are required.

Thank you for the opportunity to be of service on this project. Should you have any questions or if we can be of further assistance, please do not hesitate to contact our office.

Respectfully Submitted, PROFESSIONAL SERVICE INDUSTRIES, INC

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Christopher Coleman Project Engineer

GISTER NO. 16632 John H. Fiely, PE Department Manager Geotechnical Services

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Richard L. Curtis, PE, D.GE Senior Vice President

Attachments: Figures 1 through 7: Boring Location Plans Boring Logs





Figure 1: Boring Location Plan

Proposed Rockbridge Road Water Main ReplacementRockbridge Road from Memorial to Deshon RoadDeKalb County, GeorgiaSCALE: None DATE: 11/21/16PSI PROJECT NO.: 472451DRAWN BY: C. ColemanCHECKED BY: J. Fiely





Figure 2: Boring Location Plan

Proposed Rockbridge Road Water Main ReplacementRockbridge Road from Memorial to Deshon RoadDeKalb County, GeorgiaSCALE: None DATE: 11/21/16PSI PROJECT NO.: 472451DRAWN BY: C. ColemanCHECKED BY: J. Fiely





Figure 3: Boring Location Plan

Proposed Rockbridge Road Water Main ReplacementRockbridge Road from Memorial to Deshon RoadDeKalb County, GeorgiaSCALE: None DATE: 11/21/16PSI PROJECT NO.: 472451DRAWN BY: C. ColemanCHECKED BY: J. Fiely





Figure 4: Boring Location PlanProposed Rockbridge Road Water Main ReplacementRockbridge Road from Memorial to Deshon RoadDeKalb County, GeorgiaSCALE: None DATE: 11/21/16PSI PROJECT NO.: 472451DRAWN BY: C. ColemanCHECKED BY: J. Fiely





Figure 5: Boring Location PlanProposed Rockbridge Road Water Main ReplacementRockbridge Road from Memorial to Deshon RoadDeKalb County, GeorgiaSCALE: None DATE: 11/21/16PSI PROJECT NO.: 472451DRAWN BY: C. ColemanCHECKED BY: J. Fiely





Figure 6: Boring Location PlanProposed Rockbridge Road Water Main ReplacementRockbridge Road from Memorial to Deshon RoadDeKalb County, GeorgiaSCALE: None DATE: 11/21/16PSI PROJECT NO.: 472451DRAWN BY: C. ColemanCHECKED BY: J. Fiely



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 Figure 7: Boring Location Plan

 Proposed Rockbridge Road Water Main Replacement

 Rockbridge Road from Memorial to Deshon Road

 DeKalb County, Georgia

 SCALE: None DATE: 11/21/16
 PSI PROJECT NO.: 472451

 DRAWN BY: C. Coleman
 CHECKED BY: J. Fiely

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| | | | \square | | | Dense (SM) | Moist Bro | wn Red Ta | an Blac | k Silty SAN | ID | SM | N=18 10-14-17 | 7 | | | | | | |
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| | F | | | | Ĵ | Pro 95 Ker Tel | fessiona Chastaii inesaw, ephone | al Servic n Road N GA 301 : (770) 4 | e Indu NW, S 144 124-62 | ustries, Ir Suite 301 200 | пс. [—] | | | PROJE PROJE LOCA | ECT N ECT: TION: | IO.: | W | Rockl /ater Ma S | 47245 oridge R ain Repl tone Mtr | 1 oad acement |

| DATE | STAF | TED: | | | 1 | 1/13/16 | | DRILL | COMP | ANY: | Dri | illing Sc | olutions | | | | B | ORII | NG F | 3-07 | |
|------------------|-----------------|----------------|-------------|------------|-------------------|----------------------------------|--|-----------------------|----------------------------|-----------------------|--------------|-----------------------|---|--------------|-------------|----------|--|---|-----------------------------------|-----------------------|-----|
| | : COMI PLETK | PLETE ON DE | ED: PTI | н — | | <u>11/13/1</u> 9.0 ft | 6 | DRILL | ER: RIG: | Jason | _ LOGG | 3ED BY D-50 | C.Coler | nan | - r | ∇ | | ile Drillir | 1q | <u> </u> | N/A |
| BENC | HMAF | ικ: _ | | | [| N/A | <u>.</u> | DRILL | ING MI | ETHOD: | Ho | llow Ste | em Auger | | /ate | Ţ | Upo | n Comp | pletion | NC | ONE |
| ELEV | | l: | | | N | J/A | | SAMP | LING N | IETHOD: | : | 5 | SS | | 5 | <u> </u> | Dela | зу | | | N/A |
| | TUDE: | =. | | | | | | _ HAMN FFFIC | | PE: | / | Automa N/A | atic | | BO | RING | i LOCA | ATION: | | | |
| STAT | ION: | | J/A | | OFFS | SET: | N/A | REVIE | WED B | 3Y: | | J. Fiely | / | | | | | | | | |
| REM/ | ARKS: | | _ | | - | | | | | | | | | | | | | | | | |
| Elevation (feet) | Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | | MATE | RIAL D | ESCF | RIPTIO | N | USCS Classification | SPT Blows per 6-inch (SS) | Moisture, % | S ~ 0 | TANE | DARD P TEST N in blo loisture | PENETRA DATA wws/ft @ 25 CATH, tsf 2.0 | ATION PL LL 50 Qp 4.0 | Additional Remarks | I |
| | | | | | | RESII SAND | DUUM: Der | ise Moist | : Red Bi | rown Tan | Silty | | | | | | | | | | |
| | - 5 - | | | | | Tan C | Sray | | | | | SM | 8-15-16 N=31 9-11-16 N=27 16-18-1 N=36 | 8 | | | | | > | | |
| | | | | | | Iviediu | Im Dense N | noist I an | Gray S | SIITY SAINL | J (SM) | SM | 9-12-17 | , | | | | 6 | | | |
| | | | | | | Boring Grour Comp Cave- |) Terminate idwater Not letion in at 5 feet | d at 10 fa Encount | eet ered U | pon Drillir | ng | SM | 9-12-17 N=29 | PROJ | | NO.: | | ď | 47245 | 1 | |
| | | | | | 57 | Pro 95 | ofessiona Chastair | il Servio 1 Road | ce Ind NW, ^g | lustries, Suite 30 | , Inc. 01 | | | PROJ PROJ | ECT ECT: | NO.: | | Rock | 47245 bridge R | 1 oad | - |
| | Ī | 7 | | Ì | i/ | Ke | nnesaw, | GA 30 | 144 | 200 | | | ļ | LOCA | TION | I: | V | Vater Mater Mater | ain Repla | acement | - |
| | | | | | | re | eprione: | (770) | 424-0 | 1200 | | | | | | - | | S DeKa' | b Count | I. V GA | - |

| DATE | STAF | RTED: | _ | | 1 | 1/10/16 | | DRILL C | COMP | ANY: | Dri | lling Sc | olutions | | | | R | | JG | B-08 |
|------------------|-----------------|-------------|-------------|------------|-------------------|--------------------------|----------------------------------|-------------------------|--------------|----------------------|-----------|---------------------|---------------------------|-------------|--------------|------------------|---|---|-----------------------------------|-----------------------|
| DATE | COM | PLETI | ED: | . — | | 11/10/16 | 6 | DRILLE | R: | Jason | | ED BY | C.Colem | an | | ∇ | | | | |
| | PLETIC | ON DE | PTI | | | 7.0 ft | | | RIG: | | | D-50 | • | | Itel | Ť | VVNI | n Comr | Ig | |
| | | κκ: _ ι· | | | N | N/A | | | NG ME | | Ho | llow Ste | em Auger | | Š | Ť | Dela | in Comp iv | letion | N/A |
| | | | | | r | N/A | | | | | | Automa | atic | | BOR | | | | | 11/7 |
| | | : | | | | | | EFFICIE | | L | | N/A | | | DOI | | | | | |
| STAT | ION: | N | I/A | | OFF | SET: | N/A | REVIEW | /ED B | Y: | | J. Fiely | / | | | | | | | |
| REM/ | ARKS: | | | | | | | - | | | | | | | | | | | | |
| Elevation (feet) | O Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | FULLY | | RIAL DE | ESCF | RIPTION | J | USCS Classification | SPT Blows per 6-inch (SS) | Moisture, % | ST × 0 | AND/ Mo ST | ARD P TEST I in blo isture 2 RENG u 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 | ENETR. DATA ws/ft @ 4 5 5 5 TH, tsf * | ATION PL LL 50 Qp 4.0 | Additional Remarks |
| | | | | | | (SM) | | | | | ", LD | SM | 19-23-30 N=53 | | | | | | >>@ | D |
| | | | | | | RESID Silty S | OUUM: Mec AND (SM) | lium Dens | e Mois | st Red Bro | wn | | 11-13-16 N=29 | | | | | ø | | _ |
| | | | | | | White | Red Brown | i, trace cla | ıy | | | SM | 8-8-8 | | | | ə | | | |
| | | | | | | White | Tan | | | | | | 7-8-8 | | | | 0 | | | |
| | | | | | | Boring Groun Compl | Terminate dwater Not etion | d at 10 fee Encounte | et red Up | oon Drilling | g | | N=16 | | | | | | | |
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| | | | | | 57 | Pro 95 (| fessiona | l Service Road N | e Ind | ustries, Suite 30 | Inc. 1 | | P | ROJE | | 10.: | | Rocki | 47245 oridae 5 | 51 Road |
| | | | 5 | | | Ker | inesaw, | GA 301 | 44 | | | | L | OCA. | FION: | | W | ater Ma | ain Rep | lacement |
| 6 | | | | | IJ | Tele | ephone: | (770) 4 | 24-6 | 200 | | | | | | | | S DeKal | tone Mt | n. tv. GA |

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| DATE | STAF | RTED | | | 1 | 1/10/16 | | DRILL COM | PANY: | Drilling | Sol | lutions | | | B | ORI | NG F | 3-09 |
|------------------|--------------------|---------------|-------------|------------|-------------------|-------------------------|---------------------------------------|---------------------------------------|---------------------------|---------------------|-----|--------------------------|-------------|----------------|---|--|-----------------------------------|-----------------------|
| DATE | | | ED: | .— | | 11/10/1 | 6 # | DRILLER: | Jason | LOGGED E | BY: | C.Colema | n | <u> </u> | | ile Drillir | | |
| | | שט אוכ אעי | | ۰ - | | 25.U | | | | D-50 | Sto | m Augor | | ate | ⊻ Unc | n Com | pletion | NONE |
| | | | | | N | J/A | | | METHOD. | TIONOW | Sie | S | _ | Š | | av | | N/A |
| LATI | UDE: | | | | | | | HAMMER T | /PE: | Autor | nat | tic | | BORIN | | TION: | | |
| LONG | ITUDI | E: | | | | | | EFFICIENCY | | N/A | | | | | | | | |
| STAT | ION: | 1 | N/A | | _OFFS | ЗЕТ: _ | N/A | REVIEWED | BY: | J. Fie | ely | | | | | | | |
| REM/ | ARKS: | | | | | | | | | | | ~ | | 1 | | | | |
| Elevation (feet) | o Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | PARI | | RIAL DESC | | USCS Classification | | SPT Blows per 6-inch (SS | Moisture, % | | NDARD F TEST N in blo Moisture STRENO Qu | PENETR DATA Dws/ft @ 25 CTH, tsf # 2.0 | ATION PL LL 50 Qp 4.0 | Additional Remarks |
| | | | Ы | | | Brown | n Silty SANE | D, with rock frag | gments | 83 | | 11 50/4 | | | | | | |
| | | | M | | | | | | | | | 11-30/4 | | | | | | |
| | | | | | | SANE | DUUM: Very) (SM) | / Dense Moist I | Brown Silty | | | 19-30-36 N=66 | | | | | >>@ | |
| | | | | | | | | | | SIM | | 50/6 | | | | | >>@ | |
| | | | | | | No Re | ecovery | | | | 7 | 25-36-60/3 | | | | | _>@ | |
| | - 10 - | | | | | Boring Grour Comp | g Terminate ndwater Not vletion | d at 10 feet Encountered U | Jpon Drilling | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
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| | - 25 - | | | | | | | | | | | | | | | | | |
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| | | | | |] | Pro 95 Ke | ofessiona Chastain | I Service Ind Road NW, GA 30144 | dustries, Ir Suite 301 | IC. | | PR PR | OJE OJE | CT NO CT: _ | .: | Rocki Vater M | 472451 oridge Ro ain Repla | ad accement |
| | F | | | | IJ | Te | lephone: | (770) 424- | 6200 | | | 20 | | | | DeKa | tone Mtn | |

| DATE | STAF | RTED: | | | 1 | 1/13/16 | DRILL COMPANY: | Drilling S | olutions | | | R | | | 2_10 |
|---------------|----------------------|------------|-----------|-----------|---------------|--|---|------------------|--------------------|----------------------|------------------------|---|----------------------------------|---|-----------------------------------|
| DATE | COM | PLET | ED: | | | 11/13/16 | DRILLER: Jason | LOGGED BY | C.Colema | an | | | | | 5-10 |
| COMF | PLETIC | ON DE | EPT | H _ | | 50.0 ft | DRILL RIG: | D-50 | | | te | ⊻ Whi | ile Drillir | ng | N/A |
| BENC | HMAF | RK: _ | | | | N/A | DRILLING METHOD: | Hollow St | em Auger | | Sa | V Upo | on Comp | pletion | NONE |
| | | I: | | | N | J/A | SAMPLING METHOD: | | SS | | | | ay | | N/A |
| | | | | | | | | Automa | atic | | BOKIN | IG LOCA | ATION: | | |
| | | = | N/A | | OEES | | | | | | | | | | |
| REMA | ARKS: | | W/A | | _0110 | | | J. 1 ICI | у | | | | | | |
| vation (feet) | epth, (feet) | raphic Log | mple Type | ample No. | very (inches) | MAT | ERIAL DESCRIPTION | S Classification | ws per 6-inch (SS) | loisture, % | STA | NDARD F TEST N in blo Moisture | PENETR DATA ows/ft @ 25 | ATION PL LL 50 | Additional Remarks |
| Ele | Ō | G | Se | S | Reco | | | nsc | SPT Blo | 2 | | STRENO Qu | GTH, tsf 米 | Qp | |
| | - 0 - | | M | | | RESIDUUM: H (ML) | ard Moist Red Brown Sandy S | SILT ML | 13-13-19 | | 0 | | 0 | 4.0 | |
| | | | Ц | | | Dense Moist R | ed Brown Tan Silty SAND (SN | /) EM | N=32 | | | | | | |
| | - 5 - | | | | | PARTIALLY W | EATHERED ROCK: Sampled | as | N=43 | | | | | | |
| | | | | | | Gray White Silt | y SAND | | 50/0" | | | | | | |
| | - 10 - | | | | | Boring Termina Groundwater N Completion | ited at 10 feet lot Encountered Upon Drilling | | 50/0 | | | | | | , |
| | - 15 - | | | | | | | | | | | | | | |
| | - 20 - | | | | | | | | | | | | | | |
| | - 25 - | | | | | | | | | | | | | | |
| | - 30 - - 30 - | | | | | | | | | | | | | | |
| | - 35 - | | | | | | | | | | | | | | |
| | - 40 - | | | | | | | | | | | | | | |
| | F | | | | J | Professior 95 Chasta Kennesaw Telephone | nal Service Industries, Ir in Road NW, Suite 301 /, GA 30144 e: (770) 424-6200 | NC. | PF PF LC | ROJE ROJE DCA1 | :CT NC :CT: ГЮN: | 0.: V | Rockl Vater Ma S DeKal | 47245 bridge Ro ain Repla tone Mtn b County | 1 pad acement 1 V. GA |

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| DATE | STAF | TED: | | | 1 | 1/10/16 | | DRILL CO | OMPANY: | Dri | illing Sc | olutions | | | | BOR | NG | B -1 | 1 |
|------------------|-----------------------------------|-------------|-------------|------------|-------------------|-------------------|--------------------------------|--|----------------------------|----------|---------------------|---|-------------|--------------|-----------------------------|---|--|-------------------------|-----------------------|
| | | | ED: | | | 11/10/1 8.0.ft | 6 | | : Jason | | | C.Colem | an | <u> </u> | ∇ | While Dril | lina | | •N/A |
| | | | PII | - - | | 0.0 II | | | | <u> </u> | J-50 | em Auger | | ate | Ť, | Upon Cor | npletion | | NONE |
| | | i: | | | Ν | J/A | | SAMPLIN | G METHOD: | | | SS | | Š | Ī | Delay | | | N/A |
| LATI | UDE: | | | | • | | | HAMMER | TYPE: | | Automa | atic | | BORI | | | : | | |
| LONG | SITUDE | : _ | | | | | | EFFICIEN | | | N/A | | | | | | | | |
| STAT | | Ν | I/A | | OFF | Set: _ | N/A | | D BY: | | J. Fiely | / | | | | | | | |
| | ARKS: | | | | | | | | | | | Ô | | | | | | | |
| Elevation (feet) | Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | EII I · | MATE | | | N | USCS Classification | SPT Blows per 6-inch (SS | Moisture, % | | NDAF TI N ir Moist | EST DATA n blows/ft ture 25 ENGTH, t: 2.0 2.0 | RATION ◎ PL ↓ LL sf € Qp | 4.0 | Additional Remarks |
| | | | | | | SAND |) (SM) | | in Wildlebud | Only | SM | 9-17-32 N=49 | | | | | | P | |
| | - 5 - | | | | | RESII Micac | DUUM: De eous Silty | nse Moist Re SAND (SM) ed at 10 feet | ed Brown | | SM | 12-18-24 N=42 10-19-29 N=48 8-13-11 N=24 | | | | 0 | | 6 | |
| | | | | | | Pro | ofession | al Service | d Upon Drillir | ng | | P | ROJE | | D.: _ | | 472 | 451 | |
| | F | | | 7 | | 95 Kei Tel | Chastaii nnesaw, lephone | n Road N\ GA 3014 : (770) 42 | W, Suite 30 4 4-6200 | 01 | | P | ROJE OCA | CT: FION: | | Roc Water I | kbridge Main Re Stone I | Road eplacem Mtn. | ent |

| DATE STARTED: | 11/10/16 | DRILL COMPANY: | Drilling Solutions | BORING B-12 | |
|---|---|---|--|--|-----|
| | 11/10/16 | DRILLER: Jason LC | DGGED BY: C.Colema | | |
| | 11.0 π | | D-50 | $ \mathbf{\hat{g}} = \mathbf{\nabla}$ Upon Completion |)NF |
| | N/A | | | $- \mathbf{S} \mathbf{\nabla}$ Delay | N/A |
| | IN/A | | Automatic | | |
| LONGITUDE: | | | N/A | | |
| STATION: N/A | OFFSET: N/A | REVIEWED BY: | J. Fielv | | _ |
| REMARKS: | | | | | |
| Elevation (feet) Depth, (feet) Graphic Log Sample Type Sample No. | Recovery (inches) | RIAL DESCRIPTION | USCS Classification SPT Blows per 6-inch (SS) | STANDARD PENETRATION TEST DATA N in blows/ft © X Moisture PL 0 25 • LL 0 25 • LL STRENGTH, tsf Qu X Qp 0 2.0 4.0 | |
| | WESIDUUM: Hard with rock fragmer | ts | , 10-23-30 N=53 MH 10-20-26 N=46 | >>© | |
| | | | 18-26-36 N=62 | >>@ | |
| | Dense Moist Red fragments | Silty SAND (SM), with rock | SM 11-16-18 | | |
| | Boring Terminate Groundwater Not Completion | d at 10 feet Encountered Upon Drilling | 300 11-16-18 N=34 | | |
| | Professiona 95 Chastain Kennesaw, Telephone: | Service Industries, Inc Road NW, Suite 301 GA 30144 (770) 424-6200 | . PF | ROJECT NO.: 472451 ROJECT: Rockbridge Road OCATION: Water Main Replacement Stone Mtn. Stone Mtn. | |

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| DATE | STAF | TED: | | | 1 | 1/13/16 | | DRII | LCOM | IPANY: | | Drilling So | olutions | | | | B | ORI | NG I | 3-13 | |
|------------------|-----------------|-------------|-------------|------------|-------------------|--------------------------------|---|---------------------------|--------------------------|------------------|----------------|---------------------|--------------------------|--------------|-----|------|--|---|-----------------------------------|-----------------------|-----|
| | | | ED: | | | 11/13/1 | 6 | _ DRII | | Jason | LO | | C.Cole | eman | | | 7 Whi | le Drillir | | | Δ/Δ |
| | | | PII | - ۲ | | 0.01 NI/A | l | שח וופח | | | | D-50 Hollow St | | | ato | | | n Com | pletion | ION | NE |
| | | i: | | | Ν | J/A | | _ DRI | | METHOD | D: | | SS | 1 | Ň | | Dela | ay | | N | J/A |
| LATIT | UDE: | | | | | | | HAN | MER T | YPE: | <u> </u> | Automa | atic | | BC | RINC | G LOCA | TION: | | | |
| LONG | ITUDE | : | | | | | | EFF | ICIENC | Y | | N/A | | | | | | | | | |
| STAT | ION:_ | Ν | I/A | | OFF | Set: _ | N/A | _ REV | IEWED | BY: | | J. Fiely | / | | | | | | | | |
| REMA | ARKS: | | | | <u> </u> | | | | | | | | | | | | | | | | |
| Elevation (feet) | ⊂ Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | FILL | MAT | | DESC | | ON | USCS Classification | SPT Blows per 6-inch (SS | Moisture % | 0 | | DARD F TEST N in blo Aoisture | PENETR DATA Dws/ft @ P 25 GTH, tsf X 2.0 | ATION PL LL 50 Qp 4.0 | Additional Remarks | |
| | | | Ø | | | SANE FILL: | C (SM), wi | th rock f | Brown S | ts Silty SAN | D (SM), | SM | 8-11-1 N=21 | 0 | | | | | | | |
| | - 5 - | | X | | | with r | ock fragm | ents | | - | | SM | 3-5-5 N=10 | 5 | _ | Q | | | | | |
| | | | X | | | RESI Red E | DUUM: M Brown Tan | edium D Silty SA | ense to ND (SN | Dense M 1) | <i>l</i> loist | SM | 6-8-13 N=23 6-10-2 | 5 3 20 | | |) J | | | | |
| | | | | | | Borin Groun Comp Cave | g Termina ndwater N Jetion in at 4 fee | al Ser | vice In | Upon Dri | illing | | 6-10-2 N=30 | PROJ | ECT | NO.3 | | | 47245 | 1 | |
| | F | | | | J | 95 Ke Te | Chasta nnesaw lephone | n Roa , GA 3 : (770 | d NW 30144)) 424- | , Suite -6200 | 301 | | | PROJ LOCA | ECT | N: _ | · | Rock Vater M S | bridge R ain Repl tone Mtr | acement | |

| DATE | STAF | RTED: | _ | | 1 | 1/13/16 | | DRILL | COMF | PANY: | Dri | lling So | olutions | | Τ | | В | ORI | NG I | B-14 |
|------------------|-----------------|-------------|-------------|------------|-------------------|---------------------------|----------------------|-----------------|-------------|-----------------------|-----------|-----------------------|---------------------------|-------------|----|-------------|---|---|----------------------------|-----------------------|
| | E COM PLETIO | PLET | ED: EPTI | н — | | <u>11/13/16</u> 3.0 ft | | DRILLE DRILL | ER: RIG: | Jason | | GED BY D-50 | : C.Cole | man | | <u>۲</u> 7 | Z Wh | ile Drillir | ng | N/A |
| BENC | HMAF | RK: | | · _ | | N/A | | DRILLI | NG MI | ETHOD: | Ho | llow St | em Auger | | | ate I | _ Upo | on Comp | oletion | NONE |
| ELEV | ATION | l: | | | Ν | I/A | | SAMPL | ING N | IETHOD: | | ę | SS | | | < <u> </u> | L Del | ау | | N/A |
| | FUDE: | | | | | | | HAMMI | ER TY | PE: | | Automa N/A | atic | | В | ORIN | G LOC | ATION: | | |
| STAT | ION: | 1 | ٨/A | | OFFS | SET: | N/A | REVIEV | VED B | SY: | | J. Fiely | / | | _ | | | | | |
| REM | ARKS: | | _ | | - | | | | | | | | | | | | | | | |
| Elevation (feet) | Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | | MATE | RIAL DI | ESCI | RIPTION | I | USCS Classification | SPT Blows per 6-inch (SS) | Moisture. % | 0 | STAN | IDARD I TEST N in bl Moisture STREN Qu | PENETR DATA Dws/ft @ 25 CTH, tsf # | ATION PL LL 50 Qp | Additional Remarks |
| | - 0 - | | | <u> </u> | <u> </u> | RESID | ULIM: Ven | Stiff Moi | ist Rer | Brown Sa | ndv | | | | 0 | | | 2.0 | 4.0 | |
| | | | | | | SILT (N | ин) ИН) | | | I DIOWIT Ga | anuy | мн | 1 1 2 1 | . | | | | | | |
| | | Ш | Å | | | | | | | | | | 1-12-14 N=26 | 1 | | | | Ø | | |
| | | | | | | Auger I | Refusal at | 3 feet | arad I I | non Drilling | | | | | | | | | | |
| | | | | | | Comple | etion | LIICOUIII | | porr Drinnig | 9 | | | | | | | | | |
| | | | | | | Offset | 1½' East | | | | | | | | | | | | | |
| | | | | | | Auger I | Refusal at | 3 feet | | | | | | | | | | | | |
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| | | | | | | Prof 95 (| essional Chastain | Road | | lustries, Suite 20 | INC. 1 | | | PROJ | EC | T NO. T· | : | Rock | 47245 oridae P | 1 |
| | | 7 | | 5/ | | Ken | nesaw, (| GA 30' | 144 | | • | | | LOCA | | DN: | \\ | Vater M | ain Repl | acement |
| [| | | | | J | Tele | phone: | (770) 4 | 124-6 | 6200 | | | | | | | | S | tone Mtr | n. |

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| DAT | | RTED: | - D. | | 1 | 1/13/16 | 10 | DRILL CO | | Dr | illing So | olutions | | | | BC | RIN | GΒ | -14B |
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| COM | PLETI | | ED: PTI | ۰ <u> </u> | | <u>11/13/</u> 6.0 f | ib it | | Jason i: | | эер вү D-50 | : C.Cole | man | er | $ \nabla$ | Whi | le Drillir | ig | N/A |
| BEN | CHMAR | RK: _ | | | | N/A | | DRILLING | METHOD: | Hc | llow Ste | em Auger | | Vat | Ţ | Upo | n Comp | letion | NONE |
| ELE | | l: | | | Ν | √A | | SAMPLING | G METHOD: | | S | SS tile | | > | <u> </u> | Dela | iy TION: | | N/A |
| | I UDE: GITUDI | E: | | | | | | EFFICIEN | TYPE: | | Automa N/A | tic | | BOH | ang | LUCA | TION: | | |
| STA | | N | √A/ | | OFFS | SET: | N/A | REVIEWE |) BY: | | J. Fiely | , | | | | | | | |
| REM | ARKS: | | | | 1 | 1 | | | | | | | | | | | | | |
| Elevation (feet) | Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | | MATE | RIAL DES | CRIPTION | 1 | USCS Classification | ^T Blows per 6-inch (SS | Moisture, % | ST × | S | OARD P TEST N in blo oisture 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 | ENETR, DATA ws/ft @ 4 5 5 6 TH, tsf | | Additional Remarks |
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| | - 5 - | | | | | PAR Gray Auge Grou Comp Offse * Part likely excav | FIALLY WEA Silty SAND, r Refusal at ndwater Not oletion et from Borin tially weathe require blas vations. | ATHERED R with mica * 6 feet Encountered g B-14 red rock is rc ting to remov | OCK: Sample d Upon Drilling ock like and wi re in a trench | d as 9 | | 50/1" | | | | | | >>@ | |
| | | | | | | | | | | | | | | | | | | | |
| | F | | | | J | Pro 95 Ke Te | otessiona Chastain nnesaw, lephone: | I Service I Road NV GA 30144 (770) 424 | ndustries, /, Suite 30 4 4-6200 | Inc. 1 | | | PROJE PROJE LOCA | ECT I ECT: TION | NO.: | N | Rocki /ater Ma S | 47245 oridge Ro ain Repla tone Mtn | 1 pad acement |

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| DATE | STAF | RTED: | | | 1 | 1/11/16 | | DRILL CO | MPANY: | Drilli | ing So | olutions | | | | BOR | INC | 7 F | 2_15 |
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| DATE | COM | PLET | ED: | | | 11/11/1 | 6 | DRILLER: | Jason | LOGGE | ED BY | C.Colema | an_ | | $\overline{\nabla}$ | | | | <u>-15</u> |
| COM | PLETIC | on de | PT | H _ | | 8.0 f | t | _ DRILL RIG | : | D- | -50 | | | fei | Ť | While Dr | lling malati | ion | N/A |
| BENC | HMAF | RK: _ | | | | N/A | | DRILLING | METHOD: | Holle | ow Ste | em Auger | | S | <u> </u> | Upon Co | npieti | ion | NONE |
| ELEV | ATION | I: | | | N | J/A | | SAMPLING | G METHOD: | | S | SS | | > | <u> </u> | Delay | _ | | N/A |
| LATI | UDE: | | | | | | | | TYPE: | Ai | utoma | itic | | BORI | NG L | OCATION | l: | | |
| LONG | ill UDI | : _ | | | | | | | Тарана Тара Тар | ſ | N/A | | | | | | | | |
| | ION: | <u> </u> | N/A | | OFF | SET: _ | N/A | |) BY: | J | . Fiely | / | | | | | | | |
| REIVIA | ARNO. | | | | | | | | | | | â | | OT | | | | | |
| Elevation (feet) | Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | | MATE | RIAL DES | CRIPTION | I | USCS Classification | SPT Blows per 6-inch (SS | Moisture, % | | ANDAF T Ni Mois | RD PENE ^T EST DATA n blows/ft ture 1 25 25 RENGTH, 1 | RATI ⊚ ■ PL ■ LL sf € Q | - <u>50</u> | Additional Remarks |
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| | | | | | | RESI SANE Red 1 Borin Groun Comp | DUUM: Me O (SM) Tan Tan g Terminate ndwater Not aletion | dium Dense M ed at 10 feet t Encounterec | I Upon Drilling | y 3 | SM | 8-10-14 N=24 11-11-18 N=29 9-11-18 N=29 8-12-15 N=27 | | | | | | | |
| | F | | | 3 |] | Pro 95 Ke Te | ofessiona Chastair nnesaw, lephone: | I Service In Road NW GA 30144 (770) 424 | ndustries, I /, Suite 30 ⁻ 1 1-6200 | Inc. 1 | | PI PI L(| ROJE ROJE DCA1 | CT N CT: CT: | 0.: _ | Ro Water | 4 ckbrid Main Ston | 72451 Ige Ro Repla ie Mtn | ad icement |

| DATE | STAF | RTED: | _ | | 1 | 1/13/16 | DRILL COMPANY: | Drilling Sc | olutions | | | R | | | B_16 |
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| DATE | COM | PLET | ED: | | | 11/13/16 | DRILLER: Jason LO | OGGED BY | : C.Colema | n | | | | | 5-10 |
| СОМ | PLETI | on de | PTI | H _ | | 3.0 ft | _ DRILL RIG: | D-50 | | | ter | ⊻ Whi | le Drillir | ng Latian | N/A |
| BENC | HMAF | RK: _ | | | | N/A | DRILLING METHOD: | Hollow Ste | em Auger | | Na | Upo | n Comp | letion | NONE |
| ELEV | | l: | | | N | N/A | SAMPLING METHOD: | | <u>SS</u> | | 2 | | ау | | N/A |
| | | | | | | | | Automa | atic | | BORIN | IG LOCA | TION: | | |
| | | =: | 1/ 6 | | | | | IN/A | | | | | | | |
| | ION:_ ARKS | ľ | N/A | | _0663 | SEI: <u>N/A</u> | | J. Fiely | / | | | | | | |
| | | | | | <u> </u> | | | | ŝ | | ST 4 | | | | |
| Elevation (feet) | Depth, (feet) | Graphic Log | Sample Type | Sample No. | scovery (inches) | MAT | ERIAL DESCRIPTION | SCS Classification | Blows per 6-inch (S | Moisture, % | × 0 | TEST N in blo Moisture | DATA ows/ft © 25 | PL LL 50 | Additional Remarks |
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| | | | | | | FILL: Medium I SAND (SM) | Dense Moist Red Brown Silty | SM | 5-7-11 N=18 | | | P | | | |
| | | | | | | RESIDUUM: M | edium Dense Moist Red Brown | | IN-10 | | | | | | |
| | | | X | | | Tan Silty SAND | (SM), with mica | | 6-7-9 N=16 | | | | | | |
| | | | | | | | | SM | 5-6-8 | | | ¢ | | | |
| | | | M | | | | | | 3-6-8 | | | | | | |
| | | | :// | | | Boring Termina | ted at 10 feet | | N=14 | | | Ĩ | | | |
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| | | | | | | Profession | al Service Industries, Inc | <u> </u> | PR | OJE | |).: | <u> </u> | 47245 | 1 |
| | | | | | | 95 Chasta | n Road NW, Suite 301 | | PR | OJE | СТ: | | Rock | oridge R | .oad |
| | | 7 | | | | Kennesaw | , GA 30144 | | LO | CAT | FION: | V | Vater Ma | ain Repl | acement |
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| DATE | STAF | RTED: | _ | | 1 | 1/13/16 | | DRILL CO | OMPANY: | Dr | illing So | olutions | | | F | | | 2_17 |
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| DATE | COM | PLETI | ED: | | | 11/13/1 | 16 | DRILLER | : Jason | LOGO | GED BY | C.Colem | an | | | | | D-17 |
| COMF | PLETIC | on de | PTI | ۰ _ | | 10.0 | ft | DRILL RI | G: | | D-50 | | | ter | ⊻ W | /hile Drillii | ng | N/A |
| BENC | HMAF | RK: _ | | | | N/A | | DRILLING | 6 METHOD | : <u>Ho</u> | ollow St | em Auger | | Na | ⊥ U √ D | pon Comp | Dietion | NONE |
| | | I: | | | N | I/A | | | | D: | <u> </u> | SS | | | | | | N/A |
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| STAT | | | 1/ A | | OEEG | | NI/A | | וסו פעים מי | | | , | | | | | | |
| REMA | | r | N/A | | | <u> </u> | IN/A | | <u>ы</u> ві | | J. LICI | / | | | | | | |
| ation (feet) | oth, (feet) | aphic Log | nple Type | mple No. | ery (inches) | | MATE | RIAL DES | SCRIPTIO | ON | Classification | s per 6-inch (SS) | bisture, % | ST. | ANDARE TES N in Moistu | D PENETR ST DATA blows/ft © Ire | ATION PL LL 50 | Additional Remarks |
| Elev | - 0 - | Gr | Sar | Sa | Recov | | | | | | nscs | SPT Blow | W | 0 | STRE Qu | NGTH, tsf # | Qp 4.0 | |
| | | XXXV | | | | Asph | alt Thicknes | s = 8 inches | b bad Deres (| 2 | | | | | | | | |
| | | | \mathbb{N} | | | FILL: | Medium De SAND (SM). | nse Moist F with aspha | t fragments | Gray | SM | 3-11-15 | | | | Q | | |
| | | \times | | | | | | | | 0:11 | | N=26 | | | | | | |
| | | | M | | | SANE | DOUM: Der D (SM), with | mica | a Brown G | ray Sity | | 8-15-19 | | | | | | |
| | - 5 - | | P | | | | | | | | | N=34 | | | | + | | |
| | | | h | | | | | | | | SM | 11 10 17 | | | | | | |
| | | | | | | | | | | | | N=36 | | | | | | |
| | | | M | | | | | | | | | 45 40 04 | | | | | | |
| | - 10 - | | Ψ | | | Borin | a Terminate | d at 10 feet | | | | N=39 | | | | | 9 | |
| | | | | | | Grou | ndwater Not | Encountere | d Upon Dri | lling | | | | | | | | |
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| | | | | | 77 | 95 | Chastain | Road N | N, Suite | 301 | | PI | | CT: | . | Rock | bridge R | oad |
| | | 73 | 5 | | | Ke | nnesaw, | GA 3014 | 4 | | | L | CAT | FION: | | Water M | ain Repl | acement |
| | Telephone | | | | | | | | 4-6200 | | | | | | | S | tone Mtr | ı. |
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| DATE | STAF | RTED: | | | 1 | 1/15/16 | 6 | DRILL CON | IPANY: | Drilli | ng So | lutions | | | B | ORII | NG F | 3-18 |
|------------------|-----------------|-------------|-------------|------------|-------------------|---|--|---|---------------------------------------|--------|---------------------|---|-------------|-----------------------|---|--|-----------------------------------|-----------------------|
| DATE | | | ED: | | | 11/15/ | 16 # | _ DRILLER: | Jason | LOGGE | D BY | : C.Colema | an_ | - | V Wh | ile Drillir | | N/A |
| | | | PI | - | | 7.01 | π | | | D- | 50 | m Augor | | ate | ⊻ Unc | n Comr | letion | NONE |
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| LONG | | | | | | | | EFFICIENC | Y | /(C | J/A | | | Dortai | | | | |
| STATI | ON: | N | J/A | | OFFS | SET: | N/A | | BY: | J | Fielv | , | | | | | | |
| REMA | RKS: | | | | _ | _ | | | | | | | _ | | | | | |
| Elevation (feet) | o Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | Asph | MATE | ERIAL DESC | CRIPTION | | USCS Classification | SPT Blows per 6-inch (SS) | Moisture, % | STA × 0 | NDARD F TEST N in blo Moisture | PENETR DATA ows/ft @ 25 GTH, tsf # 2.0 | ATION PL LL 50 Qp 4.0 | Additional Remarks |
| | | | | | | Asph RESI Tan S Tan G Grou Com Cave | alt Thickne IDUUM: Me Silty SAND Gray ng Terminat Indwater No pletion ⊧-in at 4½ fe | ed at 10 feet ted at 10 feet t Encountered | oist Red Brow a Upon Drilling | vn | SM | 11-12-15 N=27 4-7-10 N=17 7-14-12 N=26 7-8-10 N=18 | | | | | | |
| | | | | | | Pr 95 Ke Te | ofessiona ofessiona chastai ennesaw, | al Service Ir n Road NW GA 30144 : (770) 424 | ndustries, Ir , Suite 301 -6200 | nc. | | PF PF LC | ROJE | CT NC CT: TION: | D.: | Rock Vater M S | 47245 pridge R ain Repla | 1 oad acement |

| DATE | STAF | TED: | | | 1 | 1/15/16 | | D | RILL CO | MPAN | IY: | Dril | ling Sc | olutions | | | | B | ORI | NG | B-19 | |
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| | | | ED: | | | 11/15/ | 16 | DF | | Ja | son | LOGG | | C.Coler | nan | | | 7 Wh | ile Drilli | | | /Δ |
| | | | P11 | - - | | 0.0 I | ι | ייט מח | |): МЕТН | | 비에 | DW St | am Auger | | ate | | | on Com | oletion | NON | IE |
| | | l: | | | N | J/A | | S/ | | | HOD: | 1101 | <u>0w 0k</u> | SS | | Š | | Del | ay | | N// | /A |
| LATI | UDE: | | | | | | | — 0, H/ | AMMER | TYPE: | : | A | utoma | ntic | | во | RING | | ATION: | | | |
| LONG | ITUDE | : | | | | | | EF | FICIEN | CY _ | | | N/A | | | | | | | | | |
| STAT | ION:_ | ١ | N/A | | _OFFS | SET: _ | N/A | RE | VIEWE | D BY: | | | J. Fiely | / | | | | | | | | |
| REM/ | ARKS: | | | | | | | | | | | | | | | | | | | | 1 | |
| Elevation (feet) | o Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | _ Asph | MAT alt Thickn | ERIA | L DES | CRIF | PTION | | USCS Classification | SPT Blows per 6-inch (SS | Moisture, % | 0 0 | KTANI K M ■ ■ | DARD F TEST N in blo loisture | PENETR DATA pws/ft @ 25 GTH, tsf 20 | PL LL 5 Qp | Additional Remarks | |
| | | | | | | FILL: (ML), | Very Stif | f Moist fragm | Red Bro ents | wn Sa | indy SILT | Г | ML | 12-15-13 N=28 | 3 | | | | Ø | | | |
| | - 5 - | | Ø | | | SILT | (ML) | ery Sti | it ivioist f | Kea Br | own San | idy | ML | 10-14-14 N=28 | 1 | | | | | | + | |
| | | | | | | Hard | Moist Re | d Brow | n Sandy | SILT (| (ML) | | ML | 14-26-27 N=53 | 7 | | | | | >> | 9 | |
| | | | | | | Borin Grou Com Cave | g Termina ndwater N oletion -in at 6 fe | et | 10 feet ountered | d Upon | Drilling | | | 6-13-16 N=29 | PROJ | | NO.:: | | | 4724 | 51 | |
| | F | | | | | Pro 95 Ke Te | otession Chasta Innesav Iephon | nal Se ain Ro v, GA e: (77 | ervice I bad NV 30144 70) 424 | ndus V, Sui 4 4-620 | tries, Ir ite 301)0 | IC. | | F | PROJI PROJI _OCA | ECT ECT: TION | NO.: : N: | V | Rock Vater M | 4724 bridge F ain Rep stone M | 51 Road Iacement tn. | |

| DATE | STAF | RTED: | | | 1 | 1/15/16 | | DRILI | COM | PANY: | D | rilling So | olutions | | | | BC | | JG I | B-20 |
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| | | | ED: | | | <u>11/15/1</u> | 6 | | ER: | Jason | LOG | | C.Coler | nan | | ∇ | While | e Drillir | | N/A |
| | | | PII | - ۲ | | 0.0 II | | | | | Ц | D-50 | om Augor | | ate | Ť | Upor | Comp | letion | NONE |
| | | i: | | | N | J/A | | | PLING | METHOD. |): | | SS | | Š | Ť | Dela | V | | N/A |
| LATIT | UDE: | | | | | | | | MER T | (PE: | | Automa | atic | | BOR | ING I | | , TION: | | |
| LONG | TUDE | : | | | | | | EFFIC | IENCY | · | | N/A | | | | | | | | |
| STATI | ON: | Ν | I/A | | OFFS | SET: _ | N/A | REVIE | WED I | BY: | | J. Fiely | / | | | | | | | |
| REMA | RKS: | | | | | | | | | | | 1 | | | | | | | | |
| Elevation (feet) | o Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | RESI | | RIAL [| DESC | | DN | USCS Classification | SPT Blows per 6-inch (SS | Moisture, % | ST ~ 0 0 | ANDA N Mo ST | ARD PI TEST in blov isture 28 isture 28 isture 20 J | ENETR/ DATA ws/ft @ | PL LL 50 Qp 4.0 | Additional Remarks |
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| - | - 5 - | | | | | with n | nica | Asiat Or | Tan I | | | SM | 10-15-2 N=35 | 0 | | | | | | |
| | | | | | | (SM), | with mica | | ay i di i | Red Silly | SAND | SM | 5-9-12 N=21 5-7-11 | | | | | | | |
| | | | | | | Boring Grour Comp | Terminate idwater No letion | ed at 10 t | ^f eet Itered L | Jpon Drill | ing | | 5-7-11 N=18 | | | | 0 | | | |
| | | | | | J | Pro 95 Ke Te | ofessiona Chastair nnesaw, lephone: | al Servi n Road GA 30 (770) | ce Ind NW, 0144 424-0 | dustries Suite 3 6200 | s, Inc. 301 | | | Proje Proje Loca ⁻ | ECT N ECT: TION: | IO.: | W | Rockt ater Ma Si | 47245 oridge R ain Repl tone Mt | 1 load acement n. |

| DATE | | RTED: | | | 1 | 1/11/16 | | DRILL CO | MPANY: | Dr | illing Sc | olutions | | | B | ORII | NG E | 3-21 |
|------------------|------------------|-------------|-------------|------------|-------------------|--------------------------------|---|--------------------------|---------------------------|------------|-----------------------|--------------------------|-------------|-------|---|--|-----------------------------------|-----------------------|
| | PLETIC | DN DE | ED: PTH | ۰ <u> </u> | | 11/11/ 8.0 f | t | | Jason Jason | | эер вү D-50 | : C.Colema | an_ | er | ∑ Wh | ile Drillir | ng | N/A |
| BENC | HMAF | RK: _ | | | | N/A | | DRILLING | METHOD: | Но | llow Ste | em Auger | | Vat | Upc | on Comp | oletion | NONE |
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| | I UDE: SITUDI | . | | | | | | EFFICIEN | ТҮРЕ: СҮ | | Automa N/A | Itic | | BORIN | IG LOCA | ATION: | | |
| STAT | ION: | N | J/A | | OFFS | ET: | N/A | REVIEWE | D BY: | | J. Fiely | / | _ | | | | | |
| REMA | ARKS: | | | | 1 | | | | | | | | 1 | 1 | | | | |
| Elevation (feet) | Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | | MATE | RIAL DES | CRIPTION | N | USCS Classification | SPT Blows per 6-inch (SS | Moisture, % | STA | NDARD F TEST N in blo Moisture STRENO Qu | PENETR DATA Dws/ft © 25 Comparison 25 Comparison 25 Comparison 20 Comparison 25 Compar | ATION PL LL 50 Qp 4.0 | Additional Remarks |
| | | | | | | FILL: (SM), | Medium De with rock fr | nse Moist Re agments | ed Tan Silty S | SAND | SM | 10-10-10 N=20 | | | Q | | | |
| | | | | | | No R | ecovery | | | | | 15-14-16 N=30 | | | | | | |
| | | | | | | RESI (SM), | DUUM: Den trace clay a | se Moist Reo nd mica | d Tan Silty SA | AND | SM | 13-22-25 N=47 | | | | | | |
| | | | M | | | Mediu trace | um Dense M clay and mid | oist Black Si :a | Ity SAND (SN | M), | SM | 8-10-11 | | | o | | | |
| | | | | | | trace Borin Grou Comp | clay and mid g Terminate ndwater Not bletion | a 10 feet Encountered | d Upon Drillin | ıg | SM | 8-10-11 N=21 | | | ©* | | | |
| | | | | | - | Pro 95 | ofessiona Chastain | Service I Road NV | ndustries, V, Suite 30 | Inc.)1 | 1 | PF | ROJE | CT NC |).: | Rock | 47245 bridge Ro | 1 |
| | Ē | え | 2 | | J | Ke Te | nnesaw, lephone: | GA 30144 (770) 424 | 4 4-6200 | | | LC | CAI | ION: | V | Vater M S | ain Repla tone Mtr | acement |

| DATE | STAF | TED: | | | 1 | 1/11/16 | | DRILL CO | MPANY: | Dri | lling Sc | olutions | | | | BOR | INC | G E | 3-22 | |
|------------------|---------------|----------------|-------------|------------|-------------------|-----------------------------|---|--|--|------------|----------------------|---------------------------|----------------|------------------------|------------------------------|---|------------------------------|-----------------------------------|-----------------|--------------|
| DATE COMF | COMI | PLETE DN DE | ED: PTI | н — | | <u>11/11/16</u> 7 0 ft | 3 | DRILLER: | Jason : | | ED BY 0-50 | : C.Coler | nan | Ľ | י \ | While Dri | Illing | | | N/A |
| BENC | HMAF | ικ | | · _ | | N/A | | DRILLING | METHOD: | Ho | llow Ste | em Auger | | /ate | Ī, | Upon Cor | mpleti | on | | NONE |
| ELEV | ATION | l: | | | N | J/A | | SAMPLING | METHOD: | | 5 | SS | | 5 | <u> </u> | Delay | | | | N/A |
| | UDE: | =. <u> </u> | | | | | | | ГҮРЕ: :Y | | Automa N/A | atic | | BOR | NG LC | OCATION | 1: | | | |
| STAT | ION: | | I/A | | OFFS | SET: | N/A | REVIEWED |) BY: | | J. Fiely | / | | | | | | | | |
| REMA | RKS: | | _ | | - | | | | | | | | | - | | | | | | |
| Elevation (feet) | Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | | MATE | RIAL DES | CRIPTION | N | USCS Classification | SPT Blows per 6-inch (SS) | Moisture, % | ST. × 0 0 | ANDAF TE N ir Moist | RD PENET EST DATA n blows/ft ture 25 ENGTH, 1 20 2.0 | - RAT № | ON - <u>50</u> p 4.0 | Additic Rema | onal Irks |
| | | | Ø | | | FILL: V | /ery Dense | Moist Tan C | layey SAND | (SC) | SC | 18-50/6 | | | | | | >>@ | | |
| | | | Ø | | | RESID SAND | UUM: Den: (SC), trace | se Moist Red e clay | Tan Clayey | | SC | 7-16-17 N=33 | | | | | » | | | |
| | | | | | | Mediur trace c Micace | m Dense M xlay eous | oist Red Tan | Silty SAND | (SM), | SM | 10-11-14 N=25 | 1 | | | | | | | |
| | | | | | | Boring Groun Compl | Terminated dwater Not etion | 3 at 10 feet Encountered | Upon Drilling | g | | N=20 | | | | | | | | |
| | Ē | | | |] | Pro 95 (Ker Tel | fessional Chastain nnesaw, (ephone: | I Service Ir Road NW GA 30144 (770) 424 | ndustries, /, Suite 30 I I-6200 | Inc. 01 | | F | PROJE PROJE | ECT N ECT: FION: | O.: _ | Ro Water | 4; ckbrid Main Ston | 72451 Ige Rc Repla e Mtn | pad acement | |

| DATE | STAF | TED: | _ | | 1 | 1/11/16 | | DRILL C | OMPAN | Y: | Drilling Sc | olutions | | | | R | | | B-23 |
|------------------|-----------------|-------------|-------------|------------|-------------------|------------------------|------------------------|-----------------------|-------------------|------------------|---------------------|--------------------------------|-------------|----------|----------|---|---|-----------------------------------|-----------------------|
| | | | ED: | .— | | 11/11/1 | 6 | | R:Jas | son L | OGGED BY | C.Coler | nan | <u> </u> | ∇ | Whi | e Drillir | | |
| | | | PIT | ۰ - | | 0.0 I | | | | 00. | L-30 | om Augor | | ate | Ī | Upo | n Com | pletion | NONE |
| | | l: | | | N | J/A | | | | HOD: | | SS | | Š | Ī | Dela | iy | | N/A |
| LATI | TUDE: | | | | | | | | R TYPE: | | Automa | atic | | BOF | RING | LOCA | TION: | | |
| LONG | SITUDE | : | | | | | | EFFICIE | NCY | | N/A | | | | | | | | |
| STAT | ION: | Ν | I/A | | OFF | Set: _ | N/A | REVIEWI | ED BY: | | J. Fiely | / | | | | | | | |
| REM/ | ARKS: | | | | <u> </u> | | | | | | | \sim | | | | | | | |
| Elevation (feet) | o Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | FILL | MATE | RIAL DE | SCRIP | TION | USCS Classification | SPT Blows per 6-inch (SS | Moisture, % | 0 0 | FAND. | ARD P TEST I in blo bisture 2 2 2 2 2 2 2 7 RENG U 2 2 2 2 | ENETR DATA ws/ft © 5 5 6TH, tsf % | ATION PL LL 50 Qp 4.0 | Additional Remarks |
| | - 5 - | | X | | | with t | races of cla | y and rock f | ragment | s | SM | 9-8-7 N=15 5-7-7 N=14 | | | 0 |)) | | | |
| | | | X | | | RESII (SM) | DUUM: Mee | dium Dense of clay | Red Silt | y SAND | SM | 4-5-6 N=11 6-7-8 N=15 | | | Ø | 9 | | | |
| | | | | | | Grour Comp Cave- | ndwater Not oletion | | ed Upon | Drilling | | | | | | | | | |
| | | | | | | Pro | ofessiona | I Service | Indust W. Suit | ries, Indite 301 | C. | | PROJE | | NO.: | | Rockl | 47245 pridae R | 1 |
| | F | X | | 7 | | 95 Ke Te | nnesaw, lephone: | GA 3014 (770) 42 | 44 24-620 | 0 | | l | LOCA | | l: | W | Ater Ma S | ain Repl tone Mti | acement |

| DATE | STAF | RTED: | _ | | 1 | 1/11/16 | | DRILL COM | IPANY: | Dril | ling Sc | olutions | | | R | ORIN | JG F | 3-24 |
|------------------|-----------------|---------------|-------------|------------|-------------------|----------------------|---------------------------------------|-----------------------------|-----------------------------|----------|---------------------|--------------------------|----------------------|-------|---|--|-----------------------------------|-----------------------|
| DATE | | | ED: | | | 11/11/1 0 0 f | 6 | DRILLER: | Jason | | | : C.Colema | an_ | 5 | V Wh | ile Drillir | | N/A |
| BENC | | שט אוכ אעי | PIT | - ۲ | | 0.U I | l | | | 비 | 1-30 10w Sta | am Auger | | ate | Up | on Comp | letion | NONE |
| ELEV | | l: | | | N | J/A | | SAMPLING | METHOD: | 110 | <u>iow Sie</u> | SS | | Ŝ | Ū Del | ay | | N/A |
| LATI | TUDE: | | | | | | | HAMMER T | YPE: | A | utoma | itic | | BORIN | | ATION: | | |
| LONG | SITUDI | E: | | | | | | EFFICIENC | Y | | N/A | | | | | | | |
| STAT | ION: | 1 | J/A | | OFFS | SET: _ | N/A | REVIEWED | BY: | | J. Fiely | / | | | | | | |
| REMA | ARKS: | | | | <u> </u> | | | | | | | | 1 | 1 | | | | |
| Elevation (feet) | o Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | Asnh | | RIAL DESC | RIPTION | | USCS Classification | SPT Blows per 6-inch (SS | Moisture, % | | NDARD I TEST N in bl Moisture STREN Qu | PENETR DATA ows/ft @ 25 GTH, tsf # 2.0 | ATION PL LL 50 Qp 4.0 | Additional Remarks |
| | | | | | | FILL: with r | Very Dense ock fragmer | Brown, Red S | Silty SAND (S | SM) | SM | 11-35-15 N=50 | | | | | ¢ |) |
| | | | | | | RESI (SM) | DUUM: Den | se Red, Browi | n Silty SAND | | | 9-18-28 | | | | | ø | |
| | | | N | | | Light | Red, Gray | | | | SM | 13-19-19 | | | | | | |
| | | | | | | Mediu (SM) | ım Dense Li | ght Red, Gray | Silty SAND | | SM | N=38 8-9-12 | | | ø | | | |
| | | | | | | Borin Grou Com | g Terminate ndwater Not pletion | d at 10 feet Encountered | Upon Drilling |) | | N=21 | | | | | | |
| | | | | | | Cave | in at 6 Feet | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | E | | | |] | Pro 95 Ke | ofessiona Chastain nnesaw. | Service In Road NW | dustries, li , Suite 301 | nc. 1 | | Pi Pi L(| ROJE ROJE DCAT | CT NO | D.: | Rockl Vater Ma | 47245 oridge R ain Repla | 1 oad acement |
| | | | | | J | Те | lephone: | (770) 424- | -6200 | | | | | | | S | tone Mtr | ı. v GA |

| DATE | STAF | RTED: | | | 1 | 1/15/16 | 6 | DRILL CO | MPANY: | Dri | lling Sc | olutions | | | | BORI | NG | B-25 |
|------------------|-------------------|-------------|-------------|------------|-------------------|------------------------------|--|---|------------------------------------|--------|---------------------|---|----------------------|---------------------|--|---------------------------------------|---|-----------------------|
| | | PLET | ED: DTI | | | <u>11/15/</u> | 16 + | DRILLER: | Jason | | SED BY | : C.Coler | nan | <u> </u> | ∇ v | Vhile Drilli | na | N/A |
| BENC | | | | ' - | | 9.01 N/A | L | | METHOD: | Ho | J-30 | | | ate | τι | Jpon Com | pletion | NONE |
| ELEV | | l: | | | N | J/A | | SAMPLIN | G METHOD: | | <u>, 1000 Old</u> | SS | | S | Ū D | Delay | | N/A |
| LATI | TUDE: | | | | - | | | HAMMER | TYPE: | | Automa | tic | | BORI | NG LO | CATION: | | |
| LONG | SITUDI | E: | | | | | | EFFICIEN | CY | | N/A | | | | | | | |
| STAT | ION:_ | 1 | ۸/A | | OFF | SET: _ | N/A | REVIEWEI |) BY: | | J. Fiely | / | | | | | | |
| REM | ARKS: | | | | | | | | | | | | | | | | | |
| Elevation (feet) | o Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | Asph | MATE | RIAL DES | CRIPTIO | N | USCS Classification | SPT Blows per 6-inch (SS | Moisture, % | ST/ × 0 | ANDARI TE N in Moistu STRE Qu | D PENETF ST DATA blows/ft @ | ATION PL LL <u>50</u> Qp <u>4.0</u> | Additional Remarks |
| | | | | | | FILL: SANI | Medium De D (SM) with | nse Black, R rock fragmer | ed, Brown S nts | ilty | SM | 20-12-9 N=21 | | | | ۹ | | |
| | - 5 - | | | | | RESI Silty : Borin | DUUM: Mec SAND (SM) g Terminate | lium Dense F with rock fra d at 10 feet | Red, Brown, [*] gments | Tan | SM | 9-13-16 N=29 9-14-16 N=30 9-13-17 N=30 | | | | | | |
| | | | | | | Borin Grou Com Cave | g Terminate ndwater Not oletion -in at 4 Feet | d at 10 feet Encountered | d Upon Drillin | Inc. | | | ROJE | ECT N | 0.: _ | | 47245 | 1 |
| | F | | | | | 95 Ke Te | Chastain chastain ennesaw, lephone: | Road NV GA 3014 (770) 424 | 4 4 4 4-6200 |)1 | | F | ROJE ROJE .OCA | CT: CT: TION: | u.: | Rock Water M | 47245 bridge R lain Repl btone Mt | acement |

| DATE | STAF | RTED: | | | 1 | 1/15/16 | ; | DRILL CO | MPANY: | Dri | illing Sc | olutions | | | B | | IG I | 3-26 |
|------------------|--------------------|---------------|-------------|------------|-------------------|----------------------|---------------------------------------|-----------------------------|---------------|---------|---------------------|--------------------------|-------------|-------|---|--|-----------------------------------|-----------------------|
| DATE | | | ED: | | | 11/15/ | 16 ** | | Jason | | | : C.Colem | an | 5 | \ | le Drillir | | N/A |
| | | שט אוכ אעי | | - - | | 5.0 I | ι | | | ا ∩⊔ | J-50 | om Augor | | ate | | n Comp | letion | NONE |
| ELEV | | | | | Ν | J/A | | | METHOD: | 110 | | SS | | Š | Ū Dela | ay | | N/A |
| LATI | TUDE: | | | | | | | HAMMER | TYPE: | | Automa | itic | | BORI | | TION: | | |
| LONG | SITUDI | E: | | | | | | EFFICIENC | Y | | N/A | | | | | | | |
| STAT | ION: | 1 | N/A | | OFFS | SET: _ | N/A | REVIEWED |) BY: | | J. Fiely | / | | | | | | |
| REMA | ARKS: | | | | <u> </u> | | | | | | | | | | | | | |
| Elevation (feet) | o Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | Asnh | MATE | RIAL DES | CRIPTION | N | USCS Classification | SPT Blows per 6-inch (SS | Moisture, % | | NDARD F TEST N in blo Moisture | PENETR/ DATA pws/ft @ 25 GTH, tsf # 20 | ATION PL LL 50 Qp 4.0 | Additional Remarks |
| | | | | | | FILL: (SM) | Dense Tan with rock fra | Red, Brown, agments | Black Silty S | SAND | SM | 12-21-14 N=35 | | | | | | |
| | | | | | | RESI SANI | DUUM: Meo D (SM) with | lium Dense F mica | Red, Brown S | iilty | | 4-7-9 N=16 | | | Ø | | | |
| | | | | | | Red, | Brown, Tan | | | | SM | 5-8-11 N=19 | | | | | | |
| | | | | | | | | | | | | 5-8-11 | | | Ø | | | |
| | | | | | | Borin Grou Com | g Terminate ndwater Not oletion | d at 10 feet Encountered | Upon Drillin | g | | N=19 | | | | | | |
| | | | | | | Cave | -in at 5 Feet | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | Pr | ofessiona | I Service II | ndustries, | Inc. | | P | | | D.: | Rock | 47245 | 1 |
| | Kennesaw, GA 30144 | | | | | | | | | , 1 | | L | OCAT | TION: | V | /ater Ma | ain Repl | acement |
| | | | | | J | Te | lephone: | (770) 424 | -6200 | | | | | | | Si | tone Mtr | ι. ν GΔ |

| DATE | STAF | RTED: | | | 1 | 1/15/16 | | DRILL C | COMPA | NY: | Dril | ling Sc | olutions | | | | BC | DRI | NG | B-27 | |
|------------------|-----------------|----------------|-------------|------------|-------------------|-------------------------|-------------------------------------|-----------------------------|----------------------|-------------|-------|---------------------|---------------------------|-------------|---------------|------------------------|--|--|-----------------------------------|------------------|-----------|
| DATE COMI | COM | PLETI DN DE | ED: PTI | н — | | <u>11/15/1</u> 8.0 f | <u>6</u> | | R: RG: | lason | LOGG | ED BY 0-50 | : C.Colen | nan | ٦ | ∇ | Whil | e Drillir | ng | | N/A |
| BENC | HMAF | RK: _ | | - | | N/A | | DRILLIN | IG MET | HOD: | Hol | low Ste | em Auger | | /ate | Ţ | Upor | n Comp | oletion | | NONE |
| ELEV | ATION | l: | | | Ν | J/A | | SAMPLI | ING ME | THOD: | | S | SS | | 5 | Ţ | Dela | у | | | N/A |
| | UDE: מחוודו | | | | | | | HAMME | | E: | Α | utoma N/A | atic | | BOR | ing l | | TION: | | | |
| STAT | ION: | <u>-</u> | J/A | | OFFS | SET: | N/A | REVIEW | ED BY | : | | J. Fiely | / | | | | | | | | |
| REM/ | ARKS: | | | | - - | | | | | | | | | | | | | | | | |
| Elevation (feet) | o Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | Asnh | MATE | RIAL DE | SCR | IPTION | | USCS Classification | SPT Blows per 6-inch (SS) | Moisture, % | ST. ~ 0 | ANDA N Moi ST | ARD PI TEST in blov isture 2: RENG J 2. | ENETR DATA ws/ft @ J 5 TH, tsf % | ATION PL LL 50 Qp 4.0 | Additio Remar | nal ks |
| | | | | | | FILL: | Dense Brov | n Silty SA | ND (SI | VI) | | SM | 8-20-20 N=40 | | | | | | Q | | |
| | - 5 - | | | | | RESI SANE | DUUM: Very (SM) with | / Dense Ro mica | ed, Bro | wn, Tan S | Silty | SM | 13-26-25 N=51 | ; | | | | | >>> |) | |
| | | | | | | Mediu (SM) | im Dense R with mica | ed, Brown | , Tan S | ilty SAND |) | SM | 9-13-13 N=26 8-9-11 | | | | | 3 | | | |
| | | <u>. 14</u> 2 | | | | Boring Grour Comp | Terminate Idwater Not Idetion | d at 10 fee Encounter | et red Upo | on Drilling | | | N=20 | | | | Ŭ | | | | |
| | | | | | | Cave | in at 7 Feet | I Service | e Indu | stries, l | nc. | | F | ROJE | ECT N | IO.: | | | 47245 | 1 | |
| | F | | | 2 | J | 95 Ke Te | Chastain nnesaw, lephone: | Road N GA 301 (770) 4 | IW, S 44 24-62 | uite 301 | 1 | | F | ROJE | ECT: TION: | | W | Rockl ater M S | bridge R ain Repl tone Mt | oad acement | |

| DATE | STAF | RTED: | | | 1 | 1/15/16 | ; | DRILL CON | IPANY: | Dril | ling Sc | olutions | | | F | | | 3-28 |
|---|-----------------|-------------|-------------|------------|-------------------|---------------|-------------------------|---------------------------|---------------|------|---------------------|-----------------------------------|-------------|---------------|--|--|-----------------------------------|-----------------------|
| DATE | | | ED: | .— | | 11/15/ | 16 | DRILLER: | Jason | LOGG | ED BY | : C.Colem | an | 5 | ∇ w | | | 5-20 |
| | | | PIR | 1 _ | | 21.0 N/A | π | DRILL RIG: | | 니 | 0-50 | m Augor | | ate | ▼ U | oon Com | oletion | NONE |
| | | κη: _ | | | N | IN/Α J/Δ | | | | | | | | Ň | Ū De | elav | | N/A |
| | TUDE: | | | | | WA | | HAMMER T | YPE: | A | utoma | tic | | BORI | | | | |
| LONG | SITUDI | E: | | | | | | EFFICIENC | Υ | | N/A | | | | | _ | | |
| STAT | ION:_ | 1 | ۸/A | | OFF | SET: _ | N/A | REVIEWED | BY: | | J. Fiely | / | | | | | | |
| REM/ | ARKS: | | | | 1 | | | | | | | | 1 | | | | | |
| Elevation (feet) | o Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | - Asph | MATE | RIAL DESC | CRIPTION | | USCS Classification | SPT Blows per 6-inch (SS) | Moisture, % | ST/ ~ 0 | ANDARD TES N in t Moistur STRE | P PENETR ST DATA blows/ft © re 4 25 25 25 NGTH, tsf % 2.0 | ATION PL LL 50 Qp 4.0 | Additional Remarks |
| | | | | | | FILL: rock | Dense Brov fragments | /n, Gray Silty | SAND (SM) w | vith | SM | 19-14-16 N=30 | | | | P | | |
| | - 5 - | | | | | RESI Silty | DUUM: Med SAND (SM) | ium Dense Re with mica | ed, Brown, Ta | an | SM | 9-11-14 N=25 8-12-8 N=20 | | | ď | | | |
| | [_ | | | | | Dens | e Red, Brow | n, Tan Silty S | AND (SM) wit | th | SM | o | | | | | | |
| | - 10 - | | Ъ | | | Porin | a Torminato | d at 10 faat | | | | 21-13-17 N=30 | | | | | | |
| | | | | | | Grou Com | ndwater Not | Encountered | Upon Drilling | | | | | | | | | |
| | - 15 - | | | | | Cave | -in at 7 Feet | | | | | | | | _ | _ | | |
| | | | | | | | | | | | | | | | | | | |
| | - 20 - | | | | | | | | | | | | | | | | | |
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| | | | | | | Pro | ofessiona | Service In | dustries. Ir | nc. | | PI | ROJE | | 0.: | | 47245 | 1 |
| | | | C | | | 95 | Chastain | Road NW | , Suite 301 | | | P | ROJE | CT: | | Rock | bridge R | oad |
| Kennesaw, GA 30144 Telephone: (770) 424-6200 | | | | | | | | | | | L | CAT | FION: | | Water M | ain Repl | acement | |
| | | | | | | Te | lephone: | (770) 424 | -6200 | | | | | | | S | tone Mtr | 1. V. CA |

L

| DATE | STAF | RTED: | _ | | 1 | 1/15/16 | | DRIL | L COM | IPANY: | D | rilling So | olutions | | | | B | | JG | R_29 |
|------------------|-----------------|--------------|-------------|------------|-------------------|-------------------|----------------------------|--------------------|------------------|-----------|-----------------------|---------------------|--------------------------|--------------|-------------|------|--|--|-----------------------------------|-----------------------|
| DATE | COM | PLET | ED: | . — | | 11/15/1 | 6 | DRIL | LER: | Jason | LOG | GED BY | : C.Colen | nan | Ļ | | | | | D-23 |
| COMP | | ON DE | PTH | 1_ | | <u>8.0 f</u> | <u>t</u> | | L RIG: | | N. 11 | D-50 | A | | ate | | | n Comr | letion | NONE |
| | | Kr∧: _ J∙ | | | N | <u>Ν/Α</u> J/Δ | | _ DRIL SAM | ling n Pi ing | | ר: <u>ח</u> ו יחו∙ | ollow St | em Auger SS | | Ĭ | | Dela | av | | N/A |
| | UDE: | • | | | | | | | MER T | YPE: | | Automa | atic | | BOI | RING | LOC/ | ATION: | | |
| LONG | ITUDI | E: | | | | | | EFFI | CIENC | Υ | | N/A | | | | | | | | |
| STAT | ION:_ | Ν | J/A | | OFFS | SET: _ | N/A | REVI | EWED | BY: | | J. Fiely | / | | | | | | | |
| REMA | RKS: | | | | | | | | | | | 1 | | | | | | | | |
| Elevation (feet) | O Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | Asnh | | RIAL | DESC | RIPTI | ON | USCS Classification | SPT Blows per 6-inch (SS | Moisture, % | S 0 0 | | DARD F TEST N in blo loisture | 2ENETR/ DATA DWS/ft @ 25 CATH, tsf X2.0 | ATION PL LL 50 Qp 4.0 | Additional Remarks |
| | | | | | | FILL: (SM) | Very Dense with rock fr | e Red, E agment | Brown, s | Gray Silt | ty SAND | SM | 14-26-27 N=53 | 7 | | | | | >>(| • • |
| | | | | | | RESI SANI | DUUM: Dei) (SM) with | nse Pur mica | ple, Tar | n, Gray S | Silty | | 13-14-22 N=36 | 2 | | | | © | | |
| | | | | | | | | | | | | SM | 12-16-23 N=39 | 3 | | | | | Ø | |
| | | | | | | Derin | - Toursia at | + 10 | feet | | | | 8-13-18 N=31 | | | | | 6 | | |
| | | | | | | Groui | dwater No oletion | t Encou | ntered | Upon Dr | illing | | | | | | | | | |
| | | | | | | Cave | in at 6 Fee | t | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
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| | | | | <u> </u> | | | | | | | | | | | | | | | | |
| | | | | | _ ? | Pro | ofessiona | al Serv | ice In | dustrie | es, Inc. | | F | ROJ | ECT | NO.: | | | 47245 | <u>51</u> |
| | | | | | | 95 Ko | | 1 K0a0 | , INVV, ח⊿⊿ | Suite | 301 | | F | KOJI OC V | | J. — | | Rocki | oridge F ain Rep | KOBO |
| | | | 9 | | | Te | lephone: | (770 |) 424- | -6200 | | | L | | | •• - | V | S | tone Mt | <u>n.</u> |
| | | | | | | | | (| , | | | | | | | - | | DeKal | h Coun | tv GA |

| DATE | STAF | RTED: | | | 1 | 1/15/16 | DRILL COMPANY: | Drilling So | olutions | | ĺ | BOR | NG I | B-30 |
|------------------|-------------------|---------------|-------------|------------|-------------------|---|--|---------------------|--------------------------------------|-------------|----------------|---|--|-----------------------|
| DATE | | | ED: | .— | | 11/15/16 | DRILLER: Jason | LOGGED B | C.Colema | <u>in</u> | - 7 | 7 While Dril | ling | N/A |
| | | שט אוכ אעי | PIT | - ۲ | | 10.0 IL | | U-30 Hollow St | om Augor | | ∎ ate | Upon Cor | npletion | NONE |
| ELEV | | l: | | | Ν | N/A | _ DRILLING METHOD: _ SAMPLING METHOD: | | SS | | ŠĪ | Delay | | N/A |
| LATI | TUDE: | | | | | | HAMMER TYPE: | Automa | atic | | BORING | G LOCATION | : | |
| LONG | SITUDI | : | | | | | EFFICIENCY | N/A | | | | | | |
| STAT | ION: | ١ | J/A | | OFFS | SET: N/A | REVIEWED BY: | J. Fiel | / | | | | | |
| REM | ARKS: | | | | | 1 | | | | 1 | | | | |
| Elevation (feet) | o Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | MAT | ERIAL DESCRIPTION | USCS Classification | SPT Blows per 6-inch (SS | Moisture, % | | DARD PENET TEST DATA N in blows/ft Aoisture 25 STRENGTH, t 20 20 | RATION PL LL 50 LL 50 4.0 4.0 | Additional Remarks |
| | - 5 - | | | | | RESIDUUM: Do SAND (SM) wit | ense Red, Brown, Tan Silty n rock fragments | SM | 12-13-20 N=33 11-23-24 N=47 | | | G | | |
| | | | | | | Medium Dense (SM) with rock | Red, Brown, Tan Silty SAND ragments | SM | 11-17-10 N=27 10-12-11 | | | 0 | | |
| | - 10 - | | | | | Boring Termina Groundwater N Completion | ed at 10 feet ot Encountered Upon Drilling ot | | N=23 | | | | | |
| | | | | | | Profession | al Service Industries, I | nc. | PR | OJE | CT NO. | | 47245 | 1 |
| | | | | | | 95 Chasta Kennesaw Telephone | n Road NW, Suite 301 , GA 30144 : (770) 424-6200 | I | PR LC | OJE CA1 | :ст: Гюn: _ | Water I | kbridge R Main Repl Stone Mti | oad acement n. |

| | | RTED: | | | 1 | 1/16/16 | | | OMPANY: | Dri | illing So | olutions | 220 | | | BORII | NG E | 3-31 |
|------------------|-----------------|-------------|-------------|------------|-------------------|---------------------------------|-------------------------------------|-------------------------------|----------------------------------|---------------|-----------------------|---------------------------|-------------|---------------------|--------------------------------|--|-----------------------------------|-----------------------|
| COM | PLETIC | ON DE | ED: PTI | ۰ <u> </u> | | 9.0 f | <u>6</u> t | DRILLER | G: Jason G: | [| эсо вт D-50 | | | er | Σv | Vhile Drillin | ng | N/A |
| BENC | HMAF | RK: _ | | | | N/A | | DRILLIN | G METHOD: | Ho | llow Ste | em Auger | | Vat | ¥ U | pon Comp | oletion | NONE |
| ELEV | ATION | l: | | | Ν | J/A | | _ SAMPLIN | | : | 5 | SS | | > | | elay | | N/A |
| | UDE: | <u>.</u> | | | | | | _ HAMMEH FFFICIEN | (TYPE: | | Automa N/A | atic | | BORI | NG LO | CATION: | | |
| STAT | ION: | | I/A | | OFFS | SET: | N/A | REVIEW | ED BY: | | J. Fiely | / | | | | | | |
| REM/ | ARKS: | | | | _ | | | | | | | - | | | | | | |
| Elevation (feet) | o Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | Aanh | MATE | | SCRIPTIO | N | USCS Classification | SPT Blows per 6-inch (SS) | Moisture, % | ST / × 0 0 | ANDARI TE N in Moistu | D PENETR ST DATA blows/ft © 25 NGTH, tsf % 2.0 | ATION PL LL 50 Qp 4.0 | Additional Remarks |
| | | | 8 | | | FILL: | Dense Red | d, Brown, Ta | n Silty SAND | (SM) | SM | 11-13-20 N=33 |) | | | Q | | |
| | - 5 - | | Ø | | | RESI SANE | DUUM: Vei) (SM) | ry Dense Re | d, Brown, Tai | n Silty | SM | 11-16-37 N=53 | , | | | | >>@ |) |
| | | | | | | Dense | e Red, Brov | wn, Tan, Gra | y Silty SAND |) (SM) | SM | 10-10-20 N=30 |) | | | P | | |
| | | | М | | | Mediu SANE | Im Dense F D (SM) | Red, Brown | Fan, Gray Sill | ty | SM | 9-9-17 | | | | | | |
| | | | | | | Boring Groun Comp Cave | 3 Terminate Idwater No Ietion | ed at 10 feet t Encounterd | ed Upon Drilli | ing | | N-20 | | | | | | |
| | | | | | . | Pri 95 | ofession: Chastaii | al Service n Road N | Industries <i>N</i> , Suite 3 | s, Inc. 01 | | F | PROJE | GCT Nr GCT: | 0.: | Rock | 47245 bridge R | 1 oad |
| | | | | | J | Ke Te | nnesaw, lephone: | GA 3014 : (770) 42 | 14 24-6200 | | | L | OCA | FION: | | Water M S | ain Repla itone Mtr | acement |

| DATE | E STAF | RTED: | _ | | 1 | 1/16/16 | 3 | DRILL CO | MPANY: | Dril | ling Sc | olutions | | | B | ORII | NG | B-32 |
|------------------|-----------------|---------------|-------------|------------|-------------------|------------------------------|--|-----------------------------|-----------------------|-----------|---------------------|------------------------------------|-------------|-------|---|---|---|-----------------------|
| DATE | | | ED: | .— | | 11/16/ | 16 | DRILLER: | Jason | | ED BY | : C.Colem | an | 5 | V Wh | ile Drillin | | |
| | | שט אוכ אעי | | - ۲ | | 0.U I | 11 | | | | -DU | | | ate | | on Com | pletion | NONE |
| ELEV | | l: | | | N | J/A | | | G METHOD: | 1101 | <u>0w 0k</u> | SS | | Š | Ū Del | ay | | N/A |
| LATI | TUDE: | | | | | | | HAMMER | TYPE: | A | utoma | itic | | BORIN | | ATION: | | |
| LONO | GITUDI | E: | | | | | | | CY | | N/A | | | | | | | |
| STAT | ION: | 1 | N/A | | OFF | SET: _ | N/A | REVIEWE |) BY: | | J. Fiely | / | | | | | | |
| REM | ARKS: | | | | <u> </u> | 1 | | | | | | | 1 | 1 | | | | |
| Elevation (feet) | o Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | – Asph | MATE | RIAL DES | CRIPTION | J | USCS Classification | SPT Blows per 6-inch (SS | Moisture, % | STA | NDARD F TEST N in blo Moisture | PENETR DATA pws/ft © P 25 GTH, tsf % 2.0 | ATION PL LL 50 Qp 4.0 | Additional Remarks |
| | | | X X | | | RESI (MH) Tan, | DUUM: Har , with mica Red, Brown | d Red, Browr | n Sandy SILT | | MH | 10-25-15 N=40 8-13-19 | | | | ø | Ø | |
| | - 5 - | | | | | Medi (SM) | um Dense T | ān, Red, Bro | wn Silty SANI | D | SM | N=32 9-10-14 N=24 8-10-11 | | | | | | |
| | | | | | | Borin Grou Com Cave | g Terminate ndwater Not pletion ⊷in at 7 Feet | d at 10 feet Encountered | d Upon Drilling | g Inc. | | 8-10-11 N=21 | ROJE | CT NC | ی ا | | 47245 | 1 |
| | F | | | | | 95 Ke Te | Chastair ennesaw, elephone: | GA 30144 (770) 424 | 4 4 4 4-6200 | 110. 1 | | PI PI L(| ROJE | CT: |).: V | Rock Vater M S | 47245 bridge R ain Repl tone Mti | acement |

| DATE | STAF | RTED: | _ | | 1 | 1/16/16 | | DRILL C | OMPANY: | [| Drilling So | olutions | | | | R | | | B-33 | |
|------------------|-----------------|-------------|-------------|------------|-------------------|----------------------------------|--|---|--|-----------------|---------------------|--------------------------|-------------|------------------------|-------------------------------|--|--|---|---------------------|------------|
| | | | ED: | | | <u>11/16/1</u> | 6 | | R: Jason | LOC | | C.Cole | man | | ∇ | Whil | e Drillir | | 5 00 | N/A |
| | | ע אר ארי | PIT | - - | | 0.0 IL | | | | . ı | Jollow St | om Augor | | ate | Ť | Upor | 1 Com | letion | | NONE |
| | | l: | | | Ν | J/A | | | |). <u> </u> | | SS | | Š | Ī | Dela | y | | | N/A |
| LATIT | UDE: | | | | • | | | HAMME | R TYPE: | | Automa | atic | | BOR | ING L | OCA | TION: | | | |
| LONG | TUDE | : | | | | | | EFFICIE | NCY | | N/A | | | | | | | | | |
| STATI | ON: | Ν | I/A | | OFFS | SET: _ | N/A | REVIEWI | ED BY: | | J. Fiely | / | | | | | | | | |
| | RKS: | | | | | | | | | | | â | 1 | 0.7 | | | | | | |
| Elevation (feet) | o Depth, (feet) | Sraphic Log | Sample Type | Sample No. | Recovery (inches) | FILL | | RIAL DE | SCRIPTI | ON | USCS Classification | SPT Blows per 6-inch (SS | Moisture, % | | ANDA 1 N Moi: STF | RD PI FEST in blov sture 22 23 RENG 22. | ENETRA DATA ws/ft ⊚ ∮ 5 5 5 TH, tsf ₩ 0 | PL LL 50 Qp | Additio Remai | nal ⁺ks |
| | | | | | | fragm | ents | v Dense Re | d Silty SAN | | SM | 20-7-25 N=32 | 5 | | | | ©_ | | | |
| | - 5 - | | X | | | with re | ock fragme | nts | | | SM | 28-30-4 N=75 | 5 | | | | | >>@ | | |
| | | | | | | Browr | m Dense E 1, Tan, Blac | Black Silty S. Sk | AND (SM) | | SM | 7-12-13 N=25 | 3 | | | | | | | |
| | | | | | | Boring Grour Comp Cave- | Terminate Idwater No letion in at 4 Fee | ed at 10 feet t Encounter t | ed Upon Dr | illing | | N=12 | | | | | | | | |
| | | | | | 1 | Prc 95 Kei Tel | ofessiona Chastair nnesaw, lephone: | al Service Road N GA 3014 (770) 42 | Industrie W, Suite 14 24-6200 | es, Inc. 301 | | | PROJE | ECT N ECT: TION: | IO.: | W | Rockl ater Ma S | 47245 oridge R ain Repl tone Mti | 1 oad acement | |

| DATE | STAF | RTED: | | | 1 | 1/11/16 | | DRILL COM | IPANY: | Dri | lling Sc | olutions | | | B | ORI | NG F | 3_34 |
|------------------|-----------------|---------------|--------------|------------|-------------------|-------------------------|---------------------------------------|----------------------------------|---------------------|-----------|---------------------|--------------------------|-------------|-------|---|--|-------------------------------------|-----------------------|
| DATE | | | ED: | .— | | 11/11/1 | 6 | DRILLER: | Jason | | ED BY | : C.Colem | an | 5 | | | | N/A |
| | | | : 11 | - ۲ | | 13.U N/A | 11 | | | Hol | 1-30 10w Sta | am Auger | | ate | ± Up | on Com | oletion | NONE |
| ELE | | v 1: | | | N | J/A | | SAMPLING | METHOD: | 110 | <u>, 10W 316</u> | SS | | ŝ | Ū De | lay | | N/A |
| LATI | TUDE: | | | | | | | HAMMER 1 | YPE: | | Automa | itic | | BORIN | IG LOC | ATION: | | |
| LON | GITUDI | E: | | | | | | EFFICIENC | Y | | N/A | | | | | | | |
| STAT | ION: | 1 | N/A | | OFF | SET: _ | N/A | REVIEWED | BY: | | J. Fiely | / | | | | | | |
| REM | ARKS: | | | | <u> </u> | | | | | | | ~ | | 1 | | | | |
| Elevation (feet) | o Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | Asnh | MATE | RIAL DES | CRIPTION | J | USCS Classification | SPT Blows per 6-inch (SS | Moisture, % | STA | NDARD TES ⁻ N in bl Moisture STREN Qu | PENETR T DATA lows/ft © e • • 25 | ATION PL LL 50 Qp 4.0 | Additional Remarks |
| | | \propto | | | | FILL | Thickness = | 6 inches | | —7 | SM | | | | | | | |
| | | | | | | RESI (SM) | DUUM: Very with mica | / Dense Tan, | Black Silty S | | SM | 13-26-26 N=52 | | | | | >>@ |) |
| | | | M | | | (SM) | | an, Diack, Gra | ay Silly SANL | | SM | 7-11-17 N=28 | | | | | | |
| | | •.I••.I*` | \mathbb{X} | | | No Sa | ample Obtaiı | ned | | | | | | | | | >>@ |) |
| | | | | | | Dens | e Tan, Black | , Gray Silty S | AND (SM) | | SM | 13-19-19 | | | | | • | |
| | | | | | | Boring Groui Comp | g Terminate ndwater Not pletion | d at 10 feet Encountered | Upon Drilling | g | | N-30 | | | | | | |
| | | | | | | Pro | ofessiona | I Service Ir | ndustries, | Inc. | | P | ROJE | |).: | | 47245 | 1 |
| | F | | |) | | 95 Ke Te | Chastain nnesaw, lephone: | Road NW GA 30144 (770) 424 | , Suite 30 -6200 | 110. 1 | | P P L | ROJE | | | Rock Water M S | bridge Re ain Repla itone Mtr | acement |

| DATE | STAF | RTED: | | | 1 | 1/16/16 | | DRILL CO | MPANY: | Dri | lling Sc | olutions | | | R | ORII | NG | B-35 | |
|------------------|-----------------|-------------|-------------|------------|-------------------|------------------|----------------------------------|------------------------------------|--------------------------------|------------|---------------------|---------------------------|----------------------|-----------------------|---|--|-----------------------------------|------------------------|---------|
| DATE | COM | PLET | ED: | .— | | 11/16/1 | 6 | DRILLER: | Jason | | ED BY | : C.Colema | an | 5 | | | | D-00 | N1/A |
| | PLETIC | ON DE | PTI | н _ | | 4.0 ft | | | i: | | D-50 | • | | atei | ⊻ wr ▼ ⊔n | ne Driiir | 1g Netion | N | |
| | | KK: _ | | | • | N/A | | | | HO | llow Ste | em Auger | | Ň | V De | lav | | 11 | |
| | | | | | F | WA | | | | | Automa | tic | | BORI | | | | | |
| | | | | | | | | EFFICIEN | CY | , | N/A | | | DOIN | | | | | |
| STAT | ION: | N | J/A | | OFFS | SET: | N/A | REVIEWE |) BY: | | J. Fielv | / | | | | | | | |
| REM/ | RKS: | | | | _ | | | | | | | | | | | | | | |
| Elevation (feet) | ⊖ Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | Aanbo | | RIAL DES | CRIPTION | N | USCS Classification | SPT Blows per 6-inch (SS) | Moisture, % | | NDARD TES [®] N in bl Moisture STREN Qu | PENETR T DATA ows/ft @ 25 | ATION PL LL 50 Qp 4.0 | Additiona Remark | al S |
| | | | | | | FILL: | Very Dense ock fragmer | Black, Brow | n Silty SAND | D (SM) | SM | 16-20-30 | | | | | | 9 | |
| | | | | | | RESII Silty S | DUUM: Mec SAND (SM) | lium Dense 1 | lan, Red, Bro | own | | 6-9-11 | | | ø | | | | |
| | | | | | | Tan. L | .ight Pink, C | Gray | | | SM | N=20 | | | | | | | |
| | | | M | | | | | | | | | N=17 4-8-8 | | | | | | | |
| | | | .23 | | | Boring Grour | g Terminate Idwater Not | d at 10 feet Encountered | d Upon Drillin | ng | | N=16 | | | | | | | |
| | | | | | | Cave- | in at 4 Feet | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | F | | | |] | Pro 95 Kei | ofessiona Chastain nnesaw, | I Service I Road NW GA 30144 | ndustries, /, Suite 30 1 | Inc.)1 | | PF PF LC | ROJE ROJE DCA1 | CT NO CT: TION: | D.: | Rock Water M | 47245 bridge F ain Rep | 51 Road lacement | _ |
| 6 | | | | | | Tel | ephone: | (770) 424 | 1-6200 | | | | | | | S DeKa | tone Mt | n. tv. GA | _ |

L

| DATE | STA | RTED: | _ | | 1 | 1/16/16 | | DRI | | IPANY: | | Drilling So | olutions | | | | B | ORI | NG | B-36 |
|------------------|-----------------|-------------|-------------|------------|-------------------|-------------------------|-------------------------------------|-----------------------|---------------------------|---------------------|-----------------|---------------------|--------------------------|----------------------------------|-----------------------|------|---|---|-------------------------------|------------------------|
| | | PLET | ED: DTI | u — | | <u>11/16/1</u> 5.0 f | 6 | _ DRI | LLER: | Jason | | GGED B | C.Colem | an | 2 | | / Whi | e Drillir | | N/A |
| BENC | | | | - | | N/Δ | | | | |)· | Hollow St | | | ate | Ī | Upo | n Comp | letion | NONE |
| ELEV | | 4: | | | ١ | VA | | _ SAI | /PLING | METHO |)D: | 1011011-01 | SS | | 3 | Ī | Dela | ıy . | | N/A |
| LATI | TUDE: | | | | | | | HAI | MMER T | YPE: | | Automa | atic | | BOF | RING | | TION: | | |
| LONO | GITUD | E: | | | | | | EFF | ICIENC | Υ | | N/A | | | | | | | | |
| STAT | ION:_ | 1 | N/A | | _OFFS | SET: _ | N/A | RE\ | IEWED | BY: | | J. Fiel | у | | | | | | | |
| REM | ARKS: | | | | | | | | | | | | Î | | | | | | | |
| Elevation (feet) | o Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | Asnh | MAT | | DESC | CRIPTI | ON | USCS Classification | SPT Blows per 6-inch (SS | Moisture, % | | | DARD P TEST N in blo loisture 2 2 2 3 3 3 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 8 7 | ENETR DATA ws/ft @ 5 5 5 5 5 7 H, tsf % | PL LL 50 Qp 4.0 | Additional Remarks |
| | | | | | | FILL RESI SANE | Thickness DUUM: Me D (SM) | = 6 inc edium E | hes Dense Ta | an, Browi | n Silty | SM | 11-13-13 N=26 | | | | / | Ø | | |
| | - 5 - | | | | | | | | | | | SM | 8-8-10 N=18 | | | | | | | - |
| | | | | | | Tan, o | Jray, Blac | ¢ | | | | | 7-8-8 N=16 | | | | ¢ | | | |
| | | | | | | Boring Groui Comr | g Terminal ndwater No pletion | ed at 1 ot Enco |) feet untered | Upon Dr | illing | | 5-8-9 N=17 | | | | 9 | | | |
| | | | | | | Cave | in at 5 Fe | et | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | E | | | | 7 | Pro 95 Ke | ofession Chastai nnesaw | al Ser n Roa GA | vice In Id NW 30144 | idustrie , Suite | es, Inc. 301 | | P P L | ROJE ROJE OCA ⁻ | ECT I ECT: TION | NO.: | N | Rockl /ater M | 47245 oridge R ain Repl | ad Road lacement |
| 6 | | | | | | Те | lephone | : (770 | 0) 424 | -6200 | | | | | | _ | | S DeKa | tone Mt | n. hv. GA |

| DATE | STAF | RTED: | _ | | 1 | 1/16/16 | ; ; | DRILL COM | IPANY: | Drilli | ng So | olutions | | | B | ORI | | 3-37 | |
|------------------|-----------------|---------------|-------------|------------|-------------------|-----------------------|--|------------------------------------|--------------------------------------|----------|---------------------|--------------------------|----------------------|-----------------------|---|---|---|---------------------------|----|
| DATE | | | ED: | u — | | 11/16/ | <u>16</u> | | Jason | LOGGE | D BY | : C.Colem | an | <u>ب</u> | V Whi | ile Drillir | | 5 01 | /Δ |
| | | שט אוכ אעי | : 11 | - ۲ | | 4.01 | <u> </u> | | | U- | | m Augor | | ate | | n Com | pletion | NON | IE |
| FLEV | | | | | • | J/A | | SAMPI ING | METHOD. | TIOIIC | Sie Sie | SS | | ĺ Š [| V Dela | av | | N/ | /A |
| LATI | TUDE: | | | - | | | | HAMMER T | YPE: | Au | utoma | tic | | BORIN | | TION: | | | |
| LONG | SITUDI | E: | | | | | | EFFICIENC | Y | Ν | I/A | | | | | | | | _ |
| STAT | ION:_ | 1 | N/A | | _OFF8 | ЗЕТ: _ | N/A | REVIEWED | BY: | J. | Fiely | 1 | | | | | | | |
| REMA | ARKS: | | | | | | | | | | | | 1 | | | | | | |
| Elevation (feet) | o Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | - Asph | | RIAL DESC | CRIPTION | | USCS Classification | SPT Blows per 6-inch (SS | Moisture, % | STA × 0 | NDARD F TEST N in blo Moisture | PENETR DATA pws/ft @ 4 25 GTH, tsf # 2.0 | ATION PL LL 50 Qp 4.0 | Additional Remarks | |
| | | | | | | FILL: | Dense Brow | vn Silty SAND | (SM) | | SM | 11-10-24 N=34 | | | | | | | |
| | | | | | | RESI SANI | DUUM: Med C (SM) | ium Dense Re | ed, Brown Sil | lty | SM | 7-10-11 N=21 | | | 4 | | | | |
| | | | | | | Dens | e Red, Brow | n Silty SAND | (SM) | | SM | 8-17-14 N=31 | | | | | | | |
| | | | | | | Mediu (SM) | um Dense G | ray, Red, Brov | vn Silty SANI | D | SM | 4-12-10 | | | 6 | / | | | |
| | | | | | | Borin Grou Com | g Terminated ndwater Not pletion | d at 10 feet Encountered | Upon Drilling | | | IN-22 | | | | | | | |
| | | | | | | Cave | -in at 5 Feet | | dustrios | | | | | | | | | | |
| | F | | | | J | Pro 95 Ke Te | oressional Chastain Innesaw, (Iephone: | Road NW, GA 30144 (770) 424- | austries, li , Suite 301 -6200 | nc. 1 | | P P L | ROJE ROJE OCA1 | CT NC CT: TION: | D.: V | Rockl Vater Ma S | 47245 bridge R ain Repl tone Mtr | 1 oad acement n. | |

| DATE | STAF | TED: | | | 1 | 1/16/16 | | | COMP | ANY: | Dri | lling Sc | olutions | | | | BO | RIN | IG E | 3-38 | |
|------------------|-----------------|----------------|-------------|------------|-------------------|-------------------------|----------------------------------|------------------------------|------------------------|-------------------------|-----------|-----------------------|---------------------------|------------------------|-----------------------|---------------------------------------|--|--|----------------------------------|-----------------------|-----|
| | COM PLETIC | PLETI DN DE | ED: PTH | ۰ <u> </u> | | <u>11/16/1</u> 4.0 f | <u>6</u> t | DRILLE | ER: RIG: | Jason | | ied By D-50 | : C.Coler | nan | er L | $\overline{\nabla}$ | While | Drillin | g | N | J/A |
| BENC | HMAF | K: _ | | | | N/A | · | DRILLI | NG ME | THOD: | Но | llow Ste | em Auger | | Vate | Ţ | Upon (| Comp | letion | NO | NE |
| ELEV | ATION | l: | | | N | J/A | | SAMPL | ING M | ETHOD: | | 5 | SS | | 5 | <u> </u> | Delay | | | N | I/A |
| | UDE: | | | | | | | | ER TYI FNCY | PE: | | Automa N/A | atic | | BOR | ING L | OCAT | ION: | | | |
| STAT | ION: | | I/A | | OFFS | SET: | N/A | REVIEV | VED B | Y: | | J. Fiely | / | | | | | | | | |
| REMA | RKS: | | | | - | | | | | | | | | - | | | | | | | _ |
| Elevation (feet) | ⊐ Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | | MATE | rial di | ESCF | RIPTION | | USCS Classification | SPT Blows per 6-inch (SS) | Moisture, % | ST × | ANDAI T Ni Mois STF Qu | RD PEN EST D/ in blows sture 25 25 RENGT | NETRA ATA s/ft © I H, tsf X | PL LL 50 Qp 4.0 | Additional Remarks | |
| | | | X | | | Gray | Sand | ATHERED |) ROCI | K: Sampled | d as | | 11-50/2 | | | | | | >>@ | | |
| | | | Ø | | | | | | | | | | 50/4 | | | | | | >>@ | | |
| | | | M | | | RESI (SM) | DUUM: Loo | se Red, B | srown S | Silty SAND | | SM | 4-4-6 N=10 | | | T | | | | | |
| | | | | | | rocks | Im Dense B fragments | Frown Silty | / SANE |) (SM) with | ו | SM | 4-7-9 N=16 | | | | | | | | |
| | | | | | | Grour Comp | I dwater Not | Encounte | et ered Up | oon Drilling | 9 | | | | | | | | | | |
| | | | | | | Cave- | in at 4 Feet | I | | | | | | | | | | | | | |
| | | | | | | Pro | ofessiona | I Servic | e Ind | ustries 1 | | | | PROJ | | 40 - | | | 472451 | | |
| | F | | | | 7 | Pro 95 Ke | otessiona Chastain nnesaw, | I Servic Road N GA 301 | e Ind NW, \$ 144 | ustries, I Suite 301 | inc. 1 | | | Proje Proje Loca | ECT N ECT: TION | IO.: | Wat | Rockb ter Ma | 472451 oridge Ro ain Repla | oad cement | |
| 6 | | | | | J | Те | lephone: | (770) 4 | 124-6 | 200 | | | | | | | | St DeKall | one Mtn | . GA | |

| DATE | STAF | TED: | _ | | 1 | 1/11/16 | | DRIL | L COM | IPANY: | C | orilling So | olutions | | Î | | B | | | B-39 |
|------------------|-----------------|-------------|-------------|------------|-------------------|-----------------------|-----------------------------------|------------------------------|-------------------------|---------------|-------------|---------------------|----------------------------|---------------|--------------|------|--|--|-----------------------------------|-----------------------|
| | | | ED: | | | <u>11/11/1</u> | 6 + | _ DRIL | LER: | Jason | LOG | | C.Coler | nan | <u> </u> | | ⁷ Whi | le Drillir | | D 00 |
| | | | PII | - - | | 0.01 N/A | ι | | | |)· ⊢ | D-30 | em Auger | | ate | Ī | | n Com | pletion | NONE |
| | | : | | | Ν | J/A | | SAM | | METHOD | /. <u> </u> | | SS | | Š | Ī | Dela | ay | | N/A |
| LATIT | UDE: | | | | | | | HAM | MER T | YPE: | | Automa | atic | | BOF | RING | | TION: | | |
| LONG | ITUDE | : | | | | | | EFFI | CIENC | Y | | N/A | | | | | | | | |
| STAT | ION:_ | Ν | I/A | | OFFS | SET: _ | N/A | _ REVI | EWED | BY: | | J. Fiely | / | | | | | | | |
| REMA | ARKS: | | | | | | | | | | | | <u> </u> | | | | | | | |
| Elevation (feet) | o Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | - Asph | MAT | ERIAL | DESC | RIPTI | ON | USCS Classification | SPT Blows per 6-inch (SS | Moisture, % | | | DARD F TEST N in blc Ioisture | 2ENETR DATA ws/ft @ 5 5 6 TH, tsf # | ATION PL LL 50 Qp 4.0 | Additional Remarks |
| | | | | | | FILL: SANE | Medium [D (SM) wit | Dense Re h rock fra | ed, Brow agments | vn, Gray s | Silty | SM | 14-15-12 N=27 | 2 | | | | Q | | |
| | | | X | | | RESI SANI | DUUM: D D (SM) | ense Dar | k Gray, | Red, Bro | own Silty | SM | 9-16-17 N=33 | , | | | | | | |
| | | | | | | Mediu (SM) | um Dense | Tan, Re | d, Brow | n Silty S/ | AND | SM | 9-10-13 N=23 6-12-16 | | | | q | | | |
| | | | | | | Borin Grou Comp | g Termina ndwater N bletion | ted at 10 ot Encou | feet ntered l | Upon Dri | illing | | N=28 | | | | | | | |
| | | | | | | Cave | -in at 5 Fe | et al Serv | <i>v</i> ice In | dustrie | es. Inc. | | | PROJI | | NO.: | | | 47245 | 1 |
| | F | | | 2 | | 95 Ke Te | Chasta nnesaw lephone | in Road , GA 3 :: (770 | d NW, 0144) 424- | Suite | 301 | | I | PROJI LOCA | ECT: TION | l: | V | Rockl /ater Ma S | bridge R ain Repl tone Mt | oad acement n. |

| DATE | STAF | RTED: | | | 1 | 1/16/16 | | DRILL CON | IPANY: | Dri | lling So | olutions | | | R | ORII | | R_40 |
|------------------|----------------|-------------|-------------|------------|-------------------|---|---------------------------------|--|-----------------------------------|------------|---------------------|---------------------------|----------------------|-----------------------|--|--|--|------------------------------------|
| DATE | COM | PLET | ED: | .— | | 11/16/16 | | DRILLER: | Jason | | ED BY | : C.Colema | an | 5 | | | | |
| | PLETIC | | PT | н _ | | 50.0 ft | | DRILL RIG: | | | <u>)-50</u> | | | ate | ⊻ wi ▼ Un | on Comr | Ig Netion | |
| | | κκ: _ | | | | N/A I/A | | | | H0 | | em Auger | | Ň | ⊥ De | lav | | N/A |
| | | · | | | 1 | | | | | | Automa | atic | | BORI | | | | 107 |
| LONG | SITUDI | E: | | | | | | EFFICIENC | Y | | N/A | | | 2014 | .0 200 | | | |
| STAT | ION: | 1 | ٨/A | | OFFS | SET: N/A | 1 | REVIEWED | BY: | | J. Fiely | / | | | | | | |
| REM/ | ARKS: | | _ | | | | | | | | | | - | | | | | |
| Elevation (feet) | Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | MA | АТЕF | RIAL DESC | CRIPTION | N | USCS Classification | SPT Blows per 6-inch (SS) | Moisture, % | STA × | NDARD TES N in bl Moisture STREN Qu | PENETR T DATA ows/ft @ 25 | ATION PL LL 50 Qp | Additional Remarks |
| | - 0 - | | | | | FILL: Mediu | m Dei | nse Brown Sil | ty SAND (S | M) | SM | 12-16-12 | | | | | | |
| | - 5 - | | | | | RESIDUUM | : Very | Dense Gray | Silty SAND | (SM) | SM | 4-15-43 N=58 | | | | | >>© |) |
| | | | | | | PARTIALLY Gray Silty S | WEA AND * | THERED RO | OCK: Sample | ed as | | 50/3 | | | | | >>@ |) |
| | - 10 - | | | | | Boring Term | inated | d at 10 feet | | | | 50/0 | | | | | >>@ | |
| | | | | | | Groundwate Completion | r Not | Encountered | Upon Drillin | g | | | | | | | | |
| | - 15 - | | | | | likely require excavations. | blast | ing to remove | e in a trench | /11 | | | | | | | | |
| | - 20 - | | | | | | | | | | | | | | | | | |
| | - 25 - | | | | | | | | | | | | | | | | | |
| | - 30 - | | | | | | | | | | | | | | | | | |
| | - 35 - | - | | | | | | | | | | | | | | | | |
| | - 40 - | | | | | | | | | | | | | | | | | |
| | F | | | 7 | J | Profess 95 Chas Kennes Telepho | ional stain aw, (one: | Service In Road NW GA 30144 (770) 424 | ndustries, , Suite 30 -6200 | Inc.)1 | | PF PF LC | ROJE ROJE DCA1 | CT NO CT: TION: | D.: | Rock Nater M S DeKa | 47245 bridge Re ain Replatione Mtr tone Mtr | 1 oad acement 1. V. GA |

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| DATE | STAF | RTED: | | | 1 | 1/16/16 | | DRILL CON | IPANY: | Dri | lling Sc | olutions | | | B | ORIN | JG F | 3_41 |
|------------------|-----------------|---------------|-------------|------------|-------------------|------------------------------|--|-----------------------------|---------------|----------|---------------------|--------------------------|----------------------|-------------|--|--|---|-----------------------|
| DATE | | | ED: | | | 11/16/ | 16 # | DRILLER: | Jason | LOGG | | : C.Colem | an | <u>ب</u> | V Wh | ile Drillir | | 1 N/A |
| | | שט אוכ אעי | : 11 | - ۲ | | 10.0 N/A | 11 | | | 비 | J-DU | am Auger | | ate | Upd | on Comp | letion | NONE |
| ELEV | | | | | Ν | J/A | | SAMPLING | METHOD: | 110 | | SS | | Š | Del | ay | | N/A |
| LATI | TUDE: | | | | | | | HAMMER T | YPE: | | Automa | itic | | BORIN | G LOC/ | ATION: | | |
| LONO | GITUDI | E: | | | | | | EFFICIENC | Y | | N/A | | | | | | | |
| STAT | ION: | 1 | N/A | | OFFS | SET: _ | N/A | REVIEWED | BY: | | J. Fiely | / | | | | | | |
| REM | ARKS: | | | | <u> </u> | | | | | <u> </u> | | | 1 | 1 | | | | |
| Elevation (feet) | o Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | Asnh | | RIAL DESC | CRIPTION | | USCS Classification | SPT Blows per 6-inch (SS | Moisture, % | | NDARD F TEST N in blo Moisture STREN Qu | PENETR DATA Dws/ft @ 25 GTH, tsf # 2.0 | ATION PL LL 50 Qp 4.0 | Additional Remarks |
| | | | | | | FILL: rock 1 | Medium De fragments | nse Gray Silty | SAND (SM) | with | SM | 21-14-15 N=29 | | | | | | |
| | | | | | | RESI (SM) | DUUM: Den | se Red, Brow | n Silty SAND | | SM | 8-13-21 N=34 | | | | | | |
| | | | | | | Mediu | um Dense R | ed, Brown Silt | y SAND (SM |) | SM | 10-12-16 N=28 | | | | | | |
| | - 10 - | | | | | Borin Grou Com Cave | g Terminate ndwater Not bletion -in at 5 Feet | d at 10 feet Encountered | Upon Drilling | I | | N=26 | | | | | | |
| | | | | | | Pro | ofessiona | I Service In | dustries. I | nc. | | P | ROJE | | | | 47245 | 1 |
| | F | | | | | 95 Ke Te | Chastain Chastain nnesaw, lephone: | GA 30144 (770) 424 | -6200 | nc. 1 | | PI PI L(| ROJE ROJE DCA1 | CT: ION: | 0.: V | Rockl Vater Ma S | 4/245 oridge Ro ain Repla tone Mtr | acement |



GENERAL NOTES

SAMPLE IDENTIFICATION

The Unified Soil Classification System (USCS), AASHTO 1988 and ASTM designations D2487 and D-2488 are used to identify the encountered materials unless otherwise noted. Coarse-grained soils are defined as having more than 50% of their dry weight retained on a #200 sieve (0.075mm); they are described as: boulders, cobbles, gravel or sand. Fine-grained soils have less than 50% of their dry weight retained on a #200 sieve; they are defined as silts or clay depending on their Atterberg Limit attributes. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size.

DRILLING AND SAMPLING SYMBOLS

- SFA: Solid Flight Auger typically 4" diameter flights, except where noted.
- HSA: Hollow Stem Auger typically 3¼" or 4¼ I.D. openings, except where noted.
- M.R.: Mud Rotary Uses a rotary head with Bentonite or Polymer Slurry
- R.C.: Diamond Bit Core Sampler
- H.A.: Hand Auger
- P.A.: Power Auger Handheld motorized auger

SOIL PROPERTY SYMBOLS

- SS: Split-Spoon 1 3/8" I.D., 2" O.D., except where noted.
 - ST: Shelby Tube 3" O.D., except where noted.
- RC: Rock Core
- TC: Texas Cone
- 🕅 BS: Bulk Sample
- PM: Pressuremeter
- CPT-U: Cone Penetrometer Testing with Pore-Pressure Readings
- N: Standard "N" penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2-inch O.D. Split-Spoon.
- N₆₀: A "N" penetration value corrected to an equivalent 60% hammer energy transfer efficiency (ETR)
- Q_u: Unconfined compressive strength, TSF
- Q_p: Pocket penetrometer value, unconfined compressive strength, TSF
- w%: Moisture/water content, %
- LL: Liquid Limit, %
- PL: Plastic Limit, %
- PI: Plasticity Index = (LL-PL),%
- DD: Dry unit weight, pcf
- $\underline{\Psi}, \underline{\nabla}, \underline{\Psi}$ Apparent groundwater level at time noted

RELATIVE DENSITY OF COARSE-GRAINED SOILS ANGULARITY OF COARSE-GRAINED PARTICLES

| Relative Density | N - Blows/foot | Description | Criteria |
|-----------------------|--------------------|-------------|--|
| Very Loose | 0 - 4 | Angular: | Particles have sharp edges and relatively plane sides with unpolished surfaces |
| Loose Medium Dense | 4 - 10 10 - 30 | Subangular: | Particles are similar to angular description, but have |
| Dense Verv Dense | 30 - 50 50 - 80 | Subrounded: | Particles have nearly plane sides, but have |
| Extremely Dense | 80+ | Rounded: | Particles have smoothly curved sides and no edges |

GRAIN-SIZE TERMINOLOGY

PARTICLE SHAPE

Modifier:

>12%

| Size Range | Description | Criteria |
|-------------------------------------|---|---|
| Over 300 mm (>12 in.) | Flat: | Particles with width/thickness ratio > 3 |
| 75 mm to 300 mm (3 in. to 12 in.) | Elongated: | Particles with length/width ratio > 3 |
| 19 mm to 75 mm (¾ in. to 3 in.) | Flat & Elongated: | Particles meet criteria for both flat and |
| 4.75 mm to 19 mm (No.4 to 3/4 in.) | | elongated |
| 2 mm to 4.75 mm (No.10 to No.4) | | |
| 0.42 mm to 2 mm (No.40 to No.10) | <u>RELATIVE I</u> | PROPORTIONS OF FINES |
| 0.075 mm to 0.42 mm (No. 200 to No. | 40) Descripti | ve Term % Dry Weight |
| 0.005 mm to 0.075 mm | | Trace: < 5% |
| <0.005 mm | | With: 5% to 12% |
| | Size Range Over 300 mm (>12 in.) 75 mm to 300 mm (3 in. to 12 in.) 19 mm to 75 mm (¾ in. to 3 in.) 4.75 mm to 19 mm (No.4 to ¾ in.) 2 mm to 4.75 mm (No.10 to No.4) 0.42 mm to 2 mm (No.40 to No.10) 0.075 mm to 0.42 mm (No. 200 to No. 0.005 mm to 0.075 mm <0.005 mm | Size Range Description Over 300 mm (>12 in.) Flat: 75 mm to 300 mm (3 in. to 12 in.) Elongated: 19 mm to 75 mm (¾ in. to 3 in.) Flat & Elongated: 4.75 mm to 19 mm (No.4 to ¾ in.) Flat & Elongated: 2 mm to 4.75 mm (No.10 to No.4) RELATIVE I 0.42 mm to 2 mm (No.40 to No.10) Description 0.005 mm to 0.42 mm (No. 200 to No.40) Description <0.005 mm |



GENERAL NOTES

(Continued)

CONSISTENCY OF FINE-GRAINED SOILS

| <u>Q_U - TSF</u> | <u>N - Blows/foot</u> | <u>Consistency</u> |
|----------------------------|-----------------------|---------------------|
| 0 - 0.25 | 0 - 2 | Very Soft |
| 0.25 - 0.50 | 2 - 4 | Soft |
| 0.50 - 1.00 | 4 - 8 | Firm (Medium Stiff) |
| 1.00 - 2.00 | 8 - 15 | Stiff |
| 2.00 - 4.00 | 15 - 30 | Very Stiff |
| 4.00 - 8.00 | 30 - 50 | Hard |
| 8.00+ | 50+ | Verv Hard |

MOISTURE CONDITION DESCRIPTION

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

RELATIVE PROPORTIONS OF SAND AND GRAVEL Descriptive Term ____% Dry Weight ____

| <u>ive Term</u> | % Dry Weight | | |
|-----------------|--------------|--|--|
| Trace: | < 15% | | |
| With: | 15% to 30% | | |
| Modifier: | >30% | | |

STRUCTURE DESCRIPTION

| Description | Criteria | Description | Criteria |
|--------------------|---|--------------------|---|
| Stratified: | Alternating layers of varying material or color with | n Blocky: | Cohesive soil that can be broken down into small |
| | layers at least ¼-inch (6 mm) thick | | angular lumps which resist further breakdown |
| Laminated: | Alternating layers of varying material or color with | h Lensed: | Inclusion of small pockets of different soils |
| | layers less than ¼-inch (6 mm) thick | Layer: | Inclusion greater than 3 inches thick (75 mm) |
| Fissured: | Breaks along definite planes of fracture with little | Seam: | Inclusion 1/8-inch to 3 inches (3 to 75 mm) thick |
| | resistance to fracturing | | extending through the sample |
| Slickensided: | Fracture planes appear polished or glossy, sometimes striated | Parting: | Inclusion less than 1/8-inch (3 mm) thick |
| | | | |

SCALE OF RELATIVE ROCK HARDNESS

| <u>Q_U - TSF</u> | <u>Consistency</u> |
|----------------------------|--------------------|
| 2.5 - 10 | Extremely Soft |
| 10 - 50 | Very Soft |
| 50 - 250 | Soft |
| 250 - 525 | Medium Hard |
| 525 - 1,050 | Moderately Hard |
| ,050 - 2,600 | Hard |
| >2.600 | Verv Hard |

ROCK VOIDS

| <u>Voids</u> | Void Diameter |
|--------------|---------------------------------|
| Pit | <6 mm (<0.25 in) |
| Vug | 6 mm to 50 mm (0.25 in to 2 in) |
| Cavity | 50 mm to 600 mm (2 in to 24 in) |
| Cave | >600 mm (>24 in) |

ROCK QUALITY DESCRIPTION

| Rock Mass Description | RQD Value | Slight |
|-----------------------|--------------|--------|
| Excellent | 90 -100 | |
| Good | 75 - 90 | |
| Fair | 50 - 75 | |
| Poor | 25 -50 | |
| Very Poor | Less than 25 | |
| | | |

ROCK BEDDING THICKNESSES

| Description | Criteria | | |
|--------------------|---|--|--|
| Very Thick Bedded | Greater than 3-foot (>1.0 m) | | |
| Thick Bedded | 1-foot to 3-foot (0.3 m to 1.0 m) | | |
| Medium Bedded | 4-inch to 1-foot (0.1 m to 0.3 m) | | |
| Thin Bedded | 1¼-inch to 4-inch (30 mm to 100 mm) | | |
| Very Thin Bedded | ¹ / ₂ -inch to 1 ¹ / ₄ -inch (10 mm to 30 mm) | | |
| Thickly Laminated | 1/8-inch to ½-inch (3 mm to 10 mm) | | |
| Thinly Laminated | 1/8-inch or less "paper thin" (<3 mm) | | |

GRAIN-SIZED TERMINOLOGY

| (Typically Sedi <u>Component</u> | mentary Rock) <u>Size Range</u> | | |
|-------------------------------------|---------------------------------|--|--|
| Very Coarse Grained | >4.76 mm | | |
| Coarse Grained | 2.0 mm - 4.76 mm | | |
| Medium Grained | 0.42 mm - 2.0 mm | | |
| Fine Grained | 0.075 mm - 0.42 mm | | |
| Very Fine Grained | <0.075 mm | | |

DEGREE OF WEATHERING

Slightly Weathered: Rock generally fresh, joints stained and discoloration extends into rock up to 25 mm (1 in), open joints may contain clay, core rings under hammer impact.
 Weathered: Rock mass is decomposed 50% or less, significant portions of the rock show discoloration and weathering effects, cores cannot be broken by hand or scraped by knife.
 Highly Weathered: Rock mass is more than 50% decomposed, complete discoloration of rock fabric, core may be extremely broken and gives clunk sound when struck by hammer, may be shaved with a knife.

SOIL CLASSIFICATION CHART

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

| MAJOR DIVISIONS | | SYMBOLS | | TYPICAL | |
|--|--|----------------------------------|--------|--|---|
| | | GRAPH | LETTER | DESCRIPTIONS | |
| | GRAVEL AND | CLEAN GRAVELS | | GW | WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES |
| | GRAVELLY SOILS | (LITTLE OR NO FINES) | | GP | POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES |
| COARSE GRAINED SOILS | MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE | GRAVELS WITH FINES | | GM | SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES |
| | | (APPRECIABLE AMOUNT OF FINES) | | GC | CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES |
| MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE | SAND AND SANDY SOILS | CLEAN SANDS | | SW | WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES |
| | | (LITTLE OR NO FINES) | | SP | POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES |
| | MORE THAN 50% OF COARSE | SANDS WITH FINES | | SM | SILTY SANDS, SAND - SILT MIXTURES |
| | PASSING ON NO. 4 SIEVE | (APPRECIABLE AMOUNT OF FINES) | | SC | CLAYEY SANDS, SAND - CLAY MIXTURES |
| | | | | ML | INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY |
| FINE SILTS AND GRAINED CLAYS SOILS | SILTS AND CLAYS | LIQUID LIMIT LESS THAN 50 | | CL | INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS |
| | | | | OL | ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY |
| MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE | SILTS AND CLAYS | LIQUID LIMIT GREATER THAN 50 | | МН | INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS |
| | | | | СН | INORGANIC CLAYS OF HIGH PLASTICITY |
| | | | | ОН | ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS |
| HIGHLY ORGANIC SOILS | | | PT | PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS | |

