

GEOTECHNICAL DESIGN REPORT
CLEWLEYVILLE ROAD OVER
INTERSTATE 395/ROUTE 9 CONNECTOR, BRIDGE NO. 6648
MAINEDOT WIN 018915.00
EDDINGTON, MAINE

by
Haley & Aldrich, Inc.
Portland, Maine

for
Maine Department of Transportation
Augusta, Maine

File No. 132076-007
August 2021





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Attention: Laura Krusinski, P.E.
Senior Geotechnical Engineer

Subject: Geotechnical Design Report
Clewleyville Road over Interstate 395/Route 9 Connector, Bridge No. 6648
MaineDOT WIN 018915.00
Eddington, Maine

Ladies and Gentlemen:

We are pleased to submit herewith our report entitled, "Geotechnical Design Report, Clewleyville Road over Interstate 395/Route 9 Connector, Bridge No. 6648, MaineDOT WIN 018915.00, Eddington, Maine." This Geotechnical Design Report (GDR) has been prepared in accordance with our proposal, dated 22 January 2021 and executed by your Richard J. Crawford on 5 February 2021, and the provisions of our General Consultant Agreement (GCA) with the Maine Department of Transportation (MaineDOT), No. CT20150706000000000010.

Introduction

This GDR presents the results of preliminary (Phase I) and final design (Phase II) phase subsurface investigation and laboratory testing programs and technical evaluations, and presents geotechnical design recommendations completed by Haley & Aldrich, Inc. (Haley & Aldrich) on behalf of MaineDOT for the proposed bridge that will carry northbound (NB) and southbound (SB) vehicular traffic on Clewleyville Road over the proposed Interstate 395/Route 9 Connector (Connector) in Eddington, Maine (see Figure 1, Project Locus).

Please note that geotechnical design recommendations and construction considerations for the Connector roadway (Connector) will be provided under separate cover.

HORIZONTAL COORDINATE SYSTEM, ELEVATION DATUM, AND BASELINE STATIONING

Plan locations of test borings are reported as northing and easting coordinates relative to the Maine State Plane Coordinate System, North American Datum of 1983 (NAD 83), Maine 2000 Central Zone. The project elevation datum and elevations referenced herein are in feet and reference the North American Vertical Datum of 1988 (NAVD 88). Two baselines were developed by MaineDOT for the proposed horizontal roadway alignments as summarized below:

- Clewleyville Road: Sta. 5+00 to Sta. 12+00
- Interstate 395/Route 9 Connector: Sta. 212+50 to Sta. 218+00

PROJECT LOCATION AND EXISTING SITE CONDITIONS

The proposed Clewleyville Road Bridge will carry NB and SB vehicular traffic over the east-west oriented Connector in Eddington, Maine. The project site on either side of Clewleyville Road predominantly consists of open, vegetated fields. Existing site grades along Clewleyville Road are relatively flat, ranging between approximately El. 199 and El. 206 between Sta. 5+00 and Sta. 11+25, respectively. Existing grades along the proposed Connector generally slope down from approximately El. 201 at Sta. 212+50 (west) to El. 197 at Sta. 217+00 (east).

PROPOSED BRIDGE STRUCTURE

During preliminary design, MaineDOT developed and evaluated multiple bridge alternatives considering several factors including but not limited to overall project cost, maintenance of traffic, and future bridge maintenance. The bridge replacement alternative recommended by MaineDOT in the Preliminary Design Report (PDR) consists of a 130-ft long, single-span bridge that is supported on two cast-in-place (CIP) concrete, near full-height, cantilever, semi-integral abutments at the stations and elevations summarized below.

Substructure	Station at Centerline of Clewleyville Road Alignment	Proposed Footing Bearing Elevation
Abutment No. 1	Sta. 7+36	El. 176
Abutment No. 2	Sta. 8+66	El. 176 to El. 184

The bridge superstructure will be constructed using metalized steel plate girders (five beam lines) running parallel to the long dimension of the bridge, with a 9-in. thick CIP concrete deck. The bridge structure will be approximately 30-ft wide (shoulder-to-shoulder) and will consist of two, 11-ft wide travel lanes and two, 4-ft wide shoulders.

Based on our review of profile and cross section drawings developed by MaineDOT for the recommended bridge and Connector alternatives, we anticipate that the existing site grades along Clewleyville Road will require minor (i.e., < 6 in.) filling and/or excavation to meet proposed finish grades. Construction of the Connector in the immediate vicinity of Clewleyville Road will require approximately 25 ft of excavation to meet proposed finish grades.

Existing and proposed site conditions are shown on Figure 2, Site and Subsurface Exploration Location Plan.

Geologic Setting

Based on our review of the Maine Geological Survey's (MGS's) Surficial Geology Map of the Veazie Quadrangle, Maine (2011), surficial geology mapped in the vicinity of Clewleyville Road consist of man-placed fill and/or naturally-deposited glacial till soils, both of which were encountered in the Phase I and Phase II subsurface explorations completed at the site.

According to MGS's Bedrock Geology Map of the Veazie Quadrangle (2011), bedrock within the site is primarily mapped as siltstone and/or claystone slate of the Brewer Formation. Mapped subordinate rock types consist of fine-grained calcareous quartz-rich meta-arenite and noncalcareous feldspathic metawacke. Thin beds of dark gray to gray-black metalimestone may also be present. The Brewer Formation is Silurian to Ordovician in age. Rock core samples collected in the Phase I and Phase II subsurface explorations completed at the site generally consisted of phyllite, siltstone, slate and metasandstone.

Please refer to subsequent sections of this GDR for more specific information on the soil and bedrock conditions present at the site.

Subsurface Exploration Programs

PRELIMINARY PHASE (PHASE I) SUBSURFACE INVESTIGATION

Haley & Aldrich completed a preliminary design phase (Phase I) subsurface exploration program at the site in July 2018. The Phase I subsurface investigation consisted of two test borings, designated BB-ECR-101 and BB-ECR-102, which were drilled in the vicinity of the proposed bridge abutments.

The test boring locations were laid out in the field by Haley & Aldrich using global positioning system (GPS) survey equipment prior to the start of drilling. "As-drilled" test boring locations and ground surface elevations were determined in the field by MaineDOT using GPS survey equipment upon the completion of drilling and were provided to Haley & Aldrich. The Phase I test boring locations and ground surface elevations are summarized in Table I and are shown on Figure 2.

The test borings were drilled by Northern Test Boring, Inc. (NTB) of Gorham, Maine using a Diedrich D50 track-mounted drill rig. Test borings were advanced to depths ranging from approximately 24 to 28 ft below ground surface (BGS) using cased-washed drilling methods and a combination of solid-stem augers and 4-in. (HW-size) outside diameter (OD) steel casing.

Soil samples were generally collected continuously through the existing fill soils and at standard, 5-ft intervals thereafter, by driving a 1-3/8-in. inside diameter (ID) split-spoon sampler with a 140-lb hammer dropped from a height of 30 in., as indicated on the test boring logs. The number of hammer blows required to advance the sampler through each 6-in. interval was recorded and is provided on the logs. The uncorrected standard penetration test (SPT) N-value (N-uncorrected) is defined as the total number of blows required to advance the sampler through the middle 12 in. of the 24-in. sampling interval. The drill rig was equipped with a calibrated automatic hammer per MaineDOT requirements. The energy-corrected SPT N-value (N_{60}), which is equal to the uncorrected N-value multiplied by the hammer efficiency factor (0.907; 90.7 percent theoretical hammer efficiency) divided by 0.6, is also provided on the logs.

Each test boring was advanced approximately 11 to 16 ft into bedrock using a roller bit and/or a 2.0-in. (NQ-size) ID, diamond-tipped core barrel.

Soil and bedrock samples were collected and preserved in glass jars and wooden boxes, respectively. The samples that were not submitted for laboratory testing are available for review upon request. The available soil and bedrock samples are currently being stored at the Haley & Aldrich storage facility in Portland, Maine.

One observation well was installed in completed borehole BB-ECR-102 to provide information on the static groundwater levels at the site. The observation well consisted of 2-in. ID, machine-slotted PVC pipe and solid PVC riser pipe extending to the existing ground surface (approximate). The observation well was outfitted with a steel roadway box assembly. The observation well installation and groundwater monitoring reports are provided in Appendix C.

All Phase I drilling and sampling activities were performed in accordance with MaineDOT requirements.

DESIGN PHASE (PHASE II) SUBSURFACE INVESTIGATION

Haley & Aldrich completed a design phase (Phase II) subsurface exploration program at the site in November and December 2020, and February 2021. The Phase II subsurface investigation consisted of nine bridge test borings, designated BB-ECR-201 through BB-ECR-206 (including BB-ECR-203A, -204A and -206A), and two highway test borings, designated HB-BE-231 through HB-BE-232, which were drilled at/near the ends of the abutment wingwalls (bridge test borings) and along the Connector, east and west of Clewleyville Road (highway test borings).

The Phase II test borings were laid out in the field by MaineDOT using GPS survey equipment prior to the start of drilling. "As-drilled" test boring locations and ground surface elevations were determined in the field by MaineDOT using GPS survey equipment upon the completion of drilling and were provided to Haley & Aldrich. The Phase II test boring locations and ground surface elevations are summarized in Table I and are shown on Figure 2.

The Phase II test borings were drilled by New England Boring Contractors (NEBC) of Hermon, Maine using a Mobile Drill B-53 truck or track-mounted drill rig. Test borings were advanced to depths ranging from approximately 12 to 50 ft BGS using similar means and methods to those used to drill the Phase I test borings. The hammer efficiency factors for the automatic hammers used were either 0.852 or 0.867 (85.2 or 86.7 percent theoretical hammer efficiency) as noted on the test boring logs.

Test borings were advanced approximately 6 to 41 ft into weathered bedrock and/or bedrock using a roller bit and/or a 2.0-in. (NQ-size) ID, diamond-tipped core barrel.

Soil and bedrock samples were collected and preserved in glass jars and wooden boxes, respectively. The soil and bedrock samples that were not submitted for laboratory testing are currently being stored at the Haley & Aldrich storage facility in Portland, Maine and are available for review upon request. All Phase II drilling and sampling activities were performed in accordance with MaineDOT requirements.

Geophysical Logging

Structural bedrock geologic data was collected in select Phase II bridge (BB) and highway (HB) test borings using downhole geophysical techniques (i.e., optical televiewer [OTV] and acoustic televiewer [ATV] logging), which was used to locate and measure discontinuities within the bedrock mass. OTV and ATV logging was completed in the following test borings: BB-ECR-201, BB-ECR-202, BB-ECR-203A, BB-ECR-204A, BB-ECR-205, BB-ECR-206A, HB-BE-231, HB-BE-232. The borehole geophysical logging was completed by Hager-Richter Geoscience, Inc. of Salem, New Hampshire under the supervision of Haley & Aldrich in November 2020 and March 2021.

Generalized Subsurface Conditions

The subsurface conditions present at the site generally consist of man-placed fill soils (pavement section subbase and base course materials) overlying naturally-deposited glacial till and bedrock. Refer to Table II for a detailed summary of the soil units and encountered thicknesses at each test boring location. Detailed soil and bedrock descriptions are provided on the test boring logs included in Appendix A. Refer to Figure 3, Interpretive Subsurface Profile, and Figures 4 and 5, Abutment No. 1 and Abutment No. 2 Interpretive Subsurface Cross Sections for a graphical representation of the subsurface conditions present along the proposed bridge alignment and across the proposed bridge abutments. A general description of each soil/bedrock unit is provided below.

Geologic Unit	Approximate Encountered Thickness (ft)	Generalized Description
Bituminous Concrete	0.3 to 0.8	A surficial layer of bituminous concrete was encountered in test borings completed within the limits of Clewleyville Road. <i>(encountered in test borings BB-ECR-101, -102, -202 and -205)</i>
Topsoil/Fill	0.2 to 4	A surficial layer of topsoil consisting of soft to stiff SILT with variable amounts of sand, gravel, and organic matter was encountered in some test borings. Fill material consisted of loose to dense, fine to coarse SAND fill material with varying amounts of silt and gravel. <i>(encountered in each test boring except BB-ECR-204A, -206A and HB-BE-231)</i>
Glacial Till	5 to 16	very stiff to hard, SILT with varying amounts of sand and gravel; loose, SAND with variable amounts of silt and gravel; very dense GRAVEL with variable amounts of silt and sand. <i>(encountered in each test boring)</i>
Weathered Bedrock	3 to 15	very dense, GRAVEL with variable amounts of silt, sand and decomposed bedrock fragments. <i>(encountered in test borings BB-ECR-205, -206 and -206A)</i>
Bedrock	top of bedrock surface encountered at depths ranging from approximately 6 to 25 ft BGS (El. 197 to El. 177) and generally slopes down from west to east and from south to north. <i>(encountered in each test boring)</i>	

Please note that soil descriptions provided on the test boring logs do not represent actual field conditions other than at the specific test boring locations. The actual conditions encountered between test boring locations may vary from those described herein.

BEDROCK CONDITIONS AND STRUCTURAL GEOLOGIC DATA

Bedrock Conditions

Approximately 2 to 28 ft of bedrock was encountered in the test borings. The sampled and recovered bedrock generally consisted of the following:

- Moderately hard to hard, fresh to highly weathered, grey, aphanitic, PHYLLITE to SILTSTONE to SLATE. Primary joints dip low to near-vertical angles and are very close to closely spaced, tight to open.
- Hard, slightly weathered, grey, porphyritic, METASANDSTONE. Primary joints dip steep to near-vertical angles and are very close to moderately closely spaced, planar to stepped, tight to open.

Rock quality designation (RQD) is a common parameter that is used to help assess the competency of sampled bedrock. RQD is defined as the sum of pieces of recovered bedrock greater than 4 in. in length divided by the total length of the bedrock core run. RQD values for the sampled and recovered bedrock

ranged from 0 to 100 percent (average = 34 percent), indicating highly variable rock quality; from very poor to excellent (average = poor) as determined using the MaineDOT Geotechnical Section “Key to Soil and Rock Descriptions and Terms Field Identification Information,” dated January 2020.

Detailed bedrock core data and descriptions are provided on Table III and on the logs in Appendix A. In addition, photographs of the recovered bedrock core samples are provided for reference in Appendix A.

Structural Geologic Data

The structural bedrock geologic data used in the kinematic analyses, which are discussed in subsequent sections of this report, were collected during the design phase (Phase II) subsurface exploration program.

The results of the OTV and ATV logging, which includes identification and measurement of the depth, aperture (i.e., openness) and orientation (dip angle and dip direction) of planar features within the bedrock mass such as fractures (or joints), foliation or bedding planes are provided in Appendix B. Bedrock structures encountered in the boreholes are grouped into five categories, as described below.

- Foliation/Vein: Planar geologic feature with no aperture.
- Fracture Rank 1: Minor fracture that may not be continuous around the borehole.
- Fracture Rank 2: Intermediate fracture that is distinct and continuous around the borehole with little to no aperture.
- Fracture Rank 3: Intermediate fracture that is distinct and continuous around the borehole with some apparent aperture.
- Fracture Rank 4: Major fracture that is distinct with continuous apparent aperture around the borehole.

Evaluation of the data considered Fracture Ranks 1 and 2 to be “closed” joints and Fracture Ranks 3 and 4 to be “open” joints. A total of 338 joints were logged within the bedrock encountered in the test borings noted above, which represents an average of approximately 3 joints per vertical linear foot of bedrock (jpf). Of those joints, 36 percent were considered “open”, and 64 percent were considered “closed”.

In general, the joint frequency (i.e., number of joints per vertical linear foot) and aperture (openness) of the joints decreases with increasing depth below the top of bedrock surface, with the exception of the rock at encountered in test boring BB-ECR-201. The RQD also tends to increase with increasing depth below the top of bedrock surface, except for the rock encountered in test borings BB-ECR-201 and BB-ECR-202.

GROUNDWATER CONDITIONS

One observation well was installed in completed borehole BB-ECR-102 to provide information on the static groundwater levels at the site. The measured water levels during the period 31 July 2018 to 12 December 2019 ranged from approximately 14 to 24 ft BGS (El. 179 to El. 190). Please note that the

observation well was unreadable after 12 December 2019 because it was paved over and therefore, no direct water level measurements could be made. Please also note that the invert of the proposed ditches along the new Connector are planned to be constructed between approximately El. 174 (south side of Connector) and El. 175 (north side of Connector) and the finished Connector roadway grade is planned to be between El. 177 and El. 179 (approximate).

In general, water levels may fluctuate with season, precipitation, local soil/bedrock conditions, and excavation means and methods. Therefore, water levels may vary from those summarized above, provided on the testing boring logs included in Appendix A and shown on the groundwater monitoring report included in Appendix C.

Laboratory Test Results

Phase I and Phase II laboratory testing programs were conducted by Haley & Aldrich on representative soil and rock samples collected during the preliminary and design phase subsurface exploration programs to aid in soil classification and determination of engineering soil and rock properties. Laboratory testing was performed in accordance with applicable American Society for Testing Materials (ASTM) testing procedures by GeoTesting Express, Inc. of Acton, Massachusetts. A summary of the lab testing results is provided below.

Laboratory Test	ASTM Test Designation	Geologic Unit	No. of Tests	Range in Test Results ¹
Moisture Content	ASTM D2216	Glacial Till	3	WC = 12.1 to 13.6%
Grain Size	ASTM D422		5	<u>AASHTO Classification:</u> A-4(0) <u>USCS Classification:</u> ML
Compressive Strength and Elastic Moduli of Rock	ASTM D4318	Bedrock	7	<u>Peak Compressive Stress:</u> 4,751 to 12,440 psi <u>Young's Modulus:</u> 3,640,000 to 15,900,000 psi <u>Poisson's Ratio</u> 0.05 to 0.43
Sliding Friction Test of Rock	ASTM D7012		1	<u>Peak Shear Stress:</u> 30.2 psi peak shear stress at 15.0 psi normal stress

¹ WC = Moisture Content; psi = pounds per square in.

All laboratory test results are shown on the test boring logs included in Appendix A with complete results provided in Appendix D.

Geotechnical Evaluations and Design Recommendations

Geotechnical design recommendations, as discussed and provided herein, were developed in accordance with the following documents:

- AASHTO Load and Resistance Factor Design (LRFD) Bridge Design Specifications, Ninth Edition, 2020, referred to herein as AASHTO LRFD,
- MaineDOT Bridge Design Guide (BDG), August 2003, with Interim Revisions through June 2018, referred to herein as Bridge Design Guide.

Engineering calculations that support the design recommendations outlined in this report are provided for reference in Appendix E.

APPROACH EMBANKMENTS

Proposed site grades along Clewleyville Road will generally be with 6 in. of existing site grades. Because existing site grades will essentially remain unchanged and based on the subsurface conditions encountered in the Phase I and Phase II test borings drilled at the site, we anticipate that post-construction settlement of the new bridge approach roadways will be negligible.

SEISMIC SITE CLASS AND DESIGN PARAMETERS

Site class was determined in accordance with AASHTO LRFD Section 3.10.3.1 using Method C. In instances where SPT N-values were equal to 0 (i.e., weight of rod or weight of hammer), were greater than 100 blows per foot (bpf) or where bedrock was present, default values of 1 and 100 bpf were used, respectively.

Based on the nature and thickness of the overburden soils and depth to bedrock at the site, as determined from the preliminary phase test borings, we recommend the site be considered "Site Class C." Spectral accelerations were determined based on the geographic site location and the recommended "Site Class C" designation using the United States Geological Survey (USGS) software application Seismic Design Parameters v. 2.0, which is based on a seismic event having a 7 percent probability of exceedance in 75 years (approximate 1,000-year return period). The recommended values are summarized below.

Design Parameter	Design Value
Site factor for short-period range of acceleration response spectrum, $F_a =$	1.200
Site factor for long-period range of acceleration response spectrum, $F_v =$	1.700
Site factor at zero-period on acceleration response spectrum, $F_{pga} =$	1.200
Horizontal response spectral acceleration coeff. at 0.2-s period on rock, $S_s (g) =$	0.144
Horizontal response spectral acceleration coeff. at 1.0-s period on rock, $S_1 (g) =$	0.043
Peak seismic ground acceleration coeff. on rock, $PGA (g) =$	0.067
Horizontal response spectral acceleration coeff. at 0.2-s period modified by $F_a, S_{D5} (g) =$	0.17
Horizontal response spectral acceleration coeff. at 1.0-s period modified by $F_v, S_{D1} (g) =$	0.07
Peak seismic ground acceleration coefficient modified by $F_{pga}, A_s (g) =$	0.08

In accordance with AASHTO LRFD Section 3.10.6, the site falls within Seismic Zone 1 based on the calculated value of S_{D1} (i.e., $S_{D1} < 0.15 =$ Seismic Zone 1 from AASHTO LRFD Table 3.10.6.1).

Based on our review of the soil conditions encountered in the test borings and the results of the laboratory testing, it is our opinion that the potential for saturated granular soils present at the site to liquefy during the design earthquake event is low.

BRIDGE ABUTMENT AND WINGWALL FOUNDATION SUPPORT

Foundation Support Type and Footing Bearing Elevations

As shown on the interpretive subsurface profile (Figure 3) and the abutment interpretive subsurface cross sections (Figures 4 and 5), the subsurface conditions present at the site consist of glacial till overlying bedrock. During the project's preliminary design phase (Phase I) spread footings bearing on bedrock were selected by MaineDOT as the preferred foundation support alternative for the bridge. Because structural geologic bedrock data was not collected and kinematic analyses (used to evaluate potential for planar and wedge sliding and toppling failures to occur) were not completed during Phase I, the bottom of abutment and wingwall footing elevations were initially established by MaineDOT based on the top of bedrock elevations completed in the Phase I test borings. Please recall that only two test borings (BB-ECR-101 and BB-ECR-102) were completed in the vicinity of the proposed bridge abutments during the Phase I subsurface exploration program. The proposed bottom of abutment and wingwall footings shown by MaineDOT in the Preliminary Design Report (PDR) were El. 188 and El. 190 for Abutment No. 1 and Abutment No. 2, respectively. Based on the preliminary bottom of abutment and wingwall footing elevations established by MaineDOT as well as the elevations of the proposed ditches along the Connector roadway, approximately 13 to 16-ft high exposed rock slopes, inclined at 1H:4V, would be present below and adjacent to the footings.

Kinematic Analyses

As summarized in previous sections of this report, structural bedrock geologic data was collected in select bridge (BB) and highway (HB) test borings using borehole geophysical techniques (OTV/ATV) during the design phase (Phase II) subsurface exploration program. The bedrock geologic data was used, in part, to conduct kinematic analyses to evaluate the potential for planar sliding, wedge sliding and toppling failures to occur within the bedrock mass between the preliminary bottom of footing elevations and the proposed Connector roadway ditch elevation.

The measured foliation and joint pole vectors and great circle representing the orientation of the proposed Connector cut slopes were plotted on stereonet to assess the potential for planar and wedge sliding and toppling failures to occur. A stereonet is a geological engineering tool that presents three-dimensional data in a two-dimensional format. On a stereonet, a discontinuity (i.e., joint) plane can be plotted as a 'great circle' or as a line (plots as a single point) called a pole, which is measured 90 degrees from the plane and represents each plane. Therefore, if a joint plane dips to the northeast, the pole to that plane will appear as a point in the southwest quadrant of the stereonet. Poles that are close to the outer edges of the stereonet represent steeply dipping planes and poles at the center of the stereonet represent planes that are horizontal. The geophysical data collected was plotted in polar format to simplify the data output. The results of the kinematic analyses are summarized below.

Substructure	Joint Set Data		Proposed Cut Slope Data			Kinematic Analysis	Percentage of Bedrock Joint Sets Within Failure Window
	Dip Direction (deg.)	Dip Angle (deg.)	Strike (deg.)	Dip Direction (deg.)	Dip Angle (deg.)		
Abutment No. 1	31° to 349°	21° to 71°	214	124	76	Toppling	10.2%
						Planar Sliding	20.6%
						Wedge Sliding	21.9%
Abutment No. 2	31° to 349°	21° to 71°	34	304	76	Toppling	23.7%
						Planar Sliding	13.5%
						Wedge Sliding	35.2%

The results of the kinematic analyses summarized above indicate that planar and wedge sliding and toppling are the dominant failure mechanisms that have a high likelihood of occurring within the exposed bedrock mass beneath the proposed Abutment No. 1 and Abutment No. 2 footings, respectively. Other types of failures (e.g., toppling at Abutment No. 1 and planar sliding at Abutment No. 2) are also possible but not as likely to occur as those noted above. Because of the potential for planar and wedge sliding and toppling failures to occur, it was determined that rock slope stabilization measures would be needed to prevent rock mass failures and to provide adequate bearing conditions for abutment breastwall and wingwall footings.

Rough order of magnitude (ROM) costs for rock slope stabilization measures were developed by Haley & Aldrich assuming that the proposed abutment and wingwall footings would remain at elevations shown in the PDR (i.e., (El. 188 at Abutment No. 1 and El. 190 at Abutment No. 2). For the purposes of the ROM cost estimate, we assumed that 1-3/8 diameter, 20-ft long galvanized steel bars spaced at 8 ft on-center would be required to eliminate the potential for a rock mass failure from occurring. The ROM costs for the assumed rock slope stabilization measures were approximately \$20,000 to \$25,000 at Abutment No. 1 and approximately \$40,000 to \$45,000 at Abutment No. 2 (total of \$60,000 to \$70,000), which were transmitted to MaineDOT via email on 26 April 2021.

This foundation support option, which includes minimal rock removal, higher abutment and wingwall footing bearing elevations, and rock slope stabilization measures, is referred to hereinafter as Alternative 1.

Alternative Abutment and Wingwall Bearing Elevations

Alternative abutment and wingwall footing bearing elevations were determined by Haley & Aldrich. Alternative 2, in comparison to Alternative 1, has lower abutment and wingwall footing bearing elevations (i.e., more rock removal) but would not include rock slope stabilization measures.

Alternative 2 abutment and wingwall footing bearing elevations were determined by superimposing the location and elevation of the footings on Connector roadway cross sections. The zone of influence (ZOI) of the footings, which is defined as the area beneath imaginary lines that extend 2 ft beyond the bottom outer edge of the footings and down on a 1H:1V was also superimposed on the cross sections. The abutment and wingwall footing bearing elevations were incrementally lowered until the ZOI line did not daylight beyond the proposed Connector roadway rock slope (assumed at 4V:1H). Alternative 2 abutment and wingwall footing bearing elevations that would eliminate the need for rock slope stabilization measures are summarized below.

Substructure		Preliminary Foundation Bearing Elevation (w/ rock stabilization; Alternative 1)	Alternative Foundation Bearing Elevation (w/o rock stabilization; Alternative 2)
Abutment No. 1	Left Wingwall	188.0	178.0
	Breastwall		176.0
	Right Wingwall		178.0
Abutment No. 2	Left Wingwall	190.0	180.0
	Breastwall		176.0
	Right Wingwall		179.0

Recommended Abutment and Wingwall Bearing Elevations

The results of the kinematic analyses, the ROM rock slope stabilization costs, and the Alternative 2 abutment and wingwall footing bearing elevations summarized above were discussed with MaineDOT Bridge Program staff on 28 April 2021.

Several factors contributed to the elimination of the rock cut stabilization alternative during the discussion with MaineDOT Bridge Program staff, including:

- cost (for rock removal and rock slope stabilization measures),
- an additional phase of work would be required to install the rock slope stabilization measures during bridge and Connector roadway construction,
- the long-term durability of rock slope stabilization measures located in the “splash zone” (e.g., corrosion of rock dowels, bearing plates and nuts)
- the need to maintain and potentially add stabilization measures in the future as time-dependent weathering of the rock slope occurs during the service life of the bridge.

The Alternative 2 abutment and wingwall footing bearing elevations, which were lowered as described above to avoid the need for rock slope stabilization measures, was the alternative that was preferred by MaineDOT. Recommended abutment and wingwall foundation bearing elevations, as determined by Haley & Aldrich and MaineDOT Bridge Program staff are presented below.

Substructure		Recommended Foundation Bearing Elevation (w/o rock stabilization)
Abutment No. 1	Left Wingwall	176.0
	Breastwall	
	Right Wingwall	
Abutment No. 2	Left Wingwall	176.0
	Breastwall	179.0/184.0
	Right Wingwall	

Abutment and Wingwall Footing Design Recommendations

Abutment and wingwall foundation recommendations are summarized below. Please note that the design recommendations presented below assume foundation subgrade preparation is completed in accordance with the guidance provided in the Construction Considerations section of this report as well as the requirements of the Contract Documents (CDs; drawings, standard specifications and special provisions).

- Bearing Resistance:
 - For the service limit state, mass concrete footings should be designed such that footing contact pressures do not exceed 20 kips per square foot (ksf). At this pressure, it is estimated that elastic settlement of footings bearing on “fair to very good” bedrock will generally be less than ½ in. per LRFD Section 10.6.2.4.4.
 - For the strength limit state, footings should be designed for a factored bearing resistance of 46 ksf using a resistance factor of 0.45.
 - For the extreme event limit state, footings should be designed for factored bearing resistance of 82 ksf, using a resistance factor of 0.8.

- Load Distribution and Eccentricity:
 - Application of permanent and transient loads is specified in AASHTO LRFD Section 11.5.6. We recommend the stress distribution at the base of the footings be assumed to be a triangular or trapezoidal distribution over the effective footing base as shown in AASHTO LRFD Figure 11.6.3.2-2.
 - The eccentricity of loading at the Strength Limit State, based on factored loads, should not exceed 0.45 of the spread footing dimensions in either direction. The eccentricity corresponds to the resultant of reaction forces falling within the middle nine-tenths (9/10) of the base width and length.
- Sliding Resistance:
 - In accordance with AASHTO LRFD Tables C3.11.5.3-1, 10.5.5.2.2-1 and Section 11.5.8, we recommend that sliding resistance of abutment and wingwall foundations be calculated using the design parameters presented below.

Subgrade Saturation Condition During Construction	Coefficient of Friction ($\tan \delta$)	Interface Friction Angle (δ , deg)	Strength Limit State Resistance Factor for Sliding (ϕ_r)	Service/Extreme Limit State Resistance Factor for Sliding (ϕ_r)
Prepared in-the-dry	0.7	35	0.8	0.9

- Lateral passive soil resistance in front of the footings, if present, should be neglected in accordance with requirements of the BDG. “Anchorage” of footings to bedrock (e.g., rock dowels) may be required to provide additional sliding resistance. If additional lateral load resistance is needed between the footings and bedrock, as determined by the bridge designer, we will provide additional geotechnical recommendations for rock dowels.

ABUTMENT AND WINGWALL DESIGN RECOMMENDATIONS

- Drainage:
 - The abutment and wingwall design should include a drainage system to intercept any groundwater and direct it to a suitable discharge point that does not adversely affect the performance of the abutment and wingwall spread footings. We recommend that drainage be provided in accordance with BDG Section 5.4.2.13.
- Lateral Earth Pressures:
 - Recommendations summarized in the table below are based on the following:
 - Abutments and wingwalls are backfilled with a free-draining material (i.e., Soil Type 4, BDG Table 3-3; total unit weight = 125 pcf; internal angle of friction = 32 degrees).
 - The abutment and wingwall backwalls are vertical.
 - Adequate drainage is provided, as recommended herein and in accordance with the requirements of the BDG, to eliminate the potential for unbalanced hydrostatic pressures to develop.

- The bridge abutments are considered semi-integral where the superstructure backwall is not attached to the abutment breastwall.
- A -0.7 degree backfill surface at Abutment No. 1 and a 0.7 degree backfill surface at Abutment 2 (based on 1.24 percent grade of proposed vertical profile of Clewleyville Road).
- A 19 degree backfill surface at Abutment No. 1 and Abutment No. 2 wingwalls (maximum slope angle indicated by MaineDOT).

Substructure	Active Lateral Earth Pressure Coefficient (K_a , dim.)	Passive Lateral Earth Pressure Coefficients (K_p , dim.)	
	Rankine	Rankine	Coulomb
Abutment No. 1 Breastwall	0.31	3.25	8.0
Abutment No. 2 Breastwall			8.8
Abutment No. 1 and No. 2 Wingwalls	0.37	NA	

- In accordance with BDG Section 5.4.3, semi-integral abutments should be designed for Rankine active earth pressures over the rigid abutment height and a uniform pressure distribution due to the height of soil behind the superstructure/end diaphragm. We recommend that the superstructure backwall (end diaphragm) be designed for full passive pressure only. For long-heeled cantilever-type walls we recommend the use of Rankine active earth pressure coefficients. In addition, alternative Rankine active earth pressure coefficients, based on a range of backfill surface inclinations, for use in designing the wingwalls are provided in the calculations in Appendix E.
- Additional lateral earth pressures due to live load surcharge are required in accordance with BDG Section 3.6.8 for abutments if an approach slab is not included. When an approach slab is specified, reduction, not elimination of the surcharge load is permitted in accordance with AASHTO LRFD Section 3.11.6.5. We recommend that the live load surcharge be estimated as a uniform horizontal earth pressure due to an equivalent height of soil that is related to the abutment and wingwall heights, as presented to BDG Table 3-4.
- If determined applicable by MaineDOT, the abutment breastwalls and wingwalls should be designed for a uniform lateral load to account for seismic soil loading in accordance with LRFD Section A.11.3.1 (Mononobe-Okabe Method). Based on the seismic site class (Site Class "C"), we recommend a seismic active earth pressure coefficient, K_{AE} , of 0.32 be used for design of Abutment No. 1 and 0.33 be used for design of Abutment No. 2. In addition, a seismic active earth pressure coefficient equal to 0.47, which is based on a 19 degree backfill slope inclination (maximum anticipated by MaineDOT), should be used for the design of the abutment wingwalls. Please note that the soil pressure calculated using K_{AE} includes both the static and seismic lateral earth loads.

FROST PROTECTION

The abutment and wingwall spread footings will bear directly on bedrock. It is our opinion that the potential for frost-induced heave for foundations bearing on bedrock is low and therefore, a minimum footing embedment depth requirement is not considered necessary.

Construction Considerations

The purpose of this section of the report is to provide comments and recommendations on items related to excavation, earthwork, and other geotechnical aspects of the proposed construction. Since it identifies potential construction issues related to foundations and earthwork, it will aid personnel who monitor the construction activities. Prospective Contractors for this project should evaluate construction issues based on their own knowledge and experience in the Eddington, Maine, area taking into consideration their proposed construction means, methods and procedures.

EXCAVATION

Soil

As stated above, construction of the bridge and the Connector will require a total of approximately 18 to 27 ft of excavation to meet proposed bottom of abutment breastwall bearing levels. Please note that of the 18 to 27 ft of total excavation required, approximately 5 to 15 ft will be within the overburden soils (i.e., glacial till).

We anticipate that excavation of the in-situ fill and glacial till can be accomplished using normal earth-excavating equipment (i.e., hydraulic backhoes and excavators). In our opinion, temporary cut slopes in glacial till should typically be stable if constructed no steeper than about 1.5H:1V. Some sloughing and raveling should be anticipated in all temporary earth slopes. All temporary excavations should be made in accordance with all OSHA and other applicable regulatory agency requirements. The Contractor should be responsible for the design, stability, and safety of all temporary excavations.

As noted on the test boring logs, the naturally-deposited glacial till soils may contain cobbles and possibly some large boulders. We recommend that the Contract Documents require the Contractor to include provisions for cobble/boulder removal in their bid.

Bedrock

Based on the elevation of the top of bedrock surface at test boring locations and the proposed footing elevations presented herein, we anticipate that up to approximately 12 to 18 ft of bedrock will need to be removed to construct the abutment footings.

It is our opinion that because of the substantial depth to which bedrock needs to be removed and our experience with similar bedrock types, the most practical method of bedrock excavation is controlled blasting. Based on the proposed cut slope angles currently shown on the plans, we anticipate that

perimeter control methods such as pre-splitting (i.e., line drilling) will be needed to minimize over-break for the rock slopes adjacent to the bridge foundations. As discussed with you, we recommend that pre-split blasting methods be used to remove rock along the Connector and Abutment No. 1 and Abutment No. 2 within the following station limits:

- Left of Connector Centerline: Sta. 214+85 to Sta. 216+45 (200 linear feet)
- Right of Connector Centerline: Sta. 213+43 to Sta. 215+13 (170 linear feet)

CONSTRUCTION DEWATERING

Groundwater was measured in the observation well at depths ranging from approximately 14 to 24 ft BGS (El. 190 to El. 179) during the period 31 July 2018 to 12 December 2019. Based on the measured water levels and considering that the proposed bottom of abutment and wingwall footings vary between El. 176 and El. 184, we anticipate groundwater will be encountered in excavations during construction since the bottom of excavation will be approximately 3 to 14 ft below the measured water levels depending on the time of year that excavation is performed. We anticipate that temporary dewatering will be required and could likely be accomplished by pumping from open sumps and temporary ditches located at the base of the excavations. Sumps should be provided with filters suitable to prevent pumping of fine-grained soil particles.

The Contractor should be responsible for controlling all surface runoff, infiltration and water from other sources at all times during excavation. Rainwater or snowmelt should be directed away from exposed foundation bearing surfaces. Dewatering should be performed as required to maintain the undisturbed nature of soil surfaces and enable all final excavation, foundation construction and backfilling to be completed “in-the-dry.”

Dewatering should be performed in accordance with all applicable regulations. Dewatering effluent should be treated as required by applicable state and local regulations.

BEDROCK SUBGRADE PREPARATION

The nature, slope, and degree of fracturing in the bedrock bearing surfaces will not be evident until the foundation excavations for the abutments and wingwalls are completed. Construction activities that disturb the bedrock below the abutment footings should not be permitted. We recommend that the bedrock surface be cleared of all loose, fractured or weathered/decomposed bedrock and soil (i.e., “unsuitable material”) prior to concrete placement. If localized areas of “unsuitable material” are found that extend below the bearing level of the footings, we recommend that Class S concrete be placed from the bottom of excavation up to the proposed footing bearing level, after the unsuitable material has been removed and the surface has been examined in the field by the Resident and/or Geotechnical Engineer, as discussed below. In cases where more significant excavation of “unsuitable material” is required we recommend that Class A concrete be placed from the bottom of the excavation up to the proposed footing bearing level. Additional recommendations are provided below.

- Foundation bearing areas should be level. If bedrock is observed to slope steeper than 4H:1V at the subgrade elevation, the bedrock should be benched to create level steps or excavated to be completely level. Smooth bedrock, if present, should be roughened or serrated prior to placing concrete to enhance sliding stability.
- In-the-dry or underwater excavation of steeply sloping and/or loose, fractured bedrock may be done using conventional excavation methods. Based on the proposed bearing level of the abutment and wingwall footings and the top of bedrock surface encountered in the test borings we anticipate the need for bedrock removal using controlled blasting techniques.
- Prior to placing concrete for the sub-footings (if over-excavation is required) or abutment and wingwall footings we recommend that the exposed bedrock surface be washed with high pressure water and air to remove loose, fractured and/or decomposed rock fragments and other debris. We also recommend that the prepared bedrock surface be approved by the Resident and/or Geotechnical Engineer prior to concrete placement.
- It is anticipated that there will be seepage of water from fractures and joints exposed in the bedrock surface. Water should be controlled by pumping from sumps so that subgrade preparation and foundation construction can be completed in-the-dry. We recommend that dewatering effluent be managed in accordance with all local, state and/or federal regulations.

Limitations

This report is prepared for the exclusive use of MaineDOT relative to the subject project. There are no intended beneficiaries other than MaineDOT. Haley & Aldrich shall owe no duty whatsoever to any other person or entity on account of the Agreement or the report. Use of this report by any person or entity other than MaineDOT for any purpose whatsoever is expressly forbidden unless such other person or entity obtains written authorization from MaineDOT and Haley & Aldrich. Use of this report by such other person or entity without the written authorization of MaineDOT and Haley & Aldrich shall be at such other person's or entities sole risk and shall be without legal exposure or liability to Haley & Aldrich.

Use of this report by any person or entity, including by MaineDOT, for a purpose other than relative to the subject project is expressly prohibited unless such person or entity obtains written authorization from Haley & Aldrich indicating that the report is adequate for such other use. Use of this report by any other person or entity for such other purpose without written authorization by Haley & Aldrich shall be at such person's or entities sole risk and shall be without legal exposure or liability to Haley & Aldrich. The information provided herein is based, in part, upon the data obtained from the referenced subsurface explorations. The nature and extent of variations between explorations may not become evident until construction. If variations then appear, it may be necessary to reevaluate the recommendations of this report.

It is our understanding that this report will be included as a reference document in the package that will be provided to the prospective Contractors for bidding. Please note that the recommendations included herein are superseded by the information contained in the CDs and that the information contained in the CDs takes precedence over the information provided in this report.

Please note that geotechnical design recommendations and construction considerations for the Connector will be provided under separate cover.

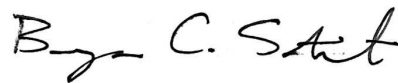
Closure

We appreciate the opportunity to continue to provide MaineDOT services on this project. Please do not hesitate to contact us if you have any questions or comments.

Sincerely yours,
HALEY & ALDRICH, INC.



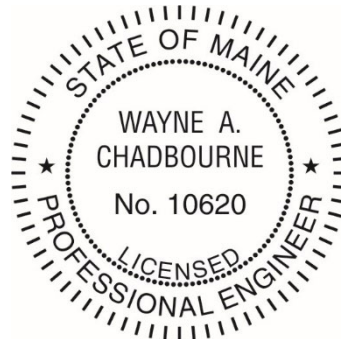
Justin A. DuBois, P.E.
Senior Engineer



Bryan C. Steinert, P.E.
Senior Project Manager



Wayne A. Chadbourne, P.E.
Principal/Lead Quality Control Engineer



Enclosures:

- Table I – Subsurface Exploration Location Data
- Table II – Subsurface Exploration Subsurface Data
- Table III – Subsurface Exploration Bedrock Data
- Figure 1 – Project Locus
- Figure 2 – Site and Subsurface Exploration Location Plan
- Figure 3 – Interpretive Subsurface Profile
- Figure 4 – Abutment No. 1 Interpretive Subsurface Cross Section
- Figure 5 – Abutment No. 2 Interpretive Subsurface Cross Section
- Appendix A – Test Boring Logs and Rock Core Photographs
- Appendix B – Borehole Geophysical Logging Reports
- Appendix C – Observation Well Installation and Groundwater Monitoring Reports
- Appendix D – Laboratory Test Results
- Appendix E – Geotechnical Design Calculations

TABLE I

Subsurface Exploration Location Data

Clewleyville Road Bridge over Interstate 395/Route 9 Connector, Bridge No. 6648

MaineDOT WIN No. 018915.00

Eddington, Maine

Haley & Aldrich, Inc. File No.: 132076-007

Test Boring No. ¹	Ground Surface Elevation (ft) ^{3,4}	Station ⁵	Offset Distance (ft) & Direction ^{5,6}	Horizontal Coordinates ²	
				Northing (Y)	Easting (X)
BB-ECR-101	201.8	215+26	39 LT	476,457	1,755,418
BB-ECR-102	203.2	214+74	37 RT	476,372	1,755,453
BB-ECR-201	200.5	215+00	76 LT	476,455	1,755,373
BB-ECR-202	201.7	215+37	51 LT	476,473	1,755,415
BB-ECR-203	198.7	216+00	46 LT	476,523	1,755,454
BB-ECR-203A	199.1	215+96	52 LT	476,523	1,755,447
BB-ECR-204	202.5	214+04	52 RT	476,306	1,755,429
BB-ECR-204A	202.1	214+02	45 RT	476,308	1,755,421
BB-ECR-205	203.4	214+44	48 RT	476,341	1,755,447
BB-ECR-206	200.7	214+99	79 RT	476,370	1,755,502
BB-ECR-206A	201.0	214+87	71 RT	476,365	1,755,489
HB-BE-231	202.3	214+00	0	476,330	1,755,383
HB-BE-232	196.8	217+00	1 RT	476,580	1,755,549

Notes:¹ Test boring locations are shown on Figure 2, Site and Subsurface Exploration Location Plan.² As-drilled coordinates of test borings were determined by MaineDOT using GPS survey equipment, are measured in feet and reference NAD83, Maine 2000 Central Zone coordinate system.³ Ground surface elevations at test boring locations were determined in the field by MaineDOT using GPS survey equipment, are measured in feet and reference the North American Vertical Datum of 1988 (NAVD 88).⁴ Station and offset information shown are approximate and are relative to the I-395/Route 9 Connector baseline and were determined by Haley & Aldrich based on information provided by MaineDOT and rounded to the nearest foot.⁵ LT = offset distance toward left direction; RT = offset distance toward right direction; ft = feet.

	Individual	Date
Prepared By:	SSM	2/8/2021
Checked By:	BCS	6/15/2021
Reviewed By:	WAC	8/31/2021

8/30/2021

TABLE II
Subsurface Exploration Subsurface Data
Clewleyville Road Bridge over Interstate 395/Route 9 Connector, Bridge No. 6648
MaineDOT WIN No. 018915.00
Eddington, Maine

Haley & Aldrich, Inc. File No.: 132076-007

Test Boring No. ¹	Ground Surface Elevation ² (ft)	Stratigraphy Data ^{2,3,4}												Bottom of Exploration Depth (ft)	Elevation of Bottom of Exploration ²
		Bituminous Concrete Thickness (ft)	Topsoil/Fill			Glacial Till			Weathered Rock			Bedrock			
			Depth to Top (ft)	Elev. of Top (ft)	Thickness (ft)	Depth to Top (ft)	Elev. of Top (ft)	Thickness (ft)	Depth to Top (ft)	Elev. of Top (ft)	Thickness (ft)	Depth to Top (ft)	Elev. of Top (ft)		
BB-ECR-101	201.8	0.3	0.3	201.5	1.7	2.0	199.8	11.1	NE	NE	NE	13.1	188.7	24.3	177.5
BB-ECR-102	203.2	0.3	0.3	202.9	2.2	2.5	200.7	10.1	NE	NE	NE	12.6	190.6	28.4	174.8
BB-ECR-201	200.5	NE	0.0	200.5	0.2	0.2	200.3	15.5	NE	NE	NE	15.7	184.8	42.1	158.4
BB-ECR-202	201.7	0.8	0.8	200.9	2.0	2.8	198.9	10.7	NE	NE	NE	13.5	188.2	30.0	171.7
BB-ECR-203	198.7	NE	0.0	198.7	3.0	3.0	195.7	10.6	NE	NE	NE	13.6	185.1	20.0	178.7
BB-ECR-203A	199.1	NE	0.0	199.1	0.3	0.3	198.8	13.2	NE	NE	NE	13.5	185.6	40.4	158.7
BB-ECR-204	202.5	NE	0.0	202.5	0.3	0.3	202.2	5.2	NE	NE	NE	5.5	197.0	12.0	190.5
BB-ECR-204A	202.1	NE	--	--	--	--	--	--	--	--	--	14.5	187.6	45.5	156.6
BB-ECR-205	203.4	0.5	0.5	202.9	2.0	2.5	200.9	6.5	9.0	194.4	4.0	13.0	190.4	35.0	168.4
BB-ECR-206	200.7	NE	0.0	200.7	4.0	4.0	196.7	5.0	9.0	191.7	3.0	12.0	188.7	16.3	184.4
BB-ECR-206A	201.0	NE	--	--	--	--	--	--	9.4	191.6	15.1	24.5	176.5	50.3	150.7
HB-BE-231	202.3	NE	NE	NE	NE	0.0	202.3	8.0	NE	NE	NE	8.0	194.3	38.3	164.0
HB-BE-232	196.8	NE	0.0	196.8	1.5	1.5	195.3	13.7	NE	NE	NE	15.2	181.6	36.0	160.8

Notes:
¹ Test boring locations are shown on Figure 2, Site and Subsurface Exploration Location Plan.
² Ground surface elevations at test boring locations were determined in the field by MaineDOT using GPS survey equipment, are measured in feet and reference the North American Vertical Datum of 1988 (NAVD 88).
³ "NE" indicates stratum was not encountered in test boring.
⁴ "--" indicates presence and thickness of stratum could not be determined because soil and rock samples were not collected.

	Individual	Date
Prepared By:	SSM	2/8/2021
Checked By:	BCS	6/15/2021
Reviewed By:	WAC	8/31/2021

TABLE III
Subsurface Exploration Bedrock Core Data
Clewleyville Road Bridge over Interstate 395/Route 9 Connector, Bridge No. 6648
MaineDOT WIN No. 018915.00
Eddington, Maine

Haley & Aldrich, Inc. File No.: 132076-007

Test Boring No. ¹	Ground Surface Elevation ² (ft)	Bedrock Core Diameter (in.)	Run					Total Core Recovery ^{3,6}		Rock Quality Designation ^{4,5,6}			Physical Rock Parameters		Lithologic, Rock Mass and Discontinuity Description
			No.	Depth Below Ground Surface (ft)			Total Length (ft)	Recovered Length (ft)	%	Length (ft)	%	Designation	Weathering	Estimated Field Strength	
				Top	Bottom	Midpoint									
BB-ECR-101	201.8	NQ (1.875")	R1	14.0	16.5	15.3	2.5	2.5	100%	0.0	0%	Very Poor	Moderate to Highly	Moderate	Grey, aphanitic, PHYLLITE, discontinuities dipping at low to vertical angles (5 to 90 degrees from horizontal axis), spacing close (1 to 3 ft), discontinuity aperatures are tight, discontinuity surfaces have slight silt infilling and pyrite on joint surfaces.
			R2	16.5	19.9	18.2	3.4	2.5	73%	0.0	0%	Very Poor	Moderate to Highly	Moderate	
			R3	19.9	22.5	21.2	2.6	2.6	100%	0.3	13%	Very Poor	Moderate to Highly	Moderate	
			R4	22.5	24.3	23.4	1.8	1.2	64%	0.3	18%	Very Poor	Moderate to Highly	Moderate	
BB-ECR-102	203.2	NQ (1.875")	R1	14.0	16.8	15.4	2.8	2.5	88%	0.6	21%	Very Poor	Slight to Moderately	Moderate	Grey, aphanitic, SILTSTONE and SLATE, discontinuities dipping at low to vertical angles (5 to 90 degrees from horizontal axis), spacing very close to moderately spaced (<2 in. to 3 ft), discontinuity aperatures are tight to open, discontinuity surfaces have slight silt infilling and pyrite on joint surfaces. Multiple highly weathered and/or fractured zones present.
			R2	16.8	18.0	17.4	1.2	1.2	100%	0.0	0%	Very Poor	Slight to Highly	Hard	
			R3	18.0	18.8	18.4	0.8	0.8	100%	0.0	0%	Very Poor	Slight to Moderately	Moderate	
			R4	18.8	20.1	19.5	1.3	1.1	88%	0.0	0%	Very Poor	Slight to Moderately	Moderate	
			R5	20.1	21.5	20.8	1.4	1.4	100%	0.5	35%	Poor	Slight to Moderately	Moderate	
			R6	21.5	26.5	24.0	5.0	4.4	88%	1.9	38%	Poor	Fresh to Slightly	Moderate to Hard	
			R7	26.5	28.4	27.5	1.9	1.5	79%	0.4	22%	Very Poor	Moderate	Moderate to Hard	
BB-ECR-201	200.5	NQ (1.875")	R1	17.0	22.3	19.7	5.3	5.0	95%	5.3	100%	Excellent	Fresh to Slightly	Moderate to Hard	Grey, aphanitic, SLATE and SILTSTONE, discontinuities dipping at low to steep angles (5 to 85 degrees from horizontal axis), spacing very close to moderately close (<2 in. to 3 ft), discontinuity aperatures are tight to open. Joint surfaces have iron oxide staining. Frequent calcite veins and highly weathered/fractured zones.
			R2	22.3	27.3	24.8	5.0	5.1	102%	5.0	100%	Excellent	Fresh	Hard	
			R3	27.3	32.2	29.8	4.9	4.7	95%	3.7	76%	Good	Fresh to Slightly	Hard	
			R4	32.2	37.2	34.7	5.0	4.4	87%	2.2	43%	Poor	Slight to Moderately	Moderate to Hard	
			R5	37.2	40.1	38.7	2.9	2.0	69%	1.5	52%	Fair	Slight	Hard	
			R6	40.1	42.1	41.1	2.0	3.0	150%	1.9	96%	Excellent	Slight to Moderately	Hard	
BB-ECR-202	201.7	NQ (1.875")	R1	15.0	20.0	17.5	5.0	3.8	75%	0.0	0%	Very Poor	Slight to Moderately	Moderate to Hard	Grey to grey-brown, aphanitic to fine grained, SLATE and METASANDSTONE, discontinuities dipping at steep to vertical angles (85 to 90 degrees from horizontal axis), spacing very close to close (<2 in. to 1 ft), discontinuity aperatures are tight to open with oxidized and calcite-coated surfaces with occasional silt-infilling. Highly fractured zones.
			R2	20.0	23.4	21.7	3.4	2.2	66%	0.0	0%	Very Poor	Slight to Moderately	Moderate	
			R3	23.4	25.6	24.5	2.2	2.2	98%	0.8	38%	Poor	Slight to Moderately	Moderate	
			R4	25.6	28.0	26.8	2.4	2.2	90%	0.3	14%	Very Poor	Slight to Moderately	Moderate	
			R5	28.0	30.0	29.0	2.0	2.0	100%	0.0	0%	Very Poor	Slight	Moderate	
BB-ECR-203	198.7	NQ (1.875")	R1	15.0	17.5	16.3	2.5	2.0	80%	0.0	0%	Very Poor	Slight to Moderately	Moderate	Grey, aphanitic, SLATE, discontinuities dipping at low to vertical angles (5 to 90 degrees from horizontal axis), spacing very close to moderately close (<2 in. to 3 ft), discontinuity aperatures are tight to open. Joint surfaces are planar, smooth and iron-stained.
			R2	17.5	20.0	18.8	2.5	2.5	100%	1.2	47%	Poor	Fresh to Slightly	Moderate	

TABLE III
Subsurface Exploration Bedrock Core Data
Clewleyville Road Bridge over Interstate 395/Route 9 Connector, Bridge No. 6648
MaineDOT WIN No. 018915.00
Eddington, Maine

Haley & Aldrich, Inc. File No.: 132076-007

Test Boring No. ¹	Ground Surface Elevation ² (ft)	Bedrock Core Diameter (in.)	Run				Total Core Recovery ^{3,6}		Rock Quality Designation ^{4,5,6}			Physical Rock Parameters		Lithologic, Rock Mass and Discontinuity Description	
			No.	Depth Below Ground Surface (ft)			Total Length (ft)	Recovered Length (ft)	%	Length (ft)	%	Designation	Weathering		Estimated Field Strength
				Top	Bottom	Midpoint									
BB-ECR-203A	199.1	NQ (1.875")	R1	15.4	17.9	16.7	2.5	2.5	100%	0.0	0%	Very Poor	Slight to Moderately	Moderate to Hard	Grey, aphanitic, SILTSTONE, discontinuities dipping at low to vertical angles (5 to 90 degrees from horizontal axis), spacing very close to moderately close (<2 in. to 3 ft), discontinuity apertures are tight to open, discontinuity surfaces are oxidized with few calcite veins. Highly fractured zones.
			R2	17.9	20.4	19.2	2.5	0.5	20%	0.0	0%	Very Poor	Slight to Moderately	Moderate to Hard	
			R3	20.4	23.5	22.0	3.1	3.2	103%	1.3	41%	Poor	Slight to Moderately	Moderate to Hard	
			R4	23.5	25.5	24.5	2.0	2.0	100%	0.8	38%	Poor	Slight to Moderately	Hard	
			R5	25.5	30.5	28.0	5.0	4.9	97%	3.0	60%	Fair	Slight to Moderately	Hard	
			R6	30.5	34.6	32.6	4.1	3.5	85%	2.2	53%	Fair	Slight to Moderately	Hard	
			R7	34.6	39.6	37.1	5.0	3.4	68%	2.6	52%	Fair	Fresh to Slightly	Hard	
			R8	39.6	40.4	40.0	0.8	1.5	188%	1.5	188%	Excellent	Fresh to Slightly	Hard	
BB-ECR-204	202.5	NQ (1.875")	R1	7.0	12.0	9.5	5.0	5.0	100%	0.9	17%	Very Poor	Slight	Hard	Grey, fine to medium grained, METASANDSTONE, discontinuities dipping at moderate to steep angles (35 to 85 degrees from horizontal axis), spacing very close to close (<2 in. to 1 ft), discontinuity apertures are tight to open with silt infilling and quartz seams. Moderate to severely fractured zones.
BB-ECR-204A	202.1	NQ (1.875")	R1	15.0	20.0	17.5	5.0	1.2	23%	0.9	17%	Very Poor	Slight to Moderately	Hard	Grey, aphanitic, SILTSTONE, discontinuities dipping at steep to vertical angles (85 to 90 degrees from horizontal axis), spacing very close to wide (<2 in. to 10 ft), discontinuity apertures are tight to open, discontinuity surfaces are planar to stepped, rough, and are oxidized with frequent calcite/quartz veins/stringers and are pitted. Highly fractured zones.
			R2	20.0	21.4	20.7	1.4	1.1	77%	0.4	30%	Poor	Slight to Moderately	Hard	
			R3	21.4	25.0	23.2	3.6	3.5	97%	3.5	97%	Excellent	Fresh to Slightly	Hard to Very Hard	
			R4	25.0	29.1	27.1	4.1	3.2	79%	1.6	39%	Poor	Fresh to Slightly	Hard to Very Hard	
			R5	29.1	33.5	31.3	4.4	4.0	91%	4.0	91%	Excellent	Fresh to Slightly	Hard to Very Hard	
			R6	33.5	36.0	34.8	2.5	2.0	80%	2.0	80%	Good	Fresh to Slightly	Hard to Very Hard	
			R7	36.0	40.5	38.3	4.5	5.0	111%	4.7	104%	Excellent	Fresh to Slightly	Hard to Very Hard	
			R8	40.5	45.5	43.0	5.0	5.0	100%	4.9	98%	Excellent	Fresh to Slightly	Hard to Very Hard	
BB-ECR-205	203.4	NQ (1.875")	R1	15.0	17.0	16.0	2.0	1.5	75%	0.0	0%	Very Poor	Slight to Moderately	Hard	Grey, fine to medium grained, METASANDSTONE, discontinuities dipping at steep to vertical angles (85 to 90 degrees from horizontal axis), spacing very close to moderately close (<2 in. to 3 ft), discontinuity apertures are tight to open with silt infilling and quartz seams.
			R2	17.0	20.0	18.5	3.0	1.9	64%	0.0	0%	Very Poor	Slight to Moderately	Hard	
			R3	20.0	21.3	20.7	1.3	1.2	96%	0.0	0%	Very Poor	Slight to Moderately	Hard	
			R4	21.3	22.1	21.7	0.8	0.8	100%	0.0	0%	Very Poor	Slight to Moderately	Hard	
			R5	22.1	23.1	22.6	1.0	1.0	100%	0.0	0%	Very Poor	Slight to Moderately	Hard	
			R6	23.1	25.0	24.1	1.9	1.3	70%	1.0	52%	Fair	Slight to Moderately	Hard	

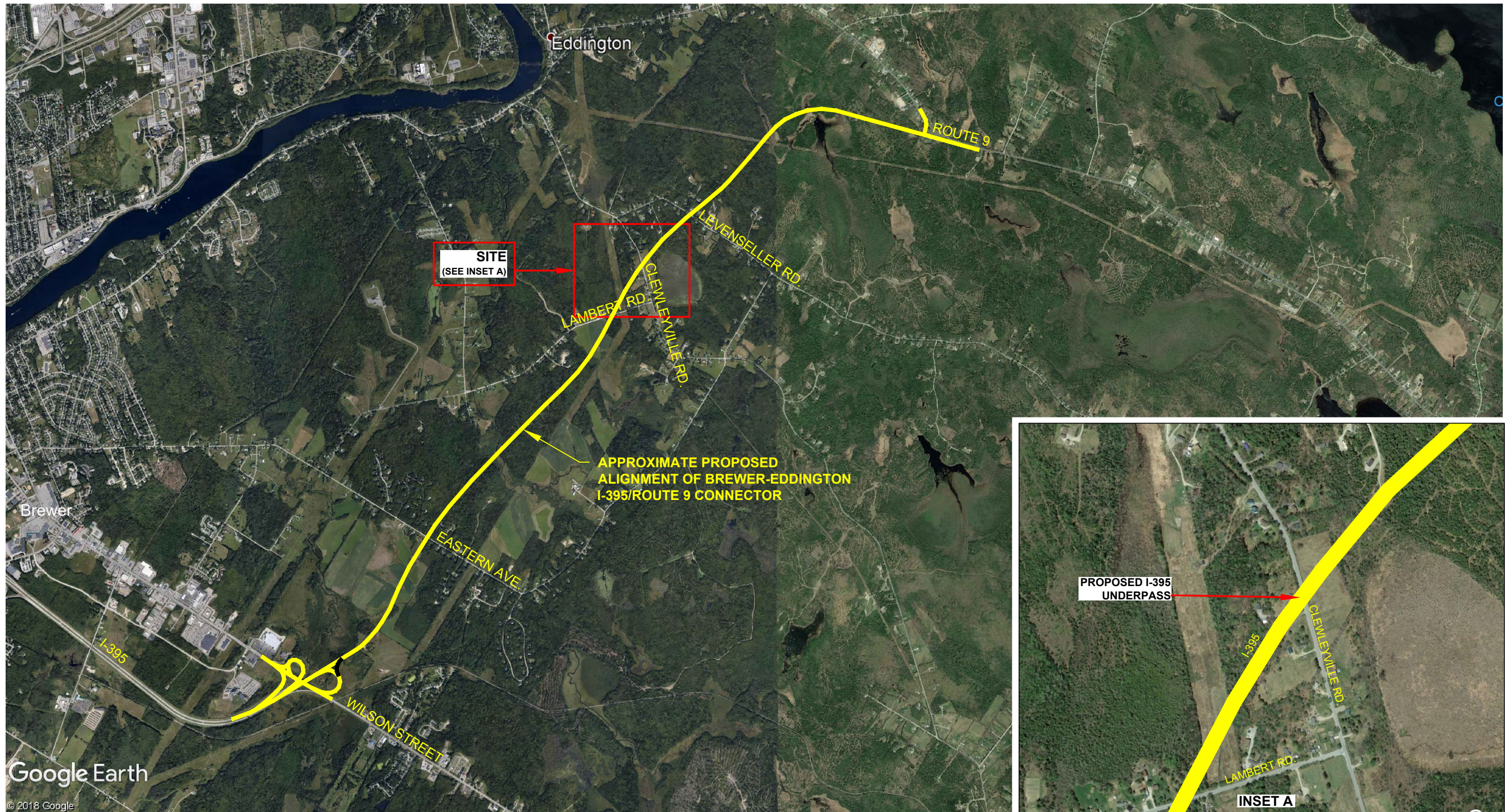
TABLE III
Subsurface Exploration Bedrock Core Data
Clewleyville Road Bridge over Interstate 395/Route 9 Connector, Bridge No. 6648
MaineDOT WIN No. 018915.00
Eddington, Maine

Haley & Aldrich, Inc. File No.: 132076-007

Test Boring No. ¹	Ground Surface Elevation ² (ft)	Bedrock Core Diameter (in.)	Run					Total Core Recovery ^{3,6}		Rock Quality Designation ^{4,5,6}			Physical Rock Parameters		Lithologic, Rock Mass and Discontinuity Description
			No.	Depth Below Ground Surface (ft)			Total Length (ft)	Recovered Length (ft)	%	Length (ft)	%	Designation	Weathering	Estimated Field Strength	
				Top	Bottom	Midpoint									
BB-ECR-205	203.4	NQ (1.875")	R7	25.0	30.0	27.5	5.0	4.3	85%	3.0	60%	Fair	Slight to Moderately	Hard	
			R8	30.0	35.0	32.5	5.0	4.7	93%	1.9	37%	Poor	Slight to Moderately	Hard	
BB-ECR-206	200.7	NQ (1.875")	R1	12.0	14.1	13.1	2.1	2.0	96%	0.0	0%	Very Poor	Slight to Moderately	Moderate	Grey, aphanitic, SLATE, discontinuities dipping at moderate to vertical angles (35 to 90 degrees from horizontal axis), spacing very close to close (<2 in. to 1 ft), discontinuity aperatures are tight to open. Silt infilling. Highly fractured zones.
			R2	14.1	16.1	15.1	2.0	1.5	75%	0.0	0%	Very Poor	Slight to Moderately	Moderate	
			R3	16.1	16.3	16.2	0.2	0.0	0%	0.0	0%	Very Poor	NA	NA	
BB-ECR-206A	201.0	NQ (1.875")	R1	25.0	30.0	27.5	5.0	2.5	50%	1.5	29%	Poor	Fresh to Moderately	Moderate to Hard	Grey, aphanitic, SLATE, discontinuities dipping at steep to vertical angles (85 to 90 degrees from horizontal axis), spacing very close to wide (<2 in. to 10 ft), discontinuity aperatures are tight to open. Occasional silt infilling frequent calcite stringers, occasional calcite veins. Highly fractured zones.
			R2	30.0	33.2	31.6	3.2	3.0	94%	1.0	31%	Poor	Fresh to Moderately	Moderate to Hard	
			R3	33.2	38.2	35.7	5.0	5.0	100%	5.0	100%	Excellent	Fresh	Hard	
			R4	38.2	43.2	40.7	5.0	4.2	83%	3.4	67%	Fair	Fresh	Hard	
			R5	43.2	47.5	45.4	4.3	1.8	41%	1.5	35%	Poor	Fresh	Hard	
			R6	47.5	50.3	48.9	2.8	4.3	155%	3.0	107%	Excellent	Fresh to Slightly	Hard	
HB-BE-231	202.3	NQ (1.875")	R1	13.0	16.0	14.5	3.0	2.3	75%	0.3	11%	Very Poor	Slight to Severely	Soft to Hard	Grey, fine to medium grained METASANDSTONE, joints dipping at low to steep angles and are very close to widely spaced. Joints are tight to open and joint surfaces are highly fractured and decomposed, planar to undulating and rough. Frequent calcite and quatz seams/veins.
			R2	16.0	19.3	17.7	3.3	1.3	40%	0.0	0%	Very Poor	Severely	NA	
			R3	19.3	23.3	21.3	4.0	3.8	94%	1.9	48%	Poor	Fresh	Hard	
			R4	23.3	27.3	25.3	4.0	3.2	79%	1.8	44%	Poor	Slight to Severely	Hard	
			R5	27.3	31.3	29.3	4.0	3.6	90%	2.7	67%	Fair	Slight to Severely	Hard	
			R6	33.3	38.3	35.8	5.0	5.0	100%	4.2	83%	Good	Fresh	Hard	
HB-BE-232	196.8	NQ (1.875")	R1	15.2	20.2	17.7	5.0	4.4	87%	3.0	60%	Fair	Fresh to Slightly	Hard	Grey, fine to medium grained METASANDSTONE, joints dipping at low to vertical angles and are very close to moderately spaced. Joints are tight to open and joint surfaces areoxidized, planar to undulating and smooth to rough. Frequent calcite veins.
			R2	21.0	26.0	23.5	5.0	4.7	93%	3.6	72%	Fair	Fresh to Slightly	Hard	
			R3	26.0	31.0	28.5	5.0	4.9	98%	3.2	63%	Fair	Fresh	Hard	
			R4	31.0	36.0	33.5	5.0	5.0	100%	1.8	35%	Poor	Fresh	Hard	

Notes:
¹ Test boring locations are shown on Figure 2, Site and Subsurface Exploration Location Plan.
² Ground surface elevations at test boring locations were determined in the field by MaineDOT using GPS survey equipment, are measured in feet and reference the North American Vertical Datum of 1988 (NAVD 88).
³ TCR = total core recovery. Total core recovery is the length of core recovered divided by the length of the run.
⁴ RQD = rock quality designation. RQD is the total length of intact, full-diameter core pieces recovered with a length greater than or equal to twice the core diameter (i.e., length of at least 4 in.) measured along the core axis. The percent RQD is the total length of RQD measured versus the run length. Note that vertical discontinuities are not included in determination of RQD.
⁵ Designation based on RQD in accordance with MaineDOT Geotechnical Section "Key to Soil and Rock Descriptions and Terms" Field Identification Information.
⁶ TCR and RQD percentages that exceed 100 percent include portions of previous core runs that were not originally recovered.

	Individual	Date
Prepared By:	JAD	4/9/2021
Checked By:	BCS	6/8/2021
Reviewed By:	WAC	8/31/2021



NOTES

1. IMAGE TAKEN FROM GOOGLE EARTH IMAGES, 2018.



**HALEY
ALDRICH**

CLEWLEYVILLE ROAD BRIDGE OVER
INTERSTATE 395/ROUTE 9 CONNECTOR, BRIDGE No. 6648
MAINEDOT WIN 018915.00
EDDINGTON, MAINE

PROJECT LOCUS

SCALE: AS SHOWN
AUGUST 2021

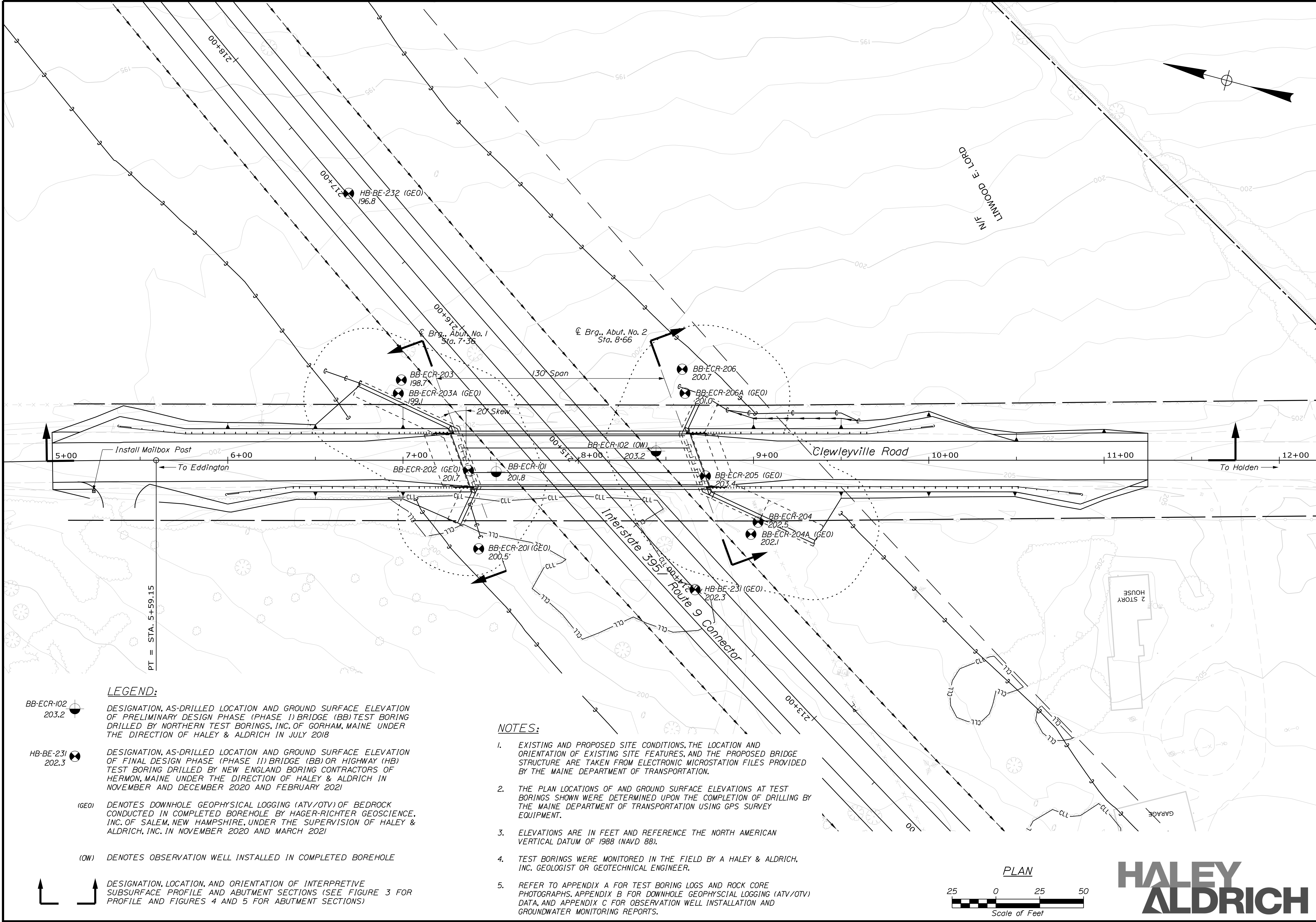
FIGURE 1

Date:9/2/2021

Username:

Division:

Filename: ... \052_Plan_ClewleyvilleRoad.dgn



LEGEND:

BB-ECR-102
203.2

HB-BE-231
202.3

(GEO)

(OW)

DESIGNATION, AS-DRILLED LOCATION AND GROUND SURFACE ELEVATION OF PRELIMINARY DESIGN PHASE (PHASE I) BRIDGE (BB) TEST BORING DRILLED BY NORTHERN TEST BORINGS, INC. OF GORHAM, MAINE UNDER THE DIRECTION OF HALEY & ALDRICH IN JULY 2018

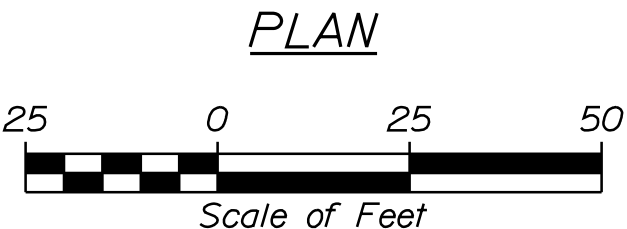
DESIGNATION, AS-DRILLED LOCATION AND GROUND SURFACE ELEVATION OF FINAL DESIGN PHASE (PHASE II) BRIDGE (BB) OR HIGHWAY (HB) TEST BORING DRILLED BY NEW ENGLAND BORING CONTRACTORS OF HERMON, MAINE UNDER THE DIRECTION OF HALEY & ALDRICH IN NOVEMBER AND DECEMBER 2020 AND FEBRUARY 2021

DOWNHOLE GEOPHYSICAL LOGGING (ATV/OTV) OF BEDROCK CONDUCTED IN COMPLETED BOREHOLE BY HAGER-RICHTER GEOSCIENCE, INC. OF SALEM, NEW HAMPSHIRE, UNDER THE SUPERVISION OF HALEY & ALDRICH, INC. IN NOVEMBER 2020 AND MARCH 2021

DESIGNATION, LOCATION, AND ORIENTATION OF INTERPRETIVE SUBSURFACE PROFILE AND ABUTMENT SECTIONS (SEE FIGURE 3 FOR PROFILE AND FIGURES 4 AND 5 FOR ABUTMENT SECTIONS)

NOTES:

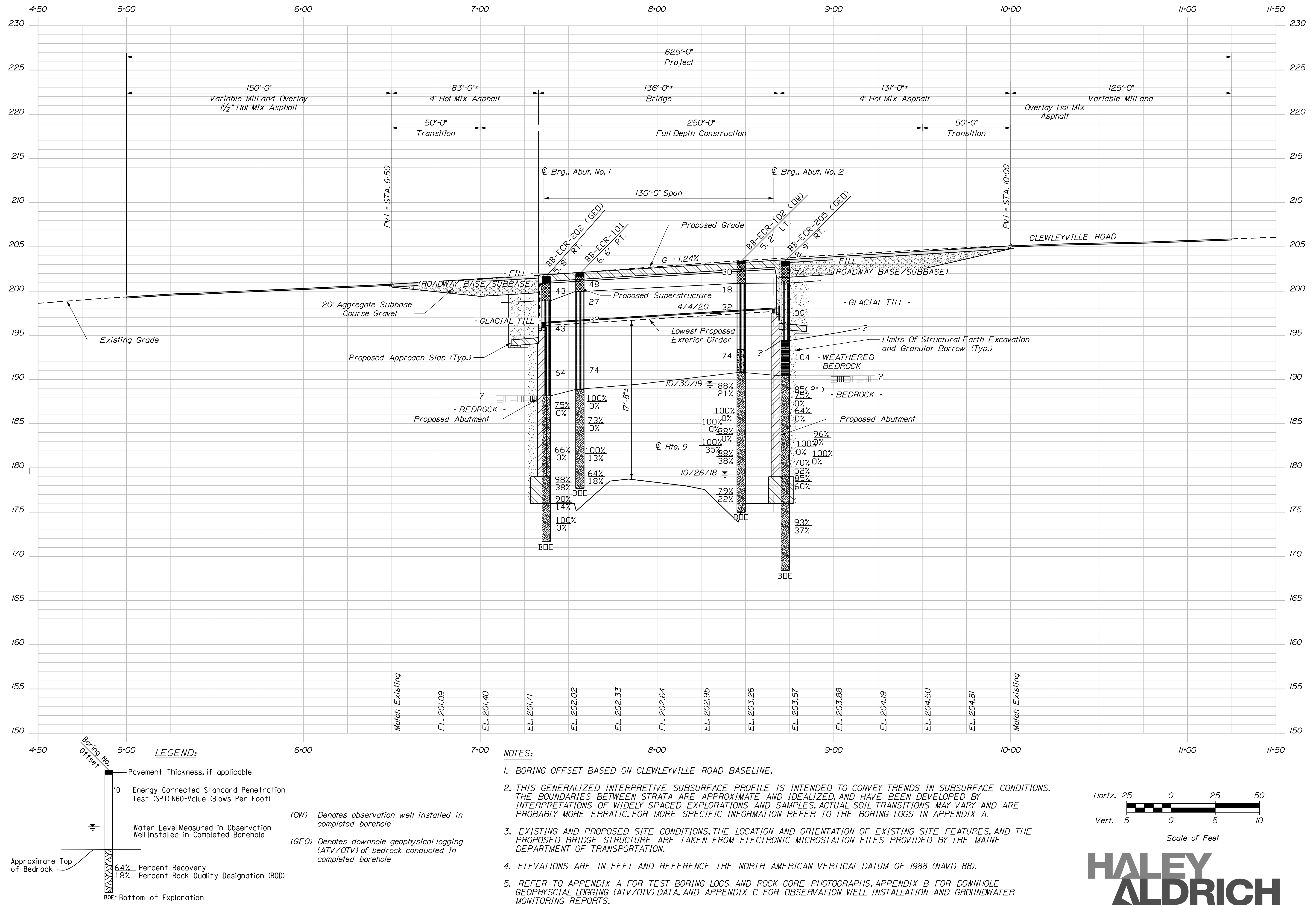
- EXISTING AND PROPOSED SITE CONDITIONS, THE LOCATION AND ORIENTATION OF EXISTING SITE FEATURES, AND THE PROPOSED BRIDGE STRUCTURE ARE TAKEN FROM ELECTRONIC MICROSTATION FILES PROVIDED BY THE MAINE DEPARTMENT OF TRANSPORTATION.
- THE PLAN LOCATIONS OF AND GROUND SURFACE ELEVATIONS AT TEST BORINGS SHOWN WERE DETERMINED UPON THE COMPLETION OF DRILLING BY THE MAINE DEPARTMENT OF TRANSPORTATION USING GPS SURVEY EQUIPMENT.
- ELEVATIONS ARE IN FEET AND REFERENCE THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
- TEST BORINGS WERE MONITORED IN THE FIELD BY A HALEY & ALDRICH, INC. GEOLOGIST OR GEOTECHNICAL ENGINEER.
- REFER TO APPENDIX A FOR TEST BORING LOGS AND ROCK CORE PHOTOGRAPHS, APPENDIX B FOR DOWNHOLE GEOPHYSICAL LOGGING (ATV/OTV) DATA, AND APPENDIX C FOR OBSERVATION WELL INSTALLATION AND GROUNDWATER MONITORING REPORTS.

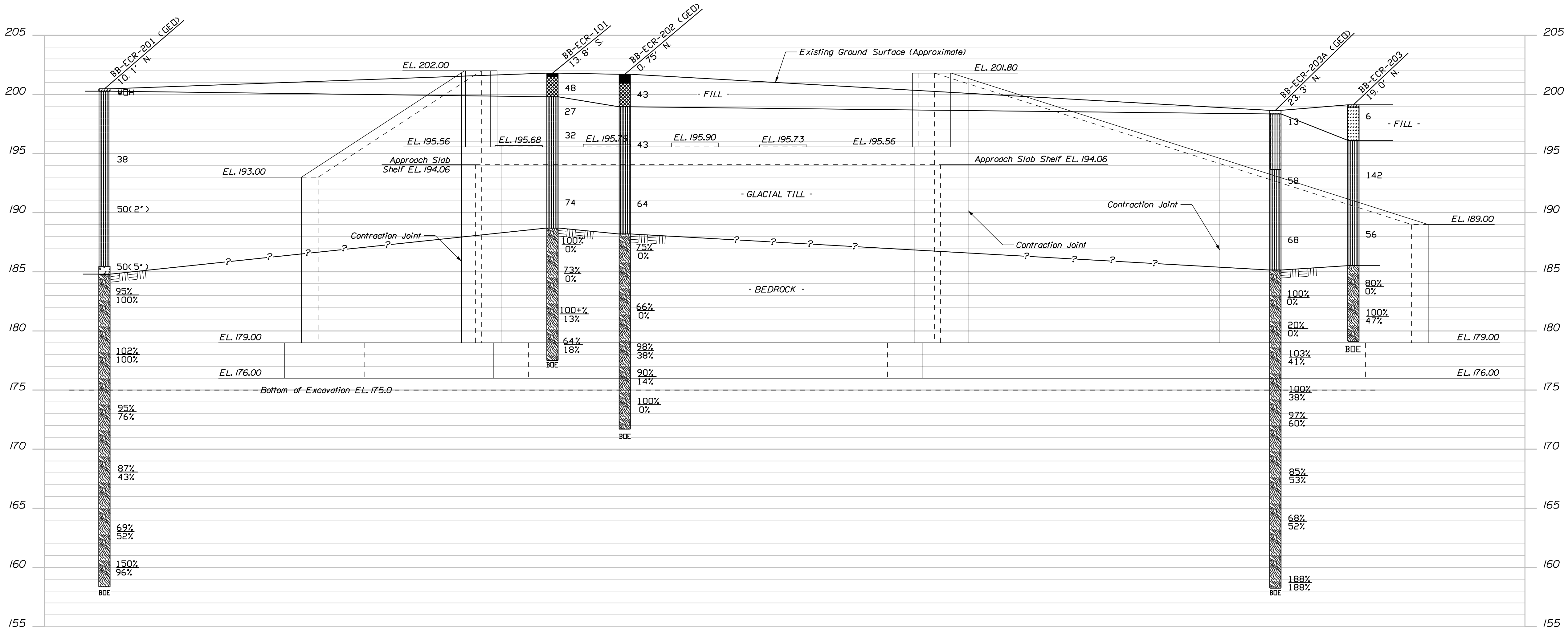


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ALDRICH

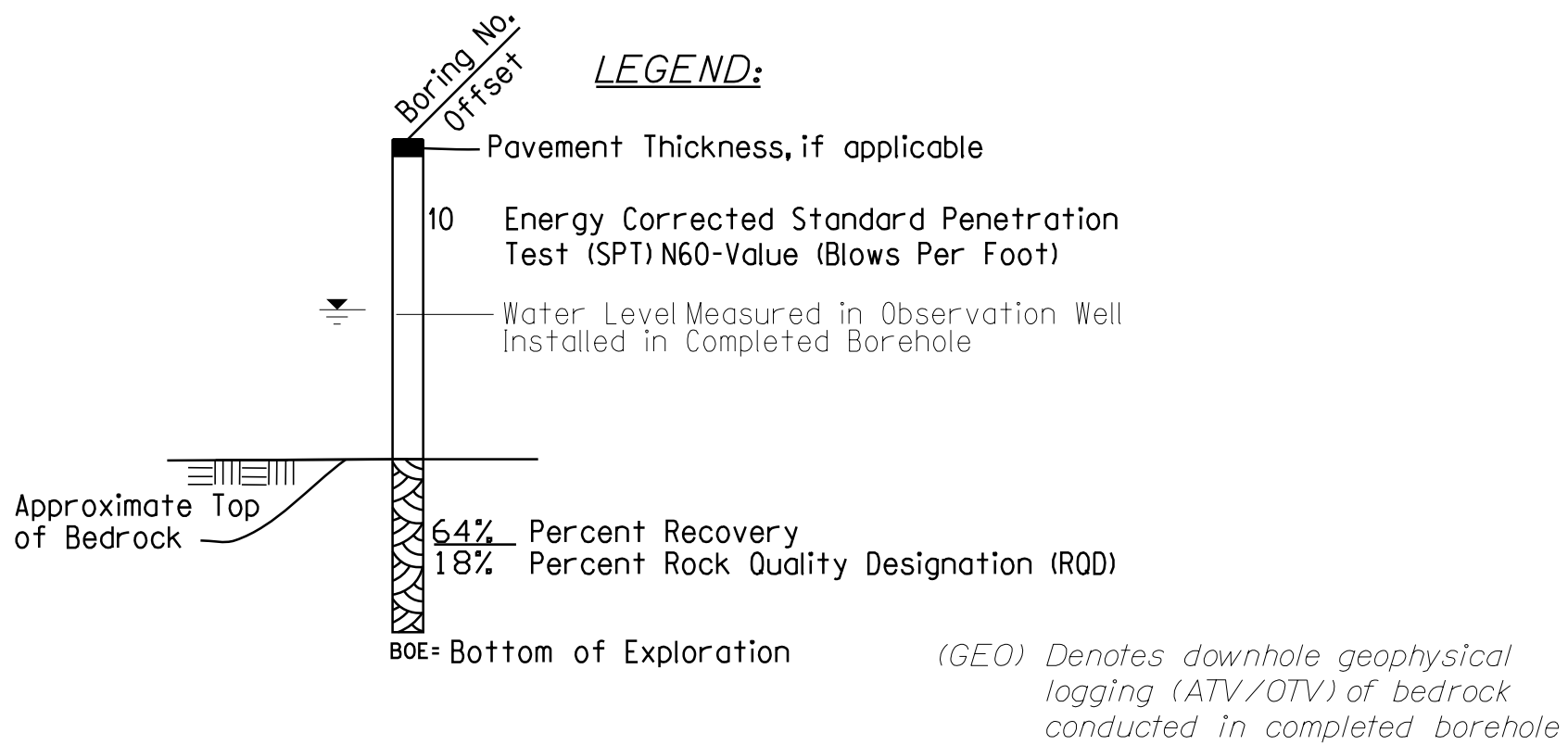
STATE OF MAINE		DEPARTMENT OF TRANSPORTATION	
STP-1891(500)		SIGNATURE	
BRIDGE NO.		P.E. NUMBER	
WIN		DATE	
018915.00		BRIDGE PLANS	

CLEWLEYVILLE ROAD OVER I-395/ROUTE 9		FIGURE	
CONNECTOR, BRIDGE NO. 6648		2	
PENOBSCOT COUNTY		OF 5	
EDDINGTON			
SITE AND SUBSURFACE			
EXPLORATION LOCATION PLAN			



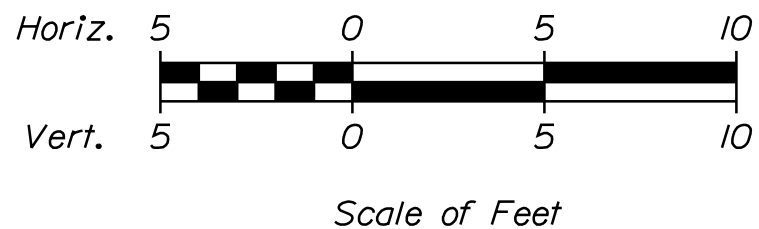


ABUTMENT NO. 1 ELEVATION



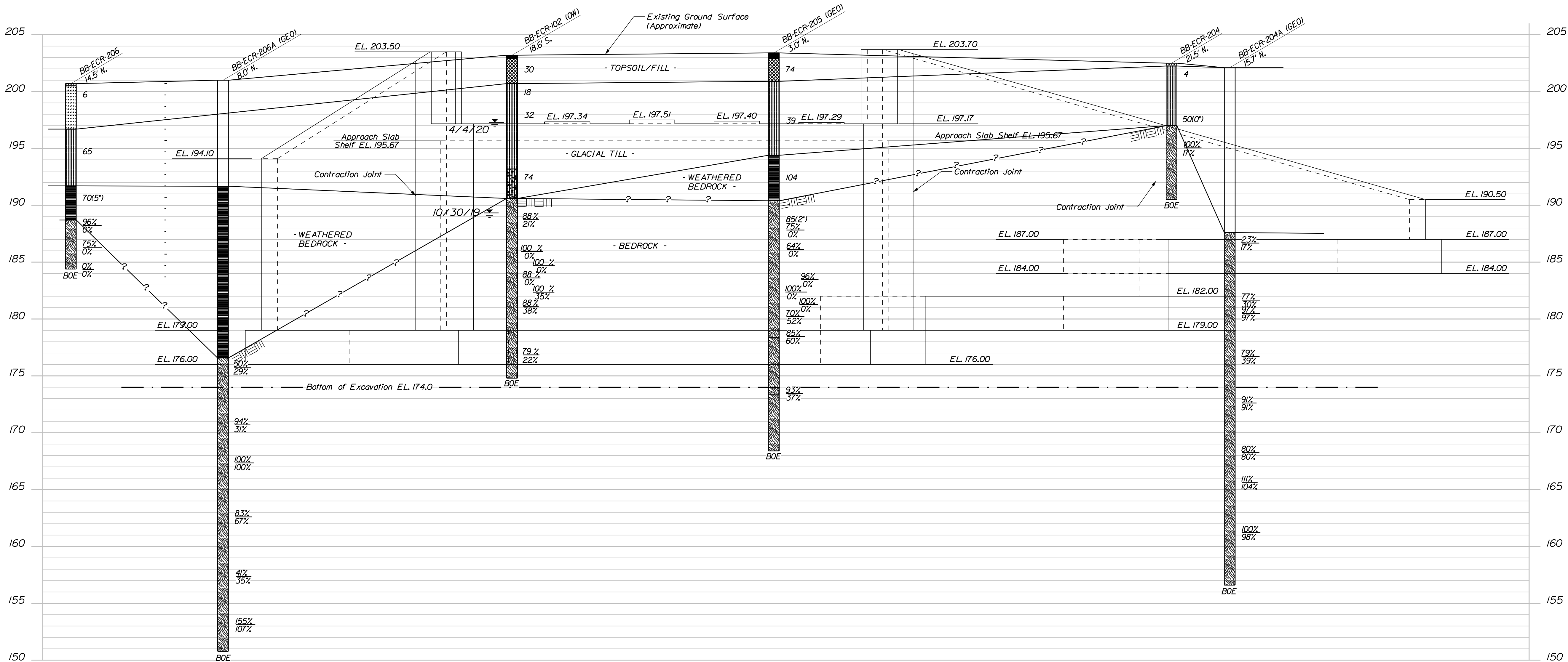
NOTES:

- BORING OFFSET BASED ON PROPOSED CLEWLEYVILLE ABUTMENT CROSS SECTION LINE.
- THIS GENERALIZED INTERPRETIVE SUBSURFACE CROSS SECTION IS INTENDED TO CONVEY TRENDS IN SUBSURFACE CONDITIONS. THE BOUNDARIES BETWEEN STRATA ARE APPROXIMATE AND IDEALIZED, AND HAVE BEEN DEVELOPED BY INTERPRETATIONS OF WIDELY SPACED EXPLORATIONS AND SAMPLES. ACTUAL SOIL TRANSITIONS MAY VARY AND ARE PROBABLY MORE ERRATIC. FOR MORE SPECIFIC INFORMATION REFER TO THE BORING LOGS IN APPENDIX A.
- EXISTING AND PROPOSED SITE CONDITIONS, THE LOCATION AND ORIENTATION OF EXISTING SITE FEATURES, AND THE PROPOSED BRIDGE STRUCTURE ARE TAKEN FROM ELECTRONIC MICROSTATION FILES PROVIDED BY THE MAINE DEPARTMENT OF TRANSPORTATION.
- ELEVATIONS ARE IN FEET AND REFERENCE THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
- REFER TO APPENDIX A FOR TEST BORING LOGS AND ROCK CORE PHOTOGRAPHS, APPENDIX B FOR DOWNHOLE GEOPHYSICAL LOGGING (ATV/OTV) DATA, AND APPENDIX C FOR OBSERVATION WELL INSTALLATION AND GROUNDWATER MONITORING REPORTS.
- REFER TO FIGURE 2 FOR LOCATION AND ORIENTATION OF CROSS SECTION.

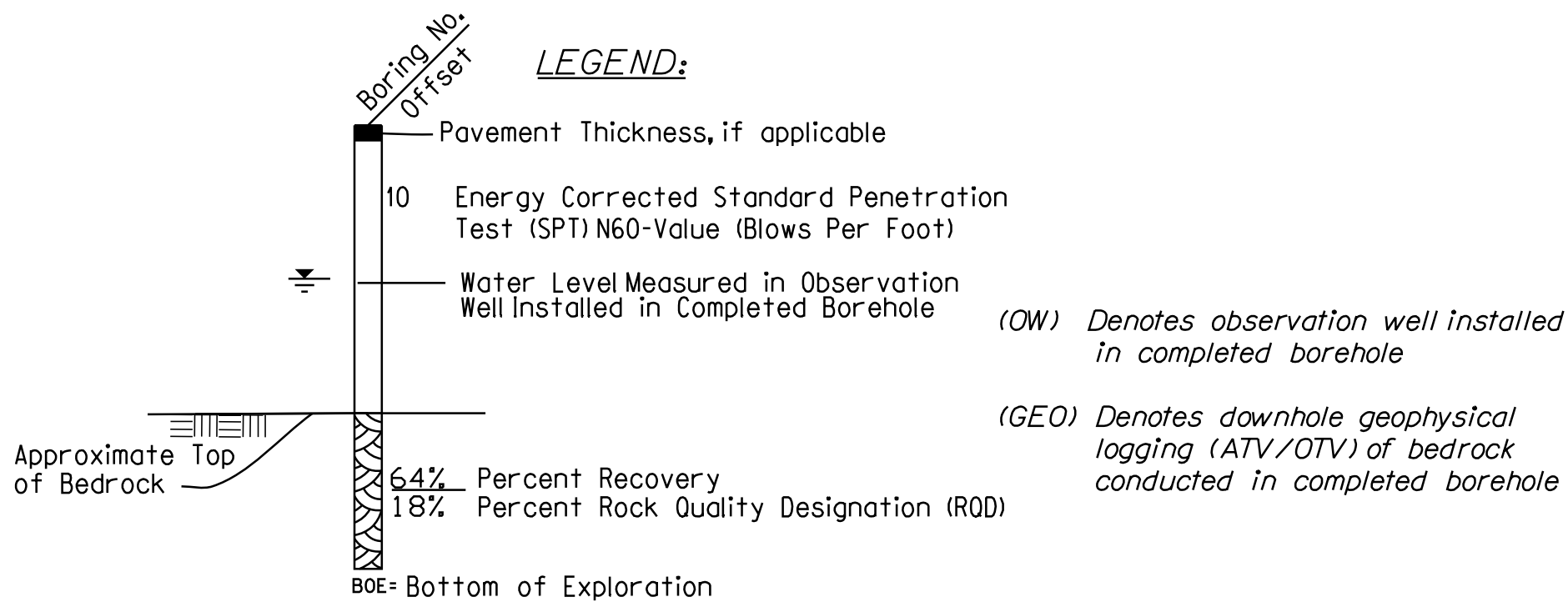


HALEY
ALDRICH

STATE OF MAINE		DEPARTMENT OF TRANSPORTATION	
STP-1891(500)		BRIDGE NO.	
WIN		018915.00	
BRIDGE PLANS			
CLEWLEYVILLE ROAD OVER I-395/ROUTE 9		CONNECTOR, BRIDGE NO. 6648	
EDDINGTON		PENOBSCOT COUNTY	
ABUTMENT NO. 1 INTERPRETIVE		SUBSURFACE CROSS SECTION	
SHEET NUMBER		4	
OF 5			

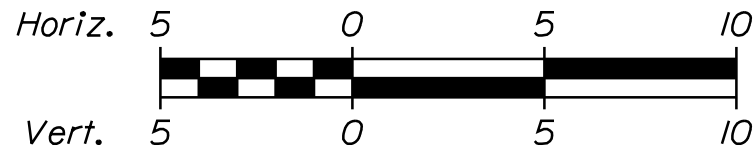


ABUTMENT NO. 2 ELEVATION



NOTES:

- BORING OFFSET BASED ON PROPOSED CLEWLEYVILLE ABUTMENT CROSS SECTION LINE.
- THIS GENERALIZED INTERPRETIVE SUBSURFACE CROSS SECTION IS INTENDED TO CONVEY TRENDS IN SUBSURFACE CONDITIONS. THE BOUNDARIES BETWEEN STRATA ARE APPROXIMATE AND IDEALIZED, AND HAVE BEEN DEVELOPED BY INTERPRETATIONS OF WIDELY SPACED EXPLORATIONS AND SAMPLES. ACTUAL SOIL TRANSITIONS MAY VARY AND ARE PROBABLY MORE ERRATIC. FOR MORE SPECIFIC INFORMATION REFER TO THE BORING LOGS IN APPENDIX A.
- EXISTING AND PROPOSED SITE CONDITIONS, THE LOCATION AND ORIENTATION OF EXISTING SITE FEATURES, AND THE PROPOSED BRIDGE STRUCTURE ARE TAKEN FROM ELECTRONIC MICROSTATION FILES PROVIDED BY THE MAINE DEPARTMENT OF TRANSPORTATION.
- ELEVATIONS ARE IN FEET AND REFERENCE THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
- REFER TO APPENDIX A FOR TEST BORING LOGS AND ROCK CORE PHOTOGRAPHS, APPENDIX B FOR DOWNHOLE GEOPHYSICAL LOGGING (ATV/OTV) DATA AND APPENDIX C FOR OBSERVATION WELL INSTALLATION AND GROUNDWATER MONITORING REPORTS.
- REFER TO FIGURE 2 FOR LOCATION AND ORIENTATION OF CROSS SECTION.



Scale of Feet

HALEY ALDRICH

APPENDIX A

Test Boring Logs and Rock Core Photographs

UNIFIED SOIL CLASSIFICATION SYSTEM				
MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE-GRAINED SOILS (more than half of material is larger than No. 200 sieve size)	GRAVELS (more than half of coarse fraction is larger than No. 4 sieve size)	CLEAN GRAVELS	GW	Well-graded gravels, gravel-sand mixtures, little or no fines.
		(little or no fines)	GP	Poorly-graded gravels, gravel sand mixtures, little or no fines.
		GRAVEL WITH FINES (Appreciable amount of fines)	GM	Silty gravels, gravel-sand-silt mixtures.
	SANDS (more than half of coarse fraction is smaller than No. 4 sieve size)	CLEAN SANDS	SW	Well-graded sands, Gravelly sands, little or no fines
		(little or no fines)	SP	Poorly-graded sands, Gravelly sand, little or no fines.
		SANDS WITH FINES (Appreciable amount of fines)	SM	Silty sands, sand-silt mixtures
FINE-GRAINED SOILS (more than half of material is smaller than No. 200 sieve size)	SILTS AND CLAYS (liquid limit less than 50)	ML	Inorganic silts and very fine sands, rock flour, Silty or Clayey fine sands, or Clayey silts with slight plasticity.	
		CL	Inorganic clays of low to medium plasticity, Gravelly clays, Sandy clays, Silty clays, lean clays.	
		OL	Organic silts and organic Silty clays of low plasticity.	
	SILTS AND CLAYS (liquid limit greater than 50)	MH	Inorganic silts, micaceous or diatomaceous fine Sandy or Silty soils, elastic silts.	
		CH	Inorganic clays of high plasticity, fat clays.	
		OH	Organic clays of medium to high plasticity, organic silts.	
HIGHLY ORGANIC SOILS	Pt	Peat and other highly organic soils.		

Desired Soil Observations (in this order, if applicable):

Color (Munsell color chart)
Moisture (dry, damp, moist, wet)
Density/Consistency (from above right hand side)
Texture (fine, medium, coarse, etc.)
Name (Sand, Silty Sand, Clay, etc., including portions - trace, little, etc.)
Gradation (well-graded, poorly-graded, uniform, etc.)
Plasticity (non-plastic, slightly plastic, moderately plastic, highly plastic)
Structure (layering, fractures, cracks, etc.)
Bonding (well, moderately, loosely, etc.,)
Cementation (weak, moderate, or strong)
Geologic Origin (till, marine clay, alluvium, etc.)
Groundwater level

MODIFIED BURMISTER SYSTEM			
<u>Descriptive Term</u>		<u>Portion of Total (%)</u>	
trace		0 - 10	
little		11 - 20	
some		21 - 35	
adjective (e.g. Sandy, Clayey)		36 - 50	

TERMS DESCRIBING DENSITY/CONSISTENCY

Coarse-grained soils (more than half of material is larger than No. 200 sieve): Includes (1) clean gravels; (2) Silty or Clayey gravels; and (3) Silty, Clayey or Gravelly sands. Density is rated according to standard penetration resistance (N-value).

<u>Density of Cohesionless Soils</u>	<u>Standard Penetration Resistance N-Value (blows per foot)</u>
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

Fine-grained soils (more than half of material is smaller than No. 200 sieve): Includes (1) inorganic and organic silts and clays; (2) Gravelly, Sandy or Silty clays; and (3) Clayey silts. Consistency is rated according to undrained shear strength as indicated.

<u>Consistency of Cohesive soils</u>	<u>SPT N-Value (blows per foot)</u>	<u>Approximate Undrained Shear Strength (psf)</u>	<u>Field Guidelines</u>
Very Soft	WOH, WOR, WOP, <2	0 - 250	Fist easily penetrates
Soft	2 - 4	250 - 500	Thumb easily penetrates
Medium Stiff	5 - 8	500 - 1000	Thumb penetrates with moderate effort
Stiff	9 - 15	1000 - 2000	Indented by thumb with great effort
Very Stiff	16 - 30	2000 - 4000	Indented by thumbnail
Hard	>30	over 4000	Indented by thumbnail with difficulty

Rock Quality Designation (RQD):

RQD (%) = $\frac{\text{sum of the lengths of intact pieces of core}^*}{\text{length of core advance}}$

*Minimum NQ rock core (1.88 in. OD of core)

Rock Quality Based on RQD	
<u>Rock Quality</u>	<u>RQD (%)</u>
Very Poor	≤25
Poor	26 - 50
Fair	51 - 75
Good	76 - 90
Excellent	91 - 100

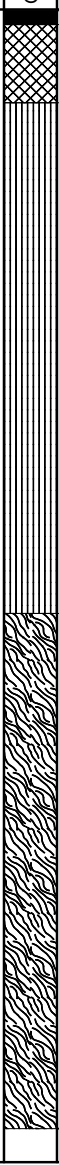
Desired Rock Observations (in this order, if applicable):

Color (Munsell color chart)
Texture (aphanitic, fine-grained, etc.)
Rock Type (granite, schist, sandstone, etc.)
Hardness (very hard, hard, mod. hard, etc.)
Weathering (fresh, very slight, slight, moderate, mod. severe, severe, etc.)
Geologic discontinuities/jointing:
-dip (horiz - 0-5 deg., low angle - 5-35 deg., mod. dipping - 35-55 deg., steep - 55-85 deg., vertical - 85-90 deg.)
-spacing (very close - <2 inch, close - 2-12 inch, mod. close - 1-3 feet, wide - 3-10 feet, very wide >10 feet)
-tightness (tight, open, or healed)
-infilling (grain size, color, etc.)
Formation (Waterville, Ellsworth, Cape Elizabeth, etc.)
RQD and correlation to rock quality (very poor, poor, etc.)
ref: ASTM D6032 and FHWA NHI-16-072 GEC 5 - Geotechnical Site Characterization, Table 4-12
Recovery (inch/inch and percentage)
Rock Core Rate (X.X ft - Y.Y ft (min:sec))

Sample Container Labeling Requirements:

WIN	Blow Counts
Bridge Name / Town	Sample Recovery
Boring Number	Date
Sample Number	Personnel Initials
Sample Depth	

Maine Department of Transportation
Geotechnical Section
Key to Soil and Rock Descriptions and Terms
Field Identification Information

Maine Department of Transportation						Project: Route 9/I-395 Connector			Boring No.: BB-ECR-101														
Soil/Rock Exploration Log US CUSTOMARY UNITS						Location: Brewer and Eddington, Maine			WIN: 18915.00														
Driller: Northern Test Borings, Inc.			Elevation (ft.): 201.8			Auger ID/OD: --																	
Operator: M. Nadeau			Datum: NAVD 88			Sampler: Split-Spoon 1.375 in. ID																	
Logged By: N. Klausmeyer			Rig Type: Diedrich D50 Track (Rig #377)			Hammer Wt./Fall: SS-140#/30; HW-140#/20																	
Date Start/Finish: 07-31-18/07-31-18			Drilling Method: SSA/HW Drive			Core Barrel: NQ-2.0 in. ID																	
Boring Location: Sta. 215+25.6, 39.4 LT			Casing ID/OD: HW-4.0 in. ID			Water Level*: 21.9 ft																	
Hammer Efficiency Factor: 0.907			Hammer Type: Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>																				
<div>Definitions: D = Split Spoon Sample MD = Unsuccessful Split Spoon Sample Attempt U = Thin Wall Tube Sample MU = Unsuccessful Thin Wall Tube Sample Attempt V = Field Vane Shear Test, PP = Pocket Penetrometer MV = Unsuccessful Field Vane Shear Test Attempt</div>						<div>R = Rock Core Sample SSA = Solid Stem Auger HSA = Hollow Stem Auger RC = Roller Cone WOH = Weight of 140lb. Hammer WOR/C = Weight of Rods or Casing WO1P = Weight of One Person</div>						<div>S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf) S_{u(lab)} = Lab Vane Undrained Shear Strength (psf) q_p = Unconfined Compressive Strength (ksf) N-uncorrected = Raw Field SPT N-value Hammer Efficiency Factor = Rig Specific Annual Calibration Value N₆₀ = SPT N-uncorrected Corrected for Hammer Efficiency N₆₀ = (Hammer Efficiency Factor/60%)*N-uncorrected</div>						<div>T_v = Pocket Torvane Shear Strength (psf) WC = Water Content, percent LL = Liquid Limit PL = Plastic Limit PI = Plasticity Index G = Grain Size Analysis C = Consolidation Test</div>					
Sample Information																							
Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows / (6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N ₆₀	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/AASHTO and Unified Class.												
0	1D	24/14	0.3 - 2.3	6/14/18/20	32	48	SSA	201.5		-BITUMINOUS CONCRETE- Brown, damp, dense, fine to coarse SAND, some silt, little fine to coarse gravel	G#474393 A-4(0), ML WC=13.3												
	2D	24/8	2.3 - 4.3	8/8/10/11	18	27		199.8		-FILL-(SM)(ROADWAY BASE/SUBBASE MATERIAL)- Yellow-brown, moist, very stiff, SILT, trace fine to coarse sand, trace fine gravel, moderately bonded													
	3D	24/24	4.3 - 6.3	10/10/11/11	21	32				-GLACIAL TILL-(ML) Yellow-brown, moist, hard, SILT, some fine to coarse sand, trace fine gravel, moderately bonded													
5							V			-GLACIAL TILL-(ML)													
							44																
							57																
							62																
							75																
10	4D	24/9	10.0 - 12.0	12/21/28/32	49	74	HW			Grey-brown, moist, hard, SILT, some fine to coarse sand, trace fine gravel, well bonded		G#474394 A-4(0), ML WC=12.1											
							V			-GLACIAL TILL-(ML)													
							RC	188.7	Top of Bedrock at El. 188.7														
15	R1	30/30	14.0 - 16.5	RQD = 0%			NQ CORE		R1: Grey, aphanitic, PHYLLITE. Moderately hard, moderate to highly weathered, joints dipping at low to vertical angles, close, tight, slight silt infilling, pyrite observed on some joint surfaces. Rock Quality=Very Poor Recovery=100%														
	R2	40.8/30	16.5 - 19.9	RQD = 0%					-BREWER FORMATION- R1 Core Times (min:sec): 14.0-15.0' (2:12); 15.0-16.0' (2:17); 16.0-16.5' (2:55) R2: Similar to R1, except no infilling. Rock Quality=Very Poor Recovery=73%														
20	R3	31.2/32	19.9 - 22.5	RQD = 13%					-BREWER FORMATION R2 Core Times (min:sec): 16.5-17.5' (1:56); 17.5-18.5' (0:17); 18.5-19.5' (2:33); 19.5-19.9' (1:11) Note: Water loss encountered from approximately 17.5 to 18.5 ft. R3: Similar to R1, except no infilling, trace pitting. Rock Quality=Very Poor Recovery=100%														
	R4	21.6/14	22.5 - 24.3	RQD = 18%					-BREWER FORMATION- R3 Core Times (min:sec): 19.9-20.9' (2:17); 20.9-21.9' (2:22); 21.9-22.5' (1:44) Note: 275-gallon water loss for core runs R1 to R3. R4: Similar to R1. Rock Quality=Very Poor														
25							V	177.5															
Remarks:																							
Stratification lines represent approximate boundaries between soil types; transitions may be gradual.										Page 1 of 2													
* 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.																							
Boring No.: BB-ECR-101																							

<div>Maine Department of Transportation</div> <div>Soil/Rock Exploration Log</div> <div>US CUSTOMARY UNITS</div>						Project: Route 9/I-395 Connector			Boring No.: BB-ECR-101		
						Location: Brewer and Eddington, Maine			WIN: 18915.00		
Driller: Northern Test Borings, Inc.				Elevation (ft.)		201.8		Auger ID/OD:			--
Operator: M. Nadeau				Datum:		NAVD 88		Sampler:			Split-Spoon 1.375 in. ID
Logged By: N. Klausmeyer				Rig Type:		Diedrich D50 Track (Rig #377)		Hammer Wt./Fall:			SS-140#/30; HW-140#/#
Date Start/Finish: 07-31-18/07-31-18				Drilling Method:		SSA/HW Drive		Core Barrel:			NQ-2.0 in. ID
Boring Location: Sta. 215+25.6, 39.4 LT				Casing ID/OD:		HW-4.0 in. ID		Water Level*:			21.9 ft
Hammer Efficiency Factor: 0.907						Hammer Type: Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>					
Definitions: D = Split Spoon Sample MD = Unsuccessful Split Spoon Sample Attempt U = Thin Wall Tube Sample MU = Unsuccessful Thin Wall Tube Sample Attempt V = Field Vane Shear Test, PP = Pocket Penetrometer MV = Unsuccessful Field Vane Shear Test Attempt						R = Rock Core Sample SSA = Solid Stem Auger HSA = Hollow Stem Auger RC = Roller Cone WOH = Weight of 140 lb. Hammer WOR/C = Weight of Rods or Casing WO1P = Weight of One Person			S _u = Peak/Remolded Field Vane Undrained Shear Strength (psf) S _{u(lab)} = Lab Vane Undrained Shear Strength (psf) q _p = Unconfined Compressive Strength (ksf) N-uncorrected = Raw Field SPT N-value Hammer Efficiency Factor = Rig Specific Annual Calibration Value N ₆₀ = SPT N-uncorrected Corrected for Hammer Efficiency N ₆₀ = (Hammer Efficiency Factor/60%)*N-uncorrected		
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25										Recovery=64% -BREWER FORMATION- R4 Core Times (min:sec): 22.5-23.5' (1:37); 23.5-24.3' (2:08) <div>Bottom of Exploration at 24.3 feet below ground surface.</div>	
30											
35											
40											
45											
50											
Remarks:											
Stratification lines represent approximate boundaries between soil types; transitions may be gradual.										Page 2 of 2	
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Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS				Project: Route 9/I-395 Connector Location: Brewer and Eddington, Maine				Boring No.: BB-ECR-102 WIN: 18915.00																																																																																																																																																																																																																																																																				
Driller: Northern Test Borings, Inc.				Elevation (ft.) 203.2				Auger ID/OD: --																																																																																																																																																																																																																																																																				
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Shear Strength (psf) or RQD (%)</th><th>N-uncorrected</th><th>N₆₀</th><th>Casing Blows</th></tr></thead><tbody><tr><td>0</td><td>1D</td><td>24/15</td><td>0.3 - 2.3</td><td>12/10/10/8</td><td>20</td><td>30</td><td>SSA</td><td>202.9</td><td rowspan="10"></td><td rowspan="10">-BITUMINOUS CONCRETE- Red-brown, dry, medium dense, fine to coarse SAND, trace fine gravel, trace silt, well graded -FILL-(SW)(ROADWAY BASE/SUBBASE MATERIAL) Red-brown grading to yellow-brown, damp, very stiff, Sandy SILT, trace fine gravel, trace organics -GLACIAL TILL-(ML) Yellow-brown, damp, hard, SILT, some fine to coarse sand, trace fine to coarse gravel, moderately bonded -GLACIAL TILL-(ML) Grey to yellow-brown, wet, very dense, fine to coarse GRAVEL, little silt, little fine to coarse sand, moderately bonded -GLACIAL TILL-(GM) Top of Bedrock at El. 190.6 R1: Grey, aphanitic SILTSTONE. Moderately hard, slightly to highly weathered, joints dipping at low to near-vertical angles, very close to close, tight to open, slight silt infilling, trace pyrite on joint surfaces, highly fractured zone, and moderately to highly weathered from approximately 15.0 to 16.8 ft. Rock Quality=Very Poor Recovery=88% -BREWER FORMATION- R1 Core Times (min:sec): 14.0-15.0' (2:56); 15.0-16.0' (2:21); 16.0-16.8' (3:07) R2: Grey, aphanitic SILTSTONE. Hard, highly weathered grading to slightly weathered, joints dipping at low to near-vertical angles, very close to close, open, slight silt infilling, highly fractured zone from approximately 16.8 to 17.3 ft. Rock Quality=Very Poor Recovery=100% -BREWER FORMATION- R2 Core Times (min:sec): 16.8-17.8' (2:41); 17.8-18.0' (1:15) R3: Grey, aphanitic SILTSTONE. Moderately hard, slightly to moderately weathered, highly fractured throughout, few discernible joints dipping at moderate to steep angles, planar, open. Rock Quality=Very Poor</td><td rowspan="10">G#474395 A-4(0), ML WC=13.6</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td>2D</td><td>24/17</td><td>2.3 - 4.3</td><td>8/7/5/5</td><td>12</td><td>18</td><td></td><td>200.7</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td>3D</td><td>24/17</td><td>4.3 - 6.3</td><td>7/9/12/15</td><td>21</td><td>32</td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>89</td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>122</td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>198</td><td></td></tr><tr><td>10</td><td>4D</td><td>20/9</td><td>10.0 - 11.7</td><td>29/25/24/50(2")</td><td>49</td><td>74</td><td>HW</td><td>193.2</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>RC</td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>190.6</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>15</td><td>R1</td><td>33.6/30</td><td>14.0 - 16.8</td><td>RQD = 21%</td><td></td><td></td><td>NQ CORE</td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td>R2</td><td>14.4/14</td><td>16.8 - 18.0</td><td>RQD = 0%</td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td>R3</td><td>9.6/10</td><td>18.0 - 18.8</td><td>RQD = 0%</td><td></td><td></td><td></td><td></td></tr><tr><td></td><td>R4</td><td>15.6/14</td><td>18.8 - 20.1</td><td>RQD = 0%</td><td></td><td></td><td></td><td></td></tr><tr><td>20</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td>R5</td><td>16.8/17</td><td>20.1 - 21.5</td><td>RQD = 35%</td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td>R6</td><td>60/53</td><td>21.5 - 26.5</td><td>RQD = 38%</td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>25</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></tbody></table>												Sample Information								Elevation (ft.)	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Operator: M. Nadeau				Datum: NAVD 88				Sampler: Split-Spoon 1.375 in. ID					
Logged By: N. Klausmeyer				Rig Type: Diedrich D50 Track (Rig #377)				Hammer Wt./Fall: SS-140#/30; HW-140#/#					
Date Start/Finish: 07-25-18/07-25-18				Drilling Method: SSA/HW Drive				Core Barrel: NQ-2.0 in. ID					
Boring Location: Sta. 214+73.7, 36.6 RT				Casing ID/OD: HW-4.0 in. ID				Water Level*: 5.9 ft					
Hammer Efficiency Factor: 0.907				Hammer Type: Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>									
Definitions: D = Split Spoon Sample MD = Unsuccessful Split Spoon Sample Attempt U = Thin Wall Tube Sample MU = Unsuccessful Thin Wall Tube Sample Attempt V = Field Vane Shear Test, PP = Pocket Penetrometer MV = Unsuccessful Field Vane Shear Test Attempt				R = Rock Core Sample SSA = Solid Stem Auger HSA = Hollow Stem Auger RC = Roller Cone WOH = Weight of 140 lb. Hammer WOR/C = Weight of Rods or Casing WO1P = Weight of One Person				Su = Peak/Remolded Field Vane Undrained Shear Strength (psf) Su(lab) = Lab Vane Undrained Shear Strength (psf) qp = Unconfined Compressive Strength (ksf) N-uncorrected = Raw Field SPT N-value Hammer Efficiency Factor = Rig Specific Annual Calibration Value N60 = SPT N-uncorrected Corrected for Hammer Efficiency N60 = (Hammer Efficiency Factor/60%)*N-uncorrected					
								Ty = Pocket Torvane Shear Strength (psf) WC = Water Content, percent LL = Liquid Limit PL = Plastic Limit PI = Plasticity Index G = Grain Size Analysis C = Consolidation Test					
Sample Information													
Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N60	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.		
25										Recovery=100% -BREWER FORMATION- R3 Core Times (min:sec): 18.0-18.8' (1:25) R4: Similar to R3, except set of steep, planar, parallel joints observed at approximately 19.8 to 20.1 ft. Highly fractured zone from approximately 18.8 to 19.3 ft. Recovery=88% -BREWER FORMATION- R4 Core Times (min:sec): 18.8-19.8' (2:26); 19.8-20.1' (0:33) R5: Similar to R3, except highly fractured, slight to moderately weathered zones from approximately 20.1 to 20.4 ft and 21.1 to 21.5 ft. Solid core stem from approximately 20.4 to 21.1 ft, joints moderately to steeply dipping, very close to close, tight to open, pitting observed. Rock Quality=Poor Recovery=100% -BREWER FORMATION- R5 Core Times (min:sec): 20.1-21.1' (1:37); 21.1-21.5' (2:27) R6: Grey, aphanitic SLATE. Moderately hard to hard, fresh to slightly weathered. Primary joints dipping at moderate to steep angles, secondary low angle joints, close to moderately close, planar, tight to open, frequent calcite veins (0.06 to 0.25-in. thick). Highly fractured, moderately to highly weathered zones from approximately 21.5 to 22.5 ft and 23.5 to 24.0 ft. Rock Quality=Poor Recovery=88% -BREWER FORMATION- R6 Core Times (min:sec): 21.5-22.5' (1:50); 22.5-23.5' (1:05); 23.5-24.5' (1:27); 24.5-25.5' (1:22); 25.5-26.5' (2:39) R7: Similar to R6, except majority of core stem is highly fractured, moderately weathered, pitting observed, discernible joints are steeply dipping, close, planar, open. Rock Quality=Very Poor Recovery=79% -BREWER FORMATION- R7 Core Times (min:sec): 26.5-27.5' (2:30); 27.5-28.4' (3:05)	qp=6,527 psi (24.3-25.6')		
	R7	22.8/18	26.5 - 28.4	RQD = 22%				174.8					
30													
35													
40													
45													
50													
Remarks: 1. Observaton well installed in completed borehole. See observation well installation and groundwater monitoring reports for details.													
Stratification lines represent approximate boundaries between soil types; transitions may be gradual.										Page 2 of 2			
* 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.										Boring No.: BB-ECR-102			

Maine Department of Transportation						Project: Route 9/I-395 Connector		Boring No.: BB-ECR-201																																																																																																																																																																																																																																																																
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Driller: New England Boring Contractors			Elevation (ft.) 200.5			Auger ID/OD: HSA-3.25 in. ID																																																																																																																																																																																																																																																																		
Operator: M. Grass			Datum: NAVD 88			Sampler: Split Spoon 1.375 in. ID																																																																																																																																																																																																																																																																		
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Date Start/Finish: 12-11-2020/12-14-2020			Drilling Method: SSA/HW Drive			Core Barrel: NQ-2.0 in. ID																																																																																																																																																																																																																																																																		
Boring Location: Sta. 214+99.6, 76.0 LT			Casing ID/OD: HW-4.0 in. ID			Water Level*: 11.5 ft																																																																																																																																																																																																																																																																		
Hammer Efficiency Factor: 0.852			Hammer Type: Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>																																																																																																																																																																																																																																																																					
<div>Definitions: D = Split Spoon Sample MD = Unsuccessful Split Spoon Sample Attempt U = Thin Wall Tube Sample MU = Unsuccessful Thin Wall Tube Sample Attempt V = Field Vane Shear Test, PP = Pocket Penetrometer MV = Unsuccessful Field Vane Shear Test Attempt</div> <div>R = Rock Core Sample SSA = Solid Stem Auger HSA = Hollow Stem Auger RC = Roller Cone WOH = Weight of 140lb. Hammer WOR/C = Weight of Rods or Casing WO1P = Weight of One Person</div> <div>S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf) S_{u(lab)} = Lab Vane Undrained Shear Strength (psf) q_p = Unconfined Compressive Strength (ksf) N-uncorrected = Raw Field SPT N-value Hammer Efficiency Factor = Rig Specific Annual Calibration Value N₆₀ = SPT N-uncorrected Corrected for Hammer Efficiency N₆₀ = (Hammer Efficiency Factor/60%) * N-uncorrected</div> <div>T_v = Pocket Torvane Shear Strength (psf) WC = Water Content, percent LL = Liquid Limit PL = Plastic Limit PI = Plasticity Index G = Grain Size Analysis C = Consolidation Test</div>																																																																																																																																																																																																																																																																								
<table><tr><th rowspan="2">Depth (ft.)</th><th colspan="7">Sample Information</th><th rowspan="2">Elevation (ft.)</th><th rowspan="2">Graphic Log</th><th rowspan="2">Visual Description and Remarks</th><th rowspan="2">Laboratory Testing Results/AASHTO and Unified Class.</th></tr><tr><th>Sample No.</th><th>Pen./Rec. (in.)</th><th>Sample Depth (ft.)</th><th>Blows/(6 in.) Shear Strength (psf) or RQD (%)</th><th>N-uncorrected</th><th>N₆₀</th><th>Casing Blows</th></tr><tr><td>0</td><td>1D</td><td>24/2</td><td>0.0 - 2.0</td><td>WOH/WOH/WOH/2</td><td></td><td></td><td>SSA</td><td>200.3</td><td rowspan="19"></td><td>Brown, moist, ver soft, SILT, organics -TOPSOIL-(OL)</td><td rowspan="4">0.2</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>5</td><td>2D</td><td>24/22</td><td>5.0 - 7.0</td><td>8/11/16/19</td><td>27</td><td>38</td><td>30</td><td></td><td></td><td>Brown, wet, hard, SILT, little clay, little fine sand, little gravel, moderately bonded -GLACIAL TILL-(ML)</td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>58</td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>79</td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>75</td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>127</td><td></td><td></td><td></td><td></td></tr><tr><td>10</td><td>3D</td><td>8/8</td><td>10.0 - 10.7</td><td>17/50(2")</td><td></td><td></td><td>WOC</td><td></td><td></td><td>Brown, wet, hard, SILT, some fine to medium sand, little clay, little gravel, moderately bonded -GLACIAL TILL-(ML)</td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>WOC</td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>WOC</td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>7</td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>11</td><td></td><td></td><td></td><td></td></tr><tr><td>15</td><td>4D</td><td>5/3</td><td>15.0 - 15.4</td><td>50(5")</td><td></td><td></td><td>20</td><td>185.5</td><td></td><td>Grey-brown, wet, very dense, GRAVEL, some fine to coarse sand, some silt, moderately bonded -GLACIAL TILL-(GP)</td><td>15.0</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>32</td><td>184.8</td><td></td><td></td><td>15.7</td></tr><tr><td></td><td>R1</td><td>64/61</td><td>17.0 - 22.3</td><td>RQD = 100%</td><td></td><td></td><td>NQ CORE</td><td></td><td></td><td>Top of Bedrock El. 184.8 R1: Grey, aphanitic, SLATE, moderately hard to hard, fresh to slightly weathered. Joints dipping at steep angles, close to moderately close, tight to open, rough, planar, iron oxide staining on joint surfaces. Rock Quality=Excellent Recovery=95% -BREWER FORMATION- R1 Core Times (min:sec): 17.0-18.0' (3:13); 18.0-19.0' (2:52); 19.0-20.0' (2:30); 20.0-21.0' (2:26); 21.0-22.3 (2:41)</td><td></td></tr><tr><td>20</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>R2: Grey, aphanitic, SLATE, hard, fresh. Joints dipping at low and steep angles, close to moderately close, tight to open, rough, planar, slight iron oxide staining on joint surfaces, calcite veins. Rock Quality=Excellent Recovery=102%</td><td></td></tr><tr><td></td><td>R2</td><td>60/61</td><td>22.3 - 27.3</td><td>RQD = 100%</td><td></td><td></td><td></td><td></td><td></td><td>Note: R2 recovery and ROD includes portion of R1 that was not</td><td></td></tr><tr><td>25</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>									Depth (ft.)	Sample Information							Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/AASHTO and Unified Class.	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows/(6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N ₆₀	Casing Blows	0	1D	24/2	0.0 - 2.0	WOH/WOH/WOH/2			SSA	200.3		Brown, moist, ver soft, SILT, organics -TOPSOIL-(OL)	0.2																																		5	2D	24/22	5.0 - 7.0	8/11/16/19	27	38	30			Brown, wet, hard, SILT, little clay, little fine sand, little gravel, moderately bonded -GLACIAL TILL-(ML)									58												79												75												127					10	3D	8/8	10.0 - 10.7	17/50(2")			WOC			Brown, wet, hard, SILT, some fine to medium sand, little clay, little gravel, moderately bonded -GLACIAL TILL-(ML)									WOC												WOC												7												11					15	4D	5/3	15.0 - 15.4	50(5")			20	185.5		Grey-brown, wet, very dense, GRAVEL, some fine to coarse sand, some silt, moderately bonded -GLACIAL TILL-(GP)	15.0								32	184.8			15.7		R1	64/61	17.0 - 22.3	RQD = 100%			NQ CORE			Top of Bedrock El. 184.8 R1: Grey, aphanitic, SLATE, moderately hard to hard, fresh to slightly weathered. Joints dipping at steep angles, close to moderately close, tight to open, rough, planar, iron oxide staining on joint surfaces. Rock Quality=Excellent Recovery=95% -BREWER FORMATION- R1 Core Times (min:sec): 17.0-18.0' (3:13); 18.0-19.0' (2:52); 19.0-20.0' (2:30); 20.0-21.0' (2:26); 21.0-22.3 (2:41)		20										R2: Grey, aphanitic, SLATE, hard, fresh. Joints dipping at low and steep angles, close to moderately close, tight to open, rough, planar, slight iron oxide staining on joint surfaces, calcite veins. Rock Quality=Excellent Recovery=102%			R2	60/61	22.3 - 27.3	RQD = 100%						Note: R2 recovery and ROD includes portion of R1 that was not		25											
Depth (ft.)	Sample Information							Elevation (ft.)		Graphic Log	Visual Description and Remarks	Laboratory Testing Results/AASHTO and Unified Class.																																																																																																																																																																																																																																																												
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	R1	64/61	17.0 - 22.3	RQD = 100%			NQ CORE				Top of Bedrock El. 184.8 R1: Grey, aphanitic, SLATE, moderately hard to hard, fresh to slightly weathered. Joints dipping at steep angles, close to moderately close, tight to open, rough, planar, iron oxide staining on joint surfaces. Rock Quality=Excellent Recovery=95% -BREWER FORMATION- R1 Core Times (min:sec): 17.0-18.0' (3:13); 18.0-19.0' (2:52); 19.0-20.0' (2:30); 20.0-21.0' (2:26); 21.0-22.3 (2:41)																																																																																																																																																																																																																																																													
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Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS				Project: Route 9/I-395 Connector Location: Brewer and Eddington, Maine		Boring No.: BB-ECR-201 WIN: 18915.00			
Driller: New England Boring Contractors			Elevation (ft.): 200.5		Auger ID/OD: HSA-3.25 in. ID				
Operator: M. Grass			Datum: NAVD 88		Sampler: Split Spoon 1.375 in. ID				
Logged By: J. Fletcher			Rig Type: Mobile B-53 Track		Hammer Wt./Fall: SS-140#/30; HW-300#				
Date Start/Finish: 12-11-2020/12-14-2020			Drilling Method: SSA/HW Drive		Core Barrel: NQ-2.0 in. ID				
Boring Location: Sta. 214+99.6, 76.0 LT			Casing ID/OD: HW-4.0 in. ID		Water Level*: 11.5 ft				
Hammer Efficiency Factor: 0.852			Hammer Type: Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>						
Definitions: D = Split Spoon Sample MD = Unsuccessful Split Spoon Sample Attempt U = Thin Wall Tube Sample MU = Unsuccessful Thin Wall Tube Sample Attempt V = Field Vane Shear Test, PP = Pocket Penetrometer MV = Unsuccessful Field Vane Shear Test Attempt									
R = Rock Core Sample SSA = Solid Stem Auger HSA = Hollow Stem Auger RC = Roller Cone WOH = Weight of 140 lb. Hammer WOR/C = Weight of Rods or Casing WO1P = Weight of One Person									
S _u = Peak/Remolded Field Vane Undrained Shear Strength (psf) S _{u(lab)} = Lab Vane Undrained Shear Strength (psf) q _p = Unconfined Compressive Strength (ksf) N-uncorrected = Raw Field SPT N-value Hammer Efficiency Factor = Rig Specific Annual Calibration Value N ₆₀ = SPT N-uncorrected Corrected for Hammer Efficiency N ₆₀ = (Hammer Efficiency Factor/60%)*N-uncorrected									
T _v = Pocket Torvane 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							Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (1/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N ₆₀	Casing Blows		
25									initially recovered. -BREWER FORMATION- R2 Core Times (min:sec): 22.3-23.3' (1:01); 23.3-24.3' (2:04); 24.3-25.3' (1:38); 25.3-26.3' (1:39); 26.3-27.3' (1:41) R3: Grey, aphanitic, SLATE, hard, fresh to slightly weathered. Joints dipping at steep angles, iron oxide staining on joint surfaces, calcite veins. Rock Quality=Good Recovery=95% -BREWER FORMATION- R3 Core Times (min:sec): 27.3-28.3' (2:13); 28.3-29.3' (1:44); 29.3-30.3' (1:34); 30.3-31.3' (2:07); 31.3-32.2' (2:20) R4: Grey, aphanitic, SLATE, moderately hard to hard, slightly to moderately weathered. Joints dipping at low and steep angles, very close to close, open, iron oxide staining on joint surfaces, calcite veins. Highly fractured zone from approximately 35.7 to 37.2 ft. Rock Quality=Poor Recovery=87% -BREWER FORMATION- R4 Core Times (min:sec): 32.2-33.2' (3:02); 33.2-34.2' (2:25); 34.2-35.2' (2:30); 35.2-36.2' (2:39); 36.2-37.2' (2:20) R5: Grey, aphanitic, SILTSTONE, hard, slightly weathered. Joints low to steeply dipping, very close to close, open, iron oxide staining on joint surfaces, calcite veins. Rock Quality=Fair Recovery=69% -BREWER FORMATION- R5 Core Times (min:sec): 37.2-38.2' (2:01); 38.2-39.2' (1:39); 39.2-40.1' (1:42) R6: Grey, aphanitic, SILTSTONE, hard, slightly to moderately weathered. Joints moderately to steeply dipping, very close to close, open, iron oxide staining on joint surfaces. Rock Quality=Excellent Recovery=150% Note: R6 recovery and RQD includes portion of R5 that was not initially recovered. -BREWER FORMATION- R6 Core Times (min:sec): 40.1-41.1' (3:23); 41.1-42.1' (3:06) 42.1' Bottom of Exploration at 42.1 feet below ground surface.
	R3	58.8/56	27.3 - 32.2	RQD = 76%					
30									
	R4	60/52	32.2 - 37.2	RQD = 43%					
35									
	R5	34.8/24	37.2 - 40.1	RQD = 52%					
40									
	R6	24/36	40.1 - 42.1	RQD = 96%					
45									
50									

Remarks:

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.


Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS				Project: Route 9/I-395 Connector Location: Brewer and Eddington, Maine		Boring No.: BB-ECR-202 WIN: 18915.00					
Driller: New England Boring Contractors		Elevation (ft.): 201.7		Auger ID/OD: HSA-3.25 in. ID							
Operator: J. Layfield		Datum: NAVD 88		Sampler: Split Spoon 1.375 in. ID							
Logged By: C. Toscano		Rig Type: Mobile B-53 Truck		Hammer Wt./Fall: SS-140#/30; HW-300#/16							
Date Start/Finish: 11-17-2020/11-17-2020		Drilling Method: SSA/HW Drive		Core Barrel: NQ-2.0 in. ID							
Boring Location: Sta. 215+36.5, 50.7 LT		Casing ID/OD: HW-4.0 in. ID		Water Level*: NE							
Hammer Efficiency Factor: 0.867		Hammer Type: Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>									
<small> Definitions: D = Split Spoon Sample MD = Unsuccessful Split Spoon Sample Attempt U = Thin Wall Tube Sample MU = Unsuccessful Thin Wall Tube Sample Attempt V = Field Vane Shear Test, PP = Pocket Penetrometer MV = Unsuccessful Field Vane Shear Test Attempt R = Rock Core Sample SSA = Solid Stem Auger HSA = Hollow Stem Auger RC = Roller Cone WOH = Weight of 140lb. Hammer WOR/C = Weight of Rods or Casing WO1P = Weight of One Person S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf) S_{u(lab)} = Lab Vane Undrained Shear Strength (psf) q_p = Unconfined Compressive Strength (ksf) N-uncorrected = Raw Field SPT N-value Hammer Efficiency Factor = Rig Specific Annual Calibration Value N₆₀ = SPT N-uncorrected Corrected for Hammer Efficiency N₆₀ = (Hammer Efficiency Factor/60%)*N-uncorrected T_v = Pocket Torvane Shear Strength (psf) WC = Water Content, percent LL = Liquid Limit PL = Plastic Limit PI = Plasticity Index G = Grain Size Analysis C = Consolidation Test </small>											
Sample Information											
Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N ₆₀	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/AASHTO and Unified Class.
0	1D	24/10	0.8 - 2.8	12/14/16/25	30	43	3	200.9		-BITUMINOUS CONCRETE-	
							4	198.9		Brown, moist, dense, fine to medium SAND, little fine gravel, trace coarse sand, trace silt	
							6			-FILL-(SP) (ROADWAY BASE/SUBBASE FILL)	
							4				
							17				
5	2D	24/18	5.0 - 7.0	7/10/20/14	30	43	HW			Olive-brown, moist, hard, SILT, little fine sand, trace gravel	
										-GLACIAL TILL-(ML)	
10	3D	24/20	10.0 - 12.0	12/20/24/20	44	64				Olive-brown, moist, hard, SILT, some fine sand, little medium to coarse sand, trace gravel, well bonded	
										-GLACIAL TILL-(ML)	
										Discernible vertical bedding 0.5 to 1.5-in. thick, platy cleavage.	
										Note: Drill action indicated strata change at 13.5 ft.	
								188.2		Top of Bedrock El. 188.2	
15	R1	60/45	15.0 - 20.0	RQD = 0%			NQ CORE			Note: Washed ahead in fractured rock from 13.5 to 15.0 ft. Drove NW (3-in.) casing and washed out borehole to 15.0 ft. R1: Grey, aphanitic, SLATE, hard to moderately hard, slightly to moderately weathered. Joints dipping steep to vertical, very close to close, planar, smooth to rough, open. Oxidized joint surfaces, occasional silt and calcite coatings, extremely fractured. Rock Quality=Very Poor Recovery=75% -BREWER FORMATION- R1 Core Times (min:sec): 15.0-16.0' (3:15); 16.0-17.0' (2:26); 17.0-18.0' (2:10); 18.0-19.0' (1:46); 19.0-20.0' (1:22) Note: Core stem reduced to gravel-size pieces from approximately 17.5 ft to 20.0 ft. Little water return from 17.0 to 20.0 ft. R2: Similar to R1, except moderately hard. Note: Very little to no water return. Rock Quality=Very Poor Recovery=66% -BREWER FORMATION- R2 Core Times (min:sec): 20.0-21.0' (1:36); 21.0-22.0' (1:29); 22.0-23.4' (1:51) R3: Similar to R2, except joints planar to stepped, tight to open. Rock Quality=Poor	qp=7,193 psi (23.6'-24.0')
20	R2	40.8/27	20.0 - 23.4	RQD = 0%							
	R3	26.4/26	23.4 - 25.6	RQD = 38%							
25											
Remarks: 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.										Page 1 of 2 Boring No.: BB-ECR-202	

<div>Maine Department of Transportation</div> <div>Soil/Rock Exploration Log</div> <div>US CUSTOMARY UNITS</div>						Project: Route 9/I-395 Connector			Boring No.: BB-ECR-202																																																																																																																																																																						
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Date Start/Finish: 11-17-2020/11-17-2020				Drilling Method: SSA/HW Drive				Core Barrel: NQ-2.0 in. ID																																																																																																																																																																							
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<table><tr><th rowspan="2">Depth (ft.)</th><th colspan="8">Sample Information</th><th rowspan="2">Graphic Log</th><th rowspan="2">Laboratory Testing Results/AASHTO and Unified Class.</th></tr><tr><th>Sample No.</th><th>Pen./Rec. (in.)</th><th>Sample Depth (ft.)</th><th>Blows (/6 in.) Shear Strength (psf) or RQD (%)</th><th>N-uncorrected</th><th>N₆₀</th><th>Casing Blows</th><th>Elevation (ft.)</th></tr><tr><td rowspan="3">25</td><td>R4</td><td>28.8/26</td><td>25.6 - 28.0</td><td>RQD = 14%</td><td></td><td></td><td>NQ CORE</td><td rowspan="10">171.7</td><td rowspan="10"></td><td rowspan="10">Recovery=98% -BREWER FORMATION- R3 Core Times (min:sec): 23.4-24.4' (1:42); 24.4-25.5' (1:58); 25.5-25.6' (1:01) R4: Similar to R3, except aphanitic to fine-grained, grading to METASANDSTONE at approximately 26.0 ft. Rock Quality=Very Poor Recovery=90% -BREWER FORMATION- R4 Core Times (min:sec): 25.6-26.0' (0:30); 26.0-27.0' (1:15); 27.0-28.0' (1:29) R5: Grey-brown, aphanitic to fine-grained, METASTANDSTONE, moderately hard, slightly weathered. Joints dipping at steep to vertical angles, very close to close, planar, smooth to rough, tight to open. Secondary low angle to moderately dipping joints, oxidized joint surfaces. Highly fractured zone from approximately 29.7 to 30.0 ft. Rock Quality=Very Poor Recovery=100% -BREWER FORMATION- R5 Core Times (min:sec): 28.0-29.0' (1:41); 29.0-30.0' (2:01) Bottom of Exploration at 30.0 feet below ground surface.</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>R5</td><td>24/24</td><td>28.0 - 30.0</td><td>RQD = 0%</td><td></td><td></td><td></td></tr><tr><td rowspan="3">30</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td rowspan="10">30.0</td><td rowspan="10"></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td rowspan="3">35</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td rowspan="10"></td><td rowspan="10"></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td rowspan="3">40</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td rowspan="10"></td><td rowspan="10"></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td rowspan="3">45</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td rowspan="10"></td><td rowspan="10"></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td rowspan="3">50</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td rowspan="10"></td><td rowspan="10"></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>												Depth (ft.)	Sample Information								Graphic Log	Laboratory Testing Results/AASHTO and Unified Class.	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N ₆₀	Casing Blows	Elevation (ft.)	25	R4	28.8/26	25.6 - 28.0	RQD = 14%			NQ CORE	171.7		Recovery=98% -BREWER FORMATION- R3 Core Times (min:sec): 23.4-24.4' (1:42); 24.4-25.5' (1:58); 25.5-25.6' (1:01) R4: Similar to R3, except aphanitic to fine-grained, grading to METASANDSTONE at approximately 26.0 ft. Rock Quality=Very Poor Recovery=90% -BREWER FORMATION- R4 Core Times (min:sec): 25.6-26.0' (0:30); 26.0-27.0' (1:15); 27.0-28.0' (1:29) R5: Grey-brown, aphanitic to fine-grained, METASTANDSTONE, moderately hard, slightly weathered. Joints dipping at steep to vertical angles, very close to close, planar, smooth to rough, tight to open. Secondary low angle to moderately dipping joints, oxidized joint surfaces. Highly fractured zone from approximately 29.7 to 30.0 ft. Rock Quality=Very Poor Recovery=100% -BREWER FORMATION- R5 Core Times (min:sec): 28.0-29.0' (1:41); 29.0-30.0' (2:01) Bottom of Exploration at 30.0 feet below ground surface.								R5	24/24	28.0 - 30.0	RQD = 0%				30								30.0																35																								40																								45																								50																							
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Boring No.: BB-ECR-202																																																																																																																																																																															

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS				Project: Route 9/I-395 Connector Location: Brewer and Eddington, Maine		Boring No.: BB-ECR-203A WIN: 18915.00				
Driller: New England Boring Contractors		Elevation (ft.): 199.1		Auger ID/OD: --						
Operator: M. Porter		Datum: NAVD 88		Sampler: Split Spoon 1.375 in. ID						
Logged By: J. Fletcher		Rig Type: Mobile B-53 Track		Hammer Wt./Fall: SS-140#/30; HW-300#/16						
Date Start/Finish: 2-22-2021/2-24-2021		Drilling Method: SSA/HW Drive		Core Barrel: NQ-2.0 in. ID						
Boring Location: Sta. 215+95.6, 51.9 LT		Casing ID/OD: HW-4.0 in. ID		Water Level*: 15.2 ft						
Hammer Efficiency Factor: 0.852		Hammer Type: Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>								
<div style="display: flex; justify-content: space-between; font-size: 0.8em;"> <div> Definitions: D = Split Spoon Sample MD = Unsuccessful Split Spoon Sample Attempt U = Thin Wall Tube Sample MU = Unsuccessful Thin Wall Tube Sample Attempt V = Field Vane Shear Test, PP = Pocket Penetrometer MV = Unsuccessful Field Vane Shear Test Attempt </div> <div> R = Rock Core Sample SSA = Solid Stem Auger HSA = Hollow Stem Auger RC = Roller Cone WOH = Weight of 140lb. Hammer WOR/C = Weight of Rods or Casing WO1P = Weight of One Person </div> <div> S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf) S_{u(lab)} = Lab Vane Undrained Shear Strength (psf) q_p = Unconfined Compressive Strength (ksf) N = uncorrected = Raw Field SPT N-value Hammer Efficiency Factor = Rig Specific Annual Calibration Value N₆₀ = SPT N-uncorrected Corrected for Hammer Efficiency N₆₀ = (Hammer Efficiency Factor/60%)*N-uncorrected </div> <div> T_v = Pocket Torvane Shear Strength (psf) WC = Water Content, percent LL = Liquid Limit PL = Plastic Limit PI = Plasticity Index G = Grain Size Analysis C = Consolidation Test </div> </div>										
Depth (ft.)	Sample Information							Graphic Log	Visual Description and Remarks	Laboratory Testing Results/AASHTO and Unified Class.
	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N ₆₀	Casing Blows			
0	1D/A	24/6	0.0 - 2.0	8/5/4/3	9	13	SSA	198.8	Dark brown, moist, stiff, SILT, trace gravel, trace fine sand, trace clay, organics -TOPSOIL-(OL)	qp=10,859 psi (20.9'-21.3')
									Grey-brown, moist, loose, medium to fine SAND, some silt, little gravel, loosely bonded -GLACIAL TILL-(SM)	
5	2D	24/24	5.0 - 7.0	10/20/21/27	41	58	217	194.1	Grey, moist, hard, SILT, little gravel, little medium to fine sand, moderately bonded -GLACIAL TILL-(ML)	
							122			
							133			
							155			
							173			
10	3D	24/24	10.0 - 12.0	18/23/25/31	48	68	33		Grey, wet, hard, SILT, little gravel, little fine sand, moderately bonded -GLACIAL TILL-(ML)	
							36			
							31		Note: Washed ahead of casing from 10.0 to 15.0 ft.	
							108			
							RC	185.6	Top of Bedrock El. 185.6	
15	R1	30/30	15.4 - 17.9	RQD = 0%			NQ CORE		R1: Grey, aphanitic, SILTSTONE, hard to moderately hard, slightly to moderately weathered. Joints vertical, very close, planar to stepped, smooth to rough, tight to open. Highly oxidized and fractured throughout. Rock Quality=Very Poor Recovery=100% -BREWER FORMATION- R1 Core Times (min:sec): 15.4-16.4' (2:11); 16.4-17.4' (2:15); 17.4-17.9' (2:11) R2: Similar to R1, except discernible steeply dipping and vertical joints. Rock Quality=Very Poor Recovery=20% -BREWER FORMATION- R2 Core Times (min:sec): 17.9-18.4' (0:56); 18.4-19.4' (3:07); 19.4-20.4' (2:41) Note: From 17.9 to 20.4 ft, lost 45 gallons of water. R3: Similar to R1, except joints steep to vertical, very close to moderately close, few calcite veins (0.25-in. thick). Highly fractured, oxidized zone from approximately 21.7 to 22.7 ft.	
	R2	30/6	17.9 - 20.4	RQD = 0%						
20	R3	37.2/38	20.4 - 23.5	RQD = 41%						
	R4	24/24	23.5 - 25.5	RQD = 38%						
25										
Remarks:										
Stratification lines represent approximate boundaries between soil types; transitions may be gradual.									Page 1 of 2	
* 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.									Boring No.: BB-ECR-203A	

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS				Project: Route 9/I-395 Connector Location: Brewer and Eddington, Maine				Boring No.: BB-ECR-203A WIN: 18915.00							
Driller: New England Boring Contractors				Elevation (ft.): 199.1				Auger ID/OD: --							
Operator: M. Porter				Datum: NAVD 88				Sampler: Split Spoon 1.375 in. ID							
Logged By: J. Fletcher				Rig Type: Mobile B-53 Track				Hammer Wt./Fall: SS-140#/30; HW-300#							
Date Start/Finish: 2-22-2021/2-24-2021				Drilling Method: SSA/HW Drive				Core Barrel: NQ-2.0 in. ID							
Boring Location: Sta. 215+95.6, 51.9 LT				Casing ID/OD: HW-4.0 in. ID				Water Level*: 15.2 ft							
Hammer Efficiency Factor: 0.852				Hammer Type: Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>											
Definitions: D = Split Spoon Sample MD = Unsuccessful Split Spoon Sample Attempt U = Thin Wall Tube Sample MU = Unsuccessful Thin Wall Tube Sample Attempt V = Field Vane Shear Test, PP = Pocket Penetrometer MV = Unsuccessful Field Vane Shear Test Attempt				R = Rock Core Sample SSA = Solid Stem Auger HSA = Hollow Stem Auger RC = Roller Cone WOH = Weight of 140 lb. Hammer WOR/C = Weight of Rods or Casing WO1P = Weight of One Person				Su = Peak/Remolded Field Vane Undrained Shear Strength (psf) Su(lab) = Lab Vane Undrained Shear Strength (psf) qp = Unconfined Compressive Strength (ksf) N-uncorrected = Raw Field SPT N-value Hammer Efficiency Factor = Rig Specific Annual Calibration Value N60 = SPT N-uncorrected Corrected for Hammer Efficiency N60 = (Hammer Efficiency Factor/60%)*N-uncorrected				Tv = Pocket Torvane Shear Strength (psf) WC = Water Content, percent LL = Liquid Limit PL = Plastic Limit PI = Plasticity Index G = Grain Size Analysis C = Consolidation Test			
Sample Information												Visual Description and Remarks		Laboratory Testing Results/AASHTO and Unified Class.	
Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N60	Casing Blows	Elevation (ft.)	Graphic Log						
25	R5	60/58	25.5 - 30.5	RQD = 60%			NO CORE				Rock Quality=Poor Recovery=103% -BREWER FORMATION- R3 Core Times (min:sec): 20.4-21.4' (3:11); 21.4-22.4' (3:11); 22.4-23.4' (2:54); 23.4-23.5' (2:39) R4: Grey, aphanitic, SILTSTONE, hard, slightly to moderately weathered. Joints steep to vertical, very close to close, highly oxidized joints, planar, smooth to rough, open. Highly fractured zone from approximately 23.5 to 24.7 ft. Calcite infilling on some joint surfaces (approximately 0.25 to 0.5-in. thick), pits and vugs within calcite. Rock Quality=Poor Recovery=100% -BREWER FORMATION- R4 Core Times (min:sec): 23.5-24.5' (2:12); 24.5-25.5' (2:10) R5: Similar to R4, except joints moderate to steeply dipping (two sets steep perpendicular joints). Frequent calcite veins (up to 0.5-in. thick), occasional pitting. Highly fractured zone from approximately 27.9 to 28.4 ft. Rock Quality=Fair Recovery=97% -BREWER FORMATION- R5 Core Times (min:sec): 25.5-26.5' (2:35); 26.5-27.5' (3:14); 27.5-28.5' (2:34); 28.5-29.5' (2:12); 29.5-30.5' (2:20) R6: Similar to R4, except joints moderate to vertical, very close to moderately close, tight to open. Highly oxidized, fractured zone from approximately 30.5 to 32.2 ft. Frequent calcite veins (0.0625 to 0.25-in. thick). Rock Quality=Fair Recovery=85% -BREWER FORMATION- R6 Core Times (min:sec): 30.5-31.5' (2:28); 31.5-32.5' (3:24); 32.5-33.5' (2:21); 33.5-34.6' (3:34) R7: Grey, aphanitic, SILTSTONE, hard, fresh to slightly weathered. Joints low angle and steeply dipping, close, planar to undulating, smooth to rough, tight to open. Frequent calcite veins (0.0625 to 0.25 in. thickness), occasional oxidized joint surfaces. Rock Quality=Fair Recovery=68% -BREWER FORMATION- R7 Core Times (min:sec): 34.6-35.6' (2:33); 35.6-36.6' (2:34); 36.6-37.6' (2:22); 37.6-38.6' (2:26); 38.6-39.6' (2:42) R8: Similar to R7, except joints steeply dipping, moderately close to close, rough, open. Joints fresh. Rock Quality=Excellent Recovery=188% Note: R8 recovery and RQD includes portion of R7 not initially recovered. -BREWER FORMATION- R8 Core Times (min:sec): 39.6-40.4' (2:27) 40.4 Bottom of Exploration at 40.4 feet below ground surface.				
30	R6	49.2/42	30.5 - 34.6	RQD = 53%											
35	R7	60/41	34.6 - 39.6	RQD = 52%											
40	R8	10/18	39.6 - 40.4	RQD = 188%											
45															
50															
Remarks:															
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.															
										Page 2 of 2					
Boring No.: BB-ECR-203A															

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS				Project: Route 9/I-395 Connector		Boring No.: BB-ECR-204	
				Location: Brewer and Eddington, Maine		WIN: 18915.00	
Driller: New England Boring Contractors		Elevation (ft.): 202.5		Auger ID/OD: HSA-3.25 in. ID			
Operator: J. Layfield		Datum: NAVD 88		Sampler: Split Spoon 1.375 in. ID			
Logged By: C. Toscano		Rig Type: Mobile B-53 Truck		Hammer Wt./Fall: SS-140#/30; HW-300#/16			
Date Start/Finish: 11-13-2020/11-13-2020		Drilling Method: SSA/HW Drive		Core Barrel: NQ-2.0 in. ID			
Boring Location: Sta. 214+04.2, 52.4 RT		Casing ID/OD: HW-4.0 in. ID		Water Level*: NE			
Hammer Efficiency Factor: 0.867		Hammer Type: Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>					
<small> Definitions: D = Split Spoon Sample MD = Unsuccessful Split Spoon Sample Attempt U = Thin Wall Tube Sample MU = Unsuccessful Thin Wall Tube Sample Attempt V = Field Vane Shear Test, PP = Pocket Penetrometer MV = Unsuccessful Field Vane Shear Test Attempt R = Rock Core Sample SSA = Solid Stem Auger HSA = Hollow Stem Auger RC = Roller Cone WOH = Weight of 140lb. Hammer WOR/C = Weight of Rods or Casing WO1P = Weight of One Person S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf) S_{u(lab)} = Lab Vane Undrained Shear Strength (psf) q_p = Unconfined Compressive Strength (ksf) N-uncorrected = Raw Field SPT N-value Hammer Efficiency Factor = Rig Specific Annual Calibration Value N₆₀ = SPT N-uncorrected Corrected for Hammer Efficiency N₆₀ = (Hammer Efficiency Factor/60%)*N-uncorrected T_v = Pocket Torvane Shear Strength (psf) WC = Water Content, percent LL = Liquid Limit PL = Plastic Limit PI = Plasticity Index G = Grain Size Analysis C = Consolidation Test </small>							
Sample Information							
Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N ₆₀	Casing Blows
0	1D	24/8	0.0 - 2.0	1/1/2/2	3	4	SSA
5	2D	6/6	5.0 - 5.5	36/50(0.0")			146 RC
	R1	60/60	7.0 - 12.0	RQD = 17%			NQ CORE
10							
15							
20							
25							
				Elevation (ft.)			
				Graphic Log			
				Visual Description and Remarks			
				Laboratory Testing Results/ AASHTO and Unified Class.			
<div style="display: flex; justify-content: space-between;"> <div> <p>-TOPSOIL/ROOTMAT-</p> <p>Yellow-brown, moist, soft, SILT, little fine sand, trace coarse sand and gravel</p> <p>-GLACIAL TILL-(ML)</p> <p>Yellow-brown, moist, hard, SILT, little fine sand, trace coarse sand and gravel, well bonded</p> <p>-GLACIAL TILL-(ML)</p> <p>Note: Pulverized rock fragment lodged in tip of spoon.</p> <p>Top of Bedrock El. 197.0</p> <p>R1: Grey, fine to medium-grained, METASANDSTONE, hard, slightly weathered. Joints moderate to steep, very close to close, planar to stepped, tight to open. Frequent SILT infillings and decomposed (pitted) quartz seams on joint surfaces. Moderately fractured from 7.0 to 10.0 ft. Severely fractured (highly oxidized) from 10.0 to 12.0 ft.</p> <p>Rock Quality=Very Poor</p> <p>Recovery=100%</p> <p>-BREWER FORMATION-</p> <p>R1 Core Times (min:sec): 7.0-8.0' (1:53); 8.0-9.0' (2:31); 9.0-10.0' (2:54); 10.0-11.0' (2:25); 11.0-12.0' (2:29)</p> <p>Bottom of Exploration at 12.0 feet below ground surface.</p> </div> <div> <p>0.3-</p> <p>5.5-</p> <p>12.0-</p> </div> </div>							
Remarks:							
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.							

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS				Project: Route 9/I-395 Connector Location: Brewer and Eddington, Maine		Boring No.: BB-ECR-204A WIN: 18915.00				
Driller: New England Boring Contractors		Elevation (ft.): 202.1		Auger ID/OD: --						
Operator: M. Porter		Datum: NAVD 88		Sampler: Split Spoon 1.375 in. ID						
Logged By: J. Fletcher		Rig Type: Mobile B-53 Track		Hammer Wt./Fall: SS-140#/30; HW-300#/16						
Date Start/Finish: 2-17-2021/2-18-2021		Drilling Method: SSA/HW Drive		Core Barrel: HQ-2.0 in. ID						
Boring Location: Sta. 214+01.9, 44.9 RT		Casing ID/OD: HW-4.0 in. ID		Water Level*: 18.0 ft						
Hammer Efficiency Factor: 0.852		Hammer Type: Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>								
Definitions: D = Split Spoon Sample MD = Unsuccessful Split Spoon Sample Attempt U = Thin Wall Tube Sample MU = Unsuccessful Thin Wall Tube Sample Attempt V = Field Vane Shear Test, PP = Pocket Penetrometer MV = Unsuccessful Field Vane Shear Test Attempt R = Rock Core Sample SSA = Solid Stem Auger HSA = Hollow Stem Auger RC = Roller Cone WOH = Weight of 140lb. Hammer WOR/C = Weight of Rods or Casing WO1P = Weight of One Person S _u = Peak/Remolded Field Vane Undrained Shear Strength (psf) S _{u(lab)} = Lab Vane Undrained Shear Strength (psf) q _p = Unconfined Compressive Strength (ksf) N-uncorrected = Raw Field SPT N-value Hammer Efficiency Factor = Rig Specific Annual Calibration Value N ₆₀ = SPT N-uncorrected Corrected for Hammer Efficiency N ₆₀ = (Hammer Efficiency Factor/60%)*N-uncorrected T _v = Pocket Torvane 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								Visual Description and Remarks	Laboratory Testing Results/AASHTO and Unified Class.
	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N ₆₀	Casing Blows	Elevation (ft.)		
0							SSA		Note: Washed ahead of casing from 5.0 to 15.0 ft.	
5							71			
							170			
							87			
							102			
							258			
10							110			
							39			
							60			
							211			
15							128/14.5"	187.6		
	R1	60/14	15.0 - 20.0	RQD = 17%			RC HQ CORE		 <p>Top of Bedrock El. 187.6 R1: Grey, aphanitic, SILTSTONE, hard, slightly to moderately weathered. Joints steeply dipping to vertical, very close to close, planar to stepped, rough, open. Oxidized joint surfaces. Majority of core stem highly fractured, reduced to gravel-sized pieces, platy. Rock Quality=Very Poor Recovery=23% -BREWER FORMATION- R1 Core Times (min:sec): 15.0-16.0' (3:17); 16.0-17.0' (2:29); 17.0-18.0' (3:14); 18.0-19.0' (3:46); 19.0-20.0' (2:15) R2: Similar to R1, 0.5-in. thick platy layers, steep angle. Majority of core stem highly fractured, reduced to gravel-sized pieces. Few calcite stringers (0.0625-in. thick). Rock Quality=Poor Recovery=77% -BREWER FORMATION- R2 Core Times (min:sec): 20.0-21.0' (3:50); 21.0-21.4' (2:17) R3: Grey, aphanitic, SILTSTONE, hard to very hard, fresh to slightly weathered. Steeply dipping joints, close to moderately close, planar to stepped, rough, open, oxidized. Calcite/quartz veins (0.25-in. thick) and intrusions (1.0 to 2.0-in. thick) pitting</p>	qp=4,672 psi (21.6'-22.1') GTX#313418 SF-1 15.0/30.2 psi (22.4')
20										
	R2	16.8/13	20.0 - 21.4	RQD = 30%						
	R3	43.2/42	21.4 - 25.0	RQD = 97%						
25										

Remarks:

1. SF-1 denotes sliding friction test completed at depth shown.
 15.0/30.2 psi represents normal and peak shear stresses, respectively.

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.

Page 1 of 3

Boring No.: BB-ECR-204A

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS				Project: Route 9/I-395 Connector Location: Brewer and Eddington, Maine				Boring No.: BB-ECR-204A WIN: 18915.00							
Driller: New England Boring Contractors				Elevation (ft.): 202.1				Auger ID/OD: --							
Operator: M. Porter				Datum: NAVD 88				Sampler: Split Spoon 1.375 in. ID							
Logged By: J. Fletcher				Rig Type: Mobile B-53 Track				Hammer Wt./Fall: SS-140#/30; HW-300#							
Date Start/Finish: 2-17-2021/2-18-2021				Drilling Method: SSA/HW Drive				Core Barrel: HQ-2.0 in. ID							
Boring Location: Sta. 214+01.9, 44.9 RT				Casing ID/OD: HW-4.0 in. ID				Water Level*: 18.0 ft							
Hammer Efficiency Factor: 0.852				Hammer Type: Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>											
Definitions: D = Split Spoon Sample MD = Unsuccessful Split Spoon Sample Attempt U = Thin Wall Tube Sample MU = Unsuccessful Thin Wall Tube Sample Attempt V = Field Vane Shear Test, PP = Pocket Penetrometer MV = Unsuccessful Field Vane Shear Test Attempt				R = Rock Core Sample SSA = Solid Stem Auger HSA = Hollow Stem Auger RC = Roller Cone WOH = Weight of 140 lb. Hammer WOR/C = Weight of Rods or Casing WO1P = Weight of One Person				S _u = Peak/Remolded Field Vane Undrained Shear Strength (psf) S _{u(lab)} = Lab Vane Undrained Shear Strength (psf) q _p = Unconfined Compressive Strength (ksf) N-uncorrected = Raw Field SPT N-value Hammer Efficiency Factor = Rig Specific Annual Calibration Value N ₆₀ = SPT N-uncorrected Corrected for Hammer Efficiency N ₆₀ = (Hammer Efficiency Factor/60%)*N-uncorrected				T _v = Pocket Torvane 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								Graphic Log	Visual Description and Remarks	Laboratory Testing Results/AASHTO and Unified Class.				
	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N ₆₀	Casing Blows	Elevation (ft.)							
25	R4	49.2/39	25.0 - 29.1	RQD = 39%			HQ CORE			within calcite. Rock Quality=Excellent Recovery=97% -BREWER FORMATION- R3 Core Times (min:sec): 21.4-22.4' (2:49); 22.4-23.4' (3:19); 23.4-25.0' (4:15) R4: Similar to R3, except joints close steep to vertical. Highly fractured zones from approximately 25.0 to 25.5 ft, approximately 27.0 to 27.5 ft and approximately 28.0 to 29.0 ft. Rock Quality=Poor Recovery=79% -BREWER FORMATION- R4 Core Times (min:sec): 25.0-26.0' (3:32); 26.0-27.0' (3:27); 27.0-28.0' (3:55); 28.0-29.1' (5:17) R5: Grey, aphanitic, SILTSTONE, hard to very hard, fresh to slightly weathered. Single steeply dipping joint at approximately 33.0 ft, wide, planar, rough, open, oxidized. Frequent calcite veins (up to 0.25-in. thick). Rock Quality=Excellent Recovery=91% -BREWER FORMATION- R5 Core Times (min:sec): 29.1-30.1' (3:58); 30.1-31.1' (3:24); 31.1-32.1' (3:16); 32.1-33.5' (2:49) R6: Similar to R5, single steeply dipping joint at approximately 35.5 ft moderately close, planar to undulating, rough, open, oxidized. Frequent very thin calcite stringers (up to 0.125-in. thick) pitting within calcite. Secondary horizontal joint, moderately close, planar, rough, tight, oxidized. Rock Quality=Good Recovery=80% R6 Core Times (min:sec): 33.5-34.0' (1:48); 34.0-35.0' (2:59); 35.0-36.0' (1:45) R7: Grey, aphanitic SILTSTONE, hard to very hard, fresh to slightly weathered. Joints steeply dipping, wide, planar, rough, open, oxidized. Secondary joints horizontal, moderately close, planar, rough, tight to open, oxidized. Frequent calcite stringers (10.0625 to 0.5-in. thick), common pitting within calcite. Rock Quality=Excellent Recovery=111% Note: R7 recovery and RQD includes portion of R6 not initially recovered. -BREWER FORMATION- R7 Core Times (min:sec): 36.0-37.0' (5:25); 37.0-38.0' (3:45); 38.0-39.0' (3:52); 39.0-40.0' (3:35); 40.0-40.5' (1:49) R8: Similar to R7, except steeply dipping to vertical joint within foliated layer (approximately 1.5-in. thick layer), moderately close to wide, planar to undulating, rough, tight to open, fresh to slightly oxidized, platy within foliated layers. Occasional calcite veins (0.25 to 0.5-in. thick). Rock Quality=Excellent Recovery=100% -BREWER FORMATION- R8 Core Times (min:sec): 40.5-41.5' (3:54); 41.5-42.5' (3:45);					
30	R5	52.8/48	29.1 - 33.5	RQD = 91%											
	R6	30/24	33.5 - 36.0	RQD = 80%											
35															
	R7	54/60	36.0 - 40.5	RQD = 104%											
40	R8	60/60	40.5 - 45.5	RQD = 98%											
45															
50															
Remarks: 1. SF-1 denotes sliding friction test completed at depth shown. 15.0/30.2 psi represents normal and peak shear stresses, respectively.															
Stratification lines represent approximate boundaries between soil types; transitions may be gradual.										Page 2 of 3 Boring No.: BB-ECR-204A					

[illegible]


Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS				Project: Route 9/I-395 Connector Location: Brewer and Eddington, Maine				Boring No.: BB-ECR-205 WIN: 18915.00																																																																																																																																																																																																																																																																																															
Driller: New England Boring Contractors				Elevation (ft.): 203.4				Auger ID/OD: HSA-3.25 in. ID																																																																																																																																																																																																																																																																																															
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Boring Location: Sta. 214+44.1, 48.0 RT				Casing ID/OD: HW-4.0 in. ID				Water Level*: NE																																																																																																																																																																																																																																																																																															
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<table><thead><tr><th colspan="8">Sample Information</th><th rowspan="2">Elevation (ft.)</th><th rowspan="2">Graphic Log</th><th rowspan="2">Visual Description and Remarks</th><th rowspan="2">Laboratory Testing Results/AASHTO and Unified Class.</th></tr><tr><th>Depth (ft.)</th><th>Sample No.</th><th>Pen./Rec. (in.)</th><th>Sample Depth (ft.)</th><th>Blows (6 in.) Shear Strength (psf) or RQD (%)</th><th>N-uncorrected</th><th>N₆₀</th><th>Casing Blows</th></tr></thead><tbody><tr><td rowspan="4">0</td><td>1D</td><td>24/15</td><td>0.5 - 2.5</td><td>15/34/17/12</td><td>51</td><td>74</td><td>HSA</td><td>202.9</td><td rowspan="4"></td><td>-BITUMINOUS CONCRETE-</td><td rowspan="4">qp=12,440 psi (24.2'-24.5')</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>200.9</td><td>Brown, dry, very dense, fine to medium SAND, little fine to coarse gravel and coarse sand</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>20</td><td>-FILL-(SP) (ROADWAY BASE/SUBBASE FILL)</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>25</td><td>Note: Washed ahead prior to driving HW casing from 0.0 to 5.0 ft.</td></tr><tr><td rowspan="4">5</td><td>2D</td><td>24/18</td><td>5.0 - 7.0</td><td>7/9/18/20</td><td>27</td><td>39</td><td>HW</td><td></td><td></td><td>Yellow-brown, moist, hard, SILT, little fine to medium sand, trace fine gravel and coarse sand</td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>-GLACIAL TILL-(ML)</td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td rowspan="4">10</td><td>3D</td><td>24/3</td><td>10.0 - 12.0</td><td>15/35/37/45</td><td>72</td><td>104</td><td></td><td>194.4</td><td></td><td>Olive-brown, wet, very dense, fine to coarse GRAVEL, some coarse sand, little silt consisting of decomposed bedrock fragments, exhibiting distinct rock fabric</td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>-WEATHERED BEDROCK-(GM)</td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>Note: Drill action and cuttings indicated bedrock at 13.0 ft.</td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>RC</td><td>190.4</td><td>Top of Bedrock at El. 190.4</td><td></td></tr><tr><td rowspan="4">15</td><td>4D</td><td>2/2</td><td>15.0 - 15.2</td><td>85(2")</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>R1</td><td>24/18</td><td>15.0 - 17.0</td><td>RQD = 0%</td><td></td><td></td><td>NO CORE</td><td></td><td></td><td>Grey, wet, very dense, fine to coarse gravel, pulverized bedrock fragments lodged in tip of spoon</td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>-BEDROCK-(GP)</td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>R1: Grey, fine to medium-grained, METASANDSTONE, hard, slightly to moderately weathered. Discernible joints steep to vertical, very close, planar, open to tight, frequent silt infillings, highly fractured.</td><td></td></tr><tr><td rowspan="4">20</td><td>R2</td><td>36/23</td><td>17.0 - 20.0</td><td>RQD = 0%</td><td></td><td></td><td></td><td></td><td></td><td>Rock Quality=Very Poor Recovery=75%</td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>-BREWER FORMATION-</td><td></td></tr><tr><td>R3</td><td>15.6/15</td><td>20.0 - 21.3</td><td>RQD = 0%</td><td></td><td></td><td></td><td></td><td></td><td>R1 Core Times (min:sec): 15.0-16.0' (2:49); 16.0-17.0' (3:49) Note: No water returned during coring.</td><td></td></tr><tr><td>R4</td><td>10/10</td><td>21.3 - 22.1</td><td>RQD = 0%</td><td></td><td></td><td></td><td></td><td></td><td>R2: Similar to R1, except fine-grained. Approximately half of recovered core consists of gravel-sized pieces.</td><td></td></tr><tr><td rowspan="4">25</td><td>R5</td><td>12/12</td><td>22.1 - 23.1</td><td>RQD = 0%</td><td></td><td></td><td></td><td></td><td></td><td>Rock Quality=Very Poor Recovery=64%</td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>-BREWER FORMATION-</td><td></td></tr><tr><td>R6</td><td>22.8/16</td><td>23.1 - 25.0</td><td>RQD = 52%</td><td></td><td></td><td></td><td></td><td></td><td>R2 Core Times (min:sec): 17.0-18.0' (2:40); 18.0-19.0' (1:36); 19.0-20.0' (3:10)</td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>R3: Similar to R2. Rock Quality=Very Poor</td><td></td></tr></tbody></table>												Sample Information								Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/AASHTO and Unified Class.	Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N ₆₀	Casing Blows	0	1D	24/15	0.5 - 2.5	15/34/17/12	51	74	HSA	202.9		-BITUMINOUS CONCRETE-	qp=12,440 psi (24.2'-24.5')								200.9	Brown, dry, very dense, fine to medium SAND, little fine to coarse gravel and coarse sand								20	-FILL-(SP) (ROADWAY BASE/SUBBASE FILL)								25	Note: Washed ahead prior to driving HW casing from 0.0 to 5.0 ft.	5	2D	24/18	5.0 - 7.0	7/9/18/20	27	39	HW			Yellow-brown, moist, hard, SILT, little fine to medium sand, trace fine gravel and coarse sand											-GLACIAL TILL-(ML)																								10	3D	24/3	10.0 - 12.0	15/35/37/45	72	104		194.4		Olive-brown, wet, very dense, fine to coarse GRAVEL, some coarse sand, little silt consisting of decomposed bedrock fragments, exhibiting distinct rock fabric											-WEATHERED BEDROCK-(GM)											Note: Drill action and cuttings indicated bedrock at 13.0 ft.									RC	190.4	Top of Bedrock at El. 190.4		15	4D	2/2	15.0 - 15.2	85(2")								R1	24/18	15.0 - 17.0	RQD = 0%			NO CORE			Grey, wet, very dense, fine to coarse gravel, pulverized bedrock fragments lodged in tip of spoon											-BEDROCK-(GP)											R1: Grey, fine to medium-grained, METASANDSTONE, hard, slightly to moderately weathered. Discernible joints steep to vertical, very close, planar, open to tight, frequent silt infillings, highly fractured.		20	R2	36/23	17.0 - 20.0	RQD = 0%						Rock Quality=Very Poor Recovery=75%											-BREWER FORMATION-		R3	15.6/15	20.0 - 21.3	RQD = 0%						R1 Core Times (min:sec): 15.0-16.0' (2:49); 16.0-17.0' (3:49) Note: No water returned during coring.		R4	10/10	21.3 - 22.1	RQD = 0%						R2: Similar to R1, except fine-grained. Approximately half of recovered core consists of gravel-sized pieces.		25	R5	12/12	22.1 - 23.1	RQD = 0%						Rock Quality=Very Poor Recovery=64%											-BREWER FORMATION-		R6	22.8/16	23.1 - 25.0	RQD = 52%						R2 Core Times (min:sec): 17.0-18.0' (2:40); 18.0-19.0' (1:36); 19.0-20.0' (3:10)											R3: Similar to R2. Rock Quality=Very Poor	
Sample Information								Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/AASHTO and Unified Class.																																																																																																																																																																																																																																																																																												
Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N ₆₀	Casing Blows																																																																																																																																																																																																																																																																																																
0	1D	24/15	0.5 - 2.5	15/34/17/12	51	74	HSA	202.9		-BITUMINOUS CONCRETE-	qp=12,440 psi (24.2'-24.5')																																																																																																																																																																																																																																																																																												
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5	2D	24/18	5.0 - 7.0	7/9/18/20	27	39	HW			Yellow-brown, moist, hard, SILT, little fine to medium sand, trace fine gravel and coarse sand																																																																																																																																																																																																																																																																																													
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10	3D	24/3	10.0 - 12.0	15/35/37/45	72	104		194.4		Olive-brown, wet, very dense, fine to coarse GRAVEL, some coarse sand, little silt consisting of decomposed bedrock fragments, exhibiting distinct rock fabric																																																																																																																																																																																																																																																																																													
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	R1	24/18	15.0 - 17.0	RQD = 0%			NO CORE			Grey, wet, very dense, fine to coarse gravel, pulverized bedrock fragments lodged in tip of spoon																																																																																																																																																																																																																																																																																													
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20	R2	36/23	17.0 - 20.0	RQD = 0%						Rock Quality=Very Poor Recovery=75%																																																																																																																																																																																																																																																																																													
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	R3	15.6/15	20.0 - 21.3	RQD = 0%						R1 Core Times (min:sec): 15.0-16.0' (2:49); 16.0-17.0' (3:49) Note: No water returned during coring.																																																																																																																																																																																																																																																																																													
	R4	10/10	21.3 - 22.1	RQD = 0%						R2: Similar to R1, except fine-grained. Approximately half of recovered core consists of gravel-sized pieces.																																																																																																																																																																																																																																																																																													
25	R5	12/12	22.1 - 23.1	RQD = 0%						Rock Quality=Very Poor Recovery=64%																																																																																																																																																																																																																																																																																													
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	R6	22.8/16	23.1 - 25.0	RQD = 52%						R2 Core Times (min:sec): 17.0-18.0' (2:40); 18.0-19.0' (1:36); 19.0-20.0' (3:10)																																																																																																																																																																																																																																																																																													
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Remarks:																																																																																																																																																																																																																																																																																																							
Stratification lines represent approximate boundaries between soil types; transitions may be gradual.										Page 1 of 2																																																																																																																																																																																																																																																																																													
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Boring No.: BB-ECR-205																																																																																																																																																																																																																																																																																																							

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Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS				Project: Route 9/I-395 Connector		Boring No.: BB-ECR-206	
				Location: Brewer and Eddington, Maine		WIN: 18915.00	
Driller: New England Boring Contractors		Elevation (ft.): 200.7		Auger ID/OD: --			
Operator: J. Layfield		Datum: NAVD 88		Sampler: Split Spoon 1.375 in. ID			
Logged By: H. Hollauer		Rig Type: Mobile B-53 Truck		Hammer Wt./Fall: SS-140#/30; HW-300#/16			
Date Start/Finish: 11-30-2020/11-30-2020		Drilling Method: SSA/HW Drive		Core Barrel: NQ-2.0 in. ID			
Boring Location: Sta. 214+98.8, 78.8 RT		Casing ID/OD: HW-4.0 in. ID		Water Level*: NE			
Hammer Efficiency Factor: 0.867		Hammer Type: Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>					
<small> Definitions: D = Split Spoon Sample MD = Unsuccessful Split Spoon Sample Attempt U = Thin Wall Tube Sample MU = Unsuccessful Thin Wall Tube Sample Attempt V = Field Vane Shear Test, PP = Pocket Penetrometer MV = Unsuccessful Field Vane Shear Test Attempt R = Rock Core Sample SSA = Solid Stem Auger HSA = Hollow Stem Auger RC = Roller Cone WOH = Weight of 140lb. Hammer WOR/C = Weight of Rods or Casing WO1P = Weight of One Person S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf) S_{u(lab)} = Lab Vane Undrained Shear Strength (psf) q_p = Unconfined Compressive Strength (ksf) N-uncorrected = Raw Field SPT N-value Hammer Efficiency Factor = Rig Specific Annual Calibration Value N₆₀ = SPT N-uncorrected Corrected for Hammer Efficiency N₆₀ = (Hammer Efficiency Factor/60%)*N-uncorrected T_v = Pocket Torvane Shear Strength (psf) WC = Water Content, percent LL = Liquid Limit PL = Plastic Limit PI = Plasticity Index G = Grain Size Analysis C = Consolidation Test </small>							
Sample Information							
Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N ₆₀	Casing Blows
0	1D	24/6	0.0 - 2.0	1/1/3/4	4	6	SSA
5	2D	24/22	5.0 - 7.0	17/22/23/30	45	65	HW
10	3D		10.0 - 10.4	70(5")			RC
	R1	25.2/24.1	12.0 - 14.1	RQD = 0%			NQ CORE
15	R2	24/18	14.1 - 16.1	RQD = 0%			
	R3	2/0	16.1 - 16.3	RQD = 0%			
20							
25							
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>Visual Description and Remarks</p> <p>-TOPSOIL-/ROOT MAT- Medium brown, dry, loose, fine to medium Silty SAND, poorly graded -TOPSOIL-(SM) Grey-brown, slightly moist, hard, SILT, some fine to coarse sand, trace fine gravel, moderately bonded -GLACIAL TILL-(ML) Grey, slightly moist, very dense, fine to coarse GRAVEL, little silt, trace fine to coarse sand -WEATHERED BEDROCK-(GM) Note: Roller bit advanced from 9.0 to 12.0 ft through weathered bedrock. Top of Bedrock at El. 188.7 R1: Grey, aphanitic, SLATE, moderately hard, slightly to moderately weathered. Joints dipping at moderate to vertical angles, very close to close, tight to open, planar to stepped, smooth to rough, bedding extremely thin, slight silt infilling, joint surfaces iron stained. Rock Quality=Very Poor Recovery=96% -BREWER FORMATION- R1 Core Times (min:sec): 12.0-13.0' (2:00); 13.0-14.1' (2:50) R2: Similar to R1, except highly fractured (primarily gravel-sized pieces), few discernible high angle to vertical joints, oxidized, planar, smooth to rough, open. Rock Quality=Very Poor Recovery=75% -BREWER FORMATION- R2 Core Times (min:sec): 14.1-15.1' (2:50); 15.1-16.1' (2:50) R3: No Recovery Note: Core barrel contains silt from possible infilled cavity. R3 Core Time (min:sec): 16.1-16.3' (0:50) Bottom of Exploration at 16.3 feet below ground surface.</p> </div> <div style="width: 45%; text-align: center;"> <p>Graphic Log</p> </div> </div>							
Remarks:							
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.

<div>Maine Department of Transportation</div> <div>Soil/Rock Exploration Log US CUSTOMARY UNITS</div>						Project: Route 9/I-395 Connector				Boring No.: BB-ECR-206A																																													
						Location: Brewer and Eddington, Maine				WIN: 18915.00																																													
Driller: New England Boring Contractors						Elevation (ft.): 201.0				Auger ID/OD: --																																													
Operator: M. Porter						Datum: NAVD 88				Sampler: Split Spoon 1.375 in. ID																																													
Logged By: J. Fletcher						Rig Type: Mobile B-53 Track				Hammer Wt./Fall: SS-140#/30; HW-300#/16																																													
Date Start/Finish: 2-18-2021/2-19-2021						Drilling Method: SSA/HW Drive				Core Barrel: NQ-2.0 in. ID																																													
Boring Location: Sta. 214+87.4, 70.9 RT						Casing ID/OD: HW-4.0 in. ID				Water Level*: 0.5 ft																																													
Hammer Efficiency Factor: 0.852						Hammer Type: Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>																																																	
Definitions: D = Split Spoon Sample MD = Unsuccessful Split Spoon Sample Attempt U = Thin Wall Tube Sample MU = Unsuccessful Thin Wall Tube Sample Attempt V = Field Vane Shear Test, PP = Pocket Penetrometer MV = Unsuccessful Field Vane Shear Test Attempt														R = Rock Core Sample SSA = Solid Stem Auger HSA = Hollow Stem Auger RC = Roller Cone WOH = Weight of 140lb. Hammer WOR/C = Weight of Rods or Casing WO1P = Weight of One Person														S _u = Peak/Remolded Field Vane Undrained Shear Strength (psf) S _{u(lab)} = Lab Vane Undrained Shear Strength (psf) q _p = Unconfined Compressive Strength (ksf) N-uncorrected = Raw Field SPT N-value Hammer Efficiency Factor = Rig Specific Annual Calibration Value N ₆₀ = SPT N-uncorrected Corrected for Hammer Efficiency N ₆₀ = (Hammer Efficiency Factor/60%)*N-uncorrected														T _v = Pocket Torvane Shear Strength (psf) WC = Water Content, percent LL = Liquid Limit PL = Plastic Limit PI = Plasticity Index G = Grain Size Analysis C = Consolidation Test													
Sample Information																																																							
Depth (ft.)		Sample No.		Pen./Rec. (in.)		Sample Depth (ft.)		Blows / (6 in.) Shear Strength (psf) or RQD (%)		N-uncorrected		N ₆₀		Casing Blows		Elevation (ft.)		Graphic Log		Visual Description and Remarks														Laboratory Testing Results/AASHTO and Unified Class.																					
0														SSA						Note: Advanced HW casing to bedrock; no overbrden samples taken.																																			

Maine Department of Transportation				Project: Route 9/I-395 Connector		Boring No.: BB-ECR-206A			
Soil/Rock Exploration Log US CUSTOMARY UNITS				Location: Brewer and Eddington, Maine		WIN: 18915.00			
Driller: New England Boring Contractors		Elevation (ft.): 201.0		Auger ID/OD: --					
Operator: M. Porter		Datum: NAVD 88		Sampler: Split Spoon 1.375 in. ID					
Logged By: J. Fletcher		Rig Type: Mobile B-53 Track		Hammer Wt./Fall: SS-140#/30; HW-300#					
Date Start/Finish: 2-18-2021/2-19-2021		Drilling Method: SSA/HW Drive		Core Barrel: NQ-2.0 in. ID					
Boring Location: Sta. 214+87.4, 70.9 RT		Casing ID/OD: HW-4.0 in. ID		Water Level*: 0.5 ft					
Hammer Efficiency Factor: 0.852		Hammer Type: Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>							
Definitions: D = Split Spoon Sample MD = Unsuccessful Split Spoon Sample Attempt U = Thin Wall Tube Sample MU = Unsuccessful Thin Wall Tube Sample Attempt V = Field Vane Shear Test, PP = Pocket Penetrometer MV = Unsuccessful Field Vane Shear Test Attempt		R = Rock Core Sample SSA = Solid Stem Auger HSA = Hollow Stem Auger RC = Roller Cone WOH = Weight of 140 lb. Hammer WOR/C = Weight of Rods or Casing WO1P = Weight of One Person		S _u = Peak/Remolded Field Vane Undrained Shear Strength (psf) S _{u(lab)} = Lab Vane Undrained Shear Strength (psf) q _p = Unconfined Compressive Strength (ksf) N = uncorrected = Raw Field SPT N-value Hammer Efficiency Factor = Rig Specific Annual Calibration Value N ₆₀ = SPT N-uncorrected Corrected for Hammer Efficiency N ₆₀ = (Hammer Efficiency Factor/60%)*N-uncorrected		T _v = Pocket Torvane 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							Laboratory Testing Results/ AASHTO and Unified Class.	
	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N ₆₀	Casing Blows		
25	R1	60/30	25.0 - 30.0	RQD = 29%			24.5 RC NO CORE		Top of Bedrock El. 176.5 R1: Grey, aphanitic, SLATE, hard to moderately hard, fresh to moderately weathered. Joints dipping at steep angle to vertical, very close to close, planar to undulating, smooth to rough, open. Occasional silt coatings and oxidation on joint surfaces. Secondary low angle to moderately dipping joints, very close to moderate, planar to stepped, rough, open. Frequent weathered calcite stringers. Highly fractured zones at approximately 25.7 ft and from approximately 27.5 to 30.0 ft. Rock Quality=Poor Recovery=50% -BREWER FORMATION- R1 Core Times (min:sec): 25.0-26.0' (5:13); 26.0-27.0' (5:21); 27.0-28.0' (4:22); 28.0-29.0' (3:31); 29.0-30.0' (2:18) R2: Similar to R1, except joints planar to stepped, platy along vertical joints, highly oxidized. Highly fractured zone from approximately 31.2 to 33.2 ft. Rock Quality=Poor Recovery=94% -BREWER FORMATION- R2 Core Times (min:sec): 30.0-31.0' (3:36); 31.0-32.0' (2:13); 32.0-33.0' (2:59); 33.0-33.2' (1:24) R3: Grey, aphanitic, SLATE, hard, fresh. Joints steep angle, fresh to slightly weathered, planar to stepped, smooth, moderately close to wide, tight to open. Occasional calcite veins (0.25-in. thick). Rock Quality=Excellent Recovery=100% -BREWER FORMATION- R3 Core Times (min:sec): 33.2-34.2' (3:00); 34.2-35.2' (2:55); 35.2-36.2' (2:45); 36.2-37.2' (2:45); 37.2-38.2' (2:36) R4: Similar to R3, with moderately dipping secondary joint, oxidized, planar, rough, tight. Steep angle primary joint parallel to well developed foliation. Quartz intrusion from approximately 38.5 to 38.6 ft. Rock Quality=Fair Recovery=83% -BREWER FORMATION- R4 Core Times (min:sec): 38.2-39.2' (2:45); 39.2-40.2' (3:00); 40.2-41.2' (3:16); 41.2-42.2' (2:29); 42.2-43.2' (2:31) R5: Grey, aphanitic, SLATE, hard, fresh. Joints dipping at steep angles along well developed foliation (0.75 to 1-in. thick seams), moderately close, planar to stepped, smooth to rough, tight to open, fresh. Rock Quality=Fair Recovery=41% -BREWER FORMATION- R5 Core Times (min:sec): 43.2-44.2' (3:06); 44.2-45.2' (2:59); 45.2-46.2' (4:42); 46.2-47.2' (3:12); 47.2-47.5' (2:38) R6: Grey, aphanitic, SLATE, hard, fresh to slightly weathered. Joints dipping at steep angles to vertical, very close to moderately close, planar to stepped, rough, tight to open, occasional silt coatings on joint surfaces. Few highly fractured zones associated with vertical joints.
30	R2	38.4/36	30.0 - 33.2	RQD = 31%					
35	R3	60/60	33.2 - 38.2	RQD = 100%					
40	R4	60/50	38.2 - 43.2	RQD = 67%					
45	R5	51.6/21	43.2 - 47.5	RQD = 35%					
50	R6	33.6/52	47.5 - 50.3	RQD = 107%					
Remarks:									
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.									

<div>Maine Department of Transportation</div> <div>Soil/Rock Exploration Log</div> <div>US CUSTOMARY UNITS</div>				<div>Project: Route 9/1-395 Connector</div> <div>Location: Brewer and Eddington, Maine</div>				<div>Boring No.: BB-ECR-206A</div> <div>WIN: 18915.00</div>									
Driller: New England Boring Contractors				Elevation (ft.): 201.0				Auger ID/OD: --									
Operator: M. Porter				Datum: NAVD 88				Sampler: Split Spoon 1.375 in. ID									
Logged By: J. Fletcher				Rig Type: Mobile B-53 Track				Hammer Wt./Fall: SS-140#/30; HW-300#/#									
Date Start/Finish: 2-18-2021/2-19-2021				Drilling Method: SSA/HW Drive				Core Barrel: NQ-2.0 in. ID									
Boring Location: Sta. 214+87.4, 70.9 RT				Casing ID/OD: HW-4.0 in. ID				Water Level*: 0.5 ft									
Hammer Efficiency Factor: 0.852				Hammer Type: Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>													
Definitions: D = Split Spoon Sample MD = Unsuccessful Split Spoon Sample Attempt U = Thin Wall Tube Sample MU = Unsuccessful Thin Wall Tube Sample Attempt V = Field Vane Shear Test, PP = Pocket Penetrometer MV = Unsuccessful Field Vane Shear Test Attempt				R = Rock Core Sample SSA = Solid Stem Auger HSA = Hollow Stem Auger RC = Roller Cone WOH = Weight of 140 lb. Hammer WOR/C = Weight of Rods or Casing WO1P = Weight of One Person				Su = Peak/Remolded Field Vane Undrained Shear Strength (psf) Su(lab) = Lab Vane Undrained Shear Strength (psf) qp = Unconfined Compressive Strength (ksf) N-uncorrected = Raw Field SPT N-value Hammer Efficiency Factor = Rig Specific Annual Calibration Value N60 = SPT N-uncorrected Corrected for Hammer Efficiency N60 = (Hammer Efficiency Factor/60%)*N-uncorrected									
Ty = Pocket Torvane Shear Strength (psf) WC = Water Content, percent LL = Liquid Limit PL = Plastic Limit PI = Plasticity Index G = Grain Size Analysis C = Consolidation Test																	
Sample Information												Graphic Log		Visual Description and Remarks		Laboratory Testing Results/ AASHTO and Unified Class.	
Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N60	Casing Blows	Elevation (ft.)									
50								NQ	150.7	<div>Rock Quality=Fair</div> <div>Recovery=155%</div> <div>Note: R6 recovery and RQD includes portion of R5 not initially recovered.</div> <div>-BREWER FORMATION-</div> <div>R6 Core Times (min:sec): 47.5-48.5' (2:59); 48.5-49.5' (2:50); 49.5-50.3' (2:23)</div> <div>Bottom of Exploration at 50.3 feet below ground surface.</div>							
75																	
Remarks:																	
Stratification lines represent approximate boundaries between soil types; transitions may be gradual.												Page 3 of 3					
* 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.												Boring No.: BB-ECR-206A					

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS				Project: Route 9/1-395 Connector Location: Brewer and Eddington, Maine				Boring No.: HB-BE-231 WIN: 18915.00					
Driller: New England Boring Contractors				Elevation (ft.): 202.3				Auger ID/OD: HSA-3.25 in. ID					
Operator: J. Layfield				Datum: NAVD 88				Sampler: Split Spoon 1.375 in. ID					
Logged By: C. Toscano				Rig Type: Mobile B-53 Truck				Hammer Wt./Fall: SS-140#/30; NW-300#/16					
Date Start/Finish: 11-11-2020/11-13-2020				Drilling Method: HSA/NW Drive				Core Barrel: NQ-2.0 in. ID					
Boring Location: Sta. 214+00.0, 0				Casing ID/OD: NW-3.0 in. ID				Water Level*: 26.0 ft					
Hammer Efficiency Factor: 0.867				Hammer Type: Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>									
Definitions: D = Split Spoon Sample MD = Unsuccessful Split Spoon Sample Attempt U = Thin Wall Tube Sample MU = Unsuccessful Thin Wall Tube Sample Attempt V = Field Vane Shear Test, PP = Pocket Penetrometer MV = Unsuccessful Field Vane Shear Test Attempt				R = Rock Core Sample SSA = Solid Stem Auger HSA = Hollow Stem Auger RC = Roller Cone WOH = Weight of 140lb. Hammer WOR/C = Weight of Rods or Casing WO1P = Weight of One Person				S _u = Peak/Remolded Field Vane Undrained Shear Strength (psf) S _{u(lab)} = Lab Vane Undrained Shear Strength (psf) q _p = Unconfined Compressive Strength (ksf) N-uncorrected = Raw Field SPT N-value Hammer Efficiency Factor = Rig Specific Annual Calibration Value N ₆₀ = SPT N-uncorrected Corrected for Hammer Efficiency N ₆₀ = (Hammer Efficiency Factor/60%)*N-uncorrected					
								T _v = Pocket Torvane Shear Strength (psf) WC = Water Content, percent LL = Liquid Limit PL = Plastic Limit PI = Plasticity Index G = Grain Size Analysis C = Consolidation Test					
Sample Information													
Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N ₆₀	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.		
0	1D	24/6	0.0 - 2.0	2/3/4/3	7	10	HSA			Brown, moist, stiff, SILT, some fine sand, little medium sand, trace gravel -GLACIAL TILL-(ML)			
										Note: Spun HSA to 5.0 ft.			
5	2D	24/24	5.0 - 7.0	40/24/34/24	58	84	129			Olive-brown, moist, hard, fine to medium sandy SILT, trace coarse sand, trace fine gravel, well bonded -GLACIAL TILL-(ML)	G#613882 A-4 (0), ML		
							119			Note: Drove casing to 8.0 ft.			
							135						
							139						
							RC			Top of Bedrock El. 194.3			
							145			Note: Lost approximately 200 gallons drill water. Note: Drill action and roller bit advancement indicated severely weathered rock from 8.0 to 13.0 ft. Note: Drove casing to refusal at 10.0 ft.			
10													
	R1	36/27	13.0 - 16.0	RQD = 11%			NQ CORE			R1: Grey, fine to medium-grained, METASANDSTONE, hard to soft, slightly weathered grading to severely weathered. Joints steep angled, open, highly fractured and decomposed, highly oxidized from 15.0 to 16.0 ft. Core Jam at 16.0 ft. Rock Quality=Very Poor Recovery=75% -BREWER FORMATION- R1 Core Times (min:sec): 13.0-14.0' (2:31); 14.0-15.0' (2:11); 15.0-16.0' (3:35) Note: No water return. R2: Recovery consists of high angular discontinuous fragments of slightly weathered bedrock. Matrix of decomposed bedrock not recovered due to high degree of weathering. Rock Quality=Very Poor Recovery=40% -BREWER FORMATION- R2 Core Times (min:sec): 16.0-17.0' (2:30); 17.0-18.0' (3:10); 18.0-19.33' (3:45) Note: No water return.			
15													
	R2	39.96/16	16.0 - 19.3	RQD = 0%									
20	R3	48/45	19.3 - 23.3	RQD = 48%									
	R4	48/38	23.3 - 27.3	RQD = 44%									
25													
Remarks:													
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.										Page 1 of 2			
Boring No.: HB-BE-231													

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS				Project: Route 9/I-395 Connector Location: Brewer and Eddington, Maine				Boring No.: HB-BE-231 WIN: 18915.00							
Driller: New England Boring Contractors				Elevation (ft.): 202.3				Auger ID/OD: HSA-3.25 in. ID							
Operator: J. Layfield				Datum: NAVD 88				Sampler: Split Spoon 1.375 in. ID							
Logged By: C. Toscano				Rig Type: Mobile B-53 Truck				Hammer Wt./Fall: SS-140#/30; NW-300#							
Date Start/Finish: 11-11-2020/11-13-2020				Drilling Method: HSA/NW Drive				Core Barrel: NQ-2.0 in. ID							
Boring Location: Sta. 214+00.0, 0				Casing ID/OD: NW-3.0 in. ID				Water Level*: 26.0 ft							
Hammer Efficiency Factor: 0.867				Hammer Type: Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>											
Definitions: D = Split Spoon Sample MD = Unsuccessful Split Spoon Sample Attempt U = Thin Wall Tube Sample MU = Unsuccessful Thin Wall Tube Sample Attempt V = Field Vane Shear Test, PP = Pocket Penetrometer MV = Unsuccessful Field Vane Shear Test Attempt				R = Rock Core Sample SSA = Solid Stem Auger HSA = Hollow Stem Auger RC = Roller Cone WOH = Weight of 140 lb. Hammer WOR/C = Weight of Rods or Casing WO1P = Weight of One Person				S _u = Peak/Remolded Field Vane Undrained Shear Strength (psf) S _u (lab) = Lab Vane Undrained Shear Strength (psf) q _p = Unconfined Compressive Strength (ksf) N-uncorrected = Raw Field SPT N-value Hammer Efficiency Factor = Rig Specific Annual Calibration Value N ₆₀ = SPT N-uncorrected Corrected for Hammer Efficiency N ₆₀ = (Hammer Efficiency Factor/60%)*N-uncorrected				T _y = Pocket Torvane 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								Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.				
	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N ₆₀	Casing Blows	Elevation (ft.)							
25										R3 Core Times (min:sec): 19.33-20.33' (1:43); 20.33-21.33' (2:40); 21.33-22.33' (2:19); 22.33-23.33' (2:49) R4: Similar to R3. Rock Quality=Poor Recovery=79% -BREWER FORMATION- R4 Core Times (min:sec): 23.33-24.33' (2:19); 24.33-25.33' (2:45); 25.33-26.33' (2:10); 26.33-27.33' (2:11) R5: Similar to R3, except grading to a dark grey, aphanitic, METASILTSTONE. Joints dipping at low and steep angles, planar to undulating, rough, open. Highly fractured seam at approximately 28.0 ft. Occasional quartz seams up to 0.5-in. thick. Rock Quality=Fair Recovery=90% -BREWER FORMATION- R5 Core Times (min:sec): 27.33-28.33' (2:49); 28.33-29.33' (4:09); 29.33-30.33' (4:49); 30.33-31.33' (4:36) Note: Washed and cleaned out bottom of borehole with rollerbit to 33.3 ft. Drill action indicated sound bedrock from 31.33 to 33.3 ft. R6: Grey, fine to medium-grained, METASANDSTONE, hard, fresh. Joints steep, wide, tight. Frequent calcite veins. Rock Quality=Good Recovery=100% -BREWER FORMATION- R6 Core Times (min:sec): 33.3-34.3' (2:31); 34.3-35.3' (1:25); 35.3-36.3' (1:21); 36.3-37.3' (1:48); 37.3-38.3' (1:28)					
	R5	48/43	27.3 - 31.3	RQD = 67%											
30											R6 Core Times (min:sec): 33.3-34.3' (2:31); 34.3-35.3' (1:25); 35.3-36.3' (1:21); 36.3-37.3' (1:48); 37.3-38.3' (1:28) Bottom of Exploration at 38.3 feet below ground surface.				
35									R6 Core Times (min:sec): 33.3-34.3' (2:31); 34.3-35.3' (1:25); 35.3-36.3' (1:21); 36.3-37.3' (1:48); 37.3-38.3' (1:28) Bottom of Exploration at 38.3 feet below ground surface.						
40									R6 Core Times (min:sec): 33.3-34.3' (2:31); 34.3-35.3' (1:25); 35.3-36.3' (1:21); 36.3-37.3' (1:48); 37.3-38.3' (1:28) Bottom of Exploration at 38.3 feet below ground surface.						
45									R6 Core Times (min:sec): 33.3-34.3' (2:31); 34.3-35.3' (1:25); 35.3-36.3' (1:21); 36.3-37.3' (1:48); 37.3-38.3' (1:28) Bottom of Exploration at 38.3 feet below ground surface.						
50									R6 Core Times (min:sec): 33.3-34.3' (2:31); 34.3-35.3' (1:25); 35.3-36.3' (1:21); 36.3-37.3' (1:48); 37.3-38.3' (1:28) Bottom of Exploration at 38.3 feet below ground surface.						
Remarks:															
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.															

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS				Project: Route 9/I-395 Connector Location: Brewer and Eddington, Maine		Boring No.: HB-BE-232 WIN: 18915.00					
Driller: New England Boring Contractors		Elevation (ft.): 196.8		Auger ID/OD: HSA-3.25 in. ID							
Operator: J. Layfield		Datum: NAVD 88		Sampler: Split Spoon 1.375 in. ID							
Logged By: C. Toscano		Rig Type: Mobile B-53 Truck		Hammer Wt./Fall: SS-140#/30; NW-300#/16							
Date Start/Finish: 11-11-2020/11-11-2020		Drilling Method: HSA/NW Drive		Core Barrel: NQ-2.0 in. ID							
Boring Location: Sta. 217+00.3, 0.8 RT		Casing ID/OD: NW-3.0 in. ID		Water Level*: --							
Hammer Efficiency Factor: 0.867		Hammer Type: Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>									
<small> Definitions: D = Split Spoon Sample MD = Unsuccessful Split Spoon Sample Attempt U = Thin Wall Tube Sample MU = Unsuccessful Thin Wall Tube Sample Attempt V = Field Vane Shear Test, PP = Pocket Penetrometer MV = Unsuccessful Field Vane Shear Test Attempt R = Rock Core Sample SSA = Solid Stem Auger HSA = Hollow Stem Auger RC = Roller Cone WOH = Weight of 140lb. Hammer WOR/C = Weight of Rods or Casing WO1P = Weight of One Person S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf) S_u(lab) = Lab Vane Undrained Shear Strength (psf) q_p = Unconfined Compressive Strength (ksf) N-uncorrected = Raw Field SPT N-value Hammer Efficiency Factor = Rig Specific Annual Calibration Value N₆₀ = SPT N-uncorrected Corrected for Hammer Efficiency N₆₀ = (Hammer Efficiency Factor/60%)*N-uncorrected T_v = Pocket Torvane Shear Strength (psf) WC = Water Content, percent LL = Liquid Limit PL = Plastic Limit PI = Plasticity Index G = Grain Size Analysis C = Consolidation Test </small>											
Sample Information											
Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N ₆₀	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/AASHTO and Unified Class.
0	1D	24/8	0.0 - 2.0	1/1/1/2	2	3	HSA	195.3		Dark brown, moist, soft, SILT, little fine sand, organics, trace roots, grass -TOPSOIL-(OL)	G#613883 A-4 (0), ML
										Grey-brown, moist, soft, SILT, little fine sand, trace medium to coarse sand, trace fine gravel found in tip of spoon -GLACIAL TILL-(ML) Note: Spun auger to 5.0 ft.	
5	2D	24/18	5.0 - 7.0	9/14/19/19	33	48	11			Olive-brown, moist, hard, SILT, little fine to medium sand, trace gravel, well bonded -GLACIAL TILL-(ML) Note: Drove NW casing with 140-lb automatic hammer from 5.0 to 10.0 ft.	
							35				
							110				
							125				
							136				
10	3D	24/18	10.0 - 12.0	12/17/20/23	37	53	36			Olive-brown, moist, hard, fine to medium sandy SILT, trace coarse sand, trace fine gravel -GLACIAL TILL-(ML) Note: Used 300-lb safety hammer to drive casing from 10.0 to 15.0 ft.	
							35				
							52				
							48				
							130				
15	4D R1	2/1 60/52	15.0 - 15.2 15.2 - 20.2	50(2") RQD = 60%			RC NQ CORE	181.8 181.6		Olive-brown, moist to wet, hard, SILT, some fine to medium sand, trace fine gravel -GLACIAL TILL-(ML) Note: Advanced rollerbit into sound rock from 15.2 to 16.0 ft. Top of Bedrock at El. 181.6 R1: Grey, fine to medium-grained, METASANDSTONE, hard, fresh to slightly weathered. Joints dipping low to moderate angles, very close to close, tight, common calcite veins (0.125 to 0.25-in. thick), frequent oxidized joint surfaces. Steep angle secondary joints perpendicular to primary joints, very close to moderately close, planar, smooth, tight. Rock Quality=Fair Recovery=87% -BREWER FORMATION- R1 Core Times (min:sec): 16.0-17.0' (1:31); 17.0-18.0' (1:34); 18.0-19.0' (1:25); 19.0-20.0' (1:32); 20.0-21.0' (2:22) R2: Similar to R1, except grey to greenish-grey and less oxidized joint surfaces (occasional) calcite infilled parallel, steep angle joints (0.125 to 0.25-in. thick). Low angle joints close to moderately close.	
20	R2	60/56	21.0 - 26.0	RQD = 72%							
25											
Remarks: Stratification lines represent approximate boundaries between soil types; transitions may be gradual.											
<small>* 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.</small>										Page 1 of 2 Boring No.: HB-BE-232	

<div>Maine Department of Transportation</div> <div>Soil/Rock Exploration Log US CUSTOMARY UNITS</div>						Project: Route 9/I-395 Connector							Boring No.: HB-BE-232																
						Location: Brewer and Eddington, Maine							WIN: 18915.00																
Driller: New England Boring Contractors						Elevation (ft.): 196.8							Auger ID/OD: HSA-3.25 in. ID																
Operator: J. Layfield						Datum: NAVD 88							Sampler: Split Spoon 1.375 in. ID																
Logged By: C. Toscano						Rig Type: Mobile B-53 Truck							Hammer Wt./Fall: SS-140#/30; NW-300#/ 																
Date Start/Finish: 11-11-2020/11-11-2020						Drilling Method: HSA/NW Drive							Core Barrel: NQ-2.0 in. ID																
Boring Location: Sta. 217+00.3, 0.8 RT						Casing ID/OD: NW-3.0 in. ID							Water Level*: --																
Hammer Efficiency Factor: 0.867						Hammer Type:																							
						Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/>																							
Definitions: D = Split Spoon Sample MD = Unsuccessful Split Spoon Sample Attempt U = Thin Wall Tube Sample MU = Unsuccessful Thin Wall Tube Sample Attempt V = Field Vane Shear Test, PP = Pocket Penetrometer MV = Unsuccessful Field Vane Shear Test Attempt						R = Rock Core Sample SSA = Solid Stem Auger HSA = Hollow Stem Auger RC = Roller Cone WOH = Weight of 140 lb. Hammer WOR/C = Weight of Rods or Casing WO1P = Weight of One Person						Su = Peak/Remolded Field Vane Undrained Shear Strength (psf) Su(lab) = Lab Vane Undrained Shear Strength (psf) qp = Unconfined Compressive Strength (ksf) N-uncorrected = Raw Field SPT N-value Hammer Efficiency Factor = Rig Specific Annual Calibration Value N60 = SPT N-unorrected Corrected for Hammer Efficiency N60 = (Hammer Efficiency Factor/60%)*N-uncorrected						Tv = Pocket Torvane Shear Strength (psf) WC = Water Content, percent LL = Liquid Limit PL = Plastic Limit PI = Plasticity Index G = Grain Size Analysis C = Consolidation Test											
Sample Information																													
Depth (ft.)		Sample No.		Pen./Rec. (in.)		Sample Depth (ft.)		Blows (/6 in.) Shear Strength (psf) or RQD (%)		N-uncorrected		N60		Casing Blows		Elevation (ft.)		Graphic Log		Visual Description and Remarks								Laboratory Testing Results/AASHTO and Unified Class.	
25														NO CORE		160.8				Rock Quality=Fair Recovery=93% -BREWER FORMATION- R2 Core Times (min:sec): 21.0-22.0' (1:24); 22.0-23.0' (1:24); 23.0-24.0' (1:19); 24.0-25.0' (1:24); 25.0-26.0' (1:36) R3: Grey to greenish-grey, fine to medium grained, METASANDSTONE, hard, fresh. Single steep to vertical joint, undulating, rough, open (approximately 29.2 to 31.0 ft). Frequent calcite veins (0.05 to 0.125-in. thick). Rock Quality=Fair Recovery=98% -BREWER FORMATION- R3 Core Times (min:sec): 26.0-27.0' (1:29); 27.0-28.0' (1:23); 28.0-29.0' (1:19); 29.0-30.0' (1:10); 30.0-31.0' (1:24) R4: Similar to R3, except joints steep to low angle, moderately close to close, highly fractured zone from 32.0 to 33.0 ft, slightly weathered. Rock Quality=Poor Recovery=100% -BREWER FORMATION- R4 Core Times (min:sec): 31.0-32.0' (1:29); 32.0-33.0' (1:51); 33.0-34.0' (1:29); 34.0-35.0' (1:33); 35.0-36.0' (1:20)									
30		R3		60/59		26.0 - 31.0		RQD = 63%																					
35																													
40																													
45																													
50																													
Remarks:																													
Stratification lines represent approximate boundaries between soil types; transitions may be gradual.																				Page 2 of 2									
* 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.																				Boring No.: HB-BE-232									

ROCK CORE PHOTOGRAPHS
I-395/ROUTE 9 CONNECTOR
MAINEDOT WIN 018915.00
BREWER/EDDINGTON, MAINE



- Top Row:** BB-ECR-101, Run No. R1 14.0 (left) to 16.5 (middle), Run No. R2 16.5 (middle) to 19.9 (right)
- Top Middle Row:** BB-ECR-101, Run No. R2 continued 16.5 (left) to 19.9 (middle-left), Run No. R3 19.9 (middle-left) to 22.5 (middle-right), Run No. R4 22.5 (middle-right) to 24.3 (right)
- Bottom Middle Row:** HB-BE-144, Run No. R1 9.1 (left) to 10.6 (middle), Run No. R2 10.6 (middle) to 14.1 (right)
- Bottom Row:** BB-ELAR-101, Run No. R5 11.6 (middle-right) to 15.5 (right)

ROCK CORE PHOTOGRAPHS
I-395/ROUTE 9 CONNECTOR
MAINEDOT WIN 018915.00
BREWER/EDDINGTON, MAINE



- Top Row:** BB-ECR-102, Run No. R1 14.0 (left) to 16.8 (middle-left), Run No. R2 16.8 (middle-left) to 18.0 (middle-right),
Run No. R3 18.0 (middle-right) to 18.8 (right)
- Top Middle Row:** BB-ECR-102, Run No. R4 18.8 (left) to 20.1 (middle-left), Run No. R5 20.1 (middle-left) to 21.5 (middle-right),
Run No. R6 21.5 (middle-right) to 26.5 (right)
- Bottom Middle Row:** BB-ECR-102, Run No. R6 continued 21.5 (left) to 26.5 (middle), Run No. R7 26.5 (middle) to 28.4 (right)
- Bottom Row:** HB-BE-148, Run No. R1 17.8 (left) to 22.8 (right)

ROCK CORE PHOTOGRAPHS
I-395/ROUTE 9 CONNECTOR
MAINEDOT WIN 018915.00
BREWER/EDDINGTON, MAINE



Top Row: BB-ECR-201, Run No. R1 17.0 (left) to 22.3 (right)

Top Middle Row: BB-ECR-201, Run No. R1 continued 17.0 (left) to 22.3 (middle), Run No. R2 22.3 (middle) to 27.3 (right)

Bottom Middle Row: BB-ECR-201, Run No. R2 continued 22.3 (left) to 27.3 (middle), Run No. R3 27.3 (middle) to 32.2 (right)

Bottom Row: BB-ECR-201, Run No. R3 continued 27.3 (left) to 32.2 (middle), Run No. R4 32.2 (middle) to 37.2 (page2)

**ROCK CORE PHOTOGRAPHS
I-395/ROUTE 9 CONNECTOR
MAINEDOT WIN 018915.00
BREWER/EDDINGTON, MAINE**



Top Row: BB-ECR-201, Run No. R4 continued 32.2 (page1) to 37.2 (middle), Run No. R5 37.2 (middle) to 40.1 (right)

Top Middle Row: BB-ECR-201, Run No. R6 40.1 (left) to 42.1 (right)

Bottom Middle Row: BB-ELER-204, Run No. R1 9.9 (left) to 14.9 (right)

Bottom Row: HB-BE-235, Run No. R1 15.0 (left) to 17.0 (middle left), Run No. R2 17.0 (middle-left) to 18.5 (middle-right), Run No. R3 18.5 (middle-right) to 21.8 (right)

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I-395/ROUTE 9 CONNECTOR
MAINEDOT WIN 018915.00
BREWER/EDDINGTON, MAINE



Top Row: BB-ECR-202, Run No. R1 15.0 (left) to 20.0 (right)
Top Middle Row: BB-ECR-202, Run No. R2 20.0 (left) to 23.4 (middle), Run No. R3 23.4 (middle) to 25.6 (right)
Bottom Middle Row: BB-ECR-202, Run No. R4 25.6 (left) to 28.0 (middle), Run No. R5 28.0 (middle) to 30.0 (right)

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I-395/ROUTE 9 CONNECTOR
MAINEDOT WIN 018915.00
BREWER/EDDINGTON, MAINE



Top Row: BB-ECR-203A, Run No. R1 15.4 (left) to 17.9 (middle left), Run No. R2 17.9 (middle left) to 20.4 (middle right),
Run No. R3 20.4 (middle right) to 23.5 (right),

Middle Row: BB-ECR-203A, Run No. R3 continued 20.4 (left) to 23.5 (middle right), Run No. R4 23.5 (middle) to 25.5 (right)

Bottom Row: BB-ECR-203A, Run No. R4 23.5 (left) to 25.5 (middle left), Run No. R5 25.5 (middle left) to 30.5 (page 5)

ROCK CORE PHOTOGRAPHS
I-395/ROUTE 9 CONNECTOR
MAINEDOT WIN 018915.00
BREWER/EDDINGTON, MAINE



Top Row: BB-ECR-203A, Run No. R5 continued 25.5 (page 4) to 30.5 (middle), Run No. R6 30.5 (middle) to 34.6 (right)
Middle Row: BB-ECR-203A, Run No. R6 continued 30.5 (left) to 34.6 (middle left), Run No. R7 34.6 (middle left) to 39.6 (right)
Bottom Row: BB-ECR-203A, Run No. R8 39.6 (left) to 40.4 (right)

ROCK CORE PHOTOGRAPHS
I-395/ROUTE 9 CONNECTOR
MAINEDOT WIN 018915.00
BREWER/EDDINGTON, MAINE



Top Row: BB-ECR-204A, Run No. R1 15.0 (left) to 20.0 (middle left), Run No. R2 20.0 (middle left) to 21.4 (middle right),
Run No. R3 21.1 (middle right) to 25.0 (right)

Middle Row: BB-ECR-204A, Run No. R3 continued 21.1 (left) to 25.0 (middle), Run No. R4 25.0 (middle) to 29.1 (right)

Bottom Row: BB-ECR-204A, Run No. R5 29.1 (left) to 33.5 (right)

ROCK CORE PHOTOGRAPHS
I-395/ROUTE 9 CONNECTOR
MAINEDOT WIN 018915.00
BREWER/EDDINGTON, MAINE



Top Row: BB-ECR-204A, Run No. R6 33.5 (left) to 36.0 (middle), Run No. R7 36.0 (middle) to 40.5 (right)

Middle Row: BB-ECR-204A, Run No. R7 continued 36.0 (left) to 40.5 (right)

Bottom Row: BB-ECR-204A, Run No. R8 40.5 (left) to 45.5 (right)

ROCK CORE PHOTOGRAPHS
I-395/ROUTE 9 CONNECTOR
MAINEDOT WIN 018915.00
BREWER/EDDINGTON, MAINE



Top Row: BB-ECR-205, Run No. R1 15.0 (left) to 17.0 (middle-left), Run No. R2 17.0 (middle-left) to 20.0 (right)

Top Middle Row: BB-ECR-205, Run No. R3 20.0 (left) to 21.3 (middle-left), Run No. R4 21.3 (middle-left) to 22.1 (middle-right), Run No. R5 22.1 (middle-right) to 23.1 (right)

Bottom Middle Row: BB-ECR-205, Run No. R6 23.1 (left) to 25.0 (middle-left), Run No. R7 25.0 (middle-left) to 30.0 (right)

Bottom Row: BB-ECR-205, Run No. R7 continued 25.0 (left) to 30.0 (middle-left), Run No. R8 30.0 (middle-left) to 35.0 (right)

**ROCK CORE PHOTOGRAPHS
I-395/ROUTE 9 CONNECTOR
MAINEDOT WIN 018915.00
BREWER/EDDINGTON, MAINE**



Top Row: BB-ECR-206, Run No. R1 12.0 (left) to 14.1 (middle), Run No. R2 14.1 (middle) to 16.1 (right)
Top Middle Row: BB-ECR-203, Run No. R1 15.0 (left) to 17.5 (middle), Run No. R2 17.5 (middle) to 20.0 (right)
Bottom Middle Row: BB-ELER-206, Run No. R1 11.0 (left) to 13.6 (middle), Run No. R2 13.6 (middle) to 16.0 (right)
Bottom Row: BB-ELER-203, Run No. R1 15.3 (left) to 20.3 (right)

**ROCK CORE PHOTOGRAPHS
I-395/ROUTE 9 CONNECTOR
MAINEDOT WIN 018915.00
BREWER/EDDINGTON, MAINE**



Top Row: BB-ECR-206A, Run No. R4 38.2 (left) to 43.2 (right)
Middle Row: BB-ECR-206A, Run No. R5 43.2 (left) to 47.5 (middle), Run No. R6 47.5 (middle) to 50.3 (right)
Bottom Row: BB-ECR-206A, Run No. R6 continued 47.5 (left) to 50.3 (right)

ROCK CORE PHOTOGRAPHS
I-395/ROUTE 9 CONNECTOR
MAINEDOT WIN 018915.00
BREWER/EDDINGTON, MAINE



Top Row: HB-BE-231, Run No. R1 13.0 (left) to 16.0 (middle), Run No. R2 16.0 (middle) to 19.3 (right)

Top Middle Row: HB-BE-231, Run No. R3 19.3 (left) to 23.3 (right)

Bottom Middle Row: HB-BE-231, Run No. R4 23.3 (left) to 27.3 (right)

Bottom Row: HB-BE-231, Run No. R5 27.3 (left) to 31.3 (right)

ROCK CORE PHOTOGRAPHS
I-395/ROUTE 9 CONNECTOR
MAINEDOT WIN 018915.00
BREWER/EDDINGTON, MAINE



Top Row: HB-BE-231, Run No. R6 33.3 (left) to 38.3 (right)
Top Middle Row: BB-ECR-204, Run No. R1 7.0 (left) to 12.0 (right)

**ROCK CORE PHOTOGRAPHS
I-395/ROUTE 9 CONNECTOR
MAINEDOT WIN 018915.00
BREWER/EDDINGTON, MAINE**



Top Row: HB-BE-232, Run No. R1 16.0 (left) to 21.0 (right)
Top Middle Row: HB-BE-232, Run No. R2 21.0 (left) to 26.0 (right)
Bottom Middle Row: HB-BE-232, Run No. R3 26.0 (left) to 31.0 (right)
Bottom Row: HB-BE-232, Run No. R4 31.0 (left) to 36.0 (right)

APPENDIX B

Borehole Geophysical Logging Reports

**BOREHOLE GEOPHYSICAL LOGGING - DATA REPORT
BOREHOLES BB-ECR-202, BB-ECR-205, BB-ELER-202,
BB-ELER-205, HB-BE-231, HB-BE-232, HB-BE-236
BREWER-EDDINGTON I-395/ROUTE 9 CONNECTOR
EDDINGTON, MAINE**

Prepared for:

Haley & Aldrich, Inc.
75 Washington Avenue | Suite 1A
Portland, Maine 04101

Prepared by:

Hager-Richter Geoscience, Inc.
8 Industrial Way - D10
Salem, New Hampshire 03079

File 20RG77
January 2021

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




Tadpole	Structure Category (Symbol Color)	Description
	Fracture Rank 1 (Light Blue)	Minor Fracture - not distinct and may not be continuous around the borehole
	Fracture Rank 2 (Blue)	Intermediate Fracture - distinct and continuous around the borehole with little or no apparent aperture
	Fracture Rank 3 (Light Green)	Intermediate Fracture - distinct and continuous around the borehole with some apparent aperture
	Fracture Rank 4 (Red)	Major Fracture - distinct with continuous apparent aperture around the borehole
	Foliation or Vein (Orange)	Planar geologic feature interpreted as foliation or a vein

Figure 1. Key to bedrock structure categories.

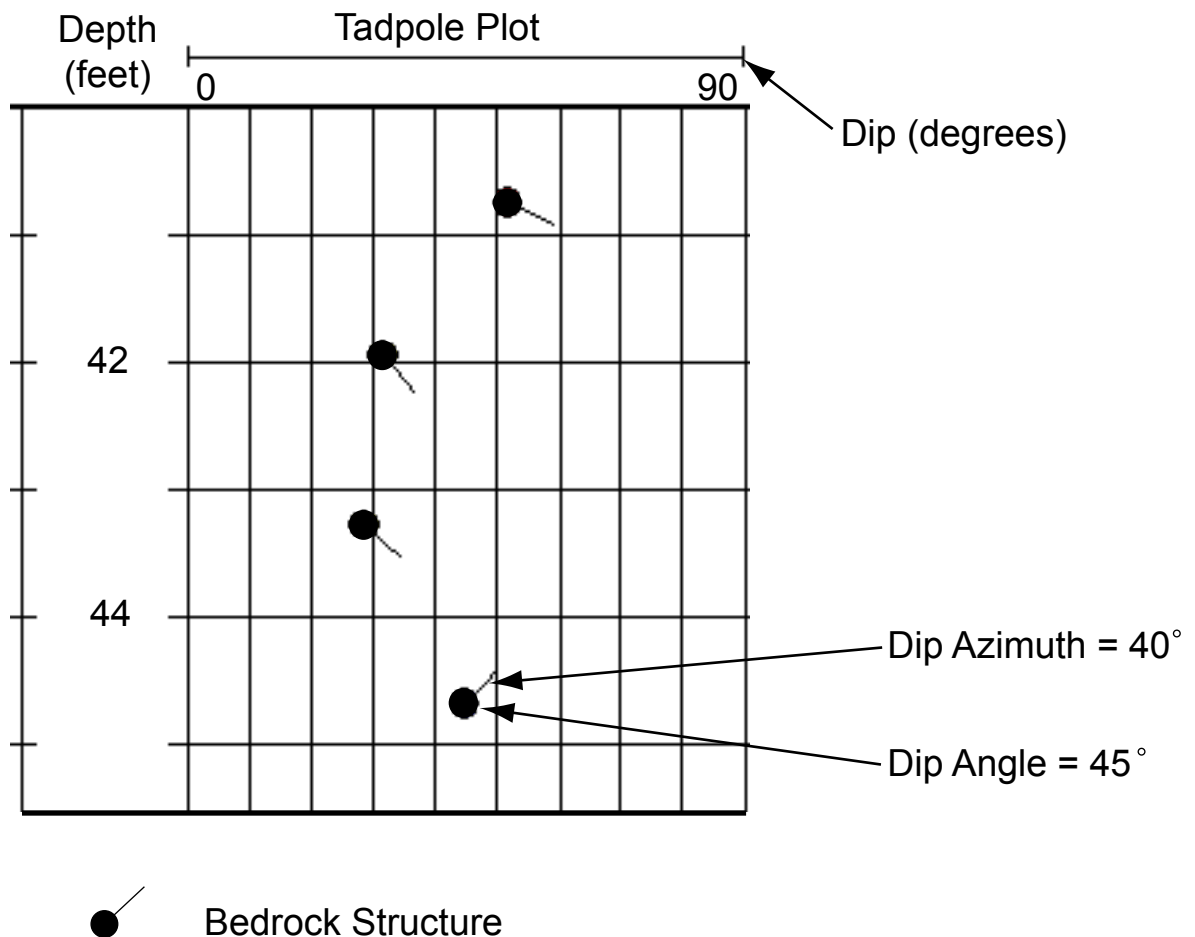


Figure 2. Tadpole plot explanation. The orientation of the bedrock structures is graphically displayed by a tadpole consisting of a circle, the head, and a line, the tail. The position of the head, left to right on the tadpole plot, gives the dip angle of the structure. The left side of the track indicates a dip angle of 0°, and the right side of the track indicates a dip angle of 90° from horizontal. The orientation of the tail gives the dip azimuth of the structure and can be read like a compass. The tail pointing directly up is 0°, north.

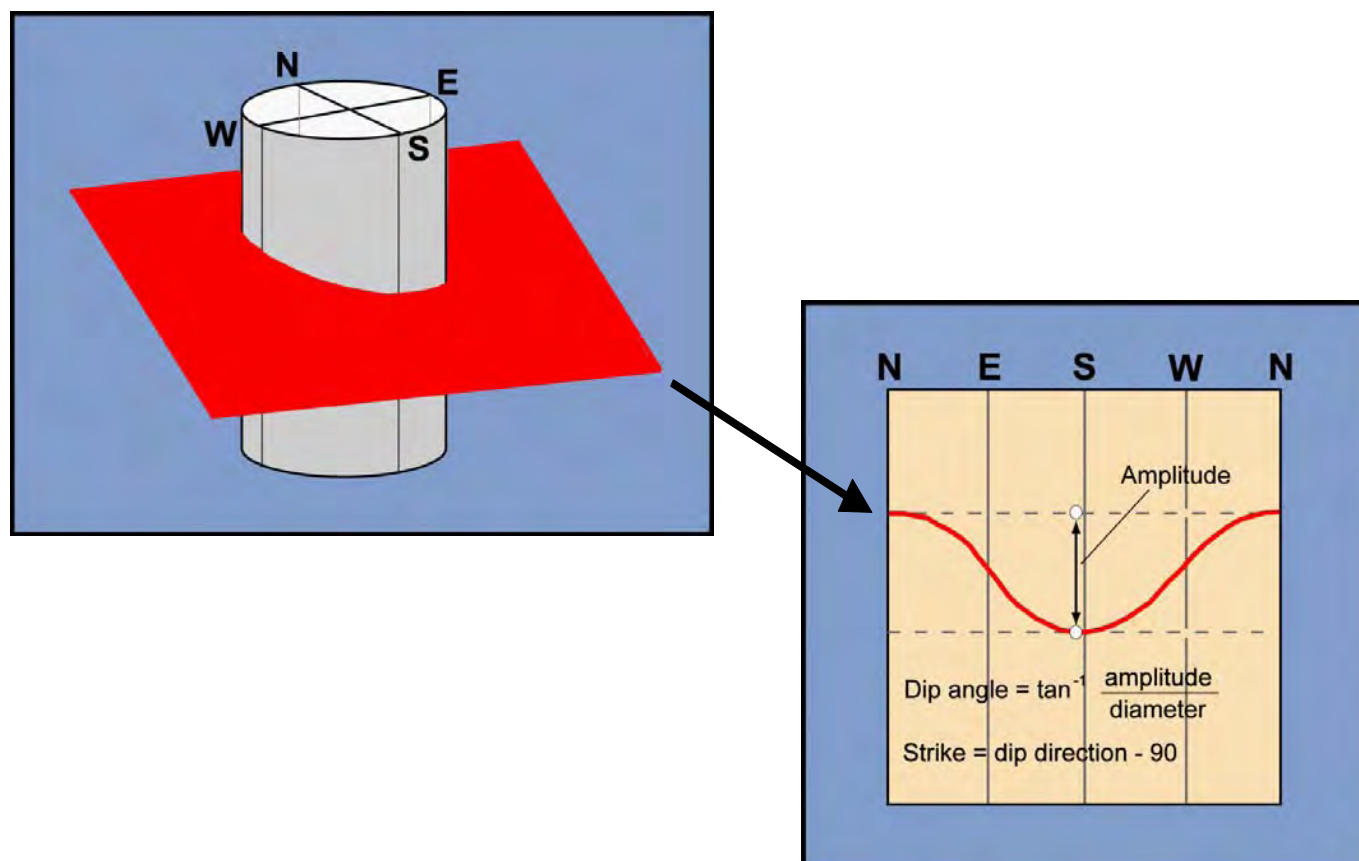


Figure 3. Televiewer Explanation Figure. The image on the left depicts a planar structure in red, such as a fracture or bedding plane, intersected by a borehole. The image on the right depicts the same structure unwrapped as it would be displayed in an optical televiewer (OTV) or acoustic televiewer (ATV) log.

Figure modified from: Garfield, R.L., Day-Lewis, F.D., Gray, M.B., Johnson, C.D., Williams, J.H. and Day-Lewis, A.D.F., 2003, Fractured-Rock Aquifer Characterization within a Regional Geologic Context: Results from the Bucknell University Hydrogeophysics Test Site, GSA Northeastern Section, 38th Annual Meeting, Paper No. 25-19.

HAGER-RICHTER GEOSCIENCE, INC.

Salem, New Hampshire
Tel: 603.893.9944

Fords, New Jersey
Tel: 732.661.0555

BB-ECR-202 - BOREHOLE GEOPHYSICAL LOGS

DATE(S) LOGGED: November 24, 2020

CLIENT: Haley & Aldrich, Inc.
PROJECT: Brewer-Eddington I-395/Route 9 Connector
LOCATION: Eddington, Maine
LOGGING GEOPHYSICIST(S): Mikko Aarnio & Justin Covert
PROJECT REP(S) ON-SITE: Dave Dearden

HRGS FILE: 20RG77

LOG DATUM: Ground Surface

ORIENTATION REFERENCE: True North (Magnetic Declination = 15.8° West)

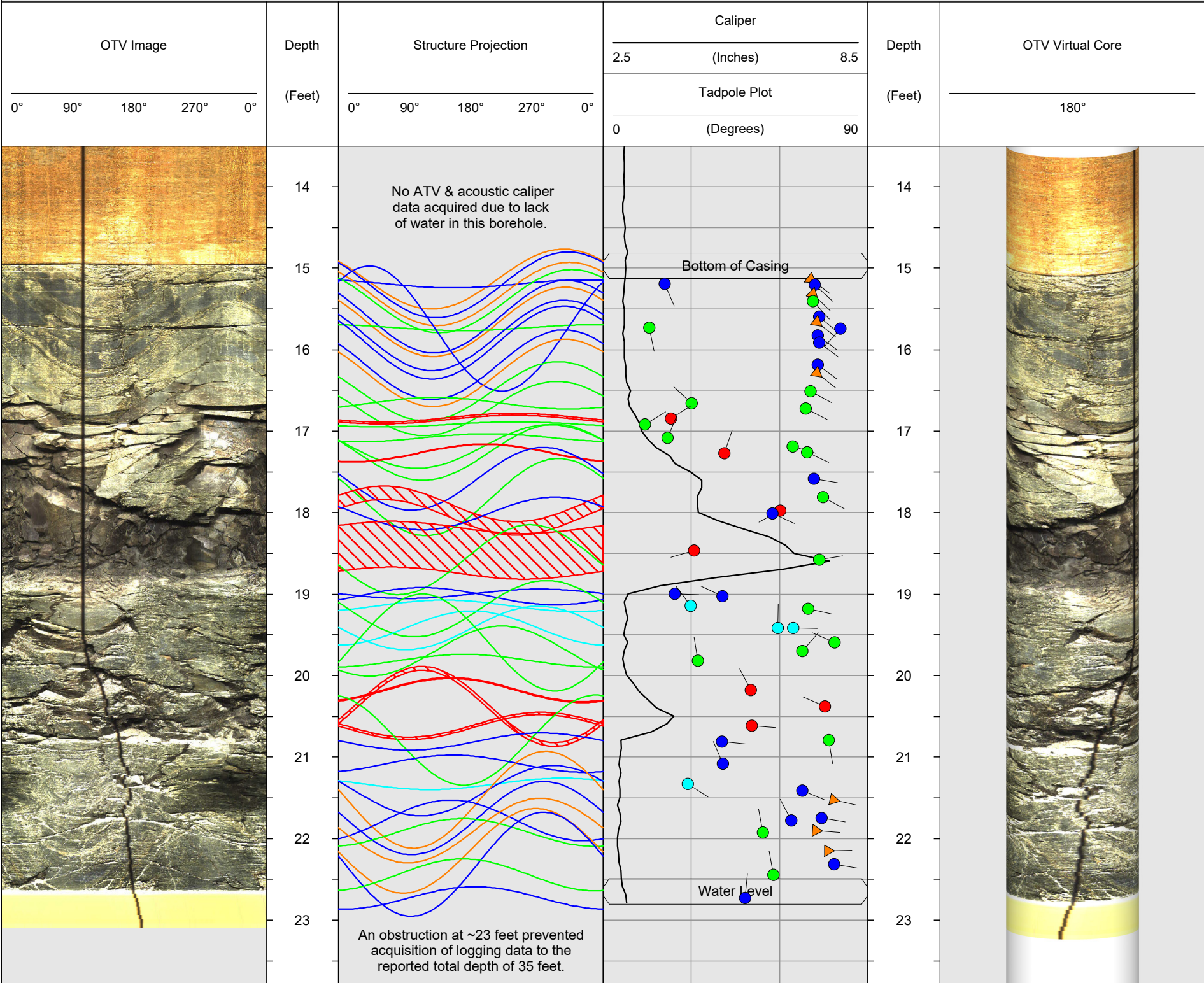
BOREHOLE DIAMETER: 3 Inches

LOGS PROCESSED BY: Robert Garfield P.G. & Nick DeCristofaro

STRUCTURE LEGEND

 Fracture Rank 1
 Fracture Rank 2
 Fracture Rank 3
 Fracture Rank 4
 Foliation / Vein

BB-ECR-202 - Borehole Geophysical Logs



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Fords, New Jersey
Tel: 732.661.0555

BB-ECR-205 - BOREHOLE GEOPHYSICAL LOGS

DATE(S) LOGGED: November 24, 2020

CLIENT: Haley & Aldrich, Inc.

PROJECT: Brewer-Eddington I-395/Route 9 Connector

LOCATION: Eddington, Maine

LOGGING GEOPHYSICIST(S): Mikko Aarnio & Justin Covert

PROJECT REP(S) ON-SITE: Dave Dearden

HRGS FILE: 20RG77

LOG DATUM: Ground Surface

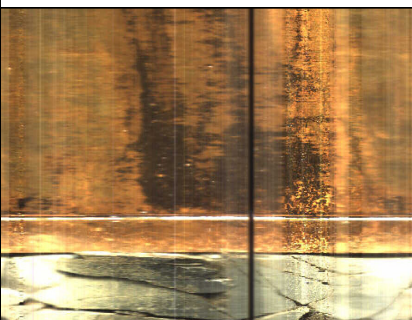
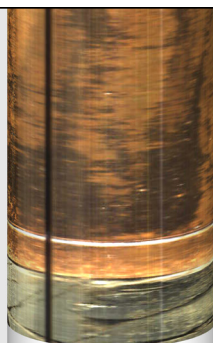
ORIENTATION REFERENCE: Data are Unoriented - See Notes Below

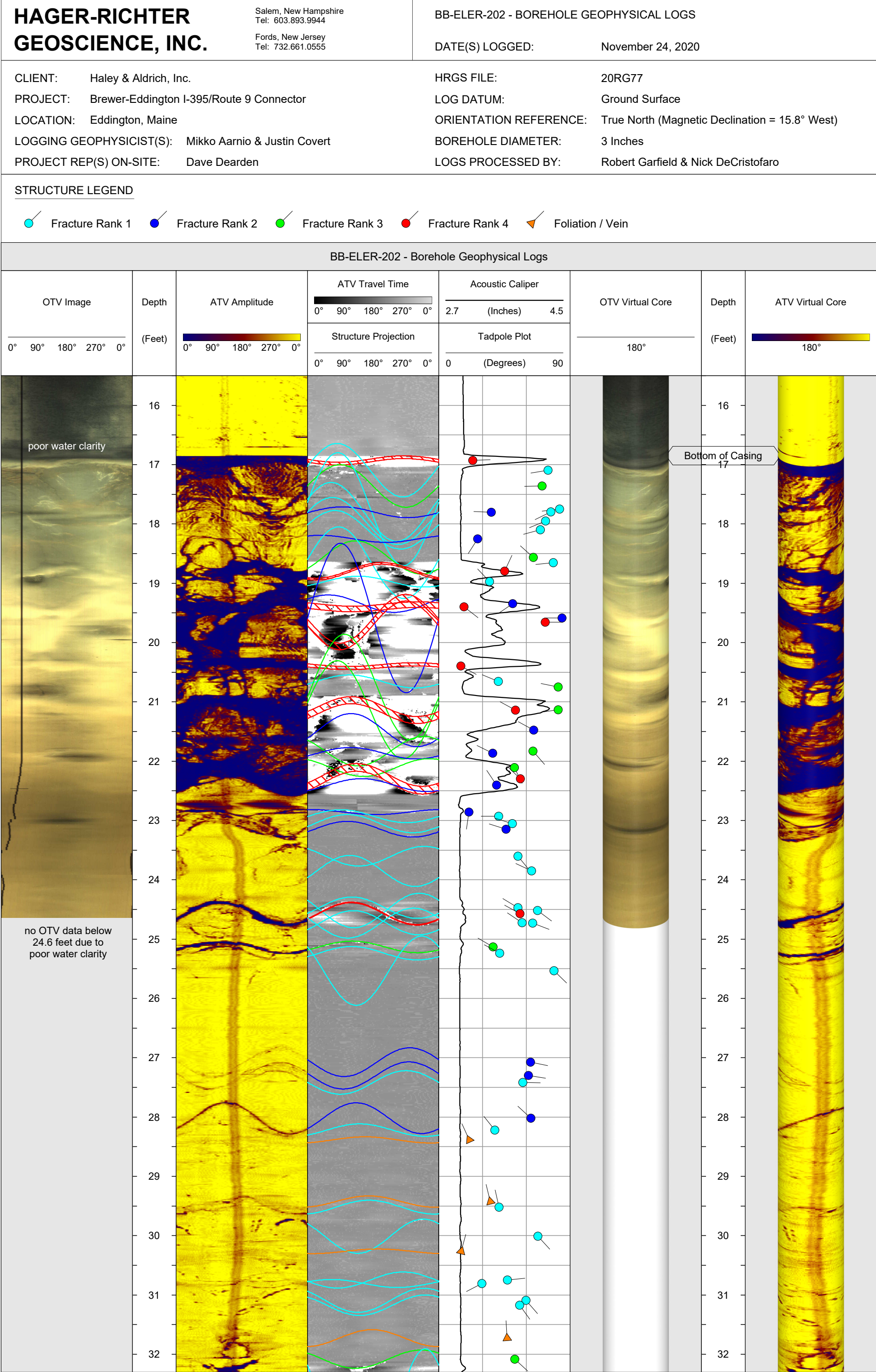
BOREHOLE DIAMETER: 3 Inches

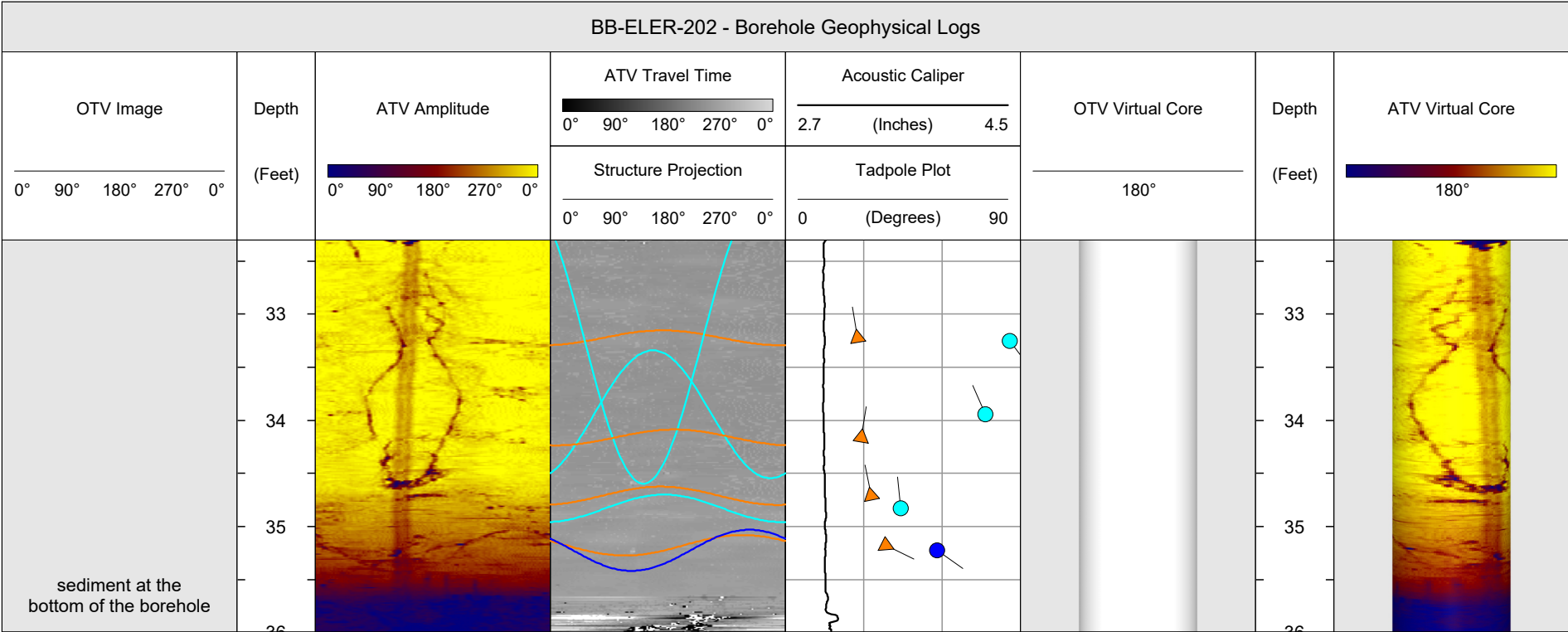
LOGS PROCESSED BY: Robert Garfield P.G. & Nick DeCristofaro

NOTE: The OTV data are unoriented due to magnetic interference from the steel casing throughout the unobstructed open bedrock portion of the borehole.

BB-ECR-205 - Borehole Geophysical Logs

OTV Image	Depth	Comments	Caliper			Depth	OTV Virtual Core
	(Feet)		2.5	(Inches)	7	(Feet)	
	15	A partial obstruction at ~17 feet prevented acquisition of OTV & ATV data; only 3-arm caliper data were acquired below ~17 feet.				15	
	16		Bottom of Casing				
	17					17	
	18					18	
	19					19	
	20					20	
	21					21	
	22					22	
	23					23	
	24					24	
	25					25	
	26					26	
	27					27	
	28					28	
29					29		
		An obstruction at ~30 feet prevented acquisition of 3-arm caliper data to the reported total depth of 35 feet.					





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DATE(S) LOGGED: November 24, 2020

HRGS FILE: 20RG77

LOG DATUM: Ground Surface

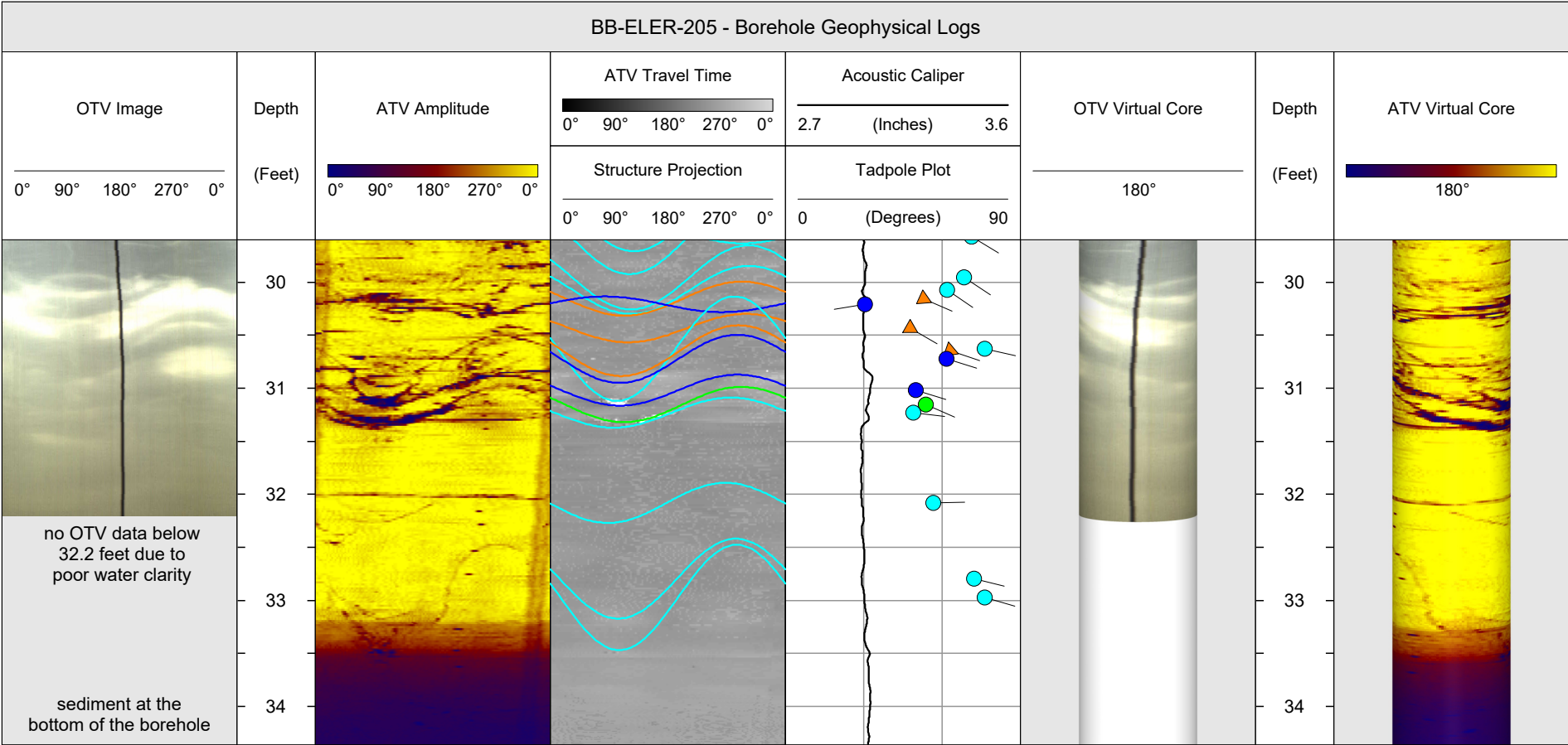
ORIENTATION REFERENCE: True North (Magnetic Declination = 15.8° West)

BOREHOLE DIAMETER: 3 Inches

LOGS PROCESSED BY: Robert Garfield & Nick DeCristofaro

 Fracture Rank 1
 Fracture Rank 2
 Fracture Rank 3
 Fracture Rank 4
 Foliation / Vein

OTV Image	Depth	ATV Amplitude	ATV Travel Time	Acoustic Caliper	OTV Virtual Core	Depth	ATV Virtual Core
0° 90° 180° 270° 0°	(Feet)	0° 90° 180° 270° 0°	0° 90° 180° 270° 0°	2.7 (Inches) 3.6	180°	(Feet)	0° 90° 180° 270° 0°
			Structure Projection	Tadpole Plot			
			0° 90° 180° 270° 0°	0 (Degrees) 90			
<p>poor water clarity</p>	13					13	
	14					14	
	15					15	
	16					16	
	17					17	
	18					18	
	19					19	
	20					20	
	21					21	
	22					22	
	23					23	
	24					24	
	25					25	
	26					26	
						27	
28						28	
29						29	



HAGER-RICHTER GEOSCIENCE, INC.

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Tel: 603.893.9944

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HB-BE-231 - BOREHOLE GEOPHYSICAL LOGS

DATE(S) LOGGED:

November 24, 2020

CLIENT: Haley & Aldrich, Inc.

PROJECT: Brewer-Eddington I-395/Route 9 Connector

LOCATION: Eddington, Maine

LOGGING GEOPHYSICIST(S): Mikko Aarnio & Justin Covert

PROJECT REP(S) ON-SITE: Dave Dearden

HRGS FILE: 20RG77

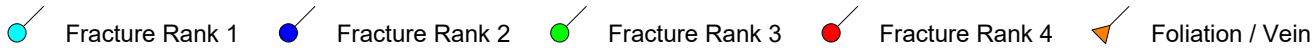
LOG DATUM: Ground Surface

ORIENTATION REFERENCE: True North (Magnetic Declination = 15.8° West)

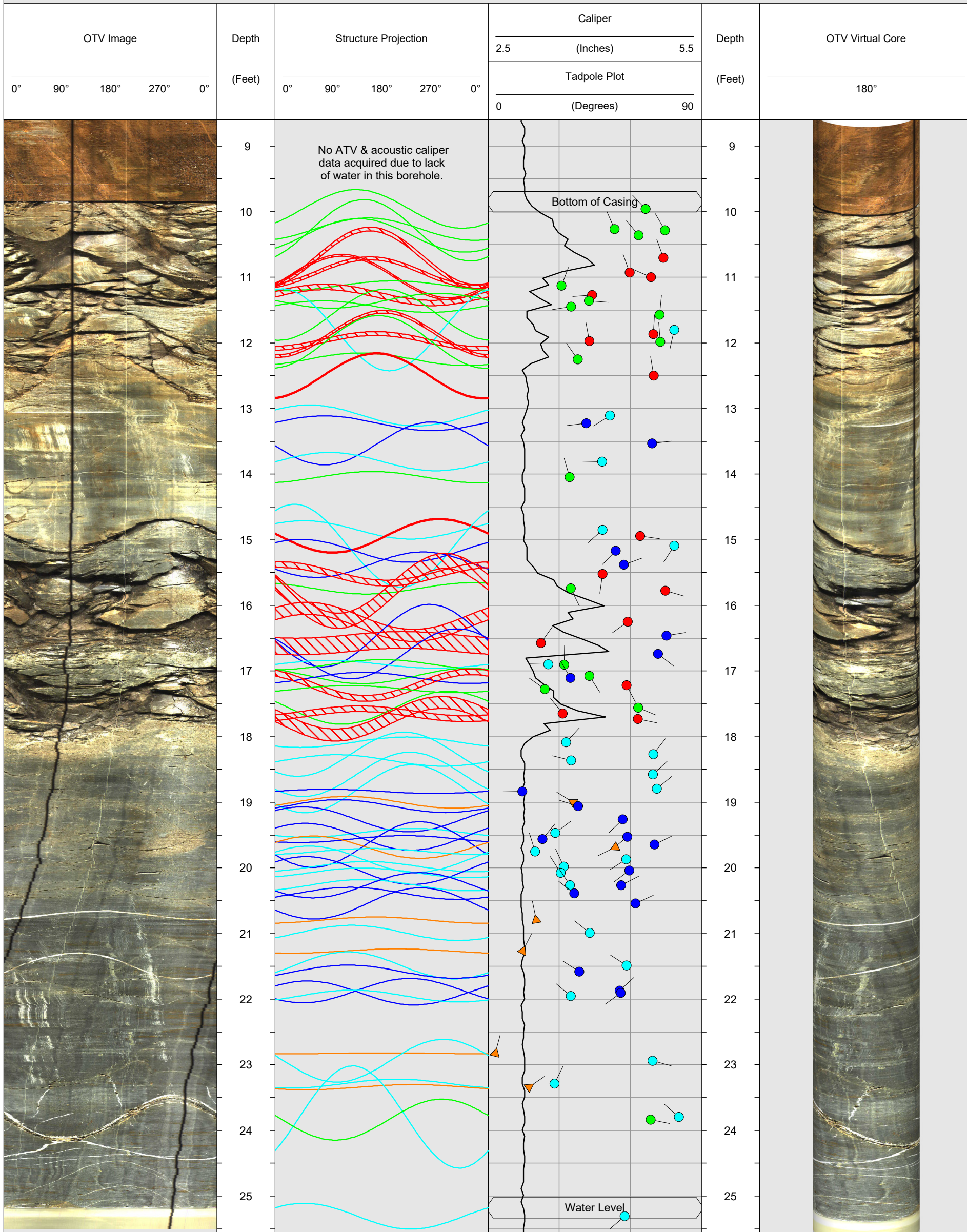
BOREHOLE DIAMETER: 3 Inches

LOGS PROCESSED BY: Robert Garfield P.G. & Nick DeCristofaro

STRUCTURE LEGEND



HB-BE-231 - Borehole Geophysical Logs



HB-BE-231 - Borehole Geophysical Logs									
OTV Image	Depth (Feet)	Structure Projection	Caliper			Depth (Feet)	OTV Virtual Core		
			2.5	(Inches)	5.5		180°		
			Tadpole Plot						
			0	(Degrees)	90				
	26	A partial obstruction at ~27.5 feet prevented acquisition of OTV & ATV data to the reported total depth of 35 feet.				26			
	27					27			
	28					28			
	29					29			
	30					30			
	31					31			
	32					32			
	33					33			
	34					34			

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HB-BE-232 - BOREHOLE GEOPHYSICAL LOGS

DATE(S) LOGGED: November 24, 2020

CLIENT: Haley & Aldrich, Inc.
PROJECT: Brewer-Eddington I-395/Route 9 Connector
LOCATION: Eddington, Maine
LOGGING GEOPHYSICIST(S): Mikko Aarnio & Justin Covert
PROJECT REP(S) ON-SITE: Dave Dearden

HRGS FILE: 20RG77

LOG DATUM: Ground Surface

ORIENTATION REFERENCE: True North (Magnetic Declination = 15.8° West)

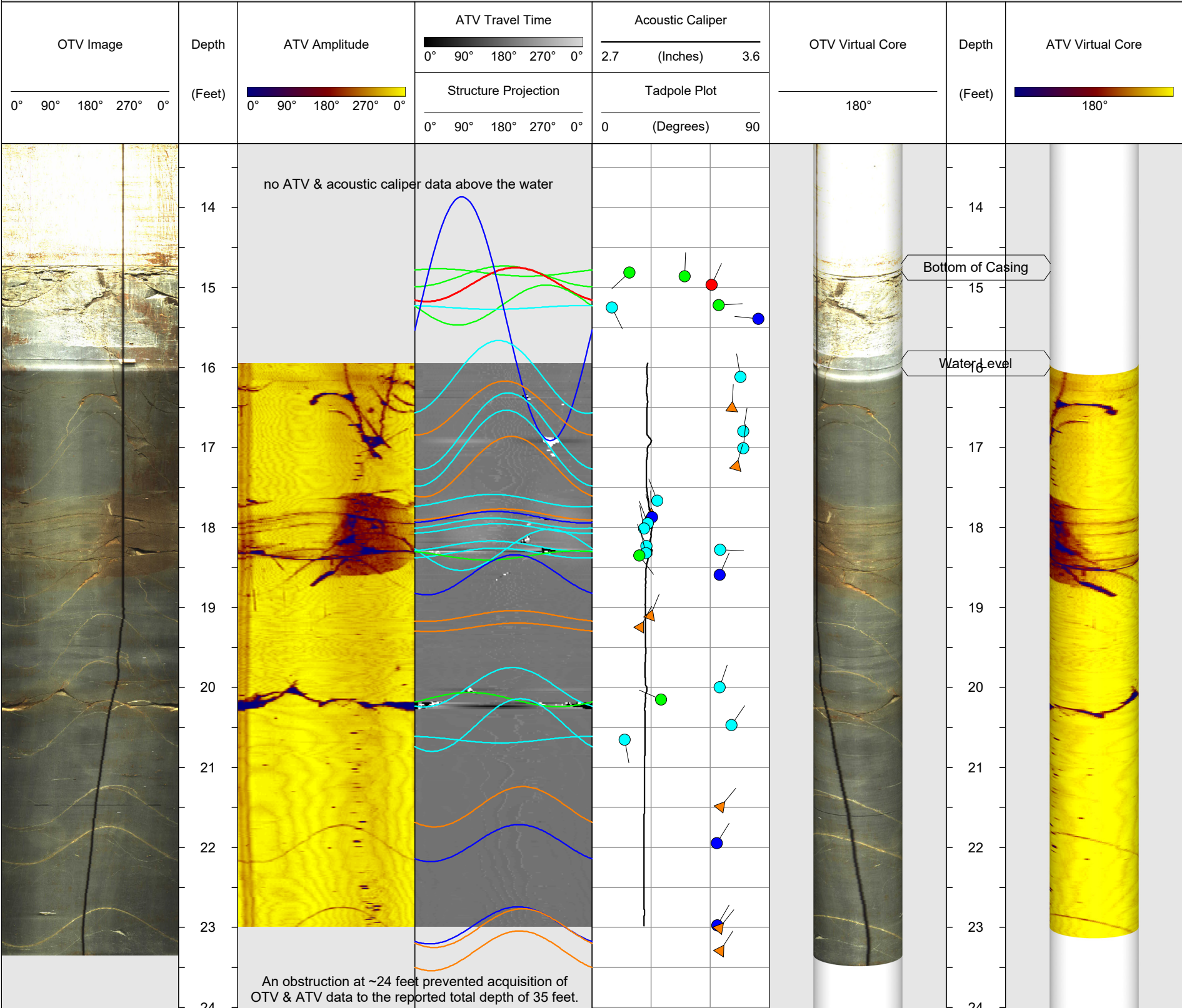
BOREHOLE DIAMETER: 3 Inches

LOGS PROCESSED BY: Robert Garfield & Nick DeCristofaro

STRUCTURE LEGEND

 Fracture Rank 1
 Fracture Rank 2
 Fracture Rank 3
 Fracture Rank 4
 Foliation / Vein

HB-BE-232 - Borehole Geophysical Logs



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Fords, New Jersey
Tel: 732.661.0555

HB-BE-236 - BOREHOLE GEOPHYSICAL LOGS

DATE(S) LOGGED: November 24, 2020

CLIENT: Haley & Aldrich, Inc.
PROJECT: Brewer-Eddington I-395/Route 9 Connector
LOCATION: Eddington, Maine
LOGGING GEOPHYSICIST(S): Mikko Aarnio & Justin Covert
PROJECT REP(S) ON-SITE: Dave Dearden

HRGS FILE: 20RG77

LOG DATUM: Ground Surface

ORIENTATION REFERENCE: True North (Magnetic Declination = 15.8° West)

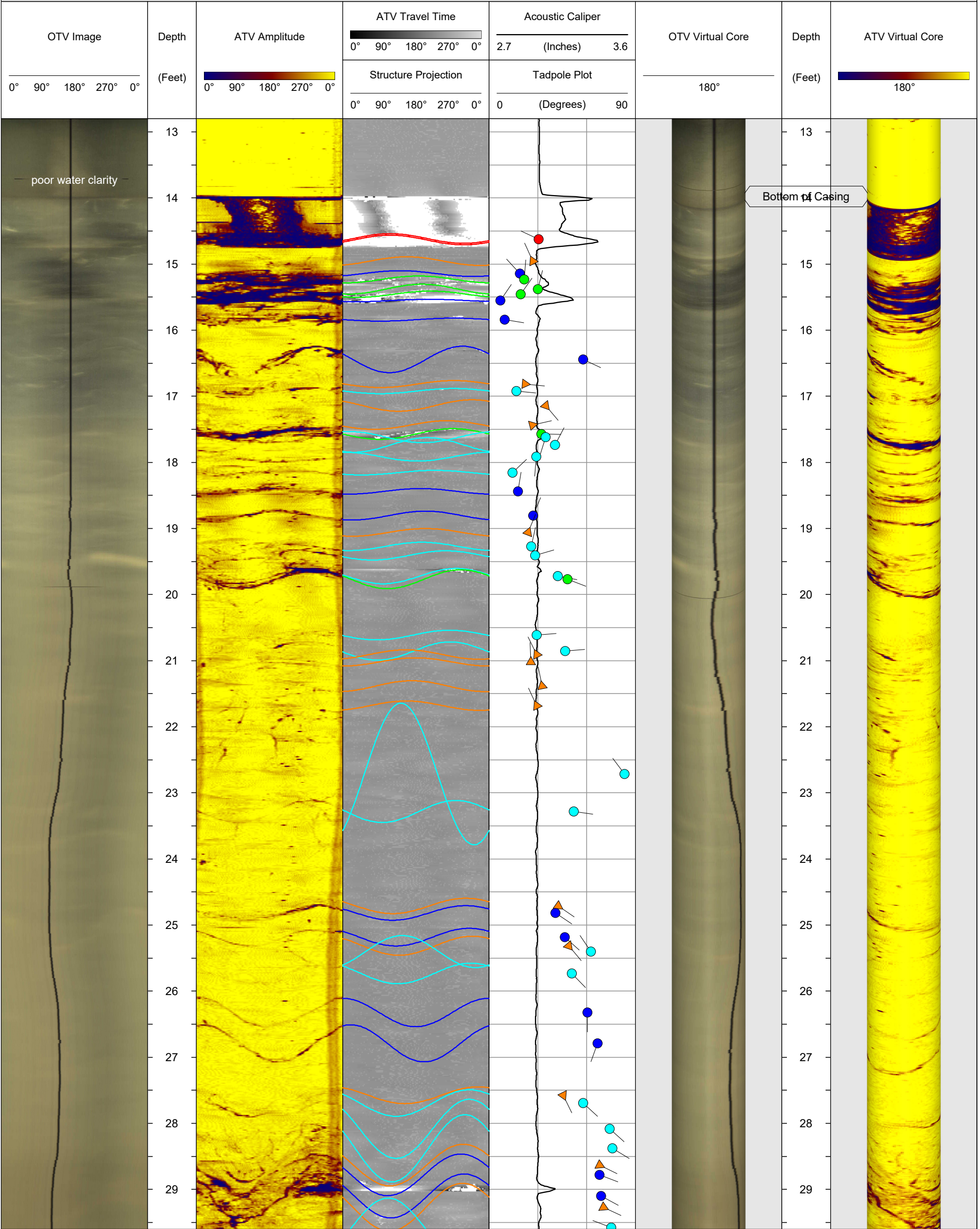
BOREHOLE DIAMETER: 3 Inches

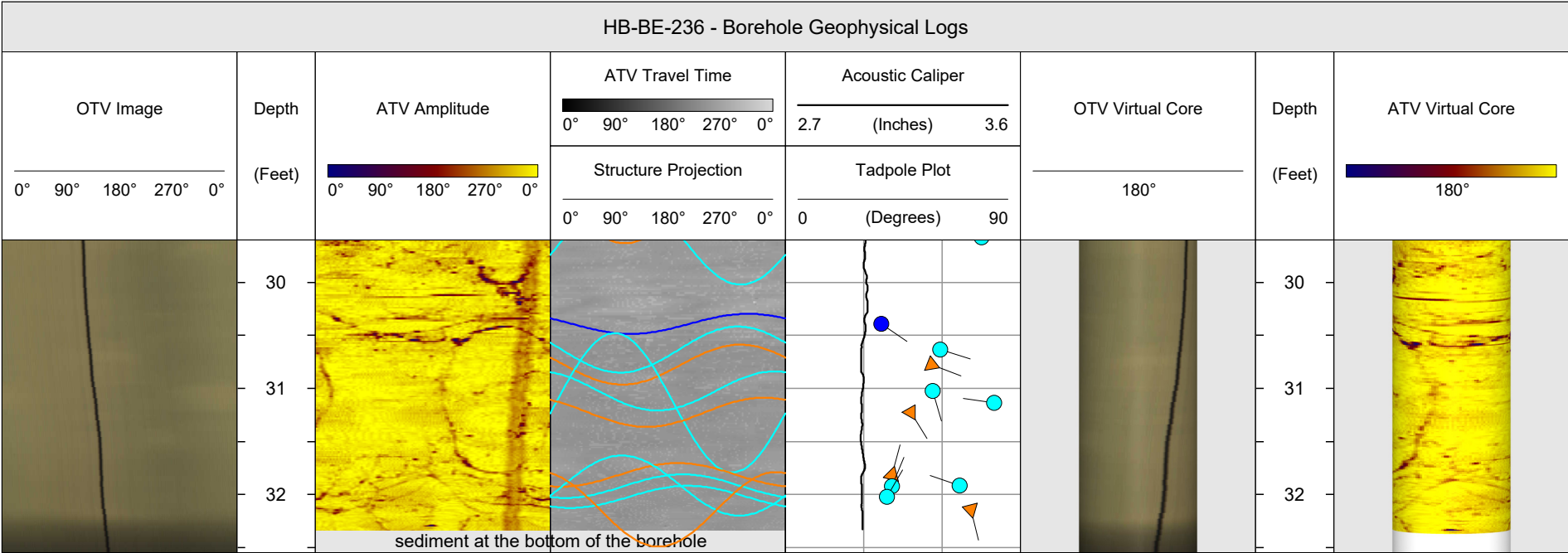
LOGS PROCESSED BY: Robert Garfield & Nick DeCristofaro

STRUCTURE LEGEND

 Fracture Rank 1
 Fracture Rank 2
 Fracture Rank 3
 Fracture Rank 4
 Foliation / Vein

HB-BE-236 - Borehole Geophysical Logs





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ALL BOREHOLES - BEDROCK STRUCTURE STATISTICS PLOTS (BB-ECR-202, BB-ELER-202, BB-ELER-205, HB-BE-231, HB-BE-232, HB-BE-236)

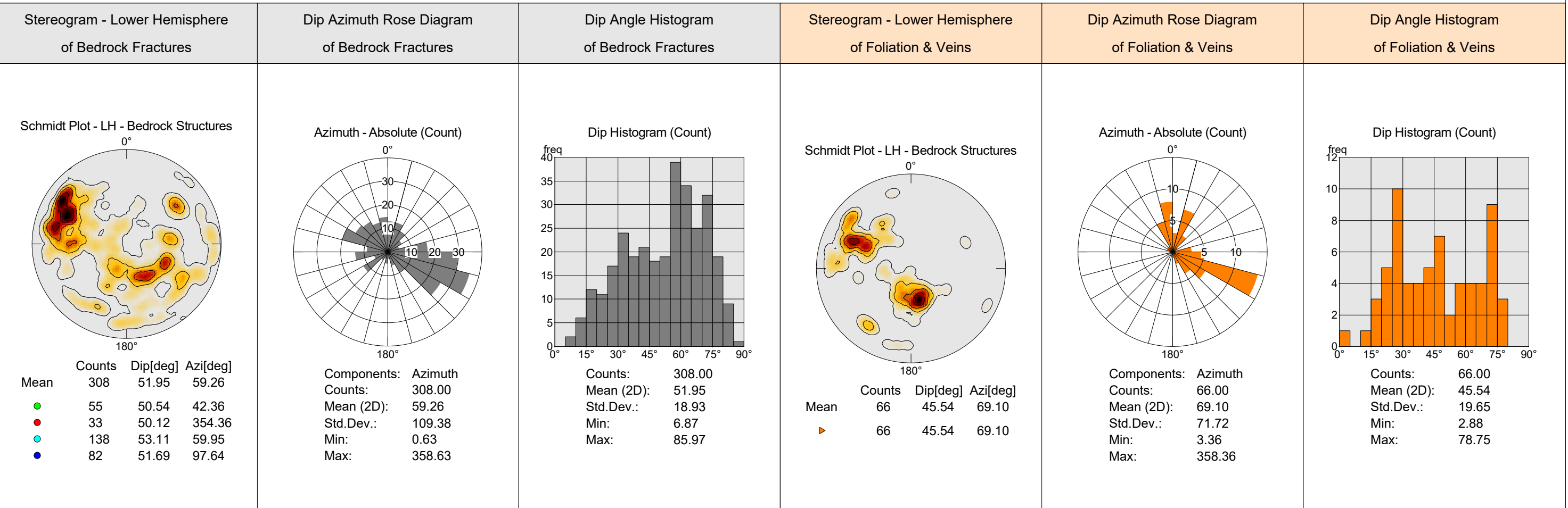
DATE(S) LOGGED: November 24, 2020

CLIENT: Haley & Aldrich, Inc.
PROJECT: Brewer-Eddington I-395/Route 9 Connector
LOCATION: Eddington, Maine

HRGS FILE: 20RG77
ORIENTATION REFERENCE: True North
MAGNETIC DECLINATION: 15.8° West

STRUCTURE LEGEND

● Fracture Rank 1 ● Fracture Rank 2 ● Fracture Rank 3 ● Fracture Rank 4 ▲ Foliation / Vein



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Tel: 732.661.0555

BB-ECR-202 - BEDROCK STRUCTURE STATISTICS PLOTS

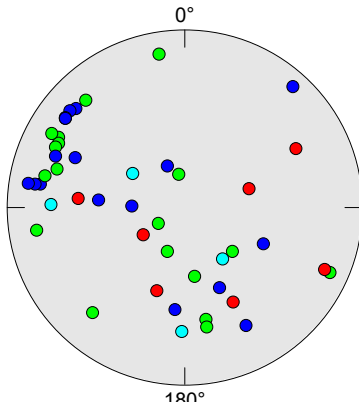
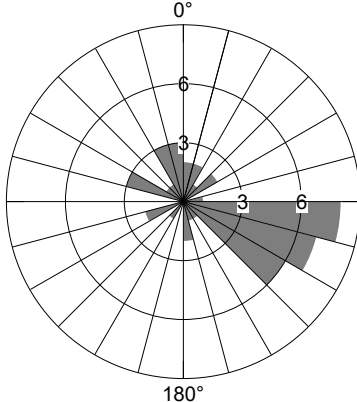
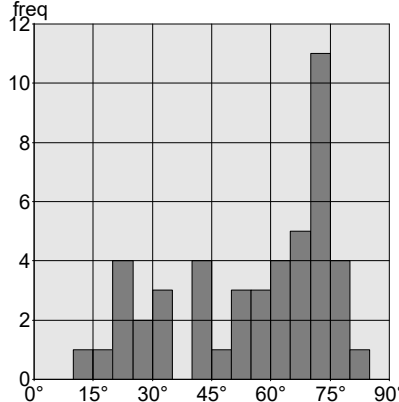
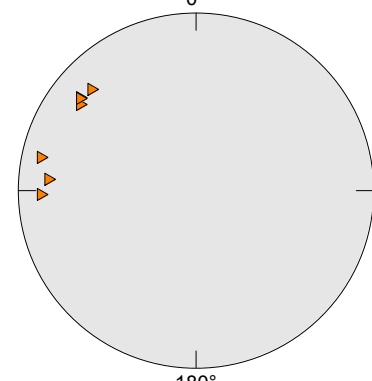
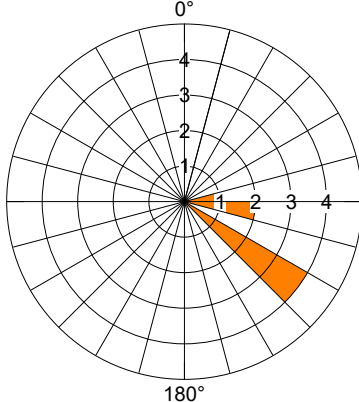
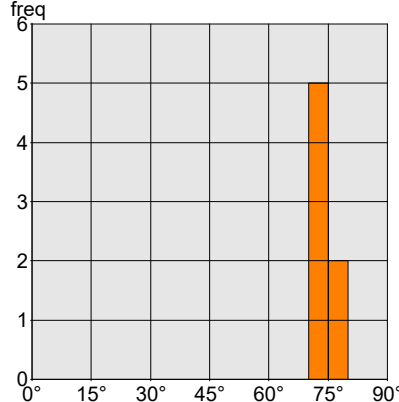
DATE(S) LOGGED: November 24, 2020

CLIENT: Haley & Aldrich, Inc.
PROJECT: Brewer-Eddington I-395/Route 9 Connector
LOCATION: Eddington, Maine

HRGS FILE: 20RG77
ORIENTATION REFERENCE: True North
MAGNETIC DECLINATION: 15.8° West

STRUCTURE LEGEND

Fracture Rank 1 Fracture Rank 2 Fracture Rank 3 Fracture Rank 4 Foliation / Vein

Stereogram - Lower Hemisphere of Bedrock Fractures	Dip Azimuth Rose Diagram of Bedrock Fractures	Dip Angle Histogram of Bedrock Fractures	Stereogram - Lower Hemisphere of Foliation & Veins	Dip Azimuth Rose Diagram of Foliation & Veins	Dip Angle Histogram of Foliation & Veins																																																																																
<div>Schmidt Plot - LH - Bedrock Structures</div>  <table><tr><th></th><th>Counts</th><th>Dip[deg]</th><th>Azi[deg]</th></tr><tr><td>Mean</td><td>47</td><td>55.60</td><td>84.61</td></tr><tr><td>●</td><td>18</td><td>59.98</td><td>108.66</td></tr><tr><td>●</td><td>18</td><td>56.72</td><td>79.66</td></tr><tr><td>●</td><td>7</td><td>47.34</td><td>331.48</td></tr><tr><td>●</td><td>4</td><td>45.66</td><td>45.90</td></tr></table>		Counts	Dip[deg]	Azi[deg]	Mean	47	55.60	84.61	●	18	59.98	108.66	●	18	56.72	79.66	●	7	47.34	331.48	●	4	45.66	45.90	<div>Azimuth - Absolute (Count)</div>  <table><tr><th>Components:</th><th>Azimuth</th></tr><tr><td>Counts:</td><td>47.00</td></tr><tr><td>Mean (2D):</td><td>84.61</td></tr><tr><td>Std.Dev.:</td><td>83.45</td></tr><tr><td>Min:</td><td>1.62</td></tr><tr><td>Max:</td><td>351.36</td></tr></table>	Components:	Azimuth	Counts:	47.00	Mean (2D):	84.61	Std.Dev.:	83.45	Min:	1.62	Max:	351.36	<div>Dip Histogram (Count)</div>  <table><tr><th>Counts:</th><th>47.00</th></tr><tr><th>Mean (2D):</th><th>55.60</th></tr><tr><th>Std.Dev.:</th><th>20.10</th></tr><tr><th>Min:</th><th>14.25</th></tr><tr><th>Max:</th><th>80.69</th></tr></table>	Counts:	47.00	Mean (2D):	55.60	Std.Dev.:	20.10	Min:	14.25	Max:	80.69	<div>Schmidt Plot - LH - Bedrock Structures</div>  <table><tr><th></th><th>Counts</th><th>Dip[deg]</th><th>Azi[deg]</th></tr><tr><td>Mean</td><td>7</td><td>73.44</td><td>114.84</td></tr><tr><td>▲</td><td>7</td><td>73.44</td><td>114.84</td></tr></table>		Counts	Dip[deg]	Azi[deg]	Mean	7	73.44	114.84	▲	7	73.44	114.84	<div>Azimuth - Absolute (Count)</div>  <table><tr><th>Components:</th><th>Azimuth</th></tr><tr><td>Counts:</td><td>7.00</td></tr><tr><td>Mean (2D):</td><td>114.84</td></tr><tr><td>Std.Dev.:</td><td>17.71</td></tr><tr><td>Min:</td><td>88.42</td></tr><tr><td>Max:</td><td>134.16</td></tr></table>	Components:	Azimuth	Counts:	7.00	Mean (2D):	114.84	Std.Dev.:	17.71	Min:	88.42	Max:	134.16	<div>Dip Histogram (Count)</div>  <table><tr><th>Counts:</th><th>7.00</th></tr><tr><th>Mean (2D):</th><th>73.44</th></tr><tr><th>Std.Dev.:</th><th>2.61</th></tr><tr><th>Min:</th><th>70.53</th></tr><tr><th>Max:</th><th>78.28</th></tr></table>	Counts:	7.00	Mean (2D):	73.44	Std.Dev.:	2.61	Min:	70.53	Max:	78.28
	Counts	Dip[deg]	Azi[deg]																																																																																		
Mean	47	55.60	84.61																																																																																		
●	18	59.98	108.66																																																																																		
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●	4	45.66	45.90																																																																																		
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BB-ELER-202 - BEDROCK STRUCTURE STATISTICS PLOTS

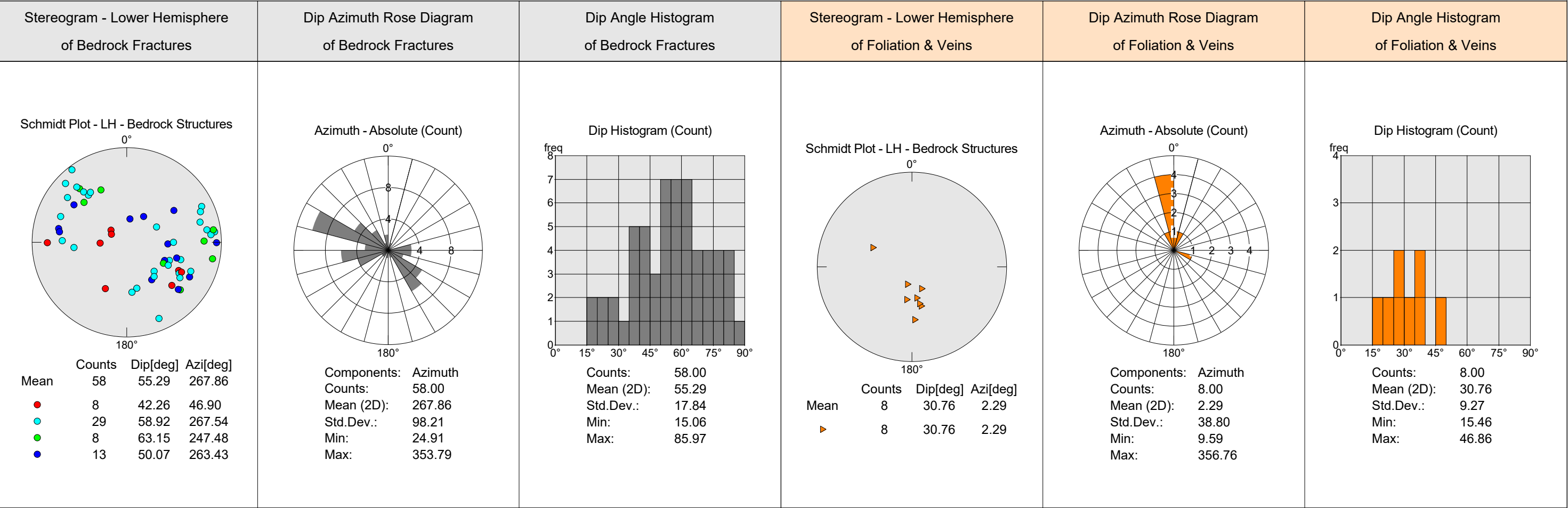
DATE(S) LOGGED: November 24, 2020

CLIENT: Haley & Aldrich, Inc.
PROJECT: Brewer-Eddington I-395/Route 9 Connector
LOCATION: Eddington, Maine

HRGS FILE: 20RG77
ORIENTATION REFERENCE: True North
MAGNETIC DECLINATION: 15.8° West

STRUCTURE LEGEND

● Fracture Rank 1
 ● Fracture Rank 2
 ● Fracture Rank 3
 ● Fracture Rank 4
 ▲ Foliation / Vein



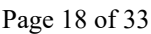
Salem, New Hampshire
Tel: 603.893.9944

Fords, New Jersey
Tel: 732.661.0555

DATE(S) LOGGED: November 24, 2020

HRGS FILE: 20RG77
ORIENTATION REFERENCE: True North
MAGNETIC DECLINATION: 15.8° West

● Fracture Rank 1 ● Fracture Rank 2 ● Fracture Rank 3 ● Fracture Rank 4 ▲ Foliation / Vein



HAGER-RICHTER
GEOSCIENCE, INC.

Salem, New Hampshire
Tel: 603.893.9944

Fords, New Jersey
Tel: 732.661.0555

HB-BE-231 - BEDROCK STRUCTURE STATISTICS PLOTS

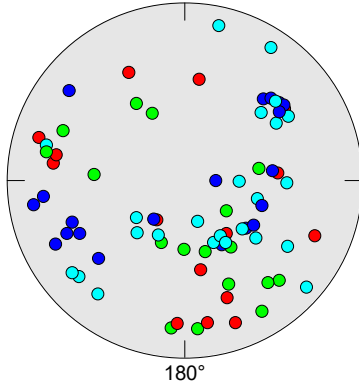
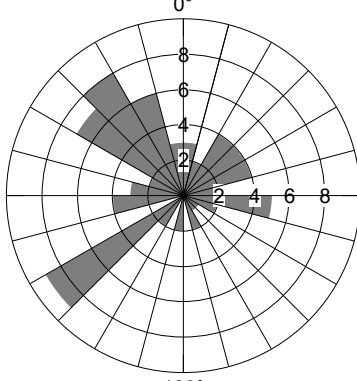
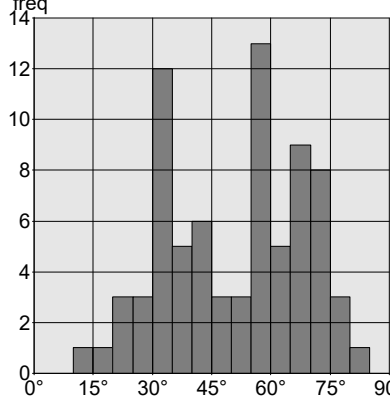
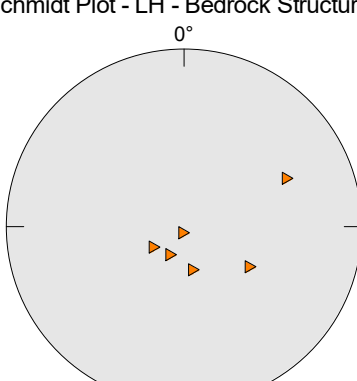
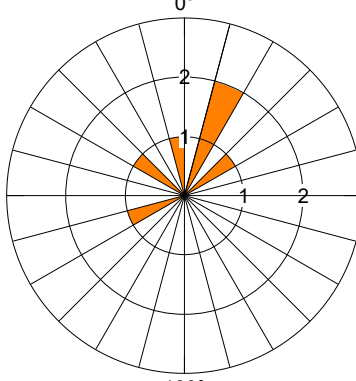
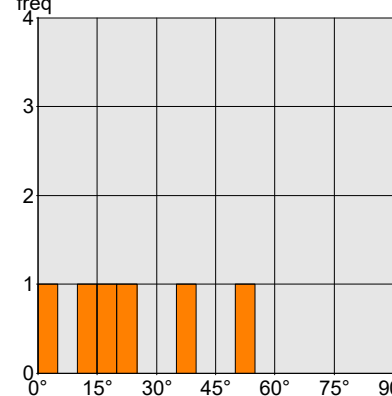
DATE(S) LOGGED: November 24, 2020

CLIENT: Haley & Aldrich, Inc.
PROJECT: Brewer-Eddington I-395/Route 9 Connector
LOCATION: Eddington, Maine

HRGS FILE: 20RG77
ORIENTATION REFERENCE: True North
MAGNETIC DECLINATION: 15.8° West

STRUCTURE LEGEND

Fracture Rank 1 Fracture Rank 2 Fracture Rank 3 Fracture Rank 4 Foliation / Vein

Stereogram - Lower Hemisphere of Bedrock Fractures	Dip Azimuth Rose Diagram of Bedrock Fractures	Dip Angle Histogram of Bedrock Fractures	Stereogram - Lower Hemisphere of Foliation & Veins	Dip Azimuth Rose Diagram of Foliation & Veins	Dip Angle Histogram of Foliation & Veins																																																																																
<div>Schmidt Plot - LH - Bedrock Structures</div>  <table><tr><th></th><th>Counts</th><th>Dip[deg]</th><th>Azi[deg]</th></tr><tr><td>Mean</td><td>76</td><td>51.51</td><td>334.04</td></tr><tr><td>●</td><td>17</td><td>49.90</td><td>354.96</td></tr><tr><td>●</td><td>15</td><td>56.81</td><td>352.58</td></tr><tr><td>●</td><td>24</td><td>49.24</td><td>312.02</td></tr><tr><td>●</td><td>20</td><td>51.55</td><td>327.71</td></tr></table>		Counts	Dip[deg]	Azi[deg]	Mean	76	51.51	334.04	●	17	49.90	354.96	●	15	56.81	352.58	●	24	49.24	312.02	●	20	51.55	327.71	<div>Azimuth - Absolute (Count)</div>  <table><tr><th>Components:</th><th>Azimuth</th></tr><tr><td>Counts:</td><td>76.00</td></tr><tr><td>Mean (2D):</td><td>334.04</td></tr><tr><td>Std.Dev.:</td><td>92.46</td></tr><tr><td>Min:</td><td>0.63</td></tr><tr><td>Max:</td><td>354.96</td></tr></table>	Components:	Azimuth	Counts:	76.00	Mean (2D):	334.04	Std.Dev.:	92.46	Min:	0.63	Max:	354.96	<div>Dip Histogram (Count)</div>  <table><tr><th>Counts:</th><th>76.00</th></tr><tr><th>Mean (2D):</th><th>51.51</th></tr><tr><th>Std.Dev.:</th><th>17.36</th></tr><tr><th>Min:</th><th>14.43</th></tr><tr><th>Max:</th><th>80.43</th></tr></table>	Counts:	76.00	Mean (2D):	51.51	Std.Dev.:	17.36	Min:	14.43	Max:	80.43	<div>Schmidt Plot - LH - Bedrock Structures</div>  <table><tr><th></th><th>Counts</th><th>Dip[deg]</th><th>Azi[deg]</th></tr><tr><td>Mean</td><td>6</td><td>23.93</td><td>353.49</td></tr><tr><td>▶</td><td>6</td><td>23.93</td><td>353.49</td></tr></table>		Counts	Dip[deg]	Azi[deg]	Mean	6	23.93	353.49	▶	6	23.93	353.49	<div>Azimuth - Absolute (Count)</div>  <table><tr><th>Components:</th><th>Azimuth</th></tr><tr><td>Counts:</td><td>6.00</td></tr><tr><td>Mean (2D):</td><td>353.49</td></tr><tr><td>Std.Dev.:</td><td>59.26</td></tr><tr><td>Min:</td><td>15.43</td></tr><tr><td>Max:</td><td>348.91</td></tr></table>	Components:	Azimuth	Counts:	6.00	Mean (2D):	353.49	Std.Dev.:	59.26	Min:	15.43	Max:	348.91	<div>Dip Histogram (Count)</div>  <table><tr><th>Counts:</th><th>6.00</th></tr><tr><th>Mean (2D):</th><th>23.93</th></tr><tr><th>Std.Dev.:</th><th>16.46</th></tr><tr><th>Min:</th><th>2.88</th></tr><tr><th>Max:</th><th>53.74</th></tr></table>	Counts:	6.00	Mean (2D):	23.93	Std.Dev.:	16.46	Min:	2.88	Max:	53.74
	Counts	Dip[deg]	Azi[deg]																																																																																		
Mean	76	51.51	334.04																																																																																		
●	17	49.90	354.96																																																																																		
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HB-BE-232 - BEDROCK STRUCTURE STATISTICS PLOTS

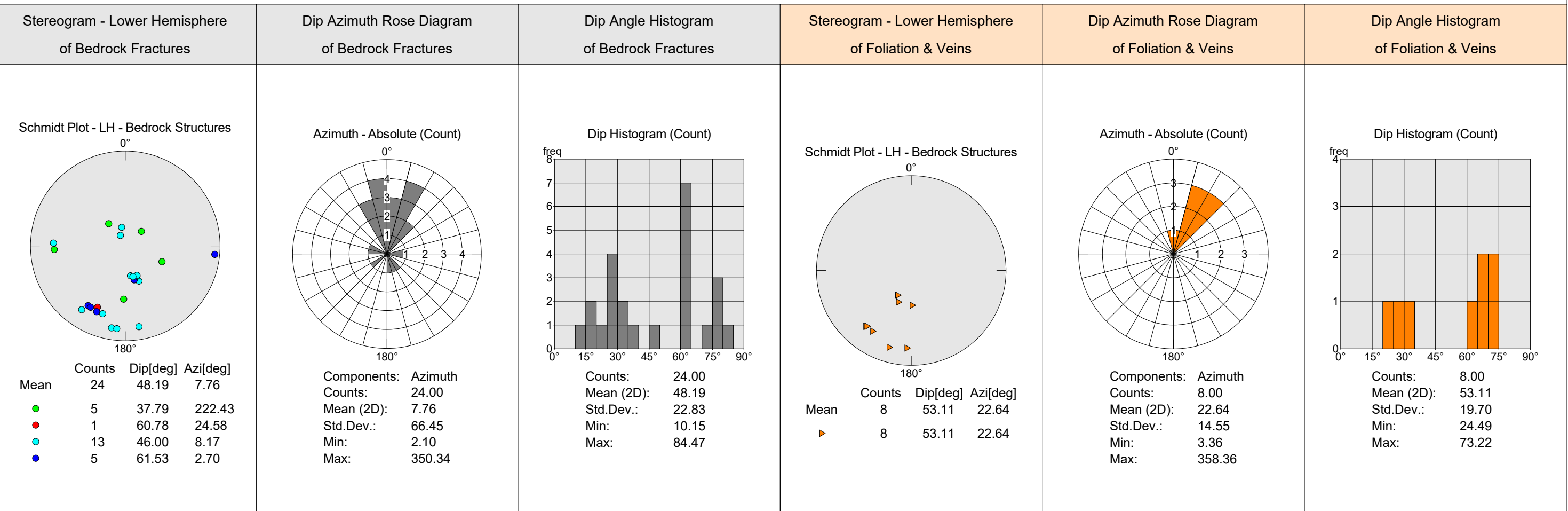
DATE(S) LOGGED: November 24, 2020

CLIENT: Haley & Aldrich, Inc.
PROJECT: Brewer-Eddington I-395/Route 9 Connector
LOCATION: Eddington, Maine

HRGS FILE: 20RG77
ORIENTATION REFERENCE: True North
MAGNETIC DECLINATION: 15.8° West

STRUCTURE LEGEND

● Fracture Rank 1 ● Fracture Rank 2 ● Fracture Rank 3 ● Fracture Rank 4 ▲ Foliation / Vein



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Tel: 603.893.9944

Fords, New Jersey
Tel: 732.661.0555

HB-BE-236 - BEDROCK STRUCTURE STATISTICS PLOTS

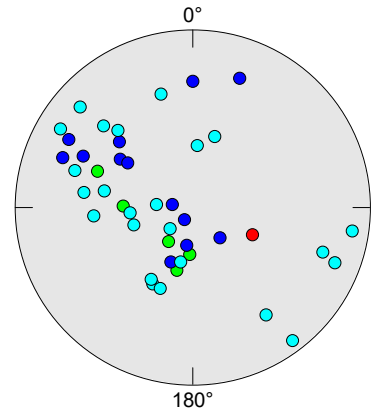
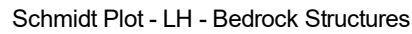
DATE(S) LOGGED: November 24, 2020





CLIENT: Haley & Aldrich, Inc.
PROJECT: Brewer-Eddington I-395/Route 9 Connector
LOCATION: Eddington, Maine

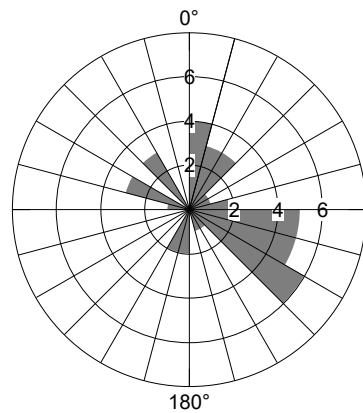
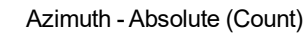
HRGS FILE: 20RG77
ORIENTATION REFERENCE: True North
MAGNETIC DECLINATION: 15.8° West

STRUCTURE LEGEND

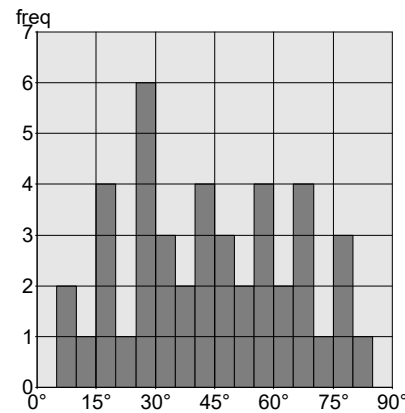
● Fracture Rank 1 ● Fracture Rank 2 ● Fracture Rank 3 ● Fracture Rank 4 ▲ Foliation / Vein



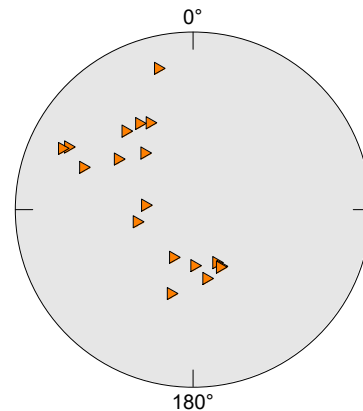
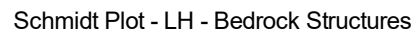
	Counts	Dip[deg]	Azi[deg]
Mean	43	43.89	82.35
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	13	40.54	105.18
	5	30.28	49.92
	24	49.22	82.62




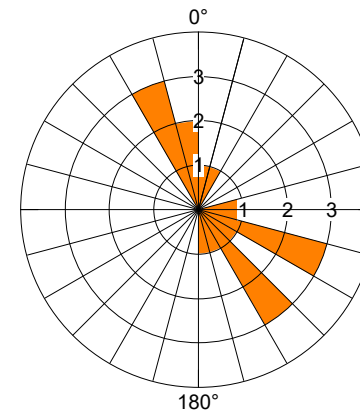
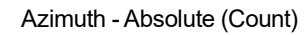
Components:	Azimuth
Counts:	43.00
Mean (2D):	82.35
Std.Dev.:	79.69
Min:	4.56
Max:	325.68



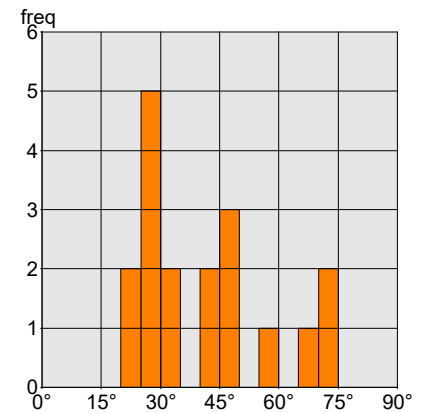
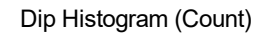
Counts:	43.00
Mean (2D):	43.89
Std.Dev.:	20.63
Min:	6.87
Max:	83.36



	Counts	Dip[deg]	Azi[deg]
Mean	18	41.09	84.68
	18	41.09	84.68



Components:	Azimuth
Counts:	18.00
Mean (2D):	84.68
Std.Dev.:	77.57
Min:	14.63
Max:	358.19



Counts:	18.00
Mean (2D):	41.09
Std.Dev.:	15.85
Min:	22.09
Max:	70.94

HAGER-RICHTER GEOSCIENCE, INC.	
BB-ECR-202 - TABLE OF BEDROCK STRUCTURES	
CLIENT	Haley & Aldrich, Inc.
PROJECT	Brewer-Eddington I-395/Route 9 Connector
LOCATION	Eddington, Maine
HRGS FILE	20RG77
DATE LOGGED	November 24, 2020
LOG DATUM	Ground Surface
DIP AZIMUTH	True North (Magnetic Declination = 15.8° West)
DIP ANGLE	Measured from Horizontal

BB-ECR-202 - TABLE OF BEDROCK STRUCTURES

Depth (Feet)	Dip Azimuth (Degrees)	Dip Angle (Degrees)	Bedrock Structure Category
15.1	127	71	Foliation / Vein
15.2	157	21	Fracture Rank 2
15.2	132	72	Fracture Rank 2
15.3	134	71	Foliation / Vein
15.4	137	71	Fracture Rank 3
15.6	130	74	Fracture Rank 2
15.7	129	73	Foliation / Vein
15.7	169	16	Fracture Rank 3
15.7	222	81	Fracture Rank 2
15.8	127	73	Fracture Rank 2
15.9	127	73	Fracture Rank 2
16.2	127	73	Fracture Rank 2
16.3	129	73	Foliation / Vein
16.5	119	70	Fracture Rank 3
16.7	313	30	Fracture Rank 3
16.7	117	69	Fracture Rank 3
16.9	57	23	Fracture Rank 4
16.9	59	14	Fracture Rank 3
17.1	22	22	Fracture Rank 3
17.2	107	64	Fracture Rank 3
17.3	115	69	Fracture Rank 3
17.3	19	41	Fracture Rank 4
17.6	99	72	Fracture Rank 2
17.8	119	75	Fracture Rank 3
18.0	242	60	Fracture Rank 4
18.0	114	58	Fracture Rank 2
18.5	253	31	Fracture Rank 4
18.6	81	73	Fracture Rank 3
19.0	92	24	Fracture Rank 2
19.0	295	41	Fracture Rank 2
19.1	323	30	Fracture Rank 1
19.2	103	70	Fracture Rank 3
19.4	2	59	Fracture Rank 1
19.4	91	65	Fracture Rank 1
19.6	294	79	Fracture Rank 3

BB-ECR-202 - TABLE OF BEDROCK STRUCTURES

Depth (Feet)	Dip Azimuth (Degrees)	Dip Angle (Degrees)	Bedrock Structure Category
19.7	41	68	Fracture Rank 3
19.8	351	32	Fracture Rank 3
20.2	333	50	Fracture Rank 4
20.4	294	75	Fracture Rank 4
20.6	95	51	Fracture Rank 4
20.8	170	77	Fracture Rank 3
20.8	95	40	Fracture Rank 2
21.1	336	41	Fracture Rank 2
21.3	123	29	Fracture Rank 1
21.4	112	68	Fracture Rank 2
21.5	102	78	Foliation / Vein
21.8	99	74	Fracture Rank 2
21.8	333	64	Fracture Rank 2
21.9	94	72	Foliation / Vein
21.9	349	54	Fracture Rank 3
22.2	88	76	Foliation / Vein
22.3	99	79	Fracture Rank 2
22.5	350	58	Fracture Rank 3
22.7	6	48	Fracture Rank 2

HAGER-RICHTER GEOSCIENCE, INC.	
BB-ELER-202 - TABLE OF BEDROCK STRUCTURES	
CLIENT	Haley & Aldrich, Inc.
PROJECT	Brewer-Eddington I-395/Route 9 Connector
LOCATION	Eddington, Maine
HRGS FILE	20RG77
DATE LOGGED	November 24, 2020
LOG DATUM	Ground Surface
DIP AZIMUTH	True North (Magnetic Declination = 15.8° West)
DIP ANGLE	Measured from Horizontal

BB-ELER-202 - TABLE OF BEDROCK STRUCTURES

Depth (Feet)	Dip Azimuth (Degrees)	Dip Angle (Degrees)	Bedrock Structure Category
16.9	88	23	Fracture Rank 4
17.1	261	75	Fracture Rank 1
17.4	269	71	Fracture Rank 3
17.8	263	83	Fracture Rank 1
17.8	244	77	Fracture Rank 1
17.8	272	36	Fracture Rank 2
18.0	247	73	Fracture Rank 1
18.1	255	69	Fracture Rank 1
18.3	213	27	Fracture Rank 2
18.6	312	65	Fracture Rank 3
18.7	265	79	Fracture Rank 1
18.8	25	45	Fracture Rank 4
19.0	317	35	Fracture Rank 1
19.3	236	51	Fracture Rank 2
19.4	128	17	Fracture Rank 4
19.6	270	84	Fracture Rank 2
19.7	90	73	Fracture Rank 4
20.4	118	15	Fracture Rank 4
20.7	293	41	Fracture Rank 1
20.8	281	82	Fracture Rank 3
21.1	262	82	Fracture Rank 3
21.1	299	52	Fracture Rank 4
21.5	299	65	Fracture Rank 2
21.8	139	65	Fracture Rank 3
21.9	296	37	Fracture Rank 2
22.1	154	52	Fracture Rank 3
22.3	314	56	Fracture Rank 4
22.4	326	39	Fracture Rank 2
22.9	188	21	Fracture Rank 2
22.9	270	41	Fracture Rank 1
23.1	288	50	Fracture Rank 1
23.2	288	46	Fracture Rank 2
23.6	141	54	Fracture Rank 1
23.9	295	64	Fracture Rank 1
24.5	301	54	Fracture Rank 1

BB-ELER-202 - TABLE OF BEDROCK STRUCTURES

Depth (Feet)	Dip Azimuth (Degrees)	Dip Angle (Degrees)	Bedrock Structure Category
24.5	127	68	Fracture Rank 1
24.6	299	56	Fracture Rank 4
24.7	304	57	Fracture Rank 1
24.7	111	64	Fracture Rank 1
25.1	300	37	Fracture Rank 3
25.2	299	42	Fracture Rank 1
25.5	134	79	Fracture Rank 1
27.1	101	63	Fracture Rank 2
27.3	99	61	Fracture Rank 2
27.4	92	58	Fracture Rank 1
28.0	312	63	Fracture Rank 2
28.2	322	39	Fracture Rank 1
28.4	336	21	Foliation / Vein
29.4	347	35	Foliation / Vein
29.5	347	41	Fracture Rank 1
30.0	138	68	Fracture Rank 1
30.3	15	15	Foliation / Vein
30.8	84	47	Fracture Rank 1
30.8	243	29	Fracture Rank 1
31.1	139	60	Fracture Rank 1
31.2	144	55	Fracture Rank 1
31.7	357	47	Foliation / Vein
32.1	133	52	Fracture Rank 3
33.2	351	28	Foliation / Vein
33.3	143	86	Fracture Rank 1
33.9	337	77	Fracture Rank 1
34.2	10	29	Foliation / Vein
34.7	348	33	Foliation / Vein
34.8	354	44	Fracture Rank 1
35.2	116	38	Foliation / Vein
35.2	126	58	Fracture Rank 2

HAGER-RICHTER GEOSCIENCE, INC.	
BB-ELER-205 - TABLE OF BEDROCK STRUCTURES	
CLIENT	Haley & Aldrich, Inc.
PROJECT	Brewer-Eddington I-395/Route 9 Connector
LOCATION	Eddington, Maine
HRGS FILE	20RG77
DATE LOGGED	November 24, 2020
LOG DATUM	Ground Surface
DIP AZIMUTH	True North (Magnetic Declination = 15.8° West)
DIP ANGLE	Measured from Horizontal

BB-ELER-205 - TABLE OF BEDROCK STRUCTURES

Depth (Feet)	Dip Azimuth (Degrees)	Dip Angle (Degrees)	Bedrock Structure Category
15.0	76	13	Fracture Rank 3
15.4	337	17	Foliation / Vein
15.5	348	64	Fracture Rank 1
15.8	319	26	Foliation / Vein
16.1	80	48	Foliation / Vein
16.2	86	50	Fracture Rank 1
16.3	88	48	Fracture Rank 2
16.3	86	50	Fracture Rank 1
16.7	86	39	Fracture Rank 1
16.9	100	42	Fracture Rank 1
17.1	111	41	Foliation / Vein
17.4	91	56	Fracture Rank 1
17.7	153	26	Foliation / Vein
17.8	199	40	Fracture Rank 4
18.3	257	42	Fracture Rank 2
18.6	350	14	Fracture Rank 2
18.8	100	63	Fracture Rank 1
19.0	97	66	Foliation / Vein
19.1	98	68	Fracture Rank 1
19.3	94	61	Foliation / Vein
19.4	78	56	Fracture Rank 2
19.5	98	37	Fracture Rank 1
19.7	359	73	Fracture Rank 1
20.0	118	55	Fracture Rank 1
20.1	21	61	Fracture Rank 1
20.1	3	17	Fracture Rank 1
20.7	112	60	Foliation / Vein
21.0	118	61	Fracture Rank 2
21.3	115	56	Fracture Rank 1
21.7	110	58	Fracture Rank 1
21.8	256	36	Fracture Rank 1
21.9	123	59	Fracture Rank 1
22.2	127	60	Fracture Rank 1
22.5	118	59	Fracture Rank 1
22.6	118	56	Fracture Rank 2

BB-ELER-205 - TABLE OF BEDROCK STRUCTURES

Depth (Feet)	Dip Azimuth (Degrees)	Dip Angle (Degrees)	Bedrock Structure Category
22.8	118	49	Foliation / Vein
23.2	118	63	Fracture Rank 1
23.5	119	56	Fracture Rank 2
23.6	118	49	Fracture Rank 1
23.7	113	61	Foliation / Vein
24.0	114	57	Fracture Rank 2
24.1	229	83	Fracture Rank 1
24.1	122	58	Foliation / Vein
24.5	119	58	Foliation / Vein
24.8	127	71	Fracture Rank 1
24.8	113	33	Fracture Rank 2
24.9	118	33	Fracture Rank 1
25.2	279	19	Fracture Rank 1
25.5	116	45	Fracture Rank 1
25.6	115	45	Fracture Rank 1
25.8	120	45	Foliation / Vein
25.9	305	66	Fracture Rank 1
26.3	84	59	Fracture Rank 1
26.5	105	43	Foliation / Vein
26.6	296	79	Foliation / Vein
26.8	127	63	Fracture Rank 1
27.1	138	36	Foliation / Vein
27.2	304	62	Fracture Rank 1
28.0	308	46	Fracture Rank 1
28.4	267	39	Fracture Rank 1
28.9	117	74	Fracture Rank 1
29.1	118	71	Fracture Rank 2
29.4	128	71	Fracture Rank 1
29.5	293	39	Fracture Rank 1
29.6	121	71	Fracture Rank 1
30.0	124	68	Fracture Rank 1
30.1	124	62	Fracture Rank 1
30.2	114	53	Foliation / Vein
30.2	261	31	Fracture Rank 2
30.4	120	48	Foliation / Vein
30.6	102	76	Fracture Rank 1
30.7	109	63	Foliation / Vein
30.7	107	62	Fracture Rank 2
31.0	107	50	Fracture Rank 2
31.2	113	54	Fracture Rank 3
31.2	97	49	Fracture Rank 1
32.1	89	57	Fracture Rank 1
32.8	104	72	Fracture Rank 1
33.0	106	76	Fracture Rank 1

HAGER-RICHTER GEOSCIENCE, INC.	
HB-BE-231 - TABLE OF BEDROCK STRUCTURES	
CLIENT	Haley & Aldrich, Inc.
PROJECT	Brewer-Eddington I-395/Route 9 Connector
LOCATION	Eddington, Maine
HRGS FILE	20RG77
DATE LOGGED	November 24, 2020
LOG DATUM	Ground Surface
DIP AZIMUTH	True North (Magnetic Declination = 15.8° West)
DIP ANGLE	Measured from Horizontal

HB-BE-231 - TABLE OF BEDROCK STRUCTURES

Depth (Feet)	Dip Azimuth (Degrees)	Dip Angle (Degrees)	Bedrock Structure Category
10.0	317	66	Fracture Rank 3
10.3	337	53	Fracture Rank 3
10.3	330	75	Fracture Rank 3
10.4	321	63	Fracture Rank 3
10.7	340	74	Fracture Rank 4
10.9	340	60	Fracture Rank 4
11.0	293	69	Fracture Rank 4
11.1	21	31	Fracture Rank 3
11.3	265	44	Fracture Rank 4
11.4	94	43	Fracture Rank 3
11.5	261	35	Fracture Rank 3
11.6	5	72	Fracture Rank 3
11.8	193	78	Fracture Rank 1
11.9	3	70	Fracture Rank 4
12.0	350	43	Fracture Rank 4
12.0	355	73	Fracture Rank 3
12.3	325	38	Fracture Rank 3
12.5	351	70	Fracture Rank 4
13.1	238	51	Fracture Rank 1
13.2	263	41	Fracture Rank 2
13.5	84	69	Fracture Rank 2
13.8	272	48	Fracture Rank 1
14.0	344	34	Fracture Rank 3
14.9	228	48	Fracture Rank 1
14.9	98	64	Fracture Rank 4
15.1	213	79	Fracture Rank 1
15.2	224	54	Fracture Rank 2
15.4	70	57	Fracture Rank 2
15.5	188	48	Fracture Rank 4
15.7	154	35	Fracture Rank 3
15.8	107	75	Fracture Rank 4
16.3	234	59	Fracture Rank 4
16.5	81	75	Fracture Rank 2
16.6	35	22	Fracture Rank 4
16.7	128	72	Fracture Rank 2

HB-BE-231 - TABLE OF BEDROCK STRUCTURES

Depth (Feet)	Dip Azimuth (Degrees)	Dip Angle (Degrees)	Bedrock Structure Category
16.9	271	25	Fracture Rank 1
16.9	1	32	Fracture Rank 3
17.1	148	43	Fracture Rank 3
17.1	330	35	Fracture Rank 2
17.2	152	58	Fracture Rank 4
17.3	306	24	Fracture Rank 3
17.6	112	63	Fracture Rank 3
17.7	322	31	Fracture Rank 4
17.7	101	63	Fracture Rank 4
18.1	43	33	Fracture Rank 1
18.3	38	70	Fracture Rank 1
18.4	284	35	Fracture Rank 1
18.6	48	70	Fracture Rank 1
18.8	51	71	Fracture Rank 1
18.8	269	14	Fracture Rank 2
19.0	302	36	Foliation / Vein
19.1	288	38	Fracture Rank 2
19.3	226	57	Fracture Rank 2
19.5	53	28	Fracture Rank 1
19.5	230	59	Fracture Rank 2
19.6	39	23	Fracture Rank 2
19.6	64	70	Fracture Rank 2
19.7	244	54	Foliation / Vein
19.8	342	20	Fracture Rank 1
19.9	238	58	Fracture Rank 1
20.0	335	32	Fracture Rank 1
20.0	232	60	Fracture Rank 2
20.1	327	31	Fracture Rank 1
20.3	326	34	Fracture Rank 1
20.3	63	56	Fracture Rank 2
20.4	308	36	Fracture Rank 2
20.5	66	62	Fracture Rank 2
20.8	349	20	Foliation / Vein
21.0	309	43	Fracture Rank 1
21.3	27	15	Foliation / Vein
21.5	302	58	Fracture Rank 1
21.6	303	38	Fracture Rank 2
21.9	48	55	Fracture Rank 2
21.9	234	56	Fracture Rank 2
22.0	310	35	Fracture Rank 1
22.8	15	3	Foliation / Vein
22.9	105	69	Fracture Rank 1
23.3	26	28	Fracture Rank 1
23.3	56	17	Foliation / Vein
23.8	311	80	Fracture Rank 1

HB-BE-231 - TABLE OF BEDROCK STRUCTURES

Depth (Feet)	Dip Azimuth (Degrees)	Dip Angle (Degrees)	Bedrock Structure Category
23.8	102	69	Fracture Rank 3
25.3	229	58	Fracture Rank 1

HAGER-RICHTER GEOSCIENCE, INC.	
HB-BE-232 - TABLE OF BEDROCK STRUCTURES	
CLIENT	Haley & Aldrich, Inc.
PROJECT	Brewer-Eddington I-395/Route 9 Connector
LOCATION	Eddington, Maine
HRGS FILE	20RG77
DATE LOGGED	November 24, 2020
LOG DATUM	Ground Surface
DIP AZIMUTH	True North (Magnetic Declination = 15.8° West)
DIP ANGLE	Measured from Horizontal

HB-BE-232 - TABLE OF BEDROCK STRUCTURES

Depth (Feet)	Dip Azimuth (Degrees)	Dip Angle (Degrees)	Bedrock Structure Category
14.8	228	19	Fracture Rank 3
14.9	2	47	Fracture Rank 3
15.0	25	61	Fracture Rank 4
15.2	87	64	Fracture Rank 3
15.3	154	10	Fracture Rank 1
15.4	275	84	Fracture Rank 2
16.1	350	75	Fracture Rank 1
16.5	3	71	Foliation / Vein
16.8	10	77	Fracture Rank 1
17.0	6	77	Fracture Rank 1
17.2	16	73	Foliation / Vein
17.7	338	33	Fracture Rank 1
17.8	358	30	Foliation / Vein
17.9	345	30	Fracture Rank 2
18.0	339	28	Fracture Rank 1
18.0	350	26	Fracture Rank 1
18.2	338	28	Fracture Rank 1
18.3	93	65	Fracture Rank 1
18.3	346	27	Fracture Rank 1
18.4	143	24	Fracture Rank 3
18.6	24	65	Fracture Rank 2
19.1	23	30	Foliation / Vein
19.3	29	24	Foliation / Vein
20.0	18	65	Fracture Rank 1
20.2	293	35	Fracture Rank 3
20.5	34	71	Fracture Rank 1
20.7	169	17	Fracture Rank 1
21.5	39	65	Foliation / Vein
22.0	32	63	Fracture Rank 2
23.0	30	64	Fracture Rank 2
23.0	39	65	Foliation / Vein
23.3	33	65	Foliation / Vein

HAGER-RICHTER GEOSCIENCE, INC.	
HB-BE-236 - TABLE OF BEDROCK STRUCTURES	
CLIENT	Haley & Aldrich, Inc.
PROJECT	Brewer-Eddington I-395/Route 9 Connector
LOCATION	Eddington, Maine
HRGS FILE	20RG77
DATE LOGGED	November 24, 2020
LOG DATUM	Ground Surface
DIP AZIMUTH	True North (Magnetic Declination = 15.8° West)
DIP ANGLE	Measured from Horizontal

HB-BE-236 - TABLE OF BEDROCK STRUCTURES

Depth (Feet)	Dip Azimuth (Degrees)	Dip Angle (Degrees)	Bedrock Structure Category
14.6	295	30	Fracture Rank 4
15.0	336	27	Foliation / Vein
15.1	318	19	Fracture Rank 2
15.2	5	22	Fracture Rank 3
15.4	14	30	Fracture Rank 3
15.5	36	20	Fracture Rank 3
15.6	34	7	Fracture Rank 2
15.8	99	10	Fracture Rank 2
16.5	115	58	Fracture Rank 2
16.8	96	22	Foliation / Vein
16.9	96	17	Fracture Rank 1
17.1	140	35	Foliation / Vein
17.4	78	27	Foliation / Vein
17.6	92	32	Fracture Rank 3
17.6	197	35	Fracture Rank 1
17.7	28	40	Fracture Rank 1
17.9	185	29	Fracture Rank 1
18.2	47	14	Fracture Rank 1
18.4	9	18	Fracture Rank 2
18.8	23	27	Fracture Rank 2
19.1	23	24	Foliation / Vein
19.3	13	26	Fracture Rank 1
19.4	74	28	Fracture Rank 1
19.7	101	42	Fracture Rank 1
19.8	111	48	Fracture Rank 3
20.6	85	29	Fracture Rank 1
20.9	85	47	Fracture Rank 1
20.9	334	29	Foliation / Vein
21.0	358	26	Foliation / Vein
21.4	349	33	Foliation / Vein
21.7	335	29	Foliation / Vein
22.7	323	83	Fracture Rank 1
23.3	98	52	Fracture Rank 1
24.7	124	42	Foliation / Vein
24.8	123	41	Fracture Rank 2

HB-BE-236 - TABLE OF BEDROCK STRUCTURES

Depth (Feet)	Dip Azimuth (Degrees)	Dip Angle (Degrees)	Bedrock Structure Category
25.2	132	46	Fracture Rank 2
25.3	139	49	Foliation / Vein
25.4	326	63	Fracture Rank 1
25.7	136	51	Fracture Rank 1
26.3	180	60	Fracture Rank 2
26.8	200	67	Fracture Rank 2
27.6	154	46	Foliation / Vein
27.7	133	58	Fracture Rank 1
28.1	132	74	Fracture Rank 1
28.4	121	76	Fracture Rank 1
28.6	117	68	Foliation / Vein
28.8	111	68	Fracture Rank 2
29.1	119	69	Fracture Rank 2
29.3	115	70	Foliation / Vein
29.6	291	75	Fracture Rank 1
30.4	124	37	Fracture Rank 2
30.6	108	59	Fracture Rank 1
30.8	111	56	Foliation / Vein
31.0	164	56	Fracture Rank 1
31.1	278	80	Fracture Rank 1
31.2	148	48	Foliation / Vein
31.8	15	41	Foliation / Vein
31.9	289	67	Fracture Rank 1
31.9	22	41	Fracture Rank 1
32.0	30	39	Fracture Rank 1
32.1	166	71	Foliation / Vein

**BOREHOLE GEOPHYSICAL LOGGING - DATA REPORT
BOREHOLES BB-ECR-201, BB-ECR-203A, BB-ECR-204A,
BB-ECR-206A, BB-ELER-206A, HB-BE-235, HB-BE-237
BREWER-EDDINGTON I-395/ROUTE 9 CONNECTOR
EDDINGTON, MAINE**

Prepared for:

Haley & Aldrich, Inc.
75 Washington Avenue | Suite 1A
Portland, Maine 04101

Prepared by:

Hager-Richter Geoscience, Inc.
8 Industrial Way - D10
Salem, New Hampshire 03079

File 20RG77
March 2021






Tadpole	Structure Category (Symbol Color)	Description
	Fracture Rank 1 (Light Blue)	Minor Fracture - not distinct and may not be continuous around the borehole
	Fracture Rank 2 (Blue)	Intermediate Fracture - distinct and continuous around the borehole with little or no apparent aperture
	Fracture Rank 3 (Light Green)	Intermediate Fracture - distinct and continuous around the borehole with some apparent aperture
	Fracture Rank 4 (Red)	Major Fracture - distinct with continuous apparent aperture around the borehole
	Foliation or Vein (Orange)	Planar geologic feature interpreted as foliation or a vein

Figure 1. Key to bedrock structure categories.

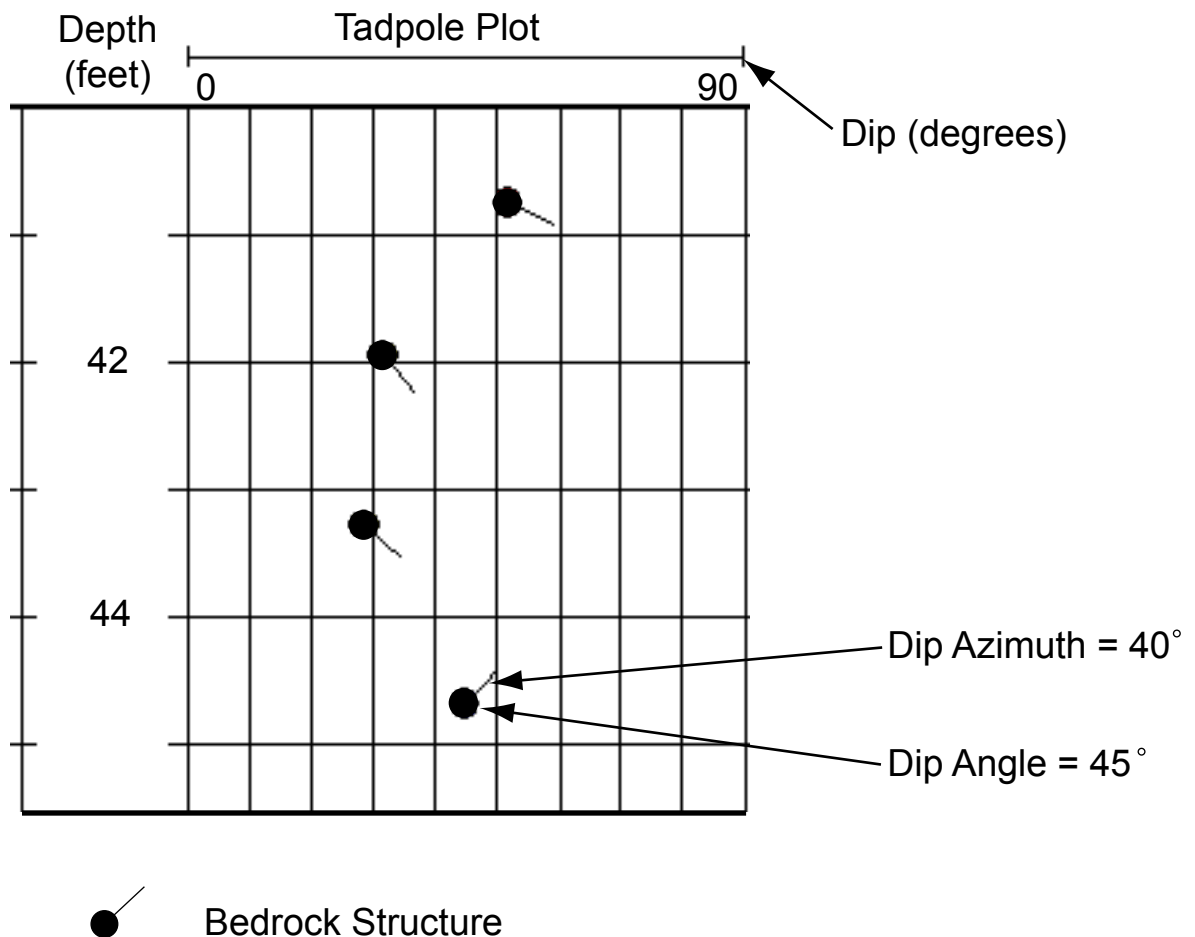


Figure 2. Tadpole plot explanation. The orientation of the bedrock structures is graphically displayed by a tadpole consisting of a circle, the head, and a line, the tail. The position of the head, left to right on the tadpole plot, gives the dip angle of the structure. The left side of the track indicates a dip angle of 0°, and the right side of the track indicates a dip angle of 90° from horizontal. The orientation of the tail gives the dip azimuth of the structure and can be read like a compass. The tail pointing directly up is 0°, north.

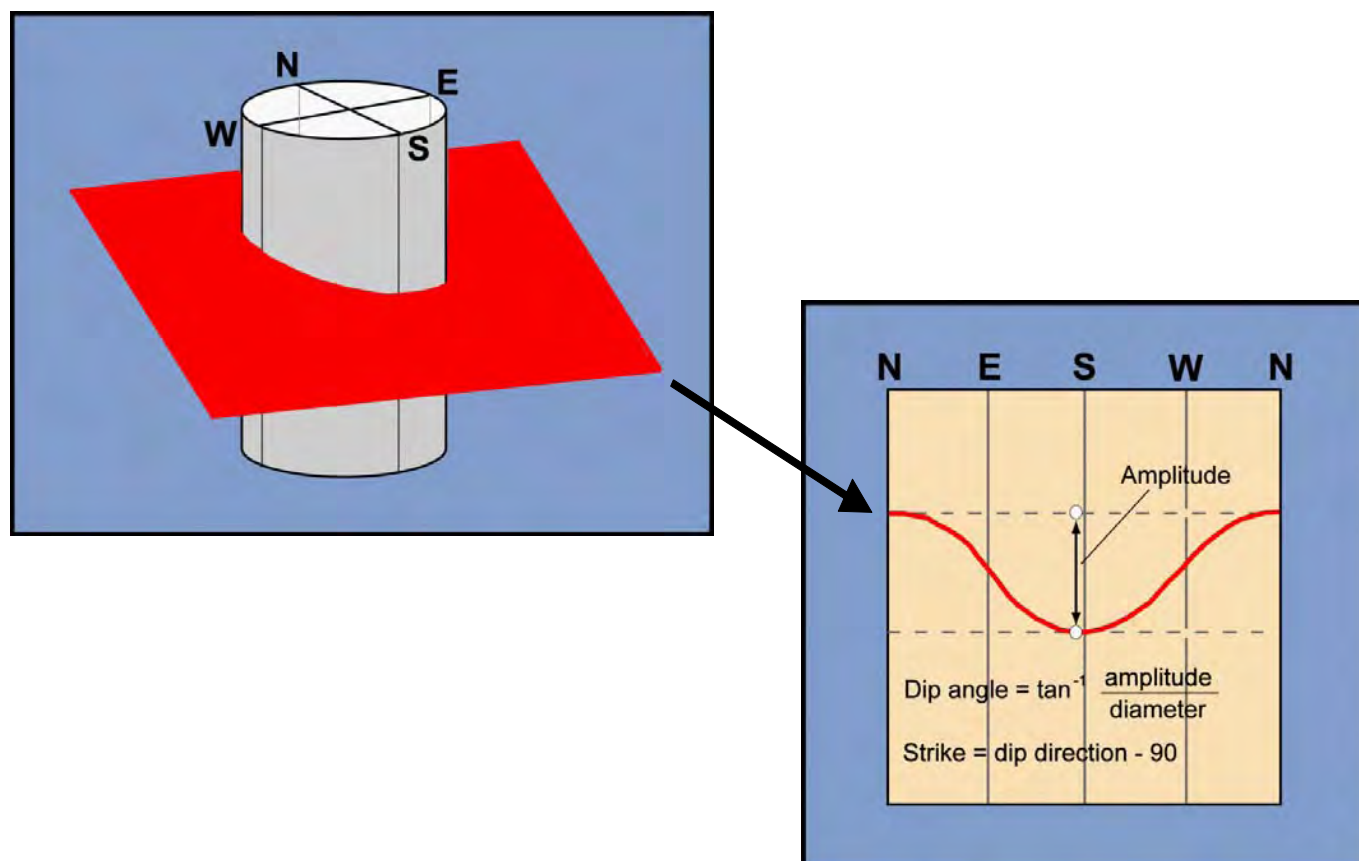


Figure 3. Televiewer Explanation Figure. The image on the left depicts a planar structure in red, such as a fracture or bedding plane, intersected by a borehole. The image on the right depicts the same structure unwrapped as it would be displayed in an optical televiewer (OTV) or acoustic televiewer (ATV) log.

Figure modified from: Garfield, R.L., Day-Lewis, F.D., Gray, M.B., Johnson, C.D., Williams, J.H. and Day-Lewis, A.D.F., 2003, Fractured-Rock Aquifer Characterization within a Regional Geologic Context: Results from the Bucknell University Hydrogeophysics Test Site, GSA Northeastern Section, 38th Annual Meeting, Paper No. 25-19.

Salem, New Hampshire
Tel: 603.893.9944

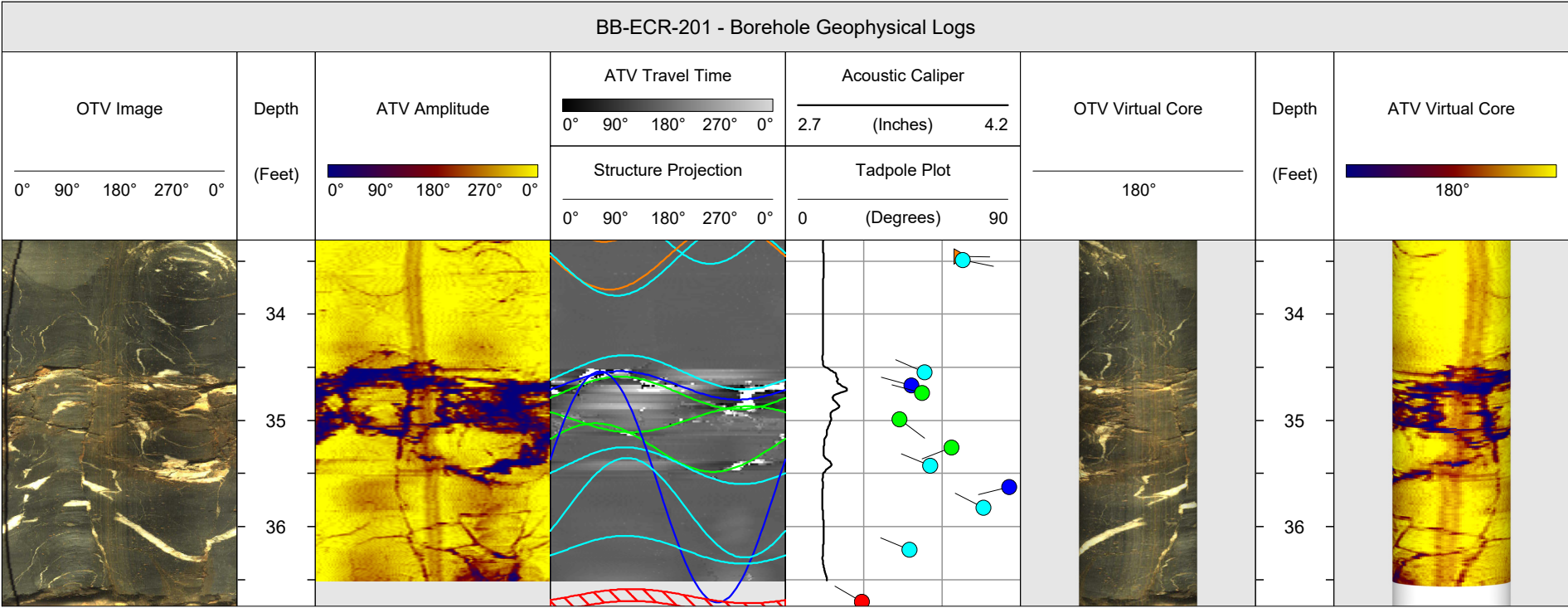
Fords, New Jersey
Tel: 732.661.0555

DATE(S) LOGGED: March 3, 2021

HRGS FILE:	20RG77
LOG DATUM:	Ground Surface
ORIENTATION REFERENCE:	True North (Magnetic Declination = 15.8° West)
BOREHOLE DIAMETER:	3.8 Inches
LOGS PROCESSED BY:	Robert Garfield & Nick DeCristofaro

 Fracture Rank 1
 Fracture Rank 2
 Fracture Rank 3
 Fracture Rank 4
 Foliation / Vein

OTV Image	Depth (Feet)	ATV Amplitude	ATV Travel Time 0° 90° 180° 270° 0°	Acoustic Caliper 2.7 (Inches) 4.2	OTV Virtual Core 180°	Depth (Feet)	ATV Virtual Core 180°
0° 90° 180° 270° 0°		0° 90° 180° 270° 0°	Structure Projection 0° 90° 180° 270° 0°	Tadpole Plot 0 (Degrees) 90			
	17					Bottom of Casing	
	18						
	19						
	20						
	21						
	22						
	23						
	24						
	25						
	26						
	27						
	28						
	29						
	30						
	31						
	32						
	33						



HAGER-RICHTER GEOSCIENCE, INC.

Salem, New Hampshire
Tel: 603.893.9944

Fords, New Jersey
Tel: 732.661.0555

BB-ECR-203A - BOREHOLE GEOPHYSICAL LOGS

DATE(S) LOGGED: March 3, 2021

CLIENT: Haley & Aldrich, Inc.
PROJECT: Brewer-Eddington I-395/Route 9 Connector
LOCATION: Eddington, Maine
LOGGING GEOPHYSICIST(S): Mikko Aarnio & Mark Jones
PROJECT REP(S) ON-SITE: Josh Fletcher

HRGS FILE: 20RG77

LOG DATUM: Ground Surface

ORIENTATION REFERENCE: True North (Magnetic Declination = 15.8° West)

BOREHOLE DIAMETER: 3.8 Inches

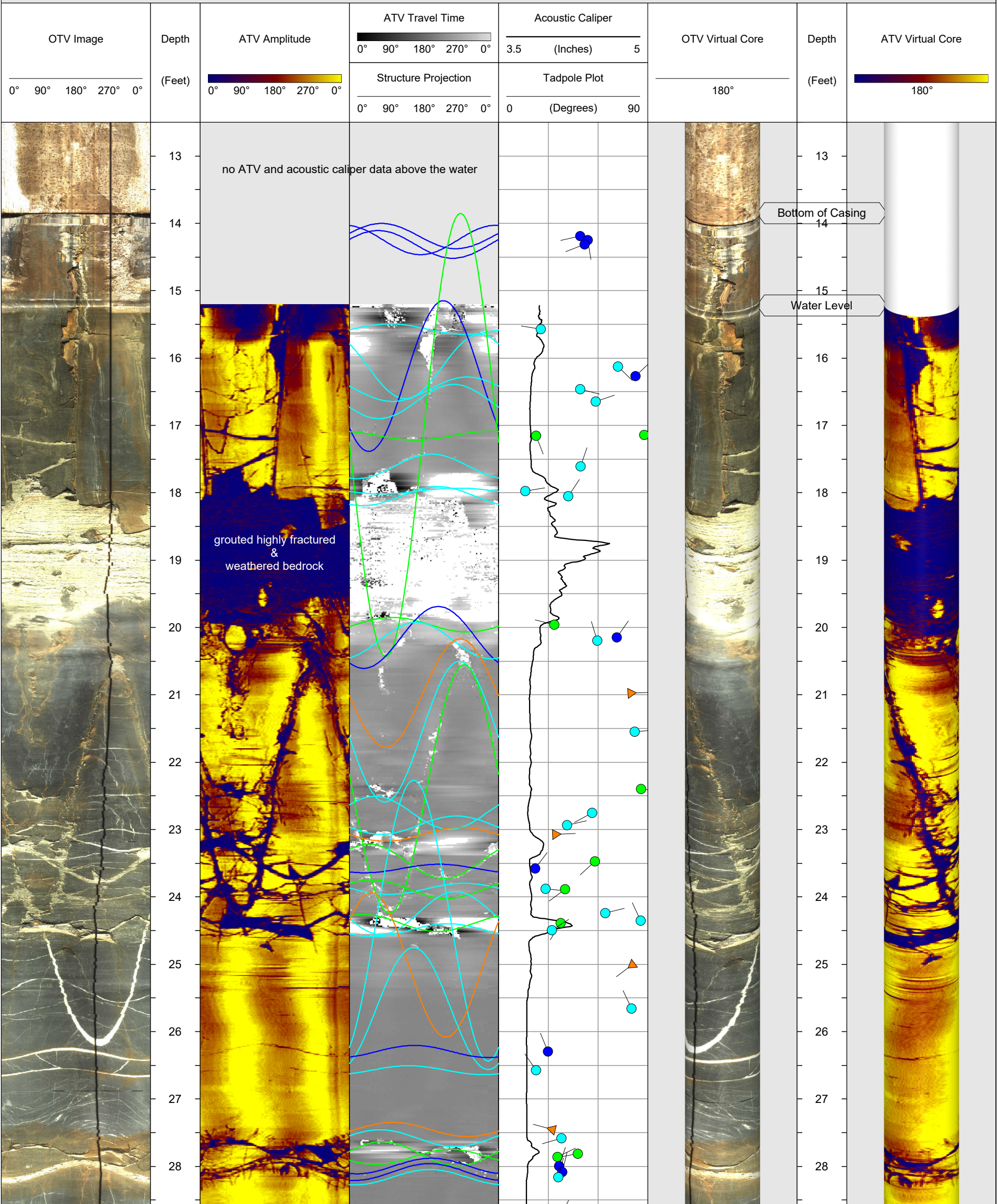
LOGS PROCESSED BY: Robert Garfield & Nick DeCristofaro

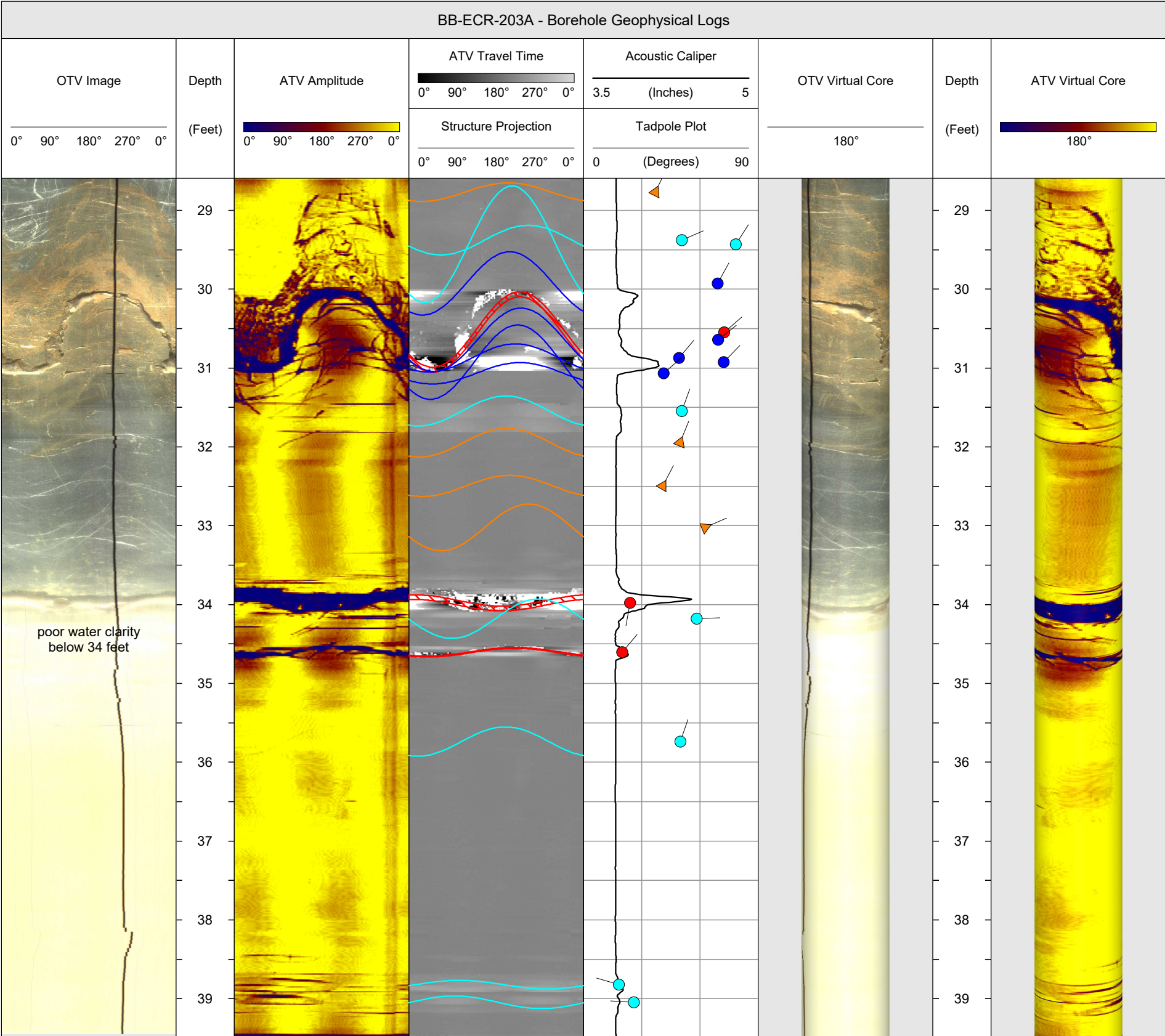
STRUCTURE LEGEND

Fracture Rank 1 Fracture Rank 2 Fracture Rank 3 Fracture Rank 4 Foliation / Vein

NOTES: Due to unstable, highly fractured and weathered, bedrock at ~18-20 feet in borehole BB-ECR-203A encountered during drilling, the drilling was suspended at a depth of ~25 feet to grout the bedrock. The grout stabilized bedrock was then drilled through and the drilling of the borehole was completed to total depth.

BB-ECR-203A - Borehole Geophysical Logs





HAGER-RICHTER GEOSCIENCE, INC.

Salem, New Hampshire
Tel: 603.893.9944

Fords, New Jersey
Tel: 732.661.0555

BB-ECR-204A - BOREHOLE GEOPHYSICAL LOGS

DATE(S) LOGGED: March 3, 2021

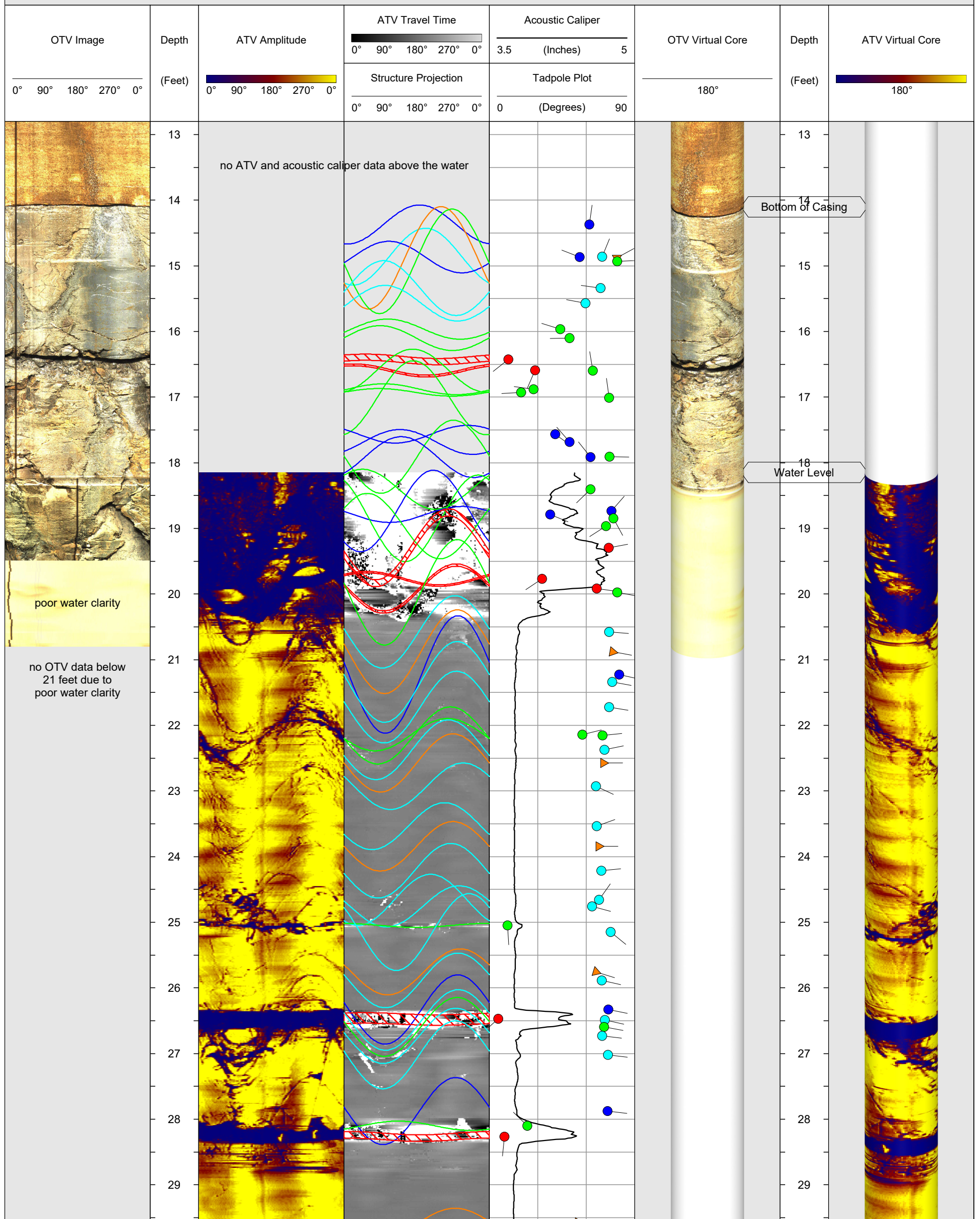
CLIENT: Haley & Aldrich, Inc.
PROJECT: Brewer-Eddington I-395/Route 9 Connector
LOCATION: Eddington, Maine
LOGGING GEOPHYSICIST(S): Mikko Aarnio & Mark Jones
PROJECT REP(S) ON-SITE: Josh Fletcher

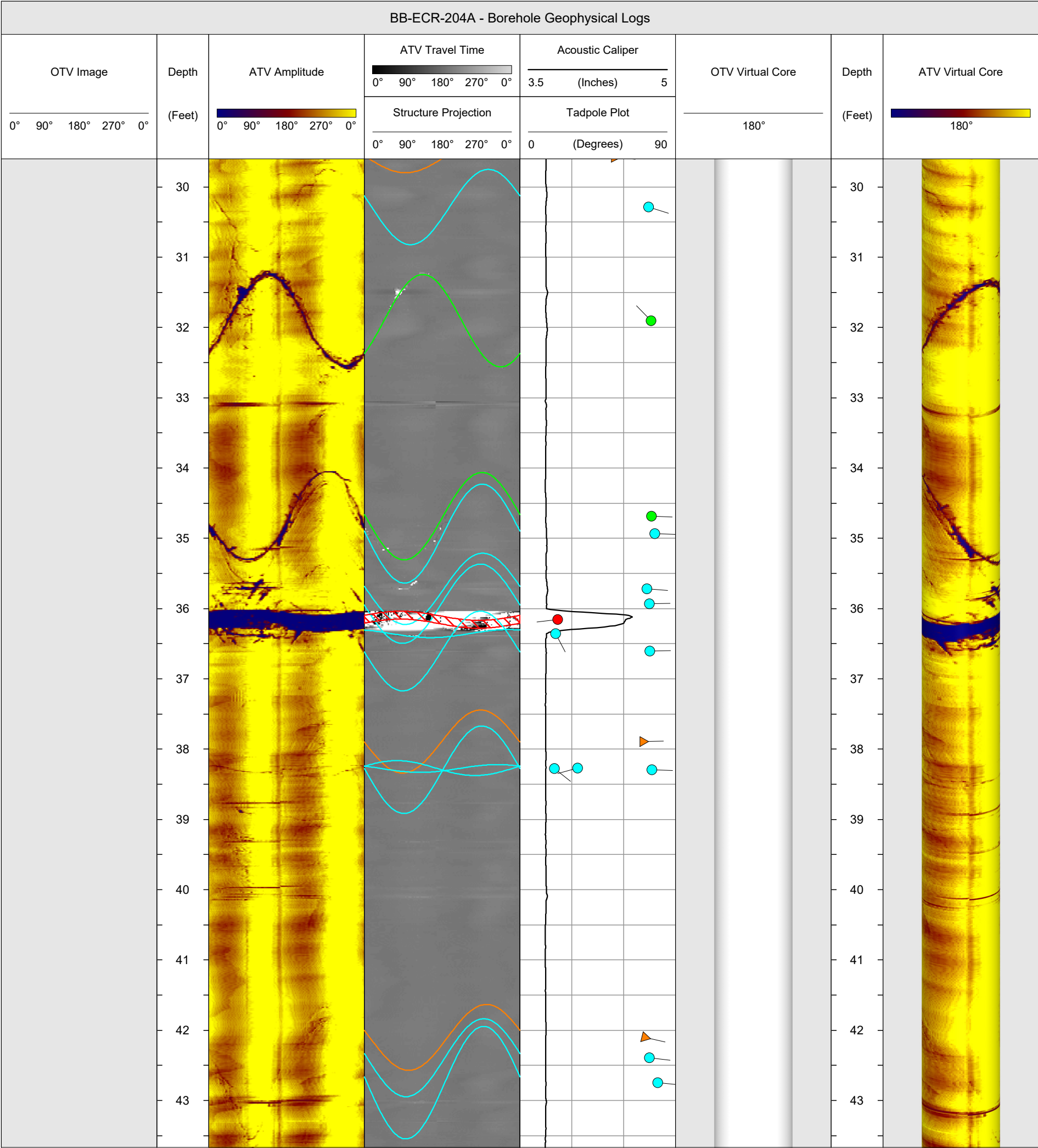
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LOG DATUM:	Ground Surface
ORIENTATION REFERENCE:	True North (Magnetic Declination = 15.8° West)
BOREHOLE DIAMETER:	3.8 Inches
LOGS PROCESSED BY:	Robert Garfield & Nick DeCristofaro

STRUCTURE LEGEND

 Fracture Rank 1
 Fracture Rank 2
 Fracture Rank 3
 Fracture Rank 4
 Foliation / Vein

BB-ECR-204A - Borehole Geophysical Logs





HAGER-RICHTER GEOSCIENCE, INC.

Salem, New Hampshire
Tel: 603.893.9944

Fords, New Jersey
Tel: 732.661.0555

BB-ECR-206A - BOREHOLE GEOPHYSICAL LOGS

DATE(S) LOGGED: March 3, 2021

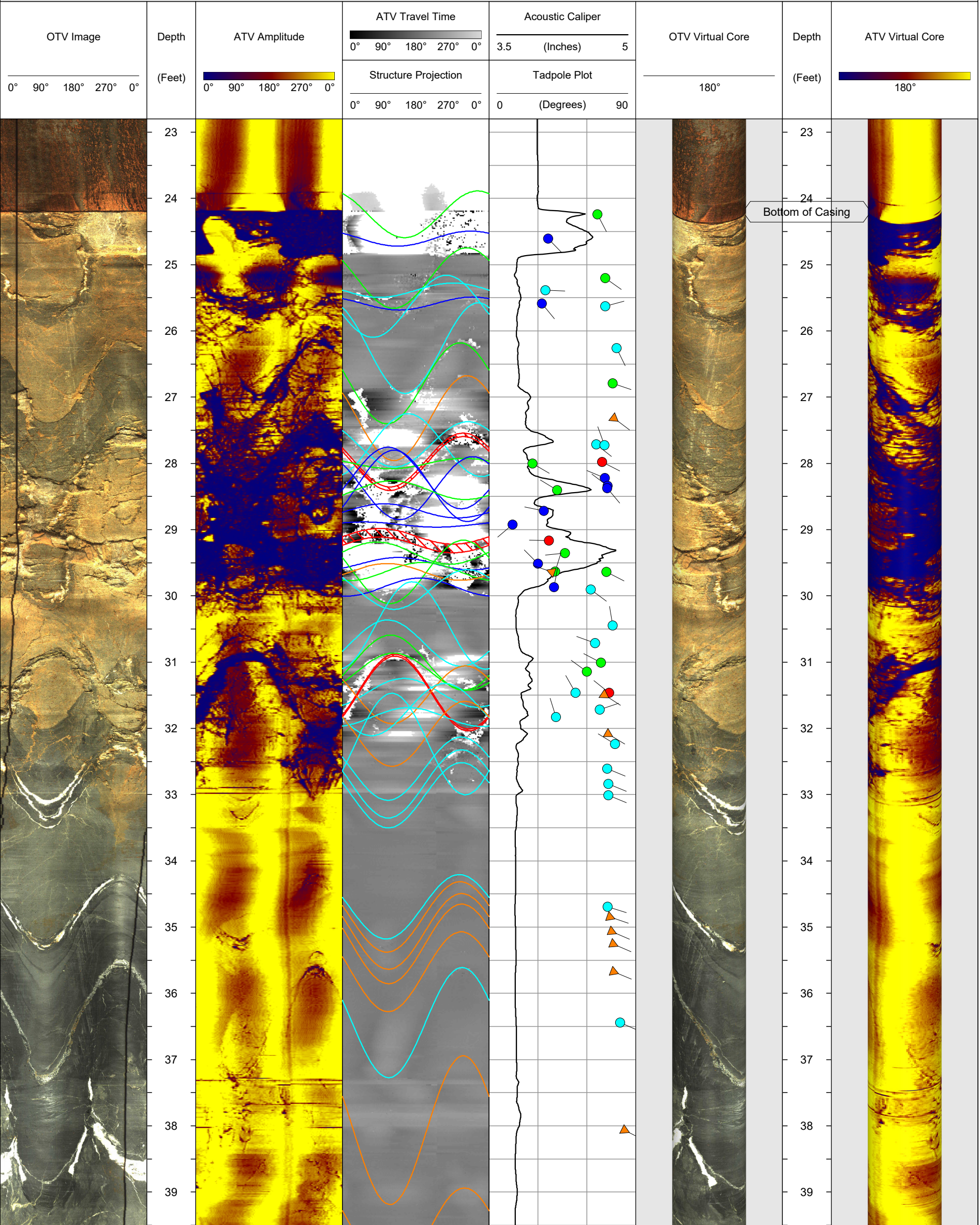
CLIENT: Haley & Aldrich, Inc.
PROJECT: Brewer-Eddington I-395/Route 9 Connector
LOCATION: Eddington, Maine
LOGGING GEOPHYSICIST(S): Mikko Aarnio & Mark Jor
PROJECT REP(S) ON-SITE: Josh Fletcher

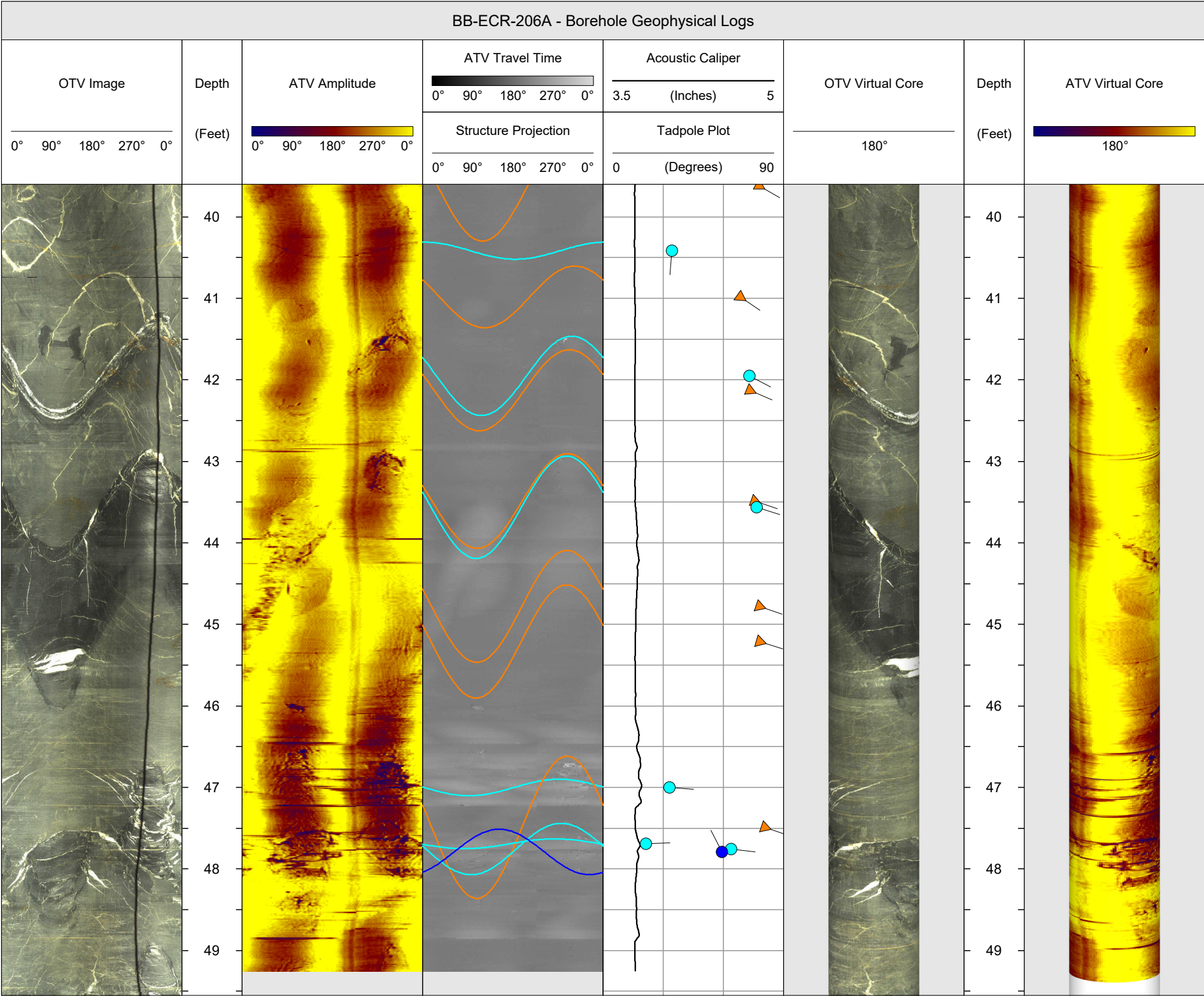
HRGS FILE:	20RG77
LOG DATUM:	Ground Surface
ORIENTATION REFERENCE:	True North (Magnetic Declination = 15.8° West)
BOREHOLE DIAMETER:	3.8 Inches
LOGS PROCESSED BY:	Robert Garfield & Nick DeCristofaro

STRUCTURE LEGEND

 Fracture Rank 1
 Fracture Rank 2
 Fracture Rank 3
 Fracture Rank 4
 Foliation / Vein

BB-ECR-206A - Borehole Geophysical Logs





HAGER-RICHTER GEOSCIENCE, INC.

Salem, New Hampshire
Tel: 603.893.9944

Fords, New Jersey
Tel: 732.661.0555

BB-ELER-206A - BOREHOLE GEOPHYSICAL LOGS

DATE(S) LOGGED: March 3, 2021

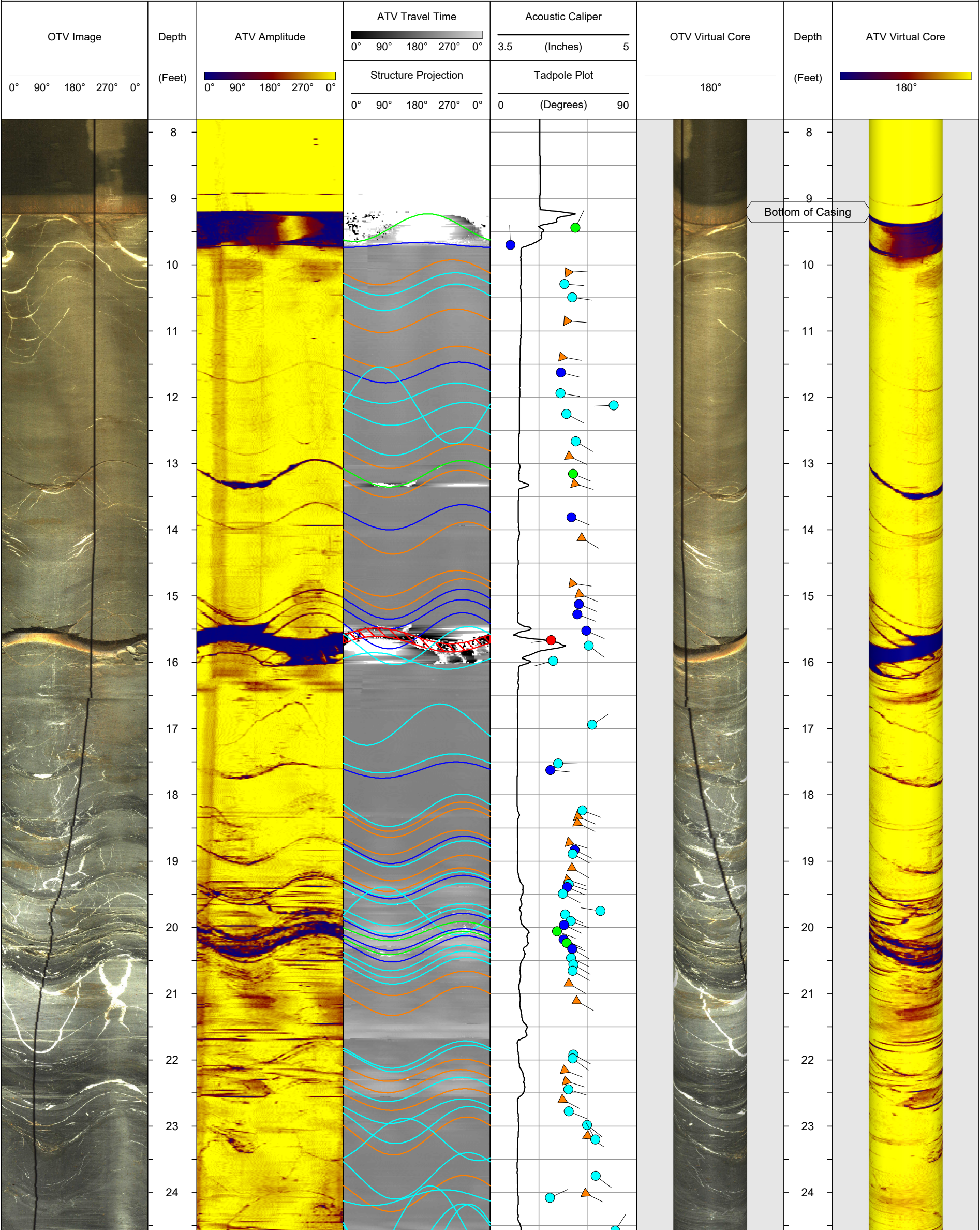
CLIENT: Haley & Aldrich, Inc.
PROJECT: Brewer-Eddington I-395/Route 9 Connector
LOCATION: Eddington, Maine
LOGGING GEOPHYSICIST(S): Mikko Aarnio & Mark Jones
PROJECT REP(S) ON-SITE: Josh Fletcher

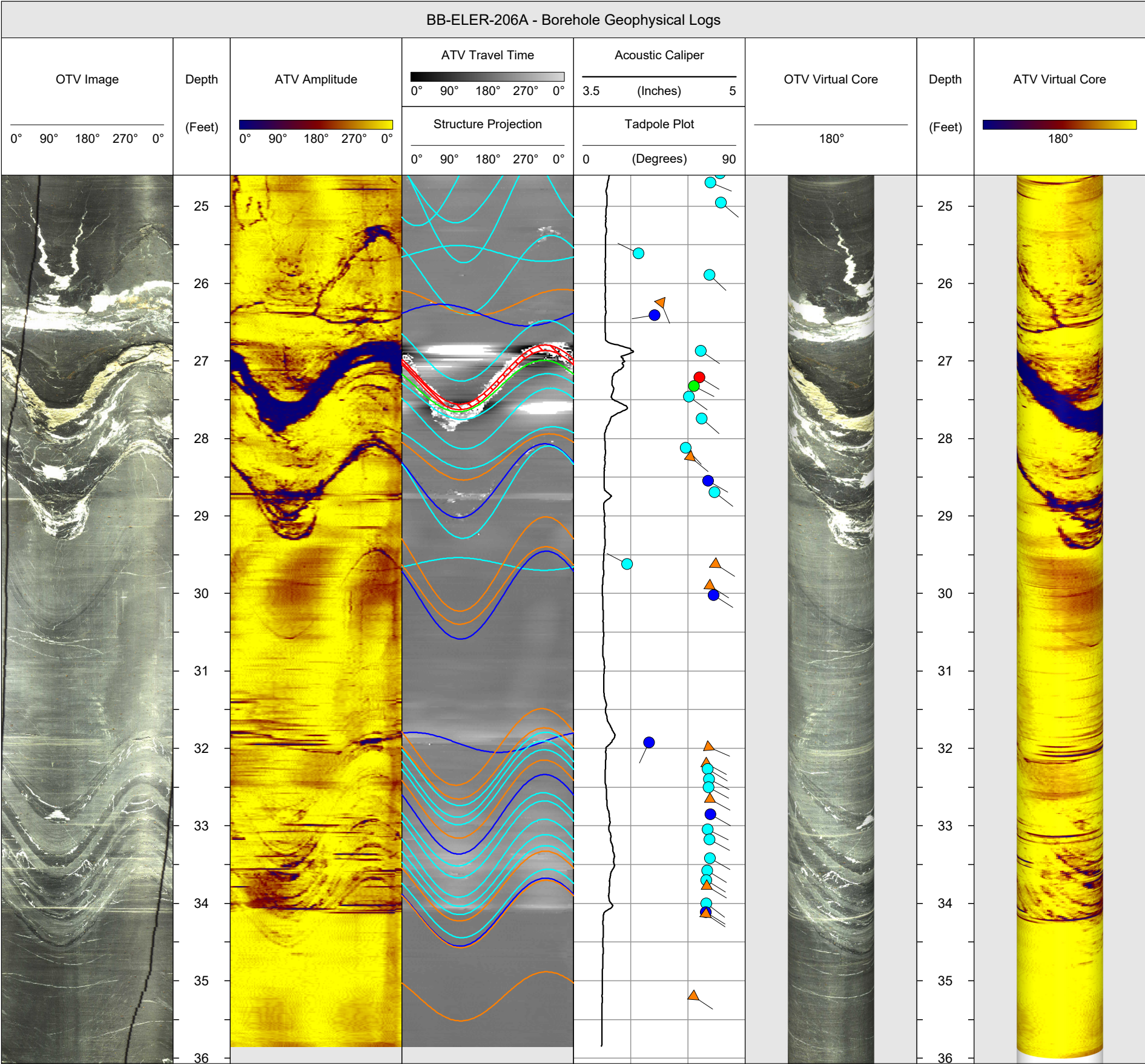
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LOG DATUM:	Ground Surface
ORIENTATION REFERENCE:	True North (Magnetic Declination = 15.8° West)
BOREHOLE DIAMETER:	3.8 Inches
LOGS PROCESSED BY:	Robert Garfield & Nick DeCristofaro

STRUCTURE LEGEND

Fracture Rank 1 Fracture Rank 2 Fracture Rank 3 Fracture Rank 4 Foliation / Vein

BB-ELER-206A - Borehole Geophysical Logs





HAGER-RICHTER GEOSCIENCE, INC.

Salem, New Hampshire
Tel: 603.893.9944

Fords, New Jersey
Tel: 732.661.0555

HB-BE-235 - BOREHOLE GEOPHYSICAL LOGS

DATE(S) LOGGED: March 3, 2021

CLIENT: Haley & Aldrich, Inc.
PROJECT: Brewer-Eddington I-395/Route 9 Connector
LOCATION: Eddington, Maine
LOGGING GEOPHYSICIST(S): Mikko Aarnio & Mark Jones
PROJECT REP(S) ON-SITE: Josh Fletcher

HRGS FILE: 20RG77

LOG DATUM: Ground Surface

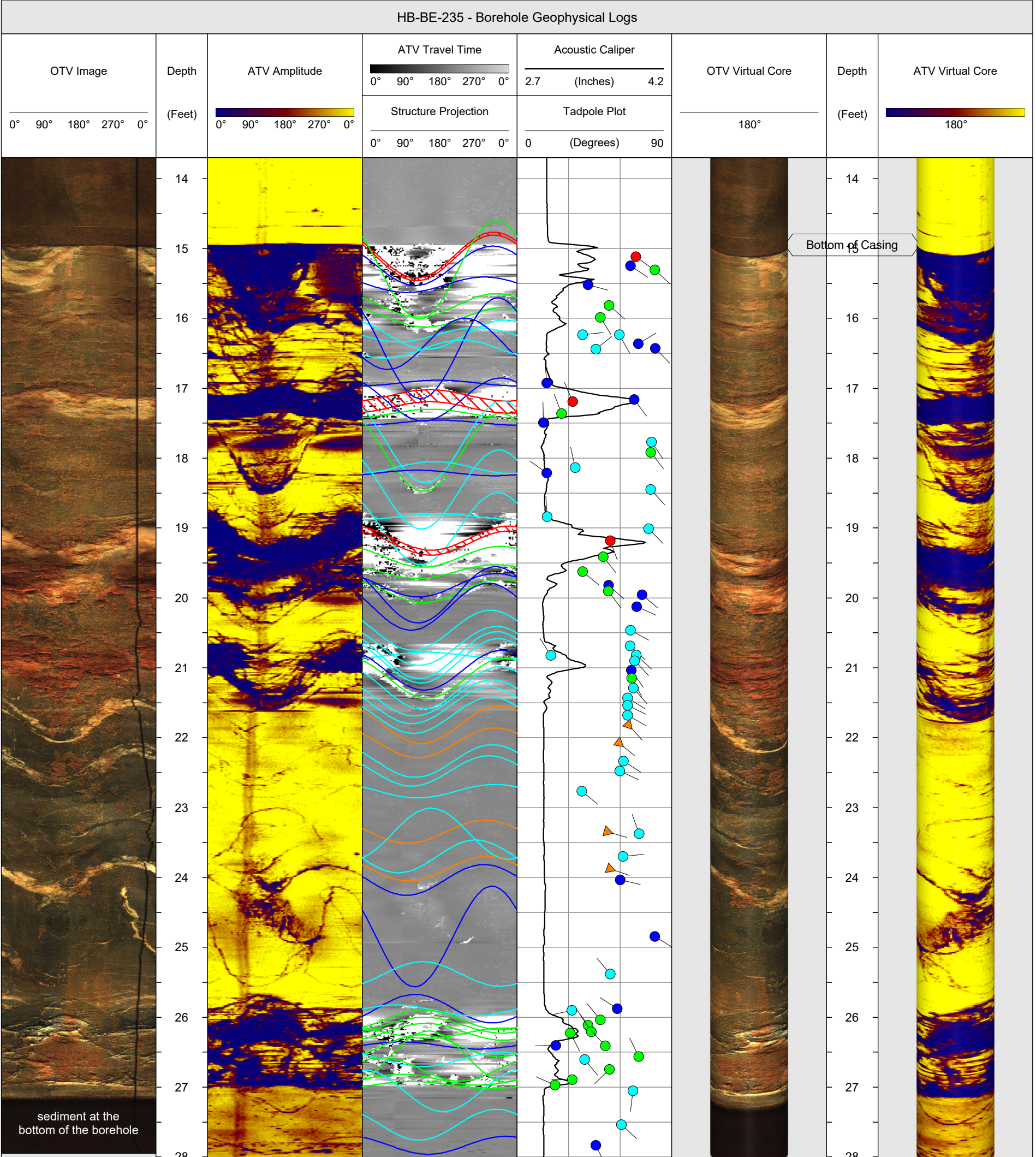
ORIENTATION REFERENCE: True North (Magnetic Declination = 15.8° West)

BOREHOLE DIAMETER: 3 Inches

LOGS PROCESSED BY: Robert Garfield & Nick DeCristofaro

STRUCTURE LEGEND

 Fracture Rank 1
 Fracture Rank 2
 Fracture Rank 3
 Fracture Rank 4
 Foliation / Vein



HAGER-RICHTER GEOSCIENCE, INC.

Salem, New Hampshire
Tel: 603.893.9944

Fords, New Jersey
Tel: 732.661.0555

HB-BE-237 - BOREHOLE GEOPHYSICAL LOGS

DATE(S) LOGGED: March 3, 2021

CLIENT: Haley & Aldrich, Inc.

PROJECT: Brewer-Eddington I-395/Route 9 Connector

LOCATION: Eddington, Maine

LOGGING GEOPHYSICIST(S): Mikko Aarnio & Mark Jones

PROJECT REP(S) ON-SITE: Josh Fletcher

HRGS FILE: 20RG77

LOG DATUM: Ground Surface

ORIENTATION REFERENCE: True North (Magnetic Declination = 15.8° West)

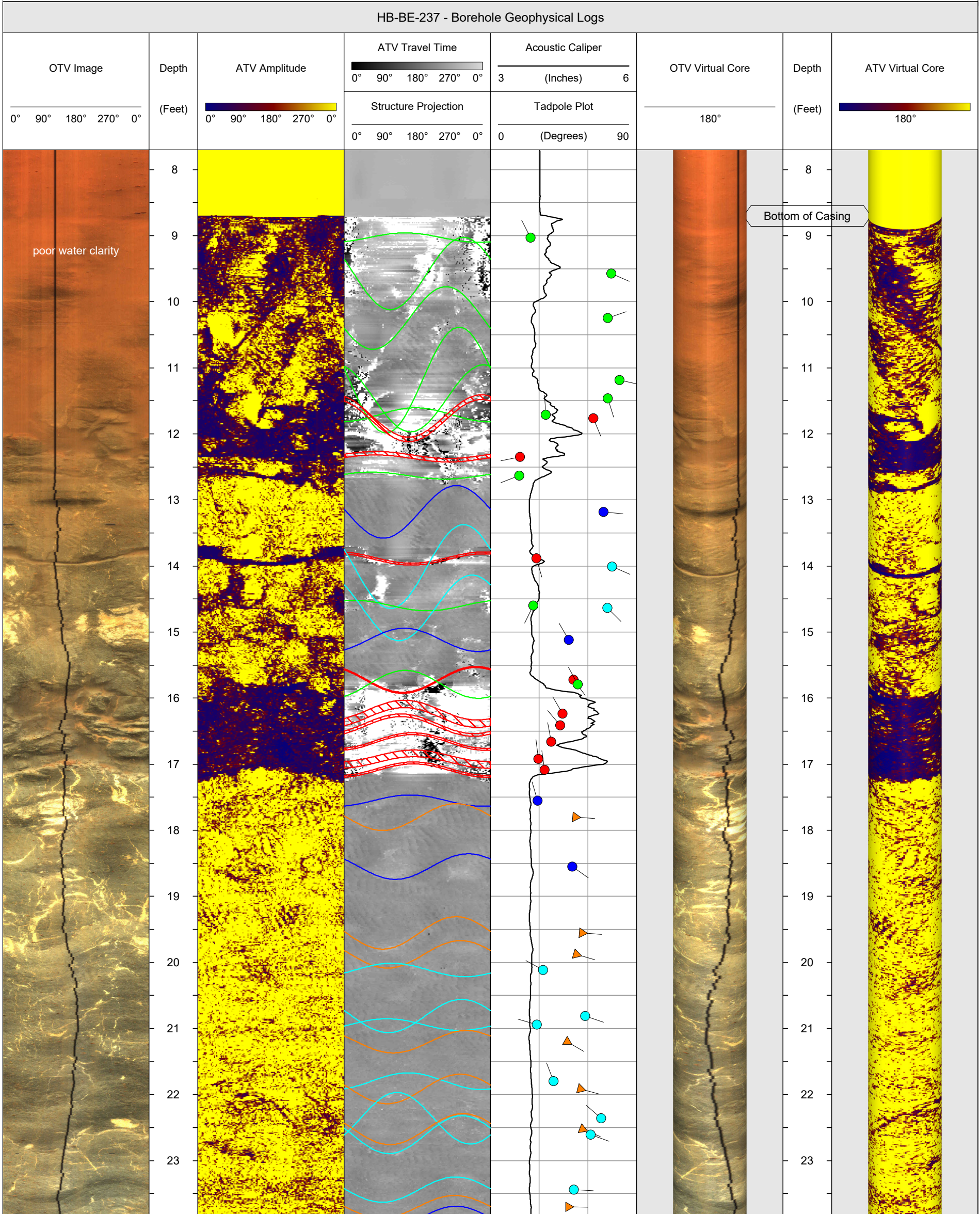
BOREHOLE DIAMETER: 3.8 Inches

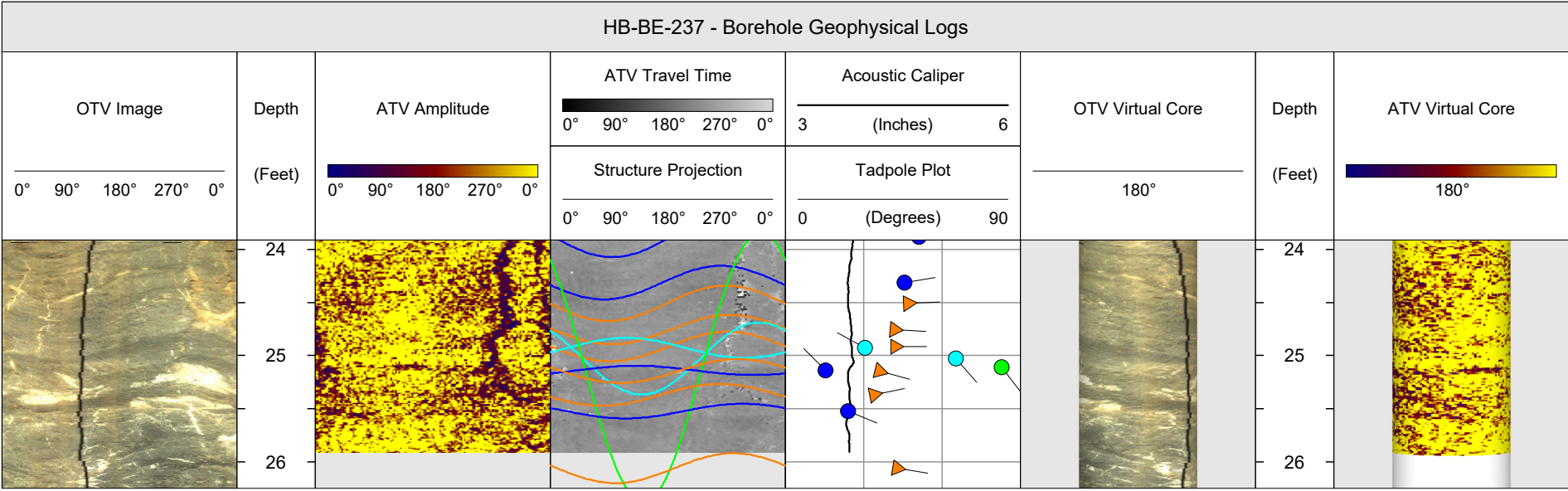
LOGS PROCESSED BY: Robert Garfield & Nick DeCristofaro

STRUCTURE LEGEND

Fracture Rank 1 Fracture Rank 2 Fracture Rank 3 Fracture Rank 4 Foliation / Vein

NOTE: The borehole was reamed to approximately 3.8 inches after NQ coring.





HAGER-RICHTER
GEOSCIENCE, INC.

Salem, New Hampshire
Tel: 603.893.9944

Fords, New Jersey
Tel: 732.661.0555

ALL BOREHOLES FROM NOVEMBER 2020 & MARCH 2021 - BEDROCK STRUCTURE STATISTICS PLOTS

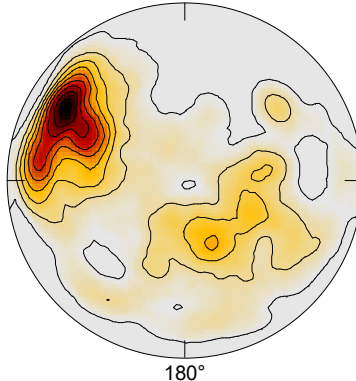
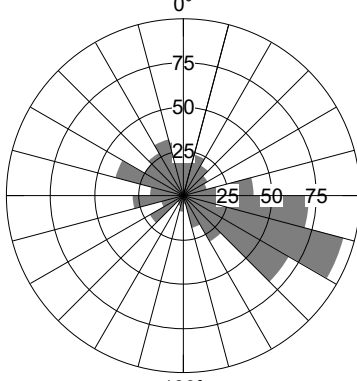
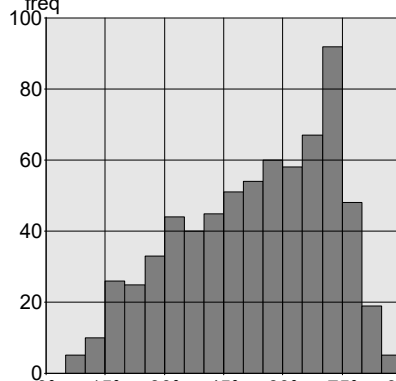
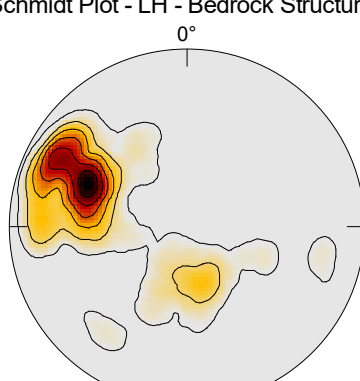
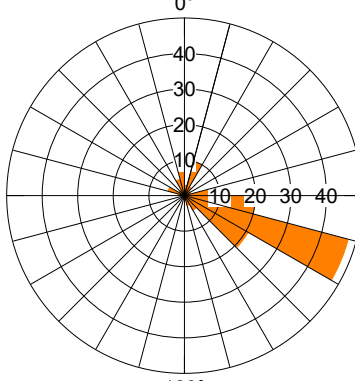
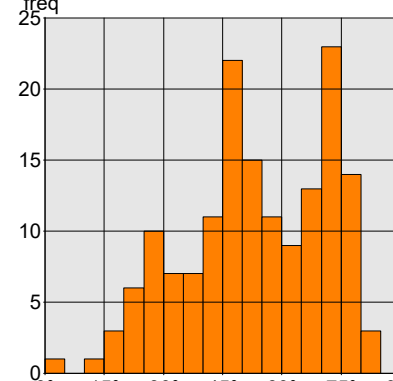
DATE(S) LOGGED: November 24, 2020 & March 3, 2021

CLIENT: Haley & Aldrich, Inc.
PROJECT: Brewer-Eddington I-395/Route 9 Connector
LOCATION: Eddington, Maine

HRGS FILE: 20RG77
ORIENTATION REFERENCE: True North
MAGNETIC DECLINATION: 15.8° West

STRUCTURE LEGEND

Fracture Rank 1 Fracture Rank 2 Fracture Rank 3 Fracture Rank 4 Foliation / Vein

Stereogram - Lower Hemisphere of Bedrock Fractures	Dip Azimuth Rose Diagram of Bedrock Fractures	Dip Angle Histogram of Bedrock Fractures	Stereogram - Lower Hemisphere of Foliation & Veins	Dip Azimuth Rose Diagram of Foliation & Veins	Dip Angle Histogram of Foliation & Veins																																																																																
<div>Schmidt Plot - LH - Bedrock Structures</div>  <table><tr><th></th><th>Counts</th><th>Dip[deg]</th><th>Azi[deg]</th></tr><tr><td>Mean</td><td>682</td><td>53.27</td><td>83.43</td></tr><tr><td>●</td><td>134</td><td>51.71</td><td>72.78</td></tr><tr><td>●</td><td>165</td><td>52.25</td><td>86.53</td></tr><tr><td>●</td><td>319</td><td>55.92</td><td>87.55</td></tr><tr><td>●</td><td>64</td><td>45.74</td><td>333.67</td></tr></table>		Counts	Dip[deg]	Azi[deg]	Mean	682	53.27	83.43	●	134	51.71	72.78	●	165	52.25	86.53	●	319	55.92	87.55	●	64	45.74	333.67	<div>Azimuth - Absolute (Count)</div>  <table><tr><th>Components:</th><th>Azimuth</th></tr><tr><td>Counts:</td><td>682.00</td></tr><tr><td>Mean (2D):</td><td>83.43</td></tr><tr><td>Std.Dev.:</td><td>99.02</td></tr><tr><td>Min:</td><td>0.63</td></tr><tr><td>Max:</td><td>359.03</td></tr></table>	Components:	Azimuth	Counts:	682.00	Mean (2D):	83.43	Std.Dev.:	99.02	Min:	0.63	Max:	359.03	<div>Dip Histogram (Count)</div>  <table><tr><th>Counts:</th><th>682.00</th></tr><tr><td>Mean (2D):</td><td>53.27</td></tr><tr><td>Std.Dev.:</td><td>19.01</td></tr><tr><td>Min:</td><td>5.57</td></tr><tr><td>Max:</td><td>87.81</td></tr></table>	Counts:	682.00	Mean (2D):	53.27	Std.Dev.:	19.01	Min:	5.57	Max:	87.81	<div>Schmidt Plot - LH - Bedrock Structures</div>  <table><tr><th></th><th>Counts</th><th>Dip[deg]</th><th>Azi[deg]</th></tr><tr><td>Mean</td><td>156</td><td>53.44</td><td>93.26</td></tr><tr><td>▶</td><td>156</td><td>53.44</td><td>93.26</td></tr></table>		Counts	Dip[deg]	Azi[deg]	Mean	156	53.44	93.26	▶	156	53.44	93.26	<div>Azimuth - Absolute (Count)</div>  <table><tr><th>Components:</th><th>Azimuth</th></tr><tr><td>Counts:</td><td>156.00</td></tr><tr><td>Mean (2D):</td><td>93.26</td></tr><tr><td>Std.Dev.:</td><td>59.00</td></tr><tr><td>Min:</td><td>3.36</td></tr><tr><td>Max:</td><td>358.36</td></tr></table>	Components:	Azimuth	Counts:	156.00	Mean (2D):	93.26	Std.Dev.:	59.00	Min:	3.36	Max:	358.36	<div>Dip Histogram (Count)</div>  <table><tr><th>Counts:</th><th>156.00</th></tr><tr><td>Mean (2D):</td><td>53.44</td></tr><tr><td>Std.Dev.:</td><td>17.87</td></tr><tr><td>Min:</td><td>2.88</td></tr><tr><td>Max:</td><td>83.09</td></tr></table>	Counts:	156.00	Mean (2D):	53.44	Std.Dev.:	17.87	Min:	2.88	Max:	83.09
	Counts	Dip[deg]	Azi[deg]																																																																																		
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HAGER-RICHTER
GEOSCIENCE, INC.

Salem, New Hampshire
Tel: 603.893.9944

Fords, New Jersey
Tel: 732.661.0555

BB-ECR-201 - BEDROCK STRUCTURE STATISTICS PLOTS

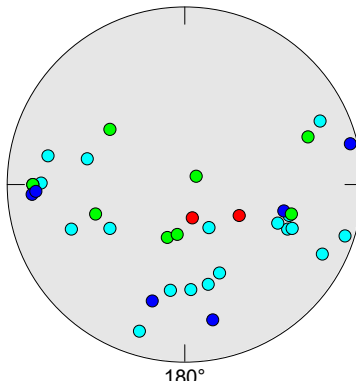
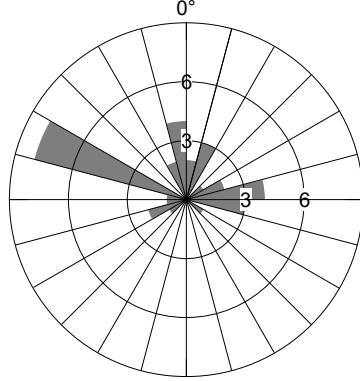
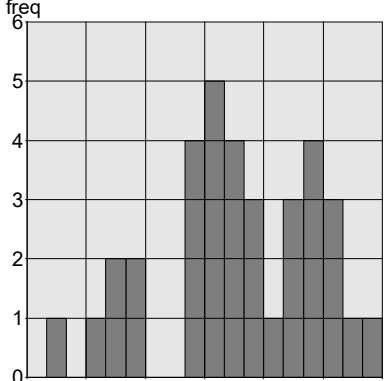
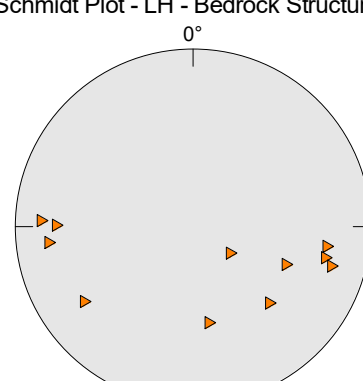
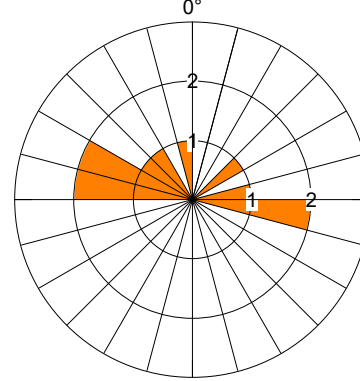
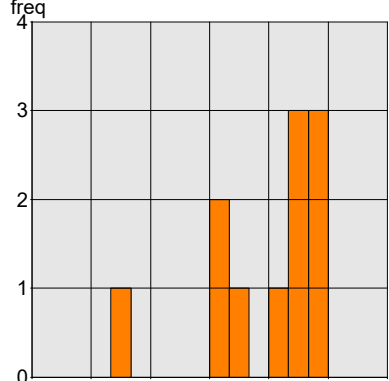
DATE(S) LOGGED: March 3, 2021

CLIENT: Haley & Aldrich, Inc.
PROJECT: Brewer-Eddington I-395/Route 9 Connector
LOCATION: Eddington, Maine

HRGS FILE: 20RG77
ORIENTATION REFERENCE: True North
MAGNETIC DECLINATION: 15.8° West

STRUCTURE LEGEND

Fracture Rank 1 Fracture Rank 2 Fracture Rank 3 Fracture Rank 4 Foliation / Vein

Stereogram - Lower Hemisphere of Bedrock Fractures	Dip Azimuth Rose Diagram of Bedrock Fractures	Dip Angle Histogram of Bedrock Fractures	Stereogram - Lower Hemisphere of Foliation & Veins	Dip Azimuth Rose Diagram of Foliation & Veins	Dip Angle Histogram of Foliation & Veins																																																																																
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	Counts	Dip[deg]	Azi[deg]																																																																																		
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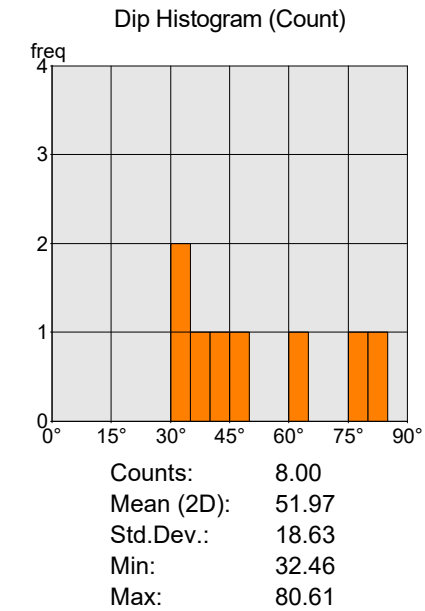
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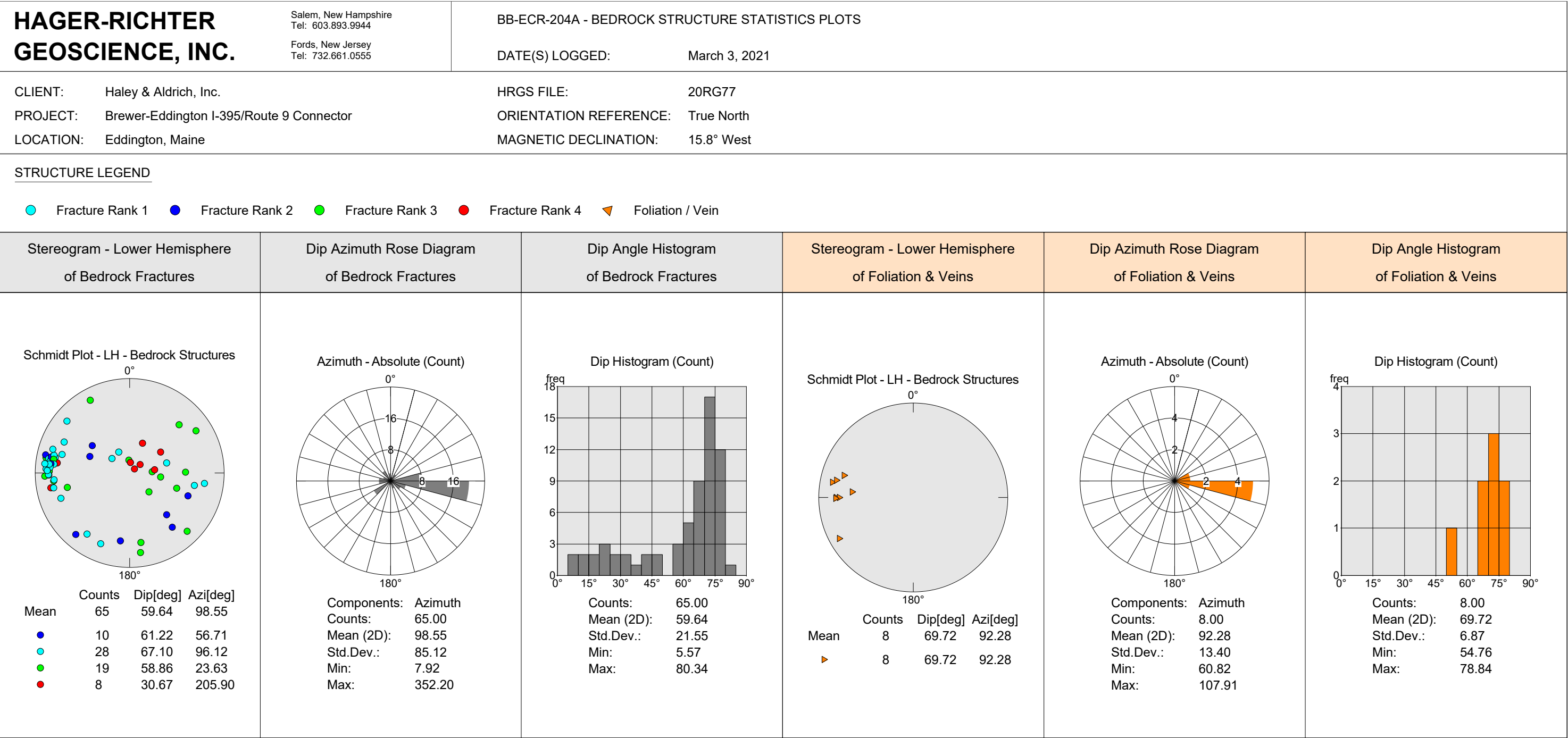
DATE(S) LOGGED: March 3, 2021

HRGS FILE: 20RG77
ORIENTATION REFERENCE: True North
MAGNETIC DECLINATION: 15.8° West

● Fracture Rank 1 ● Fracture Rank 2 ● Fracture Rank 3 ● Fracture Rank 4 ▲ Foliation / Vein

Dip Angle Histogram of Foliation & Veins





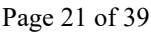
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Tel: 603.893.9944

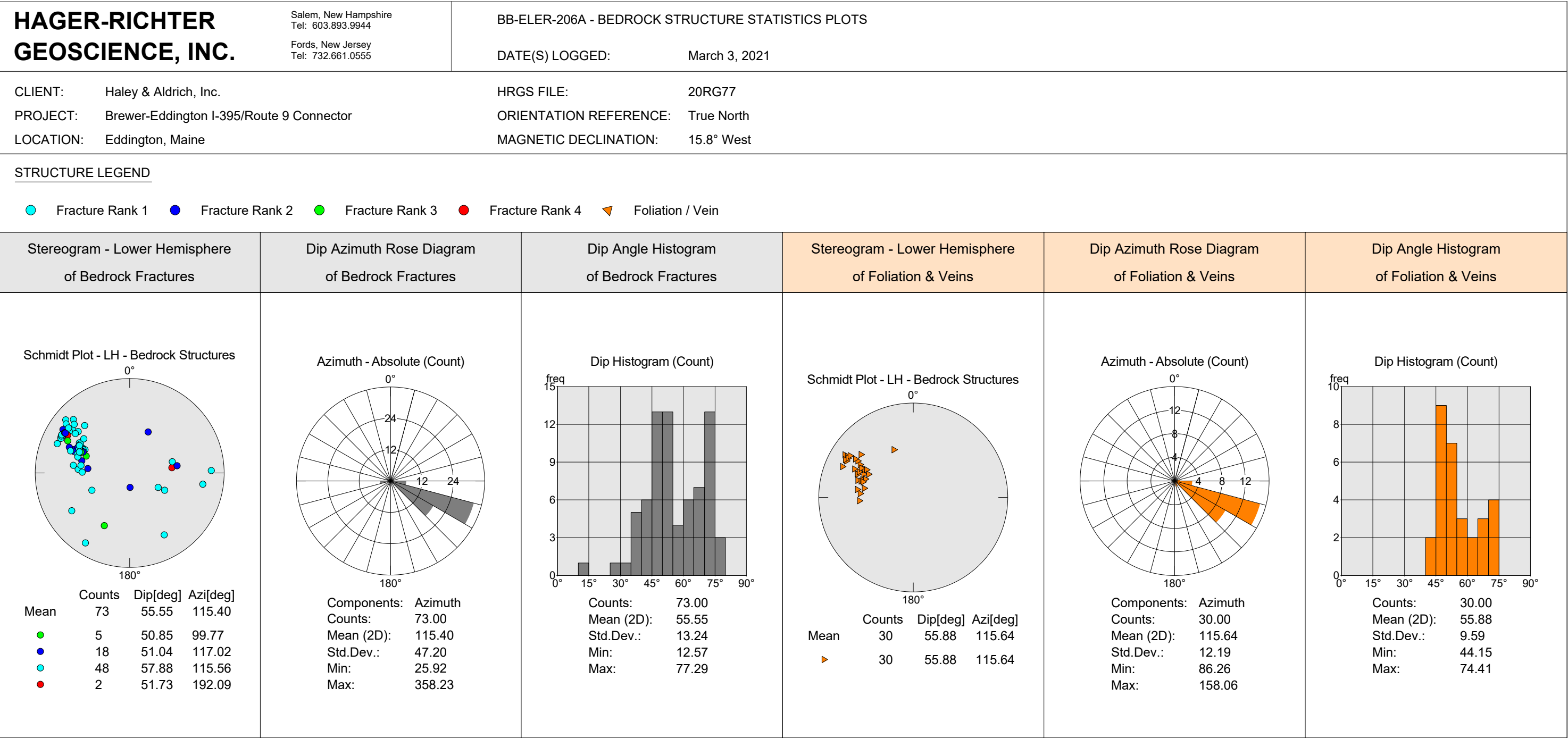
Fords, New Jersey
Tel: 732.661.0555

DATE(S) LOGGED: March 3, 2021

HRGS FILE: 20RG77
ORIENTATION REFERENCE: True North
MAGNETIC DECLINATION: 15.8° West

● Fracture Rank 1 ● Fracture Rank 2 ● Fracture Rank 3 ● Fracture Rank 4 ▲ Foliation / Vein





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Fords, New Jersey
Tel: 732.661.0555

HB-BE-235 - BEDROCK STRUCTURE STATISTICS PLOTS

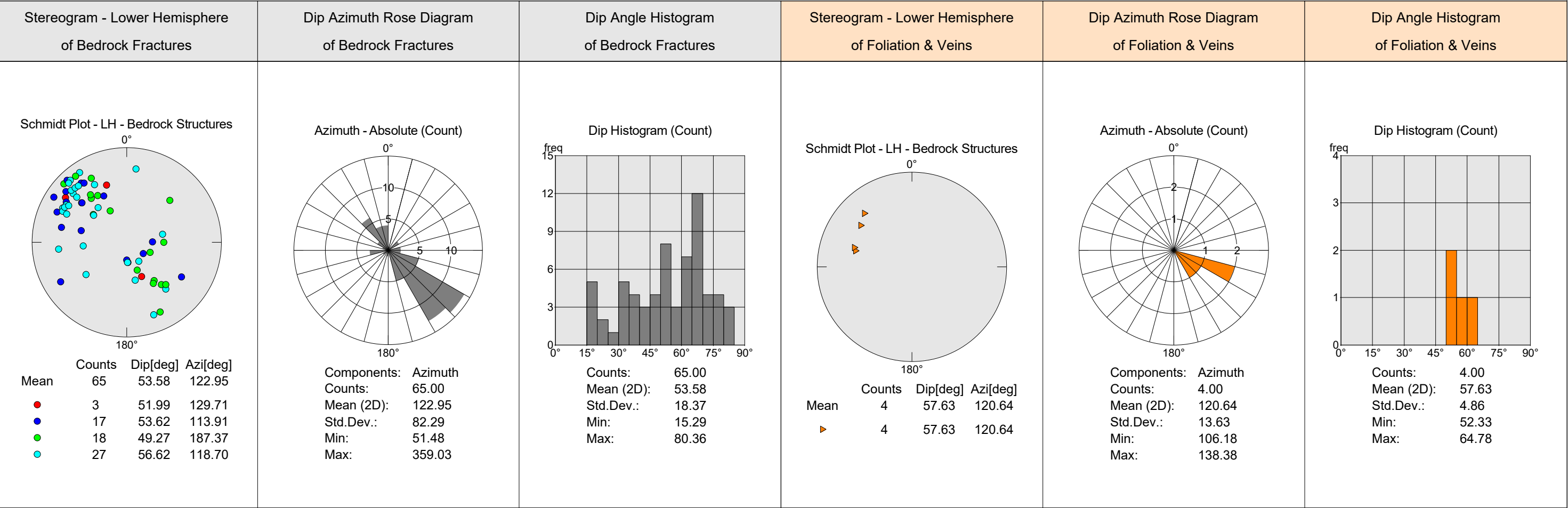
DATE(S) LOGGED: March 3, 2021

CLIENT: Haley & Aldrich, Inc.
PROJECT: Brewer-Eddington I-395/Route 9 Connector
LOCATION: Eddington, Maine

HRGS FILE: 20RG77
ORIENTATION REFERENCE: True North
MAGNETIC DECLINATION: 15.8° West

STRUCTURE LEGEND

● Fracture Rank 1 ● Fracture Rank 2 ● Fracture Rank 3 ● Fracture Rank 4 ▲ Foliation / Vein



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Tel: 603.893.9944

Fords, New Jersey
Tel: 732.661.0555

HB-BE-237 - BEDROCK STRUCTURE STATISTICS PLOTS

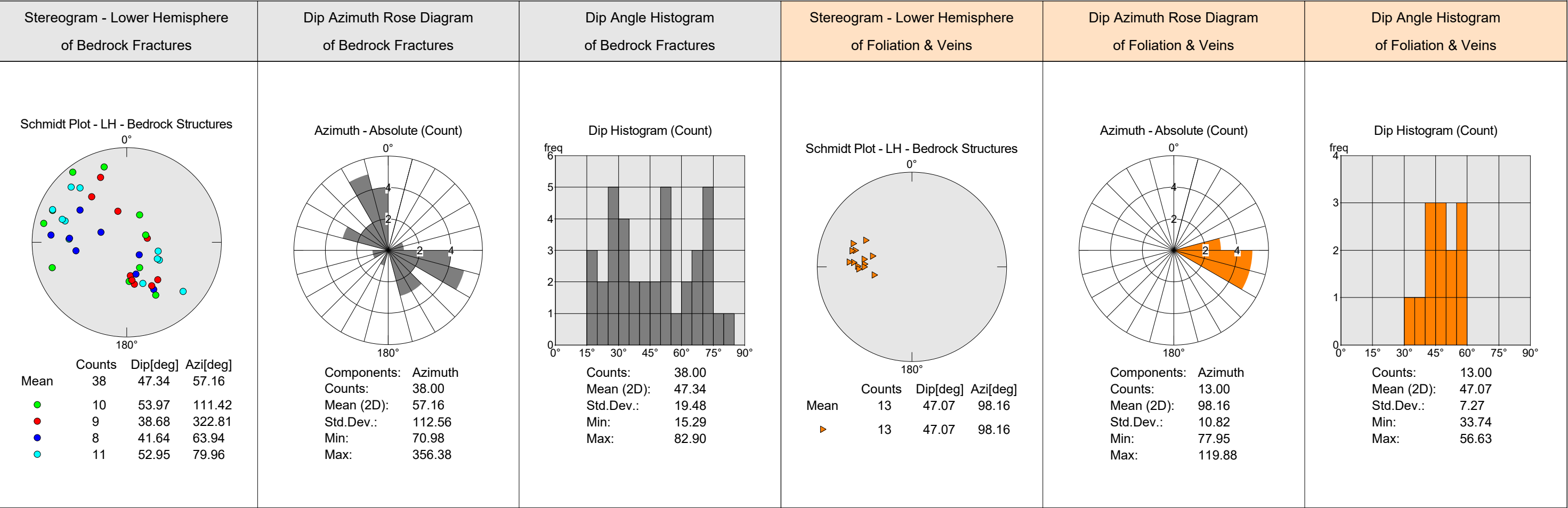
DATE(S) LOGGED: March 3, 2021

CLIENT: Haley & Aldrich, Inc.
PROJECT: Brewer-Eddington I-395/Route 9 Connector
LOCATION: Eddington, Maine

HRGS FILE: 20RG77
ORIENTATION REFERENCE: True North
MAGNETIC DECLINATION: 15.8° West

STRUCTURE LEGEND

● Fracture Rank 1 ● Fracture Rank 2 ● Fracture Rank 3 ● Fracture Rank 4 ▲ Foliation / Vein



HAGER-RICHTER GEOSCIENCE, INC.	
BB-ECR-201 - TABLE OF BEDROCK STRUCTURES	
CLIENT	Haley & Aldrich, Inc.
PROJECT	Brewer-Eddington I-395/Route 9 Connector
LOCATION	Eddington, Maine
HRGS FILE	20RG77
DATE LOGGED	March 3, 2021
LOG DATUM	Ground Surface
DIP AZIMUTH	True North (Magnetic Declination = 15.8° West)
DIP ANGLE	Measured from Horizontal

BB-ECR-201 - TABLE OF BEDROCK STRUCTURES

Depth (Feet)	Dip Azimuth (Degrees)	Dip Angle (Degrees)	Bedrock Structure Category
17.3	55	64	Foliation / Vein
18.0	347	48	Fracture Rank 1
19.5	233	7	Fracture Rank 3
20.1	330	23	Fracture Rank 1
20.1	348	67	Fracture Rank 2
22.1	278	65	Foliation / Vein
22.4	283	66	Foliation / Vein
22.9	17	75	Fracture Rank 1
24.6	287	52	Fracture Rank 1
25.3	292	47	Foliation / Vein
25.7	286	70	Foliation / Vein
26.4	18	26	Fracture Rank 3
26.7	315	51	Foliation / Vein
27.1	306	21	Foliation / Vein
27.2	346	16	Fracture Rank 4
27.4	8	51	Fracture Rank 1
28.0	9	23	Fracture Rank 3
28.1	16	58	Fracture Rank 2
28.2	357	50	Fracture Rank 1
28.3	351	46	Foliation / Vein
28.5	105	48	Fracture Rank 1
29.3	91	70	Fracture Rank 1
29.8	72	44	Fracture Rank 3
29.8	93	75	Foliation / Vein
29.9	60	41	Fracture Rank 1
30.1	90	75	Fracture Rank 4
30.2	90	75	Fracture Rank 3
30.5	86	75	Fracture Rank 2
30.6	68	58	Fracture Rank 1
31.7	288	84	Fracture Rank 1
31.9	338	45	Fracture Rank 1
32.0	87	73	Fracture Rank 2
32.9	84	71	Foliation / Vein
33.2	245	73	Fracture Rank 1
33.5	91	66	Foliation / Vein

BB-ECR-201 - TABLE OF BEDROCK STRUCTURES

Depth (Feet)	Dip Azimuth (Degrees)	Dip Angle (Degrees)	Bedrock Structure Category
33.5	102	68	Fracture Rank 1
34.6	294	53	Fracture Rank 1
34.7	285	48	Fracture Rank 2
34.7	285	52	Fracture Rank 3
35.0	126	44	Fracture Rank 3
35.3	249	64	Fracture Rank 3
35.4	292	55	Fracture Rank 1
35.6	256	86	Fracture Rank 2
35.8	297	76	Fracture Rank 1
36.2	293	47	Fracture Rank 1
36.7	300	29	Fracture Rank 4

HAGER-RICHTER GEOSCIENCE, INC.	
BB-ECR-203A - TABLE OF BEDROCK STRUCTURES	
CLIENT	Haley & Aldrich, Inc.
PROJECT	Brewer-Eddington I-395/Route 9 Connector
LOCATION	Eddington, Maine
HRGS FILE	20RG77
DATE LOGGED	March 3, 2021
LOG DATUM	Ground Surface
DIP AZIMUTH	True North (Magnetic Declination = 15.8° West)
DIP ANGLE	Measured from Horizontal

BB-ECR-203A - TABLE OF BEDROCK STRUCTURES

Depth (Feet)	Dip Azimuth (Degrees)	Dip Angle (Degrees)	Bedrock Structure Category
14.2	257	49	Fracture Rank 2
14.3	171	54	Fracture Rank 2
14.3	249	52	Fracture Rank 2
15.6	279	25	Fracture Rank 1
16.1	134	72	Fracture Rank 1
16.3	47	83	Fracture Rank 2
16.5	104	49	Fracture Rank 1
16.7	72	59	Fracture Rank 1
17.1	88	88	Fracture Rank 3
17.2	158	23	Fracture Rank 3
17.6	19	49	Fracture Rank 1
18.0	81	16	Fracture Rank 1
18.1	33	42	Fracture Rank 1
20.0	284	34	Fracture Rank 3
20.2	35	71	Fracture Rank 2
20.2	343	59	Fracture Rank 1
21.0	87	80	Foliation / Vein
21.6	85	82	Fracture Rank 1
22.4	97	86	Fracture Rank 3
22.8	242	56	Fracture Rank 1
22.9	77	41	Fracture Rank 1
23.1	87	34	Foliation / Vein
23.5	227	58	Fracture Rank 3
23.6	37	22	Fracture Rank 2
23.9	96	28	Fracture Rank 1
23.9	233	40	Fracture Rank 3
24.2	76	64	Fracture Rank 1
24.4	335	86	Fracture Rank 1
24.4	212	38	Fracture Rank 3
24.5	57	32	Fracture Rank 1
25.0	233	81	Foliation / Vein
25.7	335	80	Fracture Rank 1
26.3	338	30	Fracture Rank 2
26.6	326	22	Fracture Rank 1
27.5	286	32	Foliation / Vein

BB-ECR-203A - TABLE OF BEDROCK STRUCTURES

Depth (Feet)	Dip Azimuth (Degrees)	Dip Angle (Degrees)	Bedrock Structure Category
27.6	254	38	Fracture Rank 1
27.8	260	48	Fracture Rank 3
27.9	64	36	Fracture Rank 3
28.0	18	37	Fracture Rank 2
28.1	14	38	Fracture Rank 2
28.2	15	36	Fracture Rank 1
28.8	26	37	Foliation / Vein
29.4	66	51	Fracture Rank 1
29.4	33	79	Fracture Rank 1
29.9	28	69	Fracture Rank 2
30.5	49	73	Fracture Rank 4
30.6	51	69	Fracture Rank 2
30.9	40	49	Fracture Rank 2
30.9	44	72	Fracture Rank 2
31.1	49	41	Fracture Rank 2
31.5	20	51	Fracture Rank 1
32.0	23	50	Foliation / Vein
32.5	28	41	Foliation / Vein
33.0	67	63	Foliation / Vein
34.0	191	24	Fracture Rank 4
34.2	88	58	Fracture Rank 1
34.6	40	20	Fracture Rank 4
35.7	19	50	Fracture Rank 1
38.8	286	18	Fracture Rank 1
39.0	274	26	Fracture Rank 1

HAGER-RICHTER GEOSCIENCE, INC.	
BB-ECR-204A - TABLE OF BEDROCK STRUCTURES	
CLIENT	Haley & Aldrich, Inc.
PROJECT	Brewer-Eddington I-395/Route 9 Connector
LOCATION	Eddington, Maine
HRGS FILE	20RG77
DATE LOGGED	March 3, 2021
LOG DATUM	Ground Surface
DIP AZIMUTH	True North (Magnetic Declination = 15.8° West)
DIP ANGLE	Measured from Horizontal

BB-ECR-204A - TABLE OF BEDROCK STRUCTURES

Depth (Feet)	Dip Azimuth (Degrees)	Dip Angle (Degrees)	Bedrock Structure Category
14.4	8	62	Fracture Rank 2
14.9	22	70	Fracture Rank 1
14.9	292	56	Fracture Rank 2
14.9	61	79	Foliation / Vein
14.9	88	79	Fracture Rank 3
15.3	278	69	Fracture Rank 1
15.6	281	59	Fracture Rank 1
16.0	288	44	Fracture Rank 3
16.1	269	50	Fracture Rank 3
16.4	231	12	Fracture Rank 4
16.6	204	28	Fracture Rank 4
16.6	351	64	Fracture Rank 3
16.9	278	27	Fracture Rank 3
16.9	266	20	Fracture Rank 3
17.0	352	74	Fracture Rank 3
17.6	126	41	Fracture Rank 2
17.7	319	50	Fracture Rank 2
17.9	91	74	Fracture Rank 3
17.9	322	63	Fracture Rank 2
18.4	226	63	Fracture Rank 3
18.7	41	76	Fracture Rank 2
18.8	112	38	Fracture Rank 2
18.9	152	77	Fracture Rank 3
19.0	238	72	Fracture Rank 3
19.3	79	74	Fracture Rank 4
19.8	236	33	Fracture Rank 4
19.9	98	66	Fracture Rank 4
20.0	100	79	Fracture Rank 3
20.6	95	74	Fracture Rank 1
20.9	101	76	Foliation / Vein
21.2	102	80	Fracture Rank 2
21.3	100	76	Fracture Rank 1
21.7	99	74	Fracture Rank 1
22.1	77	58	Fracture Rank 3
22.2	84	70	Fracture Rank 3

BB-ECR-204A - TABLE OF BEDROCK STRUCTURES

Depth (Feet)	Dip Azimuth (Degrees)	Dip Angle (Degrees)	Bedrock Structure Category
22.4	79	71	Fracture Rank 1
22.6	90	71	Foliation / Vein
22.9	115	66	Fracture Rank 1
23.5	70	67	Fracture Rank 1
23.8	90	68	Foliation / Vein
24.2	85	69	Fracture Rank 1
24.7	35	68	Fracture Rank 1
24.8	105	64	Fracture Rank 1
25.1	176	11	Fracture Rank 3
25.2	130	75	Fracture Rank 1
25.8	108	66	Foliation / Vein
25.9	102	70	Fracture Rank 1
26.3	102	74	Fracture Rank 2
26.5	228	6	Fracture Rank 4
26.5	103	71	Fracture Rank 1
26.6	100	71	Fracture Rank 3
26.7	97	70	Fracture Rank 1
27.0	96	73	Fracture Rank 1
27.9	97	73	Fracture Rank 2
28.1	315	24	Fracture Rank 3
28.3	185	9	Fracture Rank 4
29.6	95	55	Foliation / Vein
30.3	107	74	Fracture Rank 1
31.9	315	76	Fracture Rank 3
34.7	92	76	Fracture Rank 3
34.9	93	78	Fracture Rank 1
35.7	94	73	Fracture Rank 1
35.9	88	75	Fracture Rank 1
36.2	263	22	Fracture Rank 4
36.4	152	21	Fracture Rank 1
36.6	89	75	Fracture Rank 1
37.9	89	71	Foliation / Vein
38.3	255	33	Fracture Rank 1
38.3	129	20	Fracture Rank 1
38.3	92	76	Fracture Rank 1
42.1	103	72	Foliation / Vein
42.4	97	75	Fracture Rank 1
42.7	96	80	Fracture Rank 1

HAGER-RICHTER GEOSCIENCE, INC.	
BB-ECR-206A - TABLE OF BEDROCK STRUCTURES	
CLIENT	Haley & Aldrich, Inc.
PROJECT	Brewer-Eddington I-395/Route 9 Connector
LOCATION	Eddington, Maine
HRGS FILE	20RG77
DATE LOGGED	March 3, 2021
LOG DATUM	Ground Surface
DIP AZIMUTH	True North (Magnetic Declination = 15.8° West)
DIP ANGLE	Measured from Horizontal

BB-ECR-206A - TABLE OF BEDROCK STRUCTURES

Depth (Feet)	Dip Azimuth (Degrees)	Dip Angle (Degrees)	Bedrock Structure Category
24.2	153	66	Fracture Rank 3
24.6	136	36	Fracture Rank 2
25.2	126	71	Fracture Rank 3
25.4	93	35	Fracture Rank 1
25.6	140	32	Fracture Rank 2
25.6	75	71	Fracture Rank 1
26.3	154	78	Fracture Rank 1
26.8	109	76	Fracture Rank 3
27.3	127	77	Foliation / Vein
27.7	128	66	Fracture Rank 1
27.7	341	71	Fracture Rank 1
28.0	117	69	Fracture Rank 4
28.0	120	27	Fracture Rank 3
28.2	292	71	Fracture Rank 2
28.3	307	73	Fracture Rank 2
28.4	140	73	Fracture Rank 2
28.4	301	42	Fracture Rank 3
28.7	281	34	Fracture Rank 2
28.9	230	14	Fracture Rank 2
29.2	272	37	Fracture Rank 4
29.4	264	46	Fracture Rank 3
29.5	315	30	Fracture Rank 2
29.6	17	40	Fracture Rank 3
29.6	117	72	Fracture Rank 3
29.6	289	38	Foliation / Vein
29.9	10	40	Fracture Rank 2
29.9	127	62	Fracture Rank 1
30.4	351	76	Fracture Rank 1
30.7	290	65	Fracture Rank 1
31.0	298	69	Fracture Rank 3
31.1	306	60	Fracture Rank 3
31.5	331	53	Fracture Rank 1
31.5	309	74	Fracture Rank 4
31.5	122	70	Foliation / Vein
31.7	72	68	Fracture Rank 1

BB-ECR-206A - TABLE OF BEDROCK STRUCTURES

Depth (Feet)	Dip Azimuth (Degrees)	Dip Angle (Degrees)	Bedrock Structure Category
31.8	343	41	Fracture Rank 1
32.1	122	73	Foliation / Vein
32.2	301	77	Fracture Rank 1
32.6	112	72	Fracture Rank 1
32.8	113	73	Fracture Rank 1
33.0	113	73	Fracture Rank 1
34.7	107	73	Fracture Rank 1
34.9	109	74	Foliation / Vein
35.1	113	75	Foliation / Vein
35.3	114	76	Foliation / Vein
35.7	112	76	Foliation / Vein
36.4	114	80	Fracture Rank 1
38.1	117	83	Foliation / Vein
39.6	120	78	Foliation / Vein
40.4	184	34	Fracture Rank 1
41.0	124	68	Foliation / Vein
42.0	118	73	Fracture Rank 1
42.1	113	73	Foliation / Vein
43.5	109	76	Foliation / Vein
43.6	107	77	Fracture Rank 1
44.8	108	78	Foliation / Vein
45.2	107	78	Foliation / Vein
47.0	95	33	Fracture Rank 1
47.5	108	81	Foliation / Vein
47.7	88	21	Fracture Rank 1
47.8	97	64	Fracture Rank 1
47.8	333	59	Fracture Rank 2

HAGER-RICHTER GEOSCIENCE, INC.	
BB-ELER-206A - TABLE OF BEDROCK STRUCTURES	
CLIENT	Haley & Aldrich, Inc.
PROJECT	Brewer-Eddington I-395/Route 9 Connector
LOCATION	Eddington, Maine
HRGS FILE	20RG77
DATE LOGGED	March 3, 2021
LOG DATUM	Ground Surface
DIP AZIMUTH	True North (Magnetic Declination = 15.8° West)
DIP ANGLE	Measured from Horizontal

BB-ELER-206A - TABLE OF BEDROCK STRUCTURES

Depth (Feet)	Dip Azimuth (Degrees)	Dip Angle (Degrees)	Bedrock Structure Category
9.4	26	52	Fracture Rank 3
9.7	358	13	Fracture Rank 2
10.1	86	48	Foliation / Vein
10.3	94	46	Fracture Rank 1
10.5	98	50	Fracture Rank 1
10.8	95	47	Foliation / Vein
11.4	101	44	Foliation / Vein
11.6	104	44	Fracture Rank 2
11.9	99	43	Fracture Rank 1
12.1	268	76	Fracture Rank 1
12.3	118	47	Fracture Rank 1
12.7	121	52	Fracture Rank 1
12.9	115	49	Foliation / Vein
13.2	113	51	Fracture Rank 3
13.3	108	52	Foliation / Vein
13.8	113	50	Fracture Rank 2
14.1	122	56	Foliation / Vein
14.8	99	50	Foliation / Vein
15.0	113	55	Foliation / Vein
15.1	113	54	Fracture Rank 2
15.3	111	54	Fracture Rank 2
15.5	113	59	Fracture Rank 2
15.7	263	37	Fracture Rank 4
15.8	127	60	Fracture Rank 1
16.0	255	39	Fracture Rank 1
16.9	57	63	Fracture Rank 1
17.5	91	42	Fracture Rank 1
17.6	96	37	Fracture Rank 2
18.2	111	57	Fracture Rank 1
18.3	113	54	Foliation / Vein
18.4	116	54	Foliation / Vein
18.7	108	49	Foliation / Vein
18.8	117	52	Fracture Rank 2
18.9	119	51	Fracture Rank 1
19.1	120	50	Foliation / Vein

BB-ELER-206A - TABLE OF BEDROCK STRUCTURES

Depth (Feet)	Dip Azimuth (Degrees)	Dip Angle (Degrees)	Bedrock Structure Category
19.3	109	48	Foliation / Vein
19.3	109	48	Fracture Rank 1
19.4	114	47	Fracture Rank 2
19.5	118	45	Fracture Rank 1
19.8	279	68	Fracture Rank 1
19.8	117	46	Fracture Rank 1
19.9	110	50	Fracture Rank 1
20.0	115	45	Fracture Rank 2
20.1	111	41	Fracture Rank 3
20.2	114	45	Fracture Rank 2
20.2	113	47	Fracture Rank 3
20.3	120	50	Fracture Rank 2
20.5	116	50	Fracture Rank 1
20.6	120	51	Fracture Rank 1
20.7	121	51	Fracture Rank 1
20.9	121	48	Foliation / Vein
21.1	119	53	Foliation / Vein
21.9	119	51	Fracture Rank 1
22.0	127	51	Fracture Rank 1
22.2	111	45	Foliation / Vein
22.3	107	47	Foliation / Vein
22.5	107	48	Fracture Rank 1
22.6	118	44	Foliation / Vein
22.8	113	48	Fracture Rank 1
23.0	129	59	Fracture Rank 1
23.2	123	60	Foliation / Vein
23.2	331	64	Fracture Rank 1
23.8	127	65	Fracture Rank 1
24.0	116	59	Foliation / Vein
24.1	65	37	Fracture Rank 1
24.6	32	77	Fracture Rank 1
24.7	112	72	Fracture Rank 1
25.0	130	77	Fracture Rank 1
25.6	296	34	Fracture Rank 1
25.9	134	71	Fracture Rank 1
26.2	158	46	Foliation / Vein
26.4	261	42	Fracture Rank 2
26.9	124	67	Fracture Rank 1
27.2	121	66	Fracture Rank 4
27.3	118	63	Fracture Rank 3
27.5	126	61	Fracture Rank 1
27.7	131	67	Fracture Rank 1
28.1	136	59	Fracture Rank 1
28.2	129	61	Foliation / Vein
28.5	120	70	Fracture Rank 2

BB-ELER-206A - TABLE OF BEDROCK STRUCTURES

Depth (Feet)	Dip Azimuth (Degrees)	Dip Angle (Degrees)	Bedrock Structure Category
28.7	128	74	Fracture Rank 1
29.6	297	28	Fracture Rank 1
29.6	122	74	Foliation / Vein
29.9	122	71	Foliation / Vein
30.0	123	73	Fracture Rank 2
31.9	205	40	Fracture Rank 2
32.0	114	71	Foliation / Vein
32.2	119	70	Foliation / Vein
32.3	122	70	Fracture Rank 1
32.4	117	71	Fracture Rank 1
32.5	119	71	Fracture Rank 1
32.7	119	71	Foliation / Vein
32.9	120	72	Fracture Rank 2
33.1	117	70	Fracture Rank 1
33.2	119	71	Fracture Rank 1
33.4	120	72	Fracture Rank 1
33.6	122	70	Fracture Rank 1
33.7	122	70	Fracture Rank 1
33.8	121	70	Foliation / Vein
34.0	126	70	Fracture Rank 1
34.1	122	69	Fracture Rank 2
34.1	123	69	Foliation / Vein
35.2	124	63	Foliation / Vein

HAGER-RICHTER GEOSCIENCE, INC.	
HB-BE-235 - TABLE OF BEDROCK STRUCTURES	
CLIENT	Haley & Aldrich, Inc.
PROJECT	Brewer-Eddington I-395/Route 9 Connector
LOCATION	Eddington, Maine
HRGS FILE	20RG77
DATE LOGGED	March 3, 2021
LOG DATUM	Ground Surface
DIP AZIMUTH	True North (Magnetic Declination = 15.8° West)
DIP ANGLE	Measured from Horizontal

HB-BE-235 - TABLE OF BEDROCK STRUCTURES

Depth (Feet)	Dip Azimuth (Degrees)	Dip Angle (Degrees)	Bedrock Structure Category
15.1	126	69	Fracture Rank 4
15.3	124	66	Fracture Rank 2
15.3	133	80	Fracture Rank 3
15.5	105	41	Fracture Rank 2
15.8	131	53	Fracture Rank 3
16.0	148	49	Fracture Rank 3
16.2	85	38	Fracture Rank 1
16.2	151	59	Fracture Rank 1
16.4	59	71	Fracture Rank 2
16.4	136	80	Fracture Rank 2
16.4	51	46	Fracture Rank 1
16.9	356	17	Fracture Rank 2
17.2	142	68	Fracture Rank 2
17.2	336	32	Fracture Rank 4
17.4	339	26	Fracture Rank 3
17.5	359	15	Fracture Rank 2
17.8	146	78	Fracture Rank 1
17.9	142	78	Fracture Rank 3
18.1	347	34	Fracture Rank 1
18.2	305	17	Fracture Rank 2
18.5	138	78	Fracture Rank 1
18.8	357	17	Fracture Rank 1
19.0	136	77	Fracture Rank 1
19.2	160	54	Fracture Rank 4
19.4	141	50	Fracture Rank 3
19.6	130	38	Fracture Rank 3
19.8	131	53	Fracture Rank 2
19.9	143	53	Fracture Rank 3
20.0	130	73	Fracture Rank 2
20.1	114	70	Fracture Rank 2
20.5	118	66	Fracture Rank 1
20.7	132	66	Fracture Rank 1
20.8	133	69	Fracture Rank 1
20.8	327	20	Fracture Rank 1
20.9	137	68	Fracture Rank 1

HB-BE-235 - TABLE OF BEDROCK STRUCTURES

Depth (Feet)	Dip Azimuth (Degrees)	Dip Angle (Degrees)	Bedrock Structure Category
21.0	144	66	Fracture Rank 2
21.2	151	67	Fracture Rank 3
21.3	139	68	Fracture Rank 1
21.4	122	64	Fracture Rank 1
21.5	116	64	Fracture Rank 1
21.7	120	64	Fracture Rank 1
21.8	138	65	Foliation / Vein
22.1	129	59	Foliation / Vein
22.3	123	62	Fracture Rank 1
22.5	115	60	Fracture Rank 1
22.8	129	38	Fracture Rank 1
23.3	106	52	Foliation / Vein
23.4	340	71	Fracture Rank 1
23.7	84	62	Fracture Rank 1
23.9	109	54	Foliation / Vein
24.0	103	60	Fracture Rank 2
24.9	122	80	Fracture Rank 2
25.4	320	54	Fracture Rank 1
25.9	302	58	Fracture Rank 2
25.9	257	32	Fracture Rank 1
26.0	321	48	Fracture Rank 3
26.1	324	41	Fracture Rank 3
26.2	327	43	Fracture Rank 3
26.2	152	31	Fracture Rank 3
26.4	268	23	Fracture Rank 2
26.4	317	51	Fracture Rank 3
26.6	334	71	Fracture Rank 3
26.6	140	39	Fracture Rank 1
26.8	226	54	Fracture Rank 3
26.9	270	32	Fracture Rank 3
27.0	293	22	Fracture Rank 3
27.1	187	67	Fracture Rank 1
27.5	132	61	Fracture Rank 1
27.8	153	46	Fracture Rank 2

HAGER-RICHTER GEOSCIENCE, INC.	
HB-BE-237 - TABLE OF BEDROCK STRUCTURES	
CLIENT	Haley & Aldrich, Inc.
PROJECT	Brewer-Eddington I-395/Route 9 Connector
LOCATION	Eddington, Maine
HRGS FILE	20RG77
DATE LOGGED	March 3, 2021
LOG DATUM	Ground Surface
DIP AZIMUTH	True North (Magnetic Declination = 15.8° West)
DIP ANGLE	Measured from Horizontal

HB-BE-237 - TABLE OF BEDROCK STRUCTURES

Depth (Feet)	Dip Azimuth (Degrees)	Dip Angle (Degrees)	Bedrock Structure Category
9.0	333	25	Fracture Rank 3
9.6	113	74	Fracture Rank 3
10.2	71	72	Fracture Rank 3
11.2	103	79	Fracture Rank 3
11.5	163	72	Fracture Rank 3
11.7	356	34	Fracture Rank 3
11.8	158	63	Fracture Rank 4
12.4	258	18	Fracture Rank 4
12.6	249	18	Fracture Rank 3
13.2	96	70	Fracture Rank 2
13.9	164	28	Fracture Rank 4
14.0	114	75	Fracture Rank 1
14.6	206	26	Fracture Rank 3
14.6	135	72	Fracture Rank 1
15.1	330	48	Fracture Rank 2
15.7	143	51	Fracture Rank 4
15.8	331	54	Fracture Rank 3
16.2	330	44	Fracture Rank 4
16.4	320	43	Fracture Rank 4
16.7	350	37	Fracture Rank 4
16.9	353	29	Fracture Rank 4
17.1	352	33	Fracture Rank 4
17.6	343	29	Fracture Rank 2
17.8	94	52	Foliation / Vein
18.6	125	50	Fracture Rank 2
19.6	95	57	Foliation / Vein
19.9	106	53	Foliation / Vein
20.1	299	32	Fracture Rank 1
20.8	109	58	Fracture Rank 1
20.9	286	29	Fracture Rank 1
21.2	120	47	Foliation / Vein
21.8	339	39	Fracture Rank 1
21.9	105	55	Foliation / Vein
22.4	311	68	Fracture Rank 1
22.5	112	57	Foliation / Vein

HB-BE-237 - TABLE OF BEDROCK STRUCTURES

Depth (Feet)	Dip Azimuth (Degrees)	Dip Angle (Degrees)	Bedrock Structure Category
22.6	110	62	Fracture Rank 1
23.4	93	51	Fracture Rank 1
23.7	91	48	Foliation / Vein
23.9	94	51	Fracture Rank 2
24.3	81	46	Fracture Rank 2
24.5	88	47	Foliation / Vein
24.8	93	42	Foliation / Vein
24.9	90	42	Foliation / Vein
24.9	298	30	Fracture Rank 1
25.0	139	65	Fracture Rank 1
25.1	142	83	Fracture Rank 3
25.1	315	15	Fracture Rank 2
25.1	105	36	Foliation / Vein
25.4	78	34	Foliation / Vein
25.5	112	24	Fracture Rank 2
26.1	99	43	Foliation / Vein

APPENDIX C

Observation Well Installation and Groundwater Monitoring Reports

HALEY ALDRICH	<h2 style="margin: 0;">OBSERVATION WELL INSTALLATION REPORT</h2>		Well No. BB-ECR-102(OW)															
			Boring No. BB-ECR-102															
PROJECT	Route 9/I-395 Connector		H&A FILE NO.															
LOCATION	Brewer, Maine/Eddington, Maine		PROJECT MGR.															
CLIENT	Maine Department of Transportation		FIELD REP.															
CONTRACTOR	Northern Test Borings Inc.		DATE INSTALLED															
DRILLER	M. Nadeau		WATER LEVEL															
<div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> Ground El. <u>203.2</u> ft El. Datum <u>NAVD 88</u> </div> <div style="width: 30%;"> Location <u>SEE PLAN</u> </div> <div style="width: 35%;"> <input type="checkbox"/> Guard Pipe <input checked="" type="checkbox"/> Roadway Box </div> </div>																		
SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL																	
Granular -FILL- 2.5 ft	-NATIVE SOIL- -GLACIAL TILL- 11.0 ft -BENTONITE- 13.0 ft -FILTER SAND- -BEDROCK- 26.0 ft BENTONITE- 28.4 ft	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>Type of protective cover <u>Steel Cover, two 0.5-in. bolts</u></p> <p>Depth of top of roadway box below ground surface <u>0.0</u> ft</p> <p>Depth of top of riser pipe below ground surface <u>0.4</u> ft</p> <p>Type of protective casing: <u>Roadbox</u></p> <p>Length <u>10.0</u> ft</p> <p>Inside Diameter <u>7.0</u> in</p> <p>Depth of bottom of roadway box <u>0.8</u> ft</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th>Type of Seals</th> <th>Top of Seal (ft)</th> <th>Thickness (ft)</th> </tr> </thead> <tbody> <tr> <td>--</td> <td>--</td> <td>--</td> </tr> <tr> <td>Bentonite Seal</td> <td>11.0</td> <td>2.0</td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table> <p>Type of riser pipe: <u>Sch. 40 PVC</u></p> <p>Inside diameter of riser pipe <u>2.0</u> in</p> <p>Type of backfill around riser <u>Native Soil</u></p> <p>Diameter of borehole <u>4.0</u> in</p> <p>Depth to top of well screen <u>13.8</u> ft</p> <p>Type of screen <u>Sch. 40 PVC</u></p> <p>Screen gauge or size of openings <u>0.010</u> in</p> <p>Diameter of screen <u>2.0</u> in</p> <p>Type of backfill around screen <u>No. 1 Filter Sand</u></p> <p>Depth of bottom of well screen <u>23.8</u> ft</p> <p>Bottom of Silt trap <u>24.0</u> ft</p> <p>Depth of bottom of borehole <u>28.4</u> ft</p> </div> <div style="width: 5%; text-align: center;"> <p>L1</p> <p>L2</p> <p>L3</p> </div> <div style="width: 45%;"> <p>(Bottom of Exploration)</p> <p>(Numbers refer to depth from ground surface in feet)</p> </div> </div>		Type of Seals	Top of Seal (ft)	Thickness (ft)	--	--	--	Bentonite Seal	11.0	2.0						
Type of Seals	Top of Seal (ft)	Thickness (ft)																
--	--	--																
Bentonite Seal	11.0	2.0																
<div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <u>13.4</u> ft Riser Pay Length (L1) </div> <div style="width: 30%;"> <u>10.0</u> ft Length of screen (L2) </div> <div style="width: 30%;"> <u>0.2</u> ft Length of silt trap (L3) </div> <div style="width: 10%;"> = </div> <div style="width: 30%;"> <u>23.6</u> ft Pay length </div> </div>																		
COMMENTS:																		

GROUNDWATER MONITORING REPORT

OW/PZ NUMBER

BB-ECR-102

Page 1 of 1

PROJECT	Route 9/I-395 Connector
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H&A FILE NO. 132076-002

LOCATION	Brewer, Maine / Eddington, Maine
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PROJECT MGR.	B. Steinert
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CLIENT	Maine Department of Transportation
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FIELD REP. N. Klausmeyer

CONTRACTOR Northern Test Borings Inc.

DATE 4/20/2020

ELEVATION OF REFERENCE POINT (ft)	203.2	REFERENCE POINT:	Ground Surface	<input checked="" type="checkbox"/>	PVC	<input type="checkbox"/>	Other	<input type="checkbox"/>
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[illegible]

APPENDIX D

Laboratory Test Results



Client:	Haley & Aldrich, Inc.		
Project:	Rt 9/I-395 Clewleyville Rd Bridge		
Location:	Brewer and Eddington, ME	Project No:	GTX-308854
Boring ID:	---	Sample Type:	---
Sample ID:	---	Test Date:	10/03/18
Depth :	---	Test Id:	474398
		Tested By:	jbr
		Checked By:	emm

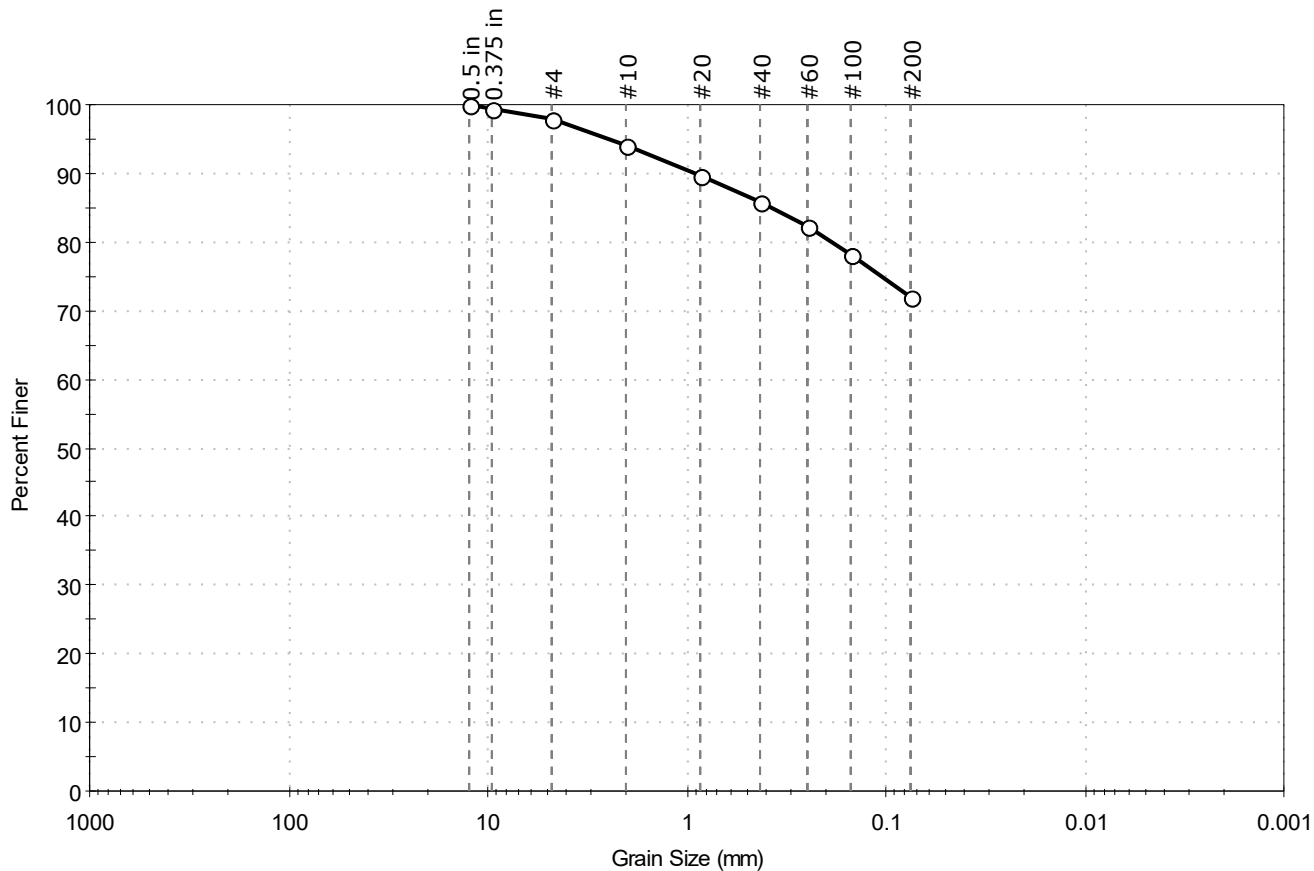
Moisture Content of Soil and Rock - ASTM D2216

Boring ID	Sample ID	Depth	Description	Moisture Content, %
BB-ECR-101	3D	4.3-6.3 ft	Moist, brown clay with sand	13.3
BB-ECR-101	4D	10-12 ft	Moist, brown sandy clay	12.1
BB-ECR-102	3D	4.3-6.3	Moist, brown sandy clay	13.6

Notes: Temperature of Drying : 110° Celsius

Client:	Haley & Aldrich, Inc.		
Project:	Rt 9/I-395 Clewleyville Rd Bridge		
Location:	Brewer and Eddington, ME	Project No:	GTX-308854
Boring ID:	BB-ECR-101	Sample Type:	jar
Sample ID:	3D	Test Date:	10/03/18
Depth :	4.3-6.3 ft	Test Id:	474393
Test Comment:	---		
Visual Description:	Moist, brown clay with sand		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	2.2	25.8	72.0

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.5 in	12.50	100		
0.375 in	9.50	99		
#4	4.75	98		
#10	2.00	94		
#20	0.85	90		
#40	0.42	86		
#60	0.25	82		
#100	0.15	78		
#200	0.075	72		

Coefficients

$D_{85} = 0.3677 \text{ mm}$ $D_{30} = \text{N/A}$
 $D_{60} = \text{N/A}$ $D_{15} = \text{N/A}$
 $D_{50} = \text{N/A}$ $D_{10} = \text{N/A}$
 $C_u = \text{N/A}$ $C_c = \text{N/A}$

Classification

ASTM N/A

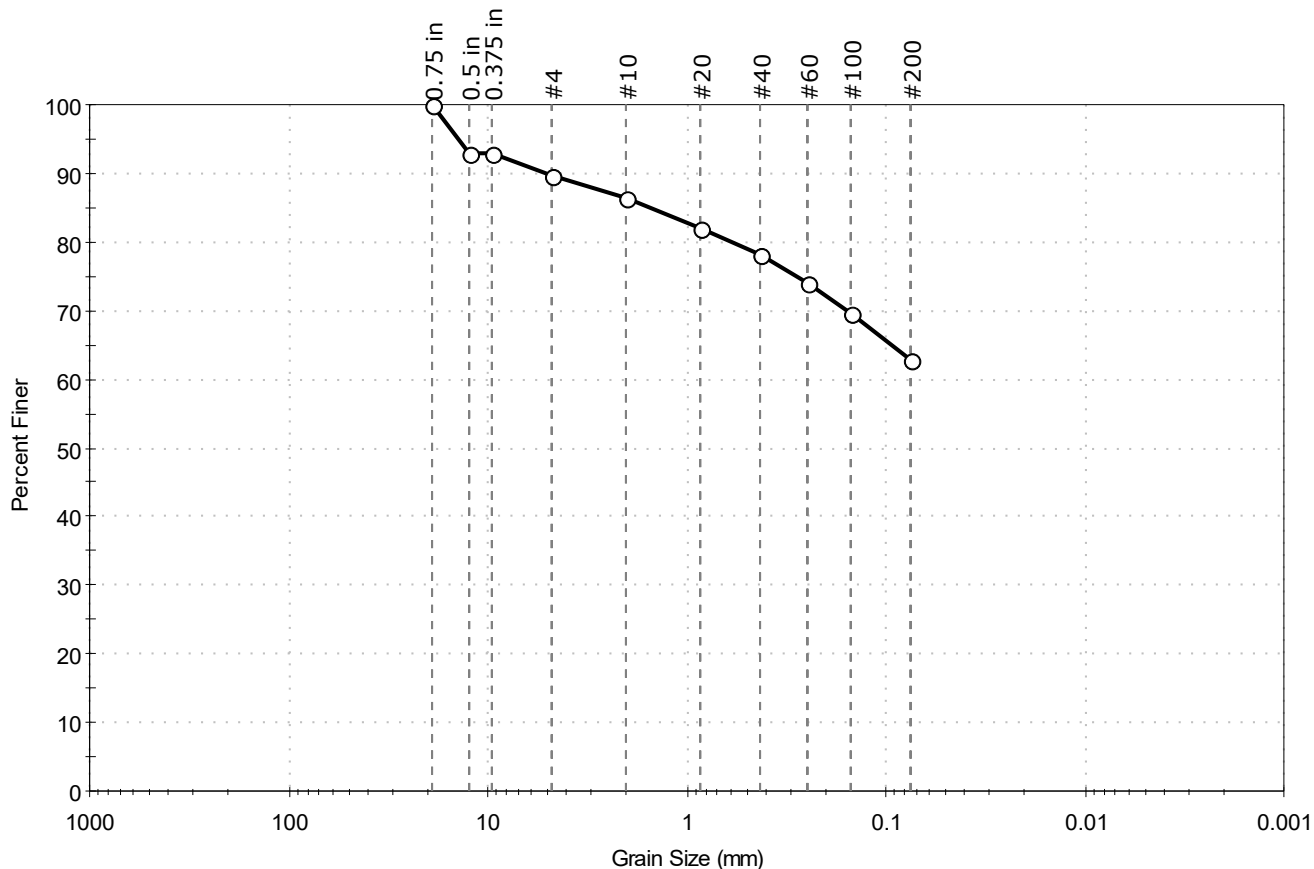
AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR
 Sand/Gravel Hardness : HARD

Client:	Haley & Aldrich, Inc.		
Project:	Rt 9/I-395 Clewleyville Rd Bridge		
Location:	Brewer and Eddington, ME	Project No:	GTX-308854
Boring ID:	BB-ECR-101	Sample Type:	jar
Sample ID:	4D	Test Date:	10/02/18
Depth :	10-12 ft	Test Id:	474394
Test Comment:	---		
Visual Description:	Moist, brown sandy clay		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	10.3	26.9	62.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	93		
0.375 in	9.50	93		
#4	4.75	90		
#10	2.00	86		
#20	0.85	82		
#40	0.42	78		
#60	0.25	74		
#100	0.15	70		
#200	0.075	63		

Coefficients

$D_{85} = 1.5132 \text{ mm}$ $D_{30} = \text{N/A}$
 $D_{60} = \text{N/A}$ $D_{15} = \text{N/A}$
 $D_{50} = \text{N/A}$ $D_{10} = \text{N/A}$
 $C_u = \text{N/A}$ $C_c = \text{N/A}$

Classification

ASTM N/A

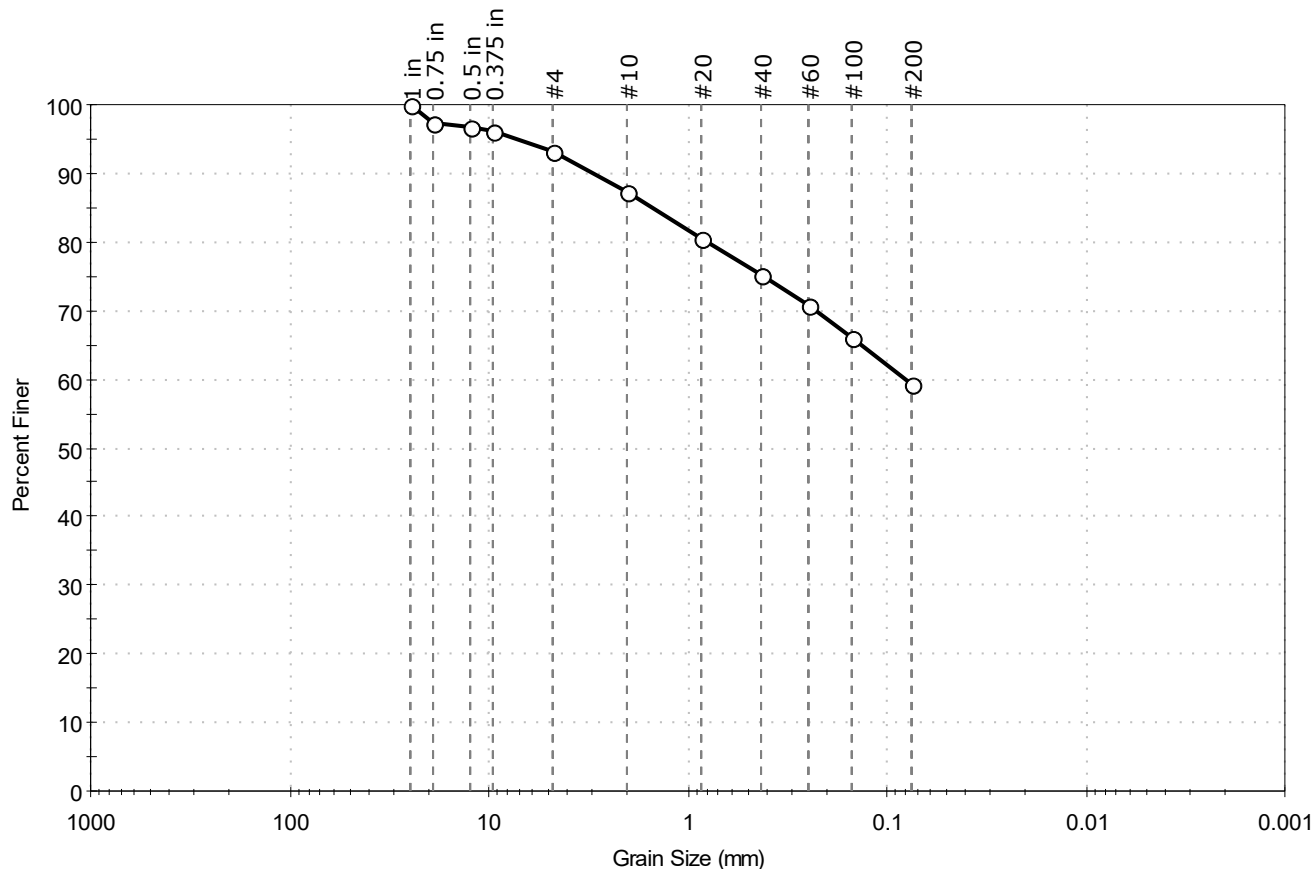
AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : **ROUNDED**
 Sand/Gravel Hardness : **HARD**

Client:	Haley & Aldrich, Inc.		
Project:	Rt 9/I-395 Clewleyville Rd Bridge		
Location:	Brewer and Eddington, ME	Project No:	GTX-308854
Boring ID:	BB-ECR-102	Sample Type:	jar
Sample ID:	3D	Test Date:	10/01/18
Depth :	4.3-6.3	Test Id:	474395
Test Comment:	---		
Visual Description:	Moist, brown sandy clay		
Sample Comment:	---		

Particle Size Analysis - ASTM D422



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	6.8	34.0	59.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 in	25.00	100		
0.75 in	19.00	97		
0.5 in	12.50	97		
0.375 in	9.50	96		
#4	4.75	93		
#10	2.00	87		
#20	0.85	81		
#40	0.42	75		
#60	0.25	71		
#100	0.15	66		
#200	0.075	59		

Coefficients

$D_{85} = 1.4750 \text{ mm}$ $D_{30} = \text{N/A}$
 $D_{60} = 0.0812 \text{ mm}$ $D_{15} = \text{N/A}$
 $D_{50} = \text{N/A}$ $D_{10} = \text{N/A}$
 $C_u = \text{N/A}$ $C_c = \text{N/A}$

Classification

ASTM N/A

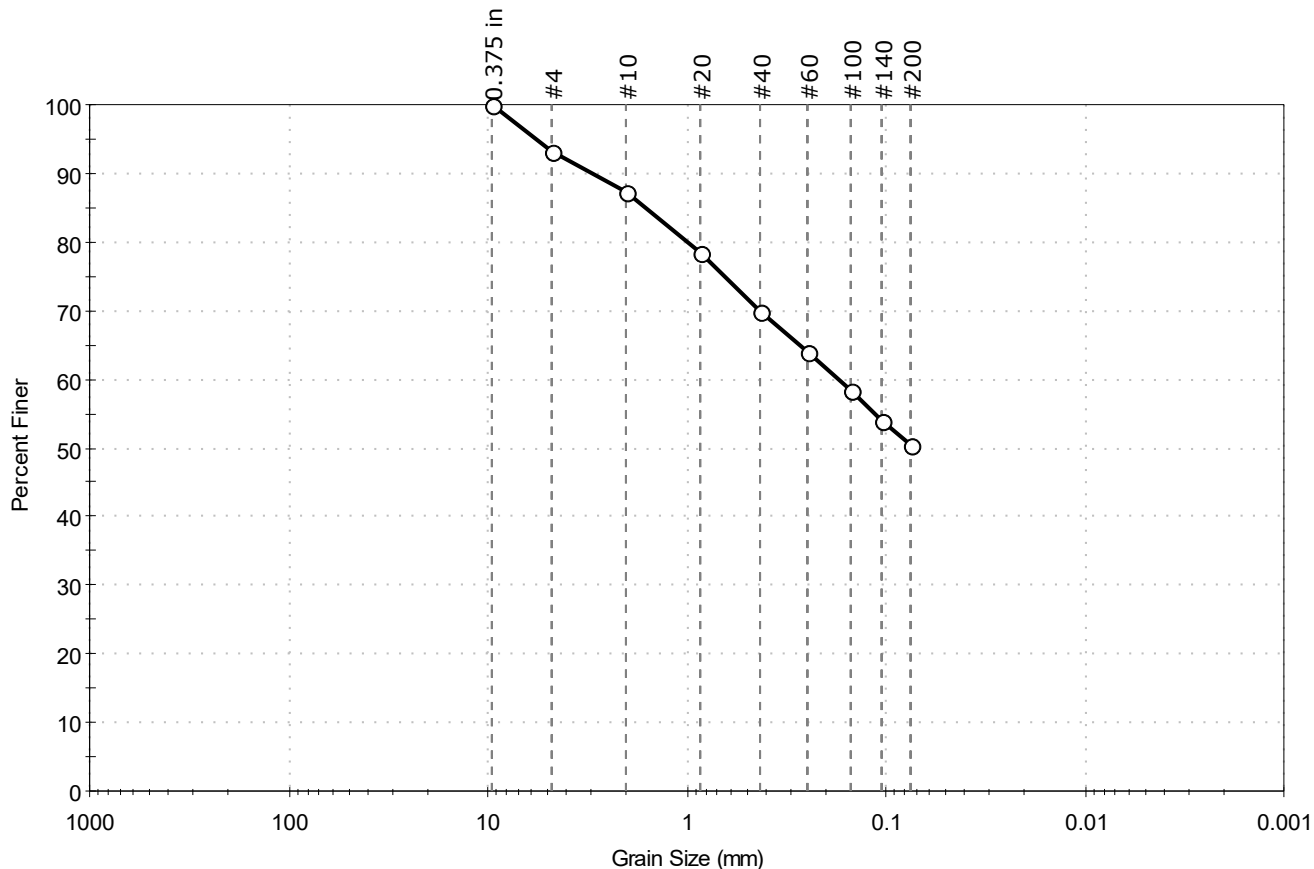
AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : **ROUNDED**
 Sand/Gravel Hardness : **HARD**

Client:	Haley & Aldrich, Inc.		
Project:	I-395/Rte 9 Connector Hwy, Brewer-Eddington		
Location:	Brewer, ME	Project No:	GTX-313370
Boring ID:	HB-BE-231	Sample Type:	jar
Sample ID:	2D	Test Date:	03/26/21
Depth :	5-7	Test Id:	613882
Test Comment:	---		
Visual Description:	Moist, pale brown sandy clay		
Sample Comment:	---		

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	6.9	42.7	50.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	93		
#10	2.00	87		
#20	0.85	78		
#40	0.42	70		
#60	0.25	64		
#100	0.15	58		
#140	0.11	54		
#200	0.075	50		

Coefficients

$D_{85} = 1.5905 \text{ mm}$ $D_{30} = \text{N/A}$
 $D_{60} = 0.1731 \text{ mm}$ $D_{15} = \text{N/A}$
 $D_{50} = \text{N/A}$ $D_{10} = \text{N/A}$
 $C_u = \text{N/A}$ $C_c = \text{N/A}$

Classification

ASTM N/A

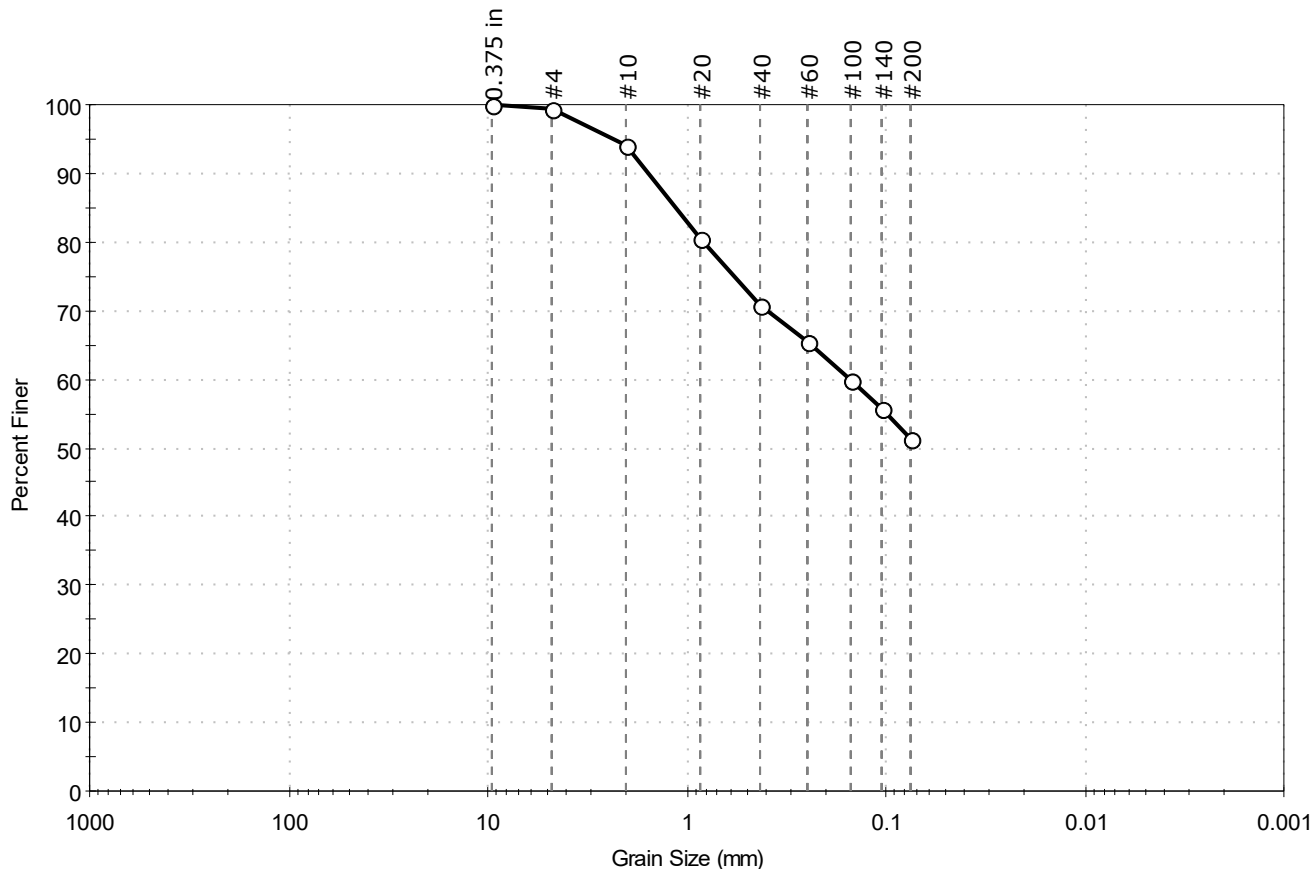
AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR
 Sand/Gravel Hardness : HARD

Client:	Haley & Aldrich, Inc.		
Project:	I-395/Rte 9 Connector Hwy, Brewer-Eddington		
Location:	Brewer, ME	Project No:	GTX-313370
Boring ID:	HB-BE-232	Sample Type:	jar
Sample ID:	3D	Test Date:	03/29/21
Depth :	10-12	Test Id:	613883
Test Comment:	---		
Visual Description:	Moist, grayish brown sandy clay		
Sample Comment:	---		

Particle Size Analysis - ASTM D6913



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.7	47.9	51.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	99		
#10	2.00	94		
#20	0.85	80		
#40	0.42	71		
#60	0.25	65		
#100	0.15	60		
#140	0.11	56		
#200	0.075	51		

Coefficients

$D_{85} = 1.1290 \text{ mm}$ $D_{30} = \text{N/A}$
 $D_{60} = 0.1521 \text{ mm}$ $D_{15} = \text{N/A}$
 $D_{50} = \text{N/A}$ $D_{10} = \text{N/A}$
 $C_u = \text{N/A}$ $C_c = \text{N/A}$

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

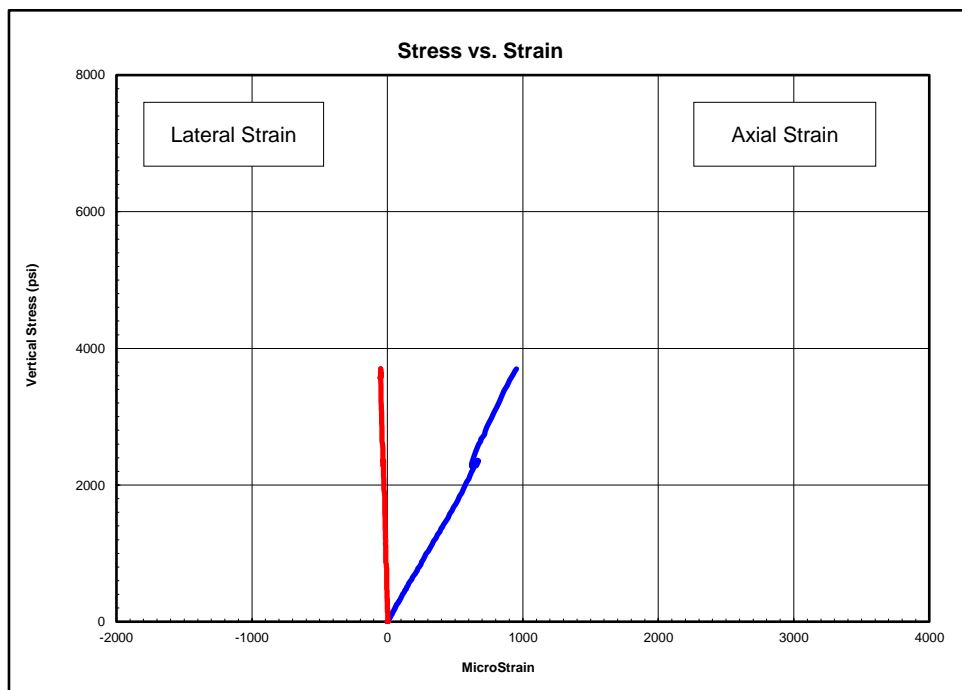
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR
 Sand/Gravel Hardness : HARD



Client:	Haley & Aldrich, Inc.
Project Name:	Rt 9/I-395 Clewleyville Rd Bridge
Project Location:	Brewer and Eddington, ME
GTX #:	308854
Test Date:	10/5/2018
Tested By:	tlm
Checked By:	jsc
Boring ID:	BB-ECR-102
Sample ID:	R6
Depth, ft:	24.3-25.6
Sample Type:	rock core
Sample Description:	See photographs Discontinuity failure

Compressive Strength and Elastic Moduli of Rock by ASTM D7012 - Method D



Peak Compressive Stress: 6,527 psi

The strain gauges failed before the peak value was attained due to an initial failure within the specimen.

Stress Range, psi	Young's Modulus, psi	Poisson's Ratio
700-2400	3,640,000	0.05
2400-3700	4,110,000	0.06
3700-5900	---	---

Notes: Test specimen tested at the approximate as-received moisture content and at standard laboratory temperature.
The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.
Young's Modulus and Poisson's Ratio calculated using the tangent to the line in the stress range listed.
Calculations assume samples are isotropic, which is not necessarily the case.

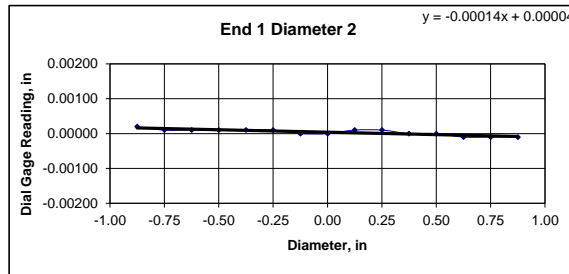
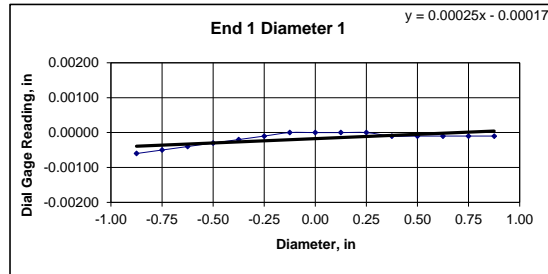


Client:	Haley & Aldrich, Inc.	Test Date:	9/27/2018
Project Name:	Rt 9/1-395 Clewleyville Rd Bridge	Tested By:	tlm
Project Location:	Brewer and Eddington, ME	Checked By:	jsc
GTX #:	308854		
Boring ID:	BB-ECR-102		
Sample ID:	R6		
Depth:	24.3-25.6 ft		
Visual Description:	See photographs		

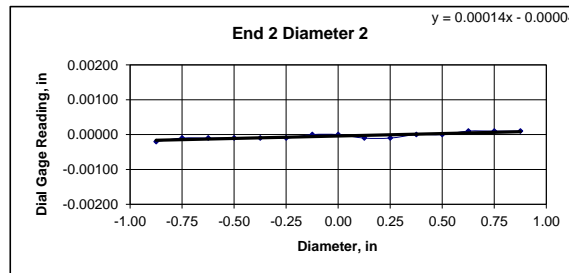
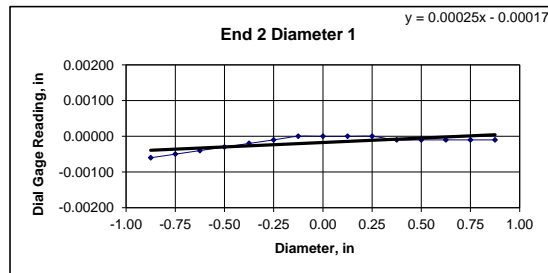
UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY				DEVIATION FROM STRAIGHTNESS (Procedure S1)	
	1	2	Average	Maximum gap between side of core and reference surface plate: Is the maximum gap \leq 0.02 in.? YES	
Specimen Length, in:	4.38	4.38	4.38	Maximum difference must be $<$ 0.020 in. Straightness Tolerance Met? YES	
Specimen Diameter, in:	1.98	1.98	1.98		
Specimen Mass, g:	596.86				
Bulk Density, lb/ft ³	168				
Length to Diameter Ratio:	2.2	Minimum Diameter Tolerance Met? YES	Length to Diameter Ratio Tolerance Met? YES		

END FLATNESS AND PARALLELISM (Procedure FP1)															
END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00060	-0.00050	-0.00040	-0.00030	-0.00020	-0.00010	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00010	-0.00010	-0.00010	-0.00010
Diameter 2, in (rotated 90°)	0.00020	0.00010	0.00010	0.00010	0.00010	0.00010	0.00000	0.00000	0.00010	0.00010	0.00000	0.00000	-0.00010	-0.00010	-0.00010
Difference between max and min readings, in: 0° = 0.00060 90° = 0.00030															
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	-0.00060	-0.00050	-0.00040	-0.00030	-0.00020	-0.00010	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00010	-0.00010	-0.00010	-0.00010
Diameter 2, in (rotated 90°)	-0.00020	-0.00010	-0.00010	-0.00010	-0.00010	-0.00010	0.00000	0.00000	-0.00010	-0.00010	0.00000	0.00000	0.00010	0.00010	0.00010
Difference between max and min readings, in: 0° = 0.0006 90° = 0.0003 Maximum difference must be < 0.0020 in. Difference = ± 0.00030															
Flatness Tolerance Met? YES															



DIAMETER 1	
End 1:	
Slope of Best Fit Line	0.00025
Angle of Best Fit Line:	0.01424
End 2:	
Slope of Best Fit Line	0.00025
Angle of Best Fit Line:	0.01424
Maximum Angular Difference:	0.00000
Parallelism Tolerance Met? Spherically Seated	YES



DIAMETER 2	
End 1:	
Slope of Best Fit Line	0.00014
Angle of Best Fit Line:	0.00802
End 2:	
Slope of Best Fit Line	0.00014
Angle of Best Fit Line:	0.00802
Maximum Angular Difference:	0.00000
Parallelism Tolerance Met? Spherically Seated	YES

PERPENDICULARITY (Procedure P1)						Maximum angle of departure must be \leq 0.25°	
END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?		
Diameter 1, in	0.00060	1.980	0.00030	0.017	YES	Perpendicularity Tolerance Met? YES	
Diameter 2, in (rotated 90°)	0.00030	1.980	0.00015	0.009	YES		
END 2							
Diameter 1, in	0.00060	1.980	0.00030	0.017	YES		
Diameter 2, in (rotated 90°)	0.00030	1.980	0.00015	0.009	YES		

Client:	Haley & Aldrich, Inc.
Project Name:	Rt 9/I-395 Clewleyville Rd Bridge
Project Location:	Brewer and Eddington, ME
GTX #:	308854
Test Date:	10/1/2018
Tested By:	cmh
Checked By:	jsc
Boring ID:	BB-ECR-102
Sample ID:	R6
Depth, ft:	24.3-25.6



After cutting and grinding

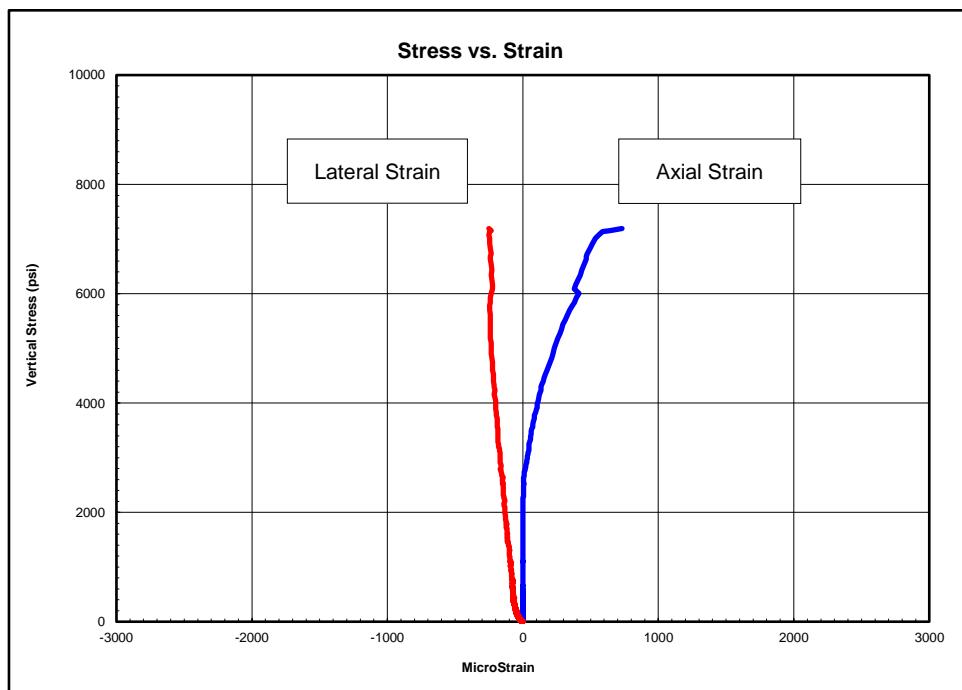


After break



Client:	Haley & Aldrich, Inc.
Project Name:	I-395/Rte 9 Connector Bridge(Cleweyville Rd)
Project Location:	Eddington, ME
GTX #:	313418
Test Date:	4/7/2021
Tested By:	cmh
Checked By:	smd
Boring ID:	BB-ECR-202
Sample ID:	R3
Depth, ft:	23.64-24.02
Sample Type:	rock core
Sample Description:	See photographs Intact material and discontinuity failure

Compressive Strength and Elastic Moduli of Rock by ASTM D7012 - Method D



Peak Compressive Stress: 7,193 psi

Young's Modulus and Poisson's Ratio could not be determined within the first stress range. The strain values recorded within the third stress range produce values of Poisson's Ratio that exceed maximum values found in rocks.

Stress Range, psi	Young's Modulus, psi	Poisson's Ratio
700-2600	---	---
2600-4600	12,300,000	0.43
4600-6500	6,700,000	---

Notes: Test specimen tested at the approximate as-received moisture content and at standard laboratory temperature.
The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.
Young's Modulus and Poisson's Ratio calculated using the tangent to the line in the stress range listed.
Calculations assume samples are isotropic, which is not necessarily the case.

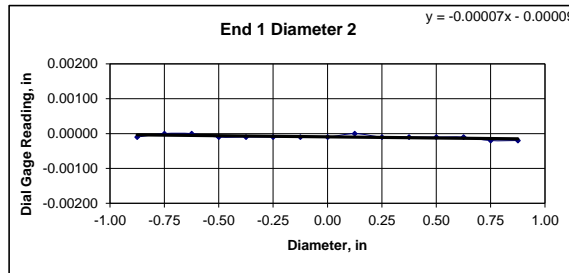
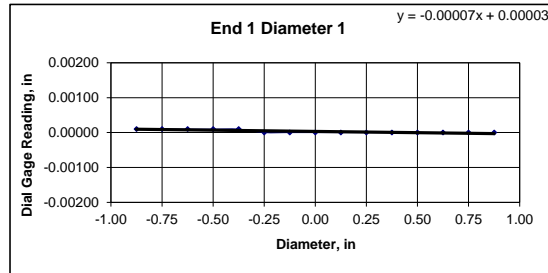


Client:	Haley & Aldrich, Inc.	Test Date:	4/1/2021
Project Name:	I-395/Rte 9 Connector Bridge (Clewesville Rd)	Tested By:	cmh
Project Location:	Eddington, ME	Checked By:	smd
GTX #:	313418		
Boring ID:	BB-ECR-202		
Sample ID:	R3		
Depth:	23.64-24.02 ft		
Visual Description:	See photographs		

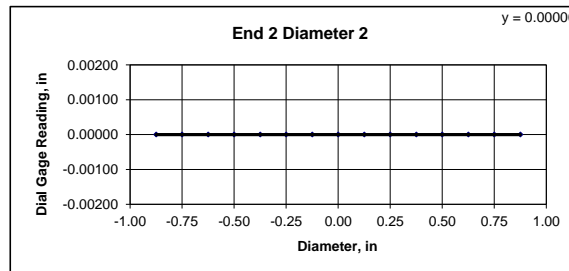
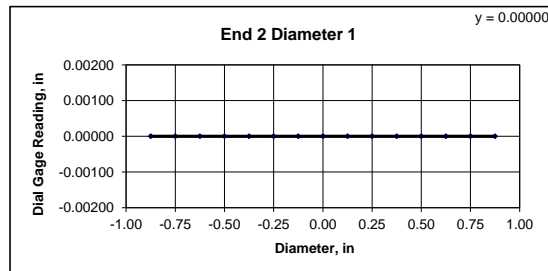
UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY				DEVIATION FROM STRAIGHTNESS (Procedure S1)	
	1	2	Average	Maximum gap between side of core and reference surface plate: Is the maximum gap \leq 0.02 in.?	
Specimen Length, in:	4.59	4.59	4.59	NO	
Specimen Diameter, in:	1.99	1.99	1.99	Maximum difference must be < 0.020 in.	
Specimen Mass, g:	642.08			Straightness Tolerance Met?	
Bulk Density, lb/ft ³ :	171			NO	
Length to Diameter Ratio:	2.3				
		Minimum Diameter Tolerance Met?	YES		
		Length to Diameter Ratio Tolerance Met?	YES		

END FLATNESS AND PARALLELISM (Procedure FP1)															
END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00010	0.00010	0.00010	0.00010	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Diameter 2, in (rotated 90°)	-0.00010	0.00000	0.00000	-0.00010	-0.00010	-0.00010	-0.00010	-0.00010	0.00000	-0.00010	-0.00010	-0.00010	-0.00010	-0.00020	-0.00020
Difference between max and min readings, in: 0° = 0.00010 90° = 0.00020															
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Diameter 2, in (rotated 90°)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Difference between max and min readings, in: 0° = 0 90° = 0 Maximum difference must be < 0.0020 in. Difference = ± 0.00010															
Flatness Tolerance Met? YES															



DIAMETER 1	
End 1:	
Slope of Best Fit Line	0.00007
Angle of Best Fit Line:	0.00409
End 2:	
Slope of Best Fit Line	0.00000
Angle of Best Fit Line:	0.00000
Maximum Angular Difference:	0.00409
Parallelism Tolerance Met?	YES
Spherically Seated	



DIAMETER 2	
End 1:	
Slope of Best Fit Line	0.00007
Angle of Best Fit Line:	0.00377
End 2:	
Slope of Best Fit Line	0.00000
Angle of Best Fit Line:	0.00000
Maximum Angular Difference:	0.00377
Parallelism Tolerance Met?	YES
Spherically Seated	

PERPENDICULARITY (Procedure P1)						Maximum angle of departure must be $\leq 0.25^\circ$	
END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?		
Diameter 1, in	0.00010	1.990	0.00005	0.003	YES		
Diameter 2, in (rotated 90°)	0.00020	1.990	0.00010	0.006	YES	Perpendicularity Tolerance Met? YES	
END 2							
Diameter 1, in	0.00000	1.990	0.00000	0.000	YES		
Diameter 2, in (rotated 90°)	0.00000	1.990	0.00000	0.000	YES		

Client:	Haley & Aldrich, Inc.
Project Name:	I-395/Rte 9 Connector Bridge (Cleweyville Rd)
Project Location:	Eddington, ME
GTX #:	313418
Test Date:	4/7/2021
Tested By:	cmh
Checked By:	smd
Boring ID:	BB-ECR-202
Sample ID:	R3
Depth, ft:	23.64-24.02



After cutting and grinding

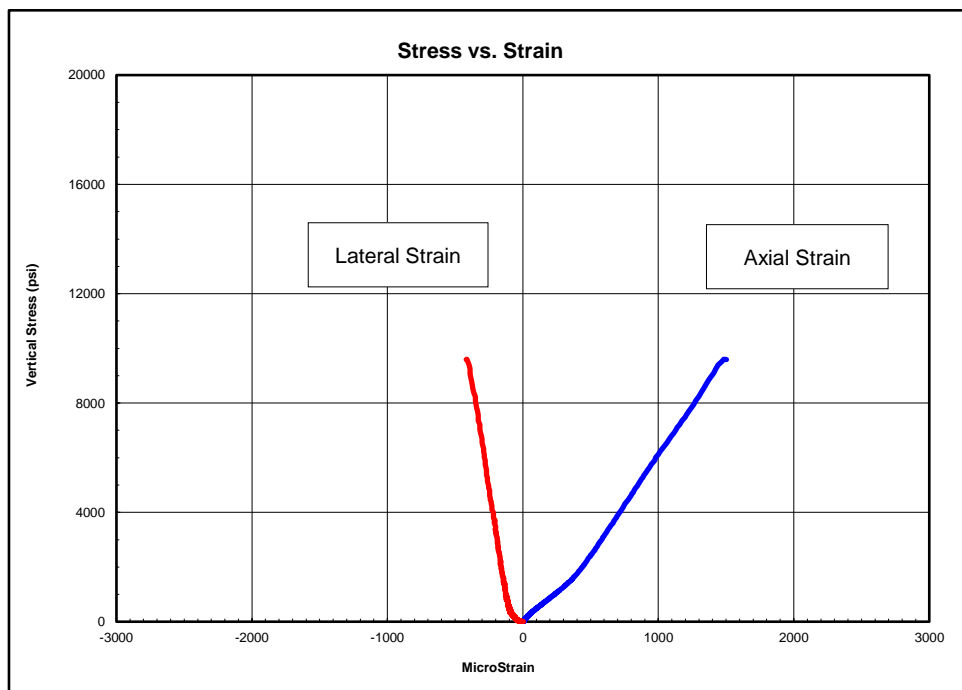


After break



Client:	Haley & Aldrich, Inc.
Project Name:	I-395/Rte 9 Connector Bridge(Cleweyville Rd)
Project Location:	Eddington, ME
GTX #:	313418
Test Date:	4/7/2021
Tested By:	cmh
Checked By:	jsc
Boring ID:	BB-ECR-203
Sample ID:	R2
Depth, ft:	17.97-18.35
Sample Type:	rock core
Sample Description:	See photographs Intact material and discontinuity failure

Compressive Strength and Elastic Moduli of Rock by ASTM D7012 - Method D



Peak Compressive Stress: 9,759 psi

Stress Range, psi	Young's Modulus, psi	Poisson's Ratio
1000-3600	5,990,000	0.19
3600-6200	7,470,000	0.24
6200-8800	7,170,000	0.25

Notes: Test specimen tested at the approximate as-received moisture content and at standard laboratory temperature.
The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.
Young's Modulus and Poisson's Ratio calculated using the tangent to the line in the stress range listed.
Calculations assume samples are isotropic, which is not necessarily the case.

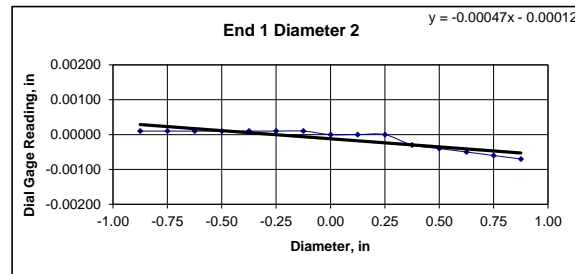
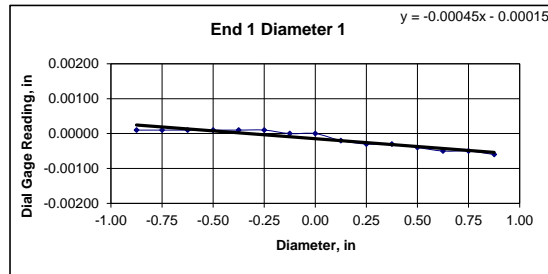


Client:	Haley & Aldrich, Inc.	Test Date:	4/2/2021
Project Name:	I-395/Rte 9 Connector Bridge (Clewesville Rd)	Tested By:	cmh
Project Location:	Eddington, ME	Checked By:	smd
GT#:	313418		
Boring ID:	BB-ECR-203		
Sample ID:	R2		
Depth:	17.97-18.35 ft		
Visual Description:	See photographs		

UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY				DEVIATION FROM STRAIGHTNESS (Procedure S1)	
	1	2	Average	Maximum gap between side of core and reference surface plate: Is the maximum gap \leq 0.02 in.? NO	
Specimen Length, in:	4.48	4.47	4.48	Maximum difference must be $<$ 0.020 in.	
Specimen Diameter, in:	1.97	1.97	1.97	Straightness Tolerance Met? NO	
Specimen Mass, g:	599.91				
Bulk Density, lb/ft ³ :	167				
Length to Diameter Ratio:	2.3				
		Minimum Diameter Tolerance Met?	YES		
		Length to Diameter Ratio Tolerance Met?	YES		

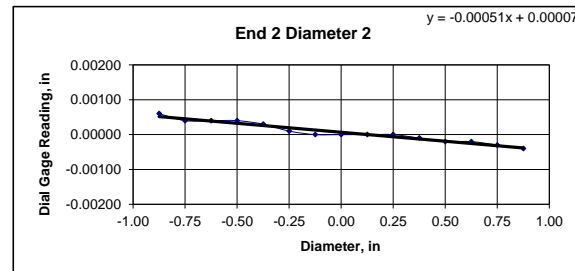
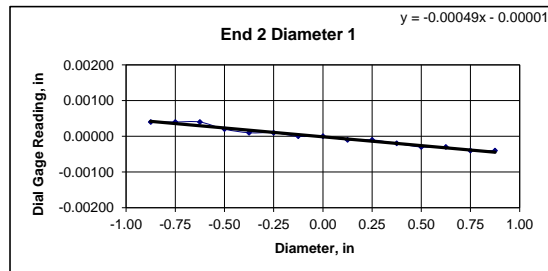
END FLATNESS AND PARALLELISM (Procedure FP1)													
END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625
Diameter 1, in	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00000	0.00000	-0.00020	-0.00030	-0.00030	-0.00040	-0.00050
Diameter 2, in (rotated 90°)	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00000	0.00000	0.00000	-0.00030	-0.00040	-0.00050
Difference between max and min readings, in:													
0° = 0.00070 90° = 0.00080													
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625
Diameter 1, in	0.00040	0.00040	0.00040	0.00020	0.00010	0.00010	0.00000	0.00000	-0.00010	-0.00010	-0.00020	-0.00030	-0.00040
Diameter 2, in (rotated 90°)	0.00060	0.00040	0.00040	0.00040	0.00030	0.00010	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00020	-0.00030
Difference between max and min readings, in:													
0° = 0.0008 90° = 0.001													
Maximum difference must be $<$ 0.0020 in. Difference = \pm 0.00050													
Flatness Tolerance Met? YES													



DIAMETER 1

End 1:	Slope of Best Fit Line	0.00045
	Angle of Best Fit Line:	0.02570
End 2:	Slope of Best Fit Line	0.00049
	Angle of Best Fit Line:	0.02832
Maximum Angular Difference:		0.00262

Parallelism Tolerance Met? YES
Spherically Seated



DIAMETER 2

End 1:	Slope of Best Fit Line	0.00047
	Angle of Best Fit Line:	0.02668
End 2:	Slope of Best Fit Line	0.00051
	Angle of Best Fit Line:	0.02947
Maximum Angular Difference:		0.00278

Parallelism Tolerance Met? YES
Spherically Seated

PERPENDICULARITY (Procedure P1)						Maximum angle of departure must be \leq 0.25°	
END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?		
Diameter 1, in	0.00070	1.970	0.00036	0.020	YES		
Diameter 2, in (rotated 90°)	0.00080	1.970	0.00041	0.023	YES	Perpendicularity Tolerance Met? YES	
END 2							
Diameter 1, in	0.00080	1.970	0.00041	0.023	YES		
Diameter 2, in (rotated 90°)	0.00100	1.970	0.00051	0.029	YES		

Client:	Haley & Aldrich, Inc.
Project Name:	I-395/Rte 9 Connector Bridge (Cleweyville Rd)
Project Location:	Eddington, ME
GTX #:	313418
Test Date:	4/7/2021
Tested By:	cmh
Checked By:	smd
Boring ID:	BB-ECR-203
Sample ID:	R2
Depth, ft:	17.97-18.35



After cutting and grinding

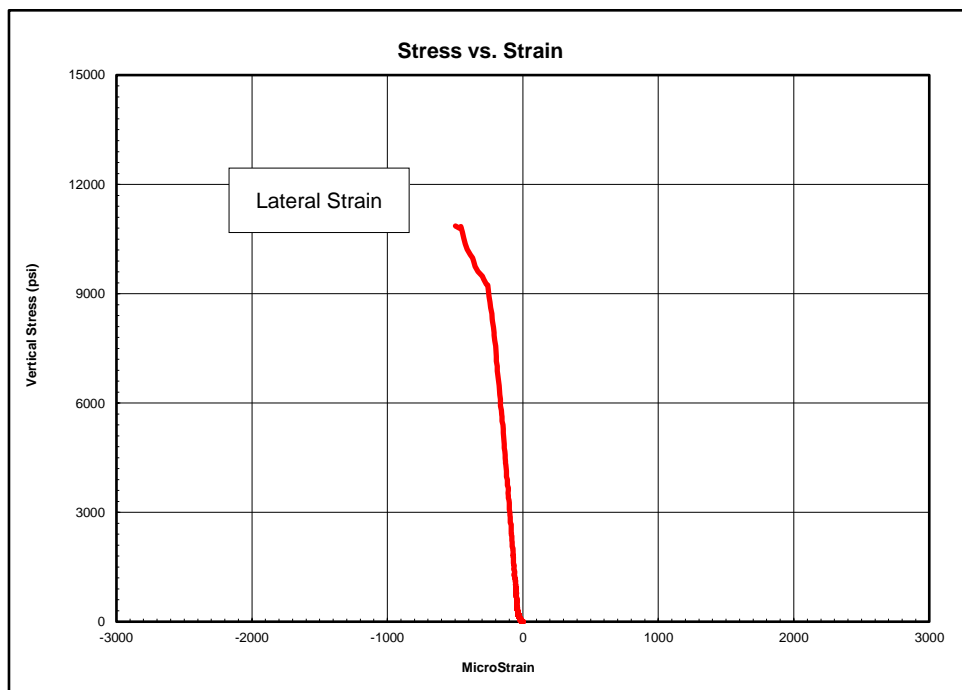


After break



Client:	Haley & Aldrich, Inc.
Project Name:	I-395/Rte 9 Connector Bridge(Cleweyville Rd)
Project Location:	Eddington, ME
GTX #:	313418
Test Date:	4/7/2021
Tested By:	cmh
Checked By:	jsc
Boring ID:	BB-ECR-203A
Sample ID:	R3
Depth, ft:	20.81-21.25
Sample Type:	rock core
Sample Description:	See photographs Discontinuity failure

Compressive Strength and Elastic Moduli of Rock by ASTM D7012 - Method D



Peak Compressive Stress: 10,859 psi

The axial strain gauges failed to record meaningful data. Young's Modulus and Poisson's Ratio could not be determined.

Stress Range, psi	Young's Modulus, psi	Poisson's Ratio
1100-4000	---	---
4000-6900	---	---
6900-9800	---	---

Notes: Test specimen tested at the approximate as-received moisture content and at standard laboratory temperature.
The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.
Young's Modulus and Poisson's Ratio calculated using the tangent to the line in the stress range listed.
Calculations assume samples are isotropic, which is not necessarily the case.

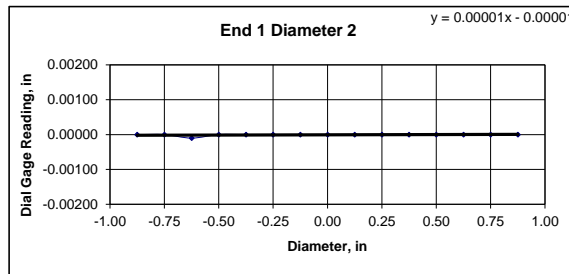
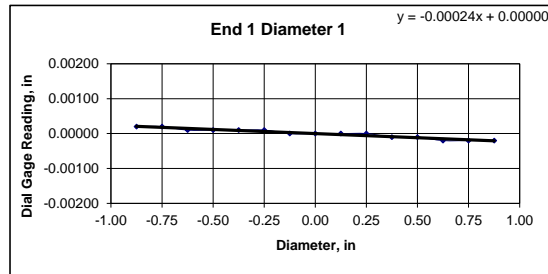


Client:	Haley & Aldrich, Inc.	Test Date:	4/2/2021
Project Name:	I-395/Rte 9 Connector Bridge (Clewesville Rd)	Tested By:	cmh
Project Location:	Eddington, ME	Checked By:	smd
GT#:	313418		
Boring ID:	BB-ECR-203A		
Sample ID:	R3		
Depth:	20.81-21.25 ft		
Visual Description:	See photographs		

UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY				DEVIATION FROM STRAIGHTNESS (Procedure S1)	
	1	2	Average	Maximum gap between side of core and reference surface plate: Is the maximum gap \leq 0.02 in.? YES	
Specimen Length, in:	5.22	5.21	5.22	Maximum difference must be < 0.020 in. Straightness Tolerance Met? YES	
Specimen Diameter, in:	2.48	2.48	2.48		
Specimen Mass, g:	1133.64				
Bulk Density, lb/ft ³	171				
Length to Diameter Ratio:	2.1				
		Minimum Diameter Tolerance Met?	YES		
		Length to Diameter Ratio Tolerance Met?	YES		

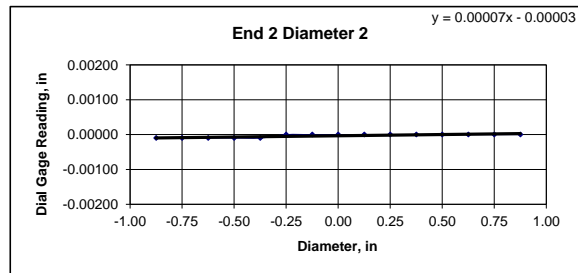
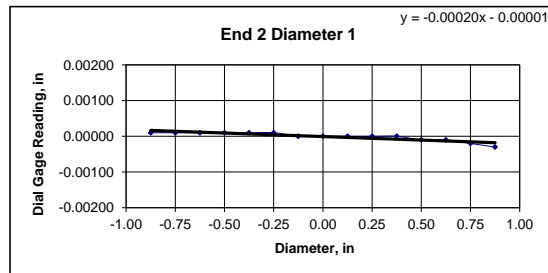
END FLATNESS AND PARALLELISM (Procedure FP1)															
END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00020	0.00020	0.00010	0.00010	0.00010	0.00010	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00010	-0.00020	-0.00020	-0.00020
Diameter 2, in (rotated 90°)	0.00000	0.00000	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Difference between max and min readings, in:															
0° = 0.00040 90° = 0.00010															
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00010	-0.00020	-0.00030
Diameter 2, in (rotated 90°)	-0.00010	-0.00010	-0.00010	-0.00010	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Difference between max and min readings, in:															
0° = 0.0004 90° = 0.0001															
Maximum difference must be < 0.0020 in. Difference = ± 0.00020															
Flatness Tolerance Met? YES															



DIAMETER 1

End 1:	Slope of Best Fit Line	0.00024
	Angle of Best Fit Line:	0.01359
End 2:	Slope of Best Fit Line	0.00020
	Angle of Best Fit Line:	0.01130
Maximum Angular Difference:		0.00229

Parallelism Tolerance Met? YES
Spherically Seated



DIAMETER 2

End 1:	Slope of Best Fit Line	0.00001
	Angle of Best Fit Line:	0.00082
End 2:	Slope of Best Fit Line	0.00007
	Angle of Best Fit Line:	0.00409
Maximum Angular Difference:		0.00327

Parallelism Tolerance Met? YES
Spherically Seated

PERPENDICULARITY (Procedure P1)						(Calculated from End Flatness and Parallelism measurements above)	
END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?	Maximum angle of departure must be $\leq 0.25^\circ$	
Diameter 1, in	0.00040	2.480	0.00016	0.009	YES	Perpendicularity Tolerance Met? YES	
Diameter 2, in (rotated 90°)	0.00010	2.480	0.00004	0.002	YES		
END 2							
Diameter 1, in	0.00040	2.480	0.00016	0.009	YES		
Diameter 2, in (rotated 90°)	0.00010	2.480	0.00004	0.002	YES		

Client:	Haley & Aldrich, Inc.
Project Name:	I-395/Rte 9 Connector Bridge (Cleweyville Rd)
Project Location:	Eddington, ME
GTX #:	313418
Test Date:	4/8/2021
Tested By:	7-Apr
Checked By:	smd
Boring ID:	BB-ECR-203A
Sample ID:	R3
Depth, ft:	20.81-21.25



After cutting and grinding

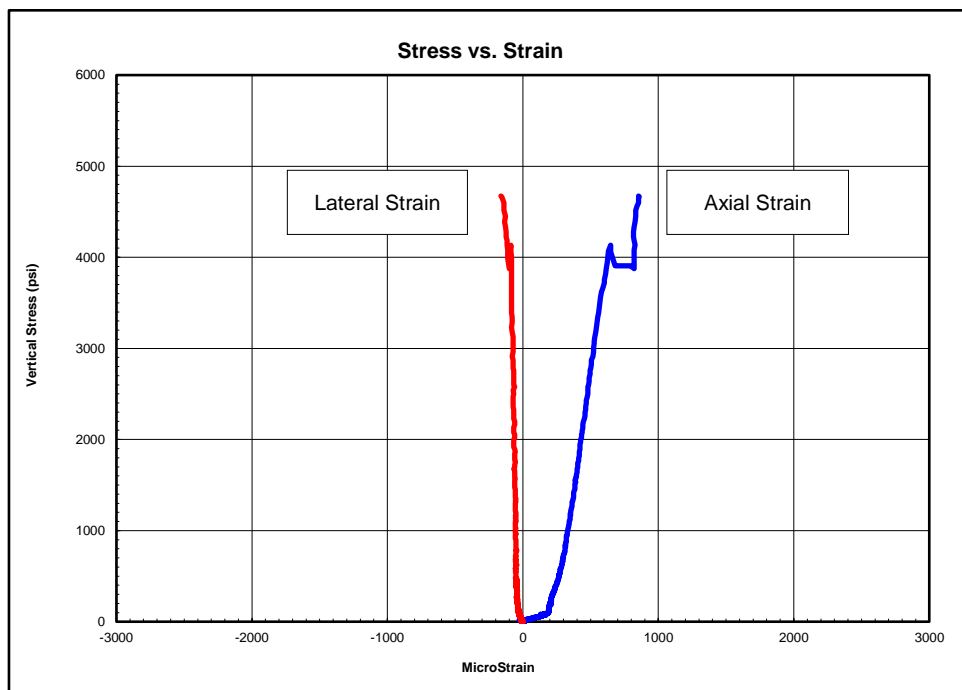


After break



Client:	Haley & Aldrich, Inc.
Project Name:	I-395/Rte 9 Connector Bridge(Cleweyville Rd)
Project Location:	Eddington, ME
GTX #:	313418
Test Date:	4/7/2021
Tested By:	cmh
Checked By:	jsc
Boring ID:	BB-ECR-204A
Sample ID:	R3
Depth, ft:	21.64-22.08
Sample Type:	rock core
Sample Description:	See photographs Intact material and discontinuity failure Best Effort End Preparation

Compressive Strength and Elastic Moduli of Rock by ASTM D7012 - Method D



Peak Compressive Stress: 4,672 psi

Stress Range, psi	Young's Modulus, psi	Poisson's Ratio
500-1700	8,620,000	0.13
1700-3000	10,900,000	0.20
3000-4100	8,980,000	0.15

Notes: Test specimen tested at the approximate as-received moisture content and at standard laboratory temperature.
The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.
Young's Modulus and Poisson's Ratio calculated using the tangent to the line in the stress range listed.
Calculations assume samples are isotropic, which is not necessarily the case.

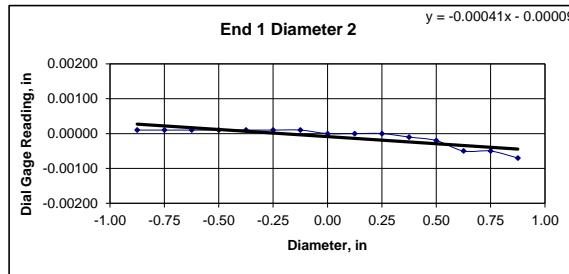
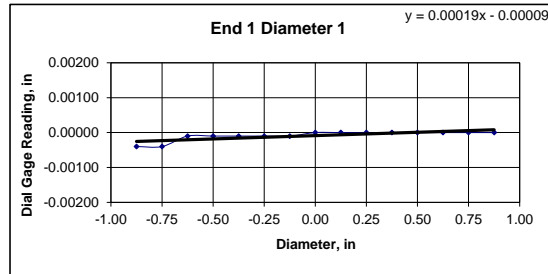


Client:	Haley & Aldrich, Inc.	Test Date:	4/1/2021
Project Name:	I-395/Rte 9 Connector Bridge (Clewesville Rd)	Tested By:	cmh
Project Location:	Eddington, ME	Checked By:	smd
GTX #:	313418		
Boring ID:	BB-ECR-204A		
Sample ID:	R3		
Depth:	21.64-22.08 ft		
Visual Description:	See photographs		

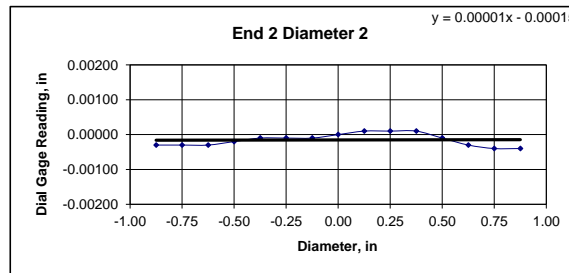
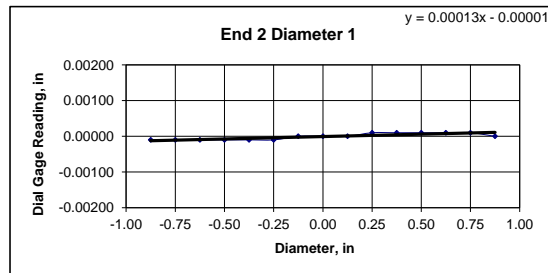
UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY				DEVIATION FROM STRAIGHTNESS (Procedure S1)	
	1	2	Average	Maximum gap between side of core and reference surface plate: Is the maximum gap ≤ 0.02 in.? NO	
Specimen Length, in:	5.47	5.46	5.47	Maximum difference must be < 0.020 in. Straightness Tolerance Met? NO	
Specimen Diameter, in:	2.49	2.48	2.49		
Specimen Mass, g:	1172.15				
Bulk Density, lb/ft ³	168				
Length to Diameter Ratio:	2.2	Minimum Diameter Tolerance Met? YES	Length to Diameter Ratio Tolerance Met? YES		

END FLATNESS AND PARALLELISM (Procedure FP1)														
END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750
Diameter 1, in	-0.00040	-0.00040	-0.00010	-0.00010	-0.00010	-0.00010	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Diameter 2, in (rotated 90°)	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00000	0.00000	0.00000	-0.00010	-0.00020	-0.00050	-0.00070
Difference between max and min readings, in: 0° = 0.00040 90° = 0.00080														
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750
Diameter 1, in	-0.00010	-0.00010	-0.00010	-0.00010	-0.00010	-0.00010	0.00000	0.00000	0.00000	0.00010	0.00010	0.00010	0.00010	0.00000
Diameter 2, in (rotated 90°)	-0.00030	-0.00030	-0.00030	-0.00020	-0.00010	-0.00010	-0.00010	0.00000	0.00010	0.00010	0.00010	-0.00010	-0.00030	-0.00040
Difference between max and min readings, in: 0° = 0.0002 90° = 0.0005 Maximum difference must be < 0.0020 in. Difference = ± 0.00040 Flatness Tolerance Met? YES														



DIAMETER 1	
End 1:	
Slope of Best Fit Line	0.00019
Angle of Best Fit Line:	0.01097
End 2:	
Slope of Best Fit Line	0.00013
Angle of Best Fit Line:	0.00769
Maximum Angular Difference:	0.00327
Parallelism Tolerance Met? Spherically Seated	YES



DIAMETER 2	
End 1:	
Slope of Best Fit Line	0.00041
Angle of Best Fit Line:	0.02341
End 2:	
Slope of Best Fit Line	0.00001
Angle of Best Fit Line:	0.00049
Maximum Angular Difference:	0.02292
Parallelism Tolerance Met? Spherically Seated	NO

PERPENDICULARITY (Procedure P1)						Maximum angle of departure must be $\leq 0.25^\circ$
	(Calculated from End Flatness and Parallelism measurements above)					
END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?	
Diameter 1, in	0.00040	2.485	0.00016	0.009	YES	
Diameter 2, in (rotated 90°)	0.00080	2.485	0.00032	0.018	YES	Perpendicularity Tolerance Met? YES
END 2						
Diameter 1, in	0.00020	2.485	0.00008	0.005	YES	
Diameter 2, in (rotated 90°)	0.00050	2.485	0.00020	0.012	YES	



Client:	Haley & Aldrich, Inc.	Test Date:	4/1/2021
Project Name:	I-395/Rte 9 Connector Bridge (Cleweyv	Tested By:	cmh
Project Location:	Eddington, ME	Checked By:	smd
GTX #:	313418		
Boring ID:	BB-ECR-204A	Reliable dial gauge measurements could not be performed on this rock type. Tolerance measurements were performed using a machinist straightedge and feeler gauges to ASTM specifications.	
Sample ID:	R3		
Depth (ft):	21.64-22.08		
Visual Description:	See photographs		

BEST EFFORT END FLATNESS TOLERANCES OF ROCK CORE SPECIMENS TO
ASTM D4543

END FLATNESS

END 1

Diameter 1	Is the maximum gap $\leq \pm 0.001$ in.?	YES
Diameter 2 (rotated 90°)	Is the maximum gap $\leq \pm 0.001$ in.?	YES

END 2

Diameter 1	Is the maximum gap $\leq \pm 0.001$ in.?	YES
Diameter 2 (rotated 90°)	Is the maximum gap $\leq \pm 0.001$ in.?	YES

End Flatness Tolerance Met? YES

Client:	Haley & Aldrich, Inc.
Project Name:	I-395/Rte 9 Connector Bridge (Cleweyville Rd)
Project Location:	Eddington, ME
GTX #:	313418
Test Date:	4/7/2021
Tested By:	cmh
Checked By:	smd
Boring ID:	BB-ECR-204A
Sample ID:	R3
Depth, ft:	21.64-22.08



After cutting and grinding

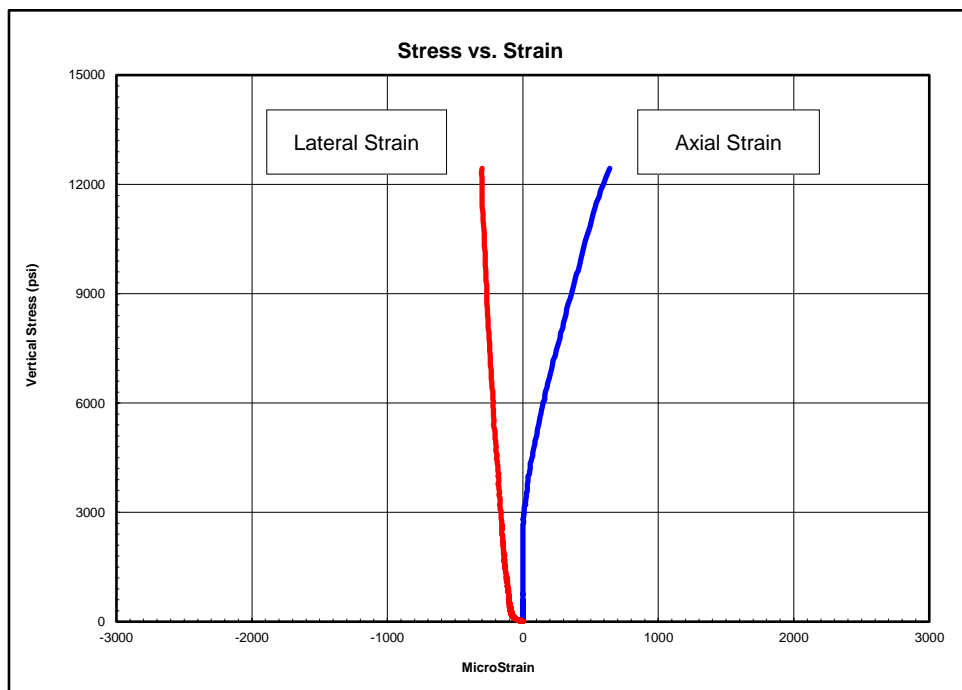


After break



Client:	Haley & Aldrich, Inc.
Project Name:	I-395/Rte 9 Connector Bridge(Cleweyville Rd)
Project Location:	Eddington, ME
GTX #:	313418
Test Date:	4/7/2021
Tested By:	cmh
Checked By:	jsc
Boring ID:	BB-ECR-205
Sample ID:	R6
Depth, ft:	24.15-24.53
Sample Type:	rock core
Sample Description:	See photographs Intact material and discontinuity failure

Compressive Strength and Elastic Moduli of Rock by ASTM D7012 - Method D



Peak Compressive Stress: 12,440 psi

The strain values recorded within the first stress range for this test produce values of Poisson's Ratio that exceed maximum values found in rocks.

Stress Range, psi	Young's Modulus, psi	Poisson's Ratio
1200-4600	---	---
4600-7900	15,900,000	0.27
7900-11200	13,700,000	0.17

Notes: Test specimen tested at the approximate as-received moisture content and at standard laboratory temperature.
The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.
Young's Modulus and Poisson's Ratio calculated using the tangent to the line in the stress range listed.
Calculations assume samples are isotropic, which is not necessarily the case.

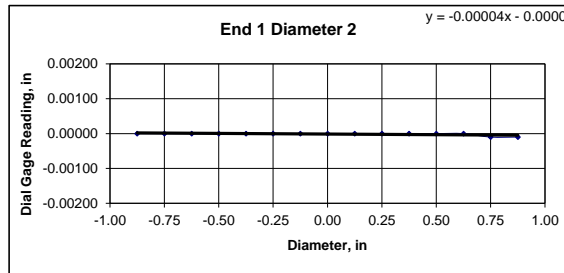
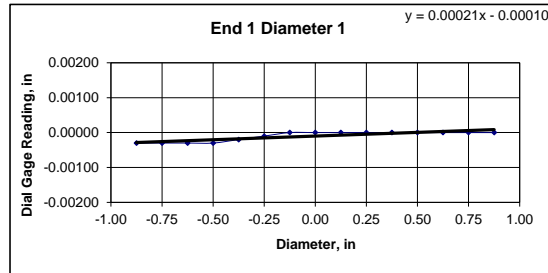


Client:	Haley & Aldrich, Inc.	Test Date:	4/2/2021
Project Name:	I-395/Rte 9 Connector Bridge (Clewesville Rd)	Tested By:	cmh
Project Location:	Eddington, ME	Checked By:	smd
GTX #:	313418		
Boring ID:	BB-ECR-205		
Sample ID:	R6		
Depth:	24.15-24.53 ft		
Visual Description:	See photographs		

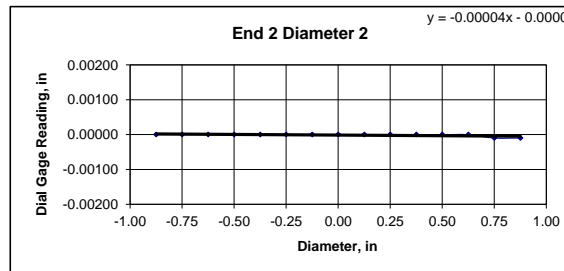
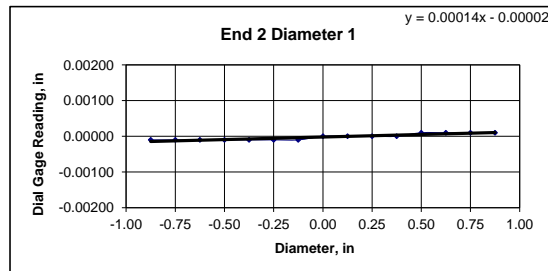
UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY				DEVIATION FROM STRAIGHTNESS (Procedure S1)	
	1	2	Average	Maximum gap between side of core and reference surface plate: Is the maximum gap \leq 0.02 in.? NO	
Specimen Length, in:	4.41	4.41	4.41	Maximum difference must be < 0.020 in. Straightness Tolerance Met? NO	
Specimen Diameter, in:	1.99	1.98	1.99		
Specimen Mass, g:	571.07				
Bulk Density, lb/ft ³	159				
Length to Diameter Ratio:	2.2	Minimum Diameter Tolerance Met? YES	Length to Diameter Ratio Tolerance Met? YES		

END FLATNESS AND PARALLELISM (Procedure FP1)														
END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750
Diameter 1, in	-0.00030	-0.00030	-0.00030	-0.00030	-0.00020	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Diameter 2, in (rotated 90°)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00010
Difference between max and min readings, in: 0° = 0.00030 90° = 0.00010														
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750
Diameter 1, in	-0.00010	-0.00010	-0.00010	-0.00010	-0.00010	-0.00010	-0.00010	0.00000	0.00000	0.00000	0.00000	0.00010	0.00010	0.00010
Diameter 2, in (rotated 90°)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010	-0.00010
Difference between max and min readings, in: 0° = 0.0002 90° = 0.0001 Maximum difference must be < 0.0020 in. Difference = \pm 0.00015 Flatness Tolerance Met? YES														



DIAMETER 1	
End 1:	
Slope of Best Fit Line	0.00021
Angle of Best Fit Line:	0.01211
End 2:	
Slope of Best Fit Line	0.00014
Angle of Best Fit Line:	0.00819
Maximum Angular Difference:	0.00393
Parallelism Tolerance Met? Spherically Seated	YES



DIAMETER 2	
End 1:	
Slope of Best Fit Line	0.00004
Angle of Best Fit Line:	0.00213
End 2:	
Slope of Best Fit Line	0.00004
Angle of Best Fit Line:	0.00213
Maximum Angular Difference:	0.00000
Parallelism Tolerance Met? Spherically Seated	YES

PERPENDICULARITY (Procedure P1) (Calculated from End Flatness and Parallelism measurements above)						Maximum angle of departure must be \leq 0.25°	
END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?		
Diameter 1, in	0.00030	1.985	0.00015	0.009	YES	Perpendicularity Tolerance Met? YES	
Diameter 2, in (rotated 90°)	0.00010	1.985	0.00005	0.003	YES		
END 2							
Diameter 1, in	0.00020	1.985	0.00010	0.006	YES		
Diameter 2, in (rotated 90°)	0.00010	1.985	0.00005	0.003	YES		

Client:	Haley & Aldrich, Inc.
Project Name:	I-395/Rte 9 Connector Bridge (Cleweyville Rd)
Project Location:	Eddington, ME
GTX #:	313418
Test Date:	4/7/2021
Tested By:	cmh
Checked By:	smd
Boring ID:	BB-ECR-205
Sample ID:	R6
Depth, ft:	24.15-24.53



After cutting and grinding



After break



Client:	Haley & Aldrich, Inc.
Project Name:	I-395/Rte 9 Connector Bridge(Cleweyville Rd)
Project Location:	Eddington, ME
GTX #:	313418
Test Date:	4/7/2021
Tested By:	cmh
Checked By:	jsc
Boring ID:	BB-ECR-206A
Sample ID:	R6
Depth, ft:	47.64-48.08
Sample Type:	rock core
Sample Description:	See photographs Discontinuity failure

Compressive Strength and Elastic Moduli of Rock by ASTM D7012 - Method D

No Graph Available
(see comment below)

Peak Compressive Stress: 4,751 psi

Both lateral and axial strain gauges failed to record meaningful data. Young's Modulus and Poisson's Ratio could not be determined.

Stress Range, psi	Young's Modulus, psi	Poisson's Ratio
500-1700	---	---
1700-3000	---	---
3000-4300	---	---

Notes: Test specimen tested at the approximate as-received moisture content and at standard laboratory temperature.
The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.
Young's Modulus and Poisson's Ratio calculated using the tangent to the line in the stress range listed.
Calculations assume samples are isotropic, which is not necessarily the case.

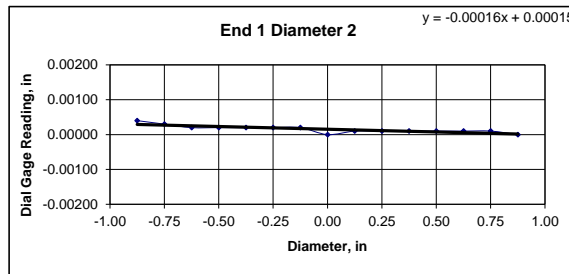
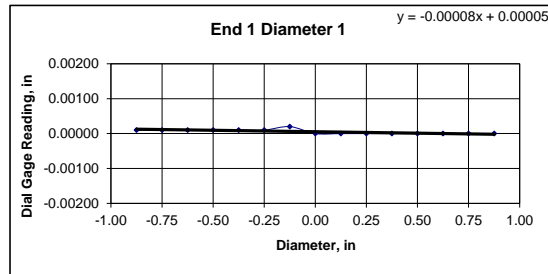


Client:	Haley & Aldrich, Inc.	Test Date:	4/1/2021
Project Name:	I-395/Rte 9 Connector Bridge (Clewesville Rd)	Tested By:	cmh
Project Location:	Eddington, ME	Checked By:	smd
GTX #:	313418		
Boring ID:	BB-ECR-206A		
Sample ID:	R6		
Depth:	47.64-48.08 ft		
Visual Description:	See photographs		

UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

BULK DENSITY				DEVIATION FROM STRAIGHTNESS (Procedure S1)	
	1	2	Average	Maximum gap between side of core and reference surface plate: Is the maximum gap ≤ 0.02 in.? NO	
Specimen Length, in:	5.28	5.29	5.29	Maximum difference must be < 0.020 in. Straightness Tolerance Met? NO	
Specimen Diameter, in:	2.46	2.46	2.46		
Specimen Mass, g:	1162.94				
Bulk Density, lb/ft ³	176				
Length to Diameter Ratio:	2.1				
		Minimum Diameter Tolerance Met?	YES		
		Length to Diameter Ratio Tolerance Met?	YES		

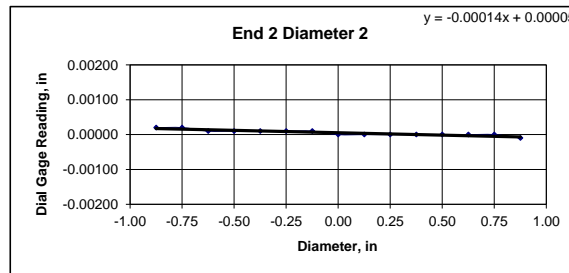
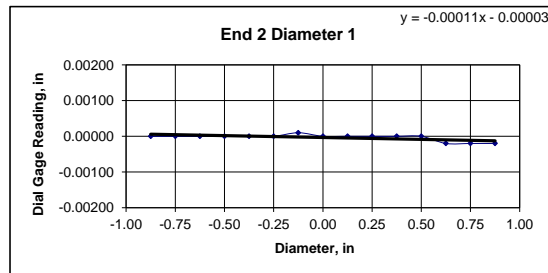
END FLATNESS AND PARALLELISM (Procedure FP1)															
END 1	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00020	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Diameter 2, in (rotated 90°)	0.00040	0.00030	0.00020	0.00020	0.00020	0.00020	0.00020	0.00000	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010	0.00000
Difference between max and min readings, in:															
0° = 0.00020 90° = 0.00040															
END 2	-0.875	-0.750	-0.625	-0.500	-0.375	-0.250	-0.125	0.000	0.125	0.250	0.375	0.500	0.625	0.750	0.875
Diameter 1, in	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00020	-0.00020	-0.00020
Diameter 2, in (rotated 90°)	0.00020	0.00020	0.00010	0.00010	0.00010	0.00010	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010
Difference between max and min readings, in:															
0° = 0.0003 90° = 0.0003															
Maximum difference must be < 0.0020 in. Difference = ± 0.00020															
Flatness Tolerance Met? YES															



DIAMETER 1

End 1:		
Slope of Best Fit Line	0.00008	
Angle of Best Fit Line:	0.00475	
End 2:		
Slope of Best Fit Line	0.00011	
Angle of Best Fit Line:	0.00606	
Maximum Angular Difference:	0.00131	

Parallelism Tolerance Met? YES
Spherically Seated



DIAMETER 2

End 1:		
Slope of Best Fit Line	0.00016	
Angle of Best Fit Line:	0.00900	
End 2:		
Slope of Best Fit Line	0.00014	
Angle of Best Fit Line:	0.00786	
Maximum Angular Difference:	0.00115	

Parallelism Tolerance Met? YES
Spherically Seated

PERPENDICULARITY (Procedure P1)						Maximum angle of departure must be $\leq 0.25^\circ$	
END 1	Difference, Maximum and Minimum (in.)	Diameter (in.)	Slope	Angle°	Perpendicularity Tolerance Met?		
Diameter 1, in	0.00020	2.460	0.00008	0.005	YES	Perpendicularity Tolerance Met? YES	
Diameter 2, in (rotated 90°)	0.00040	2.460	0.00016	0.009	YES		
END 2							
Diameter 1, in	0.00030	2.460	0.00012	0.007	YES		
Diameter 2, in (rotated 90°)	0.00030	2.460	0.00012	0.007	YES		

Client:	Haley & Aldrich, Inc.
Project Name:	I-395/Rte 9 Connector Bridge (Cleweyville Rd)
Project Location:	Eddington, ME
GTX #:	313418
Test Date:	4/7/2021
Tested By:	cmh
Checked By:	smd
Boring ID:	BB-ECR-206A
Sample ID:	R6
Depth, ft:	47.64-48.08



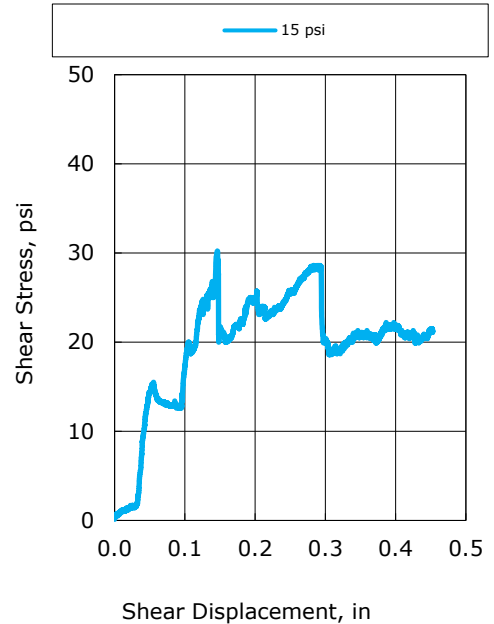
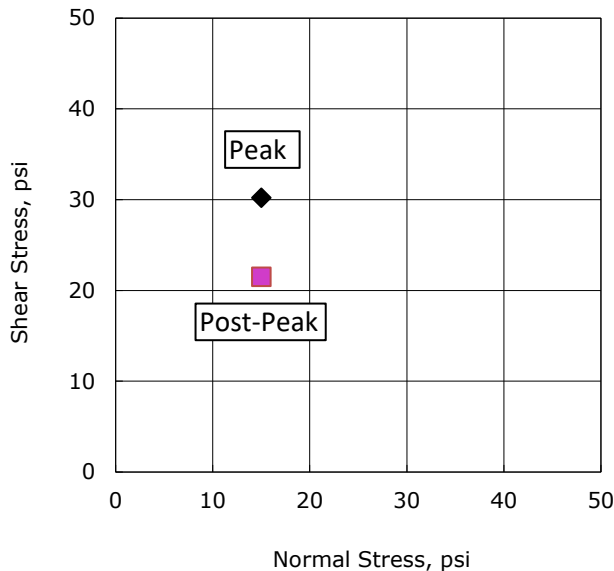
After cutting and grinding



After break

Client:	Haley & Aldrich, Inc
Project Name:	I-395/Rte 9 Connector Bridge (Cleweyville rd)
Project Location:	Eddington, ME
GTX #:	313418
Start Date:	4/12/2021
End Date:	4/12/2021
Tested By:	tlm
Checked By:	jsc
Boring ID:	BB-ECR-204A
Sample ID:	R3
Depth, ft:	22.4
Visual Description:	Rock Core with open joint

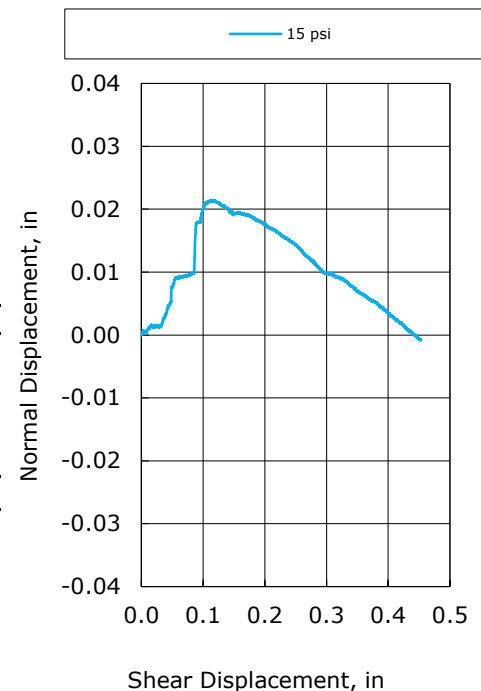
Sliding Friction Test of Rock by ASTM D5607



Test No.:	SF-1
Specimen Diameter, in:	2.49
Specimen Length, in:	3.31
Specimen Mass, grams:	700
Specimen Area, in ² :	4.86
Specimen Bulk Density, pcf	166
Shear Plane Area, in ²	7.59
Normal Stress, psi:	15.0
Peak Shear Stress, psi:	30.2
Post Peak Shear Stress, psi:	21.5
Horiz. Displacement Rate, in/min:	0.005

Peak Friction Angle:	---
Peak Cohesive Intercept, psi:	---
Post-Peak Friction Angle:	---
Post-Peak Cohesive Intercept, psi:	---
JRC Roughness	6-8

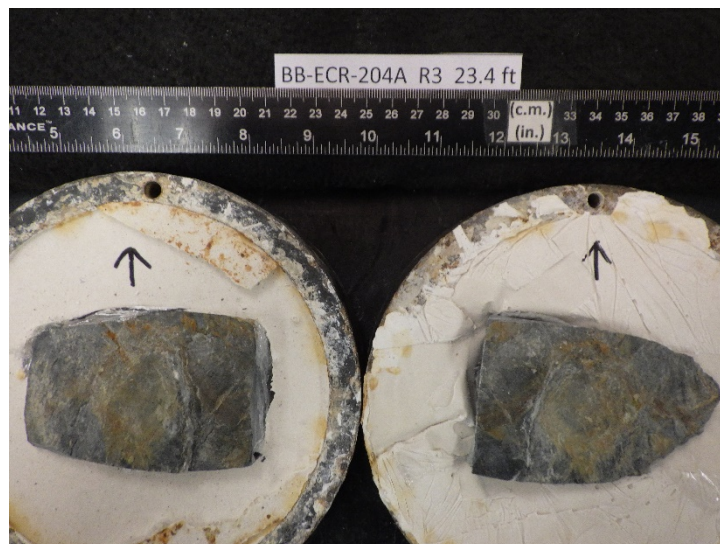
Notes: Specimen cut to length using diamond tipped saw blade.
 Tested at as-received moisture content and density.
 'Hydro-Stone Super X' encapsulating compound used to mount specimen in test rings.
 Actual strength parameters may vary and should be determined by an engineer for site-specific conditions.



Client:	Haley & Aldrich, Inc
Project Name:	I-395/Rte 9 Connector Bridge (Cleweyville rd)
Project Location:	Eddington, ME
GTX #:	313418
Start Date:	4/12/2021
End Date:	4/12/2021
Tested By:	tlm
Checked By:	smd
Boring ID:	BB-ECR-204A
Sample ID:	R3
Depth, ft:	22.4
Visual Description:	Rock Core with open joint



Pre-Test



Post-Test

APPENDIX E

Geotechnical Design Calculations

**Seismic Site Class and
Design Parameters**

File No.	132076-007
Sheet	1 of 9
Date	9-Feb-21
Computed by	JAD
Checked by	BWC

Client	Maine Department of Transportation
Project	Clewleyville Road Bridge over I-395/Route 9 Connector - WIN No. 18915.00
Subject	Seismic Site Class Evaluation

PROBLEM STATEMENT & OBJECTIVE

Determine the Seismic Site Class using SPT N-values and assumed S_u values from test borings drilled approximately near the proposed substructures.

EXECUTIVE SUMMARY

Based on the subsurface conditions encountered at the ten test borings near the proposed substructures (BB-ECR-101, BB-ECR-102, BB-ECR-201 through BB-ECR-206, HB-BE-231 and HB-BE-232), recommend a **Seismic Site Class C**. Borings BB-ECR-204, BB-ECR-206 and HB-BE-233 classified as Site Class D however, based on a sensitivity study the the classify as D because of the loose (i.e. low blow count values) in the upper 5 ft of the soil profile.

REFERENCES

1. AASHTO LRFD Bridge Design Specifications, 9th edition, 2020
2. Maine DOT Bridge Design Guide, August 2003

AVAILABLE INFORMATION

1. Boring logs dated 25 and 31 July 2018 drilled by Northern Test Boring, Inc. (monitored by Haley & Aldrich, Inc.).
2. Draft boring logs dated November and December 2020 drilled by New England Boring Contractors (monitored by Haley & aldrich, Inc.).
3. Elevations reference the North American Vertical Datum of 1988 (NAVD 88).

ASSUMPTIONS

1. Where SPT N-value was available to depths less than 100 ft, the subsurface profile was extended to 100 ft. The SPT N-values for the extended profile were then assumed based on the available information.
2. WOH/WOR = SPT N-value of 1.
3. Used Method C and assumed S_u values per MaineDOT Field Identification Card.

PROCEDURE

1. Check the site against the three categories of Site Class F (see attached Table 3.10.3.1-1), requiring site-specific ground motion response evaluation. If the site corresponds to any of these categories, classify the site as Site Class F and conduct a site-specific ground motion response evaluation.
2. Categorize the site using one of the following three methods (Method A, B, or C).

Method A

Average shear wave velocity for the upper 100 ft of the soil profile:

$$\bar{V}_s = \frac{\sum_{i=1}^n d_i}{\sum_{i=1}^n \frac{d_i}{V_{si}}}$$

where

V_{si} = shear wave velocity of i th soil (ft/s).

d_i = thickness of i th soil layer (ft).

n = total number of distinctive soil layers in the upper 100 ft of the site profile.

i = any one of the layers between 1 and n .

File No.	132076-007
Sheet	2 of 9
Date	9-Feb-21
Computed by	JAD
Checked by	BWC

Client	Maine Department of Transportation
Project	Clewleyville Road Bridge over I-395/Route 9 Connector - WIN No. 18915.00
Subject	Seismic Site Class Evaluation

PROCEDURE

Method B

Average standard penetration test (SPT) for the upper 100 ft of the soil profile:

$$\bar{N} = \frac{\sum_{i=1}^n d_i}{\sum_{i=1}^n \frac{d_i}{N_i}}$$

where

N_i = standard penetration resistance as measured directly in the field, uncorrected blow count, of i th soil layer not to exceed 100 ft (blows/ft).

d_i = thickness of i th soil layer (ft).

n = total number of distinctive soil layers in the upper 100 ft of the site profile.

i = any one of the layers between 1 and n .

Method C

Average standard penetration test (SPT) for the cohesionless layers in the upper 100 ft of the soil profile:

$$\bar{N}_{ch} = \frac{\sum_{i=1}^m d_i}{\sum_{i=1}^m \frac{d_i}{N_i}}$$

where

N_i = standard penetration resistance as measured directly in the field, uncorrected blow count, of i th cohesionless soil layer (blows/ft).

d_i = thickness of i th cohesionless soil layer (ft).

m = total number of distinctive cohesionless soil layers in the upper 100 ft of the site profile.

i = any one of the layers between 1 and m .

Average undrained shear strength for the cohesive layers in the upper 100 ft of the soil profile:

$$\bar{s}_u = \frac{\sum_{i=1}^k d_i}{\sum_{i=1}^k \frac{d_i}{s_{ui}}}$$

where

s_{ui} = undrained shear strength of i th cohesive soil layer (psf), not to exceed 5000 psf

d_i = thickness of i th cohesive soil layer (ft).

k = total number of distinctive cohesive soil layers in the upper 100 ft of the site profile.

i = any one of the layers between 1 and k .

Based on the available information, Method A/B/C will be used for the seismic Site Class evaluation.

Client	Maine Department of Transportation
Project	Clewleyville Road Bridge over I-395/Route 9 Connector - WIN No. 18915.00
Subject	Seismic Site Class Evaluation

SITE CLASS DEFINITIONS

(Table from AASHTO LRFD Bridge Design Specifications, 9th edition, 2020.)

Table 3.10.3.1-1—Site Class Definitions

Site Class	Soil Type and Profile
A	Hard rock with measured shear wave velocity, $\bar{v}_s > 5,000$ ft/s
B	Rock with $2,500$ ft/sec $< \bar{v}_s < 5,000$ ft/s
C	Very dense soil and soil rock with $1,200$ ft/sec $< \bar{v}_s < 2,500$ ft/s, or with either $\bar{N} > 50$ blows/ft, or $\bar{s}_u > 2.0$ ksf
D	Stiff soil with 600 ft/s $< \bar{v}_s < 1,200$ ft/s, or with either $15 < \bar{N} < 50$ blows/ft, or $1.0 < \bar{s}_u < 2.0$ ksf
E	Soil profile with $\bar{v}_s < 600$ ft/s or with either $\bar{N} < 15$ blows/ft or $\bar{s}_u < 1.0$ ksf, or any profile with more than 10.0 ft of soft clay defined as soil with $PI > 20$, $w > 40$ percent and $\bar{s}_u < 0.5$ ksf
F	Soils requiring site-specific evaluations, such as: <ul style="list-style-type: none"> Peats or highly organic clays ($H > 10.0$ ft of peat or highly organic clay where H = thickness of soil) Very high plasticity clays ($H > 25.0$ ft with $PI > 75$) Very thick soft/medium stiff clays ($H > 120$ ft)

Exceptions: Where the soil properties are not known in sufficient detail to determine the site class, a site investigation shall be undertaken sufficient to determine the site class. Site classes E or F should not be assumed unless the authority having jurisdiction determines that site classes E or F could be present at the site or in the event that site classes E or F are established by geotechnical data.

where:

\bar{v}_s = average shear wave velocity for the upper 100 ft of the soil profile
 \bar{N} = average Standard Penetration Test (SPT) blow count (blows/ft) (ASTM D1586) for the upper 100 ft of the soil profile
 \bar{s}_u = average undrained shear strength in ksf (ASTM D2166 or ASTM D2850) for the upper 100 ft of the soil profile
 PI = plasticity index (ASTM D4318)
 w = moisture content (ASTM D2216)



CALCULATIONS

File No. 132076-007

Sheet 4 of 9

Client Maine Department of Transportation

Date 9-Feb-21

Project Clewleyville Road Bridge over I-395/Route 9 Connector - WIN No. 18915.00

Computed by JAD

Subject Seismic Site Class Evaluation

Checked by KAR/JAD

CALCULATIONS - METHOD B

Exploration ID: BB-ECR-101

Ground Surface El.: 201.8

Sample Number	Depth (ft)	Elevation (ft)	Description	d (ft)	Cohesionless		Cohesive	
					SPT N (blows/ft)	d/N	Su (psf)	d/Su
1D	1.3	200.5	SAND (Fill)	2.0	32	0.063		
2D	3.3	198.5	SILT (Glacial Till)	2.3	18	0.128		
3D	5.3	196.5	SILT (Glacial Till)	3.9	22	0.177		
4D	11.0	190.8	SILT (Glacial Till)	4.9	49	0.100		
R1-R3	13.1	188.7	BEDROCK	86.9	100	0.869		
					$\Sigma d/N =$	1.337	$\Sigma d/Su =$	0.000
Total Thickness of Cohesionless (ft) =				100.0	N_{ch-bar} (blows/ft) =	74.8	S_{u-bar} (psf) =	#DIV/0!
Total Thickness of Cohesive (ft) =				0.0	Site Class _N =	C	Site Class _{Su} =	#DIV/0!
Total Thickness (ft) =				100.0	Site Class =	#DIV/0!		



CALCULATIONS

File No. 132076-007

Sheet 5 of 9

Client Maine Department of Transportation

Date 9-Feb-21

Project Clewleyville Road Bridge over I-395/Route 9 Connector - WIN No. 18915.00

Computed by JAD

Subject Seismic Site Class Evaluation

Checked by KAR/JAD

CALCULATIONS - METHOD B

Exploration ID: BB-ECR-102

Ground Surface El.: 203.2

Sample Number	Depth (ft)	Elevation (ft)	Description	d (ft)	Cohesionless		Cohesive	
					SPT N (blows/ft)	d/N	Su (psf)	d/Su
1D	1.3	201.9	SAND (Fill)	2.5	20	0.125		
2D	3.3	199.9	SILT (Glacial Till)	1.0	12	0.083		
3D	8.3	194.9	SILT (Glacial Till)	6.5	21	0.310		
4D	10.8	192.4	GRAVEL (Glacial Till)	2.6	49	0.053		
R1-R3	12.6	190.6	BEDROCK	87.4	100	0.874		
					$\Sigma d/N =$	1.445	$\Sigma d/Su =$	0.000
Total Thickness of Cohesionless (ft) =				100.0	N_{ch-bar} (blows/ft) =	69.2	S_{u-bar} (psf) =	#DIV/0!
Total Thickness of Cohesive (ft) =				0.0	Site Class _N =	C	Site Class _{Su} =	#DIV/0!
Total Thickness (ft) =				100.0	Site Class = #DIV/0!			

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CALCULATIONS

File No.	132076-007
Sheet	6 of 9
Date	9-Feb-21
Computed by	JAD
Checked by	BWC

Client	Maine Department of Transportation
Project	Clewleyville Road Bridge over I-395/Route 9 Connector - WIN No. 18915.00
Subject	Seismic Site Class Evaluation

CALCULATIONS - METHOD B

Exploration ID: **BB-ECR-201**
Ground Surface El.: **200.5**

Sample Number	Depth (ft)	Elevation (ft)	Description	d (ft)	Cohesionless		Cohesive	
					SPT N (blows/ft)	d/N	Su (psf)	d/Su
1D	0	200.5	SILT (Glacial Till)	5.0	27	0.185		
2D	5	195.5	SILT (Glacial Till)	5.0	50	0.100		
3D	10	190.5	SILT (Glacial Till)	5.0	50	0.100		
4D	15	185.5	GRAVEL (Glacial Till)	0.7	100	0.007		
-	15.7	184.8	BEDROCK	84.3	100	0.843		
					$\Sigma d/N =$	1.235	$\Sigma d/Su =$	0.000
Total Thickness of Cohesionless (ft) =					100.0	N_{ch-bar} (blows/ft) =	81.0	S_{u-bar} (psf) = #DIV/0!
Total Thickness of Cohesive (ft) =					0.0	Site Class _N =	C	Site Class _{Su} = #DIV/0!
Total Thickness (ft) =					100.0	Site Class =	#DIV/0!	

Exploration ID: **BB-ECR-202**
Ground Surface El.: **201.6**

Sample Number	Depth (ft)	Elevation (ft)	Description	d (ft)	Cohesionless		Cohesive	
					SPT N (blows/ft)	d/N	Su (psf)	d/Su
1D	0	200.5	AND (Road Base)	2.8	30	0.093		
2D	5	195.5	SILT (Glacial Till)	7.2	30	0.240		
3D	10	190.5	SILT (Glacial Till)	3.5	44	0.080		
-	13.5	187	BEDROCK	86.5	100	0.865		
					$\Sigma d/N =$	1.278	$\Sigma d/Su =$	0.000
Total Thickness of Cohesionless (ft) =					100.0	N_{ch-bar} (blows/ft) =	78.3	S_{u-bar} (psf) = #DIV/0!
Total Thickness of Cohesive (ft) =					0.0	Site Class _N =	C	Site Class _{Su} = #DIV/0!
Total Thickness (ft) =					100.0	Site Class =	#DIV/0!	



CALCULATIONS

File No. 132076-007
 Sheet 7 of 9
 Date 9-Feb-21
 Computed by JAD
 Checked by BWC

Client Maine Department of Transportation
 Project Clewleyville Road Bridge over I-395/Route 9 Connector - WIN No. 18915.00
 Subject Seismic Site Class Evaluation

CALCULATIONS - METHOD B

Exploration ID: BB-ECR-203
 Ground Surface El.: 198.6

Sample Number	Depth (ft)	Elevation (ft)	Description	d (ft)	Cohesionless		Cohesive	
					SPT N (blows/ft)	d/N	Su (psf)	d/Su
1D	0	198.6	SILT	3.0	4	0.750		
2D	5	193.6	SILT (Glacial Till)	7.0	98	0.071		
3D	10	188.6	SILT (Glacial Till)	3.6	39	0.092		
-	13.6	185	BEDROCK	86.4	100	0.864		
		198.6						
					$\Sigma d/N =$	1.778	$\Sigma d/Su =$	0.000
Total Thickness of Cohesionless (ft) =					100.0	N_{ch-bar} (blows/ft) =	56.3	S_{u-bar} (psf) = #DIV/0!
Total Thickness of Cohesive (ft) =					0.0	Site Class _N =	C	Site Class _{Su} = #DIV/0!
Total Thickness (ft) =					100.0	Site Class =	#DIV/0!	

Exploration ID: BB-ECR-204
 Ground Surface El.: 202.4

Sample Number	Depth (ft)	Elevation (ft)	Description	d (ft)	Cohesionless		Cohesive	
					SPT N (blows/ft)	d/N	Su (psf)	d/Su
1D	0	198.6	SILT (Glacial Till)	5.0	3	1.667		
2D	5	193.6	SILT (Glacial Till)	0.5	50	0.010		
-	5.5	193.1	BEDROCK	94.5	100	0.945		
		198.6						
					$\Sigma d/N =$	2.622	$\Sigma d/Su =$	0.000
Total Thickness of Cohesionless (ft) =					100.0	N_{ch-bar} (blows/ft) =	38.1	S_{u-bar} (psf) = #DIV/0!
Total Thickness of Cohesive (ft) =					0.0	Site Class _N =	D	Site Class _{Su} = #DIV/0!
Total Thickness (ft) =					100.0	Site Class =	#DIV/0!	

CALCULATIONS

File No.	132076-007
Sheet	8 of 9
Date	9-Feb-21
Computed by	JAD
Checked by	BWC

Client	Maine Department of Transportation
Project	Clewleyville Road Bridge over I-395/Route 9 Connector - WIN No. 18915.00
Subject	Seismic Site Class Evaluation

CALCULATIONS - METHOD B

Exploration ID: BB-ECR-205
Ground Surface El.: 203.4

Sample Number	Depth (ft)	Elevation (ft)	Description	d (ft)	Cohesionless		Cohesive	
					SPT N (blows/ft)	d/N	Su (psf)	d/Su
1D	0	203.4	AND (Road Bas	2.5	51	0.049		
2D	5	198.4	SILT (Glacial Till	6.5	27	0.241		
3D	10	193.4	ATHERED BEDR	4.0	72	0.056		
-	13	190.4	BEDROCK	77.0	100	0.770		
					$\Sigma d/N =$	1.115	$\Sigma d/Su =$	0.000
Total Thickness of Cohesionless (ft) =				90.0	N_{ch-bar} (blows/ft) =	80.7	S_{u-bar} (psf) =	#DIV/0!
Total Thickness of Cohesive (ft) =				0.0	Site Class _N =	C	Site Class _{Su} =	#DIV/0!
Total Thickness (ft) =				90.0	Site Class =	#DIV/0!		

Exploration ID: BB-ECR-206
Ground Surface El.: 200.7

Sample Number	Depth (ft)	Elevation (ft)	Description	d (ft)	Cohesionless		Cohesive	
					SPT N (blows/ft)	d/N	Su (psf)	d/Su
1D	0	203.4	SAND	4.0	4	1.000		
2D	5	198.4	SILT (Glacial Till	5.0	45	0.111		
3D	10	193.4	ATHERED BEDR	3.0	70	0.043		
-	12	191.4	BEDROCK	88.0	100	0.880		
					$\Sigma d/N =$	2.034	$\Sigma d/Su =$	0.000
Total Thickness of Cohesionless (ft) =				100.0	N_{ch-bar} (blows/ft) =	49.2	S_{u-bar} (psf) =	#DIV/0!
Total Thickness of Cohesive (ft) =				0.0	Site Class _N =	D	Site Class _{Su} =	#DIV/0!
Total Thickness (ft) =				100.0	Site Class =	#DIV/0!		

CALCULATIONS

File No.	132076-007
Sheet	9 of 9
Date	9-Feb-21
Computed by	JAD
Checked by	BWC

Client	Maine Department of Transportation
Project	Clewleyville Road Bridge over I-395/Route 9 Connector - WIN No. 18915.00
Subject	Seismic Site Class Evaluation

CALCULATIONS - METHOD B

Exploration ID: HB-BE-231
Ground Surface El.: 202.3

Sample Number	Depth (ft)	Elevation (ft)	Description	d (ft)	Cohesionless		Cohesive	
					SPT N (blows/ft)	d/N	Su (psf)	d/Su
1D	0	202.3	SILT (Glacial Till)	5.0	7	0.714		
2D	5	197.3	SILT (Glacial Till)	3.0	58	0.052		
-	8	194.3	BEDROCK	92.0	100	0.920		
					$\Sigma d/N =$	1.686	$\Sigma d/Su =$	0.000
Total Thickness of Cohesionless (ft) =				100.0	N_{ch-bar} (blows/ft) =	59.3	S_{u-bar} (psf) =	#DIV/0!
Total Thickness of Cohesive (ft) =				0.0	Site Class _N =	C	Site Class _{Su} =	#DIV/0!
Total Thickness (ft) =				100.0	Site Class =	#DIV/0!		

Exploration ID: HB-BE-232
Ground Surface El.: 196.8

Sample Number	Depth (ft)	Elevation (ft)	Description	d (ft)	Cohesionless		Cohesive	
					SPT N (blows/ft)	d/N	Su (psf)	d/Su
1D	0	202.3	LOAM	1.5	2	0.750		
2D	5	197.3	SILT (Glacial Till)	8.5	33	0.258		
3D	10	192.3	SILT (Glacial Till)	5.0	37	0.135		
4D	15	187.3	SILT (Glacial Till)	1.0	50	0.020		
-	16	186.3	BEDROCK	84.0	100	0.840		
					$\Sigma d/N =$	2.003	$\Sigma d/Su =$	0.000
Total Thickness of Cohesionless (ft) =				100.0	N_{ch-bar} (blows/ft) =	49.9	S_{u-bar} (psf) =	#DIV/0!
Total Thickness of Cohesive (ft) =				0.0	Site Class _N =	D	Site Class _{Su} =	#DIV/0!
Total Thickness (ft) =				100.0	Site Class =	#DIV/0!		

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Bearing Resistance

Client	Maine Department of Transportation
Project	Clewleyville Road Bridge over I-395/Route 9 Connector - WIN 18915.00
Subject	Bearing Resistance of Bedrock for Abutment Footings

PROBLEM STATEMENT & OBJECTIVE

Calculate the factored bearing resistance at the service, strength and extreme limit states for the proposed abutment footings bearing on bedrock.

EXECUTIVE SUMMARY

A factored bearing resistance of	46	ksf for the strength limit state is recommended.
A factored bearing resistance of	20	ksf for the service limit state for 0.5 in. settlement is recommended.
A factored bearing resistance of	82	ksf for the extreme event limit state is recommended.

AVAILABLE INFORMATION

1. Phase I (-100 series) test boring logs dated 25 and 31 July 2018 drilled by Northern Test Borings, Inc.
2. Phase II (-200 series) test boring logs dated 13 November 2020 through 18 February 2021 drilled by New England Boring
3. Bottom of abutment elevations provided by MaineDOT on 15 March 2021 (see below).
4. Phase I (preliminary design) and Phase II (final design) laboratory test results.

REFERENCES

1. AASHTO LRFD Bridge Design Specifications, 9th edition, 2020
2. NCHRP Report 651, LRFD Design and Construction of Shallow Foundations for Highway Bridge Structures, 2010.
3. The Hoek-Brown Failure Criterion, 1988.

ELEVATION DATUM

Elevations reference the North American Vertical Datum of 1988 (NAVD88).

ASSUMPTIONS

1. Bottom of footing will bear on bedrock at the following elevations:

Abutment 1 =	176.0	ft (Left Wingwall, Breastwall and Right Wingwall)	
Abutment 2 =	176.0	ft (L Wingwall and Breastwall)	179.0 ft (1/2 of Right Wingwall)
			184.0 ft (1/2 of Right Wingwall)

2. The peak compressive strength of bedrock is based on laboratory test data (see page 4 for a summary of laboratory test results).

File No.	132076-007
Sheet	2 of 10
Date	13-Apr-21
Computed by	JAD
Checked by	BCS

Client	Maine Department of Transportation
Project	Clewleyville Road Bridge over I-395/Route 9 Connector - WIN 18915.00
Subject	Bearing Resistance of Bedrock for Abutment Footings

PROCEDURE FOR STRENGTH LIMIT STATE

1. See bearing resistance for footing on rock guidance from AASHTO LRFD 2017:

10.6.3.2 - Bearing Resistance of Rock

10.6.3.2.1 - General

The methods used for design of footings on rock shall consider the presence, orientation, and condition of discontinuities, weathering profile, and other similar profiles as they apply at a particular site. For footings on competent rock, reliance on simple and direct analyses based on uniaxial compressive rock strengths and RQD may be applicable. For footings on less competent rock, more detailed investigations and analyses shall be performed to account for the effects of weathering and the presence and condition of discontinuities.

The designer shall judge the competency of a rock mass by taking into consideration both the nature of the intact rock, and the orientation and condition of the discontinuities of the overall rock mass. Where engineering judgment does not verify the presence of competent rock, the competency of the rock mass should be verified using the procedures for RMR rating.

10.6.3.2.2 Semiempirical Procedures

The nominal bearing resistance of rock should be determined using empirical correlation with the Geometrics Rock Mass Rating system. Local experience shall be considered in the use of these semi-empirical procedures. The factored bearing stress of the foundation shall not be taken to be greater than the factored compressive resistance of the footing concrete.

C10.6.3.2.2

The bearing resistance of jointed or broken rock may be estimated using the semi-empirical procedure developed by Carter and Kulhawy (1988). This procedure is based on the unconfined compressive strength of the intact rock core sample. Depending on the rock mass quality measured in terms of RMR system, the nominal bearing resistance of a rock mass varies from small fraction to six times the unconfined compressive strength of intact rock core samples.

2. See the nominal bearing resistance equation based on Carter and Kulhawy (1988) From NCHRP Report 651:

$$q_{ult} = q_u(\sqrt{s} + (m\sqrt{s} + s)^{0.5}) \quad \text{Equation 82b} \quad \text{An errata to Carter and Kulhawy 1988}$$

3. Determine the Rock Mass Ratio (RMR) and strength parameters s and m from NCHRP Report 651 to be used in Equation 82b:

RMR from Table 15 and Table 16

m and s from Hoek-Brown Failure Criterion

4. Apply resistance factor ϕ from Table 10.5.5.2.2-1 in AASHTO LRFD 2017 for bearing resistance of footings on rock

Client	Maine Department of Transportation
Project	Clewleyville Road Bridge over I-395/Route 9 Connector - WIN 18915.00
Subject	Bearing Resistance of Bedrock for Abutment Footings

PROCEDURE FOR SERVICE LIMIT STATE

1. See bearing resistance for footing on rock guidance from AASHTO LRFD 2017:

10.6.2.6 - Bearing Resistance at the Service Limit State

10.6.2.6.1 - Presumptive Values for Bearing Resistance

The use of presumptive values shall be based on knowledge of geological conditions at or near the structure site.

See Table C10.6.2.6.1-1 Presumptive Bearing Resistance for Spread Footing Foundations at the Service Limit State Modified after U.S. Department of the Navy (1982)

2. Use AASHTO LRFD 2017 presumptive bearing resistance for service limit state for settlement stated.

PROCEDURE FOR EXTREME EVENT LIMIT STATE

1. See bearing resistance for footing on rock guidance from AASHTO LRFD 2017:

11.5.8 - Resistance Factors for Extreme Event Limit state

Unless otherwise specified, all resistance factors shall be taken as 1.0 when investigating the extreme event limit state. For overall stability of the retaining wall when earthquake loading is included, a resistance factor, ϕ , of 0.9 shall be used. For bearing resistance, a resistance factor of 0.8 shall be used for gravity and semigravity walls and 0.9 for MSE Walls.

2. Use nominal resistance calculated for the Strength Limit State and apply a resistance factor of 0.8 from AASHTO LRFD 2017 Section 11.5.8 to obtain the factored resistance.

CALCULATIONS

File No.	132076-007
Sheet	4 of 10
Date	13-Apr-21
Computed by	JAD
Checked by	BCS

Client	Maine Department of Transportation
Project	Clewleyville Road Bridge over I-395/Route 9 Connector - WIN 18915.00
Subject	Bearing Resistance of Bedrock for Abutment Footings

AVAILABLE LABORATORY TEST DATA

Abutment No.	Test Boring No.	Ground Surface Elevation	Rock Core No.	Avg. Rock Specimen Depth BGS (ft)	Avg. Specimen Elevation	Depth of Specimen Below Ftg. Bearing Level (ft)	Peak Compressive Strength (psi)	Failure Type
1	BB-ECR-202	201.7	R3	24.5	177.2	-1.2	7,193	act/discontinuity
	BB-ECR-203	198.7	R2	18.8	179.9	-3.9	9,759	act/discontinuity
	BB-ECR-203A	199.1	R3	22.0	177.1	-1.1	10,859	discontinuity
2	BB-ECR-102	203.2	R6	24.0	179.2	-3.2	6,527	discontinuity
	BB-ECR-204A	202.1	R3	23.2	178.9	5.1	4,672	act/discontinuity
	BB-ECR-205	203.4	R6	24.1	179.3	-3.3	12,440	act/discontinuity

yellow highlighted cells represent data that is located above the proposed footing bearing level.

PARAMETERS FOR CALCULATIONS

1. Carter and Kulhawy (1988) methodology is based on the unconfined compressive strength of intact rock core samples. Because of the limited amount of intact rock core compressive strength data below the proposed footing bearing elevations, use both intact and discontinuity failure compressive strength data above and below the proposed footing bearing level at each Abutment.

Average peak compressive strength at proposed bridge abutments:	8,575	psi
Average peak compressive strength at Abutment 1:	9,270	psi
Average peak compressive strength at Abutment 2:	7,880	psi

Since average peak compressive strength data at each Abutment is similar, use average of all data and calculate one bearing resistance:

8,575	psi
1,235	ksf

CALCULATIONS

File No.	132076-007
Sheet	5 of 10
Date	13-Apr-21
Computed by	JAD
Checked by	BCS

Client	Maine Department of Transportation
Project	Clewleyville Road Bridge over I-395/Route 9 Connector - WIN 18915.00
Subject	Bearing Resistance of Bedrock for Abutment Footings

SUMMARY OF BEDROCK DATA AT SITE: ABUTMENT 1

Abutment No.	Test Boring No.	Ground Surface Elevation	Rock Core No.	Avg. Rock Core Depth (BGS)	Avg. Rock Core Elevation	Depth of Rock Core Below Ftg. Bearing Level (ft)	Rock Core Run Recovery (%)	Rock Quality Designation (RQD, %)
1	BB-ECR-101	201.8	R1	15.3	186.6	-10.6	100	0
			R2	18.2	183.6	-7.6	73	0
			R3	21.2	180.6	-4.6	100	13
			R4	23.4	178.4	-2.4	64	18
	BB-ECR-201	200.5	R1	19.7	180.9	-4.8	95	100
			R2	24.8	175.7	0.3	102	100
			R3	29.8	170.8	5.3	95	76
			R4	34.7	165.8	10.2	87	43
			R5	38.65	161.9	14.2	69	52
			R6	41.1	159.4	16.6	150	96
	BB-ECR-202	201.7	R1	17.5	184.2	-8.2	75	0
			R2	21.7	180.0	-4.0	66	0
			R3	24.5	177.2	-1.2	98	38
			R4	26.8	174.9	1.1	90	14
			R5	29.0	172.7	3.3	100	0
	BB-ECR-203	198.7	R1	16.3	182.5	-6.4	80	0
			R2	18.8	180.0	-3.9	100	47
	BB-ECR-203A	199.1	R1	16.7	182.5	-6.4	100	0
			R2	19.2	180.0	-3.9	20	0
			R3	22.0	177.2	-1.2	103	41
			R4	24.5	174.6	1.4	100	38
			R5	28.0	171.1	4.9	97	60
			R6	32.6	166.6	9.4	85	53
			R7	37.1	162.0	14.0	68	52
			R8	40.0	159.1	16.9	188	100

yellow highlighted cells represent data that is located above the proposed footing bearing level. because sufficient data exists below the proposed footing bearing level, exclude this data.

Average RQD above and below proposed footing bearing level: 38 %
Average RQD below the proposed footing bearing level: 57 %

Use average RQD above and below the proposed footing bearing level:
to be consistent with use of compressive strength data and for conservatism

38 %

Client	Maine Department of Transportation
Project	Clewleyville Road Bridge over I-395/Route 9 Connector - WIN 18915.00
Subject	Bearing Resistance of Bedrock for Abutment Footings

SUMMARY OF BEDROCK DATA AT SITE: ABUTMENT 2

Abutment No.	Test Boring No.	Ground Surface Elevation	Rock Core No.	Avg. Rock Core Depth (BGS)	Avg. Rock Core Elevation	Depth of Rock Core Below Ftg. Bearing Level (ft)	Rock Core Run Recovery (%)	Rock Quality Designation (RQD, %)
2	BB-ECR-102	203.2	R1	15.4	187.8	-11.8	88	21
		203.2	R2	17.4	185.8	-9.8	100	0
		203.2	R3	18.4	184.8	-8.8	100	0
		203.2	R4	19.5	183.8	-7.8	88	0
		203.2	R5	20.8	182.4	-6.4	100	35
		203.2	R6	24.0	179.2	-3.2	88	38
		203.2	R7	27.5	175.8	0.3	79	22
	BB-ECR-204	202.5	R1	9.5	193.0	-9.0	100	17
	BB-ECR-204A	202.1	R1	17.5	184.6	-0.6	23	17
		202.1	R2	20.7	181.4	2.6	77	30
		202.1	R3	23.2	178.9	5.1	97	97
		202.1	R4	27.1	175.1	9.0	79	39
		202.1	R5	31.3	170.8	13.2	91	91
		202.1	R6	34.8	167.4	16.7	80	80
		202.1	R7	38.3	163.9	20.2	111	100
		202.1	R8	43.0	159.1	24.9	100	98
	BB-ECR-205	203.4	R1	16.0	187.4	-11.4	75	0
		203.4	R2	18.5	184.9	-8.9	64	0
		203.4	R3	20.7	182.8	-6.8	96	0
		203.4	R4	21.7	181.7	-5.7	100	0
		203.4	R5	22.6	180.8	-4.8	100	0
		203.4	R6	24.1	179.4	-3.3	70	52
		203.4	R7	27.5	175.9	0.1	85	60
		203.4	R8	32.5	170.9	5.1	93	37
	BB-ECR-206	200.7	R1	13.1	187.7	-11.7	96	0
		200.7	R2	15.1	185.6	-9.6	75	0
		200.7	R3	16.2	184.5	-8.5	0	0
	BB-ECR-206A	201.0	R1	27.5	173.5	2.5	50	29
		201.0	R2	31.6	169.4	6.6	94	31
		201.0	R3	35.7	165.3	10.7	100	100
		201.0	R4	40.7	160.3	15.7	83	67
		201.0	R5	45.4	155.7	20.4	41	35
		201.0	R6	48.9	152.1	23.9	155	100

yellow highlighted cells represent data that is located above the proposed footing bearing level. because sufficient data exists below the proposed footing bearing level, exclude this data.

Average RQD above and below proposed footing bearing level:	36	%
Average RQD below the proposed footing bearing level:	64	%

Use average RQD above and below the proposed footing bearing level:		
to be consistent with use of compressive strength data and for conservatism	36	%

Client Maine Department of Transportation

Project Clewleyville Road Bridge over I-395/Route 9 Connector - WIN 18915.00

Subject Bearing Resistance of Bedrock for Abutment Footings

Strength Limit State

Determine RMR

Table 15 from NCHRP Report 651:

PARAMETER			RANGES OF VALUES						
1	Strength of intact rock material	Point load strength index	>175 ksf	85–175 ksf	45–85 ksf	20–45 ksf	For this low range, unconfined compressive test is preferred		
		Unconfined compressive strength	>4,320 ksf	2,160–4,320 ksf	1,080–2,160 ksf	520–1,080 ksf	215–520 ksf	70–215 ksf	20–70 ksf
	Relative Rating	15	12	7	4	2	1	0	
2	Drill core quality RQD		90% to 100%	75% to 90%	50% to 75%	25% to 50%	<25%		
	Relative Rating		20	17	13	8	3		
3	Spacing of joints		>10 ft	3–10 ft	1–3 ft	2 in–1 ft	<2 in		
	Relative Rating		30	25	20	10	5		
4	Condition of joints		<ul style="list-style-type: none">• Very rough surfaces• Not continuous• No separation• Hard joint wall rock	<ul style="list-style-type: none">• Slightly rough surfaces• Separation <0.05 in• Hard joint wall rock	<ul style="list-style-type: none">• Slightly rough surfaces• Separation <0.05 in• Soft joint wall rock	<ul style="list-style-type: none">• Slickensided surfaces or• Gouge <0.2 in thick or• Joints open 0.05–0.2 in• Continuous joints	<ul style="list-style-type: none">• Soft gouge >0.2 in thick or• Joints open >0.2 in• Continuous joints		
	Relative Rating		25	20	12	6	0		
5	Ground water conditions (use one of the three evaluation criteria as appropriate to the method of exploration)	Inflow per 30 ft tunnel length	None	<400 gal/hr	400–2,000 gal/hr	>2,000 gal/hr			
		Ratio = joint water pressure/major principal stress	0	0.0–0.2	0.2–0.5	>0.5			
		General Conditions	Completely Dry	Moist only (interstitial water)	Water under moderate pressure	Severe water problems			
	Relative Rating		10	7	4	0			

Table 16 from NCHRP Report 651:

Strike and dip orientations of joints		Very favorable	Favorable	Fair	Unfavorable	Very unfavorable
Ratings	Tunnels	0	–2	–5	–10	–12
	Foundations	0	–2	–7	–15	–25
	Slopes	0	–5	–25	–50	–60

Total RMR Value

Parameter	Design Value	Value Based on Table 15 (shown above)	Relative Rating
Intact Rock Strength	1235 ksf	1,080 - 2,160 ksf	7
RQD	36% to 38%	25% - 50%	8
Joint Spacing	2 in to 1 ft (observed in photos)	2 in–1 ft	10
Joint Condition	Slightly rough surfaces separation <0.05 in (observed in photos)	Slightly rough surfaces Separation <0.05 in Hard joint wall rock	20
Groundwater Condition	Moist only (interstitial water)	Moist only (interstitial water)	7
Joint Strike and Dip	Fair	Favorable	–2
Total Rating =			50

Client	Maine Department of Transportation
Project	Clewleyville Road Bridge over I-395/Route 9 Connector - WIN 18915.00
Subject	Bearing Resistance of Bedrock for Abutment Footings

Strength Limit State Continued

Determine s and m
Assume the rock type B

Table 17 from NCHRP Report 651:

RMR rating	100–81	80–61	60–41	40–21	<20
Class No.	I	II	III	IV	V
Description	Very good rock	Good rock	Fair rock	Poor rock	Very poor rock

Table 19 from NCHRP Report 651:

Rock quality	Constants	Rock type				
		A = Carbonate rocks with well developed crystal cleavage— <i>dolomite, limestone, and marble</i> B = Lithified argillaceous rocks— <i>mudstone, siltstone, shale, and slate (normal to cleavage)</i> C = Arenaceous rocks with strong crystals and poorly developed crystal cleavage— <i>sandstone and quartzite</i> D = Fine grained polyminerallic igneous crystalline rocks— <i>andesite, dolerite, diabase, and rhyolite</i> E = Coarse-grained polyminerallic igneous and metamorphic crystalline rocks— <i>amphibolite, gabbro, gneiss, granite, norite, quartz-diorite</i>				
		A	B	C	D	E
INTACT ROCK SAMPLES Laboratory size specimens free from discontinuities. CSIR rating: <i>RMR</i> = 100	m s	7.00 1.00	10.00 1.00	15.00 1.00	17.00 1.00	25.00 1.00
VERY GOOD QUALITY ROCK MASS Tightly interlocking undisturbed rock with unweathered joints at 3–10 ft. CSIR rating: <i>RMR</i> = 85	m s	2.40 0.082	3.43 0.082	5.14 0.082	5.82 0.082	8.567 0.082
GOOD QUALITY ROCK MASS Fresh to slightly weathered rock, slightly disturbed with joints at 3–10 ft. CSIR rating: <i>RMR</i> = 65	m s	0.575 0.00293	0.821 0.00293	1.231 0.00293	1.395 0.00293	2.052 0.00293
FAIR QUALITY ROCK MASS Several sets of moderately weathered joints spaced at 1–3 ft. CSIR rating: <i>RMR</i> = 44	m s	0.128 0.00009	0.183 0.00009	0.275 0.00009	0.311 0.00009	0.458 0.00009
POOR QUALITY ROCK MASS Numerous weathered joints at 2 to 12 in; some gouge. Clean compacted waste rock. CSIR rating: <i>RMR</i> = 23	m s	0.029 3×10^{-6}	0.041 3×10^{-6}	0.061 3×10^{-6}	0.069 3×10^{-6}	0.102 3×10^{-6}
VERY POOR QUALITY ROCK MASS Numerous heavily weathered joints spaced < 2 in with gouge. Waste rock with fines. CSIR rating: <i>RMR</i> = 3	m s	0.007 1×10^{-7}	0.010 1×10^{-7}	0.015 1×10^{-7}	0.017 1×10^{-7}	0.025 1×10^{-7}

Values of m and s from Hoek-Brown 1988:

$$\frac{m}{m_1} = e^{\left(\frac{RMR-100}{14}\right)} \quad \text{Equation 18}$$

m₁ is the value of m for *intact* rock

$$s = e^{\left(\frac{RMR-100}{6}\right)} \quad \text{Equation 19}$$

Rock Quality	Rock Type	RMR	m ₁	m	s
Fair	B	50	10.00	2.81E-01	2.40E-04

Client Maine Department of Transportation
 Project Clewleyville Road Bridge over I-395/Route 9 Connector - WIN 18915.00
 Subject Bearing Resistance of Bedrock for Abutment Footings

Strength Limit State Continued

Semi-empirical method by Carter and Kulhawy 1988:

$q_u = 8,575$ psi low end of the laboratory test results at Abutment 2
 $m = 0.281$
 $s = 2.40E-04$
 $q_{ult} = 102.9$ ksf Equation 82b
 $\phi = 0.45$ from Table 10.5.5.2.2-1
 $q_R = 46$ ksf Equation 82b

Service Limit State

Based on Table C10.6.2.6.1-1 and engineering judgement¹ the service limit state for bearing resistance on weathered or broken rock is recommended at: **20** ksf for settlements of up to 0.5 in.

Table C10.6.2.6.1-1—Presumptive Bearing Resistance for Spread Footing Foundations at the Service Limit State Modified after U.S. Department of the Navy (1982)

Type of Bearing Material	Consistency in Place	Bearing Resistance (ksf)	
		Ordinary Range	Recommended Value of Use
Massive crystalline igneous and metamorphic rock: granite, diorite, basalt, gneiss, thoroughly cemented conglomerate (sound condition allows minor cracks)	Very hard, sound rock	120–200	160
Foliated metamorphic rock: slate, schist (sound condition allows minor cracks)	Hard sound rock	60–80	70
Sedimentary rock: hard cemented shales, siltstone, sandstone, limestone without cavities	Hard sound rock	30–50	40
Weathered or broken bedrock of any kind, except highly argillaceous rock (shale)	Medium hard rock	16–24	20
Compaction shale or other highly argillaceous rock in sound condition	Medium hard rock	16–24	20
Well-graded mixture of fine- and coarse-grained soil: glacial till, hardpan, boulder clay (GW-GC, GC, SC)	Very dense	16–24	20
Gravel, gravel-sand mixture, boulder-gravel mixtures (GW, GP, SW, SP)	Very dense	12–20	14
	Medium dense to dense	8–14	10
	Loose	4–12	6
Coarse to medium sand, and with little gravel (SW, SP)	Very dense	8–12	8
	Medium dense to dense	4–8	6
	Loose	2–6	3
Fine to medium sand, silty or clayey medium to coarse sand (SW, SM, SC)	Very dense	6–10	6
	Medium dense to dense	4–8	5
	Loose	2–4	3
Fine sand, silty or clayey medium to fine sand (SP, SM, SC)	Very dense	6–10	6
	Medium dense to dense	4–8	5
	Loose	2–4	3
Homogeneous inorganic clay, sandy or silty clay (CL, CH)	Very dense	6–12	8
	Medium dense to dense	2–6	4
	Loose	1–2	1
Inorganic silt, sandy or clayey silt, varved silt-clay-fine sand (ML, MH)	Very stiff to hard	4–8	6
	Medium stiff to stiff	2–6	3
	Soft	1–2	1

Extreme Event Limit State

From the Strength Limit State calculations, the nominal bearing resistance is the following:

$q_{ult} = 103$ ksf

Using a resistance factor of 0.8 from Section 11.5.8, the factored bearing resistance is the following:

$q_R = 82$ ksf



CALCULATIONS

File No. 132076-007

Sheet 10 of 10

Date 13-Apr-21

Computed by JAD

Checked by BCS

Client Maine Department of Transportation

Project Clewleyville Road Bridge over I-395/Route 9 Connector - WIN 18915.00

Subject Bearing Resistance of Bedrock for Abutment Footings

CONCLUSIONS AND RECOMMENDATIONS

Strength Limit State

The recommended factored bearing resistance for the strength limit state is 46 ksf

Service Limit State

The recommended presumptive value for weathered bedrock is 20 ksf for the service limit state for a settlement up to 0.5 in.

Extreme Event Limit State

The recommended factored bearing resistance for the extreme event limit state is 82 ksf

Sliding Resistance

Client Maine Department of Transportation

Date 20-Apr-21

Project Clewleyville Road Bridge over I-395/Route 9 Connector - WIN 18915.00

Computed by JAD

Subject Sliding Resistance for Footing on Bedrock

Checked by BWC

PROBLEM STATEMENT AND OBJECTIVE

Determine the coefficient of friction between the footing and bedrock, resistance factor for sliding for the Strength Limit State, and resistance factor for sliding for the Extreme Event Limit State for the footing on bedrock, assuming the bedrock surface is prepared in-the-dry

EXECUTIVE SUMMARY

The coefficient of friction between the footing and bedrock is = **0.7**

The resistance factor for sliding at the Strength Limit State is = **0.8**

The resistance factor for sliding at the Extreme Event Limit State is = **0.9**

REFERENCES

1. AASHTO LRFD Bridge Design Specifications, 9th edition, 2020
2. Maine DOT Bridge Design Guide, August 2003, with interim revisions through March 2014

AVAILABLE INFORMATION

1. Haley & Aldrich test borings BB-ECR-101 and BB-ECR-102 and BB-ECR-201 through BB-ECR-206A.

ASSUMPTIONS

1. Abutment footing will bear on intact SLATE, SILTSTONE or METASANDSTONE bedrock.

CALCULATIONS**Coefficient of Friction Between Concrete and Bedrock**

Nominal sliding resistance between the cast-in-place concrete footing and bedrock is dependent on the coefficient of friction ($\tan\delta$) at the interface between the footing and bedrock.

Estimated footing-rock interface friction angle (δ):

35 deg., friction angle for mass concrete on clean sound rock (AASHTO LRFD Table 3.11.5.3-1)

Recommended δ = 35 deg., friction angle between footing/seal and bedrock
Recommended $\tan\delta$ = 0.7 coefficient of friction

<div> <div>HALEY ALDRICH</div> <div>CALCULATIONS</div> </div>		File No.	132076-007
		Sheet	2 of 2
Client	Maine Department of Transportation	Date	20-Apr-21
Project	Clewleyville Road Bridge over I-395/Route 9 Connector - WIN 18915.00	Computed by	JAD
Subject	Sliding Resistance for Footing on Bedrock	Checked by	BWC
<div> <div>Resistance Factors</div> <div> <div>Service Limit State</div> <p>AASHTO LRFD does not prescribe a sliding resistance factor for shallow foundations on bedrock. For retaining walls, AASHTO LRFD prescribes a sliding resistance factor of = 1.0 (Section 11.5.7).</p> <div>Strength Limit State</div> <p>AASHTO LRFD does not prescribe a sliding resistance factor for shallow foundations on bedrock. For cast-in-place concrete on sand, the sliding resistance factor is = 0.8 (Table 10.5.5.2.2-1)</p> <div>Extreme Event Limit State</div> <p>Section 10.5.5.3.3 of AASHTO LRFD prescribes a resistance factor of 0.9 for the design of foundations in the Extreme Event Limit State.</p> </div> </div>			

Table C3.11.5.3-1—Friction Angle for Dissimilar Materials (U.S. Department of the Navy, 1982a)

Interface Materials	Friction Angle, δ (degrees)	Coefficient of Friction, $\tan \delta$ (dim.)
Mass concrete on the following foundation materials:		
• Clean sound rock	35	0.70
• Clean gravel, gravel-sand mixtures, coarse sand	29 to 31	0.55 to 0.60
• Clean fine to medium sand, silty medium to coarse sand, silty or clayey gravel	24 to 29	0.45 to 0.55
• Clean fine sand, silty or clayey fine to medium sand	19 to 24	0.34 to 0.45
• Fine sandy silt, nonplastic silt	17 to 19	0.31 to 0.34
• Very stiff and hard residual or preconsolidated clay	22 to 26	0.40 to 0.49
• Medium stiff and stiff clay and silty clay	17 to 19	0.31 to 0.34
Masonry on foundation materials has same friction factors.		
Steel sheet piles against the following soils:		
• Clean gravel, gravel-sand mixtures, well-graded rock fill with spalls	22	0.40
• Clean sand, silty sand-gravel mixture, single-size hard rock fill	17	0.31
• Silty sand, gravel or sand mixed with silt or clay	14	0.25
• Fine sandy silt, nonplastic silt	11	0.19
Formed or precast concrete or concrete sheet piling against the following soils:		
• Clean gravel, gravel-sand mixture, well-graded rock fill with spalls	22 to 26	0.40 to 0.49
• Clean sand, silty sand-gravel mixture, single-size hard rock fill	17 to 22	0.31 to 0.40
• Silty sand, gravel or sand mixed with silt or clay	17	0.31
• Fine sandy silt, nonplastic silt	14	0.25
Various structural materials:		
• Masonry on masonry, igneous and metamorphic rocks:		
○ dressed soft rock on dressed soft rock	35	0.70
○ dressed hard rock on dressed soft rock	33	0.65
○ dressed hard rock on dressed hard rock	29	0.55
• Masonry on wood in direction of cross grain	26	0.49
• Steel on steel at sheet pile interlocks	17	0.31

3.11.5.4—Passive Lateral Earth Pressure Coefficient, k_p

C3.11.5.4

For noncohesive soils, values of the coefficient of passive lateral earth pressure may be taken from Figure 3.11.5.4-1 for the case of a sloping or vertical wall with a horizontal backfill or from Figure 3.11.5.4-2 for the case of a vertical wall and sloping backfill. For conditions that deviate from those described in Figures 3.11.5.4-1 and 3.11.5.4-2, the passive pressure may be calculated by using a trial procedure based on wedge theory, e.g., see Terzaghi et al. (1996). When wedge theory is used, the limiting value of the wall friction angle should not be taken larger than one-half the angle of internal friction, ϕ_f .

For cohesive soils, passive pressures may be estimated by:

The movement required to mobilize passive pressure is approximately 10.0 times as large as the movement needed to induce earth pressure to the active values. The movement required to mobilize full passive pressure in loose sand is approximately five percent of the height of the face on which the passive pressure acts. For dense sand, the movement required to mobilize full passive pressure is smaller than five percent of the height of the face on which the passive pressure acts, and five percent represents a conservative estimate of the movement required to mobilize the full passive pressure. For poorly compacted cohesive soils, the movement required to mobilize full passive pressure is larger than five percent of the height of the face on which the pressure acts.

Lateral Earth Pressures

<div>HALEYALDRICH</div>		CALCULATIONS		File No.	132076-007
				Sheet	1 of 2
Client	Maine Department of Transportation			Date	16-Apr-21
Project	Clewleyville Road Bridge over I-395/Route 9 Connector - WIN 18915.00			Calculated by	JAD
Subject	Lateral Earth Pressure Coefficients for Abutments			Checked by	BWC
Objective -Calculate the active, at-rest, and passive lateral earth pressure coefficients to design the proposed Abutment No. 1 and wingwalls					
Assumptions -Due to sloping backfill conditions at the abutments, calculate different lateral earth pressure coefficients for each proposed abutment and wingwalls -Abutments and wingwalls and their footings are backfilled with Granular Borrow based on H&A recommendations. -Free draining retaining wall, no hydrostatic pressure.					
References 1. AASHTO LRFD Bridge Design Specifications, 9th edition, 2020 2. Maine DOT Bridge Design Guide, August 2003, with interim revisions through March 2014					
EARTH PRESSURE COEFFICIENTS FOR PROPOSED ABUTMENT NO. 1					
Soil Properties and Geometry					
designates input cell					
Total Unit Weight, γ (pcf) =	125	pcf	Soil Type 4, BDG Table 3-3		
Effective Friction Angle, ϕ' =	32	degrees	Soil Type 4, BDG Table 3-3		
Backslope Angle, β =	-0.7	degrees	Preliminary bridge profile indicates -1.24% bridge grade		
Backface of Wall Angle to Horizontal, Θ =	90	degrees			
Soil and Wall Friction Angle, δ =	24	degrees	Soil Type 4, BDG Table 3-3		
Static Active Lateral Earth Pressure Coefficient, K_a					
$K_a = \sin^2 (\Theta + \phi') / r (\sin^2 \Theta \sin (\Theta - \delta))$		AASHTO LRFD Eq. 3.11.5.3-1			
where $r = [1 + \sqrt{(\sin(\phi + \delta) \sin(\phi - \beta)) / (\sin(\Theta - \delta) \sin(\Theta + \beta))}]^2$		AASHTO LRFD Eq. 3.11.5.3-2			
$K_a =$		0.27			
At-Rest Lateral Earth Pressure Coefficient, K_o					
$K_o = 1 - \sin \phi$		AASHTO LRFD Eq. 3.11.5.2-1			
$K_o =$		0.47			
Passive Lateral Earth Pressure Coefficient, K_p					
Rankine Theory					
If the ratio of lateral abutment movement to abutment height (y/H) is less than 0.005 , we recommend using Rankine theory to calculate the passive lateral earth pressure coefficient					
$K_{p, Rankine} = \tan^2 (45 + \phi' / 2)$					
$K_{p, Rankine} =$		3.25	Das, Principles of Geotechnical Engineering, 7th Ed., Eq. 13.22		
Coulomb Theory					
If the ratio of lateral abutment movement to abutment height (y/H) is greater than 0.005 , we recommend using Rankine theory to calculate the passive lateral earth pressure coefficient					
$K_p = \sin^2 (\Theta - \phi') / r (\sin^2 \Theta \sin (\Theta + \delta))$		BDG Section 3.6.6			
where $r = [1 - \sqrt{(\sin(\phi + \delta) \sin(\phi + \beta)) / (\sin(\Theta + \delta) \sin(\Theta + \beta))}]^2$		BDG Section 3.6.6			
$K_{p, Coulomb} =$		8.02			

<div>HALEYALDRICH</div>		CALCULATIONS		File No.	132076-007
				Sheet	1 of 2
Client	Maine Department of Transportation			Date	16-Apr-21
Project	Clewleyville Road Bridge over I-395/Route 9 Connector - WIN 18915.00			Calculated by	JAD
Subject	Lateral Earth Pressure Coefficients for Abutments			Checked by	BWC
Objective -Calculate the active, at-rest, and passive lateral earth pressure coefficients to design the proposed Abutment No. 2 and wingwalls					
Assumptions -Due to sloping backfill conditions at the abutments, calculate different lateral earth pressure coefficients for each proposed abutment and wingwalls -Abutments and wingwalls and their footings are backfilled with Granular Borrow based on H&A recommendations. -Free draining retaining wall, no hydrostatic pressure.					
References 1. AASHTO LRFD Bridge Design Specifications, 9th edition, 2020 2. Maine DOT Bridge Design Guide, August 2003, with interim revisions through March 2014					
EARTH PRESSURE COEFFICIENTS FOR PROPOSED ABUTMENT NO. 2					
Soil Properties and Geometry					
designates input cell					
Total Unit Weight, γ (pcf) =	125	pcf	Soil Type 4, BDG Table 3-3		
Effective Friction Angle, ϕ' =	32	degrees	Soil Type 4, BDG Table 3-3		
Backslope Angle, β =	0.7	degrees	Preliminary bridge profile indicates 1.24% bridge grade		
Backface of Wall Angle to Horizontal, Θ =	90	degrees			
Soil and Wall Friction Angle, δ =	24	degrees	Soil Type 4, BDG Table 3-3		
Static Active Lateral Earth Pressure Coefficient, K_a					
$K_a = \sin^2 (\Theta + \phi') / (r \sin^2 \Theta \sin(\Theta - \delta))$		AASHTO LRFD Eq. 3.11.5.3-1			
where $r = [1 + \sqrt{(\sin(\phi + \delta) \sin(\phi - \beta)) / (\sin(\Theta - \delta) \sin(\Theta + \beta))}]^2$		AASHTO LRFD Eq. 3.11.5.3-2			
$K_a =$		0.28			
At-Rest Lateral Earth Pressure Coefficient, K_o					
$K_o = 1 - \sin \phi$		AASHTO LRFD Eq. 3.11.5.2-1			
$K_o =$		0.47			
Passive Lateral Earth Pressure Coefficient, K_p					
Rankine Theory					
If the ratio of lateral abutment movement to abutment height (y/H) is less than 0.005 , we recommend using Rankine theory to calculate the passive lateral earth pressure coefficient					
$K_{p, Rankine} = \tan^2 (45 + \phi' / 2)$					
$K_{p, Rankine} =$		3.25	Das, Principles of Geotechnical Engineering, 7th Ed., Eq. 13.22		
Coulomb Theory					
If the ratio of lateral abutment movement to abutment height (y/H) is greater than 0.005 , we recommend using Rankine theory to calculate the passive lateral earth pressure coefficient					
$K_p = \sin^2 (\Theta - \phi') / (r \sin^2 \Theta \sin(\Theta + \delta))$		BDG Section 3.6.6			
where $r = [1 - \sqrt{(\sin(\phi + \delta) \sin(\phi + \beta)) / (\sin(\Theta + \delta) \sin(\Theta + \beta))}]^2$		BDG Section 3.6.6			
$K_{p, Coulomb} =$		8.76			

Client	Maine Department of Transportation
Project	Clewleyville Road Bridge over I-395/Route 9 Connector - WIN 18915.00
Subject	Rankine Active Earth Pressure Coefficient Ka

Date 9-Apr-21

Computed by BWC

Checked by BCS

Friction Angle= 32

Slope Behind Wall, β (deg)	K_a
0	0.307
1	0.307
2	0.308
3	0.308
4	0.309
5	0.311
6	0.312
7	0.314
8	0.316
9	0.318
10	0.321
11	0.324
12	0.328
13	0.331
14	0.336
15	0.341
16	0.346
17	0.352
18	0.356
19	0.366
20	0.374
21	0.383
22	0.393
23	0.405
24	0.418
25	0.434
26	0.451
27	0.473
28	0.498
29	0.531
30	0.574
31	0.639
32	0.848

ABUTMENT 1
ABUTMENT 2

WINGWALLS

TABLE 11-3
Rankine active earth pressure coefficients K_a using Eq. (11-7a)

β	$\phi = 26$	28	30	32	34	36	38	40	42
0	0.3905	0.3610	0.3333	0.3073	0.2827	0.2596	0.2379	0.2174	0.1982
5	0.3959	0.3656	0.3372	0.3105	0.2855	0.2620	0.2399	0.2192	0.1997
10	0.4134	0.3802	0.3495	0.3210	0.2944	0.2696	0.2464	0.2247	0.2044
15	0.4480	0.4086	0.3729	0.3405	0.3108	0.2834	0.2581	0.2346	0.2129
20	0.5152	0.4605	0.4142	0.3739	0.3381	0.3060	0.2769	0.2504	0.2262
25	0.6999	0.5727	0.4936	0.4336	0.3847	0.3431	0.3070	0.2750	0.2465
30	—	—	0.8660	0.5741	0.4776	0.4105	0.3582	0.3151	0.2784
35	—	—	—	—	—	0.5971	0.4677	0.3906	0.3340
40	—	—	—	—	—	—	—	0.7660	0.4668

Since $\cos \beta$ is a permanent entry it is convenient to include it with K'_a of Eq. (11-7) or K'_p of Eq. (11-8), giving, e.g.,

$$K_a = \cos \beta \frac{\cos \beta - \sqrt{\cos^2 \beta - \cos^2 \phi}}{\cos \beta + \sqrt{\cos^2 \beta - \cos^2 \phi}} \quad (11-7a)$$

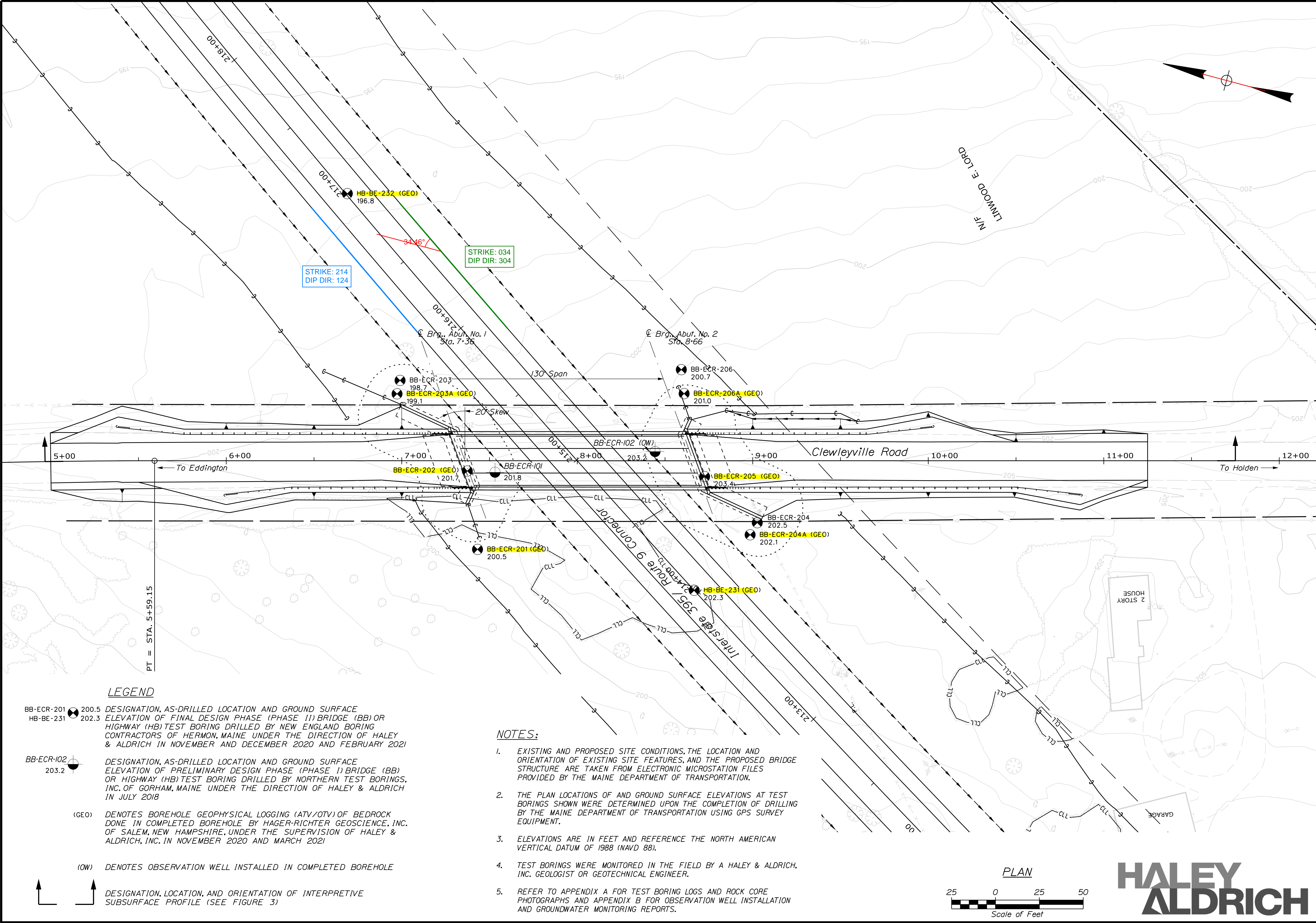
Kinematic Analyses

Date:4/7/2021

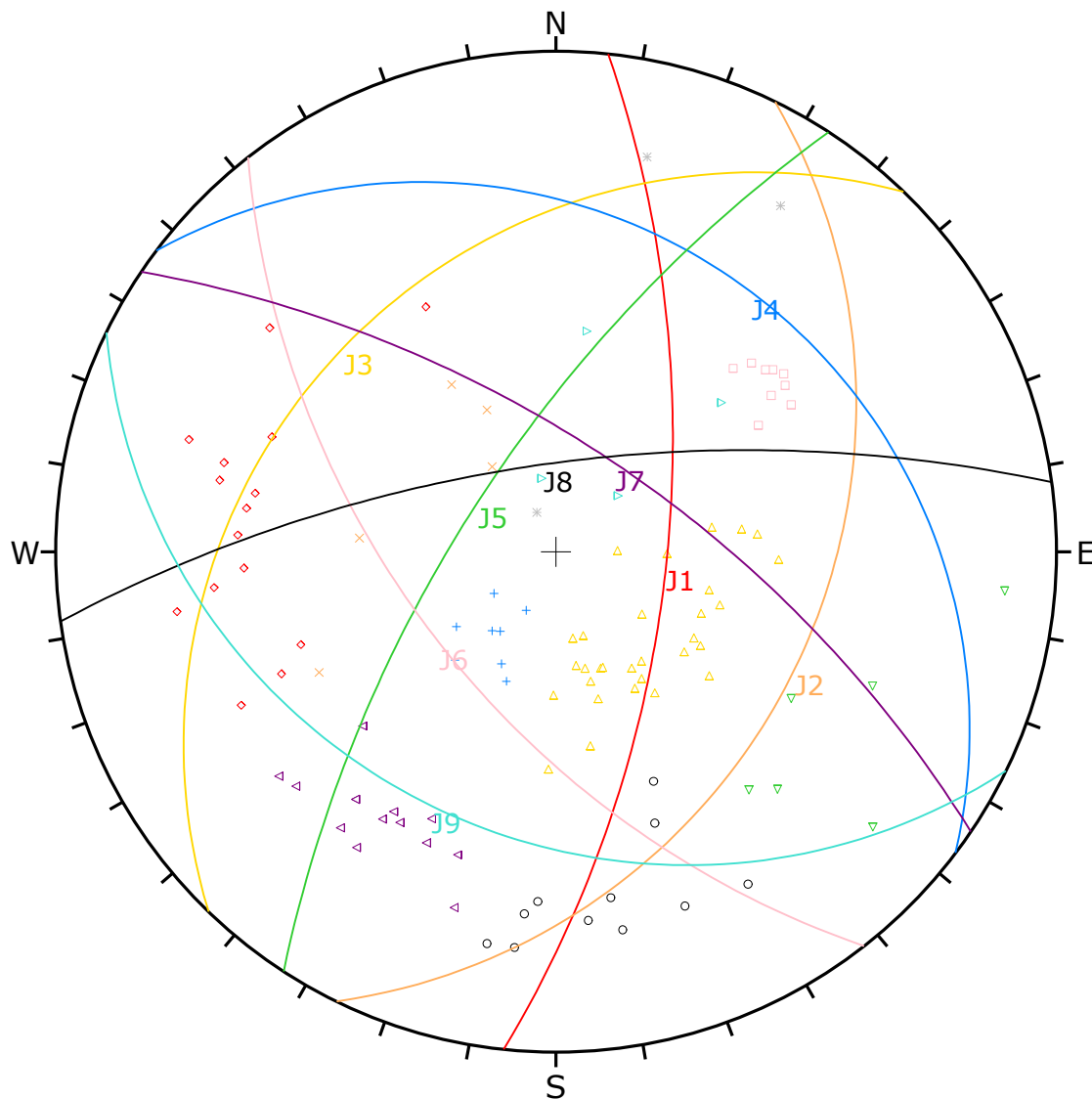
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STATE OF MAINE		DEPARTMENT OF TRANSPORTATION	
STP-1891(500)		SIGNATURE	
BRIDGE NO. 018915.00		P.E. NUMBER	
WIN		DATE	
BRIDGE PLANS		FIELD CHANGES	
I-395 - ROUTE 9 CONNECTOR		BY DATE	
CLEWLEYVILLE ROAD BRIDGE		CHECKED-REVIEWED B. STERNET K. POST 3-25-20	
BREWER-EDDINGTON PENOBSCOT COUNTY		DESIGNED-DRAWN W. CHADBOURNE 4-7-21	
SITE AND SUBSURFACE		DESIGNED-REVIEWED	
EXPLORATION LOCATION PLAN		REVISIONS 1	
FIGURE		REVISIONS 2	
2		REVISIONS 3	
OF 3		REVISIONS 4	

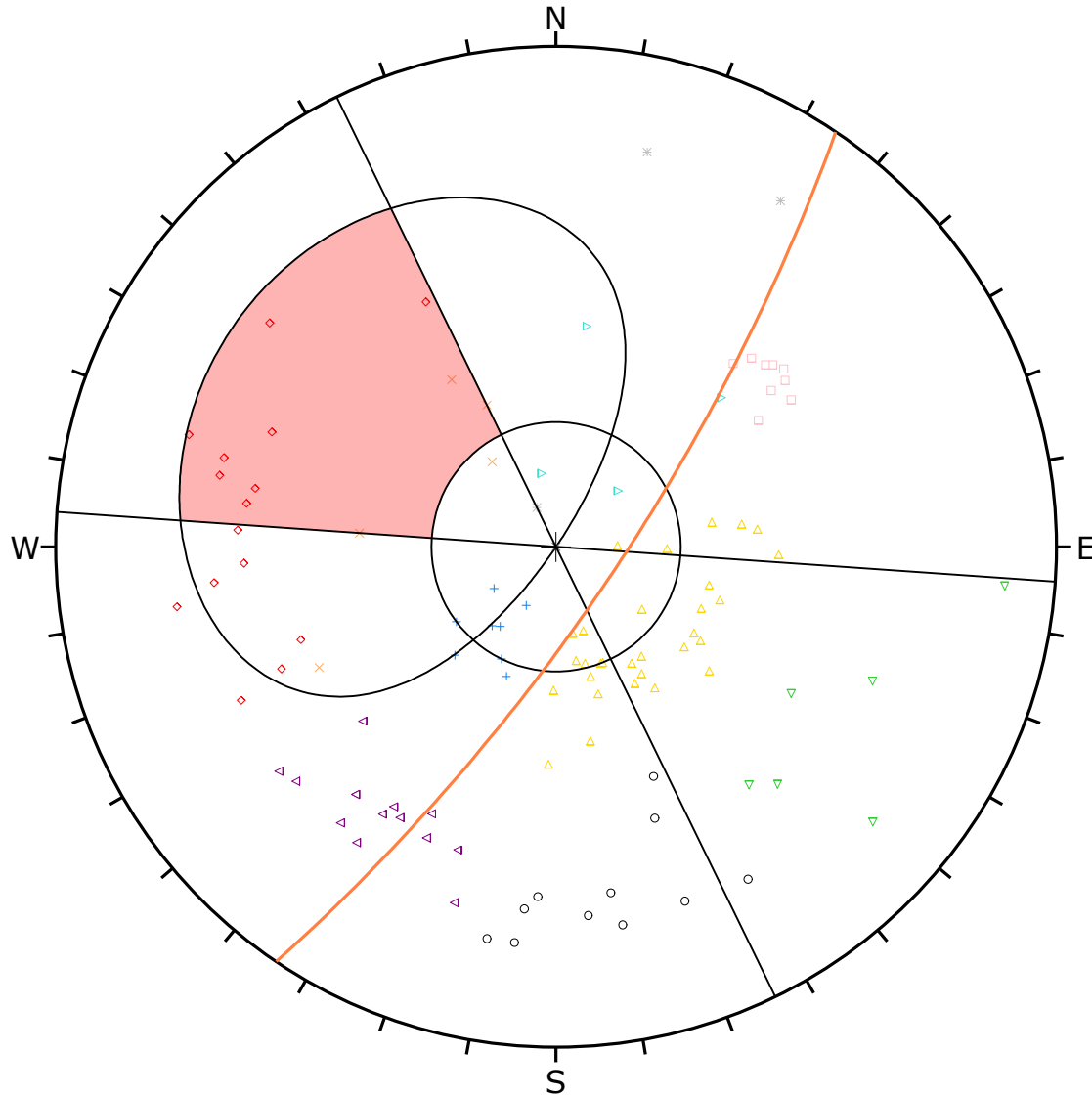


Symbol	FEATURE	Quantity
◇	J1	15
×	J2	5
△	J3	30
+	J4	8
▽	J5	6
□	J6	9
◁	J7	14
○	J8	11
▷	J9	4
*	U	3

	Color	Dip	Dip Direction	Label
Mean Set Planes				
1m	Red	65	96	J1
2m	Orange	34	116	J2
3m	Yellow	29	314	J3
4m	Blue	24	37	J4
5m	Green	69	303	J5
6m	Pink	57	232	J6
7m	Purple	66	34	J7
8m	Black	70	352	J8
9m	Cyan	31	206	J9

Plot Mode	Pole Vectors
Vector Count	105 (105 Entries)
Hemisphere	Lower
Projection	Equal Angle

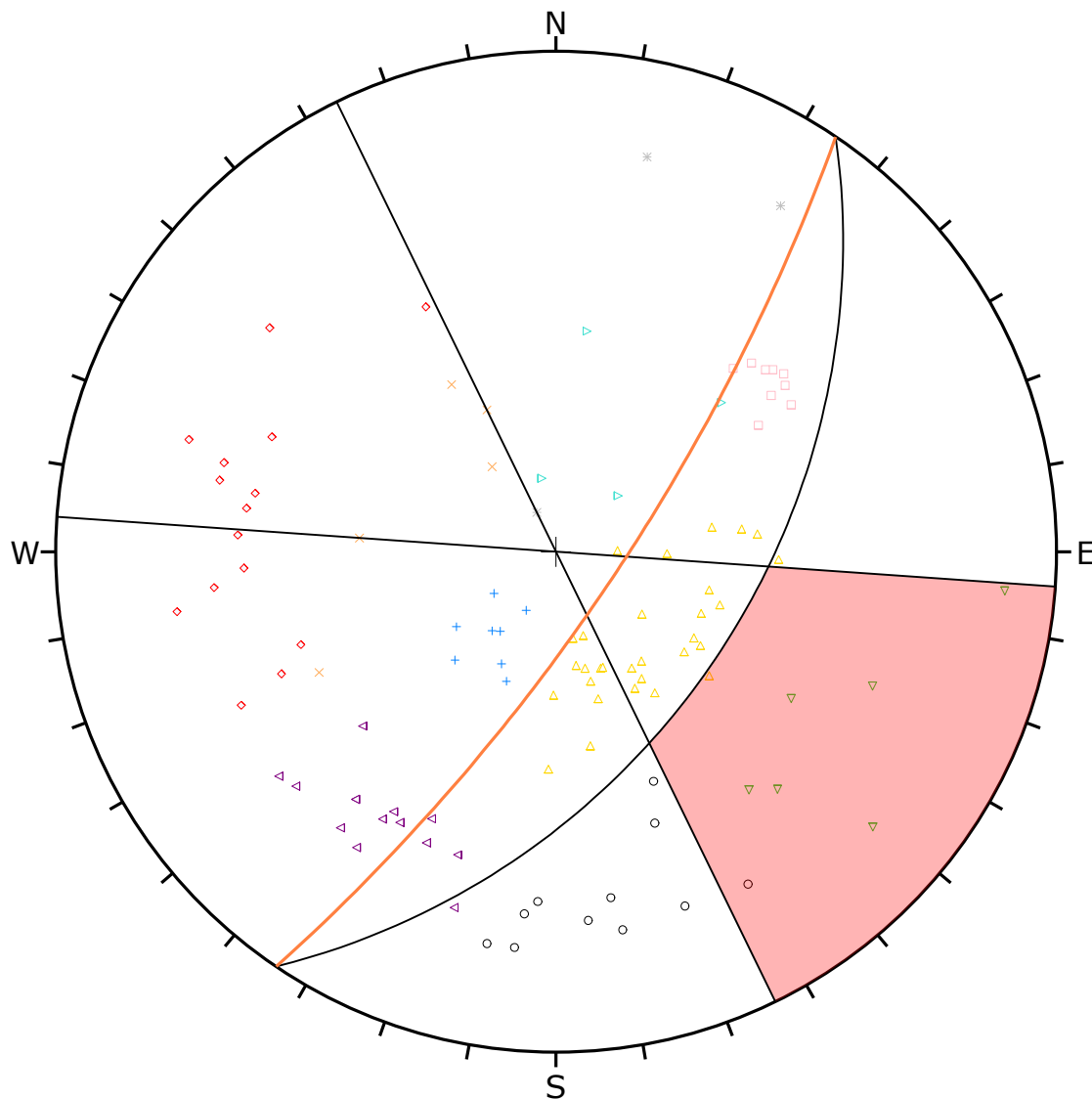
Project	Brewer-Eddington I-395/Route 9 Connector		
Analysis Description	Clewleyville Road BH Logging (Approach Borings)		
Drawn By	J. Rawlins	Company	Haley & Aldrich, Inc.
Date	June 2021	File Name	2021-0513_Clewleyville Approach borings.dips8



Symbol	FEATURE	Quantity
◇	J1	15
×	J2	5
△	J3	30
+	J4	8
▽	J5	6
□	J6	9
◀	J7	14
○	J8	11
◀	J9	4
*	U	3

Kinematic Analysis	Planar Sliding		
Slope Dip	76		
Slope Dip Direction	124		
Friction Angle	28°		
Lateral Limits	30°		
	Critical	Total	%
Planar Sliding (All)	11	105	10.48%
Planar Sliding (Set 1: J1)	8	15	53.33%
Planar Sliding (Set 2: J2)	3	5	60.00%
Plot Mode	Pole Vectors		
Vector Count	105 (105 Entries)		
Hemisphere	Lower		
Projection	Equal Angle		

<i>Project</i>	Brewer-Eddington I-395/Route 9 Connector		
<i>Analysis Description</i>	Clewleyville Road BH Logging (Approach Borings) - Planar Sliding		
<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
<i>Date</i>	June 2021	<i>File Name</i>	2021-0513_Clewleyville Approach borings.dips8



Symbol	FEATURE	Quantity
◇	J1	15
×	J2	5
△	J3	30
+	J4	8
▽	J5	6
□	J6	9
◀	J7	14
○	J8	11
▴	J9	4
*	U	3

Kinematic Analysis	Flexural Toppling
Slope Dip	76
Slope Dip Direction	124
Friction Angle	28°
Lateral Limits	30°

	Critical	Total	%
Flexural Toppling (All)	8	105	7.62%
Flexural Toppling (Set 3: J3)	1	30	3.33%
Flexural Toppling (Set 5: J5)	6	6	100.00%
Flexural Toppling (Set 8: J8)	1	11	9.09%

Plot Mode	Pole Vectors
Vector Count	105 (105 Entries)
Hemisphere	Lower
Projection	Equal Angle

Project

Brewer-Eddington I-395/Route 9 Connector

Analysis Description

Clewleyville Road BH Logging (Approach Borings) - Toppling

Drawn By

J. Rawlins

Company

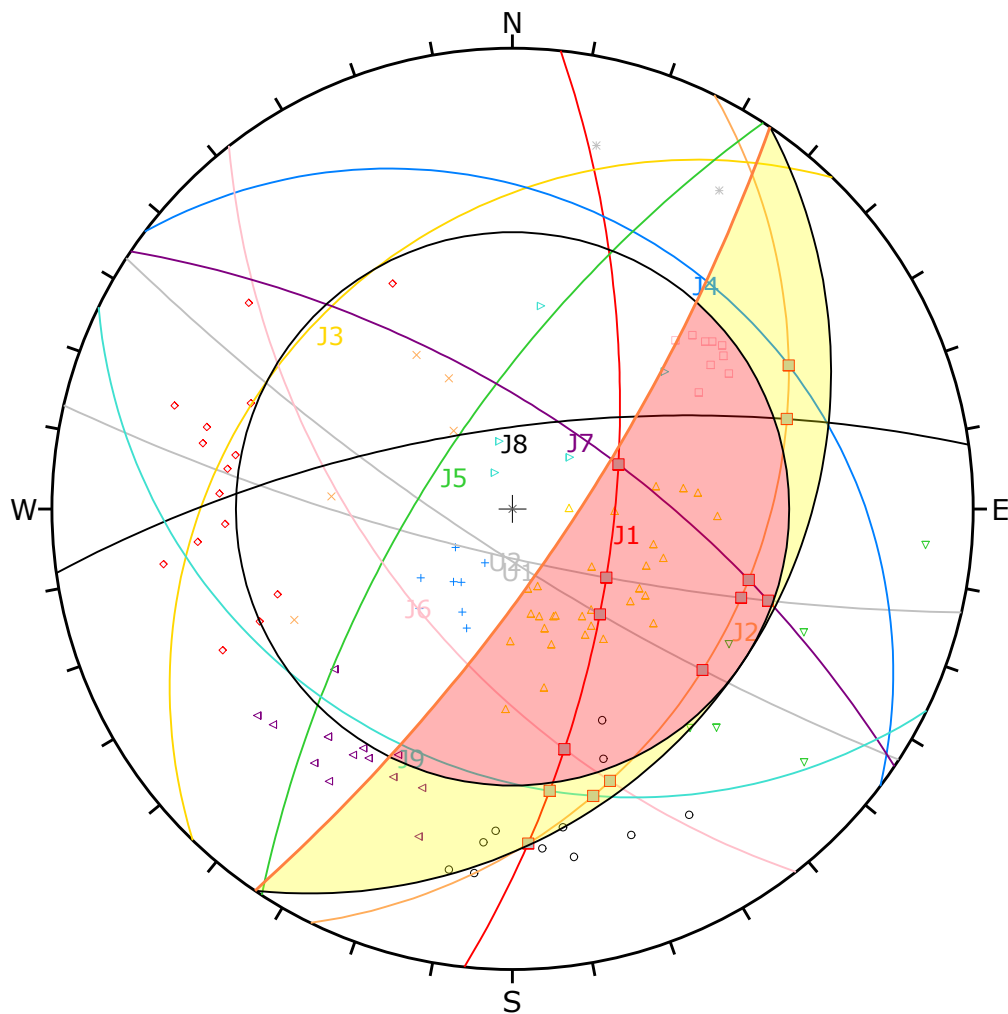
Haley & Aldrich, Inc.

Date

June 2021

File Name

2021-0513_Clewleyville Approach borings.dips8



Symbol	FEATURE	Quantity
◇	J1	15
×	J2	5
△	J3	30
+	J4	8
▽	J5	6
□	J6	9
◁	J7	14
○	J8	11
▷	J9	5
*	U	2
Symbol	Feature	
■	Critical Intersection	

Kinematic Analysis	Wedge Sliding		
Slope Dip	76		
Slope Dip Direction	124		
Friction Angle	28°		
	Critical	Total	%
Wedge Sliding	14	55	25.45%

	Color	Dip	Dip Direction	Label
User Planes				
1	■	78	193	U1
2	■	79	213	U2
Mean Set Planes				
1m	■	65	96	J1
2m	■	34	116	J2
3m	■	29	314	J3
4m	■	24	37	J4
5m	■	69	303	J5
6m	■	57	232	J6
7m	■	66	34	J7
8m	■	70	352	J8
9m	■	31	206	J9

Plot Mode	Pole Vectors
Vector Count	105 (105 Entries)
Intersection Mode	User and Mean Set Planes
Intersections Count	55
Hemisphere	Lower
Projection	Equal Angle

Project

Brewer-Eddington I-395/Route 9 Connector

Analysis Description

Clewleyville Road BH Logging (Approach Borings) - Wedge Sliding

Drawn By

J. Rawlins

Company

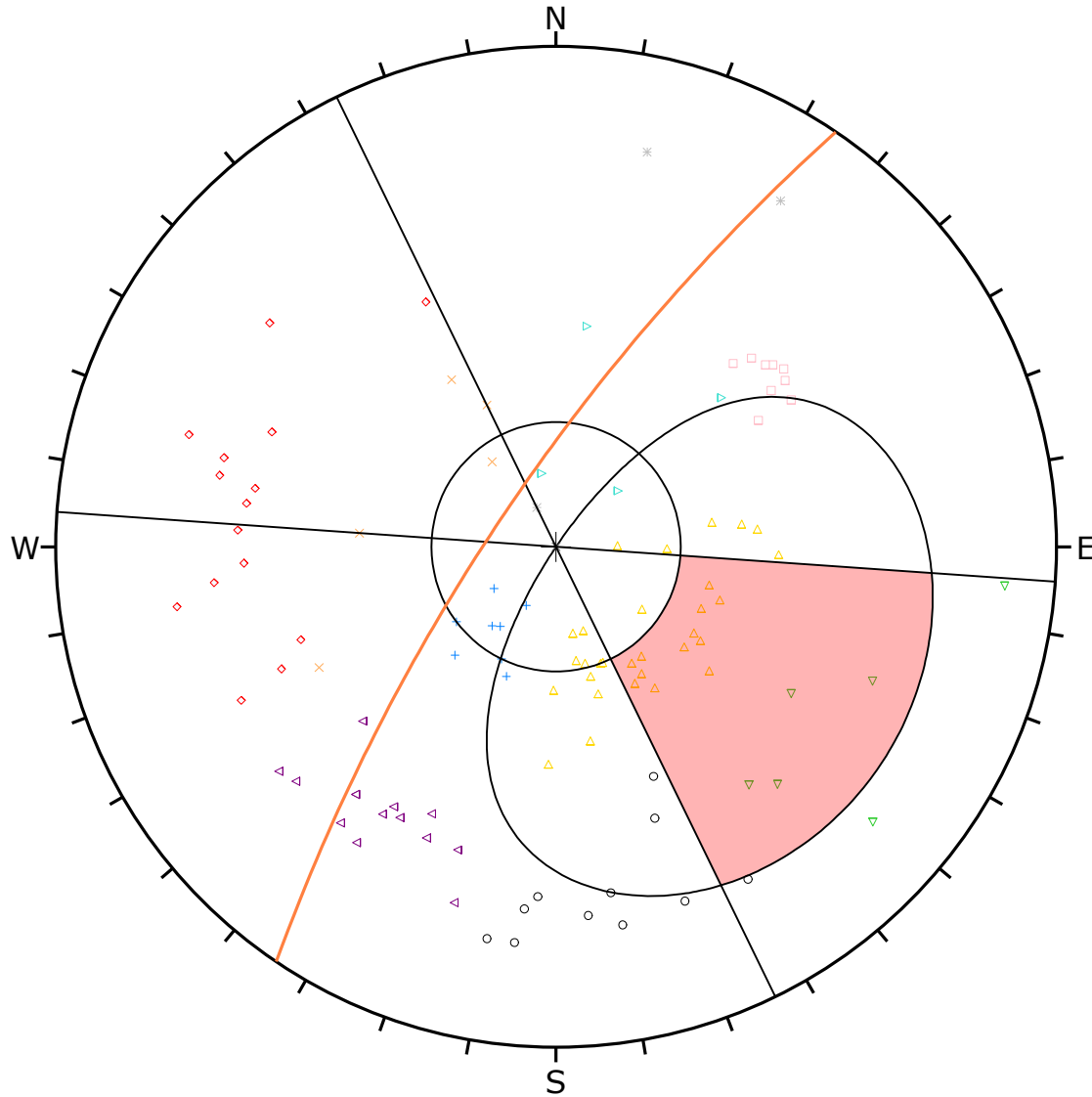
Haley & Aldrich, Inc.

Date

June 2021

File Name

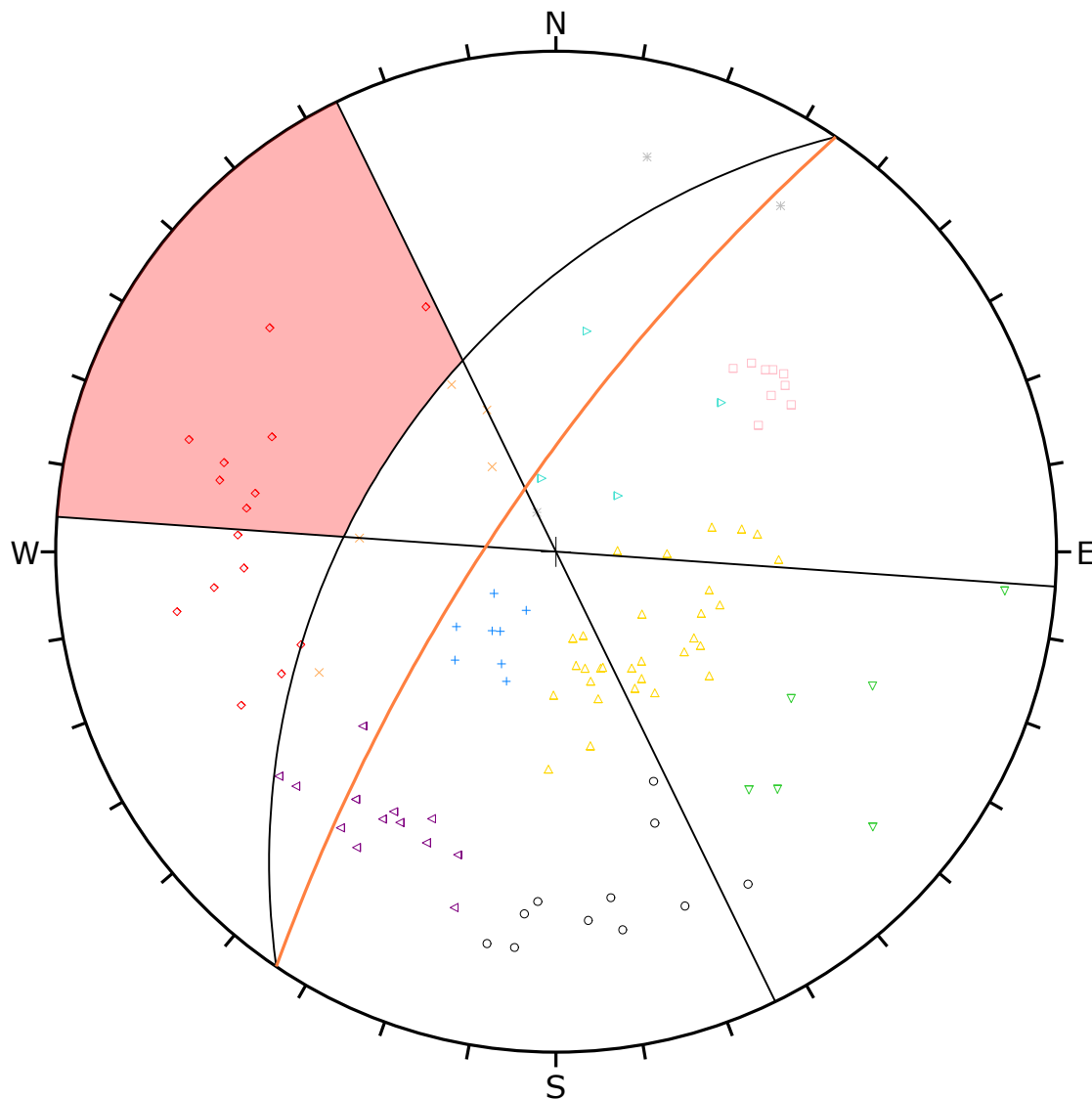
2021-0517_Clewleyville approach_wedge.dips8



Symbol	FEATURE	Quantity
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+	J4	8
▽	J5	6
□	J6	9
◁	J7	14
○	J8	11
▷	J9	4
*	U	3

Kinematic Analysis	Planar Sliding		
Slope Dip	76		
Slope Dip Direction	304		
Friction Angle	28°		
Lateral Limits	30°		
	Critical	Total	%
Planar Sliding (All)	16	105	15.24%
Planar Sliding (Set 3: J3)	12	30	40.00%
Planar Sliding (Set 5: J5)	4	6	66.67%
Plot Mode	Pole Vectors		
Vector Count	105 (105 Entries)		
Hemisphere	Lower		
Projection	Equal Angle		

<i>Project</i>	Brewer-Eddington I-395/Route 9 Connector		
<i>Analysis Description</i>	Clewleyville Road BH Logging (Approach Borings) - Planar Sliding		
<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
<i>Date</i>	June 2021	<i>File Name</i>	2021-0513_Clewleyville Approach borings.dips8



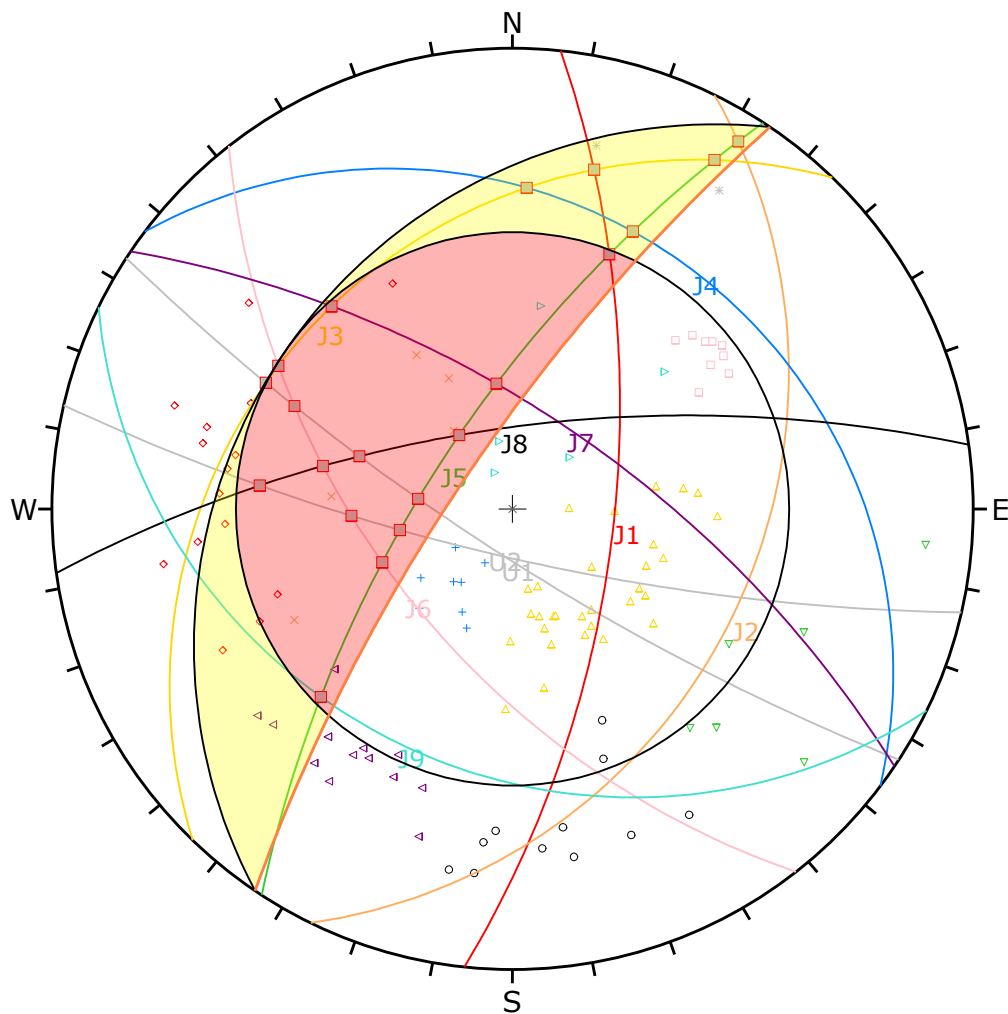
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×	J2	5
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+	J4	8
▽	J5	6
□	J6	9
◀	J7	14
○	J8	11
▶	J9	4
*	U	3

Kinematic Analysis	Flexural Toppling
Slope Dip	76
Slope Dip Direction	304
Friction Angle	28°
Lateral Limits	30°

	Critical	Total	%
Flexural Toppling (All)	8	105	7.62%
Flexural Toppling (Set 1: J1)	8	15	53.33%

Plot Mode	Pole Vectors
Vector Count	105 (105 Entries)
Hemisphere	Lower
Projection	Equal Angle

Project	Brewer-Eddington I-395/Route 9 Connector		
Analysis Description	Clewleyville Road BH Logging (Approach Borings) - Toppling		
Drawn By	J. Rawlins	Company	Haley & Aldrich, Inc.
Date	June 2021	File Name	2021-0513_Clewleyville Approach borings.dips8



Symbol	FEATURE	Quantity
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×	J2	5
△	J3	30
+	J4	8
▽	J5	6
□	J6	9
◁	J7	14
○	J8	11
▷	J9	5
*	U	2
Symbol	Feature	
■	Critical Intersection	

Kinematic Analysis	Wedge Sliding		
Slope Dip	76		
Slope Dip Direction	304		
Friction Angle	28°		
	Critical	Total	%
Wedge Sliding	20	55	36.36%

	Color	Dip	Dip Direction	Label
User Planes				
1	■	78	193	U1
2	■	79	213	U2
Mean Set Planes				
1m	■	65	96	J1
2m	■	34	116	J2
3m	■	29	314	J3
4m	■	24	37	J4
5m	■	69	303	J5
6m	■	57	232	J6
7m	■	66	34	J7
8m	■	70	352	J8
9m	■	31	206	J9

Plot Mode	Pole Vectors
Vector Count	105 (105 Entries)
Intersection Mode	User and Mean Set Planes
Intersections Count	55
Hemisphere	Lower
Projection	Equal Angle

Project

Brewer-Eddington I-395/Route 9 Connector

Analysis Description

Clewleyville Road BH Logging (Approach Borings) - Wedge Sliding

Drawn By

J. Rawlins

Company

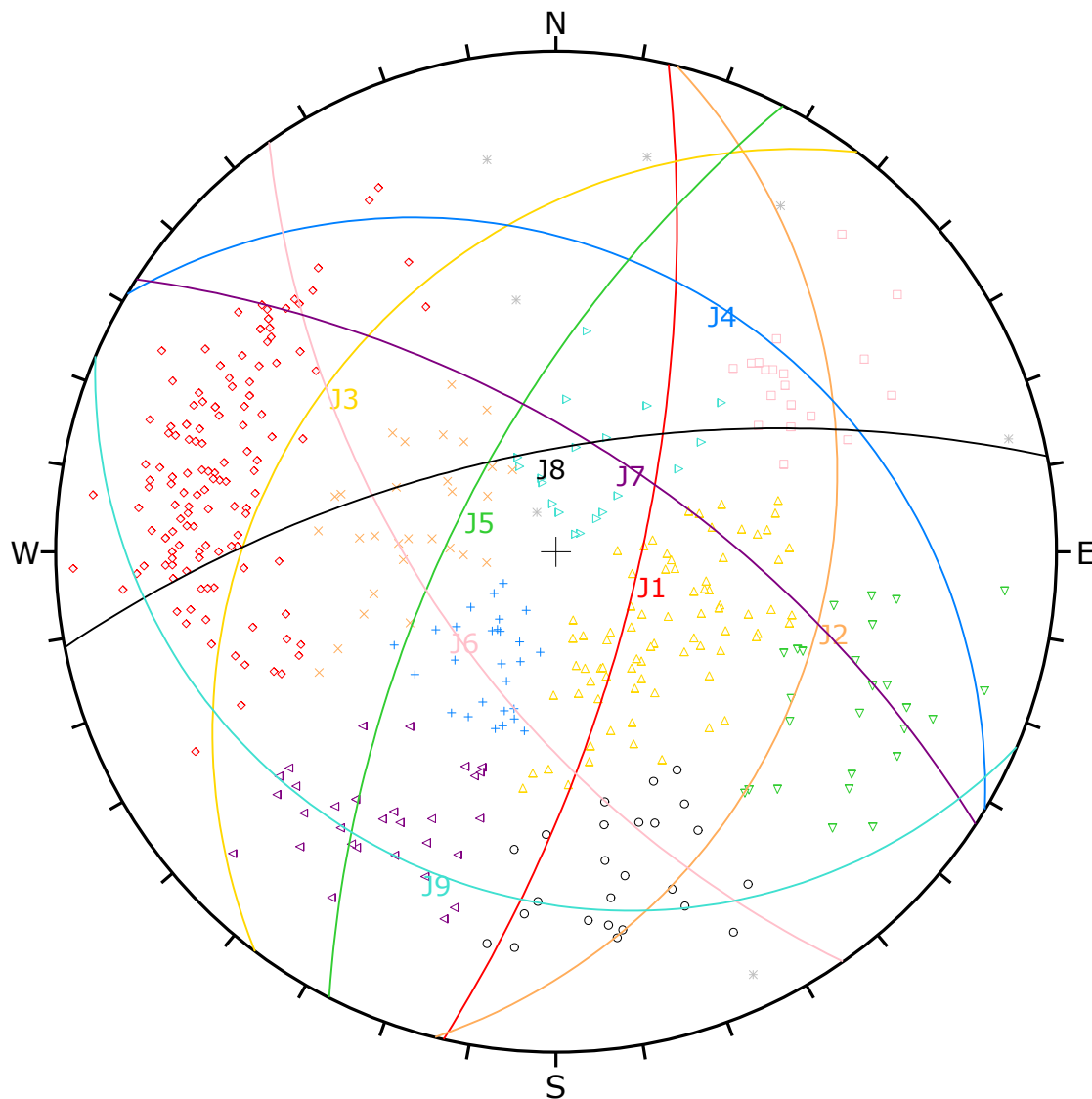
Haley & Aldrich, Inc.

Date

June 2021

File Name

2021-0517_Clewleyville approach_wedge.dips8



Symbol	FEATURE	Quantity
◇	J1	133
×	J2	29
△	J3	77
+	J4	27
▽	J5	26
□	J6	19
◁	J7	31
○	J8	25
▷	J9	19
*	U	7

	Color	Dip	Dip Direction	Label
Mean Set Planes				
1m	Red	71	103	J1
2m	Orange	33	104	J2
3m	Yellow	31	307	J3
4m	Blue	29	31	J4
5m	Green	67	297	J5
6m	Pink	61	235	J6
7m	Purple	65	33	J7
8m	Black	67	349	J8
9m	Cyan	21	203	J9

Plot Mode	Pole Vectors
Vector Count	393 (393 Entries)
Hemisphere	Lower
Projection	Equal Angle

Project

Brewer-Eddington I-395/Route 9 Connector

Analysis Description

Clewleyville Road BH Logging

Drawn By

J. Rawlins

Company

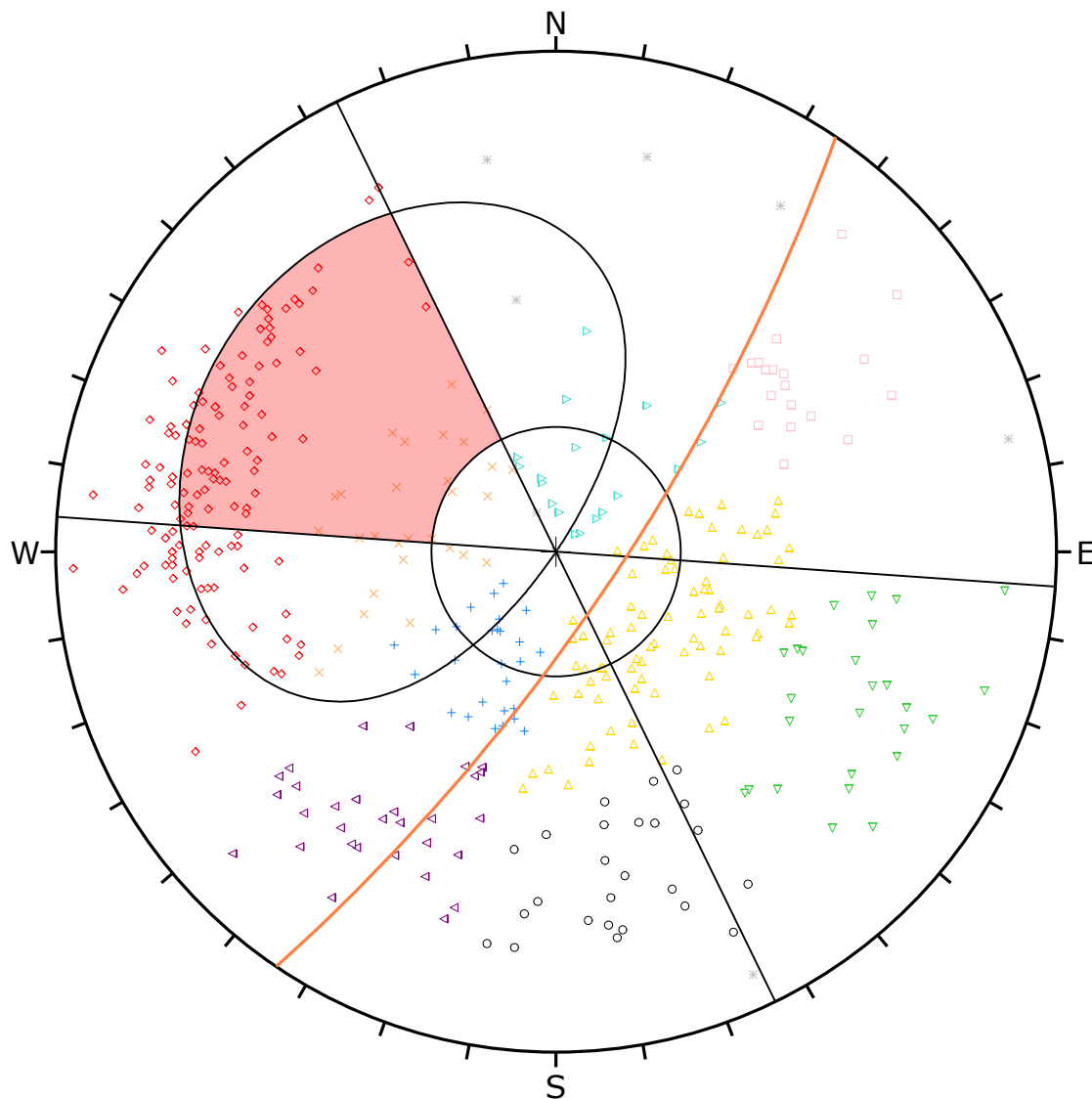
Haley & Aldrich, Inc.

Date

June 2021

File Name

2021-0409_Clewleyville borings.dips8



Symbol	FEATURE	Quantity
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+	J4	27
▽	J5	26
□	J6	19
△	J7	31
○	J8	25
▽	J9	19
*	U	7

Kinematic Analysis	Planar Sliding		
Slope Dip	76		
Slope Dip Direction	124		
Friction Angle	28°		
Lateral Limits	30°		
	Critical	Total	%
Planar Sliding (All)	81	393	20.61%
Planar Sliding (Set 1: J1)	66	133	49.62%
Planar Sliding (Set 2: J2)	15	29	51.72%
Plot Mode	Pole Vectors		
Vector Count	393 (393 Entries)		
Hemisphere	Lower		
Projection	Equal Angle		

Project

Brewer-Eddington I-395/Route 9 Connector

Analysis Description

Clewleyville Road BH Logging - Planar Sliding

Drawn By

J. Rawlins

Company

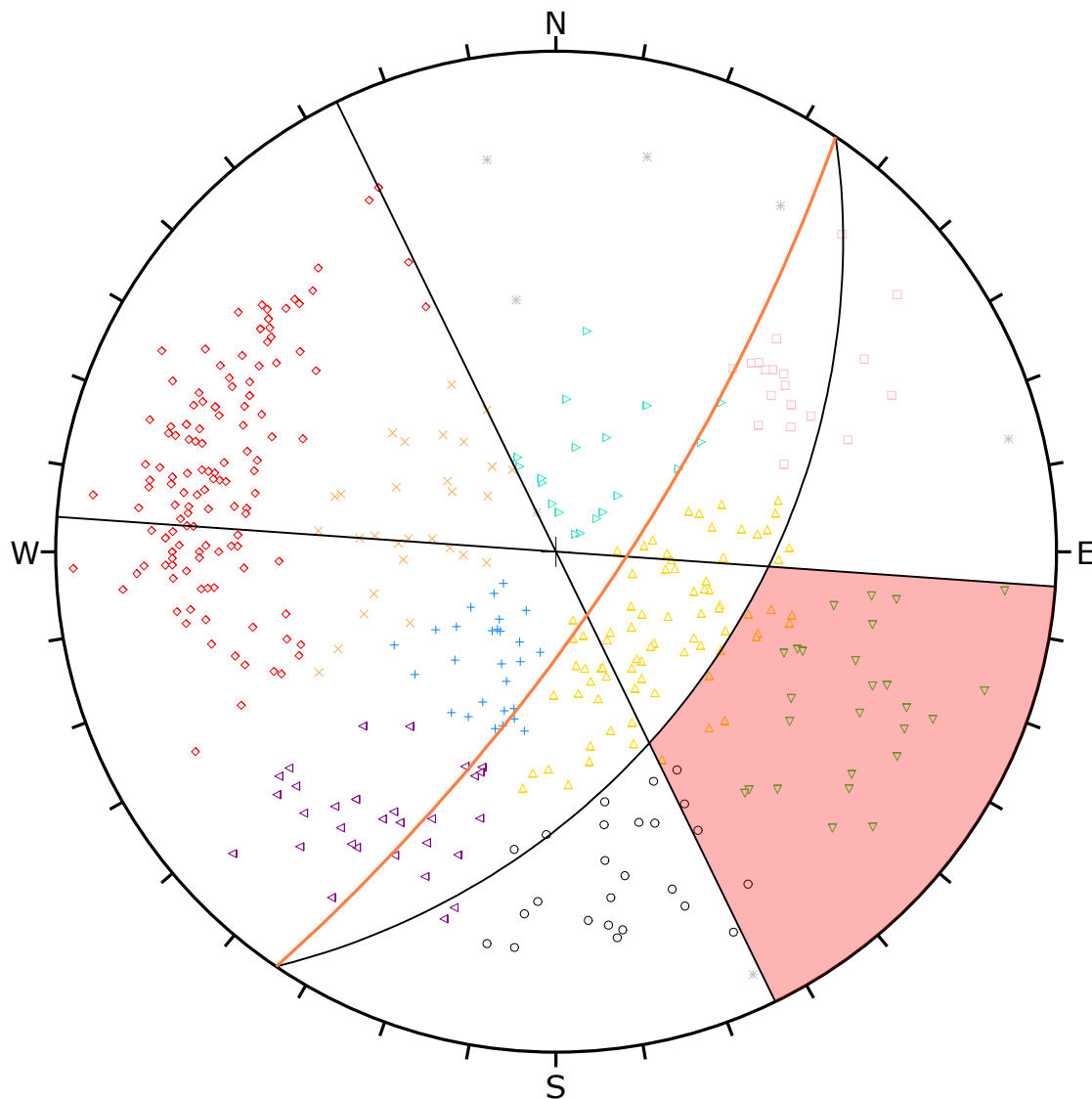
Haley & Aldrich, Inc.

Date

June 2021

File Name

2021-0409_Clewleyville borings.dips8



Symbol	FEATURE	Quantity
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△	J3	77
+	J4	27
▽	J5	26
□	J6	19
△	J7	31
○	J8	25
△	J9	19
*	U	7

Kinematic Analysis	Flexural Toppling
Slope Dip	76
Slope Dip Direction	124
Friction Angle	28°
Lateral Limits	30°

	Critical	Total	%
Flexural Toppling (All)	40	393	10.18%
Flexural Toppling (Set 3: J3)	8	75	10.67%
Flexural Toppling (Set 5: J5)	28	28	100.00%
Flexural Toppling (Set 8: J8)	4	25	16.00%

Plot Mode	Pole Vectors
Vector Count	393 (393 Entries)
Hemisphere	Lower
Projection	Equal Angle

Project

Brewer-Eddington I-395/Route 9 Connector

Analysis Description

Clewleyville Road BH Logging - Toppling

Drawn By

J. Rawlins

Company

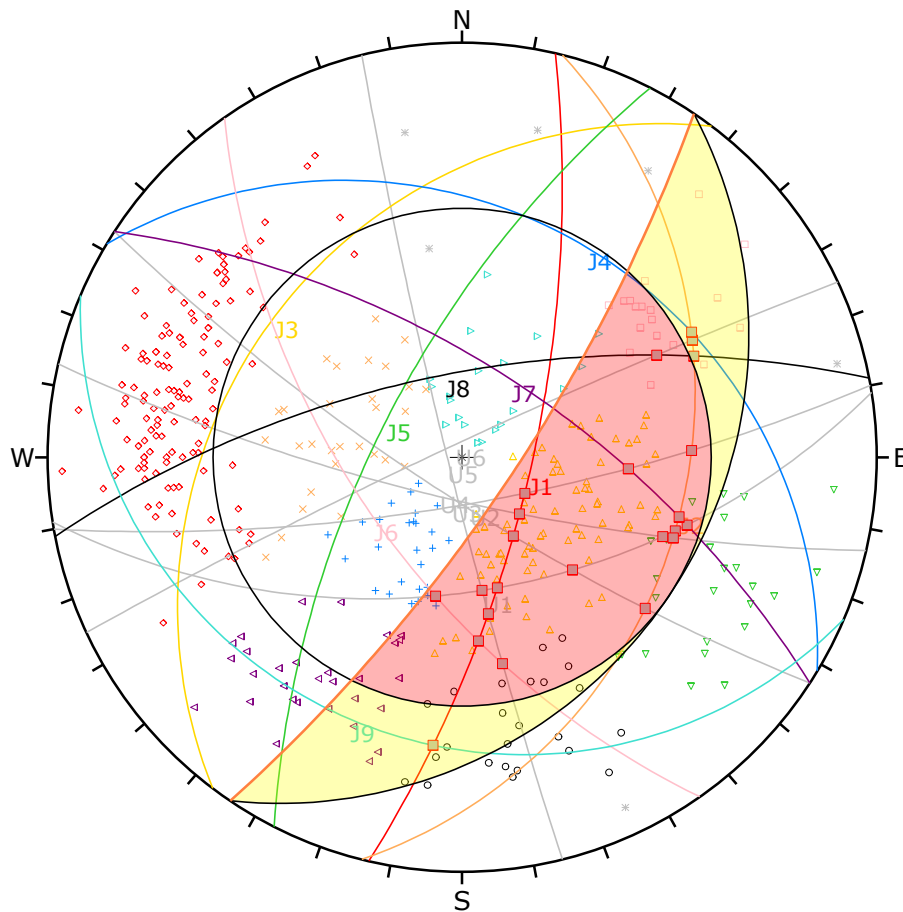
Haley & Aldrich, Inc.

Date

June 2021

File Name

2021-0409_Clewleyville borings.dips8



Symbol	FEATURE	Quantity
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×	J2	29
△	J3	77
+	J4	27
▽	J5	26
□	J6	19
◀	J7	31
○	J8	25
▶	J9	20
*	U	6

Symbol	Feature
■	Critical Intersection

Kinematic Analysis	Wedge Sliding		
Slope Dip	76		
Slope Dip Direction	124		
Friction Angle	28°		
	Critical	Total	%
Wedge Sliding	23	105	21.90%

	Color	Dip	Dip Direction	Label
User Planes				
1	■	54	171	U1
2	■	77	170	U2
3	■	78	193	U3
4	■	79	213	U4
5	■	86	256	U5
6	■	86	335	U6
Mean Set Planes				
1m	■	71	103	J1
2m	■	33	104	J2
3m	■	31	307	J3
4m	■	29	31	J4
5m	■	67	297	J5
6m	■	61	235	J6
7m	■	65	33	J7
8m	■	67	349	J8
9m	■	21	203	J9

Plot Mode	Pole Vectors
Vector Count	393 (393 Entries)
Intersection Mode	User and Mean Set Planes
Intersections Count	105
Hemisphere	Lower
Projection	Equal Angle

Project

Brewer-Eddington I-395/Route 9 Connector

Analysis Description

Clewleyville Road BH Logging - Wedge Sliding

Drawn By

J. Rawlins

Company

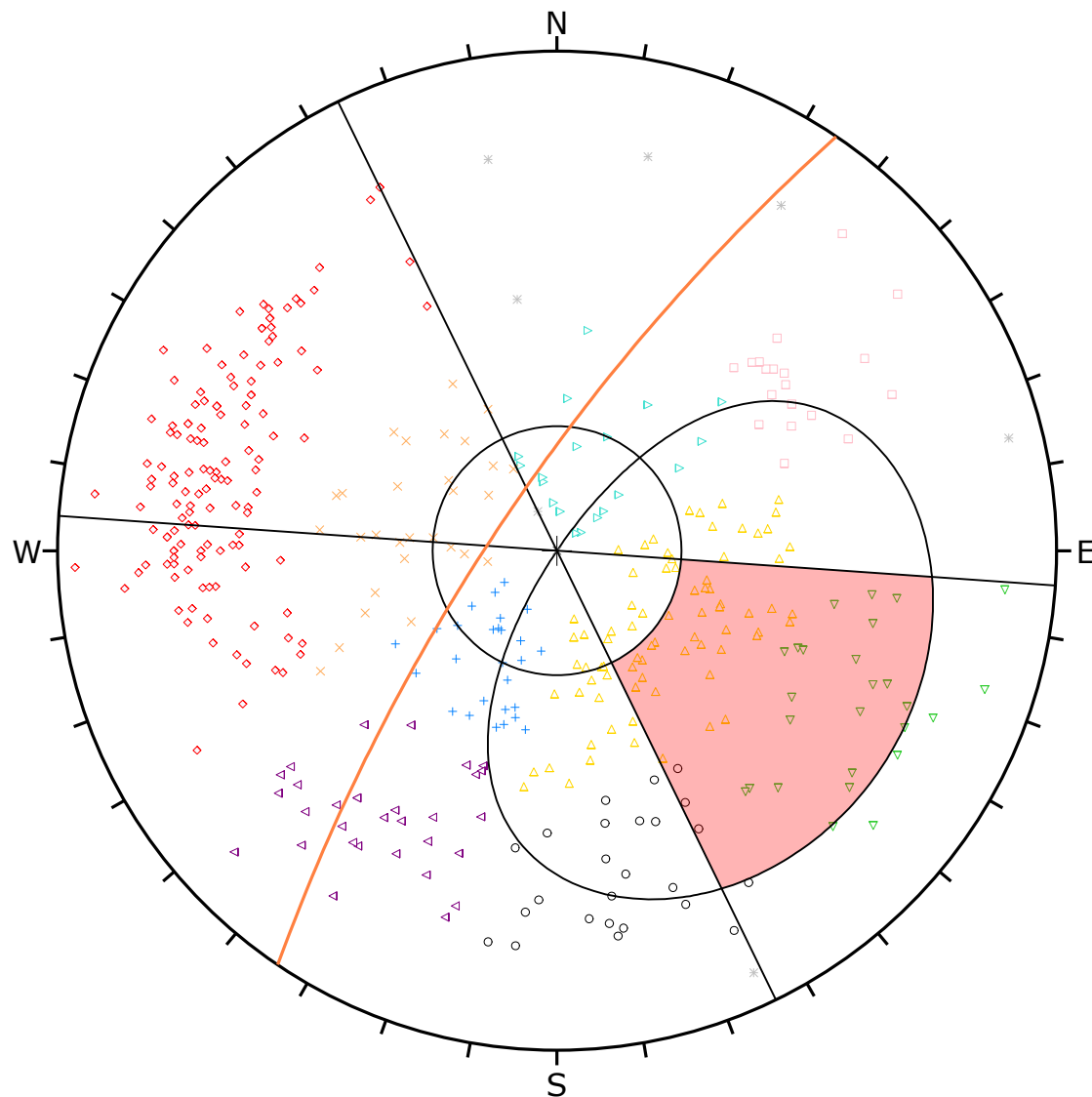
Haley & Aldrich, Inc.

Date

June 2021

File Name

2021-0409_Clewleyville borings_wedge.dips8



Symbol	FEATURE	Quantity
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×	J2	29
△	J3	77
+	J4	27
▽	J5	26
□	J6	19
△	J7	31
○	J8	25
△	J9	19
*	U	7

Kinematic Analysis	Planar Sliding
Slope Dip	76
Slope Dip Direction	304
Friction Angle	28°
Lateral Limits	30°

	Critical	Total	%
Planar Sliding (All)	53	393	13.49%
Planar Sliding (Set 3: J3)	29	75	38.67%
Planar Sliding (Set 5: J5)	21	28	75.00%
Planar Sliding (Set 8: J8)	3	25	12.00%

Plot Mode	Pole Vectors
Vector Count	393 (393 Entries)
Hemisphere	Lower
Projection	Equal Angle

Project

Brewer-Eddington I-395/Route 9 Connector

Analysis Description

Clewleyville Road BH Logging - Planar Sliding

Drawn By

J. Rawlins

Company

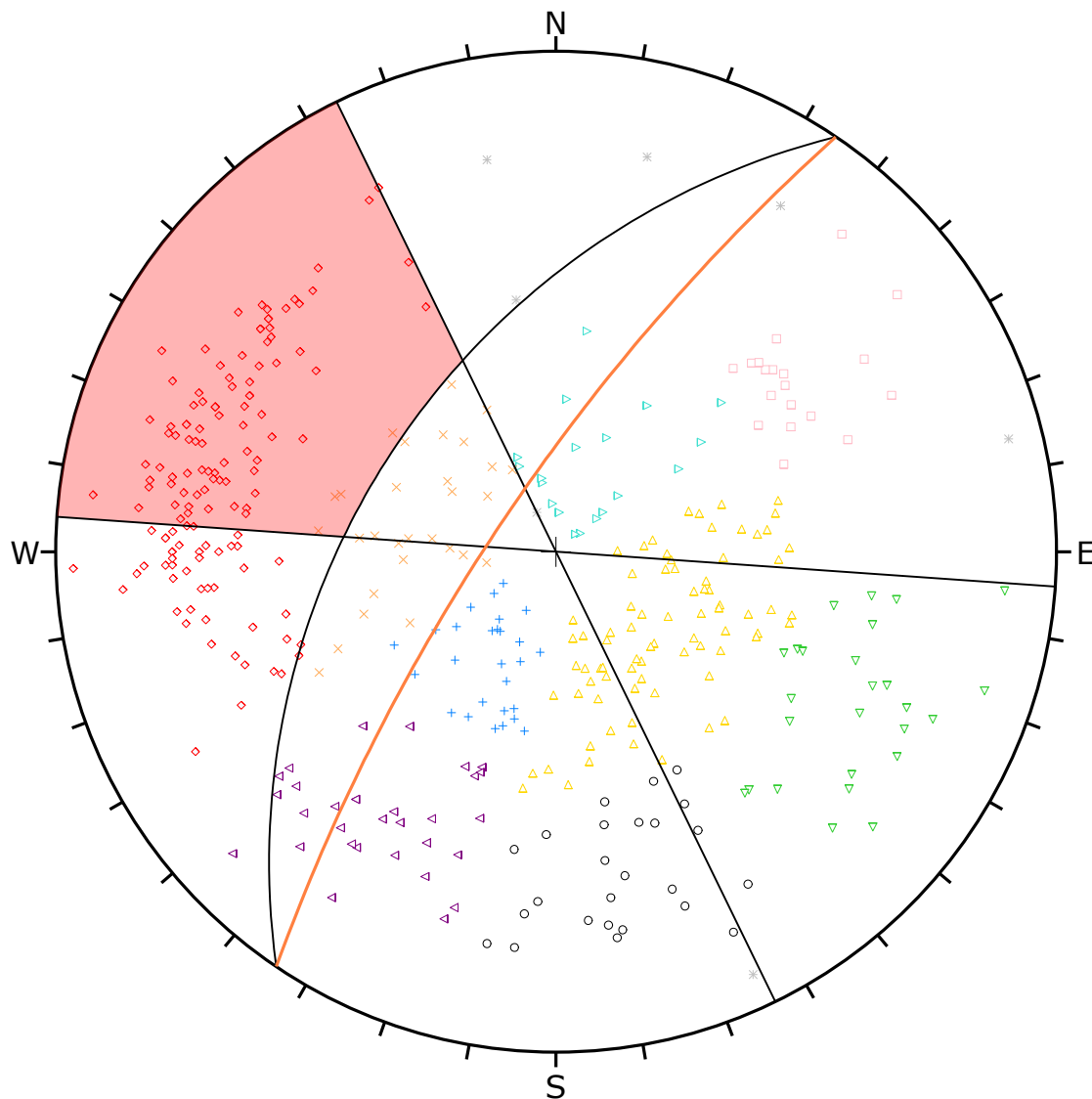
Haley & Aldrich, Inc.

Date

June 2021

File Name

2021-0409_Clewleyville borings.dips8



Symbol	FEATURE	Quantity
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△	J3	77
+	J4	27
▽	J5	26
□	J6	19
△	J7	31
○	J8	25
△	J9	19
*	U	7

Kinematic Analysis	Flexural Toppling		
Slope Dip	76		
Slope Dip Direction	304		
Friction Angle	28°		
Lateral Limits	30°		
	Critical	Total	%
Flexural Toppling (All)	93	393	23.66%
Flexural Toppling (Set 1: J1)	89	133	66.92%
Flexural Toppling (Set 2: J2)	4	29	13.79%
Plot Mode	Pole Vectors		
Vector Count	393 (393 Entries)		
Hemisphere	Lower		
Projection	Equal Angle		

Project

Brewer-Eddington I-395/Route 9 Connector

Analysis Description

Clewleyville Road BH Logging - Toppling

Drawn By

J. Rawlins

Company

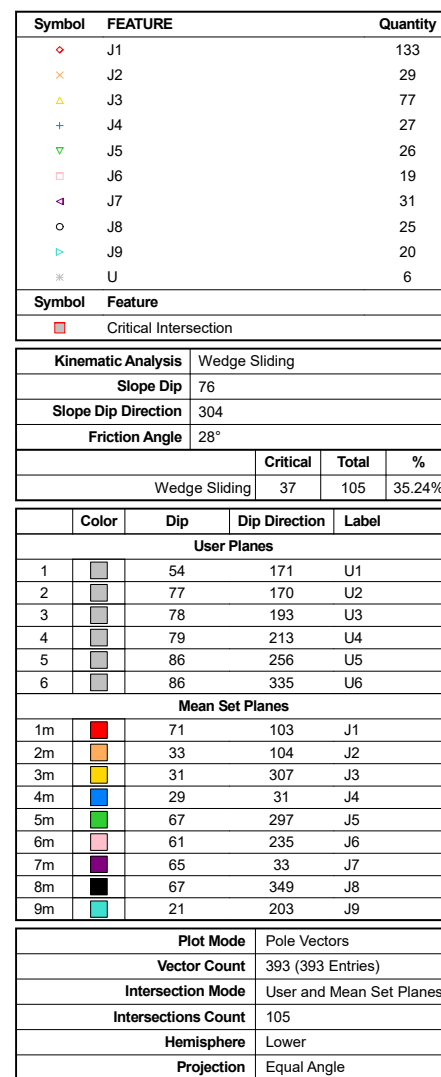
Haley & Aldrich, Inc.

Date

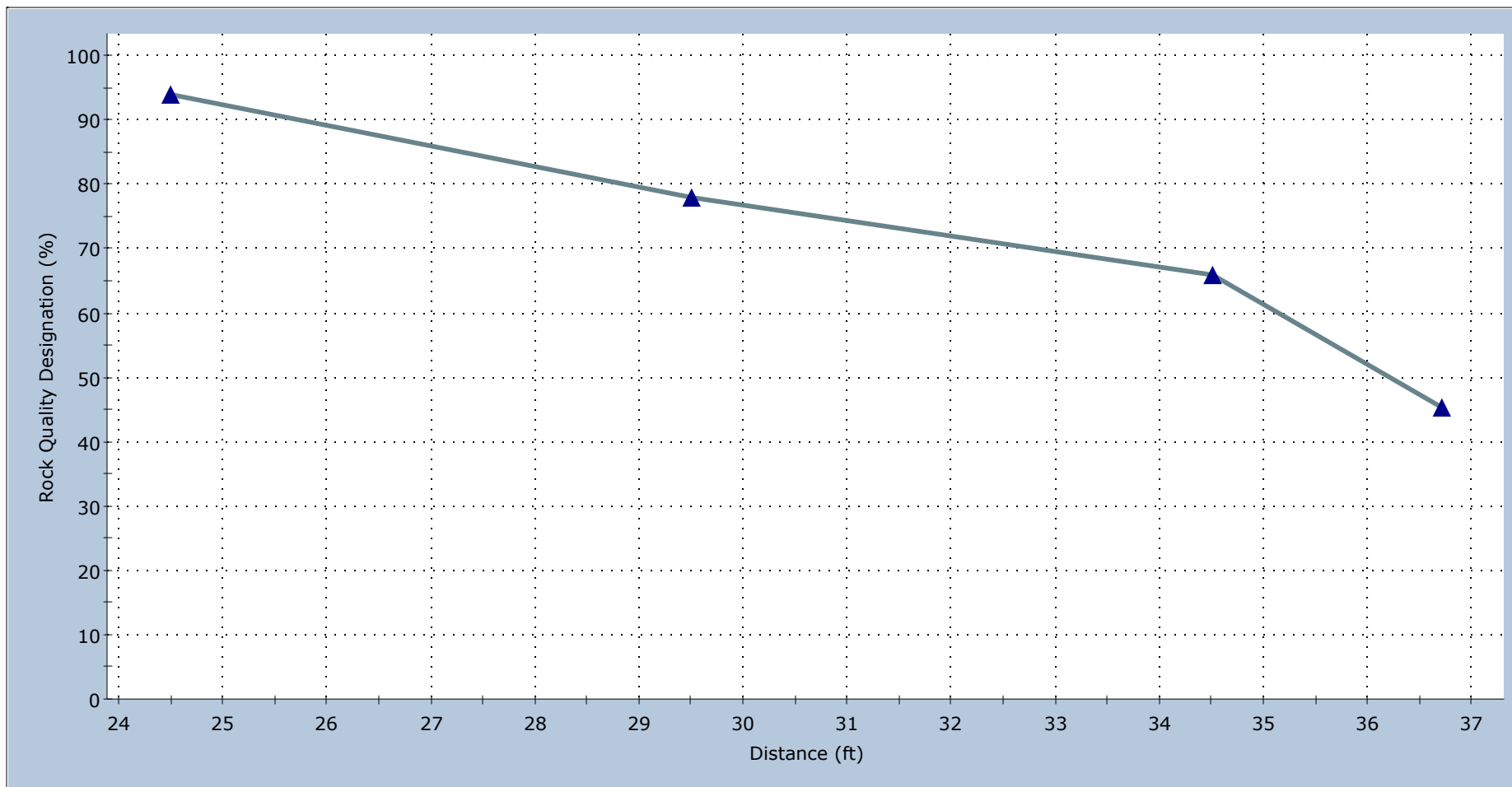
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DIPS 8.002

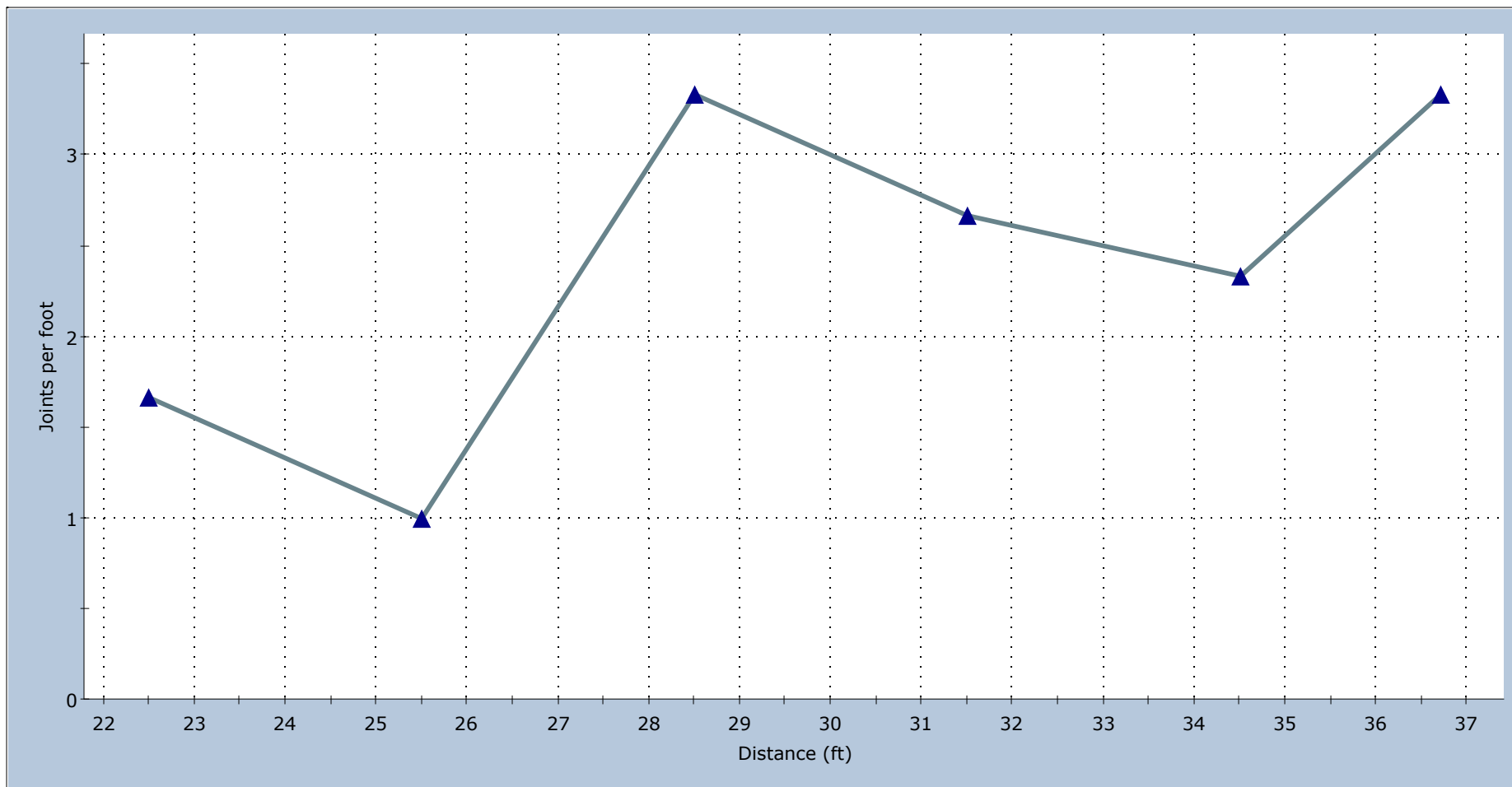
RQD Analysis Traverse L1



mean=70.864 s.d.=17.716 min=45.455 max=94.000

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - BB-ECR-201	
	<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
	<i>Date</i>	April 2021	<i>File Name</i>	2021-0414_Clewleyville_BB-ECR-201.dips8

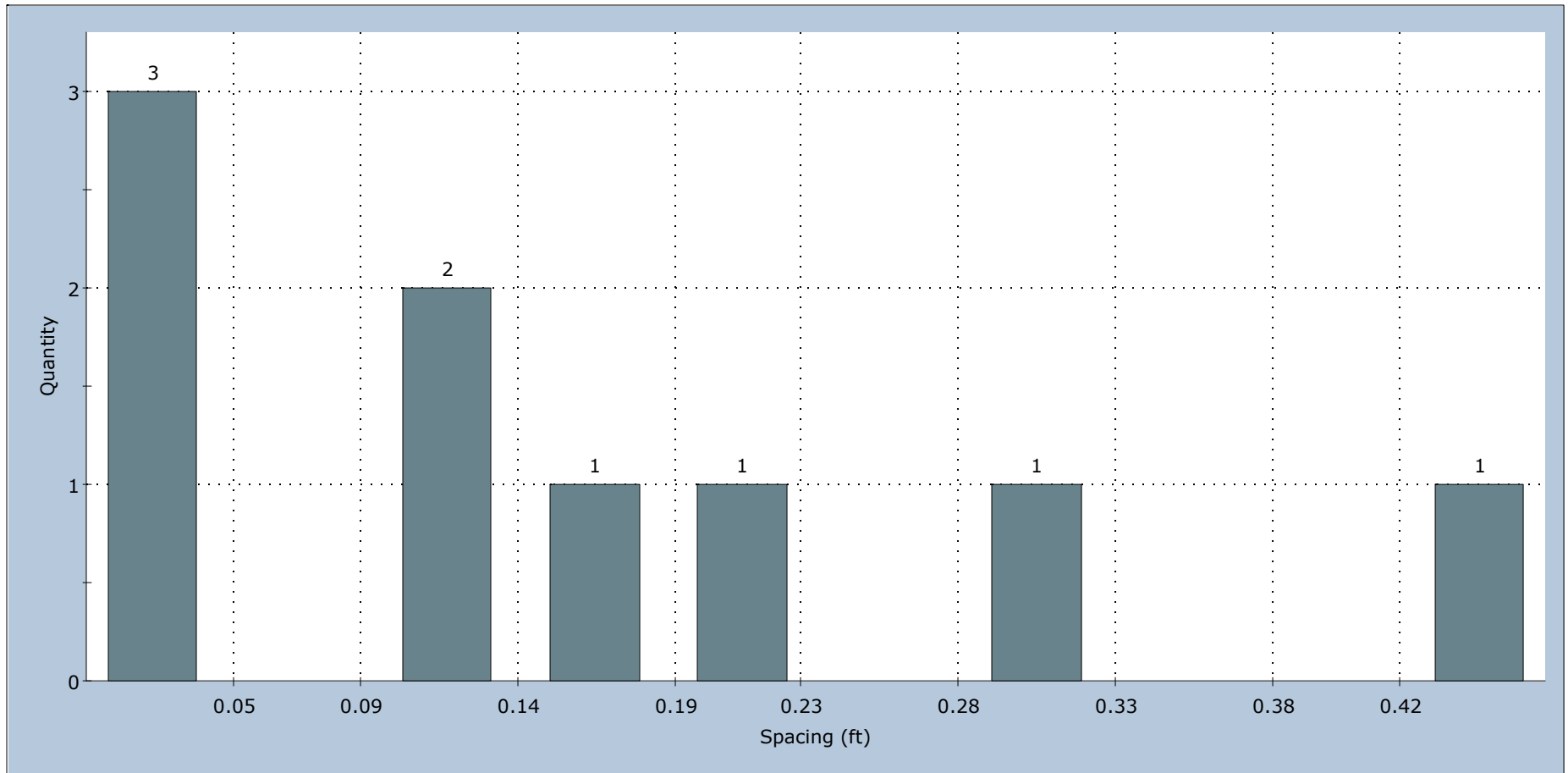
Joint Frequency Analysis Traverse L1



mean=2.389 s.d.=0.848 min=1.000 max=3.333

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - BB-ECR-201	
	<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
	<i>Date</i>	April 2021	<i>File Name</i>	2021-0414_Clewleyville_BB-ECR-201.dips8

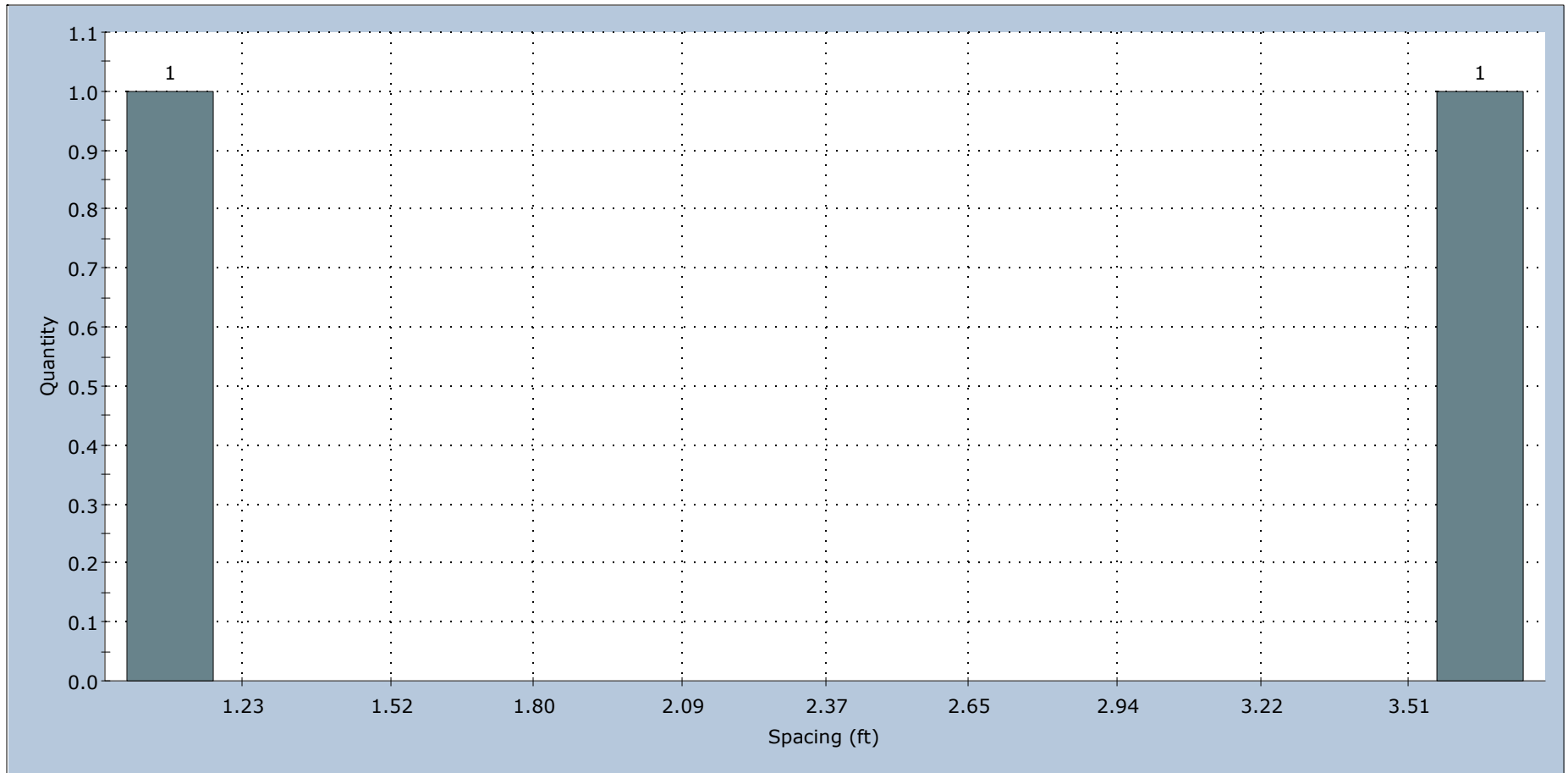
True Joint Spacing Set 1: J1 All Traverses



mean=0.156 s.d.=0.142 min=0.001 max=0.469

	Project		Brewer-Eddington I-395/Route 9 Connector	
	Analysis Description		Clewleyville Road BH Logging - BB-ECR-201	
	Drawn By	J. Rawlins	Company	Haley & Aldrich, Inc.
	Date	April 2021	File Name	2021-0414_Clewleyville_BB-ECR-201.dips8

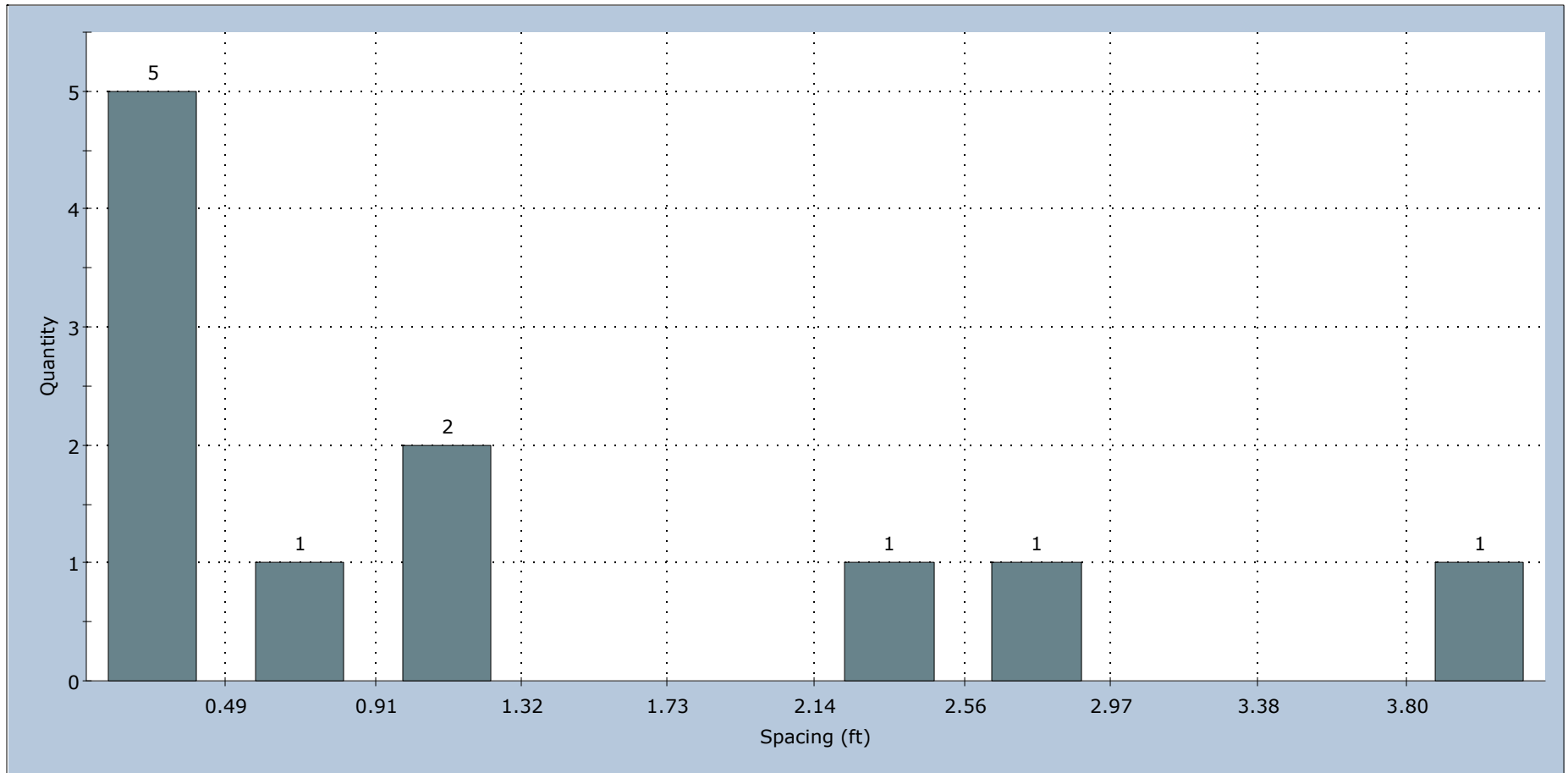
True Joint Spacing Set 2: J2 All Traverses



mean=2.370 s.d.=1.422 min=0.948 max=3.791

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - BB-ECR-201	
	<i>Drawn By</i>		J. Rawlins	<i>Company</i> Haley & Aldrich, Inc.
	<i>Date</i>		April 2021	<i>File Name</i> 2021-0414_Clewleyville_BB-ECR-201.dips8

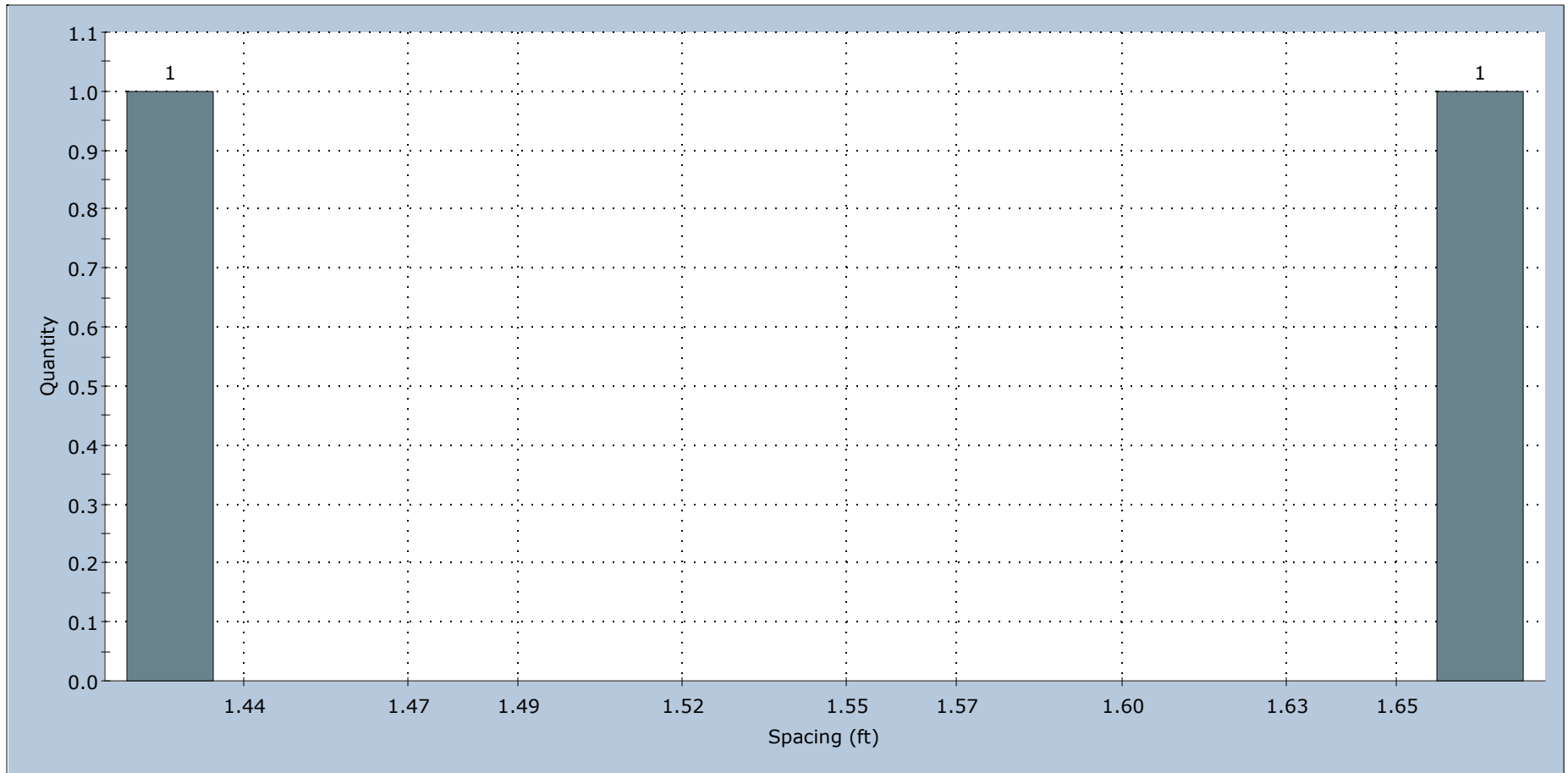
True Joint Spacing Set 3: J3 All Traverses



mean=1.221 s.d.=1.294 min=0.081 max=4.209

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - BB-ECR-201	
	<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
	<i>Date</i>	April 2021	<i>File Name</i>	2021-0414_Clewleyville_BB-ECR-201.dips8

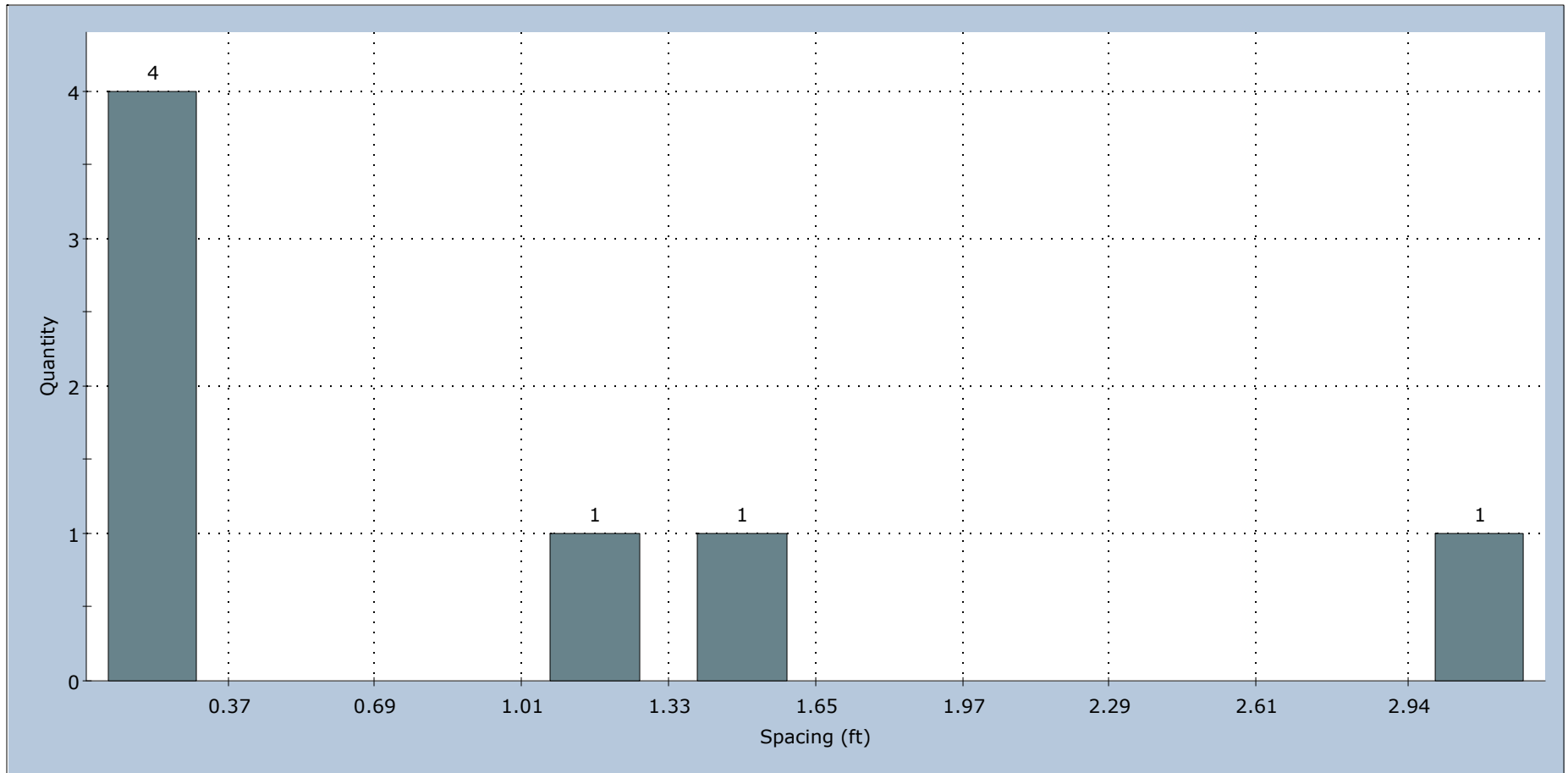
True Joint Spacing Set 4: J4 All Traverses



mean=1.546 s.d.=0.133 min=1.414 max=1.679

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - BB-ECR-201	
	<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
	<i>Date</i>	April 2021	<i>File Name</i>	2021-0414_Clewleyville_BB-ECR-201.dips8

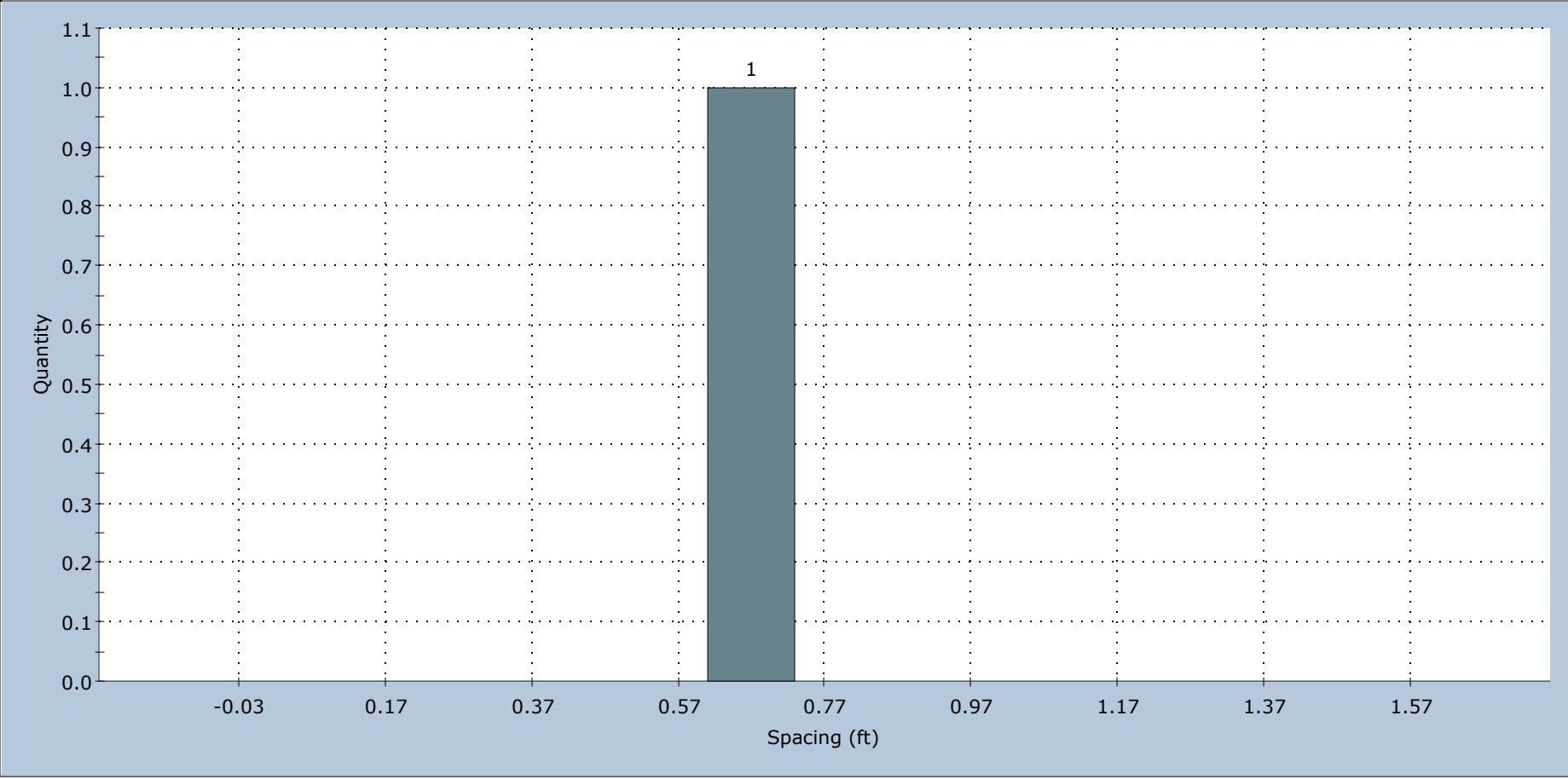
True Joint Spacing Set 5: J5 All Traverses



mean=0.898 s.d.=1.063 min=0.046 max=3.256

	Project		Brewer-Eddington I-395/Route 9 Connector	
	Analysis Description		Clewleyville Road BH Logging - BB-ECR-201	
	Drawn By		J. Rawlins	Company Haley & Aldrich, Inc.
	Date		April 2021	File Name 2021-0414_Clewleyville_BB-ECR-201.dips8

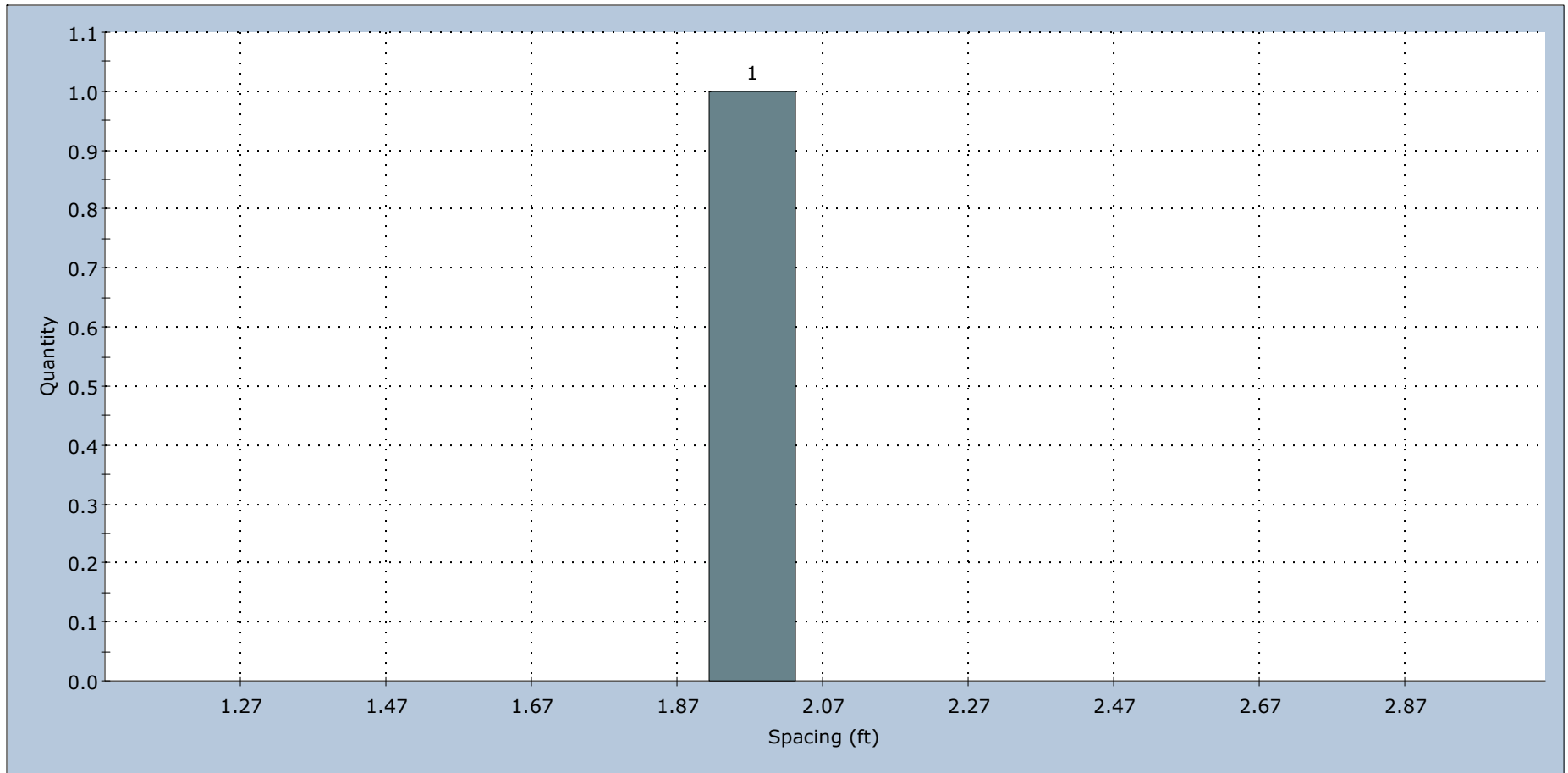
True Joint Spacing Set 6: J6 All Traverses



mean=0.770 s.d.=0.000 min=0.770 max=0.770

	Project		Brewer-Eddington I-395/Route 9 Connector	
	Analysis Description		Clewleyville Road BH Logging - BB-ECR-201	
	Drawn By		J. Rawlins	Company Haley & Aldrich, Inc.
	Date		April 2021	File Name 2021-0414_Clewleyville_BB-ECR-201.dips8

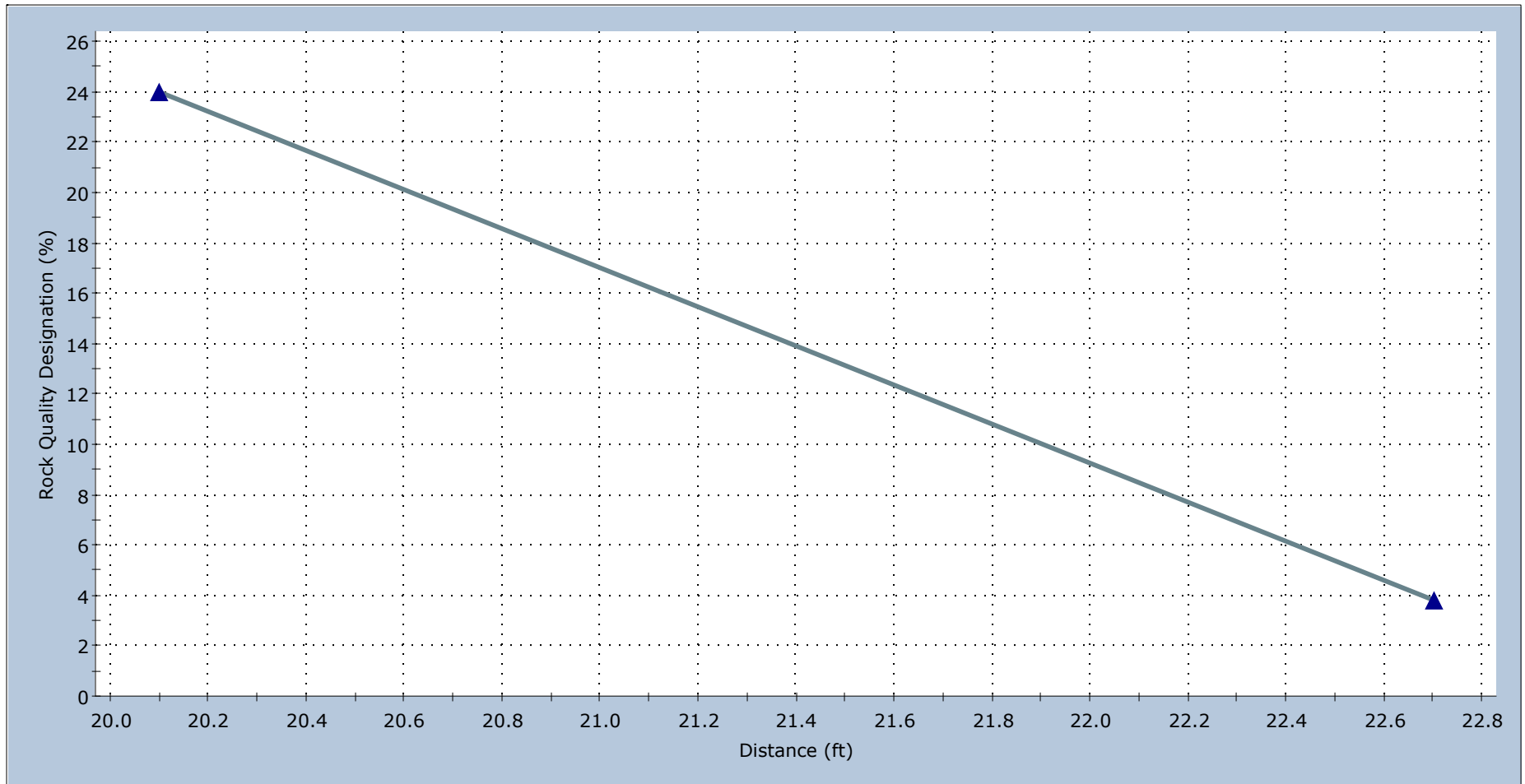
True Joint Spacing Set 7: J7 All Traverses



mean=2.074 s.d.=0.000 min=2.074 max=2.074

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - BB-ECR-201	
	<i>Drawn By</i>		J. Rawlins	<i>Company</i> Haley & Aldrich, Inc.
	<i>Date</i>		April 2021	<i>File Name</i> 2021-0414_Clewleyville_BB-ECR-201.dips8

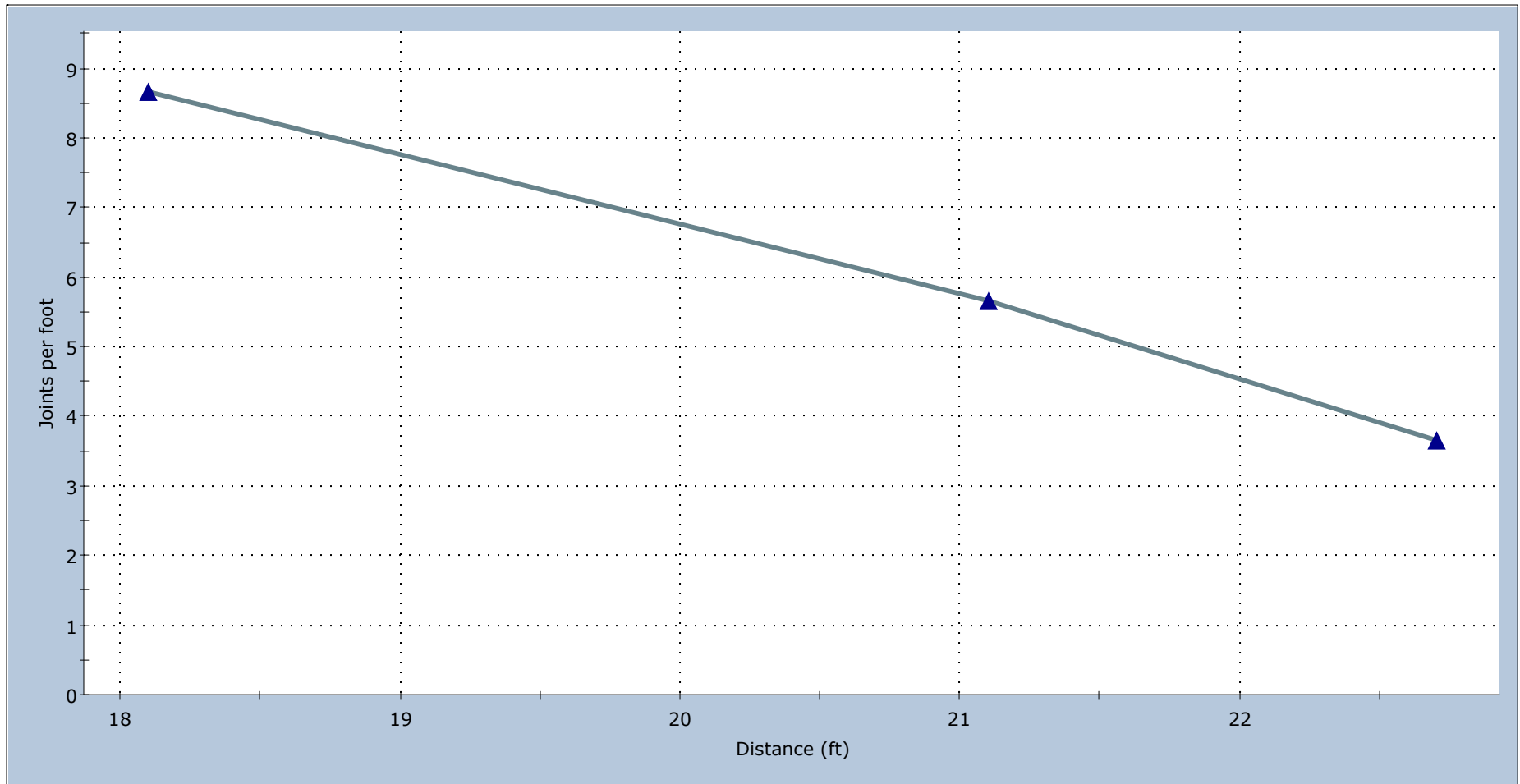
RQD Analysis Traverse L1



mean=13.923 s.d.=10.077 min=3.846 max=24.000

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - BB-ECR-202	
	<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
	<i>Date</i>	April 2021	<i>File Name</i>	2021-0414_Clewleyville_BB-ECR-202.dips8

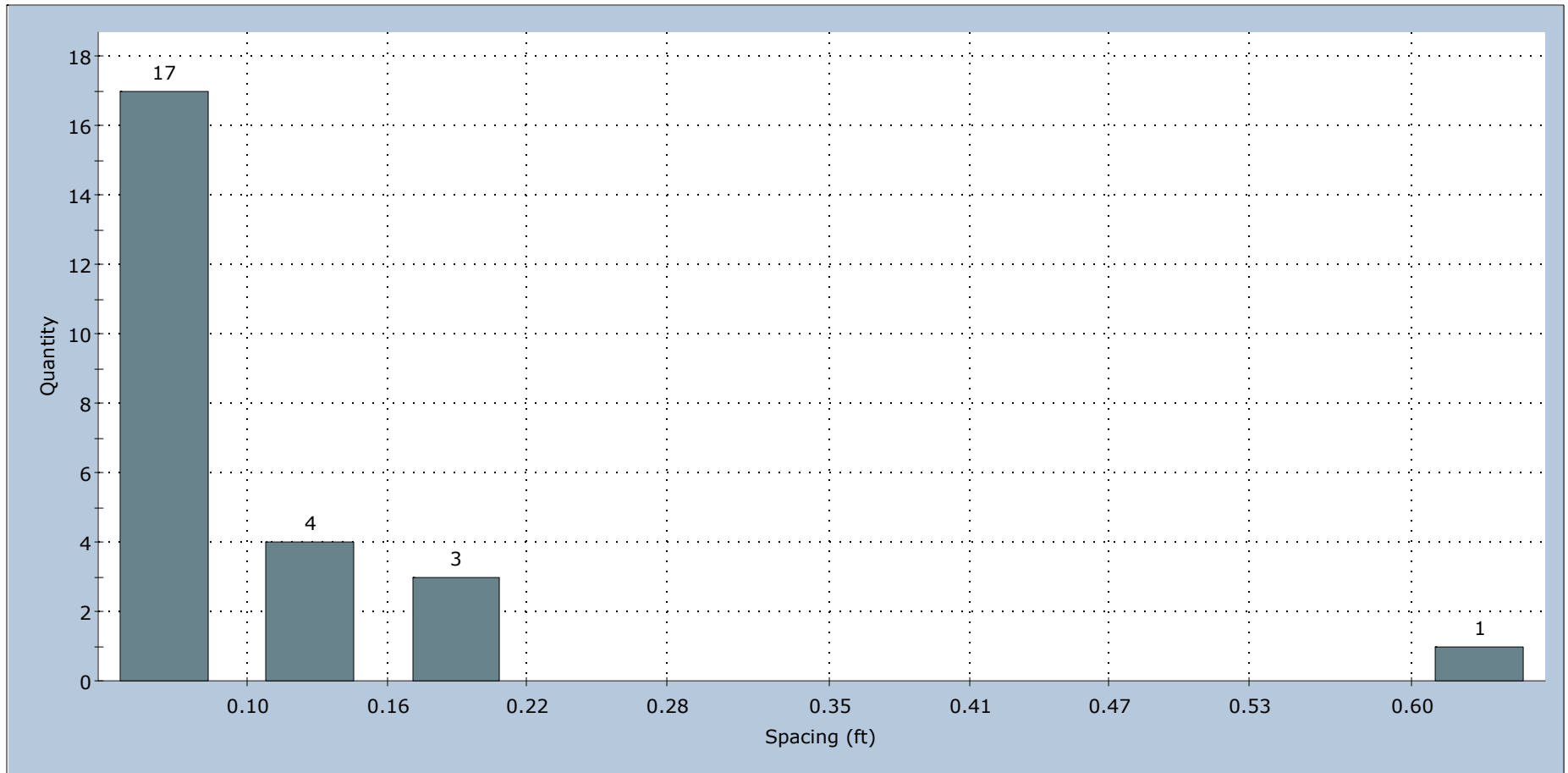
Joint Frequency Analysis Traverse L1



mean=6.000 s.d.=2.055 min=3.667 max=8.667

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - BB-ECR-202	
	<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
	<i>Date</i>	April 2021	<i>File Name</i>	2021-0414_Clewleyville_BB-ECR-202.dips8

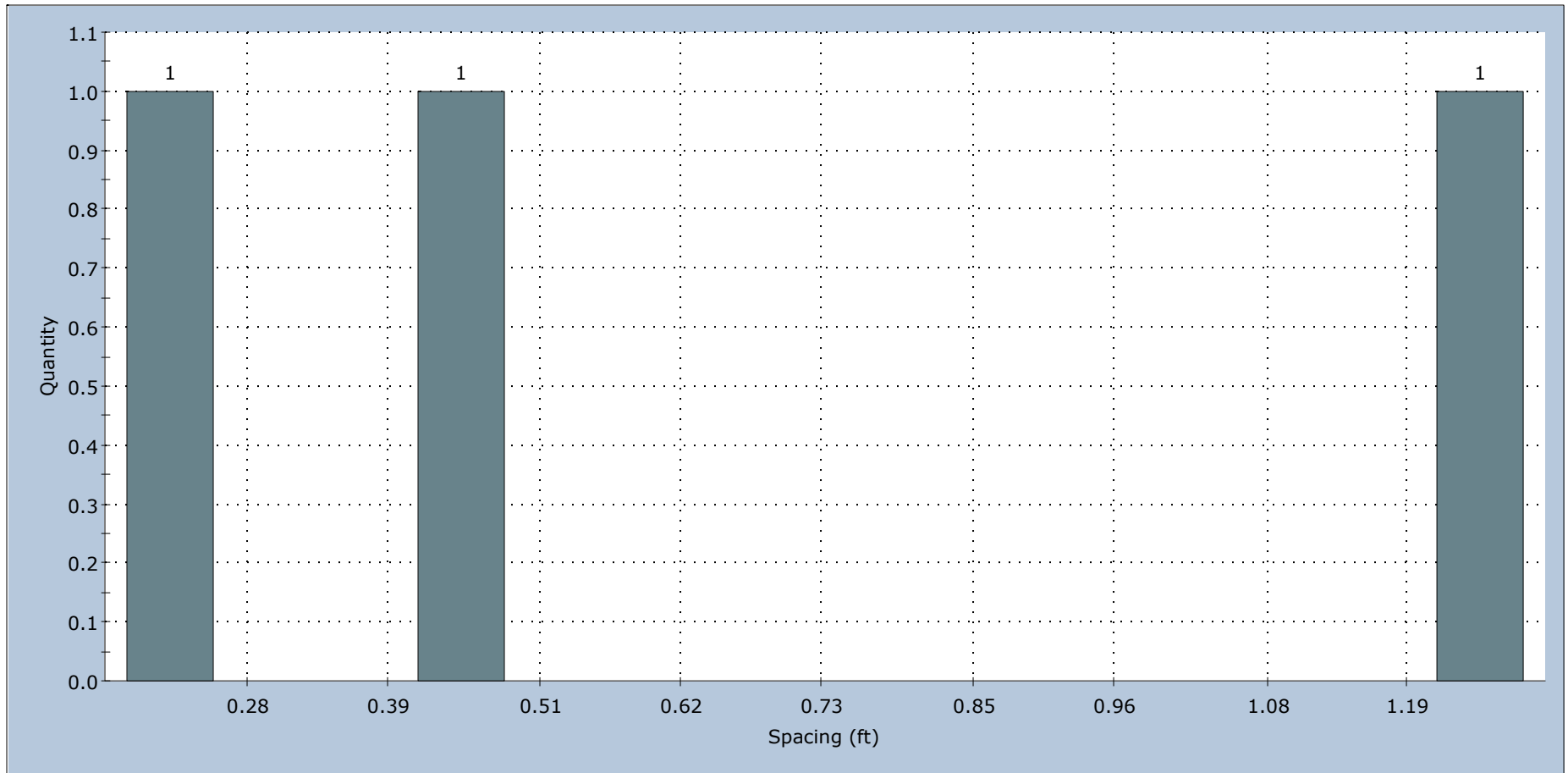
True Joint Spacing Set 1: J1 All Traverses



mean=0.095 s.d.=0.125 min=0.033 max=0.660

	Project		Brewer-Eddington I-395/Route 9 Connector	
	Analysis Description		Clewleyville Road BH Logging - BB-ECR-202	
	Drawn By	J. Rawlins	Company	Haley & Aldrich, Inc.
	Date	April 2021	File Name	2021-0414_Clewleyville_BB-ECR-202.dips8

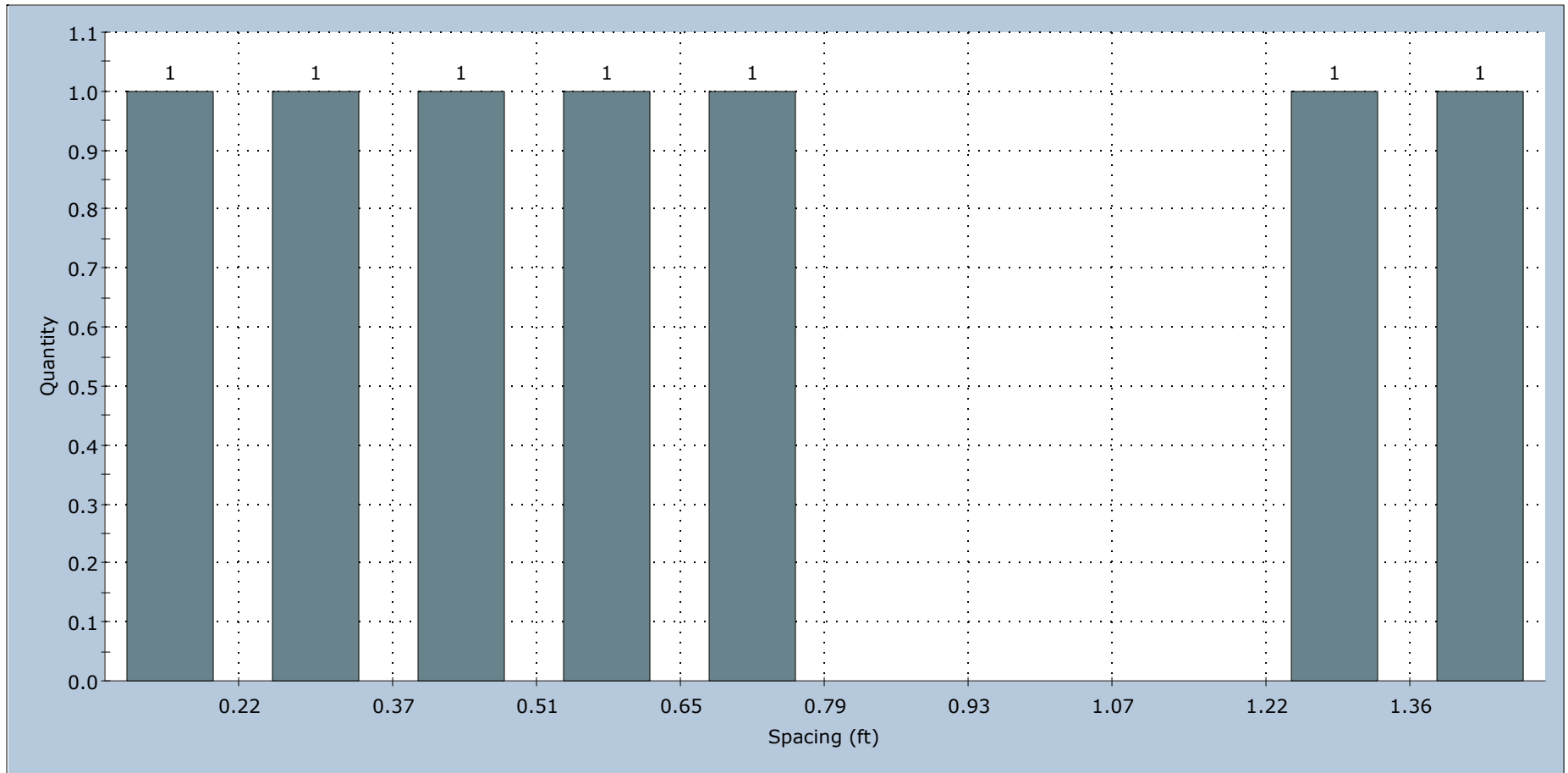
True Joint Spacing Set 2: J2 All Traverses



mean=0.625 s.d.=0.490 min=0.163 max=1.304

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - BB-ECR-202	
	<i>Drawn By</i>		J. Rawlins	<i>Company</i> Haley & Aldrich, Inc.
	<i>Date</i>		April 2021	<i>File Name</i> 2021-0414_Clewleyville_BB-ECR-202.dips8

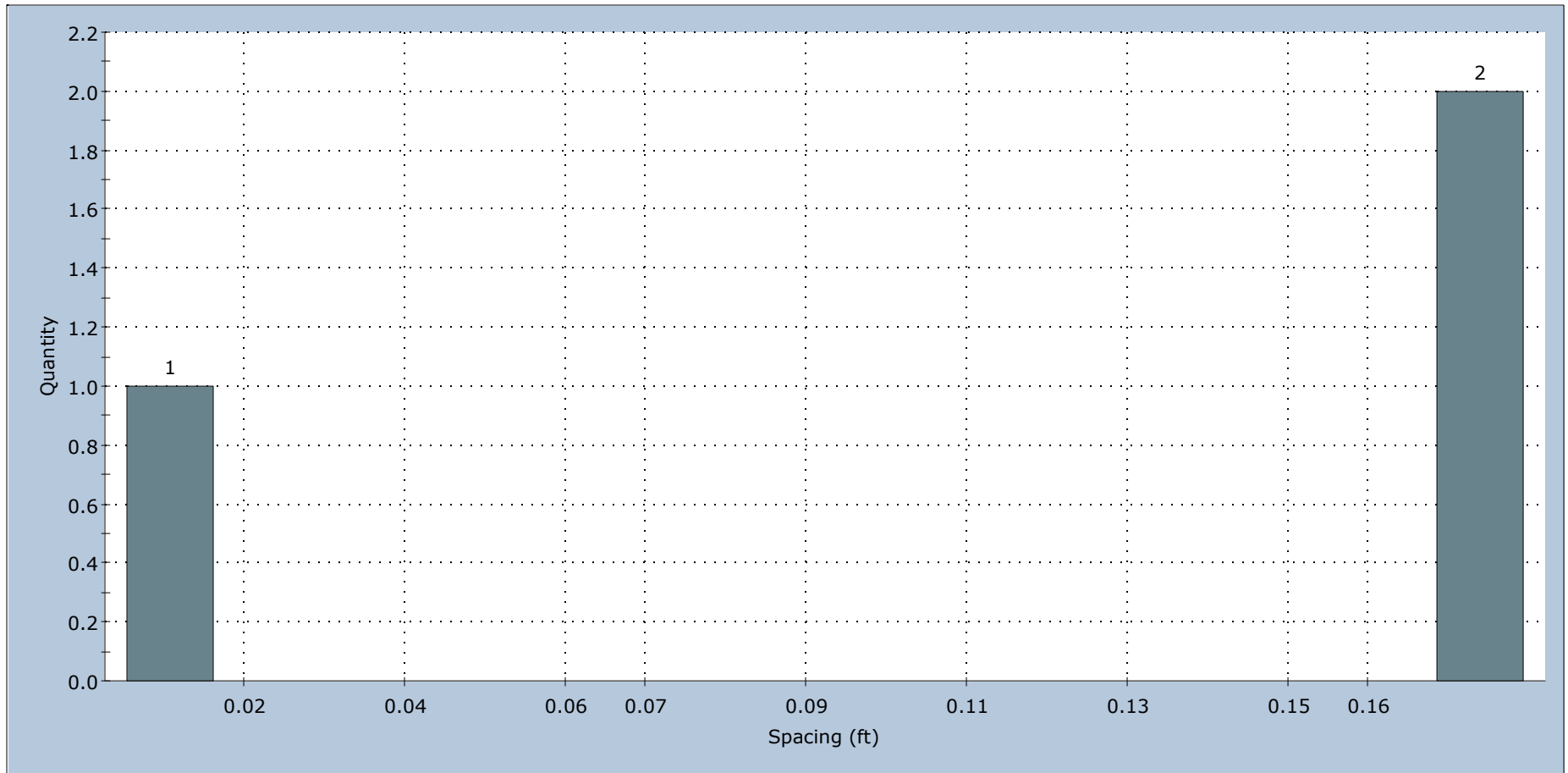
True Joint Spacing Set 3: J3 All Traverses



mean=0.714 s.d.=0.485 min=0.083 max=1.500

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - BB-ECR-202	
	<i>Drawn By</i>		J. Rawlins	<i>Company</i> Haley & Aldrich, Inc.
	<i>Date</i>		April 2021	<i>File Name</i> 2021-0414_Clewleyville_BB-ECR-202.dips8

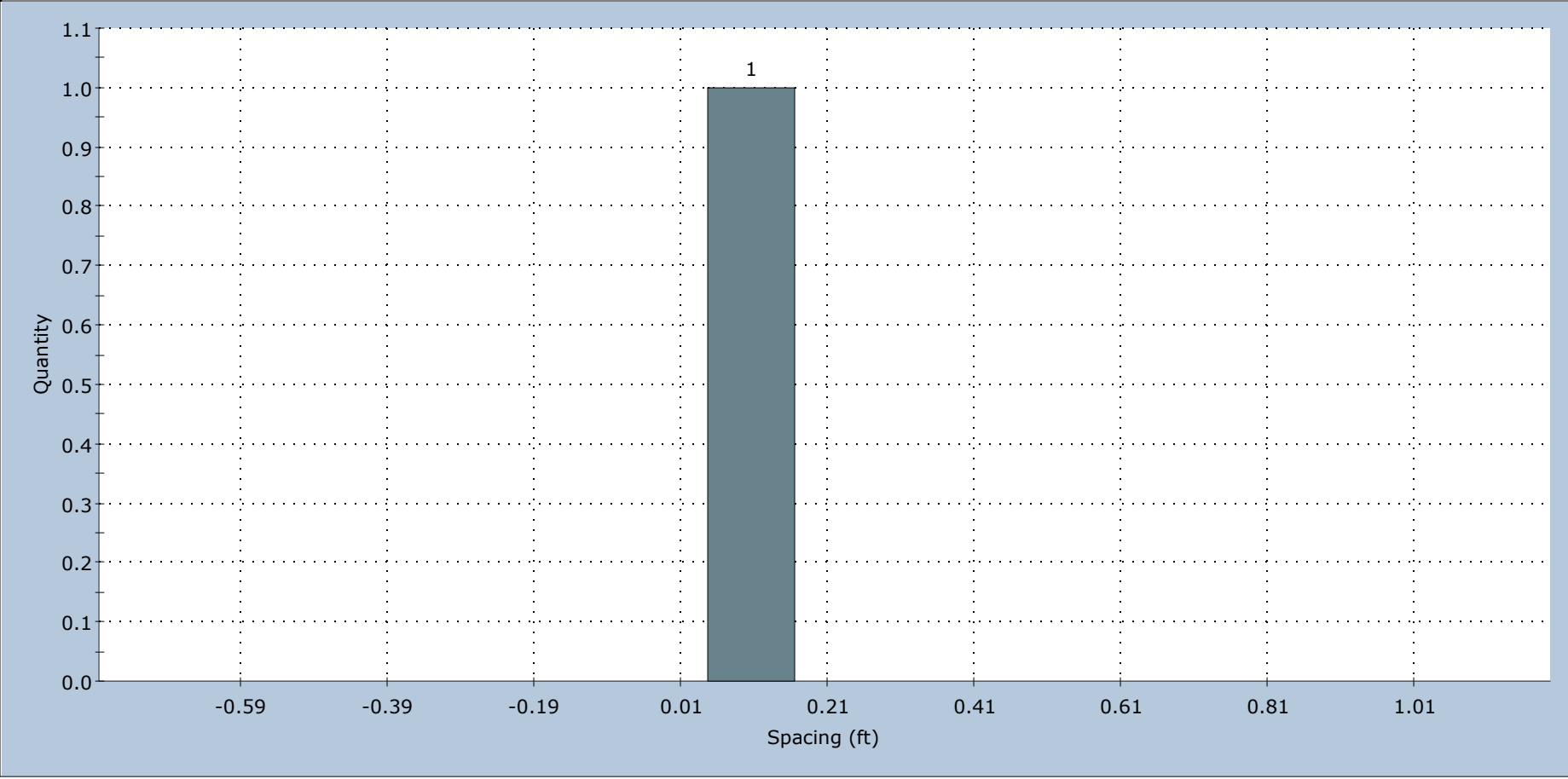
True Joint Spacing Set 4: J4 All Traverses



mean=0.123 s.d.=0.085 min=0.002 max=0.183

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - BB-ECR-202	
	<i>Drawn By</i>		J. Rawlins	<i>Company</i> Haley & Aldrich, Inc.
	<i>Date</i>		April 2021	<i>File Name</i> 2021-0414_Clewleyville_BB-ECR-202.dips8

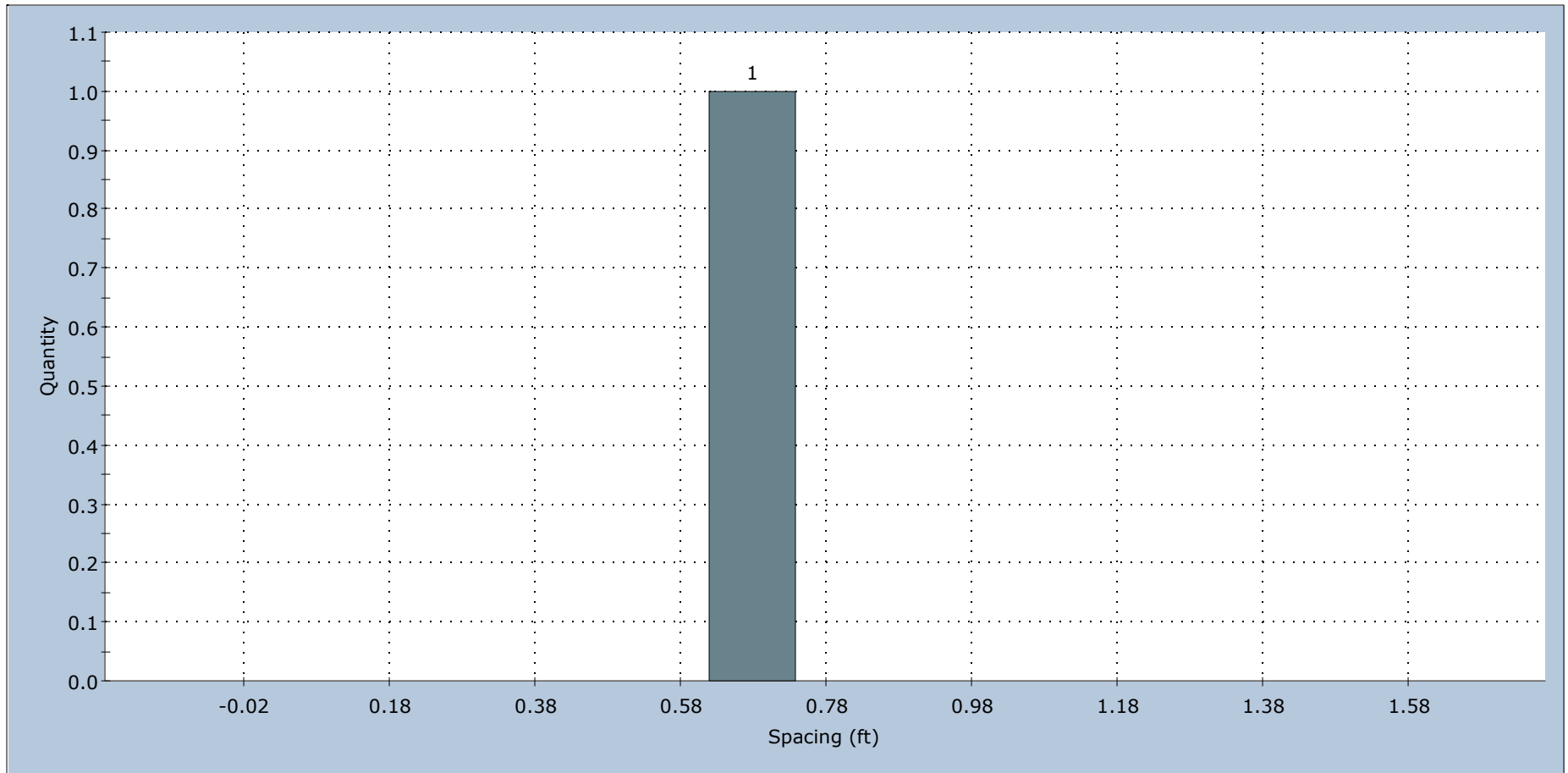
True Joint Spacing Set 5: J5 All Traverses



mean=0.207 s.d.=0.000 min=0.207 max=0.207

	Project		Brewer-Eddington I-395/Route 9 Connector	
	Analysis Description		Clewleyville Road BH Logging - BB-ECR-202	
	Drawn By		J. Rawlins	Company Haley & Aldrich, Inc.
	Date		April 2021	File Name 2021-0414_Clewleyville_BB-ECR-202.dips8

True Joint Spacing Set 6: J6 All Traverses



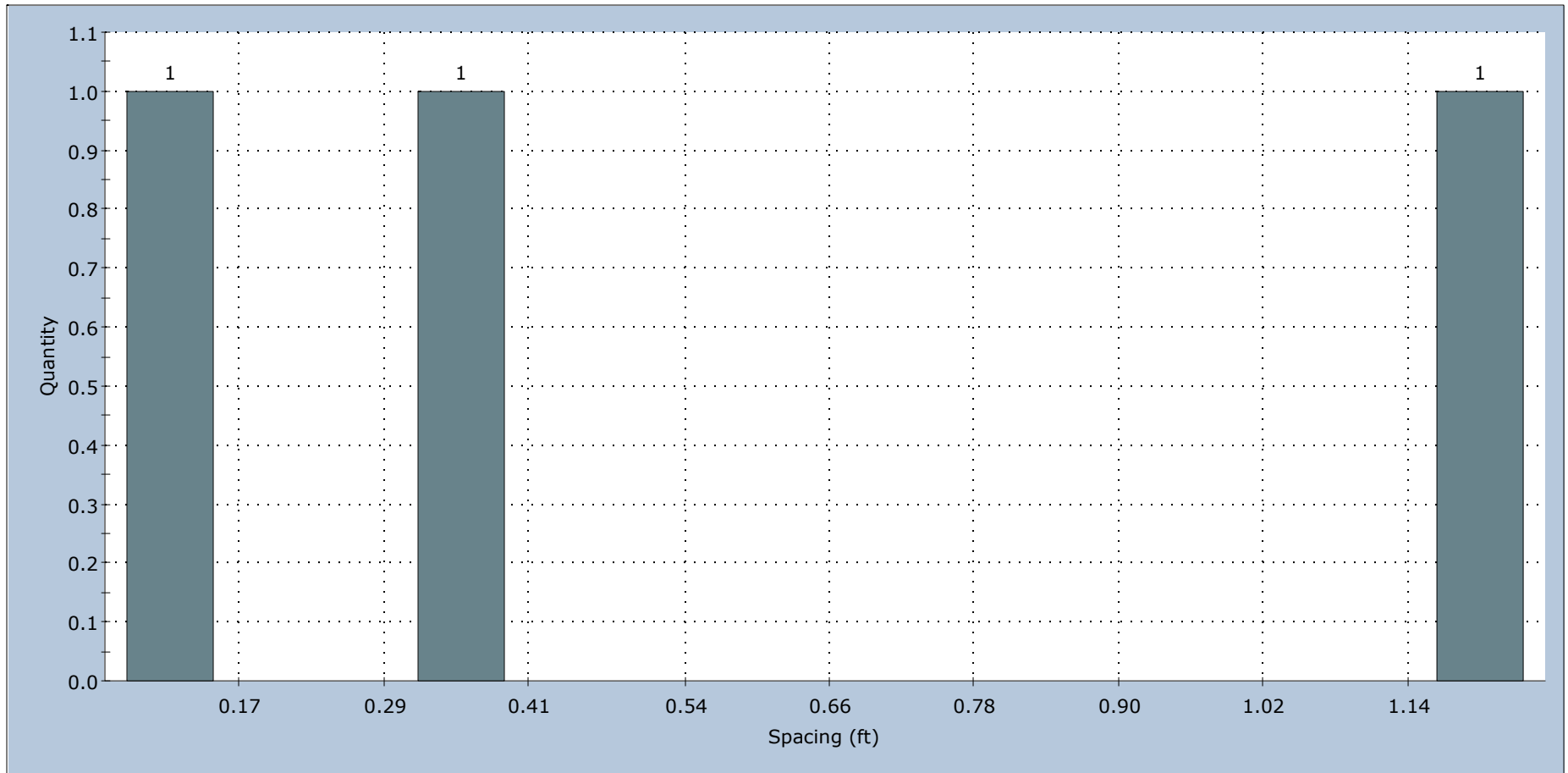
mean=0.778 s.d.=0.000 min=0.778 max=0.778

	Project		Brewer-Eddington I-395/Route 9 Connector	
	Analysis Description		Clewleyville Road BH Logging - BB-ECR-202	
	Drawn By	J. Rawlins	Company	Haley & Aldrich, Inc.
	Date	April 2021	File Name	2021-0414_Clewleyville_BB-ECR-202.dips8

True Joint Spacing

Set 8: J8

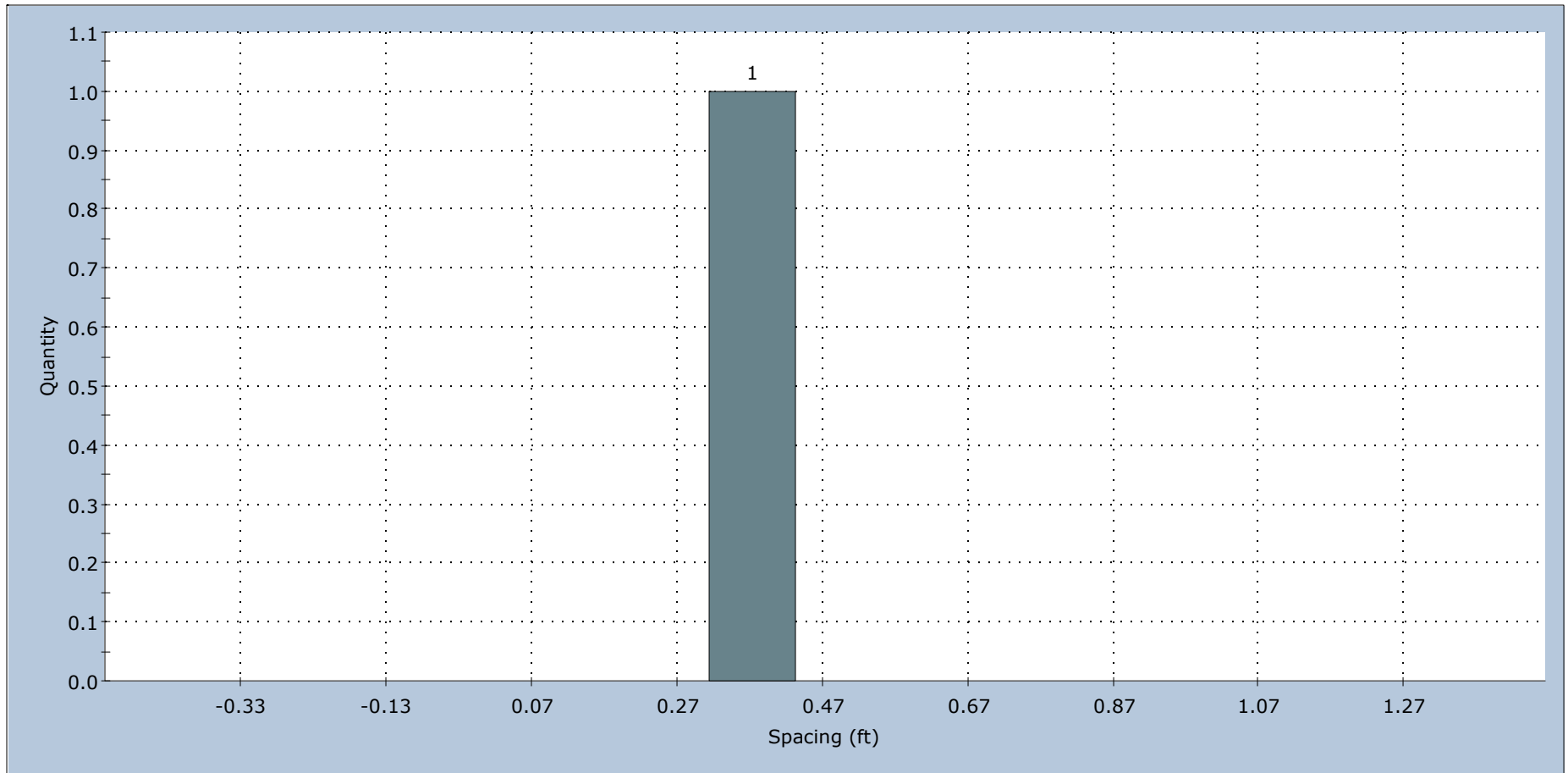
All Traverses



mean=0.543 s.d.=0.519 min=0.053 max=1.260

	Project		Brewer-Eddington I-395/Route 9 Connector	
	Analysis Description		Clewleyville Road BH Logging - BB-ECR-202	
	Drawn By	J. Rawlins	Company	Haley & Aldrich, Inc.
	Date	April 2021	File Name	2021-0414_Clewleyville_BB-ECR-202.dips8

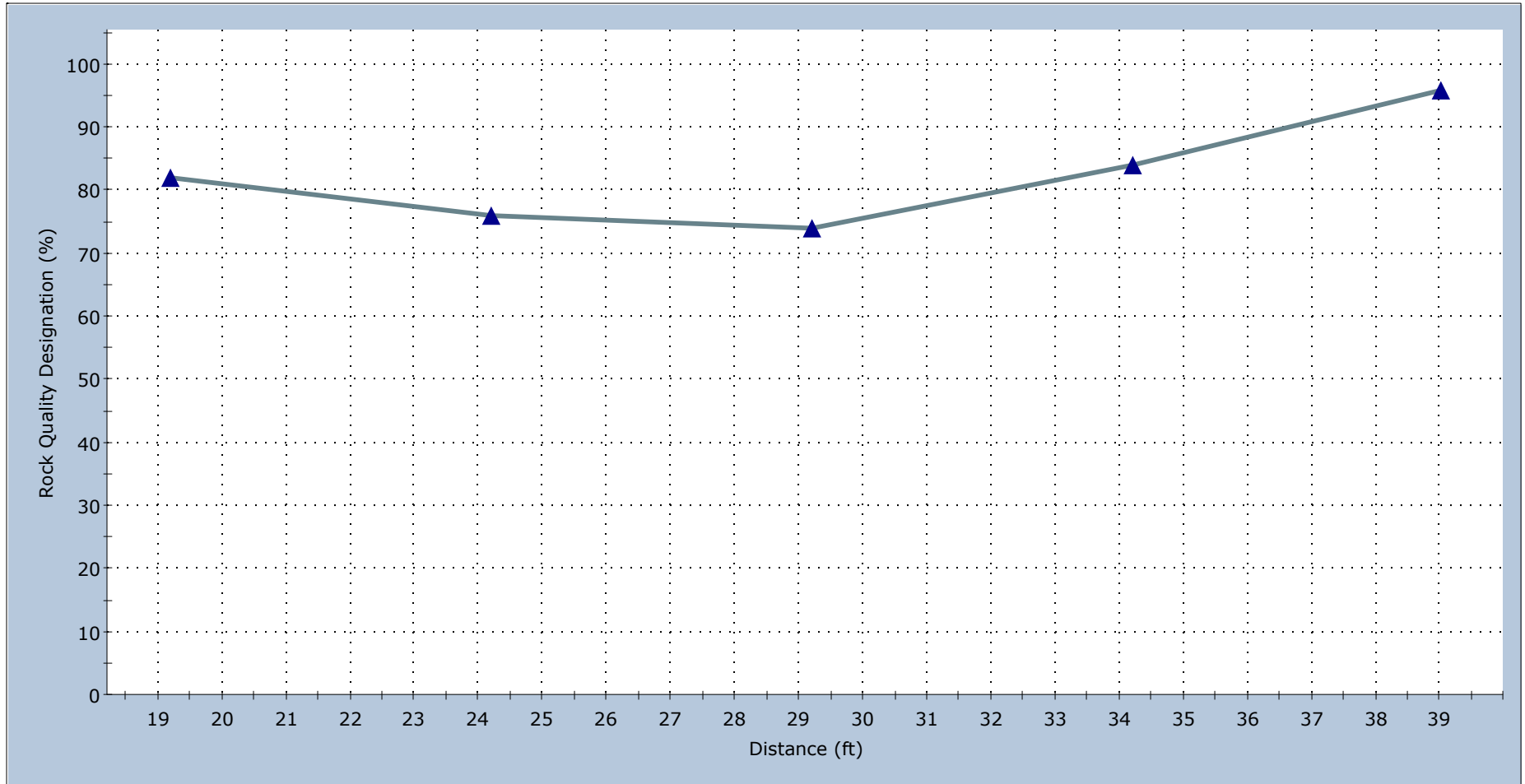
True Joint Spacing Set 9: J9 All Traverses



mean=0.474 s.d.=0.000 min=0.474 max=0.474

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - BB-ECR-202	
	<i>Drawn By</i>		J. Rawlins	<i>Company</i> Haley & Aldrich, Inc.
	<i>Date</i>		April 2021	<i>File Name</i> 2021-0414_Clewleyville_BB-ECR-202.dips8

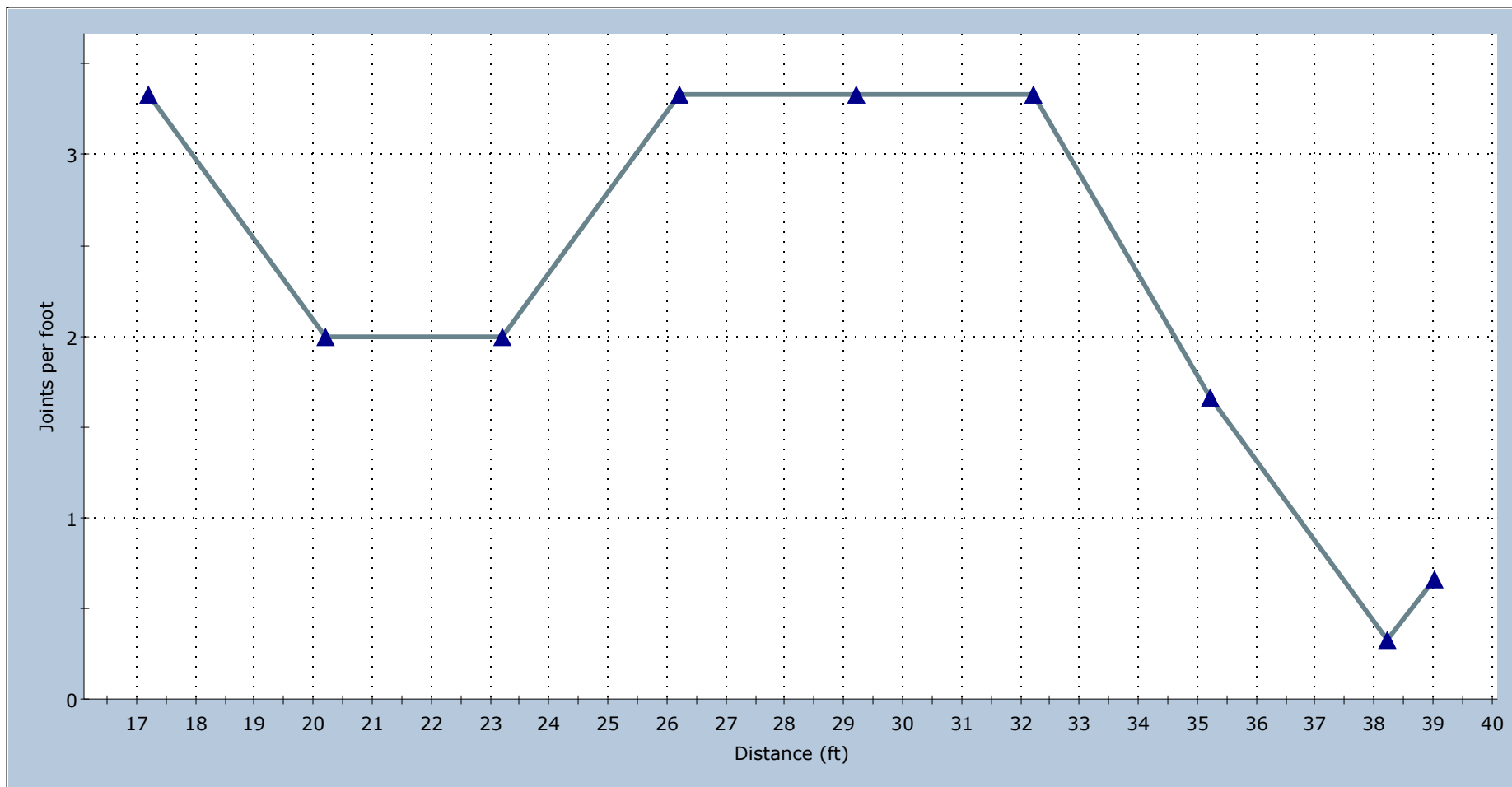
RQD Analysis Traverse L1



mean=82.367 s.d.=7.677 min=74.000 max=95.833

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - BB-ECR-203A	
	<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
	<i>Date</i>	April 2021	<i>File Name</i>	2021-0414_Clewleyville_BB-ECR-203A.dips8

Joint Frequency Analysis Traverse L1



mean=2.222 s.d.=1.122 min=0.333 max=3.333

Project

Brewer-Eddington I-395/Route 9 Connector

Analysis Description

Clewleyville Road BH Logging - BB-ECR-203A

Drawn By

J. Rawlins

Company

Haley & Aldrich, Inc.

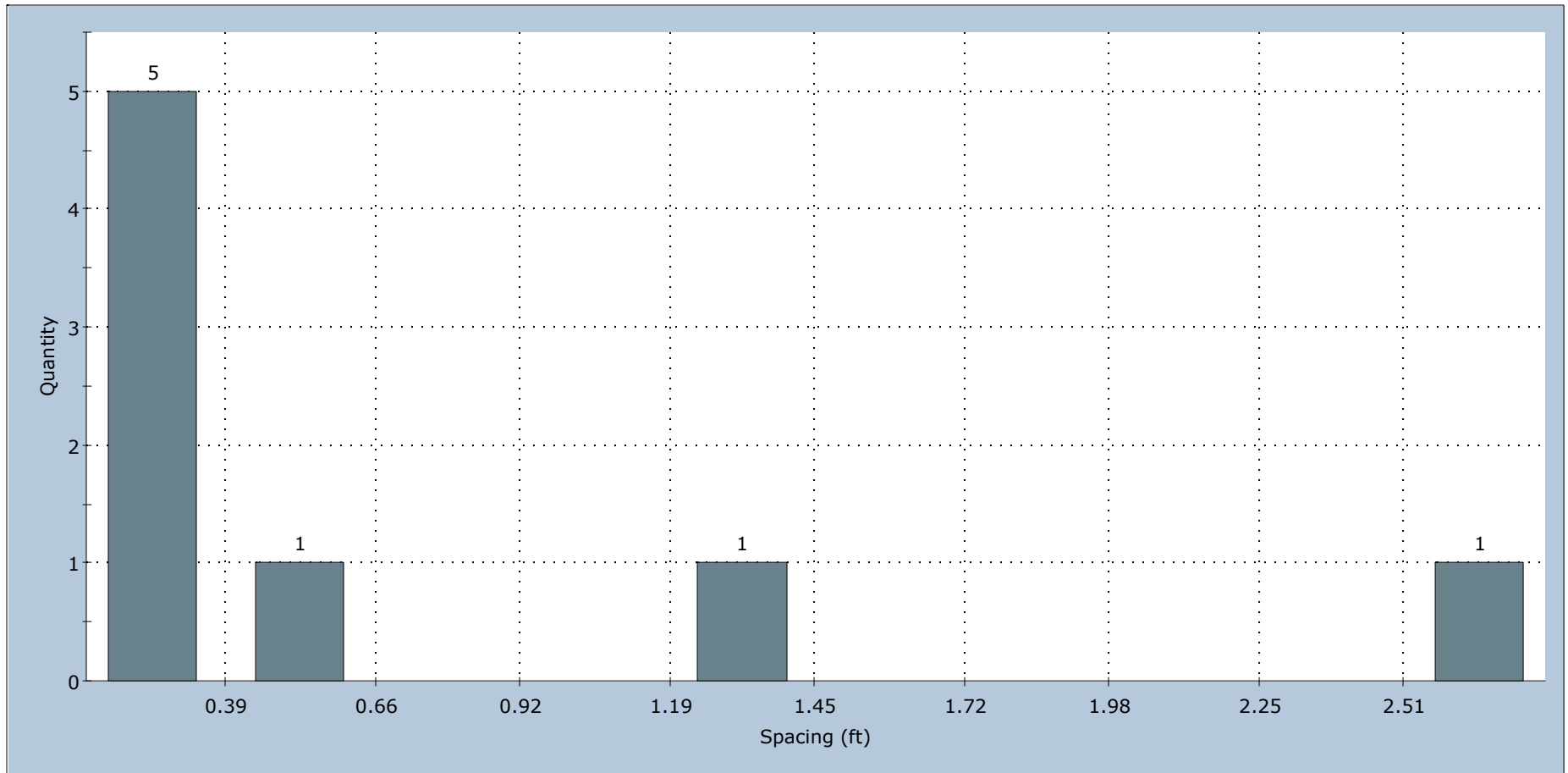
Date

April 2021

File Name

2021-0414_Clewleyville_BB-ECR-203A.dips8

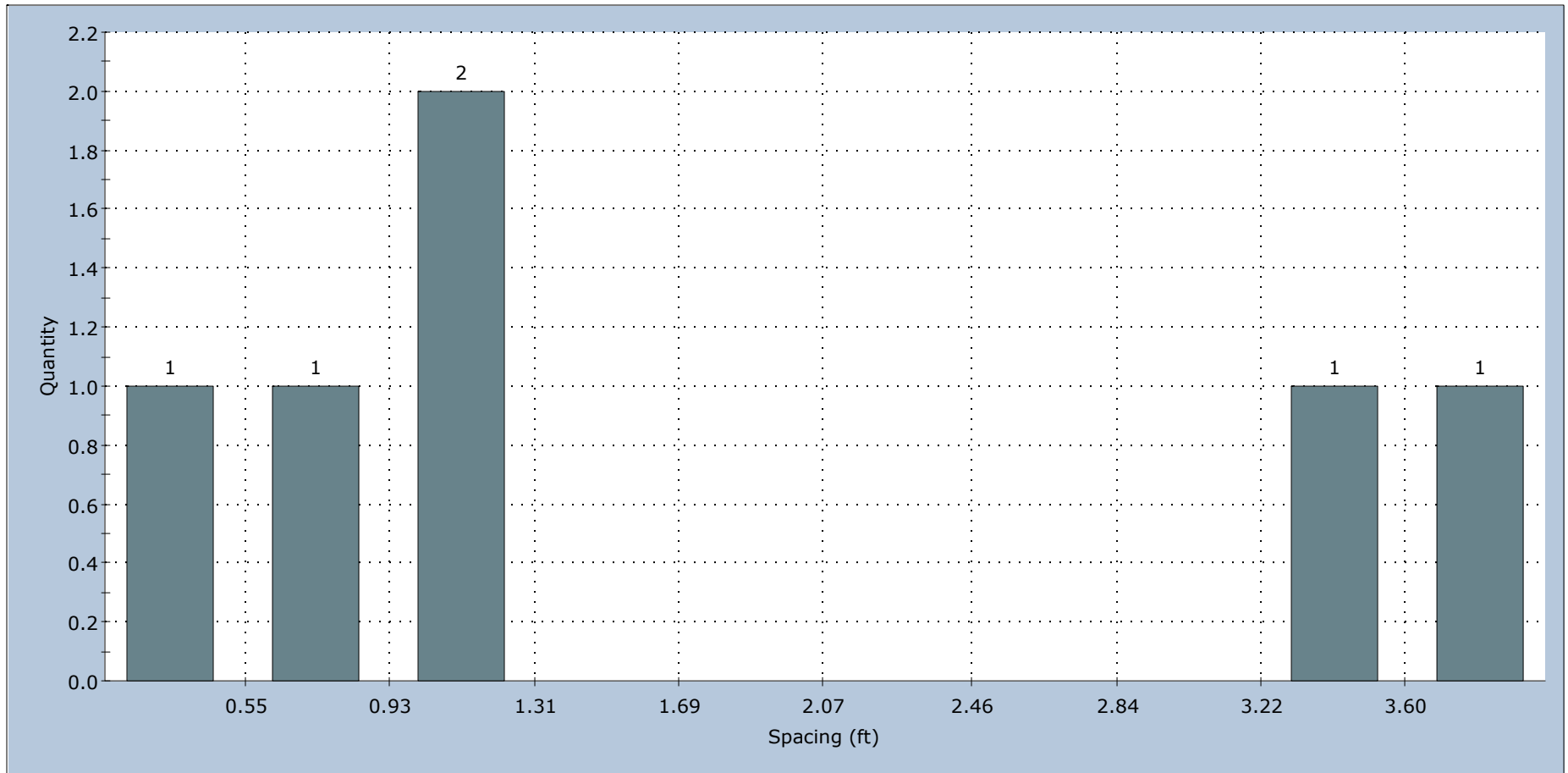
True Joint Spacing Set 1: J1 All Traverses



mean=0.715 s.d.=0.850 min=0.126 max=2.780

	Project		Brewer-Eddington I-395/Route 9 Connector	
	Analysis Description		Clewleyville Road BH Logging - BB-ECR-203A	
	Drawn By	J. Rawlins	Company	Haley & Aldrich, Inc.
	Date	April 2021	File Name	2021-0414_Clewleyville_BB-ECR-203A.dips8

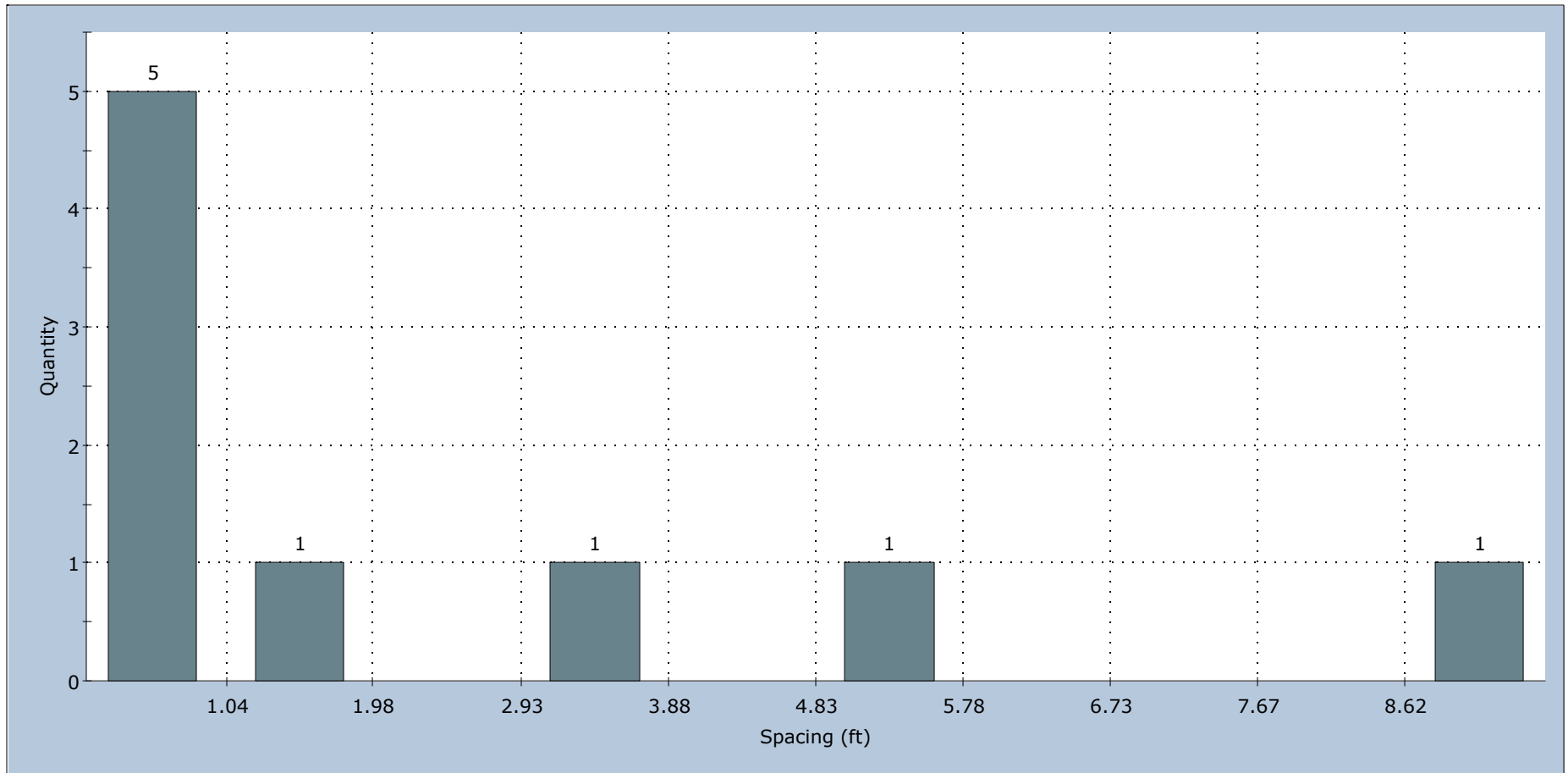
True Joint Spacing Set 2: J2 All Traverses



mean=1.749 s.d.=1.388 min=0.163 max=3.986

	Project		Brewer-Eddington I-395/Route 9 Connector	
	Analysis Description		Clewleyville Road BH Logging - BB-ECR-203A	
	Drawn By	J. Rawlins	Company	Haley & Aldrich, Inc.
	Date	April 2021	File Name	2021-0414_Clewleyville_BB-ECR-203A.dips8

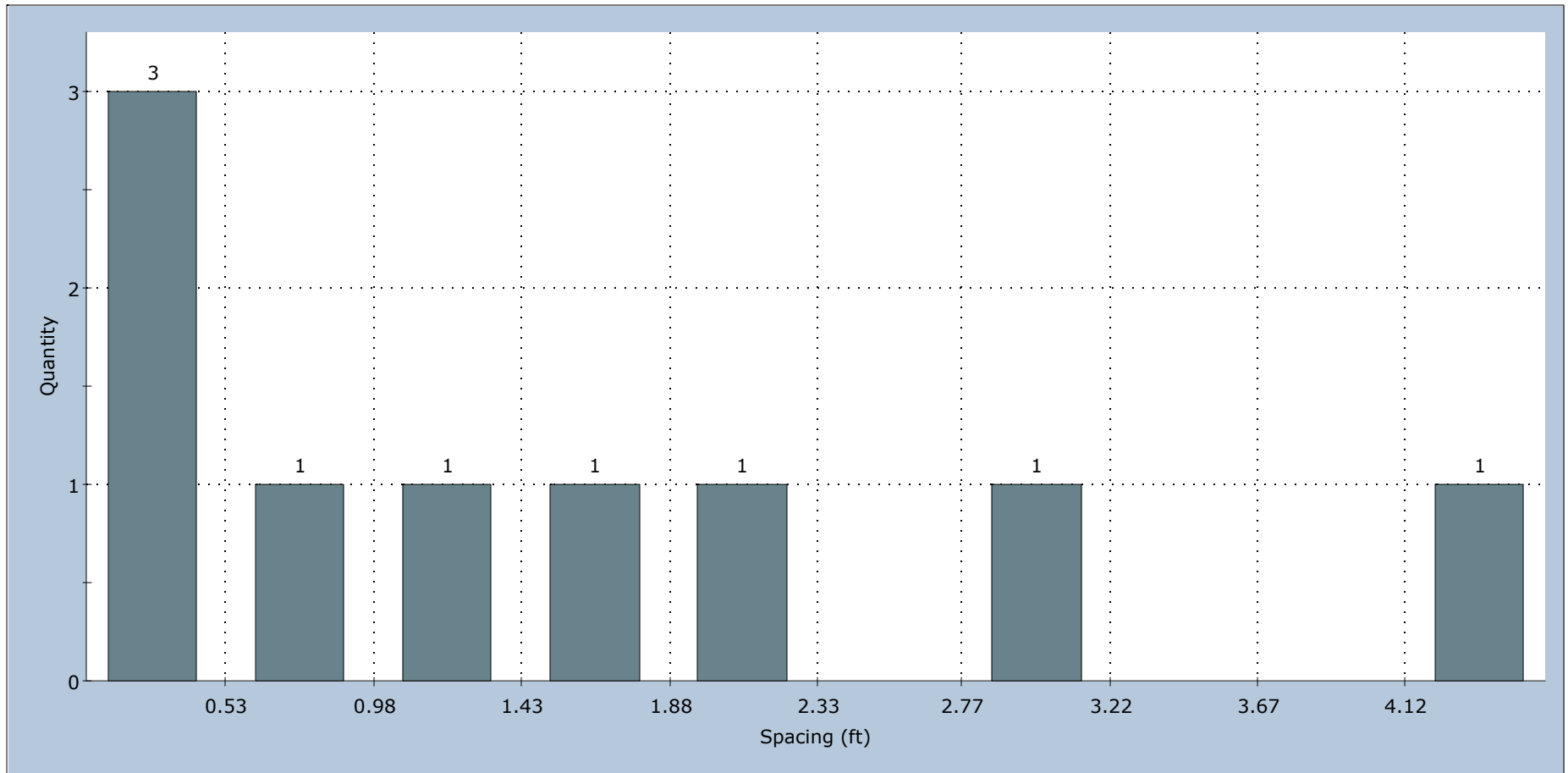
True Joint Spacing Set 3: J3 All Traverses



mean=2.398 s.d.=3.106 min=0.087 max=9.572

	Project		Brewer-Eddington I-395/Route 9 Connector	
	Analysis Description		Clewleyville Road BH Logging - BB-ECR-203A	
	Drawn By	J. Rawlins	Company	Haley & Aldrich, Inc.
	Date	April 2021	File Name	2021-0414_Clewleyville_BB-ECR-203A.dips8

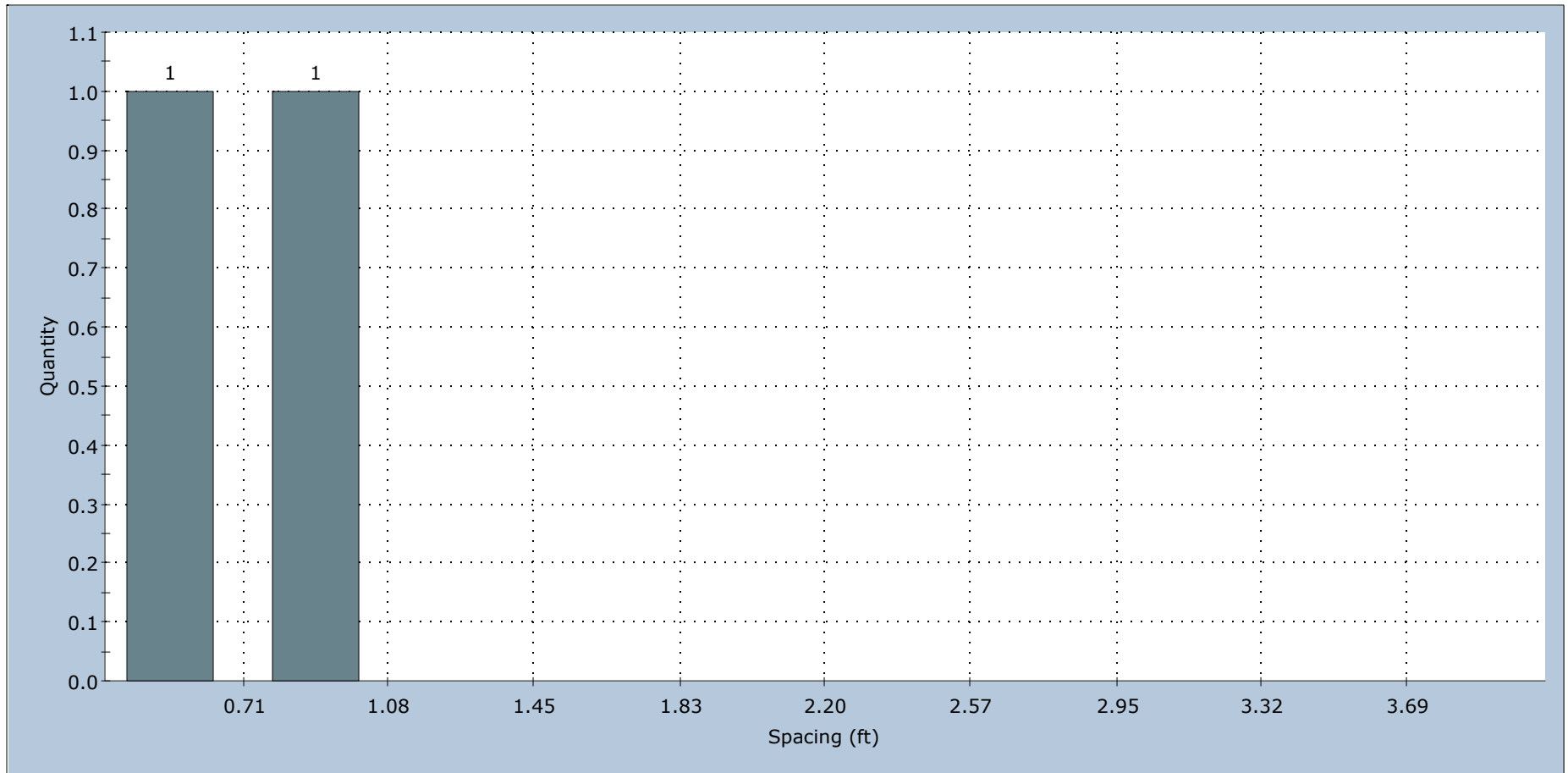
True Joint Spacing Set 4: J4 All Traverses



mean=1.523 s.d.=1.387 min=0.083 max=4.568

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - BB-ECR-203A	
	<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
	<i>Date</i>	April 2021	<i>File Name</i>	2021-0414_Clewleyville_BB-ECR-203A.dips8

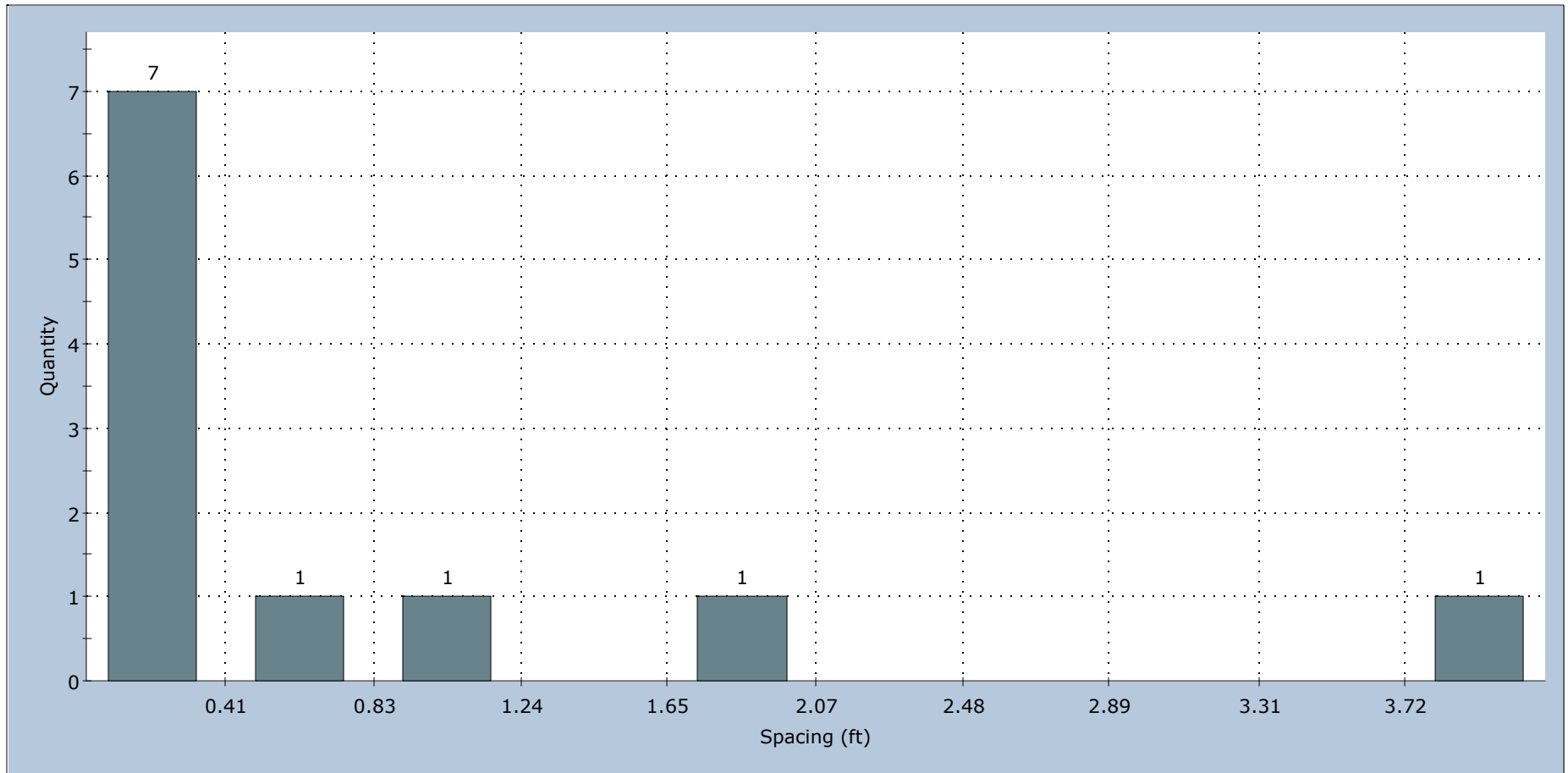
True Joint Spacing Set 6: J6 All Traverses



mean=1.706 s.d.=1.676 min=0.335 max=4.066

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - BB-ECR-203A	
	<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
	<i>Date</i>	April 2021	<i>File Name</i>	2021-0414_Clewleyville_BB-ECR-203A.dips8

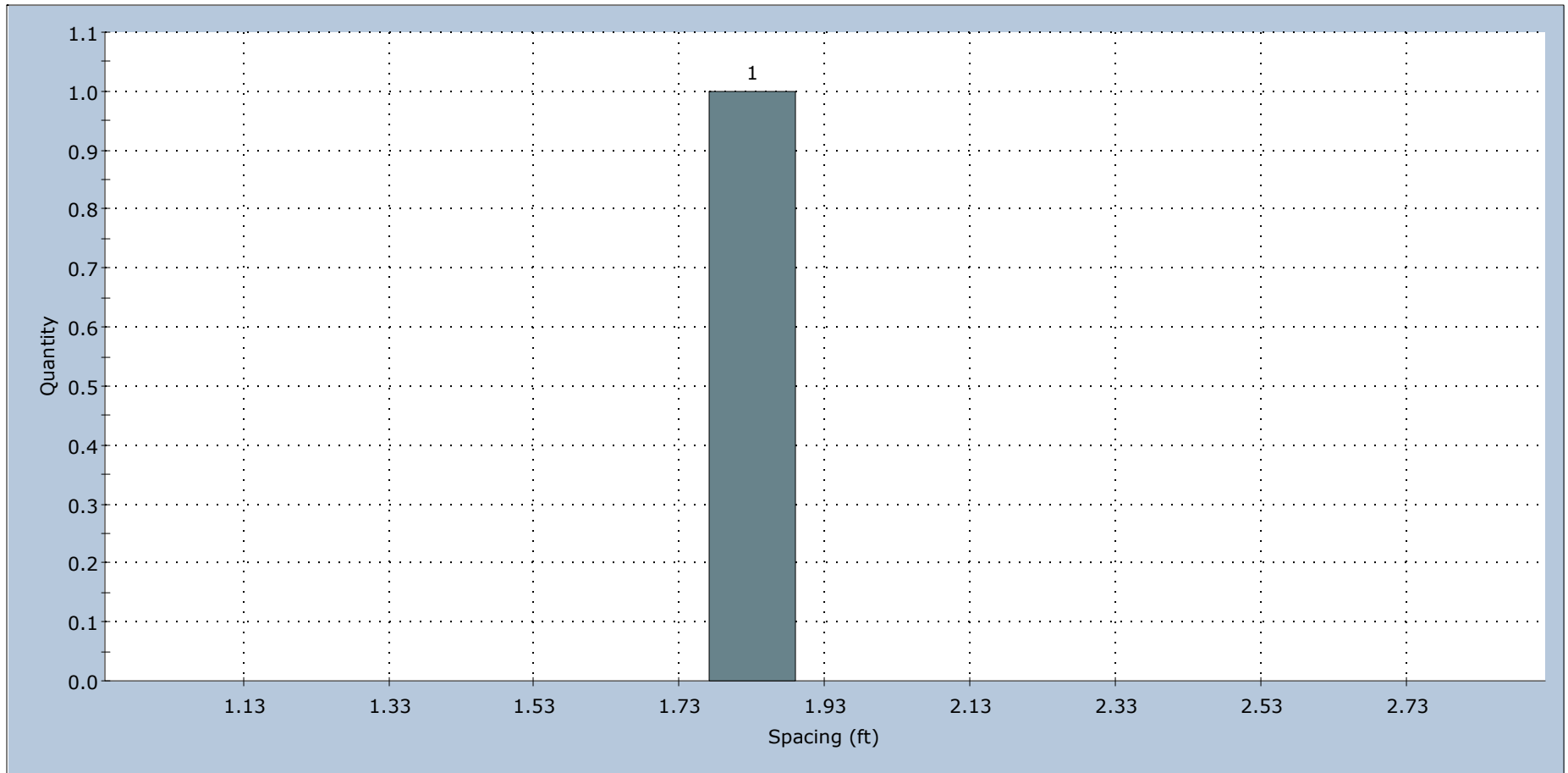
True Joint Spacing Set 7: J7 All Traverses



mean=0.793 s.d.=1.165 min=0.001 max=4.135

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - BB-ECR-203A	
	<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
	<i>Date</i>	April 2021	<i>File Name</i>	2021-0414_Clewleyville_BB-ECR-203A.dips8

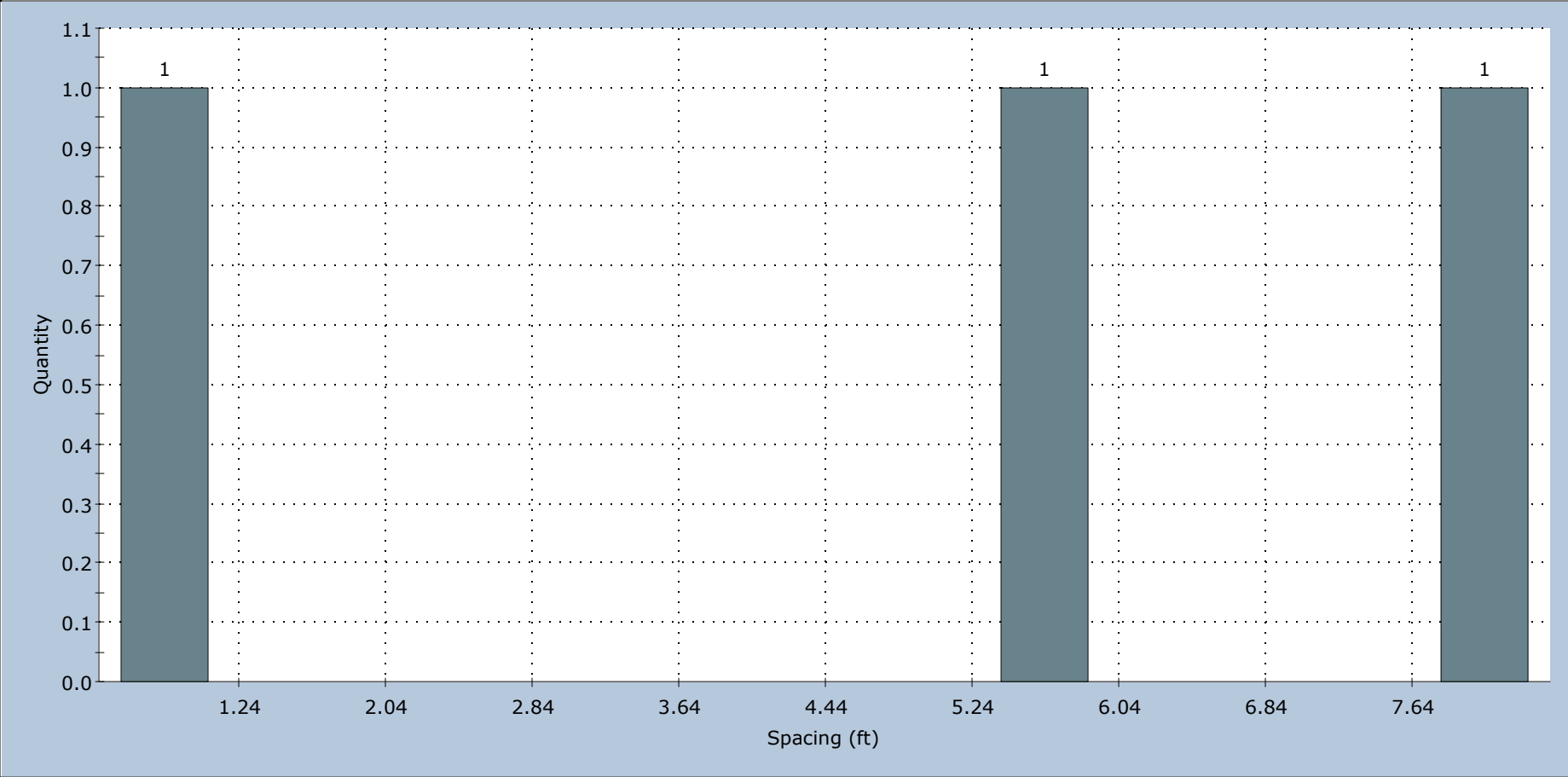
True Joint Spacing Set 8: J8 All Traverses



mean=1.930 s.d.=0.000 min=1.930 max=1.930

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - BB-ECR-203A	
	<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
	<i>Date</i>	April 2021	<i>File Name</i>	2021-0414_Clewleyville_BB-ECR-203A.dips8

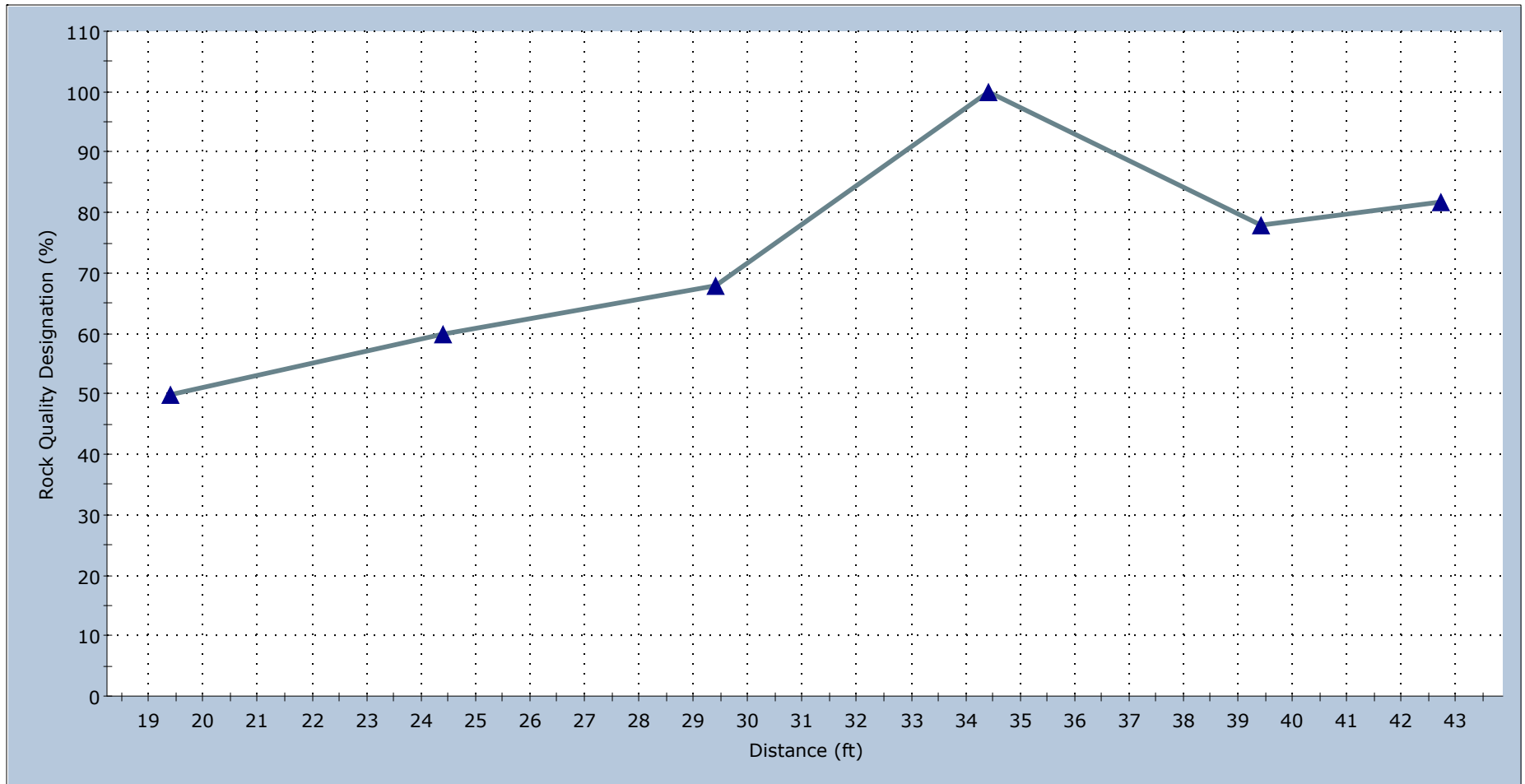
True Joint Spacing Set 9: J9 All Traverses



mean=4.921 s.d.=3.336 min=0.439 max=8.436

	Project		Brewer-Eddington I-395/Route 9 Connector	
	Analysis Description		Clewleyville Road BH Logging - BB-ECR-203A	
	Drawn By		J. Rawlins	Company Haley & Aldrich, Inc.
	Date		April 2021	File Name 2021-0414_Clewleyville_BB-ECR-203A.dips8

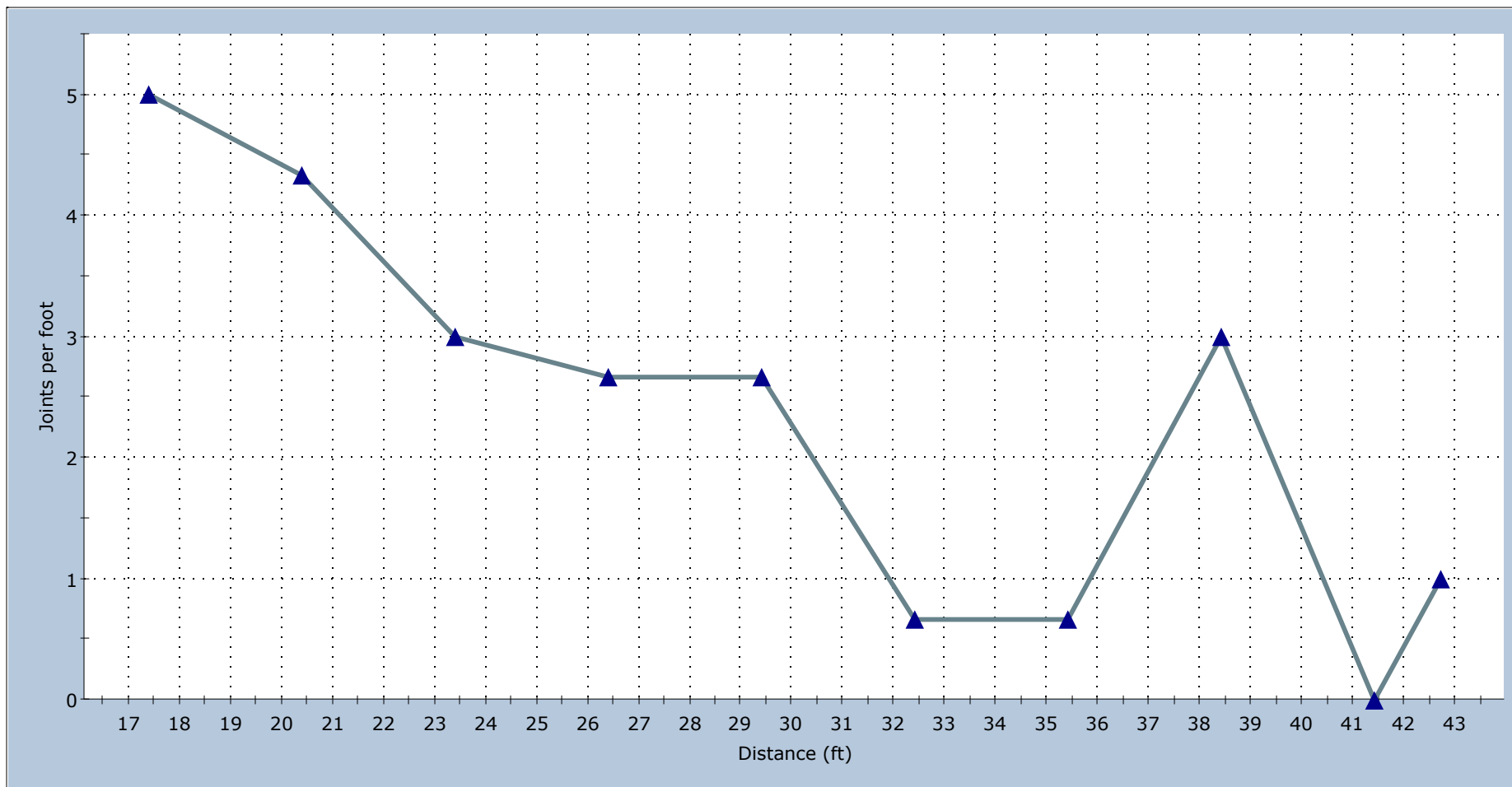
RQD Analysis Traverse L1



mean=72.970 s.d.=16.097 min=50.000 max=100.000

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - BB-ECR-204A	
	<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
	<i>Date</i>	April 2021	<i>File Name</i>	2021-0414_Clewleyville_BB-ECR-204A.dips8

Joint Frequency Analysis Traverse L1



mean=2.300 s.d.=1.581 min=0.000 max=5.000

Project

Brewer-Eddington I-395/Route 9 Connector

Analysis Description

Clewleyville Road BH Logging - BB-ECR-204A

Drawn By

J. Rawlins

Company

Haley & Aldrich, Inc.

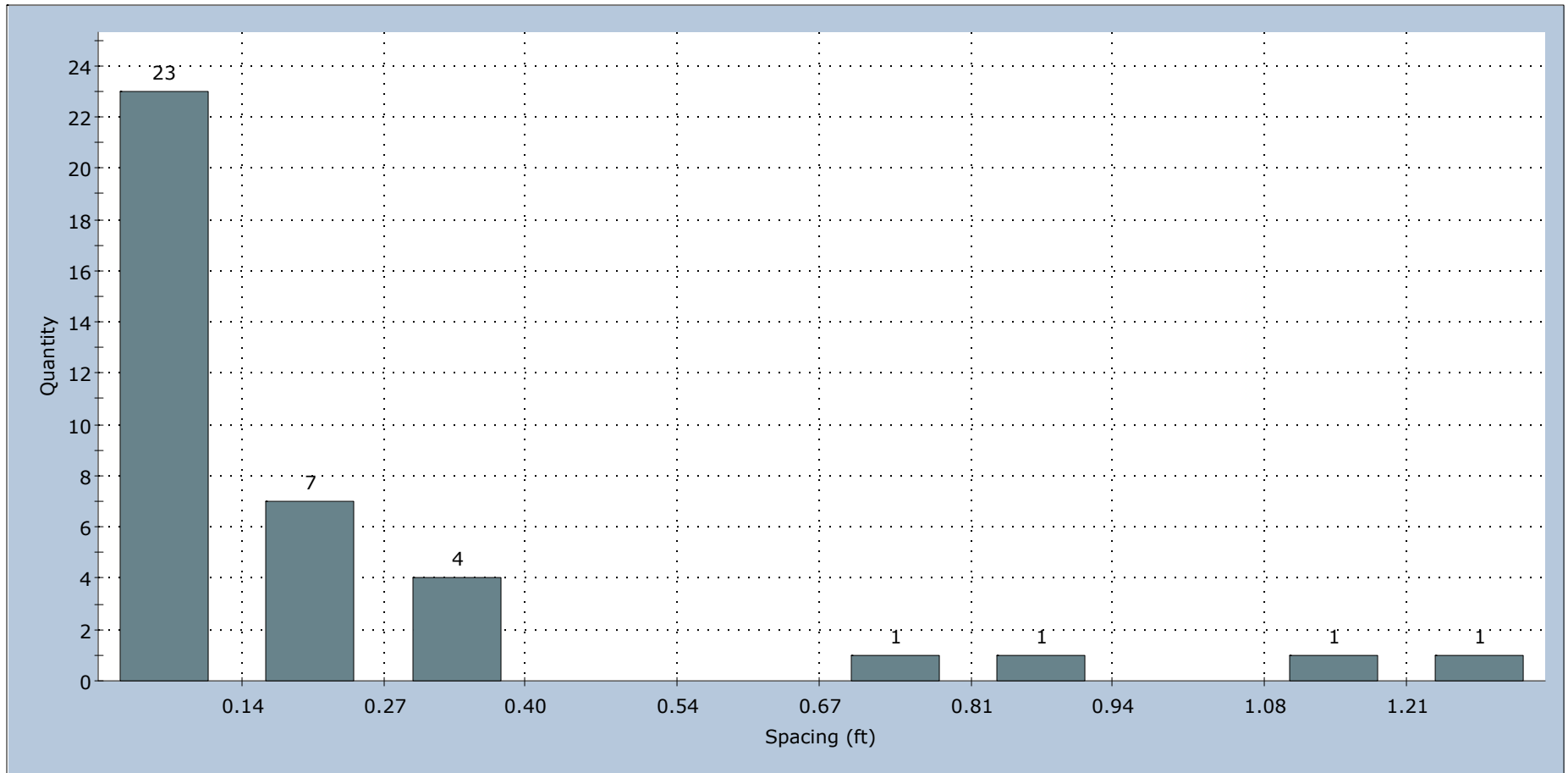
Date

April 2021

File Name

2021-0414_Clewleyville_BB-ECR-204A.dips8

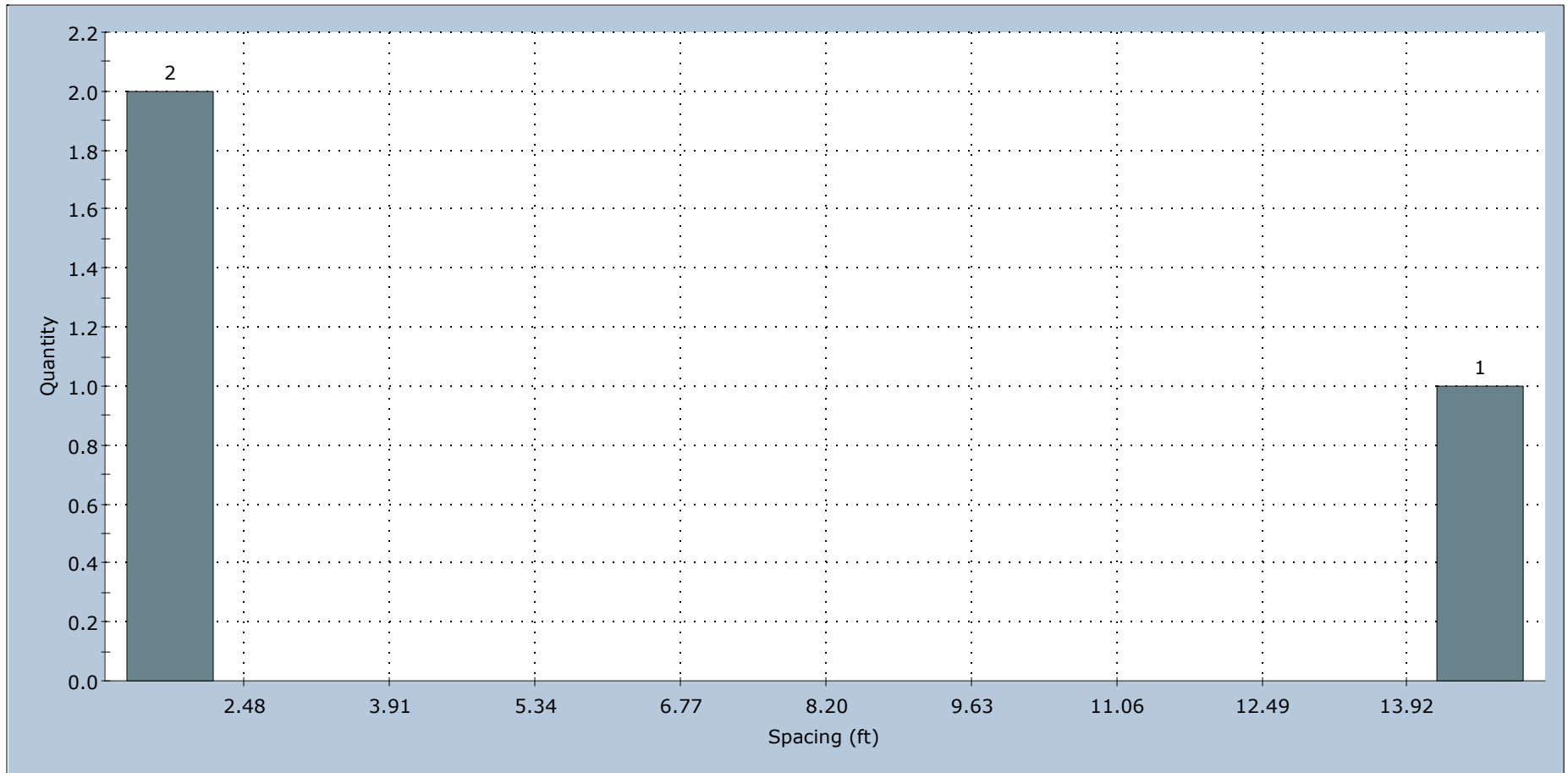
True Joint Spacing Set 1: J1 All Traverses



mean=0.224 s.d.=0.303 min=0.001 max=1.345

	Project		Brewer-Eddington I-395/Route 9 Connector	
	Analysis Description		Clewleyville Road BH Logging - BB-ECR-204A	
	Drawn By	J. Rawlins	Company	Haley & Aldrich, Inc.
	Date	April 2021	File Name	2021-0414_Clewleyville_BB-ECR-204A.dips8

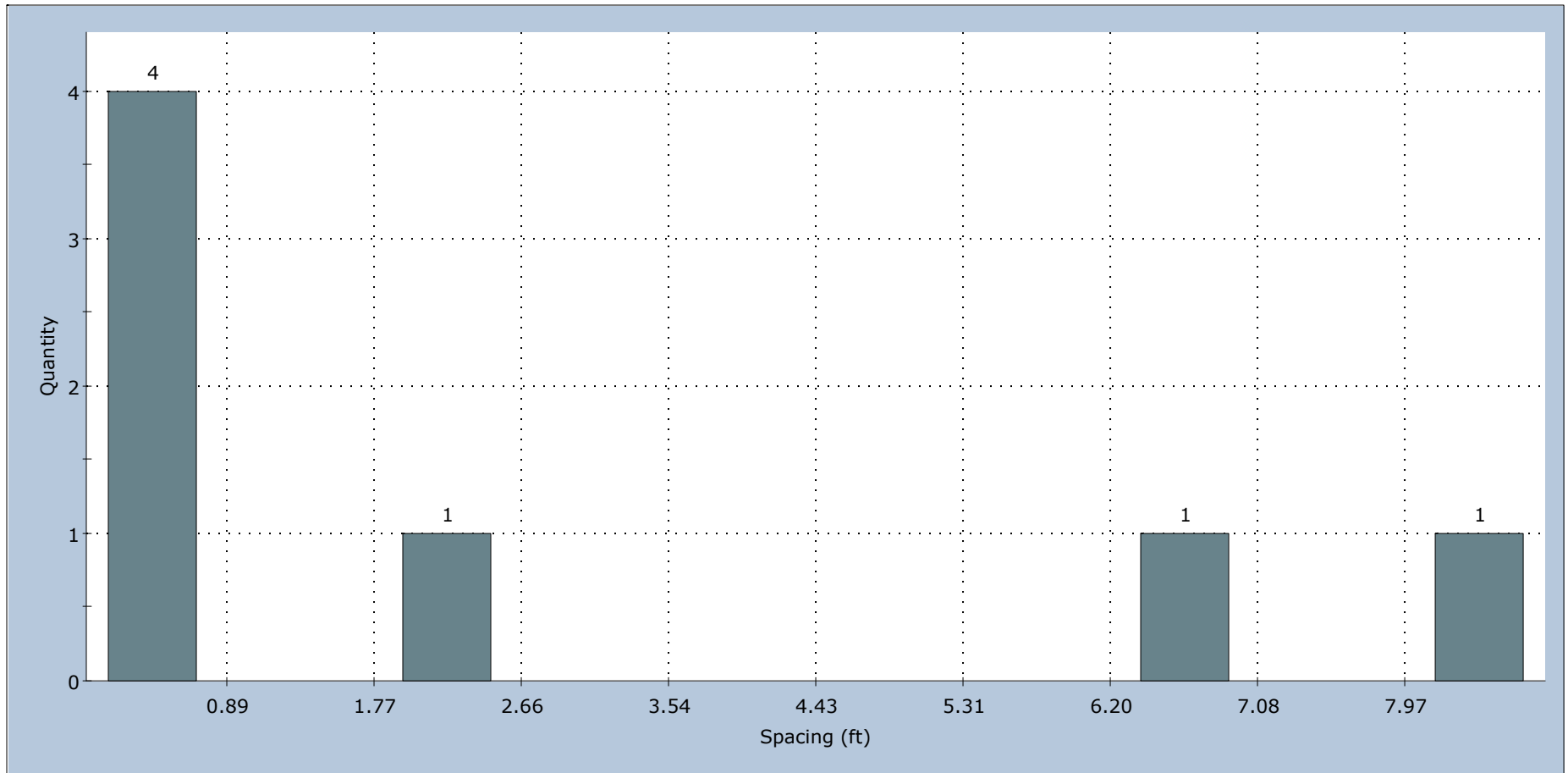
True Joint Spacing Set 2: J2 All Traverses



mean=6.017 s.d.=6.603 min=1.046 max=15.348

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - BB-ECR-204A	
	<i>Drawn By</i>		J. Rawlins	<i>Company</i> Haley & Aldrich, Inc.
	<i>Date</i>		April 2021	<i>File Name</i> 2021-0414_Clewleyville_BB-ECR-204A.dips8

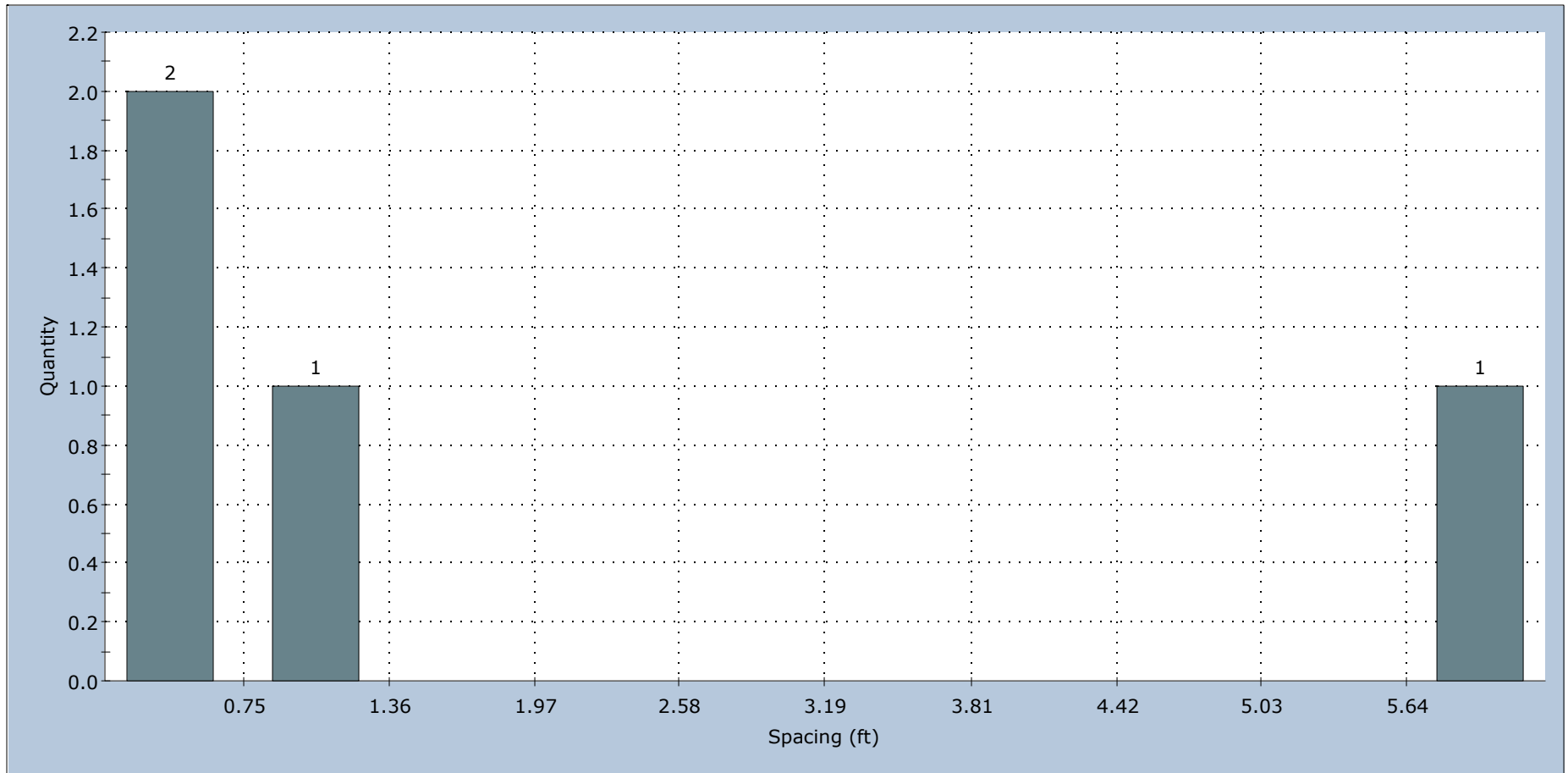
True Joint Spacing Set 3: J3 All Traverses



mean=2.713 s.d.=3.351 min=0.002 max=8.855

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - BB-ECR-204A	
	<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
	<i>Date</i>	April 2021	<i>File Name</i>	2021-0414_Clewleyville_BB-ECR-204A.dips8

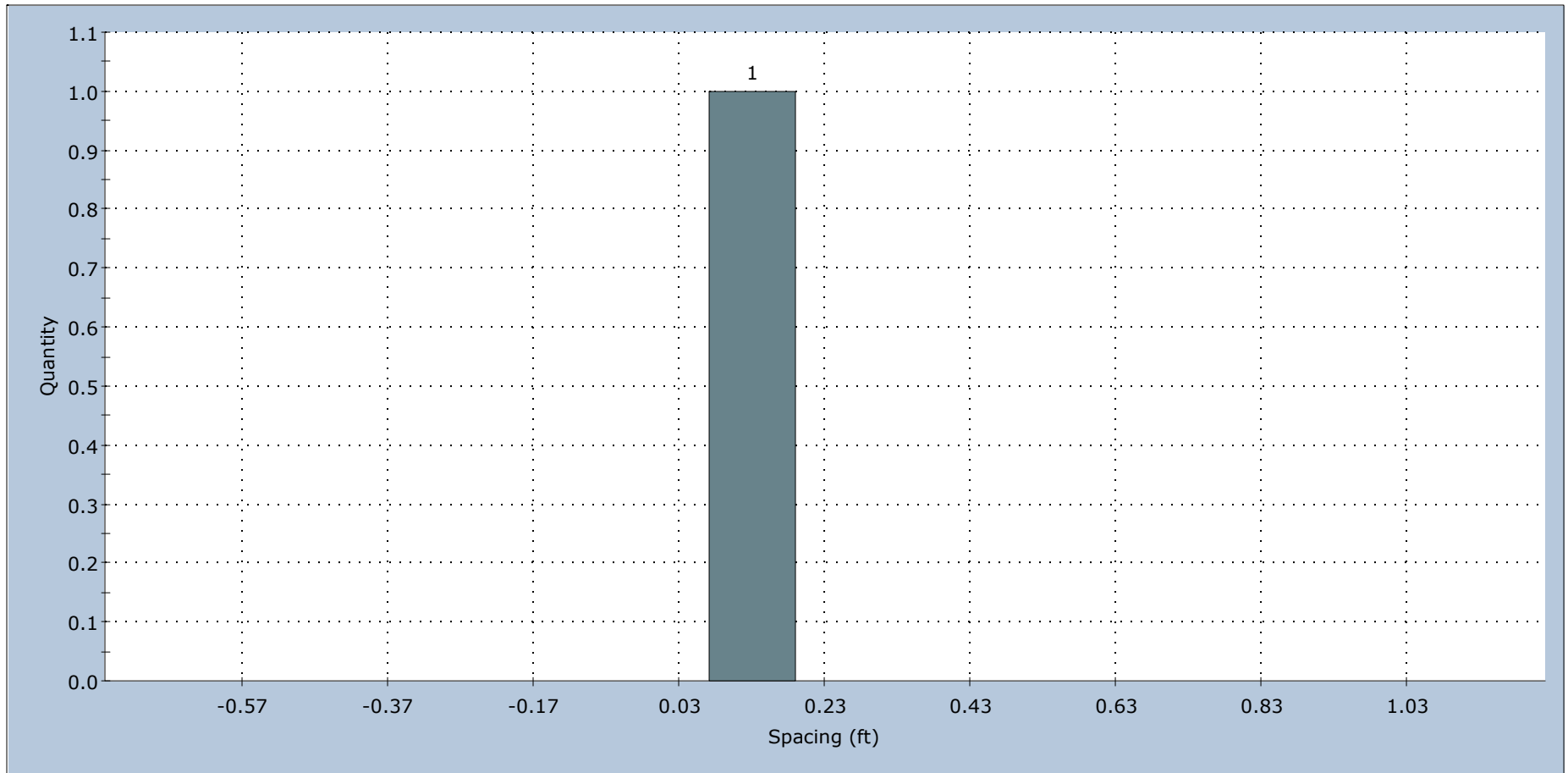
True Joint Spacing Set 5: J5 All Traverses



mean=1.898 s.d.=2.540 min=0.134 max=6.254

<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
<i>Analysis Description</i>		Clewleyville Road BH Logging - BB-ECR-204A	
<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
<i>Date</i>	April 2021	<i>File Name</i>	2021-0414_Clewleyville_BB-ECR-204A.dips8

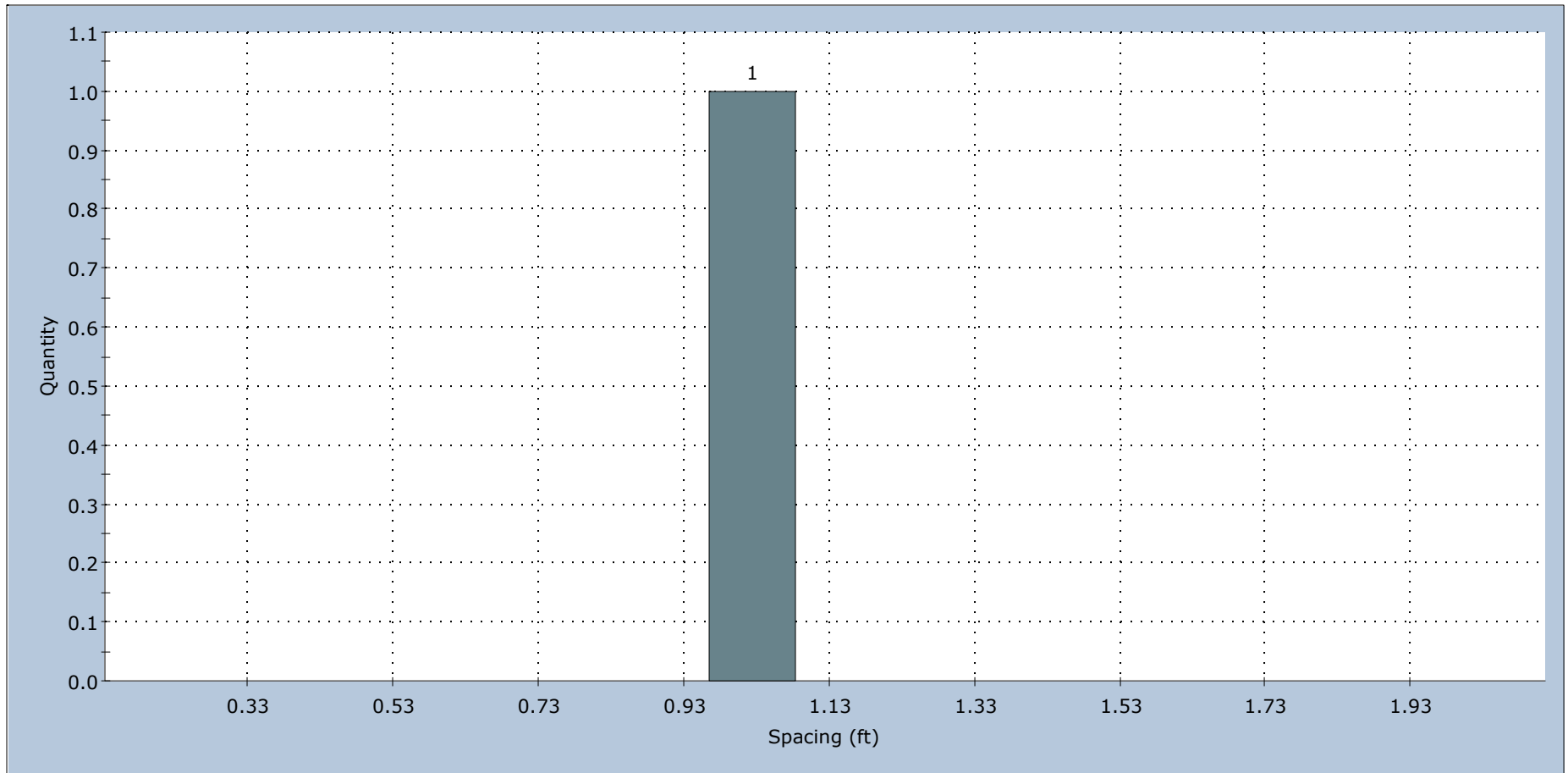
True Joint Spacing Set 6: J6 All Traverses



mean=0.231 s.d.=0.000 min=0.231 max=0.231

<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
<i>Analysis Description</i>		Clewleyville Road BH Logging - BB-ECR-204A	
<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
<i>Date</i>	April 2021	<i>File Name</i>	2021-0414_Clewleyville_BB-ECR-204A.dips8

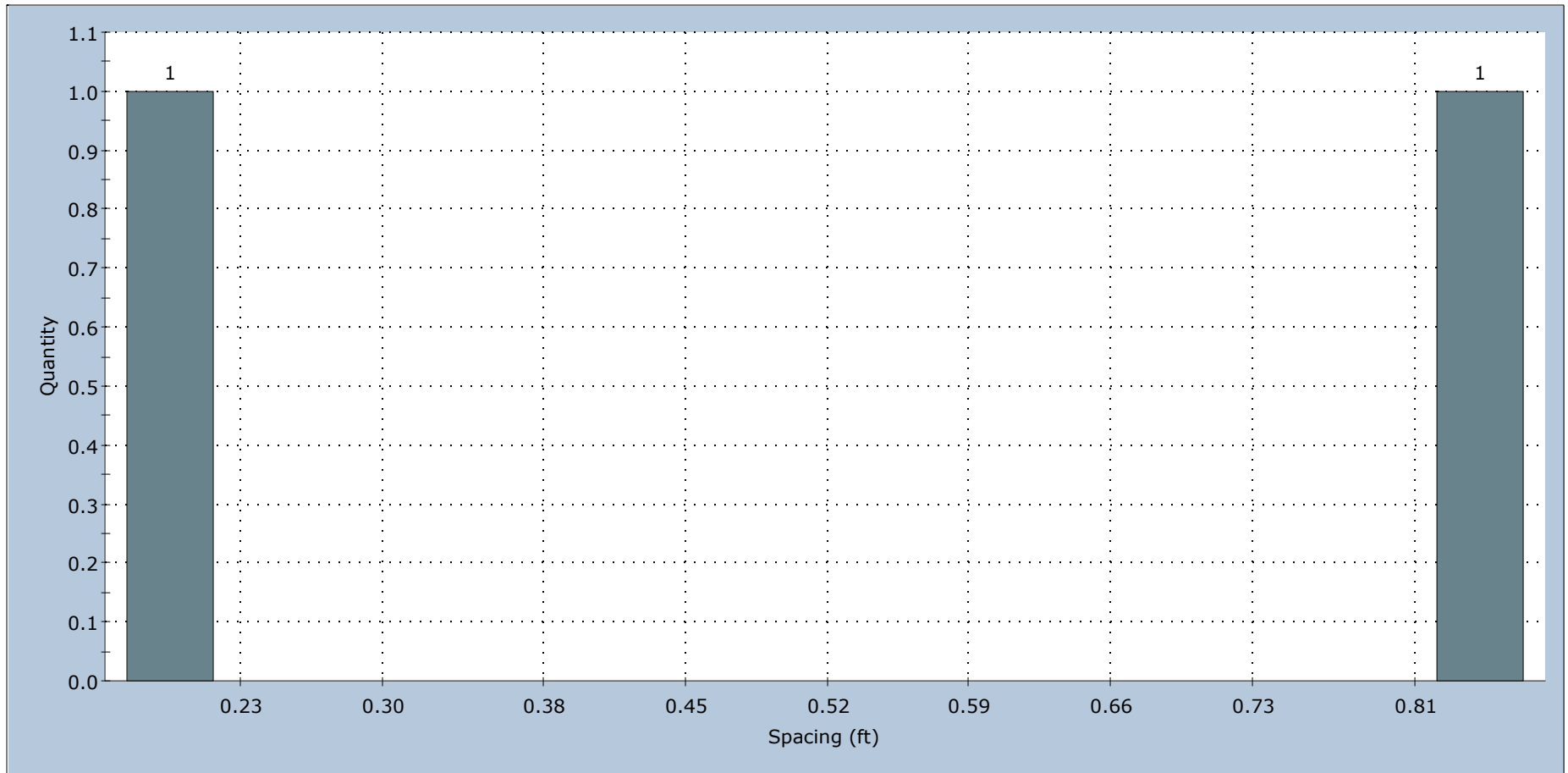
True Joint Spacing Set 7: J7 All Traverses



mean=1.125 s.d.=0.000 min=1.125 max=1.125

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - BB-ECR-204A	
	<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
	<i>Date</i>	April 2021	<i>File Name</i>	2021-0414_Clewleyville_BB-ECR-204A.dips8

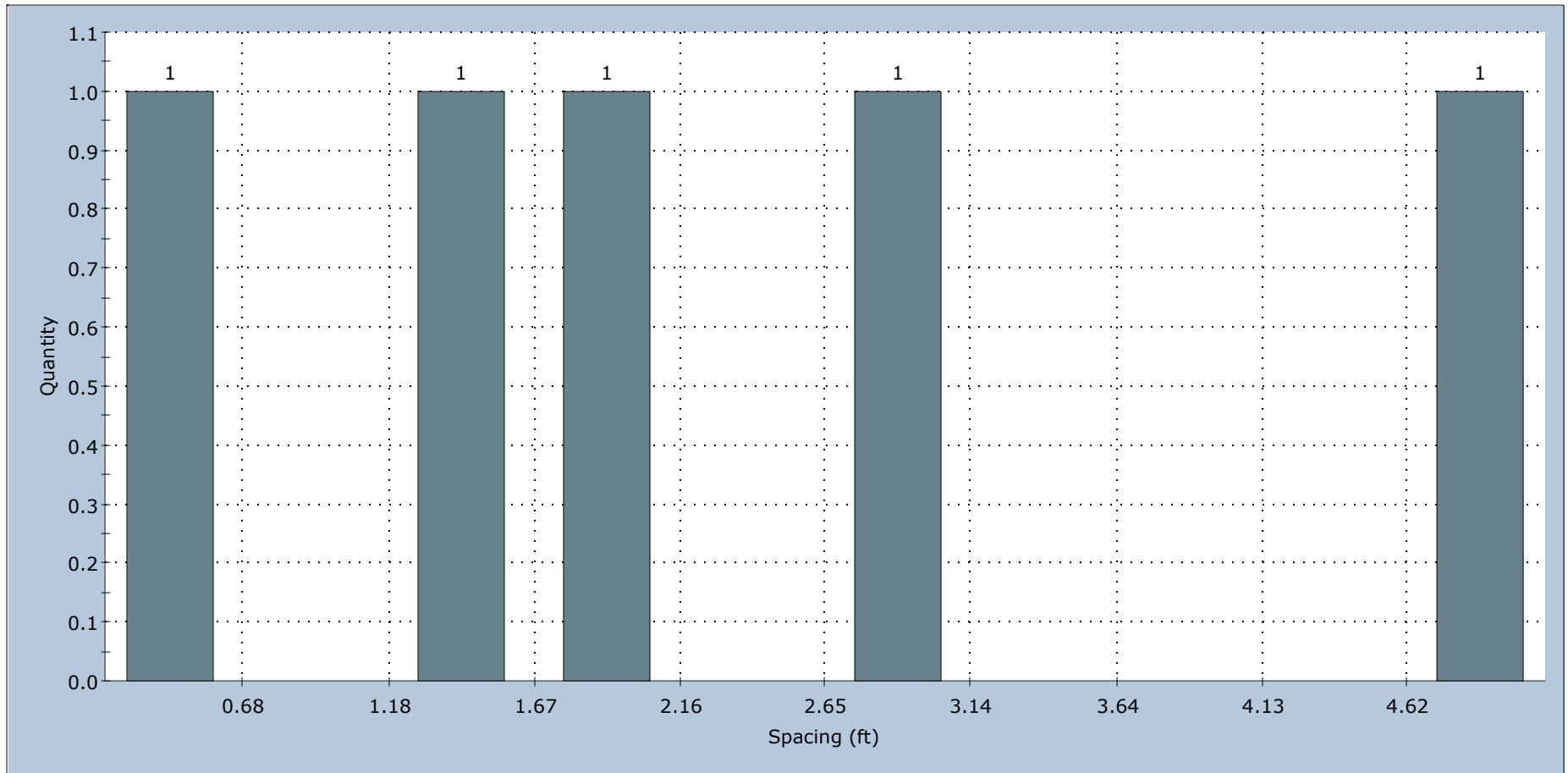
True Joint Spacing Set 8: J8 All Traverses



mean=0.519 s.d.=0.359 min=0.160 max=0.878

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - BB-ECR-204A	
	<i>Drawn By</i>		J. Rawlins	<i>Company</i> Haley & Aldrich, Inc.
	<i>Date</i>		April 2021	<i>File Name</i> 2021-0414_Clewleyville_BB-ECR-204A.dips8

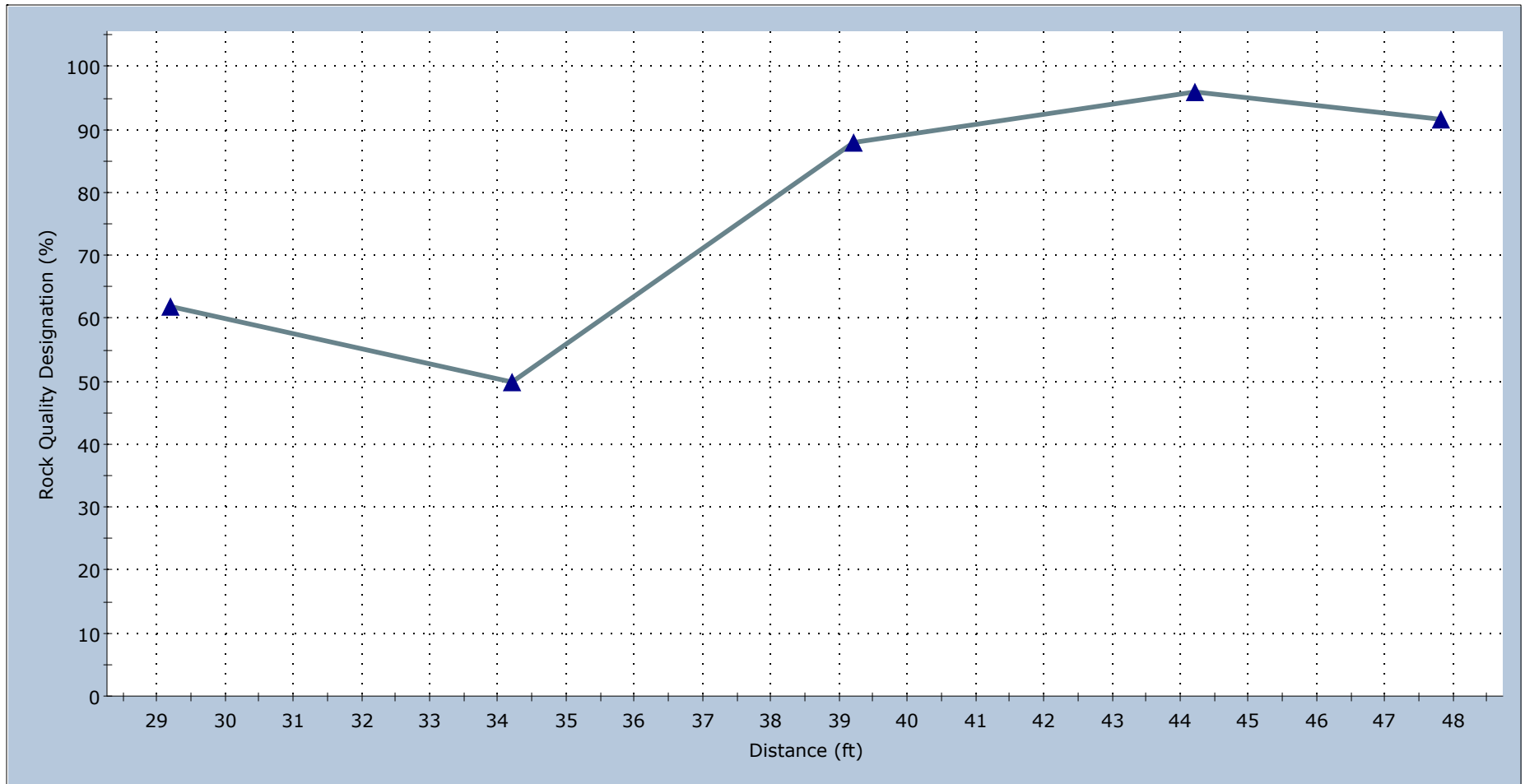
True Joint Spacing Set 9: J9 All Traverses



mean=2.295 s.d.=1.684 min=0.193 max=5.111

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - BB-ECR-204A	
	<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
	<i>Date</i>	April 2021	<i>File Name</i>	2021-0414_Clewleyville_BB-ECR-204A.dips8

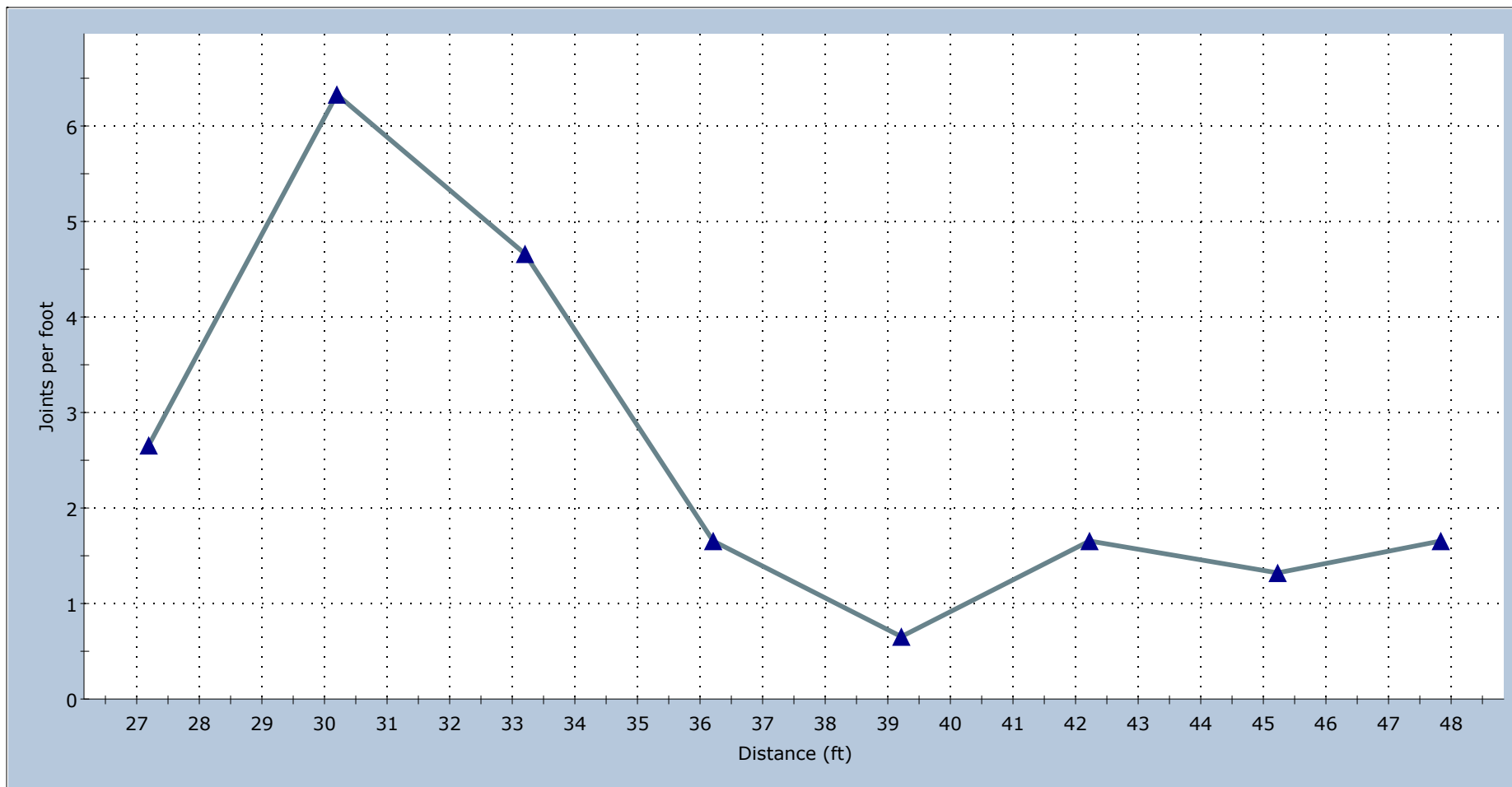
RQD Analysis Traverse L1



mean=77.533 s.d.=18.164 min=50.000 max=96.000

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - BB-ECR-206A	
	<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
	<i>Date</i>	April 2021	<i>File Name</i>	2021-0414_Clewleyville_BB-ECR-206A.dips8

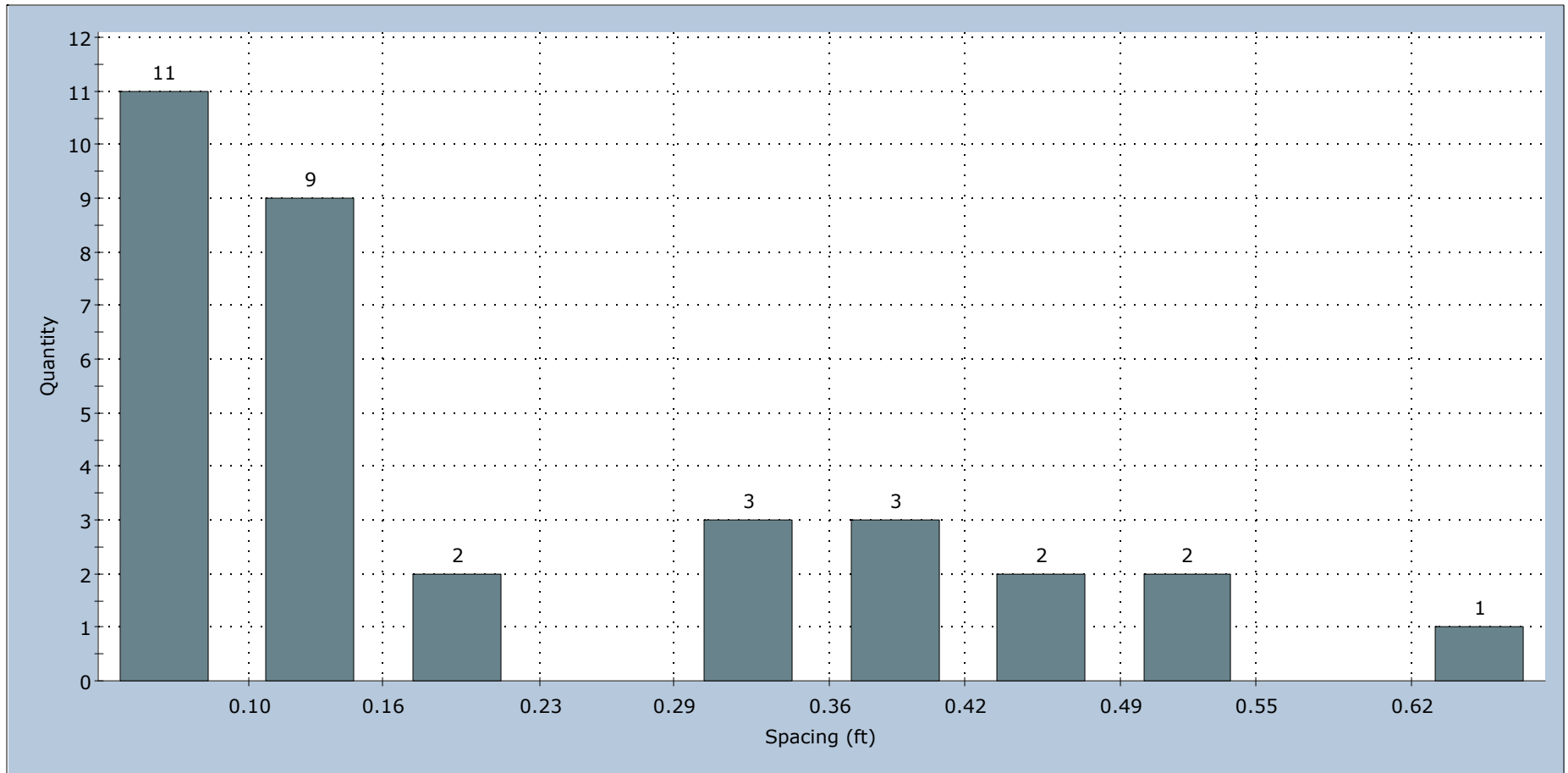
Joint Frequency Analysis Traverse L1



mean=2.583 s.d.=1.809 min=0.667 max=6.333

<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
<i>Analysis Description</i>		Clewleyville Road BH Logging - BB-ECR-206A	
<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
<i>Date</i>	April 2021	<i>File Name</i>	2021-0414_Clewleyville_BB-ECR-206A.dips8

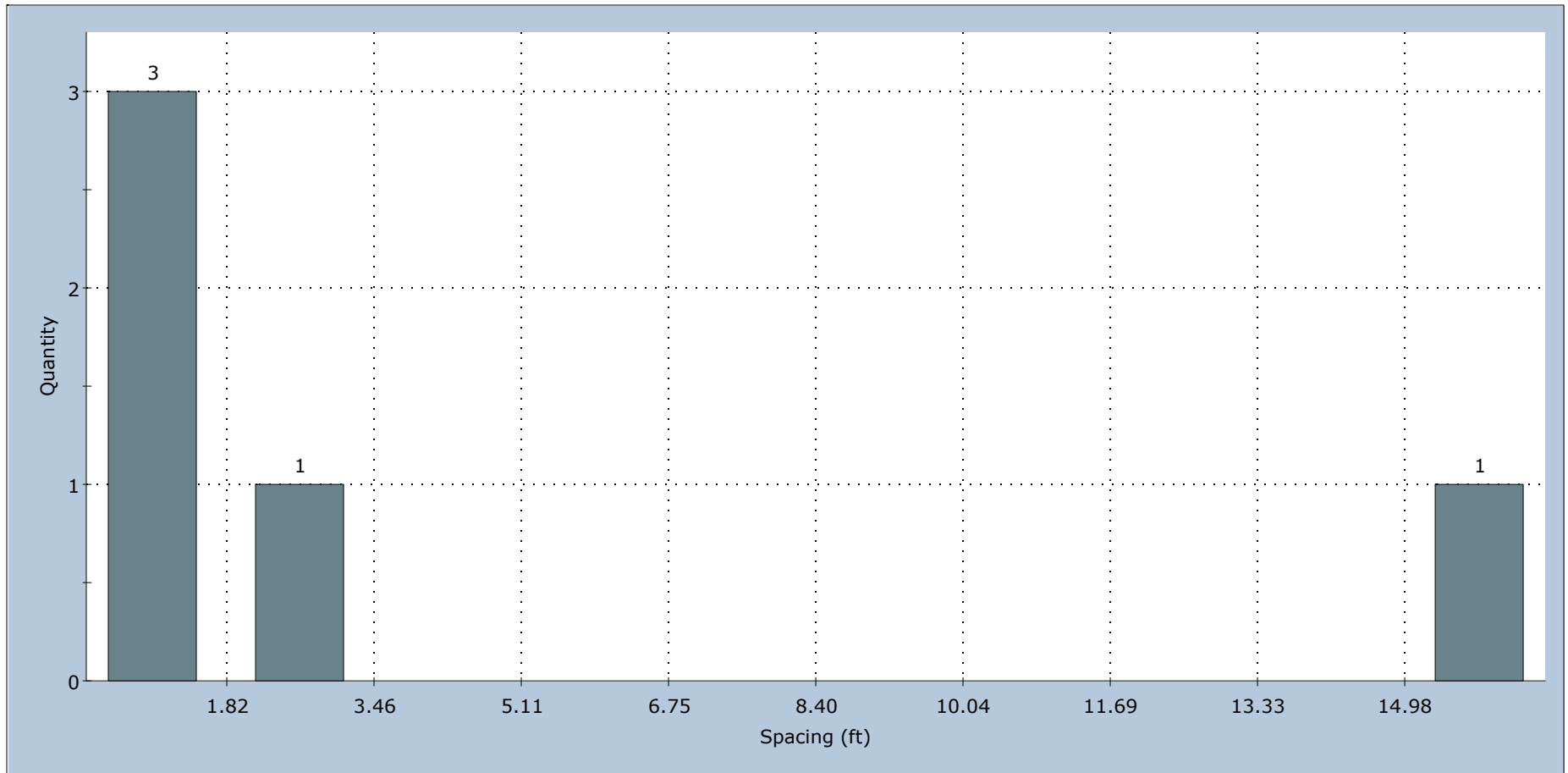
True Joint Spacing Set 1: J1 All Traverses



mean=0.212 s.d.=0.172 min=0.030 max=0.683

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - BB-ECR-206A	
	<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
	<i>Date</i>	April 2021	<i>File Name</i>	2021-0414_Clewleyville_BB-ECR-206A.dips8

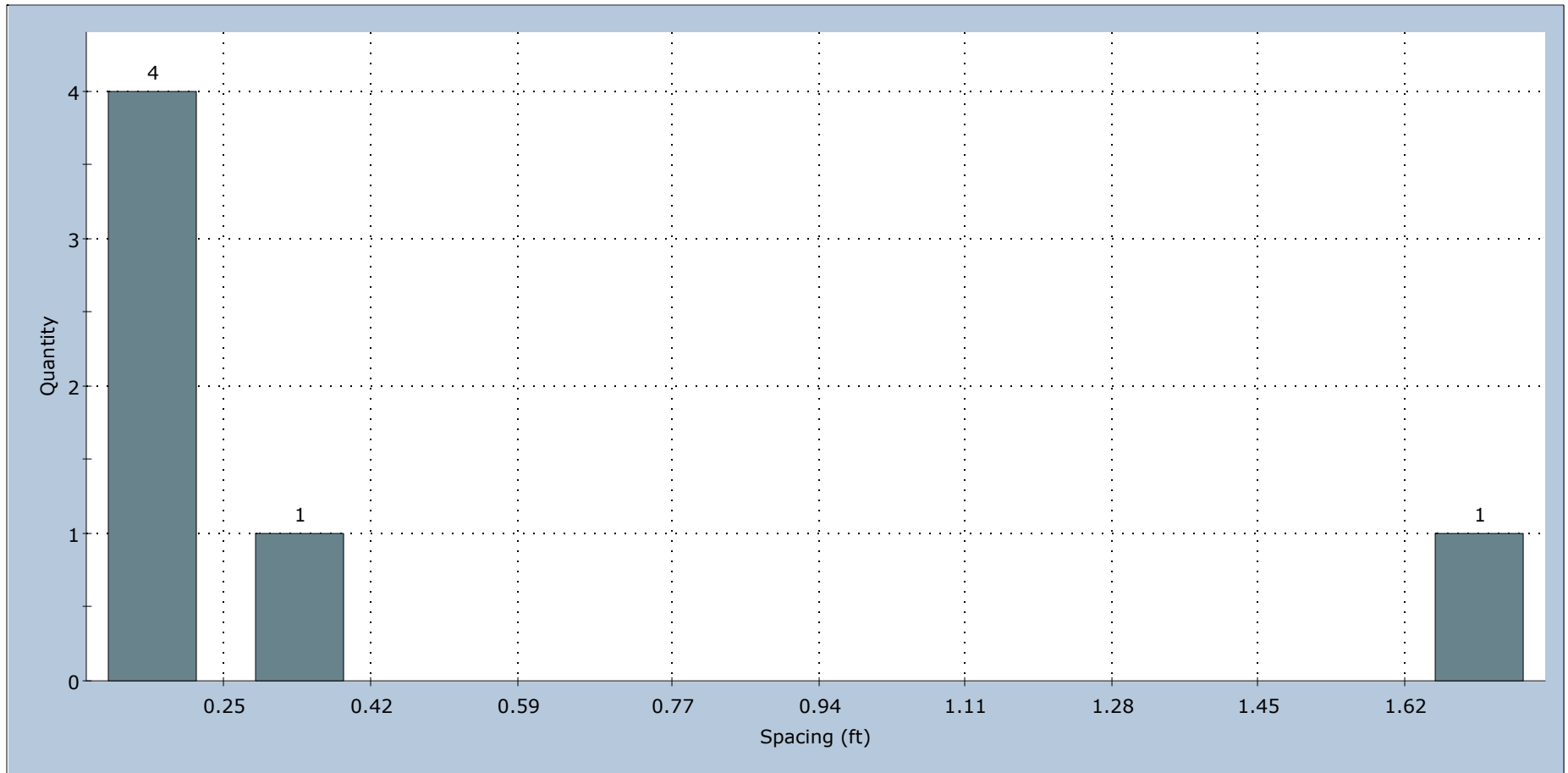
True Joint Spacing Set 2: J2 All Traverses



mean=4.042 s.d.=6.323 min=0.175 max=16.622

	Project		Brewer-Eddington I-395/Route 9 Connector	
	Analysis Description		Clewleyville Road BH Logging - BB-ECR-206A	
	Drawn By	J. Rawlins	Company	Haley & Aldrich, Inc.
	Date	April 2021	File Name	2021-0414_Clewleyville_BB-ECR-206A.dips8

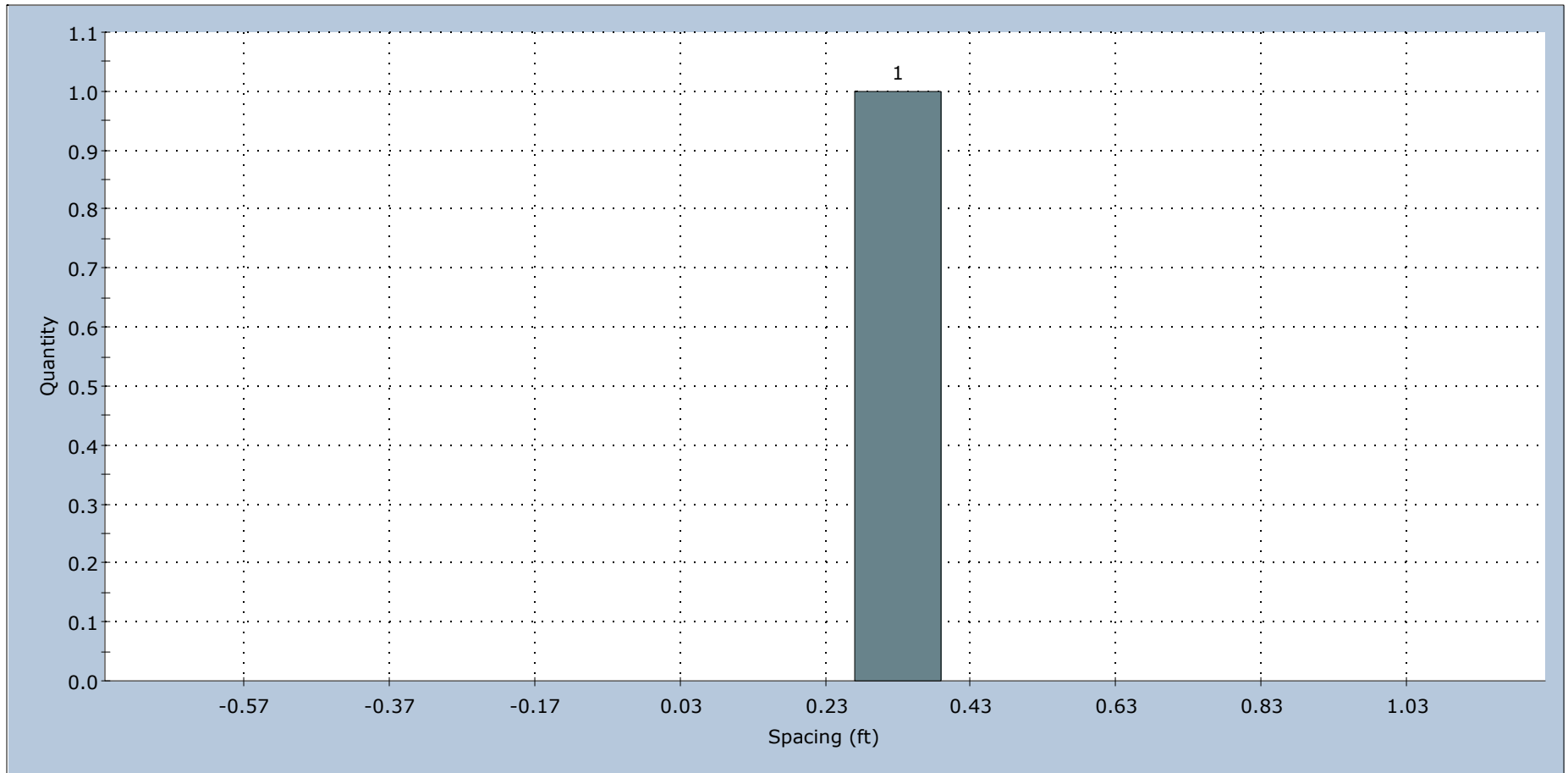
True Joint Spacing Set 3: J3 All Traverses



mean=0.462 s.d.=0.605 min=0.081 max=1.792

	Project		Brewer-Eddington I-395/Route 9 Connector	
	Analysis Description		Clewleyville Road BH Logging - BB-ECR-206A	
	Drawn By	J. Rawlins	Company	Haley & Aldrich, Inc.
	Date	April 2021	File Name	2021-0414_Clewleyville_BB-ECR-206A.dips8

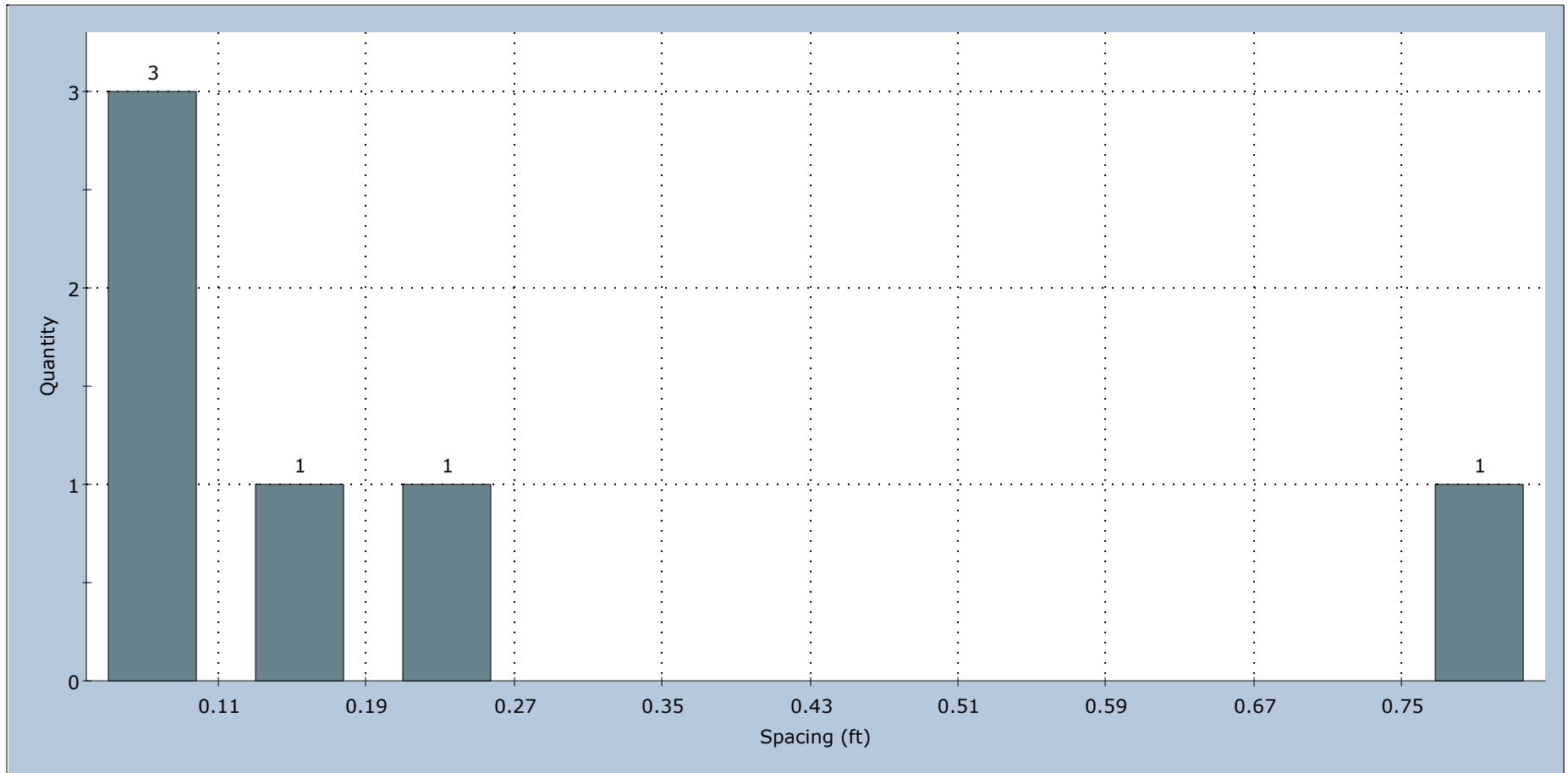
True Joint Spacing Set 4: J4 All Traverses



mean=0.230 s.d.=0.000 min=0.230 max=0.230

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - BB-ECR-206A	
	<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
	<i>Date</i>	April 2021	<i>File Name</i>	2021-0414_Clewleyville_BB-ECR-206A.dips8

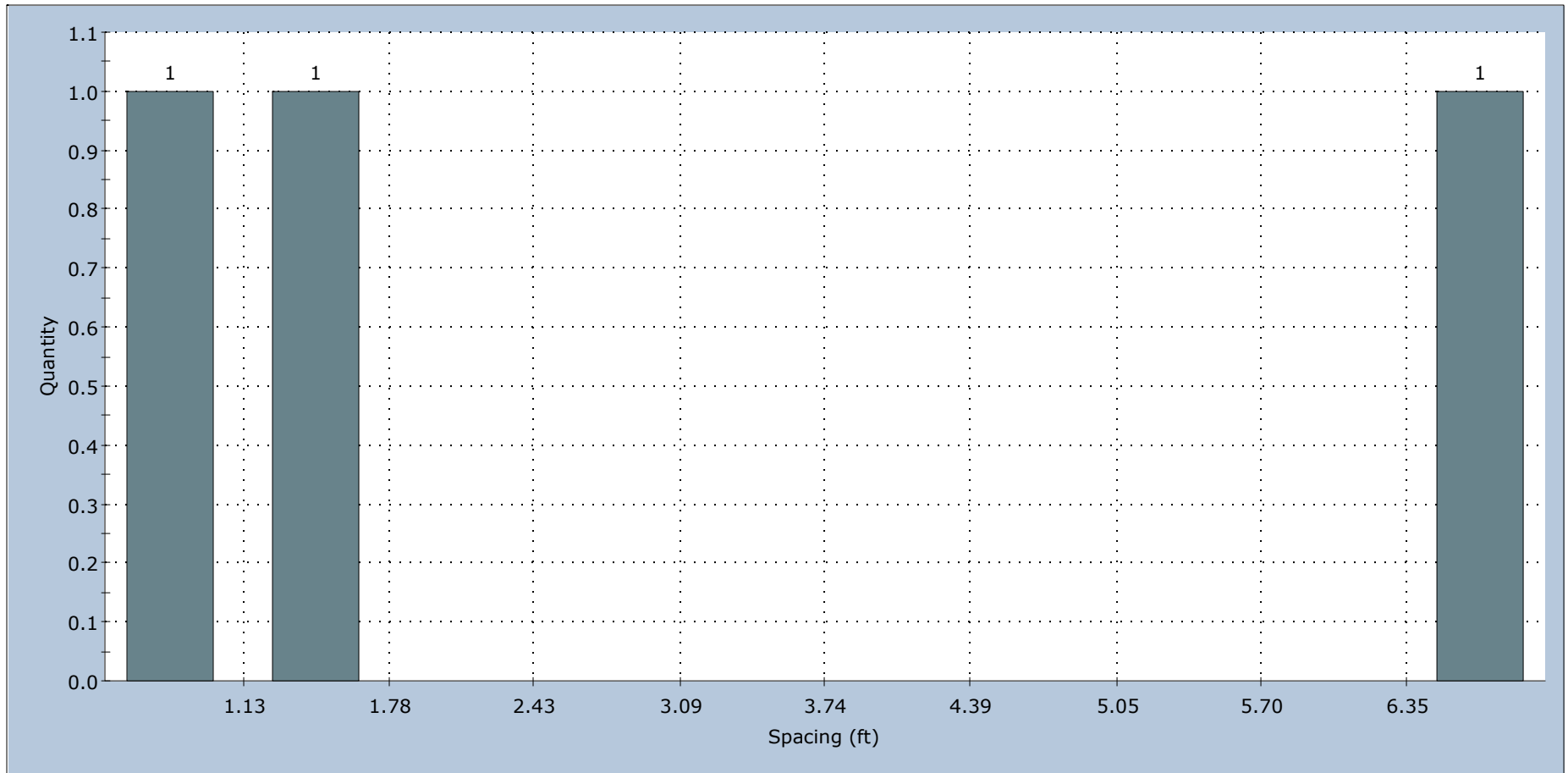
True Joint Spacing Set 5: J5 All Traverses



mean=0.231 s.d.=0.278 min=0.035 max=0.832

	Project		Brewer-Eddington I-395/Route 9 Connector	
	Analysis Description		Clewleyville Road BH Logging - BB-ECR-206A	
	Drawn By	J. Rawlins	Company	Haley & Aldrich, Inc.
	Date	April 2021	File Name	2021-0414_Clewleyville_BB-ECR-206A.dips8

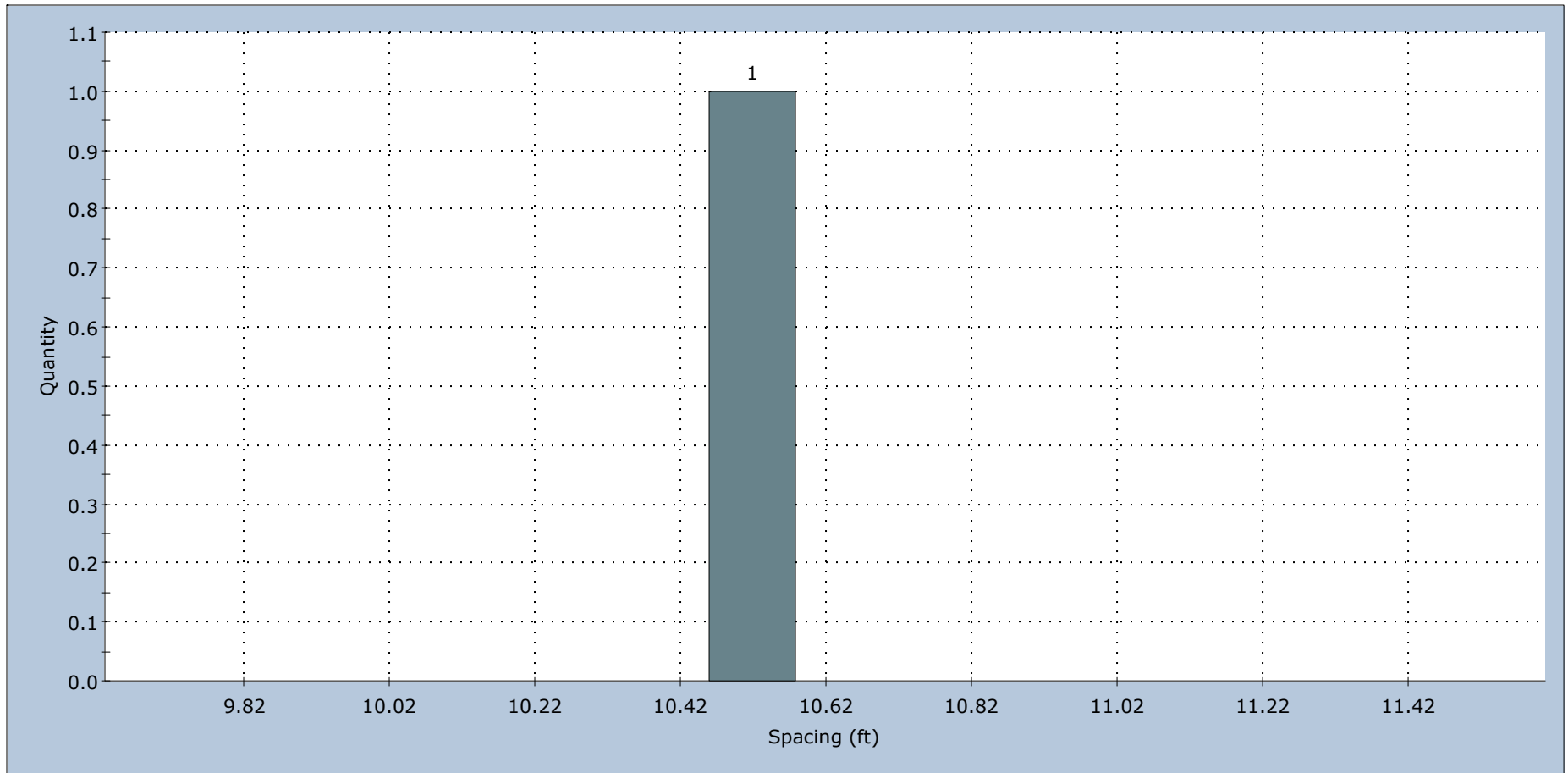
True Joint Spacing Set 8: J8 All Traverses



mean=2.880 s.d.=2.932 min=0.473 max=7.007

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - BB-ECR-206A	
	<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
	<i>Date</i>	April 2021	<i>File Name</i>	2021-0414_Clewleyville_BB-ECR-206A.dips8

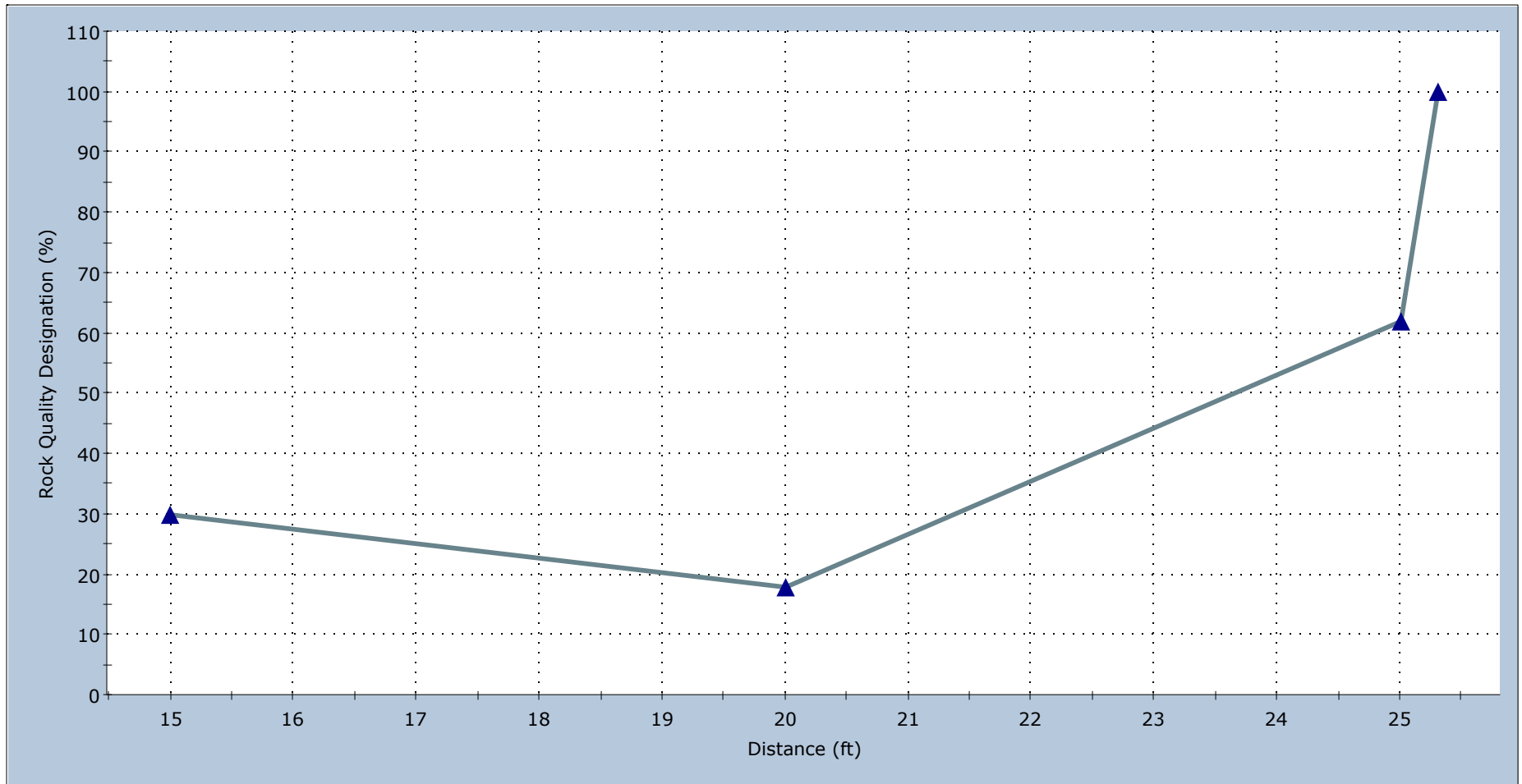
True Joint Spacing Set 9: J9 All Traverses



mean=10.619 s.d.=0.000 min=10.619 max=10.619

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - BB-ECR-206A	
	<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
	<i>Date</i>	April 2021	<i>File Name</i>	2021-0414_Clewleyville_BB-ECR-206A.dips8

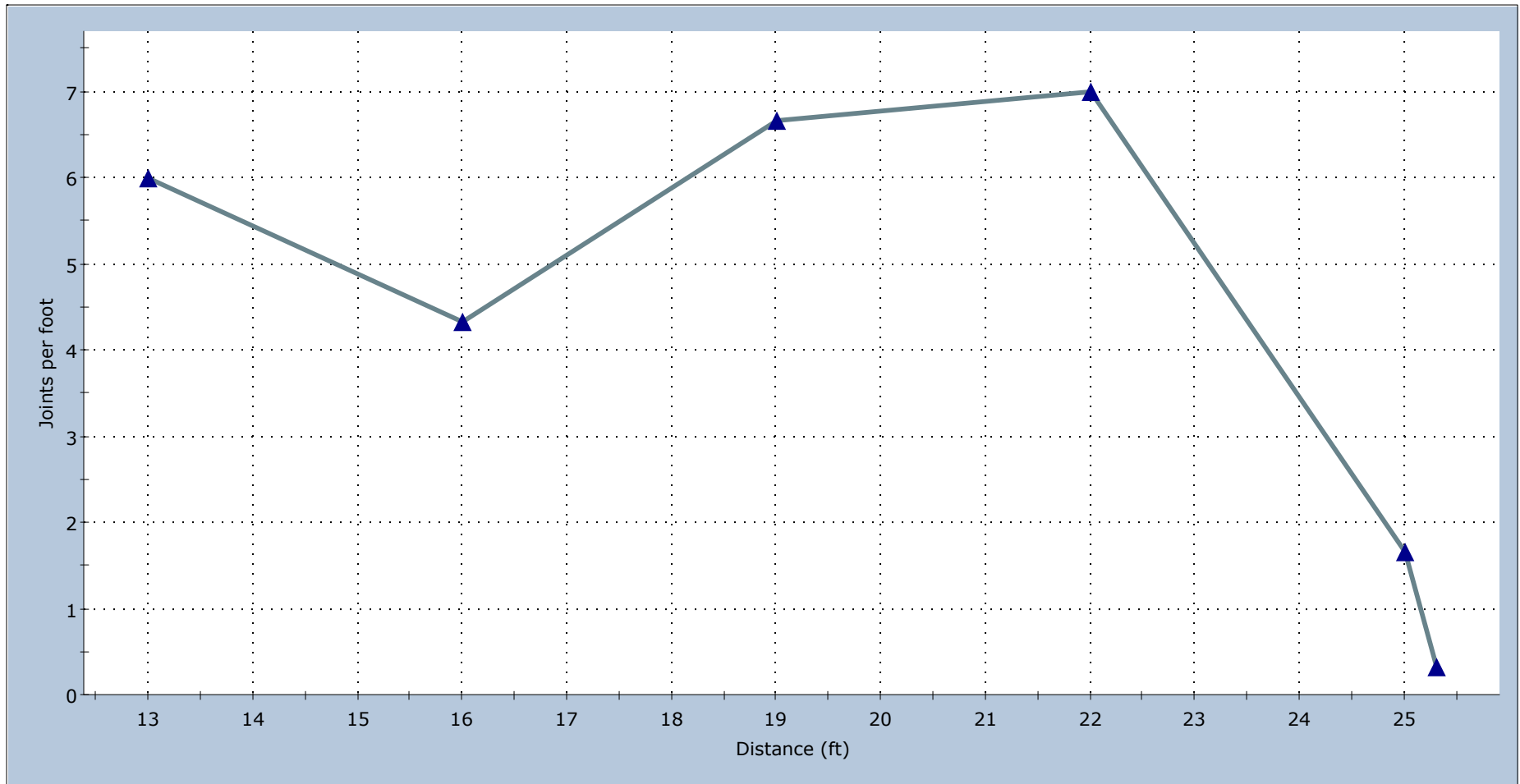
RQD Analysis Traverse L1



mean=52.500 s.d.=31.792 min=18.000 max=100.000

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - HB-BE-231	
	<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
	<i>Date</i>	April 2021	<i>File Name</i>	2021-0414_Clewleyville_HB-BE-231.dips8

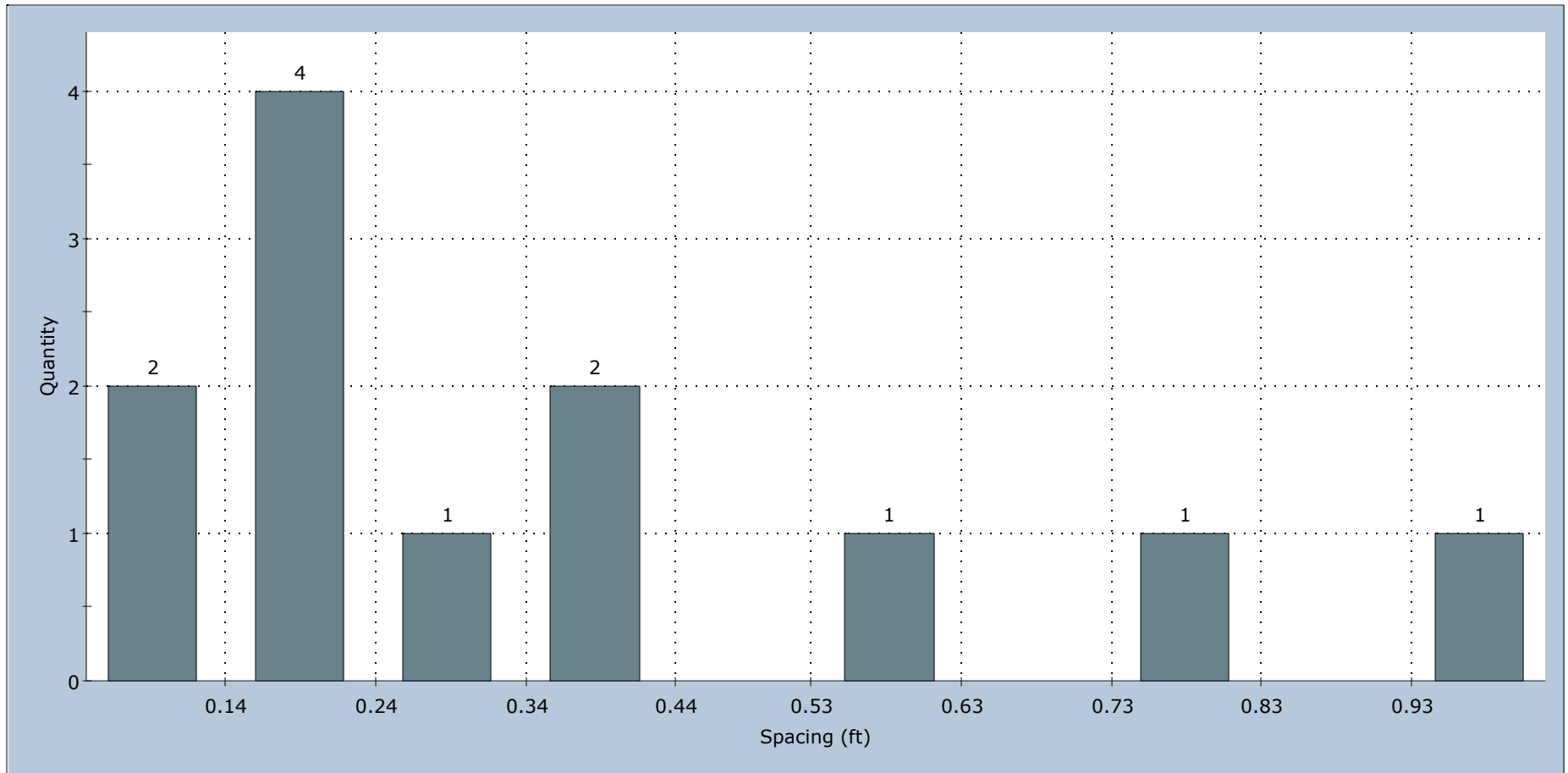
Joint Frequency Analysis Traverse L1



mean=4.333 s.d.=2.531 min=0.333 max=7.000

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - HB-BE-231	
	<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
	<i>Date</i>	April 2021	<i>File Name</i>	2021-0414_Clewleyville_HB-BE-231.dips8

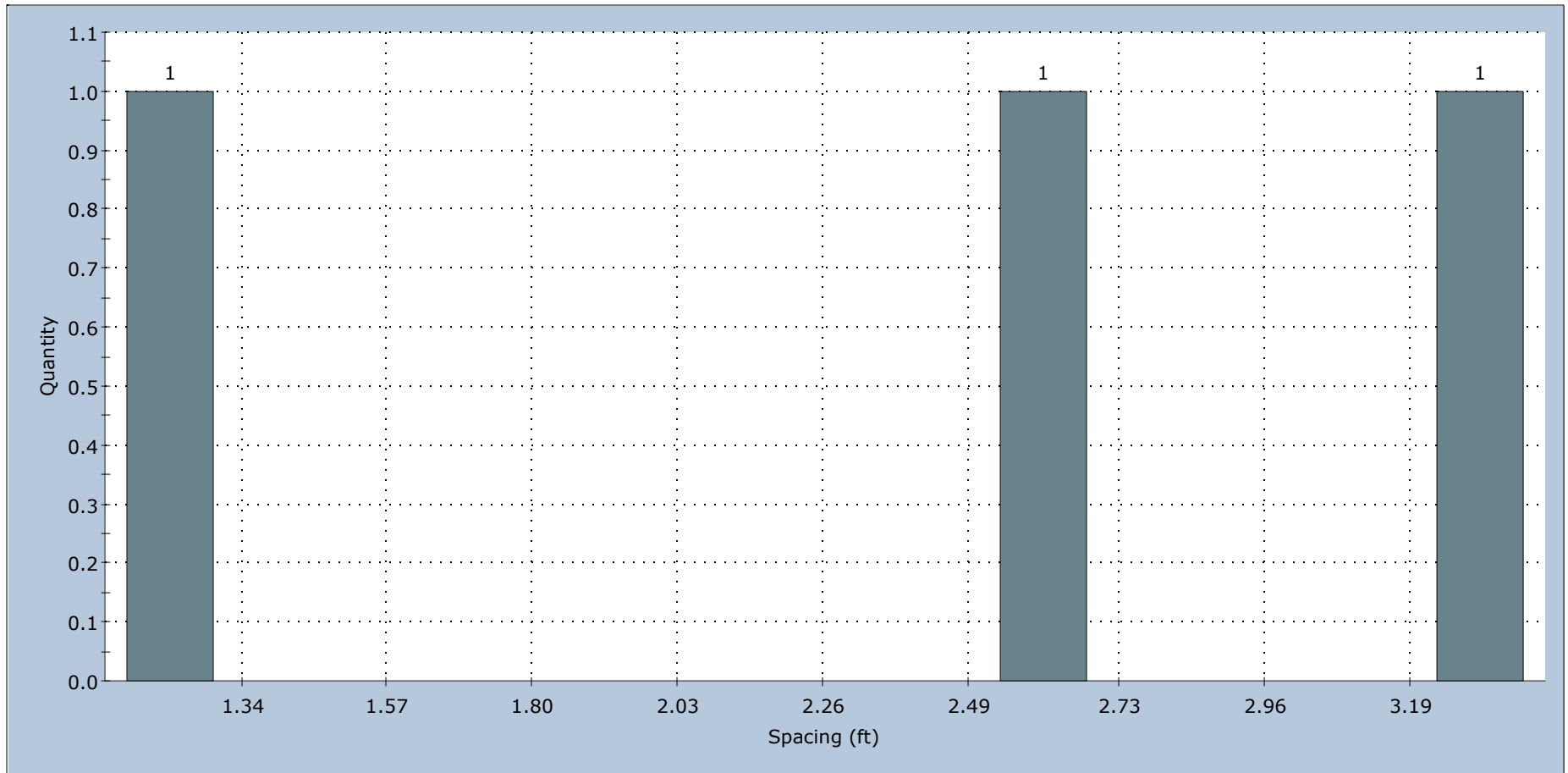
True Joint Spacing Set 1: J1 All Traverses



mean=0.366 s.d.=0.288 min=0.043 max=1.024

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - HB-BE-231	
	<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
	<i>Date</i>	April 2021	<i>File Name</i>	2021-0414_Clewleyville_HB-BE-231.dips8

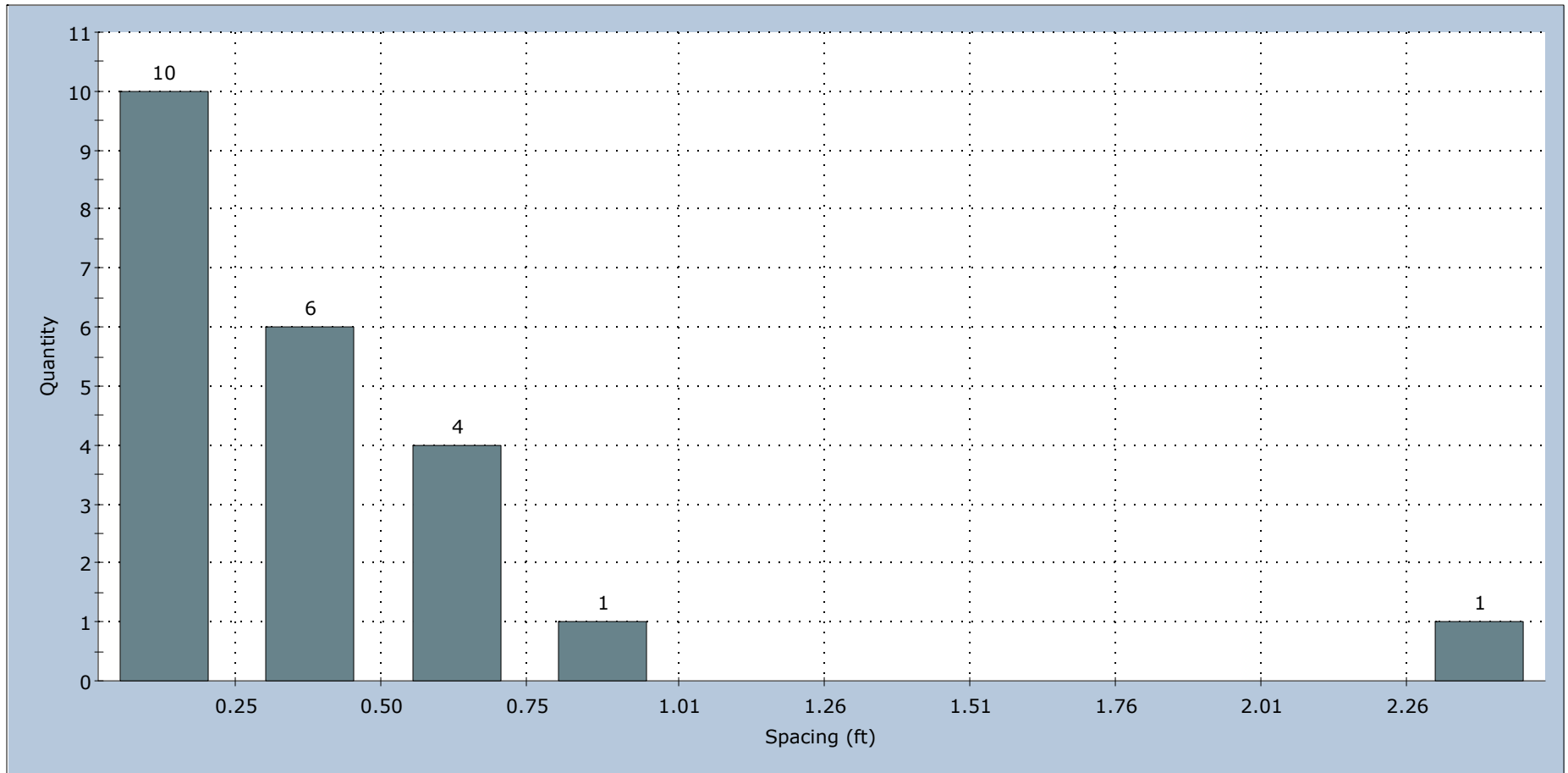
True Joint Spacing Set 2: J2 All Traverses



mean=2.357 s.d.=0.950 min=1.112 max=3.417

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - HB-BE-231	
	<i>Drawn By</i>		J. Rawlins	<i>Company</i> Haley & Aldrich, Inc.
	<i>Date</i>		April 2021	<i>File Name</i> 2021-0414_Clewleyville_HB-BE-231.dips8

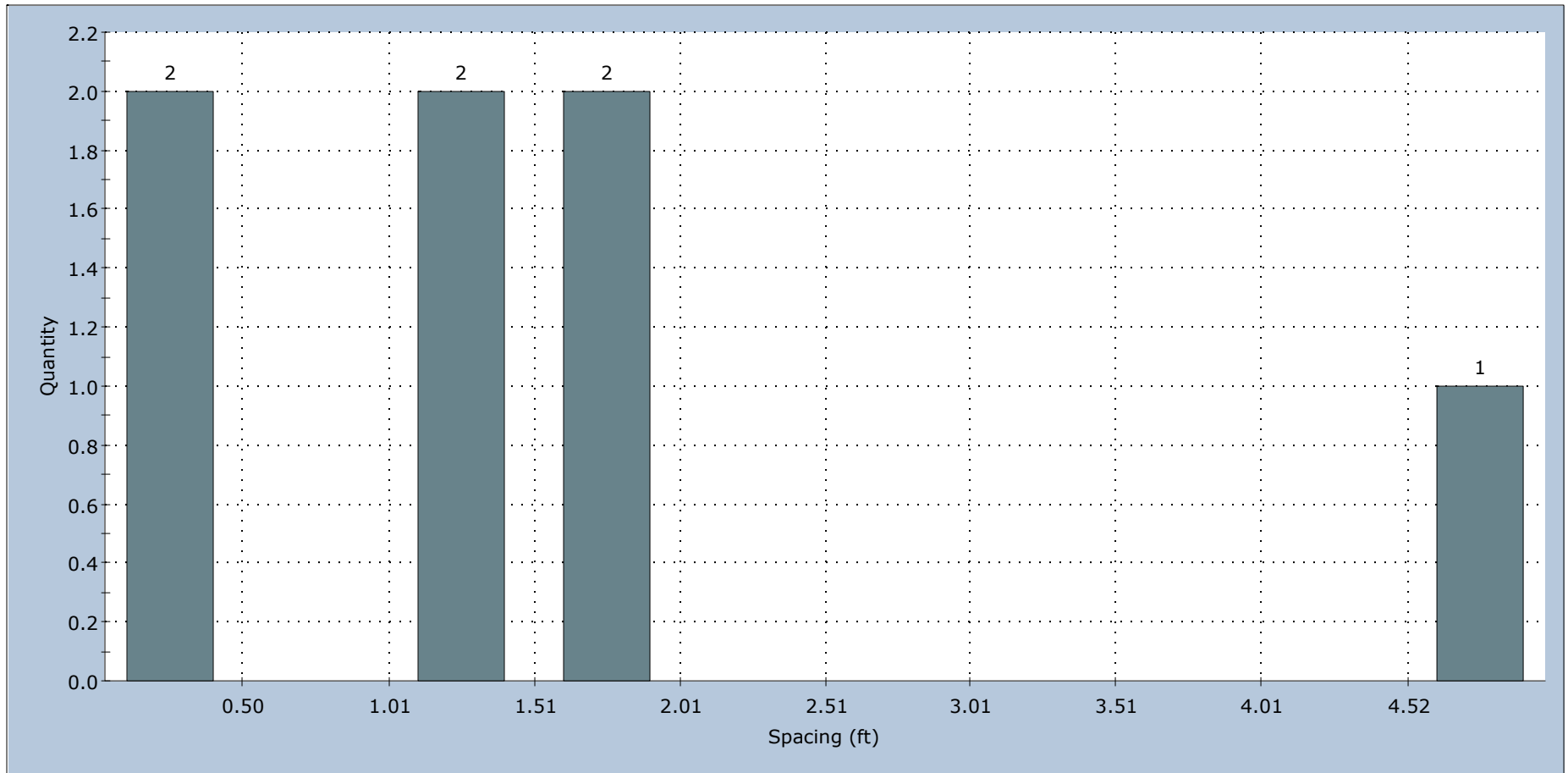
True Joint Spacing Set 3: J3 All Traverses



mean=0.406 s.d.=0.499 min=0.002 max=2.512

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - HB-BE-231	
	<i>Drawn By</i>		J. Rawlins	<i>Company</i> Haley & Aldrich, Inc.
	<i>Date</i>		April 2021	<i>File Name</i> 2021-0414_Clewleyville_HB-BE-231.dips8

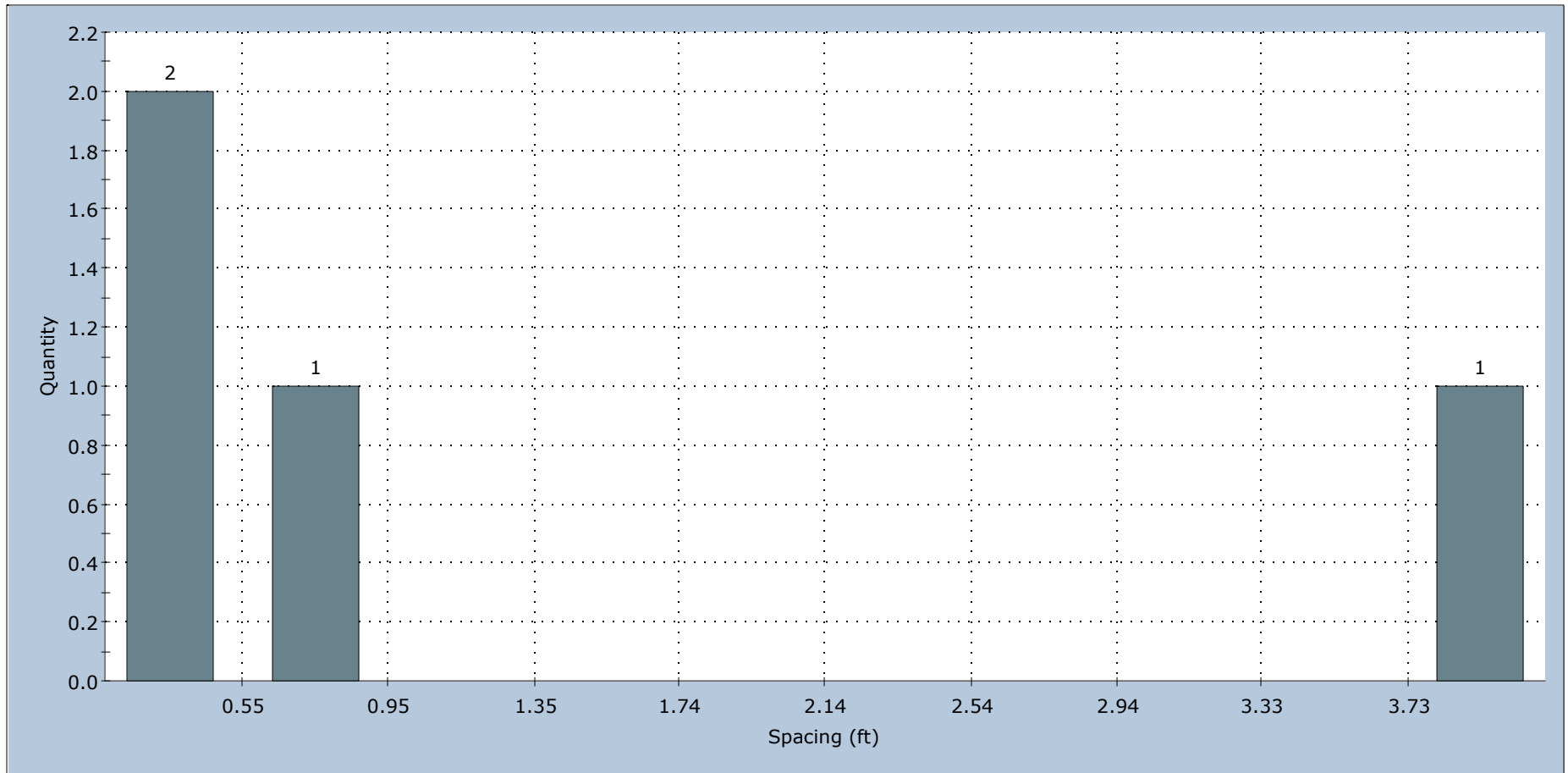
True Joint Spacing Set 4: J4 All Traverses



mean=1.590 s.d.=1.546 min=0.002 max=5.018

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - HB-BE-231	
	<i>Drawn By</i>		J. Rawlins	<i>Company</i> Haley & Aldrich, Inc.
	<i>Date</i>		April 2021	<i>File Name</i> 2021-0414_Clewleyville_HB-BE-231.dips8

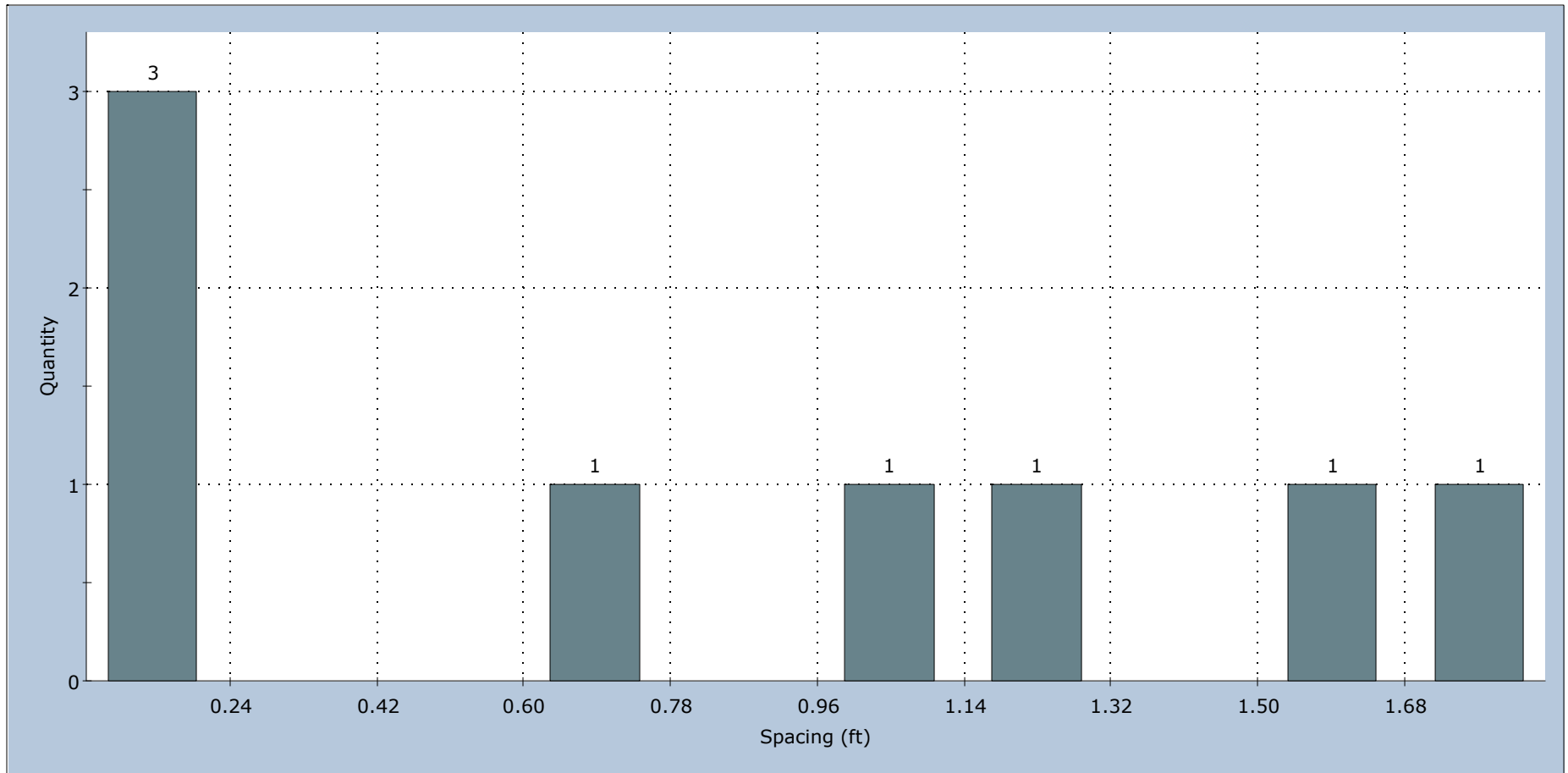
True Joint Spacing Set 5: J5 All Traverses



mean=1.356 s.d.=1.625 min=0.157 max=4.126

<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
<i>Analysis Description</i>		Clewleyville Road BH Logging - HB-BE-231	
<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
<i>Date</i>	April 2021	<i>File Name</i>	2021-0414_Clewleyville_HB-BE-231.dips8

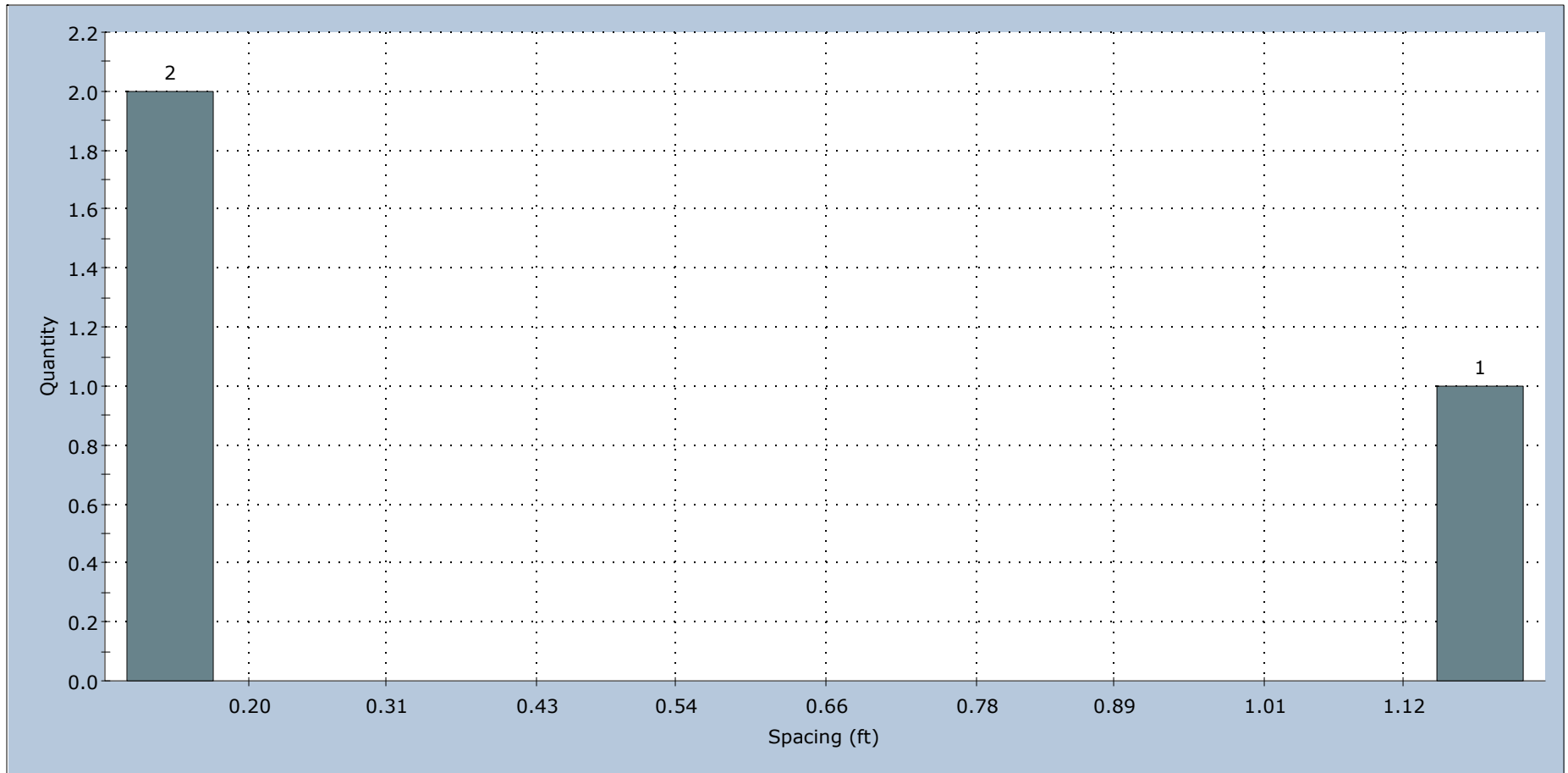
True Joint Spacing Set 6: J6 All Traverses



mean=0.835 s.d.=0.653 min=0.055 max=1.861

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - HB-BE-231	
	<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
	<i>Date</i>	April 2021	<i>File Name</i>	2021-0414_Clewleyville_HB-BE-231.dips8

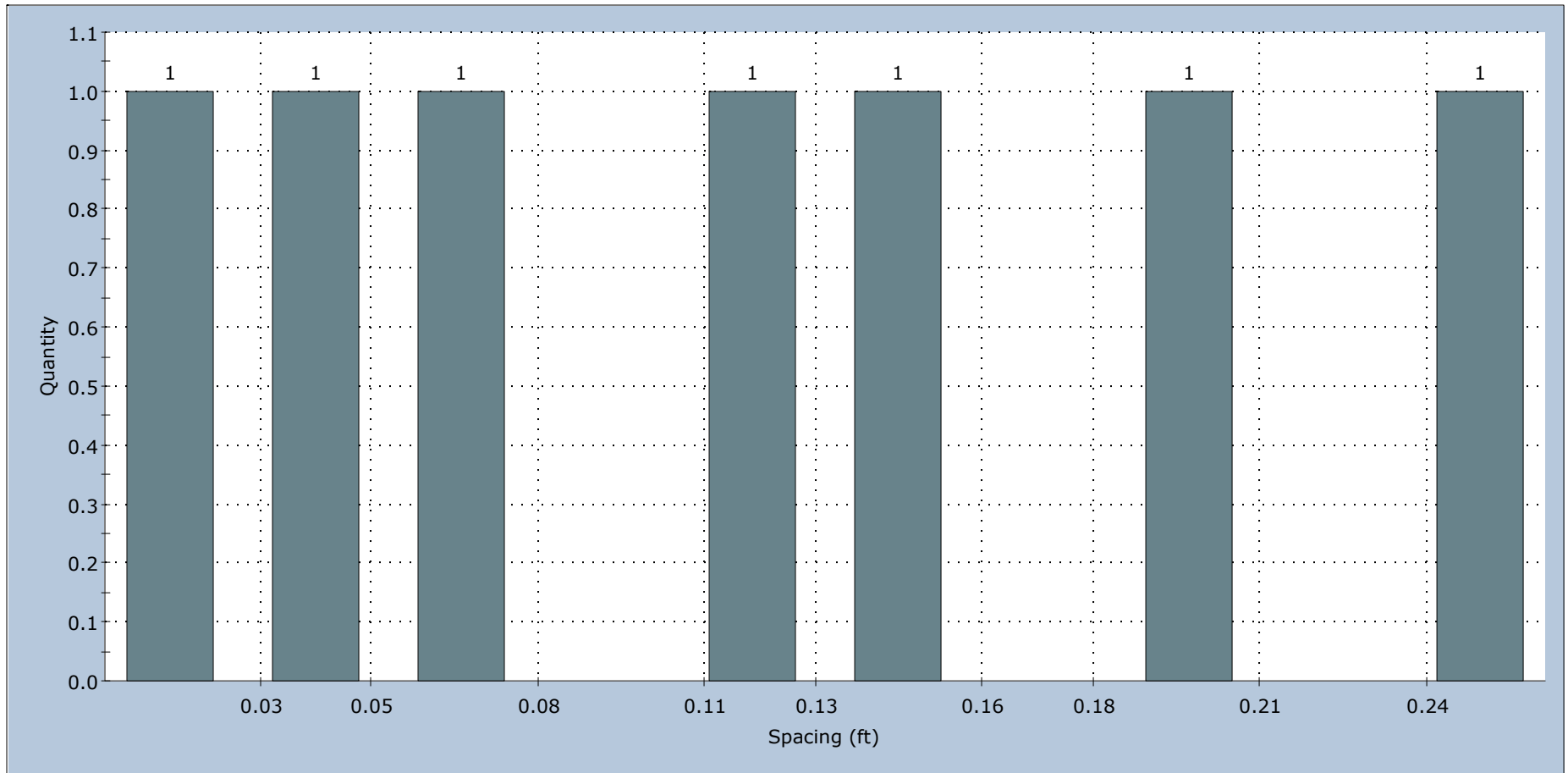
True Joint Spacing Set 7: J7 All Traverses



mean=0.480 s.d.=0.537 min=0.080 max=1.239

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - HB-BE-231	
	<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
	<i>Date</i>	April 2021	<i>File Name</i>	2021-0414_Clewleyville_HB-BE-231.dips8

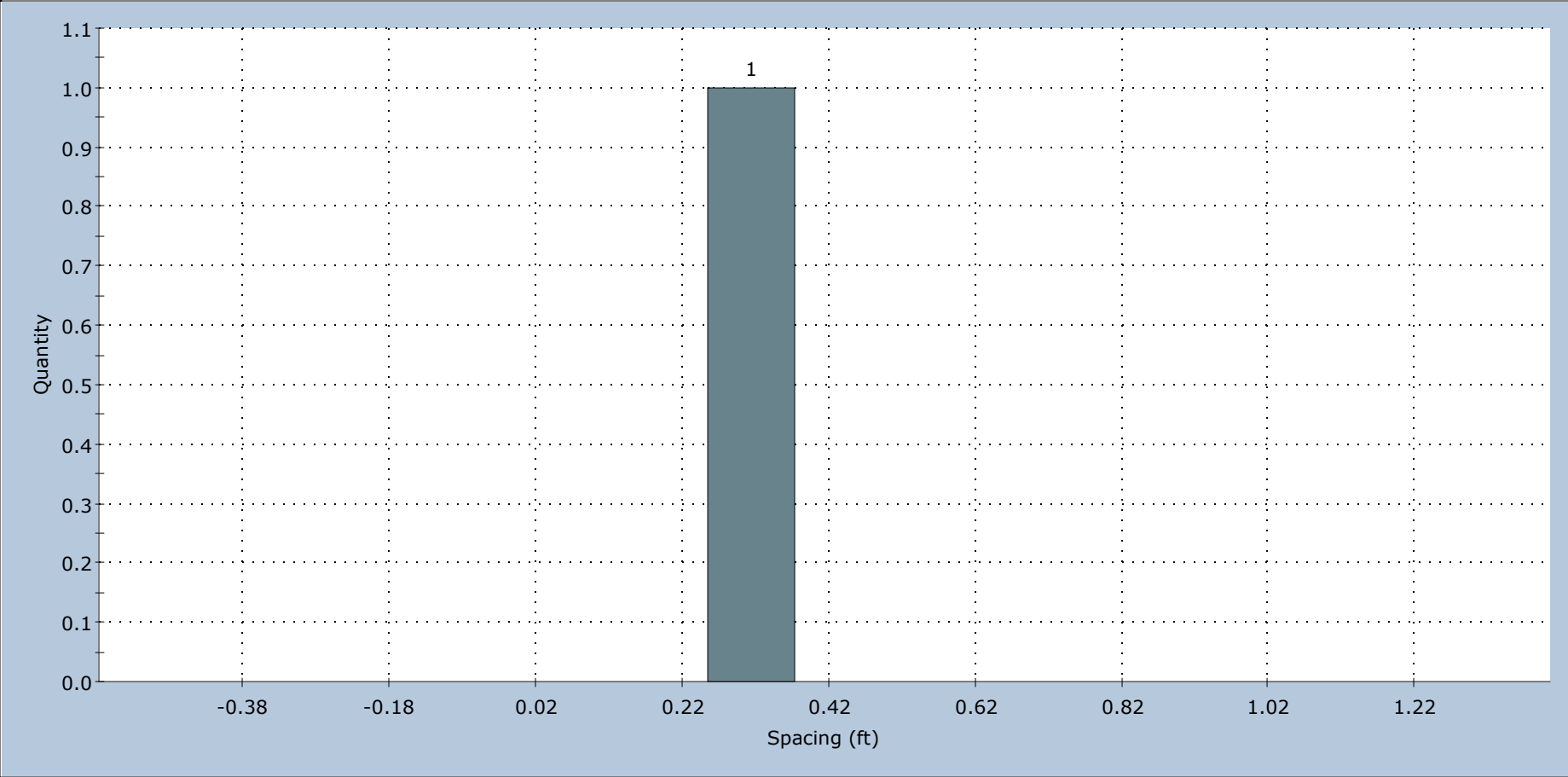
True Joint Spacing Set 8: J8 All Traverses



mean=0.118 s.d.=0.084 min=0.001 max=0.263

<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
<i>Analysis Description</i>		Clewleyville Road BH Logging - HB-BE-231	
<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
<i>Date</i>	April 2021	<i>File Name</i>	2021-0414_Clewleyville_HB-BE-231.dips8

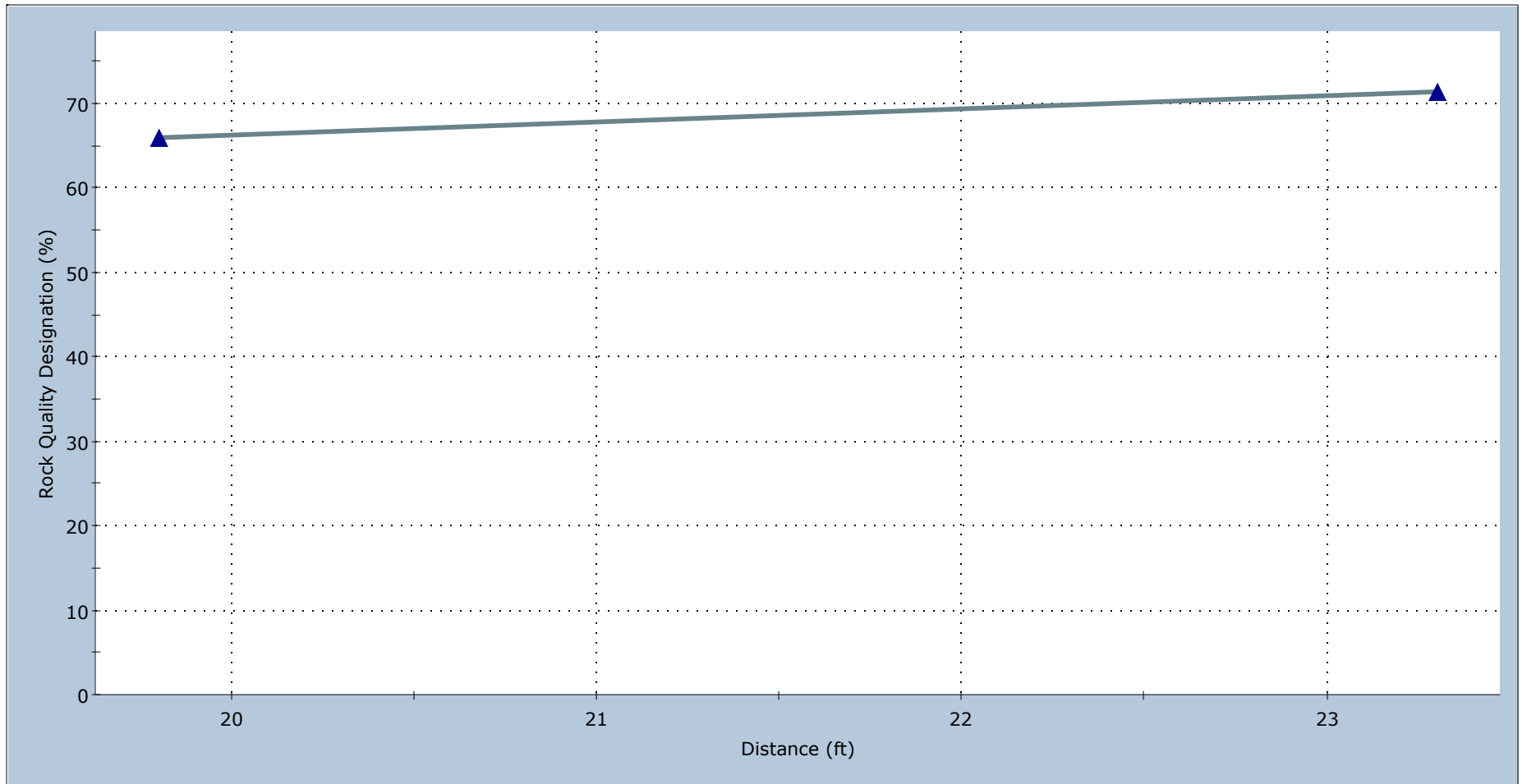
True Joint Spacing Set 9: J9 All Traverses



mean=0.415 s.d.=0.000 min=0.415 max=0.415

	Project		Brewer-Eddington I-395/Route 9 Connector	
	Analysis Description		Clewleyville Road BH Logging - HB-BE-231	
	Drawn By	J. Rawlins	Company	Haley & Aldrich, Inc.
	Date	April 2021	File Name	2021-0414_Clewleyville_HB-BE-231.dips8

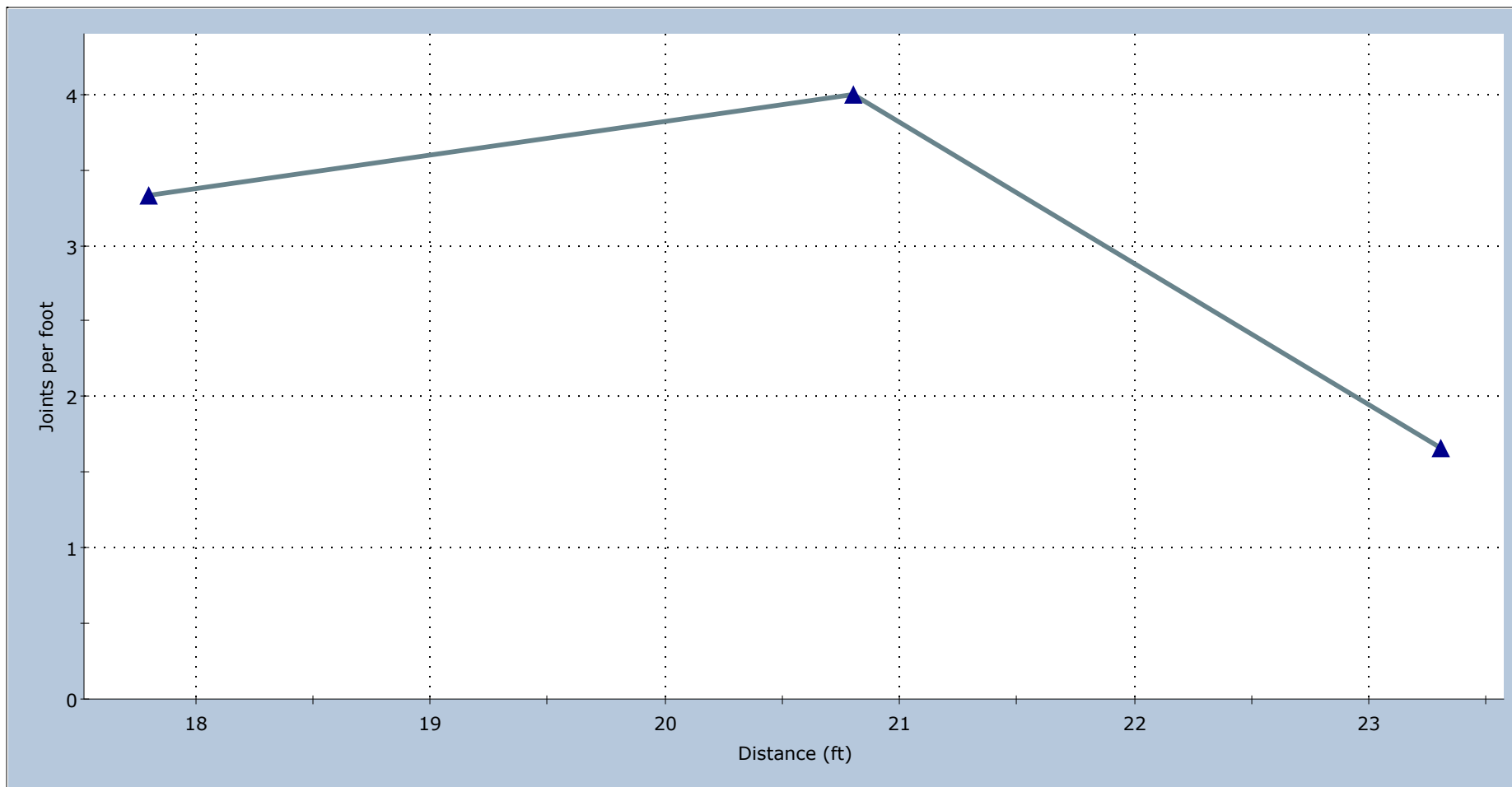
RQD Analysis Traverse L1



mean=68.714 s.d.=2.714 min=66.000 max=71.429

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - HB-BE-232	
	<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
	<i>Date</i>	April 2021	<i>File Name</i>	2021-0414_Clewleyville_HB-BE-232.dips8

Joint Frequency Analysis Traverse L1



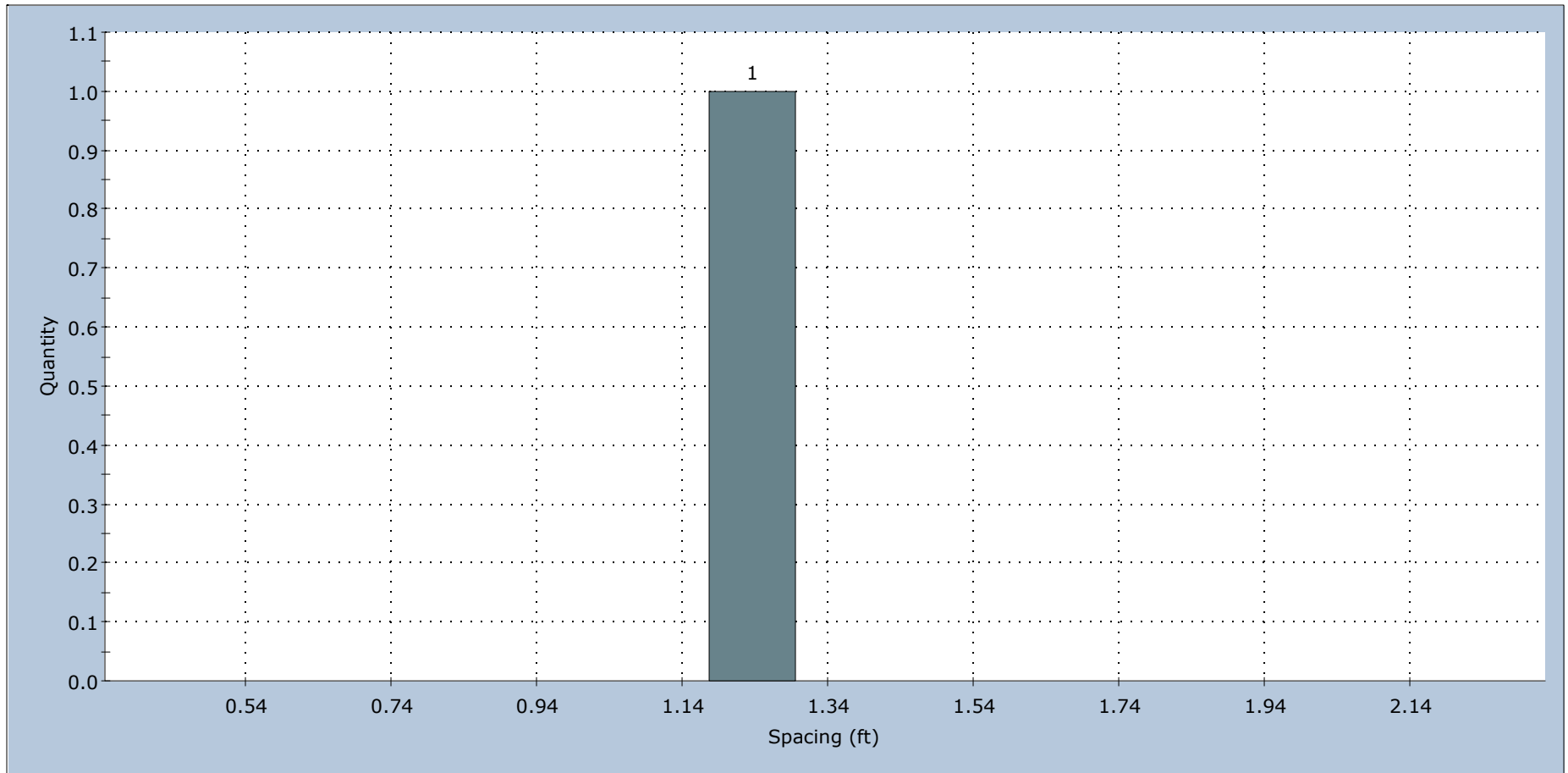
mean=3.000 s.d.=0.981 min=1.667 max=4.000

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - HB-BE-232	
	<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
	<i>Date</i>	April 2021	<i>File Name</i>	2021-0414_Clewleyville_HB-BE-232.dips8

True Joint Spacing

Set 1: J1

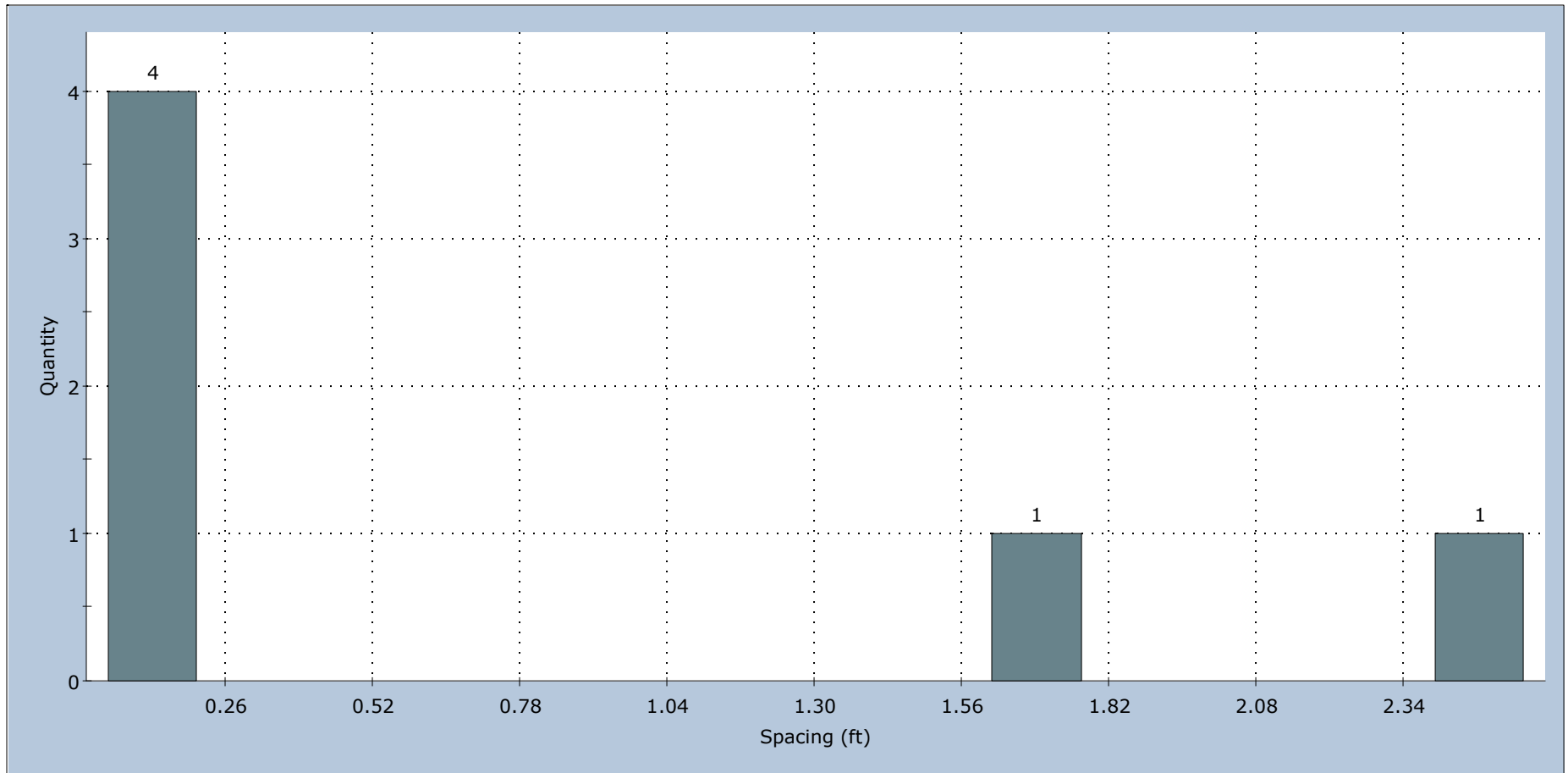
All Traverses



mean=1.336 s.d.=0.000 min=1.336 max=1.336

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - HB-BE-232	
	<i>Drawn By</i>		J. Rawlins	<i>Company</i> Haley & Aldrich, Inc.
	<i>Date</i>		April 2021	<i>File Name</i> 2021-0414_Clewleyville_HB-BE-232.dips8

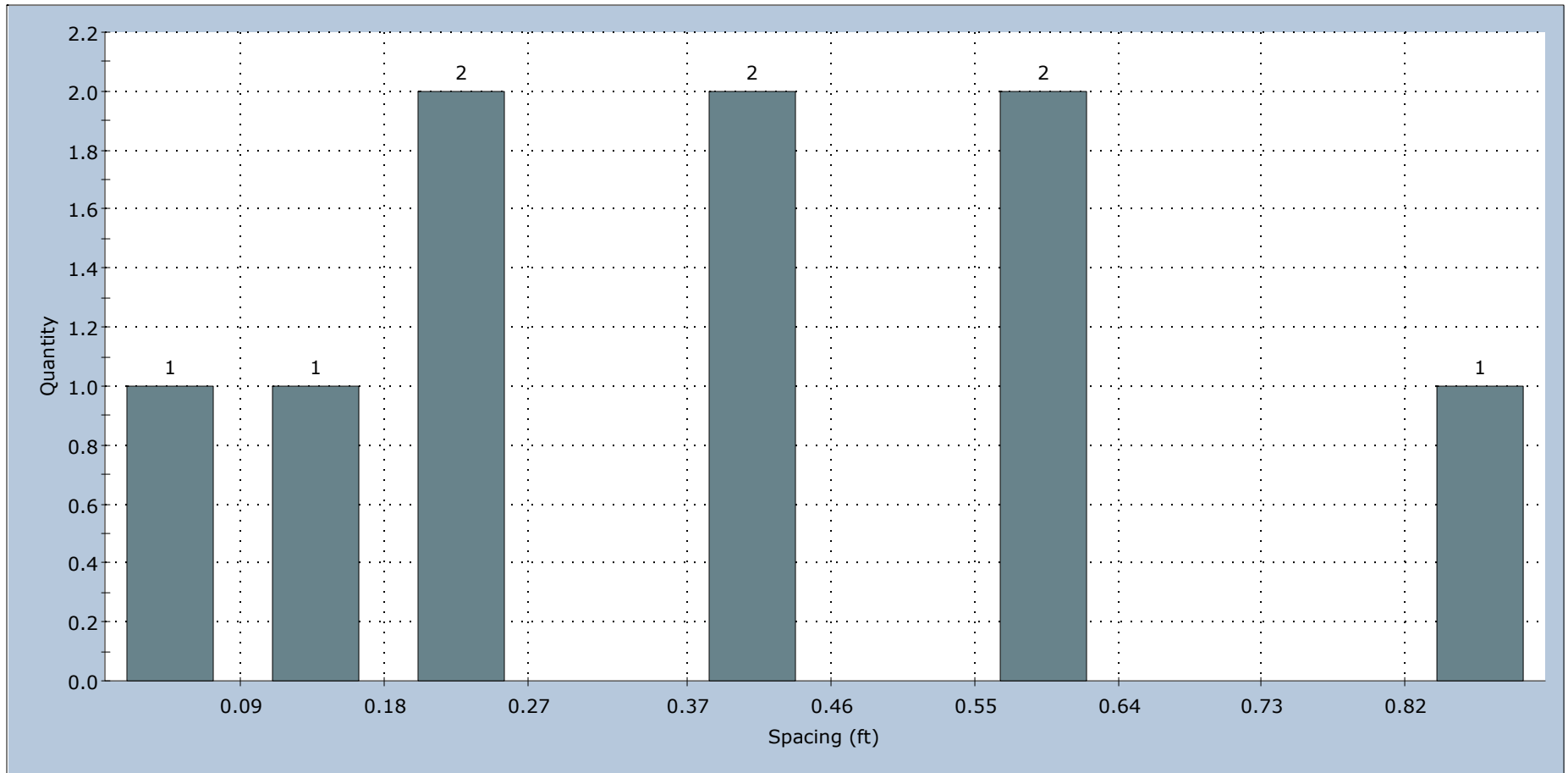
True Joint Spacing Set 3: J3 All Traverses



mean=0.767 s.d.=1.001 min=0.002 max=2.604

	Project		Brewer-Eddington I-395/Route 9 Connector	
	Analysis Description		Clewleyville Road BH Logging - HB-BE-232	
	Drawn By	J. Rawlins	Company	Haley & Aldrich, Inc.
	Date	April 2021	File Name	2021-0414_Clewleyville_HB-BE-232.dips8

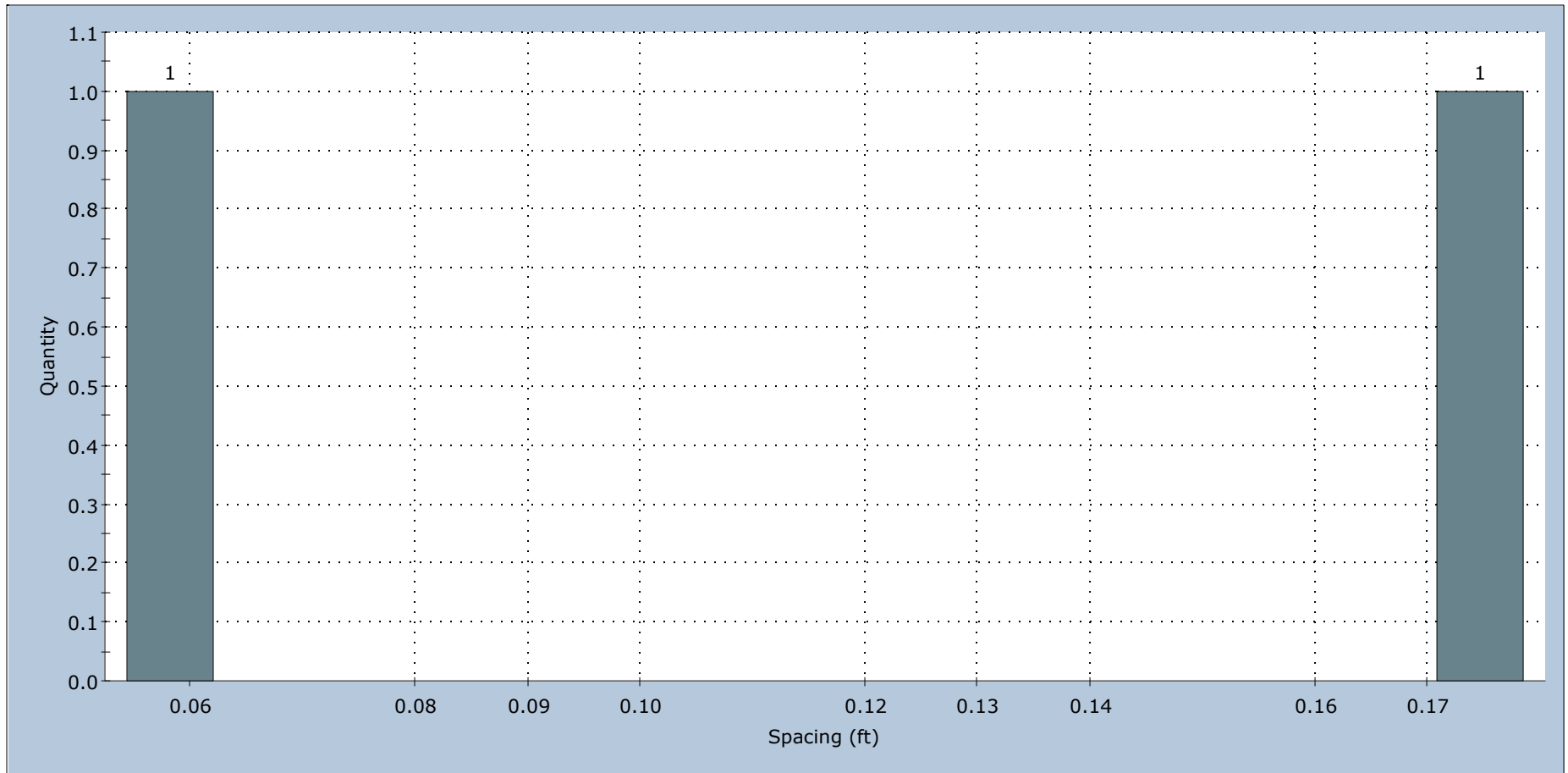
True Joint Spacing Set 7: J7 All Traverses



mean=0.382 s.d.=0.266 min=0.001 max=0.912

	Project		Brewer-Eddington I-395/Route 9 Connector	
	Analysis Description		Clewleyville Road BH Logging - HB-BE-232	
	Drawn By	J. Rawlins	Company	Haley & Aldrich, Inc.
	Date	April 2021	File Name	2021-0414_Clewleyville_HB-BE-232.dips8

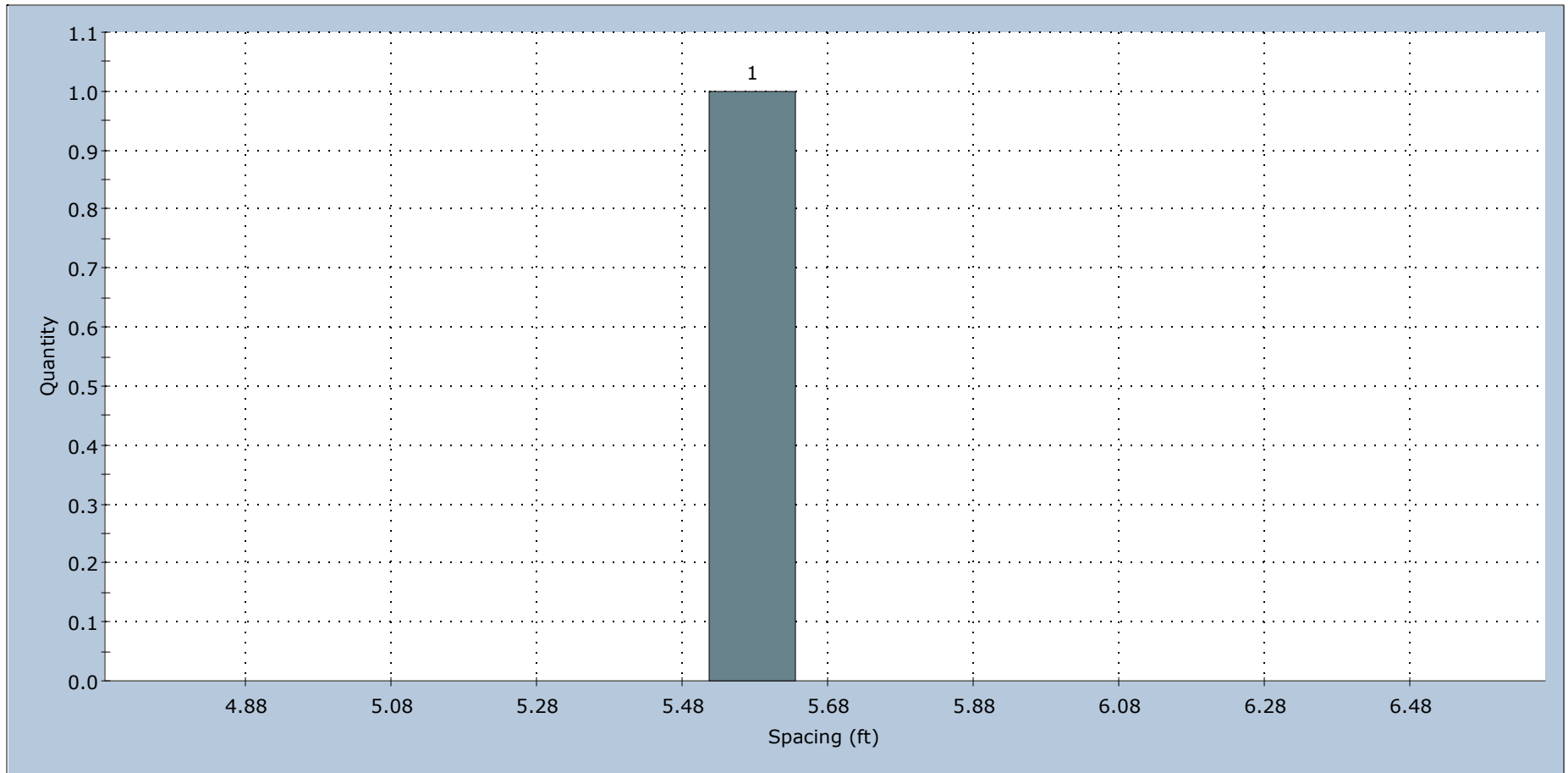
True Joint Spacing Set 8: J8 All Traverses



mean=0.116 s.d.=0.065 min=0.052 max=0.181

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - HB-BE-232	
	<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
	<i>Date</i>	April 2021	<i>File Name</i>	2021-0414_Clewleyville_HB-BE-232.dips8

True Joint Spacing Set 9: J9 All Traverses



mean=5.677 s.d.=0.000 min=5.677 max=5.677

	<i>Project</i>		Brewer-Eddington I-395/Route 9 Connector	
	<i>Analysis Description</i>		Clewleyville Road BH Logging - HB-BE-232	
	<i>Drawn By</i>	J. Rawlins	<i>Company</i>	Haley & Aldrich, Inc.
	<i>Date</i>	April 2021	<i>File Name</i>	2021-0414_Clewleyville_HB-BE-232.dips8