

Champlain Hudson Power Express



HDD Design Summary Report Crossings HDD 111.B to HDD 123 in Segment 11 – Package 7A

Catskill to Germantown
Greene County, New York

TTR Project Number: 204-3701

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1.0 INTRODUCTION

1.1 PURPOSE

The Champlain Hudson Power Express (CHPE) project consists of installing a pair of HVDC electrical transmission cables with an associated telecommunications line from Canada to New York City. The portion of the work addressed herein is located in the upland portion of the route from the south end of Lake Champlain to New York City along the uplands of the Hudson River Valley. Tetra Tech Rooney, Inc. (TTR) is designing 20 Horizontal Directional Drill (HDD) in Segment 11 – Package 7A near Catskill. HDD methods will be used to route the crossings below congested areas, railroads, under/around obstructions (e.g., existing infrastructure or utilities), and below wetlands and bodies of water to minimize impacts to the environment. This Design Summary Report addresses the design for the HDD crossings in Segment 11 - Package 7A from Catskill to Germantown. These crossings are designated HDD 111.B through HDD 123.

The purposes of this Design Summary Report are to provide the following:

- Review of the existing geological, hydrogeological, and geotechnical conditions for HDD 111.B through HDD 123 for total of 20 crossings (2 per site) in Segment 11 – Package 7A. A copy of the geotechnical reports and HDD design drawings can be found in Appendix B and D respectively.
- Provide a descriptive narrative of the HDD Crossings in support of the attached design drawings and technical specifications.
- Present stress and inadvertent release analyses that support the proposed designs. Calculation can be found in Appendix C.
- Evaluate construction considerations including inadvertent return mitigation.

2.0 PROJECT DESCRIPTION

The proposed CHPE route follows the Hudson River Valley of New York. The new transmission line will be approximately 338 miles in length, extending from the south end of Lake Champlain to Astoria, NY. Segment 11 - Package 7A is located in approximately an 8.5-mile section of the route in Greene County, New York.

A Project Overview Map and a plan showing the locations of the HDD 111.B through HDD 123 crossings are presented in Appendix A.

The HDD crossings addressed in this report are located as shown in Table 1 below:

Table 1: HDD Locations, Lengths, and Description

HDD #	Start Station	End Station	HDD Length, ft	Obstruction Crossed
111.B	70002+15	70009+80	765	Pond
111.B.2	70002+15	70009+80	765	Pond
112	70036+25	70045+85	960	Pond
112.2	70036+25	70045+85	960	Pond
113	70055+20	70061+30	610	Railroad and Highway
113.2	70055+20	70061+30	610	Railroad and Highway
115	70085+30	70098+80	1350	Water Body
115.2	70085+15	70098+77	1362	Water Body
117	70112+45	70119+80	735	Railroad
117.2	70113+70	70121+60	790	Railroad
118	70137+25	70145+75	850	Road
118.2	70137+20	70145+80	860	Road
119	70160+25	70168+65	840	Wetland
119.2	70160+25	70168+65	840	Wetland
120	70172+35	70187+05	1470	Drainage Channel
120.2	70172+35	70187+05	1470	Drainage Channel
122	70339+60	70350+40	1100	Railroad
122.2	70339+60	70350+40	1100	Railroad
123	70372+00	70380+50	850	Private Plant
123.2	70372+00	70380+50	850	Private Plant

3.0 BACKGROUND

The underground construction of two HVDC electrical transmission cables is proposed to be housed in individual 10 or 12-inch-diameter DR 9 or 7 HDPE pipes spaced approximately 15 to 20 feet apart. A third, 2-inch-diameter DR 7 pipe will be bundled with one of the 10 or 12-inch diameter pipes for a telecommunications line. The pipes are to be installed in 16 to 20-inch final ream diameter drill holes. The minimum design guidelines are to install the cables at least 25 feet below congested areas, roads, railroads, under/around other obstructions, 15 to 25 feet below wetland, and 35 to 45 feet below open bodies of water using HDD methods. HDD is a widely

used trenchless construction method to install conduits with limited disturbance to the ground around the drill alignment, minimal ground surface impacts above the alignment, and to minimize the potential of inadvertent releases of drilling fluids while drilling. The goal for using HDD methods is to install the conduits while controlling and minimizing the amount of impact to congested areas, existing underground obstructions, and to the adjacent wetlands to the extent possible.

4.0 SITE CONDITIONS

4.1 HDD DESIGN DESCRIPTIONS

Below is a brief description of the HDD crossings found in Segment 11 - Package 7A. The design drawings are included in Appendix D.

4.1.1 HDD #111.B

HDD #111.B is 765 feet long and runs parallel to the CHG&E transmission line corridor just east of the railroad right of way. This HDD begins at El. 112 feet and traverses under relatively flat terrain before passing under a pond, near station 70006+00. The HDD exits at El. 120 feet (reference datum NAVD 1988).

4.1.2 HDD #112

HDD #112 is 960 feet long and runs parallel to the CSX railway just east of the railroad right of way. This HDD begins at El. 111 feet and traverses relatively flat terrain before passing under a pond, near station 70040+00. The terrain then climbs over the final 250 feet of the drill, exiting on a hillside at El. 132 feet (reference datum NAVD 1988).

4.1.3 HDD #113

HDD #113 is 610 feet long and crosses under the CSX railway at a 14 degree angle while also crossing under the NY-23 bridge that spans the RR. The surface terrain in this area gradually ascends upward throughout the path of the HDD which enters at El. 97 feet and exits at El. 110 feet (reference datum NAVD 1988).

4.1.4 HDD #115

HDD #115 is a long drill which begins in the DPG Enterprize used car dealership parking lot and then extends under Catskill creek, paralleling the Route 9W bridge, exiting in the open space adjacent to the Main Street/Route 9W on ramp, near station 70085+00. The total length of the HDD is 1,350 feet with a short 203-foot horizontal curve in the center of the drill path. The surface terrain descends gradually on both sides of the river before dropping off into Catskill Creek. The entry point begins at El. 34 feet and exits at El. 51 feet (reference datum NAVD 1988). Equivalent pipe dimensional stress calculations for this drill yielded an unacceptable result for unconstrained collapse with the standard 10" DR 9 HDPE pipe size thus conduit piping design parameters were increased to 12" DR 7 HDPE, increasing the equivalent pipe dimensions to 16" DR 11.

4.1.5 HDD #117

HDD #117 is 735 feet long and crosses under the CSX railway at a 9 degree angle. The terrain is mostly flat for the entire drill alignment with the HDD entry at El. 101 feet and exit at El. 101 feet (reference datum NAVD 1988).

4.1.6 HDD #118

HDD #118 begins in the Hoebowl Bowling Center parking lot and crosses under Route 9W exiting along the hillside adjacent to N&S Supply of Catskill. The total length of the HDD is 850 feet with a short 186-foot horizontal curve in the center of the drill path. The surface terrain in this location declines gradually from the Hoebowl Bowling Center to the N&S Supply of Catskill while traversing the side slope adjacent to the CSX railroad. The HDD begins at El. 134 feet and terminates at El. 123 feet (reference datum NAVD 1988).

4.1.7 HDD #119

HDD #119 is 840 feet long and crosses a stream / wetland as well as runs parallel to the CSX railway. The drill path is straight and proceeds under a relatively flat existing grade which ascends slightly towards the end of the drill. The HDD begins at El. 95 feet and terminates at El. 116 feet (reference datum NAVD 1988). Equivalent pipe dimensional stress calculations for this drill yielded an unacceptable result for unconstrained collapse with standard pipe sizes thus

conduit piping design parameters were increased to 12” DR 7 HDPE tubing, increasing the equivalent pipe dimensions to 16” DR 11.

4.1.8 HDD #120

HDD #120 is 1,470 feet long and runs parallel to the CSX railway just east of the railroad right of way. The HDD bypasses two CSX culverts. The drill path is straight and proceeds under two low points adjacent to the CSX culverts. This HDD begins at El. 120 feet and terminates at El. 122 feet (reference datum NAVD 1988). Equivalent pipe dimensional stress calculations for this drill yielded an unacceptable result for unconstrained collapse with standard pipe sizes thus conduit piping design parameters were increased to 12” DR 7 HDPE tubing, increasing the equivalent pipe dimensions to 16” DR 11.

4.1.9 HDD #122

HDD #122 is 1,100 feet long and crosses under several abandoned rail lines that have been disconnected from the CSX railway. Elevation changes substantially near the beginning of the drill and levels off, maintaining a flat profile for the majority of the HDD. The HDD begins at El. 91 feet and terminates at El. 106 feet (reference datum NAVD 1988).

4.1.10 HDD #123

HDD #123 is 850 feet long and runs parallel to the CSX railway just east of the railroad right of way. The HDD is straight and crosses under an abandoned factory service bay adjacent to the CSX railway. The terrain is nearly flat with the HDD entry at El. 108 feet and exit at El. 113 feet (reference datum NAVD 1988).

4.2 GEOTECHNICAL DATA

Below is a summary of the geotechnical borings that were reviewed in the design of each of the HDD crossings found in Segment 11 - Package 7A. The Geotechnical reports are included in Appendix B.

4.2.1 HDD #111.B

At this time, no geotechnical borings are available for HDD #111.B. There are two planned Geotechnical borings that will be completed once landowner access permissions have been

granted. For the purposes of the BoreAid analyses the closest Geotechnical Boring (KB-220.5 from HDD #112) was used.

4.2.2 HDD #112

Three Geotechnical bores (KB-220.5, K-220.6, and SC-5) are located along the proposed HDD #112 alignment. After reviewing and comparing these samples, geotechnical boring SC-5 was selected to be used in the BoreAid analysis as it best represented the complete soil strata for the HDD alignment. Consideration was taken for the other geotechnical borings in the design of the HDD. Specifically, geotechnical boring KB-220.5 was referenced to extend the bottom rock layer the full depth of the HDD profile. The bore depth of this analysis extends down to 40 ft and terminated in an interbedded shale and sandstone layer. The first 5 feet of the bore is sand and the majority of the between layers are silt interspersed with sand, before transitioning into a shale and sandstone rock layer for the remaining 8 feet of the bore. The Geotechnical report for this HDD and test data is provided in Appendix B.

Based on the borings, the soil profile for the HDD #112 BoreAid analyses will be divided into seven [7] layers: Sand (SP), Silt (ML), Sand (SM), Silt (ML), Sedimentary Rock, Gravel (GM) and Sedimentary Rock. The chosen test bore did not reach the full depth of the drill path however, the other test holes corroborated that the sedimentary rock layer continued for the full depth of the HDD profile thus a final layer of sedimentary rock was added to complete the soil strata used in the IR analysis. The soil profiles used in the BoreAid analyses for this HDD are presented in Appendix C.

4.2.3 HDD #113

Two Geotechnical bores (KB-220.9 and SC-6) are located along the proposed HDD #113 alignment. The other borings listed in Appendix B (K-221.0 and B221.0-1) are located outside the extents of the HDD alignment and are provided as reference only for the geology in the area. After reviewing and comparing these samples, geotechnical boring KB-220.9 was selected to be used in the BoreAid analysis as it best represented the complete soil strata for the HDD alignment and covered the full depth of the HDD profile. Consideration was taken for the other Geotechnical borings in the design of the HDD. KB-220.9 was performed on the south side of the drill path by Kiewit on 12/20/2022 and reached a total depth of 57 feet. After penetrating

through a 2-foot-deep layer of silty sand the bore continued into fat clay and lean clay layers before passing through a silt layer for the remainder of the bore path. The Geotechnical report for this HDD and test data is provided in Appendix B.

Based on the borings, the soil profile for the HDD #113 BoreAid analyses will be divided into four [4] layers: Sand (SM), Clay (CH), Clay (CL), and Silt (ML). The soil profiles used in the BoreAid analyses for this HDD are presented in Appendix C.

4.2.4 HDD #115

Two Geotechnical bores (KB-221.3 and KB-221.4) are located along the proposed HDD #115 alignment. The other borings listed in Appendix B (CU-2, B221.14-1, B221.2-1, B221.4-1, CU-2A, and B221.5-1) are located outside the extents of the HDD alignment and are provided as reference only for the geology in the area. After reviewing and comparing these samples, geotechnical boring KB-221.3 was selected to be used in the BoreAid analysis as it best represented the complete soil strata for the HDD alignment and covered the full depth of the HDD profile. Consideration was taken for the other Geotechnical borings in the design of the HDD. KB-221.3 was performed by Kiewit on 9/20/2022 at the north end of the drill location. The KB-221.3 bore hole terminated 85 feet deep. For the first 16 feet of the boring, the soil was primarily composed of clayey gravel, sandy clay, and clayey silt before transitioning into Shale which composed the remainder of the bore path. The Geotechnical report for this HDD and test data is provided in Appendix B.

Based on the borings, the soil profile for the HDD #115 BoreAid analyses will be divided into five [5] layers: Clayey Gravel (GC), Sandy Clay (CL), Clayey Silt (ML), Clayey Gravel (GC), and Sedimentary Rock. The soil profiles used in the BoreAid analyses for this HDD are presented in Appendix C.

4.2.5 HDD #117

Three Geotechnical bores (K-221.8, B221.8-1, and KB-221.8B) are located along the proposed HDD #117 alignment. The other boring listed in Appendix B (K-221.7) is located outside the extents of the HDD alignment and is provided as reference only for the geology in the area. After reviewing and comparing these samples, geotechnical boring KB-221.8B was selected to be used in the BoreAid analysis as it best represented the complete soil strata for the HDD

alignment and covered the full depth of the HDD profile. Consideration was taken for the other Geotechnical borings in the design of the HDD. KB-221.8B was performed by Kiewit on 1/17/2023 in the middle of the drill location. The KB-221.8B bore hole terminated 82 feet deep. For the first 2 feet of the boring, the soil was comprised of fill material from the Railroad before transitioning to a clay layer followed by silt layers for the remainder of the bore path. The Geotechnical report for this HDD and test data is provided in Appendix B.

Based on the borings, the soil profile for the HDD #117 BoreAid analyses will be divided into six [6] layers: Fill – Sand with Gravel (SP), Clay (CL), Silt (ML), Silt (ML), Silt (MH), and Silt (ML). The soil profiles used in the BoreAid analyses for this HDD are presented in Appendix C.

4.2.6 HDD #118

Four Geotechnical bores (KB-222.2, K-222.3, B222.34-1, and K-222.4) are located along the proposed HDD #118 alignment. After reviewing and comparing these samples, geotechnical borings KB-222.2 were selected to be used in the BoreAid analysis as it best represented the complete soil strata for the HDD alignment and covered the full depth of the HDD profile. Consideration was taken for the other Geotechnical borings in the design of the HDD. The Soils Assistant was used in BoreAid to build the complete soil strata for HDD #118 as borings K-222.3 and K-222.4 displayed very similar soil layers as KB-222.2, but at differing depths. KB-222.2 was drilled on the northern side of the drill path and terminates at a depth of 70 feet. After passing through a 3-foot-deep layer of silty sand fill the bore continues into a region of silt and clay which persists down to 49 feet of depth at which point the bore enters a 4 foot thick band of weathered rock. Once out of the weathered rock the remainder of the drill path is composed of Graywacke. The Geotechnical report for this HDD and test data is provided in Appendix B.

Based on the borings, the soil profile for the HDD #118 BoreAid analyses will be divided into four [4] layers: Gravel (GW), Silt, (MH), Clay (CL), and Sedimentary Rock. The soil profiles used in the BoreAid analyses for this HDD are presented in Appendix C.

4.2.7 HDD #119

Two Geotechnical bores (K-222.7 & KB-222.8) are located along the proposed HDD #119 alignment. The other borings listed in Appendix B (B222.6-1, KB-222.6A and K-222.6) are located outside the extents of the HDD alignment and are provided as reference only for the

geology in the area. After reviewing and comparing these samples, geotechnical boring KB-222.8 was selected to be used in the BoreAid analysis as it best represented the complete soil strata for the HDD alignment and covered the full depth of the HDD profile. Consideration was taken for the other Geotechnical borings in the design of the HDD. KB-222.8 terminates its analysis at a total depth of 90 feet and is positioned on the southern end of the HDD path. The boring is comprised primarily of alternating Clay and Silt layers. The Geotechnical report for this HDD and test data is provided in Appendix B.

Based on the borings, the soil profile for the HDD #119 BoreAid analyses will be divided into six [6] layers: Clay (CL), Silt (MH), Clay (CH), Silt (ML), Silt (MH), and Clay (CL). The soil profiles used in the BoreAid analyses for this HDD are presented in Appendix C.

4.2.8 HDD #120

Four Geotechnical bores (B222.9-1, K-223.0, KB-223.1A, and K-223.1) are located along the proposed HDD #120 alignment. After reviewing and comparing these samples, geotechnical boring KB-223.1A was selected to be used in the BoreAid analysis as it best represented the complete soil strata for the HDD alignment and covered the full depth of the HDD profile. Consideration was taken for the other Geotechnical borings in the design of the HDD. The KB-223.1A analysis was performed on the middle of the HDD path and reached a final depth of 85 feet. The first 25 feet of the bore path consisted of Fat Clay, after which the soil transitioned to Silt for the next 20 feet, followed by 2 feet of Lean Clay, 10 feet of Weathered Rock, and finally Graywacke for the remainder of the boring. The Geotechnical report for this HDD and test data is provided in Appendix B.

Based on the borings, the soil profile for the HDD #120 BoreAid analyses will be divided into five [5] layers: Clay (CH), Silt (MH), Clay (CL), Sedimentary Rock, and Sedimentary Rock. The soil profiles used in the BoreAid analyses for this HDD are presented in Appendix C.

4.2.9 HDD #122

Five Geotechnical bores (KB-226.1, B226.1-1, K-226.2A, K-226.2B, and B226.2-1) are located along the proposed HDD #122 alignment. After reviewing and comparing these samples, geotechnical boring KB-226.1 was selected to be used in the BoreAid analysis as it best

represented the complete soil strata for the HDD alignment and covered the full depth of the HDD profile. Consideration was taken for the other Geotechnical borings in the design of the HDD. KB-226.1 was completed in the middle of the HDD path and reached a total depth of 60 feet. The first 15 feet of the bore path consisted of Silt, after which the soil transitioned to Fat Clay for the next 22 feet, followed by Graywacke for the remainder of the boring. The Geotechnical report for this HDD and test data is provided in Appendix B.

Based on the borings, the soil profile for the HDD #122 BoreAid analyses will be divided into three [3] layers: Silt (MH), Clay (CH), and Sedimentary Rock. The soil profiles used in the BoreAid analyses for this HDD are presented in Appendix C.

4.2.10 HDD #123

Three Geotechnical bores (B226.6-1, K-226.7, and KB-226.8A) are located along the proposed HDD #123 alignment. The other borings listed in Appendix B (CU-5A, K-226.8, and K-227.0) are located outside the extents of the HDD alignment and are provided as reference only for the geology in the area. After reviewing and comparing these samples, geotechnical boring KB-226.8A was selected to be used in the BoreAid analysis as it best represented the complete soil strata for the HDD alignment and covered the full depth of the HDD profile. Consideration was taken for the other Geotechnical borings in the design of the HDD. KB-226.8A terminates its analysis at a total depth of 60 feet and is positioned on the southern end of the HDD path. The initial 3 feet of material was primarily Silty Gravel with railroad ballast, after which the soil transitioned to Silt for the next 15 feet, followed by Clay for 10 feet, and finally Silt for the remainder of the boring. The Geotechnical report for this HDD and test data is provided in Appendix B.

Based on the borings, the soil profile for the HDD #123 BoreAid analyses will be divided into five [5] layers: Gravel (GM), Clay (CL), Silt (MH), Clay (CH), and Silt (MH). The soil profiles used in the BoreAid analyses for this HDD are presented in Appendix C.

5.0 DESIGN SUMMARY

5.1 HDD SEQUENCE

The HDD construction process in soils generally consists of three steps:

Step 1: Drill a small diameter (approximately 6 to 9 inches diameter) pilot hole along the preplanned drill path. During the pilot hole boring, the location of the drill bit is tracked to confirm that it is following the planned path. If the drilling is observed to start to deviate from the planned path, corrections are made using a “bent” lead drilling section and controlled rotation of drill pipe string. The drill bit is designed to cut through the soil in combination with pressurized drilling fluid assisting the cutting of the soil, and transport of the cuttings to the entry pit for removal. The drilling fluid is generally a combination of bentonite (a clay mineral) and water, combined with inert biodegradable additives to support sides of the drillhole and to better carry the cuttings to the entry pit at lower pressures and velocities. The drilling fluids typically used under waterbodies and wetland areas are typically required in the project specifications to be BMP’s state “NSF certified”. Once the pilot drill reaches the exit point, the next step of the process, hole enlargement begins.

Step 2: Enlarge the pilot hole to the diameter required for insertion of the conduits is typically referred to as reaming. This is accomplished by using successively larger reaming bits pulled or pushed through the pilot hole to gradually enlarge the drill from the smaller diameter pilot hole to a size able to accommodate the HDPE conduits. We estimate that one and possibly a second reaming pass will be used to create the 16 to 24 inch-diameter reamed drill hole.

Step 3: Pull the conduits into the enlarged hole. While the pilot hole and reaming operations are going on, the contractor will also be fabricating the conduits to be installed. The conduits come in about 40-foot-long sections and need to be fusion butt welded, de-beaded, and arranged for the pullback into the drillhole. Ideally, the complete conduit (or bundle of conduits) will be welded (and bundled) into one long length for insertion. The goal is usually to pull the bundle into the drill in one, continuous, smooth, around the clock, operation. However, depending on work area and access constraints, sometimes the pipe is assembled in 2 or 3 lengths that are then joined (welded), “on the fly” as the conduit (bundle) is slowly pulled into the drillhole. As the conduit (bundle) is pulled into the hole it is usually ballasted with clean water, and some of the drilling

fluid supporting the sides of the hole is displaced by the conduit and collected for eventual disposal.

5.2 GEOMETRY AND LAYOUT

The HDD profiles are generally defined by the following parameters:

- Entry point location.
- Exit point location.
- Entry angle.
- Exit angle.
- Horizontal and Vertical radius of curvature.
- Lengths of tangent sections.
- Length of crossing.
- Depth of crossing and depth of cover.
- Site constraints and obstructions.
- Available work and layout areas.

The proposed drill paths entry angle, exit angle, and a vertical and horizontal design radius of curvature for each HDD crossing in this segment are shown in the design drawings in Appendix D. The HDD technical specifications are found in Section 330507.13 of the Technical Specifications. Inadvertent release prevention and mitigation plans for each HDD crossing are provided as separate documents.

The site conditions posed various challenges in developing a design that is both constructible and minimizes the potential for negative environmental impacts. The proposed design has entry and exit pits areas constrained by available easements and traffic constraints. Available work areas may limit the lengths of the conduit that can be pre-assembled, necessitating having to pre-assemble the bundle into several smaller segments. Those pre-assembled segments will then have to be welded together during the pullback. HDD specific work areas at the entry and exit ends of the bores are noted on the drawings in Appendix D. In addition, space and easement constraints will require that during pullback, the above ground sections of the conduit will not be straight and will require rollers to accommodate a horizontal bend. Conduit assembly is expected to be performed at the ends of the alignment shown on the drawings in Appendix D. In some cases, the limited work area at the one end of the HDD alignment, may require that the drilling and reaming prior to pullback be performed by the HDD rig located at the one end of the alignment, but the HDD rig may need to be relocated to the other end of the alignment for the

pullback/conduit installation phase of the work. In addition, for some longer HDD's in soft/weak ground conditions, the intersection HDD method may be used to better control the risk of inadvertent drilling fluid releases.

5.3 SUBSURFACE MODEL DEVELOPMENT

A subsurface model was developed based on the boring logs as approximate representation of subsurface conditions along the proposed HDD alignment. BoreAid Version 5.1.08 (2017) modeling software (a product of Vermeer) was used to model the HDD. Geotechnical soil input parameters reflect the default BoreAid values for each soil type. These soil properties were found to be conservative assumptions for the selected soil types and were in the typical published ranges. Values for all soil properties are listed in in the BoreAid HDD simulation outputs in Appendix C.

5.3.1 BoreAid Analysis

For the BoreAid analyses, the pipe configuration analyzed was for a pipe with a dimension ratio (DR) of 9 or 7 and the following conduit configurations will be used:

- 1) The following section is assumed to not be ballasted with water during pullback.
 - a. An individual 10- or 12-inch diameter DR 9 or 7 HDPE pipe
- 2) The following bundled pull is assumed to be ballasted with water during pullback to create a near neutral buoyancy.
 - a. A bundle consisting of a 10 or 12 inch-diameter DR 9 or 7 HDPE pipe and a 2-inch-diameter DR 7 HDPE pipe

The stresses and deflections of the pipe are evaluated and compared to allowable values as shown on the BoreAid runs presented in Appendix C.

5.3.2 Inadvertent Return Analysis

BoreAid modeling software was used to perform inadvertent return analyses for each HDD alignment. The drill path alignment was selected and checked so that the allowable drill pressures are greater than the static and circulating pressures throughout most of the alignment

except at the ends. The allowable pressures are related to in-situ ground and water stresses around the drill hole, and the strength of the ground. The Limiting Formation Pressure Figure, indicate a generally acceptable factor of safety against the potential for inadvertent return along the proposed drill paths except at the ends.

Based on the drill path selection process, areas with the greatest potential for an inadvertent return were examined and adjusted during the design process to further limit the risks associated with an inadvertent return when possible. The entry and exit points generally exhibit the greatest potential for inadvertent returns. The depth of the entry/exit pits should be considered by the Contractor to increase the effective soil stress and provide a storage volume for returns to and near the entry and exit points. Note that while the potential for inadvertent return has been reduced through the design process, inadvertent returns are still possible through existing fissures in the soil or rock, shrinkage cracks, weak soils, or porous deposits of coarse gravel.

Fractures within and/or hydraulic fracturing (frac-out) of the surrounding soils may cause loss of drilling fluid pressures or inadvertent return of drilling fluid into the wetlands. The areas of greatest concern are reduced soil cover over the drill alignment and where there is a risk of release to the wetlands. The contractor will be required to institute pre-emptive measures in this area to mitigate the effects of a release in the event that one should occur. Such measures may include containment booms and a standby vacuum truck to collect any released drilling fluids immediately. Ground heave or settlement from frac-out and inadvertent returns also pose risks to structures such as roadways. The HDD alignment was designed with geometries to providing enough soil cover to reduce the risk of inadvertent return. The Inadvertent Return Contingency Plan details additional methods for mitigating inadvertent returns.

5.4 LIMITATIONS

The structural analysis and inadvertent return mitigation analysis were performed using the proposed design drill paths and typically anticipated equipment and means and methods. The HDD subcontractor must submit structural and inadvertent return mitigation calculations and analysis for each drill path, including their final drill path geometry reflecting its specific equipment and contractor's specific means, methods drilling fluids, and proposed final contractor refined final planned alignment. It is important to note that the Kiewit Design Team's analysis

has been done without consideration for point loading due to unpredictable subsurface features such as encountering rocks, boulders, or other extremely dense material that may damage the conduit. The risk of such damage is low, but has been reported on some projects in recent years.

6.0 CONSTRUCTION CONSIDERATIONS

6.1 RISK AWARENESS AND ASSESSMENT

The risks to be aware of during HDD include: inadvertent returns or fluid loss; any potential obstructions blocking or causing large deviations from the planned drill path and electromagnetic effects of the HDD steering equipment from nearby high voltage power lines.

6.2 SITE ANALYSIS

What does the site look like and what considerations might need to be taken for site access, construction of HDD entry and exit pits, and layout area for equipment and supplies. Careful consideration of all necessary jobsite activities should be analyzed from the perspective of the site conditions, terrain and nearby structures.

6.3 EROSION CONTROL

The proposed drill path crosses under roads, parking lots, water, stormwater and gas and electric utility lines, as well as under streams/wetlands, bodies of water, and railroads. The soil erosion control drawing will show where primary soil erosion control measures are required. The technical specifications and Inadvertent Return Contingency Plan both detail the requirements for both primary and secondary sediment and erosion control measures to be followed in case of an inadvertent return, which ultimately could deposit the fine bentonite sediment into the stream or wetland or bodies of water if not controlled. Construction of the exit pit will be close to the stream/wetlands. Silt fence, hay bales, and other soil erosion control measures will be required to be installed as shown in the construction drawings. Secondary control measures are to be readily accessible at or near the work areas in accordance with the project specifications and Inadvertent Return Contingency Plan.

6.4 SURVEILLANCE AND MONITORING

During installation of the pipe by HDD, monitoring the stream, wetlands, waterbodies and drill alignment for indications of potential inadvertent returns will be necessary. The contractor will have primary responsibility for this monitoring and associated response and reporting in real-time. This will be accomplished as detailed in the Inadvertent Return Contingency Plan. Continuous visual inspection of the entire path is the most significant method of detection. However, an experienced drill crew can often prevent a return by monitoring drilling fluid pressures. A loss of pressure may indicate an inadvertent return has occurred. Regardless of the level of preparation, inspection, monitoring, etc., inadvertent returns are not always possible to predict or prevent. However, a significant effort can minimize the possibility but not eliminate it.

7.0 REFERENCES

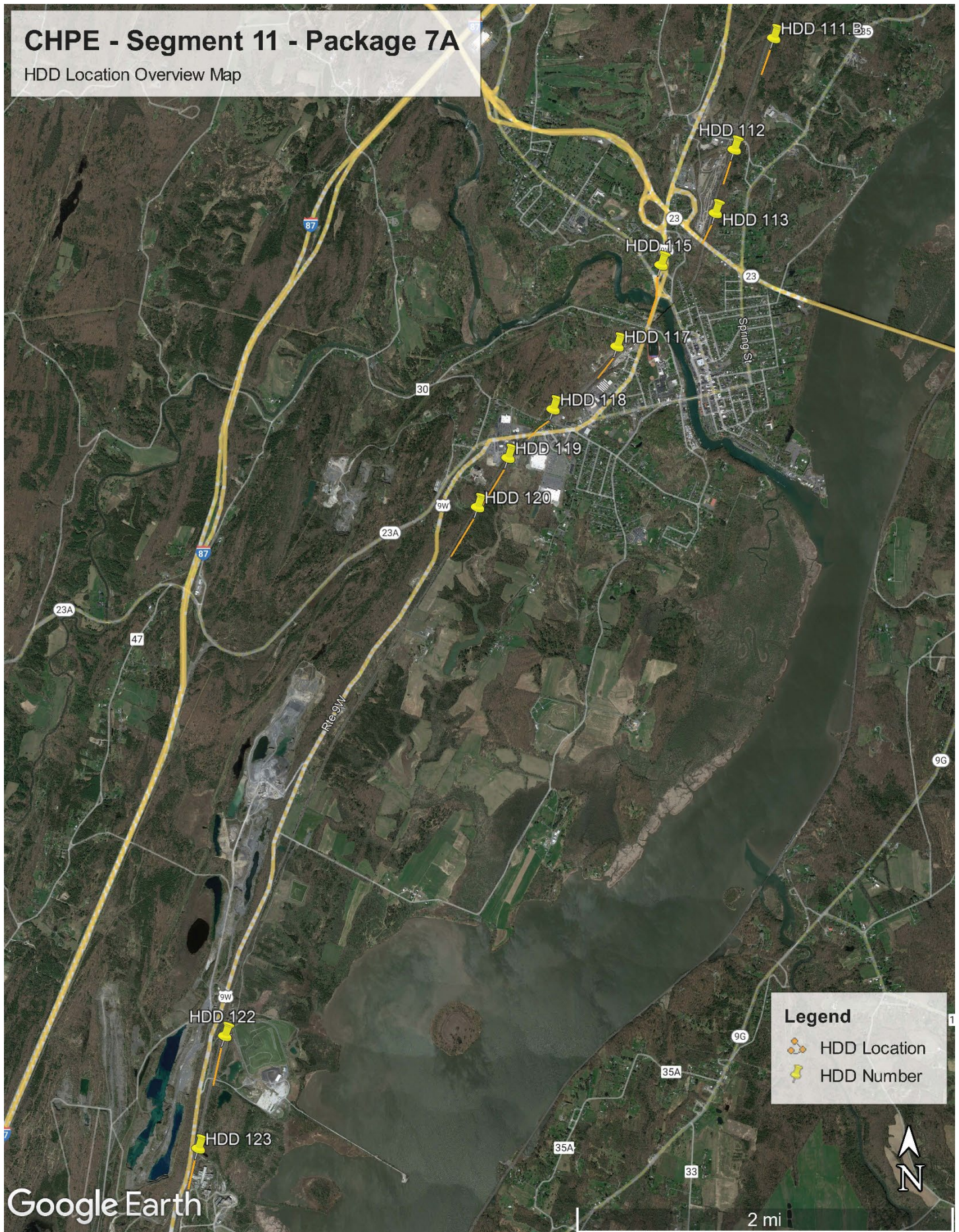
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Appendix A

Overview Map

CHPE - Segment 11 - Package 7A

HDD Location Overview Map




Appendix B

HDD Geotechnical Reports

DATE: December 16, 2022

TO: Zachary Bauer; Tetra Tech Rooney

FROM: Matthew Hawley, P.E.; Kiewit Engineering (NY) Corp. 
Jaren Knighton; Kiewit Engineering (NY) Corp.

SUBJECT: Geotechnical Data: Segment 11 – Package 7A – HDD Crossing 112 – Revision 1
Champlain Hudson Power Express Project
Catskill, New York

Kiewit Engineering is providing the attached geotechnical data for use in the horizontal direction drill (HDD) design for the Champlain Hudson Power Express project in Upstate New York. This HDD crossing is located north of Catskill, New York. The approximate station for the start of HDD crossing number 112 is STA 70036+00 (42.2354° N, 73.8631° W).

The geotechnical data at this HDD crossing is attached. The available data is taken from the previous investigation by AECOM and the recent investigations by Terracon and Kiewit, referenced below.

- AECOM, Geotechnical Data Report, Upland Segments, Champlain Hudson Power Express, dated May 28, 2021.
- Kiewit Engineering (NY) Corp., Package 7A Phase 3 Borings, Champlain Hudson Power Express, New York, dated December 8, 2022.
- Terracon Consultants-NY, Inc., Results of Field Exploration, Champlain-Hudson Power Express – Package 7a, Catskill, NY, dated May 23, 2022.

Contact us if you have questions or require additional information.

HDD 112
Borings SC-5, K-220.6
KB-220.5
Segment 11 - Design Package 7A

CHPE Segment 11 - Package 7A
HDD Soil Boring Coordinates and Elevations

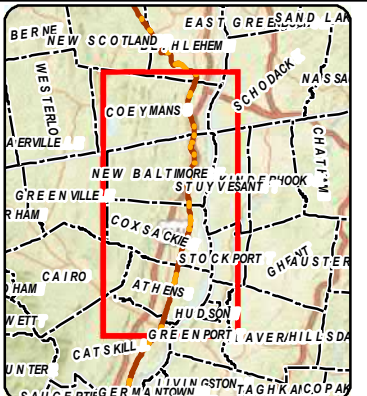
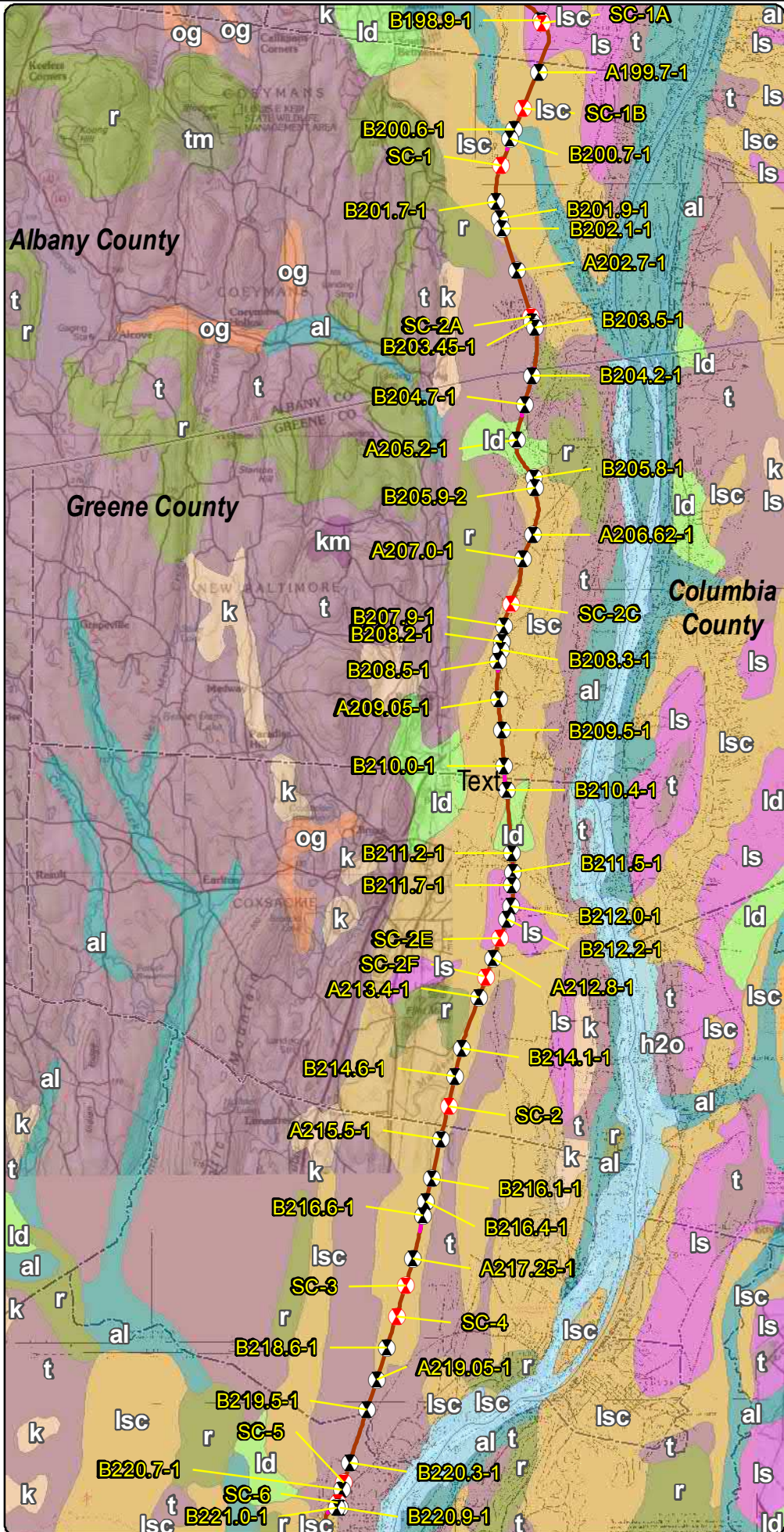
Firm	Boring	Northing (feet)	Easting (feet)	Ground Surface Elevation (feet)
TRC*	B221.0-1	1237452.6	663787.2	99.6
	B221.2-1	1236173.4	663261.8	115.0
	B221.4-1	1235622.5	662622.3	22.4
	B221.5-1	1235006.9	662058.8	95.5
	B221.6-1	1234675.8	661633.8	98.3
	B221.8-1	1234265.3	661277.2	99.4
	B222.34-1	1232191.5	659098.9	133.5
	B222.6-1	1231252.6	658182.3	113.7
	B222.9-1	1229751.0	657274.3	121.4
	B225.8-1	1215861.0	650622.7	91.0
	B226.1-1	1214654.4	650328.3	105.9
	B226.2-1	1214120.5	650254.4	108.5
	B226.6-1	1211894.7	649689.7	112.1
AECOM**	CU-1	1237028.6	663123.9	19.7
	CU-2	1236042.7	662897.0	24.8
	CU-2A	1235325.9	662268.9	38.1
	CU-5A	1210523.7	649411.8	118.4
	SC-5	1239310.3	664321.6	110.2
	SC-6	1237781.0	663919.8	101.6

Notes:

- Northings and Eastings are provided in NAD83 New York State Plane East Zone.
- Elevations are referenced to the NAVD88 datum.
- * TRC boring coordinates as shown in Table 1-6 in AECOM report (reference below). Boring elevations estimated from November 2021 topographic survey by Williams Aerial.
- ** AECOM boring coordinates and elevations as shown in Table 1-6 in AECOM report.
- *** Kiewit boring coordinates and elevations are noted on the boring logs.

Reference:

AECOM, Geotechnical Data Report, Upland Segments: Putnam Station, Washington County, to Cementon, Green County, NY, Champlain Hudson Power Express, dated May 28, 2021.



LEGEND

- 2021 Boring Location
- Previous (2013) Boring Location
- Terrestrial Route HVDC
- Submarine Route HVDC
- Terrestrial Route HVAC
- Preliminary HDD Locations
- Preliminary Pipe Bridge Location
- Town Boundary
- County Boundary

Surficial Geology

- al - Recent alluvium
- h2o - Water
- k - Kame deposits
- km - Kame moraine
- ld - Lacustrine delta
- ls - Lacustrine sand
- lsc - Lacustrine silt and clay
- og - Outwash sand and gravel
- r - Bedrock
- t - Till
- tm - Till moraine

1 0.5 0 1 Miles

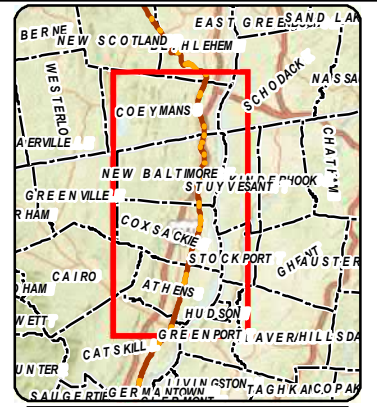
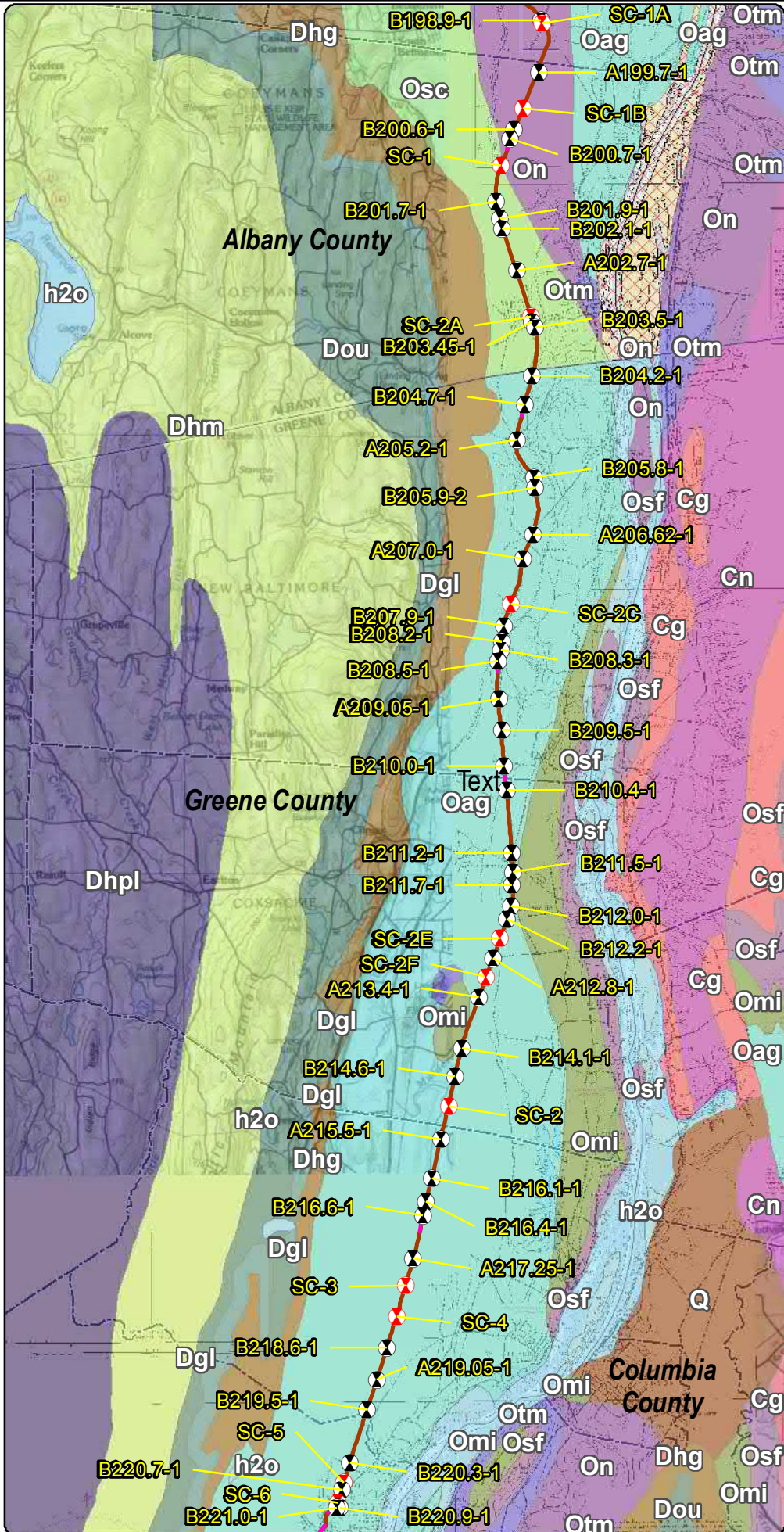
Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

Surficial Geology and Geotechnical Borings
Selkirk to Catskill
Figure 3-10

Prepared on 5/3/2021
by: **AECOM**

DATA SOURCES: ESRI, NYSDOT, NOAA, USACE, NYDOS, TDI, TRC

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LEGEND

- 2021 Boring Location
- Previous (2013) Boring Location
- Terrestrial Route HVDC
- Submarine Route HVDC
- Terrestrial Route HVAC
- Preliminary HDD Locations
- Preliminary Pipe Bridge Location
- Town Boundary
- County Boundary

Bedrock Geology

- Cg - Germantown Formation
- Cn - Nassau Formation
- Dgl - Glenerie Formation
- Dhg - Port Ewen Formation
- Dhpl - Un diff Lower Hamilton Group
- Dhpl - Piatek III Formation
- Dou - Onondaga Limestone
- No Label
- Oag - Austin Glen Form (graywacke, shale)
- Omi - Mount Merino Formation
- On - Normanskill Shale
- Osc - Schenectady Formation
- Osf - Stuyvesant Falls Formation
- Otm - Taconic Melange
- Q - Glacial and Alluvial Deposits
- h2o - Water

* Schenectady Formation includes: graywacke, sandstone, siltstone, shale

Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

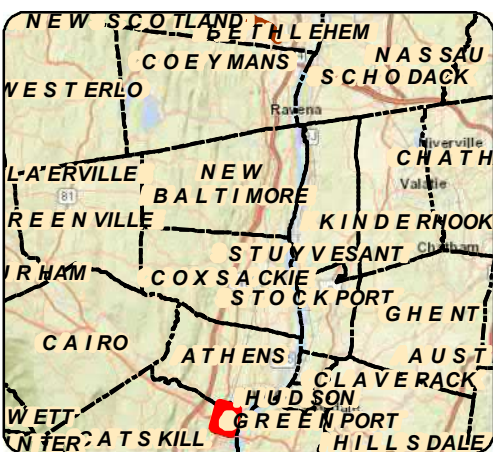
Bedrock Geology and Geotechnical Borings Selkirk to Catskill

Figure 4-10


Prepared on 5/18/2021
by: **AECOM**

DATA SOURCES: ESRI, NYSDOT, NOAA, USACE, NYDOS, TDI, TRC

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LEGEND	
111.8 ● Certified Milepost - Tenths	Streams/Ditches
● Certified Milepost	Railroad ROW
○ Preferred Alternative Milepost - Tenths	Deviation Zone
○ Preferred Alternative Milepost	Deviation Zone Outside ROW
— Terrestrial Route HVDC	Preferred Alternative Deviation Zone
— Submarine Route HVDC	Preferred Alternative Deviation Zone Outside ROW
— Terrestrial Route HVAC	Town Boundary
— Preliminary HDD Locations	Village Boundary
— Preliminary Pipe Bridge Location	State Park (OPRHP)
⊗ 2021 Boring Location	Parcel Ownership
⊗ Previous (2013) Boring Location	Road Name
	Village Name


Champlain Hudson Power Express Project
 Champlain Hudson Power Express Inc.

BORING LOCATION PLAN
Selkirk to Catskill
Figure A-10
 Sheet 18 of 18

Prepared by: **AECOM** 5/19/2021

BORING CONTRACTOR: ADT		<h1>AECOM</h1>								SHEET 1 OF 2			
DRILLER: Chris Chaillou										PROJECT NAME: CHPE -			
SOILS ENGINEER/GEOLOGIST: Chris French										PROJECT NO.: 60323056			
										HOLE NO.: SC-5			
		BORING LOG								START DATE: 1/27/21			
LOCATION: Catskill, NY MP - 220.59 (CSX Rail)										FINISH DATE: 1/27/21			
GROUND WATER OBSERVATIONS				CASING		SAMPLER		DRILL BIT		CORE BARREL			
No water observed		TYPE		Flush Joint Steel		California Modified		Tricone Roller Bit		NQ			
		SIZE I.D.		4"		2.5"		--		1 7/8"			
		SIZE O.D.		4.5"		3"		3 7/8"		3"			
		HAMMER WT.		140 lbs		140 lbs							
		HAMMER FALL		30"		30"				DRILL RIG: CME LC-55			
										BORING TYPE: SPT/Core			
										BORING O.D.: 4.5"/3"			
										SURFACE ELEV.:			
										LONGITUDE:			
										LATITUDE:			
D E P T H	CORING RATE MIN/FT	S A M P L E		PEN. in	REC. in	BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)				N Corr. ⁽²⁾	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS
		DEPTHS FROM - TO (FEET)	TYPE AND NO.										
1.0		0'-5'				Hand Cleared					SP-SW	SAND	0.0': Black fine to coarse SAND, little angular-subangular gravel, little silt; medium dense, moist
2.0													
3.0													
4.0		3'-5'	S-1										TR-1; (3.0'-5.0')
5.0													
6.0		5'-7'	S-2	24"	15"	9	7	10	13	11	ML	Clayey SILT	Brown clayey SILT, trace fine sand; medium stiff, moist
7.0													
8.0		7'-9'	S-3	24"	12"	9	10	7	6	11	ML		SAA TR-2; (8.0'-8.5')
9.0													
10.0		9'-11'	S-4	24"	9"	12	9	7	12	10	SM	Silty SAND	Brown with red/brown mottling fine to coarse SAND, some silt, little subangular-subrounded gravel, trace clay; dense, moist (weathered till)
11.0													
12.0		11'-13'	S-5	24"	18"	4	11	12	16	15	SM/ML		SAA TR-3; (12.0'-12.5')
13.0													
14.0		13'-15'	S-6	23"	22"	WOH	9	9	54/5"	12	ML	Clayey SILT	12.7': Brown clayey SILT; stiff, moist Brown clayey SILT; medium stiff, moist
15.0													
16.0													Casing set at 16', begin coring at 16'
17.0	4	16.0'-19.5'	R-1	42"	25"	RQD: n/a						SANDSTONE (possible boulder - till)	Gray sandstone, fine grained, heavily mechanically jointed, unweathered
18.0													
19.0													
20.0	3.2	19.5'-21.0'	R-2	18"	11"	RQD: n/a							SAA
NOTES:												The information contained on this log is not warranted to show the actual subsurface condition. The contractor agrees that he will make no claims against AECOM if he finds that the actual conditions do not conform to those indicated by this log.	
(1) Thick-wall ring lined drive sampler (California sampler) used for SPT samples. Rings dimensions = 2-1/2" O.D. by 2-7/16" I.D. by 6" length.													
(2) Correction factor: $N_{corr} = N \cdot \sqrt{(2.0^2 - 1.375^2) \text{in.} / (3.0^2 - 2.4^2) \text{in.}}$ = $N \cdot 0.65$.													
Soil description represents a field identification after D.M. Burmister unless otherwise noted.													
SAMPLE TYPE:		S= SPLIT SPOON		U=SHELBY TUBE		R=ROCK CORE							
PROPORTIONS:		TRACE=1-10%		LITTLE=10-20%		SOME=20-35%		AND=35-50%					

BORING CONTRACTOR: ADT	<h1>AECOM</h1>	SHEET 2 OF 2
DRILLER: Chris Chaillou		PROJECT NAME: CHPE -
SOILS ENGINEER: Chris French		PROJECT NO.: 60323056
		HOLE NO.: SC-5
BORING LOG		START DATE: 1/27/21
LOCATION: Catskill, NY MP - 220.59 (CSX Rail)		FINISH DATE: 1/27/21
		OFFSET: N/A

DEPTH	CORING RATE MIN/FT	DEPTHS FROM - TO (FEET)	TYPE AND NO.	PEN. in	REC. in	BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)			N Corr.	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS
21.0											SANDSTONE (possible boulders/till)	<p>Started to penetrate soft materials at 21'. Attempted 2" split spoon at 23' (no recovery)</p> <p>No Recovery</p> <p>Advance casing to 25.0' - attempt core.</p> <p>Sandstone - possible boulder fragments TR-4; (25.1'-25.7')</p>
22.0												
23.0		23'-23.5'	S-7	6"	0"	82						
24.0												
25.0	2	25.0'-30.0'	R-3	60"	18"	RQD: n/a						
26.0											GM	<p>30.0': Gray angular GRAVEL, some clayey silt, little fine to coarse sand; dense, wet TR-5; (30.0'-31.0' 2" split spoon)</p>
27.0												
28.0												
29.0												
30.0		30'-32'	S-7	13"	13"	22	37	50/1"				
31.0											Interbedded SHALE and SANDSTONE	<p>32.0': Interbedded shale (gray) and sandstone (gray), sandstone is fine grained, moderate mechanical jointing, slight fracturing at 45° - 50°, unweathered, few quartzite healed fractures parallel to bedding plane</p> <p>TR-6; (33.9'-34.8')</p> <p>SAA</p>
32.0	3.15	32'-37'	R-4	60"	59%	RQD: 42" = 70%						
33.0												
34.0												
35.0												
36.0											SC-5 terminated at 40', grouted to surface	
37.0	2.2	37'-40'	R-5	36"	22"	RQD: 11" = 31%						
38.0												
39.0												
40.0												
41.0												
42.0												
43.0												
44.0												
45.0												

NOTES:

Soil description represents a field identification after D.M. Burmister unless otherwise noted.

The information contained on this log is not warranted to show the actual subsurface condition. The contractor agrees that he will make no claims against AECOM if he finds that the actual conditions do not conform to those indicated by this log.

SAMPLE TYPE:	S= SPLIT SPOON	U=SHELBY TUBE	R=ROCK CORE
PROPORTIONS:	TRACE=1-10%	LITTLE=10-20%	SOME=20-35% AND=35-50%

ROCK CORE PHOTOGRAPHIC LOG

AECOM Project No: **60323056**
 Project Name: **CHPE – Upstate New York Upland Geotechnical Investigation**
 Location: **Selkirk - Catskill Segment**



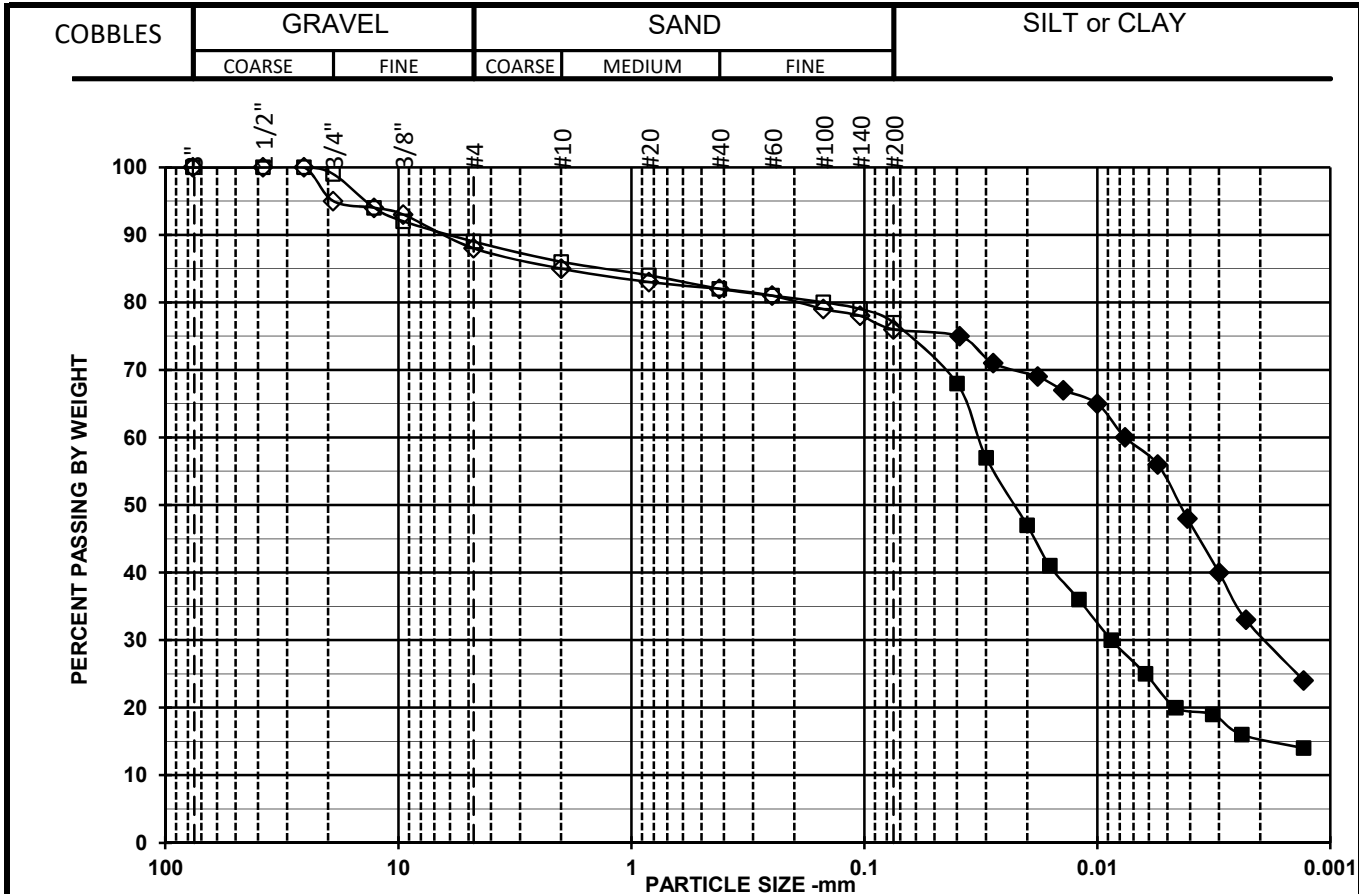
Boring No.	Depth (ft.)	Photographic Log
SC-2F	7.0-16.0	<p>CHPE - Greene Co. Borings SC-2F 7.0'-16.0' 1/26/21 60323056 - AECOM Box 1 of 1</p> <p>R-1 7.0'-12.0' Rec = $\frac{58"}{60"} = 97\%$ RQD = $\frac{58"}{60"} = 97\%$</p> <p>R-2 12.0'-16.0' Rec = $\frac{46"}{48"} = 96\%$ RQD = $\frac{45"}{48"} = 94\%$</p>
SC-5	16.0-40.0	<p>CHPE - Greene Co. Borings SC-5 16.0'-40.0' 1/27/21 60323056 - AECOM Box 1 of 1</p> <p>R-1 16.0'-19.5' Rec = $\frac{25"}{42"} = 60\%$ RQD = $\frac{16.5"}{42"} = 44\%$</p> <p>R-2 19.5'-21.0' Rec = $\frac{11"}{18"} = 61\%$ RQD = $\frac{6"}{18"} = 33\%$</p> <p>R-3 25.0'-30.0' Rec = $\frac{18"}{60"} = 30\%$ RQD = $\frac{11.5"}{60"} = 19\%$</p> <p>R-4 32.0'-37.0' Rec = $\frac{59"}{60"} = 98\%$ RQD = $\frac{42"}{60"} = 70\%$</p> <p>R-4 Cont.</p> <p>R-5 37.0'-40.0' Rec = $\frac{22"}{36"} = 61\%$ RQD = $\frac{11"}{36"} = 31\%$</p> <p style="text-align: right; color: red;">Note</p>

Note: Black foam inserts represent core pieces that were removed for geotechnical and/or thermal resistivity laboratory testing

Aquifer
CHPE - Selkirk Catskill Borings
LABORATORY SOIL TESTING DATA SUMMARY

BORING NO.	SAMPLE NO.	DEPTH (ft)	IDENTIFICATION TESTS							REMARKS
			WATER CONTENT (%)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	USCS SYMB. (1)	SIEVE MINUS NO. 200 (%)	HYDROMETER % MINUS 2 μm (%)	
SC-1	S-2	5-7	28.2	54	23	31	CH	99.4	45	
SC-1	S-4	9-11	25.8	44	22	22	CL	96.8	44	
SC-1A	S-3	7-9	11.7				SM	34.1	4	
SC-1A	S-8	20-22	22.6				SM	37.8	3	
SC-1A	S-10	30-32	35.3	37	19	18	CL	99.9	44	
SC-2C	S-2	5-7	5.8				GP-GM	8		
SC-2C	S-7	15-17	19.1	36	19	17	GC	35	14	
SC-2C	S-9	24-29	5.0	15	10	5	GC-GM	21	5	
SC-2E	S-2	5-7	38.1	61	25	36	CH	99.5	85	
SC-2E	S-5	11-13	39.5	47	23	24	CL	99.8	64	
SC-3	S-2	5-7	32.9	76	28	48	CH	99.4	93	
SC-3	S-8	20-22	62.4	55	24	31	CH	100	76	
SC-3	S-10	30-32	7.4				GW-GM	5	3	
SC-5	S-2	5-7	20.7	28	18	10	CL	77	15	
SC-5	S-6	13-15	24.9	40	21	19	CL	76	31	
SC-6	S-3	7-9	29.5	49	24	25	CL	99.9	50	
SC-6	S-8	20-22	35.2	49	23	26	CL	100	63	
SC-6	S-10	30-32	34.9	43	21	22	OL	99.9	62	

Note: (1) USCS symbol based on visual observation and Sieve and Atterberg limits reported.



Open Symbols: Sieve analysis by ASTM D6913
 Filled symbols: Hydrometer analysis by ASTM D7928 corrected for complete sample

SYMBOL	w (%)	LL	PL	PI	USCS	AASHTO	USCS DESCRIPTION AND REMARKS	DATE
□	20.7	28	18	10	CL		Brown, Lean clay with sand, Insufficient sample size	04/08/21
◇	24.9	40	21	19	CL		Brown, Lean clay with sand, Insufficient sample size	04/08/21
○								

Aquifer	CHPE - Selkirk Catskill Borings
TerraSense, LLC #7853-21008	

Symbol	□	◇	○
Boring	SC-5	SC-5	
Sample	S-2	S-6	
Depth	5-7	13-15	
% +3"	0	0	
% Gravel	11	12	
% SAND	12	12	
%C SAND	3	3	
%M SAND	4	3	
%F SAND	5	6	
% FINES	77	76	
D ₁₀₀ (mm)	25.4	25.4	
D ₆₀ (mm)	0.032	0.008	
D ₃₀ (mm)	0.009	0.002	
Cc			
Cu			

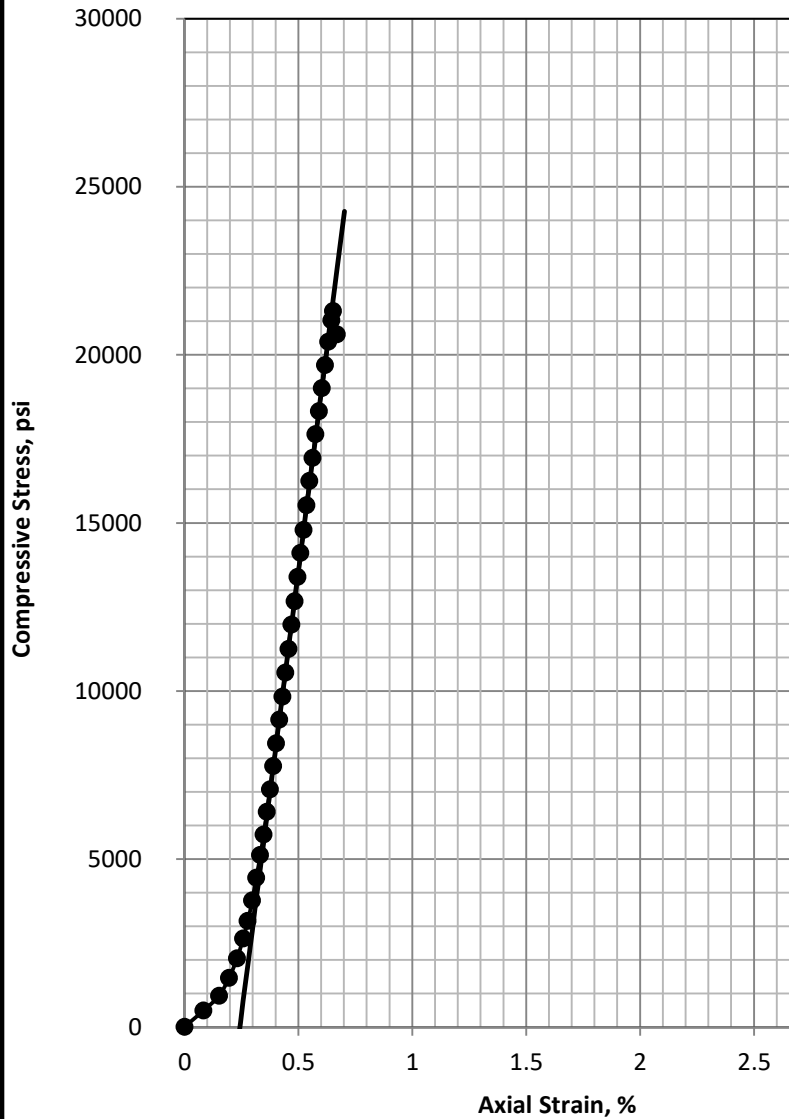
Sieve Size/ID #	Percent Finer Data	
6"	100	100
4"	100	100
3"	100	100
1 1/2"	100	100
1"	100	100
3/4"	99	95
1/2"	94	94
3/8"	92	93
#4	89	88
#10	86	85
#20	84	83
#40	82	82
#60	81	81
#100	80	79
#140	79	78
#200	77	76
5μ m	21	53
2μ m	15	31
1μ m	13	20

**PARTICLE SIZE DISTRIBUTION
 ASTM D6913 & ASTM D7928**

**Aquifer
CHPE Selkirk Catskill Borings
SUMMARY OF ROCK TESTING**

SAMPLE IDENTIFICATION			STATE PROPERTIES			ENGINEERING PROPERTY TESTS				
Boring (Sample)	Run	Depth (ft)	WATER CONTENT (1) (%)	TOTAL UNIT WGT. (pcf)	DRY UNIT WGT. (pcf)	TEST TYPE (2)	Mohs HARDNESS (-)	UNCONFINED COMPRESSION TESTS (ASTM D7012)		
								COMPRESSIVE STRENGTH (psi)	AXIAL STRAIN @ FAILURE (%)	ESTIMATED (5) ELASTIC MODULUS (psi)
SC-2F	R-1	10.6-11	0.6	168	167	UC		17520	0.31	6E+06
SC-2F	R-1	11.4-11.8				M	7			
SC-5	R-1	16.1-16.5	0.4	169	168	UC		21310	0.41	5E+06
SC-5	R-1	16.8-17.1				M	6-7			
SC-5	R-4	32.2-32.6	0.6	170	169	UC		14630	0.37	4E+06
SC-5	R-4	32.8				M	4			
(MP208.58)						M	7			
(MP 208.63)			0.5	166	165	UC		6910	0.26	3E+06
(MP208.63)						M	6			
(MP 208.65)			0.5	167	166	UC		12670	0.27	5E+06
(MP208.65)						M	7			

- Notes:
- (1) Water contents determined after trimming and shearing.
 - (2) Test Type Abbreviations: M: Mohs Hardness, UC: UC Compression test with estimated elastic moduli
 - (5) Modulus estimated based on corrected gross deformations.



Specimen Information

Water Content (%)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Length (inch)	Diameter (inch)
0.43	169	168	4.349	1.965

Specimen meets ASTM D4543 shape tolerances

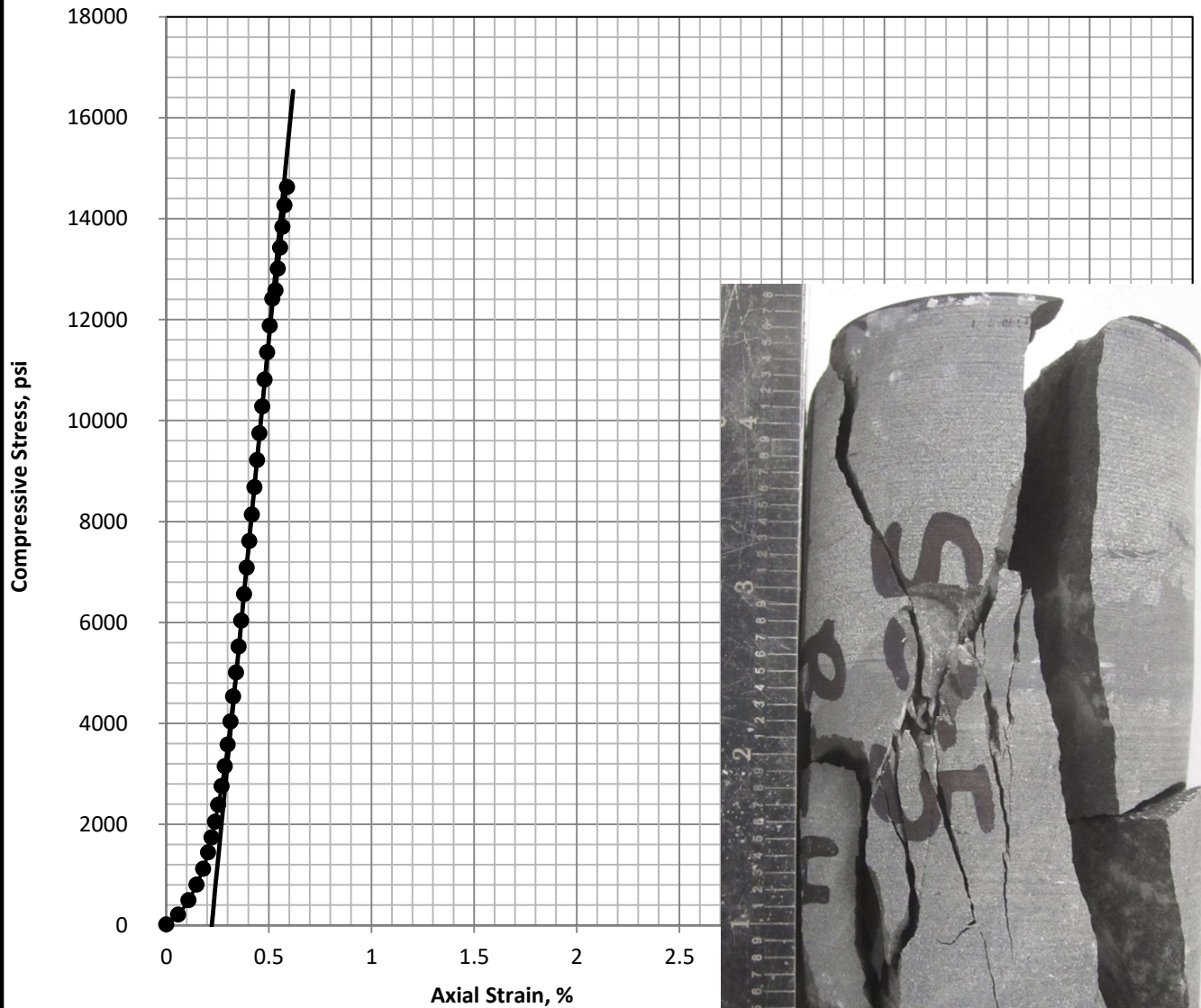
Test Summary

Strain Rate (%/min)	Corrected Strain to Peak (%)	q _u (psi)	Estimated (shown) Elastic Modulus (psi)
0.11	0.41	21310	5E+06

FAILURE PHOTO

Test by: DM
 Test Date: Apr-13-21
 Reviewed by: GET

Aquifer	CHPE Selkirk Catskill Borings	COMPRESSIVE STRESS VS STRAIN UNCONFINED COMPRESSIVE STRENGTH TEST
TerraSense, LLC Project # 7853-21008		Boring: SC-5 Run: R-1 Depth 16.1-16.5 ft.



Specimen Information

Water Content (%)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Length (inch)	Diameter (inch)
0.62	170	169	4.427	1.962

Specimen does not meet ASTM D4543 shape tolerances for side straightness

Test Summary

Strain Rate (%/min)	Corrected Strain to Peak (%)	q _u (psi)	Estimated (shown) Elastic Modulus (psi)
0.13	0.37	14630	4E+06

FAILURE PHOTO

Test by: DM
 Test Date: Apr-13-21
 Reviewed by: GET

Aquifer	CHPE Selkirk Catskill Borings	COMPRESSIVE STRESS VS STRAIN UNCONFINED COMPRESSIVE STRENGTH TEST
TerraSense, LLC Project # 7853-21008		
		Boring: SC-5 Run: R-4 Depth 32.2-32.6 ft.

EXPLORATION PLAN

Champlain-Hudson Power Express Package 7a ■ Catskill, NY
May 23, 2022 ■ Terracon Project No. JB215256D

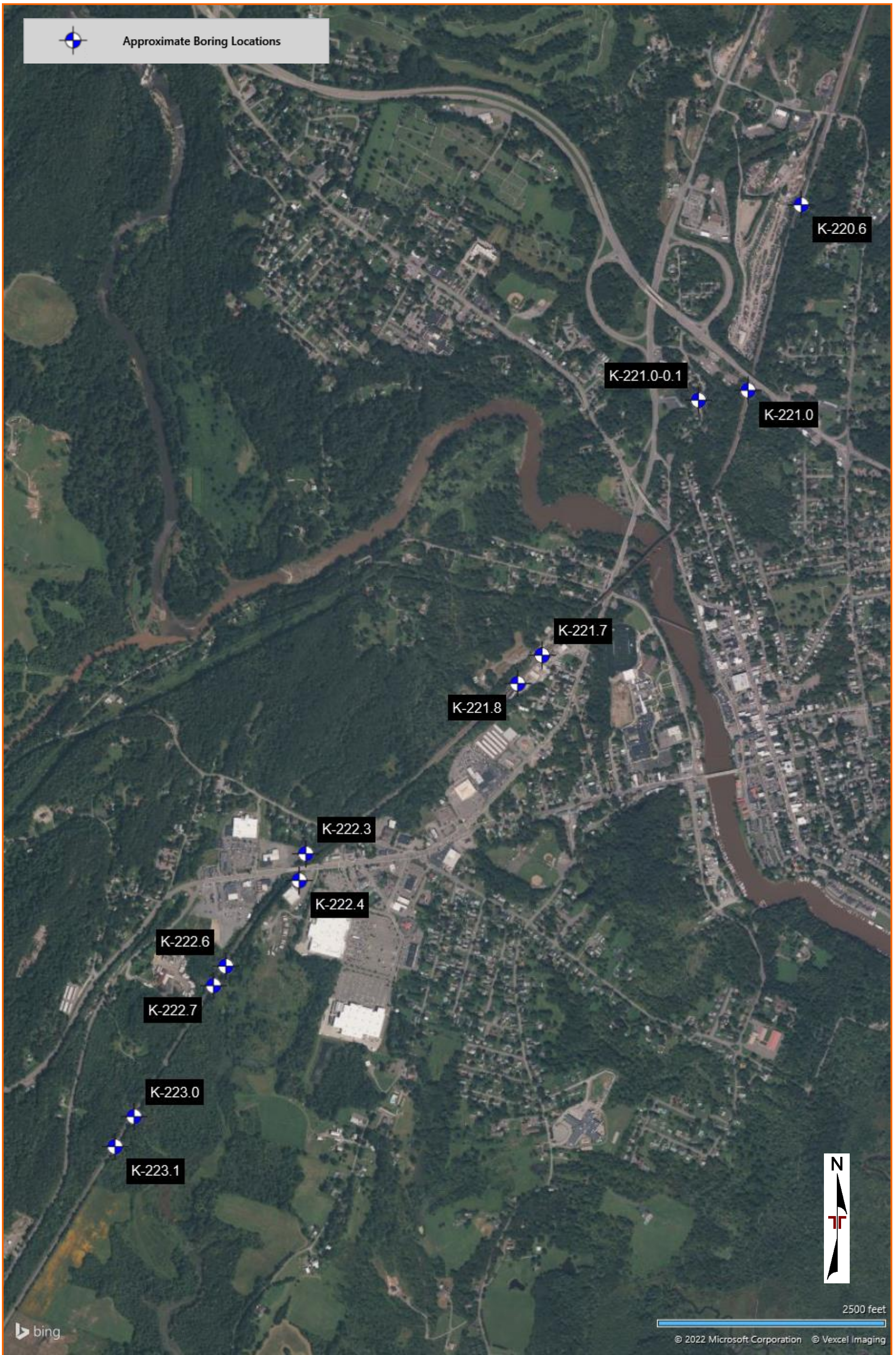


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

BORING LOG NO. K-220.6

PROJECT: Champlain-Hudson Power Express Package
7a

CLIENT: Kiewit Engineering (NY) Corp.

SITE: Champlain to Hudson HDD Crossings
Catskill, NY

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL - JB215256D CHAMPLAIN-HUDSON GRP TERRACON DATATEMPLATE.GDT 5/20/22

GRAPHIC LOG	LOCATION See Exploration Plan	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (in.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS		PERCENT FINES
	DEPTH ELEVATION (Ft.)							LL-PL-PI	PERCENT FINES	
	Surface Elev.: 112.26 (Ft.)									
	FILL - CINDERS, ASH AND GRAVEL , black, loose to medium dense	4.0	108.5	X	10	6-6-3-4 N=9				
		6.0	106.5	X	13	7-9-7-5 N=16				
	FILL - LEAN CLAY , with gravel and occasional bricks noted, brown, stiff	8.0	104.5	X	12	3-3-7-17 N=10				
	FILL - SILTY GRAVEL WITH SAND , occasional bricks noted, brown, medium dense	10.0	102.5	X	12	12-7-7-9 N=14	9.9	NP	22	
	FILL - LEAN CLAY , with gravel and occasional bricks noted, brown, stiff	12.0	100.5	X	0.5	7-6-3-5 N=9				
		13.0	99.5	X	0.5	6-6-6-8 N=12				
	FILL - WELL GRADED SAND WITH SILT AND GRAVEL , occasional bricks noted, brown, loose	15.0	97.5	X	5	2-3-3-3 N=6	16.6	NP	12	
	WEATHERED ROCK , gray, very dense	18.0	94.5	▽		50/0"				
	GRAYWACKE , highly weathered, close to moderate fractured, fair RQD, gray	20.0	92.5	█		REC = 66% RQD = 55%				
	25.0	87.5								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4 1/4" HSA

Abandonment Method:
Boring backfilled with bentonite grout upon completion

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were provided by Kiewit.

Notes:
Logged by LC
Hammer Efficiency Summary:
Energy Transfer Ratio: 89.1% +/- 4.4%
Hammer Efficiency Correction (CE): 1.49

WATER LEVEL OBSERVATIONS

▽ While drilling

30 Corporate Cir Ste 201
Albany, NY

Boring Started: 03-16-2022	Boring Completed: 03-16-2022
Drill Rig: Mobile B-57	Driller: L. Spicher
Project No.: JB215256D	

BORING LOG NO. K-220.6

PROJECT: Champlain-Hudson Power Express Package
7a

CLIENT: Kiewit Engineering (NY) Corp.

SITE: Champlain to Hudson HDD Crossings
Catskill, NY

GRAPHIC LOG	LOCATION See Exploration Plan	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	PERCENT FINES
	DEPTH							ELEVATION (Ft.)	
	Latitude: 42.234306° Longitude: -73.863847° Surface Elev.: 112.26 (Ft.)	30				REC = 22% RQD = 0%			
	GRAYWACKE , highly weathered, very close to moderate fractured, very poor RQD, gray	82.5							
	Boring Terminated at 30 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4 1/4" HSA

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (If any).

Notes:
Logged by LC
Hammer Efficiency Summary:
Energy Transfer Ratio: 89.1% +/- 4.4%
Hammer Efficiency Correction (CE): 1.49

Abandonment Method:
Boring backfilled with bentonite grout upon completion

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were provided by Kiewit.

WATER LEVEL OBSERVATIONS

While drilling



Boring Started: 03-16-2022

Boring Completed: 03-16-2022

Drill Rig: Mobile B-57

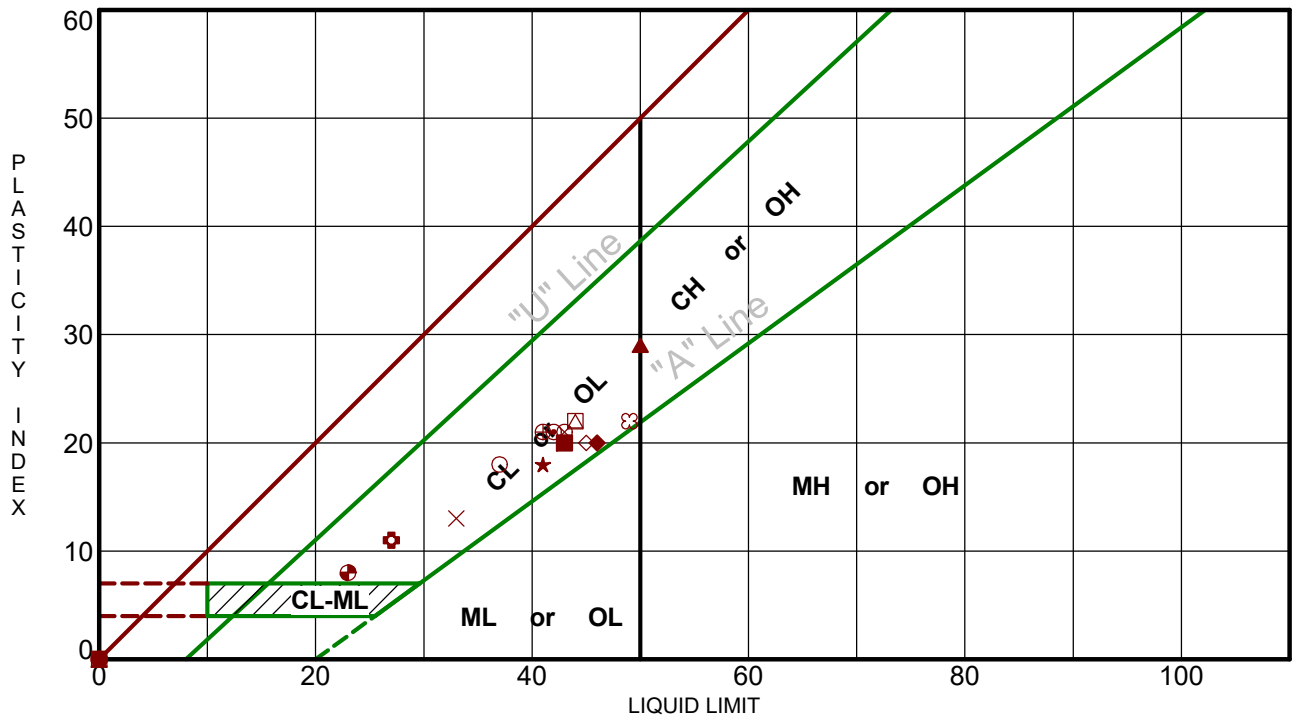
Driller: L. Spicher

Project No.: JB215256D

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL - JB215256D CHAMPLAIN-HUDSON .GPU TERRACON_DATATEMPLATE.GDT 5/20/22

ATTERBERG LIMITS RESULTS

ASTM D4318



LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. ATTERBERG LIMITS JB215256D CHAMPLAIN-HUDSON GRJ TERRACON_DATATEMPLATE.GDT 5/12/22

Boring ID	Depth (Ft)	LL	PL	PI	Fines	USCS	Description
● K-220.6	6 - 8	NP	NP	NP	22.1	GM	SILTY GRAVEL with SAND
▣ K-220.6	13 - 15	NP	NP	NP	11.9	SW-SM	WELL-GRADED SAND with SILT and GRAVEL
▲ K-221.0	8 - 10	50	21	29	73.4	CH	FAT CLAY with SAND
★ K-221.0	23 - 25	41	23	18	89.8	CL	LEAN CLAY
⊙ K-221.7	10 - 12	42	21	21	93.6	CL	LEAN CLAY
⊕ K-221.7	33 - 35	27	16	11	58.8	CL	SANDY LEAN CLAY
○ K-221.8	8 - 10	37	19	18	91.3	CL	LEAN CLAY
△ K-221.8	35 - 37	44	22	22	79.7	CL	LEAN CLAY with SAND
⊗ K-222.3	6 - 8	43	22	21	59.8	CL	SANDY LEAN CLAY
⊕ K-222.3	10 - 12	41	20	21	69.6	CL	SANDY LEAN CLAY
□ K-222.4	10 - 12	44	22	22	87.3	CL	LEAN CLAY
⊕ K-222.6	15 - 17	NP	NP	NP	6.5	GW-GM	WELL-GRADED GRAVEL with SILT and SAND
⊕ K-222.6	35 - 37	23	15	8	86.7	CL	LEAN CLAY
★ K-222.7	10 - 12	NP	NP	NP	25.3	GM	SILTY GRAVEL with SAND
⊗ K-222.7	25 - 27	49	27	22	76.3	CL	LEAN CLAY with SAND
■ K-223.0	10 - 12	43	23	20	58.5	CL	SANDY LEAN CLAY
◆ K-223.0	25 - 27	46	26	20	84.9	CL	LEAN CLAY with SAND
◇ K-223.1	15 - 17	45	25	20	71.3	CL	LEAN CLAY with SAND
× K-223.1	29 - 31	33	20	13	98.3	CL	LEAN CLAY

PROJECT: Champlain-Hudson Power Express Package 7a

SITE: Champlain to Hudson HDD Crossings Catskill, NY

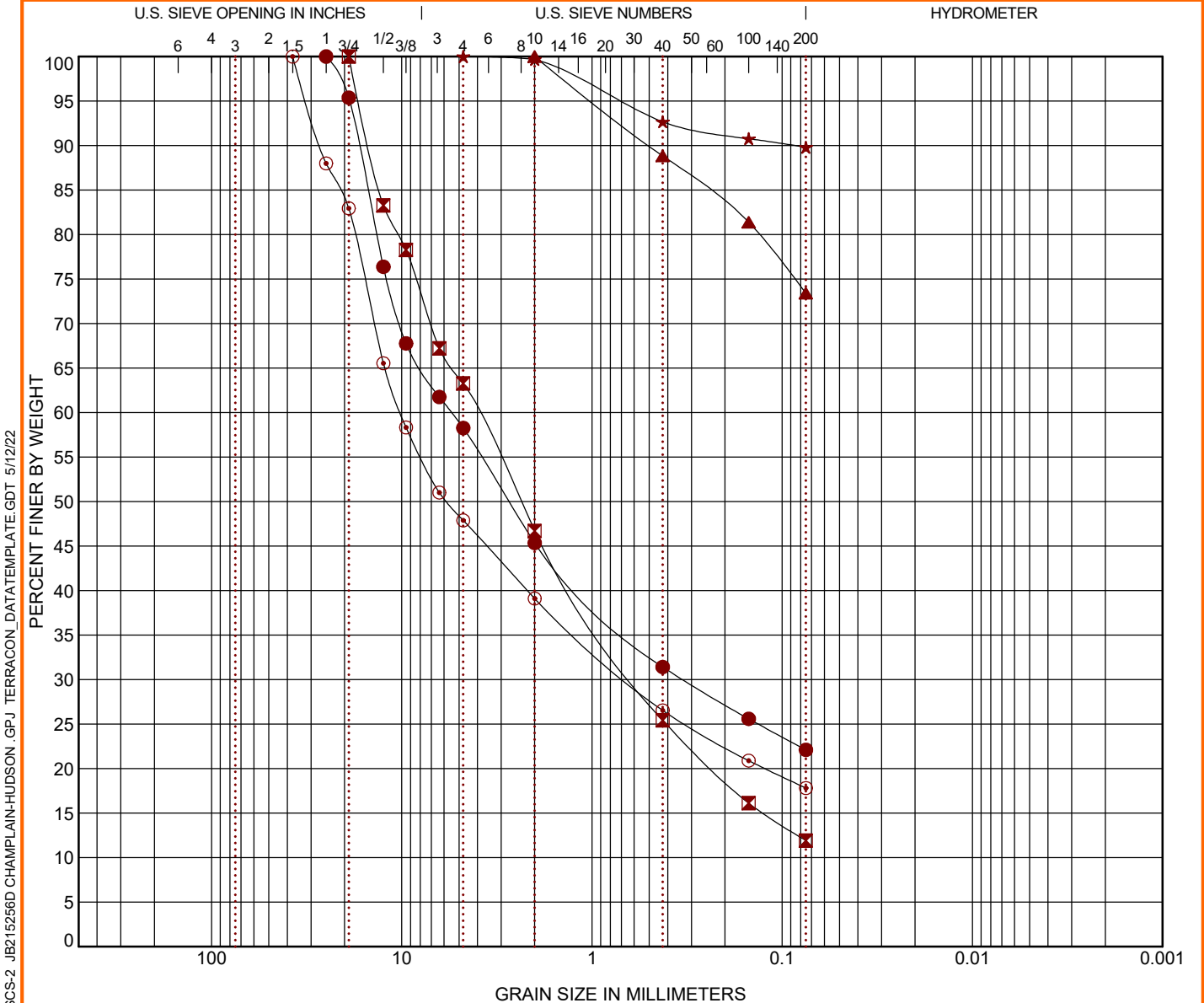


PROJECT NUMBER: JB215256D

CLIENT: Kiewit Engineering (NY) Corp.

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID	Depth (Ft)	USCS Classification				WC (%)	LL	PL	PI	Cc	Cu
● K-220.6	6 - 8	SILTY GRAVEL with SAND (GM)				9.9	NP	NP	NP		
☒ K-220.6	13 - 15	WELL-GRADED SAND with SILT and GRAVEL (SW-SM)				16.6	NP	NP	NP	1.60	73.20
▲ K-221.0	8 - 10	FAT CLAY with SAND (CH)				32.4	50	21	29		
★ K-221.0	23 - 25	LEAN CLAY (CL)				30.9	41	23	18		
⊙ K-221.0-0.1	8 - 10	SILTY GRAVEL with SAND (GM)				12.0					
Boring ID	Depth (Ft)	D ₁₀₀	D ₆₀	D ₃₀	D ₁₀	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
● K-220.6	6 - 8	25	5.489	0.33		0.0	41.7	36.2		22.1	
☒ K-220.6	13 - 15	19	4.006	0.593		0.0	36.7	51.4		11.9	
▲ K-221.0	8 - 10	2				0.0	0.0	26.6		73.4	
★ K-221.0	23 - 25	4.75				0.0	0.0	10.2		89.8	
⊙ K-221.0-0.1	8 - 10	37.5	10.125	0.651		0.0	52.1	30.1		17.8	

PROJECT: Champlain-Hudson Power Express Package 7a	30 Corporate Cir Ste 201 Albany, NY	PROJECT NUMBER: JB215256D
SITE: Champlain to Hudson HDD Crossings Catskill, NY	CLIENT: Kiewit Engineering (NY) Corp.	

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 JB215256D CHAMPLAIN-HUDSON.GPJ TERRACON_DATATEMPLATE.GDT 5/12/22



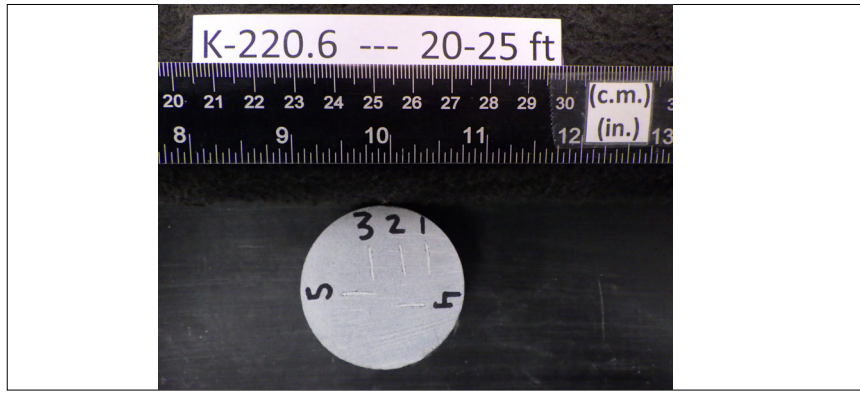
Client: Terracon Consultants, Inc.	Project No: GTX-315284	
Project: Champlain-Hudson Power Express		
Location:	Sample Type: cylinder	Tested By: tlm
Boring ID: K-220.6	Test Date: 04/29/22	Checked By: smd
Sample ID: ---	Test Id: 664262	
Depth : 20-25 ft		
Test Comment: ---		
Visual Description: ---		
Sample Comment: ---		

Abrasiveness of Rock Using the Cerchar Method by ASTM D7625

Boring ID	Sample ID	Depth	Stylus No	Reading 1	Reading 2	Average	Comments
K-220.6	---	20-25 ft	1	0.6	0.3	0.45	
			2	0.5	1.2	0.85	
			3	0.6	0.7	0.65	
			4	0.2	0.7	0.45	
			5	0.8	0.7	0.75	
			Average CAIs			0.63	
			Average CAI *			1.10	
CERCHAR Abrasiveness Index Classification						Medium abrasiveness	

Notes

Test Surface: Saw Cut
 Moisture Condition: As Received
 Apparatus Type: Original CERCHAR
 Stylus Hardness: Rockwell Hardness 54/56 HRC
 Stylus Displacement Relative to Rock Fabric:
 Styli 1-3: Normal; Styli 4-5: Parallel
 * CAI = (0.99 * CAIs) + 0.48
 CAIs = CERCHAR index for smooth (saw cut) surface
 CAI = CERCHAR index for natural surface
 Comments:

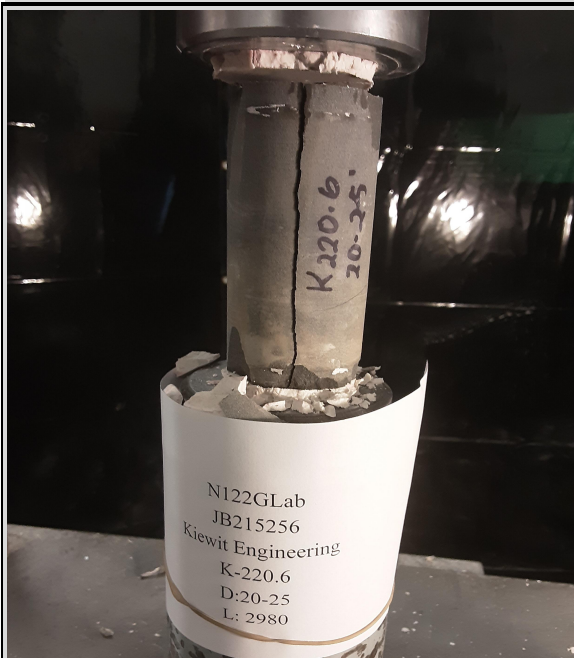
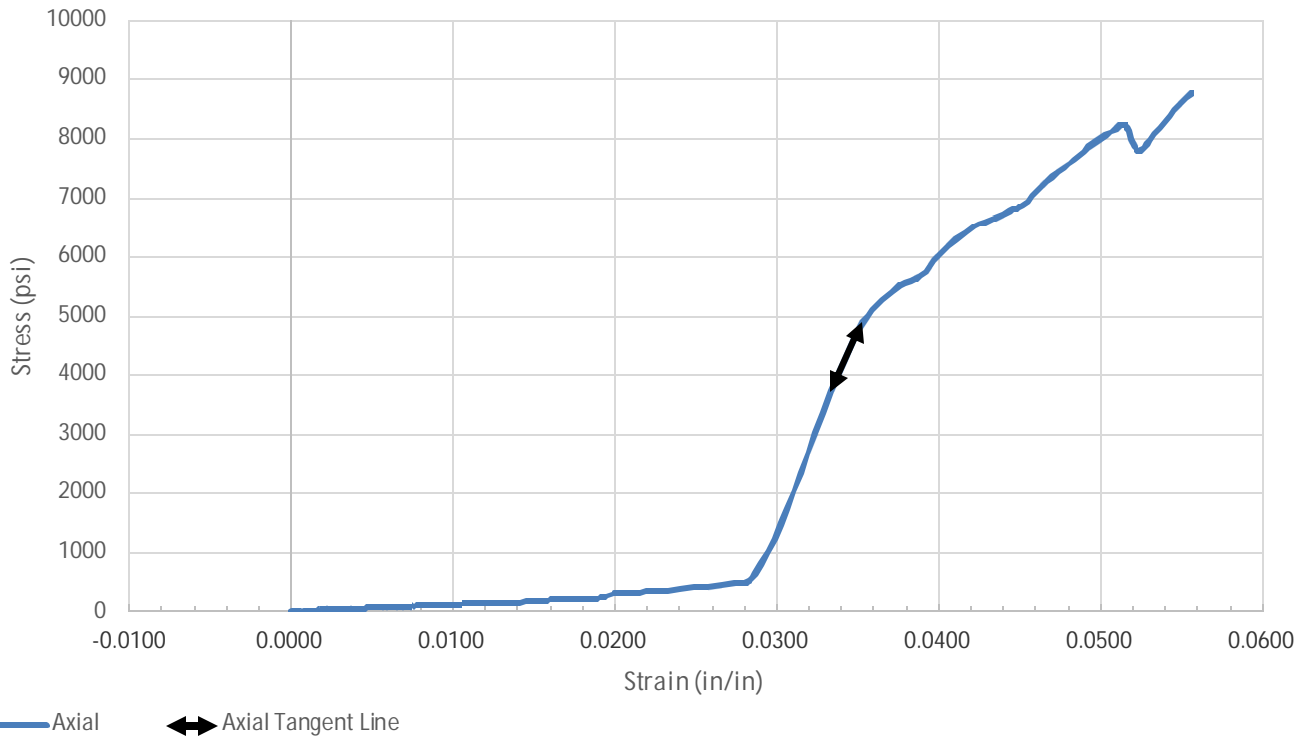


Client
Kiewit Engineering Corp

Project
Champlain-Hudson Power Express Project

Project No. JD215256

ASTM D7012 Stress/ Strain Curve



SAMPLE LOCATION			
Site:	Kiewit Engineering Power Express		
Description:	Calcareous Meta Sandstone		
Boring:	K-220.6	Depth (feet):	20-25
SPECIMEN INFORMATION			
Sample No.:		Mass (g):	552
Length (in.):	4.09	Diameter (in.):	1.97
L/D Ratio:	2.076	Density (pcf):	168.683
TEST RESULTS			
Failure Load (lbs):	26760		
Failure Strain (in/in):	0.057		
Unconfined Compressive Strength (psi):	8,780		
Elastic Modulus, E, (ksi):	598		
Time of Failure (min):	03:19		
Rate of Loading (in/sec):	0.04		
Moisture Content Post-break:	0.63%		

Rock Core D7012 Method C

Client

Kiewit Engineering Corp

Project

Champlain-Hudson Power Express Project

Project No. JD215256

Equipment:

	TICCS ID:
Calipers	W-44049
Scale	B-71466
Dial Indicator	C-70608
Compression (spherically seated)	C-48999

Samples were prepared and tested in accordance with ASTM D4543 and D7012. Deviations, if any, are noted below:
Notes:

Per ASTM D4543, this specimen has not met the requirements for straightness, by exceeding 0.02 inches.

Per ASTM D4543, this specimen has not met the requirements for perpendicularity, by exceeding 0.250°.

Per ASTM D4543, this specimen has not met the requirements for flatness, by exceeding 0.001 inches.

Per ASTM D4543, this specimen has not met the requirements for parallelism, by exceeding 0.25°.

According to ASTM D7012 Section 8.2.1, this specimen, although not meeting all requirements of ASTM D4543 is acceptable for testing. However, the results reported may differ from results obtained from a test specimen that meets the requirements of D4543.

PHOTOGRAPHY LOG



Rock Core – Boring K-220.6 (samples pulled for testing)



Rock Core – Boring K-221.0-0.1(Runs 1 to 4)



Package 7A Phase 3 Borings

Champlain Hudson Power Express
New York

PROJECT NUMBER 20001480

CREATED BY Kiewit
DATE 12/08/2022

Legend Key

- Kiewit Borings (Phase 3)





Kiewit

EXPLORATORY BORING LOG

Champlain Hudson Power Express
New York

BORING NO: KB-220.5

PROJECT NUMBER 20001480
START DATE 09/14/2022
FINISH DATE 09/16/2022

LOGGED BY J. Knighton
DRILLER/RIG T. Van Ness / CME-75
DRILL CONTRACTOR ADT Inc.

COORDINATES N 1239852.30
E 664422.09
GROUND ELEV. 117.7 ft
HAMMER TYPE/EFF. Automatic

Depth (ft)	Elevation (ft)	Graphic Log	Material Description	Sample Type	Core Run No.	Recovery % RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes	Legend			
										▲ SPT N Value	● MC (%)	— PL & LL (%)	☒ Fines Content (%)
			FILL: Silty SAND with Gravel (SM), brown, loose to dense, fine to coarse, moist			75%		12-13-27-25 (40)	Boring advanced with 3-7/8" Mud Rotary				
						50%		31-19-12-10 (31)					
5			Rock stuck in shoe at 6 - 8 ft			38%		3-2-6-5 (8)					
						10%		2-7-9-10 (16)					
10	107.7		Weathered rock			62%		6-9-10-12 (19)					
						52%		14-21-31-50/ 5" (52)					
	104.7		Graywacke, gray, closely to moderately spaced discontinuities, poor RQD, moderately weathered, with highly weathered veins						Roller bit to 15 ft Set 3" casing to 16 ft				
15													
20			Closely spaced discontinuities, very poor RQD, moderately to highly weathered						Barrel plugged at 20.5 ft				
25	92.7		Shale, dark gray, very closely to closely spaced discontinuities, high angle joints, very poor RQD, slightly to highly weathered										
30													



Kiewit

EXPLORATORY BORING LOG

Champlain Hudson Power Express
New York

BORING NO: KB-220.5

PROJECT NUMBER 20001480
 START DATE 09/14/2022
 FINISH DATE 09/16/2022

LOGGED BY J. Knighton
 DRILLER/RIG T. Van Ness / CME-75
 DRILL CONTRACTOR ADT Inc.

COORDINATES N 1239852.30
E 664422.09
 GROUND ELEV. 117.7 ft
 HAMMER TYPE/EFF. Automatic

Depth (ft)	Elevation (ft)	Graphic Log	Material Description	Sample Type	Core Run No.	Recovery %	RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes	Legend			
											▲ SPT N Value	● MC (%)	— PL & LL (%)	☒ Fines Content (%)
											20	40	60	80
			Shale, dark gray, very closely to closely spaced discontinuities, high angle joints, very poor RQD, slightly to highly weathered											
			With calcareous veins and voids at 33 ft		4	78%	43							
35			Gray, closely to moderately spaced discontinuities, fair RQD, moderately weathered		5	99%	70							
40	77.7		Graywacke, dark gray, with some shale lenses and occasional calcite fractures, poor to fair RQD, slightly weathered		6	96%	53							
45					7	96%	70							
50					8	97%	66			UCS = 9826 psi				
55					9	98%	71							
60														



Kiewit

EXPLORATORY BORING LOG

Champlain Hudson Power Express
New York

BORING NO: KB-220.5

PROJECT NUMBER 20001480
START DATE 09/14/2022
FINISH DATE 09/16/2022

LOGGED BY J. Knighton
DRILLER/RIG T. Van Ness / CME-75
DRILL CONTRACTOR ADT Inc.

COORDINATES N 1239852.30
E 664422.09
GROUND ELEV. 117.7 ft
HAMMER TYPE/EFF. Automatic

Depth (ft)	Elevation (ft)	Graphic Log	Material Description	Sample Type	Core Run No.	Recovery % RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes	Legend				
											20	40	60	80
65	52.7		Graywacke, dark gray, with some shale lenses and occasional calcite fractures, poor to fair RQD, slightly weathered		10	100% 74				Potential artesian conditions, water slowly coming out of casing the morning of 9/16/22				
			Boring Terminated at 65 ft											
70														
75														
80														
85														
90														

KB-220.5 - Runs 1 through 4

Run 1 15'-20.5' REC = $50.5/66 = 77\%$ RQD = $28/66 = 42\%$
Run 2 20.5'-25' REC = $38/54 = 70\%$ RQD = $13/54 = 24\%$ RQD = 32%
Run 3 25'-30.5' REC = $35.5/66 = 54\%$ RQD = $16/66 = 24\%$
Run 4 30.5'-35' REC = $12/54 = 78\%$ ~~RQD = $16/54 = 30\%$~~ RQD = 43%



KB-220.5 - Runs 5 through 8

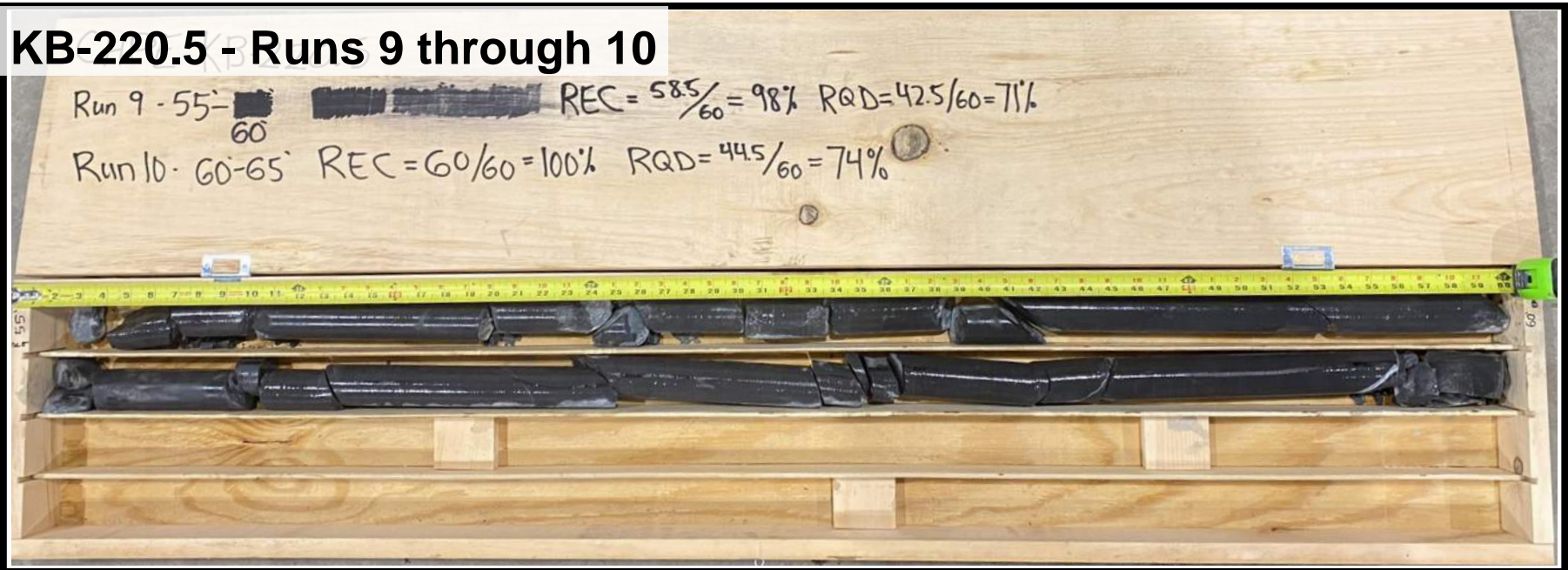
Run 5 - 35'-40' REC = $59.5/60 = 99\%$ RQD = $42/60 = 70\%$
Run 6 - 40'-45' REC = $57.5/60 = 96\%$ ~~RQD = $26.5/60 = 44\%$~~ RQD = 53%
Run 7 - 45'-50' REC = $57.5/60 = 96\%$ RQD = $42/60 = 70\%$
Run 8 - 50'-55' REC = $58/60 = 97\%$ RQD = $39.5/60 = 66\%$



KB-220.5 - Runs 9 through 10

Run 9 - 55' - ~~████████████████████~~ REC = $\frac{58.5}{60} = 98\%$ RQD = $\frac{42.5}{60} = 71\%$

Run 10 - 60' - 65' REC = $\frac{60}{60} = 100\%$ RQD = $\frac{44.5}{60} = 74\%$



Summary of Laboratory Results

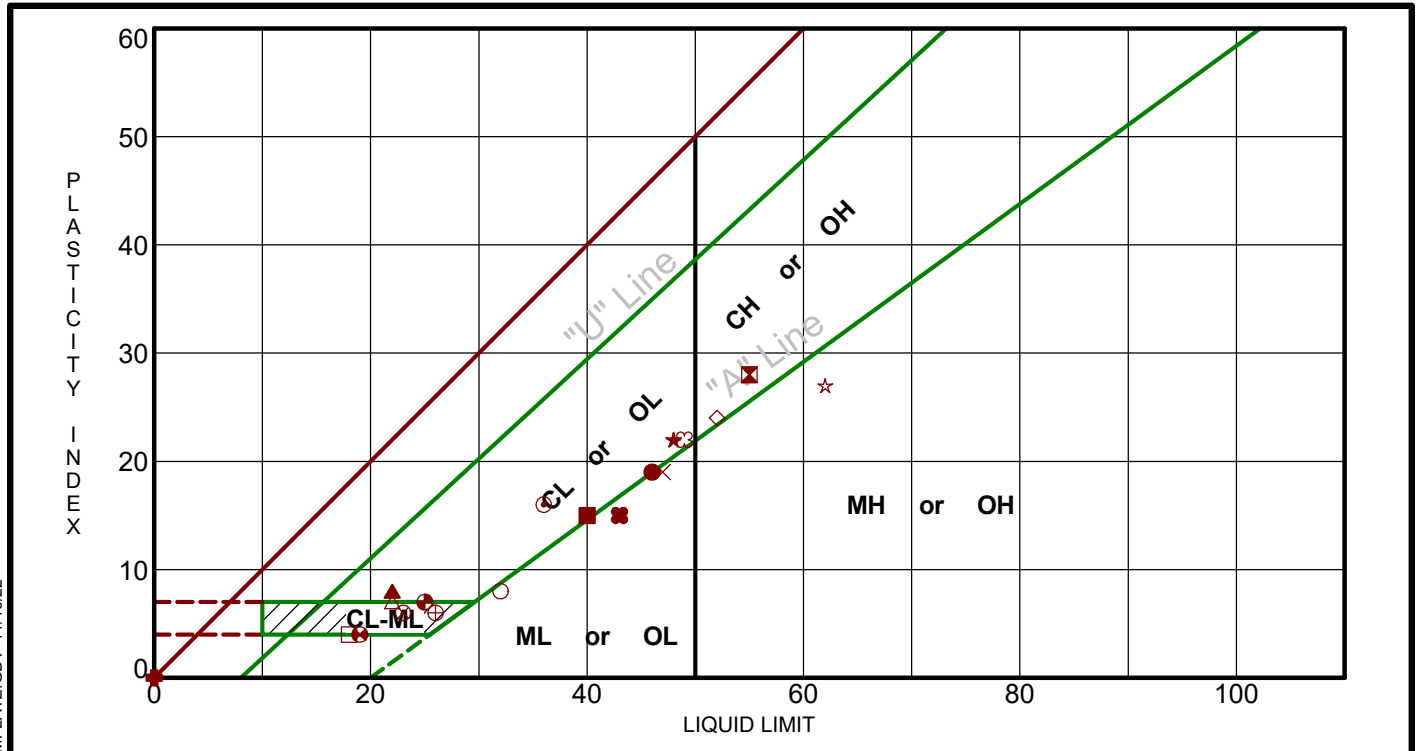
BORING ID	Depth (Ft.)	Water Content (%)
KB-183.6	8	11.5
KB-183.8	4-6	12.7
KB-184.0	4-6	19.9
KB-184.0	10-12	14.1
KB-187.5	10-12	15.9
KB-187.5	20-22	9.2
KB-187.5	30-32	14.1
KB-187.5	40-42	12.2
KB-187.5	45-47	10.9
KB-187.5	60-62	7.5
KB-187.7	10-12	6.3
KB-187.7	20-22	24.3
KB-187.7	35-37	7.2
KB-187.7	55-57	6.6
KB-190.8	4-6	10.9
KB-190.8	15-17	22.7
KB-191.7	4-6	24.0
KB-191.7	10-12	28.2
KB-191.7	25-27	33.6
KB-192.8A	8-10	29.1
KB-192.8A	20-22	30.3
KB-192.8A	40-42	19.6
KB-193.9	4-6	30.2
KB-193.9	10-12	35.1
KB-193.9	15-17	36.0
KB-193.9	35-37	56.2
KB-194.0	4-6	37.9
KB-194.0	15-17	49.1
KB-194.0	25-27	49.4
KB-194.0	35-37	11.2
KB-220.5	8-10	14.2
KB-221.0A	4-6	30.5
KB-221.0A	8-10	9.0
KB-221.0A	15-17	6.1
KB-221.0A	25-27	6.1
KB-221.0A	35-37	6.8
KB-221.3	8	17.8
KB-221.4	4-6	14.8
KB-221.4	8-10	10.5
KB-222.2	7-9	37.9
KB-222.2	25-27	36.9
KB-222.2	40-42	38.2

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. SMART LAB SUMMARY-PORTRAIT_JB215256H LAB TESTING.GPJ TERRACON_DATATEMPLATE.GDT 11/16/22

PROJECT: LAB Testing	 <p style="font-size: small;">30 Corporate Cir Ste 201 Albany, NY</p>	PROJECT NUMBER: JB215256H
SITE: Champlain- Hudson Power Express		CLIENT: Kiewit Engineering (NY) Corp Lone Tree, CO
		EXHIBIT: B-1

ATTERBERG LIMITS RESULTS

ASTM D4318



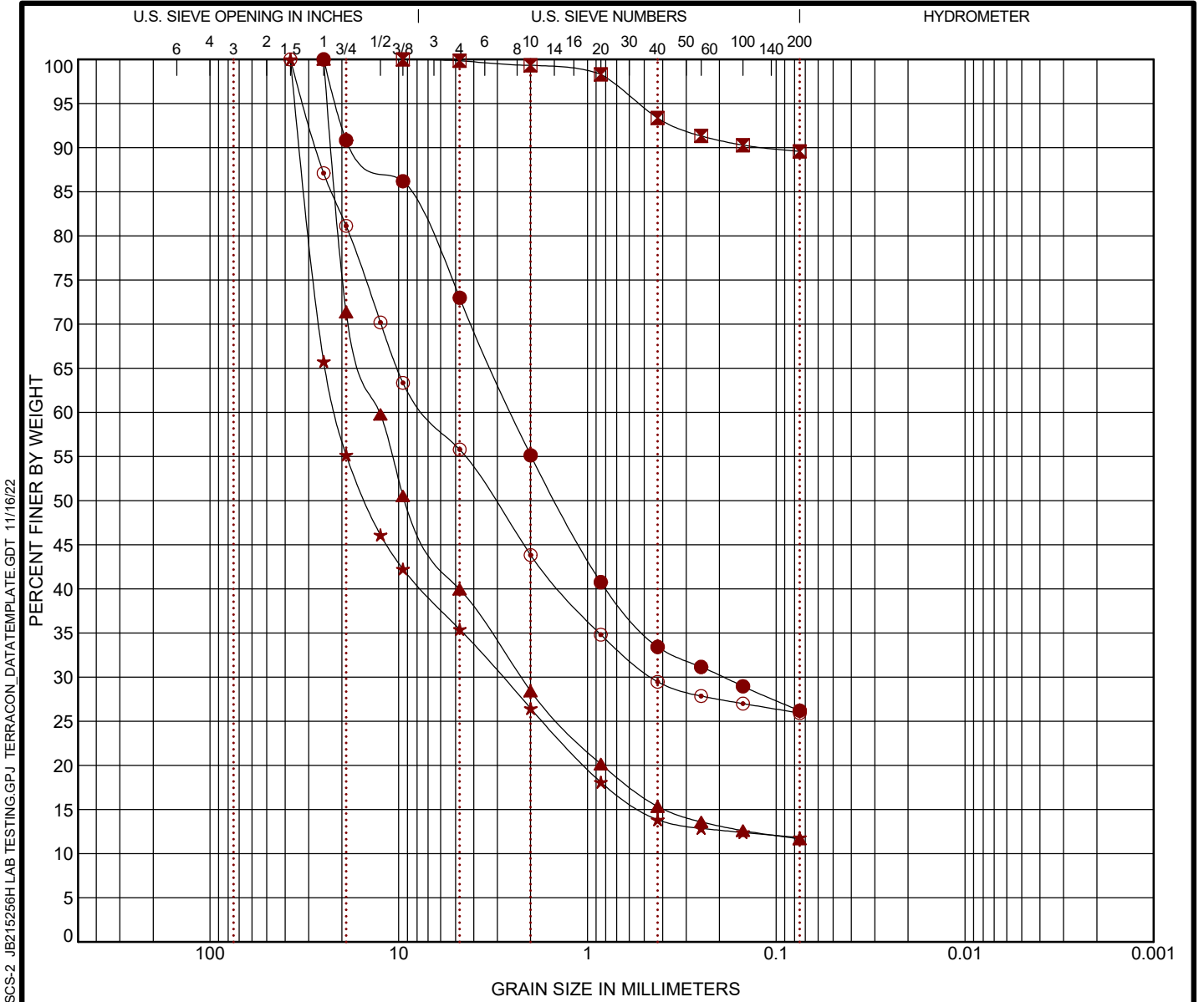
LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. ATTERBERG LIMITS JB215256H LAB TESTING.GPJ TERRACON_DATATEMPLATE.GDT 11/16/22

Boring ID	Depth (Ft)	LL	PL	PI	Fines	USCS	Description
● KB-193.9	15 - 17	46	27	19	70.4	CL	LEAN CLAY with SAND
⊠ KB-193.9	35 - 37	55	27	28	96.8	CH	FAT CLAY
▲ KB-194.0	4 - 6	22	14	8	81.9	CL	LEAN CLAY with SAND
★ KB-194.0	15 - 17	48	26	22	85.2	CL	LEAN CLAY
⊕ KB-194.0	25 - 27	36	20	16	97.0	CL	LEAN CLAY
⊕ KB-194.0	35 - 37	NP	NP	NP	14.7	SM	SILTY SAND with GRAVEL
○ KB-220.5	8 - 10	32	24	8	26.2	SM	SILTY SAND with GRAVEL
△ KB-221.0A	4 - 6	22	15	7	89.6	CL-ML	SILTY CLAY
⊗ KB-221.0A	8 - 10	23	17	6	11.7	GP-GC	POORLY GRADED GRAVEL with SILTY CLAY and SAND
⊕ KB-221.0A	15 - 17	26	20	6	11.8	GP-GC	POORLY GRADED GRAVEL with SILTY CLAY and SAND
□ KB-221.0A	25 - 27	18	14	4	25.9	GC-GM	SILTY, CLAYEY GRAVEL with SAND
⊕ KB-221.0A	35 - 37	19	15	4	21.0	SC-SM	SILTY, CLAYEY SAND with GRAVEL
⊕ KB-221.3	8	25	18	7	13.7	GC-GM	SILTY, CLAYEY GRAVEL with SAND
★ KB-222.2	7 - 9	62	35	27	100.0	MH	ELASTIC SILT
⊗ KB-222.2	25 - 27	49	27	22	94.8	CL	LEAN CLAY
■ KB-222.2	40 - 42	40	25	15	90.4	CL	LEAN CLAY
◆ KB-222.6A	15 - 17	NP	NP	NP	7.4	GP-GM	POORLY GRADED GRAVEL with SAND and SILT
◇ KB-222.6A	35 - 37	52	28	24	87.3	CH	FAT CLAY
× KB-222.6A	50 - 52	47	28	19	96.5	ML	SILT
⊕ KB-222.6A	65 - 67	43	28	15	99.3	ML	SILT

PROJECT: LAB Testing	 <p>30 Corporate Cir Ste 201 Albany, NY</p>	PROJECT NUMBER: JB215256H
SITE: Champlain- Hudson Power Express		CLIENT: Kiewit Engineering (NY) Corp Lone Tree, CO
		EXHIBIT: B-2

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY	
	coarse	fine	coarse	medium	fine		

Boring ID	Depth (Ft)	USCS Classification				WC (%)	LL	PL	PI	Cc	Cu
● KB-220.5	8 - 10	SILTY SAND with GRAVEL (SM)				14.2	32	24	8		
☒ KB-221.0A	4 - 6	SILTY CLAY (CL-ML)				30.5	22	15	7		
▲ KB-221.0A	8 - 10	POORLY GRADED GRAVEL with SILTY CLAY and SAND (GP-GC)				9.0	23	17	6	18.57	581.32
★ KB-221.0A	15 - 17	POORLY GRADED GRAVEL with SILTY CLAY and SAND (GP-GC)				6.1	26	20	6	44.15	2579.87
⊗ KB-221.0A	25 - 27	SILTY, CLAYEY GRAVEL with SAND (GC-GM)				6.1	18	14	4		
Boring ID	Depth (Ft)	D ₁₀₀	D ₆₀	D ₃₀	D ₁₀	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
● KB-220.5	8 - 10	25	2.532	0.191		0.0	27.0	46.8		26.2	
☒ KB-221.0A	4 - 6	9.5				0.0	0.2	10.3		89.6	
▲ KB-221.0A	8 - 10	25	12.6	2.252		0.0	60.0	28.3		11.7	
★ KB-221.0A	15 - 17	37.5	21.528	2.816		0.0	64.6	23.6		11.8	
⊗ KB-221.0A	25 - 27	37.5	6.99	0.455		0.0	44.2	29.9		25.9	

PROJECT: LAB Testing	<p style="font-size: small;">30 Corporate Cir Ste 201 Albany, NY</p>	PROJECT NUMBER: JB215256H
SITE: Champlain- Hudson Power Express		CLIENT: Kiewit Engineering (NY) Corp Lone Tree, CO
		EXHIBIT: B-7

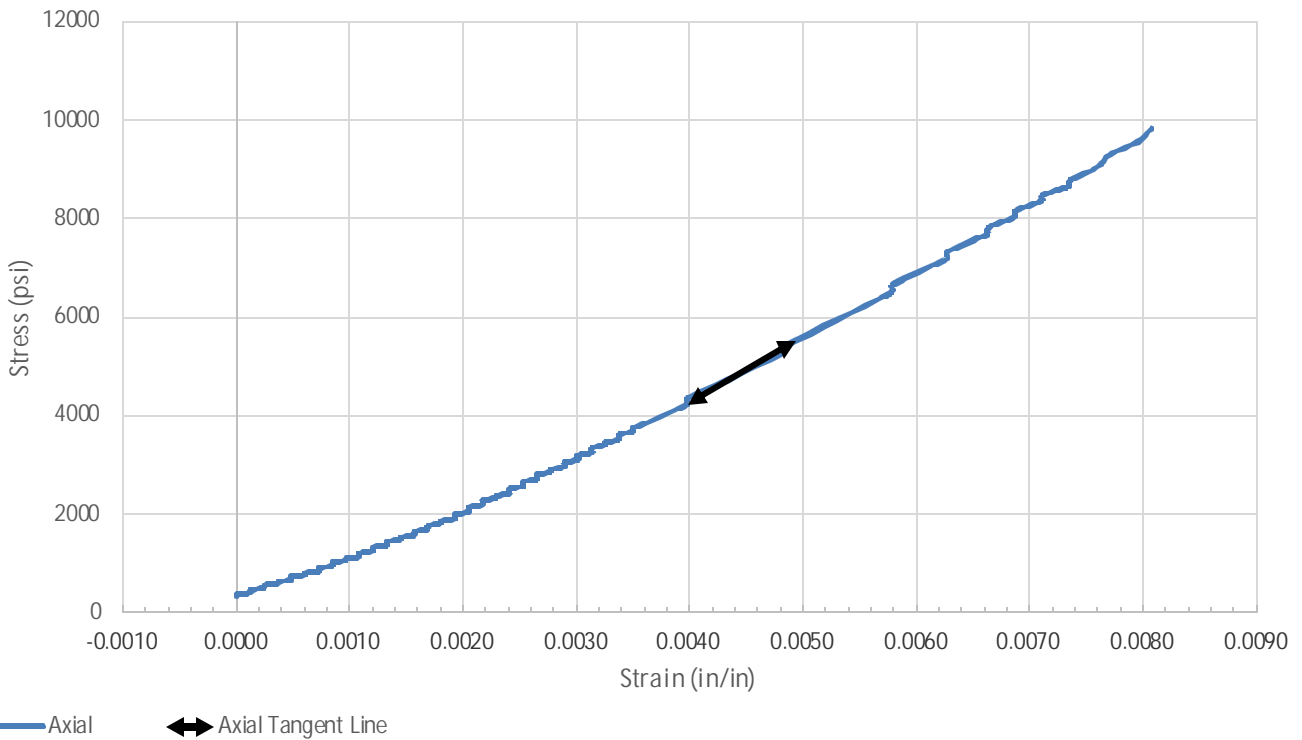
LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 JB215256H LAB TESTING.GPJ TERRACON_DATATEMPLATE.GDT 11/16/22

Client
Kiewit Engineering (NY) Corp

Project
LAB Testing

Project No. JB215256H

ASTM D7012 Stress/ Strain Curve



SAMPLE LOCATION

Site:	LAB Testing		
Description:	Greywacke		
Boring:	KB-220.5	Depth (feet):	50.0-55.0

SPECIMEN INFORMATION

Sample No.:	RC8	Mass (g):	440.95
Length (in.):	4.17	Diameter (in.):	1.75
L/D Ratio:	2.38	Density (pcf):	167.48

TEST RESULTS

Failure Load (lbs):	23635
Failure Strain (in/in):	0.009
Unconfined Compressive Strength (psi):	9,826
Elastic Modulus, E, (ksi):	1348
Time of Failure (min):	02:03
Rate of Loading (in/sec):	0.04
Moisture Content Post-break:	0.27%

Rock Core D7012 Method C



Client

Kiewit Engineering (NY) Corp

Project

LAB Testing

Project No. JB215256H

Equipment:

	TICCS ID:
Calipers	W-44049
Scale	B-71466
Dial Indicator	C-70608
Compression (spherically seated)	C-48999

Samples were prepared and tested in accordance with ASTM D4543 and D7012. Deviations, if any, are noted below:

Notes:

- Per ASTM D4543, this specimen shall have a minimum diameter of 1.875 inches, or as directed by the client.
- Per ASTM D4543, this specimen has not met the requirements for perpendicularity, by exceeding 0.250°.
- Per ASTM D4543, this specimen has not met the requirements for flatness, by exceeding 0.001 inches.
- Per ASTM D4543, this specimen has not met the requirements for parallelism, by exceeding 0.25°.
- Per ASTM D4543, this specimen has not met the requirements for flatness, by exceeding 0.001 inches.
- Per ASTM D4543 and ASTM D7012, the desired specimen length to diameter are between 2.0:1 and 2.5:1.

According to ASTM D7012 Section 8.2.1, this specimen, although not meeting all requirements of ASTM D4543 is acceptable for testing. However, the results reported may differ from results obtained from a test specimen that meets the requirements of D4543.

DATE: December 16, 2022

TO: Zachary Bauer; Tetra Tech Rooney

FROM: Matthew Hawley, P.E.; Kiewit Engineering (NY) Corp. **MKH**
Jaren Knighton; Kiewit Engineering (NY) Corp.

SUBJECT: Geotechnical Data: Segment 11 – Package 7A – HDD Crossing 113 – Revision 1
Champlain Hudson Power Express Project
Catskill, New York

Kiewit Engineering is providing the attached geotechnical data for use in the horizontal direction drill (HDD) design for the Champlain Hudson Power Express project in Upstate New York. This HDD crossing is located north of Catskill, New York. The approximate stations for the start of HDD crossing number 113 are STA 70055+00 (42.2305° N, 73.8650° W).

The geotechnical data at this HDD crossing is attached. The available data is taken from the previous investigation by AECOM and TRC and the recent investigation by Terracon, referenced below.

- AECOM, Geotechnical Data Report, Upland Segments, Champlain Hudson Power Express, dated May 28, 2021.
- TRC, Geotechnical Data Report, Champlain Hudson Power Express, Canadian Pacific Railway Borings MP 177.6-228.2, dated March 15, 2013.
- Terracon Consultants-NY, Inc., Results of Field Exploration, Champlain-Hudson Power Express – Package 7a, Catskill, NY, dated May 23, 2022.

Contact us if you have questions or require additional information.

HDD 113
Borings SC-6, B221.0-1, K-221.0
Segment 11 - Design Package 7A

CHPE Segment 11 - Package 7A
HDD Soil Boring Coordinates and Elevations

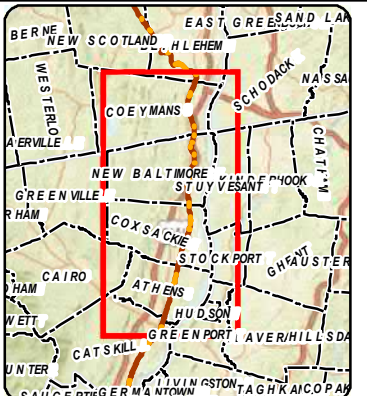
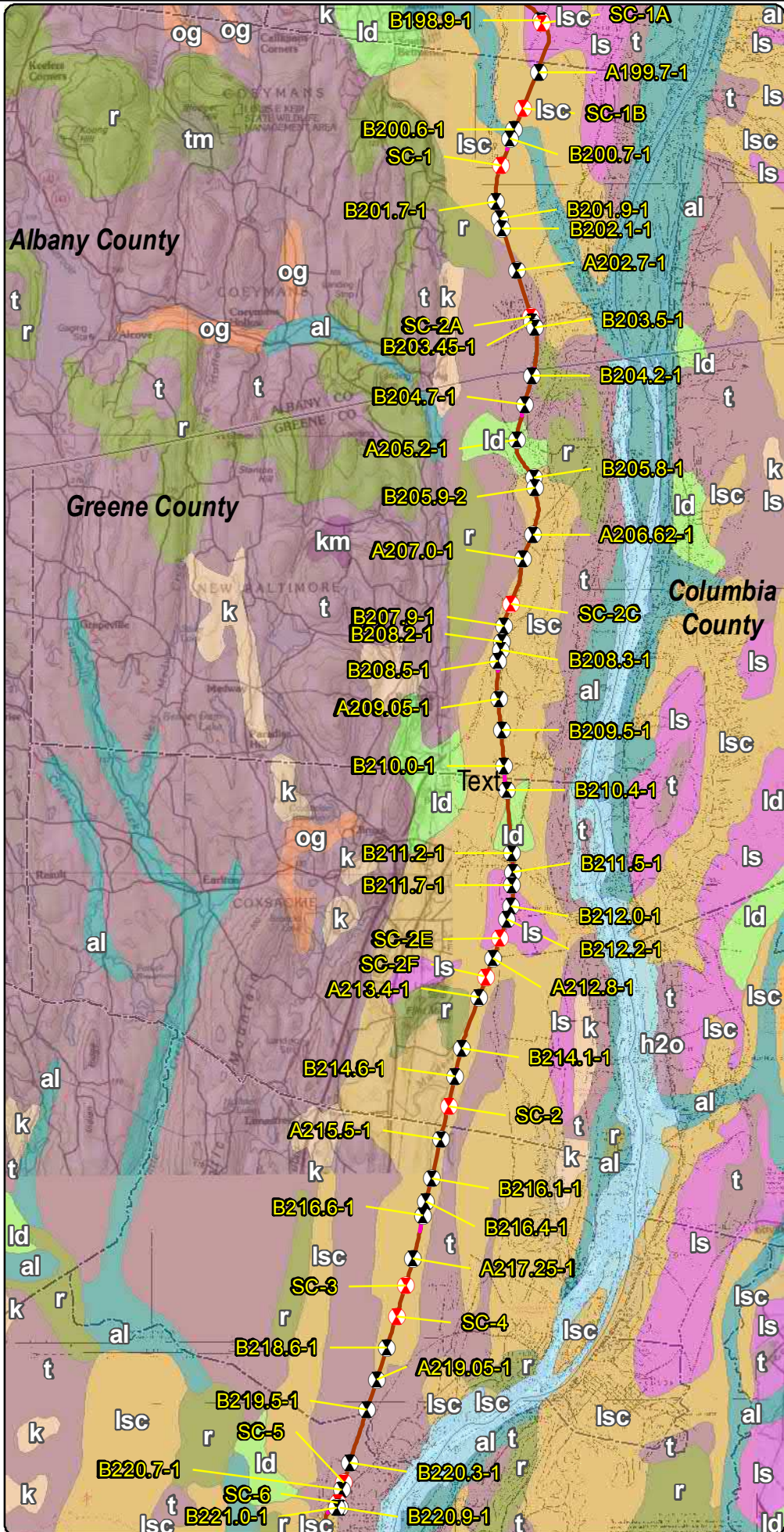
Firm	Boring	Northing (feet)	Easting (feet)	Ground Surface Elevation (feet)
TRC*	B221.0-1	1237452.6	663787.2	99.6
	B221.2-1	1236173.4	663261.8	115.0
	B221.4-1	1235622.5	662622.3	22.4
	B221.5-1	1235006.9	662058.8	95.5
	B221.6-1	1234675.8	661633.8	98.3
	B221.8-1	1234265.3	661277.2	99.4
	B222.34-1	1232191.5	659098.9	133.5
	B222.6-1	1231252.6	658182.3	113.7
	B222.9-1	1229751.0	657274.3	121.4
	B225.8-1	1215861.0	650622.7	91.0
	B226.1-1	1214654.4	650328.3	105.9
	B226.2-1	1214120.5	650254.4	108.5
	B226.6-1	1211894.7	649689.7	112.1
AECOM**	CU-1	1237028.6	663123.9	19.7
	CU-2	1236042.7	662897.0	24.8
	CU-2A	1235325.9	662268.9	38.1
	CU-5A	1210523.7	649411.8	118.4
	SC-5	1239310.3	664321.6	110.2
	SC-6	1237781.0	663919.8	101.6

Notes:

- Northings and Eastings are provided in NAD83 New York State Plane East Zone.
- Elevations are referenced to the NAVD88 datum.
- * TRC boring coordinates as shown in Table 1-6 in AECOM report (reference below). Boring elevations estimated from November 2021 topographic survey by Williams Aerial.
- ** AECOM boring coordinates and elevations as shown in Table 1-6 in AECOM report.
- *** Kiewit boring coordinates and elevations are noted on the boring logs.

Reference:

AECOM, Geotechnical Data Report, Upland Segments: Putnam Station, Washington County, to Cementon, Green County, NY, Champlain Hudson Power Express, dated May 28, 2021.



LEGEND

- 2021 Boring Location
- Previous (2013) Boring Location
- Terrestrial Route HVDC
- Submarine Route HVDC
- Terrestrial Route HVAC
- Preliminary HDD Locations
- Preliminary Pipe Bridge Location
- Town Boundary
- County Boundary

Surficial Geology

- al - Recent alluvium
- h2o - Water
- k - Kame deposits
- km - Kame moraine
- ld - Lacustrine delta
- ls - Lacustrine sand
- lsc - Lacustrine silt and clay
- og - Outwash sand and gravel
- r - Bedrock
- t - Till
- tm - Till moraine

1 0.5 0 1 Miles

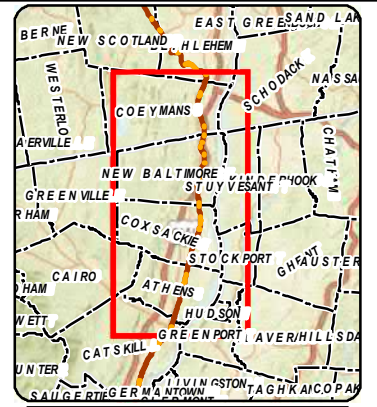
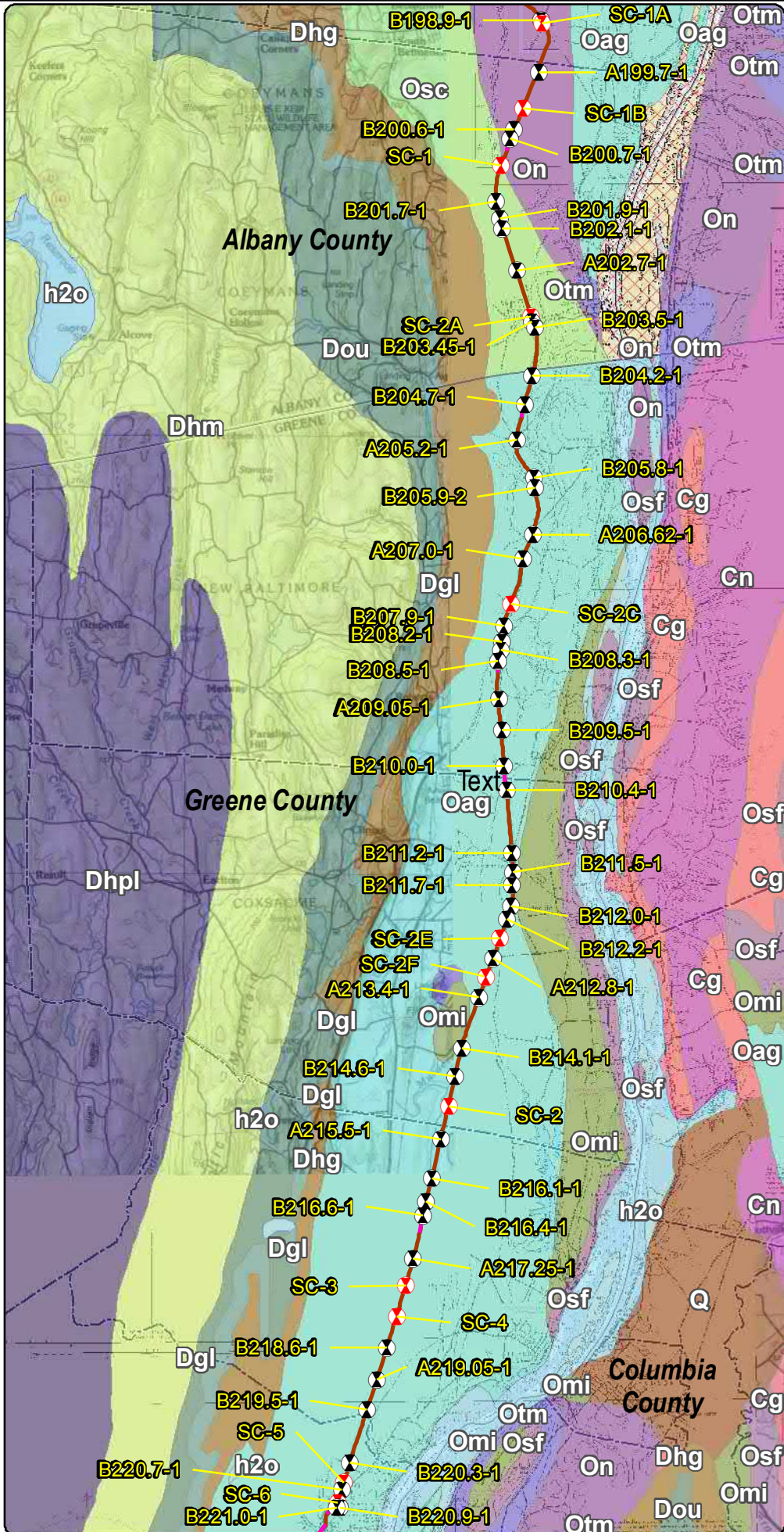
Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

Surficial Geology and Geotechnical Borings
Selkirk to Catskill
Figure 3-10

Prepared on 5/3/2021
by: **AECOM**

DATA SOURCES: ESRI, NYSDOT, NOAA, USACE, NYDOS, TDI, TRC

Y:\Projects\CHPE\Route\Consensus_Alternative_Routes\MD\Alt_5_Routes_DZ_201903Boring_Locations\Maps_for_May_2021_Report\Selkirk_to_Catskill_Boring_Locations_Surficial_May_2021_Report.mxd



LEGEND

- 2021 Boring Location
- Previous (2013) Boring Location
- Terrestrial Route HVDC
- Submarine Route HVDC
- Terrestrial Route HVAC
- Preliminary HDD Locations
- Preliminary Pipe Bridge Location
- Town Boundary
- County Boundary

Bedrock Geology

- Cg - Germantown Formation
- Cn - Nassau Formation
- Dgl - Glenerie Formation
- Dhg - Port Ewen Formation
- Dhpl - Piattek III Formation
- Dou - Onondaga Limestone
- No Label
- Oag - Austin Glen Form (graywacke, shale)
- Omi - Mount Merino Formation
- On - Normanskill Shale
- Osc - Schenectady Formation
- Osf - Stuyvesant Falls Formation
- Otm - Taconic Melange
- Q - Glacial and Alluvial Deposits
- h2o - Water

* Schenectady Formation includes: graywacke, sandstone, siltstone, shale

1 0.5 0 1 Miles

Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

Bedrock Geology and Geotechnical Borings Selkirk to Catskill
Figure 4-10


Prepared on 5/18/2021
by: **AECOM**

DATA SOURCES: ESRI, NYSDOT, NOAA, USACE, NYDOS, TDI, TRC

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LEGEND	
111.8 ● Certified Milepost - Tenths	Streams/Ditches
● Certified Milepost	Railroad ROW
○ Preferred Alternative Milepost - Tenths	Deviation Zone
○ Preferred Alternative Milepost	Deviation Zone Outside ROW
— Terrestrial Route HVDC	Preferred Alternative Deviation Zone
— Submarine Route HVDC	Preferred Alternative Deviation Zone Outside ROW
— Terrestrial Route HVAC	Town Boundary
— Preliminary HDD Locations	Village Boundary
— Preliminary Pipe Bridge Location	State Park (OPRHP)
⊗ 2021 Boring Location	Parcel Ownership
⊗ Previous (2013) Boring Location	Road Name
	Village Name



Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

BORING LOCATION PLAN
Selkirk to Catskill
Figure A-10
Sheet 18 of 18

Prepared by: **AECOM** 5/19/2021

BORING CONTRACTOR: ADT		<h1>AECOM</h1>								SHEET 1 OF 2			
DRILLER: Chris Chaillou										PROJECT NAME: CHPE -			
SOILS ENGINEER/GEOLOGIST: Chris French										PROJECT NO.: 60323056			
		BORING LOG								HOLE NO.: SC-6			
LOCATION: Catskill, NY MP - 220.9 (CSX Rail)										START DATE: 1/28/21			
										FINISH DATE: 1/28/21			
										OFFSET: N/A			
GROUND WATER OBSERVATIONS				CASING		SAMPLER		DRILL BIT		CORE BARREL			
Water at 30' (inferred)		TYPE		Flush Joint Steel		California Modified		Tricone Roller Bit		DRILL RIG: CME LC-55			
		SIZE I.D.		4"		2.5"		--		BORING TYPE: SPT			
		SIZE O.D.		4.5"		3"		3 7/8"		BORING O.D.: 4.5"			
		HAMMER WT.		140 lbs		140 lbs				SURFACE ELEV.:			
		HAMMER FALL		30"		30"				LONGITUDE:			
										LATITUDE:			
DEPTH	CORING RATE MIN/FT	S A M P L E		HAMMER FALL		BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)				N Corr. ⁽²⁾	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS
		DEPTHS FROM - TO (FEET)	TYPE AND NO.	PEN. in	REC. in								
1.0		0'-5'				Hand Cleared					SP-SW	Gravelly SAND	0.0': Black fine to coarse SAND, some angular gravel, trace silt; frozen
2.0													1.0': Brown and tan silty CLAY; medium stiff, moist
3.0													
4.0		3'-5'	S-1								CL	TR-1; (3.0'-5.0')	
5.0													
6.0		5'-7'	S-2	24"	24"	10	15	21	24	23	CL	Brown silty CLAY; stiff, moist	
7.0													
8.0		7'-9'	S-3	24"	24"	41	35	34	33	45	CL	Brown silty CLAY; very stiff, moist	
9.0													
10.0		9'-11'	S-4	24"	13"	6	8	9	19	11	CL	Brown CLAY and silt; stiff, moist	
11.0													
12.0		11'-13'	S-5	24"	24"	10	15	19	21	22	CL	Brown CLAY and silt; very stiff, moist	
13.0													
14.0		13'-15'	S-6	24"	24"	6	13	14	17	18	CL	Brown silty CLAY; stiff, moist	
15.0													
16.0		15'-17'	S-7	24"	21"	15	22	20	20	27	CL	SAA	
17.0													
18.0													
19.0													
20.0													
<p>NOTES:</p> <p>(1) Thick-wall ring lined drive sampler (California sampler) used for SPT samples. Rings dimensions = 2-1/2" O.D. by 2-7/16" I.D. by 6" length.</p> <p>(2) Correction factor: $N_{corr} = N \cdot (2.0^2 - 1.375^2) / (3.0^2 - 2.4^2)$ in. = $N \cdot 0.65$.</p> <p>Soil description represents a field identification after D.M. Burmister unless otherwise noted.</p>												<p>The information contained on this log is not warranted to show the actual subsurface condition. The contractor agrees that he will make no claims against AECOM if he finds that the actual conditions do not conform to those indicated by this log.</p>	
SAMPLE TYPE:		S= SPLIT SPOON		U=SHELBY TUBE		R=ROCK CORE							
PROPORTIONS:		TRACE=1-10%		LITTLE=10-20%		SOME=20-35%		AND=35-50%					

BORING CONTRACTOR: ADT	<h1 style="margin: 0;">AECOM</h1>	SHEET 2 OF 2
DRILLER: Chris Chaillou		PROJECT NAME: CHPE -
SOILS ENGINEER: Chris French		PROJECT NO.: 60323056 HOLE NO.: SC-6
BORING LOG		START DATE: 1/28/21 FINISH DATE: 1/28/21
LOCATION: Catskill, NY MP - 220.9 (CSX Rail)		OFFSET: N/A

DEPTH	CORING RATE MIN/FT	DEPTHS FROM - TO (FEET)	TYPE AND NO.	PEN. in	REC. in	BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)				N Corr.	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS
						6	8	9	12				
21.0		20'-22'	S-8	24"	24"	6	8	9	12	11	CL		Gray and Brown silty CLAY; stiff, moist
22.0													
23.0													
24.0													
25.0													
26.0		25'-27'	S-9	24"	24"	5	6	7	8	8	CL		Gray silty CLAY; medium stiff, moist
27.0													TR-4; (26.0'-26.5')
28.0													
29.0													
30.0													
31.0		30'-32'	S-10	24"	24%	WOH	4%	5	8	6	CH	Silty CLAY	Gray silty CLAY; soft, wet
32.0													
33.0													
34.0													
35.0													
36.0		35'-37'	S-11	24"	24"	WOH	1	2	8	2	CH		SAA 36.8': Gray SILT and clay; soft, wet TR-5; (36.0'-36.5')
37.0													
38.0													
39.0		38'-40'	S-12	24"	24"	WOH	5	5	6	7	CH		Gray CLAY and silt; soft, wet
40.0													
41.0													SC-6 terminated at 40', grouted to surface
42.0													
43.0													
44.0													
45.0													

NOTES: Soil description represents a field identification after D.M. Burmister unless otherwise noted.	The information contained on this log is not warranted to show the actual subsurface condition. The contractor agrees that he will make no claims against AECOM if he finds that the actual conditions do not conform to those indicated by this log.
SAMPLE TYPE: S= SPLIT SPOON U=SHELBY TUBE R=ROCK CORE PROPORTIONS: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%	



TEST BORING LOG

BORING **B221.0-1**

G.S. ELEV. N/A

FILE 195651

SHEET 1 OF 1

PROJECT: TDI CHAMPLAIN HUDSON POWER EXPRESS

LOCATION: CSX RAILROAD ROW, NY

GROUNDWATER DATA			
FIRST ENCOUNTERED NR			
DEPTH	HOUR	DATE	ELAPSED TIME
DRY	NR	11/27	0 HR

METHOD OF ADVANCING BOREHOLE			
a	FROM	TO	
	0.0'	10.0'	
d	FROM	TO	
	10.0'	20.0'	

DRILLER	R.CARUSO
HELPER	C. SMART
INSPECTOR	N/A
DATE STARTED	11/27/2012
DATE COMPLETED	11/27/2012

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS
5	S-1	5 7 6 5	C	DARK GRAY C/F GRAVEL, SM M/C/F SAND, TR SILT (FILL)	7.6	
	S-2	4 4 2 2				
	S-3	2 2 3 3				
	S-4	5 4 3 4				
10	S-5	4 4 4 4				
15	S-6	7 9 12				
18.5			C	GRAY CLAY, TR TO SM SILT		
20	S-7	10 14 16		END OF BORING AT 20'		
25						
30						
35						

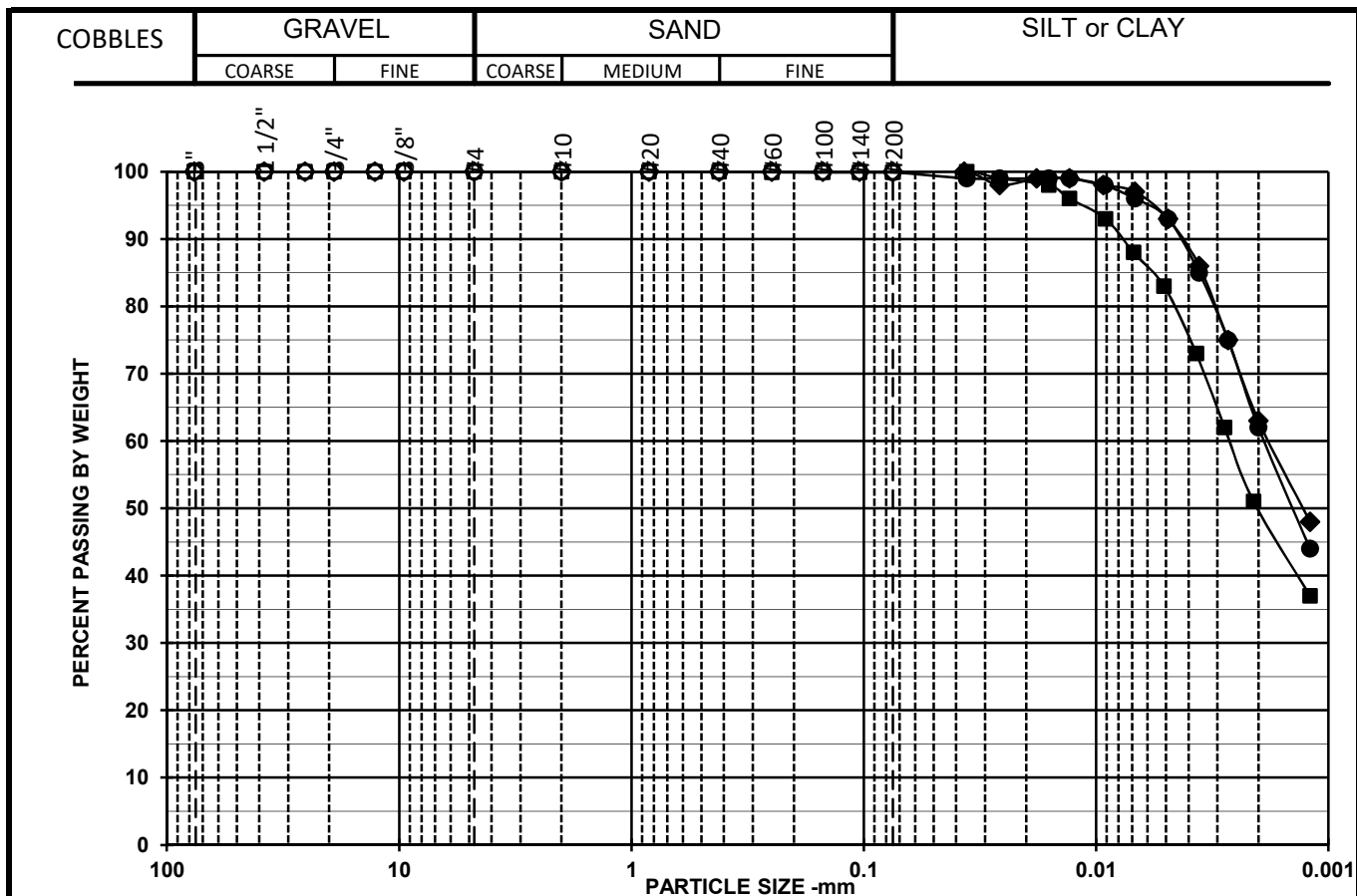
NEW PROJECTS TEST BORING LOG 195651_TDI_CSX.GPJ SITE BLAUVELT.GDT 3/12/13

DRN.	TBT
CKD.	PWK

Aquifer
CHPE - Selkirk Catskill Borings
LABORATORY SOIL TESTING DATA SUMMARY

BORING NO.	SAMPLE NO.	DEPTH (ft)	IDENTIFICATION TESTS							REMARKS
			WATER CONTENT (%)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	USCS SYMB. (1)	SIEVE MINUS NO. 200 (%)	HYDROMETER % MINUS 2 μm (%)	
SC-1	S-2	5-7	28.2	54	23	31	CH	99.4	45	
SC-1	S-4	9-11	25.8	44	22	22	CL	96.8	44	
SC-1A	S-3	7-9	11.7				SM	34.1	4	
SC-1A	S-8	20-22	22.6				SM	37.8	3	
SC-1A	S-10	30-32	35.3	37	19	18	CL	99.9	44	
SC-2C	S-2	5-7	5.8				GP-GM	8		
SC-2C	S-7	15-17	19.1	36	19	17	GC	35	14	
SC-2C	S-9	24-29	5.0	15	10	5	GC-GM	21	5	
SC-2E	S-2	5-7	38.1	61	25	36	CH	99.5	85	
SC-2E	S-5	11-13	39.5	47	23	24	CL	99.8	64	
SC-3	S-2	5-7	32.9	76	28	48	CH	99.4	93	
SC-3	S-8	20-22	62.4	55	24	31	CH	100	76	
SC-3	S-10	30-32	7.4				GW-GM	5	3	
SC-5	S-2	5-7	20.7	28	18	10	CL	77	15	
SC-5	S-6	13-15	24.9	40	21	19	CL	76	31	
SC-6	S-3	7-9	29.5	49	24	25	CL	99.9	50	
SC-6	S-8	20-22	35.2	49	23	26	CL	100	63	
SC-6	S-10	30-32	34.9	43	21	22	OL	99.9	62	

Note: (1) USCS symbol based on visual observation and Sieve and Atterberg limits reported.



Symbol	□	◇	○
Boring	SC-6	SC-6	SC-6
Sample	S-3	S-8	S-10
Depth	7-9	20-22	30-32
% +3"	0	0	0
% Gravel	0	0	0
% SAND	0.1	0	0.1
%C SAND	0	0	0
%M SAND	0	0	0
%F SAND	0.1	0	0.1
% FINES	99.9	100	99.9
D ₁₀₀ (mm)	0.841	0.075	0.841
D ₆₀ (mm)	0.003	0.002	0.002
D ₃₀ (mm)			
D ₁₀ (mm)			
Cc			
Cu			

Sieve	Percent Finer Data		
Size/ID #	□	◇	○
6"	100.0	100	100.0
4"	100.0	100	100.0
3"	100.0	100	100.0
1 1/2"	100.0	100	100.0
1"	100.0	100	100.0
3/4"	100.0	100	100.0
1/2"	100.0	100	100.0
3/8"	100.0	100	100.0
#4	100.0	100	100.0
#10	100.0	100	100.0
#20	100.0	100	100.0
#40	100.0	100	100.0
#60	99.9	100	100.0
#100	99.9	100	100.0
#140	99.9	100	100.0
#200	99.9	100	99.9
5μ m	82	93	93
2μ m	50	63	62
1μ m	32	43	38

Open Symbols: Sieve analysis by ASTM D6913
 Filled symbols: Hydrometer analysis by ASTM D7928 corrected for complete sample

SYMBOL	w (%)	LL	PL	PI	USCS	AASHTO	USCS DESCRIPTION AND REMARKS	DATE
□	29.5	49	24	25	CL		Brown, Lean clay	04/08/21
◇	35.2	49	23	26	CL		Brownish gray, Lean clay	04/08/21
○	34.9	43	21	22	OL		Gray, Organic clay	04/08/21

Aquifer	#602201207	CHPE - Selkirk Catskill Borings PO
TerraSense, LLC	#7853-21008	

PARTICLE SIZE DISTRIBUTION
ASTM D6913 & ASTM D7928

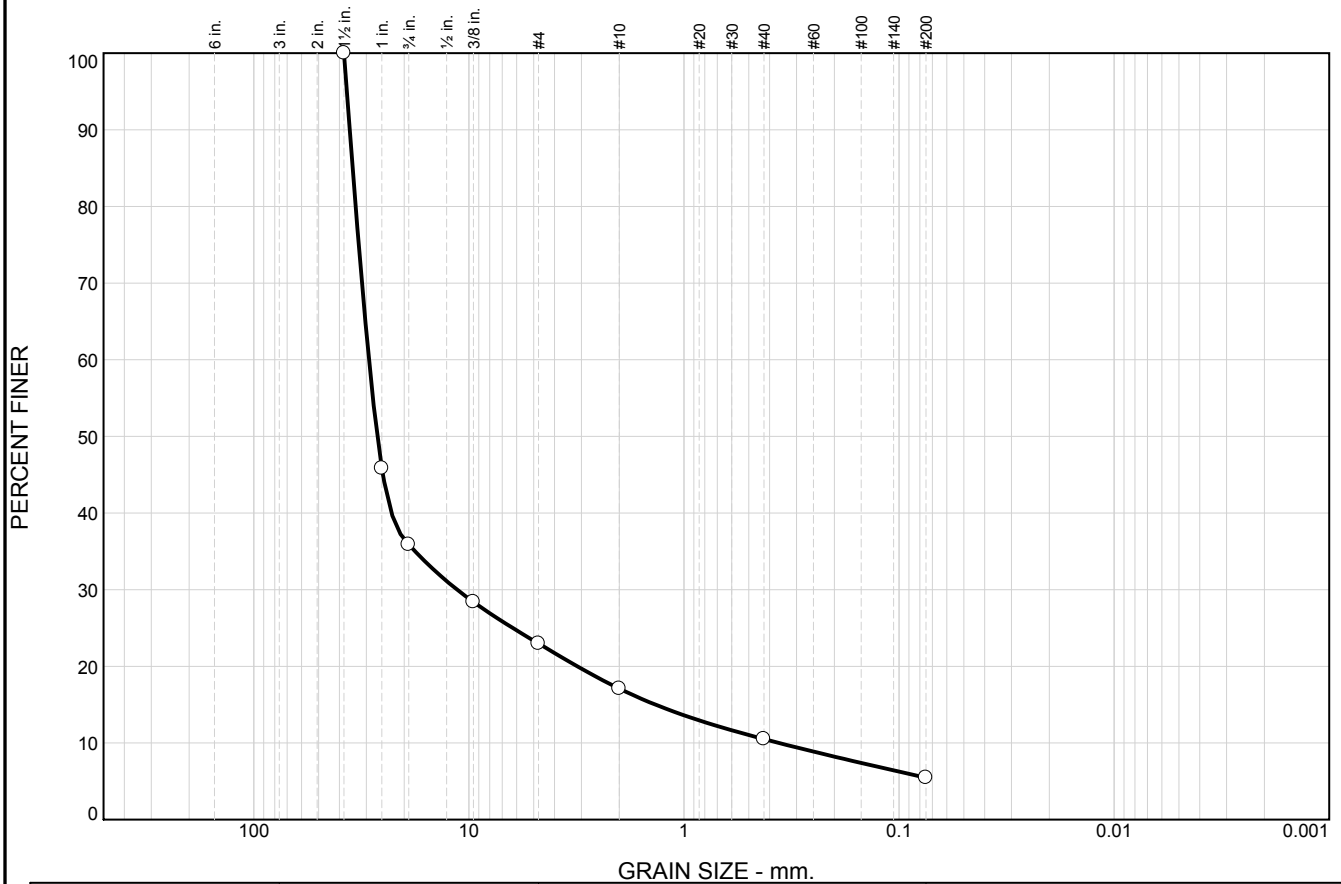


SUMMARY OF LABORATORY TEST DATA

Project Name: TDI Champlain Hudson Power Express – CSX
 Client Name: Transmission Developers, Inc.
 TRC Project #: 195651

SAMPLE IDENTIFICATION			Soil Group (USCS System)	GRAIN SIZE DISTRIBUTION				PLASTICITY				Specific Gravity	Moisture Content (%)	Unit Weight (pcf)	Compressive Strength (tsf)	Organic Content (%)
Boring #	Sample #	Depth (ft)		Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index					
	S-5	8.0-10.0	-	-	-	-	-	-	-	-	-	20.7	88.6	-	-	
	S-6	13.5-15.0	-	-	-	-	-	-	-	-	-	18.2	-	-	-	
	S-7	18.5-20.0	-	-	-	-	-	-	-	-	-	21.4	-	-	-	
B221.0-1	S-1	0.0-2.0	-	-	-	-	-	-	-	-	-	7.6	-	-	-	
	S-3	4.0-6.0	GW	77.0	17.5	5.5							4.2			
	S-4	6.0-8.0														
	S-5	8.0-10.0														
B221.14-1	S-1	0.0-2.0	-	-	-	-	-	-	-	-	-	21.3	-	-	-	
	S-3	4.0-6.0	-	-	-	-	-	-	-	-	-	6.3	-	-	-	
	S-4	6.0-8.0	GW-GM	58.7	31.3	10.0							6.4			
	S-5	8.0-10.0														

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines			
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay		
○	0.0	64.1	12.9	5.9	6.6	5.0	5.5			
×	LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
○			34.7080	29.1773	26.6607	11.3379	1.3566	0.3617	12.18	80.66

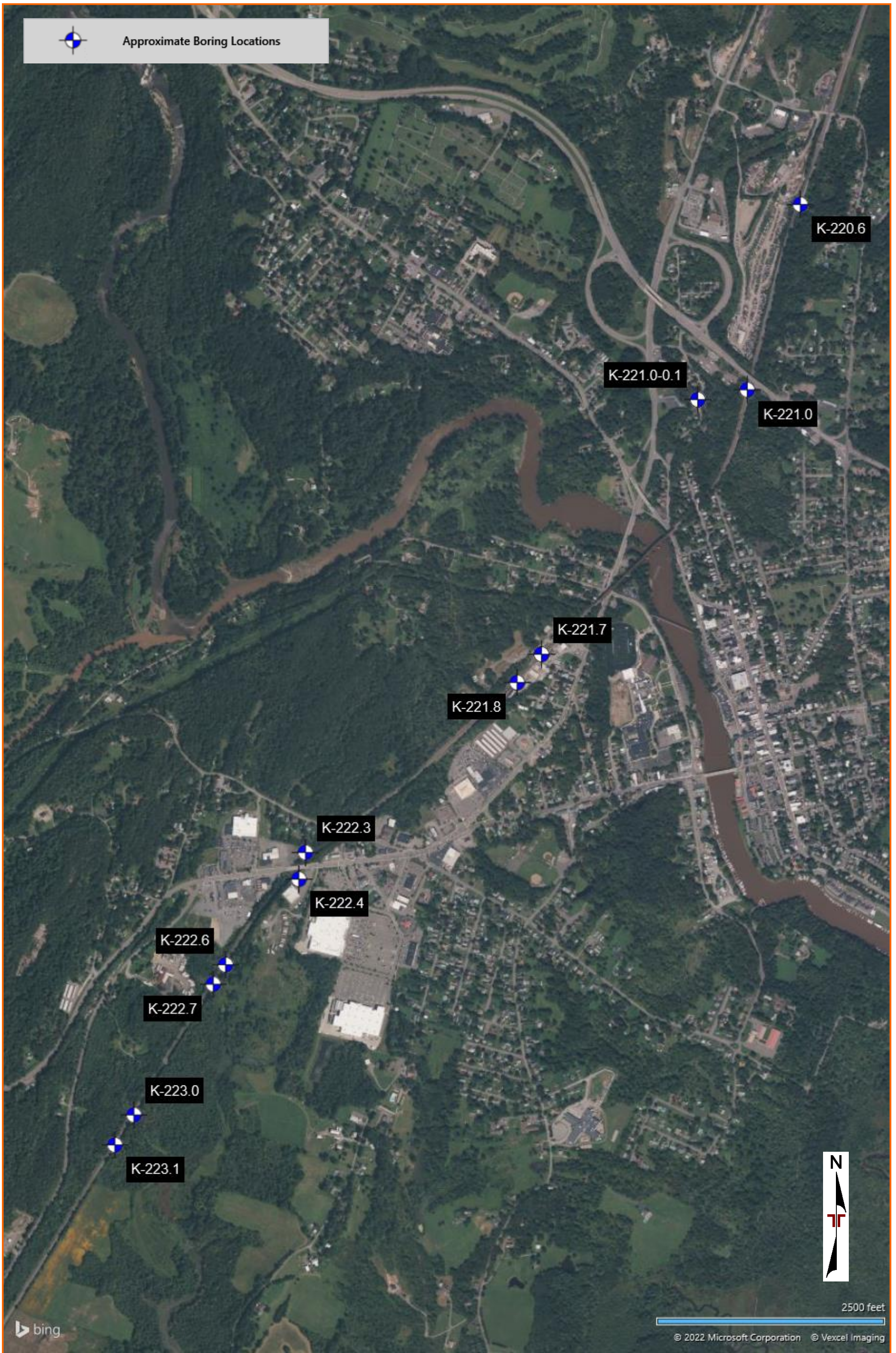
Material Description	USCS	AASHTO
○ DARK GRAY C/F GRAVEL, SM M/C/F SAND, TR SILT	GW	

Project No. 195651 Client: TRANSMISSION DEVELOPERS INC. Project: TDI CHAMPLAIN HUDSON POWER EXPRESS - CSX ○ Sample Source: B221.0-1 Depth: 4.0-10.0 FT Sample No.: S-3, S-4, & S-5	Remarks: ○ SAMPLE DESCRIPTION BASED ON VISUAL IDENTIFICATION AND LABORATORY ANALYSIS
TRC Engineers, Inc. Mt. Laurel, NJ	Figure 117

Tested By: TBT 01/10/13 **Checked By:** JPB 03/12/13

EXPLORATION PLAN

Champlain-Hudson Power Express Package 7a ■ Catskill, NY
May 23, 2022 ■ Terracon Project No. JB215256D



BORING LOG NO. K-221.0

PROJECT: Champlain-Hudson Power Express Package
7a

CLIENT: Kiewit Engineering (NY) Corp.

SITE: Champlain to Hudson HDD Crossings
Catskill, NY

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL - JB215256D CHAMPLAIN-HUDSON GPU TERRACON DATATEMPLATE.GDT 5/20/22

GRAPHIC LOG	LOCATION	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (in.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS		PERCENT FINES
	See Exploration Plan							LL-PL-PI		
	Latitude: 42.228733° Longitude: -73.866003°									
	Surface Elev.: 99.19 (Ft.)									
	ELEVATION (Ft.)									
DEPTH										
4.0	FILL - SAND AND GRAVEL , black, loose	95		3		2-2-3-6 N=5				
8.0	SILT AND CLAY (CL-ML) , brown, medium stiff to very stiff	5		2		2-2-3-3 N=5				
8.0		91		4		2-2-4-5 N=6				
8.0		13		13		5-7-9-8 N=16				
23.0	FAT CLAY WITH SAND (CH) , brown, stiff to very stiff	10		22		2-4-6-7 N=10	32.4	50-21-29	73	
23.0		15		12		5-8-10-12 N=18				
23.0		20		22		2-5-6-9 N=11				
23.0		24		24		2-4-5-6 N=9				
23.0	LEAN CLAY (CL) , brown, very soft	25		24		3-3-6-7 3" Split Spoon	30.9	41-23-18	90	

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4 1/4" HSA

Abandonment Method:
Boring backfilled with bentonite grout upon completion

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were provided by Kiewit.

Notes:
Logged by LC
Hammer Efficiency Summary:
Energy Transfer Ratio: 89.1% +/- 4.4%
Hammer Efficiency Correction (CE): 1.49
WOH = Weight of Hammer

WATER LEVEL OBSERVATIONS

No measurable groundwater prior to grouting



Boring Started: 03-15-2022	Boring Completed: 03-15-2022
Drill Rig: Mobile B-57	Driller: L. Spicher
Project No.: JB215256D	

BORING LOG NO. K-221.0

PROJECT: Champlain-Hudson Power Express Package
7a

CLIENT: Kiewit Engineering (NY) Corp.

SITE: Champlain to Hudson HDD Crossings
Catskill, NY

GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 42.228733° Longitude: -73.866003°	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (in.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	PERCENT FINES
	DEPTH							ELEVATION (Ft.)	
30.0	LEAN CLAY (CL) , brown, very soft (<i>continued</i>)					With Ring Sampler			
	LEAN CLAY (CL) , gray, very soft	69		X	24	WOH-WOH-WOH-2			
	LEAN CLAY (CL) , gray, very soft	59		X	24	WOH-WOH-WOH-1	36.0		
40.0	Boring Terminated at 40 Feet	40		X	24	WOH-WOH-WOH-2			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4 1/4" HSA

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Logged by LC
Hammer Efficiency Summary:
Energy Transfer Ratio: 89.1% +/- 4.4%
Hammer Efficiency Correction (CE): 1.49
WOH = Weight of Hammer

Abandonment Method:
Boring backfilled with bentonite grout upon completion

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were provided by Kiewit.

WATER LEVEL OBSERVATIONS

No measurable groundwater prior to grouting



Boring Started: 03-15-2022

Boring Completed: 03-15-2022

Drill Rig: Mobile B-57

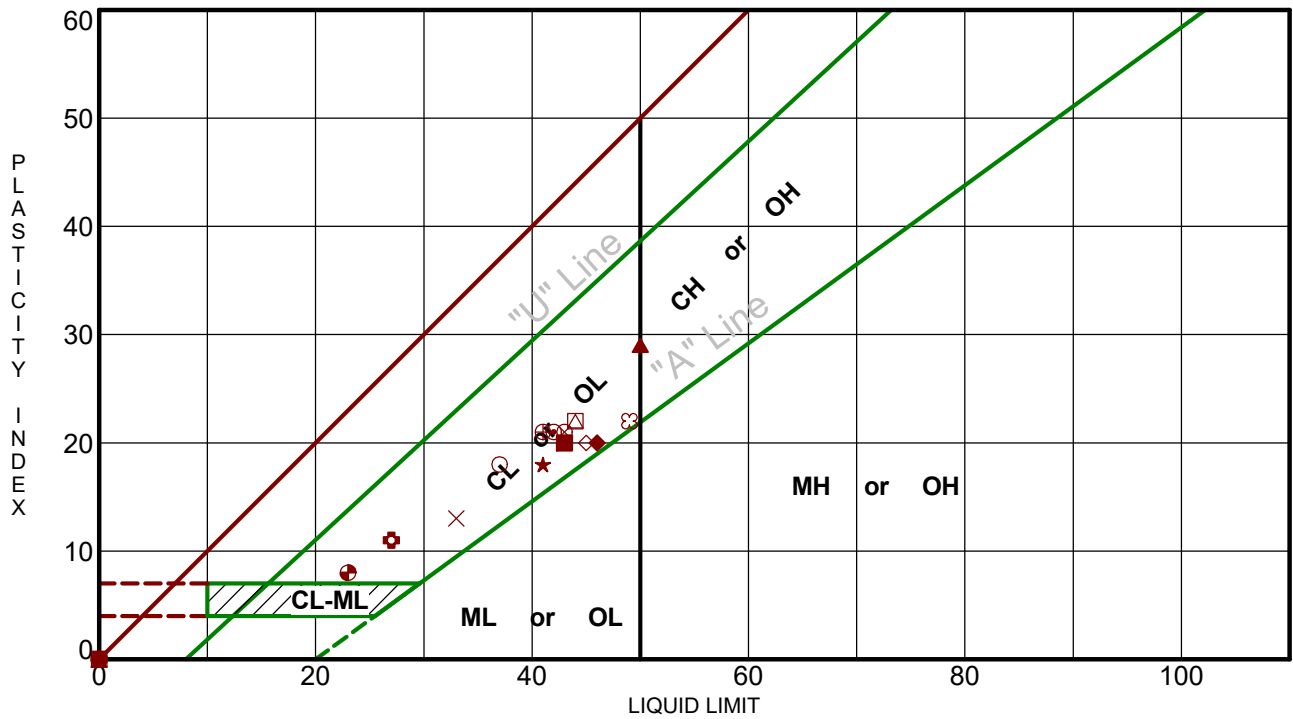
Driller: L. Spicher

Project No.: JB215256D

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL - JB215256D CHAMPLAIN-HUDSON GRU TERRACON_DATATEMPLATE.GDT 5/20/22

ATTERBERG LIMITS RESULTS

ASTM D4318



LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. ATTERBERG LIMITS JB215256D CHAMPLAIN-HUDSON.GPJ TERRACON_DATATEMPLATE.GDT 5/12/22

Boring ID	Depth (Ft)	LL	PL	PI	Fines	USCS	Description
● K-220.6	6 - 8	NP	NP	NP	22.1	GM	SILTY GRAVEL with SAND
▣ K-220.6	13 - 15	NP	NP	NP	11.9	SW-SM	WELL-GRADED SAND with SILT and GRAVEL
▲ K-221.0	8 - 10	50	21	29	73.4	CH	FAT CLAY with SAND
★ K-221.0	23 - 25	41	23	18	89.8	CL	LEAN CLAY
⊙ K-221.7	10 - 12	42	21	21	93.6	CL	LEAN CLAY
⊕ K-221.7	33 - 35	27	16	11	58.8	CL	SANDY LEAN CLAY
○ K-221.8	8 - 10	37	19	18	91.3	CL	LEAN CLAY
△ K-221.8	35 - 37	44	22	22	79.7	CL	LEAN CLAY with SAND
⊗ K-222.3	6 - 8	43	22	21	59.8	CL	SANDY LEAN CLAY
⊕ K-222.3	10 - 12	41	20	21	69.6	CL	SANDY LEAN CLAY
□ K-222.4	10 - 12	44	22	22	87.3	CL	LEAN CLAY
⊕ K-222.6	15 - 17	NP	NP	NP	6.5	GW-GM	WELL-GRADED GRAVEL with SILT and SAND
⊕ K-222.6	35 - 37	23	15	8	86.7	CL	LEAN CLAY
★ K-222.7	10 - 12	NP	NP	NP	25.3	GM	SILTY GRAVEL with SAND
⊗ K-222.7	25 - 27	49	27	22	76.3	CL	LEAN CLAY with SAND
■ K-223.0	10 - 12	43	23	20	58.5	CL	SANDY LEAN CLAY
◆ K-223.0	25 - 27	46	26	20	84.9	CL	LEAN CLAY with SAND
◇ K-223.1	15 - 17	45	25	20	71.3	CL	LEAN CLAY with SAND
× K-223.1	29 - 31	33	20	13	98.3	CL	LEAN CLAY

PROJECT: Champlain-Hudson Power Express Package 7a

SITE: Champlain to Hudson HDD Crossings Catskill, NY

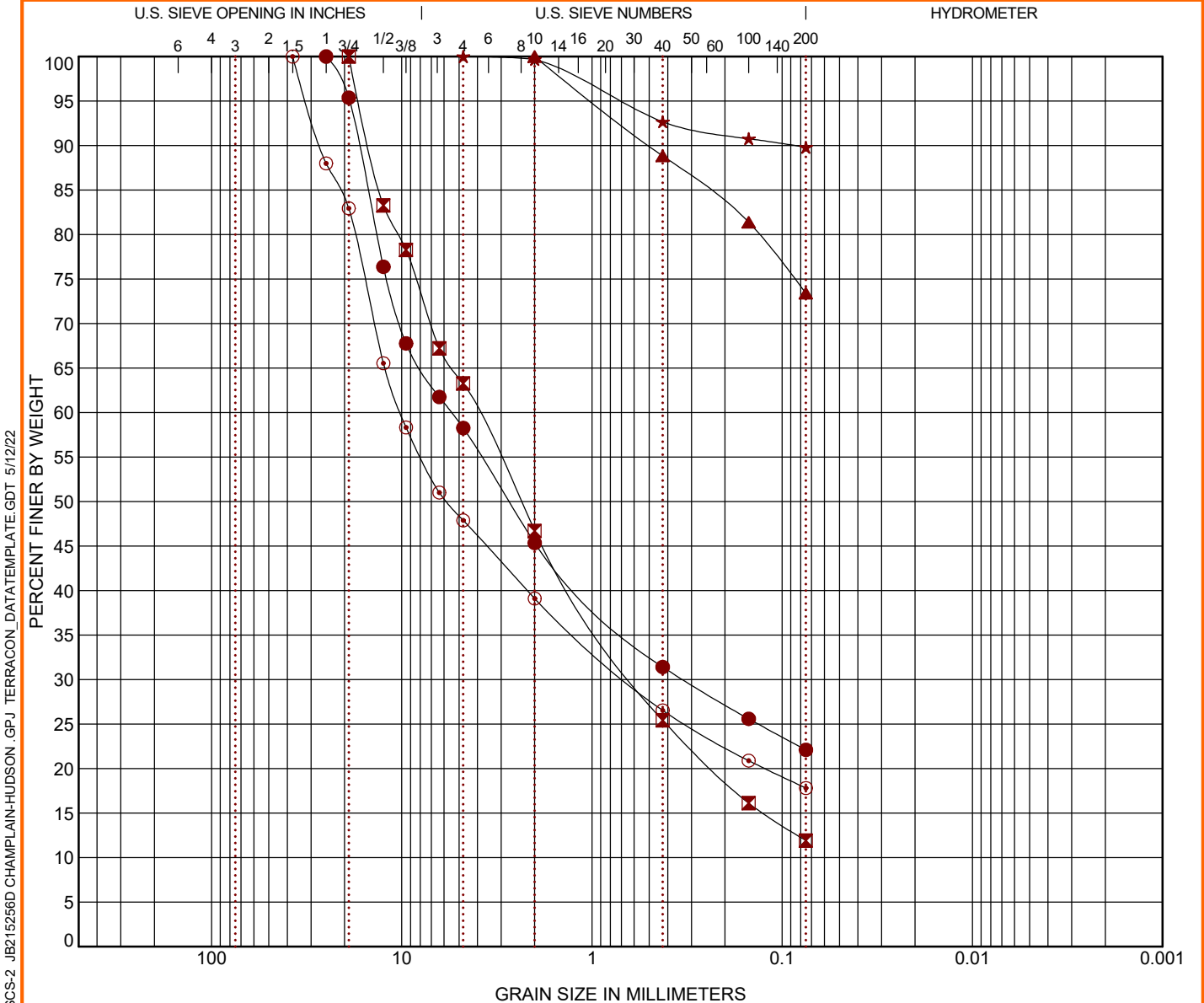


PROJECT NUMBER: JB215256D

CLIENT: Kiewit Engineering (NY) Corp.

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID	Depth (Ft)	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
● K-220.6	6 - 8	SILTY GRAVEL with SAND (GM)	9.9	NP	NP	NP		
☒ K-220.6	13 - 15	WELL-GRADED SAND with SILT and GRAVEL (SW-SM)	16.6	NP	NP	NP	1.60	73.20
▲ K-221.0	8 - 10	FAT CLAY with SAND (CH)	32.4	50	21	29		
★ K-221.0	23 - 25	LEAN CLAY (CL)	30.9	41	23	18		
⊙ K-221.0-0.1	8 - 10	SILTY GRAVEL with SAND (GM)	12.0					

Boring ID	Depth (Ft)	D ₁₀₀	D ₆₀	D ₃₀	D ₁₀	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
● K-220.6	6 - 8	25	5.489	0.33		0.0	41.7	36.2		22.1	
☒ K-220.6	13 - 15	19	4.006	0.593		0.0	36.7	51.4		11.9	
▲ K-221.0	8 - 10	2				0.0	0.0	26.6		73.4	
★ K-221.0	23 - 25	4.75				0.0	0.0	10.2		89.8	
⊙ K-221.0-0.1	8 - 10	37.5	10.125	0.651		0.0	52.1	30.1		17.8	

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 JB215256D CHAMPLAIN-HUDSON.GPJ TERRACON_DATATEMPLATE.GDT 5/12/22

PROJECT: Champlain-Hudson Power Express Package 7a

SITE: Champlain to Hudson HDD Crossings Catskill, NY



PROJECT NUMBER: JB215256D

CLIENT: Kiewit Engineering (NY) Corp.

DATE: March 15, 2023

TO: Zachary Bauer; Tetra Tech Rooney

FROM: Matthew Hawley, P.E.; Kiewit Engineering (NY) Corp. **mkh**
Jaren Knighton; Kiewit Engineering (NY) Corp.

SUBJECT: Geotechnical Data: Segment 11 – Package 7A – HDD Crossing 113 – Revision 2
Champlain Hudson Power Express Project
Catskill, New York

Kiewit Engineering is providing the attached geotechnical data for use in the horizontal direction drill (HDD) design for the Champlain Hudson Power Express project in Upstate New York. This HDD crossing is located north of Catskill, New York. The approximate station for the start of HDD crossing number 113 is STA 70055+00 (42.2305° N, 73.8650° W).

The geotechnical data at this HDD crossing is attached. The available data is taken from the previous investigation by AECOM and TRC and the recent investigations by Terracon, referenced below.

- AECOM, Geotechnical Data Report, Upland Segments, Champlain Hudson Power Express, dated May 28, 2021.
- TRC, Geotechnical Data Report, Champlain Hudson Power Express, Canadian Pacific Railway Borings MP 177.6-228.2, dated March 15, 2013.
- Terracon Consultants-NY, Inc., Results of Field Exploration, Champlain-Hudson Power Express – Package 7a, Catskill, NY, dated May 23, 2022.
- Terracon Consultants-NY, Inc., Results of Field Exploration, Champlain-Hudson Power Express-Phase 4 HDD Borings – Package 6 and 7A, Schenectady to Selkirk, dated February 8, 2023.

Contact us if you have questions or require additional information.

HDD 113
Borings SC-6, B221.0-1,
K-221.0, KB-220.9
Segment 11 - Design Package 7A

CHPE Segment 11 - Package 7A
HDD Soil Boring Coordinates and Elevations

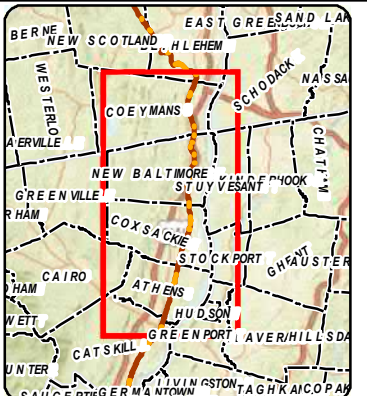
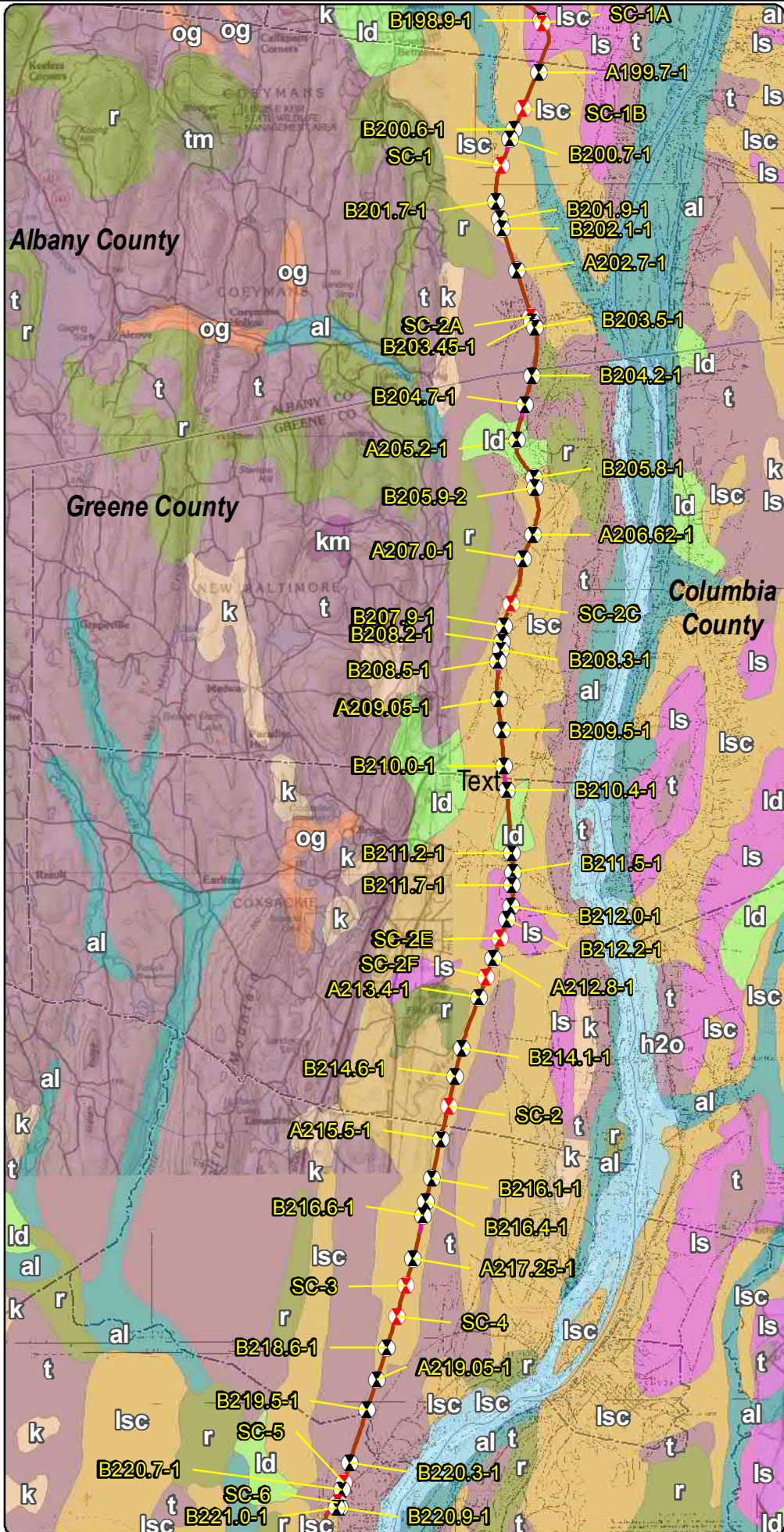
Firm	Boring	Northing (feet)	Easting (feet)	Ground Surface Elevation (feet)
TRC*	B221.0-1	1237452.6	663787.2	99.6
	B221.2-1	1236173.4	663261.8	115.0
	B221.4-1	1235622.5	662622.3	22.4
	B221.5-1	1235006.9	662058.8	95.5
	B221.6-1	1234675.8	661633.8	98.3
	B221.8-1	1234265.3	661277.2	99.4
	B222.34-1	1232191.5	659098.9	133.5
	B222.6-1	1231252.6	658182.3	113.7
	B222.9-1	1229751.0	657274.3	121.4
	B225.8-1	1215861.0	650622.7	91.0
	B226.1-1	1214654.4	650328.3	105.9
	B226.2-1	1214120.5	650254.4	108.5
	B226.6-1	1211894.7	649689.7	112.1
AECOM**	CU-1	1237028.6	663123.9	19.7
	CU-2	1236042.7	662897.0	24.8
	CU-2A	1235325.9	662268.9	38.1
	CU-5A	1210523.7	649411.8	118.4
	SC-5	1239310.3	664321.6	110.2
	SC-6	1237781.0	663919.8	101.6

Notes:

- Northings and Eastings are provided in NAD83 New York State Plane East Zone.
- Elevations are referenced to the NAVD88 datum.
- * TRC boring coordinates as shown in Table 1-6 in AECOM report (reference below). Boring elevations estimated from November 2021 topographic survey by Williams Aerial.
- ** AECOM boring coordinates and elevations as shown in Table 1-6 in AECOM report.
- *** Kiewit boring coordinates and elevations are noted on the boring logs.

Reference:

AECOM, Geotechnical Data Report, Upland Segments: Putnam Station, Washington County, to Cementon, Green County, NY, Champlain Hudson Power Express, dated May 28, 2021.



LEGEND

- 2021 Boring Location
- Previous (2013) Boring Location
- Terrestrial Route HVDC
- Submarine Route HVDC
- Terrestrial Route HVAC
- Preliminary HDD Locations
- Preliminary Pipe Bridge Location
- Town Boundary
- County Boundary

Surficial Geology

- al - Recent alluvium
- h2o - Water
- k - Kame deposits
- km - Kame moraine
- ld - Lacustrine delta
- ls - Lacustrine sand
- lsc - Lacustrine silt and clay
- og - Outwash sand and gravel
- r - Bedrock
- t - Till
- tm - Till moraine

1 0.5 0 1 Miles

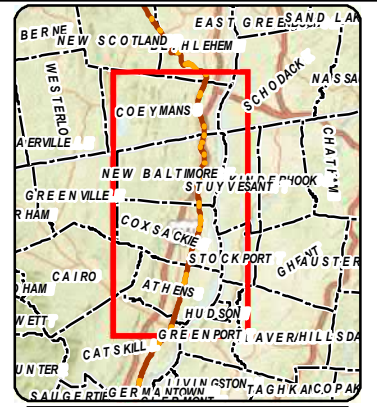
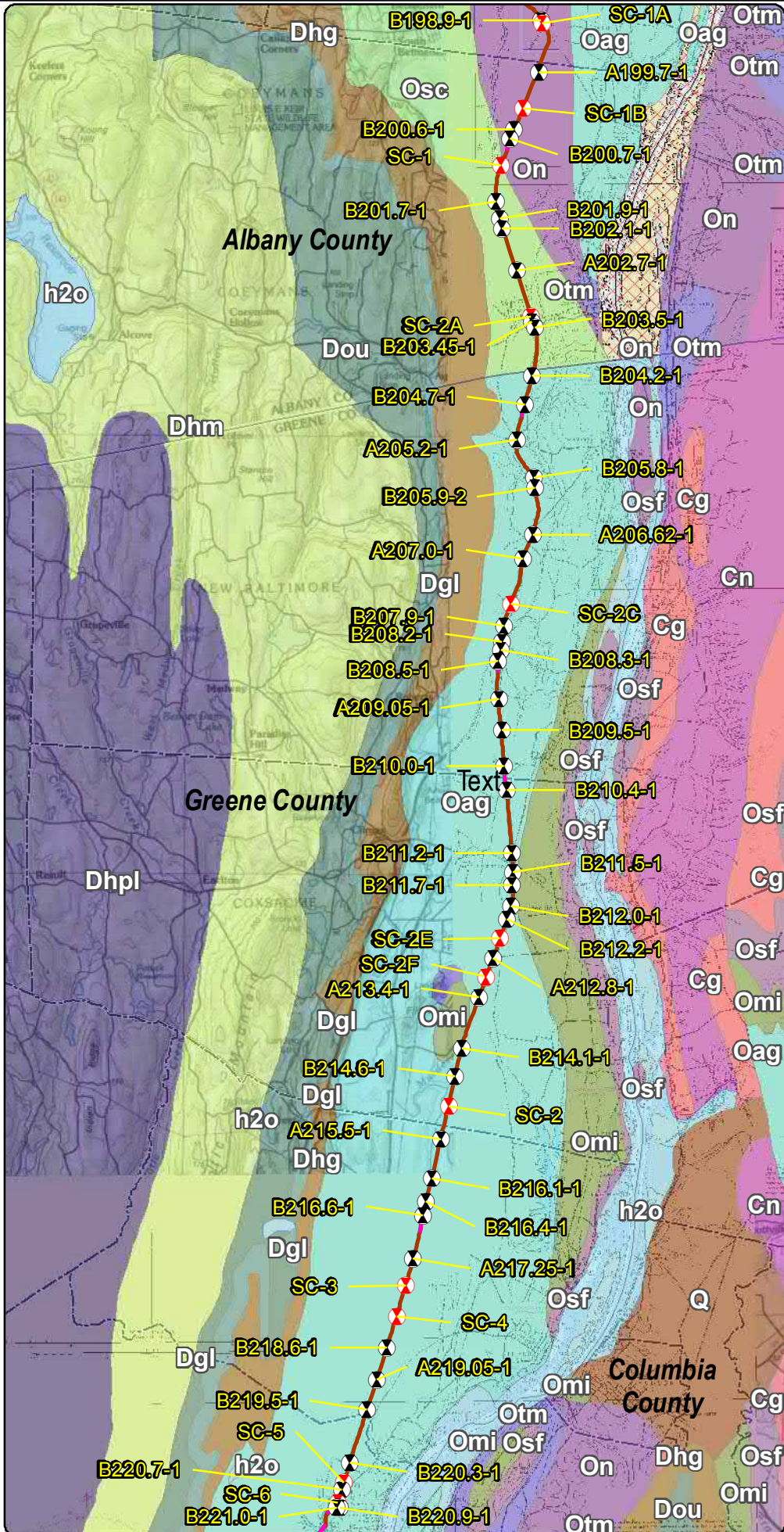
Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

**Surficial Geology and Geotechnical Borings
Selkirk to Catskill**
Figure 3-10

Prepared on 5/3/2021
by: **AECOM**

DATA SOURCES: ESRI, NYSDOT, NOAA, USACE, NYDOS, TDI, TRC

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LEGEND

- 2021 Boring Location
- Previous (2013) Boring Location
- Terrestrial Route HVDC
- Submarine Route HVDC
- Terrestrial Route HVAC
- Preliminary HDD Locations
- Preliminary Pipe Bridge Location
- Town Boundary
- County Boundary

Bedrock Geology

- Cg - Germantown Formation
- Cn - Nassau Formation
- Dgl - Glenerie Formation
- Dhg - Port Ewen Formation
- Dhpl - Piattek III Formation
- Dou - Onondaga Limestone
- No Label
- Oag - Austin Glen Form (graywacke, shale)
- Omi - Mount Merino Formation
- On - Normanskill Shale
- Osc - Schenectady Formation
- Osf - Stuyvesant Falls Formation
- Otm - Taconic Melange
- Q - Glacial and Alluvial Deposits
- h2o - Water

* Schenectady Formation includes: graywacke, sandstone, siltstone, shale

Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

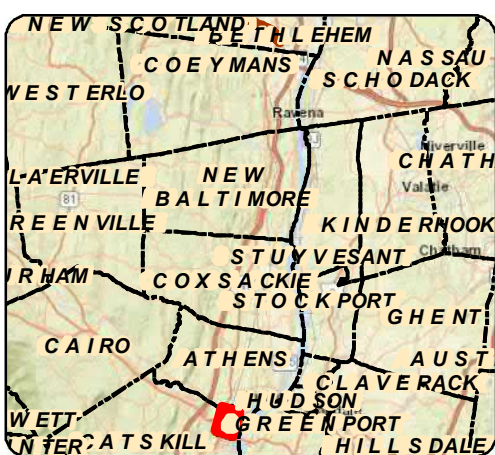
Bedrock Geology and Geotechnical Borings Selkirk to Catskill

Figure 4-10

Prepared on 5/18/2021
by: **AECOM**

DATA SOURCES: ESRI, NYSDOT, NOAA, USACE, NYDOS, TDI, TRC

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LEGEND	
111.8 ● Certified Milepost - Tenths	Streams/Ditches
● Certified Milepost	Railroad ROW
○ Preferred Alternative Milepost - Tenths	Deviation Zone
○ Preferred Alternative Milepost	Deviation Zone Outside ROW
Terrestrial Route HVDC	Preferred Alternative Deviation Zone
Submarine Route HVDC	Preferred Alternative Deviation Zone Outside ROW
Terrestrial Route HVAC	Town Boundary
Preliminary HDD Locations	Village Boundary
Preliminary Pipe Bridge Location	State Park (OPRHP)
2021 Boring Location	Parcel Ownership
Previous (2013) Boring Location	Road Name
	Village Name
	TOWN NAME


Champlain Hudson Power Express Project
 Champlain Hudson Power Express Inc.

BORING LOCATION PLAN
Selkirk to Catskill
Figure A-10
 Sheet 18 of 18

Prepared by: **AECOM** 5/19/2021

BORING CONTRACTOR: ADT		<h1>AECOM</h1>								SHEET 1 OF 2			
DRILLER: Chris Chaillou										PROJECT NAME: CHPE -			
SOILS ENGINEER/GEOLOGIST: Chris French										PROJECT NO.: 60323056			
		BORING LOG								HOLE NO.: SC-6			
LOCATION: Catskill, NY MP - 220.9 (CSX Rail)										START DATE: 1/28/21			
										FINISH DATE: 1/28/21			
										OFFSET: N/A			
GROUND WATER OBSERVATIONS				CASING		SAMPLER		DRILL BIT		CORE BARREL			
Water at 30' (inferred)		TYPE		Flush Joint Steel		California Modified		Tricone Roller Bit		DRILL RIG: CME LC-55			
		SIZE I.D.		4"		2.5"		--		BORING TYPE: SPT			
		SIZE O.D.		4.5"		3"		3 7/8"		BORING O.D.: 4.5"			
		HAMMER WT.		140 lbs		140 lbs				SURFACE ELEV.:			
		HAMMER FALL		30"		30"				LONGITUDE:			
										LATITUDE:			
DEPTH	CORING RATE MIN/FT	S A M P L E		HAMMER FALL		BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)				N Corr. ⁽²⁾	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS
		DEPTHS FROM - TO (FEET)	TYPE AND NO.	PEN. in	REC. in								
1.0		0'-5'				Hand Cleared					SP-SW	Gravelly SAND	0.0': Black fine to coarse SAND, some angular gravel, trace silt; frozen
2.0													1.0': Brown and tan silty CLAY; medium stiff, moist
3.0													
4.0		3'-5'		S-1							CL	TR-1; (3.0'-5.0')	
5.0													
6.0		5'-7'		S-2	24"	24"	10	15	21	24	23	CL	Brown silty CLAY; stiff, moist
7.0													
8.0		7'-9'		S-3	24"	24"	41	35	34	33	45	CL	Brown silty CLAY; very stiff, moist
9.0													
10.0		9'-11'		S-4	24"	13"	6	8	9	19	11	CL	Brown CLAY and silt; stiff, moist
11.0													
12.0		11'-13'		S-5	24"	24"	10	15	19	21	22	CL	Brown CLAY and silt; very stiff, moist
13.0													
14.0		13'-15'		S-6	24"	24"	6	13	14	17	18	CL	Brown silty CLAY; stiff, moist
15.0													
16.0		15'-17'		S-7	24"	21"	15	22	20	20	27	CL	SAA
17.0													
18.0													
19.0													
20.0													
<p>NOTES:</p> <p>(1) Thick-wall ring lined drive sampler (California sampler) used for SPT samples. Rings dimensions = 2-1/2" O.D. by 2-7/16" I.D. by 6" length.</p> <p>(2) Correction factor: $N_{corr} = N \cdot (2.0^2 - 1.375^2) / (3.0^2 - 2.4^2)$ in. = $N \cdot 0.65$.</p> <p>Soil description represents a field identification after D.M. Burmister unless otherwise noted.</p>												<p>The information contained on this log is not warranted to show the actual subsurface condition. The contractor agrees that he will make no claims against AECOM if he finds that the actual conditions do not conform to those indicated by this log.</p>	
SAMPLE TYPE:		S= SPLIT SPOON		U=SHELBY TUBE		R=ROCK CORE							
PROPORTIONS:		TRACE=1-10%		LITTLE=10-20%		SOME=20-35%		AND=35-50%					

BORING CONTRACTOR: ADT	<h1 style="margin: 0;">AECOM</h1>	SHEET 2 OF 2
DRILLER: Chris Chaillou		PROJECT NAME: CHPE -
SOILS ENGINEER: Chris French		PROJECT NO.: 60323056 HOLE NO.: SC-6
BORING LOG		START DATE: 1/28/21 FINISH DATE: 1/28/21
LOCATION: Catskill, NY MP - 220.9 (CSX Rail)		OFFSET: N/A

DEPTH	CORING RATE MIN/FT	DEPTHS FROM - TO (FEET)	TYPE AND NO.	PEN. in	REC. in	BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)				N Corr.	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS
						6	8	9	12				
21.0		20'-22'	S-8	24"	24"	6	8	9	12	11	CL		Gray and Brown silty CLAY; stiff, moist
22.0													
23.0													
24.0													
25.0													
26.0		25'-27'	S-9	24"	24"	5	6	7	8	8	CL		Gray silty CLAY; medium stiff, moist
27.0													TR-4; (26.0'-26.5')
28.0													
29.0													
30.0													
31.0		30'-32'	S-10	24"	24%	WOH	4%	5	8	6	CH	Silty CLAY	Gray silty CLAY; soft, wet
32.0													
33.0													
34.0													
35.0													
36.0		35'-37'	S-11	24"	24"	WOH	1	2	8	2	CH		SAA 36.8': Gray SILT and clay; soft, wet
37.0													TR-5; (36.0'-36.5')
38.0													
39.0		38'-40'	S-12	24"	24"	WOH	5	5	6	7	CH		Gray CLAY and silt; soft, wet
40.0													
41.0													SC-6 terminated at 40', grouted to surface
42.0													
43.0													
44.0													
45.0													

NOTES: Soil description represents a field identification after D.M. Burmister unless otherwise noted.	The information contained on this log is not warranted to show the actual subsurface condition. The contractor agrees that he will make no claims against AECOM if he finds that the actual conditions do not conform to those indicated by this log.
SAMPLE TYPE: S= SPLIT SPOON U=SHELBY TUBE R=ROCK CORE PROPORTIONS: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%	



TEST BORING LOG

BORING **B221.0-1**

G.S. ELEV. N/A

FILE 195651

SHEET 1 OF 1

PROJECT: TDI CHAMPLAIN HUDSON POWER EXPRESS

LOCATION: CSX RAILROAD ROW, NY

GROUNDWATER DATA			
FIRST ENCOUNTERED NR			
DEPTH	HOUR	DATE	ELAPSED TIME
DRY	NR	11/27	0 HR

METHOD OF ADVANCING BOREHOLE			
a	FROM	TO	
	0.0'	10.0'	
d	FROM	TO	
	10.0'	20.0'	

DRILLER	R.CARUSO
HELPER	C. SMART
INSPECTOR	N/A
DATE STARTED	11/27/2012
DATE COMPLETED	11/27/2012

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS
5	S-1	5 7 6 5		DARK GRAY C/F GRAVEL, SM M/C/F SAND, TR SILT (FILL)	7.6	
	S-2	4 4 2 2				
	S-3	2 2 3 3				
	S-4	5 4 3 4				
10	S-5	4 4 4 4				
15	S-6	7 9 12	18.5			
20	S-7	10 14 16	20.0	GRAY CLAY, TR TO SM SILT END OF BORING AT 20'		
25						
30						
35						

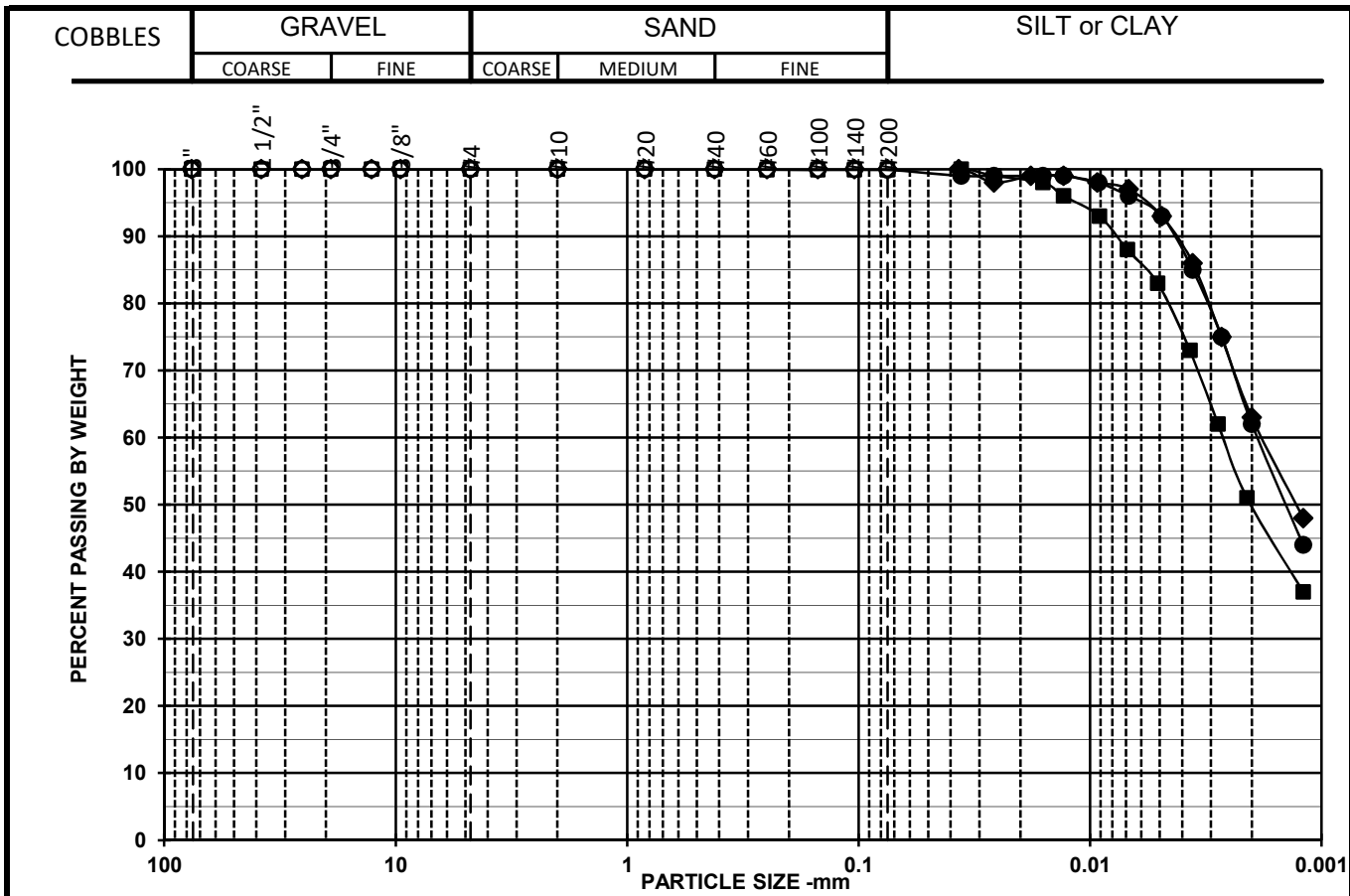
NEW PROJECTS TEST BORING LOG 195651_TDI_CSX.GPJ SITE BLAUVELT.GDT 3/12/13

DRN.	TBT
CKD.	PWK

Aquifer
CHPE - Selkirk Catskill Borings
LABORATORY SOIL TESTING DATA SUMMARY

BORING NO.	SAMPLE NO.	DEPTH (ft)	IDENTIFICATION TESTS							REMARKS
			WATER CONTENT (%)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	USCS SYMB. (1)	SIEVE MINUS NO. 200 (%)	HYDROMETER % MINUS 2 μm (%)	
SC-1	S-2	5-7	28.2	54	23	31	CH	99.4	45	
SC-1	S-4	9-11	25.8	44	22	22	CL	96.8	44	
SC-1A	S-3	7-9	11.7				SM	34.1	4	
SC-1A	S-8	20-22	22.6				SM	37.8	3	
SC-1A	S-10	30-32	35.3	37	19	18	CL	99.9	44	
SC-2C	S-2	5-7	5.8				GP-GM	8		
SC-2C	S-7	15-17	19.1	36	19	17	GC	35	14	
SC-2C	S-9	24-29	5.0	15	10	5	GC-GM	21	5	
SC-2E	S-2	5-7	38.1	61	25	36	CH	99.5	85	
SC-2E	S-5	11-13	39.5	47	23	24	CL	99.8	64	
SC-3	S-2	5-7	32.9	76	28	48	CH	99.4	93	
SC-3	S-8	20-22	62.4	55	24	31	CH	100	76	
SC-3	S-10	30-32	7.4				GW-GM	5	3	
SC-5	S-2	5-7	20.7	28	18	10	CL	77	15	
SC-5	S-6	13-15	24.9	40	21	19	CL	76	31	
SC-6	S-3	7-9	29.5	49	24	25	CL	99.9	50	
SC-6	S-8	20-22	35.2	49	23	26	CL	100	63	
SC-6	S-10	30-32	34.9	43	21	22	OL	99.9	62	

Note: (1) USCS symbol based on visual observation and Sieve and Atterberg limits reported.



Open Symbols: Sieve analysis by ASTM D6913

Filled symbols: Hydrometer analysis by ASTM D7928 corrected for complete sample

SYMBOL	w (%)	LL	PL	PI	USCS	AASHTO	USCS DESCRIPTION AND REMARKS	DATE
□	29.5	49	24	25	CL		Brown, Lean clay	04/08/21
◇	35.2	49	23	26	CL		Brownish gray, Lean clay	04/08/21
○	34.9	43	21	22	OL		Gray, Organic clay	04/08/21

Aquifer	#602201207
TerraSense, LLC	#7853-21008

CHPE - Selkirk Catskill Borings PO

Symbol	□	◇	○
Boring	SC-6	SC-6	SC-6
Sample	S-3	S-8	S-10
Depth	7-9	20-22	30-32
% +3"	0	0	0
% Gravel	0	0	0
% SAND	0.1	0	0.1
%C SAND	0	0	0
%M SAND	0	0	0
%F SAND	0.1	0	0.1
% FINES	99.9	100	99.9
D ₁₀₀ (mm)	0.841	0.075	0.841
D ₆₀ (mm)	0.003	0.002	0.002
D ₃₀ (mm)			
D ₁₀ (mm)			
Cc			
Cu			

Sieve Size/ID #	Percent Finer Data		
6"	100.0	100	100.0
4"	100.0	100	100.0
3"	100.0	100	100.0
1 1/2"	100.0	100	100.0
1"	100.0	100	100.0
3/4"	100.0	100	100.0
1/2"	100.0	100	100.0
3/8"	100.0	100	100.0
#4	100.0	100	100.0
#10	100.0	100	100.0
#20	100.0	100	100.0
#40	100.0	100	100.0
#60	99.9	100	100.0
#100	99.9	100	100.0
#140	99.9	100	100.0
#200	99.9	100	99.9
5µ m	82	93	93
2µ m	50	63	62
1µ m	32	43	38

PARTICLE SIZE DISTRIBUTION
ASTM D6913 & ASTM D7928

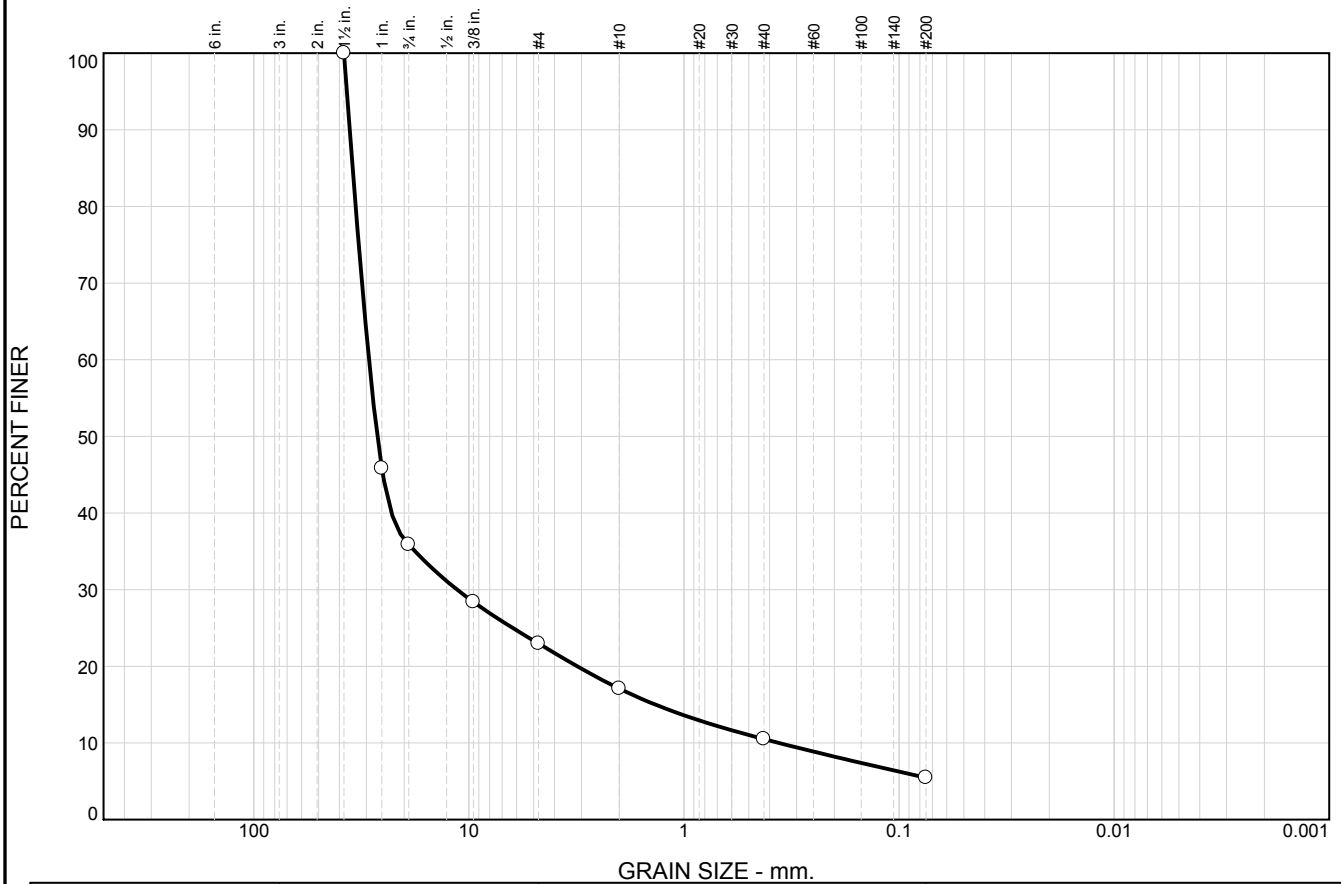


SUMMARY OF LABORATORY TEST DATA

Project Name: TDI Champlain Hudson Power Express – CSX
 Client Name: Transmission Developers, Inc.
 TRC Project #: 195651

SAMPLE IDENTIFICATION			Soil Group (USCS System)	GRAIN SIZE DISTRIBUTION				PLASTICITY				Specific Gravity	Moisture Content (%)	Unit Weight (pcf)	Compressive Strength (tsf)	Organic Content (%)
Boring #	Sample #	Depth (ft)		Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index					
	S-5	8.0-10.0	-	-	-	-	-	-	-	-	-	20.7	88.6	-	-	
	S-6	13.5-15.0	-	-	-	-	-	-	-	-	-	18.2	-	-	-	
	S-7	18.5-20.0	-	-	-	-	-	-	-	-	-	21.4	-	-	-	
B221.0-1	S-1	0.0-2.0	-	-	-	-	-	-	-	-	-	7.6	-	-	-	
	S-3	4.0-6.0	GW	77.0	17.5	5.5							4.2			
	S-4	6.0-8.0														
	S-5	8.0-10.0														
B221.14-1	S-1	0.0-2.0	-	-	-	-	-	-	-	-	-	21.3	-	-	-	
	S-3	4.0-6.0	-	-	-	-	-	-	-	-	-	6.3	-	-	-	
	S-4	6.0-8.0	GW-GM	58.7	31.3	10.0							6.4			
	S-5	8.0-10.0														

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	64.1	12.9	5.9	6.6	5.0	5.5	

	LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
○			34.7080	29.1773	26.6607	11.3379	1.3566	0.3617	12.18	80.66

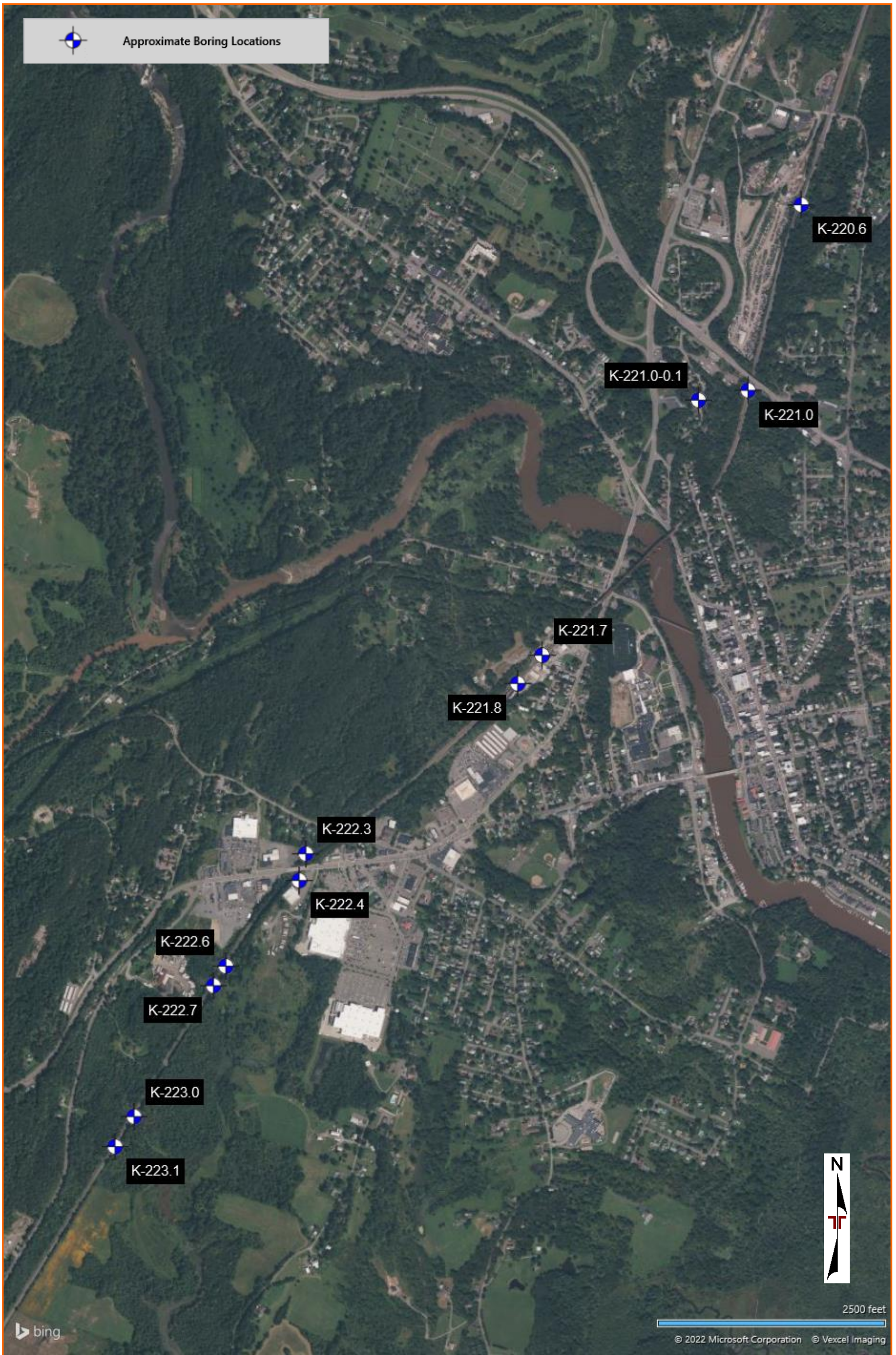
Material Description	USCS	AASHTO
○ DARK GRAY C/F GRAVEL, SM M/C/F SAND, TR SILT	GW	

<p>Project No. 195651 Client: TRANSMISSION DEVELOPERS INC.</p> <p>Project: TDI CHAMPLAIN HUDSON POWER EXPRESS - CSX</p> <p>○ Sample Source: B221.0-1 Depth: 4.0-10.0 FT Sample No.: S-3, S-4, & S-5</p>	<p>Remarks:</p> <p>○ SAMPLE DESCRIPTION BASED ON VISUAL IDENTIFICATION AND LABORATORY ANALYSIS</p>
<p>TRC Engineers, Inc.</p> <p>Mt. Laurel, NJ</p>	<p>Figure 117</p>

Tested By: TBT 01/10/13 **Checked By:** JPB 03/12/13

EXPLORATION PLAN

Champlain-Hudson Power Express Package 7a ■ Catskill, NY
May 23, 2022 ■ Terracon Project No. JB215256D



BORING LOG NO. K-221.0

PROJECT: Champlain-Hudson Power Express Package
7a

CLIENT: Kiewit Engineering (NY) Corp.

SITE: Champlain to Hudson HDD Crossings
Catskill, NY

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL - JB215256D CHAMPLAIN-HUDSON GRU TERRACON DATATEMPLATE.GDT 5/20/22

GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 42.228733° Longitude: -73.866003° Surface Elev.: 99.19 (Ft.) ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (in.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS		PERCENT FINES
								LL-PL-PI		
	FILL - SAND AND GRAVEL , black, loose					2-2-3-6 N=5				
		4.0	95			2-2-3-3 N=5				
	SILT AND CLAY (CL-ML) , brown, medium stiff to very stiff					2-2-4-5 N=6				
		8.0	91			5-7-9-8 N=16				
	FAT CLAY WITH SAND (CH) , brown, stiff to very stiff					2-4-6-7 N=10	32.4	50-21-29	73	
			10			5-8-10-12 N=18				
			15			2-5-6-9 N=11				
			20			2-4-5-6 N=9				
	LEAN CLAY (CL) , brown, very soft	23.0	76			3-3-6-7 3" Split Spoon	30.9	41-23-18	90	

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4 1/4" HSA

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Logged by LC
Hammer Efficiency Summary:
Energy Transfer Ratio: 89.1% +/- 4.4%
Hammer Efficiency Correction (CE): 1.49
WOH = Weight of Hammer

Abandonment Method:
Boring backfilled with bentonite grout upon completion

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were provided by Kiewit.

WATER LEVEL OBSERVATIONS

No measurable groundwater prior to grouting



Boring Started: 03-15-2022

Boring Completed: 03-15-2022

Drill Rig: Mobile B-57

Driller: L. Spicher

Project No.: JB215256D

BORING LOG NO. K-221.0

PROJECT: Champlain-Hudson Power Express Package
7a

CLIENT: Kiewit Engineering (NY) Corp.

SITE: Champlain to Hudson HDD Crossings
Catskill, NY

GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 42.228733° Longitude: -73.866003°	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (in.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	PERCENT FINES
	DEPTH							ELEVATION (Ft.)	
30.0	LEAN CLAY (CL) , brown, very soft (<i>continued</i>)					With Ring Sampler			
	LEAN CLAY (CL) , gray, very soft	69		X	24	WOH-WOH-WOH-2			
	LEAN CLAY (CL) , gray, very soft	59		X	24	WOH-WOH-WOH-1	36.0		
40.0	Boring Terminated at 40 Feet	40		X	24	WOH-WOH-WOH-2			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4 1/4" HSA

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Logged by LC
Hammer Efficiency Summary:
Energy Transfer Ratio: 89.1% +/- 4.4%
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See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were provided by Kiewit.

WATER LEVEL OBSERVATIONS

No measurable groundwater prior to grouting



Boring Started: 03-15-2022

Boring Completed: 03-15-2022

Drill Rig: Mobile B-57

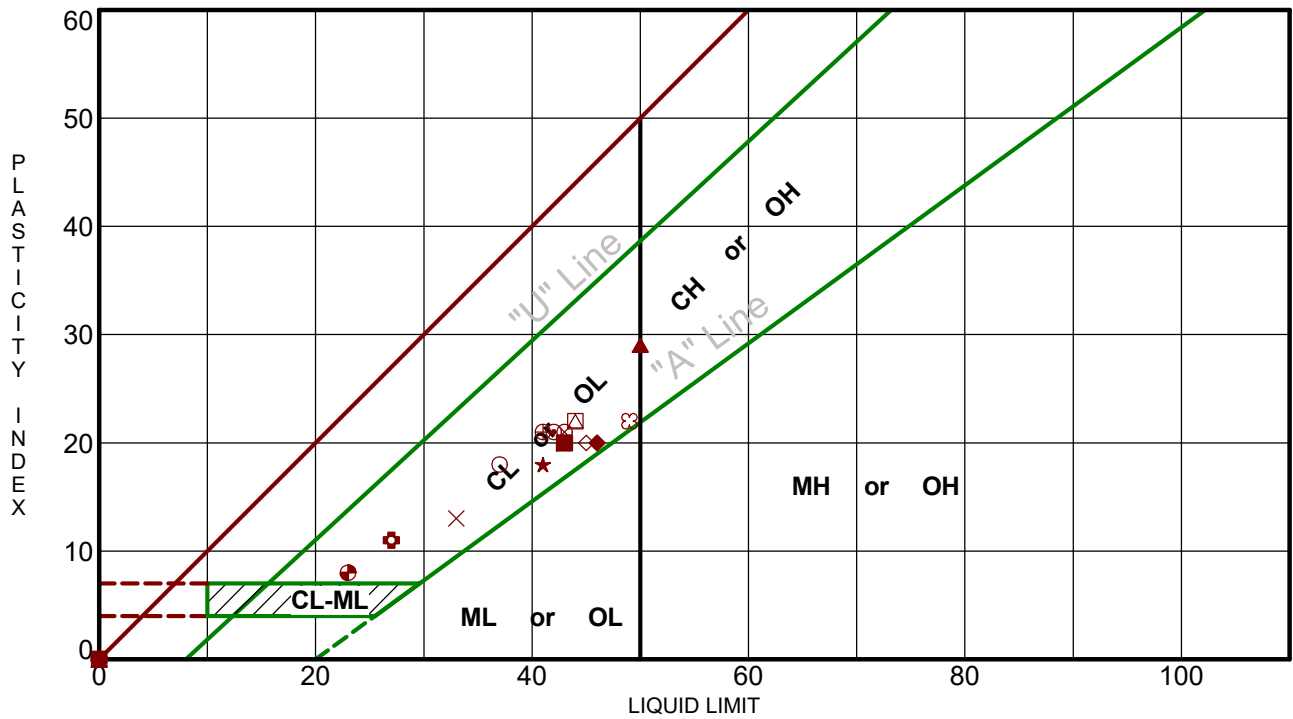
Driller: L. Spicher

Project No.: JB215256D

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL - JB215256D CHAMPLAIN-HUDSON GRU TERRACON_DATATEMPLATE.GDT 5/20/22

ATTERBERG LIMITS RESULTS

ASTM D4318



LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. ATTERBERG LIMITS JB215256D CHAMPLAIN-HUDSON.GPJ TERRACON_DATATEMPLATE.GDT 5/12/22

Boring ID	Depth (Ft)	LL	PL	PI	Fines	USCS	Description
● K-220.6	6 - 8	NP	NP	NP	22.1	GM	SILTY GRAVEL with SAND
▣ K-220.6	13 - 15	NP	NP	NP	11.9	SW-SM	WELL-GRADED SAND with SILT and GRAVEL
▲ K-221.0	8 - 10	50	21	29	73.4	CH	FAT CLAY with SAND
★ K-221.0	23 - 25	41	23	18	89.8	CL	LEAN CLAY
⊙ K-221.7	10 - 12	42	21	21	93.6	CL	LEAN CLAY
⊕ K-221.7	33 - 35	27	16	11	58.8	CL	SANDY LEAN CLAY
○ K-221.8	8 - 10	37	19	18	91.3	CL	LEAN CLAY
△ K-221.8	35 - 37	44	22	22	79.7	CL	LEAN CLAY with SAND
⊗ K-222.3	6 - 8	43	22	21	59.8	CL	SANDY LEAN CLAY
⊕ K-222.3	10 - 12	41	20	21	69.6	CL	SANDY LEAN CLAY
□ K-222.4	10 - 12	44	22	22	87.3	CL	LEAN CLAY
⊕ K-222.6	15 - 17	NP	NP	NP	6.5	GW-GM	WELL-GRADED GRAVEL with SILT and SAND
⊕ K-222.6	35 - 37	23	15	8	86.7	CL	LEAN CLAY
★ K-222.7	10 - 12	NP	NP	NP	25.3	GM	SILTY GRAVEL with SAND
⊗ K-222.7	25 - 27	49	27	22	76.3	CL	LEAN CLAY with SAND
■ K-223.0	10 - 12	43	23	20	58.5	CL	SANDY LEAN CLAY
◆ K-223.0	25 - 27	46	26	20	84.9	CL	LEAN CLAY with SAND
◇ K-223.1	15 - 17	45	25	20	71.3	CL	LEAN CLAY with SAND
× K-223.1	29 - 31	33	20	13	98.3	CL	LEAN CLAY

PROJECT: Champlain-Hudson Power Express Package 7a

SITE: Champlain to Hudson HDD Crossings Catskill, NY

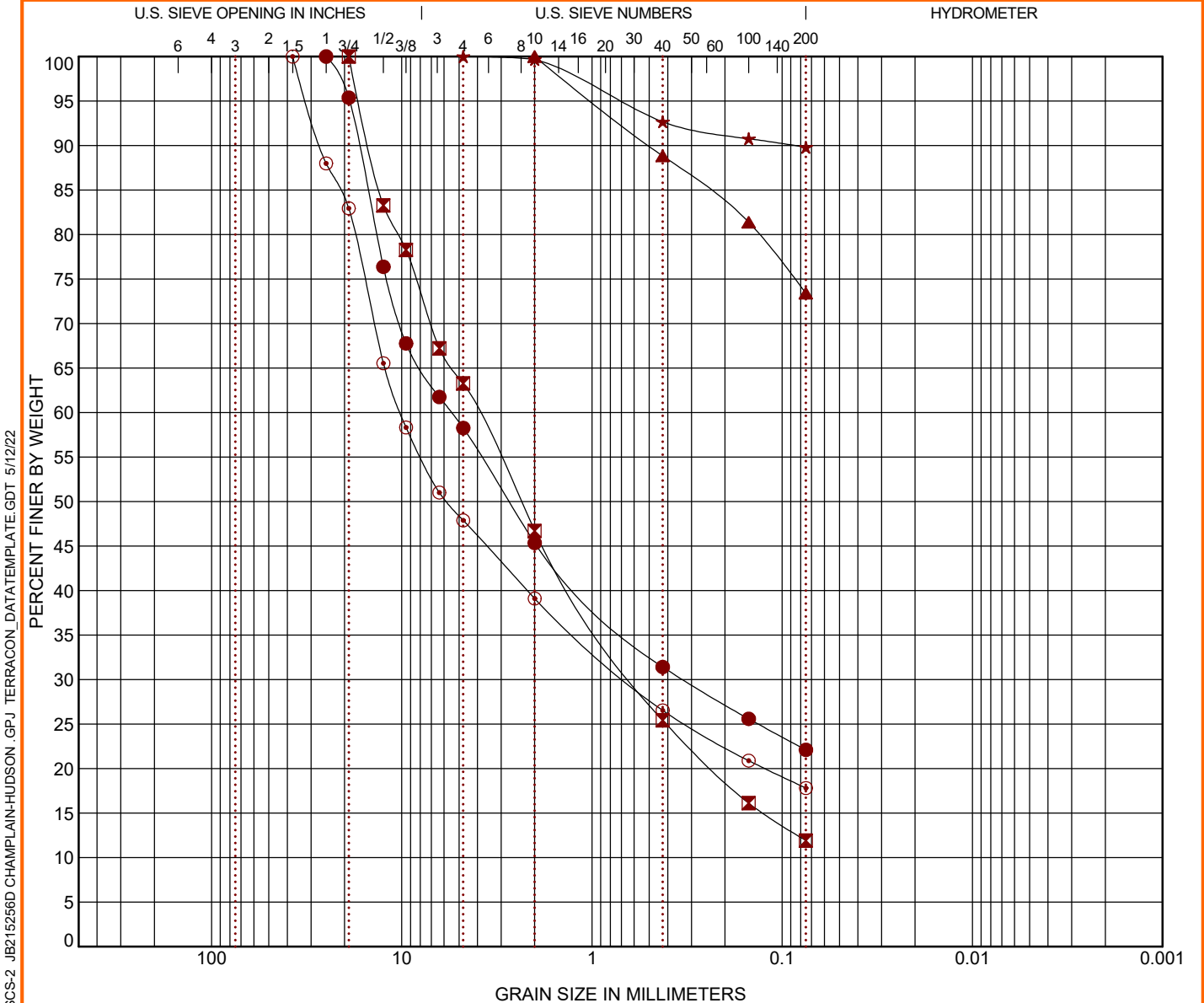


PROJECT NUMBER: JB215256D

CLIENT: Kiewit Engineering (NY) Corp.

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID	Depth (Ft)	USCS Classification				WC (%)	LL	PL	PI	Cc	Cu
● K-220.6	6 - 8	SILTY GRAVEL with SAND (GM)				9.9	NP	NP	NP		
☒ K-220.6	13 - 15	WELL-GRADED SAND with SILT and GRAVEL (SW-SM)				16.6	NP	NP	NP	1.60	73.20
▲ K-221.0	8 - 10	FAT CLAY with SAND (CH)				32.4	50	21	29		
★ K-221.0	23 - 25	LEAN CLAY (CL)				30.9	41	23	18		
⊙ K-221.0-0.1	8 - 10	SILTY GRAVEL with SAND (GM)				12.0					

Boring ID	Depth (Ft)	D ₁₀₀	D ₆₀	D ₃₀	D ₁₀	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
● K-220.6	6 - 8	25	5.489	0.33		0.0	41.7	36.2		22.1	
☒ K-220.6	13 - 15	19	4.006	0.593		0.0	36.7	51.4		11.9	
▲ K-221.0	8 - 10	2				0.0	0.0	26.6		73.4	
★ K-221.0	23 - 25	4.75				0.0	0.0	10.2		89.8	
⊙ K-221.0-0.1	8 - 10	37.5	10.125	0.651		0.0	52.1	30.1		17.8	

PROJECT: Champlain-Hudson Power Express Package 7a	<p style="font-size: small;">30 Corporate Cir Ste 201 Albany, NY</p>	PROJECT NUMBER: JB215256D
SITE: Champlain to Hudson HDD Crossings Catskill, NY	CLIENT: Kiewit Engineering (NY) Corp.	

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 JB215256D CHAMPLAIN-HUDSON.GPJ TERRACON_DATATEMPLATE.GDT 5/12/22

SITE LOCATION

Champlain-Hudson Power Express- Phase 4 HDD Borings – Package 6 and 7A
Schenectady through Selkirk, NY
February 8, 2023 ■ Terracon Project No. JB215256J

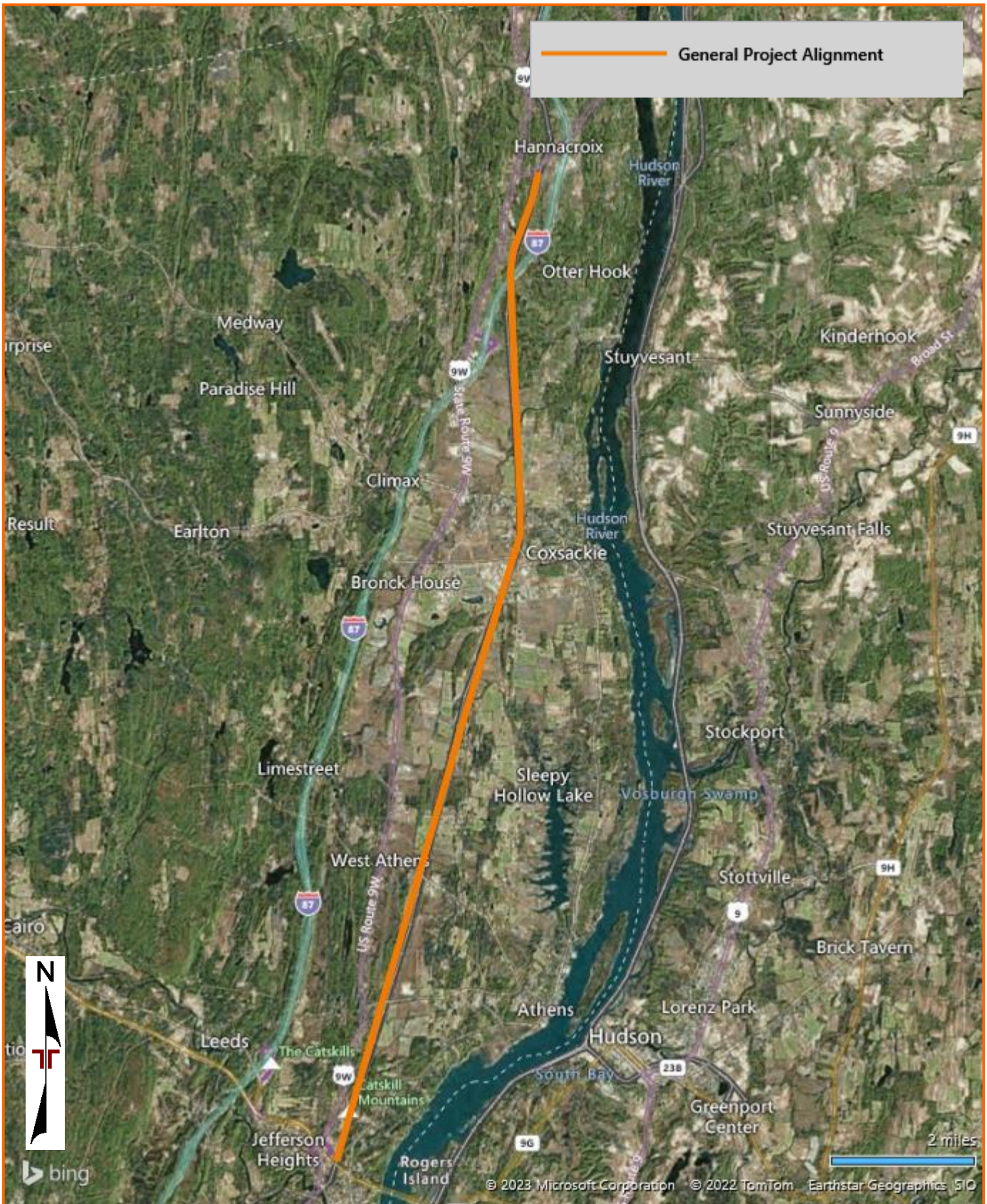
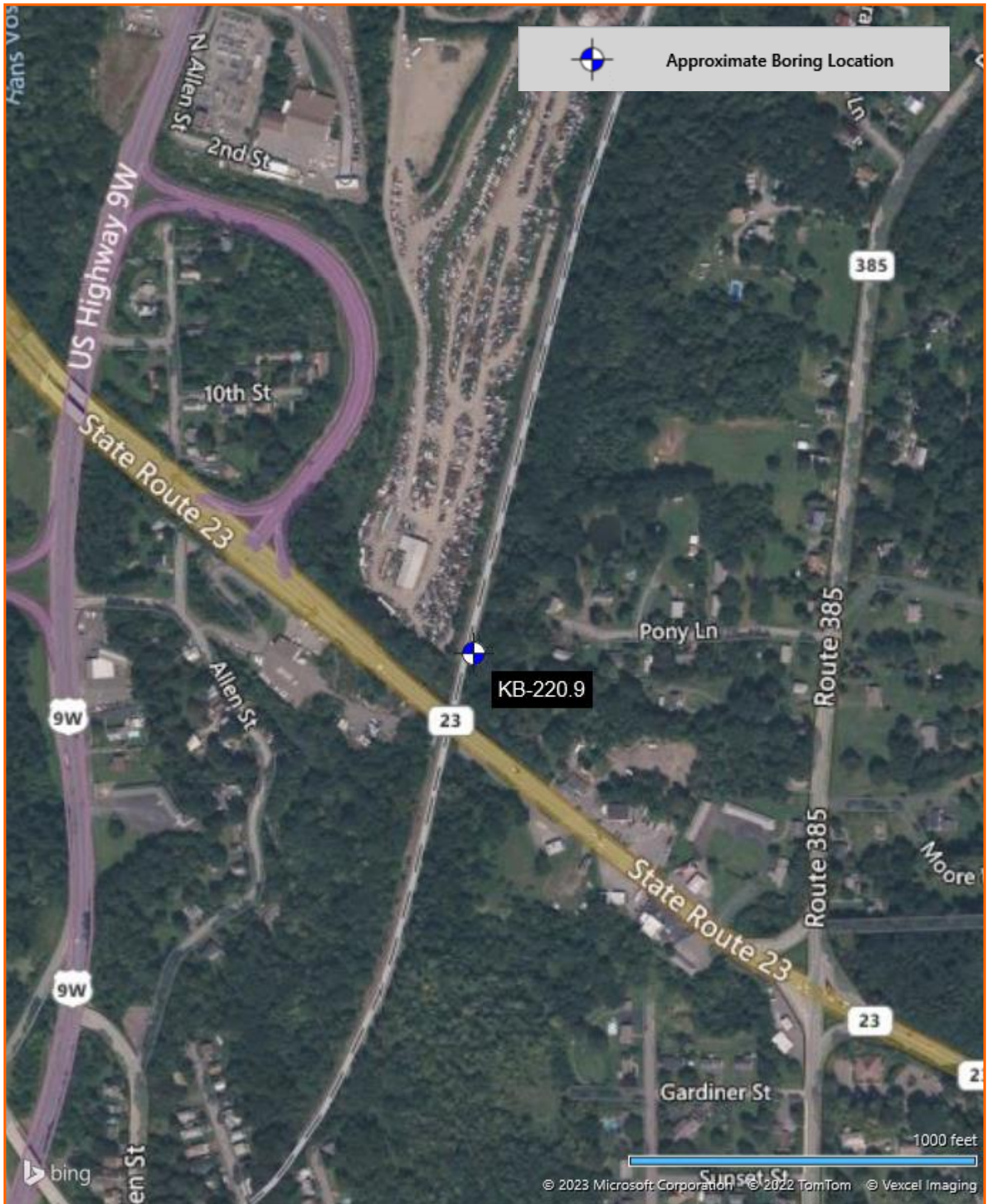


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

EXPLORATION PLAN

Champlain-Hudson Power Express- Phase 4 HDD Borings – Package 6 and 7A
Schenectady through Selkirk, NY
February 8, 2023 ■ Terracon Project No. JB215256J



BORING LOG NO. KB-220.9

PROJECT: Phase 4 Borings

CLIENT: Kiewit Engineering (NY) Corp
Lone Tree, CO

SITE: Champlain to Hudson HDD Crossings

GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 42.2296° Longitude: -73.8656° Surface Elev.: 102.6 (Ft.) ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	PERCENT FINES
								LL-PL-PI	
	1.9	100.7		X	14	1-4-3-5 N=7			
	FILL - SILTY SAND , black								
					X	20	4-3-3-4 N=6		
	FAT CLAY (CH) , varved silt and clay, brown, medium stiff to very stiff								
		5		X	18	3-3-6-7 N=9	31.0	50-27-23	98
grades with fine sand partings									
				X	24	12-11-12-14 N=23			
				X	24	14-15-13-14 N=28			
		10							
				X	24	2-4-5-4 N=9			
		15							
				X	24	WH-2-2-3 N=4	39.6	47-26-21	100
		20							
				X	24				
		25							

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
0-10' 4" Casing
10'-57" Mud Rotary

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Hammer Efficiency Summary:
Energy Transfer Ratio: 84.8% +/-3.7%
Hammer Efficiency Correction (CE): 1.41
Logged by AEB
WH = Weight of hammer
WR = Weight of rods

Abandonment Method:
Boring backfilled with bentonite grout upon completion

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were provided by others.

WATER LEVEL OBSERVATIONS

No free water encountered



Boring Started: 12-15-2022

Boring Completed: 12-20-2022

Drill Rig: Acker Renegade

Driller: L. Spicher

Project No.: JB215256J

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL - JB215256J PHASE 4 BORINGS.GPJ TERRACON_DATATEMPLATE.GDT 2/8/23

BORING LOG NO. KB-220.9

PROJECT: Phase 4 Borings

CLIENT: Kiewit Engineering (NY) Corp
Lone Tree, CO

SITE: Champlain to Hudson HDD Crossings

GRAPHIC LOG	LOCATION See Exploration Plan	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	PERCENT FINES
	DEPTH							ELEVATION (Ft.)	
LEAN CLAY (CL), varved silt and clay, gray, very soft to soft (continued)	Surface Elev.: 102.6 (Ft.)								
	ELEVATION (Ft.)								
		30		24		WH/18"-2			
		35		24		WH/12"-1-3 N=1			
		40		24		WH/18"-6 3" Split Spoon With Ring Samplers			
	45.0	45		24		WR/12"-WH/12"	33.6	42-27-15	99
		50							

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
0-10' 4" Casing
10'-57' Mud Rotary

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Hammer Efficiency Summary:
Energy Transfer Ratio: 84.8% +/-3.7%
Hammer Efficiency Correction (CE): 1.41
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WH = Weight of hammer
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Abandonment Method:
Boring backfilled with bentonite grout upon completion

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were provided by others.

WATER LEVEL OBSERVATIONS

No free water encountered



Boring Started: 12-15-2022

Boring Completed: 12-20-2022

Drill Rig: Acker Renegade

Driller: L. Spicher

Project No.: JB215256J

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL - JB215256J PHASE 4 BORINGS.GPJ TERRACON_DATATEMPLATE.GDT 2/8/23

BORING LOG NO. KB-220.9

PROJECT: Phase 4 Borings

CLIENT: Kiewit Engineering (NY) Corp
Lone Tree, CO

SITE: Champlain to Hudson HDD Crossings

GRAPHIC LOG	LOCATION See Exploration Plan	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	PERCENT FINES
	DEPTH							ELEVATION (Ft.)	
	Latitude: 42.2296° Longitude: -73.8656° Surface Elev.: 102.6 (Ft.)								
	SILT (ML) , varved silt and clay, gray, very soft (<i>continued</i>)			X	24	WR/18"-WH			
		55		X	24	WR/18"-3			
	57.0 Boring Terminated at 57 Feet 45.6								

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
0-10' 4" Casing
10'-57' Mud Rotary

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).
See [Supporting Information](#) for explanation of symbols and abbreviations.
Elevations were provided by others.

Notes:
Hammer Efficiency Summary:
Energy Transfer Ratio: 84.8% +/-3.7%
Hammer Efficiency Correction (CE): 1.41
Logged by AEB
WH = Weight of hammer
WR = Weight of rods

Abandonment Method:
Boring backfilled with bentonite grout upon completion

WATER LEVEL OBSERVATIONS
No free water encountered



Boring Started: 12-15-2022

Boring Completed: 12-20-2022

Drill Rig: Acker Renegade

Driller: L. Spicher

Project No.: JB215256J

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL. JB215256J PHASE 4 BORINGS.GPJ TERRACON_DATATEMPLATE.GDT 2/8/23

Summary of Laboratory Results

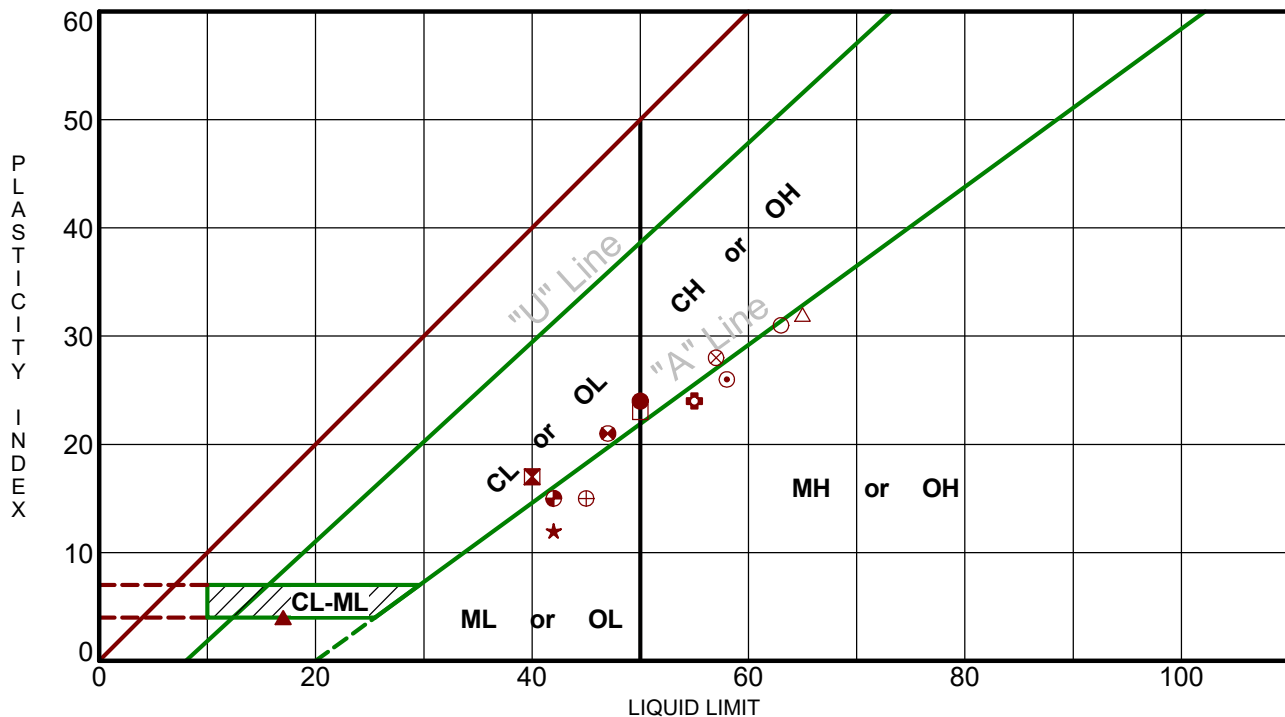
BORING ID	Depth (Ft.)	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index
KB-206.8	4-6	29.4	50	26	24
KB-206.8	15-17	32.9	40	23	17
KB-206.8	35-37	11.0	17	13	4
KB-207.0	4-6	23.7	42	30	12
KB-207.1	4-6	15.1			
KB-211.4B	4-6	32.8	58	32	26
KB-211.4B	15-17	48.0	55	31	24
KB-211.4B	40-42	36.7	63	32	31
KB-214.4	4-6	33.7	65	33	32
KB-214.4	15-17	37.6	57	29	28
KB-214.4	30-32	49.7	45	30	15
KB-220.9	4-6	31.0	50	27	23
KB-220.9	20-22	39.6	47	26	21
KB-220.9	45-47	33.6	42	27	15

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. SMART LAB SUMMARY-PORTRAIT_JB215256J PHASE 4 BORINGS.GPJ TERRACON_DATATEMPLATE.GDT 2/8/23

PROJECT: Phase 4 Borings	 30 Corporate Cir Ste 201 Albany, NY	PROJECT NUMBER: JB215256J
SITE: Champlain to Hudson HDD Crossings		CLIENT: Kiewit Engineering (NY) Corp Lone Tree, CO

ATTERBERG LIMITS RESULTS

ASTM D4318



LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. ATTERBERG LIMITS JB215256J PHASE 4 BORINGS.GPJ TERRACON_DATATEMPLATE.GDT 2/2/23

Boring ID	Depth (Ft)	LL	PL	PI	Fines	USCS	Description
● KB-206.8	4 - 6	50	26	24	87.8	CH	FAT CLAY
⊠ KB-206.8	15 - 17	40	23	17	99.4	CL	LEAN CLAY
▲ KB-206.8	35 - 37	17	13	4	37.5	SC-SM	SILTY, CLAYEY SAND with GRAVEL
★ KB-207.0	4 - 6	42	30	12	86.9	ML	SILT
⊙ KB-211.4B	4 - 6	58	32	26	53.8	MH	SANDY ELASTIC SILT
⊕ KB-211.4B	15 - 17	55	31	24	82.0	MH	ELASTIC SILT with SAND
○ KB-211.4B	40 - 42	63	32	31	96.7	MH	ELASTIC SILT
△ KB-214.4	4 - 6	65	33	32	84.2	MH	ELASTIC SILT with SAND
⊗ KB-214.4	15 - 17	57	29	28	94.7	CH	FAT CLAY
⊕ KB-214.4	30 - 32	45	30	15	93.2	ML	SILT
□ KB-220.9	4 - 6	50	27	23	97.5	CH	FAT CLAY
⊕ KB-220.9	20 - 22	47	26	21	100.0	CL	LEAN CLAY
⊕ KB-220.9	45 - 47	42	27	15	99.1	ML	SILT

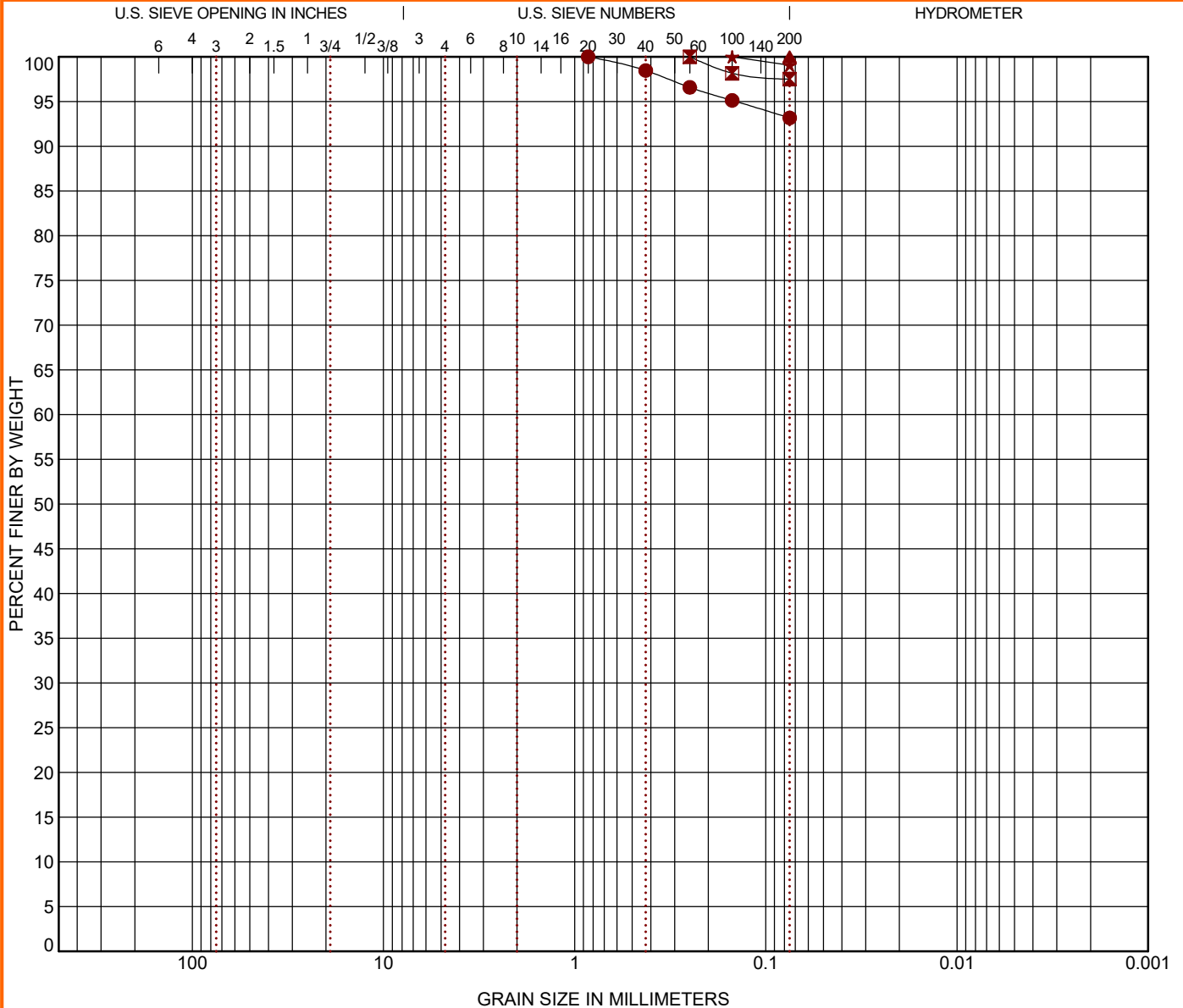
PROJECT: Phase 4 Borings
 SITE: Champlain to Hudson HDD Crossings



PROJECT NUMBER: JB215256J
 CLIENT: Kiewit Engineering (NY) Corp
 Lone Tree, CO

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID	Depth (Ft)	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
● KB-214.4	30 - 32	SILT (ML)	49.7	45	30	15		
■ KB-220.9	4 - 6	FAT CLAY (CH)	31.0	50	27	23		
▲ KB-220.9	20 - 22	LEAN CLAY (CL)	39.6	47	26	21		
★ KB-220.9	45 - 47	SILT (ML)	33.6	42	27	15		

Boring ID	Depth (Ft)	D ₁₀₀	D ₆₀	D ₃₀	D ₁₀	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
● KB-214.4	30 - 32	0.85				0.0	0.0	6.8		93.2	
■ KB-220.9	4 - 6	0.25				0.0	0.0	2.5		97.5	
▲ KB-220.9	20 - 22	0.075				0.0	0.0	0.0		100.0	
★ KB-220.9	45 - 47	0.15				0.0	0.0	0.9		99.1	

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 JB215256J PHASE 4 BORINGS.GPJ TERRACON DATATEMPLATE.GDT 2/2/23

PROJECT: Phase 4 Borings	<p style="font-size: small; margin: 0;">30 Corporate Cir Ste 201 Albany, NY</p>	PROJECT NUMBER: JB215256J
SITE: Champlain to Hudson HDD Crossings		CLIENT: Kiewit Engineering (NY) Corp Lone Tree, CO

DATE: December 16, 2022

TO: Zachary Bauer; Tetra Tech Rooney

FROM: Matthew Hawley, P.E.; Kiewit Engineering (NY) Corp. **mkh**
Jaren Knighton; Kiewit Engineering (NY) Corp.

SUBJECT: Geotechnical Data: Segment 11 – Package 7A – HDD Crossing 115 – Revision 1
Champlain Hudson Power Express Project
Catskill, New York

Kiewit Engineering is providing this memorandum for use in the horizontal direction drill (HDD) design for the Champlain Hudson Power Express project in Upstate New York. HDD crossing 115 is located northwest of Catskill, New York. This HDD crosses under the Catskill Creek at approximately STA 70090+00 (42.2244° N, 73.8702° W).

The geotechnical data at this HDD crossing is attached. The available data is taken from the previous investigations by AECOM and TRC and the recent investigation by Kiewit, referenced below.

- AECOM, Geotechnical Data Report, Upland Segments, Champlain Hudson Power Express, dated May 28, 2021.
- TRC, Geotechnical Data Report, Champlain Hudson Power Express, Canadian Pacific Railway Borings MP 177.6-228.2, dated March 15, 2013.
- Kiewit Engineering (NY) Corp., Package 7A Phase 3 Borings, Champlain Hudson Power Express, New York, dated December 8, 2022.

Contact us if you have questions or require additional information.

HDD 115
Borings CU-2, B221.14-1,
B221.2-1, B221.4-1, CU-2A,
B221.5-1, KB-221.3, KB-221.4
Segment 11 - Design Package 7A

CHPE Segment 11 - Package 7A
HDD Soil Boring Coordinates and Elevations

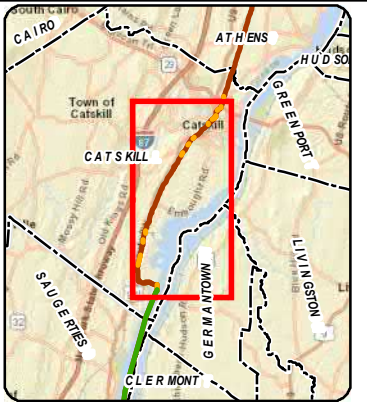
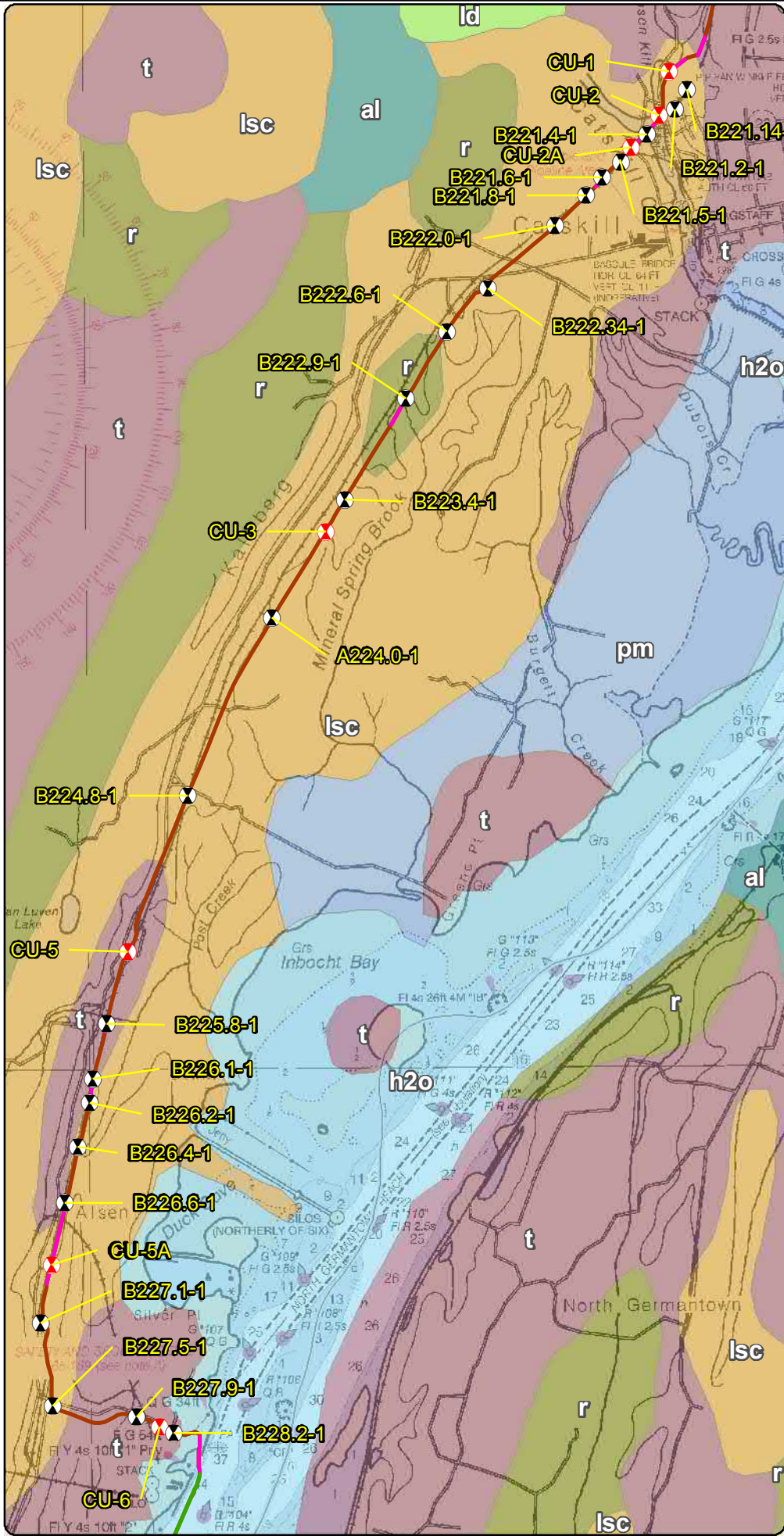
Firm	Boring	Northing (feet)	Easting (feet)	Ground Surface Elevation (feet)
TRC*	B221.0-1	1237452.6	663787.2	99.6
	B221.14-1	1236613.7	663529.1	95 (approx.)**
	B221.2-1	1236173.4	663261.8	115.0
	B221.4-1	1235622.5	662622.3	22.4
	B221.5-1	1235006.9	662058.8	95.5
	B221.6-1	1234675.8	661633.8	98.3
	B221.8-1	1234265.3	661277.2	99.4
	B222.34-1	1232191.5	659098.9	133.5
	B222.6-1	1231252.6	658182.3	113.7
	B222.9-1	1229751.0	657274.3	121.4
	B225.8-1	1215861.0	650622.7	91.0
	B226.1-1	1214654.4	650328.3	105.9
	B226.2-1	1214120.5	650254.4	108.5
	B226.6-1	1211894.7	649689.7	112.1
AECOM***	CU-1	1237028.6	663123.9	19.7
	CU-2	1236042.7	662897.0	24.8
	CU-2A	1235325.9	662268.9	38.1
	CU-5A	1210523.7	649411.8	118.4
	SC-5	1239310.3	664321.6	110.2
	SC-6	1237781.0	663919.8	101.6

Notes:

- Northings and Eastings are provided in NAD83 New York State Plane East Zone.
- Elevations are referenced to the NAVD88 datum.
- * TRC boring coordinates as shown in Table 1-6 in AECOM report (reference below). Boring elevations estimated from November 2021 topographic survey by Williams Aerial.
- ** Coordinates for B221.14-1 taken from TRC report. Elevation estimated from Google Earth.
- *** AECOM boring coordinates and elevations as shown in Table 1-6 in AECOM report.
- **** Kiewit boring coordinates and elevations are noted on the boring logs.

References:

- AECOM, Geotechnical Data Report, Upland Segments: Putnam Station, Washington County, to Cementon, Green County, NY, Champlain Hudson Power Express, dated May 28, 2021.
- TRC, Geotechnical Data Report, Champlain Hudson Power Express, Canadian Pacific Railway Borings MP 177.6-228.2, dated March 15, 2013.



LEGEND

- 2021 Boring Location
- Previous (2013) Boring Location
- Terrestrial Route HVDC
- Submarine Route HVDC
- Terrestrial Route HVAC
- Preliminary HDD Locations
- Preliminary Pipe Bridge Location
- Town Boundary
- County Boundary

Surfacial Geology

- al - Recent alluvium
- h2o - Water
- ld - Lacustrine delta
- lsc - Lacustrine silt and clay
- pm - Swamp deposits
- r - Bedrock
- t - Till

0.3 0.15 0 0.3 Miles

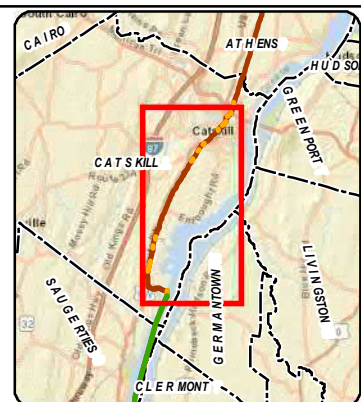
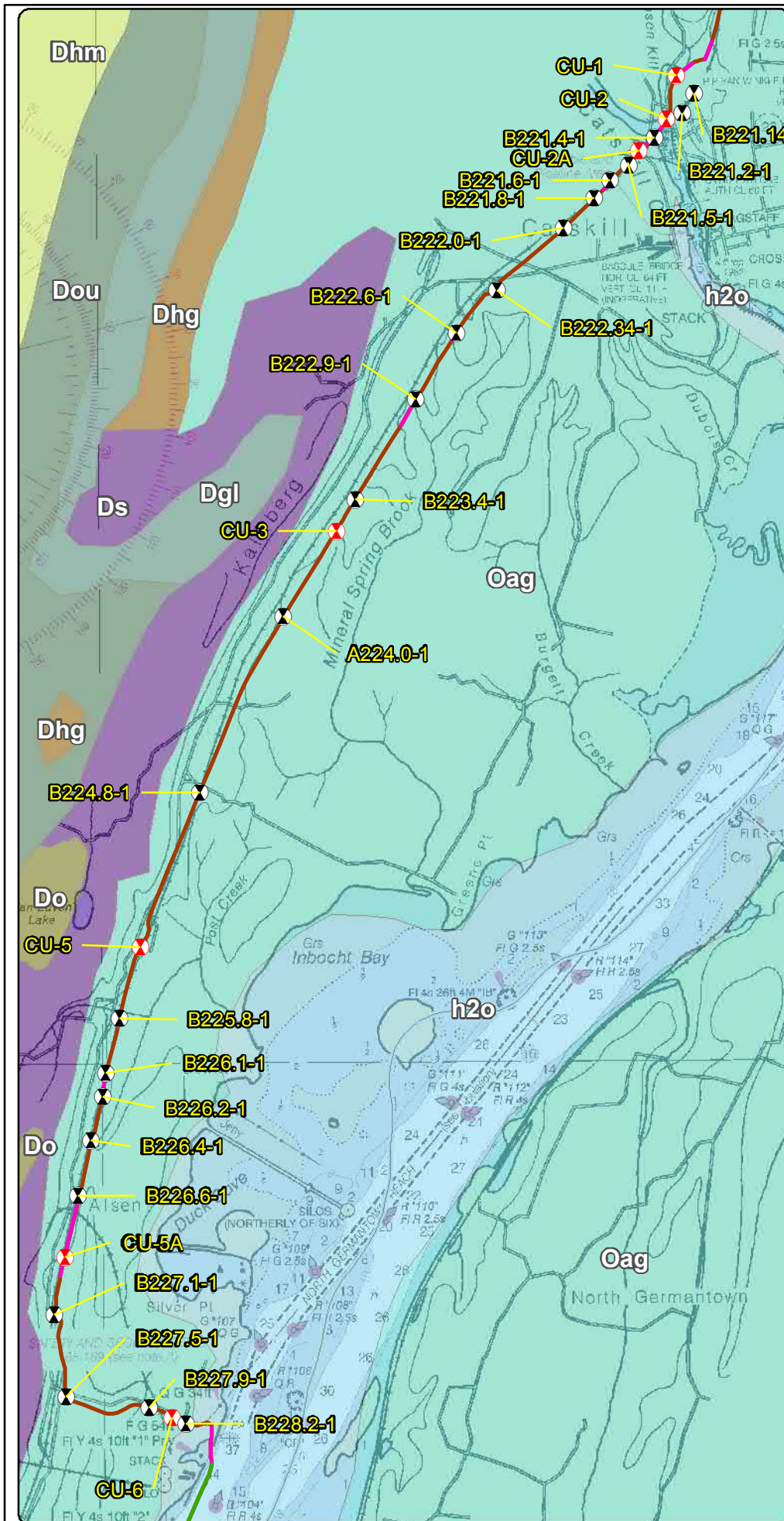
Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

**Surfacial Geology and Geotechnical Borings
Catskill to Upland
Figure 3-11**

Prepared on 5/3/2021
by: **AECOM**

DATA SOURCES: ESRI, NYSDOT, NOAA, USACE, NYDOS, TDI, TRC

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LEGEND

- 2021 Boring Location
- Previous (2013) Boring Location
- Terrestrial Route HVDC
- Submarine Route HVDC
- Terrestrial Route HVAC
- Preliminary HDD Locations
- Preliminary Pipe Bridge Location
- Town Boundary
- County Boundary

Bedrock Geology

- Dgl - Glenerie Formation
- Dhg - Port Ewen Formation
- Dhm - Undiff Lower Hamilton Group
- Do - Oriskany Sandstone
- Dou - Onondaga Limestone
- Ds - Cashaqua Shale
- Oag - Austin Glen Form (graywacke, shale)
- h2o - Water

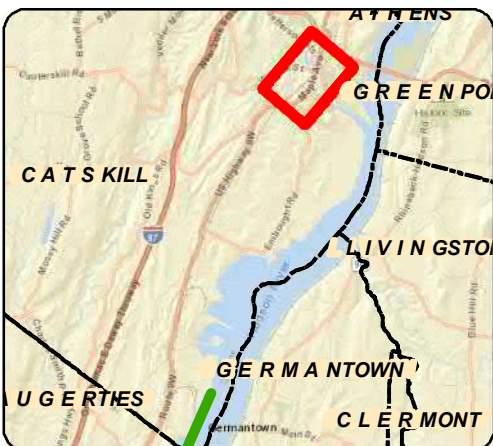
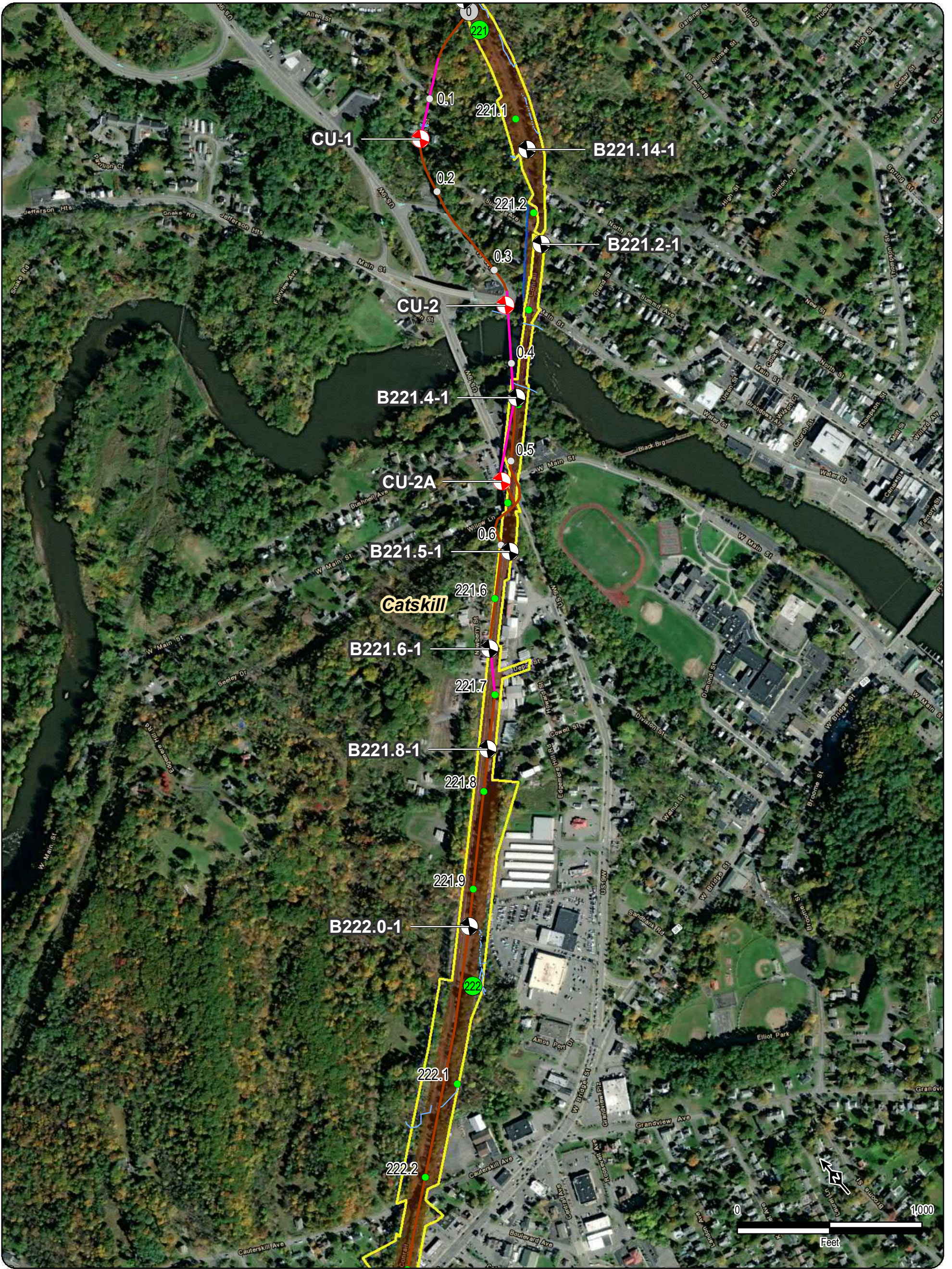
Champlain Hudson Power Express Project
 Champlain Hudson Power Express Inc.

**Bedrock Geology and Geotechnical Borings
 Catskill to Upland
 Figure 4-11**


Prepared on 5/18/2021
 by: **AECOM**

DATA SOURCES: ESRI, NYSDOT, NOAA, USACE, NYDOS, TDI, TRC

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LEGEND	
● 111.8	Certified Milepost - Tenths
● 111.8	Certified Milepost
○ 111.8	Preferred Alternative Milepost - Tenths
○ 135	Preferred Alternative Milepost
—	Terrestrial Route HVDC
—	Submarine Route HVDC
—	Terrestrial Route HVAC
—	Preliminary HDD Locations
—	Preliminary Pipe Bridge Location
⊗	2021 Boring Location
⊗	Previous (2013) Boring Location
—	Streams/Ditches
—	Railroad ROW
—	Deviation Zone
—	Deviation Zone Outside ROW
—	Preferred Alternative Deviation Zone
—	Preferred Alternative Deviation Zone Outside ROW
—	Town Boundary
—	Village Boundary
—	State Park (OPRHP)
—	Parcel Ownership
—	Road Name
—	Village Name
—	TOWN NAME


Champlain Hudson Power Express Project
 Champlain Hudson Power Express Inc.

BORING LOCATION PLAN
Catskill to Upland
Figure A-11
 Sheet 1 of 6

Prepared by: **AECOM** 5/20/2021

BORING CONTRACTOR: ADT		<h1>AECOM</h1>								SHEET 1 OF 3						
DRILLER: Chris Chaillou										PROJECT NAME: CHPE -						
SOILS ENGINEER/GEOLOGIST: Chris French										PROJECT NO.: 60323056						
		BORING LOG								HOLE NO.: CU-2						
LOCATION: Catskill, NY, MP - 0.33										START DATE: 2/10/2021						
										FINISH DATE: 2/10/2021						
										OFFSET: N/A						
GROUND WATER OBSERVATIONS					CASING		SAMPLER		DRILL BIT		CORE BARREL		DRILL RIG: CME LC-55			
Water at 15' (inferred)			TYPE		Flush Joint Steel		California Modified		Tricone Roller Bit		NQ		BORING TYPE: SPT/Core			
			SIZE I.D.		4"		2.5"		--		1 7/8"		BORING O.D.: 4.5"/3"			
			SIZE O.D.		4.5"		3"		3 7/8"		3"		SURFACE ELEV.:			
			HAMMER WT.		140 lbs		140 lbs						LONGITUDE:			
			HAMMER FALL		30"		30"						LATITUDE:			
D E P T H	CORING RATE MIN/FT	S A M P L E		HAMMER FALL		BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)				N Corr. ⁽²⁾	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS			
		DEPTHS FROM - TO (FEET)	TYPE AND NO.	PEN. in	REC. in											
1.0		0'-5'				Hand Cleared					SM	Silty SAND	Black fine-coarse SAND, little silt, trace subangular-subrounded gravel; frozen 1.2'; SAA; dense, moist 3.1'; Brown fine-coarse SAND, some silt, trace angular-subrounded gravel; dense, moist TR-1; (3.0'-5.0')			
2.0										SM						
3.0										SM						
4.0		3'-5'	S-1													
5.0																
6.0		5'-7'	S-2	24"	12"	9	8	8	9	10	SP	SAND	Black coarse SAND, some fine-medium sand, trace silt; loose, moist SAA			
7.0										4	SP					
8.0		7'-9'	S-3	24"	3"	9	6	6	8							
9.0																
10.0		9'-11'	S-4	24"	7"	5	7	6	8	8	SM	Silty SAND	Brown fine-coarse SAND, little silt, trace subrounded gravel; medium dense, moist. Brick in shoe. SAA			
11.0										8	SM/ML					
12.0		11'-13'	S-5	24"	8"	6	6	7	10			Clayey SILT	11.2'; Brown clayey SILT; medium stiff, moist Gray clayey SILT, little fine sand; soft, moist TR-2; (14.0'-14.5')			
13.0										6	ML					
14.0		13'-15'	S-6	24"	17"	5	4	5	5							
15.0												Silty SAND	Gray fine SAND, some medium-coarse sand, little silt; medium dense, saturated			
16.0		15'-17'	S-7	24"	18"	3	3	6	4	6	SM					
17.0																
18.0																
19.0																
20.0																
NOTES: (1) Thick-wall ring lined drive sampler (California sampler) used for SPT samples. Rings dimensions = 2-1/2" O.D. by 2-7/16" I.D. by 6" length. (2) Correction factor: $N_{corr} = N \cdot (2.0^2 - 1.375^2) / (3.0^2 - 2.4^2)$ in. = $N \cdot 0.65$.												The information contained on this log is not warranted to show the actual subsurface condition. The contractor agrees that he will make no claims against AECOM if he finds that the actual conditions do not conform to those indicated by this log.				
Soil description represents a field identification after D.M. Burmister unless otherwise noted.																
SAMPLE TYPE:		S= SPLIT SPOON		U=SHELBY TUBE		R=ROCK CORE										
PROPORTIONS:		TRACE=1-10%		LITTLE=10-20%		SOME=20-35%		AND=35-50%								

BORING CONTRACTOR: ADT	<h1>AECOM</h1>	SHEET 2 OF 3
DRILLER: Chris Chaillou		PROJECT NAME: CHPE -
SOILS ENGINEER: Chris French		PROJECT NO.: 60323056
		HOLE NO.: CU-2
BORING LOG		START DATE: 2/10/2021
LOCATION: Catskill, NY, MP - 0.33		FINISH DATE: 2/10/2021
		OFFSET: N/A

DEPTH	CORING RATE MIN/FT	DEPTHS FROM - TO (FEET)	TYPE AND NO.	PEN. in	REC. in	BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)				N Corr.	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS
21.0		20'-22'	S-8	24"	16"	3	3	8	8	7	SM	Silty SAND	SAA TR-3; (21.0'-21.5')
22.0													
23.0													
24.0													
25.0		25'-27'	S-9	24"	24"	WOH	2	6	7	5	ML	Clayey SILT	Brown clayey SILT; medium stiff, moist
26.0													
27.0													
28.0													
29.0													
30.0													
31.0		30'-32'	S-10	24"	12"	7	8	13	32	14	ML		Gray clayey SILT; stiff, moist
32.0													
33.0													
34.0													
35.0		35'-37'	S-11	24"	15"	20	29	30	28	38	SM/GM	Gravelly SAND	Gray fine-coarse SAND, little silt, little angular-subrounded gravel; dense, moist TR-4; (36.0'-36.5')
36.0													
37.0													
38.0													
39.0													
40.0													
41.0		40'-42'	S-12	6"	6"	131	-	-	-	-	SM/GM		Gray fine-coarse SAND, some angular gravel, little silt; very dense, moist (till) TR-5; (40.0'-40.5')
42.0													
43.0													
44.0													
45.0													

NOTES:

The information contained on this log is not warranted to show the actual subsurface condition. The contractor agrees that he will make no claims against AECOM if he finds that the actual conditions do not conform to those indicated by this log.

Soil description represents a field identification after D.M. Burmister unless otherwise noted.

SAMPLE TYPE:	S= SPLIT SPOON	U=SHELBY TUBE	R=ROCK CORE
PROPORTIONS:	TRACE=1-10%	LITTLE=10-20%	SOME=20-35% AND=35-50%

BORING CONTRACTOR: ADT	<h1 style="margin:0;">AECOM</h1>	SHEET 3 OF 3
DRILLER: Chris Chaillou		PROJECT NAME: CHPE -
SOILS ENGINEER: Chris French		PROJECT NO.: 60323056
BORING LOG		HOLE NO.: CU-2
LOCATION: Catskill, NY, MP - 0.33		START DATE: 2/10/2021
		FINISH DATE: 2/10/2021
		OFFSET: N/A

DEPTH	CORING RATE MIN/FT	DEPTHS FROM - TO (FEET)	TYPE AND NO.	PEN. in	REC. in	BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)			N Corr.	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS
46.0		45'-47'	S-13	5.5"	2"	110/5.5"	-	-	-	-	GM/SM	Gray GRAVEL and silty sand; very dense, moist Sandy GRAVEL
47.0												
48.0												
49.0												
50.0												
51.0		50'-50.1'	S-14	2"	0"	57/2"	-	-	-	-	-	Spoon refusal, no recovery - bedrock inferred @ 50.1' Gray sandstone, very fine grained, moderately jointed, unweathered, quartzite, sealed fracture at 54.7'. Fractures at 45"-50" TR-6; (51.2'-52.1') Interbedded shale at 51.9'-52.1', 52.8'-53.2' and 53.8'-54.5' Heavily jointed; interbedded shale at 57.3'-58.0' and 58.5'-59.2'
52.0	3.1	51'-55.9'	R-1	58"	54"	RQD: 32.5" = 56%						
53.0												
54.0												
55.0												
56.0												
57.0	4.1	55.9'-60.0'	R-2	50"	46"	RQD: 15.5" = 31%						
58.0												
59.0												
60.0												
61.0												CU-2 terminated at 60', grouted to surface
62.0												
63.0												
64.0												
65.0												
66.0												
67.0												
68.0												
69.0												
70.0												

NOTES:

Soil description represents a field identification after D.M. Burmister unless otherwise noted.

The information contained on this log is not warranted to show the actual subsurface condition. The contractor agrees that he will make no claims against DMJM Harris AECOM if he finds that the actual conditions do not conform to those indicated by this log.

SAMPLE TYPE:	S= SPLIT SPOON	U=SHELBY TUBE	R=ROCK CORE	
PROPORTIONS:	TRACE=1-10%	LITTLE=10-20%	SOME=20-35%	AND=35-50%

BORING CONTRACTOR: ADT		<h1>AECOM</h1>								SHEET 1 OF 3				
DRILLER: Francisco Martinez										PROJECT NAME: CHPE -				
SOILS ENGINEER/GEOLOGIST: Jillian Kosinski										PROJECT NO.: 60323056				
		BORING LOG								HOLE NO.: CU-2A				
LOCATION: Catskill, NY - Rt. 9 W and West Main St. Bypass MP - 0.53										START DATE: 2/3/21				
										FINISH DATE: 2/3/21				
										OFFSET: N/A				
GROUND WATER OBSERVATIONS				CASING		SAMPLER		DRILL BIT		CORE BARREL				
No water observed		TYPE		Flush Joint Steel		California Modified		Tricone Roller Bit		DRILL RIG: Geoprobe 7822DT				
		SIZE I.D.		4"		2.5"		--		BORING TYPE: SPT				
		SIZE O.D.		4.5"		3"		3 7/8"		BORING O.D.: 4.5"				
		HAMMER WT.		140 lbs		140 lbs				SURFACE ELEV.:				
		HAMMER FALL		30"		30"				LONGITUDE:				
										LATITUDE:				
D E P T H	CORING RATE MIN/FT	S A M P L E		PEN. in	REC. in	BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)				N Corr. ⁽²⁾	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS	
		DEPTHS FROM - TO (FEET)	TYPE AND NO.											
1.0		0'-5'				Hand Cleared						Asphalt	0.0'; Asphalt	
2.0											SM	Clayey SILT	0.5'; Brown clayey SILT, some fine sand, trace subangular gravel; moist, medium dense	
3.0														TR-1; (3.0'-4.5')
4.0		3'-4.5'	B-1											
5.0														
6.0		5'-7'	S-1	24"	9"	11	8	14	22	14	SM	Silty SAND	Brown medium-coarse SAND, some clayey silt, trace fine sand; moist, medium dense	
7.0														
8.0		7'-9'	S-2	24"	24"	24	19	20	32	13	SP		SAA, trace fine-coarse gravel (0.4"-2"); medium dense	
9.0												Gravelly SAND	TR-2; (8.0'-8.5')	
10.0		9'-11'	S-3	24"	18"	40	60	55	49	75	SP			Brown coarse SAND, fine-coarse gravel, some clayey silt, little fine-medium sand; wet, very dense
11.0														
12.0		11'-13'	S-4	24"	3"	12	8	3	3	7	SP		SAA, loose (recovery in sampler tip only)	
13.0												Silty CLAY		
14.0		13'-15'	S-5	24"	24"	4	4	4	4	5	CL			Gray silty CLAY, little fine-coarse sand, trace fine-medium gravel; moist, medium stiff
15.0														13.4'; Gray silty CLAY; moist, medium stiff
16.0		15'-17'	S-6	24"	24"	3	2	2	3	3	CL		TR-3; (14.0'-14.5')	
17.0													SAA; soft	
18.0														
19.0														
20.0														
NOTES: (1) Thick-wall ring lined drive sampler (California sampler) used for SPT samples. Rings dimensions = 2-1/2" O.D. by 2-7/16" I.D. by 6" length. (2) Correction factor: $N_{corr} = N \cdot (2.0^2 - 1.375^2) / (3.0^2 - 2.4^2)$ in. = $N \cdot 0.65$.											The information contained on this log is not warranted to show the actual subsurface condition. The contractor agrees that he will make no claims against AECOM if he finds that the actual conditions do not conform to those indicated by this log.			
Soil description represents a field identification after D.M. Burmister unless otherwise noted.														
SAMPLE TYPE:		S= SPLIT SPOON		U=SHELBY TUBE		R=ROCK CORE								
PROPORTIONS:		TRACE=1-10%		LITTLE=10-20%		SOME=20-35%		AND=35-50%						

BORING CONTRACTOR: ADT	<h1 style="margin: 0;">AECOM</h1>	SHEET 2 OF 3
DRILLER: Francisco Martinez		PROJECT NAME: CHPE -
SOILS ENGINEER: Jillian Kosinski		PROJECT NO.: 60323056 HOLE NO.: CU-2A START DATE: 2/3/21
BORING LOG		FINISH DATE: 2/3/21

LOCATION: Catskill, NY - Rt. 9 W and West Main St. Bypass MP - 0.53 OFFSET: N/A

DEPTH	CORING RATE MIN/FT	DEPTHS FROM - TO (FEET)	TYPE AND NO.	PEN. in	REC. in	BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)				N Corr.	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS
21.0		20'-22'	S-7	24"	0"	3	3	4	4	5	-		No recovery; same grey silty clay on sample barrel, may have fallen out, medium stiff
22.0													
23.0													
24.0													
25.0		25'-27'	S-8	24"	24"	4	3	3	3	4	CL		Gray silty CLAY; wet, soft
26.0													
27.0													
28.0													
29.0													
30.0		30'-32'	S-9	24"	24"	4	5	5	5	7	CL		SAA; medium stiff TR-4; (31.5'-32.0')
31.0													
32.0													
33.0													
34.0													
35.0		35'-37'	S-10	24"	24"	1	3	4	4	5	CL		SAA; medium stiff
36.0													
37.0													
38.0													
39.0													
40.0		40'-42'	S-11	24"	24"	WOH	3	3	3	4	CL		SAA; soft
41.0													
42.0													
43.0													
44.0													
45.0													

NOTES: The information contained on this log is not warranted to show the actual subsurface condition. The contractor agrees that he will make no claims against AECOM if he finds that the actual conditions do not conform to those indicated by this log.

Soil description represents a field identification after D.M. Burmister unless otherwise noted.

SAMPLE TYPE: S= SPLIT SPOON U=SHELBY TUBE R=ROCK CORE
 PROPORTIONS: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

BORING CONTRACTOR: ADT	<h1 style="margin: 0;">AECOM</h1>	SHEET 3 OF 3
DRILLER: Francisco Martinez		PROJECT NAME: CHPE -
SOILS ENGINEER: Jillian Kosinski		PROJECT NO.: 60323056 HOLE NO.: CU-2A
BORING LOG		START DATE: 2/3/21 FINISH DATE: 2/3/21

LOCATION: Catskill, NY - Rt. 9 W and West Main St. Bypass MP - 0.53 OFFSET: N/A

DEPTH	CORING RATE MIN/FT	DEPTHS FROM - TO (FEET)	TYPE AND NO.	PEN. in	REC. in	BLOWS PER 6 in ON SAMPLER (ROCK QUALITY DESIGNATION)				N Corr.	USCS CLASS.	STRAT. CHNG. DEPTH	FIELD IDENTIFICATION OF SOILS	
						3	6	6	7					
46.0		45'-47'	S-12	24"	24"	3	6	6	7	8	CL	Silty CLAY	Gray silty CLAY; medium stiff TR-5; (46.0'-46.5')	
47.0														
48.0														
49.0														
50.0														
51.0		50'-52'	S-13	24"	24"	3	4	6	8	7	CL	Silty CLAY	SAA; medium stiff	
52.0														
53.0														
54.0														
55.0														
56.0		55'-57'	S-14	24"	24"	WOH	4	7	13	7	CL	Sandy Silty CLAY (till)	SAA	
57.0											SM/GM		56.5'; Gray silty CLAY, little coarse sand, little subangular fine-medium gravel (3/8"-0.75"), moist, medium stiff	
58.0														
59.0														
60.0														
61.0		58'-60'	S-15	24"	15"	25	25	24	28	32	SM/GM	Sandy Silty CLAY (till)	Gray CLAY and silt, some fine-coarse sand, little subrounded fine-coarse gravel, dense, slightly moist TR-6; (59.5'-60.0')	
62.0														
63.0														
64.0														
65.0														
66.0														
67.0														
68.0														
69.0														
70.0														
61.0													Boring terminated at 60' bgs, grouted to surface	
62.0														
63.0														
64.0														
65.0														
66.0														
67.0														
68.0														
69.0														
70.0														

NOTES: The information contained on this log is not warranted to show the actual subsurface condition. The contractor agrees that he will make no claims against DMJM Harris AECOM if he finds that the actual conditions do not conform to those indicated by this log.

Soil description represents a field identification after D.M. Burmister unless otherwise noted.

SAMPLE TYPE: S= SPLIT SPOON U=SHELBY TUBE R=ROCK CORE
 PROPORTIONS: TRACE=1-10% LITTLE=10-20% SOME=20-35% AND=35-50%

ROCK CORE PHOTOGRAPHIC LOG

AECOM Project No: **60323056**
 Project Name: **CHPE – Upstate New York Upland Geotechnical Investigation**
 Location: **Catskill - Upland Segment**



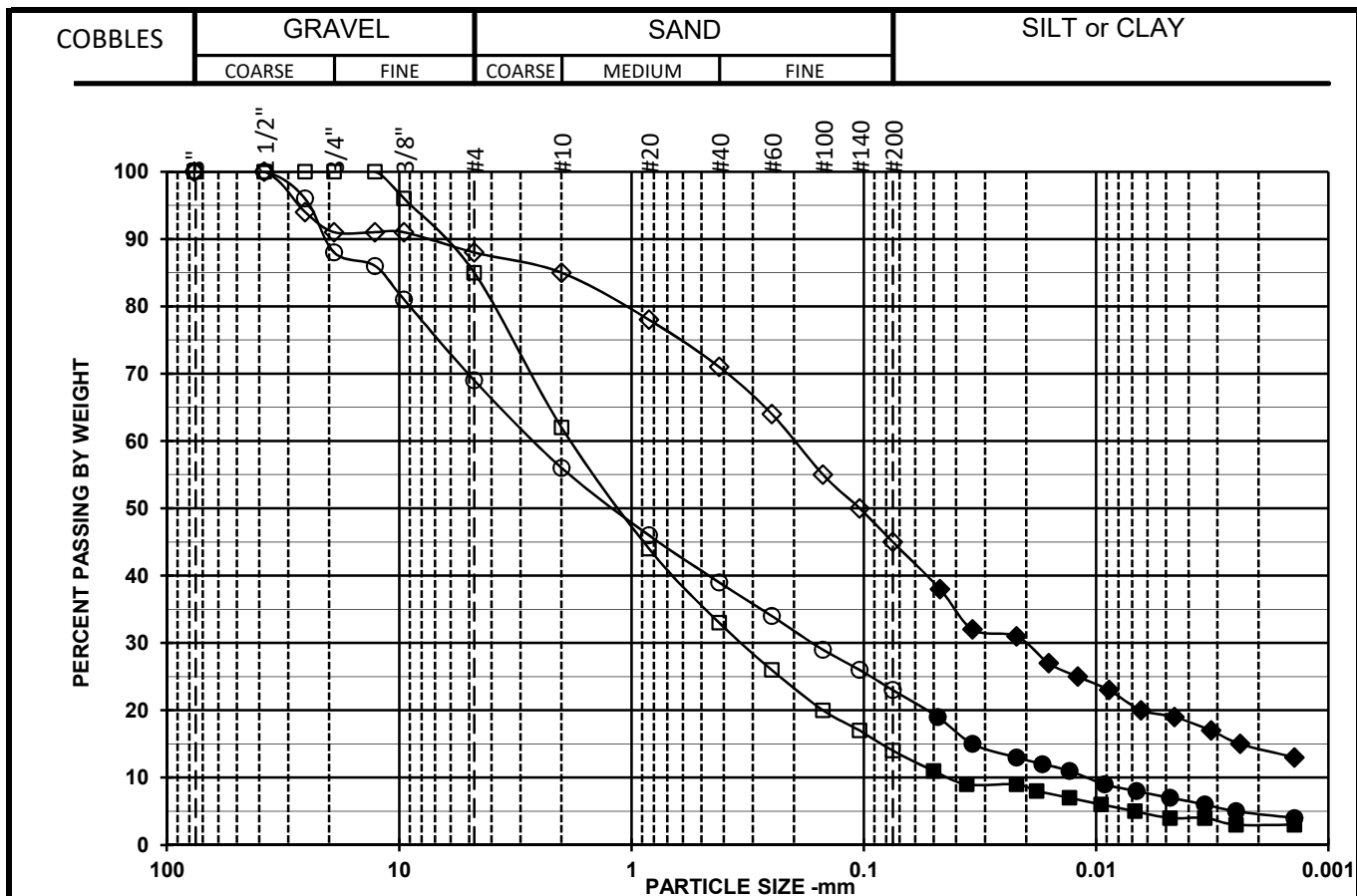
Boring No.	Depth (ft.)	Image
CU-1	20.0-40.0	
CU-2	51.0-60.0	<p>CHPE Greene Co. Borings CU-2 51.0' - 60.0' 2/10/21 60323056-AECOM Box 1 of 1</p> <p>51.0' R-1 51.0' - 55.9' Rec = $\frac{54''}{58''} = 93\%$ RQD = $\frac{32.5''}{58''} = 56\%$</p> <p>55.9' R-2 55.9' - 60.0' Rec = $\frac{46''}{50''} = 92\%$ RQD = $\frac{15.5''}{50''} = 31\%$</p> <p style="color: red;">Note</p>

Note: Black foam inserts represent core pieces that were removed for geotechnical and/or thermal resistivity laboratory testing

Aquifer
CHPE - Catskill Upland Borings
LABORATORY SOIL TESTING DATA SUMMARY

BORING NO.	SAMPLE NO.	DEPTH (ft)	IDENTIFICATION TESTS							REMARKS
			WATER CONTENT (%)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	USCS SYMB. (1)	SIEVE MINUS NO. 200 (%)	HYDROMETER % MINUS 2 μm (%)	
CU-1	S-3	7-9	7.5				SM	33	9	
CU-1	S-6	13-15	9.0				SM	16	4	
CU-2	S-2	5-7	22.1				SM	14	3	
CU-2	S-6	13-15	20.6	34	20	14	SC	45	14	
CU-2	S-11	35-37	7.0				SM	23	5	
CU-2A	S-6	15-17	59.4	53	23	30	CH	99	87	
CU-2A	S-9	30-32	35.4	37	20	17	CL	99.6	46	
CU-2A	S-14	55-57	25.1	28	17	11	CL	85	28	
CU-4	S-2	5-7	28.9	60	26	34	CH	95.7	77	
CU-4	S-4	9-11	33.0				GC	31	22	
CU-5A	S-4	9-11	33.7	64	25	39	CH	99	90	
CU-5A	S-8	20-22	29.8	59	25	34	CH	99.4	58	
CU-5A	S-11	35-37	37.8	48	23	25	CL	100	68	
CU-6	S-2	5-5.5	9.4				SM	20	7	
CU-6	S-5	11-13	9.8				SM	15	4	

Note: (1) USCS symbol based on visual observation and Sieve and Atterberg limits reported.



Open Symbols: Sieve analysis by ASTM D6913
 Filled symbols: Hydrometer analysis by ASTM D7928 corrected for complete sample

Symbol	□	◇	○
Boring	CU-2	CU-2	CU-2
Sample	S-2	S-6	S-11
Depth	5-7	13-15	35-37
% +3"	0	0	0
% Gravel	15	12	31
% SAND	71	43	46
%C SAND	23	3	13
%M SAND	29	14	17
%F SAND	19	26	16
% FINES	14	45	23
D ₁₀₀ (mm)	19.1	38.1	38.1
D ₆₀ (mm)	1.82	0.199	2.61
D ₃₀ (mm)	0.34	0.02	0.17
D ₁₀ (mm)	0.042		0.011
Cc	1.5		1
Cu	43.3		237.3

Sieve	Percent Finer Data		
Size/ID #	□	◇	○
6"	100	100	100
4"	100	100	100
3"	100	100	100
1 1/2"	100	100	100
1"	100	94	96
3/4"	100	91	88
1/2"	100	91	86
3/8"	96	91	81
#4	85	88	69
#10	62	85	56
#20	44	78	46
#40	33	71	39
#60	26	64	34
#100	20	55	29
#140	17	50	26
#200	14	45	23
5μ m	4	19	7
2μ m	3	14	5
1μ m	3	12	3

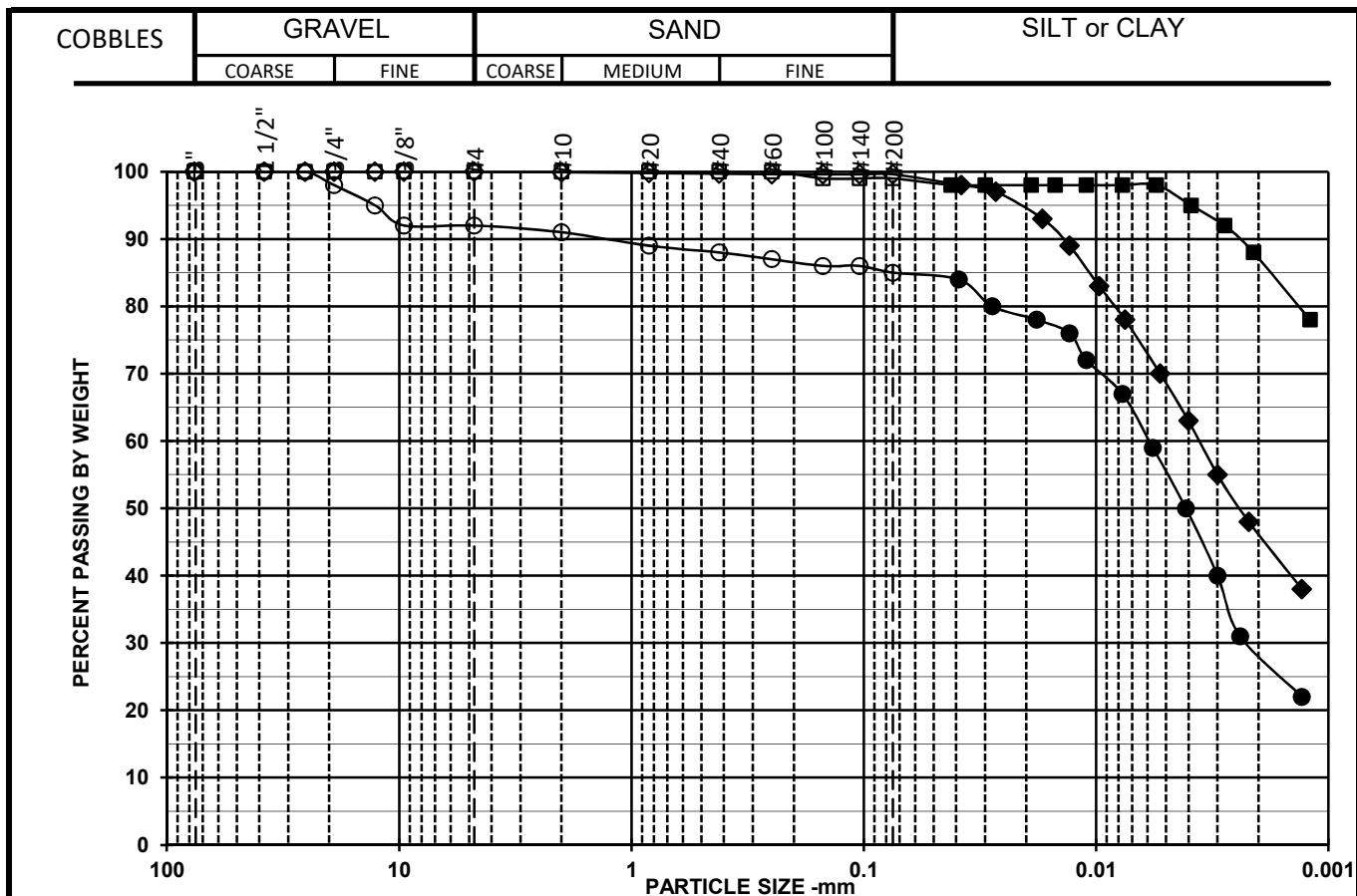
SYMBOL	w (%)	LL	PL	PI	USCS	AASHTO	USCS DESCRIPTION AND REMARKS	DATE
□	22.1				SM		Gray, Silty sand with gravel	04/29/21
◇	20.6	34	20	14	SC		Gray, Clayey sand, Insufficient sample size	04/29/21
○	7.0				SM		Gray, Silty sand with gravel, Insufficient sample size	04/29/21

Aquifer

CHPE - Catskill Upland Borings

TerraSense, LLC #7853-21007

PARTICLE SIZE DISTRIBUTION
ASTM D6913 & ASTM D7928



Open Symbols: Sieve analysis by ASTM D6913
 Filled symbols: Hydrometer analysis by ASTM D7928 corrected for complete sample

Symbol	□	◇	○
Boring	CU-2A	CU-2A	CU-2A
Sample	S-6	S-9	S-14
Depth	15-17	30-32	55-57
% +3"	0	0	0
% Gravel	0	0	8
% SAND	1	0.4	7
%C SAND	0	0.1	1
%M SAND	0	0.2	3
%F SAND	1	0.1	3
% FINES	99	99.6	85
D ₁₀₀ (mm)	2	4.75	25.4
D ₆₀ (mm)		0.004	0.006
D ₃₀ (mm)			0.002
Cc			
Cu			

Sieve	Percent Finer Data		
Size/ID #	□	◇	○
6"	100	100.0	100
4"	100	100.0	100
3"	100	100.0	100
1 1/2"	100	100.0	100
1"	100	100.0	100
3/4"	100	100.0	98
1/2"	100	100.0	95
3/8"	100	100.0	92
#4	100	100.0	92
#10	100	99.9	91
#20	100	99.8	89
#40	100	99.7	88
#60	100	99.6	87
#100	99	99.6	86
#140	99	99.6	86
#200	99	99.6	85
5µ m	97	69	55
2µ m	87	46	28
1µ m	75	33	18

SYMBOL	w (%)	LL	PL	PI	USCS	AASHTO	USCS DESCRIPTION AND REMARKS	DATE
□	59.4	53	23	30	CH		Gray, Fat clay	05/03/21
◇	35.4	37	20	17	CL		Gray, Lean clay	05/03/21
○	25.1	28	17	11	CL		Gray, Lean clay with gravel, Insufficient sample size	05/03/21

Aquifer

CHPE - Catskill Upland Borings

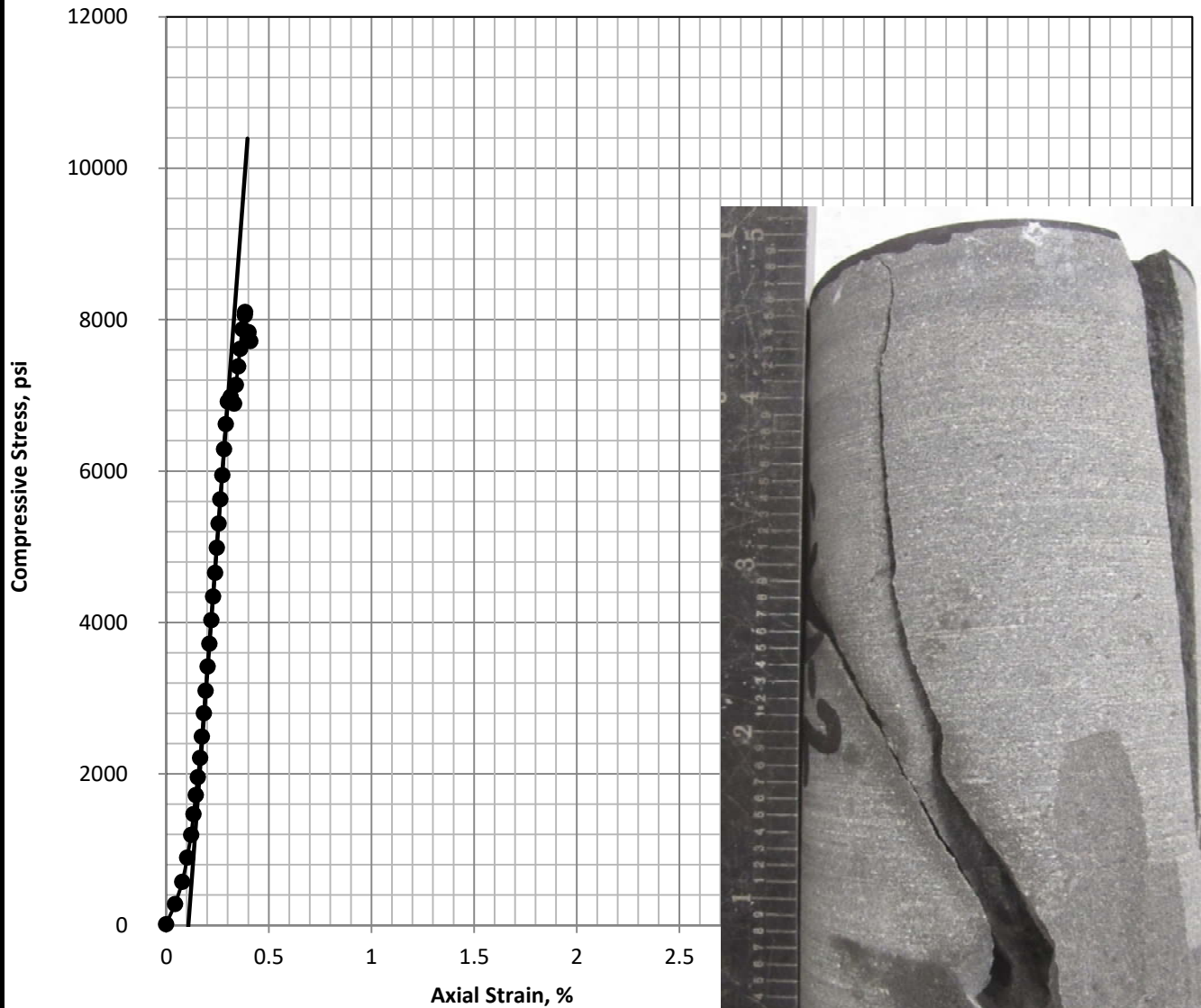
TerraSense, LLC #7853-21007

PARTICLE SIZE DISTRIBUTION
ASTM D6913 & ASTM D7928

Aquifer
CHPE - Catskill Upland Borings
SUMMARY OF ROCK TESTING

SAMPLE IDENTIFICATION			STATE PROPERTIES			ENGINEERING PROPERTY TESTS					REMARKS
Boring	Run	Depth	WATER CONTENT (1) (%)	TOTAL UNIT WGT. (pcf)	DRY UNIT WGT. (pcf)	TEST TYPE (2)	Mohs HARDNESS (-)	UNCONFINED COMPRESSION TESTS (ASTM D7012)			
								COMPRESSIVE STRENGTH (psi)	AXIAL STRAIN @ FAILURE (%)	ESTIMATED (5) ELASTIC MODULUS (psi)	
CU-1	R-1	20.5-20.9				M	4				
CU-1	R-1	20.95-21.35	0.4	169	168	UC		21660	0.41	6E+06	
CU-1	R-3	32.4-32.6				M	3				
CU-1	R-3	32.7-33.1	0.6	169	168	UC		11100	0.30	4E+06	
CU-2	R-1	53				M	7				
CU-2	R-1	53.7-54.1	0.5	169	168	UC		8100	0.28	4E+06	
CU-6	R-1	13.6-13.9				M	5				
CU-6	R-1	13.1-13.5	0.3	169	168	UC		20750	0.36	6E+06	

- (2) Test Type Abbreviations: M: Mohs Hardness, UC: UC Compression test with estimated elastic moduli
- (3) Diametral orientation across core along bedding/foliation plane, axial perpendicular to bedding/foliation plane, as applicable.
- (4) Compressive Strength determined using generalized "K" factor in ASTM D5731
- (5) Modulus estimated based on corrected gross deformations.



Specimen Information

Water Content (%)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)	Length (inch)	Diameter (inch)
0.46	169	168	4.489	1.967

Specimen meets ASTM D4543 shape tolerances

Test Summary

Strain Rate (%/min)	Corrected Strain to Peak (%)	q _u (psi)	Estimated (shown) Elastic Modulus (psi)
0.11	0.28	8100	4E+06

FAILURE PHOTO

Test by: DM
 Test Date: Apr-07-21
 Reviewed by: GET

Aquifer	CHPE - Catskill Upland Borings	COMPRESSIVE STRESS VS STRAIN UNCONFINED COMPRESSIVE STRENGTH TEST
TerraSense, LLC Project # 7853-21007		Boring: CU-2 Run: R-1 Depth 53.7-54.1 ft.



TEST BORING LOG

BORING **B221.14-1**

G.S. ELEV. N/A

FILE 195651

SHEET 1 OF 1

PROJECT: TDI CHAMPLAIN HUDSON POWER EXPRESS

LOCATION: CSX RAILROAD ROW, NY

GROUNDWATER DATA			
FIRST ENCOUNTERED NR			
DEPTH	HOUR	DATE	ELAPSED TIME
DRY	NR	11/26	0 HR

METHOD OF ADVANCING BOREHOLE			
a	FROM	TO	
	0.0'	10.0'	
d	FROM	TO	
	10.0'	25.0'	

DRILLER	R.CARUSO
HELPER	C. SMART
INSPECTOR	C. POPPE
DATE STARTED	11/26/2012
DATE COMPLETED	11/26/2012

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS		
	S-1	5 4 4 3		BLACK M/C SAND, TR TO SM SILT, TR TO SM F/ GRAVEL-SIZED ROCK FRAGMENTS (FILL)	21.3			
	S-2	3 2 2 2		4.0	BROWN F/ GRAVELLY M/C SAND, TR SILT (FILL)		6.3	
5	S-3	3 3 3 3		6.0				
	S-4	4 5 4 1			DARK BROWN C/M/F SANDY F/C GRAVEL, TR SILT (FILL)		6.4	
10	S-5	4 5 5 6						13.5
	S-6	29 9 8						17.9
15					GRAY F/C GRAVEL-SIZED ROCK FRAGMENTS, SM M/C SAND, TR SILT (PROBABLE FILL)		14.7	
	S-7	10 7 7			18.5			
20				GRAY SILT, TR TO SM CLAY, TR TO SM F/ SAND, TR TO SM F/ GRAVEL	14.7			
25	S-8	7 20 12		25.0				
				END OF BORING AT 25'				
30								
35								

NEW PROJECTS TEST BORING LOG 195651_TDI_CSX.GPJ SITE BLAUVELT.GDT 3/12/13

DRN.	TBT
CKD.	PWK



TEST BORING LOG

BORING **B221.2-1**

G.S. ELEV. N/A

FILE 195651

SHEET 1 OF 1

PROJECT: TDI CHAMPLAIN HUDSON POWER EXPRESS

LOCATION: CSX RAILROAD ROW, NY

GROUNDWATER DATA			
FIRST ENCOUNTERED DRY			
DEPTH	HOUR	DATE	ELAPSED TIME

METHOD OF ADVANCING BOREHOLE			
d	FROM	TO	
	0.0'	2.2'	
c ₂	FROM	TO	
	2.2'	11.2'	

DRILLER	P. PLANTIER
HELPER	M. NAGEY
INSPECTOR	C. POPPE
DATE STARTED	02/15/2013
DATE COMPLETED	02/15/2013

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS
				GRAY GRAVEL-SIZED ROCK FRAGMENTS (FILL)		
	S-1	2 4 4 3	2.2			
	S-2	50/0.2				
5	R-1	REC =100% RQD =0%		GRAY, MODERATELY WEATHERED, MEDIUM TO MODERATELY HARD SHALE, VERY CLOSE TO CLOSE 0 TO 45 DEGREE FRACTURES		
	R-2	REC =100% RQD =50%				
10	R-3	REC =92% RQD =62%	11.2			
				END OF BORING AT 11.2'		
15						
20						
25						
30						
35						

NEWPROJECTS TEST BORING LOG 195651_TDI_CSX.GPJ SITE BLAUVELT.GDT 3/12/13

DRN.	JPB
CKD.	PWK



TEST BORING LOG

BORING **B221.4-1**

G.S. ELEV. N/A

FILE 195651

SHEET 1 OF 1

PROJECT: TDI CHAMPLAIN HUDSON POWER EXPRESS

LOCATION: CSX RAILROAD ROW, NY

GROUNDWATER DATA			
FIRST ENCOUNTERED NR			
DEPTH	HOUR	DATE	ELAPSED TIME
3.0'	15:45	11/26	0 HR

METHOD OF ADVANCING BOREHOLE			
a	FROM	TO	TO
d	FROM 0.0'	TO 10.0'	
c2	FROM 10.0'	TO 13.9'	
	FROM 13.9'	TO 24.7'	

DRILLER	R. CARUSO
HELPER	C. SMART
INSPECTOR	C. POPPE
DATE STARTED	11/26/2012
DATE COMPLETED	11/26/2012

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS	
	S-1	3 4 5 9			27.0		
5	S-2	12 5 5 5		BROWN SILT, SM F/ GRAVEL-SIZED ROCK FRAGMENTS, TR TO SM F/ SAND			
	S-3	4 7 6 5					
	S-4	4 5 8 19	8.0			10.0	
10	S-5	20 34 37 50/0.0			BROWN SILTY F/M/C SAND, SM F/ GRAVEL		
	S-6	50/0.1	13.6				
15	R-1	REC =73% RQD =45%	14.7	GRAY, SLIGHTLY TO MODERATELY WEATHERED, HARD, GRAYWACKE, CLOSE TO VERY CLOSE 0 TO 45 DEGREE FRACTURES			
				GRAY, SLIGHTLY WEATHERED, HARD, GRAYWACKE, CLOSE, 0 TO 45 DEGREE FRACTURES			
20	R-2	REC =100% RQD =94%	19.7	GRAY, SLIGHTLY TO VERY SLIGHTLY WEATHERED, HARD, GRAYWACKE, WIDE FRACTURES			
25	R-3	REC =100% RQD =100%	24.7	END OF BORING AT 24.7'			
30							
35							

NEWPROJECTS TEST BORING LOG 195651_TDI_CSX.GPJ SITE BLAUVELT.GDT 3/12/13

DRN.	TBT
CKD.	PWK



TEST BORING LOG

BORING **B221.5-1**

G.S. ELEV. N/A

FILE 195651

SHEET 1 OF 2

PROJECT: TDI CHAMPLAIN HUDSON POWER EXPRESS

LOCATION: CSX RAILROAD ROW, NY

GROUNDWATER DATA			
FIRST ENCOUNTERED NR			
DEPTH	HOUR	DATE	ELAPSED TIME
39.2'	0	12/16	0 HR

METHOD OF ADVANCING BOREHOLE			
a	FROM	TO	10.0'
d	FROM	TO	50.0'

DRILLER	R. CARUSO
HELPER	C. SMART
INSPECTOR	N/A
DATE STARTED	12/15/2012
DATE COMPLETED	12/16/2012

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS
				BLACK F/ GRAVELLY M/F/C SAND, SM SILT (FILL)	12.8	
	S-1	6 6 7 4	2.0			
				BROWN SILT, SM F/M/C SAND (FILL)		
	S-2	5 4 4 4	4.0			
5				BROWN CLAY, TR SILT, TR F/ SAND	21.9	
	S-3	4 6 8 5				
	S-4	4 5 8 7				
10	S-5	8 12 17 13			34.3	
			13.5			
15	S-6	2 2 4		BROWN SILT, TR CLAY	36.9	
			18.5			
20	S-7	3 3 3		GRAY SILT, TR TO SM CLAY		
			23.5			
25	S-8	3 3 3		GRAY CLAY, TR SILT, TR M/F SAND	47.1	
30	S-9	WOH 2				
					38.2	
35	S-10	WOH				

NEW PROJECTS TEST BORING LOG 195651_TDI_CSX.GPJ SITE BLAUVELT.GDT 3/12/13

DRN.	TBT
CKD.	PWK



TEST BORING LOG

BORING **B221.5-1**

G.S. ELEV. N/A

FILE 195651

SHEET 2 OF 2

PROJECT: TDI CHAMPLAIN HUDSON POWER EXPRESS

LOCATION: CSX RAILROAD ROW, NY

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS
40	S-11	2 1 2		GRAY CLAY, TR SILT, TR M/F SAND	44.7	
45	S-12	WOH 1 2			34.3	
50	S-13	1 1 1	50.0		42.8	END OF BORING AT 50'
55						
60						
65						
70						
75						

NEW PROJECTS TEST BORING LOG -195651_TDI_CSX.GPJ SITE BLAUVELT.GDT 3/12/13



SUMMARY OF LABORATORY TEST DATA

Project Name: TDI Champlain Hudson Power Express – CSX
 Client Name: Transmission Developers, Inc.
 TRC Project #: 195651

SAMPLE IDENTIFICATION			Soil Group (USCS System)	GRAIN SIZE DISTRIBUTION				PLASTICITY				Specific Gravity	Moisture Content (%)	Unit Weight (pcf)	Compressive Strength (tsf)	Organic Content (%)
Boring #	Sample #	Depth (ft)		Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index					
	S-5	8.0-10.0	-	-	-	-	-	-	-	-	-	20.7	88.6	-	-	
	S-6	13.5-15.0	-	-	-	-	-	-	-	-	-	18.2	-	-	-	
	S-7	18.5-20.0	-	-	-	-	-	-	-	-	-	21.4	-	-	-	
B221.0-1	S-1	0.0-2.0	-	-	-	-	-	-	-	-	-	7.6	-	-	-	
	S-3	4.0-6.0	GW	77.0	17.5	5.5							4.2			
	S-4	6.0-8.0														
	S-5	8.0-10.0														
B221.14-1	S-1	0.0-2.0	-	-	-	-	-	-	-	-	-	21.3	-	-	-	
	S-3	4.0-6.0	-	-	-	-	-	-	-	-	-	6.3	-	-	-	
	S-4	6.0-8.0	GW-GM	58.7	31.3	10.0							6.4			
	S-5	8.0-10.0														



SUMMARY OF LABORATORY TEST DATA

Project Name: TDI Champlain Hudson Power Express – CSX
 Client Name: Transmission Developers, Inc.
 TRC Project #: 195651

SAMPLE IDENTIFICATION			Soil Group (USCS System)	GRAIN SIZE DISTRIBUTION				PLASTICITY				Specific Gravity	Moisture Content (%)	Unit Weight (pcf)	Compressive Strength (tsf)	Organic Content (%)
Boring #	Sample #	Depth (ft)		Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index					
	S-6	13.5-15.0	-	-	-	-	-	-	-	-	-	-	17.9	-	-	-
	S-8	23.5-25.0	-	-	-	-	-	-	-	-	-	-	14.7	-	-	-
B221.2-1	R-2	4.4-4.0	-	-	-	-	-	-	-	-	-	-	-	169.8	-	-
	R-3	9.0-9.8	-	-	-	-	-	-	-	-	-	-	-	169.2	412	-
B221.4-1	S-1	0.0-2.0	-	-	-	-	-	-	-	-	-	-	27.0	-	-	12.7
	S-4	6.0-8.0	-	-	-	-	-	-	-	-	-	-	10.0	-	-	-
	R-2	14.7-15.3	-	-	-	-	-	-	-	-	-	-	-	168.1	475	-
	R-3	19.7-20.4	-	-	-	-	-	-	-	-	-	-	-	167.7	680	-
B221.5-1	S-1	0.0-2.0	SM	35.6	45.4	19.0		-	-	-	-	-	12.8	-	-	-
	S-3	4.0-6.0	-	-	-	-	-	-	-	-	-	-	21.9	-	-	-
	S-4	6.0-8.0	CH	0.0	2.5	8.6	88.9	55	29	26	0.2	2.87	34.3	-	-	-

TRC Engineers, Inc.
Soil Mechanics Laboratory

Unconfined Compression Strength Test of Rock Core

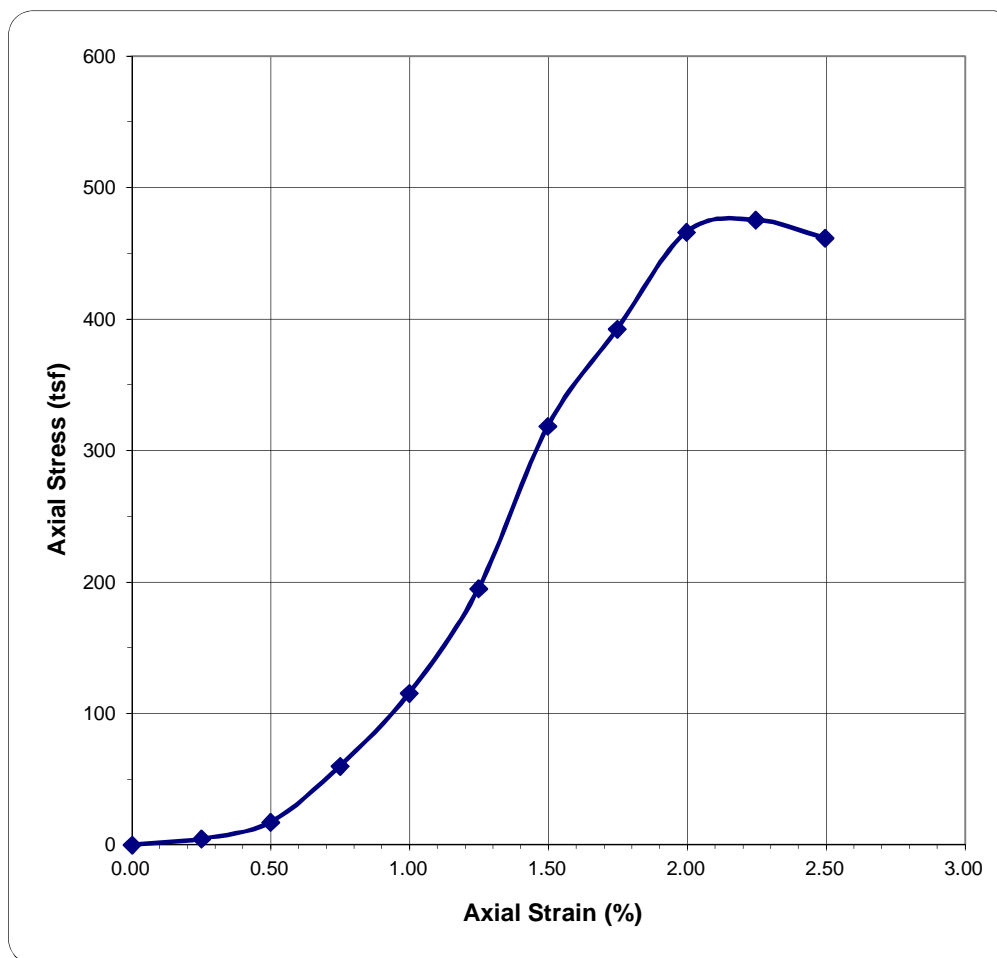
Project Name: TDI
Project No.: 195651
Boring No.: B221.4-1
Sample No.: R-2
Depth (ft): 14.7-15.3
Elevation (ft):

Average Sample Diameter (in.): 1.993
Cross Sectional Area (sq. in.): 3.120
Average Sample Height (in.): 4.008
Sample Mass-Dry (g): 551.73
Unit Weight (PCF): 168.1

Sample Description: _____
 GRAY GRAYWACKE

Test Data

Strain Dial (in.)	Load (lb)	Strain (%)	Stress (tsf)
0.000	0	0.00	0
0.010	200	0.25	5
0.020	750	0.50	17
0.030	2600	0.75	60
0.040	5000	1.00	115
0.050	8450	1.25	195
0.060	13800	1.50	318
0.070	17000	1.75	392
0.080	20200	2.00	466
0.090	20600	2.25	475
0.100	20000	2.50	462



Failure Conditions:

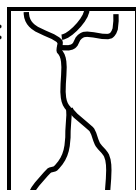


FIGURE: 155

TRC Engineers, Inc.
Soil Mechanics Laboratory

Unconfined Compression Strength Test of Rock Core

Project Name: TDI
Project No.: 195651
Boring No.: B221.4-1
Sample No.: R-3
Depth (ft): 19.7-20.4
Elevation (ft):

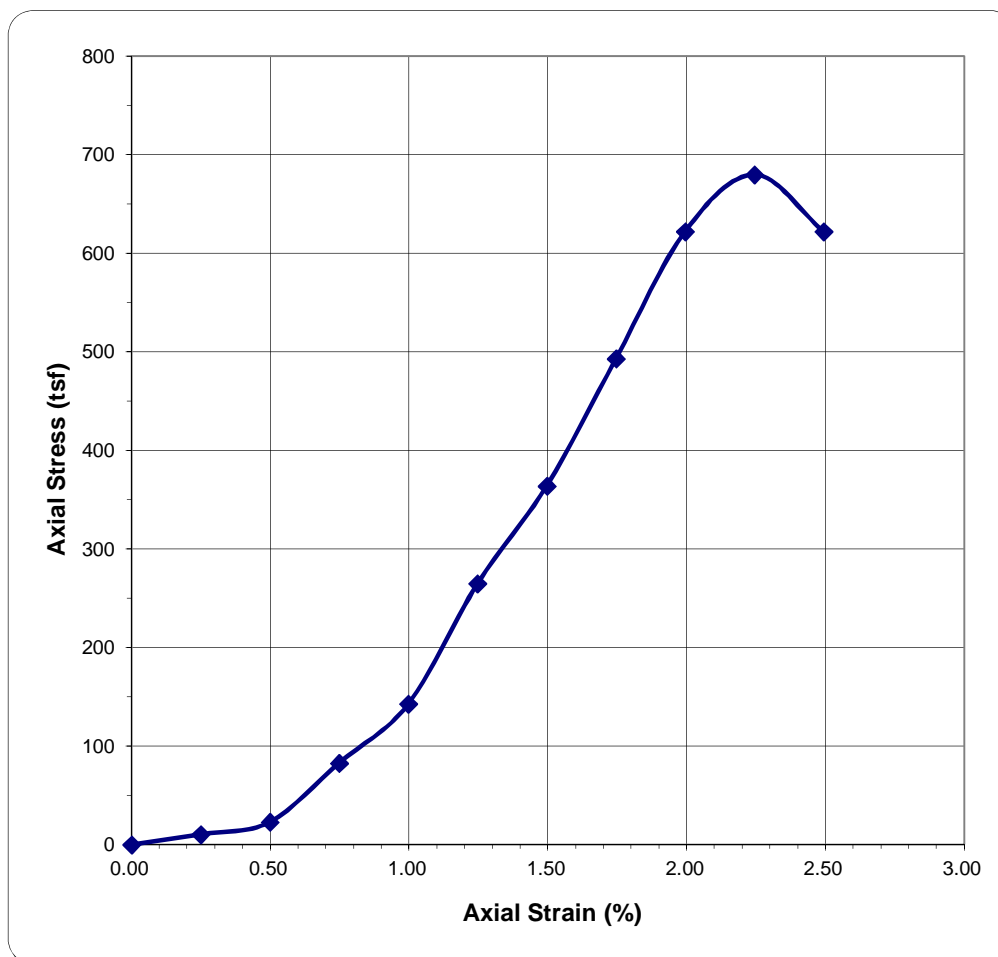
Average Sample Diameter (in.): 1.995
Cross Sectional Area (sq. in.): 3.126
Average Sample Height (in.): 4.010
Sample Mass-Dry (g): 551.69
Unit Weight (PCF) 167.7

Sample Description: _____

 GRAY GRAYWACKE

Test Data

Strain Dial (in.)	Load (lb)	Strain (%)	Stress (tsf)
0.000	0	0.00	0
0.010	450	0.25	10
0.020	1000	0.50	23
0.030	3600	0.75	83
0.040	6200	1.00	143
0.050	11500	1.25	265
0.060	15800	1.50	364
0.070	21400	1.75	493
0.080	27000	2.00	622
0.090	29500	2.24	679
0.100	27000	2.49	622



Failure Conditions:

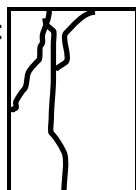


FIGURE: 156

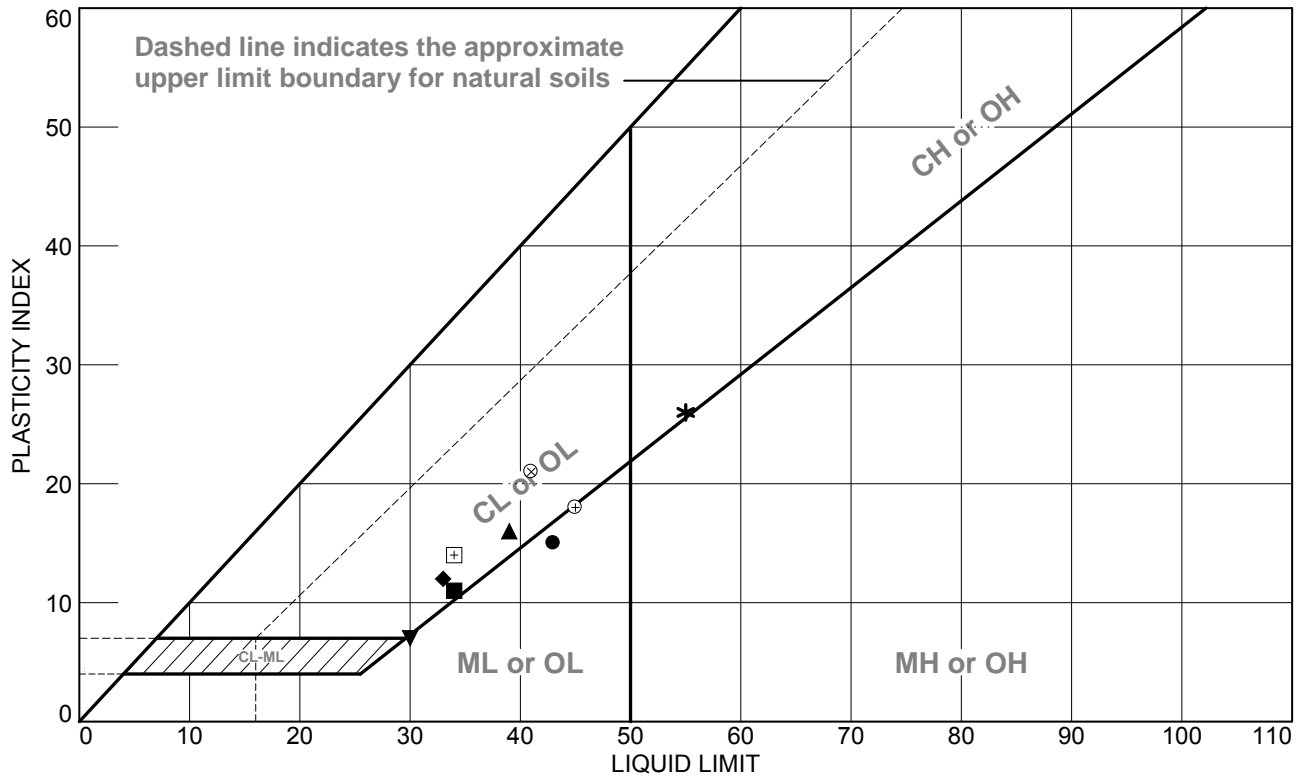


SUMMARY OF LABORATORY TEST DATA

Project Name: TDI Champlain Hudson Power Express – CSX
 Client Name: Transmission Developers, Inc.
 TRC Project #: 195651

SAMPLE IDENTIFICATION			Soil Group (USCS System)	GRAIN SIZE DISTRIBUTION				PLASTICITY				Specific Gravity	Moisture Content (%)	Unit Weight (pcf)	Compressive Strength (tsf)	Organic Content (%)
Boring #	Sample #	Depth (ft)		Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index					
	S-6	13.5-15.0	-	-	-	-	-	-	-	-	-	-	17.9	-	-	-
	S-8	23.5-25.0	-	-	-	-	-	-	-	-	-	-	14.7	-	-	-
B221.2-1	R-2	4.4-4.0	-	-	-	-	-	-	-	-	-	-	-	169.8	-	-
	R-3	9.0-9.8	-	-	-	-	-	-	-	-	-	-	-	169.2	412	-
B221.4-1	S-1	0.0-2.0	-	-	-	-	-	-	-	-	-	-	27.0	-	-	12.7
	S-4	6.0-8.0	-	-	-	-	-	-	-	-	-	-	10.0	-	-	-
	R-2	14.7-15.3	-	-	-	-	-	-	-	-	-	-	-	168.1	475	-
	R-3	19.7-20.4	-	-	-	-	-	-	-	-	-	-	-	167.7	680	-
B221.5-1	S-1	0.0-2.0	SM	35.6	45.4	19.0		-	-	-	-	-	12.8	-	-	-
	S-3	4.0-6.0	-	-	-	-	-	-	-	-	-	-	21.9	-	-	-
	S-4	6.0-8.0	CH	0.0	2.5	8.6	88.9	55	29	26	0.2	2.87	34.3	-	-	-

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	A219.05-1	S-6	13.5-15.0 FT	36.0	28	43	15	ML
■	B219.5-1	S-7	18.5-20.0 FT	28.3	23	34	11	CL
▲	B220.3-1	S-6	13.5-15.0 FT	34.8	23	39	16	CL
◆	B220.3-1	S-7 & S-8	18.5-25.0 FT	26.9	21	33	12	CL
▼	B220.7-1	S-4 & S-5	6.0-10.0 FT	15.4	23	30	7	ML
*	B221.5-1	S-4 & S-5	6.0-10.0 FT	34.3	29	55	26	CH
⊕	B221.5-1	S-9	28.5-30.0 FT	38.2	27	45	18	CL/ML
⊕	B221.6-1	S-3, S-4, & S-5	4.0-10.0 FT	38.8	20	34	14	CL
⊗	B221.8-1	S-5	8.0-10.0 FT	40.2	20	41	21	CL

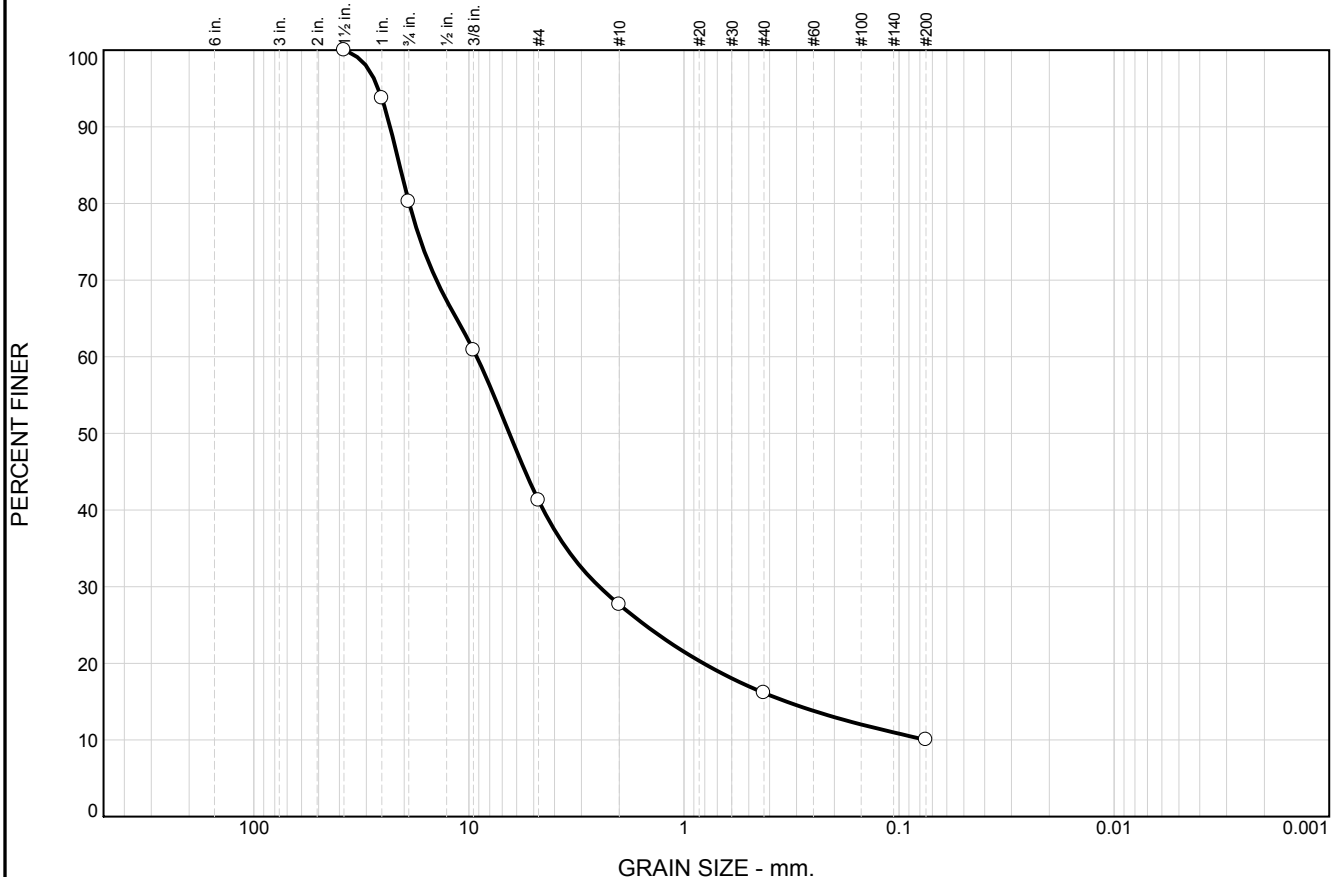
**TRC
Engineers, Inc.
Mt. Laurel, NJ**

Client: TRANSMISSION DEVELOPERS INC.
Project: TDI CHAMPLAIN HUDSON POWER EXPRESS - CSX

Project No.: 195651

Figure 8

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	19.8	38.9	13.6	11.6	6.1	10.0	

LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
		21.0085	9.1993	6.4842	2.4759	0.3338			

Material Description	USCS	AASHTO
○ DARK BROWN C/M/F SANDY F/C GRAVEL, TR SILT	GW-GM	

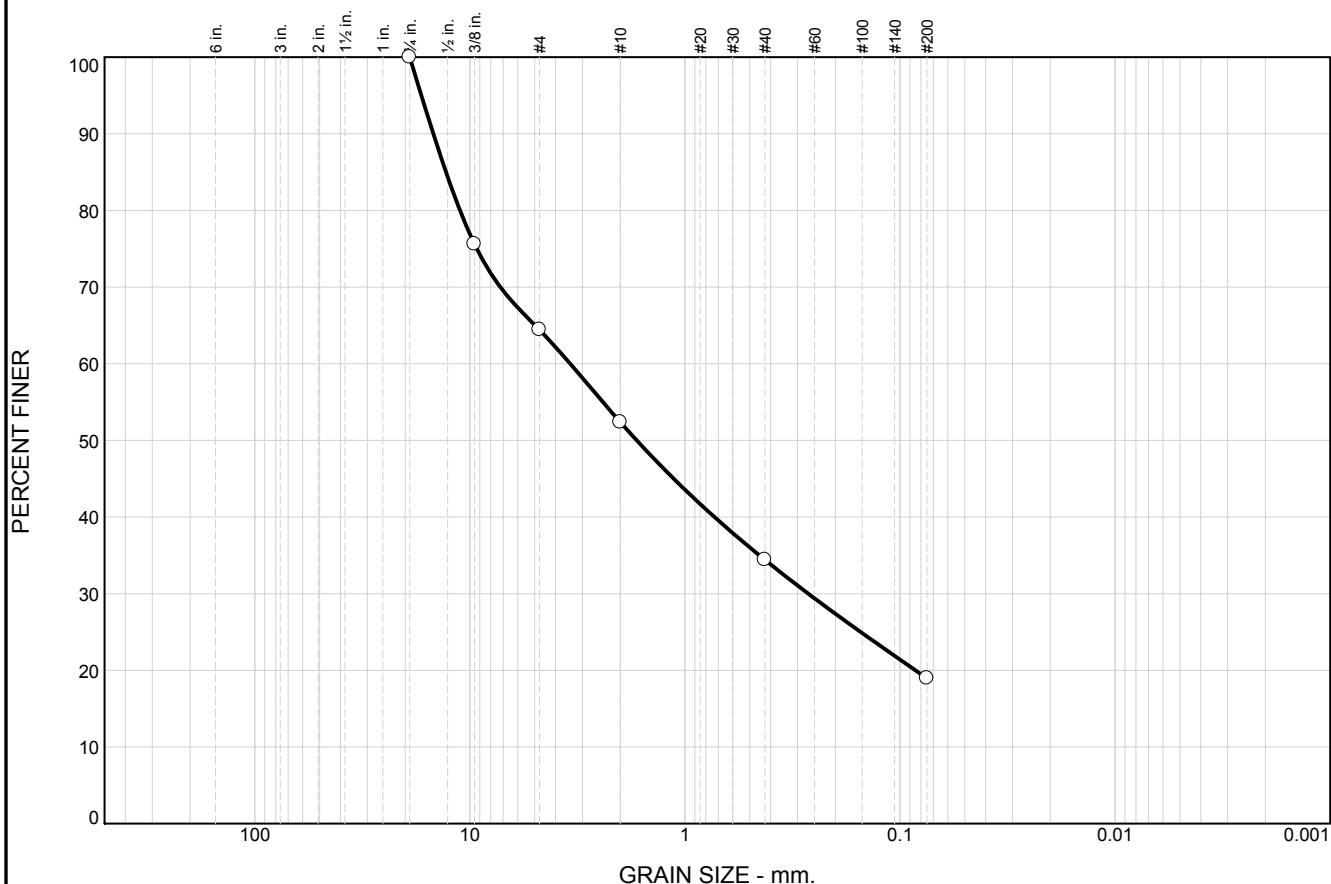
Project No. 195651 Client: TRANSMISSION DEVELOPERS INC. Project: TDI CHAMPLAIN HUDSON POWER EXPRESS - CSX ○ Sample Source: B221.14-1 Depth: 6.0-10.0 FT Sample No.: S-4 & S-5	Remarks: ○ SAMPLE DESCRIPTION BASED ON VISUAL IDENTIFICATION AND LABORATORY ANALYSIS
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TRC Engineers, Inc.
Mt. Laurel, NJ

Figure 124

Tested By: TBT 01/10/13 **Checked By:** JPB 03/12/13

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
<input type="radio"/>	0.0	0.0	35.6	12.0	18.0	15.4	19.0	

<input checked="" type="checkbox"/>	LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
<input type="radio"/>			12.9160	3.4157	1.6771	0.2672				

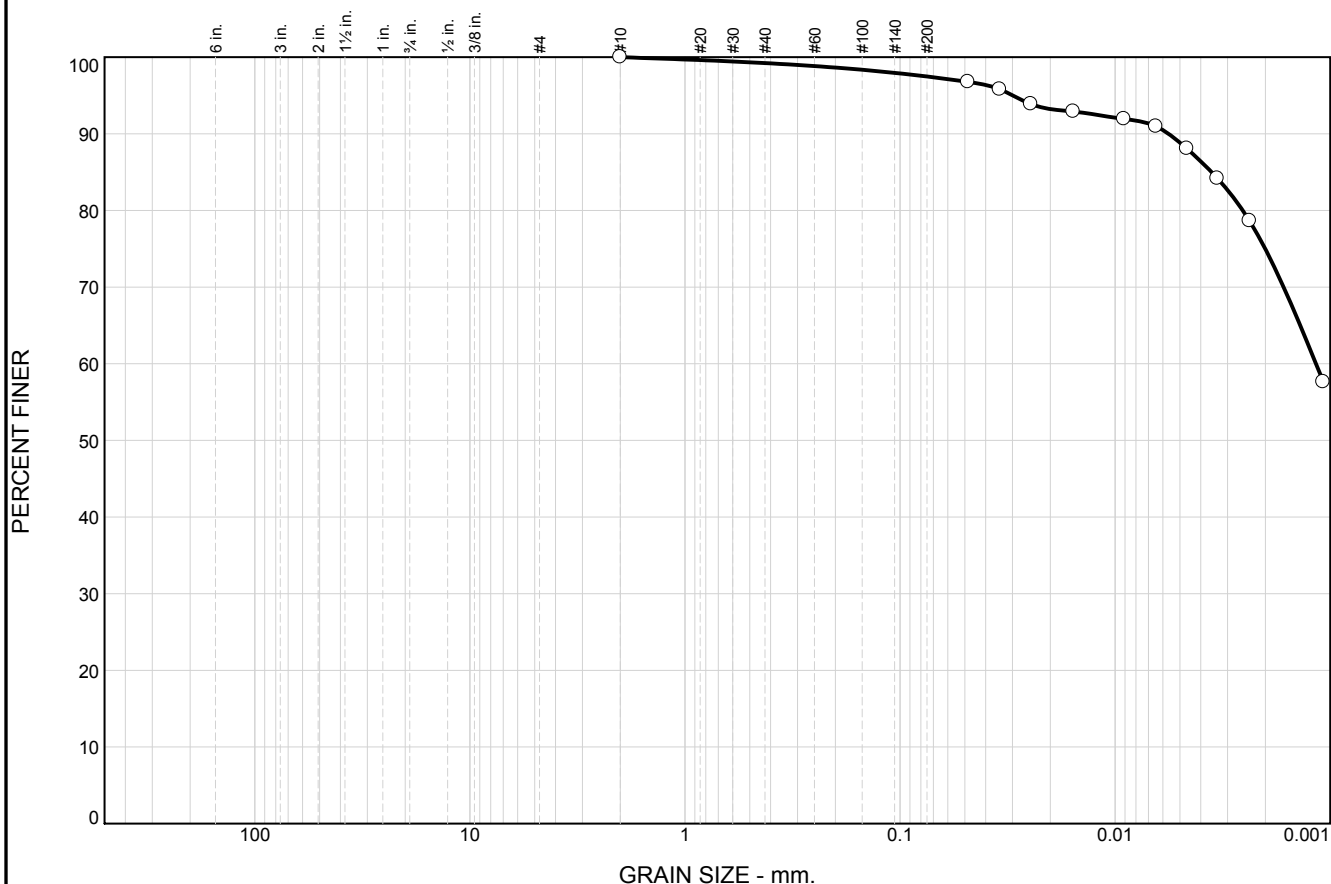
Material Description	USCS	AASHTO
<input type="radio"/> BLACK F/ GRAVELLY M/F/C SAND, SM SILT	SM	

<p>Project No. 195651 Client: TRANSMISSION DEVELOPERS INC.</p> <p>Project: TDI CHAMPLAIN HUDSON POWER EXPRESS - CSX</p> <p><input type="radio"/> Source of Sample: B221.5-1 Depth: 0.0-2.0 FT Sample Number: S-1</p>	<p>Remarks:</p> <p><input type="radio"/> SAMPLE DESCRIPTION BASED ON VISUAL IDENTIFICATION AND LABORATORY ANALYSIS</p>
<p>TRC Engineers, Inc.</p> <p>Mt. Laurel, NJ</p>	

Figure 118

Tested By: BMH 01/24/13 **Checked By:** JPB 03/12/13

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.8	1.7	8.6	88.9

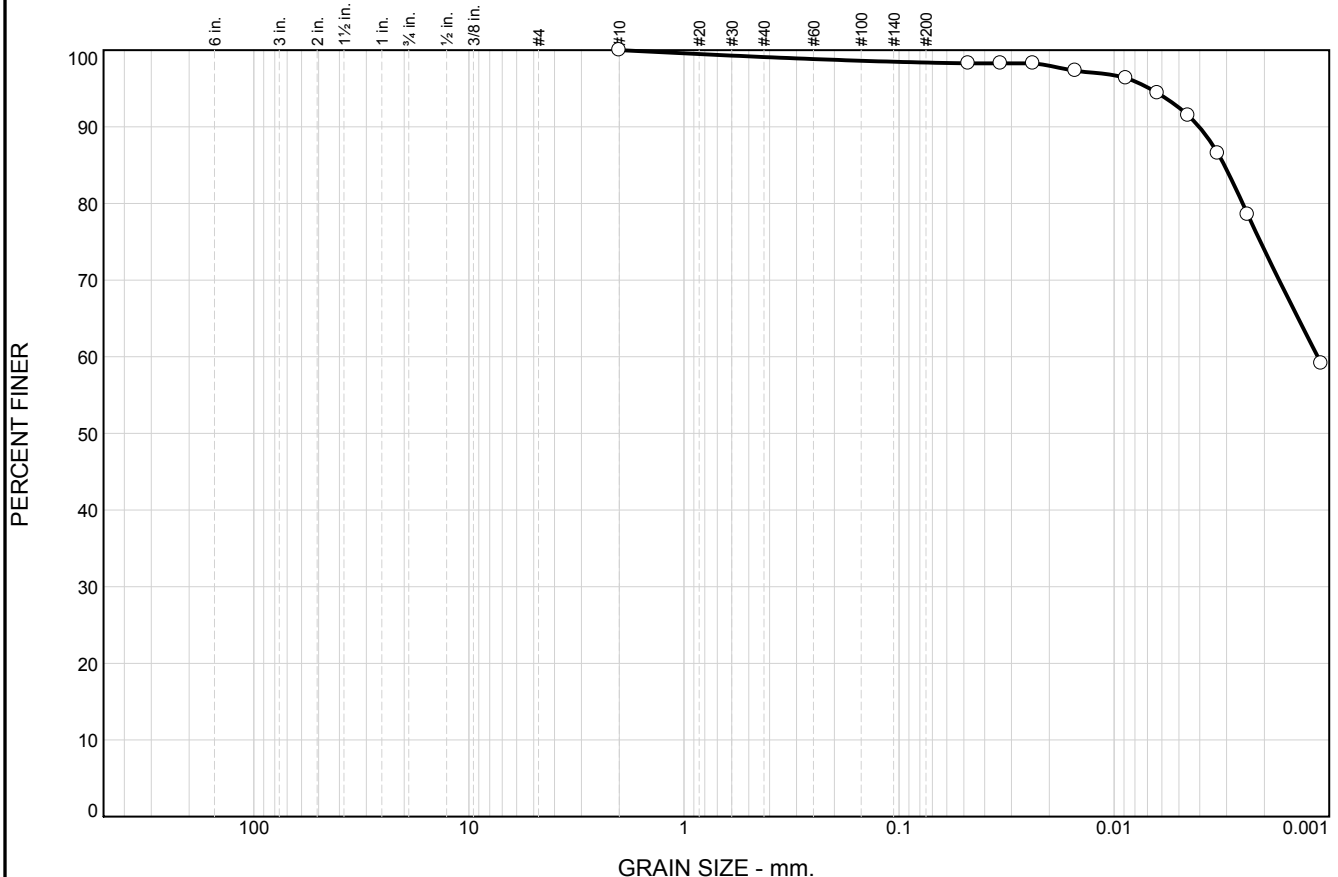
LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
55	29	0.0036	0.0012						

Material Description	USCS	AASHTO
○ BROWN CLAY, TR SILT, TR F/ SAND	CH	A-7-6(31)

<p>Project No. 195651 Client: TRANSMISSION DEVELOPERS INC.</p> <p>Project: TDI CHAMPLAIN HUDSON POWER EXPRESS - CSX</p> <p>○ Sample Source: B221.5-1 Depth: 6.0-10.0 FT Sample No.: S-4 & S-5</p>	<p>Remarks:</p> <p>○ SAMPLE DESCRIPTION BASED ON VISUAL IDENTIFICATION AND LABORATORY ANALYSIS</p>
<p>TRC Engineers, Inc.</p> <p>Mt. Laurel, NJ</p>	
<p>Figure 119</p>	

Tested By: TBT 02/11/12 **Checked By:** JPB 03/12/13

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.9	0.7	5.9	92.5

⊗	LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
○			0.0031	0.0011						

Material Description	USCS	AASHTO
○ GRAY CLAY, TR SILT, TR M/F SAND		

Project No. 195651 Client: TRANSMISSION DEVELOPERS INC. Project: TDI CHAMPLAIN HUDSON POWER EXPRESS - CSX ○ Source of Sample: B221.5-1 Depth: 38.5-40.0 FT Sample Number: S-11	Remarks: ○ SAMPLE DESCRIPTION BASED ON VISUAL IDENTIFICATION AND LABORATORY ANALYSIS
TRC Engineers, Inc. Mt. Laurel, NJ	Figure 120

Tested By: TBT 02/11/12 **Checked By:** JPB 03/12/13

TRC Engineers, Inc.
Soil Mechanics Laboratory

Unconfined Compression Strength Test of Rock Core

Project Name: TDI
Project No.: 195651
Boring No.: B221.2-1
Sample No.: R-3
Depth (ft): 9.0-9.8
Elevation (ft):

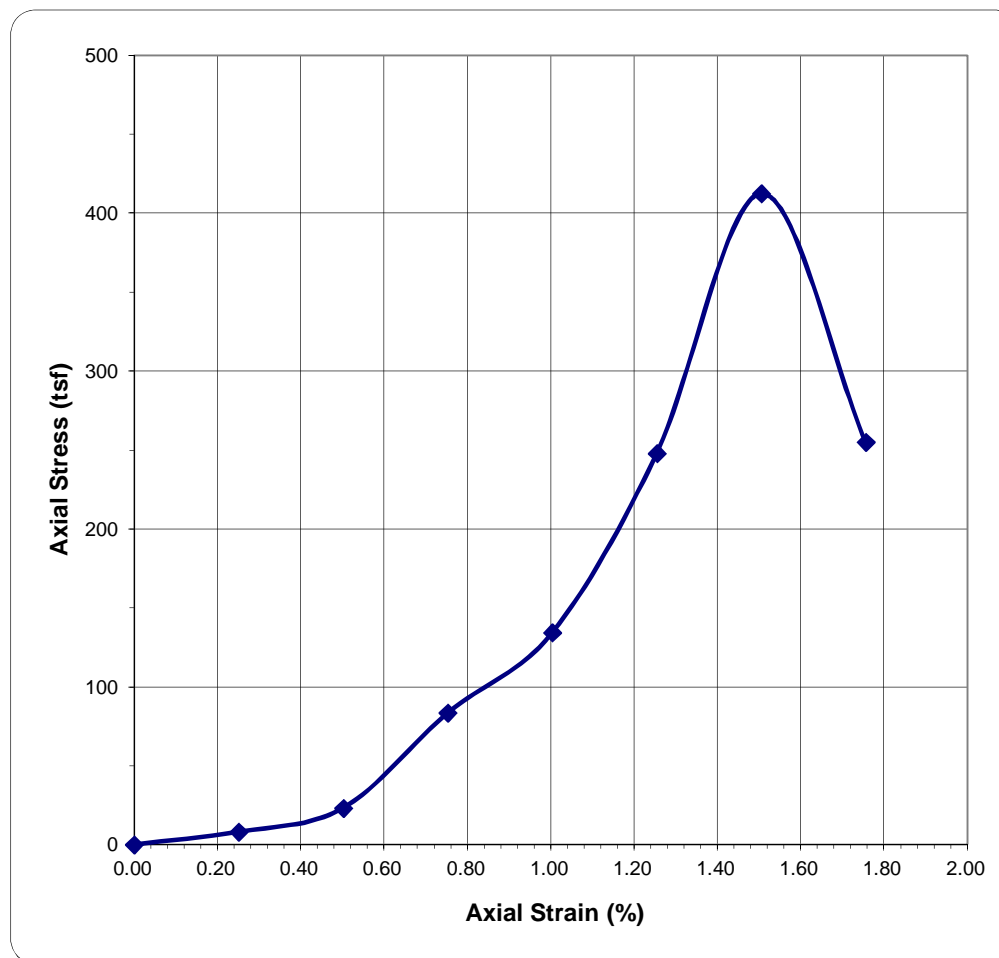
Average Sample Diameter (in.): 1.989
Cross Sectional Area (sq. in.): 3.107
Average Sample Height (in.): 3.985
Sample Mass-Dry (g): 550.03
Unit Weight (PCF) 169.2

Sample Description: _____

 GRAY SHALE

Test Data

Strain Dial (in.)	Load (lb)	Strain (%)	Stress (tsf)
0.000	0	0.00	0
0.010	350	0.25	8
0.020	1000	0.50	23
0.030	3600	0.75	83
0.040	5800	1.00	134
0.050	10700	1.25	248
0.060	17800	1.51	412
0.070	11000	1.76	255



Failure Conditions:

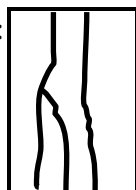


FIGURE: 154

TRC Engineers, Inc.
Soil Mechanics Laboratory

Unconfined Compression Strength Test of Rock Core

Project Name: TDI
Project No.: 195651
Boring No.: B221.4-1
Sample No.: R-2
Depth (ft): 14.7-15.3
Elevation (ft):

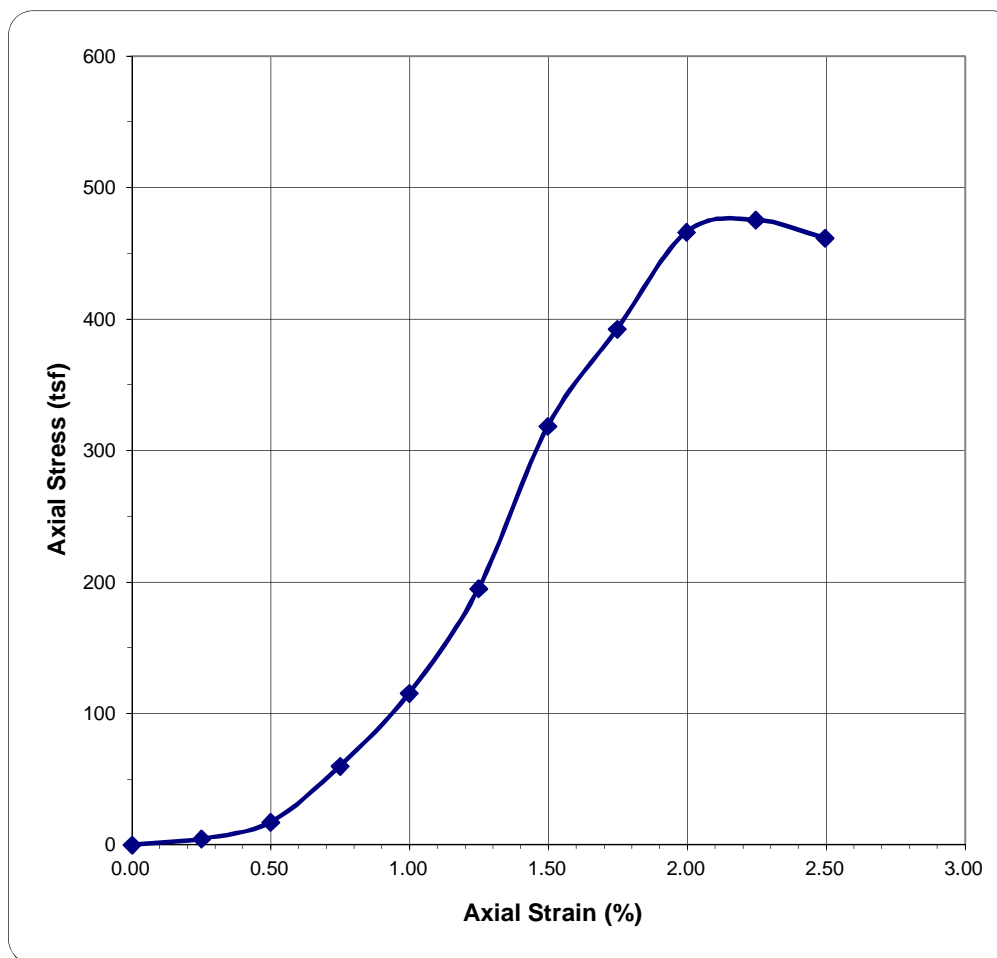
Average Sample Diameter (in.): 1.993
Cross Sectional Area (sq. in.): 3.120
Average Sample Height (in.): 4.008
Sample Mass-Dry (g): 551.73
Unit Weight (PCF) 168.1

Sample Description: _____

 GRAY GRAYWACKE

Test Data

Strain Dial (in.)	Load (lb)	Strain (%)	Stress (tsf)
0.000	0	0.00	0
0.010	200	0.25	5
0.020	750	0.50	17
0.030	2600	0.75	60
0.040	5000	1.00	115
0.050	8450	1.25	195
0.060	13800	1.50	318
0.070	17000	1.75	392
0.080	20200	2.00	466
0.090	20600	2.25	475
0.100	20000	2.50	462



Failure Conditions:

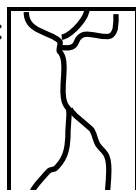


FIGURE: 155

TRC Engineers, Inc.
Soil Mechanics Laboratory

Unconfined Compression Strength Test of Rock Core

Project Name: TDI
Project No.: 195651
Boring No.: B221.4-1
Sample No.: R-3
Depth (ft): 19.7-20.4
Elevation (ft):

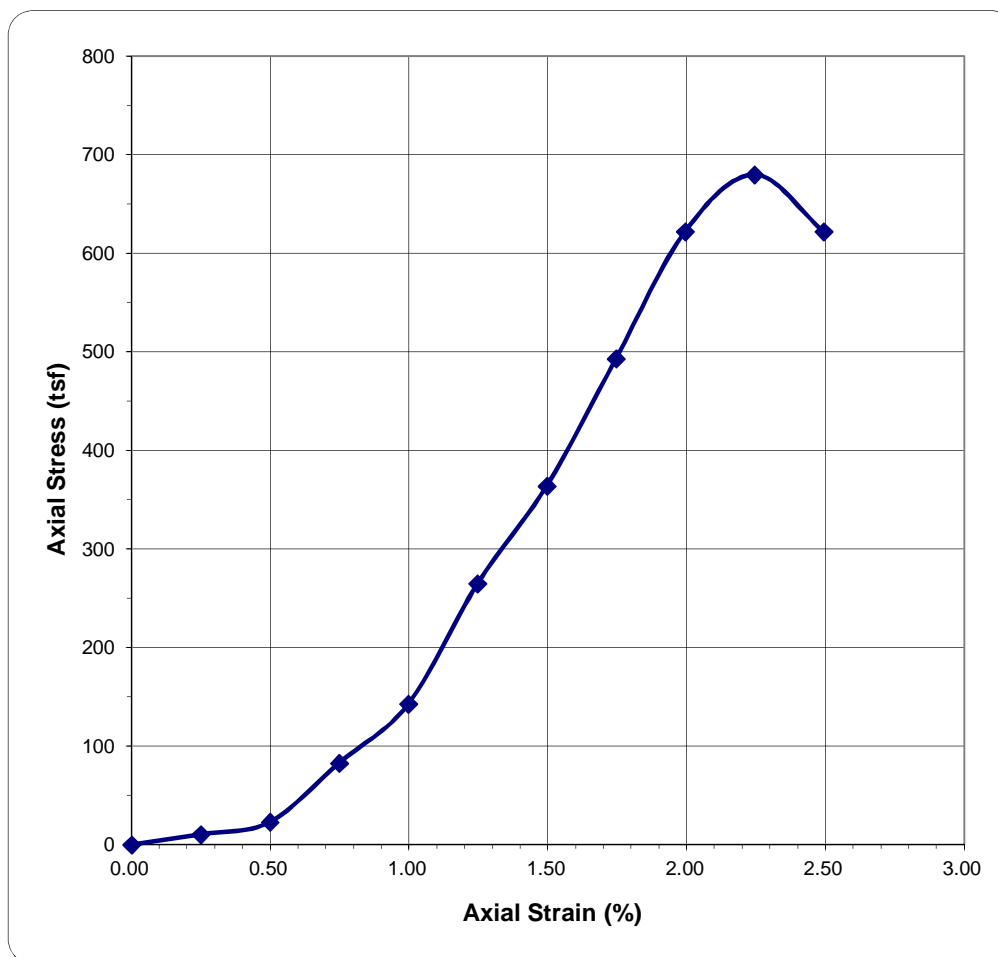
Average Sample Diameter (in.): 1.995
Cross Sectional Area (sq. in.): 3.126
Average Sample Height (in.): 4.010
Sample Mass-Dry (g): 551.69
Unit Weight (PCF): 167.7

Sample Description: _____

 GRAY GRAYWACKE

Test Data

Strain Dial (in.)	Load (lb)	Strain (%)	Stress (tsf)
0.000	0	0.00	0
0.010	450	0.25	10
0.020	1000	0.50	23
0.030	3600	0.75	83
0.040	6200	1.00	143
0.050	11500	1.25	265
0.060	15800	1.50	364
0.070	21400	1.75	493
0.080	27000	2.00	622
0.090	29500	2.24	679
0.100	27000	2.49	622



Failure Conditions:

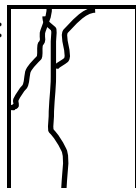


FIGURE: 156

Legend Key
● Kiewit Borings (Phase 3)





PROJECT NUMBER 20001480
START DATE 09/20/2022
FINISH DATE 09/22/2022

LOGGED BY Rafael Salas Jr
DRILLER/RIG Tim / CME-75
DRILL CONTRACTOR ADT Inc.

COORDINATES N 1236204.17
E 662544.15
GROUND ELEV. 24.4 ft
HAMMER TYPE/EFF. Automatic

Depth (ft)	Elevation (ft)	Graphic Log	Material Description	Sample Type	Core Run No.	Recovery % RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes	Legend			
										▲ SPT N Value	● MC (%)	— PL & LL (%)	☒ Fines Content (%)
23.9			6" Topsoil						Boring advanced with 3.25" Mud Rotary				
22.4			FILL: Clayey GRAVEL (GC), coarse, moist, subangular to angular			66%		1-6-5-4 (11)					
			Sandy CLAY with Gravel (CL), brown, fine to medium coarse, moist, subangular to angular gravel			38%		3-10-9-5 (19)					
5			Coarse gravel, moist			25%		14-10-4-7 (14)					
18.4			Clayey SILT (ML), reddish brown, loose, moist, low to medium plasticity			50%		12-5-5-6 (10)					
16.4			Silty Clayey GRAVEL with Sand (GC-GM), reddish brown, dense, fine to coarse gravel, moist, low to medium plasticity			75%		2-3-4-9 (7)					
10			Color change at 11 ft to grayish brown			75%		10-16-16-12 (32)					
15	9.4		Shale, gray to dark gray, closely spaced discontinuities, with fractures filled with calcite, trace fine sandstone lenses, fresh to slightly weathered			100%		50/1"					
20					1	94%			76 minute core run				
						62							
25													
30													



Kiewit

EXPLORATORY BORING LOG

Champlain Hudson Power Express
New York

BORING NO: KB-221.3

PROJECT NUMBER 20001480
 START DATE 09/20/2022
 FINISH DATE 09/22/2022

LOGGED BY Rafael Salas Jr
 DRILLER/RIG Tim / CME-75
 DRILL CONTRACTOR ADT Inc.

COORDINATES N 1236204.17
E 662544.15
 GROUND ELEV. 24.4 ft
 HAMMER TYPE/EFF. Automatic

Depth (ft)	Elevation (ft)	Graphic Log	Material Description	Sample Type	Core Run No.	Recovery %	RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes	Legend			
											SPT N Value	MC (%)	PL & LL (%)	Fines Content (%)
			Shale, gray to dark gray, closely spaced discontinuities, with fractures filled with calcite, trace fine sandstone lenses, fresh to slightly weathered		2	90%	57			114 minute core run	20	40	60	80
35			Occasional calcite veins											
			Fine sandstone lens at 37.4 to 38 ft											
40					3	100%	75			77 minute core run				
45														
50					4	98%	95			62 minute core run				
55			Fine sandstone lens at 52.8 to 56.4 ft											
60														



Kiewit

EXPLORATORY BORING LOG

Champlain Hudson Power Express
New York

BORING NO: KB-221.3

PROJECT NUMBER 20001480
 START DATE 09/20/2022
 FINISH DATE 09/22/2022

LOGGED BY Rafael Salas Jr
 DRILLER/RIG Tim / CME-75
 DRILL CONTRACTOR ADT Inc.

COORDINATES N 1236204.17
E 662544.15
 GROUND ELEV. 24.4 ft
 HAMMER TYPE/EFF. Automatic

Depth (ft)	Elevation (ft)	Graphic Log	Material Description	Sample Type	Core Run No.	Recovery %	RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes	Legend			
											SPT N Value	MC (%)	PL & LL (%)	Fines Content (%)
											20	40	60	80
			Shale, gray to dark gray, closely spaced discontinuities, with fractures filled with calcite, occasional near vertical joints, fresh to slightly weathered		5	99%	88			70 minute core run				
65														
70														
			Interbedded with sandstone/siltstone, moderately to very closely spaced discontinuities		6	100%	93			72 minute core run				
75										UCS = 8726 psi				
80														
			Moderately spaced discontinuities		7	100%	64			85 minute core run				
85														
90														



Kiewit

EXPLORATORY BORING LOG

Champlain Hudson Power Express
New York

BORING NO: KB-221.3

PROJECT NUMBER 20001480
 START DATE 09/20/2022
 FINISH DATE 09/22/2022

LOGGED BY Rafael Salas Jr
 DRILLER/RIG Tim / CME-75
 DRILL CONTRACTOR ADT Inc.

COORDINATES N 1236204.17
E 662544.15
 GROUND ELEV. 24.4 ft
 HAMMER TYPE/EFF. Automatic

Depth (ft)	Elevation (ft)	Graphic Log	Material Description	Sample Type	Core Run No.	Recovery %	RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes	Legend			
											▲ SPT N Value	● MC (%)	— PL & LL (%)	☒ Fines Content (%)
											20	40	60	80
			Shale, gray to dark gray, moderately spaced discontinuities, with fractures filled with calcite, fresh to slightly weathered		8	100%	82			74 minute core run				
95			Interbedded with sand layers, more closely spaced discontinuities, slightly weathered											
100					9	92%	53			92 minute core run				
105			Moderately spaced discontinuities											
110	-85.6		Boring Terminated at 110 ft		10	100%	95			27 minute core run				
115														
120														

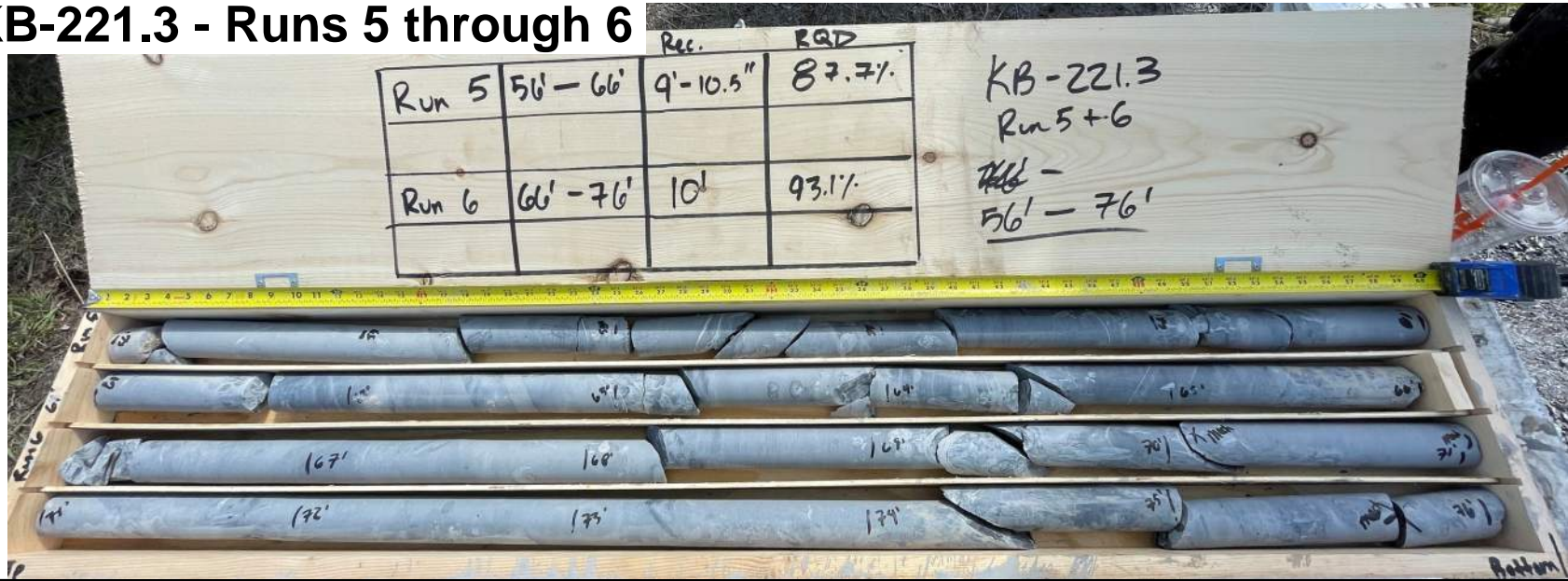
KB-221.3 - Runs 1 through 2



KB-221.3 - Runs 3 through 4



KB-221.3 - Runs 5 through 6



KB-221.3 - Runs 7 through 8



KB-221.3 - Runs 9 through 10





Kiewit

EXPLORATORY BORING LOG

Champlain Hudson Power Express
New York

BORING NO: KB-221.4

PROJECT NUMBER 20001480
START DATE 10/06/2022
FINISH DATE 10/07/2022

LOGGED BY Shabbaz Ahmad
DRILLER/RIG Tim / CME-75
DRILL CONTRACTOR ADT Inc.

COORDINATES N 1235655.06
E 662500.45
GROUND ELEV. 23.9 ft
HAMMER TYPE/EFF. Automatic

Depth (ft)	Elevation (ft)	Graphic Log	Material Description	Sample Type	Core Run No.	Recovery % RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes	Legend			
										▲ SPT N Value	● MC (%)	— PL & LL (%)	☒ Fines Content (%)
23.4			6" Topsoil						Boring advanced with 3.25" ID HSA				
			Silty SAND (SM), dark grey to brown, dense to medium dense, fine to coarse gravel, moist, subangular			79%		7-11-14-13 (25)					
			Loose, brown, mottled red clay observed			62%		8-10-8-8 (18)					
5			Dense, brown to gray			54%		2-2-5-4 (7)					
						50%		9-11-31-17 (42)					
10	13.9		Gravel with Silt (GM), gray to dark gray, very dense, fine to coarse gravel, dry, angular to subangular			100%		25-45-66-50/3" (111)					
			Moderately cemented, moist, with shale fragments					30-50/2"					
15	9.9		Shale/Siltstone, gray, laminated, moderately spaced discontinuities, high angle joints, very poor RQD, slightly weathered, occasional quartz and calcite veins						Rock coring started (no recovery for first 5')				
20					1	36%							
			Poor RQD, moderately weathered			33							
25					2	92%			30 minute core run				
			Fair RQD, slightly weathered			45							
30													



Kiewit

EXPLORATORY BORING LOG

Champlain Hudson Power Express
New York

BORING NO: KB-221.4

PROJECT NUMBER 20001480
START DATE 10/06/2022
FINISH DATE 10/07/2022

LOGGED BY Shabbaz Ahmad
DRILLER/RIG Tim / CME-75
DRILL CONTRACTOR ADT Inc.

COORDINATES N 1235655.06
E 662500.45
GROUND ELEV. 23.9 ft
HAMMER TYPE/EFF. Automatic

Depth (ft)	Elevation (ft)	Graphic Log	Material Description	Sample Type	Core Run No.	Recovery %	RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes	Legend			
											▲ SPT N Value	● MC (%)	— PL & LL (%)	☒ Fines Content (%)
											20	40	60	80
	-10.1		Shale/Siltstone, gray, laminated, moderately spaced discontinuities, high angle joints, fair RQD, slightly weathered, occasional quartz and calcite veins		3	100%	37							
35			Sandstone/Siltstone, gray, extremely closely to closely spaced discontinuities, poor RQD, slightly weathered, with vertical joints in sandstone portion		4	92%	40							
40			Shale lenses at 40.5 ft and 43 ft, extremely closely to widely spaced discontinuities, good RQD		5	94%	68							
45			Shale lens at 47 ft											
50			Occasional shale lenses at 57.5-61.2 ft, occasional near vertical joints, fair RQD, moderately weathered		6	98%	82							
55														
60					7	91%	54							



Kiewit

EXPLORATORY BORING LOG

Champlain Hudson Power Express
New York

BORING NO: KB-221.4

PROJECT NUMBER 20001480
START DATE 10/06/2022
FINISH DATE 10/07/2022

LOGGED BY Shabbaz Ahmad
DRILLER/RIG Tim / CME-75
DRILL CONTRACTOR ADT Inc.

COORDINATES N 1235655.06
E 662500.45
GROUND ELEV. 23.9 ft
HAMMER TYPE/EFF. Automatic

Depth (ft)	Elevation (ft)	Graphic Log	Material Description	Sample Type	Core Run No.	Recovery %	RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes	Legend								
											SPT N Value	MC (%)	PL & LL (%)	Fines Content (%)					
			Sandstone/Siltstone, gray, extremely closely to widely spaced discontinuities, fair RQD, slightly weathered, occasional near vertical joints																
	-40.1		Shale, gray, laminated, widely spaced discontinuities, good RQD, unweathered, with occasional siltstone/sandstone lenses																
65																			
70				8		98%	81												
			Closely to widely spaced discontinuities																
75																			
80				9		100%	95				UCS = 7620 psi								
			Interbedded with sandstone, very closely to moderately spaced discontinuities, , excellent RQD, slightly weathered																
85																			
90				10		100%	96												



Kiewit

EXPLORATORY BORING LOG

Champlain Hudson Power Express
New York

BORING NO: KB-221.4

PROJECT NUMBER 20001480
START DATE 10/06/2022
FINISH DATE 10/07/2022

LOGGED BY Shabbaz Ahmad
DRILLER/RIG Tim / CME-75
DRILL CONTRACTOR ADT Inc.

COORDINATES N 1235655.06
E 662500.45
GROUND ELEV. 23.9 ft
HAMMER TYPE/EFF. Automatic

Depth (ft)	Elevation (ft)	Graphic Log	Material Description	Sample Type	Core Run No.	Recovery % RQD	Pocket Pen. (tsf)	Blow Counts (N Value)	Notes	Legend									
										▲ SPT N Value	● MC (%)	— PL & LL (%)	☒ Fines Content (%)						
95			Sandstone lenses at 94-96.2 ft, good RQD		11	100% 82													
100																			
105	-81.1		Very poor RQD, unweathered		12	100% 0													
			Boring Terminated at 105 ft																
110																			
115																			
120																			

KB-221.4 - Runs 1 through 3



KB-221.4 - Runs 4 through 6



KB-221.4 - Runs 7 through 8



KB-221.4 - Runs 9 through 10



KB-221.4 - Runs 11 through 12



Summary of Laboratory Results

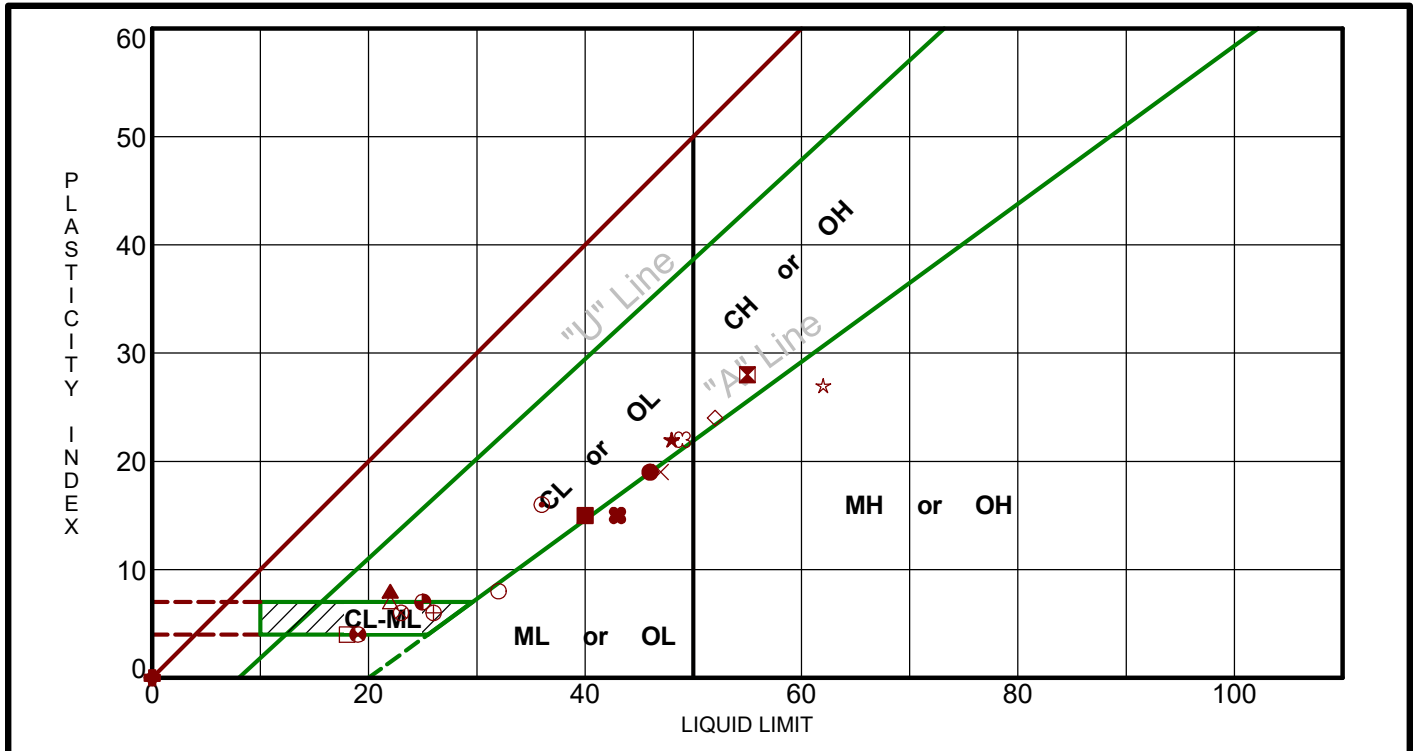
BORING ID	Depth (Ft.)	Water Content (%)
KB-183.6	8	11.5
KB-183.8	4-6	12.7
KB-184.0	4-6	19.9
KB-184.0	10-12	14.1
KB-187.5	10-12	15.9
KB-187.5	20-22	9.2
KB-187.5	30-32	14.1
KB-187.5	40-42	12.2
KB-187.5	45-47	10.9
KB-187.5	60-62	7.5
KB-187.7	10-12	6.3
KB-187.7	20-22	24.3
KB-187.7	35-37	7.2
KB-187.7	55-57	6.6
KB-190.8	4-6	10.9
KB-190.8	15-17	22.7
KB-191.7	4-6	24.0
KB-191.7	10-12	28.2
KB-191.7	25-27	33.6
KB-192.8A	8-10	29.1
KB-192.8A	20-22	30.3
KB-192.8A	40-42	19.6
KB-193.9	4-6	30.2
KB-193.9	10-12	35.1
KB-193.9	15-17	36.0
KB-193.9	35-37	56.2
KB-194.0	4-6	37.9
KB-194.0	15-17	49.1
KB-194.0	25-27	49.4
KB-194.0	35-37	11.2
KB-220.5	8-10	14.2
KB-221.0A	4-6	30.5
KB-221.0A	8-10	9.0
KB-221.0A	15-17	6.1
KB-221.0A	25-27	6.1
KB-221.0A	35-37	6.8
KB-221.3	8	17.8
KB-221.4	4-6	14.8
KB-221.4	8-10	10.5
KB-222.2	7-9	37.9
KB-222.2	25-27	36.9
KB-222.2	40-42	38.2

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. SMART LAB SUMMARY-PORTRAIT. JB215256H LAB TESTING.GPJ TERRACON_DATATEMPLATE.GDT 11/16/22

PROJECT: LAB Testing	 <p style="font-size: small;">30 Corporate Cir Ste 201 Albany, NY</p>	PROJECT NUMBER: JB215256H
SITE: Champlain- Hudson Power Express		CLIENT: Kiewit Engineering (NY) Corp Lone Tree, CO
		EXHIBIT: B-1

ATTERBERG LIMITS RESULTS

ASTM D4318



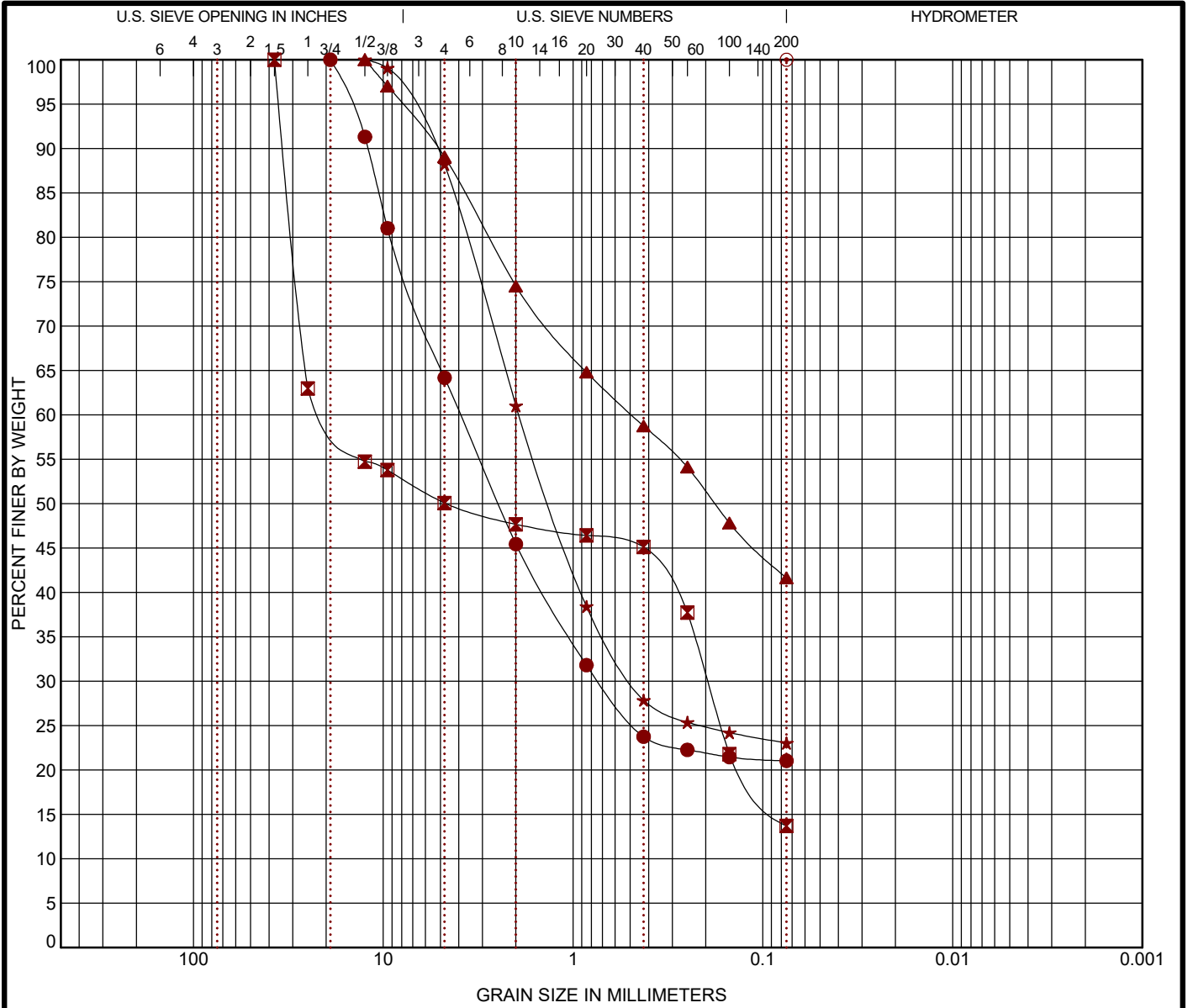
LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. ATTERBERG LIMITS JB215256H LAB TESTING.GPJ TERRACON_DATATEMPLATE.GDT 11/16/22

Boring ID	Depth (Ft)	LL	PL	PI	Fines	USCS	Description
● KB-193.9	15 - 17	46	27	19	70.4	CL	LEAN CLAY with SAND
⊠ KB-193.9	35 - 37	55	27	28	96.8	CH	FAT CLAY
▲ KB-194.0	4 - 6	22	14	8	81.9	CL	LEAN CLAY with SAND
★ KB-194.0	15 - 17	48	26	22	85.2	CL	LEAN CLAY
⊙ KB-194.0	25 - 27	36	20	16	97.0	CL	LEAN CLAY
⊕ KB-194.0	35 - 37	NP	NP	NP	14.7	SM	SILTY SAND with GRAVEL
○ KB-220.5	8 - 10	32	24	8	26.2	SM	SILTY SAND with GRAVEL
△ KB-221.0A	4 - 6	22	15	7	89.6	CL-ML	SILTY CLAY
⊗ KB-221.0A	8 - 10	23	17	6	11.7	GP-GC	POORLY GRADED GRAVEL with SILTY CLAY and SAND
⊕ KB-221.0A	15 - 17	26	20	6	11.8	GP-GC	POORLY GRADED GRAVEL with SILTY CLAY and SAND
□ KB-221.0A	25 - 27	18	14	4	25.9	GC-GM	SILTY, CLAYEY GRAVEL with SAND
⊕ KB-221.0A	35 - 37	19	15	4	21.0	SC-SM	SILTY, CLAYEY SAND with GRAVEL
⊕ KB-221.3	8	25	18	7	13.7	GC-GM	SILTY, CLAYEY GRAVEL with SAND
★ KB-222.2	7 - 9	62	35	27	100.0	MH	ELASTIC SILT
⊗ KB-222.2	25 - 27	49	27	22	94.8	CL	LEAN CLAY
■ KB-222.2	40 - 42	40	25	15	90.4	CL	LEAN CLAY
◆ KB-222.6A	15 - 17	NP	NP	NP	7.4	GP-GM	POORLY GRADED GRAVEL with SAND and SILT
◇ KB-222.6A	35 - 37	52	28	24	87.3	CH	FAT CLAY
× KB-222.6A	50 - 52	47	28	19	96.5	ML	SILT
⊕ KB-222.6A	65 - 67	43	28	15	99.3	ML	SILT

PROJECT: LAB Testing	 30 Corporate Cir Ste 201 Albany, NY	PROJECT NUMBER: JB215256H
SITE: Champlain- Hudson Power Express		CLIENT: Kiewit Engineering (NY) Corp Lone Tree, CO
		EXHIBIT: B-2

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID	Depth (Ft)	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
● KB-221.0A	35 - 37	SILTY, CLAYEY SAND with GRAVEL (SC-SM)	6.8	19	15	4		
☒ KB-221.3	8	SILTY, CLAYEY GRAVEL with SAND (GC-GM)	17.8	25	18	7		
▲ KB-221.4	4 - 6	SILTY SAND (SM)	14.8					
★ KB-221.4	8 - 10	SILTY SAND (SM)	10.5					
◎ KB-222.2	7 - 9	ELASTIC SILT (MH)	37.9	62	35	27		

Boring ID	Depth (Ft)	D ₁₀₀	D ₆₀	D ₃₀	D ₁₀	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
● KB-221.0A	35 - 37	19	3.917	0.728		0.0	35.8	43.1		21.0	
☒ KB-221.3	8	37.5	19.495	0.195		0.0	49.9	36.4		13.7	
▲ KB-221.4	4 - 6	12.5	0.491			0.0	10.9	47.4		41.6	
★ KB-221.4	8 - 10	12.5	1.924	0.489		0.0	11.8	65.2		23.0	
◎ KB-222.2	7 - 9	0.075				0.0	0.0	0.0		100.0	

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 JB215256H LAB TESTING.GPJ TERRACON_DATATEMPLATE.GDT 11/16/22

PROJECT: LAB Testing

SITE: Champlain- Hudson Power Express



PROJECT NUMBER: JB215256H

CLIENT: Kiewit Engineering (NY) Corp
Lone Tree, CO

EXHIBIT: B-8

Client

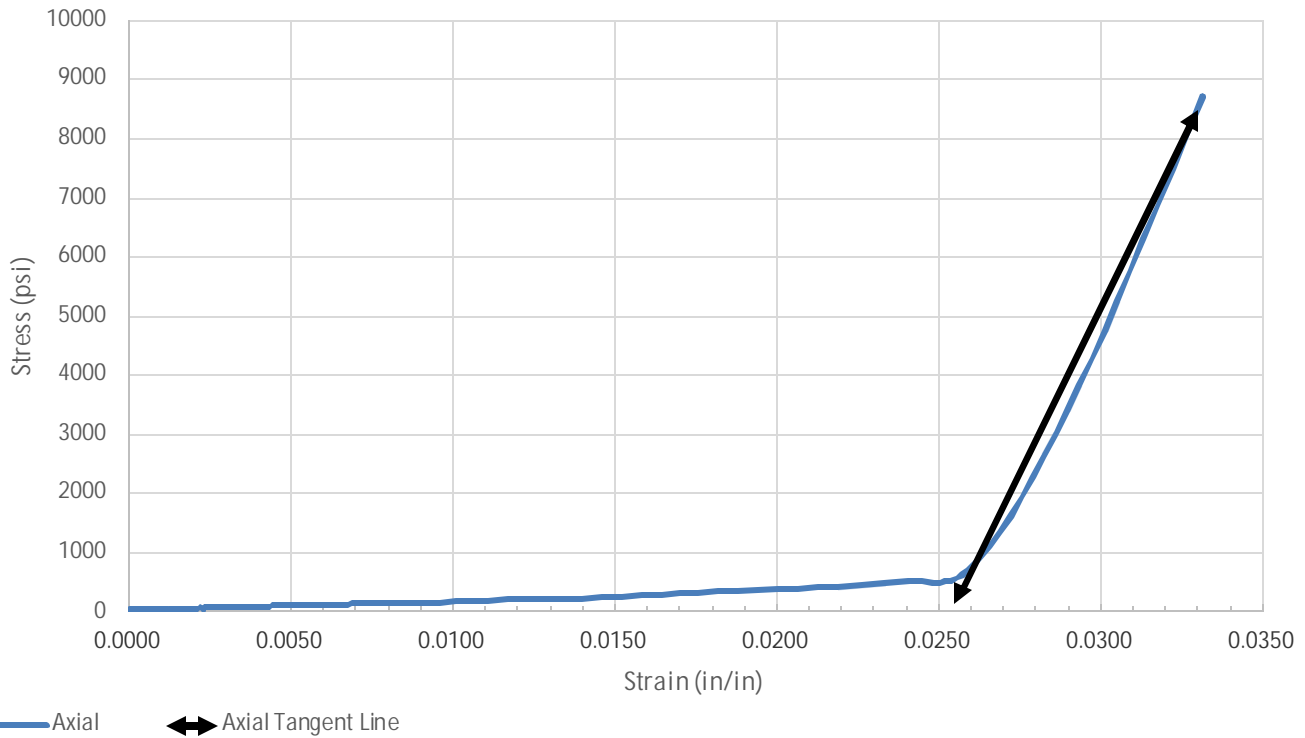
Kiewit Engineering (NY) Corp

Project

LAB Testing

Project No. JB215256H

ASTM D7012 Stress/ Strain Curve



SAMPLE LOCATION			
Site:	LAB Testing		
Description:	Shale Interbedded with Sandstone/Siltstone		
Boring:	221.3	Depth (feet):	76-86
SPECIMEN INFORMATION			
Sample No.:		Mass (g):	432.26
Length (in.):	4.09	Diameter (in.):	1.74
L/D Ratio:	2.35	Density (pcf):	169.32
TEST RESULTS			
Failure Load (lbs):	20750		
Failure Strain (in/in):	0.036		
Unconfined Compressive Strength (psi):	8,726		
Elastic Modulus, E, (ksi):	1114		
Time of Failure (min):	01:23		
Rate of Loading (in/sec):	0.04		
Moisture Content Post-break:	0.94%		

Client

Kiewit Engineering (NY) Corp

Project

LAB Testing

Project No. JB215256H

Equipment:

	TICCS ID:
Calipers	W-44049
Scale	B-71466
Dial Indicator	C-70608
Compression (spherically seated)	C-48999

Samples were prepared and tested in accordance with ASTM D4543 and D7012. Deviations, if any, are noted below:
Notes:

- Per ASTM D4543, this specimen shall have a minimum diameter of 1.875 inches, or as directed by the client.
- Per ASTM D4543, this specimen has not met the requirements for straightness, by exceeding 0.02 inches.
- Per ASTM D4543, this specimen has not met the requirements for perpendicularity, by exceeding 0.250°.
- Per ASTM D4543, this specimen has not met the requirements for flatness, by exceeding 0.001 inches.
- Per ASTM D4543, this specimen has not met the requirements for parallelism, by exceeding 0.25°.
- Per ASTM D4543, this specimen has not met the requirements for flatness, by exceeding 0.001 inches.
- Per ASTM D4543 and ASTM D7012, the desired specimen length to diameter are between 2.0:1 and 2.5:1.

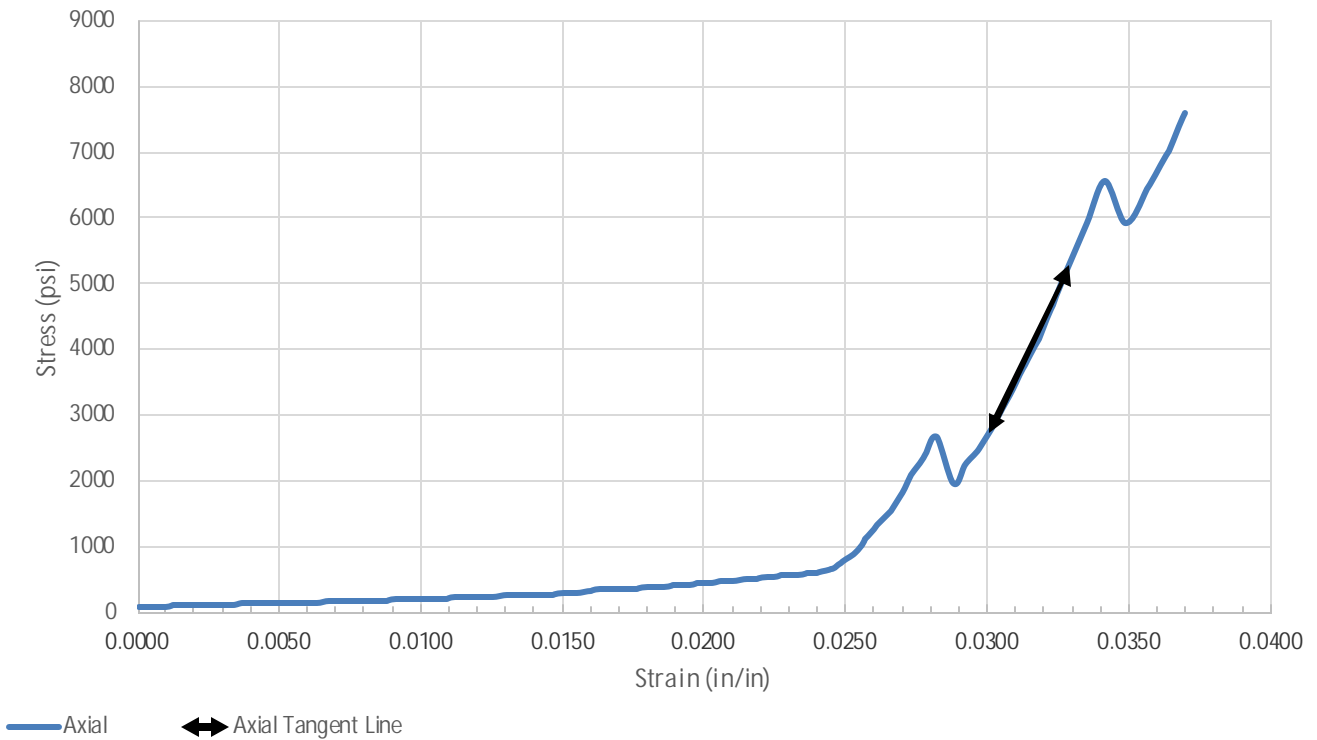
According to ASTM D7012 Section 8.2.1, this specimen, although not meeting all requirements of ASTM D4543 is acceptable for testing. However, the results reported may differ from results obtained from a test specimen that meets the requirements of D4543.

Client
Kiewit Engineering (NY) Corp

Project
LAB TESTING

Project No. JB215256H

ASTM D7012 Stress/ Strain Curve



SAMPLE LOCATION

Site:	LAB TESTING		
Description:	Shale		
Boring:	KB-221.4	Depth (feet):	79

SPECIMEN INFORMATION

Sample No.:		Mass (g):	436.46
Length (in.):	4.05	Diameter (in.):	1.75
L/D Ratio:	2.31	Density (pcf):	170.69

TEST RESULTS

Failure Load (lbs):	18328
Failure Strain (in/in):	0.041
Unconfined Compressive Strength (psi):	7,620
Elastic Modulus, E, (ksi):	897
Time of Failure (min):	01:23
Rate of Loading (in/sec):	0.04
Moisture Content Post-break:	0.70%

Rock Core D7012 Method C



Client

Kiewit Engineering (NY) Corp

Project

LAB TESTING

Project No. JB215256H

Equipment:

	TICCS ID:
Calipers	W-44049
Scale	B-71466
Dial Indicator	C-70608
Compression (spherically seated)	C-48999

Samples were prepared and tested in accordance with ASTM D4543 and D7012. Deviations, if any, are noted below:

Notes:

- Per ASTM D4543, this specimen shall have a minimum diameter of 1.875 inches, or as directed by the client.
- Per ASTM D4543, this specimen has not met the requirements for perpendicularity, by exceeding 0.250°.
- Per ASTM D4543, this specimen has not met the requirements for flatness, by exceeding 0.001 inches.
- Per ASTM D4543, this specimen has not met the requirements for parallelism, by exceeding 0.25°.
- Per ASTM D4543, this specimen has not met the requirements for flatness, by exceeding 0.001 inches.
- Per ASTM D4543 and ASTM D7012, the desired specimen length to diameter are between 2.0:1 and 2.5:1.

According to ASTM D7012 Section 8.2.1, this specimen, although not meeting all requirements of ASTM D4543 is acceptable for testing. However, the results reported may differ from results obtained from a test specimen that meets the requirements of D4543.

Client Kiewit Engineering (NY) Corp	Project LAB Testing
---	-------------------------------

Project No. JB215256H

Splitting Tensile Strength of Intact Rock Core Specimens, ASTM D3967					
Boring	221.3	Material Description		Shale Interbedded with Sandstone/Siltstone	
Sample No	RC-7	Equipment Used		Tinius Olsen (120,000lbs)	
Depth (ft)	76-86	TICCS ID/Serial No.		C-48999, 118285	
Lab No	9520	Calibration Date		11/2/2021	
TENSILE STRENGTH					
Lab No.	1	2	3	4	5
Diameter (in)	1.75	1.75	1.75	1.75	1.75
Length (in)	0.67	0.6	0.63	0.69	0.55
Length Diameter Ratio	0.38	0.34	0.36	0.39	0.31
Rate of Loading	0.067	0.06	0.063	0.069	0.055
Moisture Condition	0.94%	0.94%	0.94%	0.94%	0.94%
Maximum Applied Load (lbf)	2457	3511	2311	3793	1845
Splitting Tensile Strength (psi)	1334.7	2129.8	1335.1	2000.8	1220.9
TENSILE STRENGTH					
Lab No.	6	7	8	9	10
Diameter (in)	1.75	--	--	--	--
Length (in)	0.74	--	--	--	--
Length Diameter Ratio	0.42	--	--	--	--
Rate of Loading	0.074	--	--	--	--
Moisture Condition	0.94%	--	--	--	--
Maximum Applied Load (lbf)	2317	--	--	--	--
Splitting Tensile Strength (psi)	1139.6	--	--	--	--

Client
Kiewit Engineering (NY) Corp

Project
LAB TESTING

Project No. JB215256H

Splitting Tensile Strength of Intact Rock Core Specimens, ASTM D3967

Boring	KB-221.4	Material Description		Shale	
Sample No	RC-9	Equipment Used		Tinius Olsen (120,000lbs)	
Depth (ft)	79	TICCS ID/Serial No.		C-48999, 118285	
Lab No	9825	Calibration Date		11/1/2022	
TENSILE STRENGTH					
Lab No.	1	2	3	4	5
Diameter (in)	1.74	1.74	1.74	1.74	1.74
Length (in)	0.67	0.66	0.55	0.57	0.54
Length Diameter Ratio	0.39	0.38	0.32	0.33	0.31
Rate of Loading	0.067	0.066	0.055	0.033	0.054
Moisture Condition	0.70%	0.70%	0.70%	0.70%	0.70%
Maximum Applied Load (lbf)	4240	4061	3168	3168	4897
Splitting Tensile Strength (psi)	2316.6	2252.4	2108.5	2034.5	3319.6
TENSILE STRENGTH					
Lab No.	6	7	8	9	10
Diameter (in)	1.74	1.74	1.74	1.74	1.74
Length (in)	0.52	0.58	0.64	0.58	0.63
Length Diameter Ratio	0.30	0.33	0.37	0.33	0.36
Rate of Loading	0.052	0.058	0.064	0.058	0.063
Moisture Condition	0.70%	0.70%	0.70%	0.70%	0.70%
Maximum Applied Load (lbf)	2114	1702	4811	4125	4799
Splitting Tensile Strength (psi)	1488.2	1074.2	2751.7	2603.4	2788.4



Client: Terracon Consultants, Inc.	Project No: GTX-315284	
Project: Champlain-Hudson Power Express		
Location:	Sample Type: cylinder	Tested By: tlm
Boring ID: KB-221.3	Test Date: 10/25/22	Checked By: smd
Sample ID: ---	Test Id: 689778	
Depth : 76'-86'		
Test Comment: ---		
Visual Description: ---		
Sample Comment: ---		

Abrasiveness of Rock Using the Cerchar Method by ASTM D7625

Boring ID	Sample ID	Depth	Stylus No	Reading 1	Reading 2	Average	Comments
KB-221.3	---	76-86 ft	1	0.9	0.5	0.70	
			2	0.5	0.8	0.65	
			3	1.1	1.2	1.15	
			4	0.9	0.8	0.85	
			5	0.8	1.0	0.90	
			Average CAIs			0.85	
			Average CAI *			1.32	

CERCHAR Abrasiveness Index Classification Medium abrasiveness

Notes

Test Surface: Saw Cut
 Moisture Condition: As Received
 Apparatus Type: Original CERCHAR
 Stylus Hardness: Rockwell Hardness 54/56 HRC
 Stylus Displacement Relative to Rock Fabric:
 Styli 1-3: Normal; Styli 4-5: Parallel
 * CAI = (0.99 * CAIs) + 0.48
 CAIs = CERCHAR index for smooth (saw cut) surface
 CAI = CERCHAR index for natural surface
 Comments:



DATE: March 15, 2023

TO: Zachary Bauer; Tetra Tech Rooney

FROM: Matthew Hawley, P.E.; Kiewit Engineering (NY) Corp. **MKH**
Jaren Knighton; Kiewit Engineering (NY) Corp.

SUBJECT: Geotechnical Data: Segment 11 - Package 7A - HDD Crossing 117 – Revision 1
Champlain Hudson Power Express Project
Catskill, New York

Kiewit Engineering is providing the attached geotechnical data for use in the horizontal direction drill (HDD) design for the Champlain Hudson Power Express project in Upstate New York. This HDD crossing is located west of Catskill, New York. The approximate station for the start of HDD crossing number 117 is to be determined (42.2203° N, 73.8753° W).

The geotechnical data at this HDD crossing is attached. The available data is taken from the previous investigation by TRC and the recent investigations by Terracon and Kiewit, referenced below.

- TRC, Geotechnical Data Report, Champlain Hudson Power Express, Canadian Pacific Railway Borings MP 177.6-228.2, dated March 15, 2013.
- Terracon Consultants-NY, Inc., Results of Field Exploration, Champlain-Hudson Power Express – Package 7a, Catskill, NY, dated May 23, 2022.
- Kiewit Engineering (NY) Corp., Package 7A Phase 4 Borings, Champlain Hudson Power Express, NY, dated February 17, 2023.

Contact us if you have questions or require additional information.

HDD 117
Borings K-221.8,
B221.8-1, KB-221.8B
Segment 11 - Design Package 7A

CHPE Segment 11 - Package 7A
HDD Soil Boring Coordinates and Elevations

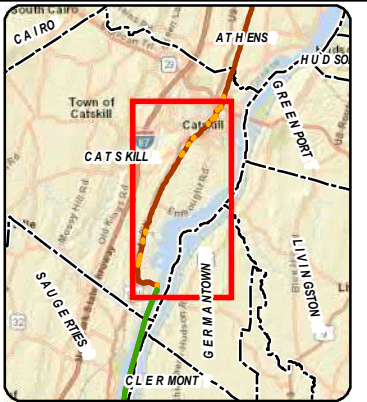
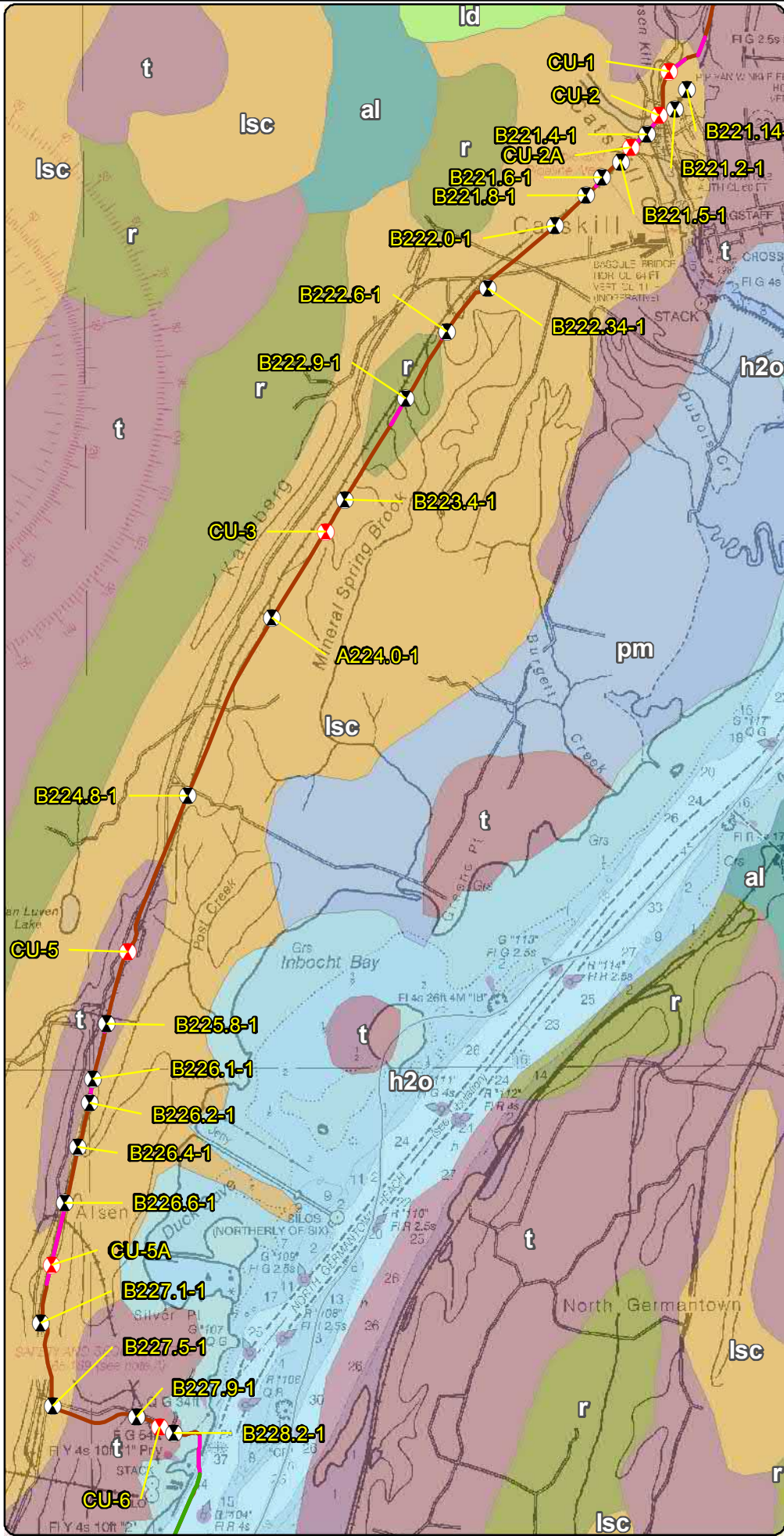
Firm	Boring	Northing (feet)	Easting (feet)	Ground Surface Elevation (feet)
TRC*	B221.0-1	1237452.6	663787.2	99.6
	B221.2-1	1236173.4	663261.8	115.0
	B221.4-1	1235622.5	662622.3	22.4
	B221.5-1	1235006.9	662058.8	95.5
	B221.6-1	1234675.8	661633.8	98.3
	B221.8-1	1234265.3	661277.2	99.4
	B222.34-1	1232191.5	659098.9	133.5
	B222.6-1	1231252.6	658182.3	113.7
	B222.9-1	1229751.0	657274.3	121.4
	B225.8-1	1215861.0	650622.7	91.0
	B226.1-1	1214654.4	650328.3	105.9
	B226.2-1	1214120.5	650254.4	108.5
	B226.6-1	1211894.7	649689.7	112.1
AECOM**	CU-1	1237028.6	663123.9	19.7
	CU-2	1236042.7	662897.0	24.8
	CU-2A	1235325.9	662268.9	38.1
	CU-5A	1210523.7	649411.8	118.4
	SC-5	1239310.3	664321.6	110.2
	SC-6	1237781.0	663919.8	101.6

Notes:

- Northings and Eastings are provided in NAD83 New York State Plane East Zone.
- Elevations are referenced to the NAVD88 datum.
- * TRC boring coordinates as shown in Table 1-6 in AECOM report (reference below). Boring elevations estimated from November 2021 topographic survey by Williams Aerial.
- ** AECOM boring coordinates and elevations as shown in Table 1-6 in AECOM report.
- *** Kiewit boring coordinates and elevations are noted on the boring logs.

Reference:

AECOM, Geotechnical Data Report, Upland Segments: Putnam Station, Washington County, to Cementon, Green County, NY, Champlain Hudson Power Express, dated May 28, 2021.



LEGEND

- 2021 Boring Location
- Previous (2013) Boring Location
- Terrestrial Route HVDC
- Submarine Route HVDC
- Terrestrial Route HVAC
- Preliminary HDD Locations
- Preliminary Pipe Bridge Location
- Town Boundary
- County Boundary

Surfacial Geology

- al - Recent alluvium
- h2o - Water
- ld - Lacustrine delta
- lsc - Lacustrine silt and clay
- pm - Swamp deposits
- r - Bedrock
- t - Till

0.3 0.15 0 0.3 Miles

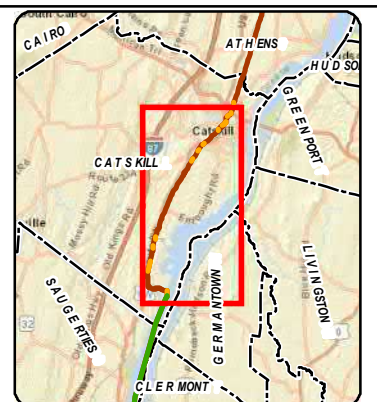
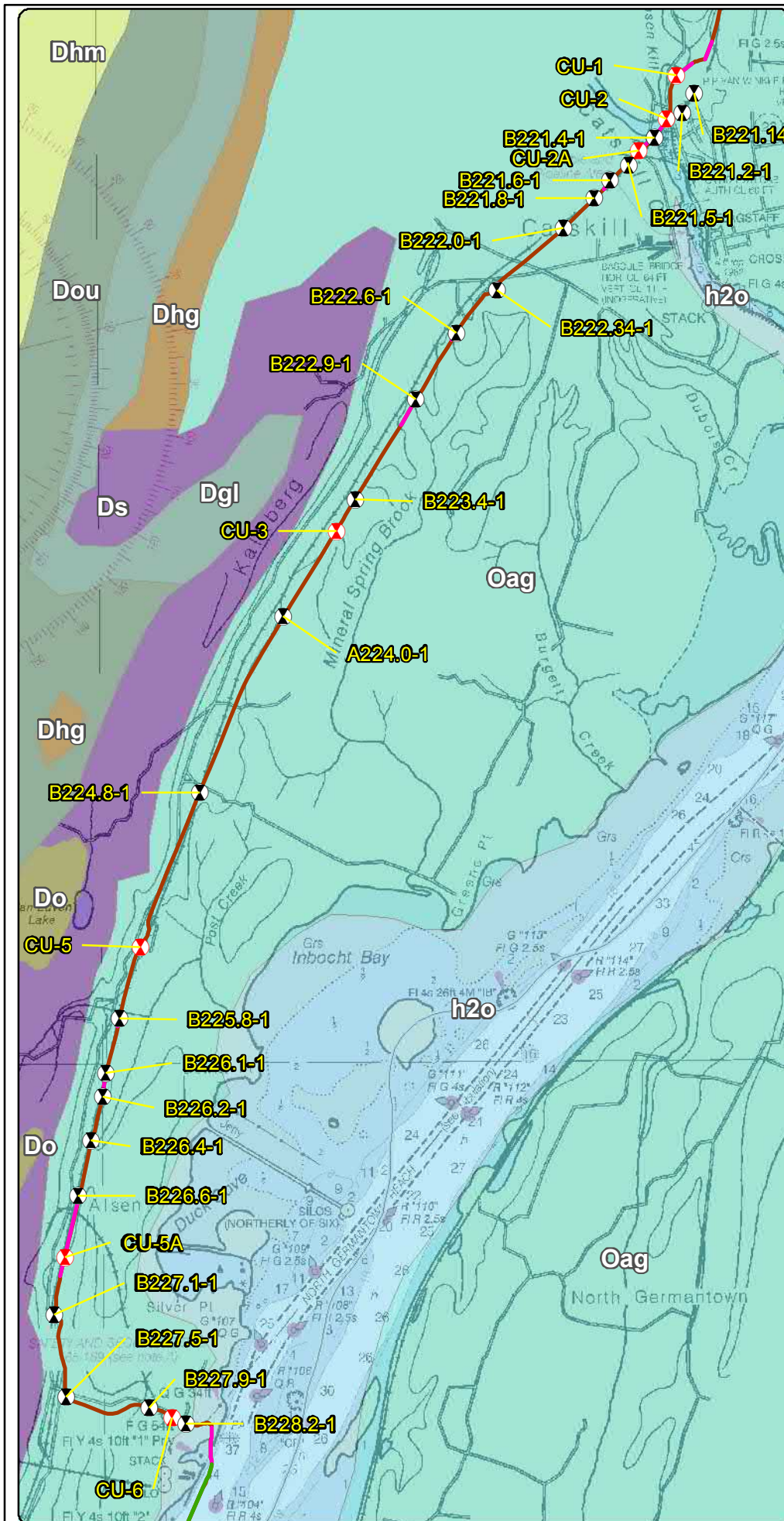
Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

**Surfacial Geology and Geotechnical Borings
Catskill to Upland
Figure 3-11**

Prepared on 5/3/2021
by: **AECOM**

DATA SOURCES: ESRI, NYSDOT, NOAA, USACE, NYDOS, TDI, TRC

Y:\Projects\CHPE\Route\Consensus_Alternative_Routes\MD\Alt 5_Routes_DZ_201903\Boring_Locations\Maps_for_May_2021_Report\Catskill_to_Upland_Boring_Locations_Surfacial_May_2021_Report.mxd



LEGEND

- 2021 Boring Location
- Previous (2013) Boring Location
- Terrestrial Route HVDC
- Submarine Route HVDC
- Terrestrial Route HVAC
- Preliminary HDD Locations
- Preliminary Pipe Bridge Location
- Town Boundary
- County Boundary

Bedrock Geology

- Dgl - Glenerie Formation
- Dhg - Port Ewen Formation
- Dhm - Undiff Lower Hamilton Group
- Do - Oriskany Sandstone
- Dou - Onondaga Limestone
- Ds - Cashaqua Shale
- Oag - Austin Glen Form (graywacke, shale)
- h2o - Water

0.3 0.15 0 0.3 Miles

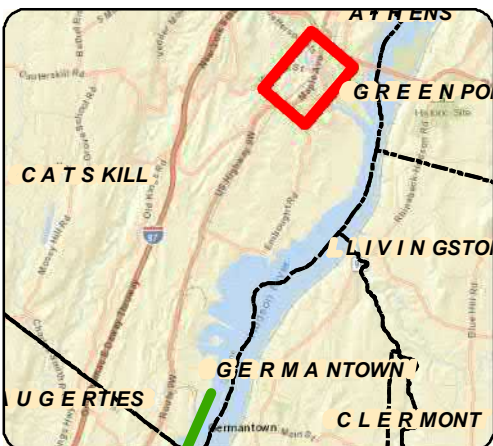
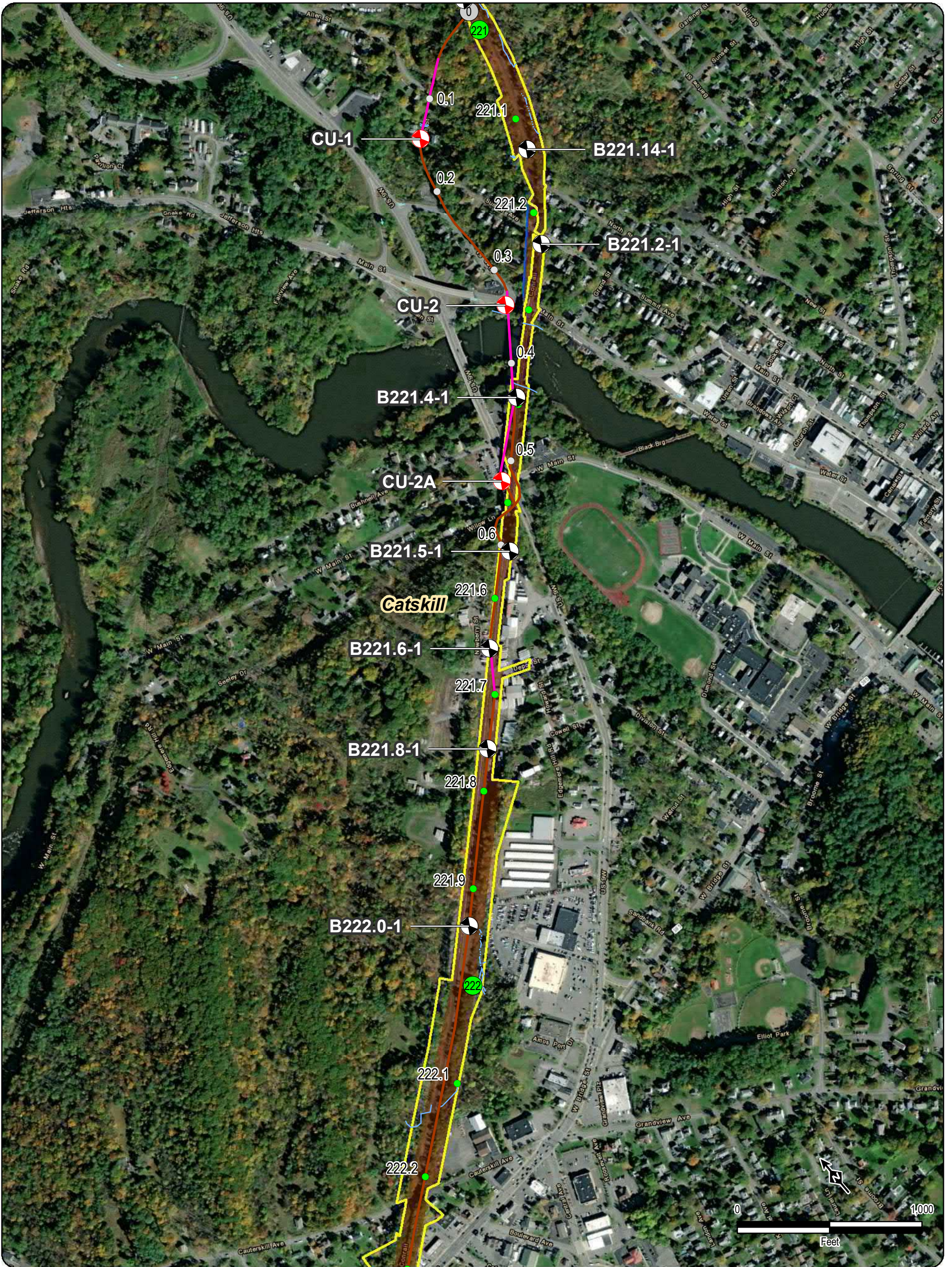
Champlain Hudson Power Express Project
Champlain Hudson Power Express Inc.

**Bedrock Geology and Geotechnical Borings
Catskill to Upland
Figure 4-11**


Prepared on 5/18/2021
by: **AECOM**

DATA SOURCES: ESRI, NYSDOT, NOAA, USACE, NYDOS, TDI, TRC

Y:\Projects\CHPE\Route\Consensus_Alternative_Routes\MD\Alt 5_Routes_DZ_201909\Boring_Locations\Maps_for_May_2021_Report\Catskill_to_Upland_Boring_Locations_Bedrock_May_2021_Report.mxd



LEGEND	
● 111.8	Certified Milepost - Tenths
● 111.8	Certified Milepost
○ 111.8	Preferred Alternative Milepost - Tenths
○ 135	Preferred Alternative Milepost
—	Terrestrial Route HVDC
—	Submarine Route HVDC
—	Terrestrial Route HVAC
—	Preliminary HDD Locations
—	Preliminary Pipe Bridge Location
⊗	2021 Boring Location
⊗	Previous (2013) Boring Location
—	Streams/Ditches
—	Railroad ROW
—	Deviation Zone
—	Deviation Zone Outside ROW
—	Preferred Alternative Deviation Zone
—	Preferred Alternative Deviation Zone Outside ROW
—	Town Boundary
—	Village Boundary
—	State Park (OPRHP)
—	Parcel Ownership
—	Road Name
—	Village Name


Champlain Hudson Power Express Project
 Champlain Hudson Power Express Inc.

BORING LOCATION PLAN
Catskill to Upland
Figure A-11
 Sheet 1 of 6

Prepared by: **AECOM** 5/20/2021



TEST BORING LOG

BORING **B221.8-1**

G.S. ELEV. N/A

FILE 195651

SHEET 1 OF 1










PROJECT: TDI CHAMPLAIN HUDSON POWER EXPRESS

LOCATION: CSX RAILROAD ROW, NY

GROUNDWATER DATA			
FIRST ENCOUNTERED NR			
DEPTH	HOUR	DATE	ELAPSED TIME
15.0'	NR	11/20	0 HR

METHOD OF ADVANCING BOREHOLE			
a	FROM	TO	
	0.0'	10.0'	
d	FROM	TO	
	10.0'	20.0'	

DRILLER	R. CARUSO
HELPER	C. SMART
INSPECTOR	C. POPPE
DATE STARTED	11/19/2012
DATE COMPLETED	11/19/2012

DEPTH	A	B	C	DESCRIPTION	Wn	REMARKS
	S-1	32 50/0.1		GRAY F/C GRAVEL-SIZED ROCK FRAGMENTS, SM SILT, SM F/M SAND	2.0	
5	S-2	11 4 4 5		BROWN CLAYEY SILT, TR TO SM M/C/F SAND, TR F/ GRAVEL	35.0	
	S-3	5 4 4 5			6.0	
	S-4	2 2 3 3			38.2	
10	S-5	4 3 5 4			40.2	
				GRAY SILTY CLAY, TR F/M SAND	49.5	
15	S-6	4 3 4				
						
20	S-7	3 4 4		END OF BORING AT 20'		
25						
30						
35						

NEW PROJECTS TEST BORING LOG 195651_TDI_CSX.GPJ SITE BLAUVELT.GDT 3/12/13

DRN.	TBT
CKD.	PWK

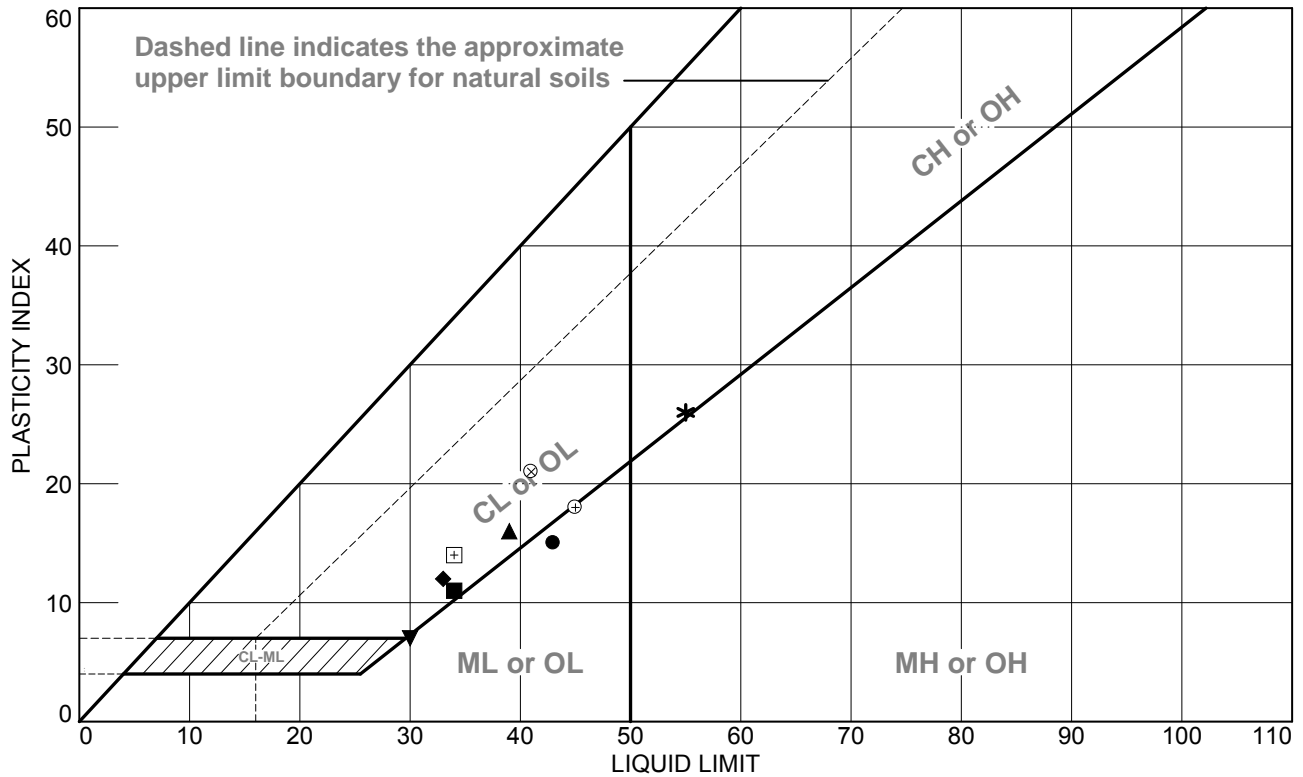


SUMMARY OF LABORATORY TEST DATA

Project Name: TDI Champlain Hudson Power Express – CSX
 Client Name: Transmission Developers, Inc.
 TRC Project #: 195651

SAMPLE IDENTIFICATION			Soil Group (USCS System)	GRAIN SIZE DISTRIBUTION				PLASTICITY				Specific Gravity	Moisture Content (%)	Unit Weight (pcf)	Compressive Strength (tsf)	Organic Content (%)
Boring #	Sample #	Depth (ft)		Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index					
	S-6	13.5-15.0	-	-	-	-	-	-	-	-	-	41.0	-	-	-	
B221.8-1	S-2	2.0-4.0	CL-ML	3.8	11.4	84.8		-	-	-	-	35.0	-	-	-	
	S-4	6.0-8.0	-	-	-	-	-	-	-	-	-	38.2	-	-	-	
	S-5	8.0-10.0	CL	5.5		33.9	60.6	41	20	21	1.0	2.78	40.2	-	-	-
	S-6	13.5-15.0	-	-		-	-	-	-	-	-	-	49.5	-	-	-
B222.0-1	S-2	2.0-4.0	ML	0.4	15.3	84.3		-	-	-	-	-	22.3	-	-	-
	S-3	4.0-6.0														
	S-4	6.0-8.0	-	-	-	-	-	-	-	-	-	2.8	-	-	-	
	S-5	8.0-10.0	GW-GM	71.1	17.8	11.1		-	-	-	-	-	3.5	-	-	-
	S-6	13.5-15.0														
	S-7	18.5-20.0	-	-	-	-	-	-	-	-	-	-	23.2	-	-	-

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	A219.05-1	S-6	13.5-15.0 FT	36.0	28	43	15	ML
■	B219.5-1	S-7	18.5-20.0 FT	28.3	23	34	11	CL
▲	B220.3-1	S-6	13.5-15.0 FT	34.8	23	39	16	CL
◆	B220.3-1	S-7 & S-8	18.5-25.0 FT	26.9	21	33	12	CL
▼	B220.7-1	S-4 & S-5	6.0-10.0 FT	15.4	23	30	7	ML
*	B221.5-1	S-4 & S-5	6.0-10.0 FT	34.3	29	55	26	CH
⊕	B221.5-1	S-9	28.5-30.0 FT	38.2	27	45	18	CL/ML
⊕	B221.6-1	S-3, S-4, & S-5	4.0-10.0 FT	38.8	20	34	14	CL
⊗	B221.8-1	S-5	8.0-10.0 FT	40.2	20	41	21	CL

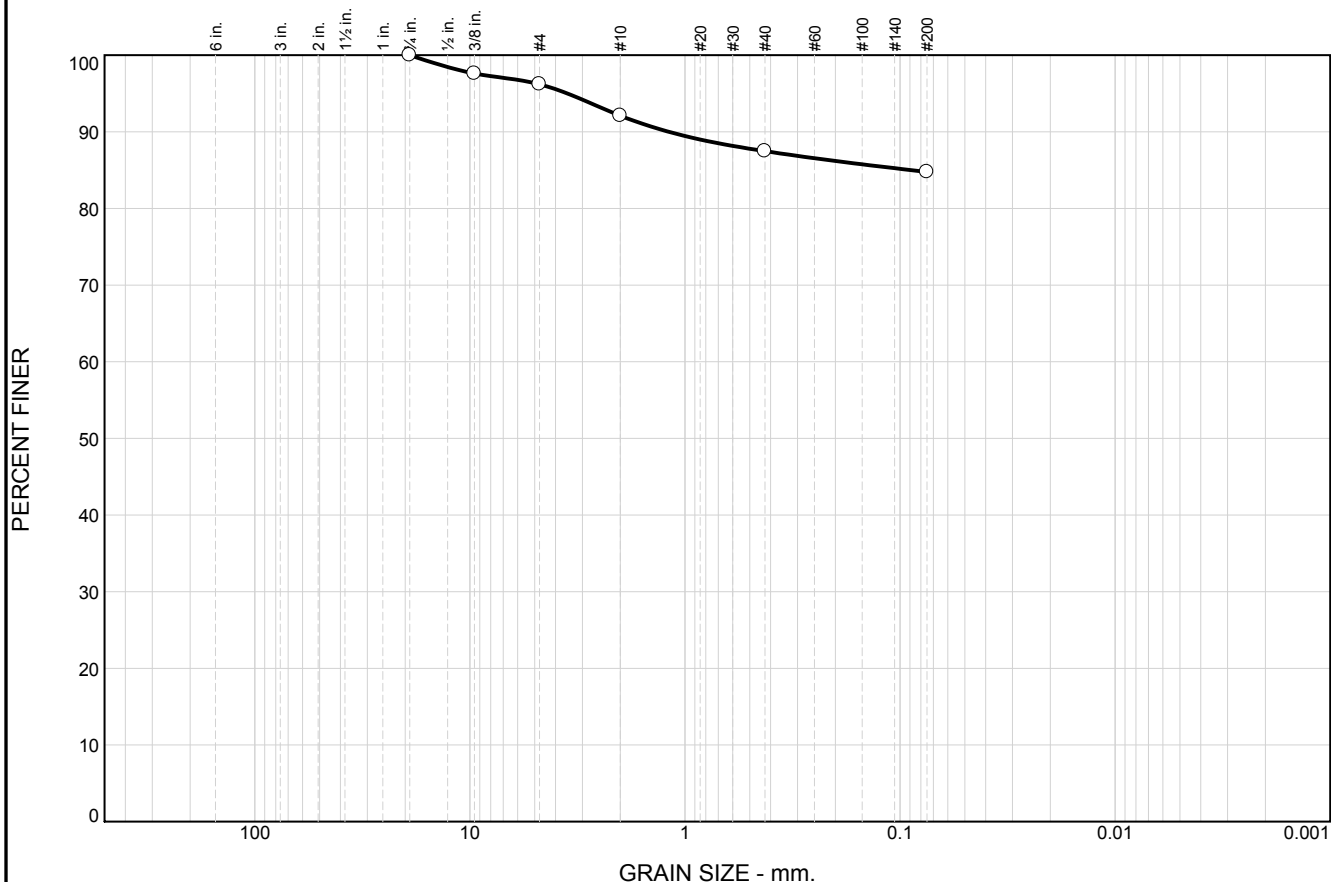
**TRC
Engineers, Inc.
Mt. Laurel, NJ**

Client: TRANSMISSION DEVELOPERS INC.
Project: TDI CHAMPLAIN HUDSON POWER EXPRESS - CSX

Project No.: 195651

Figure 8

Particle Size Distribution Report



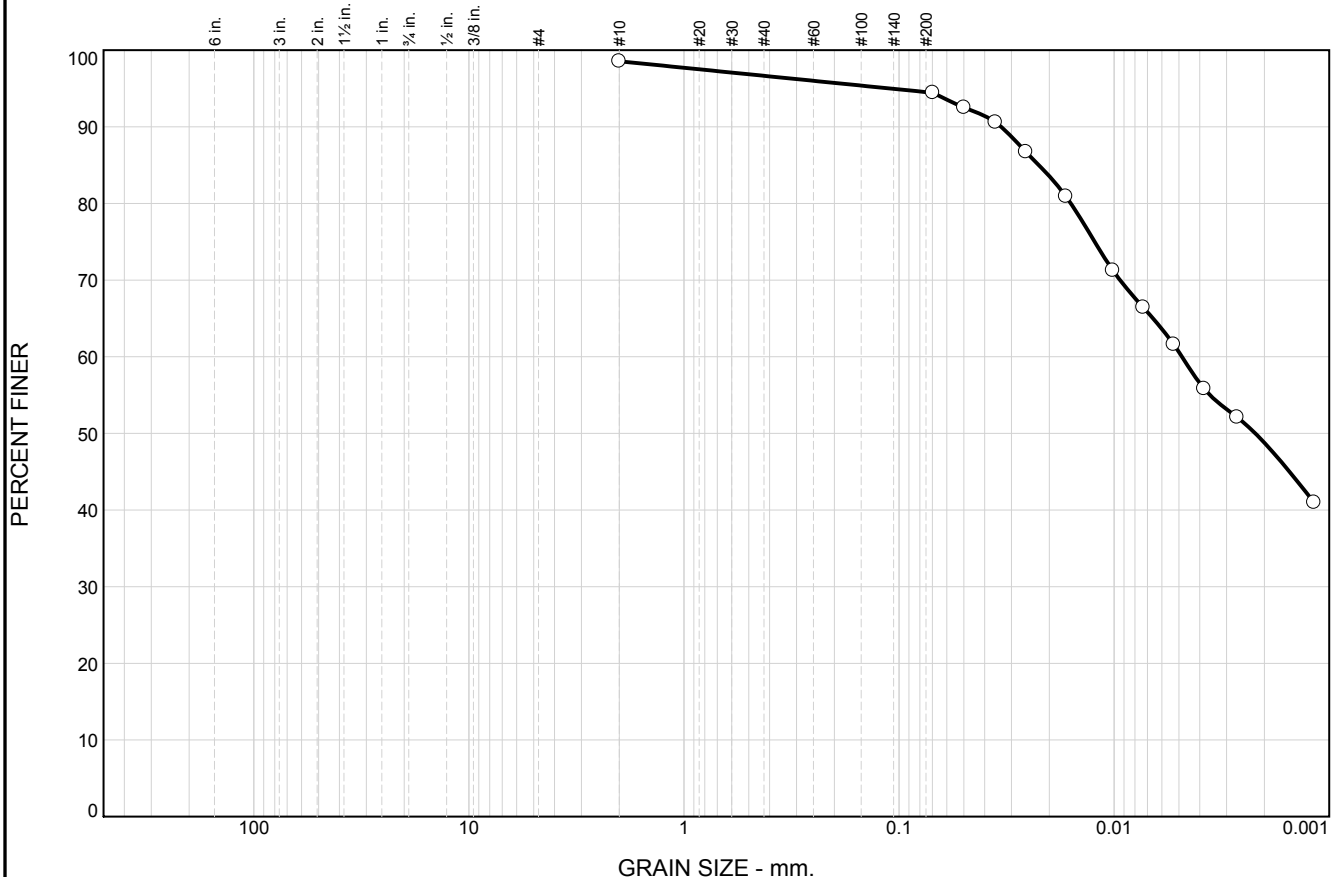
% +3"		% Gravel		% Sand			% Fines			
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay		
<input type="radio"/>	0.0	0.0	3.8	4.1	4.6	2.7	84.8			
<input type="checkbox"/>	LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
<input type="radio"/>			0.0887							

Material Description	USCS	AASHTO
<input type="radio"/> BROWN CLAYEY SILT, TR TO SM M/C/F SAND, TR F/ GRAVEL		

Project No. 195651 Client: TRANSMISSION DEVELOPERS INC. Project: TDI CHAMPLAIN HUDSON POWER EXPRESS - CSX <input type="radio"/> Source of Sample: B221.8-1 Depth: 2.0-4.0 FT Sample Number: S-2	Remarks: <input type="radio"/> SAMPLE DESCRIPTION BASED ON VISUAL IDENTIFICATION AND LABORATORY ANALYSIS
TRC Engineers, Inc. Mt. Laurel, NJ	Figure 122

Tested By: TBT 12/19/12 **Checked By:** JPB 03/12/13

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○				1.9	2.2	33.9	60.6

LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
○	41	20	0.0224	0.0048	0.0022				

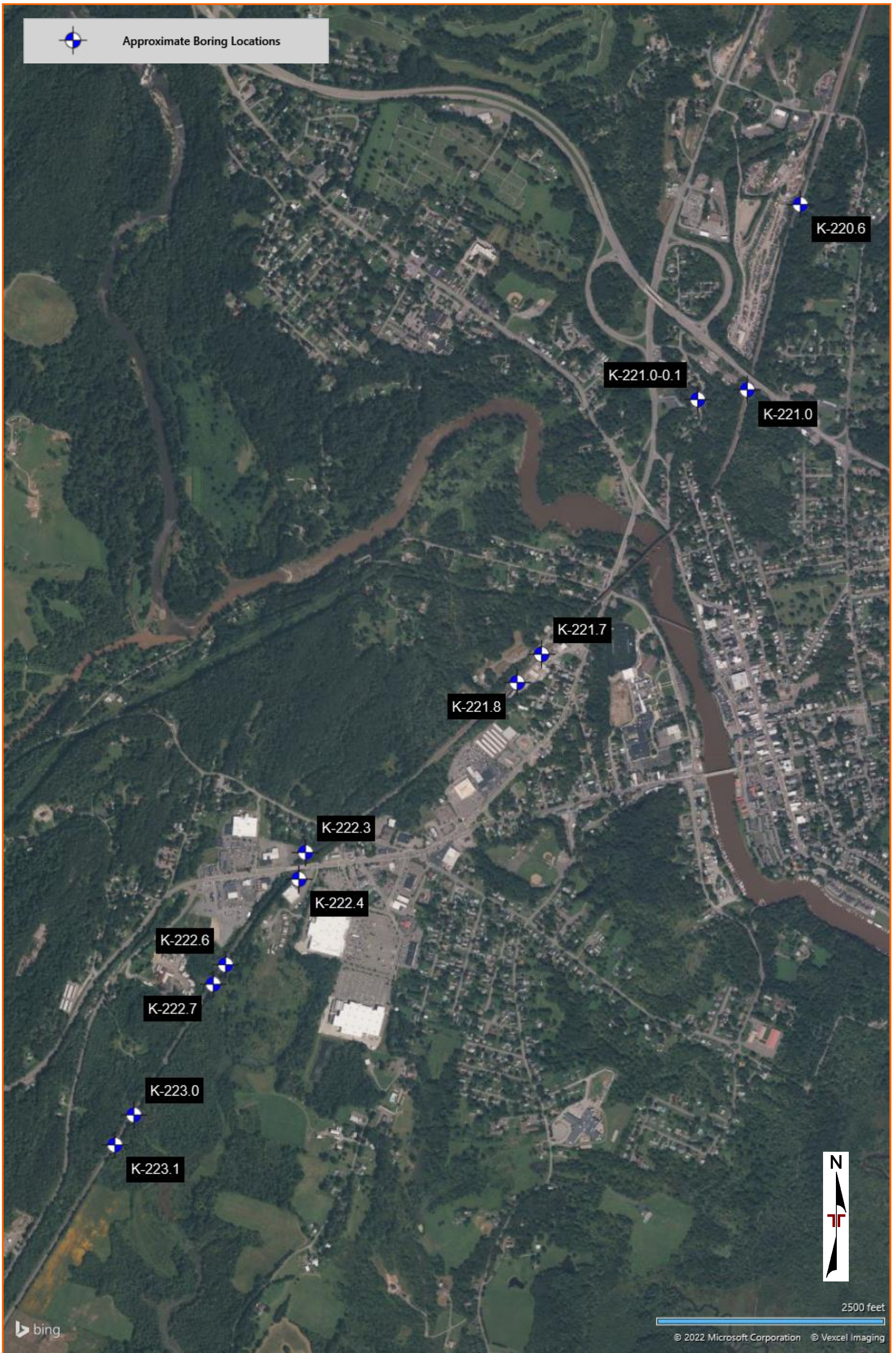
Material Description	USCS	AASHTO
○ GRAY SILTY CLAY, TR F/M SAND	CL	A-7-6(21)

<p>Project No. 195651 Client: TRANSMISSION DEVELOPERS INC.</p> <p>Project: TDI CHAMPLAIN HUDSON POWER EXPRESS - CSX</p> <p>○ Source of Sample: B221.8-1 Depth: 8.0-10.0 FT Sample Number: S-5</p>	<p>Remarks:</p> <p>○ SAMPLE DESCRIPTION BASED ON VISUAL IDENTIFICATION AND LABORATORY ANALYSIS</p>
<p>TRC Engineers, Inc.</p> <p>Mt. Laurel, NJ</p>	
<p>Figure 123</p>	

Tested By: TBT 12/20/12 **Checked By:** JPB 03/12/13

EXPLORATION PLAN

Champlain-Hudson Power Express Package 7a ■ Catskill, NY
May 23, 2022 ■ Terracon Project No. JB215256D



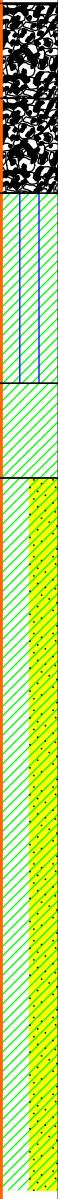
BORING LOG NO. K-221.8

PROJECT: Champlain-Hudson Power Express Package
7a

CLIENT: Kiewit Engineering (NY) Corp.

SITE: Champlain to Hudson HDD Crossings
Catskill, NY

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL - JB215256D CHAMPLAIN-HUDSON GRU TERRACON DATATEMPLATE.GDT 5/20/22

GRAPHIC LOG	LOCATION See Exploration Plan	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (in.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS		PERCENT FINES
	DEPTH ELEVATION (Ft.)							LL-PL-PI	PERCENT FINES	
	FILL - BALLAST WITH SAND , black, medium dense	97.5		X	20	6-8-6-12 N=14				
	FILL - CINDERS, CLAY AND SILT , black, medium stiff	95.5		X	15	9-5-3-3 N=8				
	SILT AND CLAY (CL-ML) , brown, very soft to soft	5		X	14	1-1-1-3 N=2				
		8.0		X	0	WOH-1-2-1				
	LEAN CLAY (CL) , brown, soft	91.5		X	0	2-1-2-1 N=3	40.2	37-19-18	91	
	LEAN CLAY WITH SAND (CL) , gray, very soft to soft	10		X	24	1-1-1-1 N=2				
	15		X	15	1-1-2-1 N=3					
	20		X	24	WOH-WOH-1-1	36.0				
	25									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4 1/4 HSA

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

Notes:

Logged By MO
Hammer Efficiency Summary:
Energy Transfer Ratio: 86.9% +/-2.2%
Hammer Efficiency Correction (CE):1.52
WOH = Weight of Hammer

Abandonment Method:
Backfilled with bentonite grout upon completion

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were provided by Kiewit.

WATER LEVEL OBSERVATIONS

No measurable groundwater prior to grouting



Boring Started: 03-15-2022

Boring Completed: 03-15-2022

Drill Rig: Mobile B-57

Driller: S. Kahn

Project No.: JB215256D

BORING LOG NO. K-221.8

PROJECT: Champlain-Hudson Power Express Package
7a

CLIENT: Kiewit Engineering (NY) Corp.

SITE: Champlain to Hudson HDD Crossings
Catskill, NY

GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 42.219928° Longitude: -73.875350°	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS	PERCENT FINES	
	Surface Elev.: 99.54 (Ft.) ELEVATION (Ft.)							LL-PL-PI		
<div style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: 8px; position: absolute; left: -20px; top: 50%; white-space: nowrap;">THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL. JB215256D CHAMPLAIN-HUDSON GRU TERRACON_DATATEMPLATE.GDT 5/20/22</div>	LEAN CLAY WITH SAND (CL) , gray, very soft to soft <i>(continued)</i>	30		X	24	WOH-WOH-WOH-WOH				
		35		X		WOH-WOH-WOH-WOH				
		40.0	35		X	1	WOH-WOH-1-2 3" Split Spoon With Ring Samplers	48.3	44-22-22	80
		59.5	40		X	24	WOH-WOH-WOH-WOH			
Boring Terminated at 40 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4 1/4 HSA

Abandonment Method:
Backfilled with bentonite grout upon completion

See [Exploration and Testing Procedures](#) for a description of field and laboratory procedures used and additional data (if any).

See [Supporting Information](#) for explanation of symbols and abbreviations.

Elevations were provided by Kiewit.

Notes:
Logged By MO
Hammer Efficiency Summary:
Energy Transfer Ratio: 86.9% +/-2.2%
Hammer Efficiency Correction (CE):1.52
WOH = Weight of Hammer

WATER LEVEL OBSERVATIONS

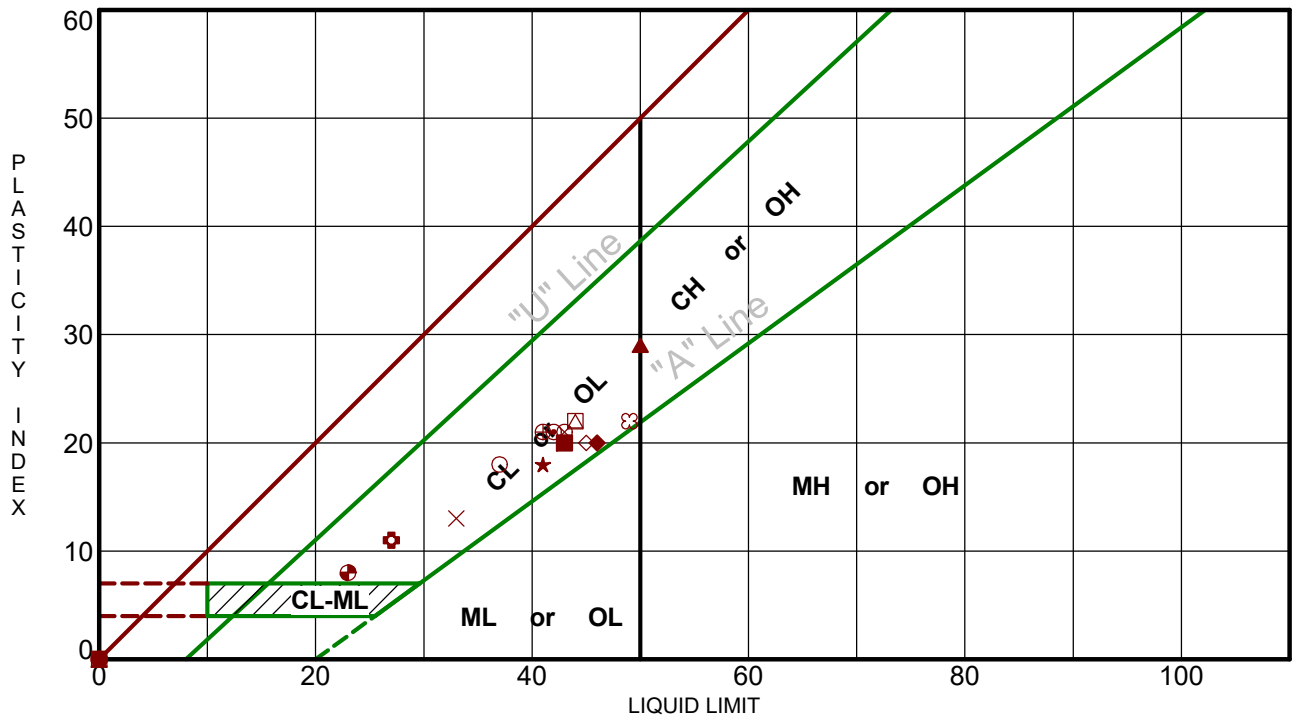
No measurable groundwater prior to grouting



Boring Started: 03-15-2022	Boring Completed: 03-15-2022
Drill Rig: Mobile B-57	Driller: S. Kahn
Project No.: JB215256D	

ATTERBERG LIMITS RESULTS

ASTM D4318



LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. ATTERBERG LIMITS JB215256D CHAMPLAIN-HUDSON.GPJ TERRACON_DATATEMPLATE.GDT 5/12/22

Boring ID	Depth (Ft)	LL	PL	PI	Fines	USCS	Description
● K-220.6	6 - 8	NP	NP	NP	22.1	GM	SILTY GRAVEL with SAND
◻ K-220.6	13 - 15	NP	NP	NP	11.9	SW-SM	WELL-GRADED SAND with SILT and GRAVEL
▲ K-221.0	8 - 10	50	21	29	73.4	CH	FAT CLAY with SAND
★ K-221.0	23 - 25	41	23	18	89.8	CL	LEAN CLAY
⊙ K-221.7	10 - 12	42	21	21	93.6	CL	LEAN CLAY
⊕ K-221.7	33 - 35	27	16	11	58.8	CL	SANDY LEAN CLAY
○ K-221.8	8 - 10	37	19	18	91.3	CL	LEAN CLAY
△ K-221.8	35 - 37	44	22	22	79.7	CL	LEAN CLAY with SAND
⊗ K-222.3	6 - 8	43	22	21	59.8	CL	SANDY LEAN CLAY
⊕ K-222.3	10 - 12	41	20	21	69.6	CL	SANDY LEAN CLAY
◻ K-222.4	10 - 12	44	22	22	87.3	CL	LEAN CLAY
⊕ K-222.6	15 - 17	NP	NP	NP	6.5	GW-GM	WELL-GRADED GRAVEL with SILT and SAND
⊕ K-222.6	35 - 37	23	15	8	86.7	CL	LEAN CLAY
★ K-222.7	10 - 12	NP	NP	NP	25.3	GM	SILTY GRAVEL with SAND
⊗ K-222.7	25 - 27	49	27	22	76.3	CL	LEAN CLAY with SAND
■ K-223.0	10 - 12	43	23	20	58.5	CL	SANDY LEAN CLAY
◆ K-223.0	25 - 27	46	26	20	84.9	CL	LEAN CLAY with SAND
◇ K-223.1	15 - 17	45	25	20	71.3	CL	LEAN CLAY with SAND
× K-223.1	29 - 31	33	20	13	98.3	CL	LEAN CLAY

PROJECT: Champlain-Hudson Power Express Package 7a

SITE: Champlain to Hudson HDD Crossings Catskill, NY

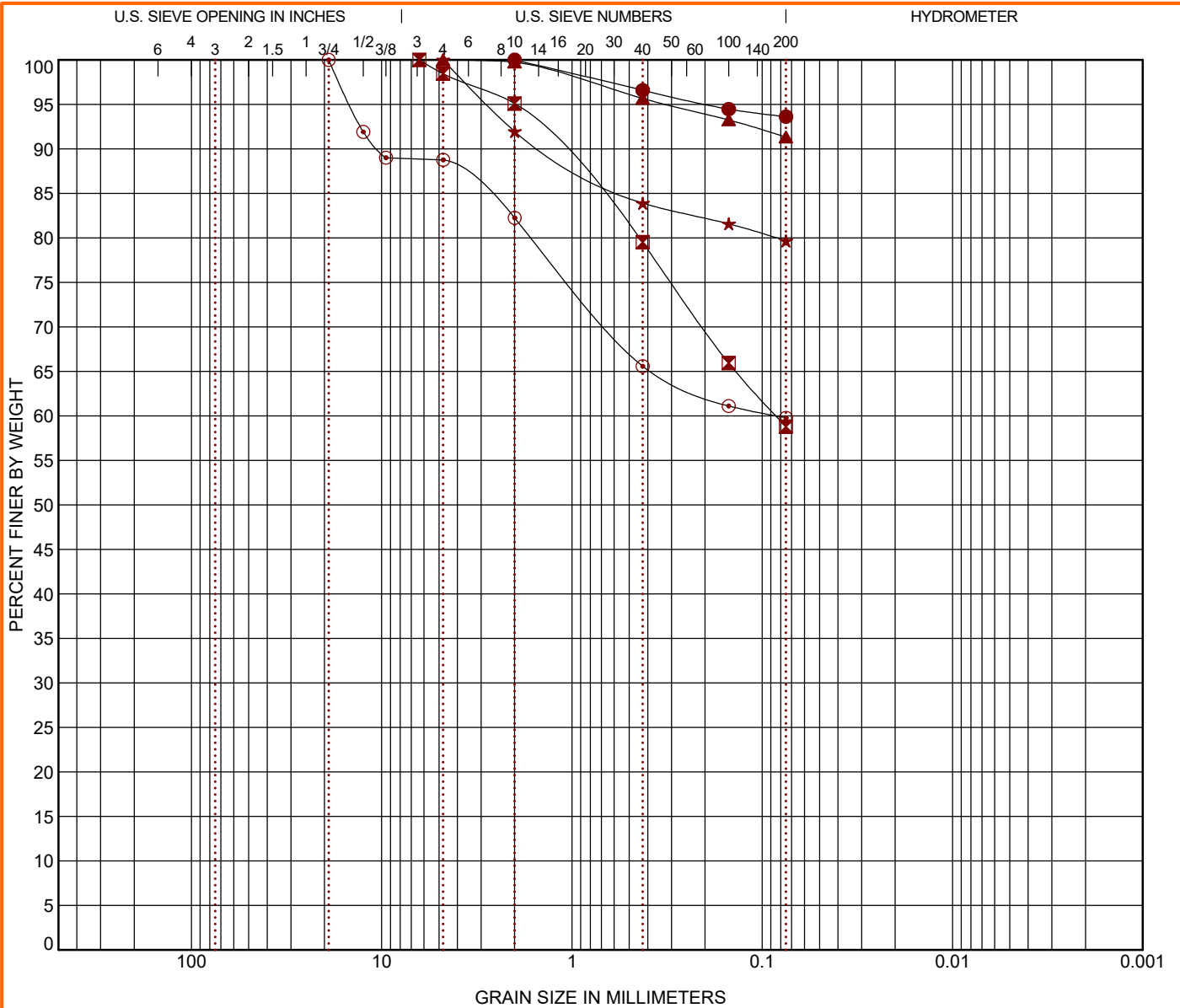


PROJECT NUMBER: JB215256D

CLIENT: Kiewit Engineering (NY) Corp.

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 JB215256D CHAMPLAIN-HUDSON.GPJ TERRACON_DATATEMPLATE.GDT 5/12/22

Boring ID	Depth (Ft)	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
● K-221.7	10 - 12	LEAN CLAY (CL)	41.7	42	21	21		
⊠ K-221.7	33 - 35	SANDY LEAN CLAY (CL)	23.8	27	16	11		
▲ K-221.8	8 - 10	LEAN CLAY (CL)	40.2	37	19	18		
★ K-221.8	35 - 37	LEAN CLAY with SAND (CL)	48.3	44	22	22		
⊙ K-222.3	6 - 8	SANDY LEAN CLAY (CL)	25.9	43	22	21		

Boring ID	Depth (Ft)	D ₁₀₀	D ₆₀	D ₃₀	D ₁₀	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
● K-221.7	10 - 12	2				0.0	0.0	6.4		93.6	
⊠ K-221.7	33 - 35	6.35	0.084			0.0	1.6	39.6		58.8	
▲ K-221.8	8 - 10	4.75				0.0	0.0	8.7		91.3	
★ K-221.8	35 - 37	4.75				0.0	0.0	20.3		79.7	
⊙ K-222.3	6 - 8	19	0.084			0.0	11.2	29.0		59.8	

PROJECT: Champlain-Hudson Power Express
Package 7a

SITE: Champlain to Hudson HDD Crossings
Catskill, NY



PROJECT NUMBER: JB215256D

CLIENT: Kiewit Engineering (NY) Corp.