Appendix G

Geotechnical Data

GEOTECHNICAL DATA REPORT

ASHTON HYDROELECTRIC DEVELOPMENT
STREAMDIVER TURBINE CONCEPT
CUMBERLAND, RHODE ISLAND

Prepared for:

New England Hydropower Company
Beverly, Massachusetts

Prepared by:

Kleinschmidt Associates

January 2022

Kleinschmidt

GEOTECHNICAL DATA REPORT

To: Mr. Michael Kerr
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From: Helen Russell, E.I.
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Date: January 7, 2022

Re: **Geotechnical Data Report**
Ashton Hydroelectric Development – StreamDiver Concept
Cumberland, Rhode Island
Project No. 4161008.01

1.0 INTRODUCTION AND PURPOSE

Kleinschmidt Associates (Kleinschmidt) is pleased to present this Geotechnical Data Report to New England Hydropower Company, LLC (NEHC) to summarize geotechnical investigation data obtained at the Ashton Dam site (Site) in Cumberland, Rhode Island. The investigation will be used to support the design and construction of the proposed Ashton Hydroelectric Project with the Voith StreamDiver turbine concept (Project). Geotechnical explorations and laboratory testing were conducted in general accordance with Kleinschmidt's Proposals for Engineering Services, which were submitted to NEHC on August 31, 2020 and November 9, 2020.

The purpose of this geotechnical investigation was to obtain information on the subsurface conditions at/near the left (looking downstream) end of the existing dam, proximate to the footprint of the proposed development. Data from this investigation will inform the design and construction of the Project, including seepage analyses, seepage cutoff evaluation/design, cofferdam design, preliminary dewatering estimates, and evaluation of foundation support and subgrade preparation.

Geotechnical explorations were performed in July and September 2021, and geotechnical laboratory testing was completed in July and October 2021. This report briefly summarizes

applicable project background information, presents the geotechnical exploration and laboratory testing programs, and describes the subsurface conditions encountered. The contents of this report are subject to the attached Limitations (Attachment 1).

2.0 PROJECT INFORMATION

The following subsections identify the project datum and provide general descriptions of the Site, the regional geologic setting, and the proposed development.

2.1 Project Datum

Elevations reported herein are based on the North American Vertical Datum (NAVD) of 1988. Elevations are reported in units of feet.

Any references in this report to "left" and "right" are based on looking downstream.

2.2 Existing Conditions

The existing Ashton Dam is located on the Blackstone River in the towns of Cumberland and Lincoln, in Providence County, Rhode Island. The dam is classified as a low hazard dam by the Rhode Island Department of Environmental Management (RIDEM). The dam was constructed in 1885 and consists of a stone-masonry gravity dam with a main spillway, a low-level gate structure, a lower-level spillway (with a crest approximately 2.5 feet below the crest of the main spillway), and stone-masonry abutments on each side of the river.

An 1894 Commissioning Report describes the dam's foundation as a "well-bonded rubble-masonry laid close in cement mortar." Wood sheet piling was reportedly installed across the width of the river/dam to create a water-tight work area, but the final depth and/or extents of the timber cofferdam was not recorded. The foundation of the downstream apron reportedly consists of concrete and rubble masonry laid on top of timbers to create a mattress. The upstream end was reportedly bolted to the dam, while the downstream end was fixed in place with a steel sheet pile, with final depth unknown.

The dam spans approximately 260 feet across the river and has high and low spillway crest elevations of +73.6 feet and +71 feet, respectively. The total impoundment surface area is approximately 35 acres, which provides a storage capacity of about 200 acre-feet at normal pond/flow conditions.

The existing dam has remained in satisfactory condition for over 130 years and has survived a flood comparable to the 100-year flood without noticeable structural damage.

2.3 Regional Geologic Setting

The Site is situated within the southern portion of the Blackstone River basin, where the surficial terrain has been characterized and shaped by erosional and glacial processes. The near-surface soils in the region typically consist of glacial outwash material and glacial till blanketing the bedrock. Near the river, however, the near-surface soils are normally characterized by alluvial deposits consisting of stratified silt, sand, and gravel.

According to the Bedrock Geologic Map of Rhode Island (Hermes, Gromet, and Murray, 1994), bedrock in this region is characterized as metamorphic rock of the Blackstone Group and typically consists of quartzite, greenstone, and/or schist. Bedrock is mapped as dipping sharply to the east at angles of 45 to 80 degrees from horizontal.

2.4 Proposed Development

The proposed development (i.e., Project) involves the removal of the lower-level (auxiliary) spillway and construction of a new concrete powerhouse that will house four (4) new Voith StreamDiver turbines. The proposed development will also include a new control building, a transformer and containment pad, a crushed stone access road and parking area, and a bioretention basin, all to be constructed along the left riverbank.

The new powerhouse will be approximately 54 feet wide and will span between the existing low-level gate structure and the left abutment wall. The structure will include upstream and downstream training walls and aprons, with riprap likely to be placed upstream and downstream of the aprons to provide additional erosion protection.

The new powerhouse, training walls, and associated aprons will require excavation of approximately 8.5 to 12.5 feet below the existing river bottom to achieve the target subgrade/bottom of foundation elevation of about +51.5 feet. This is approximately 28.5 feet below the left riverbank/top of retaining wall and about 22 feet below the normal pond/river elevation of +73.6 feet. The foundation details are still being evaluated, but the design is considering a mat (concrete) foundation to be founded on piles or upon native alluvial soils.

3.0 GEOTECHNICAL EXPLORATIONS & LABORATORY TESTING

The primary components of the geotechnical exploration and laboratory testing programs, as completed, are described in the following subsections.

3.1 2021 Geotechnical Explorations

3.1.1 Sonic Borings

In September of 2021, Kleinschmidt subcontracted Cascade Drilling (Cascade) to drill three (3) angled test borings (designated as B-01-21, B-02-21, and B-03-21) and one (1) vertical test boring (designated as B-1V-21) via a track-mounted TerraSonic TSi 150CC Compact-Crawler drill rig. Kleinschmidt selected the boring locations in relation to existing Site features and the proposed development, and under the constraints of drill rig access and any underground or overhead utility conflicts. The as-drilled boring locations are depicted on Figure 1.

The angled test borings were advanced 126 to 150 feet at angles ranging from 40 to 45 degrees relative to horizontal, which corresponds to vertical boring depths of about 89 to 100 feet below the ground surface (bgs). The vertical test boring (B-1V-21) was advanced to a depth of 68 feet bgs.

The borings were performed using sonic drilling methods using a 4-inch inside-diameter core barrel and 6-inch outer-diameter casing. Each soil/rock core retrieved was photographed, and grab samples were collected at the discretion of the Kleinschmidt engineer on-site. Kleinschmidt directed the drilling, testing, and sampling activities and logged the subsurface conditions encountered at each boring location.

Upon completion, each sonic boring was backfilled with cement-bentonite grout placed via tremie methods. Selected soil samples were sealed in moisture-tight containers and returned to Kleinschmidt's office for further review, classification, and/or geotechnical laboratory testing. Detailed records of the drilling, sampling/testing, and subsurface conditions observed at each test boring location are provided on the attached Sonic Boring Logs (Attachment 2A).

3.1.2 Drive-and-Wash Borings

In July of 2021, Kleinschmidt subcontracted Northern Test Boring (NTB) to drill three (3) vertical geotechnical test borings (designated as B-04-21, B-05-21, and B-06-21) via a track-mounted Diedrich D50 drill rig. Kleinschmidt selected the boring locations in relation to existing Site features and the proposed development, and under the constraints of drill rig access and any underground or overhead utility conflicts. The as-drilled boring locations are depicted on Figure 1.

These borings were advanced to depths ranging from about 37 to 70 feet bgs via drive-and-wash drilling methods using 4-inch inside-diameter flush-joint steel casing, a roller bit, and water. As the borings were advanced, standard penetration tests (SPTs) were conducted at regular intervals and soil samples were obtained via 2-inch outside-diameter split-spoon samplers driven by a 140-pound automatic hammer. SPTs were performed in general accordance with ASTM D1586, Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils. Kleinschmidt directed the drilling, testing, and sampling activities and logged the subsurface conditions encountered at each boring location. Detailed records of the drilling, testing/sampling, and subsurface conditions observed at each boring location are provided on the attached Drive-and-Wash Boring Logs (Attachment 2B).

Upon completion, boring B-04-21 was backfilled with cement-bentonite grout placed via tremie methods. Borings B-05-21 and B-06-21 were restored as traditional standpipe piezometers. The Piezometer Construction Diagrams (Attachment 3) provide details of each piezometer installation.

Selected soil samples were sealed in moisture-tight containers and returned to Kleinschmidt's office for further review, classification, and/or geotechnical laboratory testing.

3.1.3 As-Drilled Survey

NEHC subcontracted DGT Associates (DGT) to survey the horizontal location and elevation of each boring and piezometer upon completion of the geotechnical exploration program. Vertical elevations including the ground surface, the top of riser (TOR), and/or the rim of the protective casing were surveyed to an accuracy of 0.01 feet.

3.2 2021 Geotechnical Laboratory Testing

Kleinschmidt selected representative soil samples for geotechnical laboratory testing. Kleinschmidt subcontracted Soil Metrics, LLC to perform the testing. The following tests were completed:

- 8 moisture contents (ASTM D2216), and
- 8 particle-size analyses (washed sieve only) (ASTM D422).

Geotechnical laboratory testing was performed in general accordance with ASTM procedures. The results are summarized in Table 1 (attached). Test results are provided in Attachment 4.

4.0 SUBSURFACE CONDITIONS

The following subsections briefly describe the soil, bedrock, and groundwater conditions encountered at the site, based on results of the geotechnical explorations and laboratory testing. Detailed descriptions of the conditions observed at each test boring are provided on the attached Boring Logs (Attachment 2). Figures 2 and 3 (attached) provide Interpreted Subsurface Profiles along/through the footprint of the proposed development.

4.1 Soils

The overburden soils encountered at the exploration locations appear to be generally consistent with the regional geologic maps/published data described herein (Section 2.3). The primary soil strata encountered are briefly described in the paragraphs below.

4.1.1 Existing Fill

Existing Fill materials were encountered at the ground surface at each test boring location. The Existing Fill extended to depths ranging from about 9 to 11 feet bgs (vertical) at the exploration locations. It is our understanding that there used to be a canal along the left bank of the river, land-side of the existing shoreline stone retaining wall.

Most of the Existing Fill material was described as brown to dark brown silt (ML), sandy silt (ML), silty sand (SM), or sand (SW) with trace to some gravel-sized particles and

occasional cobbles, boulders, and organics. The Existing Fill is interpreted to be re-worked alluvium that was likely sourced from local/nearby areas.

In boring B-02-21, rock fill and/or boulders were encountered from approximately 3.5 to 10.5 feet bgs (4.5 to 15 feet of angled drilling). Similarly, in boring B-04-21, a layer of gravel with sand (GW) and occasional cobbles was encountered from about 5 to 10 feet bgs. These coarse granular fill/rock fill materials are likely associated with backfilling of the former canal.

The Existing Fill was described generally as loose to medium dense based on SPT N-values that ranged from 4 to 11. The average N-value was about 9.

4.1.2 Native Alluvium

Native soils typically described primarily as brown to gray sand with trace amounts of silt and trace to some gravel (SW/SP) and/or silty sand (SM) were encountered beneath the Existing Fill at each boring location. This stratum includes occasional layers of gravel with some sand and trace silt (GP). This stratum also contains occasional cobbles and boulders and is interpreted to be Native Alluvium. The Alluvium extended to the termination depths of 70 feet bgs and 37 feet bgs, respectively, in borings B-04-21 and B-05-21; to 56 feet bgs at boring B-06-21; to 64 feet bgs in boring B-1V-21; and to depths ranging between 86 and 89 feet bgs (121 to 134.5 feet of angled drilling) in the three angled sonic borings (B-01-21, B-02-21, and B-03-21).

The Alluvium was described as loose to dense based on N-values ranging from 5 to 46. The average N-value was about 17. Eight (8) particle-size analyses indicate that the Alluvium is comprised of about 2 to 49% gravel, 43 to 86% sand, and 1 to 25% fines (silt/clay). The results of eight (8) moisture content tests ranged from 7.5 to 18.7%.

4.1.3 Glacial Till

Native soil described as gray silty sand with some angular gravel (SM) was encountered beneath the Alluvium at a depth of 89 feet bgs (131 feet of angled drilling) at boring B-01-21. This stratum is interpreted to be Glacial Till.

4.2 Bedrock

Bedrock was encountered in the three angled test borings at depths ranging between 86 and 93 feet bgs (121 and 136.5 feet of angled drilling). These depths correspond to top

of rock elevations of about -7.7 feet to -11.7 feet beneath the left side of the river. Bedrock was encountered and/or interpreted to have been encountered based on practical refusal to further penetration in borings B-1V-21 and B-06-21 at depths of 64 and 56 feet bgs, respectively. These depths correspond to top of rock elevations of about +16.5 feet and +22.2 feet along the shoreline, land-side of the existing retaining wall. The interpreted top of bedrock depths/elevations are depicted on Figures 1, 2, and 3.

In general, the top of the bedrock was found to be slightly to moderately weathered but became less weathered/more competent with increasing depth bgs. The bedrock was described as gray, hard, and fractured to severely fractured.

4.3 Groundwater

Wet soils and/or groundwater were encountered in borings B-01-21, B-02-21, B-03-21, and B-4-21 at depths ranging between 8.5 and 11.5 feet bgs (vertically). These depths correspond to elevations ranging between +66 and +74 feet. Short-term (i.e., at time of drilling) observations of wet soils and/or groundwater in test borings should be considered approximate. Kleinschmidt estimates that this investigation occurred during a period of seasonally normal groundwater. Site groundwater levels should be expected to fluctuate with changes to the water level in the Blackstone River, seasonally, and in response to precipitation events, construction activity, site use, and adjacent site use.

Going forward, the depth to groundwater can be measured in prior wells/piezometers installed by others (see below) and the new piezometers (B-05-21 and B-06-21) installed as part of this investigation.

5.0 Prior Investigations and Testing (By Others)

In 2016, Ransom Consulting (Ransom) completed a limited geotechnical/environmental investigation consisting of three (3) borings along the left bank of the Blackstone River, proximate to the existing Ashton Dam. Figure 1 shows the location of the prior Ransom borings in relation to the currently proposed development. The 2016 boring logs are provided in Attachment 5.

Subsurface conditions encountered within the borings indicate that the area consists of fill soils ranging in thickness from 8 to 15 feet, overlying a native deposit of loose to dense alluvium consisting of silt, sand, and gravels. Near a depth of 10 to 15 feet bgs, at an elevation of +66 feet (NAVD 88), dense to very dense sand and gravel was encountered.

This material was approximately 5 feet thick and reported high SPT N-values. Marginal sample recovery prevented full classification of the soils. Minimal laboratory testing was performed on samples, leading to partial characterization of these soils.

Underlying this dense alluvium is a loose to medium dense sand with minimal gravel. The deepest boring was advanced to 49 feet bgs, at an approximate elevation of +28.2 feet. Split-spoon sampling at this depth indicated practical refusal to further penetration. This refusal is/was interpreted to be the probable top of bedrock.

6.0 DISCUSSION

Key findings from this investigation are summarized as follows:

- The Native Alluvium appears to consist primarily of relative "clean" (i.e., minimal fines content) sand with variable amounts of gravel. These soils are estimated to be quite permeable.
- No continuous layers of low-permeability soil were encountered at depth.
- The top of bedrock appears to slope down fairly steeply (and/or step down in a terraced fashion) from left to right. A terraced bedrock surface is exposed along the existing bike path and railroad tracks just to the west of the Project area.
- The top of bedrock also appears to slope or steep down gradually from downstream to upstream, proximate to the existing dam.

The findings from this investigation (and prior investigations/testing by others) will be used to inform the design and construction of the Project, including seepage analyses, seepage cutoff evaluation/design, cofferdam design, preliminary dewatering estimates, and evaluation of foundation support and subgrade preparation.

Attached:

Figures

Tables

Attachment 1: Limitations

Attachment 2: 2021 Boring Logs

- Attachment 2A: Sonic Borings
- Attachment 2B: Drive-and-Wash Borings

Attachment 3: 2021 Piezometer Construction Diagrams

Attachment 4: 2021 Geotechnical Laboratory Testing

Attachment 5: Prior Investigation(s) and Testing by Others

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FIGURES

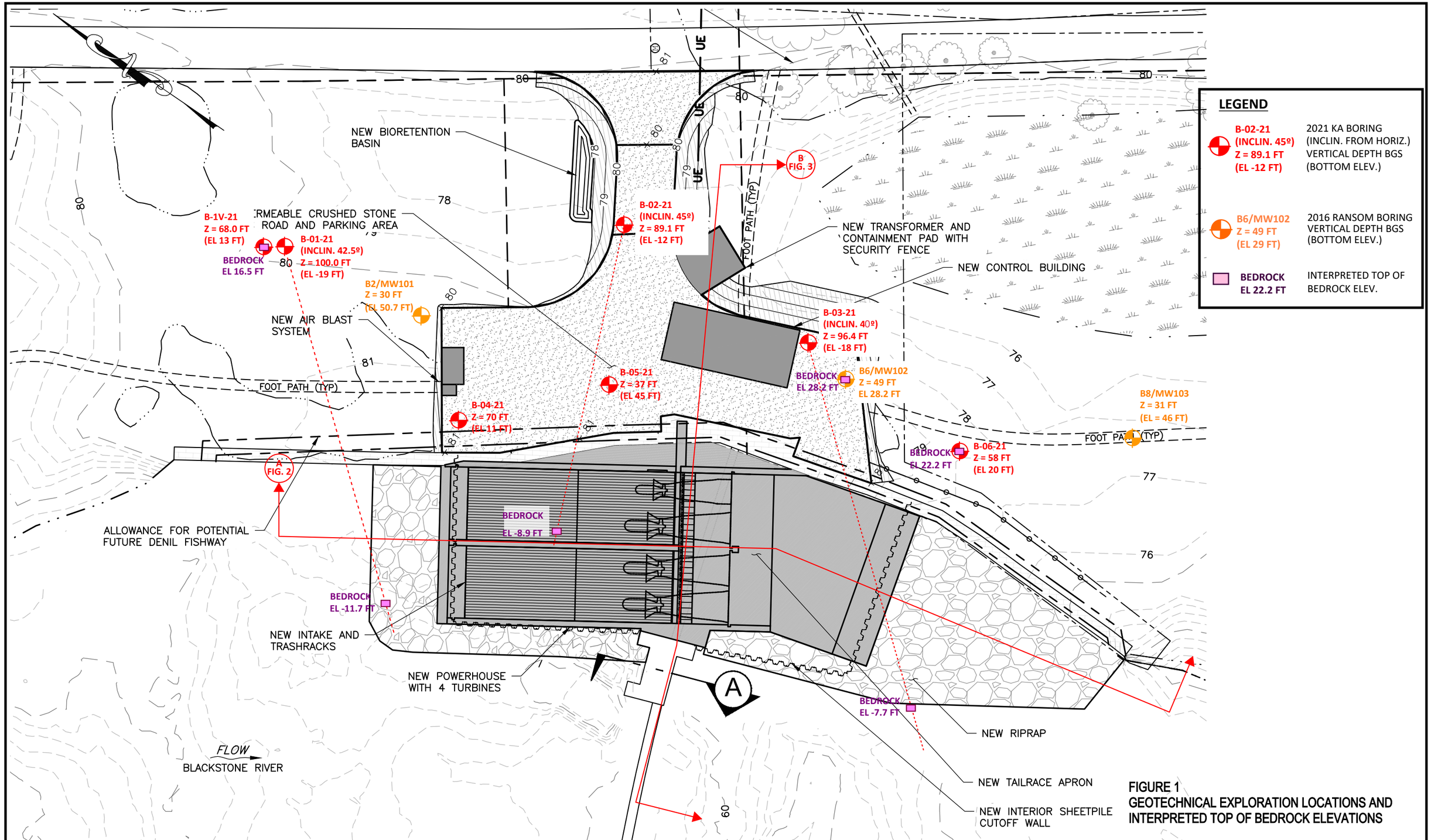

FIGURE 1
GEOTECHNICAL EXPLORATION LOCATIONS AND INTERPRETED TOP OF BEDROCK ELEVATIONS

ASHTON HYDROELECTRIC DEVELOPMENT PROJECT
CUMBERLAND, RHODE ISLAND
4161008

Kleinschmidt

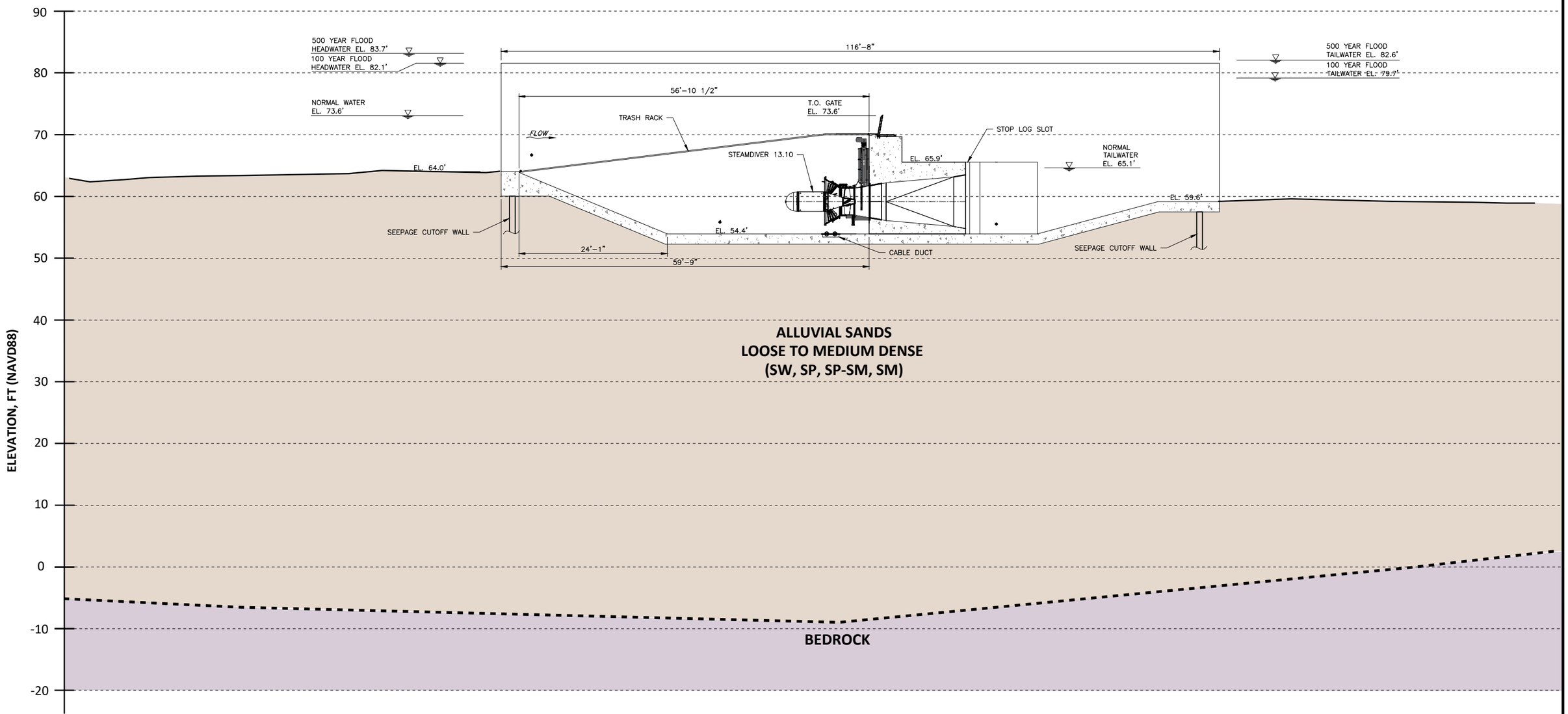

FIGURE 2
INTERPRETED SUBSURFACE PROFILE, SECTION A

ASHTON HYDROELECTRIC DEVELOPMENT PROJECT
CUMBERLAND, RHODE ISLAND
4161008

Kleinschmidt

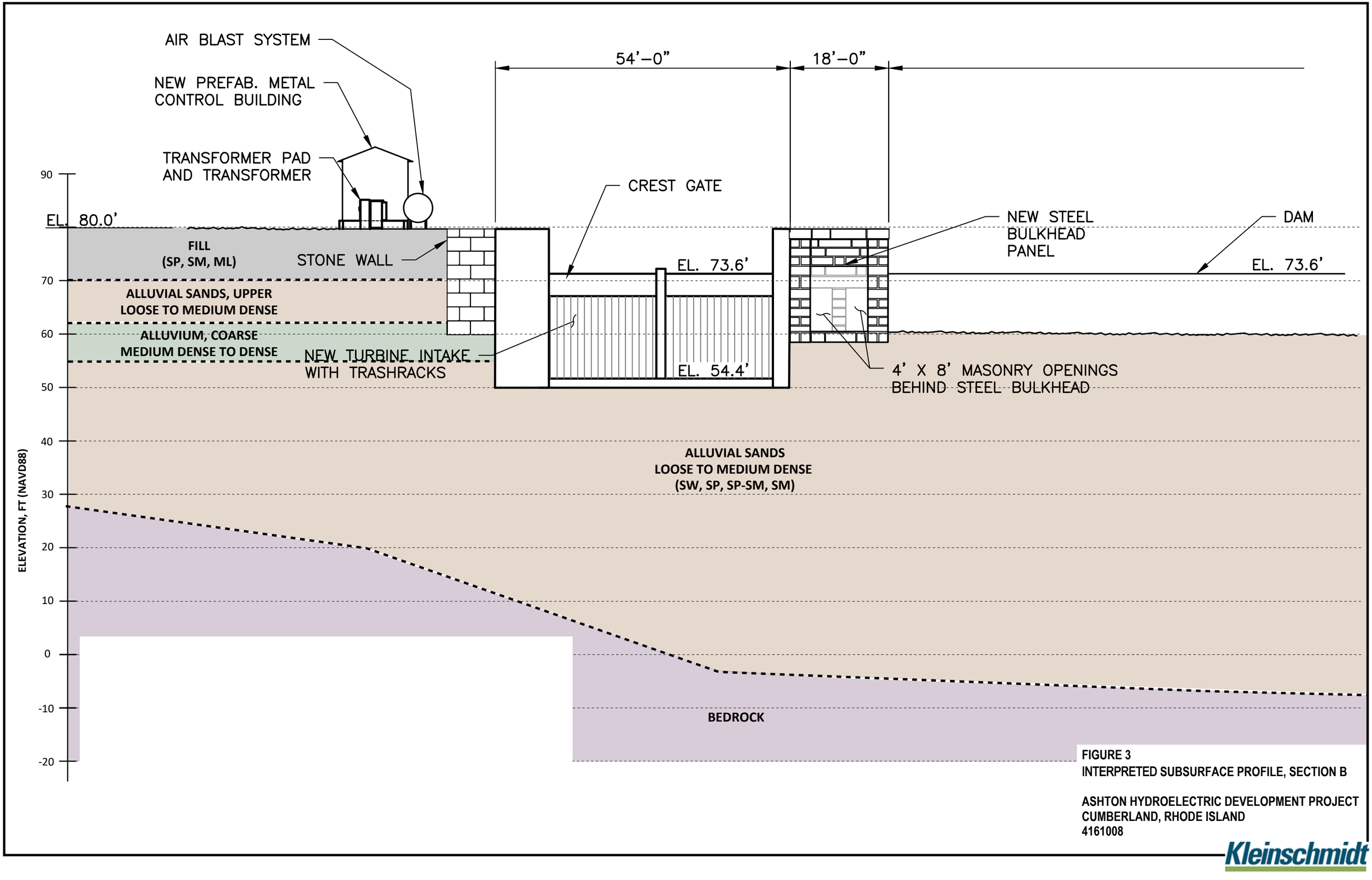

FIGURE 3
INTERPRETED SUBSURFACE PROFILE, SECTION B

ASHTON HYDROELECTRIC DEVELOPMENT PROJECT
CUMBERLAND, RHODE ISLAND
4161008

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TABLES

Table 1
Summary of Geotechnical Laboratory Testing Data

Exploration Information		Sample Information				Laboratory Testing Data / Results							
Type	No.	No.	Depth Interval (ft bgs)	Primary Stratum	USCS D 2487 D 2488	Water Content D 2216 (%)	Organic Content D 2974 (%)	Particle-Size Analysis D 422			Atterberg Limits D4318		
								Gravel (%)	Sand (%)	Fines (%)	LL	PL	PI
Sonic Borings	B-01-21	GS-01-21-4	33 - 35	Alluvium	SW	8.8	--	48.5	49.2	2.4	--	--	--
		GS-01-21-10	95 - 98	Alluvium	SW-SM	13.7	--	6.4	82.1	11.5	--	--	--
	B-02-21	GS-02-21-6	51 - 53	Alluvium	SM	16.1	--	1.9	86.0	12.2	--	--	--
	B-03-21	GS-03-21-3	55 - 60	Alluvium	SP	9.5	--	16.2	79.0	4.8	--	--	--
Drive-and-Wash Borings	B-04-21	SS-07	30 - 32	Alluvium	SP	13.1	--	30.7	68.0	1.3	--	--	--
	B-05-21	SS-07	35 - 37	Alluvium	SM	7.5	--	32.0	42.8	25.2	--	--	--
	B-06-21	SS-04A	30 - 31	Alluvium	SW-SM	10.1	--	23.2	65.7	11.1	--	--	--
		SS-06	40 - 42	Alluvium	SM	18.7	--	2.0	81.5	16.5	--	--	--

Prepared By: HR
Checked By: TC

ATTACHMENT 1

LIMITATIONS

LIMITATIONS

Explorations

1. The boring logs and related information depict subsurface conditions only at the specific locations and at the particular time designated on the logs. Soil conditions at other locations may differ from conditions occurring at these boring locations. The data and analyses presented in this report are based in part upon the information obtained from widely-spaced subsurface explorations. Subsurface conditions between exploration locations may vary from those encountered at the exploration locations.

2. The subsurface conditions described in this report are intended to convey general trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed based on interpretation of widely-spaced explorations and associated testing/sampling data. Actual strata transitions may be more gradual, but could be more erratic, particularly for transitions between existing/historic fill materials and native soils. For specific information, refer to the individual boring logs.

3. Groundwater levels reported on the logs, piezometer construction diagrams, summary tables, and/or in the body of the report are factual data only for the dates shown. These data have been reviewed and interpretations have been made in the text of this report. Fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, and other factors differing from the time the measurements were made.

Use of Report

4. This report has been prepared for the exclusive use of New England Hydropower Company, LLC in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.

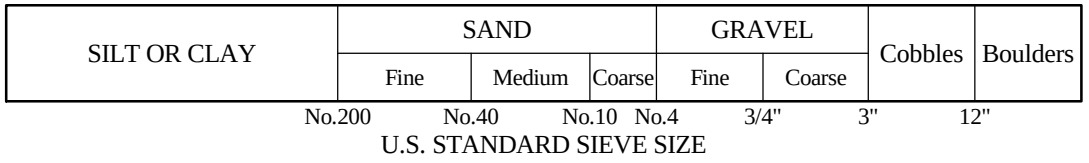
5. Kleinschmidt has prepared this report for the specific project described herein. This report was completed to support design of the proposed Ashton Hydroelectric Project with the Voith StreamDiver Turbine Concept. Contractors wishing to receive a copy of this report may secure it with the understanding that its scope is limited to preliminary geotechnical review of site conditions made based on widely-spaced explorations and information available at the time of the investigation.

ATTACHMENT 2

2021 BORING LOGS

MAJOR DIVISIONS			GROUP SYMBOLS		GENERAL DESCRIPTIONS
COARSE GRAINED SOILS (More than 50% RETAINED on No. 200 sieve)	GRAVELS (More than 50% of coarse fraction RETAINED on No. 4 sieve)	CLEAN GRAVELS (Less than 5% fines)		GW	Well graded gravels or gravel-sand mixtures; trace or no fines.
				GP	Poorly graded gravels or gravel-sand mixtures; trace or no fines.
		GRAVELS WITH FINES (More than 12% fines)		GM	Silty gravels or gravel-sand-silt mixtures.
				GC	Clayey gravels or gravel-sand-clay mixtures.
	SANDS (50% or more of coarse fraction PASSES the No. 4 sieve)	CLEAN SANDS (Less than 5% fines)		SW	Well graded sands or sand-gravel mixtures; trace or no fines.
				SP	Poorly graded sands or sand-gravel mixtures, trace or no fines.
		SANDS WITH FINES (More than 12% fines)		SM	Silty sands or sand-gravel-silt mixtures.
				SC	Clayey sands or sand-gravel-clay mixtures.
FINE GRAINED SOILS (50% or more PASSES the No. 200 sieve)	SILTS AND CLAYS (Liquid Limit LESS than 50)			ML	Inorganic silts or rock flour. Non-plastic or very slightly plastic. PI < 4 or plots below "A" line.
				CL	Inorganic lean clay. Low to medium plasticity. PI > 7 and plots on or above "A" line.
				OL	Organic silts, clays, and silty clays. Low to medium plasticity.
	SILTS AND CLAYS (Liquid Limit of 50 or GREATER)			MH	Inorganic elastic silt. PI plots below "A" line.
				CH	Inorganic fat clay. High plasticity. PI plots on or above "A" line.
				OH	Organic silts and clays. High plasticity.
HIGHLY ORGANIC SOILS				PT	Peat and other highly organic soils. Decomposed vegetable tissue. Fibrous to amorphous texture.

BOUNDARY CLASSIFICATIONS: Soils possessing characteristics of two groups are designated by combinations of group symbols.



References: ASTM D 2487 (Unified Soil Classification System) and ASTM D 2488 (Visual-Manual Procedure).

TYPICAL SYMBOLS

Shelby Tube	Auger Cuttings
Standard Split Spoon Sample	3" Split Spoon Sample
Rock Core	Dynamic Cone Penetrometer
Vane Shear	Bulk/Grab Sample
Geoprobe Sample	Sonic or Vibro-Core Sample
Water Table at time of drilling	Water Table after 24 hours

CORRELATION OF STANDARD PENETRATION TEST (SPT) WITH RELATIVE DENSITY AND CONSISTENCY

GRAVEL, SAND, & SILT (NON-PLASTIC)		SILT (PLASTIC) & CLAY		
N-Value	Relative Density	N-Value	Su (psf)	Consistency
0 - 4	Very Loose	0 - 2	0 - 250	Very Soft
4 - 10	Loose	2 - 4	250 - 500	Soft
10 - 30	Medium Dense	4 - 8	500 - 1000	Medium Stiff
30 - 50	Dense	8 - 15	1000 - 2000	Stiff
Over 50	Very Dense	15 - 30	2000 - 4000	Very Stiff
		Over 30	Over 4000	Hard

SPT Notes: WR = Weight of Rods; WH = Weight of Hammer

TERMS DESCRIBING SOILS (excludes particles > 3", organics, debris, etc.)	TERMS DESCRIBING MATERIALS (i.e. particles > 3", organics, debris, etc.)
Trace: Particles present, but < 5%	Occasional: Particles present, but < 10%
Few: 5% to 15%	Frequent: 10% to 25%
Little: 15% to 25%	Many: > 25%
Some: 25% to 50%	

TERMS DESCRIBING MOISTURE	TERMS DESCRIBING STRUCTURE
Dry: Absence of moisture; dusty	Layer: > 3" thick
Moist: Damp, but no visible water	Seam: 1/16" to 3" thick
Wet: Visible/free water	Parting: < 1/16" thick

KEY TO SYMBOLS AND DESCRIPTIONS

Kleinschmidt

ATTACHMENT 2A

SONIC BORINGS

Project:	Ashton Hydroelectric Develop.			**Boring No.:**	B-01-21 (Angled)
Location:	Cumberland, RI			**Project No.**	4161008
Driller:	Cascade Environmental	**Project Feature:**	Proposed Powerhouse	**Borehole ID/OD:**	5.5" ID / 6" OD
Operator:	Robert	**Elevation:**	80.5'	**Hammer Type:**	N/A
Logged By:	Helen Russell	**Datum:**	NAVD88	**Rod Size:**	3.5"
Date Start/Finish:	9/24/21-9/27/21	**Rig Type:**	TSi 150CC Compact-Crawler	**Core Barrel:**	4" ID / 4.75" OD
Boring Location:	See Exploration Plan	**Drilling Method:**	Sonic Drilling	**Water Level*:**	~ 9.1' bgs (vertical) at time of drilling

Definitions
SS = Split Spoon Sample
MSS = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of hammer
WOR = Weight of rods

Su = insitu Field Vane Shear Strength (psf)
Tv = Pocket Torvane Shear Strength (psf)
qp = Unconfirmed Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value

Su(lab) = Lab Vane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
Pi = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample Information: Sample No.	Barrel/Casing Driven (ft.)	Penetration/ Recovery (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Test Results
0–13					Dark brown to brown, silt (ML), some fine to coarse sand, trace gravel, trace organics, moist: EXISTING FILL	
4	CR-1	0-10	10.0/5.5			
13–20	CR-2	10-18	8.0/3.5		Dark brown, subangular to subrounded gravel (GP), some fine to coarse sand, trace silt, occasional cobbles, wet: ALLUVIUM	
20–24	CR-3	18-28	10.0/6.0		Brown, silty fine sand (SM), some rounded gravel, wet: ALLUVIUM	

Remarks:

Boring drilled at an angle of approximately 42.5 degrees relative to horizontal. Each linear foot of angled drilling equates to approximately 0.68 feet of vertical drilling. Boring terminated at 148 feet of angled drilling which equates to approximately 100 feet of vertical drilling.

- bgs: below ground surface

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.
***Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made**

Project:	Ashton Hydroelectric Develop.			**Boring No.:**	B-01-21 (Angled)
Location:	Cumberland, RI			**Project No.**	4161008
Driller:	Cascade Environmental	**Project Feature:**	Proposed Powerhouse	**Borehole ID/OD:**	5.5" ID / 6" OD
Operator:	Robert	**Elevation:**	80.5'	**Hammer Type:**	N/A
Logged By:	Helen Russell	**Datum:**	NAVD88	**Rod Size:**	3.5"
Date Start/Finish:	9/24/21-9/27/21	**Rig Type:**	TSi 150CC Compact-Crawler	**Core Barrel:**	4" ID / 4.75" OD
Boring Location:	See Exploration Plan	**Drilling Method:**	Sonic Drilling	**Water Level*:**	~ 9.1' bgs (vertical) at time of drilling

Definitions
SS = Split Spoon Sample
MSS = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of hammer
WOR = Weight of rods

Su = insitu Field Vane Shear Strength (psf)
Tv = Pocket Torvane Shear Strength (psf)
qp = Unconfirmed Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value

Su(lab) = Lab Vane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
Pi = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample Information: Sample No.	Barrel/Casing Driven (ft.)	Penetration/ Recovery (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Test Results
25					Brown, silty fine sand (SM), some rounded gravel, wet: ALLUVIUM	
26						
27						
28						
29						
30						
31						
32	CR-4	28-38	10.0/7.5		Gray-brown, medium to coarse sand (SW), some subrounded gravel, trace silt, wet: ALLUVIUM	
33					Grab sample GS-01-21-4 (33 to 35 ft linear drilling)	WC = 8.8% Fines = 2.4%
34						
35						
36						
37						
38						
39						
40						
41						
42	CR-5	38-48	10.0/4.0			
43						
44						
45						
46						
47						
48						
49						

Remarks:

Boring drilled at an angle of approximately 42.5 degrees relative to horizontal. Each linear foot of angled drilling equates to approximately 0.68 feet of vertical drilling. Boring terminated at 148 feet of angled drilling which equates to approximately 100 feet of vertical drilling.

- bgs: below ground surface

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.
***Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made**

Kleinschmidt	Project:	Ashton Hydroelectric Develop.	Boring No.:	B-01-21 (Angled)
	Location:	Cumberland, RI	Project No.	4161008

Driller:	Cascade Environmental	**Project Feature:**	Proposed Powerhouse	**Borehole ID/OD:**	5.5" ID / 6" OD
Operator:	Robert	**Elevation:**	80.5'	**Hammer Type:**	N/A
Logged By:	Helen Russell	**Datum:**	NAVD88	**Rod Size:**	3.5"
Date Start/Finish:	9/24/21-9/27/21	**Rig Type:**	TSi 150CC Compact-Crawler	**Core Barrel:**	4" ID / 4.75" OD
Boring Location:	See Exploration Plan	**Drilling Method:**	Sonic Drilling	**Water Level*:**	~ 9.1' bgs (vertical) at time of drilling

Definitions
SS = Split Spoon Sample
MSS = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of hammer
WOR = Weight of rods

Su = insitu Field Vane Shear Strength (psf)
Tv = Pocket Torvane Shear Strength (psf)
qp = Unconfirmed Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value

Su(lab) = Lab Vane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
Pi = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample Information: Sample No.	Barrel/Casing Driven (ft.)	Penetration/ Recovery (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Test Results
50					Gray-brown, medium to coarse sand (SW), some subrounded gravel, trace silt, wet: ALLUVIUM	
51						
52						
53	CR-6	48-58	10.0/8.0			
54						
55						
56						
57						
58						
59						
60						
61						
62						
63	CR-7	58-68	10.0/3.0			
64						
65						
66						
67						
68						
69						
70						
71						
72						
73	CR-8	68-78	10.0/6.5			
74						

Remarks:

Boring drilled at an angle of approximately 42.5 degrees relative to horizontal. Each linear foot of angled drilling equates to approximately 0.68 feet of vertical drilling. Boring terminated at 148 feet of angled drilling which equates to approximately 100 feet of vertical drilling.

- bgs: below ground surface

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.
***Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made**

Project:	Ashton Hydroelectric Develop.			**Boring No.:**	B-01-21 (Angled)
Location:	Cumberland, RI			**Project No.**	4161008
Driller:	Cascade Environmental	**Project Feature:**	Proposed Powerhouse	**Borehole ID/OD:**	5.5" ID / 6" OD
Operator:	Robert	**Elevation:**	80.5'	**Hammer Type:**	N/A
Logged By:	Helen Russell	**Datum:**	NAVD88	**Rod Size:**	3.5"
Date Start/Finish:	9/24/21-9/27/21	**Rig Type:**	TSi 150CC Compact-Crawler	**Core Barrel:**	4" ID / 4.75" OD
Boring Location:	See Exploration Plan	**Drilling Method:**	Sonic Drilling	**Water Level*:**	~ 9.1' bgs (vertical) at time of drilling

Definitions
SS = Split Spoon Sample
MSS = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of hammer
WOR = Weight of rods

Su = insitu Field Vane Shear Strength (psf)
Tv = Pocket Torvane Shear Strength (psf)
qp = Unconfirmed Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value

Su(lab) = Lab Vane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
Pi = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample Information: Sample No.	Barrel/Casing Driven (ft.)	Penetration/ Recovery (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Test Results
75					Gray-brown, medium to coarse sand (SW), some subrounded gravel, trace silt, wet: ALLUVIUM	
76						
77						
78						
79						
80						
81						
82						
83	CR-9	78-88	10.0/7.0			
84						
85						
86						
87						
88						
89						
90						
91						
92						
93	CR-10	88-98	10.0/9.0			
94						
95					Gray-brown, fine to medium sand with silt (SW-SM), few coarse sand, few gravel, moist to wet: ALLUVIUM Grab sample GS-01-21-10 (95 to 98 ft linear drilling)	WC = 13.7% Fines = 11.5%
96						
97						
98						
99						

Remarks:

Boring drilled at an angle of approximately 42.5 degrees relative to horizontal. Each linear foot of angled drilling equates to approximately 0.68 feet of vertical drilling. Boring terminated at 148 feet of angled drilling which equates to approximately 100 feet of vertical drilling.

- bgs: below ground surface

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.
***Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made**

Kleinschmidt		**Project:**	Ashton Hydroelectric Develop.	**Boring No.:**	B-01-21 (Angled)
		Location:	Cumberland, RI	**Project No.**	4161008
Driller:	Cascade Environmental	**Project Feature:**	Proposed Powerhouse	**Borehole ID/OD:**	5.5" ID / 6" OD
Operator:	Robert	**Elevation:**	80.5'	**Hammer Type:**	N/A
Logged By:	Helen Russell	**Datum:**	NAVD88	**Rod Size:**	3.5"
Date Start/Finish:	9/24/21-9/27/21	**Rig Type:**	TSi 150CC Compact-Crawler	**Core Barrel:**	4" ID / 4.75" OD
Boring Location:	See Exploration Plan	**Drilling Method:**	Sonic Drilling	**Water Level*:**	~ 9.1' bgs (vertical) at time of drilling

Definitions
SS = Split Spoon Sample
MSS = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of hammer
WOR = Weight of rods

Su = insitu Field Vane Shear Strength (psf)
Tv = Pocket Torvane Shear Strength (psf)
qp = Unconfirmed Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value

Su(lab) = Lab Vane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
Pi = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample Information: Sample No.	Barrel/Casing Driven (ft.)	Penetration/ Recovery (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Test Results
100					Gray-brown, fine to medium sand with silt (SW-SM), few coarse sand, few gravel, moist to wet: ALLUVIUM	
101						
102						
103	CR-11	98-108	10.0/8.5			
104						
105						
106						
107						
108						
109						
110						
111						
112						
113	CR-12	108-118	10.0/7.5		Brown, fine to coarse sand (SW), trace to some subrounded gravel, trace silt, moist to wet: ALLUVIUM -occasional to some cobbles	
114						
115						
116						
117						
118						
119						
120						
121						
122						
123	CR-13	118-128	10.0/2.0			
124						

Remarks:

Boring drilled at an angle of approximately 42.5 degrees relative to horizontal. Each linear foot of angled drilling equates to approximately 0.68 feet of vertical drilling. Boring terminated at 148 feet of angled drilling which equates to approximately 100 feet of vertical drilling.

- bgs: below ground surface

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.
***Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made**

Project:	Ashton Hydroelectric Develop.			**Boring No.:**	B-01-21 (Angled)
Location:	Cumberland, RI			**Project No.**	4161008
Driller:	Cascade Environmental	**Project Feature:**	Proposed Powerhouse	**Borehole ID/OD:**	5.5" ID / 6" OD
Operator:	Robert	**Elevation:**	80.5'	**Hammer Type:**	N/A
Logged By:	Helen Russell	**Datum:**	NAVD88	**Rod Size:**	3.5"
Date Start/Finish:	9/24/21-9/27/21	**Rig Type:**	TSi 150CC Compact-Crawler	**Core Barrel:**	4" ID / 4.75" OD
Boring Location:	See Exploration Plan	**Drilling Method:**	Sonic Drilling	**Water Level*:**	~ 9.1' bgs (vertical) at time of drilling

Definitions
SS = Split Spoon Sample
MSS = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of hammer
WOR = Weight of rods

Su = insitu Field Vane Shear Strength (psf)
Tv = Pocket Torvane Shear Strength (psf)
qp = Unconfirmed Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value

Su(lab) = Lab Vane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
Pi = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample Information: Sample No.	Barrel/Casing Driven (ft.)	Penetration/ Recovery (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Test Results
125					Brown, fine to coarse sand (SW), trace to some subrounded gravel, trace silt, moist to wet: ALLUVIUM	
126						
127						
128					-occasional to some cobbles	
129						
130						
131						
132					Gray, silty fine to medium sand (SM), few coarse sand, some angular gravel, wet: GLACIAL TILL	
133	CR-14	128-138	10.0/8.5			
134						
135					Grab sample GS-01-21-14 (134.5 to 135.5 ft linear drilling)	
136						
137					Gray, bedrock/weathered bedrock, hard, recovery is fractured to severely fractured, including apparent vertical seams: BEDROCK	
138						
139						
140						
141						
142						
143	CR-15	138-148	10.0/5.0			
144						
145						
146						
147						
148						
149					Bottom of boring at 148' angled drilling and approximately 100' bgs	

Remarks:

Boring drilled at an angle of approximately 42.5 degrees relative to horizontal. Each linear foot of angled drilling equates to approximately 0.68 feet of vertical drilling. Boring terminated at 148 feet of angled drilling which equates to approximately 100 feet of vertical drilling.

- bgs: below ground surface

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.
***Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made**

Project:	Ashton Hydroelectric Develop.			**Boring No.:**	B-01V-21 (Vertical)
Location:	Cumberland, RI			**Project No.**	4161008
Driller:	Cascade Environmental	**Project Feature:**	Proposed Powerhouse	**Borehole ID/OD:**	5.5" ID / 6" OD
Operator:	Robert	**Elevation:**	80.5'	**Hammer Type:**	N/A
Logged By:	Helen Russell	**Datum:**	NAVD88	**Rod Size:**	3.5"
Date Start/Finish:	9/27/2021	**Rig Type:**	TSi 150CC Compact-Crawler	**Core Barrel:**	4" ID / 4.75" OD
Boring Location:	See Exploration Plan	**Drilling Method:**	Sonic Drilling	**Water Level*:**	Not Measured

Definitions
SS = Split Spoon Sample
MSS = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of hammer
WOR = Weight of rods

Su = insitu Field Vane Shear Strength (psf)
Tv = Pocket Torvane Shear Strength (psf)
qp = Unconfirmed Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value

Su(lab) = Lab Vane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
Pi = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Elevation (ft.)	Depth (ft.)	Sample Information: Sample No.	Sample Information: Barrel/Casing Driven (ft.)	Sample Information: Penetration/ Recovery (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Test Results	AASHTO and Unified Class.
80	0					Casing and core barrel advanced with no soil sampling. Objective to tag rock at the boring location.		
	1							
	2							
	3							
	4							
	5							
75	6							
	7							
	8							
	9							
	10							
70	11							
	12							
	13							
	14							
	15							
65	16							
	17							
	18							
	19							
	20							
60	21							
	22							
	23							
	24							

Remarks:

Boring location offset 5' from B-1-21. Boring was advanced vertically with no soil sampling.

- bgs: below ground surface

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.
***Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made**

Project:	Ashton Hydroelectric Develop.			**Boring No.:**	B-01V-21 (Vertical)
Location:	Cumberland, RI			**Project No.**	4161008
Driller:	Cascade Environmental	**Project Feature:**	Proposed Powerhouse	**Borehole ID/OD:**	5.5" ID / 6" OD
Operator:	Robert	**Elevation:**	80.5'	**Hammer Type:**	N/A
Logged By:	Helen Russell	**Datum:**	NAVD88	**Rod Size:**	3.5"
Date Start/Finish:	9/27/2021	**Rig Type:**	TSi 150CC Compact-Crawler	**Core Barrel:**	4" ID / 4.75" OD
Boring Location:	See Exploration Plan	**Drilling Method:**	Sonic Drilling	**Water Level*:**	Not Measured

Definitions
SS = Split Spoon Sample
MSS = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of hammer
WOR = Weight of rods

Su = insitu Field Vane Shear Strength (psf)
Tv = Pocket Torvane Shear Strength (psf)
qp = Unconfirmed Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value

Su(lab) = Lab Vane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
Pi = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Elevation (ft.)	Depth (ft.)	Sample Information: Sample No.	Sample Information: Barrel/Casing Driven (ft.)	Sample Information: Penetration/ Recovery (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Test Results	AASHTO and Unified Class.
55	25					Casing and core barrel advanced with no soil sampling. Objective to tag rock at the boring location.		
	26							
	27							
	28							
	29							
50	30							
	31							
	32							
	33							
	34							
	35							
45	36							
	37							
	38							
	39							
	40							
40	41							
	42							
	43							
	44							
	45							
35	46							
	47							
	48							
	49							

Remarks:

Boring location offset 5' from B-1-21. Boring was advanced vertically with no soil sampling.

- bgs: below ground surface

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.
***Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made**

Project:	Ashton Hydroelectric Develop.			**Boring No.:**	B-01V-21 (Vertical)
Location:	Cumberland, RI			**Project No.**	4161008
Driller:	Cascade Environmental	**Project Feature:**	Proposed Powerhouse	**Borehole ID/OD:**	5.5" ID / 6" OD
Operator:	Robert	**Elevation:**	80.5'	**Hammer Type:**	N/A
Logged By:	Helen Russell	**Datum:**	NAVD88	**Rod Size:**	3.5"
Date Start/Finish:	9/27/2021	**Rig Type:**	TSi 150CC Compact-Crawler	**Core Barrel:**	4" ID / 4.75" OD
Boring Location:	See Exploration Plan	**Drilling Method:**	Sonic Drilling	**Water Level*:**	Not Measured

Definitions
SS = Split Spoon Sample
MSS = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of hammer
WOR = Weight of rods

Su = insitu Field Vane Shear Strength (psf)
Tv = Pocket Torvane Shear Strength (psf)
qp = Unconfirmed Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value

Su(lab) = Lab Vane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
Pi = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Elevation (ft.)	Depth (ft.)	Sample Information: Sample No.	Barrel/Casing Driven (ft.)	Penetration/ Recovery (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Test Results	AASHTO and Unified Class.
30	50					Casing and core barrel advanced with no soil sampling. Objective to tag rock at the boring location.		
	51							
	52							
	53							
	54							
25	55							
	56							
	57							
	58							
	59							
20	60							
	61							
	62							
	63							
	64					Gray, bedrock/weathered bedrock, hard, recovery is severely fractured: BEDROCK		
15	65	CR-1	64-68	4.0/2.0				
	66					Core barrel stopped at 64' bgs and hard drilling was encountered. Core barrel advanced to 68' bgs and sample retrieved.		
	67							
	68							
	69					Bottom of boring at 68' bgs.		
10	70							
	71							
	72							
	73							
	74							

Remarks:

Boring location offset 5' from B-1-21. Boring was advanced vertically with no soil sampling.

- bgs: below ground surface

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.
***Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made**

Kleinschmidt

Project:	Ashton Hydroelectric Develop.			**Boring No.:**	B-02-21 (Angled)
Location:	Cumberland, RI			**Project No.**	4161008
Driller:	Cascade Environmental	**Project Feature:**	Proposed Powerhouse	**Borehole ID/OD:**	5.5" ID / 6" OD
Operator:	Robert	**Elevation:**	76.7'	**Hammer Type:**	N/A
Logged By:	Helen Russell	**Datum:**	NAVD88	**Rod Size:**	3.5"
Date Start/Finish:	9/22/21-9/23/21	**Rig Type:**	TSi 150CC Compact-Crawler	**Core Barrel:**	4" ID / 4.75" OD
Boring Location:	See Exploration Plan	**Drilling Method:**	Sonic Drilling	**Water Level*:**	~ 10.6' bgs (vertical) at time of drilling

Definitions
SS = Split Spoon Sample
MSS = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of hammer
WOR = Weight of rods

Su = insitu Field Vane Shear Strength (psf)
Tv = Pocket Torvane Shear Strength (psf)
qp = Unconfirmed Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value

Su(lab) = Lab Vane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
Pi = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample Information: Sample No.	Barrel/Casing Driven (ft.)	Penetration/ Recovery (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Test Results
0					Brown, fine to coarse sand with gravel (SW), trace silt, trace organics, moist: EXISTING FILL	
1						
2						
3						
4						
5	CR-1	0-10	10.0/7.5		Possible boulder(s)/rock fill, hard drilling and drill rig overheating from 4.5' to 15', samples similar to bedrock samples: EXISTING FILL	
6						
7						
8						
9						
10						
11						
12						
13						
14						
15	CR-2	10-20	10.0/5.0		Gray-brown, subangular to subrounded gravel (GP), some fine to coarse sand, trace silt, wet: ALLUVIUM	
16						
17						
18						
19						
20						
21						
22						
23						
24	CR-3	20-30	10.0/3.0			

Remarks:

Boring drilled at an angle of approximately 45 degrees relative to horizontal. Each linear foot of angled drilling equates to approximately 0.71 feet of vertical drilling. Boring terminated at 126 feet of angled drilling which equates to approximately 89 feet of vertical drilling.

- bgs: below ground surface

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.
***Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made**

Project:	Ashton Hydroelectric Develop.			**Boring No.:**	B-02-21 (Angled)
Location:	Cumberland, RI			**Project No.**	4161008
Driller:	Cascade Environmental	**Project Feature:**	Proposed Powerhouse	**Borehole ID/OD:**	5.5" ID / 6" OD
Operator:	Robert	**Elevation:**	76.7'	**Hammer Type:**	N/A
Logged By:	Helen Russell	**Datum:**	NAVD88	**Rod Size:**	3.5"
Date Start/Finish:	9/22/21-9/23/21	**Rig Type:**	TSi 150CC Compact-Crawler	**Core Barrel:**	4" ID / 4.75" OD
Boring Location:	See Exploration Plan	**Drilling Method:**	Sonic Drilling	**Water Level*:**	~ 10.6' bgs (vertical) at time of drilling

Definitions
SS = Split Spoon Sample
MSS = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of hammer
WOR = Weight of rods

Su = insitu Field Vane Shear Strength (psf)
Tv = Pocket Torvane Shear Strength (psf)
qp = Unconfirmed Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value

Su(lab) = Lab Vane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
Pi = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample Information: Sample No.	Barrel/Casing Driven (ft.)	Penetration/ Recovery (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Test Results
25–33					Gray-brown, subangular to subrounded gravel (GP), some fine to coarse sand, trace silt, wet: ALLUVIUM	
34	CR-4	30-40	10.0/6.5		Grab sample GS-02-21-4 (34 to 36 ft linear drilling)	
35–39					Gray-brown, subangular to subrounded gravel (GP), some fine to coarse sand, trace silt, wet: ALLUVIUM	
40–42					Gray, fine to medium sand with little silt (SM), trace coarse sand, trace gravel, wet: ALLUVIUM	
43	CR-5	40-48	8.0/6.5		Gray, fine to medium sand with little silt (SM), trace coarse sand, trace gravel, wet: ALLUVIUM	
44–49					Gray, fine to medium sand with little silt (SM), trace coarse sand, trace gravel, wet: ALLUVIUM	

Remarks:

Boring drilled at an angle of approximately 45 degrees relative to horizontal. Each linear foot of angled drilling equates to approximately 0.71 feet of vertical drilling. Boring terminated at 126 feet of angled drilling which equates to approximately 89 feet of vertical drilling.

- bgs: below ground surface

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.
***Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made**

Kleinschmidt		**Project:**	Ashton Hydroelectric Develop.	**Boring No.:**	B-02-21 (Angled)
		Location:	Cumberland, RI	**Project No.**	4161008
Driller:	Cascade Environmental	**Project Feature:**	Proposed Powerhouse	**Borehole ID/OD:**	5.5" ID / 6" OD
Operator:	Robert	**Elevation:**	76.7'	**Hammer Type:**	N/A
Logged By:	Helen Russell	**Datum:**	NAVD88	**Rod Size:**	3.5"
Date Start/Finish:	9/22/21-9/23/21	**Rig Type:**	TSi 150CC Compact-Crawler	**Core Barrel:**	4" ID / 4.75" OD
Boring Location:	See Exploration Plan	**Drilling Method:**	Sonic Drilling	**Water Level*:**	~ 10.6' bgs (vertical) at time of drilling

Definitions
SS = Split Spoon Sample
MSS = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

R = Rock Core Sample
SSA = Solid Stem Auger
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Su(lab) = Lab Vane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
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G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample Information: Sample No.	Barrel/Casing Driven (ft.)	Penetration/ Recovery (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Test Results
50					Gray, fine to medium sand with little silt (SM), trace coarse sand, trace gravel, wet: ALLUVIUM	
51						
52						
53	CR-6	48-58	10.0/6.0		Grab sample GS-02-21-6 (51 to 53 ft linear drilling)	WC = 16.1% Fines = 12.2%
54						
55						
56						
57						
58						
59						
60						
61						
62						
63	CR-7	58-68	10.0/8.0			
64						
65						
66					Gray, subrounded to rounded gravel with fine to coarse sand (GP), trace silt, occasional cobbles, wet: ALLUVIUM	
67						
68						
69						
70						
71						
72						
73	CR-8	68-78	10.0/8.5		Gray, fine to coarse sand with rounded gravel (SW), trace silt, wet: ALLUVIUM	
74					- limited sample recovery from 88' to 108'	

Remarks:

Boring drilled at an angle of approximately 45 degrees relative to horizontal. Each linear foot of angled drilling equates to approximately 0.71 feet of vertical drilling. Boring terminated at 126 feet of angled drilling which equates to approximately 89 feet of vertical drilling.

- bgs: below ground surface

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.
***Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made**

Project:	Ashton Hydroelectric Develop.			**Boring No.:**	B-02-21 (Angled)
Location:	Cumberland, RI			**Project No.**	4161008
Driller:	Cascade Environmental	**Project Feature:**	Proposed Powerhouse	**Borehole ID/OD:**	5.5" ID / 6" OD
Operator:	Robert	**Elevation:**	76.7'	**Hammer Type:**	N/A
Logged By:	Helen Russell	**Datum:**	NAVD88	**Rod Size:**	3.5"
Date Start/Finish:	9/22/21-9/23/21	**Rig Type:**	TSi 150CC Compact-Crawler	**Core Barrel:**	4" ID / 4.75" OD
Boring Location:	See Exploration Plan	**Drilling Method:**	Sonic Drilling	**Water Level*:**	~ 10.6' bgs (vertical) at time of drilling

Definitions
SS = Split Spoon Sample
MSS = Unsuccessful Split Spoon Sample attempt
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MV = Unsuccessful Insitu Vane Shear Test attempt

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WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
Pi = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample Information: Sample No.	Barrel/Casing Driven (ft.)	Penetration/ Recovery (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Test Results
75					Gray, fine to coarse sand with rounded gravel (SW), trace silt, wet: ALLUVIUM - limited sample recovery from 88' to 108'	
76						
77						
78						
79						
80						
81						
82						
83	CR-9	78-88	10.0/9.0			
84						
85						
86						
87						
88						
89						
90						
91						
92						
93	CR-10	88-98	10.0/0.0			
94						
95						
96						
97						
98						
99						

Remarks:

Boring drilled at an angle of approximately 45 degrees relative to horizontal. Each linear foot of angled drilling equates to approximately 0.71 feet of vertical drilling. Boring terminated at 126 feet of angled drilling which equates to approximately 89 feet of vertical drilling.

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Project:	Ashton Hydroelectric Develop.			**Boring No.:**	B-02-21 (Angled)
Location:	Cumberland, RI			**Project No.**	4161008
Driller:	Cascade Environmental	**Project Feature:**	Proposed Powerhouse	**Borehole ID/OD:**	5.5" ID / 6" OD
Operator:	Robert	**Elevation:**	76.7'	**Hammer Type:**	N/A
Logged By:	Helen Russell	**Datum:**	NAVD88	**Rod Size:**	3.5"
Date Start/Finish:	9/22/21-9/23/21	**Rig Type:**	TSi 150CC Compact-Crawler	**Core Barrel:**	4" ID / 4.75" OD
Boring Location:	See Exploration Plan	**Drilling Method:**	Sonic Drilling	**Water Level*:**	~ 10.6' bgs (vertical) at time of drilling

Definitions
SS = Split Spoon Sample
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MU = Unsuccessful Thin Wall Tube Sample attempt
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MV = Unsuccessful Insitu Vane Shear Test attempt

R = Rock Core Sample
SSA = Solid Stem Auger
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Su(lab) = Lab Vane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
Pi = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample Information: Sample No.	Barrel/Casing Driven (ft.)	Penetration/ Recovery (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Test Results
100					Gray, fine to coarse sand with rounded gravel (SW), trace silt, wet: ALLUVIUM	
101						
102						
103	CR-11	98-108	10.0/1.0		- limited sample recovery from 88' to 108'	
104						
105						
106						
107						
108					Brown, fine to coarse sand (SW), trace rounded gravel, wet: ALLUVIUM	
109						
110						
111						
112						
113	CR-12	108-118	10.0/6.0			
114						
115						
116						
117						
118						
119						
120						
121						
122	CR-13	118-126	10.0/4.0		Gray, bedrock/weathered bedrock, hard, recovery is fractured to severely fractured, including apparent vertical seams: BEDROCK	
123						
124						

Remarks:

Boring drilled at an angle of approximately 45 degrees relative to horizontal. Each linear foot of angled drilling equates to approximately 0.71 feet of vertical drilling. Boring terminated at 126 feet of angled drilling which equates to approximately 89 feet of vertical drilling.

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Stratification lines represent approximate boundaries between soil types; transitions may be gradual.
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Project:	Ashton Hydroelectric Develop.			**Boring No.:**	B-02-21 (Angled)
Location:	Cumberland, RI			**Project No.**	4161008
Driller:	Cascade Environmental	**Project Feature:**	Proposed Powerhouse	**Borehole ID/OD:**	5.5" ID / 6" OD
Operator:	Robert	**Elevation:**	76.7'	**Hammer Type:**	N/A
Logged By:	Helen Russell	**Datum:**	NAVD88	**Rod Size:**	3.5"
Date Start/Finish:	9/22/21-9/23/21	**Rig Type:**	TSi 150CC Compact-Crawler	**Core Barrel:**	4" ID / 4.75" OD
Boring Location:	See Exploration Plan	**Drilling Method:**	Sonic Drilling	**Water Level*:**	~ 10.6' bgs (vertical) at time of drilling

Definitions
SS = Split Spoon Sample
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V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of hammer
WOR = Weight of rods

Su = insitu Field Vane Shear Strength (psf)
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Su(lab) = Lab Vane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
Pi = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample Information: Sample No.	Sample Information: Barrel/Casing Driven (ft.)	Sample Information: Penetration/ Recovery (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Test Results
125					Gray, bedrock/weathered bedrock, hard, recovery is fractured to severely fractured, including apparent vertical seams: BEDROCK	
126					Bottom of boring at 126' angled drilling and approximately 89' bgs	
127						
128						
129						
130						
131						
132						
133						
134						
135						
136						
137						
138						
139						
140						
141						
142						
143						
144						
145						
146						
147						
148						
149						

Remarks:

Boring drilled at an angle of approximately 45 degrees relative to horizontal. Each linear foot of angled drilling equates to approximately 0.71 feet of vertical drilling. Boring terminated at 126 feet of angled drilling which equates to approximately 89 feet of vertical drilling.

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Kleinschmidt		**Project:**	Ashton Hydroelectric Develop.	**Boring No.:**	B-03-21 (Angled)
		Location:	Cumberland, RI	**Project No.**	4161008
Driller:	Cascade Environmental	**Project Feature:**	Proposed Powerhouse	**Borehole ID/OD:**	5.5" ID / 6" OD
Operator:	Robert	**Elevation:**	78.8'	**Hammer Type:**	N/A
Logged By:	Helen Russell	**Datum:**	NAVD88	**Rod Size:**	3.5"
Date Start/Finish:	9/20/21-9/22/21	**Rig Type:**	TSi 150CC Compact-Crawler	**Core Barrel:**	4" ID / 4.75" OD
Boring Location:	See Exploration Plan	**Drilling Method:**	Sonic Drilling	**Water Level*:**	~ 9.3' bgs (vertical) at time of drilling

Definitions
SS = Split Spoon Sample
MSS = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

R = Rock Core Sample
SSA = Solid Stem Auger
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N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value

Su(lab) = Lab Vane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
Pi = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample Information: Sample No.	Barrel/Casing Driven (ft.)	Penetration/ Recovery (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Test Results
0					Dark brown to black, silty fine sand (SM), trace medium to coarse sand, trace to some gravel, trace organics, moist: EXISTING FILL	
1						
2						
3	CR-1	0-5	5.0/4.5			
4						
5						
6						
7						
8	CR-2	5-10	5.0/6.0			
9						
10						
11						
12						
13	CR-3	10-15	5.0/6.0		Grab sample GS-03-21-3 (12.5 to 14.5 ft linear drilling)	
14						
15						
16					Brown to dark brown, subangular to subrounded gravel with fine to coarse sand and silt (GM), occasional cobbles, wet: ALLUVIUM	
17						
18	CR-4	15-20	5.0/4.5			
19						
20						
21						
22						
23						
24						
	CR-5	20-30	10.0/6.0			

Remarks:

Boring drilled at an angle of approximately 40 degrees relative to horizontal. Each linear foot of angled drilling equates to approximately 0.64 feet of vertical drilling. Boring terminated at 150 feet of angled drilling which equates to approximately 96 feet of vertical drilling.

- bgs: below ground surface

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.
***Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made**

Project:	Ashton Hydroelectric Develop.			**Boring No.:**	B-03-21 (Angled)
Location:	Cumberland, RI			**Project No.**	4161008
Driller:	Cascade Environmental	**Project Feature:**	Proposed Powerhouse	**Borehole ID/OD:**	5.5" ID / 6" OD
Operator:	Robert	**Elevation:**	78.8'	**Hammer Type:**	N/A
Logged By:	Helen Russell	**Datum:**	NAVD88	**Rod Size:**	3.5"
Date Start/Finish:	9/20/21-9/22/21	**Rig Type:**	TSi 150CC Compact-Crawler	**Core Barrel:**	4" ID / 4.75" OD
Boring Location:	See Exploration Plan	**Drilling Method:**	Sonic Drilling	**Water Level*:**	~ 9.3' bgs (vertical) at time of drilling

Definitions
SS = Split Spoon Sample
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Depth (ft.)	Sample Information: Sample No.	Barrel/Casing Driven (ft.)	Penetration/ Recovery (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Test Results
25					Brown to dark brown, subangular to subrounded gravel with fine to coarse sand and silt (GM), occasional cobbles, wet: ALLUVIUM Grab sample GS-03-21-5 (25 to 30 ft linear drilling)	
26						
27						
28						
29						
30					Gray-brown, fine to coarse sand with subrounded to rounded gravel (SW), few to trace silt, occasional cobbles, wet: ALLUVIUM	
31						
32						
33						
34						
35	CR-6	30-40	10.0/4.0			
36						
37						
38						
39						
40						
41						
42						
43	CR-7	40-45	5.0/1.0			
44						
45						
46						
47						
48	CR-8	45-50	5.0/1.0			
49						

Remarks:

Boring drilled at an angle of approximately 40 degrees relative to horizontal. Each linear foot of angled drilling equates to approximately 0.64 feet of vertical drilling. Boring terminated at 150 feet of angled drilling which equates to approximately 96 feet of vertical drilling.

- bgs: below ground surface

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.
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Project:	Ashton Hydroelectric Develop.			**Boring No.:**	B-03-21 (Angled)
Location:	Cumberland, RI			**Project No.**	4161008
Driller:	Cascade Environmental	**Project Feature:**	Proposed Powerhouse	**Borehole ID/OD:**	5.5" ID / 6" OD
Operator:	Robert	**Elevation:**	78.8'	**Hammer Type:**	N/A
Logged By:	Helen Russell	**Datum:**	NAVD88	**Rod Size:**	3.5"
Date Start/Finish:	9/20/21-9/22/21	**Rig Type:**	TSi 150CC Compact-Crawler	**Core Barrel:**	4" ID / 4.75" OD
Boring Location:	See Exploration Plan	**Drilling Method:**	Sonic Drilling	**Water Level*:**	~ 9.3' bgs (vertical) at time of drilling

Definitions
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C = Consolidation Test

Depth (ft.)	Sample Information: Sample No.	Barrel/Casing Driven (ft.)	Penetration/ Recovery (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Test Results
50					Gray, subrounded to rounded gravel with fine to coarse sand (GP), trace silt, occasional cobbles, wet: ALLUVIUM	
51						
52						
53	CR-9	50-55	5.0/0.0			
54						
55						
56					Gray, fine to coarse sand (SW), trace to some gravel, trace silt, occasional cobbles, moist to wet: ALLUVIUM	
57						
58	CR-10	55-60	5.0/5.5		Grab sample GS-03-21-10 (55 to 60 ft linear drilling)	WC = 9.5% Fines = 4.8%
59						
60						
61						
62						
63	CR-11	60-65	5.0/4.0			
64						
65						
66						
67						
68	CR-12	65-70	5.0/2.5			
69						
70						
71						
72						
73	CR-13	70-75	5.0/5.5			
74						

Remarks:

Boring drilled at an angle of approximately 40 degrees relative to horizontal. Each linear foot of angled drilling equates to approximately 0.64 feet of vertical drilling. Boring terminated at 150 feet of angled drilling which equates to approximately 96 feet of vertical drilling.

- bgs: below ground surface

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Project:	Ashton Hydroelectric Develop.			**Boring No.:**	B-03-21 (Angled)
Location:	Cumberland, RI			**Project No.**	4161008
Driller:	Cascade Environmental	**Project Feature:**	Proposed Powerhouse	**Borehole ID/OD:**	5.5" ID / 6" OD
Operator:	Robert	**Elevation:**	78.8'	**Hammer Type:**	N/A
Logged By:	Helen Russell	**Datum:**	NAVD88	**Rod Size:**	3.5"
Date Start/Finish:	9/20/21-9/22/21	**Rig Type:**	TSi 150CC Compact-Crawler	**Core Barrel:**	4" ID / 4.75" OD
Boring Location:	See Exploration Plan	**Drilling Method:**	Sonic Drilling	**Water Level*:**	~ 9.3' bgs (vertical) at time of drilling

Definitions
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MSS = Unsuccessful Split Spoon Sample attempt
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Depth (ft.)	Sample Information: Sample No.	Barrel/Casing Driven (ft.)	Penetration/ Recovery (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Test Results
75					Gray, fine to coarse sand (SW), trace to some gravel, trace silt, occasional cobbles, moist to wet: ALLUVIUM	
76						
77						
78	CR-14	75-80	5.0/5.0			
79						
80						
81						
82						
83						
84						
85	CR-15	80-90	10.0/10.0			
86						
87						
88						
89						
90						
91						
92						
93						
94						
95	CR-16	90-100	10.0/10.0			
96						
97						
98						
99						

Remarks:

Boring drilled at an angle of approximately 40 degrees relative to horizontal. Each linear foot of angled drilling equates to approximately 0.64 feet of vertical drilling. Boring terminated at 150 feet of angled drilling which equates to approximately 96 feet of vertical drilling.

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Project:	Ashton Hydroelectric Develop.			**Boring No.:**	B-03-21 (Angled)
Location:	Cumberland, RI			**Project No.**	4161008
Driller:	Cascade Environmental	**Project Feature:**	Proposed Powerhouse	**Borehole ID/OD:**	5.5" ID / 6" OD
Operator:	Robert	**Elevation:**	78.8'	**Hammer Type:**	N/A
Logged By:	Helen Russell	**Datum:**	NAVD88	**Rod Size:**	3.5"
Date Start/Finish:	9/20/21-9/22/21	**Rig Type:**	TSi 150CC Compact-Crawler	**Core Barrel:**	4" ID / 4.75" OD
Boring Location:	See Exploration Plan	**Drilling Method:**	Sonic Drilling	**Water Level*:**	~ 9.3' bgs (vertical) at time of drilling

Definitions
SS = Split Spoon Sample
MSS = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of hammer
WOR = Weight of rods

Su = insitu Field Vane Shear Strength (psf)
Tv = Pocket Torvane Shear Strength (psf)
qp = Unconfirmed Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value

Su(lab) = Lab Vane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
Pi = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample Information: Sample No.	Barrel/Casing Driven (ft.)	Penetration/ Recovery (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Test Results
100					Gray, fine to coarse sand (SW), trace to some gravel, trace silt, occasional cobbles, moist to wet: ALLUVIUM	
101						
102						
103						
104						
105	CR-17	100-110	10.0/10.0			
106					Gray, silty fine to medium sand (SM), wet: ALLUVIUM	
107					Grab sample GS-03-21-17 (106 to 110 ft linear drilling)	
108						
109						
110						
111						
112						
113						
114						
115	CR-18	110-120	10.0/8.0			
116						
117						
118						
119						
120					Gray to brown, silty fine to medium sand (SM), trace gravel, wet: ALLUVIUM	
121						
122						
123						
124						

Remarks:

Boring drilled at an angle of approximately 40 degrees relative to horizontal. Each linear foot of angled drilling equates to approximately 0.64 feet of vertical drilling. Boring terminated at 150 feet of angled drilling which equates to approximately 96 feet of vertical drilling.

- bgs: below ground surface

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.
***Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made**

Project:	Ashton Hydroelectric Develop.			**Boring No.:**	B-03-21 (Angled)
Location:	Cumberland, RI			**Project No.**	4161008
Driller:	Cascade Environmental	**Project Feature:**	Proposed Powerhouse	**Borehole ID/OD:**	5.5" ID / 6" OD
Operator:	Robert	**Elevation:**	78.8'	**Hammer Type:**	N/A
Logged By:	Helen Russell	**Datum:**	NAVD88	**Rod Size:**	3.5"
Date Start/Finish:	9/20/21-9/22/21	**Rig Type:**	TSi 150CC Compact-Crawler	**Core Barrel:**	4" ID / 4.75" OD
Boring Location:	See Exploration Plan	**Drilling Method:**	Sonic Drilling	**Water Level*:**	~ 9.3' bgs (vertical) at time of drilling

Definitions
SS = Split Spoon Sample
MSS = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of hammer
WOR = Weight of rods

Su = insitu Field Vane Shear Strength (psf)
Tv = Pocket Torvane Shear Strength (psf)
qp = Unconfirmed Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value

Su(lab) = Lab Vane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
Pi = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample Information: Sample No.	Barrel/Casing Driven (ft.)	Penetration/ Recovery (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Test Results
125	CR-19	120-130	10.0/10.0		Gray to brown, silty fine to medium sand (SM), trace gravel, wet: ALLUVIUM	
126						
127						
128						
129						
130						
131						
132						
133						
134						
135	CR-20	130-140	10.0/7.0		Gray, bedrock/weathered bedrock, hard, recovery is fractured to severely fractured, including apparent vertical seams: BEDROCK	
136						
137						
138						
139						
140						
141						
142						
143						
144						
145	CR-21	140-150	10.0/9.0			
146						
147						
148						
149						

Remarks:

Boring drilled at an angle of approximately 40 degrees relative to horizontal. Each linear foot of angled drilling equates to approximately 0.64 feet of vertical drilling. Boring terminated at 150 feet of angled drilling which equates to approximately 96 feet of vertical drilling.

- bgs: below ground surface

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.
***Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made**

Project:	Ashton Hydroelectric Develop.			**Boring No.:**	B-03-21 (Angled)
Location:	Cumberland, RI			**Project No.**	4161008
Driller:	Cascade Environmental	**Project Feature:**	Proposed Powerhouse	**Borehole ID/OD:**	5.5" ID / 6" OD
Operator:	Robert	**Elevation:**	78.8'	**Hammer Type:**	N/A
Logged By:	Helen Russell	**Datum:**	NAVD88	**Rod Size:**	3.5"
Date Start/Finish:	9/20/21-9/22/21	**Rig Type:**	TSi 150CC Compact-Crawler	**Core Barrel:**	4" ID / 4.75" OD
Boring Location:	See Exploration Plan	**Drilling Method:**	Sonic Drilling	**Water Level*:**	~ 9.3' bgs (vertical) at time of drilling

Definitions
SS = Split Spoon Sample
MSS = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of hammer
WOR = Weight of rods

Su = insitu Field Vane Shear Strength (psf)
Tv = Pocket Torvane Shear Strength (psf)
qp = Unconfirmed Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value

Su(lab) = Lab Vane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
Pi = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample Information: Sample No.	Sample Information: Barrel/Casing Driven (ft.)	Sample Information: Penetration/ Recovery (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Test Results
150					Bottom of boring at 150' angled drilling and approximately 96' bgs	
151						
152						
153						
154						
155						
156						
157						
158						
159						
160						
161						
162						
163						
164						
165						
166						
167						
168						
169						
170						
171						
172						
173						
174						

Remarks:

Boring drilled at an angle of approximately 40 degrees relative to horizontal. Each linear foot of angled drilling equates to approximately 0.64 feet of vertical drilling. Boring terminated at 150 feet of angled drilling which equates to approximately 96 feet of vertical drilling.

- bgs: below ground surface

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.
***Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made**

ATTACHMENT 2B

DRIVE-AND-WASH BORINGS

Project:	Ashton Hydroelectric Develop.			**Boring No.:**	B-04-21 (Vertical)
Location:	Cumberland, RI			**Project No.**	4161008
Driller:	Northern Test Boring	**Project Feature:**	Proposed Powerhouse	**Borehole ID/OD:**	4" OD
Operator:	Michael Nadeau	**Elevation:**	81.2'	**Hammer Type:**	Automatic
Logged By:	ENE	**Datum:**	NAVD88	**Rod Size:**	NQJ Rods
Date Start/Finish:	7/12/21	**Rig Type:**	Diedrich D50 track-mount	**Core Barrel:**	
Boring Location:	See Exploration Plan	**Drilling Method:**	Drive and Wash	**Water Level*:**	~ 8.5' bgs at time of drilling

Definitions
SS = Split Spoon Sample
MSS = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of hammer
WOR = Weight of rods

Su = insitu Field Vane Shear Strength (psf)
Tv = Pocket Torvane Shear Strength (psf)
qp = Unconfirmed Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value

Su(lab) = Lab Vane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
Pi = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Elevation (ft.)	Depth (ft.)	Sample Information: Sample No.	Sample Interval (ft.)	Pen./Rec. (in.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	Casing Blows	Graphic Log	Visual Description and Remarks	Laboratory Test Results	AASHTO and Unified Class.
80	0	SS-01	0-2	14	4-5-5-4	10			Dark brown, silt, some sand, some organics, little gravel, loose to medium dense, moist: EXISTING FILL		ML
	1										
	2								Orange-brown, f-c sand, some gravel, loose to medium dense, moist: EXISTING FILL		
	3										
	4										
	5	SS-02	5-7	10	3-5-5-8	10			Brown, angular to subrounded gravel, some f-c sand, little silt, loose, moist: EXISTING FILL		GW
75	6										
	7								- Auger grinding until ~8' bgs		
	8										
	9										
	10	SS-03	10-12	14	3-3-2-2	5	26		Brown to light brown, f-c sand, some silt, little angular to subrounded gravel, loose, moist: ALLUVIUM		SW-SM
70	11						30				
	12						19		Dark brown, silt, some f-m sand, loose, wet: ALLUVIUM		
	13						21				
	14						22				
	15	SS-04	15-17	16	1-2-4-10	6			Olive brown, silty fine sand, loose, wet: ALLUVIUM		SP-SM
65	16										
	17								- 16.8' bgs: Becomes dark gray w/occasional organics		
	18						71				
	19						124				
	20	SS-05	20-22	6	6-14-24-14	38			Brown, angular to subrounded gravel, some f-c sand, trace silt, dense, wet: ALLUVIUM		GW
60	21						44				
	22						57				
	23						91				
	24						163				

Remarks:

- SSA to 5-7' and 10-12' samples, then switched to drive & wash.
- 4" casing advanced to 65' bgs. Casing came detached at 60' bgs. Used 3" roller bit to advance through offset casing down to 70' bgs.
- River level at approximately 75.5' El. at time of drilling.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.
***Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made**

Project:	Ashton Hydroelectric Develop.	**Boring No.:**	B-04-21 (Vertical)
Location:	Cumberland, RI	**Project No.**	4161008

Driller:	Northern Test Boring	**Project Feature:**	Proposed Powerhouse	**Borehole ID/OD:**	4" OD
Operator:	Michael Nadeau	**Elevation:**	81.2'	**Hammer Type:**	Automatic
Logged By:	ENE	**Datum:**	NAVD88	**Rod Size:**	NQJ Rods
Date Start/Finish:	7/12/21	**Rig Type:**	Diedrich D50 track-mount	**Core Barrel:**	
Boring Location:	See Exploration Plan	**Drilling Method:**	Drive and Wash	**Water Level*:**	~ 8.5' bgs at time of drilling

Definitions
SS = Split Spoon Sample
MSS = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of hammer
WOR = Weight of rods

Su = insitu Field Vane Shear Strength (psf)
Tv = Pocket Torvane Shear Strength (psf)
qp = Unconfirmed Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value

Su(lab) = Lab Vane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
Pi = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Elevation (ft.)	Depth (ft.)	Sample Information: Sample No.	Sample Interval (ft.)	Pen./Rec. (in.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	Casing Blows	Graphic Log	Visual Description and Remarks	Laboratory Test Results	AASHTO and Unified Class.
55	25	SS-06	25-27	5	4-5-5-2	10			Gray-brown f-c sand, some subrounded gravel, trace silt, loose to medium dense, wet: ALLUVIUM		SW
	26										
	27										
	28										
	29										
	30	SS-07	30-32	6	2-3-3-4	6				WC = 13.1% Fines = 1.3%	SW
50	31										
	32						45				
	33						51				
	34						68				
	35	SS-08	35-37	2	3-6-6-7	12			Gray-brown subangular to subrounded gravel, some f-c sand, little silt, medium dense, wet: ALLUVIUM		GW
45	36						33				
	37						51				
	38						71				
	39						69				
	40	SS-09	40-42	1	4-5-6-6	11			Gray-brown f-c sand, some subrounded gravel, trace silt, medium dense, wet: ALLUVIUM		SW
40	41						44				
	42						52				
	43						79				
	44						84				
	45	SS-10	45-47	6	5-6-5-6	11					SW
35	46						51				
	47						68		- 46.8' bgs: 2" dark gray coarse gravel layer		
	48						79				
	49						72				

Remarks:

- SSA to 5-7' and 10-12' samples, then switched to drive & wash.
- 4" casing advanced to 65' bgs. Casing came detached at 60' bgs. Used 3" roller bit to advance through offset casing down to 70' bgs.
- River level at approximately 75.5' El. at time of drilling.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.
***Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made**

Kleinschmidt		**Project:**	Ashton Hydroelectric Develop.	**Boring No.:**	B-04-21 (Vertical)
		Location:	Cumberland, RI	**Project No.**	4161008
Driller:	Northern Test Boring	**Project Feature:**	Proposed Powerhouse	**Borehole ID/OD:**	4" OD
Operator:	Michael Nadeau	**Elevation:**	81.2'	**Hammer Type:**	Automatic
Logged By:	ENE	**Datum:**	NAVD88	**Rod Size:**	NQJ Rods
Date Start/Finish:	7/12/21	**Rig Type:**	Diedrich D50 track-mount	**Core Barrel:**	
Boring Location:	See Exploration Plan	**Drilling Method:**	Drive and Wash	**Water Level*:**	~ 8.5' bgs at time of drilling

Definitions
SS = Split Spoon Sample
MSS = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of hammer
WOR = Weight of rods

Su = insitu Field Vane Shear Strength (psf)
Tv = Pocket Torvane Shear Strength (psf)
qp = Unconfirmed Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value

Su(lab) = Lab Vane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
Pi = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Elevation (ft.)	Depth (ft.)	Sample Information: Sample No.	Sample Interval (ft.)	Pen./Rec. (in.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	Casing Blows	Graphic Log	Visual Description and Remarks	Laboratory Test Results	AASHTO and Unified Class.
30	50	SS-11	50-52	3	3-5-6-6	11					SW
	51										
	52										
	53										
	54										
	55										
25	56	SS-12	55-57	7	12-5-6-11	11			- 55' bgs: Light gray, some silt, little gravel		SW-SM
	57										
	58										
	59										
	60										
20	61								- 60' bgs: Casing became offset. Unable to take any more samples below 55-57' sample. A 3" roller bit was used to go through the offset casing down to 70' bgs.		
	62										
	63										
	64										
	65										
15	66										
	67										
	68										
	69										
	70								- Bottom of boring at 70' bgs. No refusal.		
10	71										
	72										
	73										
	74										

Remarks:

- SSA to 5-7' and 10-12' samples, then switched to drive & wash.
- 4" casing advanced to 65' bgs. Casing came detached at 60' bgs. Used 3" roller bit to advance through offset casing down to 70' bgs.
- River level at approximately 75.5' El. at time of drilling.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.
***Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made**

Project:	Ashton Hydroelectric Develop.	**Boring No.:**	B-05-21 (Vertical)
Location:	Cumberland, RI	**Project No.**	4161008

Driller:	Northern Test Boring	**Project Feature:**	Proposed Powerhouse	**Borehole ID/OD:**	4" OD
Operator:	Michael Nadeau	**Elevation:**	81.9'	**Hammer Type:**	Automatic
Logged By:	ENE	**Datum:**	NAVD88	**Rod Size:**	NQJ Rods
Date Start/Finish:	7/13/21	**Rig Type:**	Diedrich D50 track-mount	**Core Barrel:**	
Boring Location:	See Exploration Plan	**Drilling Method:**	Drive and Wash	**Water Level*:**	Not measured

Definitions
SS = Split Spoon Sample
MSS = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of hammer
WOR = Weight of rods

Su = insitu Field Vane Shear Strength (psf)
Tv = Pocket Torvane Shear Strength (psf)
qp = Unconfirmed Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value

Su(lab) = Lab Vane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
Pi = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Elevation (ft.)	Depth (ft.)	Sample Information: Sample No.	Sample Interval (ft.)	Pen./Rec. (in.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	Casing Blows	Graphic Log	Visual Description and Remarks	Laboratory Test Results	AASHTO and Unified Class.
	0	SS-01	0-2	13	2-5-6-6	11			Dark brown, silt, some fine sand, trace gravel, trace organics, medium dense, moist: EXISTING FILL		ML
80	1										
	2										
	3										
	4										
	5	SS-02	5-7	8	2-3-5-6	8			Brown, silty f-c sand, little to some gravel, loose, moist: EXISTING FILL		SM
75	6										
	7										
	8										
	9										
	10	SS-03	10-12	17	9-8-4-4	12			Light brown, f-c sand, little subangular to subrounded fine gravel, medium dense, moist: ALLUVIUM		SM
	11										
70	12						21				
	13						27				
	14						27				
	15	SS-04	15-17	18	2-2-3-2	5			Brown, silty f-c sand, trace fine gravel, loose to medium dense, wet: ALLUVIUM		SM
	16										
65	17										
	18										
	19										
	20						41				
	21						59				
60	22						81				
	23						77				
	24						58				

Remarks:

- SSA to 5-7' and 10-12' samples, then switched to drive & wash.
- Advanced 4" casing to 40' bgs. Casing came detached at 35' bgs. 3" roller bit could not get through offset casing. Casing from 35-40' left in ground and never washed out.
- Piezometer was installed to depth 33.5' bgs.
- Top of Piezometer Riser surveyed at 83.05'.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.
***Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made**

Project:	Ashton Hydroelectric Develop.	**Boring No.:**	B-05-21 (Vertical)
Location:	Cumberland, RI	**Project No.**	4161008

Driller:	Northern Test Boring	**Project Feature:**	Proposed Powerhouse	**Borehole ID/OD:**	4" OD
Operator:	Michael Nadeau	**Elevation:**	81.9'	**Hammer Type:**	Automatic
Logged By:	ENE	**Datum:**	NAVD88	**Rod Size:**	NQJ Rods
Date Start/Finish:	7/13/21	**Rig Type:**	Diedrich D50 track-mount	**Core Barrel:**	
Boring Location:	See Exploration Plan	**Drilling Method:**	Drive and Wash	**Water Level*:**	Not measured

Definitions
SS = Split Spoon Sample
MSS = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of hammer
WOR = Weight of rods

Su = insitu Field Vane Shear Strength (psf)
Tv = Pocket Torvane Shear Strength (psf)
qp = Unconfirmed Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value

Su(lab) = Lab Vane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
Pi = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Elevation (ft.)	Depth (ft.)	Sample No.	Sample Interval (ft.)	Pen./Rec. (in.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	Casing Blows	Graphic Log	Visual Description and Remarks	Laboratory Test Results	AASHTO and Unified Class.
	25	SS-05	25-27	1	4-4-6-8	10			- 25' bgs: some fine gravel, little silt		SW
	26										
55	27						82		- 25-30' bgs: roller bit grinding		
	28						79				
	29						80				
	30	SS-06	30-32	5	4-6-4-5	10			- 30' bgs: gray-brown, some silt, trace gravel		SM
	31						55				
50	32						68				
	33						86				
	34						72				
	35	SS-07	35-37	5	8-23-23-17	46				WC = 7.5% Fines = 25.2%	
	36								- 35' bgs: brown, some gravel, dense		SM
45	37								- Casing advanced to 40' bgs and became offset at 35' bgs. A 3" rollerbit was unable to get past the offset casing. Bottom of boring at 37' bgs.		
	38										
	39										
	40										
	41										
40	42										
	43										
	44										
	45										
	46										
35	47										
	48										
	49										

Remarks:

- SSA to 5-7' and 10-12' samples, then switched to drive & wash.
- Advanced 4" casing to 40' bgs. Casing came detached at 35' bgs. 3" roller bit could not get through offset casing. Casing from 35-40' left in ground and never washed out.
- Piezometer was installed to depth 33.5' bgs.
- Top of Piezometer Riser surveyed at 83.05'.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.
***Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made**

Kleinschmidt	**Project:**	Ashton Hydroelectric Develop.	**Boring No.:**	B-06-21 (Vertical)	
	Location:	Cumberland, RI	**Project No.**	4161008	
Driller:	Northern Test Boring	**Project Feature:**	Proposed Powerhouse	**Borehole ID/OD:**	4" OD
Operator:	Michael Nadeau	**Elevation:**	78.2'	**Hammer Type:**	Automatic
Logged By:	ENE	**Datum:**	NAVD88	**Rod Size:**	NQJ Rods
Date Start/Finish:	7/13/21	**Rig Type:**	Diedrich D50 track-mount	**Core Barrel:**	
Boring Location:	See Exploration Plan	**Drilling Method:**	Drive and Wash	**Water Level*:**	Not measured

Definitions
SS = Split Spoon Sample
MSS = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of hammer
WOR = Weight of rods

Su = insitu Field Vane Shear Strength (psf)
Tv = Pocket Torvane Shear Strength (psf)
qp = Unconfirmed Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value

Su(lab) = Lab Vane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
Pi = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Elevation (ft.)	Depth (ft.)	Sample Information: Sample No.	Sample Interval (ft.)	Pen./Rec. (in.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	Casing Blows	Graphic Log	Visual Description and Remarks	Laboratory Test Results	AASHTO and Unified Class.
	0								Dark brown, silt, some f-c sand, trace fine gravel, trace organics, loose, moist: EXISTING FILL		
	1										
	2										
75	3										
	4										
	5										
	6										
	7										
70	8										
	9										
	10										
	11	SS-01	10-12	19	1-2-2-3	4					ML
	12								Brown, fine sand, some silt, trace coarse sand, loose, moist: ALLUVIUM		SM
	13										
65	14						94		- 13-15' bgs: rollerbit grinding		
	15						100				
	16	SS-02	15-17	10	12-16-29-16	45			Orange-brown, subangular to subrounded gravel, some silt, little f-c sand, trace clay, dense, wet: ALLUVIUM		GW-GM
	17						75				
	18						93				
60	19						87				
	20						68				
	21										
	22						78				
	23						92				
55	24						76				
							59				

Remarks:
- SSA to 10-12' sample, then switched to drive & wash.
- Piezometer was installed to depth of 42' bgs.
- Top of Piezometer Riser surveyed at 81.18'.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.
***Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made**

Project:	Ashton Hydroelectric Develop.	**Boring No.:**	B-06-21 (Vertical)
Location:	Cumberland, RI	**Project No.**	4161008

Driller:	Northern Test Boring	**Project Feature:**	Proposed Powerhouse	**Borehole ID/OD:**	4" OD
Operator:	Michael Nadeau	**Elevation:**	78.2'	**Hammer Type:**	Automatic
Logged By:	ENE	**Datum:**	NAVD88	**Rod Size:**	NQJ Rods
Date Start/Finish:	7/13/21	**Rig Type:**	Diedrich D50 track-mount	**Core Barrel:**	
Boring Location:	See Exploration Plan	**Drilling Method:**	Drive and Wash	**Water Level*:**	Not measured

Definitions
SS = Split Spoon Sample
MSS = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of hammer
WOR = Weight of rods

Su = insitu Field Vane Shear Strength (psf)
Tv = Pocket Torvane Shear Strength (psf)
qp = Unconfirmed Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value

Su(lab) = Lab Vane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
Pi = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Elevation (ft.)	Depth (ft.)	Sample Information: Sample No.	Sample Interval (ft.)	Pen./Rec. (in.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	Casing Blows	Graphic Log	Visual Description and Remarks	Laboratory Test Results	AASHTO and Unified Class.
	25	SS-03	25-27	0	5-6-7-7	13			Gray, f-c sand, some silt, little fine gravel, medium dense, wet: ALLUVIUM		SM
	26										
	27										
50	28										
	29										
	30	SS-04	30-32	12	6-13-19-15/3"-50/0"	32			Brown, f-c sand, some gravel, little silt, very dense, wet: ALLUVIUM	WC = 10.1% Fines = 11.1%	SM
	31								- 31.5 - 32' bgs: cobble		
	32										
45	33										
	34								- 34 - 34.5' bgs: cobble		
	35	SS-05	35-37	12	19-10-7-6	17			- 35' bgs: gray to gray-brown		SM
	36								- 36' bgs: gray, silty fine sand		
	37						60				
40	38						61				
	39						76				
	40	SS-06	40-42	15	2-3-3-5	6			Brown, fine sand, little medium to coarse sand, little silt, trace gravel, loose, wet: ALLUVIUM	WC = 18.7% Fines = 16.5%	SM
	41										
	42								Advanced hole with 3" rollerbit from 42' to 58' bgs.		
35	43										
	44										
	45										
	46								- 46' bgs: gravel on rollerbit		
	47										
30	48										
	49								- 49' bgs: gravel on rollerbit		

Remarks:
- SSA to 10-12' sample, then switched to drive & wash.
- Piezometer was installed to depth of 42' bgs.
- Top of Piezometer Riser surveyed at 81.18'.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.
***Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made**

Kleinschmidt	Project:	Ashton Hydroelectric Develop.	Boring No.:	B-06-21 (Vertical)
	Location:	Cumberland, RI	Project No.	4161008

Driller:	Northern Test Boring	**Project Feature:**	Proposed Powerhouse	**Borehole ID/OD:**	4" OD
Operator:	Michael Nadeau	**Elevation:**	78.2'	**Hammer Type:**	Automatic
Logged By:	ENE	**Datum:**	NAVD88	**Rod Size:**	NQJ Rods
Date Start/Finish:	7/13/21	**Rig Type:**	Diedrich D50 track-mount	**Core Barrel:**	
Boring Location:	See Exploration Plan	**Drilling Method:**	Drive and Wash	**Water Level*:**	Not measured

Definitions
SS = Split Spoon Sample
MSS = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test
MV = Unsuccessful Insitu Vane Shear Test attempt

R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of hammer
WOR = Weight of rods

Su = insitu Field Vane Shear Strength (psf)
Tv = Pocket Torvane Shear Strength (psf)
qp = Unconfirmed Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value

Su(lab) = Lab Vane Shear Strength (psf)
WC = Water Content, percent
LL = Liquid Limit
PL = Plastic Limit
Pi = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Elevation (ft.)	Depth (ft.)	Sample Information: Sample No.	Sample Interval (ft.)	Pen./Rec. (in.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	Casing Blows	Graphic Log	Visual Description and Remarks	Laboratory Test Results	AASHTO and Unified Class.
	50										
	51										
	52										
25	53										
	54										
	55										
	56										
	57										
20	58										
	59										
	60										
	61										
	62										
15	63										
	64										
	65										
	66										
	67										
10	68										
	69										
	70										
	71										
	72										
5	73										
	74										

- 55' bgs: f-m sand with gravel, gravel on rollerbit

Rollerbit grinding on boulder or possible bedrock

- Bottom of boring at 58' bgs.

Remarks:

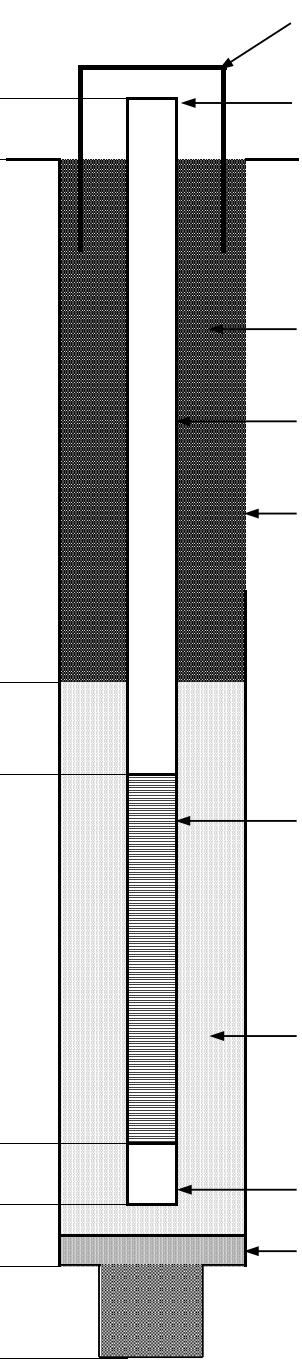
- SSA to 10-12' sample, then switched to drive & wash.
- Piezometer was installed to depth of 42' bgs.
- Top of Piezometer Riser surveyed at 81.18'.

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.
***Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made**

ATTACHMENT 3

2021 PIEZOMETER CONSTRUCTION DIAGRAMS

KLEINSCHMIDT				STANDPIPE PIEZOMETER CONSTRUCTION DIAGRAM
Project: Ashton Hydroelectric Development		**Project Number:**		
Location: Cumberland, Rhode Island		4161-008		**B-05-21**
Client: New England Hydropower Co.		**Date:** 12/10/21		
Drilling Method: 4-inch Dia. Rotary Wash (Cased; Drive-and-Wash)				**Measuring Point**
Install Date: 07/13/21				**Type:** Top of Riser
Installed By: Northern Test Boring Inc.				**Elevation (ft):** **83.1**
Item	**Depth (ft bgs)**	**Elevation (ft)**	**Legend**	**Description**

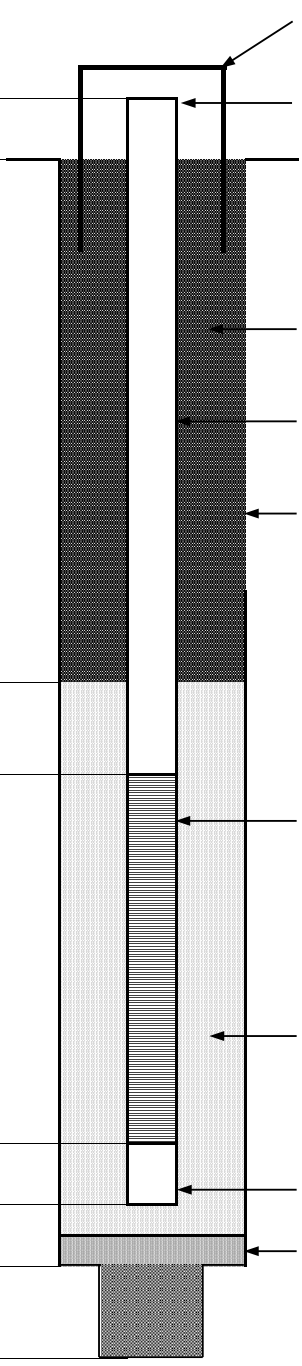


Item	Depth (ft bgs)	Elevation (ft)	Description	
			Protective Steel Casing	
Top of Riser	1.2	83.1	Stickup Type:	PVC (Sch. 40)
			Stickup Diameter:	2-inch
Ground Surface	0.0	81.9		
			Backfill:	Bentonite Chips (Hydrated)
			Riser Pipe Type:	PVC (Sch. 40)
			Riser Pipe ID:	2-inch
			Borehole Diameter:	4.25 inches
Top of Filter Pack	27.0	54.9		
Top of Screen	28.5	53.4		
			Screen Type:	PVC (Sch. 40)
			Screen ID:	2-inch
			Screen Slot Size:	0.010-inch
			Screen Length:	5.0 feet
			Filter/Sand Pack Type:	Filter Sand
Base of Screen	33.5	48.4		
End Cap	33.5	48.4	Sump:	N/A
Drilled Depth	37.0	44.9	Fallback/Backfill:	Filter Sand
Total Depth	37.0	44.9		

Notes: Top of riser elevation was surveyed by DGT Associates Surveying & Engineering on September 28, 2021

KLEINSCHMIDT				STANDPIPE PIEZOMETER CONSTRUCTION DIAGRAM
Project:	Ashton Hydroelectric Development	**Project Number:**	4161-008	**B-06-21**
Location:	Cumberland, Rhode Island			
Client:	New England Hydropower Co.	**Date:**	12/10/21	
Drilling Method:	4-inch Dia. Rotary Wash (Cased; Drive-and-Wash)			**Measuring Point**
Install Date:	7/13/2021			**Type:** Top of Riser
Installed By:	Northern Test Boring Inc.			**Elevation (ft):** 81.2

Item	Depth (ft bgs)	Elevation (ft)	Legend	Description
Top of Riser	3.0	81.2		Protective Steel Casing Stickup Type: PVC (Sch. 40) Stickup Diameter: 2-inch
Ground Surface	0.0	78.2		
				Backfill: Bentonite Chips (Hydrated)
				Riser Pipe Type: PVC (Sch. 40) Riser Pipe ID: 2-inch
				Borehole Diameter: 4.25 inches
Top of Filter Pack	34.5	43.7		
Top of Screen	37.0	41.2		Screen Type: PVC (Sch. 40) Screen ID: 2-inch Screen Slot Size: 0.010-inch Screen Length: 5.0 feet
				Filter/Sand Pack Type: Filter Sand
Base of Screen	42.0	36.2		
End Cap	42.0	36.2		Sump: N/A
Drilled Depth	58.0	20.2		Fallback/Backfill: Bentonite Chips (Hydrated)
Total Depth	58.0	20.2		

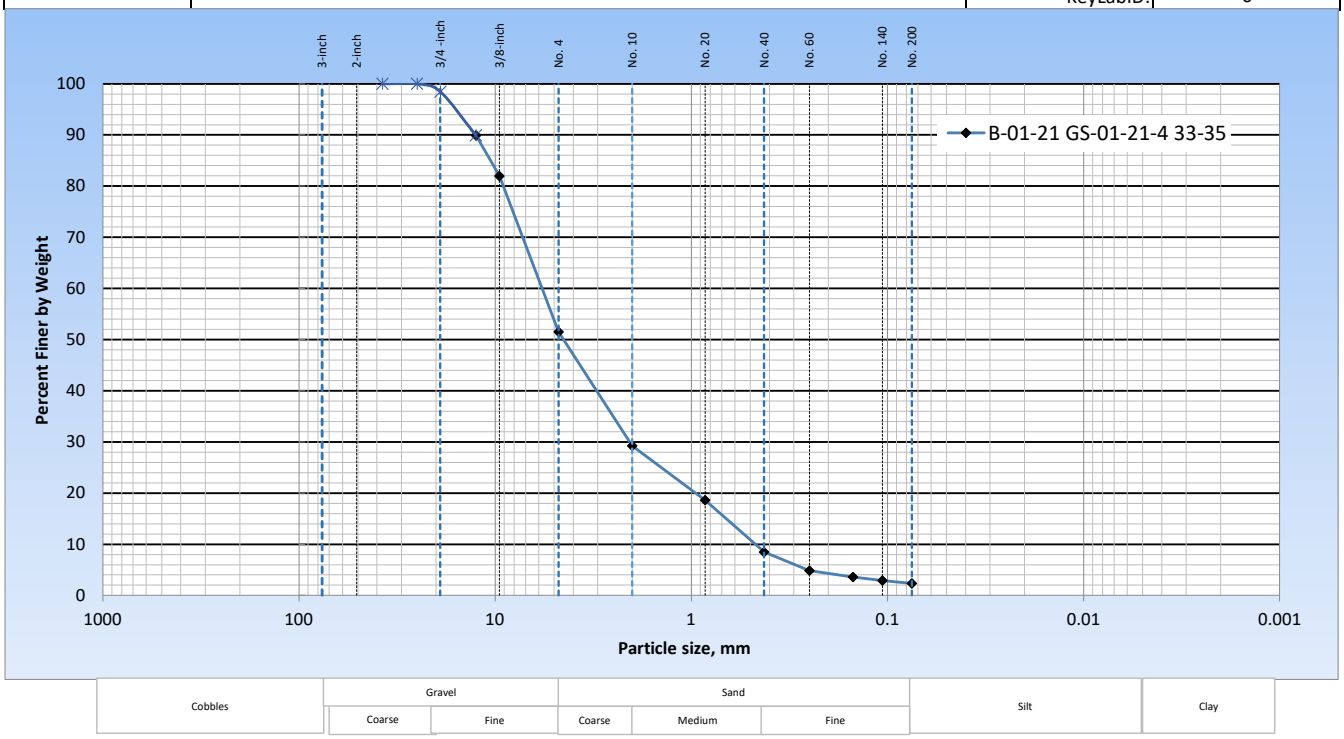


Notes: Top of riser elevation was surveyed by DGT Associates Surveying & Engineering on September 28, 2021

ATTACHMENT 4

2021 GEOTECHNICAL LABORATORY TESTING

	Particle Size Distribution	Job No.:	104-122
		Client:	Kleinschmidt
Site Name	Ashton Hydro Development	Client Project No.:	
		Boring/Test Pit No:	B-01-21
Site Location	Ashton, RI	Sample No:	GS-01-21-4
		Depth:	33-35
Test Method	AASHTO 311	Sample Type:	Grab
		KeyLabID:	0



Sieving	
Particle Size mm	% Passing
100	100.0
75	100.0
50	100.0
37.5	100.0
25	100.0
19	98.4
12.5	89.9
9.5	82.0
4.75	51.5
2	29.2
0.85	18.6
0.425	8.5
0.25	4.9
0.15	3.6
0.106	2.9
0.075	2.4

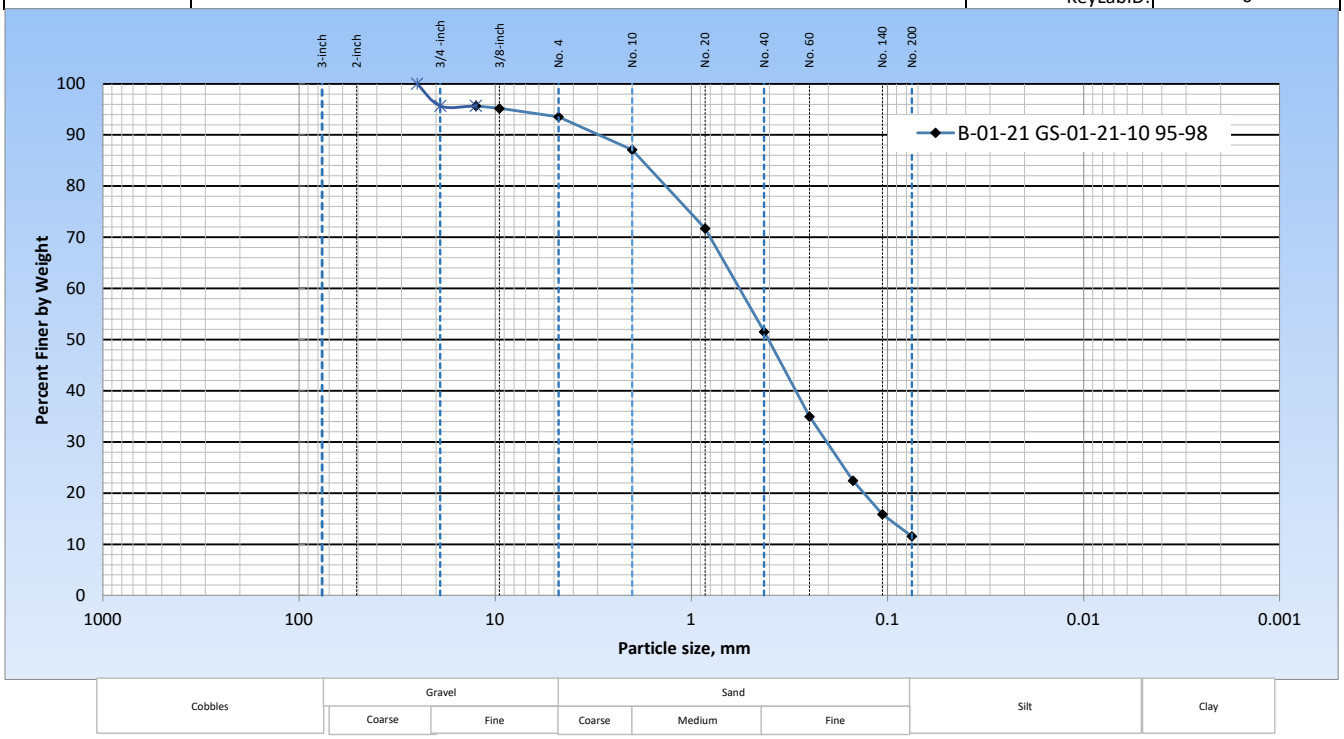
Moisture Content:	8.8

Sample Proportions	% Dry Mass
Very Coarse > 75 mm	0.0
Coarse Gravel 75 mm - 19 mm	1.6
Fine Gravel 19 mm - 4.75 mm	46.9
Coarse Sand 4.75 to 2.0 mm	22.3
Medium Sand 2.0 to 0.435 mm	20.8
Fine Sand: 0.425 to 0.075 mm	6.1
Fines: <0.075 mm	2.4

Soil Classification
Brown Gravelly medium to coarse SAND, trace fine sand and silt (SW)

Tested by		Checked by		Approved by		Printed Date	Figure No.
SJR	Date	sjr	Date	sjr	Date		
	11/5/2021		11/6/2021		11/6/2021		

	Particle Size Distribution		
		Job No.:	104-122
		Client:	Kleinschmidt
Site Name	Ashton Hydro Development	Client Project No.:	
		Boring/Test Pit No:	B-01-21
Site Location	Ashton, RI	Sample No:	GS-01-21-10
		Depth:	95-98
Test Method	AASHTO 311	Sample Type:	Grab
		KeyLabID:	0



Sieving	
Particle Size mm	% Passing
100	100.0
75	100.0
50	100.0
37.5	100.0
25	100.0
19	95.7
12.5	95.7
9.5	95.2
4.75	93.6
2	87.1
0.85	71.7
0.425	51.5
0.25	35.0
0.15	22.4
0.106	15.9
0.075	11.5

Moisture Content:	13.7

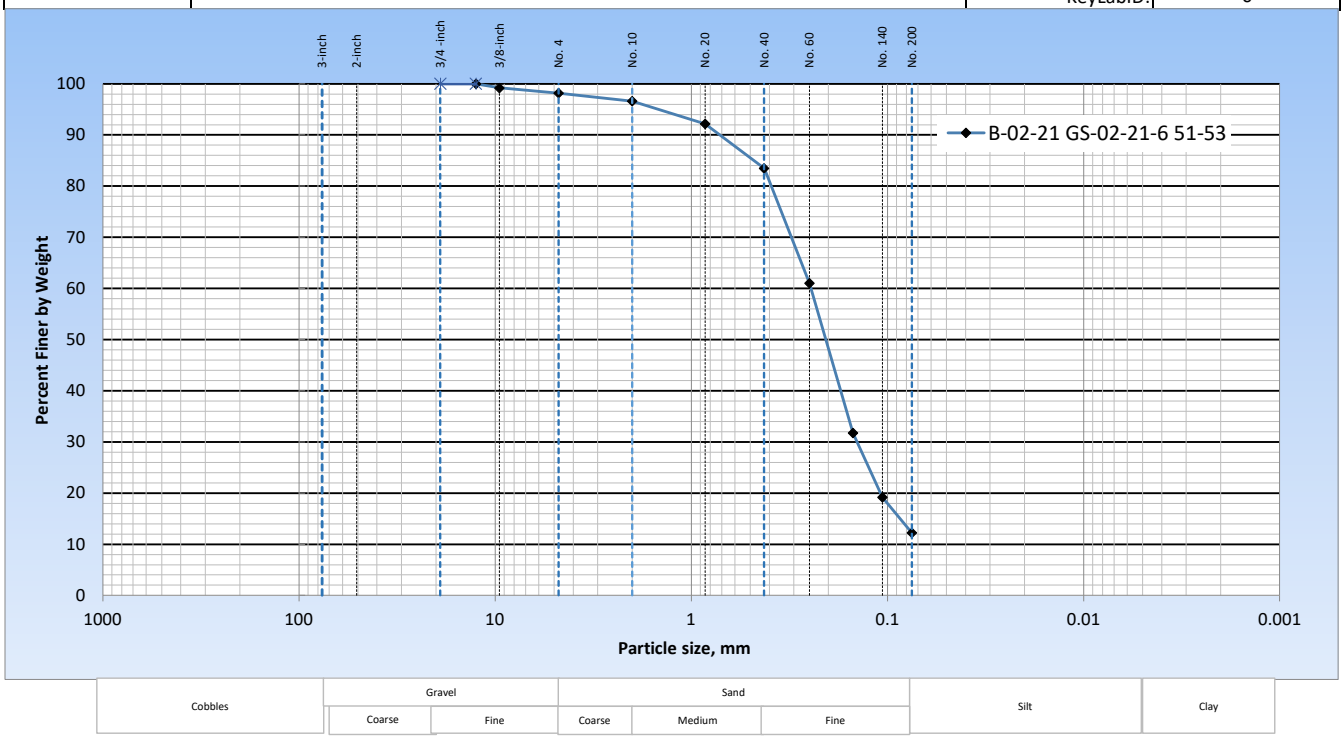
Sample Proportions	% Dry Mass
Very Coarse > 75 mm	0.0
Coarse Gravel 75 mm - 19 mm	4.3
Fine Gravel 19 mm - 4.75 mm	2.1
Coarse Sand 4.75 to 2.0 mm	6.5
Medium Sand 2.0 to 0.435 mm	35.6
Fine Sand: 0.425 to 0.075 mm	40.0
Fines: <0.075 mm	11.5

Soil Classification
Grayish brown fine to coarse SAND, little silt, trace fine gravel (SM)

Tested by		Checked by		Approved by		Printed Date	Figure No.
SJR	Date	sjr	Date	sjr	Date		
	11/5/2021		11/6/2021		11/6/2021		

Soil Metrics LLC Geotechnical Engineering

	Particle Size Distribution		
		Job No.:	104-122
		Client:	Kleinschmidt
Site Name	Ashton Hydro Development	Client Project No.:	
		Boring/Test Pit No:	B-02-21
Site Location	Ashton, RI	Sample No:	GS-02-21-6
		Depth:	51-53
Test Method	AASHTO 311	Sample Type:	Jar
		KeyLabID:	0



Sieving	
Particle Size mm	% Passing
100	100.0
75	100.0
50	100.0
37.5	100.0
25	100.0
19	100.0
12.5	100.0
9.5	99.2
4.75	98.1
2	96.6
0.85	92.2
0.425	83.5
0.25	61.0
0.15	31.8
0.106	19.2
0.075	12.2

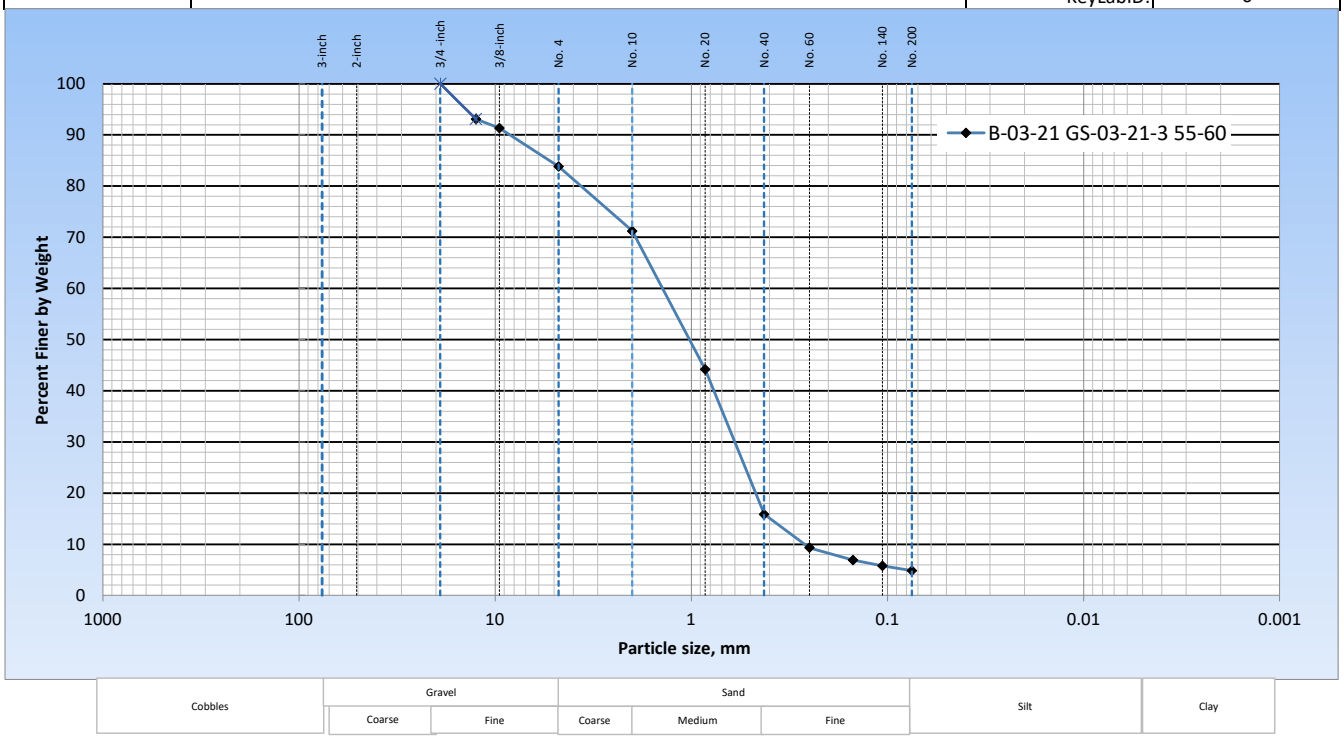
Moisture Content:	16.1

Sample Proportions	% Dry Mass
Very Coarse > 75 mm	0.0
Coarse Gravel 75 mm - 19 mm	0.0
Fine Gravel 19 mm - 4.75 mm	1.9
Coarse Sand 4.75 to 2.0 mm	1.6
Medium Sand 2.0 to 0.435 mm	13.1
Fine Sand: 0.425 to 0.075 mm	71.3
Fines: <0.075 mm	12.2

Soil Classification
Gray fine SAND, little medium to coarse sand and silt, trace fine gravel (SP/SM)

Tested by		Checked by		Approved by		Printed Date	Figure No.
SJR	Date 11/5/2021	sjr	Date 11/6/2021	sjr	Date 11/6/2021		

	Particle Size Distribution		
		Job No.:	104-122
		Client:	Kleinschmidt
Site Name	Ashton Hydro Development	Client Project No.:	
		Boring/Test Pit No:	B-03-21
Site Location	Ashton, RI	Sample No:	GS-03-21-3
		Depth:	55-60
Test Method	AASHTO 311	Sample Type:	Jar
		KeyLabID:	0



Sieving	
Particle Size mm	% Passing
100	100.0
75	100.0
50	100.0
37.5	100.0
25	100.0
19	100.0
12.5	93.1
9.5	91.3
4.75	83.8
2	71.2
0.85	44.2
0.425	15.8
0.25	9.3
0.15	6.9
0.106	5.8
0.075	4.8

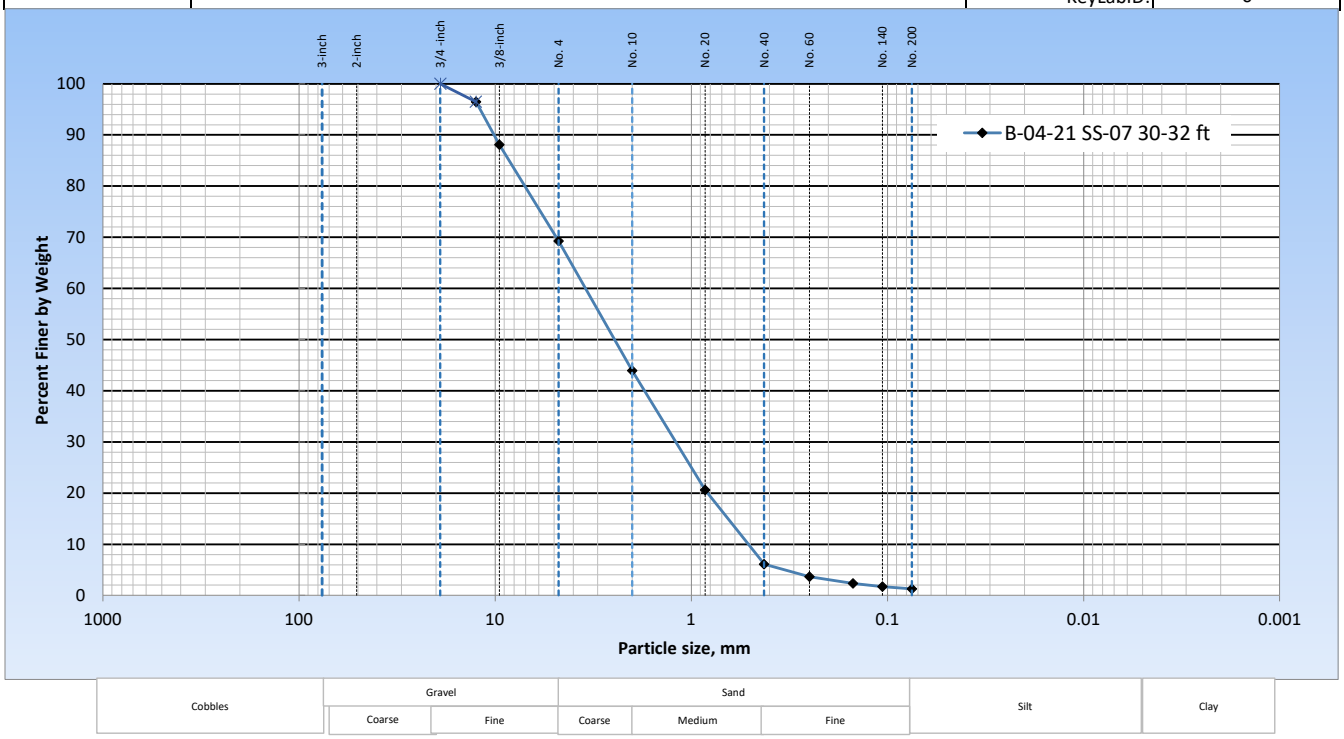
Sample Proportions	% Dry Mass
Very Coarse > 75 mm	0.0
Coarse Gravel 75 mm - 19 mm	0.0
Fine Gravel 19 mm - 4.75 mm	16.2
Coarse Sand 4.75 to 2.0 mm	12.6
Medium Sand 2.0 to 0.435 mm	55.4
Fine Sand: 0.425 to 0.075 mm	11.0
Fines: <0.075 mm	4.8

Soil Classification
Gray/brown fine to coarse SAND, little fine gravel, trace silt. (SW)

Moisture Content:	9.5

Tested by		Checked by		Approved by		Printed Date	Figure No.
SJR	Date 11/5/2021	sjr	Date 11/6/2021	sjr	Date 11/6/2021		

	Particle Size Distribution		
		Job No.:	104-180
		Client:	Kleinschmidt
Site Name	Ashton Hydro Development	Client Project No.:	NA
		Boring/Test Pit No:	B-04-21
Site Location	Ashton, RI	Sample No:	SS-07
		Depth:	30-32 ft
Test Method	AASHTO 311	Sample Type:	Jar
		KeyLabID:	0



Sieving	
Particle Size mm	% Passing
100	100.0
75	100.0
50	100.0
37.5	100.0
25	100.0
19	100.0
12.5	96.5
9.5	88.1
4.75	69.3
2	44.0
0.85	20.6
0.425	6.1
0.25	3.6
0.15	2.3
0.106	1.7
0.075	1.3

Moisture Content:	13.1

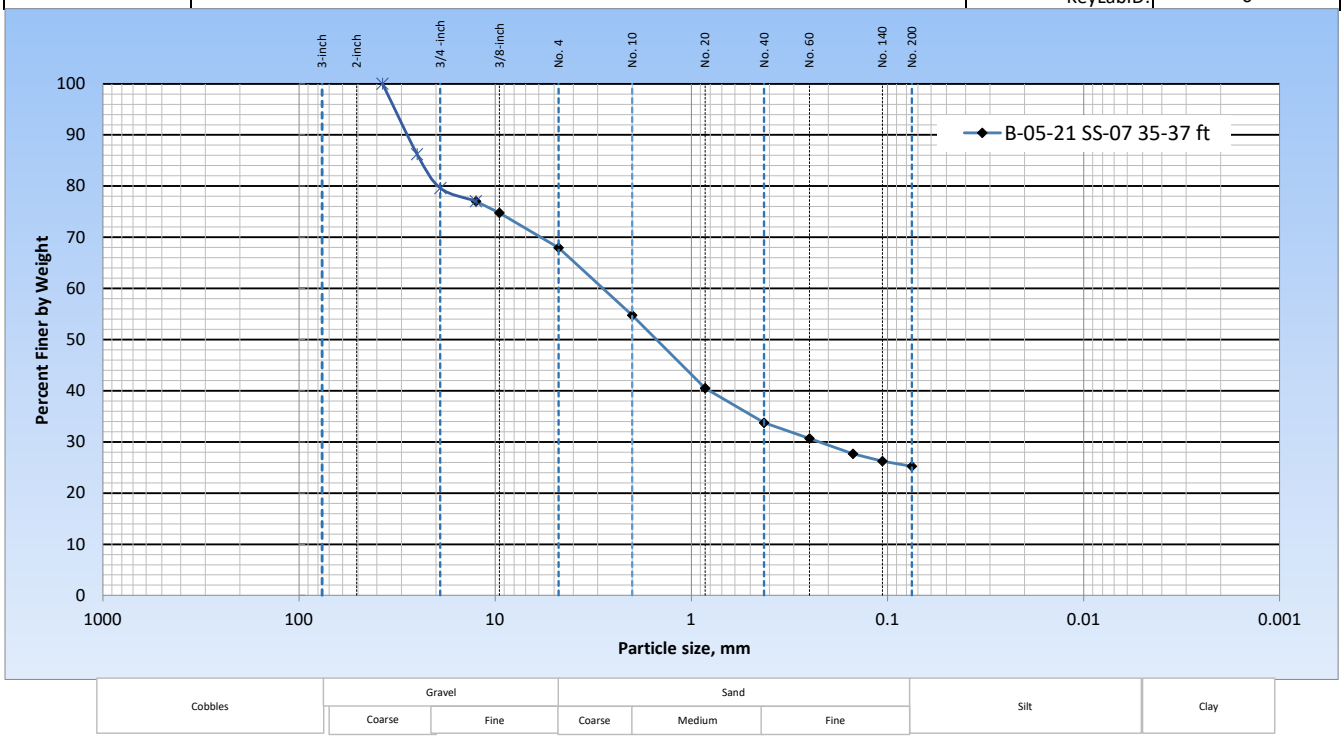
Sample Proportions	% Dry Mass
Very Coarse > 75 mm	0.0
Coarse Gravel 75 mm - 19 mm	0.0
Fine Gravel 19 mm - 4.75 mm	30.7
Coarse Sand 4.75 to 2.0 mm	25.3
Medium Sand 2.0 to 0.435 mm	37.9
Fine Sand: 0.425 to 0.075 mm	4.8
Fines: <0.075 mm	1.3

Soil Classification
Brown Gravelly SAND, trace silt (SW)

Tested by		Checked by		Approved by		Printed Date	Figure No.
SJR	Date	sjr	Date	sjr	Date		
	7/23/2021		7/23/2021		7/23/2021		

Soil Metrics LLC Geotechnical Engineering

	Particle Size Distribution		
		Job No.:	104-180
		Client:	Kleinschmidt
Site Name	Ashton Hydro Development	Client Project No.:	NA
		Boring/Test Pit No:	B-05-21
Site Location	Ashton, RI	Sample No:	SS-07
		Depth:	35-37 ft
Test Method	AASHTO 311	Sample Type:	Jar
		KeyLabID:	0



Sieving	
Particle Size mm	% Passing
100	100.0
75	100.0
50	100.0
37.5	100.0
25	86.3
19	79.6
12.5	77.1
9.5	74.8
4.75	68.0
2	54.8
0.85	40.5
0.425	33.7
0.25	30.7
0.15	27.7
0.106	26.2
0.075	25.2

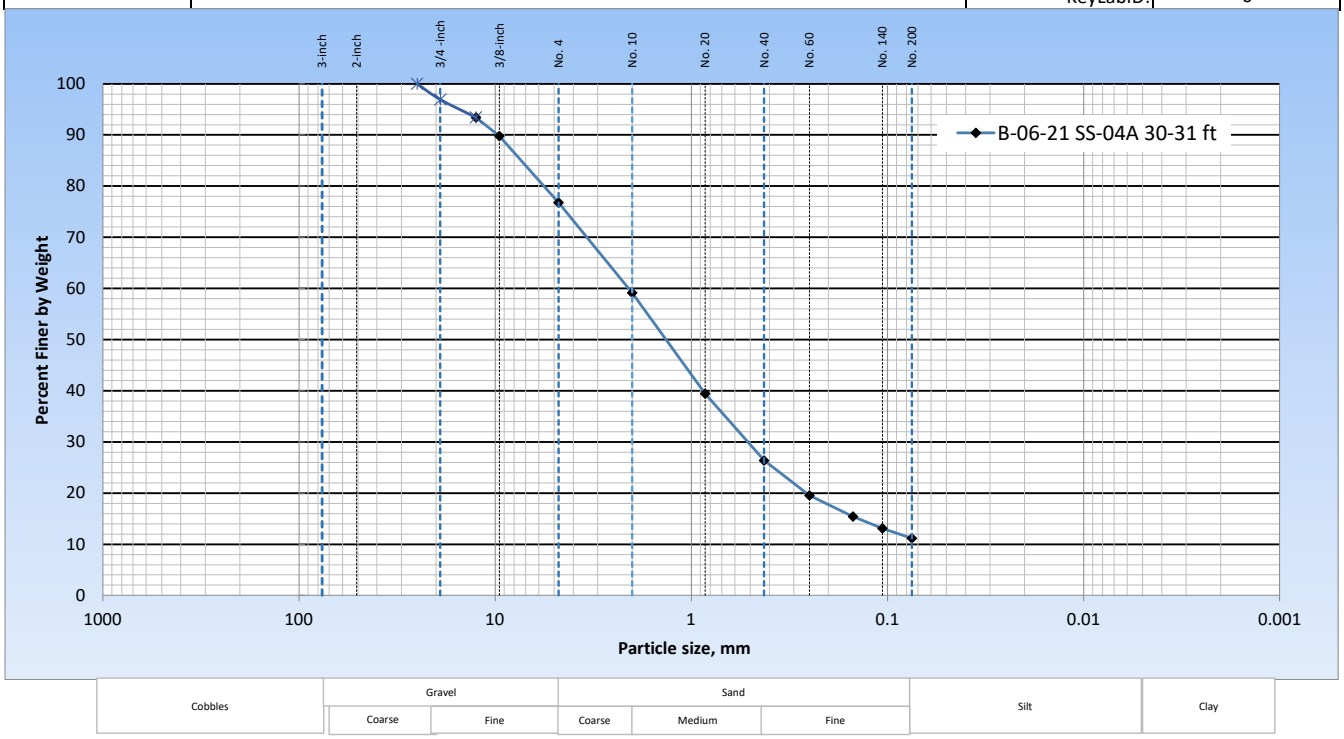
Sample Proportions	% Dry Mass
Very Coarse > 75 mm	0.0
Coarse Gravel 75 mm - 19 mm	20.4
Fine Gravel 19 mm - 4.75 mm	11.6
Coarse Sand 4.75 to 2.0 mm	13.2
Medium Sand 2.0 to 0.435 mm	21.1
Fine Sand: 0.425 to 0.075 mm	8.5
Fines: <0.075 mm	25.2

Soil Classification
Brown Gravelly Silty SAND, (SM)

Moisture Content:	7.5

Tested by		Checked by		Approved by		Printed Date	Figure No.
SJR	Date 7/23/2021	sjr	Date 7/23/2021	sjr	Date 7/23/2021		

	Particle Size Distribution		
		Job No.:	104-180
		Client:	Kleinschmidt
Site Name	Ashton Hydro Development	Client Project No.:	NA
		Boring/Test Pit No:	B-06-21
Site Location	Ashton, RI	Sample No:	SS-04A
		Depth:	30-31 ft
Test Method	AASHTO 311	Sample Type:	Jar
		KeyLabID:	0



Sieving	
Particle Size mm	% Passing
100	100.0
75	100.0
50	100.0
37.5	100.0
25	100.0
19	96.9
12.5	93.4
9.5	89.8
4.75	76.8
2	59.1
0.85	39.4
0.425	26.4
0.25	19.5
0.15	15.4
0.106	13.1
0.075	11.1

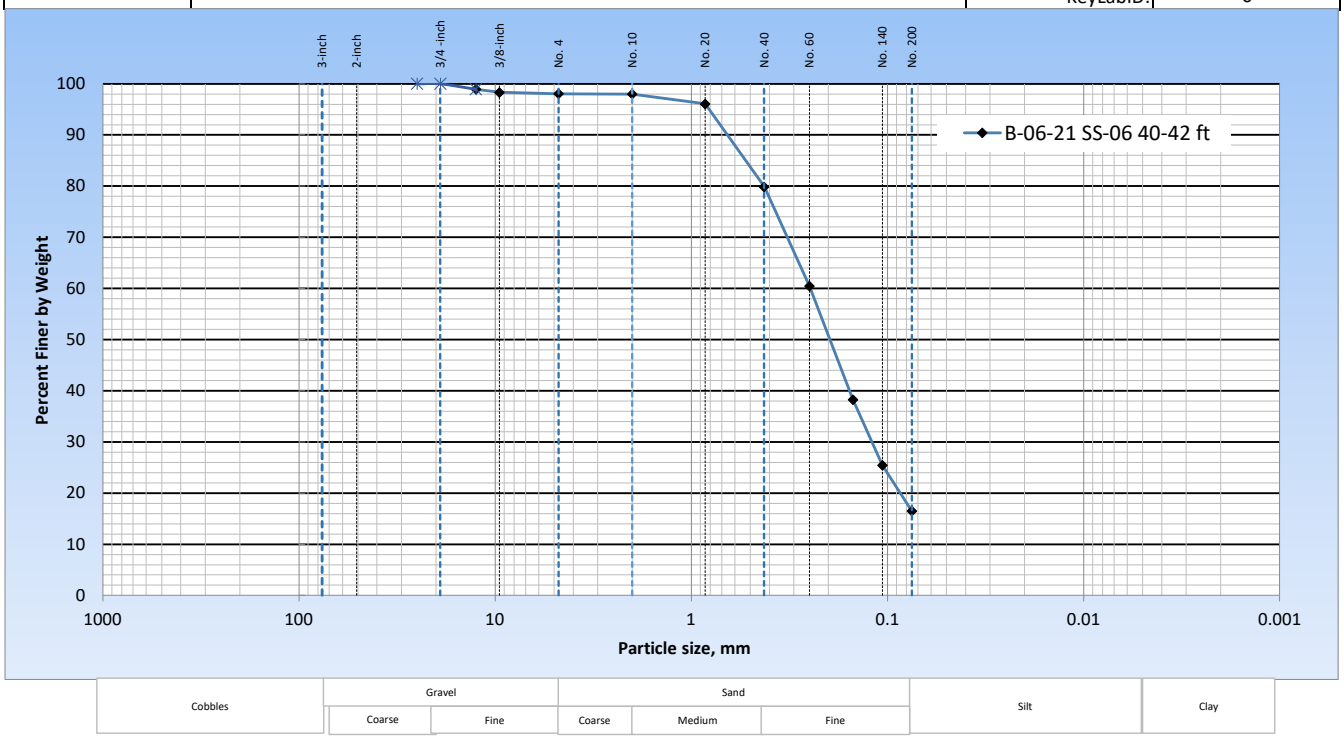
Moisture Content:	10.1

Sample Proportions	% Dry Mass
Very Coarse > 75 mm	0.0
Coarse Gravel 75 mm - 19 mm	3.1
Fine Gravel 19 mm - 4.75 mm	20.1
Coarse Sand 4.75 to 2.0 mm	17.7
Medium Sand 2.0 to 0.435 mm	32.8
Fine Sand: 0.425 to 0.075 mm	15.2
Fines: <0.075 mm	11.1

Soil Classification
Brown Gravelly SAND, little silt, (SM)

Tested by		Checked by		Approved by		Printed Date	Figure No.
SJR	Date	sjr	Date	sjr	Date		
	7/23/2021		7/23/2021		7/23/2021		

	Particle Size Distribution		
		Job No.:	104-180
		Client:	Kleinschmidt
Site Name	Ashton Hydro Development	Client Project No.:	NA
		Boring/Test Pit No:	B-06-21
Site Location	Ashton, RI	Sample No:	SS-06
		Depth:	40-42 ft
Test Method	AASHTO 311	Sample Type:	Jar
		KeyLabID:	0



Sieving	
Particle Size mm	% Passing
100	100.0
75	100.0
50	100.0
37.5	100.0
25	100.0
19	100.0
12.5	98.9
9.5	98.3
4.75	98.0
2	98.0
0.85	96.1
0.425	79.9
0.25	60.5
0.15	38.3
0.106	25.4
0.075	16.5

Moisture Content:	18.7

Sample Proportions	% Dry Mass
Very Coarse > 75 mm	0.0
Coarse Gravel 75 mm - 19 mm	0.0
Fine Gravel 19 mm - 4.75 mm	2.0
Coarse Sand 4.75 to 2.0 mm	0.1
Medium Sand 2.0 to 0.435 mm	18.1
Fine Sand: 0.425 to 0.075 mm	63.4
Fines: <0.075 mm	16.5

Soil Classification
Brown fine SAND, trace gravel, little medium to coarse sand, little silt, (SM)

Tested by		Checked by		Approved by		Printed Date	Figure No.
SJR	Date 7/23/2021	sjr	Date 7/23/2021	sjr	Date 7/23/2021		

ATTACHMENT 5

PRIOR INVESTIGATION(S) AND TESTING BY OTHERS

RANSOM Consulting Engineers and Scientists

B2/MW101

Reviewed by:	JPJ	Total Depth:	30 Feet	Logged By:	JPJ
Date Reviewed:	11/11/16	Boring Diameter:	4 Inches	Date Drilled:	11/2/16 to 11/2/16
Surface Elevation:	80.7'	Well Stickup:	2.5' +/-	Driller:	NECB

DEPTH	DESCRIPTION (Based on USCS and modified Burmister Soil Classification System)	SOIL PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)
1	Loose, dark brown, fine to medium SAND, some silt, little gravel, little coal (Fill).	Fill		S1	2-4-4-3	8	24/13	<1
2								
3								
4								
5	Medium dense, brown to light brown, fine SAND, some silt, little gravel.	Sand		S2	6-8-9-4	17	24/13	<1
6								
7	Very dense, brown, fine to coarse SAND, some silt, some gravel.			S3	22-22-29-26	51	24/8	<1
8								
9	Medium dense, brown, fine SAND and SILT, little rounded gravel.	Sand		S4	12-10-9-10	19	24/15	<1
10								
11	6" Loose, brown, fine to medium SAND, some silt, trace root fibers, over 7" loose, dark brown SILT, little root fibers.	Silt		S5A S5B	8-4-2-5	6	24/13	<1 <1
12								
13	No recovery.			S6	6-5-5-7	11	24/0	<1
14								
15	9" Very dense, brownish gray SILT, some fine sand, over 11" very dense, borwn, fine to coarse SAND and GRAVEL, trace silt.	Gravel		S7A S7B	3-10-24-30	34	24/20	<1 <1
16								
17	Very dense, brown GRAVEL and fine to coarse SAND, little silt.			S8	27-26-25-28	51	24/19	<1
18								
19	Very dense, brown GRAVEL, some fine to coarse sand, little silt.	Gravel		S9	30-34-22-35	56	24/9	<1
20								
21								
22								
23	Medium dense, brown/gray, fine to coarse SAND, some gravel, trace silt.							
24		Sand		S10	4-6-8-9	14	24/9	<1

WELL CONSTRUCTION

WATER LEVELS:

During Drilling	End of Boring	Date:
15' +/-	14.3'	11/2/16 @ 14:15

WELL LEGEND: Filter Sand; Native Fill; Bentonite; Bentonite Grout; Concrete; PVC Screen; PVC Riser

NOTES:
1. Soil borings conducted using ATV drilling rig with 4" drive and wash casing.
2. Standard penetration test conducted with 2" OD split barrel sampler driven by 140 lb. safety hammer.
3. NM=Not measured; NA=not applicable.

CLIENT:
Kleinschmidt Associates

SITE:
Ashton Dam

,

Project No.: 161.02037.101

RANSOM Consulting Engineers and Scientists

B2/MW101

Reviewed by:	JPJ	Total Depth:	30 Feet	Logged By:	JPJ
Date Reviewed:	11/11/16	Boring Diameter:	4 Inches	Date Drilled:	11/2/16 to 11/2/16
Surface Elevation:	80.7'	Well Stickup:	2.5' +/-	Driller:	NECB

DEPTH	DESCRIPTION (Based on USCS and modified Burmister Soil Classification System)	SOIL PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
26–29	Medium dense, brown/gray, coarse SAND, trace gravel.	Sand		S11	9-9-8-11	17	24/1	<1	
30	End of exploration 30'.								
31–49									

WATER LEVELS:

During Drilling	End of Boring	Date:
15' +/-	14.3'	11/2/16 @ 14:15

WELL LEGEND: Filter Sand; Native Fill; Bentonite; Bentonite Grout; Concrete; PVC Screen; PVC Riser

NOTES:
1. Soil borings conducted using ATV drilling rig with 4" drive and wash casing.
2. Standard penetration test conducted with 2" OD split barrel sampler driven by 140 lb. safety hammer.
3. NM=Not measured; NA=not applicable.

CLIENT: Kleinschmidt Associates

SITE: Ashton Dam

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Project No.: 161.02037.101

RANSOM Consulting Engineers and Scientists

B6/MW102

Reviewed by:	JPJ	Total Depth:	49 Feet	Logged By:	JPJ
Date Reviewed:	11/11/16	Boring Diameter:	4 Inches	Date Drilled:	11/2/16 to 11/3/16
Surface Elevation:	77.2'	Well Stickup:	3' +/-	Driller:	NECB

DEPTH	DESCRIPTION (Based on USCS and modified Burmister Soil Classification System)	SOIL PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)
1	2" TOPSOIL, over 8" medium dense, brown, fine to coarse SAND, some silt, some gravel, trace coal fragments, dry (Fill).	Fill		S1	4-13-9-6	22	24/12	<1
2								
3	1" Similar to above, over 16" brown, fine SAND, some silt, trace roots (Fill).			S2	7-4-6-11	10	24/17	<1
4								
5	No recovery (wash cuttings very dark brown).			S3	7-5-5-7	10	24/0	NA
6								
7	No recovery.	Silt		S4	3-3-4-7	7	24/0	NA
8								
9	Loose, very dark brown SILT, some fine sand, trace organics (roots).	Silt		S5	3-2-5-7	7	24/7	<1
10								
11	Dense, 4" Similar to above, over 3" brown SILT, some fine to coarse sand, trace gravel.			S6	5-11-28-25	39	24/7	<1
12								
13	Very dense, yellowish brown GRAVEL, some fine to coarse sand, little silt, wet.	Gravel		S7	25-87-89-36	176	24/21	<1
14								
15	Dense, brown/gray GRAVEL, some fine to coarse sand, wet.			S8	19-20-22-26	42	24/5	<1
16								
17	Dense, gray GRAVEL and fine to coarse SAND, some silt, wet.	Gravel		S9	14-20-20-14	40	24/11	<1
18								
19	Medium dense, gray, fine to coarse SAND, some gravel, little silt, wet.	Sand		S10	7-12-10-12	22	24/14	<1
20								
21								
22								
23	Medium dense, gray SILT, some fine sand, wet.							
24		Silt		S11	4-4-6-8	10	24/17	<1

WELL CONSTRUCTION

WATER LEVELS:

During Drilling 12' +/- | End of Boring | Date:

WELL LEGEND: Filter Sand | Native Fill | Bentonite | Bentonite Grout | Concrete | PVC Screen | PVC Riser

NOTES:
1. Soil borings conducted using ATV drilling rig with 4" drive and wash casing.
2. Standard penetration test conducted with 2" OD split barrel sampler driven by 140 lb. safety hammer.
3. NM=Not measured; NA=not applicable.

CLIENT: Kleinschmidt Associates

SITE: Ashton Dam

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Project No.: 161.02037.101 | Page: 1

RANSOM Consulting Engineers and Scientists

B6/MW102

Reviewed by:	JPJ	Total Depth:	49 Feet	Logged By:	JPJ
Date Reviewed:	11/11/16	Boring Diameter:	4 Inches	Date Drilled:	11/2/16 to 11/3/16
Surface Elevation:	77.2'	Well Stickup:	3' +/-	Driller:	NECB

DEPTH	DESCRIPTION Based on USCS and modified Burmister Soil Classification System	SOIL PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
26									
27									
28									
29	Loose, gray, fine SAND and SILT, wet.	Silt and Sand		S12	3-4-5-6	9	24/19	<1	
30									
31									
32									
33									
34	Medium dense, gray, fine SAND and SILT, wet.			S13	5-5-7-7	12	24/14	<1	
35									
36									
37									
38									
39	9" Gray, fine to coarse SAND, some gravel, some silt, over 4" brown, fine to medium SAND, some silt, over 7" gray, fine to coarse SAND, some gravel, some silt, wet.	Sand		S14	12-7-7-12	14	24/20	<1	
40									
41									
42									
43									
44	Medium dense, gray, fine to medium SAND, trace silt, wet.								
45		Sand		S15	4-4-6-8	10	24/19	<1	
46									
47									
48	Gray, fine to coarse SAND, some gravel.								
49	Split-spoon refusal, end of exploration 49'.			S16	100-1/2"	100+	.5/.5	<1	

WATER LEVELS:

During Drilling 12' +/- | End of Boring | Date:

WELL LEGEND:

Filter Sand | Native Fill | Bentonite | Bentonite Grout | Concrete | PVC Screen | PVC Riser

NOTES:

1. Soil borings conducted using ATV drilling rig with 4" drive and wash casing.
2. Standard penetration test conducted with 2" OD split barrel sampler driven by 140 lb. safety hammer.
3. NM=Not measured; NA=not applicable.

CLIENT:
Kleinschmidt Associates

SITE:
Ashton Dam

,

Project No.: 161.02037.101

RANSOM Consulting Engineers and Scientists

B8/MW103

Reviewed by:	JPJ	Total Depth:	31 Feet	Logged By:	JPJ
Date Reviewed:	11/11/16	Boring Diameter:	4 Inches	Date Drilled:	11/3/16 to 11/4/16
Surface Elevation:	77.0'	Well Stickup:	3' +/-	Driller:	NECB

DEPTH	DESCRIPTION (Based on USCS and modified Burmister Soil Classification System)	SOIL PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)
1–4	2" TOPSOIL. Loose, brown, fine SAND and SILT, trace gravel, trace coal fragments. Medium dense, brown, fine SAND, some silt, trace gravel, trace brick and coal fragments.	Fill	S1	2-3-4-13	7	24/15	<1	
			S2	15-11-13-10	24	24/14	<1	
4–6	Medium dense, dark brown SILT, some fine sand, trace organics (roots).	Silt	S3	6-7-7-9	14	24/17	<1	
6–9	2" Similar to above, over 13" medium dense, gray/brown, fine SAND and SILT. Medium dense, brown, fine SAND, some silt, trace gravel, trace coarse sand.		S4	7-9-10-9	19	24/15	<1	
			S5	2-4-6-6	10	24/14	<1	
9–12	Dense, brown, fine to coarse SAND, some gravel, some silt, wet.		S6	10-15-21-26	36	24/15	<1	
12–14	Very dense, brown, fine to coarse SAND and GRAVEL, some silt, wet.	Sand	S7	32-27-28-55	55	24/17	<1	
14–16	Dense, yellowish brown, fine to coarse SAND and GRAVEL, some silt, wet.		S8	20-21-23-18	44	24/14	<1	
16–18	Medium dense, gray, fine to coarse SAND, some gravel, trace silt, wet.	Sand and Gravel	S9	8-7-8-7	15	24/13	<1	
18–20	Dense, gray, fine to coarse SAND and GRAVEL, wet.		S10	17-22-8-7	30	24/7	<1	
20–23								
23–24	Medium dense, gray, medium to coarse SAND, some gravel, wet.	Sand	S11	29-11-5-5	16	24/5	<1	

WELL CONSTRUCTION

WATER LEVELS:

During Drilling	End of Boring	Date:
10' +/-	11.45'	11/4/16 @ 7:00

WELL LEGEND: Filter Sand; Native Fill; Bentonite; Bentonite Grout; Concrete; PVC Screen; PVC Riser

NOTES:
1. Soil borings conducted using ATV drilling rig with 4" drive and wash casing.
2. Standard penetration test conducted with 2" OD split barrel sampler driven by 140 lb. safety hammer.
3. NM=Not measured; NA=not applicable.

CLIENT: Kleinschmidt Associates

SITE: Ashton Dam

,

Project No.: 161.02037.101

RANSOM Consulting Engineers and Scientists

B8/MW103

Reviewed by:	JPJ	Total Depth:	31 Feet	Logged By:	JPJ
Date Reviewed:	11/11/16	Boring Diameter:	4 Inches	Date Drilled:	11/3/16 to 11/4/16
Surface Elevation:	77.0'	Well Stickup:	3' +/-	Driller:	NECB

DEPTH	DESCRIPTION Based on USCS and modified Burmister Soil Classification System	SOIL PROFILE	SAMPLE	SAMPLE NUMBER	BLOWS (per 6")	SPT-N Value	PENETRATION/ RECOVERY	OVM (ppm) / DEXSIL (ppm)	WELL CONSTRUCTION
26									
27									
28									
29	Dense, gray, fine to coarse SAND, some gravel, trace silt, wet.	Sand		S12	14-10-34-21	44	24/4	<1	
30									
31	End of exploration 31'.								
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									
42									
43									
44									
45									
46									
47									
48									
49									

WATER LEVELS:

During Drilling	End of Boring	Date:
10' +/-	11.45'	11/4/16 @ 7:00

WELL LEGEND:

Filter Sand | Native Fill | Bentonite | Bentonite Grout | Concrete | PVC Screen | PVC Riser

NOTES:
1. Soil borings conducted using ATV drilling rig with 4" drive and wash casing.
2. Standard penetration test conducted with 2" OD split barrel sampler driven by 140 lb. safety hammer.
3. NM=Not measured; NA=not applicable.

CLIENT:
Kleinschmidt Associates

SITE:
Ashton Dam

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Project No.: 161.02037.101